YMF WACO F5 SERIES
MAINTENANCE MANUAL

YMFAMM-1

SECTION 1 RECORD of REVISIONS

1.1 REVISION LOG

LTR.	DATE	DESCRIPTION	PAGES AFFECTED
E	05/10/2010	Complete rewrite, reformatted, all pages.	1 through 31
F	02/08/2013	Sec. 7 Paragraph 7.2(c) Revised. Fig. 7.2 Added. Paragraph 7.4 added. New number of pages is 33.	2,23,24,28
G	06/20/2016	Sec. 10 revised. Form F-236 added	33
H	07/21/2017	Sec. 7 revised. Fig. 4 added Sec. 10 revised	30 33

Note:
Newly revised material is identified by a vertical line in the left margin of the paragraph of text affected.

SECTION 2 CONTENTS

2.1 TABLE of CONTENTS

SECTION 3 DEFINITIONS

3.1 TERMS:
Aeronautical terms used in this manual are as defined in CFR Title 14 Part 1, "Definitions and Abbreviations". Other terms used are defined as follows:

3.2 SPECIAL INSTRUCTIONS:
Information or instructions considered to be of special significance are annotated as shown below:

(a) **NOTE:** - Used to call attention to information or instructions of an advisory nature only. This information is enclosed in a box as shown below:

NOTE

(b) **CAUTION:** - Used to call attention to information or instructions which, if not followed, **could** lead to a non-airworthy condition or result in the airplane being operated outside of it's Approved Limits. This information is enclosed in a box as shown below:

CAUTION

(c) **WARNING:** - Used to call attention to information or instructions which, if not followed, **would** result in a non-airworthy condition. This information is enclosed in a box as shown below:

WARNING

3.3 SERVICE LETTERS:

Service Letters are issued by WACO Classic Aircraft Corporation as needed to provide additional maintenance information not included in the current revised maintenance manual or to alert owners and operators of service issues that if unaddressed could lead to an un-airworthy condition. Compliance with Service Letters is not mandatory but is strongly advised to insure the continued airworthiness of the affected aircraft. WACO Classic Aircraft will make every reasonable effort to make Service Letters available to all owners of record.

3.4 SERVICE INSTRUCTIONS:

Service Instructions are provided as needed to assist maintenance personnel with the installation of Service Kits or when a replacement part or assembly has been changed in such a way as to require additional information not included in the current revised Maintenance Manual.

SECTION 4 INTRODUCTION

4.1 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS:

In accordance with Federal Aviation Regulations (FAR) Part 23, Appendix G, this Maintenance Manual constitutes the Instructions for Continued Airworthiness for the YMF WACO F5 series aircraft manufactured by WACO Classic Aircraft Corporation and its predecessor Classic Aircraft Corporation and supersedes previous editions of the WACO Classic Service Manual as revised March 13, 2006 which is obsolete.

SECTION 5 GENERAL:

5.1 DESCRIPTION:

The WACO Classic Aircraft YMF WACO F5 series aircraft is a single engine, three place, open bi-plane seating two passengers in the front cockpit and a single pilot in the rear and having a conventional landing gear arrangement. The fuselage frame and tail surfaces are constructed of TIG welded 4130 steel tubing and the wings of premium aircraft grade Sitka spruce with 4130 steel fittings throughout. The fuselage frame is fitted with mahogany plywood formers and spruce stringers to give it shape. The entire aircraft is covered with Ceconite (Polyfiber) 102 Dacron fabric and finished according to WACO Classic Process Specifications with the standard finish color being PPG Urethane enamel. All models are equipped with a Jacobs 7 cylinder radial engine either carburetor or fuel injection equipped and with either a fixed pitch or constant speed propeller.

The following table lists the various models of the series.

MODEL DESIGNATION	SERIAL NUMBERS	MAXINUM GROSS WEIGHT	MODEL YEAR
YMF WACO F5A	F5001 THRU F5009	2650 Pounds	1986 to1987
YMF WACO F5B	F5010 THRU F5O36	2770 Pounds	1987to1991
YMF WACO F5C	F5C040 and Up	2950 Pounds	1991 and On

5.2 SPECIFICATIONS:

All models are manufactured in conformance with FAA Type Certificate Number ATC542 and Supplemental Type Certificate Number SA1000GL the details of which can be found by accessing the Type Certificate Data Sheet (TCDS) for the WACO Aircraft Company YMF at www.faa.gov. Although a summary of specifications is given here, the TCDS should always be consulted when making conformity determinations.

5.2.1 MODEL DESIGNATIONS:

Although Type Certificate Data Sheet ATC542 lists this series simply as the Model YMF F5 modification, modified by STC SA1000GL, for the purpose of clearly identifying to which aircraft an instruction or reference applies, the following model designations are used in this manual.

Model YMF WACO F5A (Approved March 10, 1986):

This model is the first of the series manufactured by Classic Aircraft Corporation of Lansing MI having a maximum gross takeoff weight of 2650 pounds, a Jacobs R755B2 engine and carry serial numbers F5001 through F5009. Although fitted with a Jacobs R755B2 engine rated at 275 HP at 2200 RPM, this model airframe is limited by propeller or placard to 245 HP and 1950 RPM at sea level.

CAUTION

ALTHOUGH A VARIETY OF PROPELLERS ARE ELEGIBLE FOR INSTALLATION ON THIS MODEL, IT SHOULD BE NOTED THAT THE 245 HP LIMITATION CAN BE EXCEEDED WITH A PROPELLER OF LESS THAN 96 IN. DIAMETER AND LESS THAN 72 IN. PITCH. IT IS THE OPERATOR'S RESPONSIBILITY TO INSURE THAT THE RPM AND HP LIMITATION IS NOT EXCEEDED.

Model YMF WACO F5B (Approved January 28, 1988):

This model is the second of the series manufactured by Classic Aircraft Corporation at Lansing MI, has a maximum gross takeoff weight of 2770 pounds and are identified by serial numbers F5010 through F5036. This model is fitted with a Jacobs R755B2 engine with a horsepower rating of 275 at 2200 RPM and is not HP limited.

Model YMF WACO F5C (Approved June 24, 1991):

The F5C is the third model of the series and has been manufactured in both Lansing and Battle Creek MI, first by Classic Aircraft Corporation and since 1997 by WACO Classic Aircraft Corporation. This version has a maximum gross takeoff weight of 2950 pounds and is powered by the Jacobs R755B2 engine rated at 275 HP at 2200 RPM and may be either carburetor or fuel injection equipped.

Model YMF WACO F5C-8 (Approved May 12, 2010):

The F5C-8 is a variation of the F5C with the optional Jacobs R755A2 engine rated at 300 HP at 2200 RPM installed either during manufacture or as a retrofit and may be equipped with either carburetor or fuel injection. Serial numbers F5C040 and up are eligible for this option and can be identified by a "-8" in the serial number (example F5C-8-121).

5.2.2 DIMENSIONS:

The general dimensions of the Models F5A and F5B are as follows:

WING SPAN (UPPER)	30 Ft. 0 In. (9.14M)
WING SPAN (LOWER)	26 Ft. 10 In. (8.18M)
LENGTH (OVERALL)	23 Ft. 4 In. (7.11M)
HEIGHT (OVERALL)	8 Ft. 6 In. (2.59M)

The general dimensions of the Model F5C are as follows:

WING SPAN (UPPER)	30 Ft. 0 In. (9.14M)
WING SPAN (LOWER)	26 Ft. 10 In. (8.18M)

LENGTH (OVERALL)	23 Ft. 10 In. (7.26M)
HEIGHT (OVERALL)	8 Ft. 6 In. (2.59M)

5.2.3 FLUID CAPACITIES:

FUEL SYSTEM:

All models have a standard fuel system capacity of 48 US Gal. (182 Litre) in two 24 gallon main tanks located in the center wing section above the front cockpit. One or two optional 12 US Gal. (45 Litre) tanks may be installed in the upper wings, one left or one right or both left and right, just outboard of the center wing section. These are connected to and feed directly into the respective adjacent main fuel tank outlet and cannot be individually selected.

ENGINE OIL SYSTEM:

The Jacobs engine is of the dry sump type with the lubricating oil being contained in a 4 (15 Litre) or 5 (19 Litre) gallon capacity tank mounted aft of the engine and forward of the firewall. The required engine oil capacity is established by regulation depending on fuel capacity. Airplanes equipped with a standard 48 gallon fuel system may have a 4 gallon oil tank and those with optional auxiliary fuel must have a 5 gallon oil tank.

HYDRAULIC SYSTEM:

The hydraulic system of all models consists of a hydraulically operated toe brake system. The reservoir is located on the left side of the engine firewall and has a capacity of approximately one pint.

5.2.4 FLUID GRADES:

FUEL (AVIATION):

All models require 80 Octane Aviation Gasoline minimum grade fuel.

ENGINE OIL:

All models require the use of only aviation grade engine oils, with or without ashless dispersant (AD). It is recommended that AD type oil be used to reduce sludge buildup. Single grade or multi-grade oils may be used. If single grade oil is used, the ambient temperature in which the engine will be operated should be considered as follows:

Ground Temperature	*Grade of Oil*
Above 50 Deg. F (10 Deg. C)	100 Saybolt or SAE 50
50 Deg. F to 20 Deg. F (10 C to -5 C)	80 Saybolt or SAE 40
Below 20 Deg. F (-5 C)	65 Saybolt or SAE 30

In very hot ground conditions or if the inlet oil temperature frequently exceeds 185 Deg. F (85 C), Grade 120 Saybolt (SAE 60) should be used.

HYDRAULIC FLUID:

The hydraulic brake system in all models requires the use of Mil-H-5606 Hydraulic oil (Red) or equivalent.

5.3 GROUND HANDLING

5.3.1 MOVING:

Always disengage the tail wheel steering mechanism before attempting to move the airplane by hand or by towing. This can be accomplished by moving the tail wheel steering control located on the left side of the rear cockpit to the forward position.

To move the airplane it is recommended that a suitable tug or tow vehicle be used with a spreader type tow bar attached to the tow rings provided on the inboard side of each main landing gear axel. An acceptable alternate method would be the use of a tail wheel type towing device such as the **Tail-Dragger Dragger**®. In selecting a tail wheel towing device it is important to insure that it will be low enough to not come in contact with the rudder when connected, will securely engage the tail wheel or strut without danger of unwanted disengagement and has the power needed to safely move a 3000 pound airplane considering the surface to be traversed. If no towing device or tug is available, the airplane can be moved by hand by gripping the front inter-plane strut at its base near the leading edge of the lower wing. It is recommended that two persons be used for moving by hand, one on each side, and, if possible, a third person at the tail in front of the horizontal stabilizer gripping the stabilizer spar at the base of the fin to assist in steering, taking care not to push against the fuselage, fin or stabilizer.

5.3.2 TAXIING:

CAUTION

IMPORTANT: GROUND RUN OPERATIONS SHOULD BE CONDUCTED ONLY BY PERSONNEL PROPERLY TRAINED AND EXPERIENCED IN THE OPERATION OF THIS TYPE AIRCRAFT!

Before attempting to taxi the airplane, ground personnel should be instructed and approved by a qualified person authorized by the owner. Engine starting and shut-down procedures as well as taxi techniques should be covered.

ENGINE STARTING PROCEDURES:

Before Starting Engine:

(a) Seat - Position and lock
(b) Seat belt and shoulder harness – Fasten

NOTE

For safety it is recommended that the seat belt and shoulder harness be fastened even for taxi and run-up operations

(c) Parking brake* - As needed *Refer to parking brake operating instructions below before using!
(d) All electrical switches and avionics - Off
(e) Fuel selectors - Both on
(f) Fuel quantity indicators – Check

Normal Engine Start - Carburetor Equipped:

(a) Battery master switch - On
(b) Light switches - As needed
(c) Ignition switch - "Bat Ign" position ("Off" if dual magnetos are installed)
(d) Mixture control - Full rich (forward position)
(e) Carburetor heat control - Off (forward position)
(f) Propeller control (if Hamilton Standard Propeller installed) - High pitch (Low RPM) full aft
(g) Throttle lever - Cracked (1/4 inch) open
(h) Engine primer pump - As needed (10 to 12 strokes for cold engine, (2 or 3 for hot engine)
(i) Starter - Engage

CAUTION

Do not pump the throttle to start. Fuel can collect in the air inlet and cause a fire hazard. If the engine does not start immediately, disengage the starter, wait 2 to 3 minutes and repeat the start procedure.

(j) Ignition switch - Both position after engine starts (Both after 2 – 3 revolutions if dual mags are Installed)
(k) Primer pump - As needed to keep engine running (cold weather)
(l) Primer pump - Lock closed when no longer needed
(m) Oil pressure - Check (30 PSI min within 15 sec) If no oil pressure within 30 sec shut down and check for cause.
(n) Propeller control lever (if Hamilton Standard prop installed) - After 30 sec. Move to full forward position

(o) Alternator field switch - On
(p) Avionics master switch - On
(q) Engine warm-up - 600 RPM for 30 seconds after start then 800 to 1000 RPM to warm up

Normal Engine Start Fuel Injection Equipped (Cold):

(a) Mixture control in idle cut-off position
(b) Set throttle to 1/8 open
(c) Master switch - ON
(d) Boost pump switch - ON
(e) Move mixture control to FULL RICH until fuel flow meter reads 4 to 6 GPH then immediately return mixture control to cut-off position
(f) Engage starter. When engine starts, move mixture control to full rich
(g) After start, to verify function of engine driven fuel pump, momentarily switch boost pump off and watch fuel flow gauge for possible loss of pressure.

Hot Engine Start Fuel Injection Equipped:

Use the same procedure as for cold starts except that the boost pump May be left off and step (e) eliminated

Engine Start Using External Power:

CAUTION

The airplane has a negative ground electrical system. Be sure the positive and negative leads are connected to the corresponding terminals of the power source. To prevent arcing at the power plug, no power is to be applied to the power cable while the connection is being made.

(a) Battery master, avionics, alternator, and all other electrical switches - Off
(b) External power unit - Off and connect
(c) External power unit - Output set to 24 Volts and On
(d) Battery master switch - On
(e) Engine - Start using normal procedures described above
(f) External power unit - Off and disconnect after engine is started

AFTER ENGINE START

(1) Before beginning to taxi, be sure the area in front of the airplane is clear of obstacles. It is advisable to initiate a slight turn to one side or the other as soon as practical to see this area. Taxi a few feet forward and apply the brakes to determine their effectiveness.
(2) While taxiing, make slight turns to ascertain the effectiveness of the steering. The tail wheel steering should be engaged for normal steering, however, it may be disengaged and the brakes and rudder used to make sharp turns.
(3) Observe wing clearance when taxiing near buildings or other stationary objects keeping in mind that the upper wings extend beyond the lower wings and the tips cannot be seen from the pilot's seat. If possible, station an observer outside the airplane.
(4) When taxiing over uneven ground avoid holes and ruts.
(5) Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones, gravel or any loose material that may cause damage to the propeller blades. It is also advisable to not taxi through aircraft tie-down areas except as necessary for parking to avoid the possibility of striking an unseen parked aircraft or chocks.

NOTE

REMEMBER – FORWARD VISIBILITY IS LIMITED. USE EXTREME CAUTION WHEN TAXIING

5.3.3 PARKING:

* Parking Brake Operating Instructions:

1. To apply the parking brake:
   (a) Apply brakes by depressing toe brake pedals
   (b) Pull parking brake control "T" handle out

NOTE

Initial brake application pressure should be only enough to allow the control handle to be pulled out. Keep in mind that to release the parking brake, more pressure must be applied than was initially used, and that any brake application while the control handle is out traps additional pressure in the system. It is possible to accumulate enough pressure in the brake system so that the parking brake cannot be released. If this condition occurs, the pressure must be relieved by loosing the brake hose fitting at each brake caliper. Retighten after the parking brake valve has been returned to the off position.

2. To release the parking brake:

CAUTION

Do not push the parking brake control "T" handle in before applying brake pressure. Doing so can bend the control cable resulting in the control valve not being moved completely to the off position. Subsequent brake operation could result in unwanted parking brake application.

(a) Apply brake pressure by depressing toe brake pedals firmly
(b) Push the parking brake control "T" handle in

When parking the airplane, be sure that it is sufficiently protected from adverse weather conditions and that it presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is suggested that it be moored securely, into the wind if possible. If the parking brake is set, follow the instructions above.

CAUTION

Brakes should not be set when overheated or during cold weather when accumulated moisture may freeze a brake

Aileron and elevator controls should be secured with the aft seat belt and chocks used to properly block the wheels.

5.3.4 MOORING

The airplane should be moored for immovability, security and protection. The following procedures should be used for the proper mooring of the airplane.

(1) Head the airplane into the wind if possible.
(2) Immobilize the ailerons and elevators by looping the seat belt around the control stick and pulling it snug.
(3) Block the wheels.
(4) Secure tie-down ropes to the wing tie-down rings and to the tail wheel fork at approximately 45 degree angles to the ground. When using rope of non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

CAUTION

Use bowline knots, square knots or locked slip knots. Do not use plain slip knots.

NOTE

Additional preparation for high winds include using tie-down ropes from the propeller shaft and securing the rudder.

(5) Install a pitot head cover if available. Be sure to remove the pitot head cover before flight.

5.3.5 JACKING:

To raise the aircraft for landing gear servicing or weighing, jack point sockets are located just forward of the main landing gear legs and access is attained by removing the small round covers in the lower fairings. Insert the 5/8" jack point fitting into the socket and place the jack under it to hold it in place. The jacks may be used individually for lifting one wheel or together when raising both wheels simultaneously. The tail may be raised by jacking under the horizontal bushing located at the extreme aft end of the fuselage under the tail post. On some aircraft it is necessary to remove the lower tail fairing to gain access to the horizontal bushing.

WEIGHING THE AIRPLANE

The airplane is to be weighed in the level flight position. This necessitates an elevated platform on which to rest the scale for the tail wheel. The airplane should be first brought onto the main wheel scales either by jacking or rolling into position and then lifting the tail onto the elevated tail wheel scale. The airplane must be leveled horizontally and should be as level laterally as practical. The horizontal leveling means is the top longeron under the horizontal stabilizer (see Figs. 5-1, 5-2) and the rear cockpit floor can be used to level laterally. Aircraft serial numbers F5C120 and up have leveling lugs located under the left horizontal stabilizer. These can be accessed by temporarily replacing the two truss head machine screws found there with screws of the same size but long enough to allow a leveling device to rest upon them both (see Fig. 5-3).

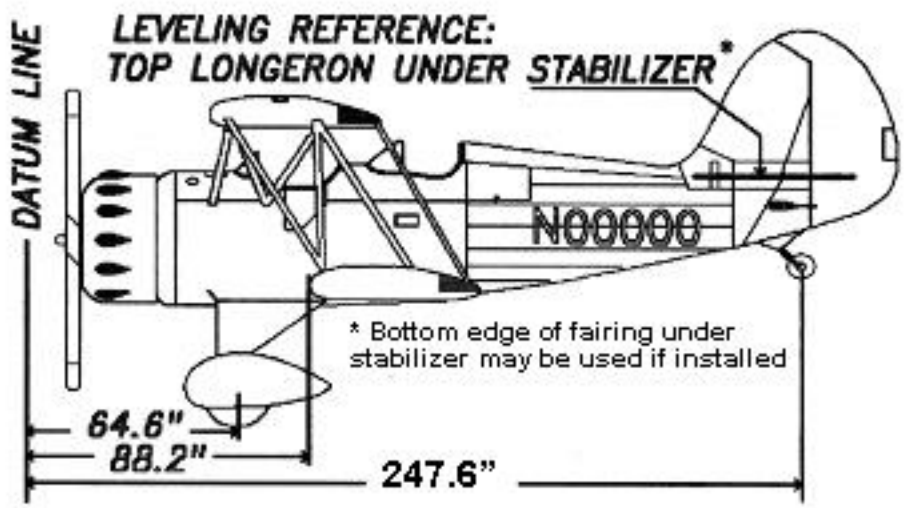


Fig. 5-1
Serial Numbers F5001 through F5036

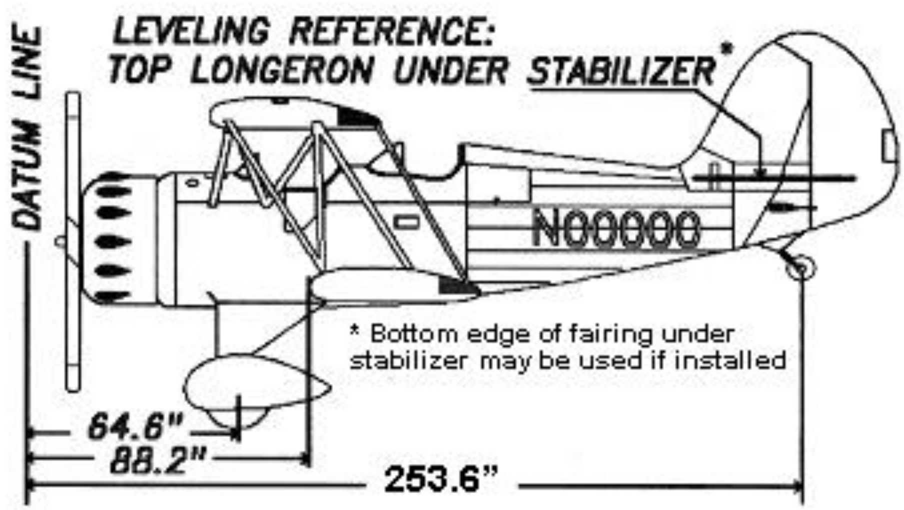


Fig. 5-2
Serial Numbers F5C040 and Up

Fig. 5-3

5.3.6 CARE OF THE AIRPLANE

Your WACO airplane is a piece of fine machinery and is deserving of care and attention. When not in use it should be stored in a hangar as near dustproof, weatherproof and fireproof as is available. The finish of an airplane deteriorates much faster when out in the weather than when properly sheltered.

CLEANING THE AIRPLANE

It is desirable to keep the airplane clean both inside and outside at all times. We advise the use of petroleum solvent for cleaning the airplane finish only when it is absolutely necessary to remove grease spots. The best method of cleaning the airplane is to use warm water and mild detergent, washing a spot of about three square feet at a time and rinsing immediately afterward. Begin at the upper surface of one of the top wings and wash that wing, both upper and lower surface, working in from the tip and across to the other side. Then wash fuselage; tail surfaces and lower wing and lastly, landing gear. After completely washing and rinsing one surface, say one complete wing, if a chamois is available, go over the surface with chamois, which will add to the smoothness and luster of the finish.

While washing the airplane, one has a good opportunity to inspect the vent grommets along the lower side of the trailing edge of wings and tail surfaces. These vents should be kept open at all times and it is well to make sure these are open by sticking a small instrument, such as a match or something of that nature, through the holes as you come to them while washing. Care should be taken to keep water off the engine and also out of the cockpits. For the leather interior and coaming wraps, we recommend a good grade of saddle soap be used to keep the leather clean and pliable.

SECTION 6 AIRFRAME

6.1 FUSELAGE

The Federal Aviation Administration (FAA) occasionally publishes Airworthiness Directives (ADs) that apply to specific groups of aircraft. They are mandatory changes and are to be complied with within a time limit set by the FAA. When an AD is issued, it is sent to the latest registered owner of the affected aircraft and also to subscribers of the service. The owner should periodically check with his/her A&P mechanic for the latest issued AD against the aircraft and accessories.

One hundred hour inspections are required by law if the aircraft is used commercially. Otherwise this inspection is left to the discretion of the owner. This inspection is a complete check of the aircraft and its systems, and should be accomplished by a qualified aircraft and powerplant mechanic who owns or works for a reputable repair shop. The inspection is listed, in detail, in the inspection report of the appropriate service manual.

An annual inspection is required once a year to keep the Airworthiness Certificate in effect. It is the same as a 100-hour inspection except that it must be signed by an Inspection Authorized (IA) mechanic or a Flight Standards District Office (FSDO) representative. This inspection is required whether the aircraft is operated commercially or for pleasure.

For all information regarding engine operation, servicing and maintenance refer to the Jacobs Operators Manual. For all other accessory items such as instruments, radios, strobe lights, etc., refer to their respective manufacturer's service manuals. Items needing repair or overhaul should be returned to the manufacturer or an approved repair station.

6.2.1 INSPECTION PERIODS

An inspection schedule check list form can be found in Section 10 of this manual and should be used to perform the following inspections.

(A) 50 Hour Maintenance Schedule – Every 50 hours

(1) Engine check. (See Jacobs Operators Manual in Section 10)

(2) Oil in engine should be changed every 50 hours or less with the oil of viscosity and grade defined in Section 3 of Jacobs Operators Manual.

(3) Inspect gasoline gauges, and if sediment or water has accumulated in the bottom, remove it by opening the valve at the bottom of the gauge or by removing the gauge from the tank and shake the sediment out through the top. In extreme cases it may be necessary to remove and disassemble the gauge and then the gauge can be cleaned with a small bottle brush. Care must be taken when reinstalling the drain valve as to not over tighten. For the plastic type gauge see fuel gauge installation instruction sheet in Section 7 of this manual.

(4) Clean gasoline strainer.

(5) Make it a practice to keep the entire airplane clean inside and outside, this will greatly facilitate inspection.

(6) Inspect airplane carefully and at the same time use light oil and lubricate moving parts on control system such as aileron and tail hinges, aileron strut connections, etc. (See Lubricant Chart).

(7) Brake Service – The brake system is filled with MIL-H-5056 (petroleum base) hydraulic brake fluid. The fluid level should be checked periodically or at every 50 hour inspection and replenished when necessary. The brake reservoir is located on the left lower firewall in the engine compartment. If the entire system must be refilled, fill with fluid under pressure from the wheel end of the system. This will eliminate air from the system.

No adjustment of the brake clearances is necessary. If, after extended service, brake blocks become excessively worn, they should be replaced with new segments. See Parker Hannifin Maintenance Sheets in Section 7 of this manual for details.

(8) Check tire inflation and condition. Keep 7:50 x 10 tires inflated to 30 P.S.I. Keep 10" tail wheel tire inflated to 60 P.S.I. When checking tire pressure, examine the tires for wear, cuts, bruises and slippage. Replace when required.

The main wheel tires are 7:50 x 10, 6 ply with tubes. The tail wheel tire is 10 x 3.5 x 4 with tube.

(9) Battery Service – Access to the battery is obtained by removing the cover in the top cowl and removing the cover of the battery box. Check the drain tube to see that it is open and draining properly. Check the box for condition; clean and paint as required.

The battery should be checked for proper fluid level. DO NOT fill the battery above the baffle plates. DO NOT fill the battery with acid – use only water. A hydrometer check will determine the percent of charge in the battery. Reinstall box cover and safety. Reinstall cowl cover.

If the battery is not up to charge, recharge starting at a 4 amp rate and finishing with a 2 amp rate. Quick charges are not recommended.

(10) Induction Air Filter Service – The dry type of air filter must be inspected at least

every 50 hours, and more often, even daily, when operating in dusty conditions. The filter is disposable and inexpensive and a spare should always be kept on hand for a rapid replacement.

(a) Removal of Engine Air Filter

The filter is located in the lower front of the engine cowl and is accessible in the chin scoop intake with the cowling intact. It may be removed by the following procedure:

(1) Remove spring pin from top of filter.

(2) Remove the filter from intake opening.

(b) Cleaning Engine Air Filter

(1) Tap the filter gently to remove loose dirt particles, being careful not to damage the filter. DO NOT wash the filter in any liquid. DO NOT attempt to blow out dirt with compressed air.

(2) If the filter is excessively dirty or shows any damage, discard it and replace it immediately.

(3) Wipe the filter housing with a clean cloth.

(c) Installation of Engine Air Filter

(1) After cleaning or when replacing the filter, install the filter in the reverse order of removal.

(11) Propeller Service – Clean propeller with water and mild detergent. Inspect blades and tipping for damage and repair as required. The complete propeller and hub should be waxed periodically. Whether prop is wood or metal, it should occasionally be checked for balance, leading edge repairs and generally reconditioned. It is suggested that it be returned to the propeller factory for reconditioning. For additional service instructions, see Sensenich instruction sheets or MT-Propeller maintenance instructions, as applicable, in Section 10 of this manual.

(B) 100 Hour Inspection – Every 100 Hours

(1) Give airplane a regular 50 hour check as outlined above.

(2) Remove weight from one side of the landing gear at a time so that the wheels can be tested for play in the splined section of the oleo struts. The allowable play is movement of ½ inch from extreme toe-in position to extreme toe-out position on each wheel at outer circumference of tire. When play exceeds this, install new bronze splined bushing.

(3) Check the oil in oleo shock struts as described elsewhere in this manual. If excessive leakage of the oleo is found, it is recommended to remove the strut and service per instructions in the maintenance section of this manual.

(4) Service wheels and brakes per Parker Hannifin Maintenance Procedure sheets in Section 10 of this manual.

(5) Raise tail of airplane and support with a horse or something of that nature at the tail post, making sure that it is protected with a pad. Remove tail cowl, which is screwed to bottom of fuselage to keep dirt out. Now, carefully inspect the tail wheel mechanism for wear and play. It is suggested that the entire mechanism be cleaned thoroughly and re-lubricated.

Lubricate tail wheel fork support and tail wheel shock strut, both of which are supplied with a zerk fitting, the fitting on the shock being just inside the fuselage. This fitting can be reached through the aluminum cowling at the bottom of the fuselage, which is screwed to the bottom of the fuselage.

(6) Test leading edge of stabilizer for play in stabilizer bearing. If there is play, remove tail cowl and take up play by removing shims from the socket, which holds the threaded ball to the stabilizer.

(7) If stabilizer works hard with tail cowl removed, clean threads on long adjustment screw thoroughly and then lubricate with heavy oil or cup grease. If stabilizer cable is slipping, there is an adjustment to take up play in the stabilizer cable. Tighten until slipping is prevented.

Remove metal pan at bottom of fuselage just behind the motor cowling and check controls, cables and parts. If the ship has been flown from a dry, dusty airport and these controls are covered with grit, clean them thoroughly with solvent removing all grit and then lubricate per Lubrication Chart. Where cables go around the pulleys, check to make sure they have not frayed. This can easily be detected by moving the hand carefully over the control cables. If they are frayed, there will be sharp ends of wire sticking out at the frayed point.

(8) Inspect fire extinguisher mounting and check for proper pressure (if installed)

(9) Carefully inspect the entire ship removing inspection plates where necessary.

A Progressive Maintenance Program can be approved by the FAA. It involves routine and detailed inspections at 50-hour intervals. The purpose of the program is to allow maximum utilization of the aircraft, to reduce maintenance inspection cost and to maintain a maximum standard of continuous airworthiness. Complete details are available from your A&P mechanic.

(C) Preventative Maintenance

(1) The holder of a Pilot Certificate issued under FAR Part 61 may perform certain preventative maintenance described in FAR Part 43. This maintenance may be performed only on an aircraft, which the pilot owns or operates and which is not used in air carrier service. The following is a list of maintenance which the pilot may perform:

(a) Repair or change tires and tubes.
(b) Service landing gear wheel bearings, such as cleaning, greasing or replacing.
(c) Service landing gear shock struts by adding oil.
(d) Replace defective safety wire and cotter keys.
(e) Lubrication not requiring disassembly other than removal of non-structure items such as cover plates, cowling or fairings.
(f) Replenish hydraulic fluid in the hydraulic reservoir.
(g) Refinish the exterior or interior of the aircraft (excluding balanced control surfaces) when removal or disassembly of any primary structure or operating system is not required.
(h) Replace side windows and safety belts.
(i) Replace seats or seat parts with replacement parts approved for the aircraft.
(j) Replace bulbs, reflectors and lenses of position and landing lights.

(k) Replace cowling not requiring removal of the propeller.

(l) Replace, clean or set spark plug clearance.

(m) Replace any hose connection, except hydraulic connections, with replacement hoses.

(n) Replace prefabricated fuel lines.

(o) Replace the battery and check fluid level and specific gravity.

(2) Although the above work is allowed by law, each individual should make a self-analysis as to the ability to perform the work. If the above work is accomplished, an entry must be made in the appropriate logbook. The entry should contain:

(a) The date the work was accomplished.

(b) Description of the work.

(c) Number of hours on the aircraft.

(d) The certificate number of pilot performing the work.

(e) Signature of the individual doing the work.

(D) Airplane Alterations

(1) If the owner desires to have the aircraft modified, FAA approval must be obtained for the alteration. Major alterations accomplished in accordance with the Advisory Circular 43.13-2, when performed by an A&P mechanic may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

(2) The owner or pilot is required to ascertain that the following aircraft papers are in order in the aircraft:

(a) To be displayed in the aircraft at all times:

(1) Aircraft Airworthiness Certificate Form FAA-8100-2.

(2) Aircraft Registration Certificate Form FAA-8050-3.

(3) Aircraft Radio Station License if transmitters are installed.

(b) To be carried in the aircraft at all times:

(1) Pilot's Operating Handbook.

(2) Weight and Balance data plus a copy of the latest Repair and Alteration

Form FAA-337, if applicable.

(3) Although the aircraft and engine logbooks are not required to be installed in the aircraft, they should be made available upon request. Logbooks should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

(E) Fabric Covering and Finish

This aircraft as covered by WACO Classic Aircraft Corporation use the Ceconite 102 fabric and Randolph Butyrate Dope System. In this covering system, the Ceconite 102 fabric is attached to the airframe with Ceconite Super Seam cement and then heat shrunk to the desired tautness with an electric clothes iron. The fabric is then primed for doping by brushing on two coats of G-6302 Rand-O-Proof Primer, followed by a spray coat of W-8350 Non-Tautening Clear Butyrate Dope. At this time the rib stitching is done and then the protective grade A cotton pinked tapes, reinforcing patches, inspection rings and drain grommets are applied using 9701 Tautening Clear Butyrate Dope as the adhesive. After allowing the dope to dry, the surface is sanded to remove rough tape edges, brush marks, etc., followed by four spray coats of W-8350 clear dope, sanding as required between coats.

To protect the fabric from the deteriorating effects of sunlight, three spray coats of silver dope are applied. The silver dope is prepared by adding 2 ½ to 3 ounces of silver paste to each gallon of unthinned W-8350 dope. The silver dope is thinned as necessary for spraying. A spray coat of white butyrate dope is applied as a final step in the dope system, which prepares it for the finish paint of the customers' choice. WACO Aircraft Serial Numbers F5001 through F5C096 have been finished with Dupont Imron Polyurethane Enamel. Serial numbers F5C097 and up have been finished with PPG Delta Polyurethane Enamel.

The finish is very durable and requires only washing to retain its original shine. When washing, flush off the abrasive dust and dirt using flowing water and a sponge or soft cloth. Then wash with mild detergent to remove grease and surface deposits. Rinse with clean water to remove detergent residue and wipe dry with a soft towel or chamois.

If the dope or Ceconite surface is damaged it should be repaired immediately. Small cracks in the dope can be sealed by carefully feeding thin cyanoacrylate instant glue into the crack until the crack is filled. This reattaches the dope to the fabric and seals the crack. The crack can then be sanded and repainted in the usual manner. Care must be used to mask the adjoining areas as any glue drips or runs will instantly mark the surface.

When a repair requires doping, all of the enamel must be sanded off of the area where dope will be applied because the dope will not bond to the enamel.

Small holes or tears may be repaired with a patch cut from a three-inch cotton pinked tape or cotton cloth. Patches should be cut out with pinking shears, large enough to extend 12 ½ inches beyond the edges of the repair. The patch should be cemented in place with Ceconite Super Seam Cement and then finished with the original dope and paint schedule.

Larger patches and replacement panels must be Ceconite 102 fabric cemented in place using Ceconite Super Seam Cement with 1 ½ inch edge lap. After the cement has dried, shrink the patch to the desired tautness and then apply two coats of G-6302 Ran-O-Proof Primer and one coat of W-8350 Butyrate Dope. The edges of the patch should be covered with two inch pinked tape and then the patch should be finished with the original dope and paint schedule.

When panels between ribs must be replaced, cut the fabric one inch inside the rib nearest the damaged portion and carry the patch over and beyond the rib by three inches. The replacement panel must extend over the leading edge and back to the front spar and the other lapped over the trailing edge. When the replacement panel extends over ribs, apply reinforcing tape and rib stitch it, without disturbing the old rib stitching. All large patches and replacement panels shall be taped over all edges and refinished per the original dope and finish schedule.

6.2 LANDING GEAR

(A) Landing Gear Oleo Shock Struts

These shock struts are so constructed that initial landing shock is absorbed by the oleo action before the piston reaches the shock spring at the top of the strut. Taxi shocks are absorbed by this coil spring in combination with the normal oleo action of the strut.

You will note there is practically no rebound after the initial impact with the ground in landing, as this initial impact is taken entirely by the oleo action of the strut.

Very little maintenance is required. It is suggested, however, that the oil level be checked EVERY 100 HOURS, if the ship is in regular service.

If excessive oil leakage occurs, the struts should be dismantled completely and each part cleaned with solvent. Each part should be inspected and all worn parts, if any, should be replaced. The struts when reassembled should be filled with new oil.

Instructions on Filling Shock Struts

(1) Remove lock wire locking 1/8" pipe plug at upper end of shock strut and remove plug.

(2) With strut compressed to contact spring, add oil until it is within 3 ½" of the plug opening. Use MIL-H-5056 petroleum base hydraulic fluid. Cycle strut to fill air pockets, recheck fluid level.

(3) Replace plug securely making sure to lock in place with lock wire.

(B) Instructions for Disassembling & Reassembling Shock Struts

(1) Remove top and bottom gear fairings.

(2) Drain oil into container having approximately one-quart capacity by removing the plug at the top of the strut and the plug at the lower end of splined axle.

(3) Remove brake cylinder and line from bracket at wheel. Unfasten the line from the strut but do not disconnect the brake line.

(4) Remove wheel assembly.

(5) Remove bolt attaching lower end of strut to cross brace strut, thereby permitting the strut to swing out so internal parts can be removed.

(6) Remove lock ring #14133 and back off nut #14132.

(7) Slip leather boot #12127 down off from grooved flange by removing the upper clamp, thereby permitting access to bolts. By removing these bolts and pulling on the axle the internal parts will slide out of the cylinder.

(8) Remove the lock wire which locks the aluminum retainer bearing #14135 and unscrew retainer bearing using a spanner wrench in holes provided for same. Care must be taken not to burr up the slots on this part, as this would cause scoring to the inside wall of the outer tube.

(9) Pull piston assembly #19234 from splined axle.

(10)Slide spring #12021, piston stop #15599 and retainer off from upper end of piston assembly.

(11) To assemble, insert piston assembly into splined axle taking care to get leather plunger inserted evenly all around and assemble in the opposite manner from disassembling. Attention is also drawn to be sure that all surfaces of inside of housing, spring, piston tube and splined strut tube are coated with cup grease before assembly. Apply Permatex "Form A Gasket" or equivalent to threads in #14135 piston retainer bearing when installing onto the splined strut. After assembly is completed, re-lubricate splined bushing with grease gun at zerk fitting provided. Refill oil as above.

6.3 EMPENAGE

(A) Tail Assembly and Rigging

Get the stabilizer right side up, which will place the ball nut on bottom, and flange pointing downward. First, screw this ball nut on the threaded bolt, which will be done by having one man in the airplane work the stabilizer adjustment which will turn the bolt, and let another man hold the stabilizer properly aligned so the threads will start. When the nut has been screwed down to a neutral position, attach the rear of the stabilizer to the fuselage.

The elevator control cables can now be connected, making sure to attach correct cables to the top and bottom of the elevator horn. Adjust the elevator cables and position of the elevators by the turnbuckles, being careful to not let over two threads form either end of the turnbuckle barrel show after adjustment. When properly adjusted, set cable tension to 25 +/- 5 pounds.

The elevator control travel should be adjusted as follows: Set the stabilizer trim to the full nose down position. Align the elevator with the stabilizer as viewed from the end. The elevator balance area should align with the end rib of the stabilizer when in this position. This is considered the neutral position for establishing the elevator travels. For aircraft without a down stop at the elevator horn, the down travel should be 27 +/- 5 degrees. Adjustment is made by changing the cable length with the turnbuckles as required to move the elevator to the desired position with the stick full forward. Reset cable tension and safety all components. The elevator up travel should be 33 +/- 2 degrees and may be adjusted by varying the length of the stop tube welded to the fin post.

For aircraft with a down stop at the elevator horn, set the down stop at 23 +/- 1 degree down and the up stop at 33 +/- 2 degrees up. Adjustment is made by varying the length of the stop tubes welded to the fin post. Then adjust the turnbuckles to position the control stick to the desired location. Reset cable tension and safety all components.

Install the fin by inserting the fin into the tail post, bolting it in place with a bolt just above the lower rudder hinge. Bolt the front of the fin to the bracket on the stabilizer support tubes.

Lubricate all working parts as detailed on Lubrication Chart. Inspect carefully all nuts and cotter keys and then install tail cowl, screwing in place using screws and holes provided for same.

Attach the top and bottom tail wires to the stabilizer. The bottom wire is the shorter one. The clip on the stabilizer end of the top tail wire is more nearly straight than that on the upper end. Tighten the tail wires, being careful that the stabilizer is kept straight. When properly adjusted, both bottom wires will be approximately the same length and both top wires the same length. Check by eye to see that the fin post is perpendicular to the top of the fuselage and the stabilizer is parallel to the top of the fuselage. Alignment of the rudder hinge bearings is controlled by the adjustment of the upper tail wires for side to side alignment and by varying the engagement in and out for fore and aft alignment. Using a straight edge along the side and back of the bearings, check the alignment and make any adjustments necessary. Set the upper brace wire tension to 500 +/- 50 pounds. Secure all check nuts and safeties. Add a drop of soft loctite to rudder hinge bearing shank threads after completing adjustments.

The rudder may now be attached to bearings on fin post. Attach the rudder cable turnbuckles to the rudder horn and adjust turnbuckles until rudder action from stop to stop gives comfortable pedal action.

The rudder should be checked for travels of 30 +/- 2 degrees right and left. If adjustment is required, vary the length of the stop tubes on the fin post as required. When the rudder rigger is complete, attach the tail wheel steering cables and again check operation. Lubricate all working parts to complete the installation.

6.4 WINGS

6.4.1 ASSEMBLY INSTRUCTIONS

Rights and lefts are determined while standing at the tail and looking toward the nose of the airplane.

Bolts and clevis pins should be installed with heads up, forward and outboard. Make it a practice to tighten the nut and insert the cotter key on each bolt as used, never leaving any finishing process to be done at a later date. This will avoid the possibility of leaving out the very important cotter keys.

(A) Wing Installation and Rigging

For the assembly and rigging of your airplane we recommend the following procedure:

Jack the airplane, remove the pants and wheels, then lower the axles onto secure blocking. Check the fuselage for level laterally by using a level across the cockpit floor. Adjust as required to level by shimming the blocking under the axles. All blocking must be solid and secure as some bumping and shaking will occur during wing installation.

Cabane Installation

Attach cabane struts to the eyebolts in the top longerons. Attach wing center section to the top of the cabane struts. Next, check to ascertain that the incidence is 0 degrees. To do this, compare the angle of the top fuselage longeron under the stabilizer with the bottom surface of the center section between the spars. They should be the same. If not, it will be necessary to adjust the center section angle by relocating the washers on the upper longeron eyebolts as required.

When the incidence is correct, secure all eyebolts and strut bolts. Next install the flying wires being sure to have both end fittings equally engaged. Hang a plumb line from each front wing attach fitting on the center section. Adjust the flying wires to center the center section over the fuselage. This is indicated by having equal distance between the plumb lines and the top longerons. Adjust the flying wire tension by turning both wires equal amounts until 1175/1300 pounds tension is attained. Check to ascertain that all flying wire end fittings have proper engagement. Lock all check nuts and recheck all safeties.

Wing Installation and Rigging

Place a padded support where the outboard end of the upper wing panel will be. Slide upper wing into center section attach fittings using care to enter the pitot tubes and harness into the proper place. Install wing attach bolts. Place a padded support where the outboard end of the lower wing will be. Slide the wing into place being sure to enter the aileron control rod into place. Install wing attach bolts. Install the landing wires being sure to have both end fittings equally engaged and adjust both wires equally to obtain 2 degrees of dihedral. Install the center inter plane strut. Adjust front inter plane strut to length required to hold upper wing at 0 degrees incidence measured on lower surface at the strut points between the spars to match the center section and then install. Adjust rear inter plane strut to hold lower wing at 0 degrees incidence measured on the lower surface at the strut points between the spars to match the lower surface at the butt rib between the spars and then install. Install the wings on the other side using the same procedure.

Install all three flying wires on each side being sure to have both end fittings equally engaged. Adjust all flying wires to the point where tension is just starting to build up. At this point, adjust the center flying wire to 1175/1300 pounds tension. Then adjust rear flying wire to 1175/1300 pounds tension. Now adjust front flying wire to 800/900 pounds tension. Check the tension in both landing wires and adjust by decreasing the tight wire and increasing the lower tensioned wire equal amounts until they are equal in tension. Recheck the flying wires to be sure they are still within tension tolerance. Recheck dihedral and incidence angels, making any final adjustment necessary. Check to ascertain that all flying wire and fittings have proper engagement. Tighten all check nuts and then recheck all cotter pins, lock nuts, check nuts, etc., for security and proper safeties.

Aileron Control Installation and Rigging

Block all ailerons in neutral position (aileron trailing edge aligned with the wing trailing edge). Block control stick in neutral (centered between cockpit sides). From underneath the airplane through the belly access panel, adjust the aileron push rod end fittings until the rod end fitting hold aligns with the control rod fittings and safety the bolts with a cotter pin. Tighten the check nuts on the push rod end fittings.

Next adjust the aileron interconnect strut end fittings for equal engagement of both ends and a length to provide a slip fit of the end attachment bolts through the aileron fittings with the strut in position. Be sure to install 11688 bushing in each fitting and install. Tighten all check nuts and recheck all safeties.

Remove the blocking from the ailerons and control stick. Check the aileron control system for free movement and proper operation. Set the up angular travel of both lower ailerons from neutral (trailing edge of aileron and wing aligned) to full up at 25 +/- 3 degrees. This is accomplished by changing the length of the stop tab located on the lower wing skin next to the aileron bell crank as required.

Lubricate the various working parts of the control system using engine oil. Controls will naturally be rather stiff on a new airplane until they have been worked in for a few hours.

Complete the installation of pitot and static lines, electrical harness, fuel system, fairings and access panels and covers.

If properly rigged, the airplane should fly in a normal course with “hands off” for an indefinite period in smooth air. However, if it should prove to be a little right wing heavy, for instance, this can be corrected by lengthening slightly the right rear inter plane strut, or if left wing heavy, the left rear strut.

SECTION 7 POWERPLANT

7.1 ENGINE COWLS

Proper maintenance is an essential requirement to get proper service and long life from the NACA cowl. At each engine check the felt pads should be carefully examined and kept in good condition to make sure there is no metal to metal contact between the cowl and the engine. We use deicer boot adhesive cement to make the felt pads adhere in their proper location, and if these come loose from time to time, they should be replaced with new pads.

The cowl should be kept snug with attachment fittings uniformly adjusted so as to distribute the load over the various fittings, rather than having one tight and carrying the entire load. It is well to remember that the engine expands when hot and it is better to be a little on the loose side than to have them too tight. The cowl should not vibrate in flight and if it is observed to start vibrating or shaking, steps should be taken to correct the condition causing this problem. Sometimes it will be found in a rough propeller or engine rather than in the actual cowl mountings.

7.2 ENGINE REMOVAL & INSTALLATION

The procedure for removing the engine is the same for both the R-755B2 and the R-755A2 engine. All hardware, controls, hoses, fuel and oil systems are identical in both cases. The procedure is as follows:

(a) Remove cowl
(b) Disconnect engine controls – throttle, mixture and carb heat
(c) Disconnect fuel and oil lines
(d) Remove exhaust system
(e) Disconnect electrical connections – mag P leads, battery ignition lead, alternator
(f) Attach hoist using Jacobs engine sling (see Illustration No. 4, page 25)
(g) Lift the engine slightly, remove engine bolts and swing engine free of engine mount

Installation procedure is the same for both the A2 and B2 engine models with the exception of the mounting bolt length as follows:

(a) Lift the new engine into position using the Jacobs engine sling
(b) Install new mount rubber cones SA22387 (16)
(c) 1. For the R-755A2, Install new AN6-45 mount bolts (8) and AN310-6 Nuts (8) and cotter pins. Tighten the AN310 nuts until there is approximately 1/8 in between the large washer under the head of the bolt and the edge of the mount rubber cup (see Fig. 7.2) and the cotter pin hole in the bolt aligns with a castellation in the nut. Install the cotter pin.
2. For the R-755B2, Install new An6-35 mount bolts (8) and AN310-6 Nuts (8) and cotter pins. Tighten the AN310 nuts until there is approximately 1/8 in between the large washer under the head of the bolt and the edge of the mount rubber cup (see Fig. 7.2) and the cotter pin hole in the bolt aligns with a castellation in the nut. Install the cotter pin.

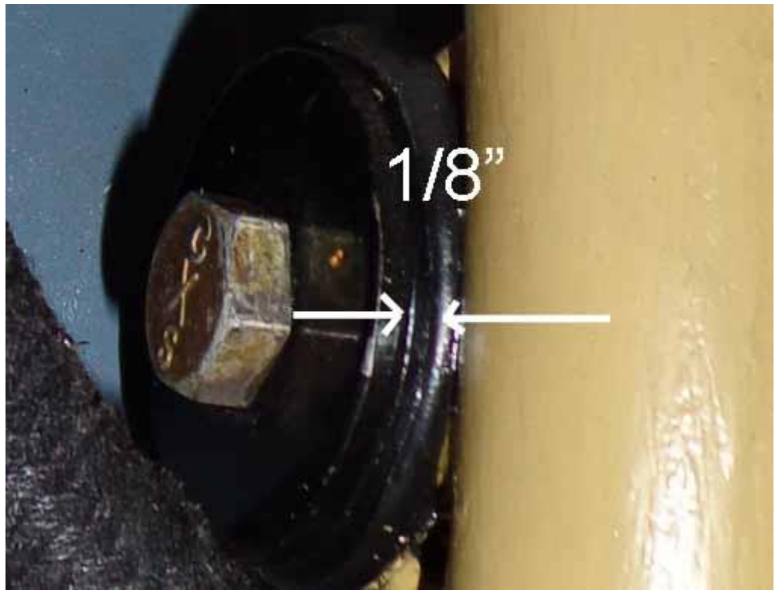


Fig 7.2

(d) Reconnect all electrical connections
(e) Reconnect fuel and oil lines
(f) Reconnect engine controls, throttle, mixture and carb heat
(g) Install exhaust system

See paragraph 7.3 for additional information provided by the Jacobs R-755 Instruction Manual.

7.3 The following is an excerpt from the Jacobs R-755 Instruction Manual, Section 2 Unpacking and Installation:

"To remove the engine from the shipping case and install in the plane, equipment consisting of crankshaft lifting nut, hoist, assembly stand and rocker box lifting sling should be available. Refer to illustration No. 4 and to paragraph headed "LIFTING SLING" in this section for fabrication instructions for the lifting sling.

The procedure is as follows using and assembly stand:

1. *Remove 4 bolts and lift cover of shipping case.*
2. *Remove waterproof cover on engine.*
3. *Unfasten ignition cable ends where anchored to shipping case.*
4. *Remove nuts holding mount plate in shipping case.*
5. *Remove engine with crankshaft lifting nut, Part No. T-3034, and hoist. The steel mount plate should remain attached to the engine.*
6. *Mount engine on assembly stand by means of the mount plate.*
7. ***If the engine is to be operated immediately, it will be convenient at this time to drain rust preventative oil from cylinders by removing plugs in spark plug holes and turning the engine over several revolutions.***
8. *Rotate assembly stand to place crankshaft in horizontal position.*
9. *By means of the rocker box lifting sling, lift the engine free from the assembly stand. The mount plate should THEN be removed, by two men if possible, being careful to clear all parts of the engine.*
10. *Mount in airplane, using lifting sling. (See illustration No. 4.)*

If an assembly stand is not available, the shipping crate with the engine should be placed on a flat, level surface and the following procedure used:

1. *Remove cover of shipping case, engine waterproof cover, and unfasten ignition cable ends as described above.*
2. *Check to determine that bolts holding mount plate to the bottom half of shipping case are tight. Carefully stand bottom half of shipping crate on its side so that the engine is in the flight position (with carburetor at bottom).*
3. *Install rocker box lifting sling as described in the paragraph headed "LIFTING SLING" in this section. Use hoist to take up slack in the cable.*
4. *Remove the six nuts between the engine mount plate and the shipping crate and employ hoist carefully to slide engine free of the crate.*
5. *Remove engine mount plate as described above and proceed with installation.*

When the engine mount bolts are seated in rubber bushings, the bolts should be drawn only moderately tight in accordance with the airplane manufacturer's instructions, and should all be of equal tightness.

Carburetor controls should be arranged to operate smoothly and permit full travel of the levers. If the magneto is equipped with an advance lever it should be wired in the advance position (clockwise as far as possible).

The distributor adapter housing should be filled ¼ full with engine lubricating oil through the upper drive opening before the accessory is installed.

All fuel and oil lines should be neatly installed in such a manner as to prevent the possibility of air pockets or vapor locks. Only the best quality metal tubing or hose should be used. Lines should be of good annealed seamless tubing without any short bends or kinks. All lines should be securely fastened to avoid vibration and chafing.

OIL LINES

The oil lines connecting the oil tank to the engine should be at least ¾ inch tubing.

The supply line from the tank should be connected to the oil strainer. A second line is then installed from the outlet side of the strainer to the fitting located in the rear case on the right side of the oil pump.

A return line from the outlet fitting on the left side of the oil pump returns scavenged oil to the tank.

FUEL LINES

Fuel may be supplied to the carburetor either by gravity or by pressure. When the gravity system is used the carburetor float level is set for a pressure of 1 ½ lbs. and the fuel tank should be high enough above the carburetor to produce a pressure of about 1 ½ lbs. at the carburetor.

A fuel strainer should be installed at the low point between the fuel tank and carburetor.

When the pressure system is used the float level of the carburetor is set for a pressure of 3 lbs. and the fuel pump pressure should be set at 3 lbs. and the fuel pump pressure should be set at 3 lbs. the fuel line should be run from the strainer to the inlet side of the fuel pump and from the outlet of the fuel pump to the carburetor. No external by-pass fuel line is required, as the approved fuel pumps have built-in by-pass.

LIFTING SLING

Whenever it is required that the engine be handled on a hoist the rocker box type lifting sling as shown in illustration No. 4 should be used. The sling should be fabricated locally from high quality steel wire cable .250 inch diameter. The steel cable should preferably be inserted in light weight rubber hose or other type protective sheath. Only one length of cable is used. Thread the cable through the rocker boxes, using the numbers on the illustration as a guide. Cable Sections 1 and 4 must be in front of Cable Sections 2 and 5 respectively. In this position Sections 1 and 4 will act to prevent Sections 2 and 5 from slipping off the rocker boxes.

Securely clamp cable end 1 to 6, allowing enough slack so that Cable Sections 1 and 4 will clear the rocker boxes of the No. 1 (top) cylinder. Apply lifting action slowly so that the cable will center itself and all four lifting sections become taut. As cable is tightened, also check to see that the cable loops around the outside rocker boxes at 2 and 5 are not too close to the forward edge of the rocker boxes. The engine as supported by this lifting sling will have the crankshaft tipped slightly upward so that it can easily be attached to the aircraft structure.

Only the engine itself may be lifted with the rocker box type lifting sling. Do not attempt to lift the engine plus overhaul stand by this method.

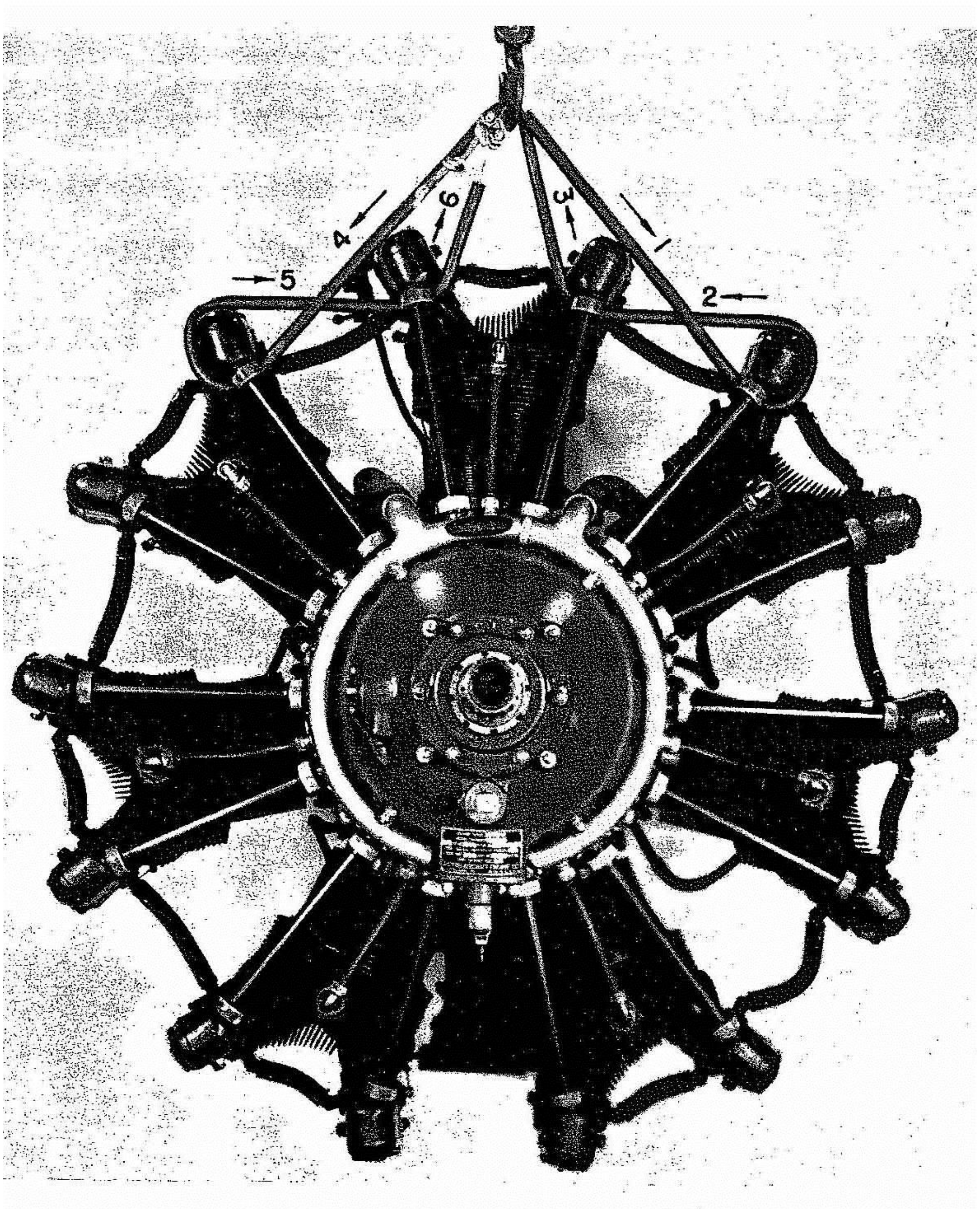


ILLUSTRATION NO. 4

RUNNING-IN

All Jacobs engines are thoroughly tested and run-in at the factory. However, a hone-hour check run should be made before flight, to check the installation.

Before starting, turn the propeller at least six complete turns by hand to determine that there is no oil or gasoline accumulated in the lower cylinders.

If rust preventative oil has not been previously drained from the cylinders, all plugs must be removed from rear spark plug holes. The engine must then be turned slowly by hand at least ten revolutions to drain the rust preventative oil. The engine should again be rotated several revolutions after reinstallation of the spark plugs.

After the engine has been started, the oil pressure and fuel pressure should be immediately checked. The engine should be run-in at 600 RPM to 1000 RPM. Set controllable propellers in low pitch.

After the oil is warm, check the oil and fuel lines, cowling, baffles and controls.

In order to avoid overheating during the check run, a gasket type thermocouple should be installed under one of the rear spark plugs, and the temperature closely observed. The oil temperature should not be permitted to exceed allowable limits. The head temperature should not be permitting to exceed 400° F (200° C) except when opening the throttle to check maximum engine speed, when a maximum temperature of 450° F (232° C) is permissible.

DO NOT "REV-UP" THE ENGINE UNTIL THE OIL HAS BEEN THOROUGHLY HEATED AND A SUFFICIENT LENGTH OF TIME ALLOWED FOR ALL PARTS TO BECOME THOROUGHLY LUBRICATED. THE "REVVING-UP" SHOULD NOT TAKE PLACE UNTIL THE ENGINE IS READY FOR FLIGHT AND SHOULD NOT EXCEED 20 SECONDS."

7.4 COMPRESSION TESTING OF ENGINE CYLINDERS:

Using the Differential Compression Test method described in FAA Advisory Circular AC 43.13-1B CHG 1, paragraph 8-14(a), test to determine the internal condition of the combustion chamber cylinder assembly by ascertaining if any appreciable internal leakage is occurring. If a cylinder has less than a 60/80 reading on the differential test gauges on a hot engine, the cylinder must be removed and inspected. To determine the cylinder's problem area, have someone hold the propeller at the weak cylinder's top dead center and with compressed air still being applied, listen. If air is heard coming out of the exhaust pipe, the cylinder's exhaust-valve is not seating properly. If air is heard leaking out of the air cleaner/carburetor heat box, the intake valve is leaking. If air is heard coming out of the engine crankcase breather tube, the piston rings are defective. Remove and repair/overhaul the defective cylinder.

7.4.1 When the spark plugs are removed from the engine, identify them to coincide with the cylinder and location from which they were removed. Close examination of the plugs will reveal the actual operating conditions and aid in diagnosing problems within each individual cylinder.

7.4.2 The operating and maintenance records of the engine should be reviewed. Records of previous compression tests are of assistance in determining progressive wear conditions and help to establish the necessary maintenance corrective actions.

PROPELLER INSTALLATION

There are Four (4) different propeller installations approved on the YMF WACO F5 series aircraft.

A. The Fixed Pitch Sensenich wood W90T6JA and JB series and the Fixed Pitch Sensenich wood W96JA and JB series (Fig. 1). These propellers are eligible for installation on the Jacobs R-755B2, 275 HP engine only. See Section 10 (D) of this manual for installation and maintenance instructions for these propellers.

Fig. 1

B. The Fixed Pitch MT-Propeller Model MT 233 R 150-6AJ wood propeller (Fig. 2). This propeller is eligible for installation on both the R-755B2 275 HP and R755A2 300 HP engines. See Section 10 (E) of this manual for installation and maintenance instructions for this propeller.

Fig 2

C. The Hamilton Standard Model 2B20 Metal Constant Speed propeller (Fig. 3). This propeller is eligible for installation on both the R-755B2 275 HP engine and the R-755A2 300 HP engine. See Section 10 (F) of this manual for installation instructions.

Fig. 3

D, The MT MODEL MTV-15-AA-C/C-236-29 Constant Speed propeller (Fig. 4). This propeller is eligible for installation on both the R-755B2 (including R-755B2M) 275 HP engine and the R-755A2 (including R-755A2M) 300 HP engine. See Section 10 (N) of this manual for installation and maintenance instructions.

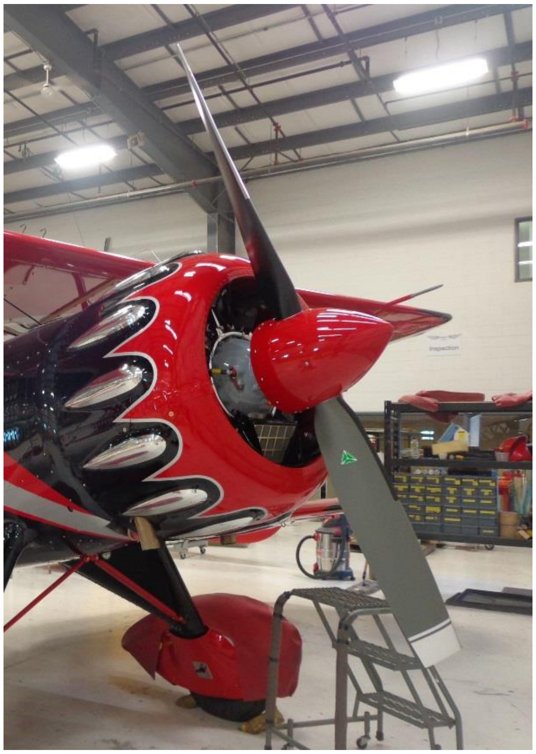


Figure 4

SECTION 8 SYSTEMS

8.1 GASOLINE SYSTEM

Your WACO airplane is equipped with what is considered the simplest, most practical gasoline system obtainable, namely, a direct gravity flow of gasoline from wing tanks to carburetor. However, owing to the comparatively thin wing section, it is necessary that these tanks be fairly long and shallow.

These tanks will drain to almost the last cup of gasoline in a normal flight position, but it is important that you have at least ten gallons of gasoline in the tank USED for take-off before a take-off is attempted. We recommend that a take-off never be made without at least ten gallons of gasoline in the selected tanks. This will insure a steady and continual flow of gasoline to the carburetor.

Another item to take into consideration is that on the ground the gasoline will collect at the lower end of the tank. Since the gauges are located pretty well in the center of the tank, an accurate reading cannot be obtained from the gasoline gauge on the ground,

although, these gauges are quite accurate for use in level flight. Therefore, particular care should be taken in checking the gasoline supply while the ship is on the ground.

It is important that the vent lines protruding from top tanks be kept open at all times. It is also important that gas tank caps fit snugly and do not leak. Occasionally, the steel clip fittings which hold these tank caps in place will get pulled out of shape and not have the correct tension. This can be quickly remedied by putting them back in shape with a pair of pliers and if this fails to stop the leak, the cap should be replaced.

You need not be alarmed if after filling the tanks completely, one tank appears to drain faster than the other does. This is normal and there is no set rule as to which tank will drain fastest under certain conditions. On some airplanes one tank will drain faster one day and the other the next day.

You will note the tanks have been provided with two outlet lines, one at the front and one at the rear. This is to take care of all conditions and make sure the carburetor gets gas both during a steep climb and a steep descent.

If the tank appears to leak, first make sure that all fittings are tight before going tot he trouble of removing the tanks. Leaks are usually found to be around the gasoline gauges or one of the fittings and easily repaired by tightening, or, if necessary, removing and adding filler such as thread dope or white lead to the threads and replacing.

Gas Tank Vent Fittings

Screw vent lines in place in upper surface of upper wings taking care to have openings in gooseneck line towards the REAR.

8.2 OIL SYSTEM

The engine oil system consists of a five gallon reservoir mounted aft of the engine on the top of the engine mount and is connected to the engine pressure pump inlet and scavenge pump outlet with ¾ inch aluminum and Mil 6000 rubber lines. There is a removable brass screen housing mounted on the firewall through which all oil passes prior to entering the pressure pump inlet. This screen can be removed for cleaning at each oil change (see inspection schedule). There is an oil cooler mounted on the left side of the engine mount through which all return oil from the engine scavenge pump passes prior to entering the oil reservoir. See the Jacobs Operators Manual in Section 10 of this manual for additional information.

8.3 ELECTRICAL SYSTEM

The electrical system consists of two 12 volt 25 or 35 AH lead acid batteries housed in a sealed battery box mounted aft of the engine compartment ahead of the firewall and connected in series to provide 24 VDC to the main A/C buss and is identical for both the A2 and the B2 engine installations. The battery charge is maintained by the gear driven JASCO 50 Amp alternator mounted on the engine accessory case and controlled by a JASCO solid state Regulator/OV-protection module mounted on the firewall. All circuits are protected by circuit breakers. There is a 24 volt E80 starter mounted on the accessory case at the rear of the engine. See Section 10 for wiring diagrams.

SECTION 9 AIRWORTHINESS LIMITATIONS

9.1 APPLICABILITY

The Airworthiness Limitations section is FAA approved and specifies maintenance required under §§43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

9.2 LIFE LIMITED PARTS

There are no life limited parts or assemblies or mandatory replacement times for this aircraft.

9.3 INSPECTION INTERVALS

Inspection intervals for this aircraft are as required by applicable Federal Aviation Regulation under which the aircraft is to be operated. It is the responsibility of the owner/operator to insure that required inspections are completed.

9.4 ALTERATIONS

This aircraft is manufactured in accordance with STC SA1000GL and may not be altered without the express written consent of WACO Classic Aircraft Corporation.

SECTION 10 MISCELLEOUNEOUS MAINTENANCE INFORMATION

10.1 The following pages contain the inspection schedule form and additional manufacturers maintenance instructions for accessories and equipment installed on this aircraft.

A. WCAC FORM SMWS SCHEDULED MAINTENANCE WORKSHEET

B. WIREING DIAGRAMS

C. JACOBS OPERATORS MANUAL MODELS R-755A2 7 R-755B2

D. SENSENICH PROPELLER CO. INSTALLATION AND MAINTENANCE INSTRUCTIONS

E. MT-PROPELLER INSTALLATION AND MAINTENANCE MODEL MT233R150-6AJ

F. HAMILTON STANDARD MODEL 2B20 CONSTANT SPEED PROPELLER INSTRUCTIONS

G. BENDIX BATTERY IGNITION SERVICE INSTRUCTIONS AND PARTS LIST

H. BENDIX-SCINTILLA AIRCRAFT MAGNETOS SERVICE INSTRUCTIONS

I. SIGTRONICS (JASCO) ALTERNATOR TROUBLE SHOOTING INFORMATION

J. BRACKET AIR FILTER INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

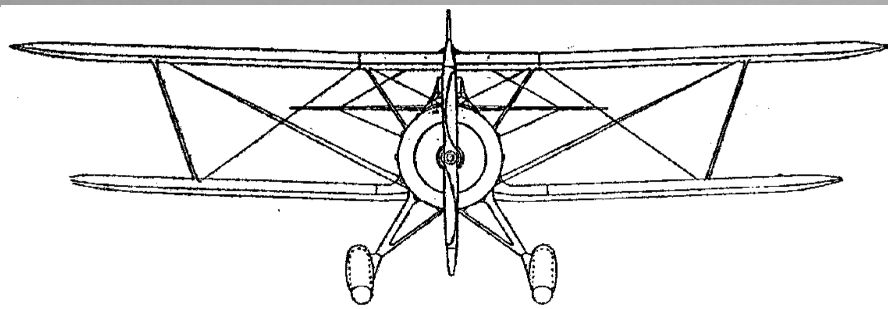
K. PARKER HANNIFIN WHEEL AND BRAKE MAINTENANCE PROCEDURES

L. SERVICE LETTERS and SERVICE BULETINS

M, K&L SOARING FORM F-236

N. MT-PROPELLER INSTALLATION AND MAINTENCE MODEL MTV-15-AA-C/C-236-29

WACO CLASSIC



AIRCRAFT MAKE	MODEL	SERIAL NUMBER	REGISTRATION NUMBER
Classic Aircraft **WACO Classic Aircraft**	**YMF WACO F5** **YMF WACO F5C**		

AIRFRAME TIME TOTAL: ----------------------

ENGINE TIME TOTAL: ----------------------------------

TACHOMETER HOURS: ----------------------

ENGINE TIME SMOH: ----------------------------------

HOBBS METER HOURS: ----------------------

OWNERS NAME: --

ADDRESS: --

PHONE: ---

FAX: ---

MOBILE: ---

EMAIL: ---

TYPE OF INSPECTION:

☐ 50 HOUR

☐ 100 HOUR

☐ ANNUAL

START DATE: -----------------------

	WACO CLASSIC	50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
A.	**PROPELLER**					
	MT_Propeller or Sensenich Wood Propeller:					
1	Remove spinner		0	0		
2	Inspect hub nut for security and safety		0	0		
3	Inspect spinner bracket for condition and security		0	0		
4	Re-install spinner		0	0		
5	Inspect propeller hub bolts and nuts. Retorque bolts in accordance with Sensenich Propeller Co. Installation and Maintenance Instructions dated 6 Nov 1992 or MT_Propeller maintenance	0	0	0		
6	Check track of blades per Sensenich Maintenance Instructions dated 6 Nov 1992 or MT_Propeller maintenance instructions.		0	0		
7	Clean and wax the blades	0	0	0		
8	Inspect blades and tipping for damage or cracks. For metal propellers, use the manufacturers recommended inspection and maintenance procedures.	0	0	0		
	Hamilton Standard Constant Speed Propeller:					
9	Remove spinner front half (if installed)	0	0	0		
10	Refer to Hamilton Standard Propeller Service Manual for correct lubrication instructions.	0	0	0		
11	Inspect spinner and spinner bulkheads for security, cracks or other de	0	0	0		
12	Inspect blades for nicks, scratches or any other defects.	0	0	0		
13	Inspect counter weights for security.	0	0	0		
14	Inspect piston for surface condition, and evidence of leaks.	0	0	0		
15	Re-install spinner	0	0	0		
	MT Propeller MTV-15-AA-C Constant Speed Propeller:					
16	Remove spinner Dome (if installed)	0	0	0		
17	Refer to MT Propeller Service Manual for correct maintenance instructions.	0	0	0		
18	Inspect spinner and spinner bulkheads for security, cracks or other de	0	0	0		
19	Inspect blades for nicks, scratches or any other defects.	0	0	0		
20	Inspect counter weights for security.	0	0	0		
21	Inspect piston for surface condition, and evidence of leaks.	0	0	0		
22	Re-install spinner	0	0	0		

		50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
B.	**POWERPLANT**- For detailed instructions see Section 5 of the JACOBS Engine Operators Manual					
1	Remove cowling		0	0		
2	Clean and inspect the cowl for cracks, distortion, security and condition of felt pads, loose or missing fasteners and latches		0	0		
3	Drain engine oil	0	0	0		
4	Clean engine oil inlet screen located on bottom of firewall	0	0	0		
5	Inspect the oil pressure and oil temperature sender installations for leaks and security		0	0		
6	Inspect oil tank, hoses, lines and fittings for leaks, chafing, cracks and general condition		0	0		
7	Fill oil tank with 5 gallons of engine oil. See JACOBS Operators Manual Section 3 for correct grade	0	0	0		
8	Inspect oil radiator mounting, clean fins, air duct security and leaks		0	0		
9	Inspect fuel lines, valves, hoses and lines for leaks, security, chafing and general condition		0	0		
10	Drain carburetor float chamber and clean carburetor screen. Reinstall screen and safety		0	0		
11	Inspect carburetor, controls and attachment		0	0		
12	Drain and clean fuel strainer. Check for presence of water/foreign matter and correct color	0	0	0		
13	Inspect primer, lines and fittings for leaks and security		0	0		
14	Inspect air filter in accordance with Bracket Air Filter Document I-194 dated 3-16-94	0	0	0		
15	Inspect carburetor air box for condition and attachment		0	0		
16	Check throttle, mixture and carburetor heat controls for correct travel and general condition. All should have 1/8" min. cushion at travel limits		0	0		
17	Check intake pipes for security and evidence of leakage		0	0		
18	Check valve clearance (.007 to .012) with a cold engine (See JACOBS Service Manual page 49 for correct adjustment procedure)		0	0		
19	Check push rod housings for security and leaks		0	0		
20	Make a compression check and record the figures below		0	0		
21	Check exhaust and induction hot air system and annually pressure test the heat exchanger system	0	0	0		
22	Check heater bypass valve for proper operation. Insure that carburetor heat valve is allowed full travel with cabin heat selected		0	0		
23	Inspect engine mount for cracks and general condition		0	0		
24	Inspect breather tube for obstruction and security		0	0		
25	Inspect engine installation/ rubber mount bushings and attachment bolts for condition and security		0	0		
26	Cylinder compression leakage test Ref. YMFAMM-1 Rev. F para. 7.4		0	0		
	Minimum acceptable differential pressure (Lbs.) 60/80					

1	2	3	4	5	6	7
80	80	80	80	80	80	80

		50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
B.	**POWERPLANT** continued					
26	Check crankcase and cylinders for oil leaks, cracks, attachment of all nuts, screws and fittings etc.		0	0		
27	Remove all inter-cylinder baffles if necessary. Re-torque all cylinder hold-down nuts to 250-300 lb/in in accordance with JACOBS Engine Service Manual		0			
28	Inspect all cylinder baffles and baffle seals for condition		0	0		
29	Inspect condition of all firewall seals		0	0		
30	Inspect condition, attachment and wiring of starter and alternator		0	0		
31	Service Alternator if required See note 7 page 10.		0	0		
32	Inspect spark plugs. Clean, gap (.015-.018) and replace as required		0	0		
33	Inspect ignition harness and insulators		0	0		
34	Check magneto leads and distributor/coil wiring		0	0		
35	Service the magneto(s) and distributor (if installed) in accordance with Section 5 of the JACOBS Engine Operators Manual		0	0		
36	Check magneto and distributor timing in accordance with JACOBS Engine Operators Manual Section 5		0	0		
37	Capacity test the battery		0	0		
38	Inspect and service battery (see note: 5), vents and drains	0	0	0		
39	Inspect battery box, solenoids, connections and wires for condition, security and safeties.	0	0	0		
40	Inspect prop governor, controls and oil lines if installed		0	0		
41	Inspect vacuum pump, lines, regulator and separator if installed		0	0		
42	Wash down and clean engine	0	0	0		
43	Lubricate engine controls, linkages, heat boxes and carburetor	0	0	0		
44	Service brake reservoir and check lines for leaks and security	0	0	0		
45	Re-install cowlings	0	0	0		

	WACO CLASSIC	50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
C.	**COCKPIT/ ELECTRICAL/ RADIO/ INSTRUMENTS -** For detailed instructions see WACO Classic Aircraft Service Manual					
1	Inspect front cockpit door and pilot's step door for condition and operation		0	0		
2	Inspect front and rear windshields for condition and security	0	0	0		
3	Inspect upholstery for condition and cleanliness	0	0	0		
4	Inspect seats, belts and harness and attachments for operation, condition and security		0	0		
5	Check stabilizer trim for smooth operation and security	0	0	0		
6	Inspect rudder pedals and brake cylinders for condition, security and operation		0	0		
7	Inspect brake hoses, lines and fittings		0	0		
8	Check operation, condition and security of the parking brake valve installation **CAUTION: It is very important to refer to the Airplane Flight Manual Section V, Normal Operating Procedures, for instructions in the correct operation of this control. Failure to follow correct procedure can result in damage to the parking brake control system and subsequent unintentional parking brake application during flight operations!**	0	0	0		
9	Inspect control stick and torque tube assy for operation, condition and security and for free movement to control limits		0	0		
10	Check all engine and flight controls for proper operation	0	0	0		
11	Check landing, navigation, cockpit and instrument lights	0	0	0		
12	Check pitot heat for operation	0	0	0		
13	Check pitot/static systems condition of Pitot tube, static ports and plumbing		0	0		
14	Inspect all instrument mounting, lines and attachments		0	0		
15	Certify altimeter system if appropriate		0	0		
16	Certify pitot system if appropriate		0	0		
17	Carry out Compass swing					
18	Check compass card valid until next check	0	0	0		
19	Check pressure instruments with test equipment or by comparison		0	0		
20	Check operation of cockpit heat controls, attachment of hoses and valves		0	0		
21	Inspect fuel valves and lines for operation, leaks and security	0	0	0		
22	Check fire extinguisher for charge and security if installed	0	0	0		
23	Check tail-wheel steering disengagement for proper operation	0	0	0		
24	Check that all placards and instrument markings are present and correct		0	0		
25	Check for proper tow hook release operation if installed		0	0		
26	Check ELT and battery IAW note 5 on page 10		0	0		
27	OP/C over/under-volt system, warnings.		0	0		
28	Check all ground operable circuits. Exercise all circuit breakers		0	0		
38	Check insulators, controllers, instruments, displays, mics, headsets, jackplugs and sockets		0	0		
39	Check Instrument legibility and markings of ranges and limits and consistent with ambient conditions		0	0		

		50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
D.	**FUSELAGE and EMPENNAGE**					
1	Remove inspection covers and fairings		0	0		
2	Inspect fabric for holes or deterioration (See Note 9 and FAA AC 43.13-1B)		0	0		
3	Inspect front (if installed) and rear baggage compartment doors and proper stowage of equipment	0	0	0		
4	Inspect electronic installations for security		0	0		
5	Inspect antennae mounts and wiring for security		0	0		
6	Inspect rudder, elevator and stabilizer trim cables, turnbuckles, fairleads, pulleys and attachments for safety devises, condition and proper operation		0	0		
7	Inspect fuselage structure for damage or corrosion		0	0		
8	Inspect fin and rudder structure and hinges for condition and security		0	0		
9	Inspect stabilizer and elevator structure, hinges (see Note 6) and mounting for condition and security		0	0		
10	Check external brace wires for corrosion, correct tension and safety		0	0		
11	Check stabilizer trim screw for end play, security and proper lubrication		0	0		
12	Check for correct rudder and elevator travels and proper elevator cable tension (see WACO Classic Maintenance Manual YMFAMM-1 page 20 paragraph 6.3 for detailed instructions)		0	0		
13	Lubricate elevator hinge bearings in accordance with WACO YMF-5 lubrication chart	0	0	0		
14	If Glider/Banner Tow Hitch system is installd, inspect in accordance with K&L Soaring Form F-236 (See Sec. 10 of YMFAMM-1)		0	0		
15	Vacuum interior and inspect all areas under and behind seats for tools, rags and other loose equipment	0	0	0		
16	Inspect internal structure of fuselage, bulkheads and tail section. (see Note 9)		0	0		
17	Re-install inspection covers and fairings		0	0		

		50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
E.	**LANDING GEAR -** See WACO Classic Aircraft Maintenance Manual pages 19 and 20 for detailed instructions for servicing main struts					
1	Remove fairing at tail wheel attachment		0	0		
2	Raise tail to clear tire (Block under rear fin post)		0	0		
3	Check condition and spacing of rubber shock pads		0	0		
4	Inspect all attachments for tightness, security and safety		0	0		
5	Inspect fork bushings for wear	0	0	0		
6	Inspect tail wheel tire for wear or damage	0	0	0		
7	Remove tail wheel and clean, inspect and repack bearings. Re-install and safety tail wheel		0	0		
8	Check tail wheel tire pressure - inflate to 60 PSI		0	0		
9	Lubricate tail wheel strut in accordance with WACO YMF-5 Lubrication Chart	0	0	0		
10	Re-install tail wheel attachment fairings		0	0		
11	Remove main gear fairings as required		0	0		
12	Jack airplane to clear wheels		0	0		
13	Inspect brake lines, fittings and wheel cylinders for security, condition, operation, chaffing and evidence of leaks		0	0		
14	Check strut shaft for excessive looseness in splines and evidence of fluid leaks		0	0		
15	Inspect tires for wear or damage	0	0	0		
16	Remove wheels - clean and inspect wheels and brakes in accordance with Parker-Hannifin Maintenance Procedure for 40-223/30-176 Wheel and Brake Assemblies used on the WACO YMF-5 dated 31 Jul 1985		0	0		
17	Check main tire pressures. Inflate to 30 PSI	0	0	0		
18	Check fluid level in oleo struts. Adjust fluid level using MIL-H-5606 petroleum base hydraulic fluid in accordance with WACO Classic Maintenance Manual Section 6.2		0	0		
19	Check all attachment bolts for security		0	0		
20	Lubricate main struts in accordance with WACO YMF-5 Lubrication Chart	0	0	0		
21	Inspect main landing gear fairings and brackets for condition		0	0		
22	Re-install main landing gear fairings		0	0		

		50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
F.	**WINGS and CENTER SECTION**					
1	Remove inspection covers and fairings		0	0		
2	Inspect drain holes, glued joints, bonded assemblies, protective treatments and finishes (see Note 9)		0	0		
3	Inspect fabric for holes or deterioration (see Note 9 and FAA AC 43.13-1B)		0	0		
4	Inspect fuel tanks, lines and caps for leaks, condition, security and proper markings. Check fuel guages for correct markings and indicator for freedom of movement	0	0	0		
5	Check tank vents are unobstructed	0	0	0		
6	Inspect ailerons and hinges for condition and security		0	0		
7	Inspect aileron control rods, fairleads, bearings, bell cranks and attachments for condition and security		0	0		
8	Lubricate aileron system hinges and fittings in accordance with WACO YMF Lubrication Chart	0	0	0		
9	Check ailerons for correct travels (see WACO Classic Maintenance Manual for travel limits)		0	0		
10	Inspect wing attachment bolts for condition and security		0	0		
11	Inspect interplane and cabane struts and their attachments for condition and security		0	0		
12	Inspect flying wires for condition, proper tension and security (see WACO Classic Maintenance Manual for proper wire tension)		0	0		
13	Inspect wing structure for condition and internal drag wire for security and tension		0	0		
14	Inspect security, condition and operation of wing tip lights, landing lights, pitot tube heater and standby compass		0	0		
15	Re-install inspection covers and fairings		0	0		

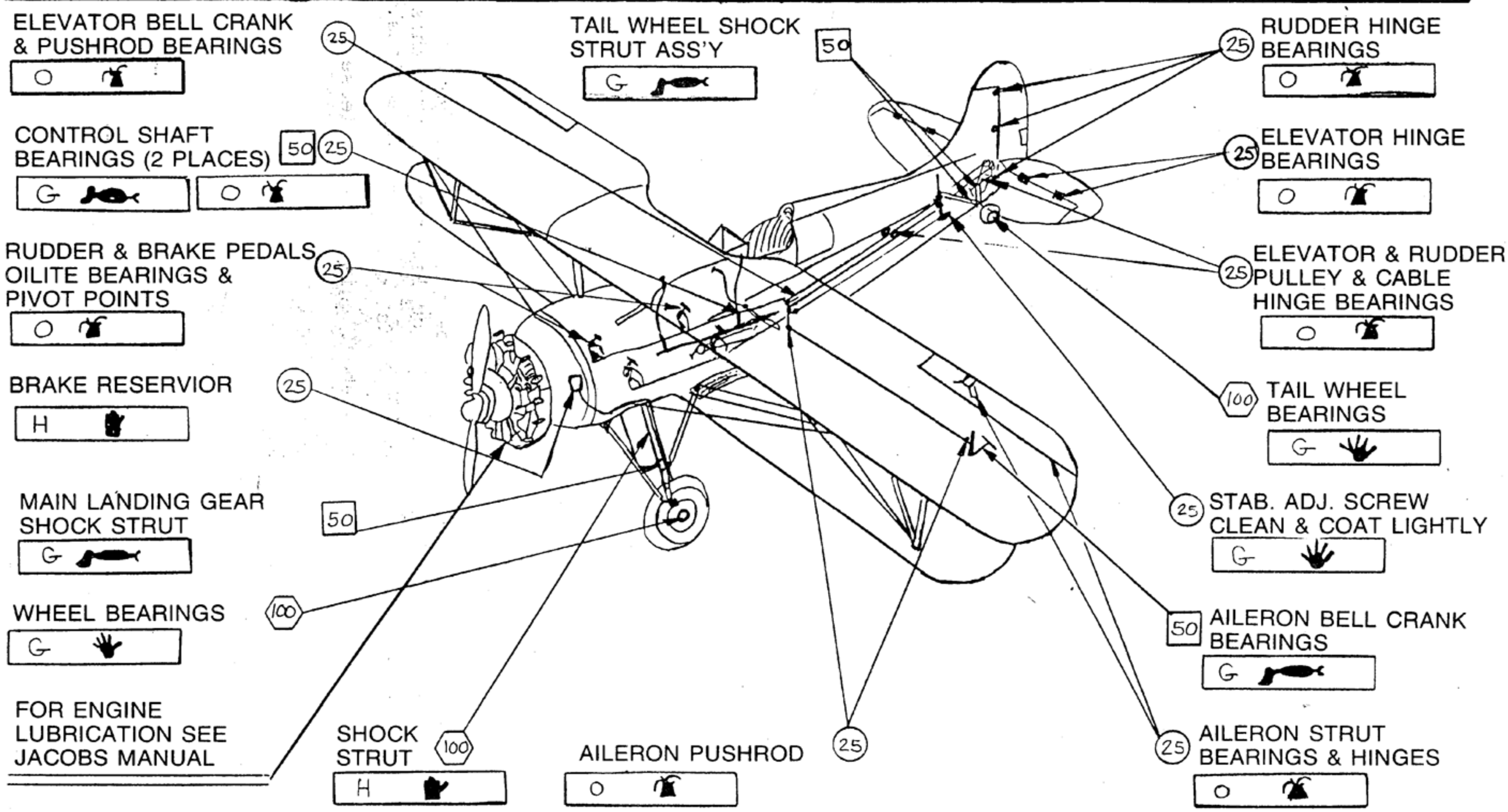
		50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
G.	**OPERATIONAL INSPECTION/ GROUND RUN**					
	IMPORTANT: GROUND RUN OPERATIONAL INSPECTION SHOULD BE CONDUCTED ONLY BY PERSONNEL PROPERLY TRAINED AND EXPERIENCED IN THE OPERATION OF THIS TYPE AIRCRAFT!					
1	Check fuel tank selectors	0	0	0		
2	Check fuel quantity sight tubes for correct indication and freedom of movement	0	0	0		
3	Check oil pressure and temperature	0	0	0		
4	Check alternator output	0	0	0		
5	Check carburetor heat	0	0	0		
6	Check gyros for noise and roughness	0	0	0		
7	Check ignition and switch operation	0	0	0		
8	Check propeller operation and smoothness	0	0	0		
9	Check engine idle	0	0	0		
10	Check electronic equipment operation	0	0	0		
11	Check parking brake operation. **CAUTION: It is very important to refer to the Airplane Flight Manual Section V, Normal Operating Procedures, for instructions in the correct operation of this control. Failure to follow correct procedure can result in damage to the parking brake control system and subsequent unintended parking brake application during flight operations!**	0	0	0		
12	Check throttle and mixture operation	0	0	0		
13	Check engine for leaks during and following the ground run	0	0	0		
14	Check instruments and systems and services	0	0	0		
15	Check radio for electromagnetic interference	0	0	0		
16	Operationally check starter.	0	0	0		
17	Check battery bus low voltage light is extinguished at approx 1,000 RPM	0	0	0		
18	Following ground run, ensure all cowlings access panels and doors are closed and secure	0	0	0		

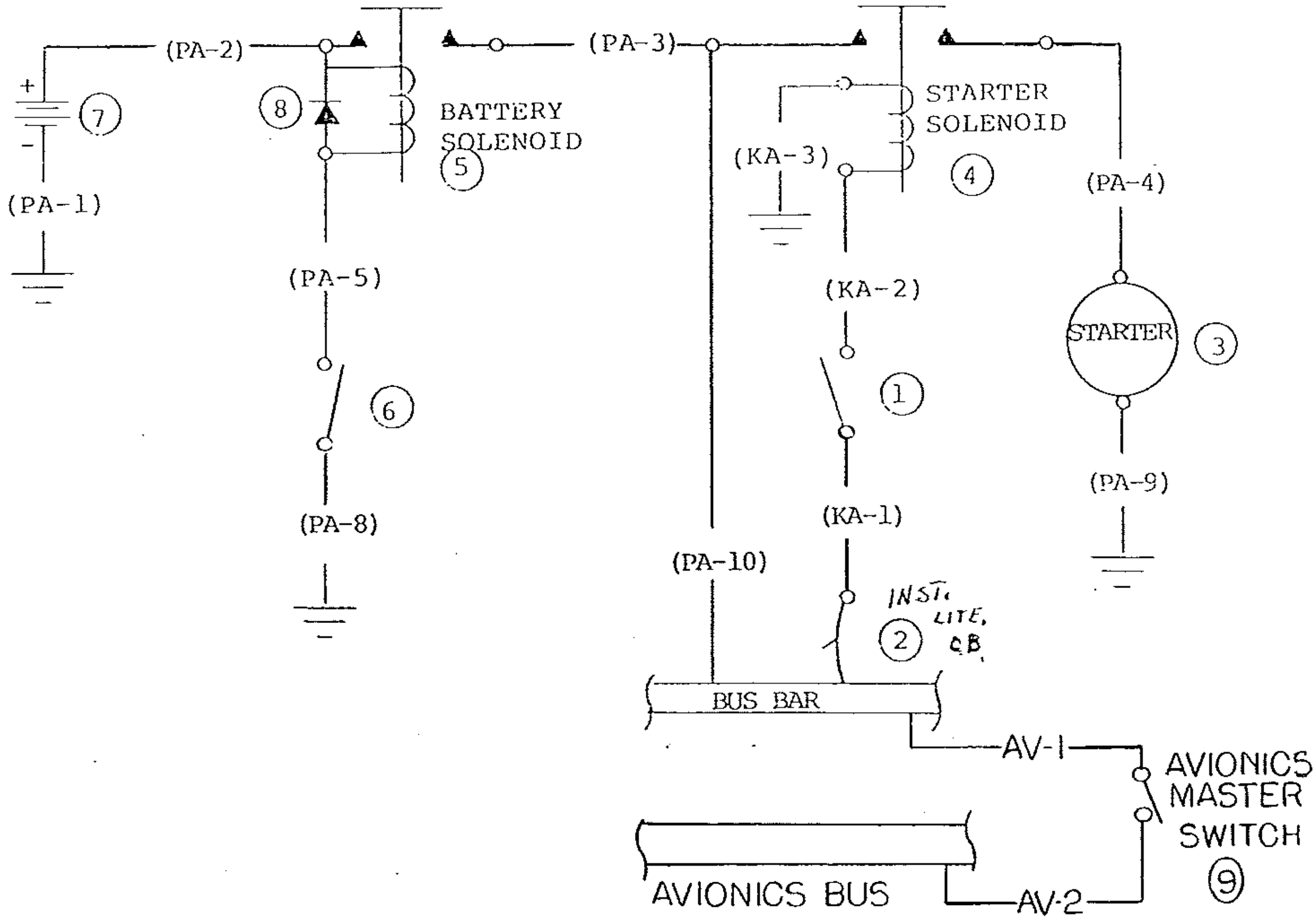
	WACO CLASSIC	50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
	NOTE GUIDANCE					
	Note 1: As per equipment list in AFM					
	Note 2: Check for latest airworthiness directives from the FAA					
	Note 3: Contact WACO Classic Aircraft Corporation at: flywaco@wacoclassic.com or General Manager at 269-565 1000					
	Note 4: See note 3					
	Note 5: Replace battery every five years or on condition					
	Note 6: See service letter 92-1					
	Note 7: See Jasco service information in Maintenance section of the Service Manual. Skytronics recommends every 250 hrs inspection take place with servicing as required according to condition					
	Note 8: Review the schedule to ensure that the maintenance needs of the aircraft are being met such that continuing safe operation can be assured. Account should be taken of the previous maintenance history, operating environment and utilization					
	Note 9: The need for removal of fabric for detailed inspection of attachments must be assessed when accomplishing this task at the annual inspection					

		50 HR	100 HR	ANNUAL	MECHANIC	INSPECTOR
	DOCUMENTATION AND CERTIFICATION					
1	Airworthiness	0	0	0		
2	Registration	0	0	0		
3	Equipment List (note 1)	0	0	0		
4	Weight and Balance (AFM pages 13-20)	0	0	0		
5	Airplane Flight Manual	0	0	0		
6	Jacobs Engine Operator's Manual (within AFM)	0	0	0		
7	Radio Station License (if required).	0	0	0		
8	All FAA AD's complied with. (Note 2)	0	0	0		
9	Any FAA bi-weekly AD's	0	0	0		
12	Mandatory placards are in place and legible	0	0	0		
13	All manufacturers service letters complied with. (Note 3)	0	0	0		
14	All manufacturers bulletins complied with. (Note 4)	0	0	0		
15	Aircraft conforms to FAA specifications.	0	0	0		
16	Log book entries completed and certified	0	0	0		
17	Review schedule. See note 8	0	0	0		
	Organization:					
	Certificate Number:					
	Name:					
	Signature of Inspector:					
	Date:					

WACO MODEL YMF - 5

LUBRICANTS		FREQUENCY IN HOURS	METHOD OF APPLICATION
G = MIL - G - 81322A	GEN. PURPOSE GREASE	25 50 100	HAND
O = MIL - L - 7870A	GEN. PURPOSE OIL	WHERE NO INTERVAL IS SPECIFIED, LUBRICATION IS REQUIRED AS ASSEMBLED OR INSTALLED.	GREASE GUN
H = MIL - H - 5606	HYDRAULIC OIL		OIL CAN
			OIL POUR CAN





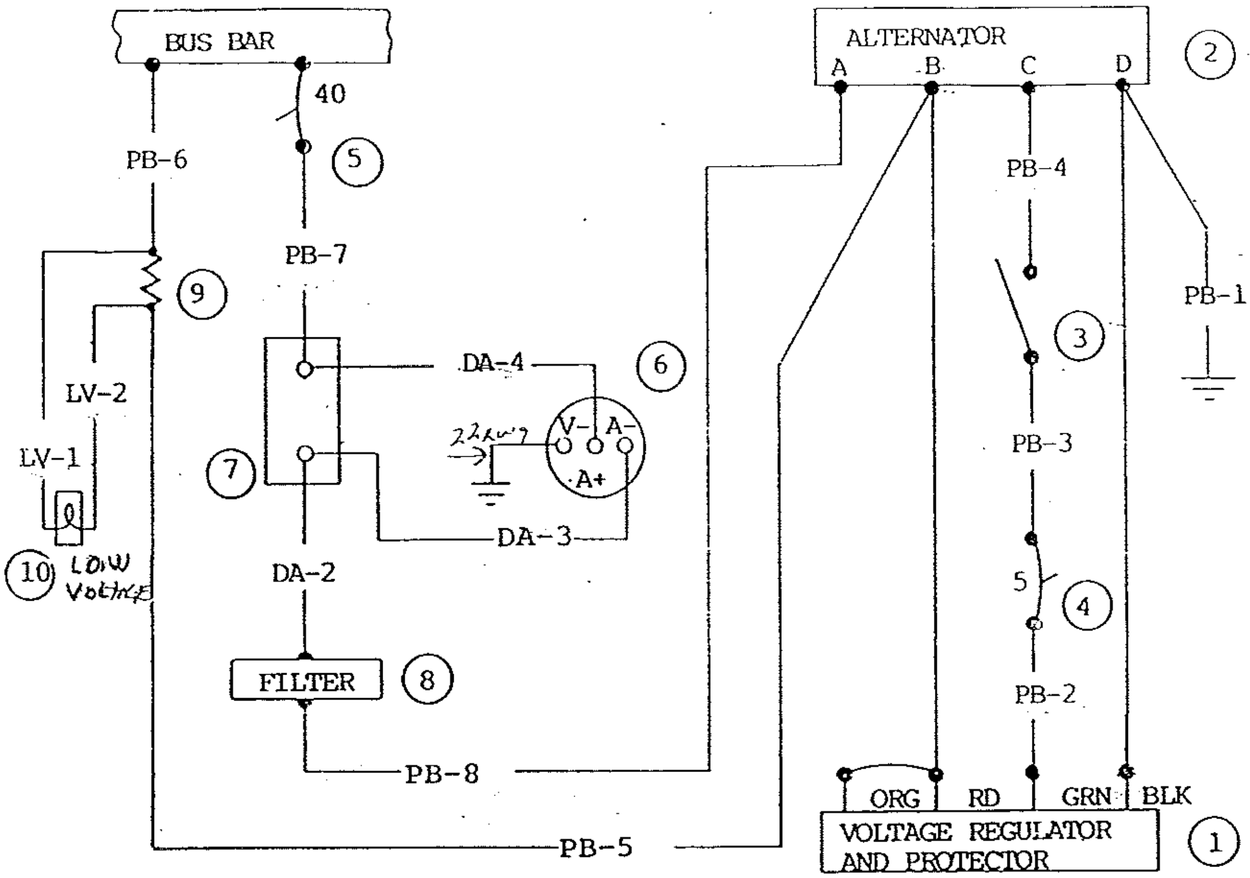
WIRE NO.	GA	MATERIAL	TERMINALS	
AV 1	10	MIL W 22759 16	35108	35108
AV 2	10	MIL W 22759 16	35108	35108
KA-3	22	MIL-W-22759/16	31890	31909
KA-2	22	MIL-W-22759/16	31885	31890
KA-1	22	MIL-W-22759/16	31885	31890
PA-10	8	MIL-W-22759/16	324043	324045
PA-9	2	MIL-W-22759/16	324054	324054
PA-8	22	MIL-W-22759/16	31885	66105-1
PA-5	22	MIL-W-22759/16	31885	31890
PA-4	2	MIL-W-22759/16	324054	324054
PA-3	2	MIL-W-22759/16	324054	324054
PA-2	2	MIL-W-22759/16	324054	324054
PA-1	2	MIL-W-22759/16	324054	324054

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
9	112235101	SWITCH
8	0770728	DIODE ASS'Y
7	50113	BATTERY
6	MS35058-22	MASTER SWITCH
5	S-2475-1	BATTERY SOLENOID
4	S-2443-1	STARTER SOLENOID
3	E80 MODEL 756-2	STARTER
2	109-205-101	CIRCUIT BREAKER
1	031-0326-00	KING SWITCH

EQUIPMENT TABLE

CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM
BATTERY MASTER & STARTER



WIRE NO.	GA	MATERIAL	TERMINALS	
DA-4	22	MIL-W-22759/16	31885	31885
DA-3	22	MIL-W-22759/16	31885	31885
DA-2	8	MIL-W-22759/16	324045	324045
LV-2	22	MIL-W-22759/16	-------	------
LV-1	22	MIL-W-22759/16	------	------
PB-8	8	MIL-W-22759/16	324045	324082
PB-7	8	MIL-W-22759/16	324043	324045
PB-6	18	MIL-W-22759/16	31890	------
PB-5	18	MIL-W-22759/16	31908	------
PB-4	18	MIL-W-22759/16	31885	31903
PB-3	18	MIL-W-22759/16	31885	31890
PB-2	18	MIL-W-22759/16	31890	-----
PB-1	8	MIL-W-22759/16	324045	324045

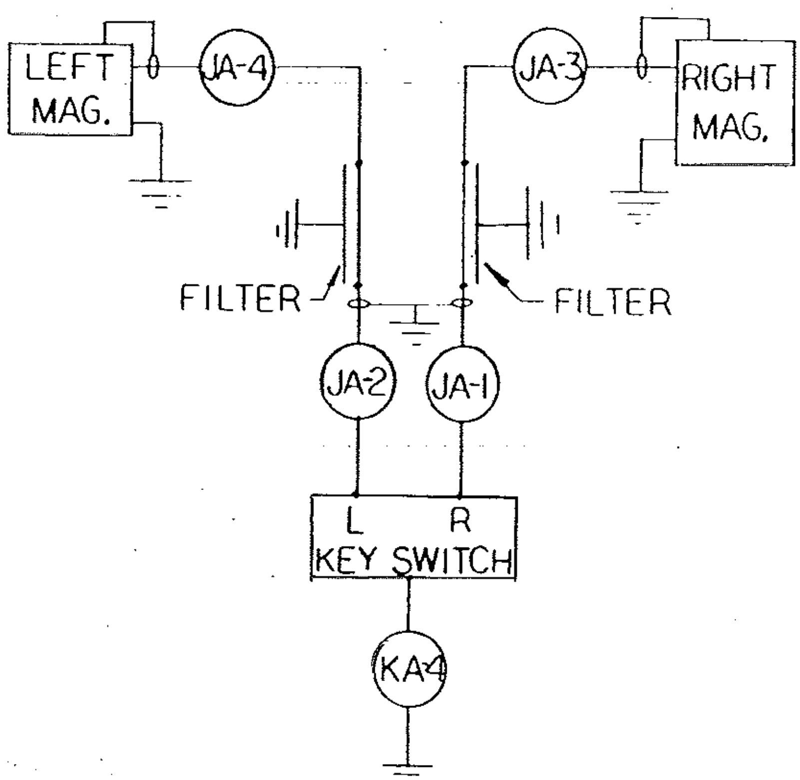
WIRE TABLE

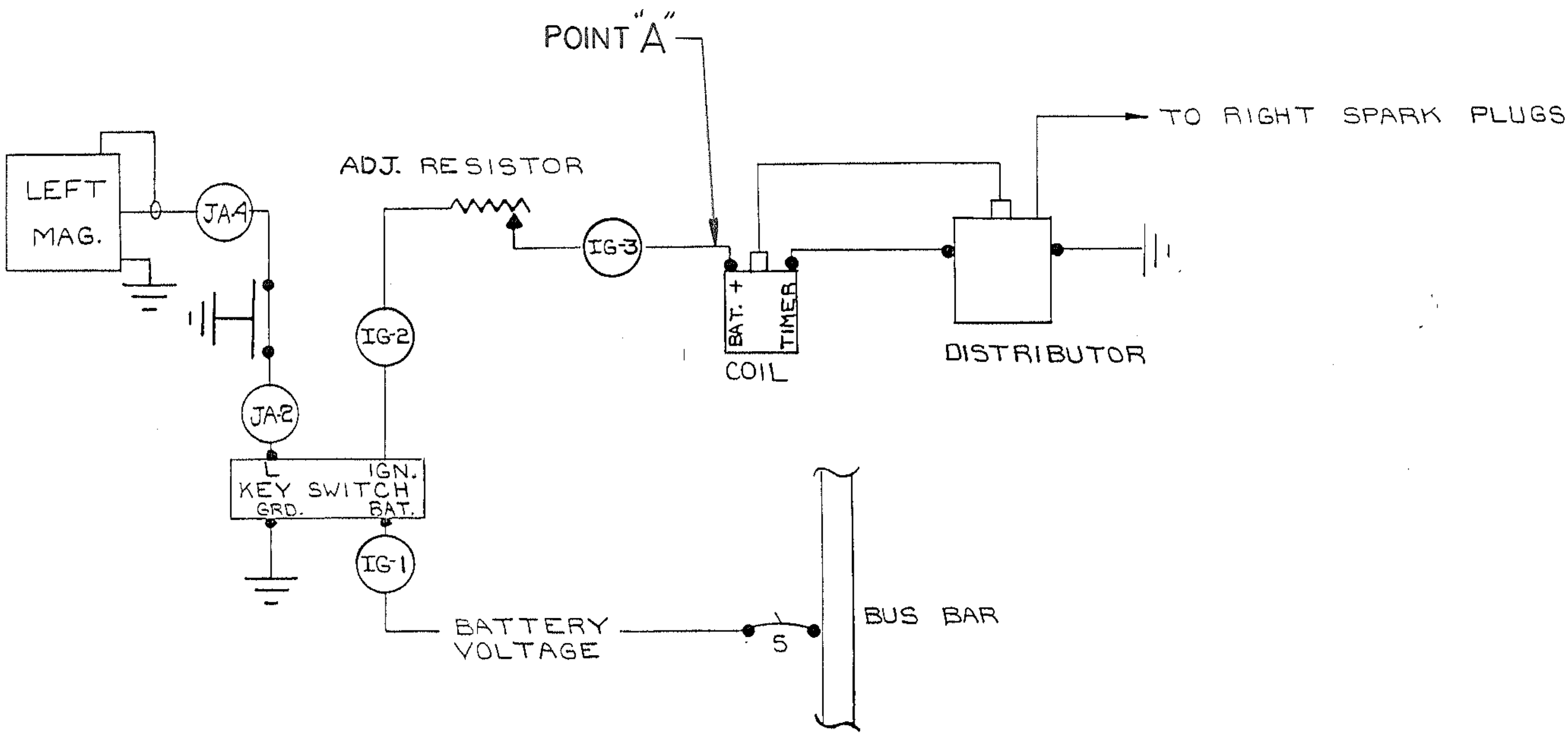
ITEM NO.	PART NO.	DESCRIPTION
10	25F1205	Lamp
9	54186	Resistor
8	20-0520-10	Filter
7	12-902-3	Shunt
6	12-2004	Volt/Ammeter
5	109-240-101	Circuit Break.
4	109-205-101	Circuit Break.
3	MS35058-22	Field Switch
2	7555T	Alternator
1	J12M24SP	Voltage Reg.

EQUIPMENT TABLE

CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM
Alternator Installation

DUAL MAGNETO SCHEMATIC



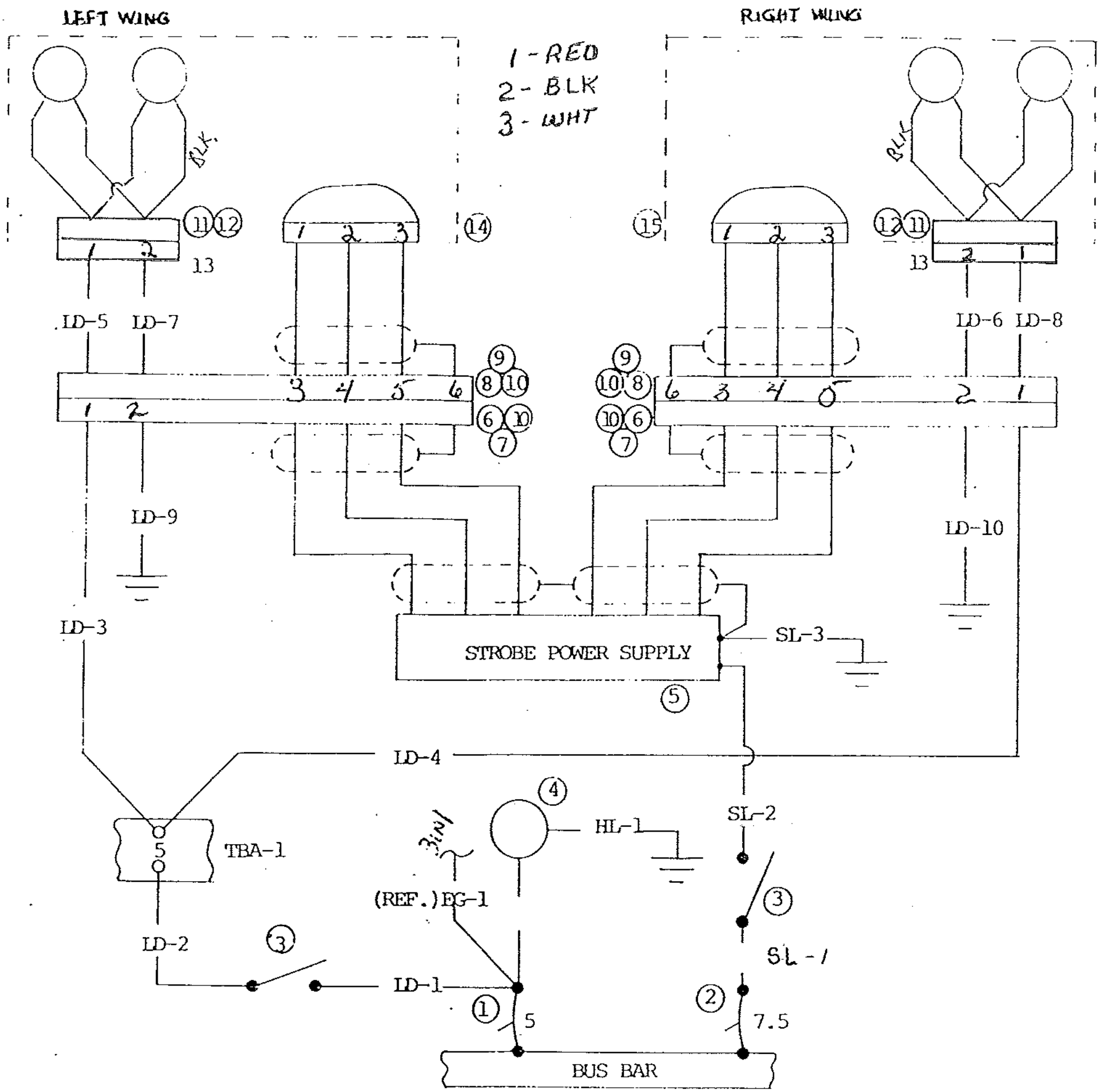


MAG./DISTRIBUTOR WIRING SCHEMATIC

ON AIRCRAFT WITH A 12 VOLT COIL (2 1/4" DIA.), SET VOLTAGE AT POINT "A" TO 11/12 VOLTS WITH IGNITION ON AND POINTS CLOSED. VOLTMETER BETWEEN POINT "A" AND GROUND.

ON AIRCRAFT WITH A 6 VOLT COIL (3" DIA.), SET VOLTAGE AT POINT "A" TO 5.5/6 VOLTS WITH IGNITION ON AND POINTS CLOSED. VOLTMETER BETWEEN POINT "A" AND GROUND.

THE SYSTEM SHOULD BE AT 28.5 OPERATING VOLTS WHILE CHECKING COIL VOLTAGE.



WIRE NO.	GA	MATERIAL	TERMINALS
WIRE TABLE			

ITEM NO.	PART NO.	DESCRIPTION
EQUIPMENT TABLE		

CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM
Strobe and Nav. Lights

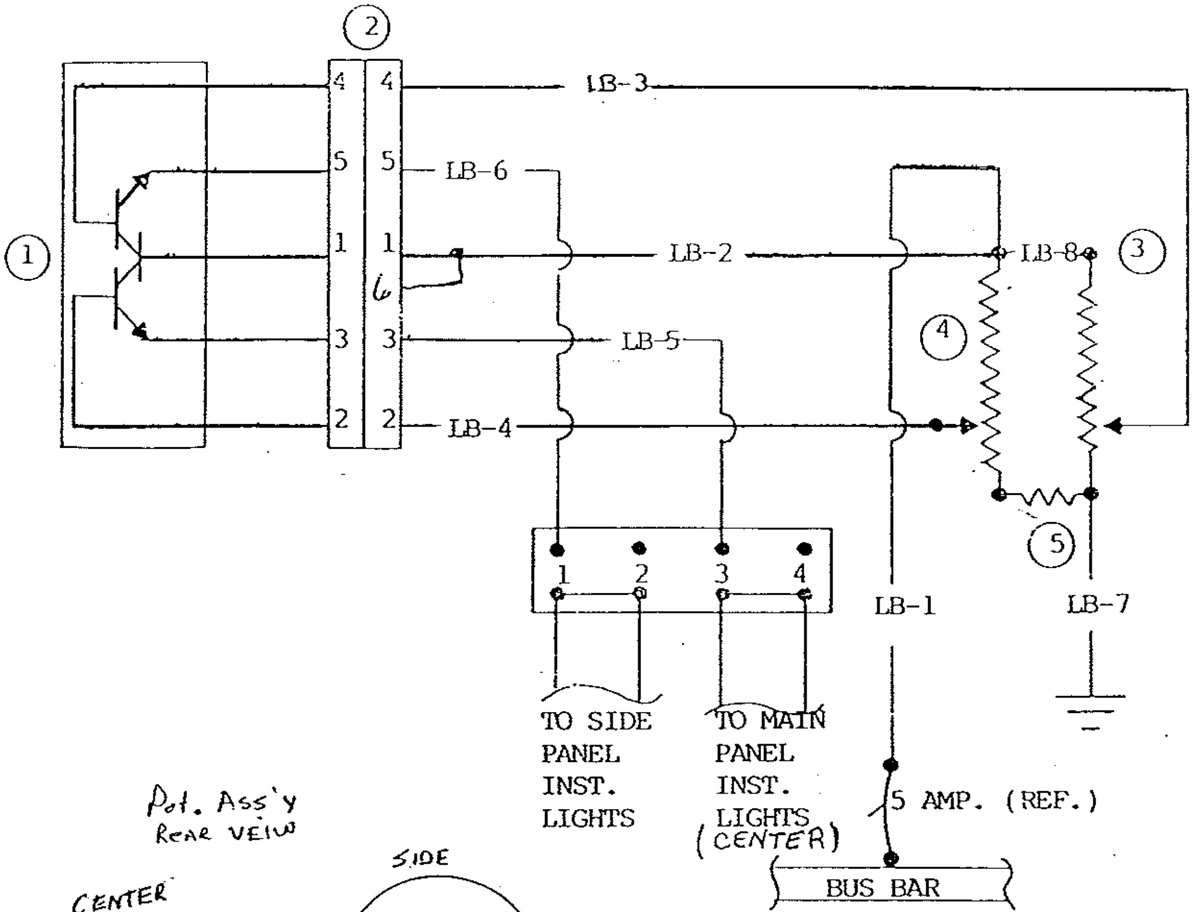
WIRE NO.	GA	MATERIAL	TERMINALS	
LD-10	18	MIL-W-22759/16	31885	66103-1
LD-9	18	MIL-W-22759/16	31885	66103-1
LD-8	18	MIL-W-22759/16	S1635-2	66105-1
LD-7	18	MIL-W-22759/16	S1635-2	66105-1
LD-6	18	MIL-W-22759/16	S1635-2	66105-1
LD-5	18	MIL-W-22759/16	S1635-2	66105-1
LD-4	18	MIL-W-22759/16	31885	66103-1
LD-3	18	MIL-W-22759/16	31885	66103-1
LD-2	18	MIL-W-22759/16	31885	31885
LD-1	18	MIL-W-22759/16	31885	31890
LD-1	18	MIL-W-22759/16	31890	---------
HL-2	18	MIL-W-22759/16	31885	---------
SL-3	18	MIL-W-22759/16	31901	---------
SL-2	18	MIL-W-22759/16	31885	---------
SL-1	18	MIL-W-22759/16	31885	31890

WIRE TABLE

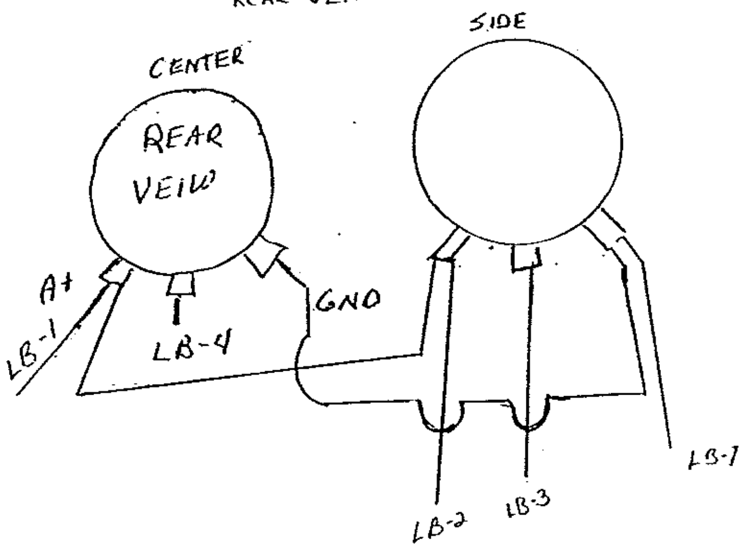
ITEM NO.	PART NO.	DESCRIPTION
15	A600-PG	Pos. Light
14	A600-PR	Pos. Light
13	S1638-2	Receptacle
12	S1638-1	Plug
11	S1636-2	Socket
10	206966-1	Hood
9	206708-1	Plug
8	66105-1	Socket
7	206705-2	Receptacle
6	66103-1	Pin
5	A413AHDADF	Power Supply
4	Type C4	Lamp Ass'y
3	MS35058-22	Switch
2	109-705-101	Circuit Break.
1	109-205-101	Circuit Break.

EQUIPMENT TABLE

CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM
Strobe and Nav. Lights



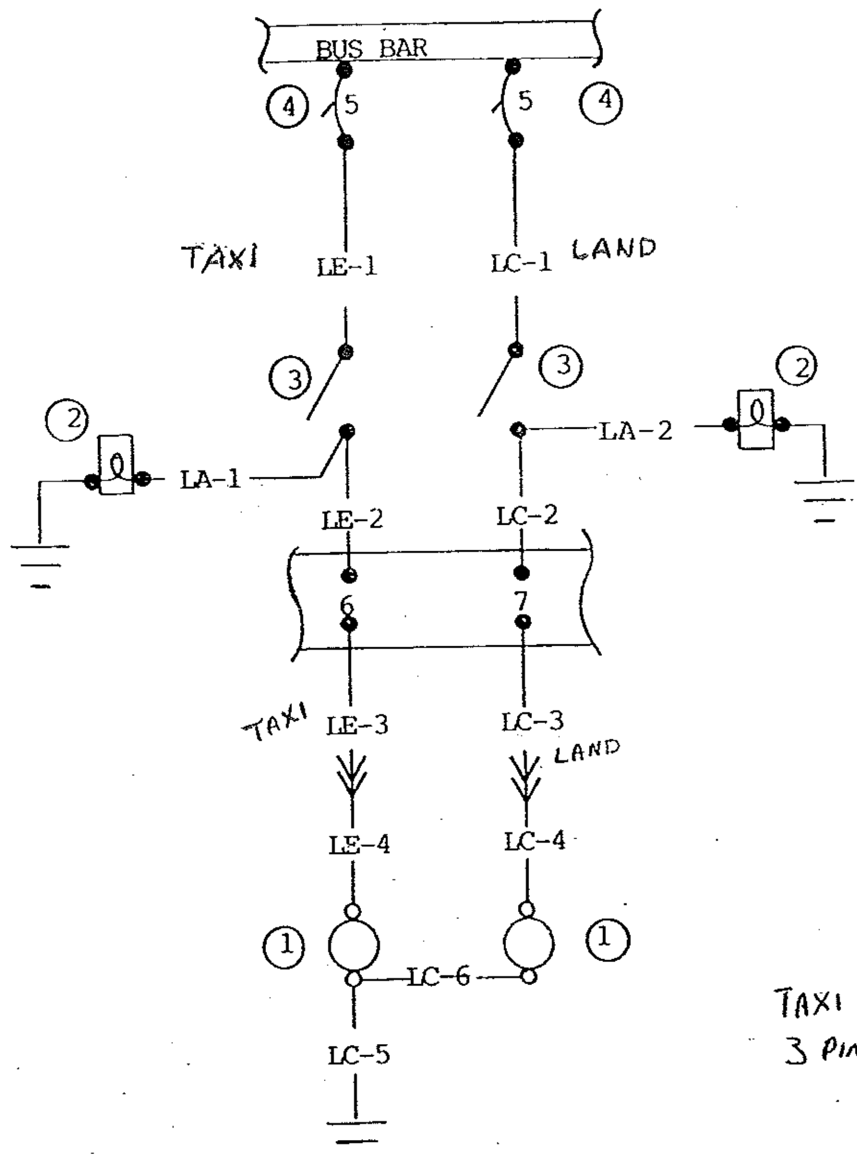
Pot. Ass'y
Rear view



LB-8	20	MIL-W-22759/16	------	------
LB-7	20	MIL-W-22759/16	66105-1	--------
LB-6	20	MIL-W-22759/16	S1635-1SF	31885
LB-5	20	MIL-W-22759/16	S1635-1SF	31885
LB-4	20	MIL-W-22759/16	S1635-1SF	------
LB-3	20	MIL-W-22759/16	S1635-1SF	------
LB-2	20	MIL-W-22759/16	S1635-1SF	------
LB-1	20	MIL-W-22759/16	31885	------
WIRE NO.	GA	MATERIAL	TERMINALS	
WIRE TABLE				

5	S-2000C201-J	Resistor
4	S-1904-2	Pot. Ass'y
3	S1904-2	Pot. Ass'y
2	S-1640-6	Housing
1	1570166-2	Dimmer Ass'y
ITEM NO	PART NO.	DESCRIPTION
EQUIPMENT TABLE		

CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM
Instrument Light Dimmer



TAXI & LAND. LITE
3 PIN. CON.

TAXI LA-1	GND	LAND. LA-2
↓	↓	↓
1	2	3

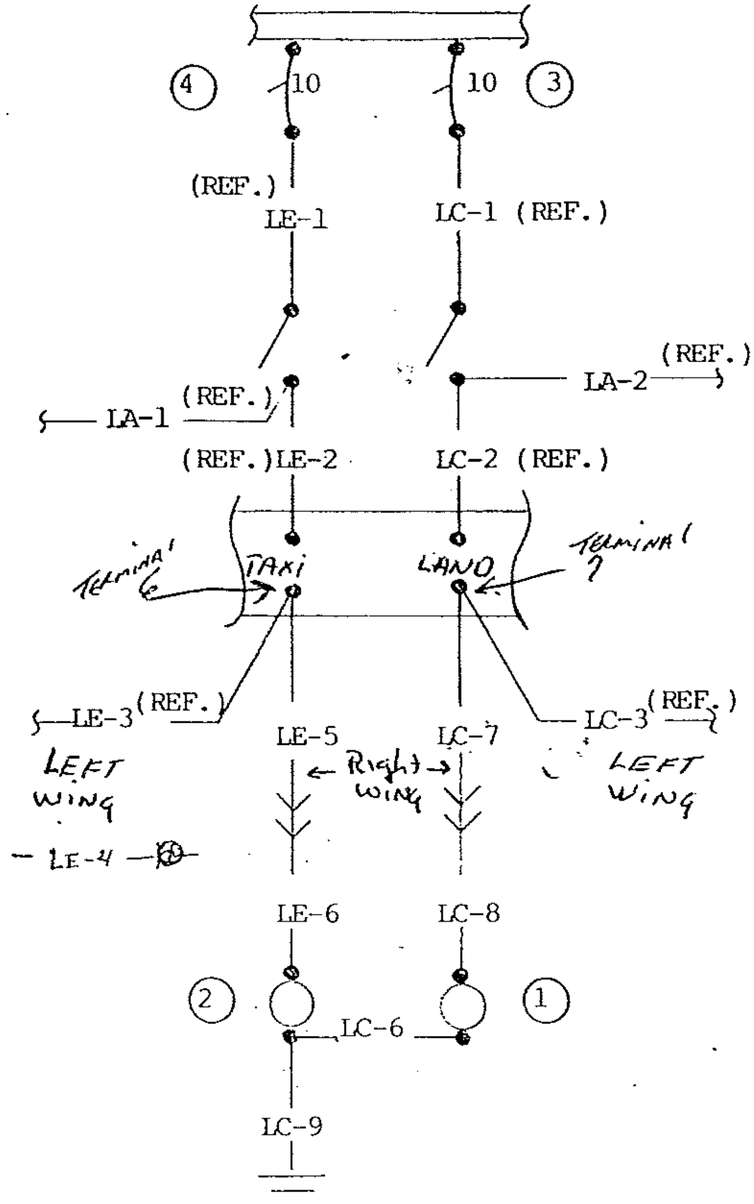
WIRE NO.	GA	MATERIAL	TERMINALS	
LA-2	22	MIL-W-22759/16	-------	------
LA-1	22	MIL-W-22759/16	-------	------
LC-6	18	MIL-W-22759/16	31890	31890
LC-5	18	MIL-W-22759/16	31890	31890
LC-4	18	MIL-W-22759/16	31890	S1636-1
LC-3	18	MIL-W-22759/16	S1635-1S	31885
LC-2	18	MIL-W-22759/16	31885	31885
LC-1	18	MIL-W-22759/16	31885	31890
LE-4	18	MIL-W-22759/16	31890	S1635-1SF
LE-3	18	MIL-W-22759/16	S1636-1	31885
LE-2	18	MIL-W-22759/16	31885	31885
LE-1	18	MIL-W-22759/16	31885	31890

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
4	109-205-101	Circuit Brek.
3	MS35058-22	Switch
2	25F1208	Lamp
1	GE4594	Landing Light

EQUIPMENT TABLE

CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM
Landing & Taxi Lights Left Wing



LC-9	18	MIL-W-22759/16	31890	31890
LC-8	18	MIL-W-22759/16	31890	S1636-1
LC-7	18	MIL-W-22759/16	S1635-1SF	31885
LC-6	18	MIL-W-22759/16	31890	31890
LE-6	18	MIL-W-22759/16	31890	S 1635-1SF
LE-5	18	MIL-W-22759/16	S 1636-1	31885
WIRE NO.	GA	MATERIAL	TERMINALS	

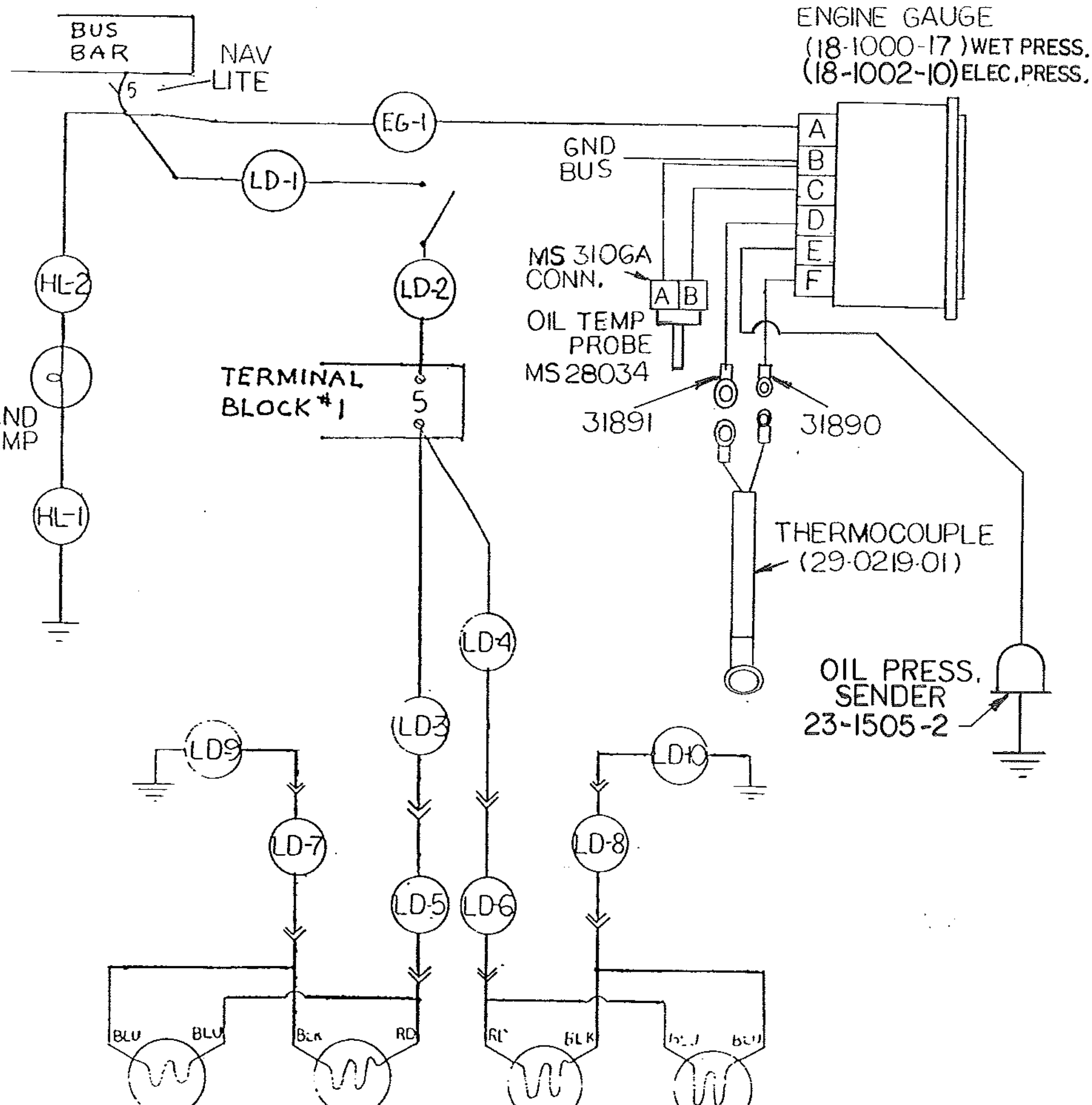
WIRE TABLE

4	109-210-101	Circuit Break.
3	109-210-101	Circuit Break.
2	GE 4594	Taxi Light
1	GE 4594	Landing Light
ITEM NO.	PART NO.	DESCRIPTION

EQUIPMENT TABLE

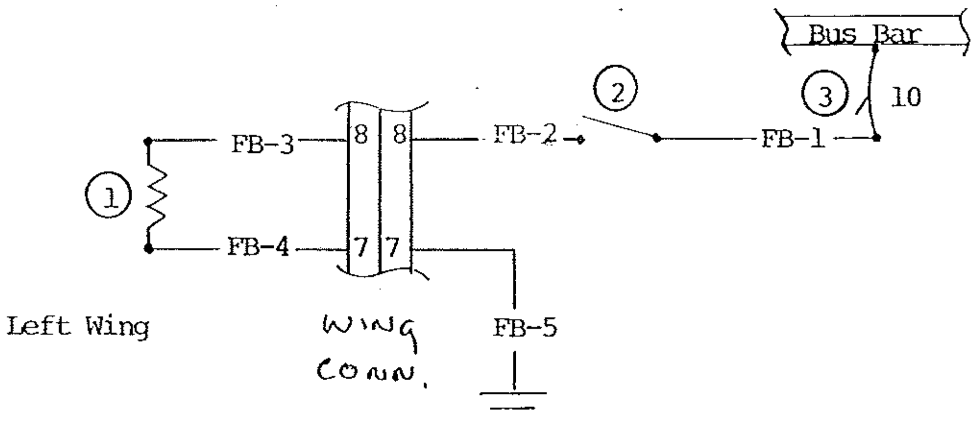
CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM (option)
Right Landing & Taxi Lights

Schematic, Nav. Lights and Instruments



LEFT NAV LIGHTS

RIGHT NAV LIGHTS



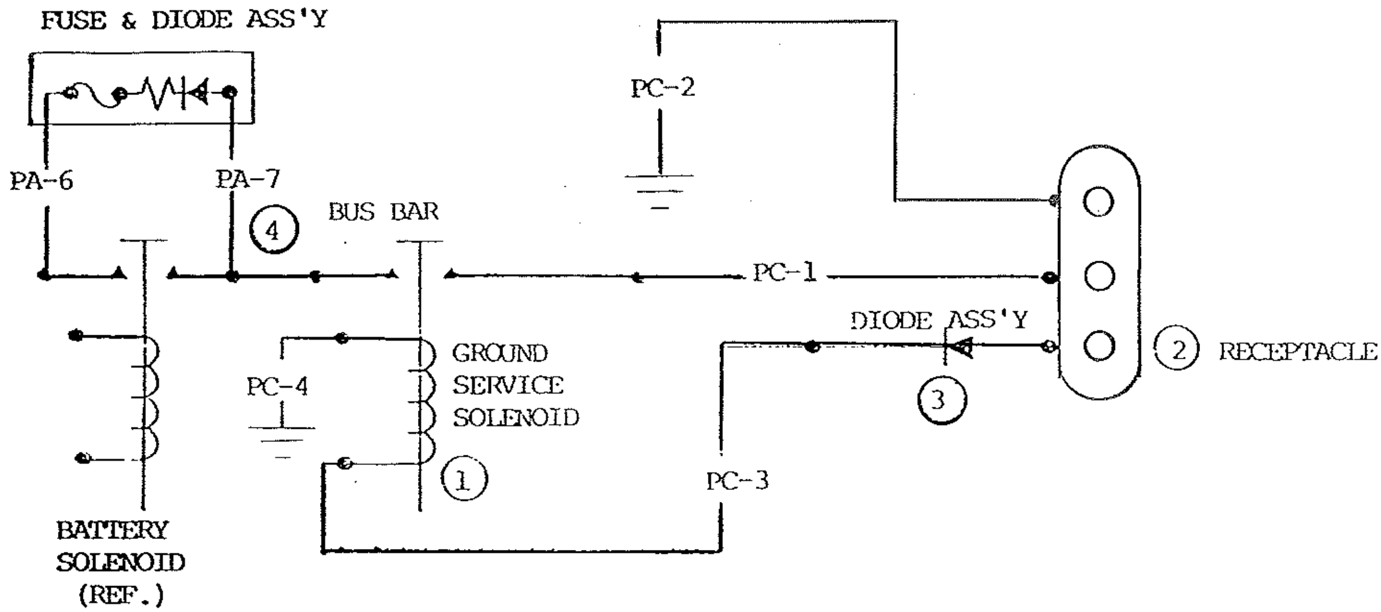
WIRE NO.	GA	MATERIAL	TERMINALS	
FB-5	18	MIL-W-22759/16	66103-1	31901
FB-4	18	MIL-W-22759/16	66105-1	-----
FB-3	18	MIL-W-22759/16	66105-1	-----
FB-2	18	MIL-W-22759/16	66103-1	31885
FB-1	18	MIL-W-22759/16	31885	31890

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
3	109-210-101	Circuit Breaker
2	MS35058-22	Switch
1	AN5816-2	Pitot Tube

EQUIPMENT TABLE

CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM
Pitot Heat (Option)



WIRE NO.	GA	MATERIAL	TERMINALS	
PA-7	22	MIL-W-22759/16	31909	--------
PA-6	22	MIL-W-22759/16	31909	--------
PA-4	22	MIL-W-22759/16	31907	31890
PA-3	22	MIL-W-22759/16	31890	--------
PA-2	2	MIL-W-22759/16	324054	324054
PA-1	2	MIL-W-22759/16	324054	324054

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
4	50283	BUS BAR
3	1570043	DIODE ASS'Y
2	MS3506-1	RECEPTACLE
1	S-2475-1	SOLENOID

EQUIPMENT TABLE

CLASSIC AIRCRAFT CORPORATION
WACO YMF WIRING DIAGRAM
APU RECEPTACLE (OPTION)

OPERATORS MANUAL

JACOBS AIRCRAFT ENGINE MODELS

R-755A and R-755B

JACOBS AIRCRAFT ENGINE COMPANY

POTTSTOWN - PENNSYLVANIA - U. S. A.

Cable: JAECO, POTTSTOWN

PRINTED IN U.S.A.
FIRST ISSUE 1948
REVISED 1960

INDEX

NOTICE

THE DETAILED INSTRUCTIONS ON OPERATION, MAINTENANCE AND LUBRICATION ARE MOST IMPORTANT and you cannot expect satisfactory service from your engine unless they are followed implicitly.

They have been made as concise as possible, and the few minutes required to familiarize yourself with them can save you many dollars in service.

JACOBS AIRCRAFT ENGINE COMPANY
POTTSTOWN, PENNSYLVANIA, U. S. A.

WARRANTY

The Jacobs Aircraft Engine Company warrants all engines manufactured by it to be free from defects in material or workmanship. The obligation of the Jacobs Aircraft Engine Company under this warranty is limited to the replacement of parts returned to it for inspection and examination at the factory, transportation charges prepaid, within three months (90 days) or one hundred hours flying time—whichever is the shorter—after delivery of the engine to the initial purchaser. Should parts prove upon examination to be defective they will be replaced free of charge.

This warranty shall not apply to any engine or part that has been repaired or altered outside the factory in any way so as, in the manufacturer's judgment, to affect its operation, or which has been subjected to accident, neglect or misuse.

The Jacobs Aircraft Engine Company further guarantees that each engine has been block tested and developed its full rated horse-power.

The Jacobs Aircraft Engine Company reserves the right to change engine or parts specifications or prices without incurring any responsibility as to engines or parts previously sold.

The Jacobs Aircraft Engine Company shall not be held responsible for guarantees in addition to the above, verbal or written, made by any representative. Neither does it make any warranty with regard to equipment not a product of the Jacobs Aircraft Engine Company, such as magnetos, ignition parts, carburetors, or any other standard accessories, as they are usually guaranteed by their respective manufacturers.

The above constitutes the sole guarantee of the Jacobs Aircraft Engine Company.

FOREWORD

THIS manual has been prepared for the purpose of providing helpful and necessary instructions for the operation, care and maintenance of your Jacobs Aircraft Engines to enable them to deliver the most satisfactory service throughout the many hundreds of hours they are built to serve you. The instructions given are the result of careful consideration of factory and field experience, and cover the best methods of procedure for operation, lubrication, and maintenance of Jacobs engines.

Great care has been taken to avoid undue emphasis on minor details, and when minor items have been made prominent it is because experience has amply dictated the wisdom of giving these points special care and attention.

The manufacturer strongly recommends that the instructions given herein be followed implicitly in the operation of the engines covered and in the performance of any work on them. The manufacturer advocates that for major overhaul or any major repairs its engines be taken to an authorized Jacobs Service Base or Service Station or brought to the factory. It is very important that no unnecessary or amateur service be performed on the engine, as this has been found in most cases to be detrimental.

It has been the aim of the manufacturer to build an engine to give the maximum of service with the minimum of attention other than proper lubrication and fuel; and the latest knowledge in design has been combined with the best materials obtainable and the finest and most painstaking workmanship to attain this end.

JACOBS AIRCRAFT ENGINE COMPANY
POTTSTOWN, PENNSYLVANIA, U. S. A.

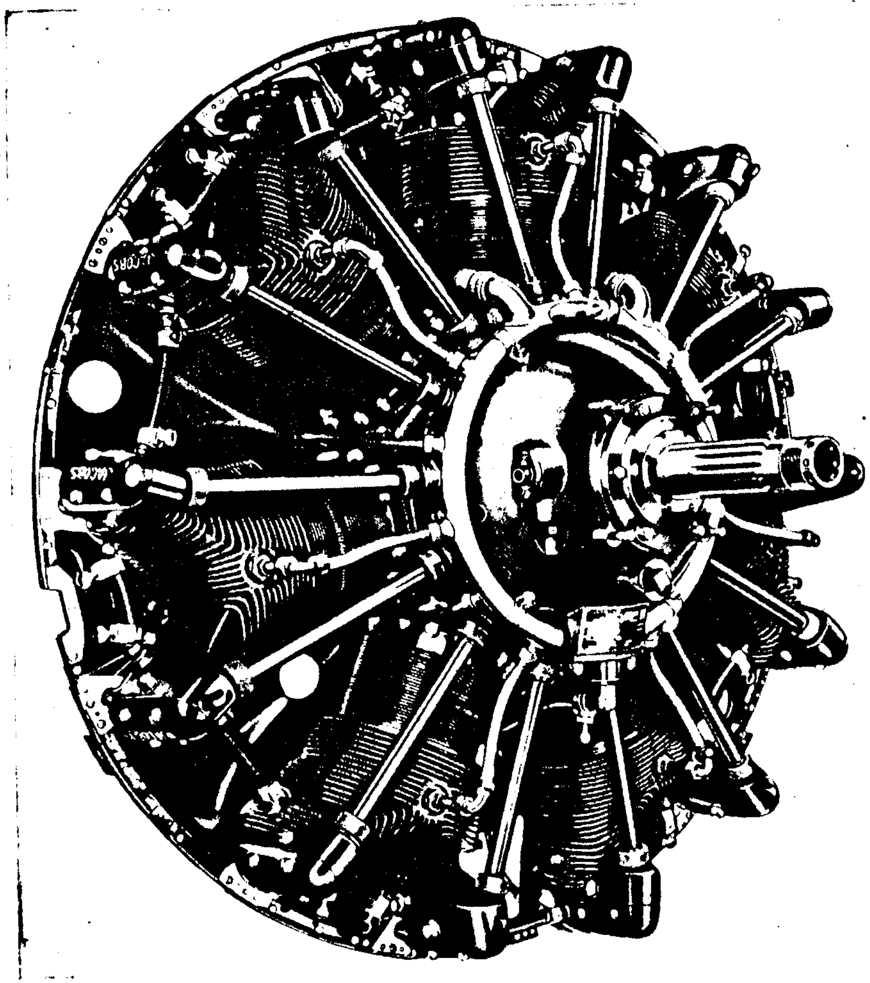


ILLUSTRATION No. 1

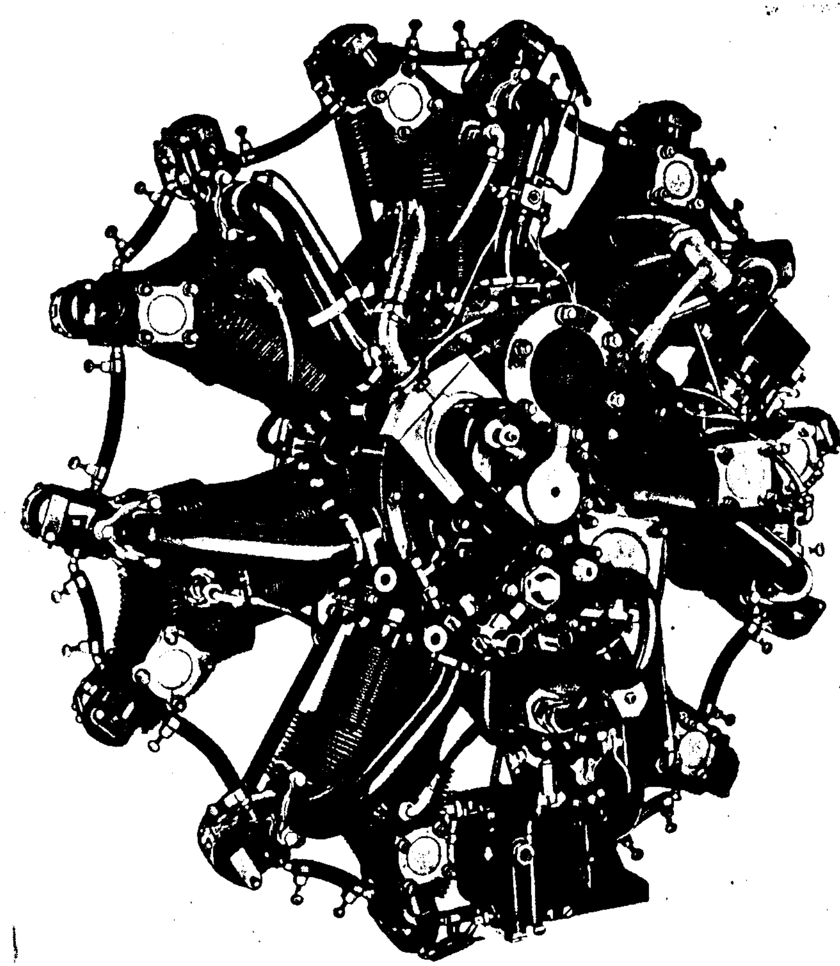


ILLUSTRATION No. 2

MODEL R-755A

ENGINE DATA

Name	Jacobs
Model	R-755A and R-755B - all items the same except as noted
Type	7 Cyl., Direct Drive, Air-Cooled Radial
A.T.C. No.	237
Rated Horsepower	300 H.P. at 2200 RPM at Full Throttle, R-755B : 275 H.P. at 2200 RPM at Full Throttle
Take-Off Rating (One Minute)	300 H.P. at 2200 RPM at Full Throttle, R-755B : 275 H.P. at 2200 RPM at Full Throttle
Bore	$5\frac{1}{4}''$—133.35 mm.
Stroke	5″ —127.0 mm.
Displacement	757 cu. in.—12.40 liters
Compression Ratio	6 : 1
Ignition	1 Scintilla Magneto, Model VMN7-DF5 1 Scintilla Distributor (Battery and Coil)
Spark Plugs	Champion C-26S B.G. SS485A
Spark Plug Gap	.015″-.018″
Magneto Breaker Point Gap	.012″
Battery Ignition Distributor Breaker Point Gap	.016″
Timing at Full Advance	31° B.T.C.
Generator	Eclipse 25 Ampere, 12 Volt
Oil Consumption at Rated RPM	.018 lbs./B.H.P.-hour
Oil Consumption at Cruising	.015 lbs./B.H.P.-hour
Carburetor	Stromberg NA-R7A, $2\frac{1}{16}''$ Venturi
Fuel Required	80 Octane Minimum
Fuel Consumption at Sea Level:	
Cruising	.48 lbs./B.H.P.-hour
Valve Timing (Average Hot Running Clearance: Intake .035″—Exhaust .040″)	
Intake Opens	21° B.T.C.
Intake Closes	62° A.B.C.
Exhaust Opens	62° B.B.C.
Exhaust Closes	12° A.T.C.
Valve Tappet Clearance (Intake Cold)	.008″
Valve Tappet Clearance (Exhaust Cold)	.008″
Valve Spring Loading (plus or minus 10%)	
Valve Closed: Inner at $1\frac{7}{8}''$	35 lbs.
Outer at $1\frac{7}{8}''$	60 lbs.
Valve Open: Inner at $1\frac{13}{32}''$	50 lbs.
Outer at $1\frac{13}{32}''$	90 lbs.

Master Rod Location	No. 1 cylinder
Length from end of propeller shaft to end of starter	40.2″—1021 mm.
Overall Diameter	44.0″—1118 mm.
Center of Gravity (Bare Engine):	
Distance below Crankshaft C/L	.23″—5.8 mm.
Distance Forward of Mounting Bolt Circle	6.89″—175 mm.
Crankshaft Rotation (from Front of Engine)	Counter-Clockwise
Crankshaft Spline	S.A.E. #20
Diameter Mounting Bolt Circle	16½″
Number of Mounting Bolts	8
Diameter of Mounting Bolts	⅜″

Dry Weight of Standard R-755A1 Engine includes the following:

1 Magneto, 1 Battery Ignition Distributor and Coil, Complete Radio Shielded Ignition Assembly with 14 Shielded Spark Plugs, Carburetor, Priming System, Vacuum Pump Drive, and including all standard accessory drives and covers.

Total Dry Weight—R-755A1	505 lbs.—229 Kgs.	Also R755B1
Total Dry Weight R-755A2 Engine (with Propeller Governor Drive and provisions for mounting Hamilton Standard Constant Speed Propeller)	511 lbs.—232 Kgs.	Also R-755B2

Miscellaneous:

Tool Kit	7 lbs.
Instruction Book	1 lb.
Oil Strainer (separately mounted)	2 lbs.

Available Extra Equipment:

Starter: Eclipse Series E80, Type 397 (12 or 24 Volt)	19.0 lbs.
Generator: Eclipse Type 309, Model 8 (12 Volt-25 Amp)	21.5 lbs.
Fuel Pump: Pesco Model No. 2P-R400 BLYA (Square Shaft)	2.2 lbs.
Romec Model No. RD-4140	2.4 lbs.
Vacuum Pump: Pesco Model No. 3P-194-E, Type B-2A	3.4 lbs.
Romec Model No. RD-2112B, Type B-2A	4.0 lbs.
Propeller Governor: Hamilton Model 1A4-A5	4.5 lbs.
Hydraulic Pump: Pesco IP-320-F	2.5 lbs.

Shipping Case, Overall Dimensions:

Length 57½″, Width 53½″, Height 51″

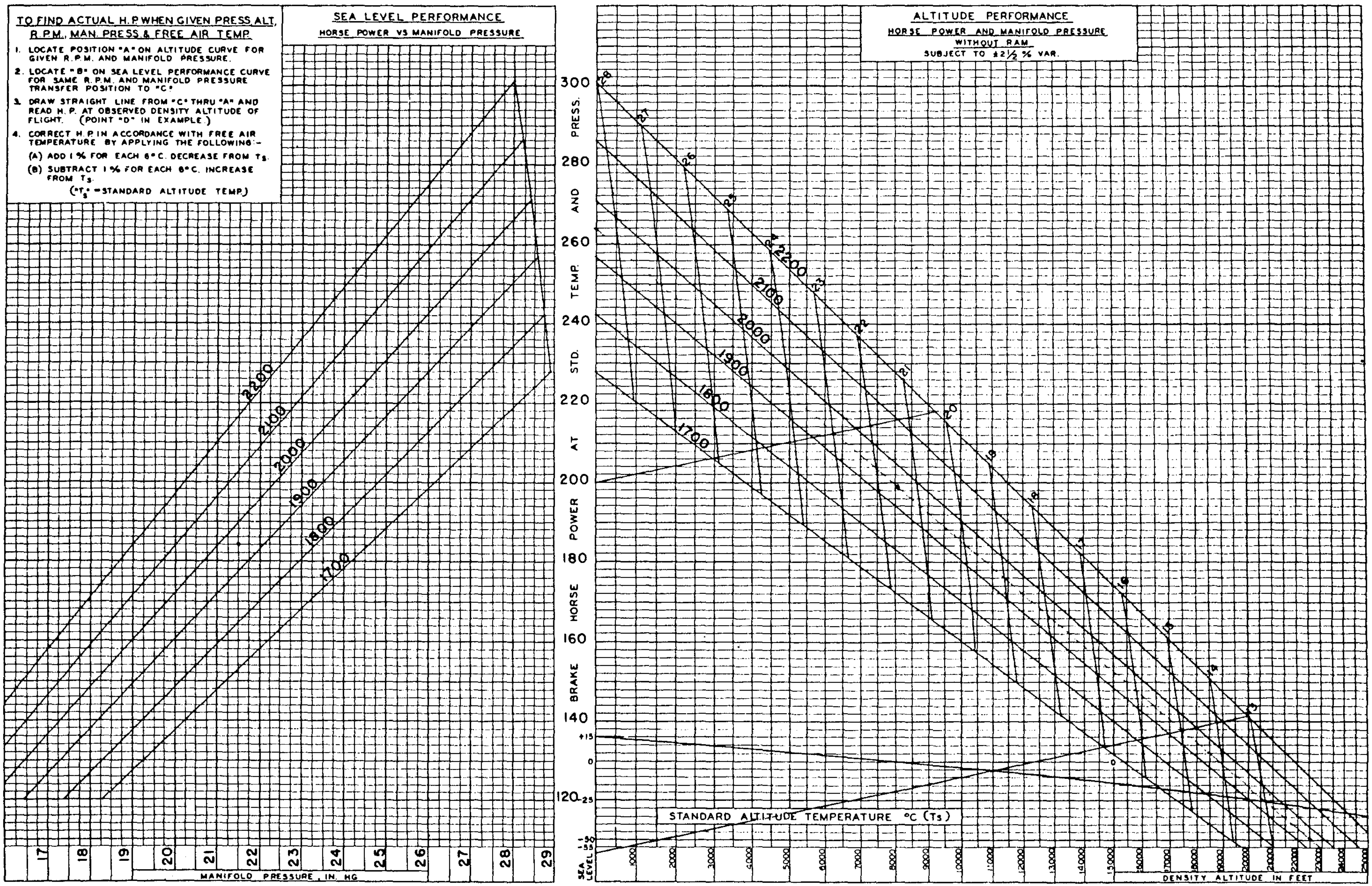
Weight, with mounting plate	560 lbs.—254 Kgs.

ACCESSORY DRIVES:

The gear ratio of each accessory drive to the engine crankshaft and the direction of rotation is as follows, for a typical installation.

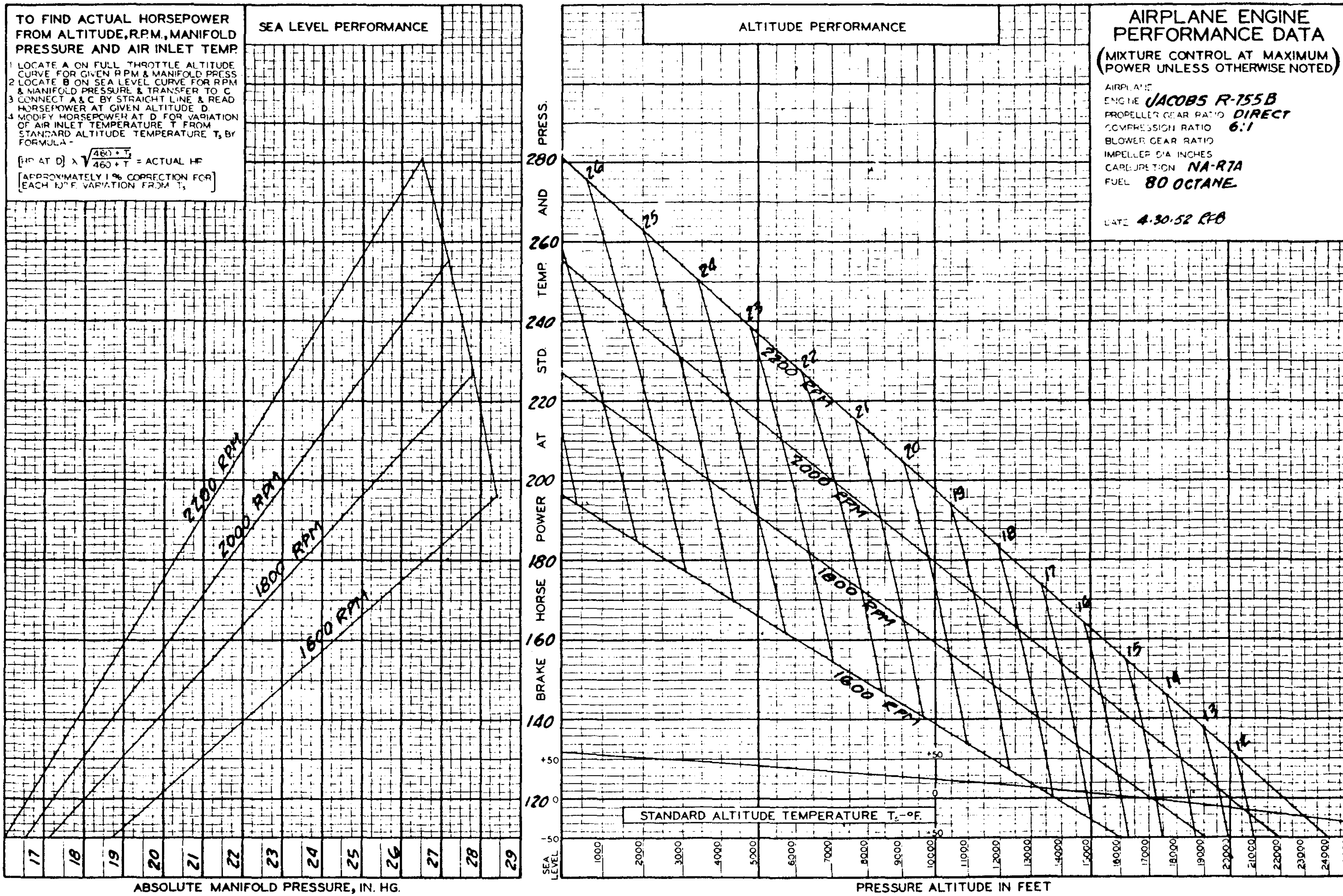
DRIVES	DIRECTION OF ROTATION	GEAR RATIO
Starter	Counter-Clockwise	1.5 : 1
Generator	Counter-Clockwise	1.42 : 1
Tachometer	Counter-Clockwise	.5 : 1
Fuel Pump	Clockwise	1. : 1
Oil Pump	Counter-Clockwise	.5 : 1
*Vacuum Pump	Counter-Clockwise	.875 : 1 or 1 : 1
*Propeller Governor	Counter-Clockwise	1. : 1
Magneto	Counter-Clockwise	.875 : 1
Distributor	Counter-Clockwise	.5 : 1
*Hydraulic Pump	Counter-Clockwise	.875 : 1 or 1 : 1

*Optional drives provided on the accessory drive unit.



SEA LEVEL AND ALTITUDE PERFORMANCE CURVES

R-755A ENGINE


TO FIND ACTUAL HORSEPOWER FROM ALTITUDE, R.P.M., MANIFOLD PRESSURE AND AIR INLET TEMP.
1 LOCATE A ON FULL THROTTLE ALTITUDE CURVE FOR GIVEN RPM & MANIFOLD PRESS
2 LOCATE B ON SEA LEVEL CURVE FOR RPM & MANIFOLD PRESSURE & TRANSFER TO C
3 CONNECT A & C BY STRAIGHT LINE & READ HORSEPOWER AT GIVEN ALTITUDE D.
4 MODIFY HORSEPOWER AT D FOR VARIATION OF AIR INLET TEMPERATURE T FROM STANDARD ALTITUDE TEMPERATURE T_s BY FORMULA -
$[\text{HP AT D}] \times \sqrt{\frac{460 + T_s}{460 + T}} = \text{ACTUAL HP}$
[APPROXIMATELY 1% CORRECTION FOR EACH 10° F. VARIATION FROM T_s]
SEA LEVEL PERFORMANCE
2200 RPM
2000 RPM
1800 RPM
1600 RPM
17
18
19
20
21
22
23
24
25
26
27
28
29
ABSOLUTE MANIFOLD PRESSURE, IN. HG.
BRAKE HORSE POWER AT STD. TEMP. AND PRESS.
280
260
240
220
200
180
160
140
120
ALTITUDE PERFORMANCE
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
2200 RPM
2000 RPM
1800 RPM
1600 RPM
+50
0
-50
STANDARD ALTITUDE TEMPERATURE T_s - °F.
SEA LEVEL
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
20000
21000
22000
23000
24000
25000
PRESSURE ALTITUDE IN FEET
AIRPLANE ENGINE PERFORMANCE DATA
(MIXTURE CONTROL AT MAXIMUM POWER UNLESS OTHERWISE NOTED)
AIRPLANE
ENGINE JACOBS R-755B
PROPELLER GEAR RATIO DIRECT
COMPRESSION RATIO 6:1
BLOWER GEAR RATIO
IMPELLER DIA INCHES
CARBURETION NA-R7A
FUEL 80 OCTANE
DATE 4-30-52 RFB

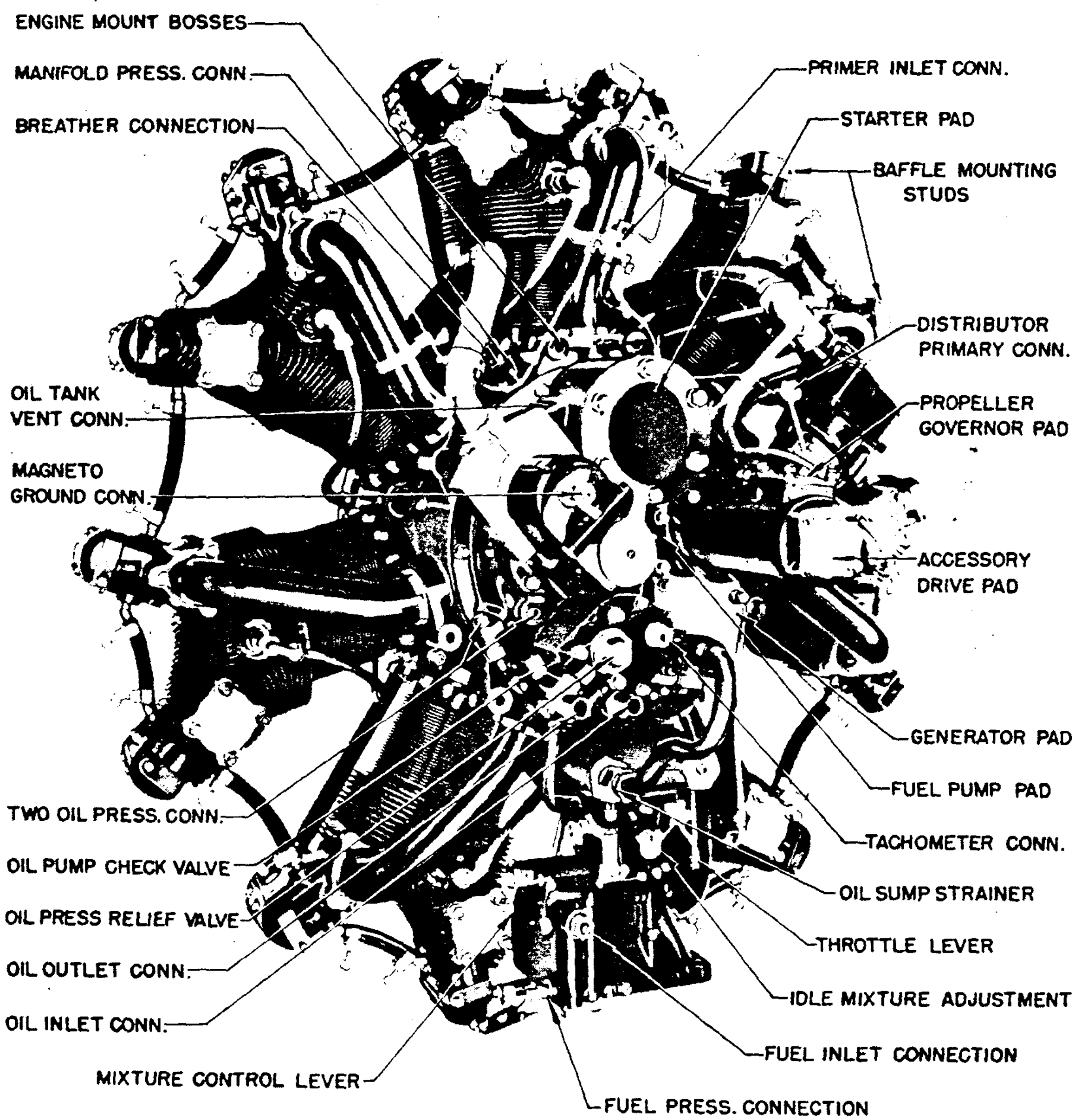


ILLUSTRATION NO. 3

R-755A LEFT REAR VIEW

Accessories and connections for the R-755A Engine are shown above.

SECTION 1
GENERAL DESCRIPTION

The Jacobs Model R-755A engine is an unsupercharged seven-cylinder air-cooled radial engine with a piston displacement of 757 cubic inches.

The variations of the R-755A model engine are identified by the number following the "A".

The R-755A1 engine is the basic engine without accommodations for hydraulically operated propellers.

The R-755A2 engine has provisions for mounting constant speed hydraulically operated propellers and has different accessory drive arrangement than the R-755A1 engine.

CRANKCASE

The crankcase assembly consists of five castings, namely: front case, front section of main crankcase, rear section of main crankcase, rear intermediate bearing plate, and rear case. The two sections of the main crankcase, or power section, are secured together by through-bolts and studs, and the other case sections are secured to these by an ample number of specially heat-treated studs. All joints are heavily flanged.

The front case is a magnesium alloy casting and carries the cam gear and pinion assembly, tappet assemblies, propeller oil transfer ring assembly, thrust bearing and thrust plate.

The front section of the main crankcase is an aluminum alloy casting, and carries the front main crankshaft roller bearing.

The rear section of the main crankcase is a magnesium alloy casting in which the intake manifold and oil sump are integrally cast, and carries the rear main crankshaft roller bearing and the carburetor. The two sections of the main crankcase are bolted together before final machining, and machined as one unit. Therefore, these sections cannot be replaced separately.

The rear intermediate bearing plate is a magnesium alloy casting which carries the rear crankshaft ball bearing and accessory drive bearings and bushings.

All the oil feed bushings and bearings are diamond bored in special fixtures and are not interchangeable in the field. Drilled oil passages leading from the oil feed bearing to the bushings furnish pressure lubrication to all bushings.

The rear case is a magnesium alloy casting with mounting pads for ignition units, generator, starter, oil pump, fuel pump, and drive units for additional accessories.

CYLINDERS

The cylinder barrels are machined from heat-treated chrome molybdenum steel forgings, with closely spaced fins and accurately ground bores.

The cylinder heads are heat-treated aluminum alloy castings with rocker arm supports and housings cast integral. They are screwed and shrunk on the barrels. See note on page 14.

CRANKSHAFT

The crankshaft is of the two-piece clamp design and is machined and ground from selected chrome-nickel molybdenum steel forgings. The front half, which has an S.A.E. #20 spline, is machined and plugged for the installation of constant speed propellers. The crankshaft is carefully balanced both statically and dynamically.

MASTER ROD

The master rod is of the one-piece type, made from a chrome nickel molybdenum steel forging and machined all over, carrying a steel-back lead-bronze bearing and bronze piston pin bushing, which are shrunk in place and afterward diamond bored to a mirror finish. The master rod is drilled to carry pressure oil from the master rod bearing to the knuckle pins. The master rod surface is shot-blasted for greater fatigue resistance.

LINK RODS

The link rods are sturdy H section polished aluminum alloy forgings with diamond bored knuckle pin and piston pin holes.

PISTONS See note on page 14.

Pistons are of forged aluminum alloy with diamond bored piston pin holes and accurately machined ring grooves.

PISTON PINS

Piston pins are of nitralloy steel with glass hard surface. They are of the full floating type, with aluminum plugs in the ends.

VALVE OPERATING MECHANISM

The valve operating mechanism is of the push rod-rocker arm type. The cam and valve tappet assemblies are located in the front case. The cam hub is of forged aluminum and operates on a nitralloy crankshaft sleeve. The cam ring, which is riveted to the hub, is of chrome-nickel molybdenum steel. It has two hardened and ground tracks with three lobes each, and rotates at one-sixth crankshaft speed. The push rods are enclosed in oil-tight housings. Rocker arms ride on dual tapered roller bearings.

VALVES

Valves are made by Thompson Products, Inc., of a special C.N.S. steel, and are of the tulip type. The exhaust valves have hollow stems and are sodium cooled.

VALVE SEATS

Valve seats are machined from forged aluminum bronze and shrunk in place in the aluminum cylinder head.

VALVE SPRINGS

Two springs are used on both inlet and exhaust valves and are of chrome vanadium steel. Both are wound in the same direction and held in place by a cupped washer and split cone fitted to the valve stem.

LUBRICATION SYSTEM

General

Oil from the oil tank is sent through a screen type strainer exterior of the engine to the oil inlet connection. The oil then goes directly to the pressure stage of the oil pump. A check valve is built into the oil pump and prevents leakage of oil into the engine when the engine is not in operation. Pressure oil forces open the check valve and enters the relief valve. Both the check valve and relief valve are of the ball and spring type and are non-adjustable. Excess oil by-passed at the relief valve goes directly to the oil-out connection of the engine, thereby avoiding excessive accumulations of oil in the sump or overloading of the oil scavenge pump section. The oil pressure gauge connection is located immediately after the relief valve. Pressure oil flows to the oil transfer bearing located in the rear intermediate bearing plate. Here oil is fed to the crankshaft and provides pressure lubrication to the starter, magneto, distributor, generator and oil pump drive bushings through five radial passages. Oil flows through the hollow crankshaft to provide lubrication to the master rod bearing and knuckle pins. The cylinder walls and piston pins are lubricated by a crankshaft oil spray jet of the non-clogging type and by splash from the master rod bearing and link rods. The cam hub is pressure lubricated by oil from the hollow front half of the crankshaft. Drain oil from the power section and the rear section flows directly to the sump surrounding the air intake passage above the carburetor. Drain oil from the nose section also flows to this sump through an exterior drain line. Scavenge oil is taken from the sump to the scavenge section of the oil pump through an exterior line. A coarse screen is provided at the oil outlet of the sump to prevent large foreign particles from entering the lubrication system. Oil from the scavenge section of the oil pump is sent back to the oil tank.

Automatic Valve Gear Lubrication

Oil from the pressure oil pump is sent through an external line to the fitting at the rear of the sump on the nose section. The nose section is fitted with a cast-in tube which carries pressure oil to all the valve tappet guides. Oil is metered from the tappet guide into the hollow tappet and passes to the push rod through the opening in the ball socket. Oil then flows through the hollow push rod to the rocker arm ball socket, and through drilled holes in the rocker arm to the rocker arm bearings. All parts of the valve gear are thus lubricated with oil under pressure. All rocker boxes are interconnected for drainage and for proper breathing. The whole rocker box system is vented to the crankcase through a line connected to one of the upper rocker box covers. The oil pump has one pressure section and two scavenge sections. One scavenge section is used to drain oil from the nose section, power section, and rear section. The second scavenge section is used to scavenge the oil which has drained from the rocker boxes into the lowest rocker box cover.

Propeller Control Oil System (Hamilton Standard Type Propellers)

A propeller oil transfer seal is placed immediately behind the thrust bearing for engines intended to be used with constant speed propellers. A total of eight oil seal rings are used to prevent excessive leakage of oil from the transfer seal. In the constant speed control system, high pressure oil from the propeller governor unit is led through an external line to the pressure connection at the right side of the nose section. Propeller oil from this connection goes through the propeller oil transfer seal to the hollow front half of the crankshaft. A plug is provided in the front half of the crankshaft to separate the engine lubricating system and the propeller oil control system. When adjustable or fixed pitch propellers are used on engines equipped with the propeller oil transfer seal, an external line is installed to provide pressure oil to the connection on the right side of the nose section so that the transfer seal rings will be safely lubricated.

CARBURETOR

The carburetor is an updraft Stromberg Type NA-R7A and is of the single venturi type fed from a single float chamber. It is mounted at the bottom of the rear half of the power section. The carburetor can be adjusted for either fuel pump or gravity feed operation. The carburetor is equipped with a needle type manual mixture control. Movement of the mixture control to the full lean "idle cut-off" position provides an effective means for stopping the engine by shutting off the fuel flow. The NA-R7A carburetor is equipped with a large capacity accelerating pump for smooth acceleration and with a needle valve operated economizer system which provides a lean mixture for cruising and richens the mixture at take-off and high power.

IGNITION SYSTEM

Ignition is furnished from three independent sources by two complete and independent systems to each cylinder. The electrical energy is furnished to the rear bank of spark plugs by a Scintilla VMN7-DF5 magneto, which is mounted on the left magneto pad on the rear case, and operates at ⅞ engine speed. Energy is furnished to the front bank of spark plugs from both the aircraft battery and the engine-driven generator through a Scintilla distributor and coil. The distributor is mounted on an adapter on the right magneto pad on the rear case, and operates at ½ engine speed.

The battery ignition distributor has completely automatic spark advance. When set to fire at 31° B.T.C. in the fully advanced position, the distributor automatically retards itself to fire 1° before top dead center at cranking speeds. The magneto, in the typical installation, is locked in the full advance position. The battery ignition system offers improved idling performance by providing a high voltage retarded spark at idling speeds. Starting is also aided and simplified by the full retarded spark supplied by the battery ignition system. No booster ignition system is required.

Both magneto and battery ignition systems are fully radio-shielded.

ACCESSORIES

The rear case provides mounting pads for generator, starter and fuel pump, in addition to the oil pump, magneto and distributor adapter. The standard distributor adapter provides drive and pad for vacuum pump on the rear. Special adapters are available with provision for mounting hydraulic constant speed propeller control or hydraulic pump, or both, in addition to the vacuum pump. One tachometer drive is also provided.

NOTE: Beginning with R-755A2 Engine Serial No. 31466 the cylinder barrels were porous chrome plated and Piston Assembly 4274A replaced 4260A in Engines Serial No. 31466 thru 31579.

Beginning with R 755A2 Engine Serial No. 31580 wedge type compression rings were introduced and current Piston Assembly 4276A became the standard arrangement.

All R-755B engines use Piston Assembly 4276A.

R:755B engine is similar to the R-755A. The main difference being the intake manifold and the rocker drain lines.

SECTION 2
UNPACKING AND INSTALLATION

To remove the engine from the shipping case and install in the plane, equipment consisting of crankshaft lifting nut, hoist, assembly stand and rocker box lifting sling should be available. Refer to illustration No. 4 and to paragraph headed "LIFTING SLING" in this section for fabrication instructions for the lifting sling.

The procedure is as follows using an assembly stand:

1. Remove 4 bolts and lift cover of shipping case.
2. Remove waterproof cover on engine.
3. Unfasten ignition cable ends where anchored to shipping case.
4. Remove nuts holding mount plate in shipping case.
5. Remove engine with crankshaft lifting nut, Part No. T-6034, and hoist. The steel mount plate should remain attached to the engine.
6. Mount engine on assembly stand by means of the mount plate.
7. ***If the engine is to be operated immediately, it will be convenient at this time to drain rust preventive oil from cylinders by removing plugs in spark plug holes and turning the engine over several revolutions.***
8. Rotate assembly stand to place crankshaft in horizontal position.
9. By means of the rocker box lifting sling, lift the engine free from the assembly stand. The mount plate should THEN be removed, by two men if possible, being careful to clear all parts of the engine.
10. Mount in airplane, using lifting sling. (See illustration No. 4.)

If an assembly stand is not available, the shipping crate with the engine should be placed on a flat, level surface and the following procedure used:

1. Remove cover of shipping case, engine waterproof cover, and unfasten ignition cable ends as described above.
2. Check to determine that bolts holding mount plate to the bottom half of shipping case are tight. Carefully stand bottom half of shipping crate on its side so that the engine is in the flight position (with carburetor at bottom).
3. Install rocker box lifting sling as described in the paragraph headed "LIFTING SLING" in this section. Use hoist to take up slack in the cable.
4. Remove the six nuts between the engine mount plate and the shipping crate and employ hoist carefully to slide engine free of the crate.
5. Remove engine mount plate as described above and proceed with installation.

When the engine mount bolts are seated in rubber bushings, the bolts should be drawn only moderately tight in accordance with the airplane manufacturer's instructions, and should all be of equal tightness.

Carburetor controls should be arranged to operate smoothly and permit full travel of the levers. If the magneto is equipped with an advance lever it should be wired in the advance position (clockwise as far as possible).

The distributor adapter housing should be filled ¼ full with engine lubricating oil through the upper drive opening before the accessory is installed.

All fuel and oil lines should be neatly installed in such a manner as to prevent the possibility of air pockets or vapor locks. Only the best quality metal tubing or hose should be used. Lines should be of good annealed seamless tubing without any short bends or kinks. All lines should be securely fastened to avoid vibration and chafing.

OIL LINES

The oil lines connecting the oil tank to the engine should be at least ¾ inch tubing.

The supply line from the tank should be connected to the oil strainer. A second line is then installed from the outlet side of the strainer to the fitting located in the rear case on the right side of the oil pump.

A return line from the outlet fitting on the left side of the oil pump returns scavenged oil to the tank.

FUEL LINES

Fuel may be supplied to the carburetor either by gravity or by pressure. When the gravity system is used the carburetor float level is set for a pressure of 1½ lbs. and the fuel tank should be high enough above the carburetor to produce a pressure of about 1½ lbs. at the carburetor.

A fuel strainer should be installed at the low point between the fuel tank and carburetor.

When the pressure system is used the float level of the carburetor is set for a pressure of 3 lbs. and the fuel pump pressure should be set at 3 lbs. The fuel line should be run from the strainer to the inlet side of the fuel pump and from the outlet of the fuel pump to the carburetor. No external by-pass fuel line is required, as the approved fuel pumps have built-in by-pass.

LIFTING SLING

Whenever it is required that the R-755A engine be handled on a hoist the rocker box type lifting sling as shown in illustration No. 4 should be used. The sling should be fabricated locally from high quality steel wire cable .250 inch diameter. The steel cable should preferably be inserted in light weight rubber hose or other type protective sheath. Only one length of cable is used. Thread the cable through the rocker boxes, using the numbers on the illustration as a guide. Cable Sections 1 and 4 must be in front of Cable Sections 2 and 5 respectively. In this position Sections 1 and 4 will act to prevent Sections 2 and 5 from slipping off the rocker boxes. Securely clamp cable end 1 to 6, allowing enough slack so that Cable Sections 1 and 4 will clear the rocker boxes of the No. 1 (top) cylinder. Apply lifting action slowly so that the cable will center itself and all four lifting sections become taut. As cable is tightened, also check to see that the cable loops around the outside rocker boxes at 2 and 5 are not too close to the forward edge of the rocker boxes. The engine as supported by this lifting sling will have the crankshaft tipped slightly upward so that it can easily be attached to the aircraft structure.

Only the engine itself may be lifted with the rocker box type lifting sling. Do not attempt to lift the engine plus overhaul stand by this method.

RUNNING-IN

All Jacobs engines are thoroughly tested and run-in at the factory. However, a one-hour check run should be made before flight, to check the installation.

Before starting, turn the propeller at least six complete turns by hand to determine that there is no oil or gasoline accumulated in the lower cylinders.

If rust preventive oil has not been previously drained from the cylinders, all plugs must be removed from rear spark plug holes. The engine must then be turned slowly by hand at least ten revolutions to drain the rust preventive oil. The engine should again be rotated several revolutions after reinstallation of the spark plugs.

After the engine has been started, the oil pressure and fuel pressure should be immediately checked. The engine should be run-in at 600 RPM to 1000 RPM. Set controllable propellers in low pitch.

After the oil is warm, check the oil and fuel lines, cowling, baffles and controls.

In order to avoid overheating during the check run, a gasket type thermocouple should be installed under one of the rear spark plugs, and the temperature closely observed. The oil temperature should not be permitted to exceed allowable limits. The head temperature should not be permitted to exceed 400° F. (200° C.) except when opening the throttle to check maximum engine speed, when a maximum temperature of 450° F. (232° C.) is permissible.

DO NOT "REV-UP" THE ENGINE UNTIL THE OIL HAS BEEN THOROUGHLY HEATED AND A SUFFICIENT LENGTH OF TIME ALLOWED FOR ALL PARTS TO BECOME THOROUGHLY LUBRICATED. THE "REVVING-UP" SHOULD NOT TAKE PLACE UNTIL THE ENGINE IS READY FOR FLIGHT AND SHOULD NOT EXCEED 20 SECONDS.

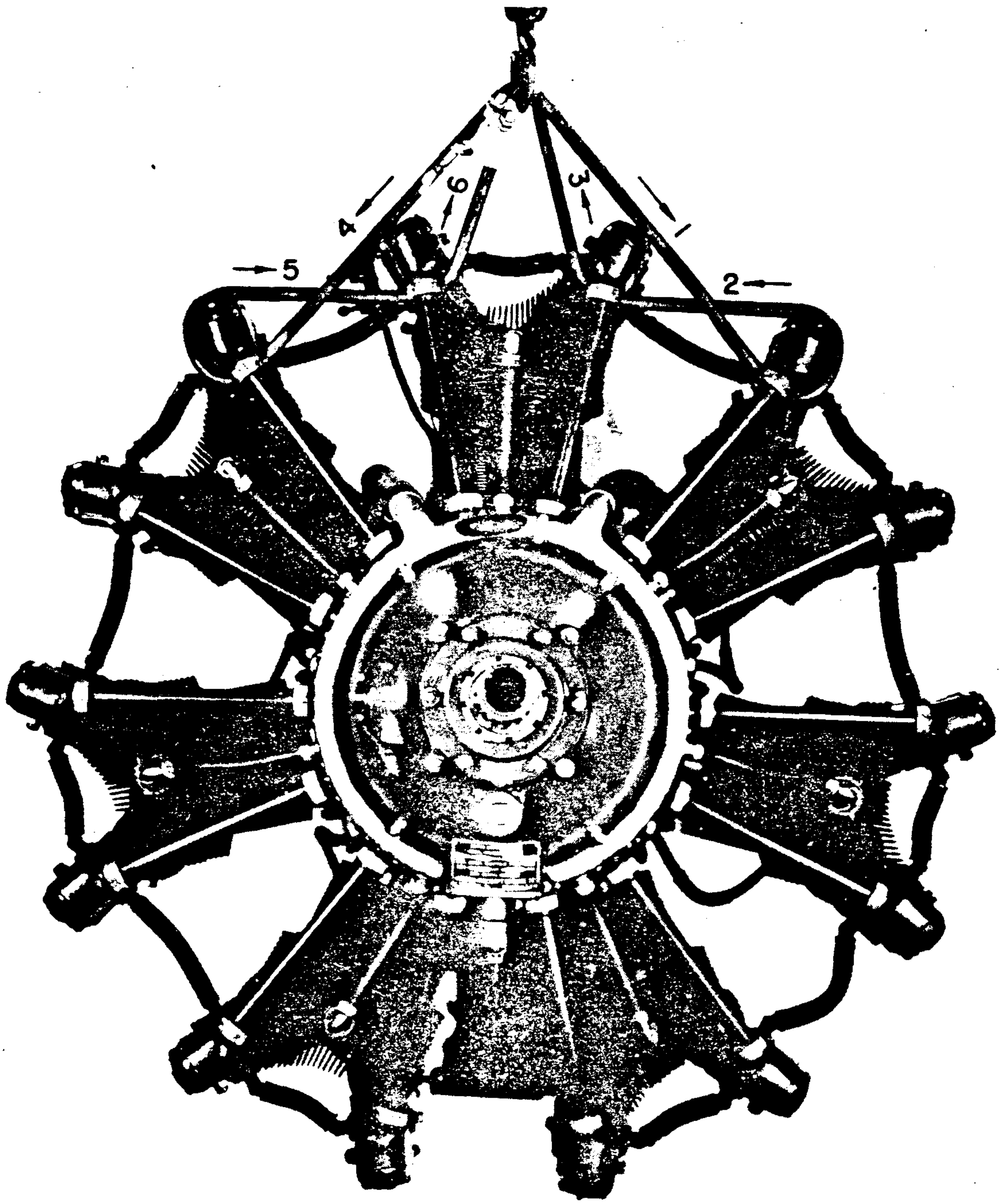


ILLUSTRATION NO. 4

R-755A Engine Lifting Sling, Rocker Box Type
(See Page 16)

SECTION 3
FUEL AND LUBRICATION

FUEL

High grade aviation gasoline should be used at all times. The use of inferior grade fuels may cause overheating and detonation resulting in damage to the engine. Poor fuels can also affect reliability, engine power and economy, and can cause engine roughness. Fuels having a lower octane rating than that outlined in the engine specifications should never be used for flight. Precautions should be taken to keep fuel free of water and sediment when refueling the airplane.

Aviation gasoline with a minimum knock rating of 80 octane should be used in the R-755A engine.

Fuels containing a minimum lead content are preferred. Fuels used in the R-755A engine model should not normally contain more than 2 cc's of lead per gallon. Unleaded aircraft fuels having a rating of 80 octane are available for use in the R-755A engine. When fuels containing a low lead content are not available, it is permissible to use fuels containing up to a maximum of 4 cc's of lead per gallon for limited periods only.

LUBRICATION

The first function of a lubricant is that of reducing engine wear, and to this end it is most important that oil of the proper type, quality and grade be used. Failure to use the proper type and amounts of lubricant can ruin your engine in a very short time.

ENGINE OIL

Oils of the following viscosity (Saybolt Universal at 210° F.) should be used under the temperature ranges set opposite each.

GROUND TEMPERATURE	GRADE OF OIL
Above 50°F. (10°C.)	100 Saybolt or SAE 50
50°F. to 20°F. (10°C. to —5°C.)	80 Saybolt or SAE 40
Below 20°F. (—5°C.)	65 Saybolt or SAE 30

When making an oil change, the prevailing temperature conditions during which that oil will be used should be anticipated in determining the grade of oil. See Section 4 covering Operating Instructions for recommended oil-inlet temperatures. In severe cold weather engines should be provided with nose boards and lagging should be used to maintain recommended oil temperatures. Grade 120 Saybolt (SAE 60) aviation oil should be used in hot weather if the oil-inlet temperature frequently exceeds 185°F. (85°C.).

We recommend using aviation oils of the highest quality. Oils that are approved by Jacobs must conform to the general physical specifications given below. However, oils cannot be approved on the basis of specifications alone, as many necessary qualities of oils for satisfactory operation in aircraft engines cannot be covered adequately in a specification.

It is recommended that Jacobs engines be operated only on oils approved by the Jacobs Aircraft Engine Co. Operators not familiar with oil brands approved by the Jacobs Aircraft Engine .Co. should write our Service Department for the list of tested and approved engine oils.

SPECIFICATIONS
AVIATION GRADE
(SAYBOLT)

	120	100	80
Viscosity 210° F. (Saybolt Universal)	115–125	93–103	76–84
Viscosity Index (Minimum)	95	95	100
Flash Point °F. (Minimum)	490	470	450
Pour Test °F. (Maximum)	20	10	Zero
Carbon Residue % Conradson (Maximum)	1.3	1.0	0.9
Neutralization No. (Maximum)	0.10	0.10	0.10
Emulsion Separation Test using Distilled Water (Maximum for complete separation)	1 hr.	1 hr.	1 hr.

DRAIN PERIOD

For aircraft operated frequently under favorable conditions, it is recommended that the oil be changed every fifty hours of flying time. Under less favorable circumstances, such as dusty conditions, infrequent operation, or operation with either unusually high or low oil-inlet temperatures the drain period should be decreased to 25 hours flying time. The oil should be drained just after flight while both the engine and the oil are warm. Precautions should be taken when handling oil to keep it absolutely free of dirt and water.

New oil is a good clean lubricant. During use, various materials are formed or accumulated in the oil which degrade the lubricating value and increase its dirtiness. Such contaminating materials as dust, water, and oxidized gummy materials formed by decomposed oil, become present in any engine. This makes periodical changing, according to a set schedule, a necessary procedure.

Extended drain periods may result in sludge formation in the engine, oil lines or oil tank, stuck piston rings and valve trouble.

DON'TS ON LUBRICATION

Don't try to economize on lubrication by buying cheap oil.

Don't run the engine longer than a normal drain period of fifty (50) hours.

Don't use reclaimed or reconditioned oil.

Don't mix dopes or special preparations with the engine oil.

Don't run engine with low oil pressure. Ascertain the cause.

Don't run engine with too little oil in the tank.

SECTION 4
OPERATION INSTRUCTIONS

(See Plate 5 for Pilot's Instruction Chart)

1. Starting and Ground Operation

Before starting the engine, refer to Section 5 for the Daily and Pre-flight check.

Drain gas strainer. Be sure gas is turned on.

Move the mixture control to the "full rich" position and the air heater control to the "full cold" position. If the engine is equipped with a Hamilton Standard constant speed controllable propeller, the engine should be started with the propeller in the low RPM (h gh pitch) position to prevent starving the engine of oil. After 30 seconds operation the propeller control should be moved to the take-off (low pitch) position and warm-up continued.

If the engine is warm, merely crack the throttle, turn the switch to "battery," operate the starter and turn switch to "both" when engine fires.

If the engine is cool, but not cold, pump the primer three or four times while turning over with the starter before turning on the switch.

If the engine is cold, close throttle tight, leave switch in OFF position, turn engine over three or sour revolutions either by hand or starter, and at the same time operate the primer for four to six full steady strokes. Leave primer in the full out position, crack the throttle, use the starter, turn on the switch to "battery." As soon as the engine starts turn the switch to "both." Pump the primer, as necessary, until the engine runs smoothly. (Primer injects gasoline directly into the intake ports.) Be sure to close primer when finished using, or it will leak gasoline into the cylinders, increasing the consumption and interfering with satisfactory running.

Never, under any circumstances, pump the throttle.

Jacobs engines will start quickly and easily with the above procedure, unless there is something wrong. If your engine fails to start easily, consult the instructions on "Failure to Start" under "ENGINE TROUBLE." Do not grind away on the starter nor use the primer excessively. Repeated or protracted use of the starter and primer will cause serious damage to the engine, as the lubricating oil will be washed off the piston and cylinder walls and they may become scored before the oil in the crankcase has warmed enough to circulate properly and lubricate them again.

Immediately after starting, note if oil pressure gauge shows a minimum of thirty (30) pounds pressure. If the oil pressure does not register on the gauge within 15 seconds, the engine should be stopped and an investigation made. The engine should be idled for a short period at 600 RPM, gradually increased to 800-900 RPM and warmed up at that speed. This is just as effective as running at higher speeds, and is much easier on the engine.

The propeller control should be in the "low pitch" position for warm-up, ground check, and taxiing.

Warm the engine up slowly and do not take-off until the oil temperature has reached the minimum allowable temperature for take-off. Do not "rev" the engine up before take-off any longer than is necessary to determine whether it is turning up properly. Check the loss in RPM when switched from "Both" to the magneto alone and to the battery ignition alone. The drop in either case should not exceed 90 RPM. (For maximum performance the drop from "Both" to magneto or battery alone should not exceed 60 RPM.) This check should be made in as short a time as possible and running on either single ignition should not exceed 5 seconds. Be sure that the carburetor mixture (altitude adjustment) lever is in full rich position (all the way in on most installations). Check the engine operation on all fuel tanks to insure that all fuel lines are open and free of water.

Complete the check of the list of items given in Section 5 under "Ground Check."

2. Take-Off and Climb

The following instructions cover the R-755A engine equipped with a constant speed propeller.

The mixture control should always be in the "Full Rich" position for take-off.

The carburetor heat control should normally be in the "Full Cold" position. See paragraph 5e, "Carburetor Air Heater Operation," in this section.

The propeller control should be set in the full "Low Pitch" position. (*Note:* The engine should have been started and operated for 30 seconds in high pitch with the Hamilton Standard Propeller.)

The R-755A engine is rated at 2200 RPM and full throttle for take-off.

As soon as practical after take-off the airplane should be brought to the climb position. Specified climb conditions are 24 In. Hg. or less manifold pressure and 2050 RPM.

Use of conservative manifold pressures is recommended for climb. It is usually desirable to climb at a higher speed and flatter angle than the best climb condition to improve cylinder cooling.

Climbing at or near full throttle (especially after initial take-off while the oil temperature is still below normal) should be minimized as its excessive use will increase engine maintenance and shorten the period between engine overhauls. As soon as practicable after initial take-off the engine should be throttled back to normal cruising speed or lower until the oil inlet temperature has reached the normal operating range.

Cylinder and oil temperature limits and other limiting conditions for take-off and climb are given under Item 5 "Operating Conditions" in this section. The Pilot's Instruction Chart at the rear of this manual summarizes information on take-off and climb conditions.

3. Cruising

"Desired Cruising" power should be used for most cruising operation. Use of conservative manifold pressure for cruising will give the longest life between engine overhauls. "Desired Cruising" limits are 1850 to 2000 RPM and 21.5 In. Hg. or less manifold pressure. The engine should be operated at the smoothest RPM within the recommended speed range. The typical engine cruising speed is 1950 RPM.

"Maximum Cruising" limits are 1900 to 2000 RPM and 22.5 In. Hg. or less manifold pressure.

Other limiting conditions for cruising operation are given under the heading "Operating Conditions" (Item 5) in this section.

A combination of low RPM and high manifold pressure should be avoided in the R-755A engine. For any cruising under 1900 RPM, 21.5 In. Hg. manifold pressure should not be exceeded. It is always preferable to obtain additional cruising horsepower when desired by the use of a higher RPM rather than by a higher manifold pressure as smoother operation of the engine and longer life will result from this procedure.

The engine should not be cruised over 2000 RPM under 10,000 feet. Over 10,000 feet, it is permissible to cruise at over 2000 RPM but never exceed 2100 RPM.

Cruising operation data is summarized in the Pilot's Instruction Chart at the rear of the Manual.

4. Flight Precautions

The engine instruments should be observed in flight to determine whether the engine is performing satisfactorily. Special attention should be given to the cylinder head temperature, oil temperature and oil pressure gauges to see that they are within the limits specified under "Operating Conditions."

If the cylinder head temperature rises suddenly or becomes excessive, or if the oil temperature suddenly rises above the maximum limit, or the oil pressure falls below the minimum operating limit, the engine should be throttled down and the cause determined as soon as possible.

If the RPM is irregular or power dropping rapidly, an immediate investigation should be made to ascertain the trouble.

If there is any possibility that ice formation in the carburetor may have caused the loss in power, carburetor heat should be applied immediately. (See "Carburetor Air Heater Operation" in this Section.)

NOTE: A drop in manifold pressure without change in throttle setting or altitude is an indication of ice formation.

5. Operating Conditions

The following are the recommended operating conditions for Jacobs R-755A engines:

5a. Cylinder Temperatures

The maximum allowable cylinder head temperatures, as measured with a spark plug gasket type thermocouple, are as follows:

500° F. (260° C.) at take-off power, (one minute)
450° F. (232° C.) at rated power, and
400° F. (205° C.) at 70% of rated power (continuous cruising operation).

The maximum allowable cylinder barrel temperatures as measured on the lee side of the cylinder by a thermocouple imbedded in the fillet where the barrel joins the cylinder hold-down flange, are as follows:

300° F. (150° C.) at take-off power,
300° F. (150° C.) at normal rated power, and
275° F. (135° C.) at 70% of rated power (continuous cruising operation).

In a steep full throttle climb the cylinder head temperatures should not exceed 450°F. (232°C.). Steep full throttle climbing should not be done unless absolutely necessary, as it is very apt to be detrimental to the engine and will increase engine maintenance and shorten engine life. For cruising, cylinder head temperatures should always be between 300° F. (150° C.) and 400° F. (205° C.).

5b. Oil Temperature in Flight

See Section 3 for the proper grade of oil to be used at the prevailing ground temperature. The minimum oil-inlet temperature for take-off should be held within 60°F. (33°C.) of the desired oil-inlet temperature for take-off. Every effort should be made to maintain oil temperatures in flight close to the desired temperatures given below for proper lubrication of the engine. In cold weather the engine should be baffled to bring the oil-inlet temperature up to the recommended minimum desired value. The rate of oil circulation is below the desired quantity at low oil-inlet temperatures.

The maximum and desired oil inlet temperatures are as follows:

OIL VISCOSITY (SAYBOLT)	MAXIMUM TEMPERATURE	DESIRED TEMPERATURE
100	190°F. (88°C.)	160°F. (70°C.)
80	175°F. (80°C.)	140°F. (60°C.)
65	160°F. (70°C.)	130°F. (55°C.)

Grade 120 oil has a maximum temperature limitation of 200°F. (93°C.) and is used only in hot weather (see Section 3).

5c. Oil Pressure

Desired oil pressure in flight—75 lbs./sq. in.
Minimum oil pressure in flight—60 lbs./sq. in.
Maximum oil pressure in flight—90 lbs./sq. in.

5d. Fuel Pressure

Fuel pump installation—3 to 4 lbs.
Gravity fuel system—1 to 2 lbs.

5e. Carburetor Air Heater Operation

Ice formation in the carburetor can cause dangerous loss of engine power and eventual engine stoppage. A carburetor air heater is provided to prevent or remove the formation of ice. Carburetor icing can usually be detected by a gradual loss of RPM or loss of manifold pressure occurring with constant throttle setting and without change of altitude.

Icing of the carburetor is most likely to occur when any type of precipitation is present in the air or when the relative humidity is high, with atmospheric temperatures up to 70°F. (20°C.) and may be experienced at temperatures up to 85°F. (30°C.). On a clear day with temperatures below 20° F. (-7° C.), icing is not apt to occur, even though the relative humidity may be high.

To prevent carburetor icing under atmospheric conditions likely to form ice, a fuel-air mixture temperature of 40° F. (5° C.) should be maintained just above the carburetor. Under icing conditions this requires a carburetor air temperature gauge reading of 85-95°F. (30 to 35°C.) since a drop in temperature of 40°F. or more can occur in the mixture as it passes through the carburetor.

NOTE: If ice has already formed, heat in excess of the above mentioned values may be applied for short intervals to melt the ice.

The air heating system should be designed so that there will be no marked restriction of the air supply to the carburetor with the heat full on. An excessive restriction of the air supply to the carburetor will cause substantial loss of power and may cause poor mixture distribution.

The carburetor air heater should be in the "full cold" position when starting, to prevent damage in the event of engine backfire. Carburetor heat may be used to assist the engine warm-up. Under icing conditions carburetor heat should be applied in ground operations until immediately before take-off. For take-off the carburetor air heater control should be moved to the "full cold" position except under unusually bad icing conditions, when only fractional use of the air heater is advised. Loss of power, detonation and serious overheating of the engine can be caused by excessive carburetor heat. The heat control should be kept as near the "full cold" position as practical during flight. Under non-icing conditions only enough heat should be supplied to relieve engine roughness due to cold carburetor air.

Carburetor icing is more apt to occur at small throttle openings. The carburetor heat control should therefore be in the "hot" position for the long glide before landing. Carburetor heat, together with short bursts of power, also assist in keeping the engine warm.

5f. Mixture Control

In airplanes not equipped with a fuel-air ratio indicator, the mixture should be maintained in the "full rich" position for all operation below 6000 feet altitude. Above 6000 feet the mixture control should be carefully leaned enough to produce smooth engine operation.

If the engine runs rough when carburetor heat is applied it is probably due to a rich mixture and the carburetor heat should be reduced if practical, or the mixture should be carefully leaned enough to give smooth operation.

When a fuel-air ratio indicator is used, the mixture ratio should be held at approximately .078 at cruising power, or to the approved scale reading on the instrument showing allowable fuel-air ratio at the operating manifold pressure.

In using the mixture control to lean the mixture, either with or without a fuel-air ratio indicator, the mixture control should be pulled out very gradually until the engine operates smoothly. In attempting to obtain a particular reading on a fuel-air ratio indicator, allowance must be made for the time lag of the indicator in responding to a change in mixture ratio.

Caution: Too lean a fuel-air ratio can cause overheating and damage to the engine. Upon descent to a lower altitude the mixture control should be checked to see that it has been moved to a richer position.

6. Landing Approach

The propeller should be in the low-pitch (take-off) position. The mixture control should be in the "full rich" position.

The cruising glide should be begun far enough away from destination so that a gradual descent can be made with power on. On approaching the landing field the engine should be throttled down gradually and the glide with closed throttle should not be longer than necessary. Closing the throttle suddenly and coming in on a long closed throttle glide will drop the cylinder head temperatures too suddenly, and is apt to warp the valves and cylinders. Particular attention should be paid to this point in cold weather. The engine should be cleared at intervals during a long glide to prevent cooling the engine too suddenly and to prevent fouling the spark plugs.

It is advisable not to use the engine more than necessary in taxiing as the air speed for cooling is lacking on the ground, and excessive use of the engine after landing will heat the cylinder heads when they should be cooling preparatory to stopping the engine.

7. Stopping

The mixture control should be in the "full rich" position.

The engine should always be allowed to idle for at least two minutes with the throttle closed before stopping the engine. (The throttle back stop should be adjusted to allow it to idle as slowly as possible without danger of its stopping in a glide.)

Idling not only permits the temperature of the various engine parts to equalize, but works oil up around the pistons and rings, thus leaving the engine in good condition for the next start. This is particularly important if the engine is to be left standing for any considerable time where there is likely to be moisture and condensation.

It is recommended that the engine be stopped by using the mixture control providing it has been idled for two minutes as above. The procedure should be to place mixture control in full lean (idle cut-off) position, partially open throttle with switch still on. When engine stops be sure to turn off switch. Leaving the switch on will discharge the battery and very likely injure the coil.

To stop the engine using the ignition switch, idle two minutes (see above) and move the ignition switch to "off" with the throttle closed and the mixture control in the "full rich" position.

Shutting off the engine without sufficient idling is likely to cause warpage of valves and cylinders because of the rapid temperature drop that occurs.

Be sure the switch is turned to the OFF position and the mixture control returned to "full rich" before leaving the ship.

SECTION 4A
OPERATION INSTRUCTIONS
FOR R755B ENGINES

I. STARTING AND GROUND OPERATION

Before starting the engine, refer to Section 5 for the Daily and Pre-flight check.

Drain gas strainer. Be sure gas is turned on.

Move the mixture control to the "full rich" position and the air heater control to the "full cold" position. If the engine is equipped with a Hamilton Standard constant speed controllable propeller, the engine should be started with the propeller in the low RPM (high pitch) position to prevent starving the engine of oil. After 30 seconds operation the propeller control should be moved to the take-off (low pitch) position and warm-up continued.

If the engine is warm, merely crack the throttle, turn the switch to "battery", operate the starter and turn switch to "both" when engine fires.

If the engine is cool, but not cold, pump the primer three or four times while turning over with the starter before turning on the switch.

If the engine is cold, close throttle tight, leave switch in OFF position, turn engine over three or four revolutions either by hand or starter, and at the same time operate the primer for four to six full steady strokes. Leave primer in the full out position, crack the throttle, use the starter, turn on the switch to "battery". As soon as the engine starts turn the switch to "both". Pump the primer, as necessary, until the engine runs smoothly. (Primer injects gasoline directly into the intake ports). Be sure to close primer when finished using, or it will leak gasoline into the cylinders, increasing the consumption and interfering with satisfactory running.

Never, under any circumstances, pump the throttle.

Jacobs engines will start quickly and easily with the above procedure, unless there is something wrong. If your engine fails to start easily, consult the instructions on "Failure to Start" under "ENGINE TROUBLE." Do not grind away on the starter nor use the primer excessively. Repeated or protracted use of the starter and primer will cause serious damage to the engine, as the lubricating oil will be washed off the piston and cylinder walls and they may become scored before the oil in the crankcase has warmed enough to circulate properly and lubricate them again.

Immediately after starting, note if oil pressure gauge shows a minimum of thirty (30) pounds pressure. If the oil pressure does not register on the gauge within 15 seconds, the engine should be stopped and an investigation made. The engine should be idled for a short period at 600 RPM, gradually increase to 800-900 RPM and warmed up at that speed. This is just as effective as running at higher speeds, and is much easier on the engine.

The propeller control should be in the "low pitch" position for warm-up, ground check, and taxiing.

Warm the engine up slowly and do not take-off until the oil temperature has reached the minimum allowable temperature for take-off. Do not "rev" the engine up before take-off any longer than is necessary to determine whether it is turning up properly. Check the loss in RPM when switched from "Both" to the magneto alone and to the battery ignition alone. The drop in either case should not exceed 90 RPM. (For maximum performance the drop from "Both" to magneto or battery alone should not exceed 60 RPM.) This check should be made in as short a time as possible and running on either single ignition should not exceed 5 seconds. Be sure that the carburetor mixture (altitude adjustment) lever is in full rich position (all the way in on most installations). Check the engine operation on all fuel tanks to insure that all fuel lines are open and free of water.

Complete the check of the list of items given in Section 5 under "Ground Check".

2. TAKE-OFF AND CLIMB

The following instructions cover the R755B engine equipped with a constant speed propeller.

The mixture control should always be in the "Full Rich" position for take-off.

The carburetor heat control should normally be in the "Full Cold" position. See paragraph 5e, "Carburetor Air Heater Operation", in this section.

The propeller control should be set in the full "Low Pitch" position. (Note: The engine should have been started and operated for 30 seconds in high pitch with the Hamilton Standard Propeller).

The R755B engine is rated at 2200 RPM full throttle for take-off.

As soon as practical after take-off the airplane should be brought to the climb position. Specified climb conditions are 24 In. Hg. or less manifold pressure and 2050 RPM.

Use of conservative manifold pressures is recommended for climb. It is usually desirable to climb at a higher speed and flatter angle than the best climb condition to improve cylinder cooling.

Climbing at or near full throttle (especially after initial take-off while the oil temperature is still below normal) should be minimized as its excessive use will increase engine maintenance and shorten the period between engine overhauls. As soon as practicable after initial take-off the engine should be throttled back to normal cruising speed or lower until the oil inlet temperature has reached the normal operating range.

Cylinder and oil temperature limits and other limiting conditions for take-off and climb are given under Item 5 "Operating Conditions" in this section. The Pilot's Instruction Chart at the rear of this manual summarizes information on take-off and climb conditions.

3. CRUISING

"Desired Cruising" power should be used for most cruising operation. Use of conservative manifold pressure for cruising will give the longest life between engine overhauls. "Desired Cruising" limits are 1850 to 2000 RPM and 21.5 In.Hg. or less manifold pressure. The engine should be operated at the smoothest RPM within the recommended speed range. The typical engine cruising speed is 1950 RPM.

"Maximum Cruising" limits are 1900 to 2000 RPM and 22 In.Hg. or less manifold pressure.

Other limiting conditions for cruising operation are given under the heading "Operating Conditions" (Item 5) in this section.

A combination of low RPM and high manifold pressure should be avoided in the R755B engine. For any cruising under 1900 RPM, 21.5 In.Hg. manifold pressure should not be exceeded. It is always preferable to obtain additional cruising horsepower when desired by the use of a higher RPM rather than by a higher manifold pressure as smoother operation of the engine and longer life will result from this procedure.

The engine should not be cruised over 2000 RPM under 10,000 feet. Over 10,000 feet, it is permissible to cruise at over 2000 RPM but never exceed 2100 RPM.

Cruising operation data is summarized in the Pilot's Instruction Chart at the rear of the Manual.

4. FLIGHT PRECAUTIONS

The engine instruments should be observed in flight to determine whether the engine is performing satisfactorily. Special attention should be given to the cylinder head temperature, oil temperature and oil pressure gauges.

If the cylinder head temperature rises suddenly or becomes excessive, or if the oil temperature suddenly rises above the maximum limit, or the oil pressure falls below the minimum operating limit, the engine should be throttled down and the cause determined as soon as possible.

If the RPM is irregular or power dropping rapidly, an immediate investigation should be made to ascertain the trouble.

If there is any possibility that ice formation in the carburetor may have caused the loss in power, carburetor heat should be applied immediately. (See "Carburetor Air Heater Operation" in this Section.)

NOTE: A drop in manifold pressure without a change in throttle setting or altitude is an indication of ice formation.

5. OPERATING CONDITIONS

The following are the recommended operating conditions for Jacobs R755B engines:

5A. CYLINDER TEMPERATURES

The maximum allowable cylinder head temperatures, as measured with a spark plug gasket type thermocouple, are as follows:

500° F. (260° C.) at take-off power, (one minute)

450° F. (232° C.) at rated power, and

400° F. (205° C.) at 70% of rated power (continuous cruising operation).

The maximum allowable cylinder barrel temperatures as measured on the lee side of the cylinder by a thermocouple imbedded in the fillet where the barrel joins the cylinder hold-down flange, are as follows:

300° F. (150° C.) at take-off power,

300° F. (150° C.) at normal rated power, (continuous cruising operation).

In a steep full throttle climb the cylinder head temperatures should not exceed 450°F. (232°C.). Steep full throttle climbing should not be done unless absolutely necessary, as it is very apt to be detrimental to the engine and will increase engine maintenance and shorten engine life. For cruising, cylinder head temperatures should always be between 300° F. (150° C.) and 400° F. (205° C.).

5B. OIL TEMPERATURE IN FLIGHT

See Section 3 for the proper grade of oil to be used at the prevailing ground temperature. The minimum oil-inlet temperature for take-off should be held within 60° F. (33°C.) of the desired oil-inlet temperature for take-off. Every effort should be made to maintain oil temperatures in flight close to the desired temperatures given below for proper lubrication of the engine. In cold weather the engine should be baffled to bring the oil-inlet temperature up to the recommended minimum desired value. The rate of oil circulation is below the desired quantity at low oil-inlet temperatures.

The maximum and desired oil inlet temperatures are as follows:

OIL VISCOSITY (SAYBOLT)	MAXIMUM TEMPERATURE	DESIRED TEMPERATURE
100	190°F.(88°C.)	160°F.(70°C.)
80	175°F.(80°C.)	140°F.(60°C.)
65	160°F.(70°C.)	130°F.(55°C.)

Grade 120 oil has a maximum temperature limitation of 200° F. (93°C.) and is used only in hot weather (see Section 3).

5C. OIL PRESSURE

Desired oil pressure in flight--75 lbs./sq.in.
Minimum oil pressure in flight--60 lbs./sq.in.

Maximum oil pressure in flight--90 lbs./sq.in.

5D. FUEL PRESSURE

Fuel pump installation - 3 to 4 lbs.
Gravity fuel system - 1 to 2 lbs.

5E. CARBURETOR AIR HEATER OPERATION

Ice formation in the carburetor can cause dangerous loss of engine power and eventual engine stoppage. A carburetor air heater is provided to prevent or remove the formation of ice. Carburetor icing can usually be detected by a gradual loss of RPM or loss of manifold pressure occurring with constant throttle setting and without change of altitude.

Icing of the carburetor is most likely to occur when any type of precipitation is present in the air or when the relative humidity is high, with atmospheric temperatures up to 70° F. (20° C.) and may be experienced at temperatures up to 85° F. (30° C.). On a clear day with temperatures below 20° F. (-7° C.), icing is not apt to occur, even though the relative humidity may be high.

To prevent carburetor icing under atmospheric conditions likely to form ice, a fuel-air mixture temperature of 40° F. (5° C.) should be maintained just above the carburetor. Under icing conditions this requires a carburetor air temperature gauge reading of 85-95° F. (30 to 35° C.) since a drop in temperature of 40° F. or more can occur in the mixture as it passes through the carburetor.

NOTE: If ice has already formed, heat in excess of the above mentioned values may be applied for short intervals to melt ice.

The air heating system should be designed so that there will be no marked restriction of the air supply to the carburetor with the heat full on. An excessive restriction of the air supply to the carburetor will cause substantial loss of power and may cause poor mixture distribution.

The carburetor air heater should be in the "full cold" position when starting, to prevent damage in the event of engine backfire. Carburetor heat may be used to assist the engine warm-up. Under icing conditions carburetor heat should be applied in ground operations until immediately before take-off. For take-off the carburetor air heater control should be moved to the "full cold" position except under unusually bad icing conditions, when only fractional use of the air heater is advised. Loss of power, detonation and serious overheating of the engine can be caused by excessive carburetor heat. The heat control should be kept as near the "full cold" position as practical during flight. Under non-icing conditions only enough heat should be supplied to relieve engine roughness due to cold carburetor air.

Carburetor icing is more apt to occur at small throttle openings. The carburetor heat control should therefore be in the "hot" position for the long glide before landing. Carburetor heat, together with short bursts of power, also assist in keeping the engine warm.

5F. MIXTURE CONTROL

In airplanes not equipped with a fuel-air ratio indicator, the mixture should be maintained in the "full rich" position for all operation below 6000 feet altitude. Above 6000 feet the mixture control should be carefully leaned enough to produce smooth engine operation.

If the engine runs rough when carburetor heat is applied it is probably due to a rich mixture and the carburetor heat should be reduced if practical, or the mixture should be carefully leaned enough to give smooth operation.

When a fuel-air ratio indicator is used, the mixture ratio should be held at approximately .078 at cruising power, or to the approved scale reading on the instrument showing allowable fuel-air ratio at the operating manifold pressure.

In using the mixture control to lean the mixture, either with or without a fuel-air ratio indicator, the mixture control should be pulled out very gradually until the engine operates smoothly. In attempting to obtain a particular reading on a fuel-air ratio indicator, allowance must be made for the time lag of the indicator in responding to a change in mixture ratio.

CAUTION: Too lean a fuel-air ratio can cause overheating and damage to the engine. Upon descent to a lower altitude the mixture control should be checked to see that it has been moved to a richer position.

6. LANDING APPROACH

The propeller should be in the low-pitch (take-off) position. The mixture control should be in the "full rich" position.

The cruising glide should be begun far enough away from destination so that a gradual descent can be made with power on. On approaching the landing field the engine should be throttled down gradually and the glide with closed throttle should not be longer than necessary. Closing the throttle suddenly and coming in on a long closed throttle glide will drop the cylinder head temperatures too suddenly, and is apt to warp the valves and cylinders. Particular attention should be paid to this point in cold weather. The engine should be cleared at intervals during a long glide to prevent cooling the engine too suddenly and to prevent fouling the spark plugs.

It is advisable not to use the engine more than necessary in taxiing as the air speed for cooling is lacking on the ground, and excessive use of the engine after landing will heat the cylinder heads when they should be cooling preparatory to stopping the engine.

7. STOPPING

The mixture control should be in the "full rich" position.

The engine should always be allowed to idle for at least two minutes with the throttle closed before stopping the engine. (The throttle back stop should be adjusted to allow it to idle as slowly as possible without danger of its stopping in a glide.)

Idling not only permits the temperature of the various engine parts to equalize, but works oil up around the pistons and rings, thus leaving the engine in good condition for the next start. This is particularly important if the engine is to be left standing for any considerable time where there is likely to be moisture and condensation.

It is recommended that the engine be stopped by using the mixture control providing it has been idled for two minutes as above. The procedure should be to place mixture control in full lean (idle cut-off) position, partially open throttle with switch still on. When engine stops be sure to turn off switch. Leaving the switch on will discharge the battery and very likely injure the coil.

To stop the engine using the ignition switch, idle two minutes (see above) and move the ignition switch to "off" with the throttle closed and the mixture control in the "full rich" position.

NOTE: Shutting off the engine without sufficient idling is likely to cause warpage of valves and cylinders because of the rapid temperature drop that occurs.

Be sure the switch is turned to the off position and the mixture control returned to "full rich" before leaving the ship.

SECTION 5
INSPECTION–MAINTENANCE AND ENGINE CHECKS

It is recommended that tools supplied in the engine tool kit be used for engine maintenance where applicable. Additional tools required for maintenance may be obtained from our Service Department.

DAILY AND PRE-FLIGHT

1. Fuel and Oil Level Check.
2. Engine Controls.

   Check for full range of movement and for free operation.
3. Exterior Inspection.

   Inspect exposed portions of the following for looseness or other unsatisfactory condition:

   a. Cowling and exhaust manifold.

   b. Ignition harness and wiring.

   c. Hose connections and hose.

   d. Baffles.
4. Ground Check.

   (Refer to Section 4, Operating Instructions, and to Pilot's Instruction Chart for recommended limits.)

   The following items should be checked for proper limits before take-off:

   a. Oil Temperature.

   b. Oil Pressure.

   c. Cylinder Temperature.

   d. Fuel Pressure.

   e. Generator Charging Rate.

   f. Propeller and Governor Operation.

   g. Check engine at full throttle for normal RPM with propeller in full low pitch.

   h. Test ignition by checking the RPM on both ignition systems and on the magneto alone and the battery alone. The drop in RPM when going from the "Both" position to operation on either battery or magneto system alone, should not exceed 90 RPM. Check the "off" position of the ignition switch at idle speed to determine whether the engine stops firing and that the magneto ground is properly connected. Return the switch to "on" before engine stalls.

AIR FILTER AND FUEL STRAINER

It is extremely important that air filters be cleaned and reoiled at the periods recommended by the aircraft manufacturer. Sand and dust penetrating an improperly serviced air filter can materially shorten the life of your engine. Aircraft operated under dusty conditions should have air filter serviced at frequent intervals.

The fuel strainer in the fuel inlet line should also be serviced frequently in accordance with the aircraft manufacturer's instructions. Special attention should be given to the fuel strainer under humid conditions or when rapid changes in temperature occur.

FIFTY HOUR INSPECTION OUTLINE

(See text following outline for detailed instructions.)

Accomplish the following work in addition to daily inspection:

*1. Compression Check.

2. Fuel and Oil Systems.

   Clean oil screen.

   Change oil.

   Check oil and fuel lines.

   *Check carburetor.

3. Ignition.

   Check spark plugs.

   Check ignition harness and other wiring.

   *Check timing and service magneto and distributor.

4. Induction and Exhaust Systems.

   Check induction system, including air filter, air scoop, hot air mixing valve and intake pipes.

   Check exhaust manifold, muffs, and supports.

5. Valves.

   *Check valve clearances.

6. Engine Nuts and Fastenings.
   *Check propeller hub nut.
   *Check engine nuts and fastenings.
7. Miscellaneous.
   Check cylinder baffles.
   Check engine breather.
   Check engine mount, cowl, etc.
8. Accessories.
9. Ground Check.
   *Check at first 25 hour inspection after installation and at 100 hour inspections thereafter.

FIFTY HOUR CHECK INSTRUCTIONS

(The airplane should be in a sheltered working area protected from dust.)

Remove cowling and turn master switch to the "Off" position.

*1. Compression Check.

Cylinders should be checked for loss of compression by removing all front spark plugs except the one in the cylinder being checked, while turning propeller in direction of rotation.

This check should preferably be made while the engine is still warm and pistons and rings well lubricated.

2. Fuel and Oil Systems.

Clean Oil Screens.

Remove oil screen in the oil-inlet strainer, if used, and check for foreign and metal particles. If metal particles are found in any quantity, an investigation should be made. If metal chips or foreign particles are present and no other unsatisfactory condition is noted, the engine external oil system should be cleaned and flushed. The coarse type oil screen in the sump need not be removed between overhauls. If an inspection of the oil sump is desired the large plug at the right of the sump may be removed.

Change Oil.

Change oil as recommended under Lubrication (Section 3). Use only high-grade aviation oil as recommended.

Check Oil and Fuel Lines.

Check oil and fuel lines for chafing, looseness, evidence of leakage, or other damage.

Check all hose clamps or other type connections for proper torque.

**Check Carburetor.*

Put a small quantity of oil on the accelerating pump mechanism. Remove the carburetor fuel strainer and the float chamber drain plug, drain the float chamber, clean screen and replace. **_Care should be exercised in reinstallation of the fuel strainer and drain plug to prevent damage to the threads in the aluminum body._** Check all exposed portions of carburetor for tightness.

3. Ignition.

Check Spark Plugs.

Spark plugs should be checked for condition, fouling and gap setting. Plugs in poor condition should be completely reconditioned or replaced.

Plugs not requiring reconditioning may be cleaned by thoroughly rinsing the electrode end only in non-leaded gasoline and drying carefully, using heat if necessary. Carbon on electrodes may be removed with a soft wire brush.

Gaps should be reset to .015—.018 using a spark plug resetting tool and wire type feeler gauge.

Spark plug gaps should never exceed .025".

When spark plugs are bomb tested it is recommended that they be tested at about 125 lbs./sq.in. with carbon dioxide. Be sure to use a well-fitting wrench of proper size when removing or installing spark plugs. Spark plugs should be installed with a torque of 300—360 in. pounds. The reconditioning of spark plugs should be accomplished in accordance with the spark plug manufacturer's instructions and should not be attempted without the proper tools or equipment.

Check Ignition Harness and Other Wiring.

Check the ignition harness and all wires connected to the coil, distributor, starter, generator, voltage regulator and switch, making sure that the wires are tight, in good condition, and are held securely in place. Check spark plug elbow and all other shielding nuts for proper torque.

**Check Timing and Service Magneto and Distributor.*

Lubricate the magneto by adding 20 to 30 drops of SAE 40 oil into the oil cup on the front end plate and 5 to 8 drops only into the oil cup on the magneto coil cover. **CAUTION: _Over-oiling at the magneto coil cover oiler may cause breaker points to foul._** Remove the breaker cover. The felt wick at the bottom of the contact breaker should be moistened with SAE 40 oil if found to be dry. If the breaker points need dressing they should be removed from the magneto and redressed in accordance with the manufacturer's recommendations. Do not allow any oil to remain on the breaker points. Check the magneto breaker points for proper clearance of .010" to .014" and preferably .012".

Remove the distributor cap. Check the lubricating felt attached to the breaker cam follower and apply two drops only of SAE 40 lubricating oil, if dry. Check the battery ignition distributor breaker points for proper clearance. The clearance should be .014" to .018" and preferably .016". If necessary, the stationary contact point should be adjusted to provide the proper clearance.

***Check the Distributor and Magneto Timing.**

Remove magneto shield and magneto distributor blocks. The magneto breaker points and battery ignition distributor should have been checked for proper clearance. No. 1 piston must be placed on firing top center. Using timing disc and pointer, Tool No. T-33000, the procedure is as follows (a top dead center indicator calibrated for 31° advance may also be used if the propeller is not removed):

With propeller removed, place the pointer on the two uppermost studs of the thrust bearing plate. Slide the timing disc onto the crankshaft and tighten the locating screw in the crankshaft spline space indicated by the arrow in the front end of the crankshaft. If the crankshaft is now rotated until the arrow points to the No. 1 cylinder and the timing pointer indicates 0 degrees on the timing disc, No. 1 piston will be at top center. (Make sure that both valves are closed, indicating that No. 1 cylinder is at top center on the firing stroke).

The battery distributor has an automatic advance of 30° and is timed at 1° before top dead center in the full retard position. Place a .0015" thick feeler gauge between the breaker points. Hold the rotor in full retard (clockwise position) at all times. Turn the crankshaft in direction of engine rotation until thickness gauge can be removed with a slight pressure. If timing is not correct, loosen the two nuts on distributor mounting studs and set crankshaft at 1° before top center. Rotate distributor until timing is correct. Tighten nuts and recheck distributor timing while turning crankshaft, using timing light or feeler gauge.

The magneto timing should be checked in the full advance position. Magnetos equipped with an advance lever should have this lever turned to full advance (clockwise as far as possible) when timing the magneto. Magnetos without the advance lever are internally locked in the full advance position. Use a timing light or a .0015" feeler gauge between the breaker points.

Rotate the crankshaft in the direction of propeller rotation until the magneto points just open. If the timing is not set correctly at 31° before top center, loosen the two nuts holding the magneto. Move the magneto in the range provided by the slots until the magneto points just begin to open with the crankshaft set in the 31° advance position. Tighten nuts and recheck timing. Installations with spark advance lever on the magneto and not having a cockpit spark advance control should have this lever wired in the full advance (clockwise) position.

If it is necessary to remove the magneto, it should be reinstalled as follows: Turn the magneto shaft until the timing marks on the large magneto distributor gear index with the timing marks on the inside of the magneto front end plate. Install the magneto as nearly as possible in this position and partially tighten nuts. Time magneto as described above. If a correct setting cannot be obtained, remove the magneto, pull the engine magneto drive gear back out of engagement and rotate it to allow mounting of the magneto spline in approximately the correct timing position. Push magneto drive gear back into engagement, reinstall magneto and check timing as described above. Make sure mounting nuts are tight.

4. Induction and Exhaust Systems.

Check Induction System, Including Air Filter, Air Scoop, Hot Air Mixing Valve and Intake Pipes.

Check the air filter, air scoop, hot air mixing valve and intake pipes for tightness and proper condition. Check the intake pipe packing nuts.

The latter should not be too tight to permit slight movement of pipes due to cylinder expansion.

Check Exhaust Manifold, Muffs, and Supports.

Check the exhaust manifold for security of attachment, tightness, cracks and other damage. Check muffs and manifold for possibility of exhaust gas mixing with cabin or carburetor air heat.

5. Valves.

**Valve Clearances.*

The motor should be cold for valve clearance checking and adjustment. Turn the crankshaft to top center position on the compression stroke for No. 1 cylinder. When the arrow on the front of the crankshaft is in line with the cylinder, the piston is at top center. Check for broken valve springs and free operation of the rocker arm.

The correct valve clearance for both intake and exhaust valves is .008". Do not disturb the clearance of a valve which shows .007" to .012" clearance. If resetting is required, adjust clearance to obtain .008". Tighten the adjusting screw lock-nut by hand to torque of 300—325 inch pounds, using only the proper wrench.

After checking No. 1 cylinder turn the engine to the other cylinders in firing order, as follows: No. 3, 5, 7, 2, 4 and 6. Rotate the engine two complete revolutions and recheck the valve clearances. Any valve having a clearance lower than .007" should be reset. Rocker boxes should be cleaned if sludge is present and parts should be well lubricated with engine oil before replacing covers. Replace any damaged gaskets. Rocker box cover nuts should be snug but not too tight (the normal torque limit is 50 inch pounds).

6. Engine Nuts and Fastenings.

**Check Propeller Hub Nut.*

The propeller hub nut should be carefully checked for tightness in accordance with the manufacturer's instructions. The propeller nut is usually installed with a torque of about 700 foot pounds. If the propeller nut is found to be loose the thrust nut should be checked for proper tightness using thrust nut wrench, Part No. T-748-B, and a spline wrench. A steady pull of about 600–650 foot pounds gives the proper tightness.

**Check Engine Nuts and Fastenings*

Engine nuts should be carefully checked for tightness. Reference should be made to the Table of Limits for proper tightening torque where specified. The push rod packing nuts should be snug but not too tight.

7. Miscellaneous.

Check Cylinder Baffles.

Check engine baffles for cracks, security, and proper positioning. Check to see that baffles are not chafing any lines or engine sump.

Check Engine Breather.

Check engine breather for security and to see that it is not restricted.

Check Engine Mount, Cowl, etc.

Check engine mount, mount bolt torque, battery, engine controls, cowl, etc., in accordance with the airplane manufacturer's instructions.

8. Accessories.

Accessories should be serviced in accordance with the manufacturer's instructions.

The Eclipse type generator and voltage regulator should be inspected at 50 hour intervals.

The Eclipse type starter should be inspected at 150 hour intervals.

9. Ground Check.

Check all items as listed under the Daily and Pre-Flight Inspection. If necessary, reset adjustable propellers and propeller governors as recommended in the specific instructions given in the aircraft manufacturer's instruction manual. The following are general instructions given for reference only. The low pitch stop should be set to allow the propeller to turn 2050 RPM against the blocks. The governor should be set to allow a maximum of 2200 RPM. The high pitch stop should be set so as to allow the airplane to maintain flight using full high pitch. The high pitch stop is frequently set at 1400-1500 RPM for full throttle operation against the blocks. The drop in RPM when going from the "both" position to either battery or magneto system alone is limited to 90 RPM and should not exceed 60 RPM for best performance. It is desirable to hold to the 60 RPM drop after a 50 or 100 hour inspection.

If necessary, adjust idle stop screw on the throttle and idle mixture lever at rear of carburetor when the engine is hot to obtain proper idling speed and smooth operation.

It should not be necessary to reset oil pressure unless some trouble exists and no adjustment is provided in the oil pressure relief valve.

OVERHAUL

Under normal operating conditions it is advisable to completely overhaul Jacobs engines every 550-600 hours on the early R-755A2 engine types which did not incorporate the chrome plated cylinder barrels and wedge type pistons and rings. If examination of the engine by an experienced mechanic indicates a good mechanical condition with smooth operation, good compression on all cylinders and full power, an oil change should be performed and careful observation of the oil screens and oil should be made for carbon particles , sludge, etc. The pilots report of oil consumption over a given period, together with other operating characteristics must also be considered at this time. At their discretion, an engine believed to be in good condition may then be recommended for a 25 percent extension of time with these items being reviewed at all periodic checks.

Some operators, under favorable conditions, may be able to safely utilize a second 25 percent extension on the same basis.

The later R-755A2 engines and the R-755B2 factory remanufactured engines which also incorporated the chrome cylinder plating and the wedge type upper two compression piston rings, have a longer service life and 800 hours is considered as a normal overhaul period with a first and second extension of 25 percent each being practical in many cases under reasonable care.

NEW PARTS

If inspection reveals that new parts are required, the proper Parts List for the engine model concerned should be consulted in order that the parts can be properly identified in ordering.

***Items in Section 5 marked with an asterisk should be checked at first 25 hour inspection after engine installation and at 100 hour inspections thereafter.**

SECTION 6
ENGINE TROUBLES

FAILURE TO START

Read Instructions on "Starting" in Section 4.

Check fuel supply in tanks and be sure the stop cocks are turned on.

DO NOT PUMP THE THROTTLE. A primer is provided for easy starting.

The engine may be overprimed and can be cleared by either turning the propeller opposite the direction of rotation with the throttle open AND SWITCH OFF, or by opening the throttle wide and pressing the starter with the SWITCH OFF. The latter method is more likely to run the battery down but if it is in good condition, can be tried once or twice without seriously draining the battery.

If the weather is at all damp or cold, remove the front spark plugs and dry them by applying heat, as they may be shorted by condensation.

THIS PROCEDURE SHOULD BE FOLLOWED IN ANY ATMOSPHERIC CONDITIONS THAT MIGHT CAUSE CONDENSATION ON THE PLUGS, as it is quite a common cause of failure to start. Spark plugs should also be checked for improper gap and fouling by oil.

Examine gasoline strainer. IT IS NOT SUFFICIENT TO DRAIN THE GAS STRAINER. TAKE IT APART AND EXAMINE BOTH SIDES OF THE SCREEN.

Check gas flow at carburetor.

Check gasoline line for damage that might restrict the flow of the gasoline.

Check the vent on the gas tank and make sure it is not clogged. If the gas flow to the carburetor is OK, check the carburetor, examine for clogged screen, jets, sticky float or needle valve.

Check for water in the gasoline or for restrictions due to water freezing in the fuel system.

The battery may be low. See that it is kept fully charged and check with hydrometer.

Check all wiring and terminals. If the ammeter shows a heavy discharge upon turning on the switch, this is an indication of a short in the wiring or ignition system. No discharge showing on the ammeter may mean that the engine has stopped with the points open, and if the ammeter fails to show any discharge or oscillation when the engine is rotating it is an indication of an open circuit, a bad coil, or dirty points.

If a spark cannot be obtained at the plugs, trace the current from the battery to the distributor, which can be done with a voltmeter. In the normal installation proceed as follows: First see that there is current to the negative side of the ammeter on the instrument panel; then check the positive side of the ammeter for current; next check the current from the switch to the coil and from the coil to the distributor; next check the distributor contact points and secondary wire leading from the coil to the distributor. During the inspection, see that all wires are in good condition and securely fastened to the terminals.

In cold weather congealed oil may make it difficult for the starter to turn the engine over rapidly enough. The proper grade of oil should be used for the atmospheric temperature encountered. Turning the propeller over by hand before using the starter will help relieve the stiffness of the engine and the load on the battery. Under extreme cold weather conditions, the oil should be preheated before it is put in the tank, and the engine then started immediately.

Check for air leaks at the carburetor mounting flange, loose intake pipe connections, defective intake pipe packing, or lost priming hole plug.

Check for stuck valves or improper valve clearances.

LOW OIL PRESSURE

Low pressure may be caused by:

1. Dirt in the oil strainer. Remove screen and clean thoroughly.
2. Poor connections in the oil suction line, causing the pump to draw air. Check all connections and lines.
3. Low oil supply. Check quantity of oil in tank.
4. Dirt under the ball in relief valve of pressure pump, causing improper seating. Clean.
5. Defective oil gauge. Check with new gauge.
6. Restricted oil line. Examine for defects.
7. Broken, clogged, or kinked pressure gauge line. Be sure line has no sharp kinks.
8. Use of an oil unsuited to the engine requirements. Always use oil of the quality, body, and character recommended under "Lubrication."

EXCESSIVE OIL TEMPERATURE

1. Insufficient amount of oil in tank—minimum recommended five gallons.
2. Insufficient cooling of oil cooler or engine.
3. Dirty oil.
4. Obstruction in oil screen or oil line.

5. Worn or stuck rings.
6. Worn master rod bearing.
7. Improper scavenging due to air leaks in line from sump, or restricted line to tank.

EXCESSIVE OIL CONSUMPTION

1. Worn piston rings.
2. Excessive master rod clearances.
3. Excessive oil pressure. Inspect relief valve.
4. Improper grade of oil.
5. Scavenger pump not operating.

OVERHEATING

1. Mixture too lean.
2. Use of altitude adjustment at low altitudes.
3. Oil supply low.
4. Improper grade of gasoline.
5. Retarded ignition timing.
6. Damaged baffles.

ROUGHNESS

Check for defective or fouled spark plugs. Clean or replace.

Faulty ignition—check wiring, breaker points, coil, condensers, ignition timing.

Check magneto distributor blocks. Check battery distributor, distributor cap.

Roughness can be caused by the engine misfiring due to a restricted gas line or a partly clogged fuel strainer, or leak in the induction system. Check manifold pipes and connections. Check fuel flow, the carburetor float level and see that the jets are free from dirt.

Improper Carburetor Air Temperature. Check air temperature gauge for accuracy and adjust carburetor air heat so that the air temperature is within the recommended operating temperature limits.

Tighten propeller hub nut.

Check propeller for balance and track. Propeller should track within 1/16". Check also for position. Metal propeller should be on center of crankshaft throw. Wood propeller should be 15° to 18° ahead of top center in anti-clockwise rotation as a rule. Due to various weather conditions, wood propellers may absorb moisture which throws them out of balance. Changing the location of the blades in relation to engine rotating parts, by removing the propeller and putting it on at a different angle, will sometimes overcome engine roughness. Wood propellers should be frequently checked for balance and track and kept protected with a good varnish.

The pitting or galling of the rear propeller cone may cause roughness. See that the cone and cone seat in the propeller hub are smooth and clean.

Check tightness of crankshaft thrust nut. Approximately 600 foot-pounds torque is required to properly tighten.

Check for loose mounting bolts from the engine to the mounting ring, and for cracked or broken mounting lugs on mounting ring and engine.

Check for poor compression. This may be due to sticky valves or improper valve clearance. If not, and it is necessary to remove a cylinder to check the valve seating or piston rings, follow instructions in Section 7.

IRREGULAR RUNNING

While there are a number of causes for an engine to run irregularly, the following are the most common:

1. Intermittent firing spark plug. Remove, clean, set gaps, and bomb test.
2. Ignition points. Check for pitted points and proper gap.
3. Ignition wire. Check for broken or burned insulator and loose connections.
4. Sticky valves. See that the valves are free in the guides and rocker boxes are well lubricated.
5. Fuel. Be sure that the proper grade of fuel is used and that it is free from water or any other foreign matter. (See fuel specifications.)
6. Icing carburetor. Be sure to use sufficient carburetor heat. See Operation Instructions.

LOW POWER

Low power may be caused by one or more of the following:

Improper functioning of the ignition system. The drop in RPM when going from the "Both" position to operation on either battery or magneto system alone, should not exceed 90 RPM. If magneto or battery ignition system appears to be defective, check the spark plugs, ignition wires, breaker points, coil, condenser, and timing.

Poor compression; see "Roughness."

Restriction in air induction system. Check for full opening of throttle valve. Check any carburetor screens, air cleaners, preheaters, etc.

Excessive carburetor air temperature. Check for proper operation of carburetor heat control or defective carburetor air temperature gauge.

Icing carburetor; see "Operation Instructions."

Incorrect setting of propeller. A propeller set with too high pitch will not permit the engine to turn up to desired RPM.

Improper grade of fuel.

Restriction in fuel supply. Check for unrestricted flow of fuel to carburetor inlet and for proper operation of carburetor.

SECTION 7
REMOVAL, REPAIR, AND ASSEMBLY OF CYLINDER

The usual periodic top overhaul is not recommended. In the event that any cylinder shows poor compression it should, of course, be taken off and properly serviced. It is recommended that only necessary work be performed on the engine and that no cylinder be removed which is in good condition. The work should be done by trained personnel experienced in the overhaul of aircraft engines, and if possible, at an authorized service station. The instructions in the Jacobs Overhaul Manual should be observed. The following instructions are included as an aid to emergency work, should such be necessary.

REMOVAL (CYLINDER AND PISTON)

If it is necessary to remove one or more cylinders for service work, proceed as follows, using tools in the Service Tool Kit and Special Service Tools where needed:

1. Disconnect storage battery; remove cowl ring, baffles, inner cowling, and exhaust manifolds.
2. Remove cylinders and pistons one at a time. It is essential that the master rod cylinder (No. 1) be removed last.
3. Loosen the intake pipe flanges and intake pipe packing nuts. Unscrew packing nuts at upper and lower ends of push rod tubes.
4. Disconnect ignition wires; remove primer lines, spark plugs, and rocker box drain lines.
5. Bring piston to top dead center. Remove cylinder hold-down nuts and lift off cylinder. Cylinders should preferably be placed on wood or other soft surface to prevent damage to end of barrel.
6. If removal of piston is required, push out the piston pin. If the piston pin is tight in the piston, do not drive on the aluminum plug in the pin, but remove the piston rings and heat the piston. The pin may then be easily removed.
7. Turn the next piston to top center and proceed as above until all required cylinders and pistons have been removed. As soon as a cylinder and piston are removed, cover the opening to prevent any dirt or foreign objects from falling into the opening.

CAUTION: Whenever No. 1 cylinder, containing the master rod, is removed, be sure to hold and block the master rod in a central position relative to the cylinder bore as any appreciable side motion of the master rod will move the pistons in other cylinders remaining on the engine and allow the bottom oil ring to come out of the cylinder bore, resulting in breaking the ring or piston of the other cylinder when the master rod is brought back to its central position.

REMOVAL (VALVE)

(Note: Valve Spring Compressor, Part No. T-409-10, and Valve Grinding Holder, Part No. T-13000, are Special Service Tools and are not furnished in the Flight Service Tool Kit.)

If it is necessary to remove a valve, proceed as follows:

1. Remove rocker box cover.
2. Remove rocker arm shaft nut and washer.
3. Remove rocker arm shaft and rocker arm. Place cylinder on a wooden valve assembly block shaped to fit the inside of the head. Compress valve springs using tool, Part No. T-409-10. Remove valve spring washers and springs. Valve may then be removed.

REPAIR

If piston rings need replacement, proceed as follows:

1. Use a piston ring spreader and remove all rings.
2. Remove all carbon from the top of the piston and the piston ring grooves and lands. Great care should be taken not to scratch the piston ring grooves and lands.
3. Piston ring side and end clearance should be checked to be in accordance with the requirements of the piston assembly drawings. Piston ring gaps should be checked in a standard ring gauge, Part No. T-9000.
4. Extreme care should be taken to see that each piston ring is installed in its proper ring groove in the piston as indicated in the piston assembly drawing. Rings with the word "Top" on one side should be installed with this marking toward the top of the piston. When new piston rings are installed, the latest type piston ring arrangement as shown in the piston assembly drawings should be used.

Pistons that are cracked or badly scored should be replaced. When ordering new pistons, specify the size and part number as stamped on the head of the old piston.

5. Light scores or scratches on pistons or cylinders may be refinished with a fine stone and kerosene, and polished with crocus cloth and kerosene.

6. If it is desired to check clearances of piston pin in piston, piston in cylinder, etc., the Jacobs Overhaul Manual should be referred to. The maximum permissible out of round of the cylinder is .006".

7. If new piston rings are installed, or if it is necessary to replace a cylinder because of scoring or excessive wear of the barrel, the engine should be run-in in accordance with the run-in schedule in this section.

8. Inspect valve seats. If reseating is necessary, remove only as much metal as is required to produce a good seat. The seat should be from 1/8" to 5/32" wide and never wider than the face of the valve. The valve seat angle is 45°. If the valve is cracked or shows evidence of valve stretch, or if there is a considerable amount of pitting or scoring on the valve stem, the valve should be replaced. If the seat on the valve is slightly pitted it should be refaced on a grinder before lapping to the cylinder seat. The valves should be refaced to 45° on a standard valve grinding machine. Remove only as much metal as required to make a good seat. The valve should be lapped into its seat by hand, using valve grinding holder, Part No. T-13000, and using a good grade of valve grinding compound. Use only enough compound to cover the valve seat. Do not allow compound to get on the valve stem or in the valve guide holes. Be sure all traces of the compound are removed by cleaning thoroughly with gasoline. The valves should be checked for tightness with gasoline.

9. Check the push rods for straightness and wear and push rod ball ends for tightness.

10. Check rocker arm bearing for roughness and looseness. If replacement is necessary, remove bearing and install new bearing with an arbor press.

ASSEMBLY (VALVES AND CYLINDERS)

1. Lubricate valve stems, assemble valves in guides, and place cylinder on valve assembly block.

2. Assemble springs, washers, and washer locks, using Valve Spring Compressor, Part No. T-409-10.

3. Install rocker arms, rocker arm shafts, and nuts.

4. Start assembling No. 1, which is the master rod cylinder. Oil the piston pin and assemble piston to the rod which should be in the top center position; oil piston and cylinder bore, keeping the outside of the cylinder skirt clean and dry. Stagger piston ring gaps around the piston to prevent blowby. Stretch the rubber crankcase sealing ring over the cylinder skirt just below the flange and, using the piston ring compressor tool, Part No. T-14000, slip the cylinder on and bolt to the crankcase, making sure that the rubber sealing ring has worked down into the chamfer of the crankcase. This forms a seal between the cylinder and crankcase and prevents oil leakage. The other cylinders are assembled in the same manner.

5. Next, assemble the intake pipes, making sure that the intake pipe flange is first tightened to the cylinder head while the packing nut is perfectly free; second, tighten the packing nut just snugly, making sure that it is not too tight, otherwise it will grip the intake pipe so tightly that it cannot slide in and out of the rubber packing gland during the expansion and contraction of the cylinders, and will result in cracking or breaking the intake pipe flange at the cylinder head.

6. Assemble push rod tubes and tighten packing nuts.

7. Check push rods for straightness and wear. Oil push rods and install. Place adjusting screws in position and set valve clearances. Install inter-cylinder hose lines. Place a liberal amount of oil in each rocker box and install rocker box covers.

GROUND RUN-IN AFTER REPLACEMENT OF PISTON RINGS OR CYLINDERS

After the engine has been carefully checked and assembled, it should be run-in on the ground under the supervision of an experienced mechanic. The airplane should be headed into the wind with the cowling removed. The propeller should be in the low pitch position. (Use a four-blade test club, if available.) The maximum allowable cylinder head temperature for the run-in is 400° F. (205° C.). Oil temperature and pressure should be within operating limits.

The run-in should be as follows for installation of piston rings or piston and ring assembly:

1 hour at 1000 RPM.

2 hours at 1200 RPM.

1/2 hour at 1400 RPM.

Total of 1/2 hour of short intervals at speeds up to 1900 RPM and short cooling periods at 1000 RPM.

If a cylinder is replaced, run an additional ½ hour at each of the different speeds listed.

Check engine speed for normal ground RPM with cowling ring installed.

SECTION 8
PREPARATION FOR STORAGE

1. General

Engines that are installed in airplanes should be operated at frequent intervals to prevent corrosion of engine parts. Engines that have been operated on leaded fuels are especially susceptible to corrosion. Conditions such as high humidity, rapid variation in temperatures, and salt air, also cause corrosion to occur much more rapidly. Due to variable atmospheric and engine conditions it is impractical to give any definite rules as to the length of time an engine should remain idle without corrosion preventive treatment. Where it is impractical to operate the engine at frequent intervals, the following instructions for corrosion preventive treatment should be followed. They are applicable to engines stored in a hangar or other enclosed space under favorable conditions.

Corrosion Preventive Compound, Army-Navy Specification AN-VV-C-576, Type II, is designed to give protection from corrosion to aircraft engines in storage. This compound may be procured from Standard Oil of New Jersey or Pennsylvania under their No. AE-604 corrosion preventive or from other vendors. The compounds specified above are already mixed with lubricating oil and need not be further diluted. Because it is fluid with a viscosity similar to engine lubricating oil, it is easy to apply and when an engine is taken from storage no difficult procedure for cleaning is involved.

2. Allowable Idle Time Without Preparation for Storage.

a. An engine that has been last operated on leaded fuel and which is being kept in short period storage should be started and warmed up at weekly intervals. The engine should be operated long enough to bring the oil-in temperature up to 140° F. (60° C.). In tropical or warm, humid areas, or near salt water, it may be necessary to start the engine at intervals of less than one week.

If engine operation is not practical at weekly intervals, it is recommended that the engine be prepared for short period storage. (See item 3). Should there be any delay in preparation of the engine for storage, it is recommended that the engine be pulled through by hand for five or six revolutions at five-day intervals or more often under unfavorable conditions.

b. To decrease possibility of corrosion, it is recommended that fuels be procured with a minimum content of lead. Aircraft fuels are now available with 80 octane rating containing no lead. Fuels containing more than 2 ml. of lead per gallon should be procured only when no other suitable fuel is available. If the engine has not been recently operated on leaded fuel, it can ordinarily be allowed to stand for two to four weeks without preparation for storage, but in that case the engine should be turned over each week by turning the propeller about six revolutions by hand. Under unfavorable conditions engines using unleaded fuels should also be started and warmed up at weekly intervals.

3. Short Period Storage (Normally two months or less)

a. If the engine has last been operated on leaded fuel, it is desirable that the engine be operated for 20 minutes prior to shut-down using unleaded fuel. If unleaded fuel is used having an octane number lower than that specified for the engine, it is important that the propeller RPM be held at 1000 RPM or under with the propeller in low pitch.

b. All spark plugs should be removed. The inside of each cylinder should be sprayed with Standard Oil AE-604 Corrosion Preventive or equivalent through the spark plug holes. In order that the valves will be thoroughly coated the engine must be rotated so that the valves can be sprayed when open, thus protecting the stems and outer surfaces of the valves and seats. The cylinder walls should be sprayed when the piston is at the bottom of its stroke. Be sure to completely coat all surfaces of valves and cylinders, but avoid using excess compound which can accumulate in the lower cylinders. Replace spark plugs or shipping plugs.

c. Cover all unprotected exterior parts with

AE-604 Corrosion Preventive.

d. Before putting the engine back into service, clean all exterior parts. Remove spark plugs and remove as much corrosion preventive compound as possible from the cylinders by draining and by the use of a hand pump, while rotating the crankshaft. Replace spark plugs and rotate the crankshaft several times by hand before using the starter.

4. Long Period Storage

If the engine is removed from an airplane for an indefinite period or it is to be stored for an extended period of time, it should be prepared for Long Period Storage. This procedure should also be followed when an engine is not to be used for several days after an overhaul. See the Jacobs Overhaul Manual for instructions on Long Period Storage.

PILOTS' INSTRUCTION CHART - JACOBS R-755A2 ENGINES

OPERATING CONDITION	FUEL PRESS. P.S.I.	OIL PRESS. P.S.I.
Desired --	3 - 4	75
Maximum --	4	90
Minimum --	3	60
Idling --	1.0	25

MIXTURE CONTROL - Do not use mixture control under 6000 ft.
FUEL - Aviation Grade 80 Minimum

OIL GRADE AND TEMPERATURE

GRADE OF OIL	GROUND TEMPERATURE	OIL TEMP. (DESIRED)	OIL TEMP. (MAX.)
100	Above 50°F.	160°F. (70°C.)	190°F. (88°C.)
80	50°F. to 20°F.	140°F. (60°C.)	175°F. (80°C.)
65	Below 20°F.	130°F. (55°C.)	160°F. (70°C.)

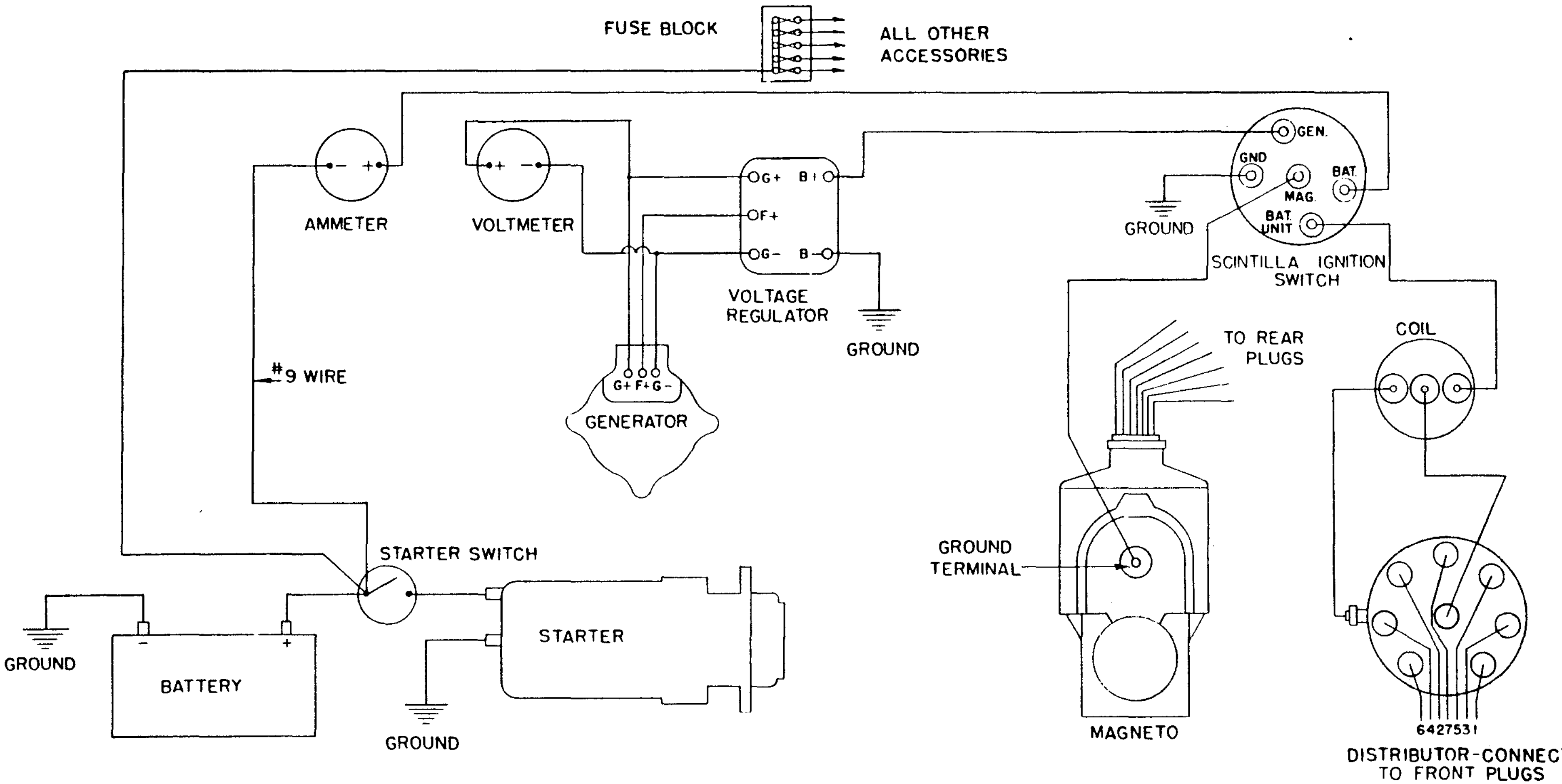
Grade 120 oil with a maximum allowable temperature of 200°F.(93°C.) may be used in hot weather.
Continue warm-up until oil temperature for ground check and take-off is within 60°F. (33°C.) of the desired oil temperature given above.

- OPERATION -	R.P.M. PROP. SET.	MANIFOLD PRESSURE IN. HG.	MAX. CYL. HEAD TEMP.	CARBURETOR HEAT	MAX. OIL CONS. QTS./HR.	- COMMENTS -
START	High Pitch 30 seconds	Throttle Open One-tenth	-----	Full Cold	-----	Battery Ignition only until Engine fires
WARM-UP	800 - 1000 Low Pitch	-----	400°F. (205°C.)	Full Hot	-----	
GROUND CHECK	Low Pitch		400°F. (205°C.)	As Required	-----	Ground Check - 10 sec. max. Ignition Check- 1600 R.P.M.
TAKE-OFF	2200	Full Throttle	500°F. (260°C.)	Full Cold	-----	Minimum Cyl. Head Temp. 248°F. (120°C.) (See Note 1.)
RATED POWER	2200	Full Throttle	450°F. (232°C.)	As Required	-----	
CLIMB	2050	24.0 or less	450°F. (232°C.)	As Required	-----	
CRUISING, MAX.	2000 Max. 1900 Min.	22.5 or less	400°F. (205°C.)	As Required	2.0	(See Note 2)
CRUISING, DESIRED	2000 Max. 1850 Min.	21.5 or less	400°F. (205°C.)	As Required	2.0	(See Note 2)
LANDING APPROACH	Take-Off	-----	400°F. (205°C.)	Full Hot	-----	Clear Engine at Intervals
STOPPING ENGINE	500 High Pitch	-----	330°F. (166°C.)	Full Cold	-----	Move mixture control to full lean and cut ignition as engine stops.

NOTES

1. Take-Off
   Most engine harm results from improper operation before it is properly warmed and temperatures stabilized. For this reason, on your initial take-off use maximum power only when and as necessary for safe operation of the airplane and reduce power as quickly as possible. Continue operation at reduced power until the engine reaches normal operating temperatures.

2. Cruising Conditions
   It is desirable to operate the engine at the smoothest r.p.m. and a corresponding manifold pressure within the limits indicated. When operating the engine under 1900 r.p.m. it is desirable not to exceed 21.5 In.Hg. manifold pressure.



NOTES

FOR RADIO INSTALLATION ALL WIRING MUST BE PROPERLY SHIELDED AND ALL SHIELDING MUST BE COMPLETELY AND PROPERLY GROUNDED.

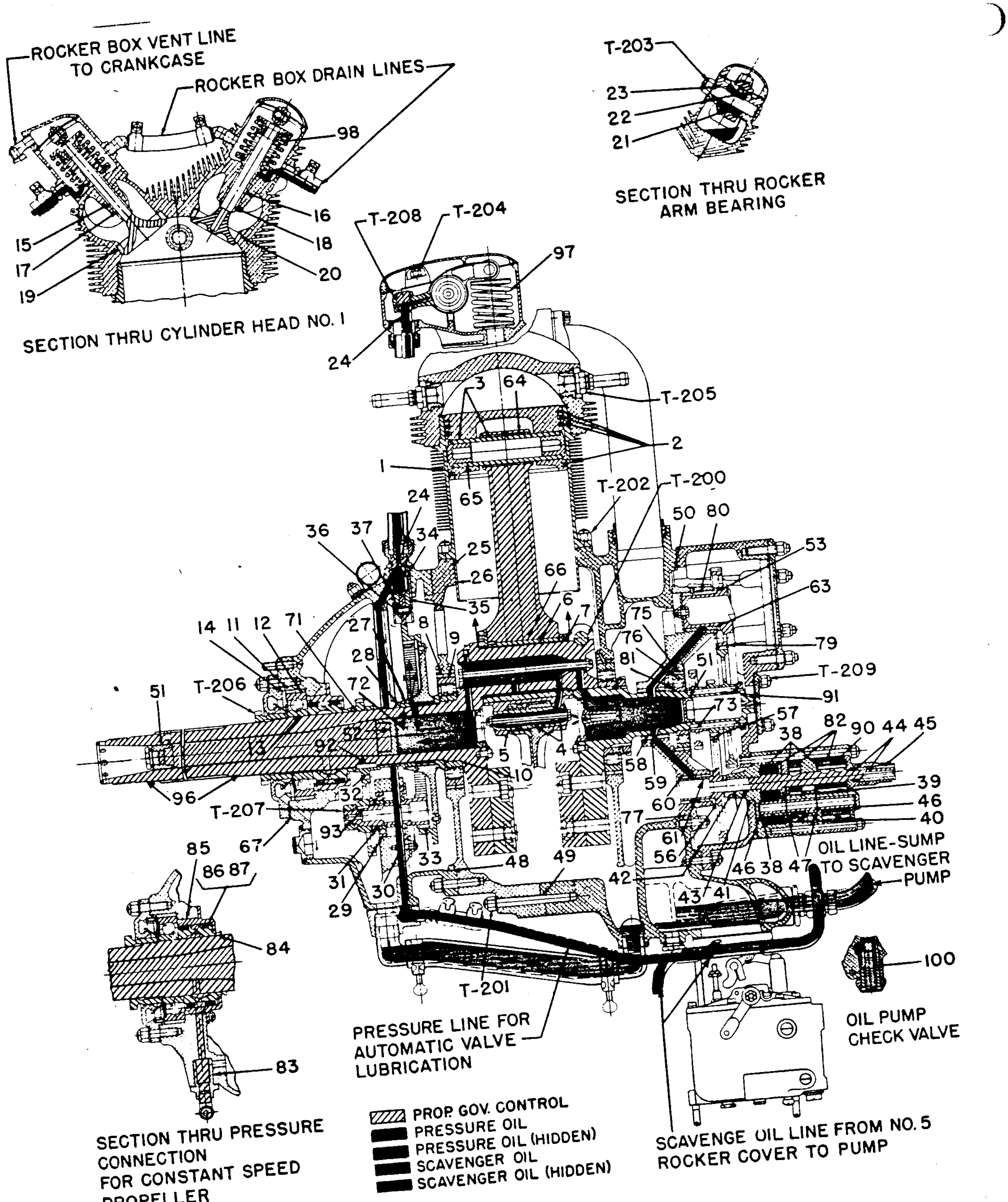
ALL PRIMARY WIRING WHETHER PLAIN OR RADIO SHIELDED MUST BE 14 EXCEPT AS NOTED.

MAGNETO-BATTERY IGNITION SYSTEM

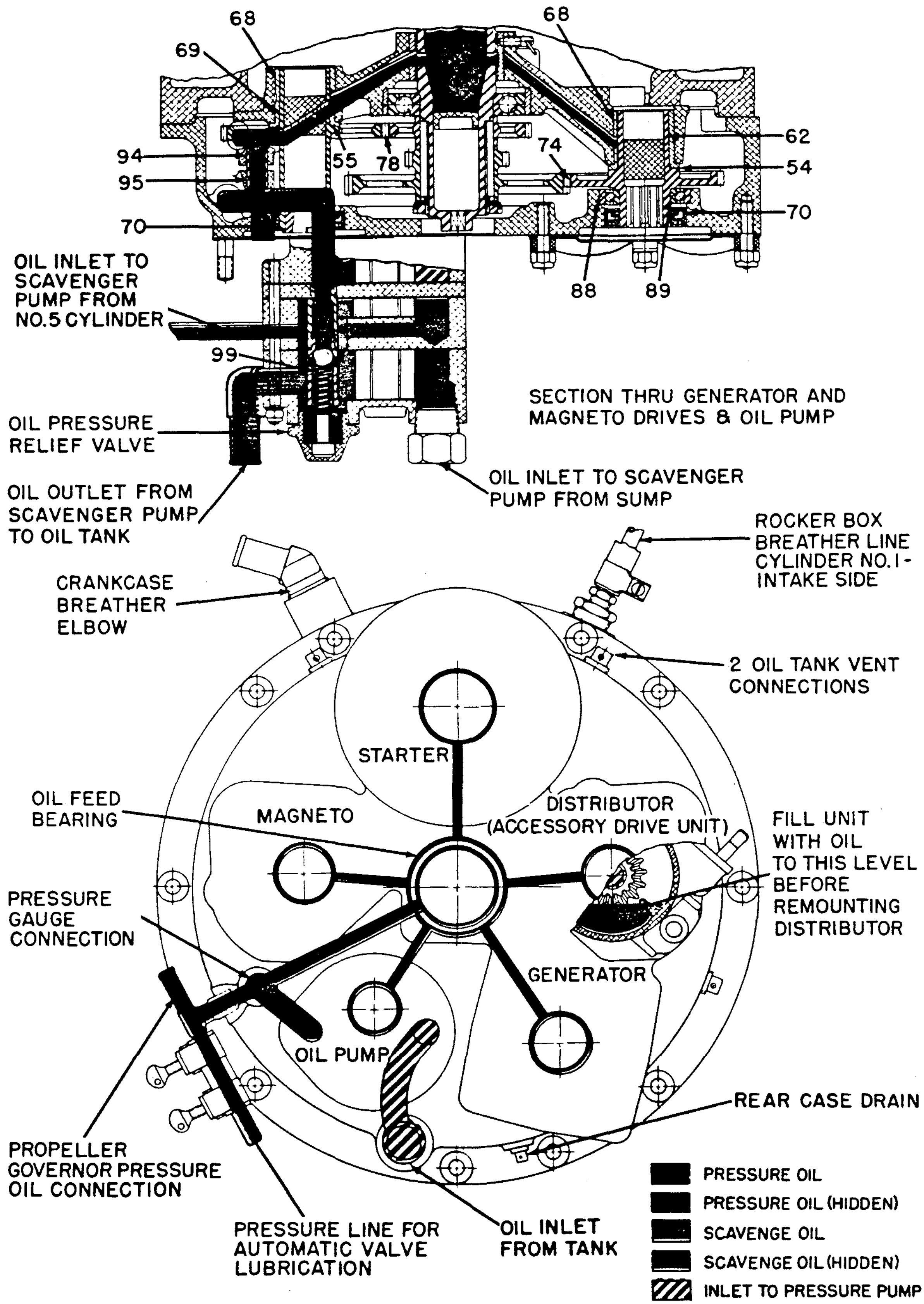
TYPICAL WIRING DIAGRAM FOR SINGLE ENGINE INSTALLATION

JACOBS AIRCRAFT ENGINE CO.
POTTSTOWN, PENNA. U.S.A.

PLATE 2



ENGINE LIMITS AND LUBRICATION DIAGRAM
SHEET 1



ENGINE LIMITS AND LUBRICATION DIAGRAM
SHEET 2

SENSENICH PROPELLER CO.

A Division of the Philadelphia Bourse, Inc.

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November 6, 1992

INSTALLATION & MAINTENANCE INSTRUCTIONS

W98AB, W96JB, W90T6JB PROPELLERS

The W98AB & W96JB series propellers are designed for assembly in a splined hub, JACOBS 90205 with 41/64 diameter mounting bolts. Assembly of the propeller to the hub and installation of the propeller assembly must be accomplished by personnel holding the appropriate authority.

I. PROPELLER/HUB ASSEMBLY

A) If the propeller and hub are already assembled when delivered, proceed to the instructions furnished by the hub supplier for mounting the assembly on the engine crankshaft(Item III).

B) If the propeller and hub must be assembled the following procedure is recommended:

1) Position the propeller on a bench with the blades horizontal. Insert the hub into the hub bore from the rear so that the double width spline is at one o'clock or seven o'clock as you look at the front face of the propeller, and assemble the front face plate. Insert the attaching bolts through the rear hub face, propeller, and front face plate (so that the nuts will be on the front face plate), using a soft head hammer to tap them in place. Tighten the nuts lightly and evenly (the threads must be clean and free from oil).

2) Place the assembly on a propeller stand and tighten the attaching bolts in small increments (moving diagonally across the bolt circle) to 300 inch-lb. wrench torque. It is permissible to increase wrench torque to 350 inch-lb. to allow insertion of cotter keys. If a conventional propeller stand is not available, the assembly may be temporarily mounted on the engine crankshaft while the propeller attaching bolts are tightened (it is recommended that a spark plug be removed from each cylinder to facilitate checking of blade track, and to prevent possible engine firing as it is turned).

3) The propeller blade tips should track within 1/16 inch of each other when propeller hub assembly is completed. This can be checked by rotating the blade tips past a fixed reference point. Slight adjustment of bolt torque on opposite sides of the hub is usually sufficient to correct blade track.

4) The propeller attaching bolts must be safety wired after proper pre-load (300 to 350 inch-lb. wrench torque) and proper track (within 1/16 inch at blade tips) are obtained.

II. PROPELLER BALANCE

A) Propellers are carefully balanced when manufactured. After assembly with a hub, a final balance check is recommended so that changes which may have occurred during storage may be corrected. To check balance, a rigid knife edge balance, with an arbor which seats in the hub cone-seats, or a suspension type balance can be used - **IN A ROOM FREE FROM AIR CURRENTS.** When properly balanced, there should be no persistent tendency for the assembly to rotate from any position on a knife edge balance, or to tilt on a suspension balance.

B) Sheet metal balance weights, installed under bolt-pairs on the light side, may be used to correct either horizontal or vertical balance.

III. INSTALLATION OF PROPELLER ON ENGINE CRANKSHAFT

1) **INSTALLATION:**

a) The spacer, rear cone, propeller hub, front cone, and hub retaining nut should be assembled on the engine shaft in that order. Parts should be lightly coated with grease before assembly.

b) The hub retaining nut should be tightened to 450 ft-lb. wrench torque. This may be applied by a man of approximately 175 lb., using a 31 inch rod. If 450 ft-lb. will not allow the lock pin holes to align, a maximum of 500 ft-lb. is permissible to achieve alignment.

c) Secure the retaining nut by inserting the clevis pin and cotter.

2) **REMOVAL:**

To remove the propeller hub from the engine shaft, the clevis pin securing the hub retaining nut must first be removed. The hub nut may then be unscrewed, pull the hub off the shaft.

CAUTION

Be sure that, when the propeller hub nut is fully torqued, it has not run out of threads but that the hub is firmly seated on the cones. This can be ascertained by turning the bare nut down on the crankshaft and counting the turns to bottom (usually 9 to 10). Count turns of the nut during propeller/hub installation. When the retaining nut is fully torqued at least one turn, but not more than 3, must remain on the crankshaft threads.

Installation, and removal, of a propeller/hub must be accomplished by personnel holding the appropriate FAA license.

NOTE: These instructions were supplied to SENSENICH PROPELLER CO. to accompany propeller/hub assembly instructions as applicable to CONTINENTAL W-670 and JACOBS R-755 engines. Recommendations may differ for installation on other engines.

IV. OPERATING AND MAINTENANCE TIPS

The following practices will add service-life to your wood propeller:

1) Do not use the propeller as a tow-bar when moving your aircraft on the ground.

2) Avoid engine run-up in areas containing loose stones and gravel.

3) Place the propeller in a horizontal position when parked.

4) Inspect the blades and metal tipping frequently for bruises, scars or other damage.

5) If your propeller is subjected to any kind of impact, do not operate it until it has been thoroughly inspected by qualified personnel.

6) Protect your propeller from moisture by waxing with an automotive type paste wax. Check the drain holes in the metal tipping to be sure they are open.

7) Inspect and check bolts for tightness at least every 100 flight-hours or annually. More frequent checks may be necessary when climatic changes are extreme.

8) Have all wood and metal tipping repairs accomplished by the factory or by an approved propeller repair facility.

9) Check balance of the complete hub/propeller assembly whenever there is evidence of roughness in operation.

10) If your propeller begins to show any of the following marks, it should be retired from service:

a) Crack(s) in the hub bore.
b) A deep cut across the wood grain.
c) A long, wide, or deep crack parallel to the grain.
d) A separated lamination.
e) Oversize or elongated hub bore or bolt holes.
f) An appreciable warp (discovered through inspection or through rough operation).
g) An appreciable portion of missing wood.
h) Obvious damage beyond economical repair.

REFER TO FAA PUBLICATION AC43.13-1A FOR FURTHER INFORMATION

These instructions are generally applicable for installation of wood aircraft propellers in JACOBS 90205 or equivalent splined hubs.

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INSTALLATION & MAINTENANCE INSTRUCTIONS

W98AA, W96JA, W90T6JA PROPELLERS

The W98AA & W96JA series propellers are designed for assembly in a splined hub, AC41G2325-9 or equivalent. Assembly of the propeller to the hub and installation of the propeller assembly must be accomplished by personnel holding the appropriate authority.

I. PROPELLER/HUB ASSEMBLY

A) If the propeller and hub are already assembled when delivered, proceed to the instructions furnished by the hub supplier for mounting the assembly on the engine crankshaft(Item III).

B) If the propeller and hub must be assembled the following procedure is recommended:

1) position the propeller on a bench with the blades horizontal. Insert the hub into the hub bore from the rear so that the double width spline is at 90 or 270 degrees (90 degrees to the axis of the blades), and assemble the front face plate. Insert the attaching bolts through the rear hub face , propeller, and front face plate (so that the nuts will be on the front face plate), using a soft head hammer to tap them in place. Tighten the nuts lightly and evenly (the threads must be clean and free from oil).

2) Place the assembly on a propeller stand and tighten the attaching bolts in small increments (moving diagonally across the bolt circle) to 250 inch-lb. wrench torque. It is permissible to increase wrench torque to 300 inch-lb. to allow insertion of cotter keys. If a conventional propeller stand is not available, the assembly may be temporarily mounted on the engine crankshaft while the propeller attaching bolts are tightened (it is recommended that a spark plug be removed from each cylinder to facilitate checking of blade track, and to prevent possible engine firing as it is turned).

3) The propeller blade tips should track within 1/16 inch of each other when propeller hub assembly is completed. This can be checked by rotating the blade tips past a fixed reference point. Slight adjustment of bolt torque on opposite sides of the hub is usually sufficient to correct blade track.

4) The propeller attaching bolts must be safety wired after proper pre-load (250 to 300 inch-lb. wrench torque) and proper track (within 1/16 inch at blade tips) are obtained.

II. PROPELLER BALANCE

A) Propellers are carefully balanced when manufactured. After assembly with a hub, a final balance check is recommended so that changes which may have occurred during storage may be corrected. To check balance, a rigid knife edge balance, with an arbor which seats in the hub cone-seats, or a suspension type balance can be used - **IN A ROOM FREE FROM AIR CURRENTS.** When properly balanced, there should be no persistent tendency for the assembly to rotate from any position on a knife edge balance, or to tilt on a suspension balance.

B) Sheet metal balance weights, installed under bolt pairs on the light side, may be used to correct either horizontal or vertical balance.

III. INSTALLATION OF PROPELLER ON ENGINE CRANKSHAFT

1) INSTALLATION:

a) The rear cone, propeller hub, front cone, hub retaining nut, and snap ring should be assembled on the engine shaft in that order. Parts should be lightly coated with grease before assembly.

b) The hub retaining nut should be tightened to 450 ft-lb. wrench torque. This may be applied by a man of approximately 175 lb., using a 31 inch rod. If 450 ft-lb. will not allow the lock pin holes to align, a maximum of 500 ft-lb. is permissible to achieve alignment.

c) The snap ring should be inserted over the retaining nut and the nut secured by the clevis pin and cotter.

2) REMOVAL:

To remove the propeller hub from the engine shaft, the clevis pin securing the hub retaining nut must first be removed. The hub nut may then be unscrewed, drawing the hub nut off the shaft. The front cone and nut may be removed from the hub by removing the snap ring.

<u>CAUTION</u>

Be sure that, when the propeller hub nut is fully torqued, it has not run out of threads but that the hub is firmly seated on the cones. This can be ascertained by turning the bare nut down on the crankshaft and counting the turns to bottom (usually 9 to 10). Count turns of the nut during propeller/hub installation. When the retaining nut is fully torqued at least one turn, but not more than 3, must remain on the crankshaft threads.

Installation, and removal, of a propeller/hub must be accomplished by personnel holding the appropriate FAA license.

NOTE: These instructions were supplied to SENSENICH PROPELLER CO. to accompany propeller/hub assembly instructions as applicable to CONTINENTAL W-670 and JACOBS R-755 engines. Recommendations may differ for installation on other engines.

IV. OPERATING AND MAINTENANCE TIPS

The following practices will add service-life to your wood propeller:

1) Do not use the propeller as a tow-bar when moving your aircraft on the ground.

2) Avoid engine run-up in areas containing loose stones and gravel.

3) Place the propeller in a horizontal position when parked.

4) Inspect the blades and metal tipping frequently for bruises, scars or other damage.

5) If your propeller is subjected to any kind of impact, do not operate it until it has been thoroughly inspected by qualified personnel.

6) Protect your propeller from moisture by waxing with an automotive type paste wax. Check the drain holes in the metal tipping to be sure they are open.

7) Inspect and check bolts for tightness at least every 100 flight-hours or annually. More frequent checks may be necessary when climatic changes are extreme.

8) Have all wood and metal tipping repairs accomplished by the factory or by an approved propeller repair facility.

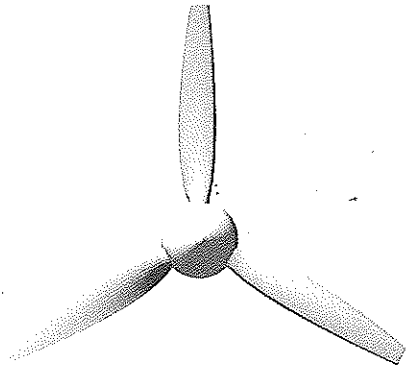
9) Check balance of the complete hub/propeller assembly whenever there is evidence of roughness in operation.

10) If your propeller begins to show any of the following marks, it should be retired from service:

a) Crack(s) in the hub bore.
b) A deep cut across the wood grain.
c) A long, wide, or deep crack parallel to the grain.
d) A separated lamination.
e) Oversize or elongated hub bore or bolt holes.
f) An appreciable warp (discovered through inspection or through rough operation).
g) An appreciable portion of missing wood.
h) Obvious damage beyond economical repair.

REFER TO FAA PUBLICATION AC43.13-1A FOR FURTHER INFORMATION

These instructions are generally applicable for installation of wood aircraft propellers in AC41G2325-9 splined hubs.



mt-propeller

ATA 61-01-12

(E-112)

BETRIEBS- UND EINBAUANWEISUNG

OPERATION AND INSTALLATION MANUAL

MT-HOLZ-COMPOSITE

FESTPROPELLER

MT-WOOD-COMPOSITE

FIXED PITCH PROPELLERS

91.7" Dia (92)
59.1" Pitch (60)

Ausgabe 14: 19. März 2009
Issue 14: March 19th, 2009
LBA-anerkannt
LBA-approved

EASA DE.21G.0008
EASA.21J.020

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No.	Date of issue	Page
1	24.06.19983	all
2	25.11.1993	all, replaces english edition E-203
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4	09.02.1998	2, 3, 12, 12-1, 12-2, 12-3, 12-4, 12-5, 13, 14
5	10.03.2000	0-1, 2, 3, 4, 9, 12-3, 12-4, 16
6	03.07.2001	2, 3, 12-1, 15
7	20.01.2003	2, 3, 7, 12-2, 12-3, 14
8	24.11.2003	2, 3, 9, 10, 16-1, 16-2, 16-3
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1. ALLGEMEINES

Feste Holz-Composite MT-Propeller sind entsprechend dem höchsten Industriestandard aus handverlesenem deutschen Eschenholz, mehrfach verleimt mit Kunststoffüberzug und aufgeklebtem rostfreien Stahlkantenbeschlag für unbeschränkte Betriebszeit hergestellt.

Mehr als 2500 dieser Propeller sind weltweit im Einsatz an Motorseglern, Kunstflugzeugen und Oldtimer-Flugzeugen.

Triebwerksleistungen von 40 bis 400 PS und Durchmesser von 120 cm bis 250 cm sind möglich.

Aufgrund des guten Feuchtigkeitsschutzes können die Propeller in allen Umgebungsbedingungen verwendet werden.

1. GENERAL

Fixed pitch natural-composite MT-Propellers are built to the highest standard in the industry from hand-selected German ash wood, multiple laminated and plastic covered with bonded on stainless steel metal tipping, installed for unlimited life.

More than 2500 of these propellers are worldwide in service for use in motorgliders, aerobatic aircraft and vintage airplanes.

Engine power ranging from 40 HP to 400 HP and diameters from 120 cm (50 inches) to 250 cm (100 inches) are possible.

Due to its protections from moisture, the propellers can be operated in all environmental conditions.

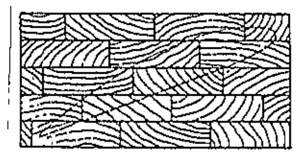
3. BAUBESCHREIBUNG

3.1 Die hier beschriebenen MT-Festpropeller mit Kantenschutz in Hartholz-Konstruktion entsprechen dem EASA-Kennblatt EASA P.006.

3.2 Grundwerkstoff für diese Propeller ist für diese besondere Anwendung ausgesuchtes Eschenholz, gelagert und behandelt nach unseren Herstellungsanweisungen. Fortlaufende Tests sichern die hohe Qualität unseres Produktes

Der Blattkörper ist mit wasserfestem Kunstharzleim zu einem Block verklebt. Dadurch bleiben die Blätter bestmöglich in ihren ursprünglichen Abmessungen.

Während der Herstellung wird laufend die Geometrie kontrolliert, wie Blattbreite, Blattdicke, Profilform, Spur und Rundlauf.



Verleimter Holz-Block
Glued wood-block

Die geringe Dichte des Materials (ca. 0,7 g/cm³) ermöglicht Propellergewichte, die ca. 50 % der gegenwärtigen Metallpropeller betragen. Das polare Massenträgheitsmoment ist deutlich geringer als das von Metallpropellern. Dadurch läuft ein Composite Propeller wesentlich ruhiger.

Drehzahlbeschränkungen sind wegen der hohen natürlichen Dämpfung des Holzes nicht nötig. Blattspitzen-Ermüdungsbrüche, wie sie bei Metallpropellern immer wieder vorkommen, sind unbekannt.

3. CONSTRUCTION

3.1 MT fixed pitch propellers described herein, with metal tipping and hardwood construction correspond to EASA TCDS EASA P.006.

3.2 Basic material for these propellers is ashwood, selected for this special application and conditioned according to our manufacturing specifications. Continuous testing secures high quality of our product.

The body is glued together with water resistant artificial glue to a block. This keeps the blades as much as possible in its initial dimensions.

During the manufacturing steps, constant quality control is applied for the physical dimensions as there are blade width, blade thickness, blade angle, track and profile contour.

The low density of the material used (approx. 0.7 g/cm³) allows a weight of approx. 50 % of the current metal propellers. Also, the polar moment of inertia is considerably lower than those of metal propellers. Therefore the composite propeller runs much smoother.

No RPM placards are needed because of the high damping characteristics of wood. Blade tip fatigue failures, as they occur continuously with metal propellers are unknown.

4. MONTAGE

4.0 Einbau

4.1 Propellermuster und Zustand prüfen. Nabe reinigen und trocknen lassen.

4.2 Triebwerk oder Propellernabenflansch reinigen und trocknen lassen. Öl auf der Oberfläche muß vermieden werden. Bolzen auf Gewindezustand, Risse und Korrosion prüfen.

4.3 Bei Befestigung an einer Konus-Nabe, die Verbindungsflächen, -teile und -gewinde sorgfältig prüfen (Konus, Nabenmutter).

4.4 Propeller auf den Triebwerks- oder Nabenflansch schieben, Frontplatte, Bolzen, Unterlegscheiben und Muttern, falls vorhanden, anbauen. Frontplatte immer verwenden.

Propeller nicht gewaltsam auf den Flansch bzw. die Nabe schieben. Es können Spaltrisse entstehen. Die Ursache der ungenügenden Passung feststellen. Überstehender Lack in der Nabe oder den Zentrierbuchsenansenkungen kann entfernt werden. Paßt der Propeller noch immer nicht, an den Hersteller zurücksenden.

Hinweis:

Um alternativ einen vibrationsärmeren Lauf des Propellers zu erzielen, ist eine Repositionierung von 180 ° zulässig.
Falls dies jedoch nicht den gewünschten Erfolg zeigt und auch eine Dynamische Wuchtung nicht durchgeführt werden kann, ist eine Repositionierung auch bis zur nächsten Index-Buchse, d.h. von nur 60° möglich.
Zunächst sollte der Propeller stets so positioniert sein, dass er sich so weit wie möglich in vertikaler Lage befindet, und zwar so dass sich der Kolben des am nächst stehenden Zylinders am TDC befindet.

4. INSTALLATION

4.0 Installation

4.1 Check propeller type and condition. Clean propeller hub and let dry.

4.2 Clean engine or propeller hub flange and let dry. Oil on the surfaces must be avoided. Check bolts for cracks, thread and corrosion.

4.3 If you have a bolt hub, check carefully connection surface (cone, hub nut), parts and thread.

4.4 Put propeller on engine flange or hub flange. Install front plate, bolts, washers and nuts, if applicable. Always use a front plate.

Do not push the propeller on the hub (flange) with high force. Cracks may occur. Check the reason of non-fitting. Too much lacquer in the hub or the drive bushing countersunk can be removed. If propeller still does not fit send it back to the factory.

Note:

As an alternate way to find a better balance of the propeller, a reposition of the propeller by 180° is approved.
If this does not bring the desired results and dynamic balancing is not available, the repositioning can also be to the next drive bushing or in other words by 60° only.

Initially, the propeller should always be positioned in such a way, that it is as much as vertical as possible when the piston of the nearest cylinder to the propeller is on TDC.

4.6.2 Falls ein zusätzlicher Zwischenflansch montiert wird, müssen die Stopmuttern bzw. die Bolzen zur Montage des Zwischenflansches auf dem Triebwerk wie folgt angezogen werden:

für A - Flansche mit 45-47 Nm (33 - 35 ftlbs)
- z.B. Rotax etc.

für D - Flansche mit 85-90 Nm (63 - 66 ftlbs)
- z.B. Conti IO-240 etc.

für B - Flansche mit 85-90 Nm (63-66 ftlbs)
- z.B.Lycoming O-360 etc.

Werte gelten für trockenes sauberes Gewinde!
Bolzen über Kreuz anziehen!

Korrekten Sitz des Propellers auf der Nabe oder dem Flansch prüfen. Zwischen diesen beiden Teilen ist kein Abstand erlaubt.

Kontrolle des Anzugsmoments nach dem ersten Flug. Nach den ersten 25 Stunden alle 100 Stunden oder einmal jährlich kontrollieren.

Anmerkung:
Bolzen, die hier nicht aufgeführt sind, erfordern andere Anzugsmomente. Die zutreffenden Werte beim Hersteller erfragen.

4.6.2 In case that an extra spacer flange is used, the stop nuts respectively the bolts, in order to mount the spacer on the engine flange, must be torqued as follows:

for A - flange with 45-47 Nm (33 - 35 ftlbs)
- i.e. Rotax and s.o.

for D - flange with 85-90 Nm (63 - 66 ftlbs)
- i.e. Conti IO-240 and s.o.

for B - flange with 85-90 Nm (63 - 66 ftlbs)
- i.e. Lycoming O-360 and s.o.

Values are for dry and cleaned threads only!
Torque bolts crosswise!

Check that propeller fits to the flange or hub.
No space allowed between those two parts.

Check torque moment after the first flight!
After the first 25 hours, every 100 hours or once a year.

Note:
Some bolts, not specified herein, may require other torque moments. Please ask the manufacturer for the correct value.

4.9 Bolzen paarweise mit Draht sichern oder passenden Splint zum Sichern der Kronenmuttern verwenden.

Nabenmutter sichern wie im Triebwerkshandbuch angegeben.

4.10 Demontage:
Die Schritte ab 4.1 in umgekehrter Reihenfolge ausführen. Wenn der Propeller stramm sitzt, darf nur leichte Kraft aufgewendet werden, um ihn vom Flansch zu entfernen. Bei Verwendung von hartem Werkzeug, Beschädigung des Propellers. Nur Handkraft anwenden.

4.11 Triebwerksflansch, Konus- oder Spline-Nabe vor Korrosion schützen.

4.12 Bolzen und Befestigungsteile sollten mit zur Überprüfung eingeschickt werden. Konus-, Spline-Naben oder andere demontierbare Teile sollten mit dem Propeller gesendet werden. Sie brauchen ebenfalls Überholung oder Inspektion.

4.9 Safety wire bolts in pairs or use correct cotter pin to safety castellated nuts.

Safety hub nut as specified in the engine manual.

4.10 Removal:
Refer to 4.1 in the inverted direction. If propeller fits strong, soft force only may be used to remove it from the flange. In any case, if hard tools are used, the propeller will be damaged. Use only hand force.

4.11. Protect engine flange, cone or spline shaft against corrosion.

4.12 Bolts and attaching parts should also be sent in for inspection. Tapered hubs, spline hubs or any other detachable hubs should be sent with the propeller. These parts need also overhaul or inspection.

5.3.1 Mögliche Beschädigungen entlang des Kantenbeschlags

5.3.1.1 Runde Dellen (über 6 mm x 6 mm nicht reparieren, Beschlag wechseln)

5.3.1.2 Spitze Dellen (über 6 mm x 6 mm nicht reparieren, Beschlag wechseln)

5.3.1.3 Risse (Risse im Beschlag sind nicht erlaubt, Beschlag wechseln)

5.3.1.4 Hohlstellen (max. 2,5 cm², Abstand zwischen den Hohlstellen min. 14 cm, sonst zur Reparatur)

5.3.1.5 Erosion

5.3.1.6 Blitzschlag

5.3.1 Possible Damage along Erosion Sheath

5.3.1.1 Circular dents (more than 0,24 inch x 0,24 inch do not repair, change erosion sheath)

5.3.1.2 Pointed dents (more than 0,24 inch x 0,24 inch do not repair, change erosion sheath)

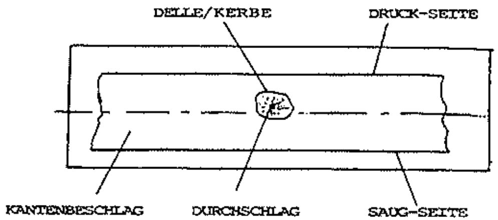
5.3.1.3 Cracks (no cracks allowed in the erosion sheath, otherwise change erosion sheath)

5.3.1.4 Hollow and debonded spots (max. 0.39 square inch, no two spots may occur within 5.5 inch of each other, otherwise blade must be repaired)

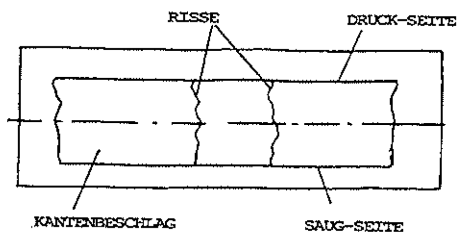
5.3.1.5 Erosion

5.3.1.6 Lightning strike

Sind keine Risse vorhanden, muß die Delle in jedem Fall mit Epoxy verspachtelt werden, damit keine Feuchtigkeit in den Blattkörper eindringen kann. Zusätzlich ist dieser Bereich des Beschlags bei jeder Vorflugkontrolle genauestens auf neue mögliche Risse zu untersuchen. Der Beschlag ist baldigst zu ersetzen.

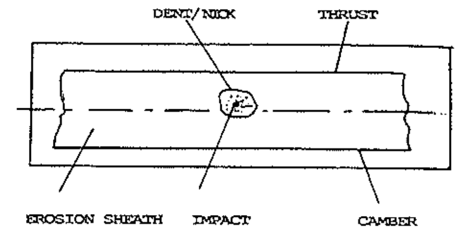


5.6 Falls die unter 5.3.1.3 genannten Querrisse im Beschlag vorhanden sind, muß der Beschlag sofort ersetzt werden, d.h. Propeller zur Reparatur/Überholung zum Hersteller oder zu einer autorisierten Servicestation senden. Das Blatt muss nach Anweisung des Überholungshandbuches E-497 repariert/überholt werden.

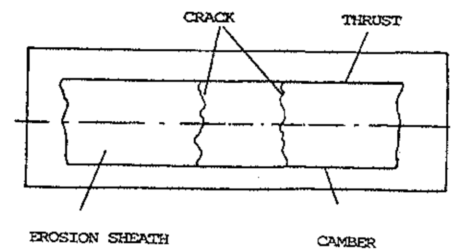


5.7 Falls die unter 5.3.1.4 genannten Hohlstellen vorhanden sind, diese markieren und bei jeder Vorflugkontrolle beobachten, ob weitere Delaminationen entstehen bzw. die vorhandenen Delaminationen

If there are no cracks, the dent must be filled with Epoxy so that no moisture can enter into the blade body. Check this area carefully for possible cracks whenever performing pre-flight inspection. The erosion sheath must be replaced as soon as possible.



5.6 If there are any cracks (as mentioned under item 5.3.1.3), the erosion sheath must be replaced as soon as possible. The propeller is to be returned to the manufacturer or to an authorized service station for repair/overhaul. The blade must be repaired/overhauled in accordance with Overhaul Manual E-497.



5.7 If any hollow and debonded spots exist (as mentioned under item 5.3.1.4), mark them. Whenever performing pre-flight inspection, monitor whether there are further delamination and/or whether the

5.9 Blasen und Delaminationen

Sind Blasen oder Delaminationen vorhanden, diese anzeichnen und weiter beobachten. Blasen von Harzgallen sollen geöffnet werden, damit das Harz ausfließen kann. Die Löcher mit 5-min Epoxy füllen und verschleifen. Größere Blasen müssen geöffnet und das Laminat entfernt werden. Diese Flächen mit neuem Laminat reparieren. Schäden an der Austrittskante können auch auf diese Art repariert werden.

5.9.1 Eingedrückte / gebrochene Austrittskanten

Beschädigte Austrittskanten können mit 5 Minuten Epoxy repariert werden, vorausgesetzt, die Beschädigung ist nicht tiefer als 5 mm (0,20 inches) und nicht breiter als 15 mm (0,60 inches).
Am wichtigsten dabei ist, dass <u>keine Feuchtigkeit</u> in den lasttragenden Blattkern eindringen kann.

Bei größerer Beschädigung Hersteller kontaktieren!

5.10 Blitzschlag

Falls ein Blatt Anzeichen von Blitzschlag hat, Blatt und Kantenbeschlag nach 5.4 und 5.7 untersuchen sowie einen Bericht zum Hersteller (MT-Propeller) senden.

5.11 PU-Kantenschutz

Falls der PU-Kantenschutz am inneren Teil des Blattes beschädigt oder nicht vorhanden ist, sofort (max. 2 Stunden) ersetzen. Das kann von einer fachkundigen Person gemacht werden.

<u>**Achtung:**</u>
Als zusätzlicher Kantenschutz kann vom Betreiber des Flugzeuges bei Bedarf ein dünnes ¾" Scotch 3-M selbstklebendes PU-Tape (oder ähnliches) angebracht werden, um somit einen zusätzlichen Kantenschutz der Eintrittskanten zu gewährleisten.

5.9 Blisters and delaminations

Are blisters or delaminations visible, mark them and check them periodically. Blisters from sap (resin) shall be opened to release the material. Fill void with 5-min Epoxy and sand. Larger delaminations shall be opened and the material be removed. Such areas must be covered with new fiber glass laminate. Damage on the trailing edge can be repaired the same way.

5.9.1 Crunched Trailing Edges

Crunched trailing edges can be repaired by using 5 minute Epoxy if the damage is not deeper than 5 mm (0,20 inches) and not wider than 15 mm (0,60 inches).
Most important is, that <u>no moisture</u> can enter into the load carrying blade body.

If damage is bigger contact manufacturer.

5.10 Lightning strike

If a blade has an indication of lightning strike, check the entire blade and erosion sheath per item 5.4 and 5.7. Also send a report to the manufacturer (MT-Propeller)

5.11 PU-Erosion protection tape

If the PU-tape at the inner portion of the blade is damaged or does not exist any more, replace it immediately (max. 2 hours). This can be done by a qualified person.

<u>**Note:**</u>
For additional erosion protection, a thin ¾" Scotch 3-M Self Adhesive PU-tape (or euivalent) can be used as an option of the operation in order to provide additonal protection of the leading edge of the propeller.

5.13 Jahreskontrolle oder Kontrolle bis zu 15 % Überdrehzahl von zertifizierten Drehzahl:

Propeller nach den Anweisungen in 5.12 prüfen. Propeller vom Flugzeug abbauen und Nabenkörper nach Rissen untersuchen. Zwei verschiedenartige Risse können auftreten:

Radiale Risse

Wenn diese nur in der äußeren Holzschicht auftreten, sind sie nicht kritisch und können repariert werden. Sie dürfen nicht länger sein, als der Flanschdurchmesser.

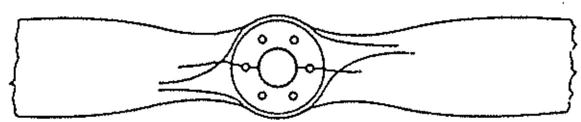
5.13 Annual inspection or inspection after up to 15 % overspeed of the certified RPM:

Inspect propeller as per instructions given under 5.12. Remove propeller from aircraft and carefully inspect the hub body for cracks. Two different cracks may occur:

Radial cracks

If they are found only in the outer timber layer, they will not be objectionable and can be repaired. They may not be longer than the flange diameter.

Mögliche radiale Risse



Possible radial cracks

Tangentiale Risse entstehen nur bei Überbelastung. Sie können vom konkaven Bereich des Nabenkörpers ausgehen. Diesen Bereich sorgfältig prüfen. Wenn sie durch eine Bolzenbohrung oder bis zur Zentralbohrung gehen, muß der Propeller sofort aus dem Betrieb genommen werden. Reparatur nicht möglich.

Tangential cracks occur from overstress only. They may start in the concave area of the hub body. Check this area carefully. If they extend through a bolt hole, or even to the central bore, the propeller must be removed from service immediately. Repair is not possible.

6. WARTUNG UND REPARATUR

Anmerkung: Deutliche Risse, die vom Holzkern ausgehen, gehen durch die Decklage und Lack und sind deshalb von außen zu sehen. Diese Risse sind Radialrisse und Tangentialrisse wie oben beschrieben.

Zusätzliche feine Risse im Lack oder Metallkantenbeschlag, wie oben beschrieben, müssen ernst genommen werden, obwohl sie üblicherweise zuerst im Lack entstehen und nicht im Holzkern.

6.1 Propeller mindestens alle 50 Stunden und sonst wenn nötig, mit Autoreinigungsmittel oder gleichwertigem reinigen,

6.2 Normale Steinschläge sind unbedenklich so lange der Kunststoffschutz des Holzkernes intakt ist. Luftblasen mit max. 15 mm Durchmesser sind nur dann unbedenklich, wenn sie während des Betriebs nicht wachsen.

Kratzer oder Kerben sollten bei der üblichen Pflege mit einer Schicht aus wasserbeständigem Lack abgedeckt werden.

6.3 Wenn Risse im Metallkantenbeschlag oder Delaminierung auftreten, muß der Beschlag gemäß 5.3 untersucht und gegebenenfalls ersetzt werden.

6. MAINTENANCE AND REPAIR

Note: Serious cracks which originate from the wooden core, are extending through the covering material and lacquer and so are visible from outside. These cracks are radial cracks or tangential cracks as described above.

Additional fine cracks in the lacquer or the metal tipping, as described above, are considered of serious character, although they usually start at first in the lacquer and not in the wooden core.

6.1 Clean propeller if necessary with any car wash solution or equivalent, but at least every 50 hours.

6.2 Normal stone nicks are unimportant as long as the plastic protection of the wood core exists. Air bubbles with a maximum of 15 mm (0.6 inch) in diameter are unimportant only if the size does not increase during use.

Scratches and nicks should be protected during routine maintenance with a coating of water resistant lacquer.

6.3 If cracks in the erosion sheath or debonding occur, the erosion sheath must be inspected according to 5.3 and if necessary be replaced.

6.8 DYNAMISCHES WUCHTEN

6.8.1 Allgemein

6.8.1.1 Beim dynamischen Wuchten sind entsprechende Meßgeräte zu verwenden. Auf die Höhe der dynamischen Unwucht zu achten, üblicherweise soll die Rest-Unwucht nach einer solchen Maßnahme unter 0,2 IPS liegen.

6.8.1.2 Es ist den Anweisungen der Geräte-Hersteller für dynamisches Wuchten zu folgen.

6.8.1.3 Ist die festgestellte dynamische Unwucht größer als 1,2 IPS, muß der Propeller abgebaut und erst statisch nachgewuchtet werden

6.8.2 KONTROLLVERFAHREN VOR DEM WUCHTEN

6.8.2.1 Vor dem dynamischen Wuchten ist eine Sichtkontrolle der Propelleranlage durchzuführen, nachdem der Propeller wieder an das Flugzeug angebaut worden ist.

6.8.2.2 Vor dem dynamischen Wuchten sind Anzahl und Position der Wuchtgewichte aus der statischen Wuchtung zu notieren.

6.8.2.3 Es wird empfohlen, die Wuchtegewichte an Aluminium-Spinnerträgern, die vorher nicht durchbohrt wurden, radial anzubringen.

6.8 DYNAMIC BALANCE

6.8.1 Overview

6.8.1.1 Dynamic balance is accomplished by using an accurate means of measuring the amount and location of the dynamic imbalance. After such a undertake the remaining imbalance should be below 0,2 ips.

6.8.1.2 Follow the instructions from the equipment manufacturers for dynamic balance.

6.8.1.3 If the dynamic imbalance is bigger than 1,2 ips, the propeller must be removed and statically rebalanced.

6.8.2 INSPECTION PROCEDURES PRIOR TO BALANCING

6.8.2.1 Visually inspect the propeller assembly after it has been reinstalled on the aircraft prior to dynamic balancing.

6.8.2.2 Prior to dynamic balance record the number and location of all balance weights from the static balance.

6.8.2.3 It is recommended that placement of balance weights on aluminum spinner bulkheads which have not been previously drilled be placed in a radial location.

6.8.3.4 Das maximale Wuchtgewicht an einer Position darf 32 g nicht überschreiben. Das entspricht in etwa acht AN970 - ( ) Scheiben.

6.8.3.5 Die Wuchtgewichte sind mit 10-32 inch-Schrauben anzubringen. Die Qualität muß allgemeinen Flugzeughersteller-Standards entsprechen.

6.8.3.6 Die Schrauben der Wuchtgewichte müssen nach der Installation mindestens einen Gewindegang und höchstens vier Gewindegänge aus der Stoppmutter herausstehen.

6.8.3.7 Alle dynamisch gewuchteten Propeller müssen am Blatt Nr. 1 einen Aufkleber erhalten. Dieser informiert das Wartungspersonal, daß die installierten Wuchtgewichte nicht der statischen Wuchtung entsprechen.

6.8.3.8 Falls Änderungen durchgeführt wurden, ist die Position der statischen und dynamischen Wuchtgewichte im Propeller-Logbook einzutragen.

6.8.3.4 Do not exceed maximum weight per location of 32 g. This is approximately equal to eight AN970 style washers.

6.8.3.5 Weights are to be installed using aircraft quality 10-32 inch screws of bolts.

6.8.3.6 Balance weight screws attached to the spinner bulkheads must protrude through the self-locking nuts a minimum of one thread and a maximum of four threads.

6.8.3.7 All propellers which have been dynamically balanced must install a decal on blade no. 1. This will alert repair station personnel that the existing balance weight configuration may not be correct for static balance.

6.8.3.8 Record number and location of dynamic balance weights, and static balance weights if they have been reconfigured, in the Propeller Logbook.

Note:

7. VERSAND UND LAGERUNG

7.1 Kein Propeller sollte auf den Spitzen stehend gelagert werden. Wenn eine Lagerung nötig ist, die Originalverpackung benutzen.

Bei kaltem Wetter sollte der Propeller nicht in der Nähe von Heizungen stehen oder in Räumen mit starken Temperaturschwankungen.

Der Propeller sollte in normalem Klima gelagert werden (Temperatur -15° C bis +35° C, rel. Luftfeuchte 40 % bis 70 %).

7.2 Sorgfältiges Verpacken ist der beste Schutz gegen Beschädigungen beim Transport. Deshalb wird der Propeller vom Hersteller in einer speziellen Kartonverpackung verschickt. Diese Verpackung kann für Rücksendungen bei Überholungen verwendet werden. Die Blattspitzen und die Austrittskante sollten ausreichend geschützt werden. Wenn eine Holzkiste verwendet wird, muß der Propeller durch die Zentralbohrung oder die Bolzenlöcher fixiert werden.

7. SHIPPING AND STORAGE

7.1 No propeller should be stored by standing on the tips. If storage is required, it is recommended to use the original packing.

In cold weather the propeller should not be stored close to heating systems or in rooms with extreme changes in temperature.

Additionally the Propeller should be stored in a controlled environment (Temperatures +5° F to 95°F and rel. humidity 40 % to 70 %).

7.2 Careful packing is the best protection against damage during shipment. Therefore the propeller is shipped from the factory in a special cardboard container. This container may be used for reshipment for overhaul. The blade tips and trailing edge should be sufficiently protected. If a wooden case is used for shipment, the propeller should be fastened through the central bore or the bolt holes.

6.8.2.4 Die radiale Lage soll innerhalb der Biegung liegen, an der der Spinnerträger die Befestigungsfläche für den Spinnerdom bildet.

6.8.2.5 Es sind Bohrlöcher für die Verwendung von AN3 ( ) Bolzen mit Sicherungsmuttern akzeptabel.

ACHTUNG: Im Chadwick-Helmuth Manual AW-9511-2 „The Smooth Propeller" sind einige typische Beschreibungen zur Spinnerträger-Nacharbeit enthalten.

6.8.2.6 Alle angebrachten Wuchtgewichte dürfen nicht die Zelle des Flugzeuges (Cowling) bzw. das Triebwerk beim Rotieren berühren.

6.8.3 ANBRINGUNG DER WUCHTGEWICHTE FÜR DIE DYNAMISCHE WUCHTUNG

6.8.3.1 Vorzugsweise werden die dynamischen Wuchtgewichte am hinteren Spinnerträger befestigt. An der Spinnerstürzplatte sind die statischen Wuchtgewichte angebracht, falls zutreffend.

6.8.3.2 Falls vorhanden, wird durch das Entfernen der dynamischen Wuchtgewichte der Propeller in seine ursprüngliche statische Wucht gebracht. Die statischen Wuchtgewichte dürfen nur ausnahmsweise entfernt werden.

6.8.3.3 Verwenden Sie nur Edelstahl bzw. kadmierte Scheiben als Wuchtgewichte am Spinnerträger

6.8.2.4 The radial location should be inboard of the bend at which point the bulkhead creates a flange to attach the spinner dome.

6.8.2.5 Drilling holes for use with the AN3-( ) type bolts with self-locking nuts is acceptable.

NOTE: Chadwick-Helmuth Manual AW-9511-2, „The Smooth Propeller" specifies several generic bulkhead rework procedures.

6.8.2.6 All hole/balance weight locations must take into consideration, and must avoid, any possibility of interfering with the adjacent airframe and engine components.

6.8.4 PLACEMENT OF BALANCE WEIGHTS FOR DYNAMIC BALANCE

6.8.3.1 The preferred method of attachment of dynamic balance weights is to add the weights to the rear spinner bulkhead. The static balancing weights are installed on the spinner front plate, if applicable.

6.8.3.2 Subsequent removal of the dynamic balance weights, if they exist, will return the propeller to its original static balance condition. The static balance weights are only allowed to remove exceptionally.

6.8.3.3 Use only stainless or plated steel washers as dynamic balance weights on the spinner bulkhead.

6.4 Aufsplittern an der Austrittskante kann von einem Steinschlag kommen. Wenn der beschädigte Bereich nicht länger als 40 mm ist, mit Epoxy-Kleber ausleimen. Wenn Holzmaterial fehlt (nicht tiefer als 6 mm), mit Epoxy füllen, härten und glatt schleifen. Mit wasserfestem Lack abdecken, vorzugsweise Polyurethan.

6.5 Kleine Oberflächenkratzer und Kerben können durch Füllen mit Epoxy-Harz und Lackieren mit Polyurethan-Lack repariert werden.

6.6 Abgebrochene oder beschädigte Blätter können beim Hersteller repariert werden, wenn mindestens 85 % des Blattkörpers rißfrei vorhanden sind. Beschädigungen z.B. an der Austrittskante können angeleimt werden, die Kunststoffummantelung kann ersetzt werden, ebenso kann ein neuer Kantenbeschlag angebracht werden.

6.7 Beschädigten oder fehlenden PU-Streifen am Kantenbeschlag ersetzen.

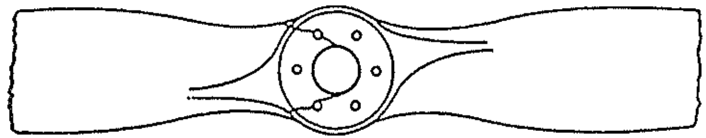
6.4 Splitting of the trailing edge can arise from a stone hit. If the area is not longer than 40 mm (1.5 inches) glue with Epoxy cement. If some wood material is missing (not deeper than 6 mm, 0.25 inches) fill damaged area with Epoxy, let harden, grind surface smooth and cover with water resistant lacquer, preferably Polyurethane.

6.5 Small surface scratches and nicks can be repaired by filling them with Epoxy resin and covering them with Polyurethane lacquer.

6.6 Broken tips and damaged blades can be repaired by the manufacturer if a minimum of 85 % of the blade remains without cracks. Damages on the trailing edge can be repaired because the epoxy cover can be replaced and a new erosion sheet can be installed.

6.7 Damaged or missing PU-strip on the leading edge must be replaced by a new one.

Mögliche tangentiale Risse



Possible tangential cracks

5.14 Überdrehzahl:

Bis zu 15 % über der zertifizierten Drehzahl sind Maßnahmen nach 5.12 und 5.13 nötig.

Überdrehzahlen von mehr als 15 % über der zugelassenen Maximaldrehzahl verursacht eine Einschränkung der Lufttüchtigkeit. Eine Inspektion ist pflichtmässig vorgeschrieben. Der Propeller ist an den Hersteller oder an eine authorisierte Reperaturwerft zu senden.

5.15 Anzugsmomente

Anzugsmoment nach dem ersten Flug, nach den ersten 25 Stunden, alle 100 Stunden und einmal jährlich kontrollieren.

5.14 Overspeed:

Up to 15 % above the certified RPM inspection per 5.12 and 5.13 is required.

Overspeed of more than 15 % above the certified RPM creates an airworthiness limitation against the propeller. A mandatory inspection is required. The propeller must be sent to the manufacturer or to an authorized service station.

5.15 Torque moments

Check torque moment after the first flight, after the first 25 hours, every 100 hours and once a year.

5.12 100 Stunden Kontrolle (Regelmäßig bis zur Jahreskontrolle durchzuführen)

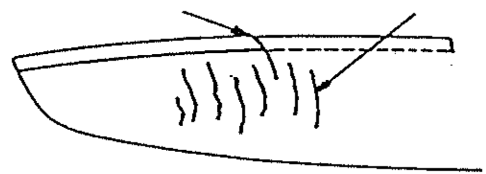
Anzugsmomente der Befestigungsbolzen prüfen! Propeller mit Autoreinigungsmittel oder gleichwertigem reinigen. Normale Vorflugkontrolle durchführen, dabei insbesondere die Lackoberfläche auf Druck- und Saugseite prüfen, sowie die Klebung des Kantenbeschlags. Ist der selbstklebende PU-Streifen beschädigt, diesen ersetzen. Feine Risse im Lack oder im Metallkantenbeschlag quer zur Blattachse sind Anzeichen für Biegeschwingungen. Solche Risse treten meist im Außenbereich des Blattes auf. Plötzlicher Blattverlust kann nicht auftreten, weil die Belastungen vom Holzkern getragen werden. Wenn solche Risse auftreten, den Hersteller bezüglich Lufttüchtigkeit informieren, möglichst mit einem Foto und der Angabe der Betriebszeit. Der Propeller sollte nicht weiter betrieben werden..

5.12 100 hours inspection (periodically to be done up to the annual inspection)

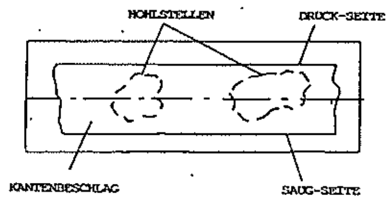
Check torque moment of the mounting bolts! Clean the propeller with any car wash solution or equivalent. Make the normal preflight inspection, but especially inspect the lacquer surface on the flat side and the camber side, as well as for debonding of the blade tipping. If the self-adhesive PU-strip is damaged, replace it. Fine cracks in the lacquer surface or in the metal tipping across the blade axis are indications of bending vibrations. Such cracks mostly occur in the outer part of the blade. No sudden blade failure can occur due to these cracks since the load is carried by the wooden core. If such cracks do occur, the factory should be consulted regarding airworthiness, if possible together with a photo and information about operating time. The propeller is to be removed from service.

Mögliche Risse quer zum
Blatt oder Kantenbeschlag

Possible cracks across blade or tipping

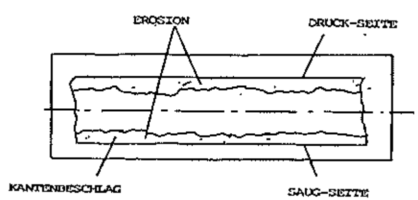


5.7 sich vergrößern. Diese Kontrolle kann mit einer geeigneten Münze ausgeführt werden (Tap-Test). Die Hohlstellen dürfen auf keinen Fall mehr als 30 % der gesamten Fläche des Kantenbeschlags übersteigen (in Längsrichtung max. 2,5 cm erlaubt). Ist dies der Fall muß das Blatt sofort zum Hersteller bzw. einer autorisierten Servicestation zur Reparatur gesandt werden. In jedem Fall muß vor jedem Flug die sichere Befestigung des Kantenbeschlags geprüft werden. Das Blatt muss nach

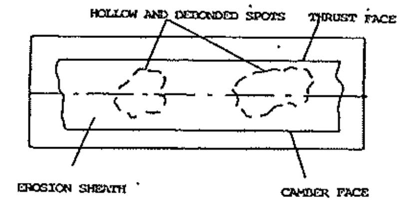


Anweisung des Überholungshandbuches E-497 repariert/überholt werden.

5.8 Die unter 5.3.1.5 genannte Erosion, welche die Lackschicht auf dem Kantenbeschlag wegerodiert, ist durch die hohe Umfangsgeschwindigkeit des Propellerblattes ganz natürlich. Es ist jedoch immer darauf zu achten, daß auf keinen Fall die Erosion (über das gesamte Blatt gesehen) so tief ist, daß der GFK-Überzug beschädigt ist und die Möglichkeit besteht, daß Feuchtigkeit in den Blattkörper eindringen kann. Ist das der Fall, muß das Blatt sofort repariert/überholt werden. Gleiches gilt für einen durcherodierten Kantenbeschlag. Ist der PU-Kantenschutz beschädigt, sofort erneuern.

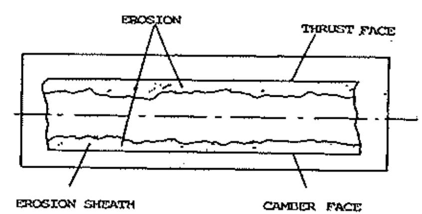


5.7. already existing delamination becomes worse. The inspection can be executed by using an appropriate coin (Tap-Test). The hollow and debonded spots must not exceed 30 % of the surface of the erosion sheath at all (lengthwise only 1 inch allowed). Otherwise the blade is to be sent to the manufacturer or to an authorized service station for repair as soon as possible. Check secure fixing of the erosion sheath in any case every time before flight. The blade must be repaired/overhauled

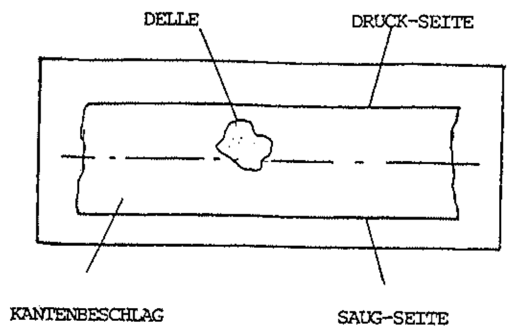


in accordance with Overhaul Manual E-497.

5.8 The erosion mentioned under item 5.3.1.5, which erodes the lacquer layer from the erosion sheath, occurs due to the peripheral speed of the blade and is normal. However, always take care that the erosion never becomes so deep that FRP-coat is damaged an there is a possibility that moisture may enter into the blade body. In this case the blade must be repaired/overhauled immediately. Return the blades also, if the erosion sheath is eroded through. If the PU-protection tape is damaged, replace it immediately.

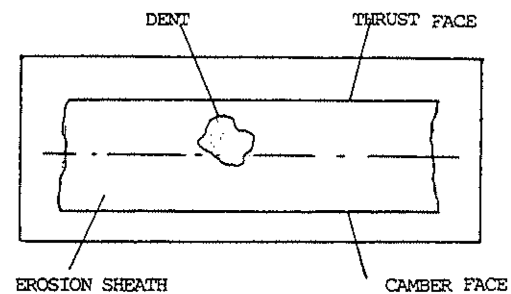


5.4 Falls die unter 5.3.1.1 genannten Einschläge im Kantenbeschlag vorhanden sind, untersuchen, ob sie durch den Kantenbeschlag hindurch gehen. Ist dies nicht der Fall kann man diese Dellen mit Epoxy auffüllen und danach bündig abschleifen. Zusätzlich ist dieser Bereich bei jeder Vorflugkontrolle auf mögliche Risse zu untersuchen. Der Beschlag kann bis zur nächsten Reparatur/Überholung bleiben.



5.5 Falls die unter 5.3.1.2 genannten Einschläge im Kantenbeschlag vorhanden sind, ist der Kantenbeschlag möglicherweise durchgeschlagen. Ist der Beschlag nicht durchgeschlagen, nach Punkt 5.4 vorgehen. Ist der Beschlag durchgeschlagen, den Beschlag auf mögliche Risse untersuchen.

5.4 In case of any impact as mentioned under item 5.3.1.1, check whether it penetrates through the erosion sheath. If not, fill dent with Epoxy and grind off until there is a smooth surface. Check this area carefully for possible cracks whenever performing pre-flight inspection. Erosion sheath may remain until next repair/overhaul will be done.



5.5 In case of impacts in the erosion sheath (as mentioned under item 5.3.1.2 the sheath may possibly be penetrated. If not, proceed as described under item 5.4. If yes, check erosion sheath for possible cracks.

5. KONTROLLE

Anmerkung: Ein Holz-Composite Propeller ist immer so gut, wie er aussieht. Wenn die gesamte Oberfläche von der Zentralbohrung bis zu den Spitzen rißfrei ist, ist keine Nacharbeit oder Überholung nötig. Keine Kalenderzeitbeschränkung.

Achtung: Den Propeller nicht zum Schieben des Flugzeuges benutzen! Der Propeller ist eines der wichtigsten Teile ihres Flugzeuges!

5.1 Vorflug-Kontrolle

5.2 Den gesamten Propeller prüfen, insbesondere den Metallkantenschutz auf Risse und die Austrittskanten auf gesplittertes Holz durch Steinschläge. Es ist normal, daß der Lack am Kantenschutz weg erodiert. Zur Zeit ist kein Material bekannt, das den hohen Kräften der feinen Partikel widersteht, die den Spitzenbereich des Propellers treffen. Kontrollieren ob PU-Streifen unbeschädigt und vorhanden.

5.3 Ein feiner Riß entlang dem Kantenschutz oder am Anfang des Kantenschutzes ist ein Anzeichen, daß das Blech sich von der Verklebung löst. Solche Risse können auftreten und sind ein Zeichen für die unterschiedliche Dehnung der Materialien (Holz, Stahl).

Entscheidend ist, ob das Blech sich löst. In diesem Fall ist der Propeller nicht länger lufttüchtig und darf nicht weiter betrieben werden.

5. INSPECTION

Note: A wooden composite propeller is always as good as it looks. If the total surface from the central bore to the tips shows no cracks, no reconditioning or overhaul will be necessary. There is no calendar time limitation.

Attention: Do not use your propeller as a handle to move the airplane! The propeller is one of the most important parts of your airplane!

5.1 Preflight inspection

5.2 Take a look at the complete propeller observing the leading edge protecting metal for cracks and the trailing edge for possible splitting by stone damage. It is normal that the painting erodes away from the metal sheeting at the leading edge. At present there is no material known to withstand the high force of fine particles hitting the tip area of the propeller. Check for existing and proper PU-strip .

5.3 A fine crack along the blade tipping or at the beginning of the tipping is an indication that the metal sheet is debonding. Sometimes such cracks occur. They are a normal indication of the different expansion of the material (wood, steel).

Critical is whether the metal sheet becomes loose. In this case the propeller is no longer airworthy and must be removed from service immediately.

4.6.3 Falls ein Spinner benutzt wird, müssen die Spinnerschrauben mit 4-5 Nm (35-44 inlbs) angezogen werden.

Hinweis:
Die statischen Wuchtgewichte sind am hinteren Spinnerträger installiert, um die Bauteile (Zwischenflansch / Propeller / Spinner) entsprechend zu wuchten.
Ein Problem könnte allerdings auftreten, wenn der Original - Propeller durch einen neuen Propeller mit unterschiedlicher Wuchtung ersetzt wird.
In diesem Falle ist der Austausch der existierenden Wuchtgewichte notwendig und, falls keine Statische Wuchtung möglich ist, wird eine Dynamische Wuchtung empfohlen.

-

4.7 Korrektes Anzugsmoment bei Kegel-, Spline-, oder Hirth-Naben verwenden, wie vom Triebwerkshersteller vorgeschrieben.

4.8 Spur prüfen. Max. zulässig sind 3 mm, 10 cm von der Blattspitze an der Austrittskante gemessen. Ist die Spur größer, Ursache feststellen und Anlageflächen prüfen. Umsetzen auf dem Flansch möglich. Unterschiedliche Anzugsmomente bis 3 Nm zulässig. Wenn dies keine Abhilfe schafft, Propeller zum Hersteller zurückschicken.

Achtung:

Keine Ausgleichsunterlagen oder Papier verwenden!

Das Motordrehmoment wird hauptsächlich durch Reibung übertragen!

4.6.3 In case a spinner is used, the spinner screws must be torqued to 4-5 Nm (35-44 inlbs).

Note:
It has been discovered that static balance weights are installed at the rear spinner bulkhead of the propeller spacer flange in order to balance the assembly (spacer flange / propeller / spinner) as required.
The problem is, that when the original propeller must be replaced, the new propeller may have a different static balancing requirement.
Therefore, removal of the existing balance weights is required and dynamic balancing, if no static balancing is possible, is recommended.

4.7 Use the recommended torque moment for tapered, spline or Hirth hub installation as specified by the engine manufacturer.

4.8 Check blade track 10 cm (4 inches) from the blade tip on the trailing edge. Max. permissible is 3 mm (1/8"). If propeller is not within the limit, remove it, check for reason and mating surfaces, Turn propeller on the flange. Different torque moments up to 3 Nm (30 inlb) permissible. Does this procedure not change the situation, send propeller back to the factory.

Warning:

Do not use any shimming material or paper to correct the track.
The torque (horse power) is mainly transferred by friction!.

4.5 Bolzen oder Muttern gleichmäßig und über Kreuz festziehen. Eindrücken der Frontplatte in die Nabe vermeiden.

Achtung:
Wenn kein Spinner verwendet wird, muß die Frontplatte die Zentralbohrung des Propellers vollständig abdecken, um das Eindringen von Wasser in die Nabe zu verhindern.

4.6 Vorgeschriebene Anzugsmomente der Flanschbolzen:

M6, 1/4"	- 28 UNF	8 – 9 Nm	(70 – 80 inlbs)
M8, 5/16"	- 24 UNF	15 – 17 Nm	(133 – 150 inlbs)
M10, 3/8"	- 24 UNF	23 – 25 Nm	(203 – 220 inlbs)
M12, 7/16"	- 20 UNF	25 – 27 Nm	(220 – 240 inlbs)
1/2"	- 20 UNF	33 – 35 Nm	(293 – 310 inlbs)

4.6.1 Falls Stopmuttern verwendet werden, um den Propeller direkt auf dem Zwischenflansch zu montieren, müssen folgende Anzugsmomente verwendet werden:

M6, 1/4"	- 28 UNF	10 - 12 Nm	(88 - 106 inlbs)
M8, 5/16"	- 24 UNF	20 - 22 Nm	(177 - 194 inlbs)
M10, 3/8"	- 24 UNF	28 - 30 Nm	(247 - 265 inlbs)
M12, 7/16"	- 20 UNF	34 - 36 Nm	(300 - 320 inlbs)
1/2"	-20 UNF	45 - 47 Nm	(400 - 420 inlbs)

4.5 Tighten bolts or nuts uniformly and crosswise. Avoid crushing of the front plate in the hub.

Attention:
If no spinner is used, the front plate must cover the central bore of the propeller completely to avoid water entering this part of the hub.

4.6 Recommended Torque Moments Flange Bolts:

M6, 1/4"	- 28 UNF	8 - 9 Nm	(70 - 80 inlbs)
M8, 5/16"	- 24 UNF	15 - 17 Nm	133 - 150 inlbs)
M10, 3/8"	- 24 UNF	23 - 25 Nm	(203 - 220 inlbs)
M12, 7/16"	- 20 UNF	25 - 27 Nm	(220 - 240 inlbs)
1/2"	- 20 UNF	33 - 35 Nm	(293 - 310 inlbs)

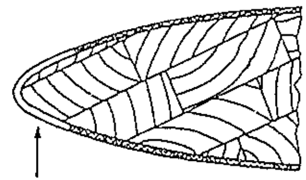
4.6.1 In case stop nuts are used to mount the propeller on the spacer the following torque values must be used:

M6, 1/4"	- 28 UNF	10 - 12 Nm	(88 - 106 inlbs)
M8, 5/16"	- 24 UNF	20 - 22 Nm	(177 - 194 inlbs)
M10, 3/8"	- 24 UNF	28 - 30 Nm	(247 - 265 inlbs)
M12, 7/16"	- 20 UNF	34 - 36 Nm	(300 - 320 inlbs)
1/2"	-20 UNF	45 - 47 Nm	(400 - 420 inlbs)

3.3 Kantenbeschlag

Frühere Ausführungen von Kantenbeschlägen waren durch Nageln oder Nieten mit dem Blatt verbunden.

MT-Propeller wendet modernste Klebetechnik an. Die Beschläge aus rostfreiem Edelstahlblech sind mit einem hochfesten Spezial-Epoxyharz-Kleber aufgebracht und können so oft als nötig gewechselt werden.



MT-Standard Kantenbeschlag
MT-standard blade tipping

3.3.1. PU-Folie

Der innere Bereich des Blattes ist mit einer selbstklebenden PU-Folie geschützt.

3.4 Oberflächenschutz

Sorgfältig getestete Polyurethan-Lacke werden verwendet, um den Holz-Blattkörper gegen Feuchtigkeit und Erosion zu schützen. Der Speziallack ist beständig gegen Kraftstoff, Öl und andere chemische Produkte. Diese Lackart hat außerdem eine hervorragende Flexibilität.

Farbiger Lack muß verwendet werden, wegen der zerstörenden Wirkung der UV-Strahlen auf Holz. Auf der flachen (Druck-) Seite, wird schwarzer Lack gegen die Reflexionen des Sonnenlichtes verwendet. Die Spitzen sind mit einer Sicherheitskontrastfarbe versehen.

3.5 Sonderausführungen

Einige MT-Propeller haben einen Kunststoffmantel aus Fiberglas mit Epoxy, um den Oberflächenschutz und die Steifigkeitseigenschaften des Blattes zu verbessern.
Weitere Ausführungen mit Sperrholzverstärkung sind möglich.

3.3 Blade tipping

Former blade tipping was fastened by nails or rivets to the blade.

MT-Propeller uses the newest bonding techniques. The tipping from stainless steel is bonded with special high strength Epoxy-resin adhesive, and may be replaced as often as necessary.

3.3.1. PU-Strip

The inner portion of the blade is protected by a self-adhesive PU-Strip.

3.4 Surface finish

Carefully tested polyurethane lacquer is used to protect the wooden body against moisture and erosion. The special lacquer will be resistant against fuel, oil and other chemical products. This type of lacquer has also an excellent flexibility.

Colored lacquer is needed because of the wood destroying UV-beams. On the flat (thrust-) side, black lacquer is needed against reflection of sunlight, and the tips are painted as a safety mark.

3.5 Special design

Some MT-Propellers have a plastic covering of Epoxy fiber glass to improve surface protection and stability characteristics of the blade.

Also other designs may have plywood reinforced blades.

2. KENNZEICHNUNG

```
MT  150 L  90 - 1  A  ( )
1   2   3  4    5  6   7
```

1: Hersteller MT-Propeller Entwicklung GmbH
2: Durchmesser in cm
3: Ausführung und Einbau:
   R = rechtsgängiger Zug
   RD = rechtsgängiger Druck
   L = linksgängiger Zug
   LD = linksgängiger Druck
4: Steigung bei 0,75 Blattradius (cm)
5. Belastungsklasse
6: Nabenanschlußbezeichnung nach Liste des Herstellers
7: geringfügige Abweichung von 6

Werknummer: 93 XXX 1 = Baujahr
1 2 2 = laufende Nummer

2. MODEL DESIGNATION

```
MT  150 L  90 - 1  A  ( )
1   2   3  4    5  6   7
```

1: Manufacturer MT-Propeller Entwicklung GmbH
2: Diameter in cm
3: Sense of rotation:
   R = right hand tractor
   RD = right hand pusher
   L = left hand tractor
   LD = left hand pusher
4: Pitch in cm at 0,75 blade radius
5: Load limit class
6: Hub drilling for installation according to manufacturer's list
7: Minor deviations from item 6

Serial-Number: 93 XXX 1 = Year of manufacture
1 2 2 = consecutive number

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9-2	**19.03.2009**				

*NOTE PARAGRAPH 3 ON
PAGE 42.....

2. MODEL 2D30. 4/2D40, 2B30 *

a. INSTALLATION PROCEDURE.—This installation procedure is written so that only the service tools described in paragraph 1. of section V and commonly used commercial tools are required. No other tools are needed to install the propeller.

(1) PROPELLERS FOR CRANKCASE BREATHING ENGINES.

(*a*) Install the rear cone spacer, if used, and the rear cone on the propeller shaft, and move them back against the engine thrust nut. Cover the shaft threads with a thread protector or wrap the threads with tape if a suitable protector is not available.

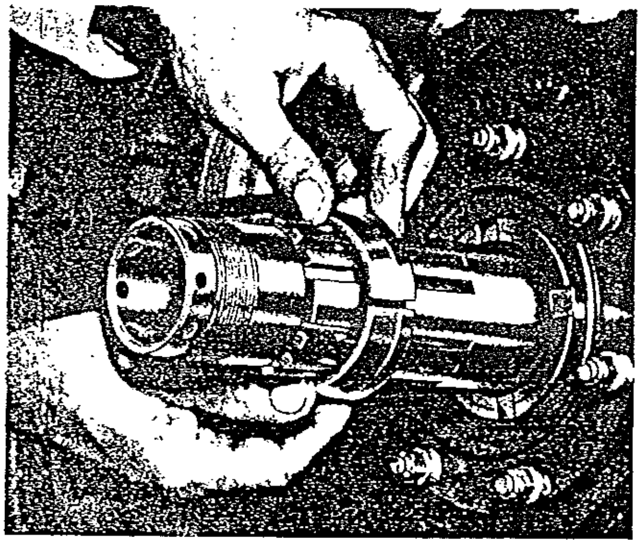


Figure 17 — Installing Rear Cone on Propeller Shaft

(*b*) Remove the cylinder head lock ring and the cylinder head if they are installed in the propeller. Attach a hoisting sling to the propeller blades and lift the assembly so the blank spline in the propeller spider is in line with the wide spline of the propeller shaft. Install the propeller on the shaft, using care not to damage the threads and the splines of the shaft or spider, and slide it back against the rear cone.

Note

On most new engines, oil and corrosion preventives are flushed from the cylinders prior to installation of the engine on the aircraft. However, in case this has not been done and the engine is allowed to stand idle for an appreciable time after propeller installation and before engine run-up, the portion of the cylinders wiped clean of protective by rotating the propeller shaft during installation may corrode. In such cases, attach a single hoisting sling to the blade in line with the blank spline of the spider so that at installation the propeller will line up with the engine shaft wide spline (usually left in the top position).

(*c*) Using a blade turning device on each blade, turn the blades to a position near the low angle setting of the propeller. The blades should be at approximately the same angle in order to keep the cylinder from being cocked. Care should be used during this operation to move both blades at the same time and not to pull the propeller off the shaft. Remove the thread protector or tape from the shaft threads.

(*d*) Coat the shaft threads of the piston with thread lubricant conforming to Specification No. AN-C-53-1 or clean engine oil, and insert the piston through the cylinder. Place the piston lock ring over the inboard end of the piston with the end having the large inside diameter facing the cylinder. Install the

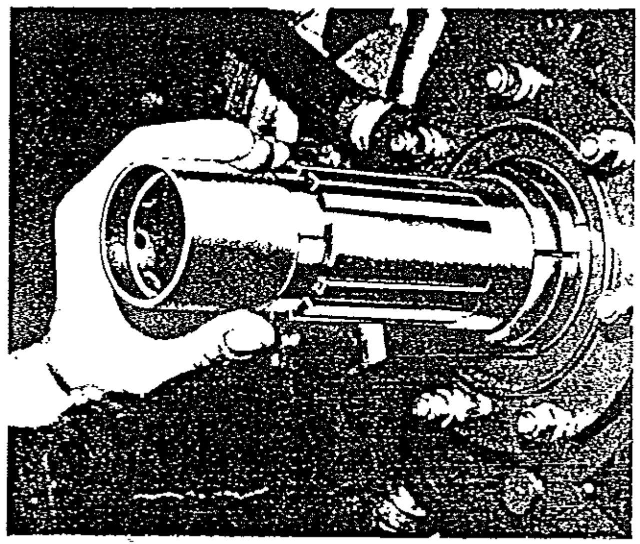


Figure 18 — Covering Shaft With Thread Protector

hub snap ring and the front cone spacer in that order over the end of the piston and push them out against the lock ring. Lightly coat the front cone packing

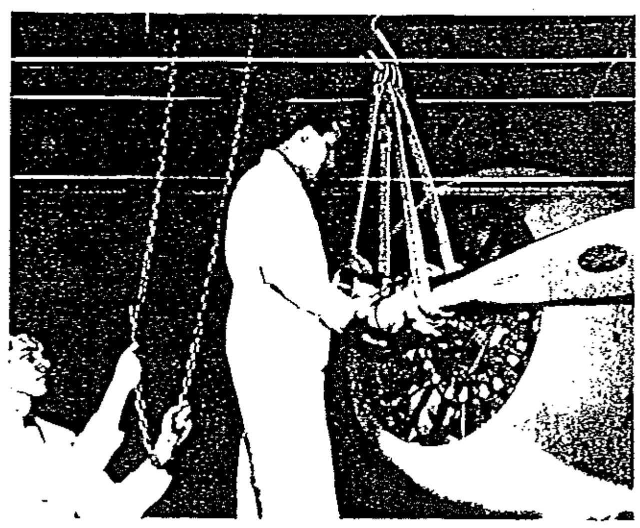


Figure 19 — Installing Propeller on Shaft

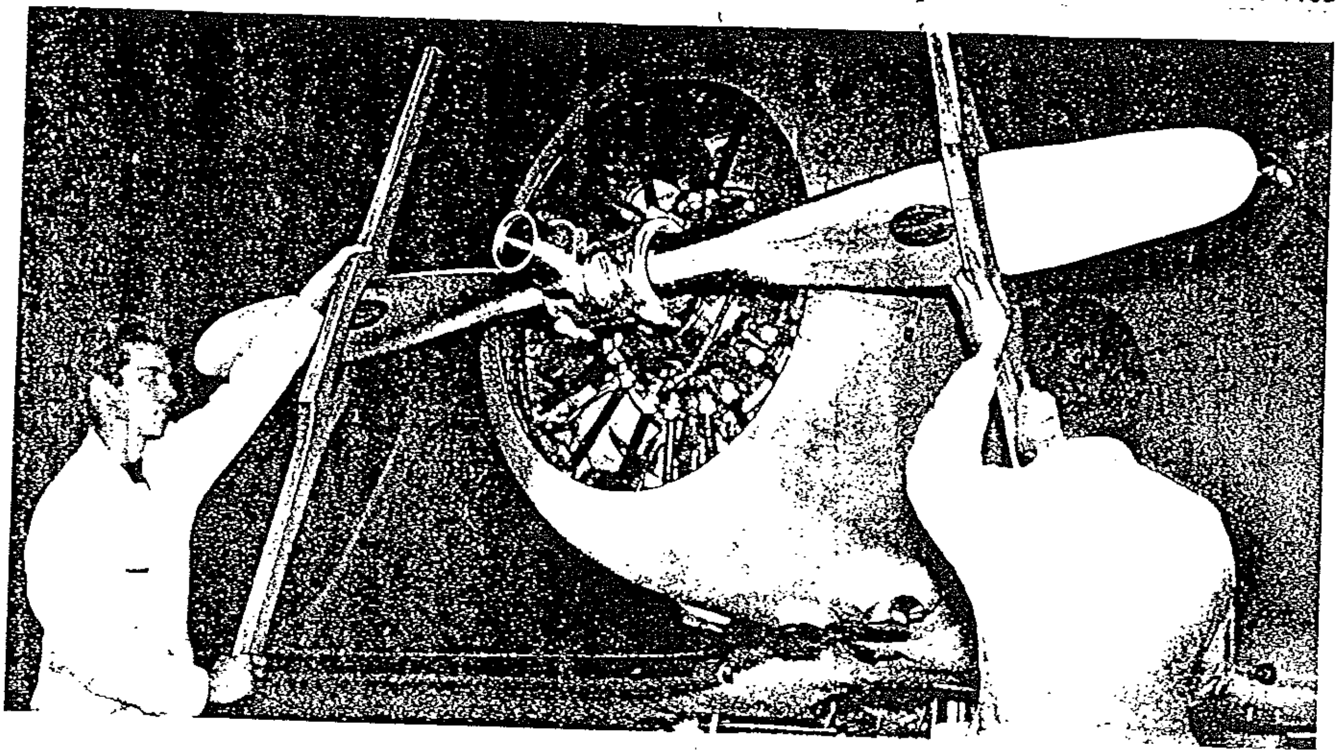


Figure 20 — Turning Blades to Low Angle

washer and front cone with clean engine oil and place the beveled end of the packing washer against the beveled inboard end of the piston. Check the pair numbers stamped on the two front cone halves for agreement and then assemble the cone halves around the piston flange. Fit the packing washer into its position in the inside groove of the front cone. Make sure that the packing washer is properly seated against the piston and in the front cone groove.

(*e*) Slide the piston and front cone assembly into the spider until it contacts the shaft threads. Carefully align the piston and shaft threads and screw the piston onto the shaft using a short bar with the proper installation wrench listed in section V, paragraph 1. In no case should force be used to tighten the piston if there is any indication of binding or if the threads are not properly engaged since this may cause serious damage to the threads.

(*f*) If the piston does not turn freely onto the shaft, the following checks should be made. Make sure the blades are not set at different angles, thus causing the cylinder and piston to be cocked out of line with the propeller shaft. Check the front cone packing washer to insure that it is properly seated and inspect the piston and shaft threads for damage. In extreme cases where it is impossible to start the piston on the shaft by any of these means, the counterweights and counterweight bearing shafts should be removed. When removing the adjusting screw assemblies, do not disturb the position of the adjusting nuts. (For procedure, see section VI, paragraph 2.) This will completely free the cylinder and piston and allow the piston to be more easily started onto the propeller shaft. After the piston has been tightened, place the counterweight thrust bearing assemblies and thrust washers into the cylinder bushings. Assemble the counterweight bearing assemblies into the bracket slots and screw the bearing shafts into the cylinder. Line up the cotter pin holes in the shafts with those in the cylinder bosses and install the cotter pins. Place the counterweight bearing retainer spacers into the bracket slots and assemble the counterweights. Install

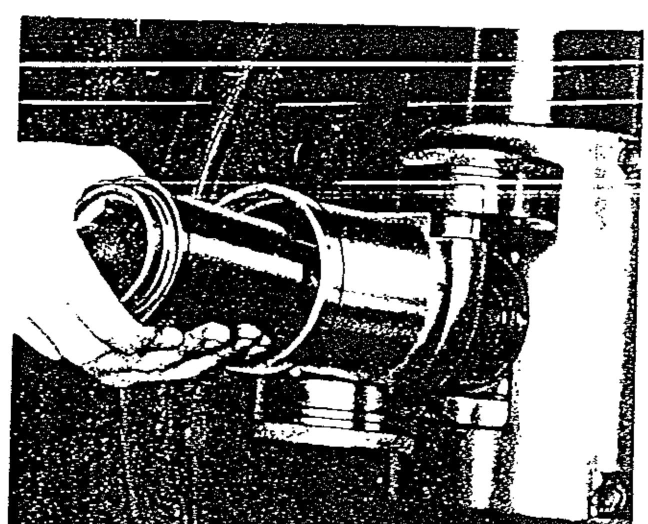


Figure 21 — Inserting Piston Through Cylinder

the adjusting screw assemblies making sure the adjusting nuts are in their proper position on the screws. Tighten the counterweight caps onto the counterweights and install the clevis pins and cotter pins. During the reassembly of the foregoing parts, care should be used to install the parts so that their position numbers correspond with the bracket numbers.

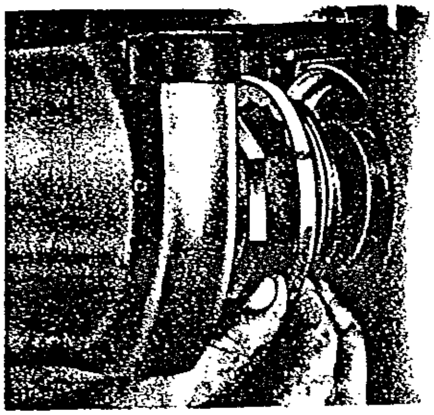


Figure 22 — Positioning Piston Lock Ring

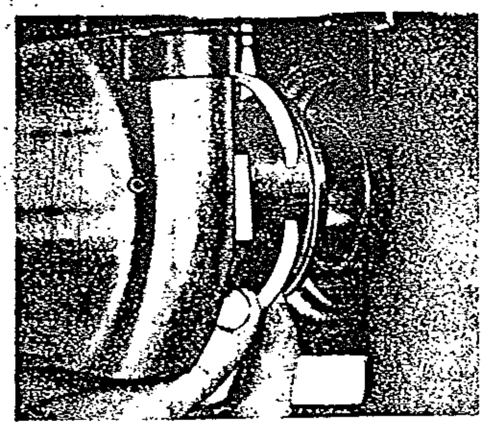


Figure 23 — Positioning Hub Snap Ring

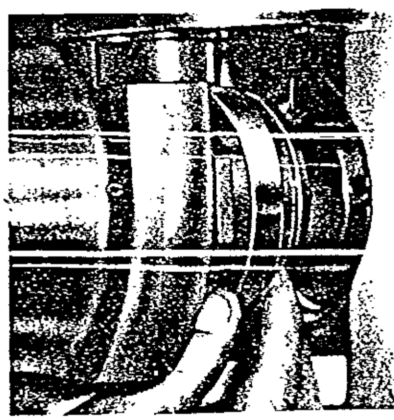


Figure 24 — Positioning Front Cone Spacer

(g) Finish tightening the piston by applying a force of 180 pounds at the end of a four-foot bar installed into the installation wrench. To make sure the piston is fully tightened, strike the bar once close to the wrench with a hammer weighing about 2-1/2 pounds while the 180-pound force is being applied.

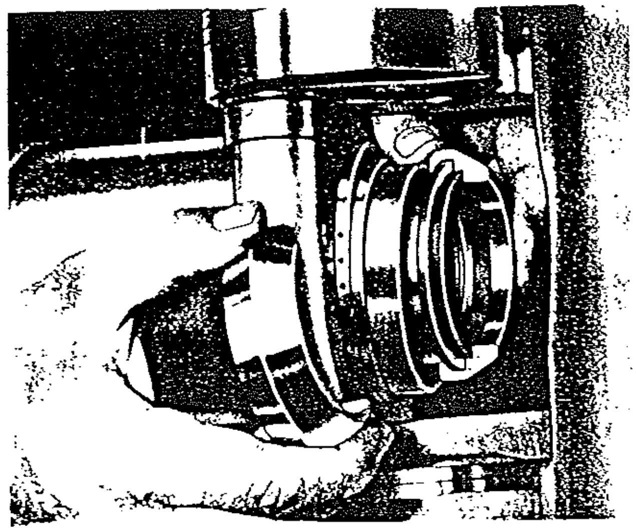


Figure 25 — Installing Front Cone Packing Washer and Cone

(h) Move the front cone spacer into the spider and against the front cone. Compress the hub snap ring and install it into the snap ring groove in the spider. Position the piston lock ring in the top of the spider around the octagon portion of the piston so that the two cotter pin holes in the outboard end of the spider line up with two of the eight cotter pin holes in the lock ring. By indexing the lock ring around the piston it is always possible to find a position in which the two cotter pin holes in the spider line up with two of the lock ring holes without any further tightening of the piston. Safety the lock ring to the spider with a cotter pin in each of the two sets of aligned holes. The cotter pins should be installed

Figure 26 — Starting Piston onto Propeller Shaft

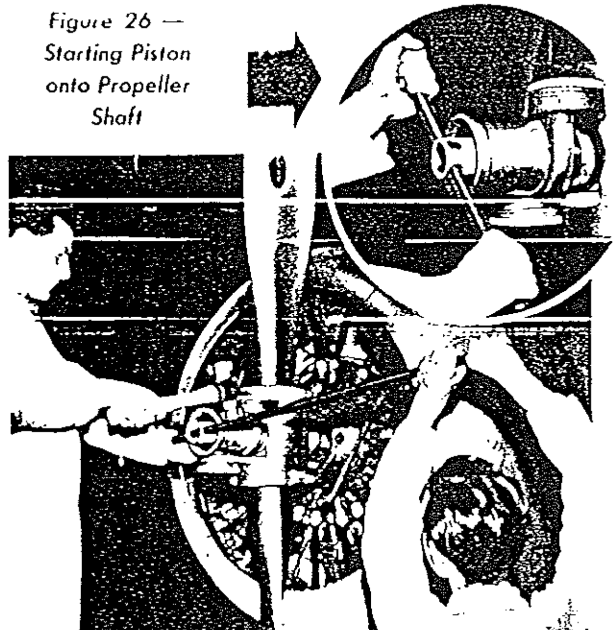


Figure 27 — Final Tightening of Propeller Piston

with the heads facing toward the piston. In order to install the cotters in this position, it will be necessary to first bend them slightly to clear the side of the piston.

(*i*) Using a blade turning device on each blade, turn the blades to the full high pitch position. Install the inboard piston gasket on the piston, with the chamfered end facing toward the spider, and seat it on the piston shoulder. Place the outboard piston gasket onto the piston and against the inboard gasket with the sealing lips facing away from the spider. The inboard and outboard gaskets should not be confused and be installed in the wrong sequence. The inboard gasket is not designed to be an oil seal but simply a guide for the cylinder and can be identified by the 45-degree chamfer on the edge of the outside diameter and on the small inside diameter. The outboard gasket acts as an oil seal and can be identified by the single 45-degree chamfer on the edge of the larger inner diameter. See figures 31 and 32.

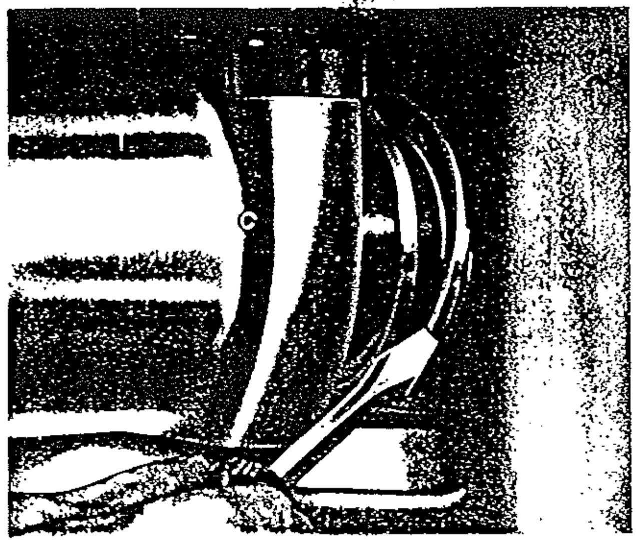


Figure 29 — Installing Hub Snap Ring in Spider

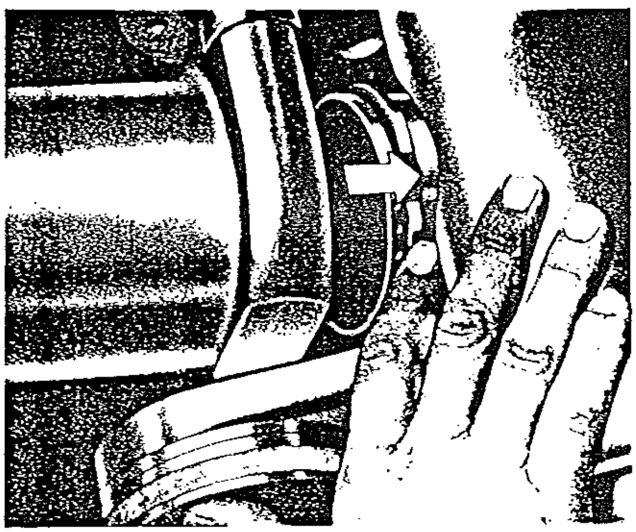


Figure 28 — Moving Front Cone Spacer into Position

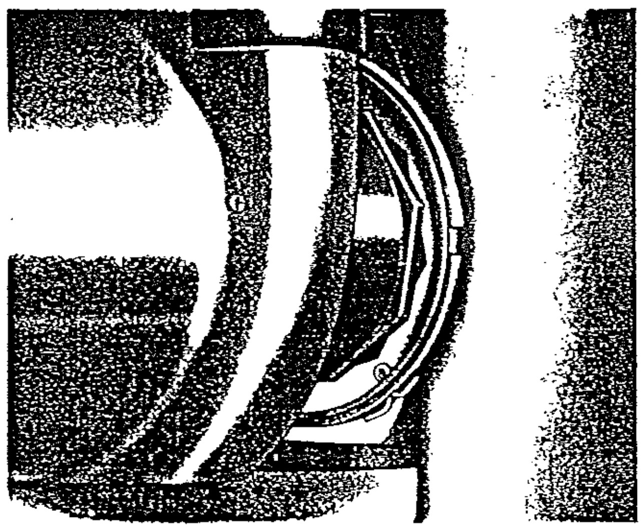


Figure 30 — Piston Lock Ring Installed and Cottered

WARNING

Under no circumstances should the piston gaskets be soaked in oil. Preoiling can soften the portion of the gasket under the retaining nut sufficiently to cause failure of the gasket and serious oil leakage from the propeller. Gaskets that have been preoiled or are otherwise not in satisfactory condition are to be replaced.

(*j*) Install and tighten the piston gasket nut firmly with the installation wrench listed in section V, paragraph 1, and a short bar 1-1/2 to 2 feet long. Line up one of the cotter pin slots in the nut with a cotter pin hole in the piston, and install the cotter pin with the head pointing away from the piston.

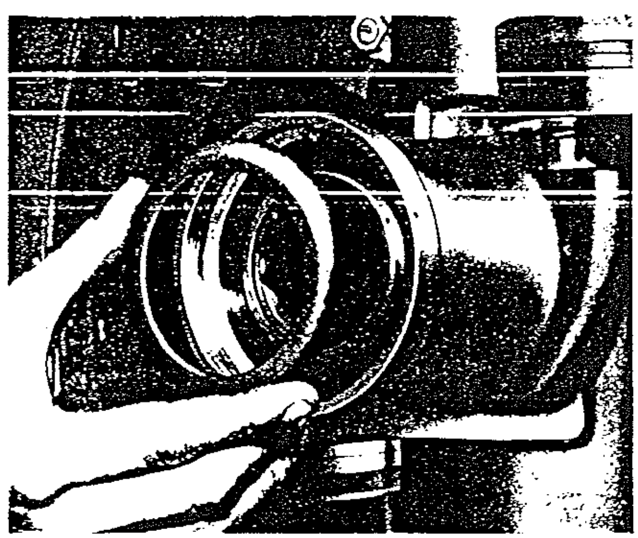


Figure 31 — Installing Piston Inboard Gasket

(*k*) Place the cylinder head gasket onto its seat in the end of the cylinder using grease, if necessary, to hold it in place. The gasket should be installed with the split face against the cylinder seat. Screw the cylinder head into the cylinder and tighten it firmly with the proper installation wrench and a 1-1/2 to 2-foot bar. Line up one of the locking holes in the cylinder head with a locking hole in the cylinder. Install the cylinder head lock ring and snap it into position in the groove in the cylinder head.

(*l*) Upon completion of the installation, all visible cotter pins and lock rings should be checked.

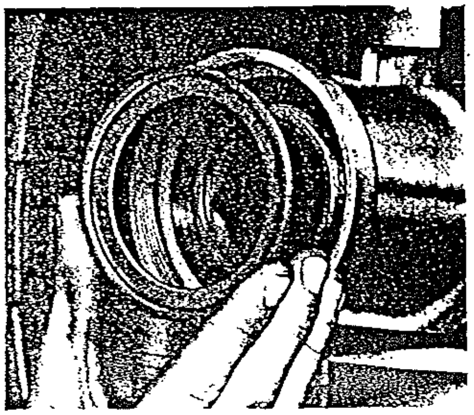


Figure 32 — Installing Piston Outboard Gasket

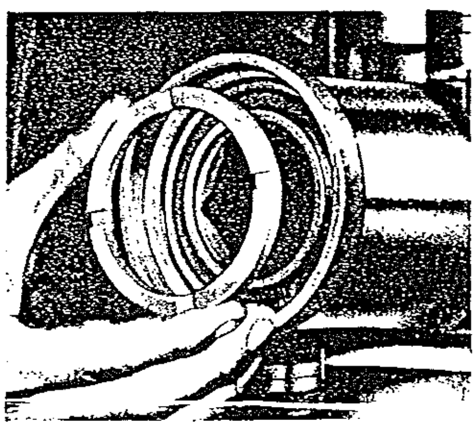


Figure 33 — Installing Piston Gasket Nut

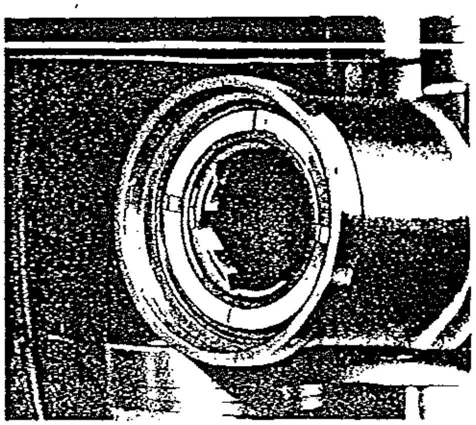


Figure 34 — Piston Gasket Nut Tightened and Cottered

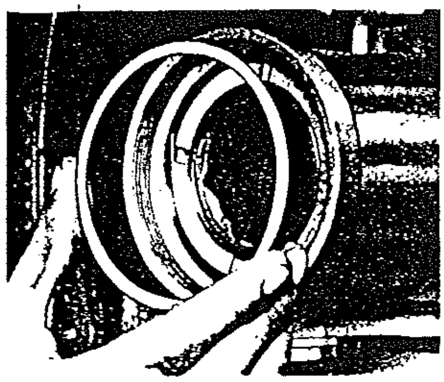


Figure 35 — Inserting Cylinder Head Gasket

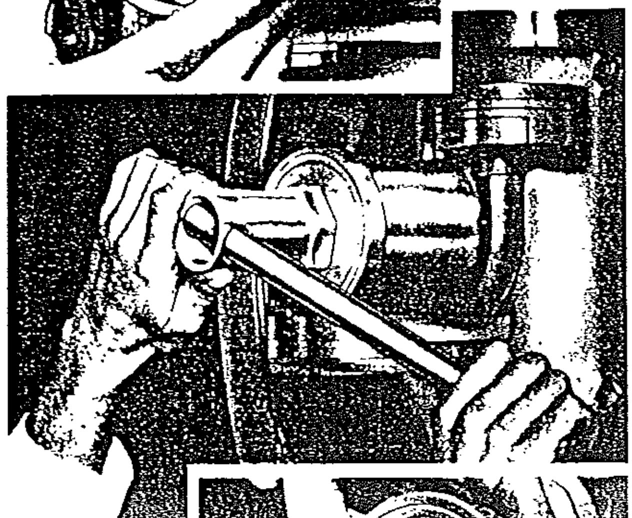


Figure 36 — Tightening Cylinder Head

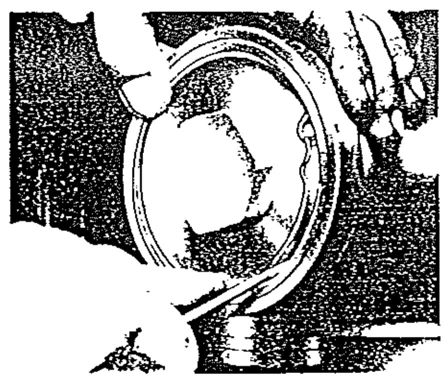


Figure 37 — Installing Head Lock Ring

(2) PROPELLERS FOR SHAFT BREATHING ENGINES.

(*a*) Install the rear cone spacer, if used, and the rear cone on the propeller shaft and move them back against the engine thrust nut. Cover the shaft threads with a thread protector or wrap the threads with tape, if a suitable protector is not available.

(*b*) Install the oil supply pipe assembly and the oil supply pipe gasket, if used, into the propeller shaft. Tighten the supply pipe snugly but not excessively since this may damage the internal oil pipe in the propeller shaft. Lock the oil supply pipe with safety wire.

(*c*) Remove the cylinder head lock ring and the cylinder head if they are installed in the propeller. Insert the front cone spacer into the bore above the front cone seat of the spider and install the hub snap ring into the spider snap ring groove. Place the piston lock ring in the bore in the outboard end of the spider with the end having the large inside diameter facing toward the cylinder.

(*d*) Attach a hoisting sling to the propeller blades and lift the assembly so the blank spline in the propeller spider is in line with the wide spline of the propeller shaft. Install the propeller on the shaft using care not to damage the shaft threads and the splines of the shaft or spider, and then slide it back against the rear cone.

(*e*) Using a blade turning device on each blade, turn the blades to a position near the low angle setting of the propeller. The blades should be at approximately the same angle in order to keep the cylinder from being cocked. Care should be used during this operation to move both blades at the same time and not to pull the propeller off the shaft since there is nothing locking the propeller to the shaft at this time. Remove the thread protector or tape from the shaft threads.

(*f*) Remove the piston lock ring, hub snap ring, and front cone spacer from their positions in the spider and let them hang on the oil supply pipe. Coat the shaft threads of the piston with thread lubricant conforming to Specification No. AN-C-53-1 or clean engine oil and insert the piston through the cylinder. Place the piston lock ring, hub snap ring, and front cone spacer, in that order, over the end of the piston and slide them toward the outboard end of the piston. Assemble the two front cone halves around the piston flange first making sure that the pair numbers stamped on the cone halves are identical.

(*g*) Slide the piston and front cone assembly into the spider until it contacts the shaft threads. Carefully align the piston and shaft threads and screw the piston onto the shaft using a short bar with the proper installation wrench listed in section V, paragraph 1. In no case should force be used to tighten the piston if there is any indication of binding or if the threads are not properly engaged since this may cause serious damage to the threads.

(*h*) If the piston does not turn freely onto the shaft, make sure the blades are not set at different angles thus causing the cylinder and piston to be cocked out of line with the propeller shaft. Also check the piston and shaft threads for damage. In extreme cases where it is impossible to start the piston on the shaft by any other means, the counterweights and counterweight bearing shafts should be removed. When removing the adjusting screw assemblies, do not disturb the position of the adjusting nuts. (For procedure, see section VI, paragraph 2.) This will completely free the cylinder and piston and allow the piston to be properly started onto the propeller shaft. After the piston has been tightened, place the counterweight thrust bearing assemblies and thrust washers into the cylinder bushings. Assemble the counterweight bearing assemblies into the bracket slots and screw the bearing shafts into the cylinder. Line up the cotter pin holes in the shafts with those in the cylinder bosses and install the cotter pins. Place the counterweight bearing retainer spacers into the bracket slots

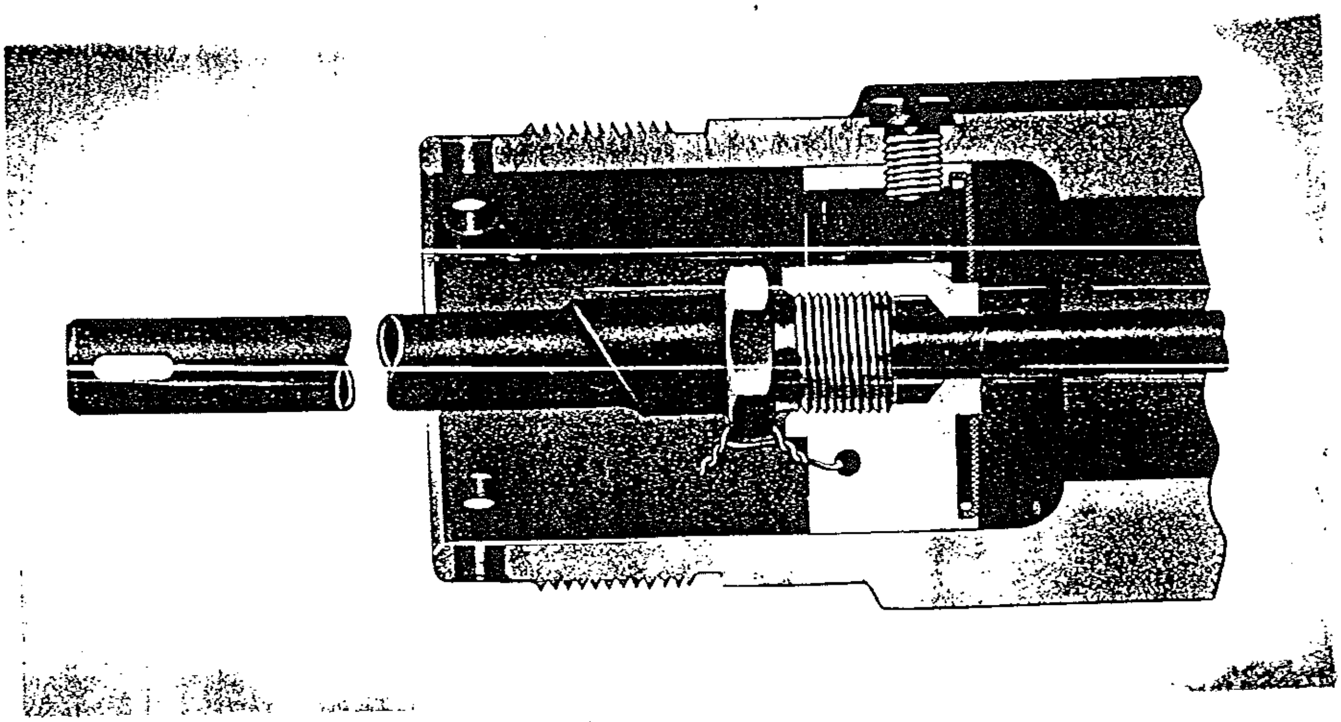


Figure 38 — Oil Supply Pipe Installed in Propeller Shaft

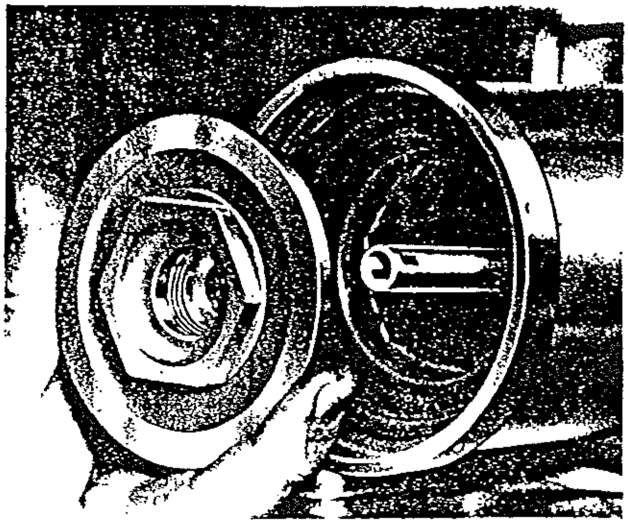


Figure 39 — Installing Shaft Breathing Type Piston Gasket Nut

and assemble the counterweights. Install the adjusting screw assemblies making sure the adjusting nuts are in their proper position on the screws. Tighten the counterweight caps onto the counterweights and install the clevis pins and cotter pins. During the reassembly of the foregoing parts, care should be used to install the parts so that their position numbers correspond with the bracket position numbers.

(*i*) Finish tightening the piston by applying a force of 180 pounds at the end of a four-foot bar installed into the installation wrench. To make sure the piston is fully tightened, strike the bar once close to the wrench with a hammer weighing about 2-1/2 pounds while the 180-pound force is being applied. The proper installation wrench for the model 2D30 propeller is listed in paragraph 1. of section V.

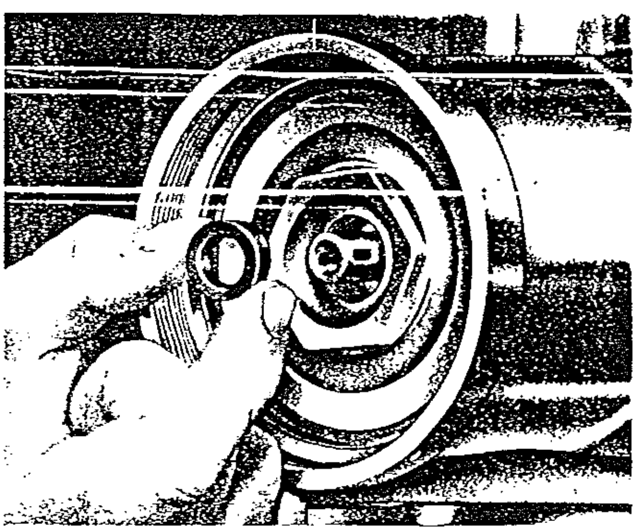


Figure 40 — Installing Oil Supply Pipe Packing Washer

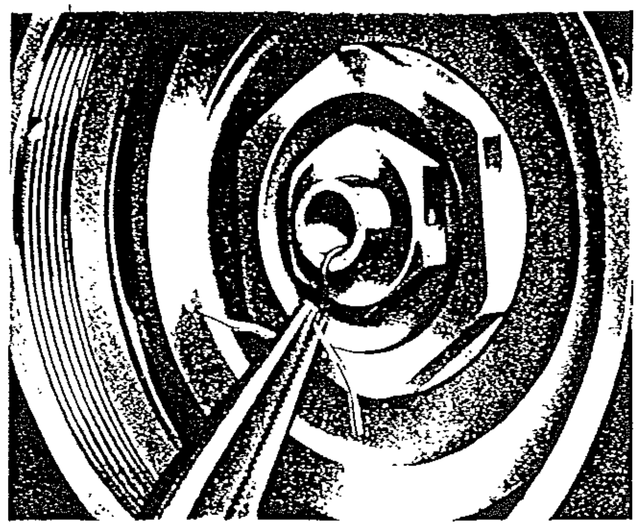


Figure 41 — Locking Oil Supply Pipe Packing Nut

(*j*) Move the front cone spacer into the spider against the front cone. Compress the hub snap ring and install it into the snap ring groove in the spider. Position the piston lock ring in the top of the spider around the octagon portion of the piston so that the two cotter pin holes in the outboard end of the spider line up with two of the eight cotter pin holes in the lock ring. By indexing the lock ring around the piston, it is always possible to find a position in which the two cotter pin holes in the spider line up with two of the lock ring holes without any further tightening of the piston. Safety the lock ring to the spider with a cotter pin in each of the two sets of aligned holes. The cotter pins should be installed with the heads facing toward the piston. In order to install the cotters in this position, it will be necessary to first bend them slightly to clear the side of the piston.

(*k*) Using a blade turning device on each blade, turn the blades to the full high pitch position. Install the inboard piston gasket on the piston, with the chamfered end facing toward the spider, and seat it on the piston shoulder. Place the outboard piston gasket onto the inboard gasket with the sealing lips facing away from the spider. The inboard and outboard gaskets should not be confused and be installed in the wrong sequence. The inboard gasket is not designed to be an oil seal but simply a guide for the cylinder and can be identified by the 45-degree chamfer on the edge of the outside diameter and on the small inside diameter. The outboard gasket acts as an oil seal and can be identified by the single 45-degree chamfer on the edge of the larger inner diameter.

(*l*) Install and tighten the piston gasket nut firmly with the installation wrench shown in section V, paragraph 1. and a short bar 1-1/2 to 2 feet long.

WARNING

Under no circumstances should the piston gaskets be soaked in oil. Preoiling can soften the portion of the gasket under the retaining nut sufficiently to cause failure of the gasket and serious oil leakage from the propeller. Gaskets that have been preoiled or are otherwise not in satisfactory condition are to be replaced.

(*m*) Install the oil supply pipe packing washer over the end of the pipe and push it into position in the bore of the piston gasket nut. Tighten the oil supply pipe packing nut firmly into place and line up one of the locking holes in the nut with one of the locking slots in the pipe. Safety the nut to the supply pipe with safety wire.

(*n*) Place the cylinder head gasket onto its seat in the end of the cylinder using grease, if necessary, to hold it in place. The gasket should be installed with the split face against the cylinder seat. Screw the cylinder head into the cylinder and tighten it firmly with the proper installation wrench and a 1-1/2 to 2-foot bar. Line up one of the locking holes in the cylinder head with a locking hole in the cylinder. Install the cylinder head lock ring and snap it into position in the groove in the cylinder head.

(*o*) Upon completion of the installation, all visible cotter pins and lock rings should be checked.

b. ADJUSTMENTS.—Following completion of the propeller installation, move the blades into the full low pitch position by means of blade turning devices. Check the low blade angle setting by means of a universal bubble type protractor located at the proper blade reference station. Move the blades into the full high pitch position and check the high blade angle setting. The high blade angles should be within 0.1 degree of the specified setting for the propeller. The low blade angles should be within 0.3 degree of the specified setting and within 0.2 degree of each other. The correct high and low angle settings of the propeller may be found in applicable technical publications, and the propeller should have been set to those angles at overhaul. If, however, due to slight reductions in diameter resulting from blade repair the blade angle settings are not correct, remove the counterweight caps and check the position of the adjusting screw nuts. Adjust the nuts as required until the blade angles correspond to the proper setting within the allowable tolerance. When adjusting the nuts, it is important that the nut at the high angle end of each adjusting screw be placed as closely to the same distance from the end of the counterweight slot as is possible and still maintain the blade angles within the blade angle tolerance. This likewise applies to the nut at the low angle end of the slot. Following this procedure will insure that the bearing shafts contact the nuts at the same time, and will prevent the cylinder from cocking during operation. After the proper blade angles have been obtained, reinstall the counterweight caps and safety them by means of clevis pins and cotter pins.

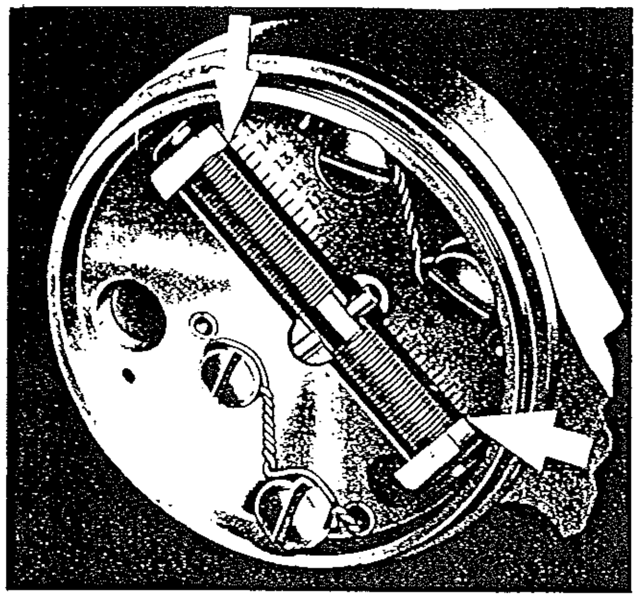


Figure 42 — Check Setting of Counterweight Adjusting Screw Nuts

c. REMOVAL PROCEDURE.—In general, the procedure for removing the propeller is the reverse of the installation procedure.

(1) By means of a blade turning device, move the Blades into the high pitch position. Remove the cylinder head lock ring and unscrew the cylinder head. Take the cylinder head gasket out of the cylinder.

(2) On propellers for shaft breathing engines, remove the safety wire from the oil supply pipe packing nut. Unscrew the packing nut and the piston gasket nut, and remove the outboard piston gasket. On propellers for crankcase breathing engines, remove the cotter pin, unscrew the piston gasket nut, and take out the outboard piston gasket.

(3) Move the blades to a position near the low angle setting of the propeller and remove the two cotter pins from the piston lock ring. Slide the lock ring away from the spider.

(4) Attach a hoisting sling to the propeller blades and, using the proper wrench and bar, unscrew the piston completely off the propeller shaft threads. As the piston is unscrewed, the front cone spacer contacts the hub snap ring thus partially backing the propeller off the shaft with the piston.

(5) Disengage the hub snap ring from the spider. Remove the front cone (and the front cone packing washer in the case of propellers for crankcase breathing engines), front cone spacer, hub snap ring, and piston lock ring from the piston. Take the piston out of the cylinder.

(6) Cover the propeller shaft threads with a thread protector or wrap the threads with tape if a suitable protector is not available. Slide the propeller carefully off the shaft using care not to damage the shaft threads and the splines of the shaft or spider. In the case of propellers for shaft breathing engines, also be careful not to damage the oil supply pipe.

(7) On propellers for shaft breathing engines, remove the safety wire from the inboard end of the oil supply pipe, and then carefully unscrew the pipe.

(8) If another propeller is not to be installed immediately, clean, oil, and cover the propeller shaft. If the propeller is to be stored for any length of time, all metal surfaces of the propeller should be protected against corrosion by applying a coat of corrosion preventive compound to Specification No. AN-VV-C-576a-1.

3. MODEL 2B20.

Model 2B20 propellers do not incorporate front cone spacers; otherwise, the installation, adjustment, and removal procedures are the same as those described for the model 2D30 propeller in paragraphs 2.a., b., and c. of this section.

4. MODEL 12D40.

The installation, adjustment, and removal procedures for the model 12D40 propeller are identical with the model 2D30 propeller described in paragraphs 2.a., b., and c. of this section.

5. MODEL 2E40.

a. INSTALLATION PROCEDURE.

(1) PROPELLERS WITHOUT SPRING RETURN ASSEMBLY.

(*a*) Install the rear cone spacer (if used) and the rear cone on the propeller shaft.

(*b*) If the engine is the crankcase breathing type, the following installation procedure is necessary. After making sure that the ends of each of the chevron packings are staggered approximately 90 degrees, the assembled propeller shaft oil plug is placed in the open end of the propeller shaft and secured by four screws which are inserted through the locking holes of the propeller shaft. Next, turn the "hex" base of the oil pipe in a counterclockwise direction. The chevron packing will be expanded forming an oil-tight seal. The pipe is then secured to one of the (four) screws by means of safety wire.

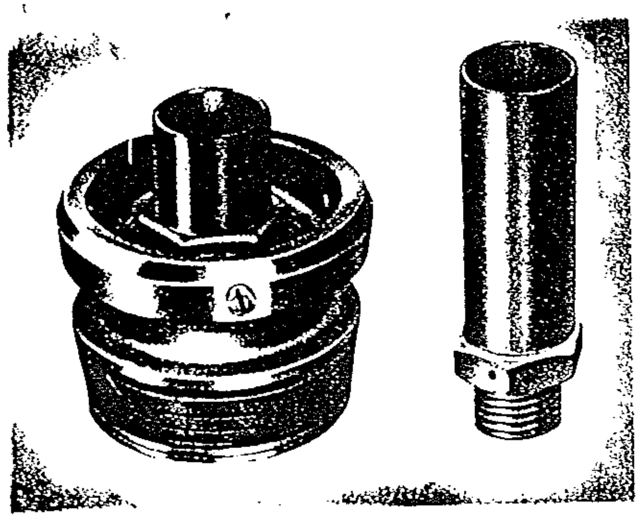


Figure 43 — Shaft Plug and Short Oil Pipe

(*c*) If the engine is the shaft breathing type, the following procedure is necessary. Install the oil supply pipe gasket (if one is required) over the oil supply pipe threads, and turn the oil supply pipe into the oil plug or "Y" connection inside the propeller shaft. Secure the oil supply pipe by means of safety wire.

(*d*) Apply thread lubricant to Specification No. AN-C-53-1 or clean engine oil to the shaft threads. Then, cover the shaft threads with a thread protector, or wrap them with tape.

(*e*) After removing the cylinder head and cylinder head lock ring, attach a hoisting sling and raise the propeller with the blank spline of the spider in line with the propeller shaft wide spline. Carefully install the propeller on the shaft, and move it back against the rear cone.

Note

On most new engines, oil and corrosion preventives are flushed from the cylinders prior to installation of the engine on the aircraft. However, in case this has not been done and the engine is allowed to stand idle for an appreciable time after propeller installation and before engine run-up, the portion of the cylinders wiped clean of protective by rotating the propeller shaft during installation may corrode. In such cases, attach a single hoisting sling to the blade in line with the blank spline of the spider so that at installation the propeller will line up with the engine shaft wide spline (usually left in the top position) and it will not be necessary to rotate the shaft.

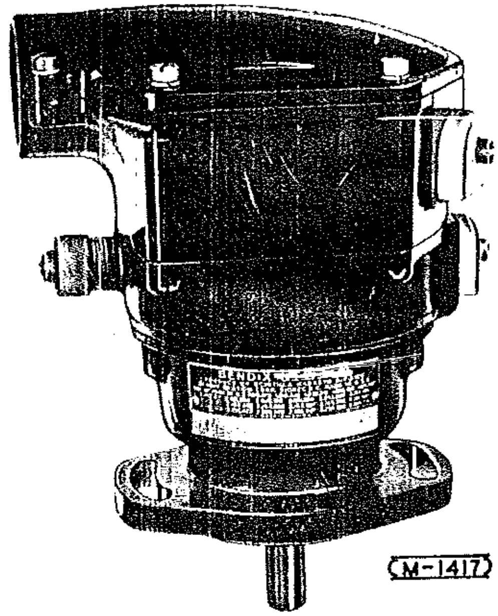
(*f*) Move the blades to a position near the low pitch setting using blade turning devices. Make

SERVICE INSTRUCTIONS AND PARTS LIST

BENDIX

BATTERY IGNITION

Type WL-7A Battery Timer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SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
SIDNEY, NEW YORK, U. S. A.

FORM L-30-7

BENDIX AIRCRAFT BATTERY IGNITION

Type WL-7a

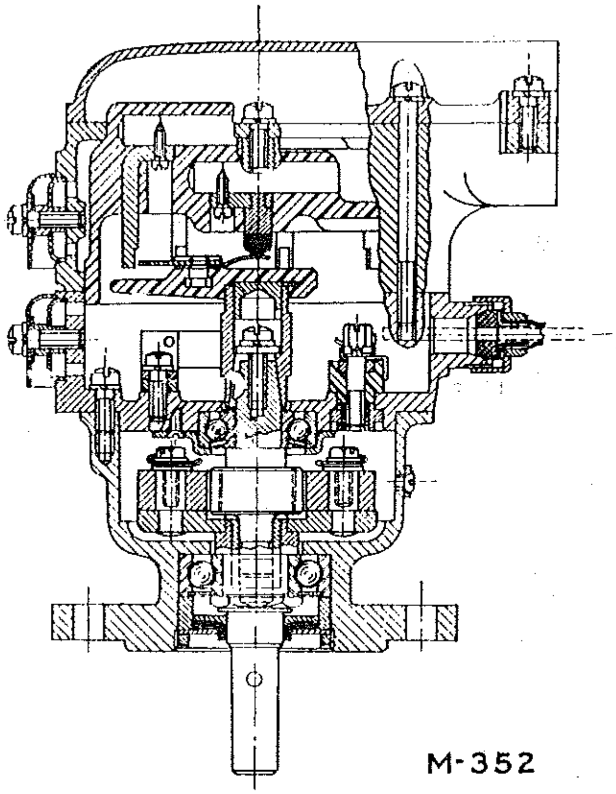


Fig. 1
Sectional View of WL-7a Timer Distributor

Description

The Bendix type WL-7a battery timer-distributor operates in conjunction with a high tension ignition coil and derives its energy from the storage battery of the airplane. The battery timer supplies ignition for the front spark plugs of the engine only. Ignition for the rear plugs is supplied by a magneto.

The type WL-7a timer-distributor incorporates an automatic, centrifugally-operated spark advance mechanism which has a range of 15° as measured on the timer driveshaft. Since the timer is driven at half the speed of the engine, this is the equivalent of a 30° spark advance on the engine crankshaft. Since the engine is timed to fire fully advanced at 30° before top center, the timer will provide a fully retarded spark, which is delivered at the top center position of the piston for the prevention of kick-backs at starting. Then as the engine is speeded up the automatic advance feature functions to provide the full running advance of 30°.

Installing and Timing to the Engine

Turn the engine in the normal operating rotation to the full advance firing position on the compression stroke as instructed by the engine manufacturer's manual.

Remove the radio shield and distributor head from the timer. Grasp the distributor finger and turn it at least one full revolution in the normal operating direction until the breaker contacts of the timer are just opening and the high tension segment on the finger is in a position where it will line up with the No. 1 cylinder electrode in the distributor head. It will be noted in doing this that the distributor finger can be turned a fraction of a revolution before the drive shaft of the timer begins to turn. This interval represents the range of the automatic advance mechanism which is normally in a retarded position when the unit is stationary, but which is shifted to full advance by turning the finger in the manner just described. Be sure all play or backlash is removed from the mechanism by holding the driveshaft lightly if necessary. Should the finger be turned beyond the No. 1 firing position, do not turn the finger backward to correct it. Make another complete revolution to be certain that the firing position (points just opening) is reached by turning the finger in the normal direction of rotation. Then gently release the finger without moving the driveshaft of the unit. This procedure will leave the driveshaft set in the full advance No. 1 firing position as required for correct timing to the engine.

Install the timer on the engine in this relation and run the mounting nuts down sufficient to hold the timer in place, but not enough to prevent turning the timer as necessary for the final adjustment. Then again turn the finger as before to place the unit in full advance, and while holding the finger in this position rotate the entire timer unit through the angle provided by the elongated screw holes in the mounting flange to the position where the contact points are just on the instant of opening. It is recommended that a timing light be connected across the points as a means of determining the opening position. The use of cellophane or shims between the points is not recommended because such practice is likely to result in the introduction of foreign material between the point surfaces, causing unsatisfactory operation of the breaker.

If sufficient adjustment of the timing is not afforded by the elongated mounting screw holes, additional range can be obtained by loosening the three screws (M, Fig. 2) and rotating the upper part of the housing as necessary. Remember that the advance mechanism must be kept in the full advance position for all adjustments. When the correct adjustment has been obtained, tighten and lock the mounting screws.

Care in Operation

Inspection of Breaker Felts. Approximately every 100 hours remove each distributor head and examine the lubricating felt attached to the cam follower. If it is dry, apply two drops of medium bodied lubricating oil on it. Never allow oil to reach the breaker contact points as this would cause pitting of the points and consequently interference with engine operation.

Inspection of Breaker Contacts. When examining the breaker felts, check the adjustment of the contact points as follows:

Turn the engine crankshaft so that the clearance between the contact points is a maximum. This clearance as measured with a feeler gauge should be from .014" to .018". If adjustment for clearance is necessary, loosen the two screws A and B (Fig. 2) which hold the contact point assembly C in place. Move this contact point assembly to the right or left until the desired clearance (.016") is obtained after which the screws A and B

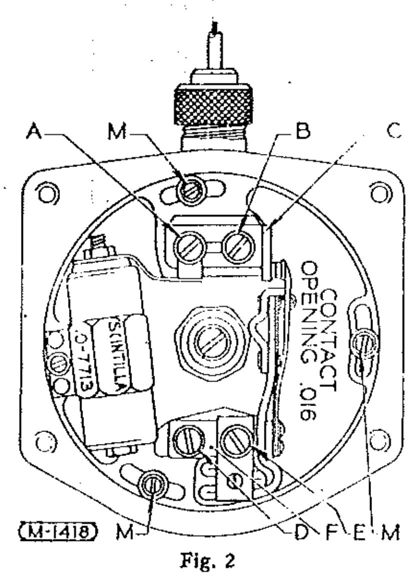
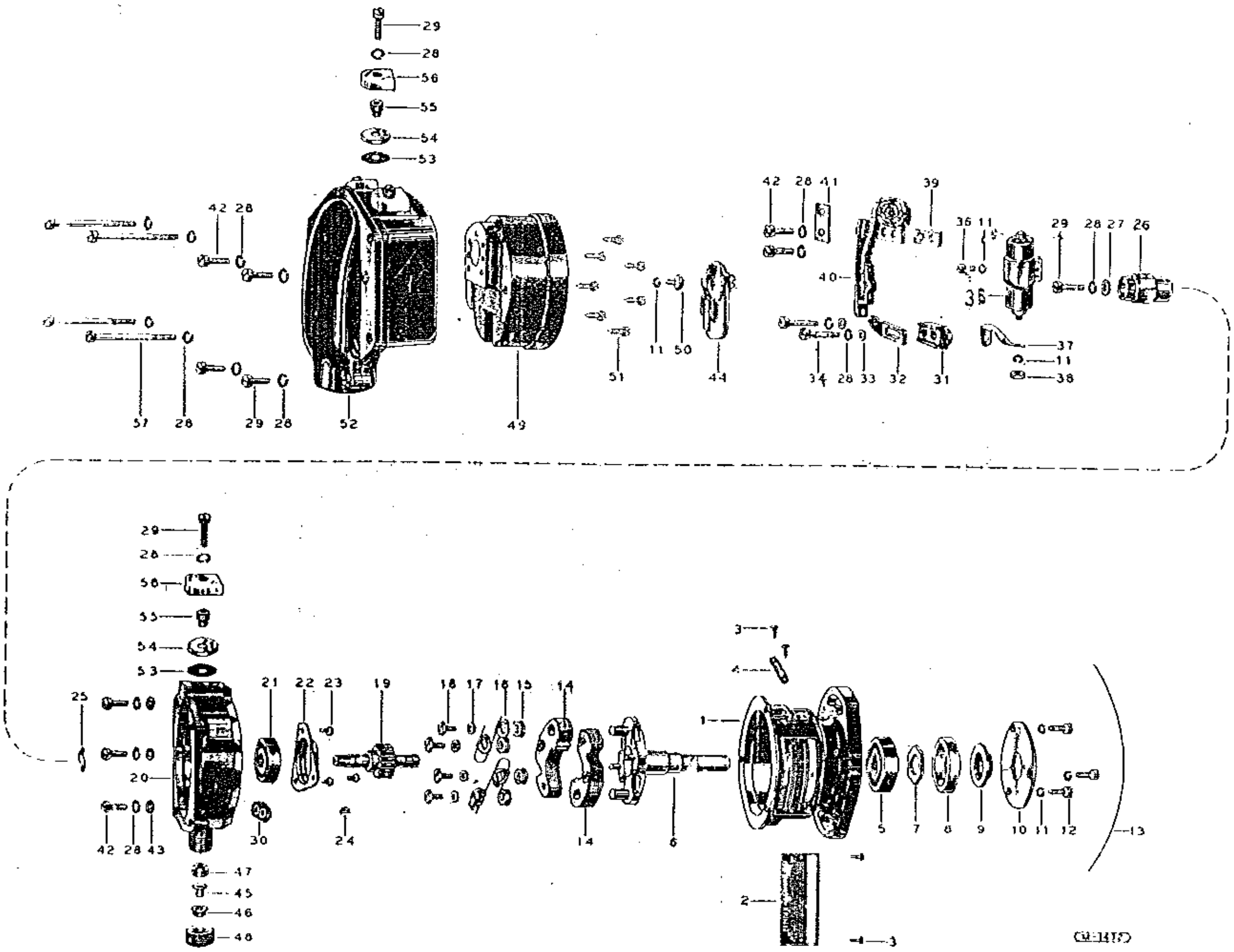


Fig. 2
Breaker View

are re-tightened. Vertical alignment of the contact points is obtained by loosening the two screws D and E and moving the movable contact point assembly F to the position desired.

After the proper clearance has been obtained, turn the engine crankshaft until the piston of No. 1 cylinder reaches its full advance firing position on its compression stroke. Loosen the three screws M and, while holding finger in the full advance position, move the breaker housing assembly until the contact points just begin to open. At this position, the distributor finger should be opposite the No. 1 electrode of the distributor head. Re-tighten the screws M after adjustment is made. If necessary, additional advance range can be obtained by loosening the two mounting flange hold-down bolts and rotating the whole unit through the range provided in the slots of the mounting flange.

Inspection of Distributor Finger and Distributor Head. At the above inspection periods, examine the carbon brush in the distributor head and the contact spring on the distributor finger for excessive wear. The distributor finger can be removed with an upward pressure applied with the hand. Do NOT use a screw driver for prying off distributor finger.



Exploded Parts View of the Type WL-7a Battery Timer

SERVICE PARTS LIST

Ref. No.	Part No.	Qty.	Description	Ref. No.	Part No.	Qty.	Description
			SECTION I				
1	**	1	HOUSING—Timer	5	10 604Z	1	BEARING—Ball (*Drive End*)
2	2 782Z	1	PLATE—Identification	6	10-5908Y	1	SHAFT—Drive
3	10 17712		DRIVE SCREW (2, *Identification Plate*) †(2, *Rotation Direction Plate* 10-16389)	7	10-7596	1	NUT—Drive Shaft
				8	10-5414	1	RETAINER—Inner (*Oil Seal*)
				9	10 5413Y	1	OIL SEAL—Drive Shaft
4	†10 16389	1	PLATE—Rotation Direction (*Housings having non-threaded holes for Rotation Direction Plate Drive Screw*)	10	10-16633	1	RETAINER—Outer (*Oil Seal*) (*On and after Serial No.* 1101)
				*	10-5412	1	RETAINER—Outer (*Oil Seal*) (*Up to and including Serial No.* 1100)
*	†10-1108	1	PLATE—Rotation Direction (*Housings having threaded holes for Rotation Direction Plate Screws*)	*	10-7597	1	NUT—Retaining (*Oil Seal*) (*Up to and including Serial No.* 1100)
*	†10 9859	2	SCREW (*Rotation Direction Plate* 10–1108)	11	10-7501	6	WASHER—Lock (3, *Oil Seal Retainer Screw, on and after Serial No.* 1101) (1, *Condenser Screw*) (1, *Condenser Terminal*) (1, *Carbon Brush*)

*Not illustrated
**See Section II for Part No.
†Not required for use on timer housings having cast arrows

Ref. No.	Part No.	No. Req.	Description
[illegible]	10-16637	3	SCREW—Oil Seal Retainer (*On and after Serial No.* 1101)
[illegible]	10-30939	AR	WIRE—Safety (*Oil Seal Outer Retainer Screw*) (*On and after Serial No.* 1101)
[illegible]	**	2	FLYWEIGHT—15° Advance Range
[illegible]	**	AR	WASHER—Shim (*Flyweight Screw*)
[illegible]	**	2	SPRING—Flyweight Tension
[illegible]	**	4	WASHER (*Flyweight Spring Screw*)
[illegible]	10-9860	4	SCREW—Flyweight
[illegible]	10-8329	1	SHAFT—Cam
[illegible]	10-13270Y	1	HOUSING—Breaker
[illegible]	[illegible]	1	BEARING—Ball (*Breaker End*)
[illegible]	[illegible]	1	RETAINER (*Cam Shaft Bearing*)
[illegible]	[illegible]	2	SCREW—Cam Shaft Bearing Retainer
[illegible]	2-181	1	KEY—Woodruff (*Cam*)
[illegible]	10-5921	1	WASHER—Spring (*Cam*)
26	**	1	CAM—Breaker
27	10-9621	1	WASHER—Plain (*Cam Screw*)
[illegible]	10-3132	19	WASHER—Lock (1, *Cam Screw*) (2, *Contact and Cam Follower Screw*) (2, *Adjustable Contact Screw*) (3, *Breaker Housing Screw*) (2, *Distributor Head Screw*) (2, *Shield Clamping Screw*) (3, *Ventilator Screw*) (4, *Shield Fastening Screw*)
29	10-3661	6	SCREW (1, *Cam*) (3, *Ventilator Shield Assembly*) (2, *Shield Clamping*)
30	[illegible]	1	BLOCK—Insulating (*Adjustable Contact Assembly*)
[illegible]	10-3316	1	INSULATOR—Adjustable Contact Assembly
[illegible]	[illegible]	1	ADJUSTABLE CONTACT ASSEMBLY
[illegible]	[illegible]	2	WASHER—Plain (*Adjustable Contact Screw*)
34	10-18185	2	SCREW—Adjustable Contact Assembly
35	10-7713-3	1	CONDENSER
36	10-12540	1	SCREW—Condenser
37	10-7102	1	CONNECTOR (*Condenser to Breaker*)
38	10-7727	1	NUT—Condenser Terminal
39	10-7101	1	BLOCK—Locating (*Contact and Cam Follower, Not Used in Breaker Housings incorporating raised boss for Contact and Cam Follower Assembly*)
40	10-33483	1	CONTACT AND CAM FOLLOWER ASSEMBLY
41	10-3461-3	1	PLATE—Retaining (*Contact and Cam Follower Assembly Felt*)
42	10-4018	7	SCREW (2, *Contact and Cam Follower Assembly*) (3, *Breaker Housing*) (2, *Distributor Head*)
43	10-4023	3	WASHER—Plain (*Breaker Housing Screw*)
44	10-33636	1	FINGER—Distributor
45	10-7029	1	FERRULE—Inner (*Ground Cable*)
46	10-7030	1	FERRULE—Outer (*Ground Cable*)
47	10-2674	1	GROMMET—Rubber (*Ground Cable*)
48	10-3657	1	NUT—Ground Cable Outlet
49	10-9862Y	1	HEAD—Distributor
50	10-22529	1	CARBON BRUSH—Distributor Head (*Distributor Heads incorporating removable Carbon Brush*)
*	10-7627	1	CARBON BRUSH—Distributor Head (*Distributor Heads incorporating spun-in Carbon Brush*)
51	2-185	8	SCREW—Cable Piercing
52	10-9854Y	1	SHIELD ASSEMBLY—Radio
53	10-9351	3	SCREEN—Ventilator
54	10-7441	3	RETAINER—Ventilator Screen
55	10-7573	3	SPACER—Ventilator Shield
56	10-7572	3	SHIELD—Ventilator
57	10-3368	4	SCREW—Radio Shield

*Not illustrated.
**See Section II for Part No.

SECTION II

Parts Special for WL-7a Timer, Spec. No. 10-13810-2

Ref. No.	Part No.	No. Req.	Description
1	10-16631Y	1	HOUSING—Timer
14	10-23295	2	FLYWEIGHT—15° Advance Range—Clw.
15	10-7305	AR	WASHER—Shim (*Flyweight Screw*)
16	10-12719	2	SPRING—Flyweight Tension
17	10-9858	4	WASHER—Plain (*Flyweight Spring Screw*)
26	10-15811	1	CAM—Breaker—Clw.

Parts Special for WL-7a Timer, Spec. No. 10-52021-1

Ref. No.	Part No.	No. Req.	Description
1	10-52022	1	HOUSING—Timer
14	10-23296	2	FLYWEIGHT—15° Advance Range—Anti-clw.
16	10-52074	1	SPRING—Flyweight Tension
	10-52076	1	SPRING—Flyweight Tension
*	10-7022	1	RETAINER—Flyweight Tension Spring 10-52074
17	10-17920	4	WASHER—Special (*Flyweight Spring Screw*)
26	10-13709	1	CAM—Breaker—Anti-Clw.

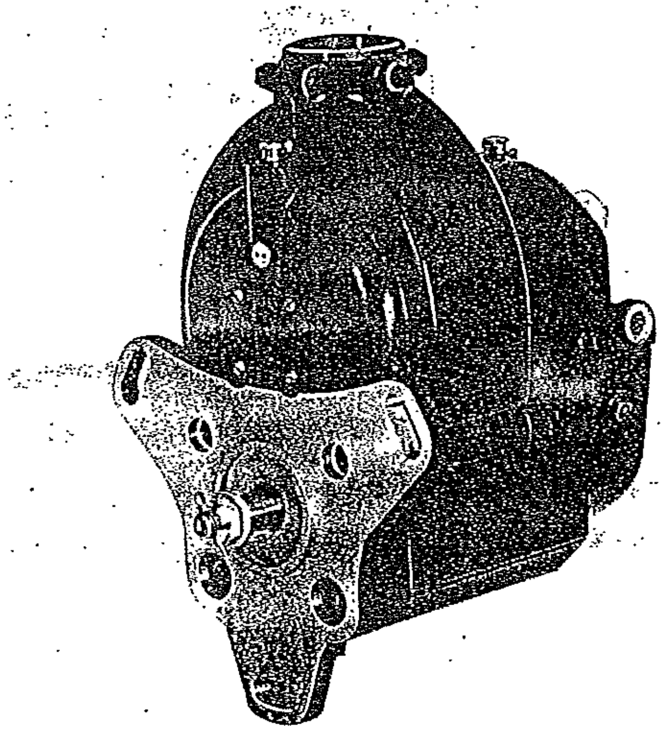
*Not illustrated

SERVICE PARTS LIST

BENDIX

AIRCRAFT MAGNETOS

TYPES VMN7D, VMN7DF, and VMN7DF-5



Magneto Type VMN7DF

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BENDIX AVIATION CORPORATION
SIDNEY, NEW YORK, U. S. A.

FORM L-104-5

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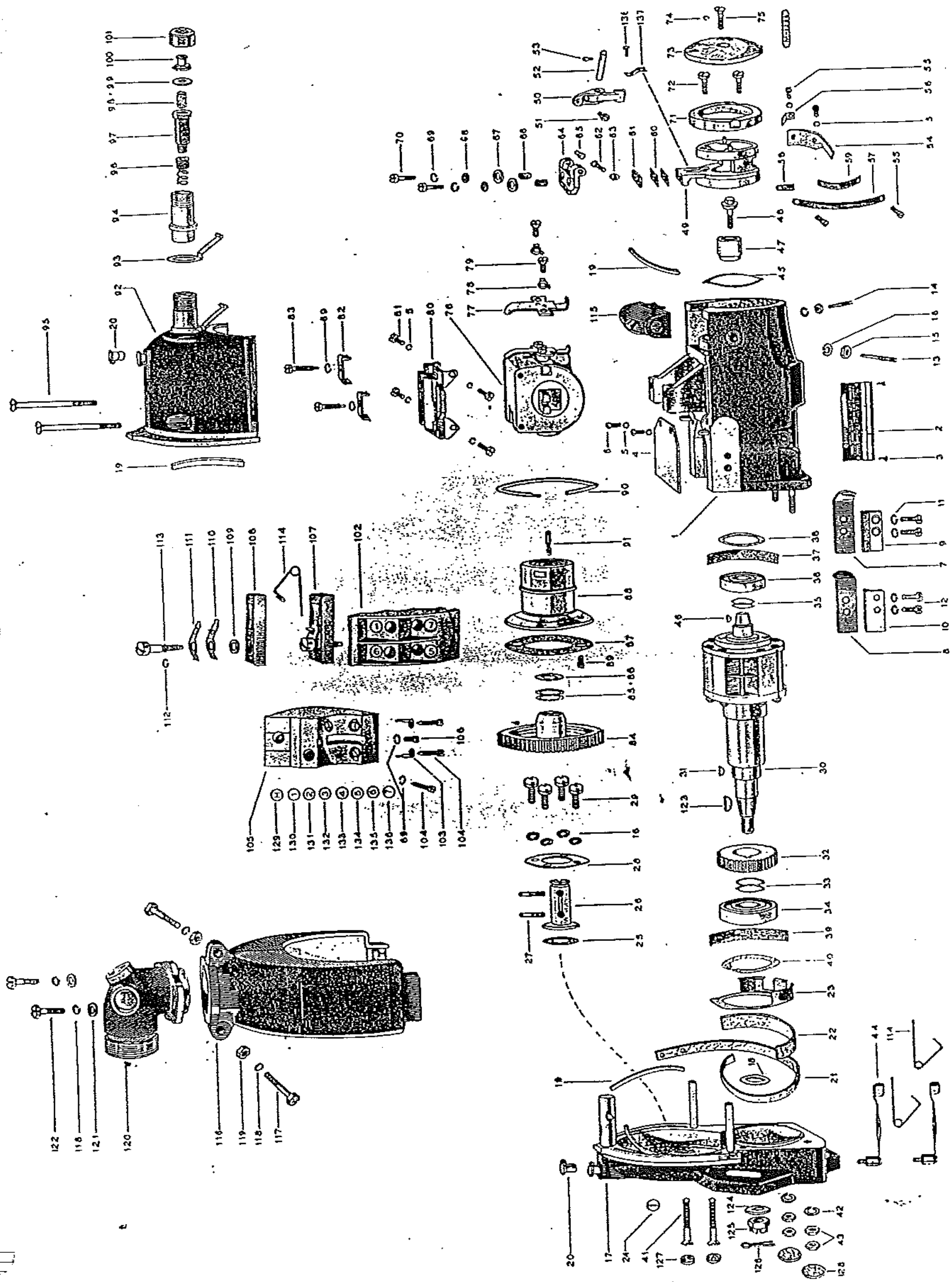


EXPLODED VIEW OF DETAIL PARTS

PARTS INTERCHANGEABILITY OF VMN7 SERIES MAGNETOS

Magneto Type	Spec. No.	Magneto Housing	Front End Plate	Breaker End Cover or Lever	Distributor Cylinder	Distributor Block (R. H. Side)
VMN7DF	10-19273-1	10-2483W	10-12287Z	10-3761Y	10-13400	10-5510Z
	10-19273-3	10-2483W	10-12287Z	10-3761Y	10-13400	10-5510Z
	10-19273-5	10-2483W	10-22618	10-17411	10-13400	10-5510Z
	10-20273-1	10-2483W	10-1890Z	10-20185	10-13400	10-5510Z
	10-20273-4	10-2483W	10-1890Z	10-17411	10-13400	10-5510Z
	10-20273-5	10-2483W	10-1890Z	10-20185	10-13400	10-5510Z
	10-20273-6	10-2483W	10-1890Z	10-17322	10-13400	10-5510Z
VMN7DF-5	10-21819-2	10-2483W	10-7198Y	10-3719	10-13400	10-18554
VMN7D	10-22499-1	10-7629Z	10-4138Y	10-16991Y	10-13400	10-5510Z
	10-22499-3	10-7629Z	10-25596	10-16991Y	10-13400	10-5510Z
	10-30525-1	10-7629Z	10-4138Y	10-16991Y	10-13358	10-5522Z
VMN7DF	10-24024-1	10-2483W	10-1890Z	10-17411	10-13358	10-5522Z

Magneto Type	Spec. No.	Distributor Block (L. H. Side)	Distributor Block Clamp Assy.	Radio Shield	Radio Shield Outlet
VMN7DF	10-19273-1	10-5511Z	10-13636	10-14392	10-12846W
	10-19273-3	10-5511Z	10-2489Y	—	—
	10-19273-5	10-5511Z	10-13636	—	—
	10-20273-1	10-5511Z	10-13636	—	—
	10-20273-4	10-5511Z	10-13636	10-7445Y	—
	10-20273-5	10-5511Z	10-2489Y	—	—
	10-20273-6	10-5511Z	10-13636	—	—
VMN7DF-5	10-21819-2	10-18555	10-23842	—	—
VMN7D	10-22499-1	10-5511Z	10-13636	—	—
	10-22499-3	10-5511Z	10-13636	—	—
	10-30525-1	10-5523Z	10-13636	—	—
VMN7DF	10-24024-1	10-5523Z	10-13636	—	—

SERVICE PARTS LIST

Ref. No.	Part No.	No. Req.	Description
1	10-2483W	1	HOUSING—Magneto (*For Flange Mounted Magnetos*)
*	10-7629Z	1	HOUSING—Magneto (*For Base Mounted Magnetos*)
2	2-782Z	1	PLATE—Magneto Identification
3	10-22067	2	DRIVE SCREW—Magneto Identification Plate
4	10-9622	1	PLATE—Insulating
5	2-194	8	WASHER—Lock (2, *Insulating Plate Screw*) (1, *Cam Oil Wick Screw*) (1, *Cam Oil Wick Retainer Screw*) (4, *Condenser Screw*)
6	10-1338	2	SCREW—Insulating Plate
7	10-1885	1	HOOK—Radio Shield Clamp (*R. H. Side*)
8	10-2487	1	HOOK—Radio Shield Clamp (*L. H. Side*)
9	10-1886Y	1	SPACER—Radio Shield Clamp (*R. H. Side*)
10	10-2486Y	1	SPACER—Radio Shield Clamp (*L. H. Side*)
11	10-2493	4	WASHER—Lock (*Radio Shield Clamp Hook Screw*)
12	10-780	4	SCREW (*Radio Shield Clamp Hook*)
13	2-514-6	2	SCREW—1.031" long
14	2-514-8		SCREW—1.187" long
*	2-514-11		SCREW—1.437" long (*Breaker Range Adjusting*)
15	2-532	2	NUT (*Breaker Range Adjusting Screw*)
16	2-339		WASHER—Lock (2, *Breaker Range Adjusting Screw*) (4, *Magneto Housing, when used with 10-960 Plugging Screws for Radio Shield Clamp Hook Screw Holes, Non-shielded installations*) (2, *Front End Plate, when used with 10-960 Plugging Screws for Radio Shield Clamp Screw Holes, Non-shielded installations*) (4, *Large Gear Axle Retainer Screw*) (2, *Radio Shield Clamping Screw, 10-7445Y Radio Shield*)
*	10-960	6	SCREW—Plugging (4, *Magneto Housing, for Radio Shield Clamp Hook Screw Holes, Non-shielded installations*) (2, *Front End Plate, for Radio Shield Clamp Screw Holes, Non-shielded installations*)
17	10-1890Z	1	PLATE—Front End (3 *Bolt, Flange Mounted, 1-7/8" Pilot*)
*	10-12287Z	1	PLATE—Front End (3 *Bolt, Flange Mounted—3" Pilot*)
*	10-22618	1	PLATE—Front End (3 *Bolt Flange Mounted—3" Pilot*)
*	10-7198Y	1	PLATE—Front End (2 *Bolt Flange Mounted—3" Pilot*)
*	10-4138Y	1	PLATE—Front End (*Base Mounted*)
*	10-25596	1	PLATE—Front End (*Base Mounted*)

*Not illustrated.

Ref. No.	Part No.	No. Req.	Description
18	10-21721	1	WASHER—Felt (*Drive Shaft Hole*)
19	2-274	AR	STRIP—Felt (*Specify Length*) (*Front End Plate*) (*Magneto Cover*) (*Breaker Cover*)
20	2-628	2	OIL CUP (1, *Front End Plate*) (1, *Magneto Cover*)
21	10-13773	1	STRIP—Felt (*Axle Main Oiling*)
22	10-16640	AR	STRIP—Felt (*Axle Auxiliary Oiling*) (*Specify Length*)
23	10-13774	1	RETAINER (*Axle Oiling Strips*)
24	2-319	1	DISC—Rotation Direction
25	10-13775	1	GASKET—Large Gear Axle
26	10-13776	1	AXLE—Large Gear
27	2-552	2	OIL WICK—Large Gear Axle
28	10-13777	1	RETAINER—Distributor (*Gear Axle*)
29	10-13778	4	SCREW (*Large Gear Axle Retainer*)
30	10-5643Y	1	MAGNET—Rotating
31	2-181	1	KEY—Woodruff (*Small Gear*)
32	2-292Z	1	GEAR—Distributor—Small
33	2-189-1	AR	WASHER—Shim .0025" thick
	2-189-2		WASHER—Shim .004" thick
	2-189-3		WASHER—Shim .005" thick
	2-189-4		WASHER—Shim .008" thick
	2-189-5		WASHER—Shim .010" thick
	2-189-6		WASHER—Shim .012" thick (*Magnet End Play Adjusting, Drive End*)
34	2-463	1	BEARING—Ball (*Magnet, Drive End*)
35	2-161-1	AR	WASHER—Shim .0025" thick
	2-161-2		WASHER—Shim .004" thick
	2-161-3		WASHER—Shim .005" thick
	2-161-4		WASHER—Shim .008" thick
	2-161-5		WASHER—Shim .010" thick
	2-161-6		WASHER—Shim .012" thick (*Magnet End Play Adjusting, Breaker End*)
36	2-462	1	BEARING—Ball (*Magnet, Breaker End*)
37	2-141-1	AR	STRIP—Insulating .007" thick
	2-141-2		STRIP—Insulating .008" thick
	2-141-3		STRIP—Insulating .009" thick
	2-141-4		STRIP—Insulating .010" thick
	2-141-5		STRIP—Insulating .011" thick
	2-141-6		STRIP—Insulating .012" thick (*Magnet Bearing Outer Race*)
38	2-140	1	GASKET (*Magnet Bearing Outer Race*)
39	2-139-1	AR	STRIP—.007" thick
	2-139-2		STRIP—.008" thick
	2-139-3		STRIP—.009" thick
	2-139-4		STRIP—.010" thick
	2-139-5		STRIP—.011" thick
	2-139-6		STRIP—.012" thick (*Magnet Bearing Outer Race*)
40	2-138	1	GASKET (*Magnet Bearing Outer Race*)
41	2-158	2	SCREW—Front End Plate
42	2-281	2	WASHER—Lock (*End Plate Mounting Stud*)
43	2-164	4	NUT (*End Plate Mounting Stud*)
44	10-3074	2	CLAMP—Radio Shield
45	10-1792-1	AR	WASHER—Spring Shim .0179" thick
	10-1792-2		WASHER—Spring Shim .0226" thick
	10-1792-3		WASHER—Spring Shim .0253" thick
	10-1792-4		WASHER—Spring Shim .0285" thick
	10-1792-5		WASHER—Spring Shim .0350" thick (*Breaker Assembly, End Play Adjusting*)
46	2-182	1	KEY—Woodruff (*Cam*)
47	10-20223	1	CAM—Breaker
48	2-167	1	SCREW—Cam
49	10-3145Z	1	HOUSING—Breaker
50	2-350	1	LEVER—Breaker Contact
51	10-28909	1	CONTACT SCREW—Breaker (*Short*)
52	10-2148	1	AXLE—Contact Lever
53	10-13332	1	SCREW (*Contact Lever Axle*)
54	2-466	1	OIL WICK—Cam
55	2-176	4	SCREW (1, *Cam Oil Wick*) (1, *Cam Oil Wick Retainer*) (2, *Contact Lever Main Spring*)
56	10-13331	1	RETAINER—Cam Oil Wick
57	2-146	1	SPRING—Main (*Contact Lever*)
58	2-145	1	SPRING—Reinforcing—Short (*Contact Lever Main Spring*)
59	2-440	1	SPRING—Reinforcing—Long (*Contact Lever Main Spring*)
60	10-13328-1	AR	PLATE—Insulating .005" thick
	10-13328-2		PLATE—Insulating .008" thick
	10-13328-3		PLATE—Insulating .010" thick
	10-13328-4		PLATE—Insulating .015" thick
	10-13328-5		PLATE—Insulating .020" thick (*Contact Support Adjusting*)
61	10-13329	1	PLATE—Insulating, Thick (*Contact Support*)
62	10-28908	1	CONTACT SCREW—Breaker—Long
63	2-65	1	NUT—Adjusting (*Long Contact Screw*)
64	10-25171	1	SUPPORT—Contact
65	2-150	1	STOP—Fiber (*Contact Support*)
66	10-13330	2	BUSHING—Insulating (*Contact Support Screw*)
67	2-165	2	WASHER—Insulating (*Contact Support Screw*)
68	2-801	2	WASHER—Plain (*Contact Support Screw*)
69	2-220	6	WASHER—Lock (2, *Contact Support Screw*) (2, *Coil Core Screw*) (1, *Booster Electrode Screw*) (1, *Booster Cable Piercing Screw*)
70	2-172	2	SCREW (*Contact Support*)
71	10-13722	1	RETAINER—Breaker Assembly
72	10-13723	2	SCREW (*Breaker Assembly Retainer*)
73	10-3761Y	1	END COVER—Breaker (*Fixed Spark*)
*	10-17411	1	LEVER—Breaker Advance—Single Arm, Offset Type (*Drilled Two holes .191" Dia.*)
*	10-20185	1	LEVER—Breaker Advance—Single Arm Flush Type (*Drilled 1 hole .1875" Dia.*)
*	10-17322	1	LEVER—Breaker Advance—Single Arm, Offset Type (*Wright Specification*) (*Use Advance Lever 10-3719, Drill and Tap 1, 1/4-20P hole, 2 1/4" Radius*)
*	10-16991Y	1	LEVER—Breaker Advance—Single Arm Flush Type (*Drilled 2 holes .191" Dia.*)
*	10-3719	1	LEVER—Breaker Advance—Single Arm, Offset Type
74	10-600	1	RING—Lock (*2-545 Screw*)
75	2-545	1	SCREW (1, *Breaker End Cover*) (*Fixed Spark*) (1, *Breaker Advance Lever*) (*Variable Spark*)
76	10-14857	1	COIL
77	10-13374	1	SUPPORT AND BRUSH ASSEMBLY—Primary
78	10-7308	2	WASHER—2 Ear Lock (*Support and Brush Assembly Screw*)
79	10-4874	2	SCREW—Support and Brush Assembly
80	10-13373Y	1	CONDENSER
81	10-528Z	4	SCREW—Condenser
82	2-819	2	CLAMP—Coil Core
83	2-177	2	SCREW—Coil Core
84	10-9373Y	1	GEAR—Distributor—Large
85	10-5289-11	AR	WASHER—Shim .028" thick
	10-5289-12		WASHER—Shim .032" thick
	10-5289-13		WASHER—Shim .035" thick
	10-5289-14		WASHER—Shim .042" thick (*Large Gear End Play Adjusting*)
86	10-2024	1	RING—Lock (*Large Gear*)
87	10-9624	1	GASKET—Cylinder—Large
88	10-13400	1	CYLINDER—Distributor—Clw.

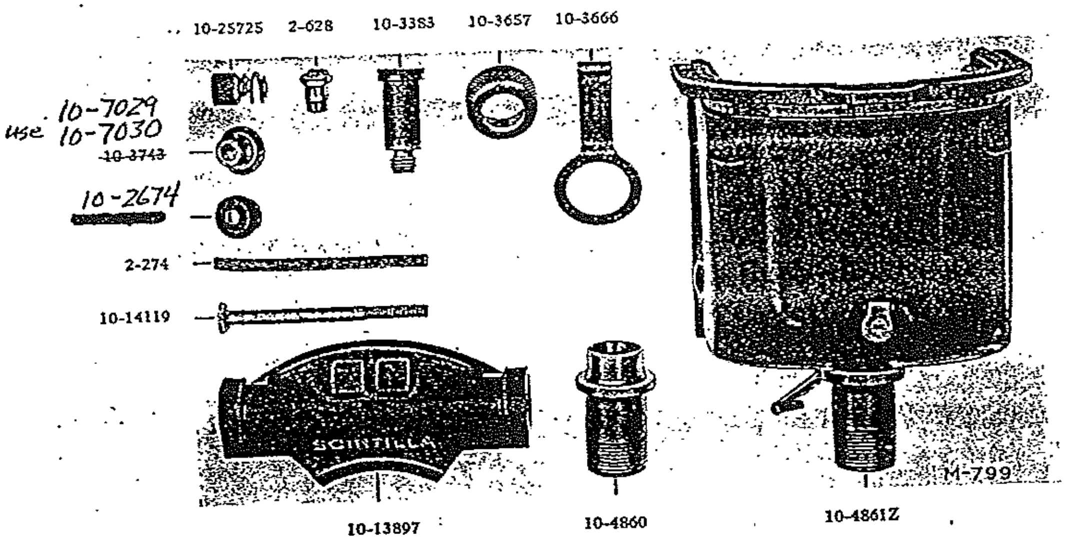
*Not illustrated.

Ref. No.	Part No.	No. Req.	Description
*	10-13358	1	CYLINDER—Distributor—Anti-clw.
89	10-13779	1	SCREW—Locating (*Distributor Cylinder to Gear*)
90	10-13780	1	RING—Lock (*Distributor Cylinder*)
91	10-12647	1	CARBON BRUSH—Distributor Cylinder
92	10-4861Z	1	COVER—Magneto
93	10-3666	1	CLAMP—Breaker Cover
94	10-4860	1	ADAPTOR—Ground Terminal
95	10-14119	2	SCREW—Magneto Cover
96	10-25725	1	CONTACT ASSEMBLY—Ground Terminal
97	10-3383	1	TERMINAL SCREW—Ground Wire
98	10-26199	1	TUBE—Insulating (*Ground Terminal*)
99	10-26198	1	WASHER—Plain (*Ground Terminal*)
100	10-3743	1	FERRULE (*Ground Terminal Screw*)
101	10-3657	1	NUT (*Ground Terminal Screw*)
102	10-5510Z	1	BLOCK—Distributor—Clw.—R. H. Side
103	10-4744	8	ELECTRODE—Distributor Block
104	10-7439	8	SCREW—Cable Piercing
105	10-5511Z	1	BLOCK—Distributor—Clw.—L. H. Side
*	10-5522Z	1	BLOCK—Distributor—Anti-clw. R. H. Side
*	10-5523Z	1	BLOCK—Distributor—Anti-clw. L. H. Side
*	10-18554	1	BLOCK—Distributor—Clw.—R. H. Side (*Prepared for Breeze Type Shielding*)
*	10-18555	1	BLOCK—Distributor—Clw.—L. H. Side (*Prepared for Breeze Type Shielding*)
106	10-13591	1	SCREW (*Booster Electrode*)
107	10-2489Y	1	CLAMP ASSEMBLY—Distributor Block (*Shielded Installations*)
*	10-13636	1	CLAMP ASSEMBLY—Distributor Block (*Non-Shielded Installations*)
*	10-23842	1	CLAMP ASSEMBLY—Distributor Block (*Prepared for Breeze Type Shielding*)
108	10-2745Z	1	CLAMP—Distributor Block (*Shielded Installations*)
*	10-13635	1	CLAMP—Distributor Block (*Non-Shielded Installations*)
*	10-24001	1	CLAMP—Distributor Block (*Prepared for Breeze Type Shielding*)
109	10-13640	1	WASHER—Felt (*Distributor Block Clamp*)
110	10-13637	1	SPRING (*Distributor Block Clamp*)
111	10-2746Z	1	SPRING—Reinforcing (*Distributor Block Clamp Spring*)
*	10-24002	1	SPRING—Distributor Block Clamp (*Prepared for Breeze Type Shielding*)
*	10-24003	1	SPRING—Reinforcing (*Distributor Block Clamp Spring*)
112	10-2633	1	RING—Lock (*Distributor Block Clamp Screw*)
113	10-13638	1	SCREW (*Distributor Block Clamp*)
114	2-152Z	3	PIN—Safety (*2, Radio Shield Clamp*) (*Radio Shielded Installations*) (*1, Distributor Block Clamp Screw*)
*	10-29619	1	PIN—Safety (*Distributor Block Clamp Screw*) (*Breeze Installations*)
115	10-13897	1	COVER—Breaker
*	10-14489	1	SHIELD ASSEMBLY—Radio (*Includes Cable Outlet*)
116	10-14392	1	SHIELD ASSEMBLY—Radio (*Less Cable Outlet*)
*	10-7445Y	1	SHIELD ASSEMBLY—Radio
117	10-5779	2	SCREW—Clamping (*10-14392 Radio Shield*)
*	10-1525	2	SCREW—Clamping (*10-7445Y Radio Shield*)
118	10-3132		WASHER—Lock (*2, Radio Shield Clamping Screw*) (*2, Radio Shield Outlet Screw*) (*1, Harness Adaptor Locking Screw, 10-7445Y Radio Shield*)
*	10-3164	1	SCREW—Harness Adaptor Locking, 10-7445Y Radio Shield
119	10-5780	2	NUT (*Radio Shielding Clamping Screw, 10-14392 Radio Shield*)
*	10-1467	2	NUT (*Radio Shield Clamping Screw, 10-7445Y Radio Shield*)
120	10-12846W	1	OUTLET—Radio Shield Cable (*Used with 10-14392 Radio Shield*)
121	10-13190	2	WASHER—Plain (*Radio Shield Outlet Screw*)
122	10-9915	2	SCREW (*Radio Shield Outlet*)
123	2-295Z	1	KEY—Woodruff (*Drive Shaft*) (*Except Wright Requirements*)
*	2-828Z	1	KEY—Woodruff (*Drive Shaft*) (*Wright Requirements*)
124	2-965	1	WASHER—Plain (*Drive Shaft Nut*)
125	10-4092	1	NUT—Drive Shaft
126	10-18918	1	PIN—Cotter (*Drive Shaft Nut*)
127	10-4140	2	PLUG—Leather (*Flange Mounted End Plate Screw Hole*)
128	10-3154-1	2	PLUG—Leather (*.156" thick*)
	10-3154-2	2	PLUG—Leather (*.218" thick*) (*Flange Mounted End Plate Mounting Stud Hole*)
137	2-132	1	SPRING—Breaker Lever End Play Adjusting
138	2-131	1	RIVET (*Breaker Lever Adjusting Spring*)

Note: *Present production magnetos incorporate distributor blocks with molded cable identification numerals. The following parts are special for use on magnetos which incorporated cable identification discs in the distributor blocks:*

Ref. No.	Part No.	No. Req.	Description
129	2-318	1	DISC—H
130	2-321	1	DISC—No. 1
131	2-322	1	DISC—No. 2
132	2-323	1	DISC—No. 3
133	2-324	1	DISC—No. 4
134	2-325	1	DISC—No. 5
135	2-326	1	DISC—No. 6
136	2-327	1	DISC—No. 7

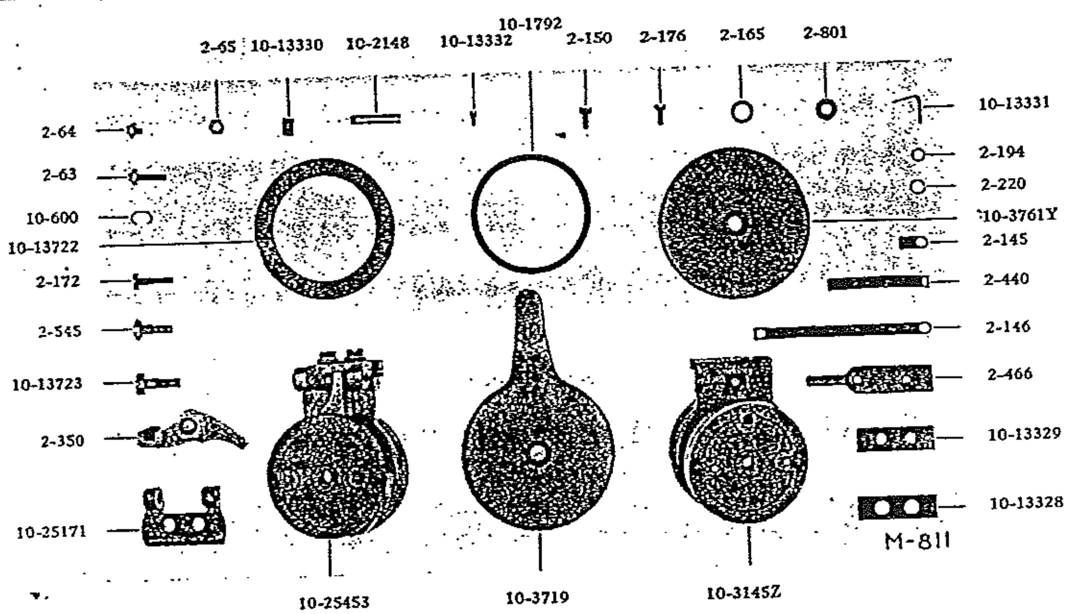
*Not illustrated.



COIL COVER

Part No.	No. Req.	Description
2-274		STRIP—Felt (*Specify length*)
2-628	1	OIL CUP—Coil Cover
10-3383	1	TERMINAL SCREW—Ground
10-3657	1	NUT (*Ground Terminal Screw*)
10-3666	1	CLAMP—Breaker Cover
10-3743	1	FERRULE (*Ground Terminal Screw*)
10-4860	1	BUSHING—Ground Terminal
10-4861Z	1	COVER—Coil (*Shielded Ground Terminal*)
10-13897	1	COVER—Breaker
10-14119	2	SCREW—Fastening (*Coil Cover*)
10-25725	1	CONTACT BUTTON—Ground Terminal Screw
*10-26198	1	WASHER—Plain (*Ground Terminal*)
*10-26199	1	SLEEVE—Insulating (*Ground Terminal*)

*Not illustrated.



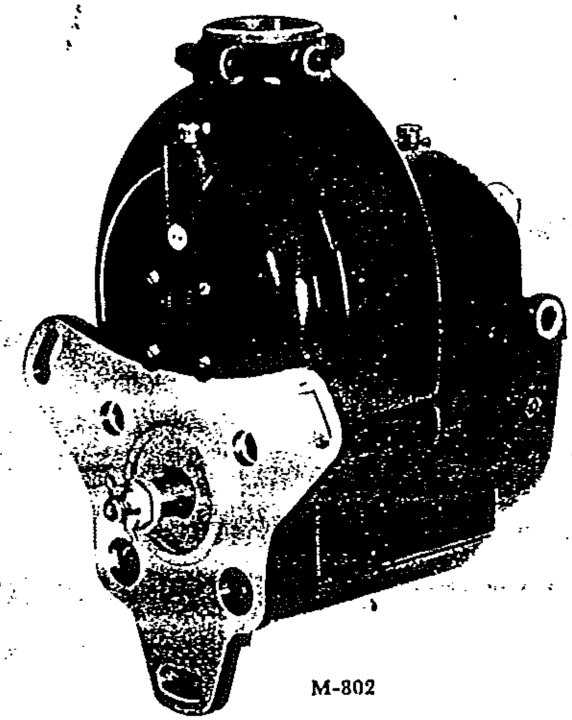
BREAKER ASSEMBLY

Part No.	No. Req.	Description
2-63	1	CONTACT SCREW—Breaker—Long
2-64	1	CONTACT SCREW—Breaker—Short
2-65	1	NUT—Adjusting (*Long Contact Screw*)
2-145	1	SPRING—Reinforcing—Short (*Contact Lever Main Spring*)
2-440	1	SPRING—Reinforcing—Long (*Contact Lever Main Spring*)
2-146	1	SPRING—Contact Lever—Main
2-150	1	STOP—Fiber (*Contact Support*)
2-165	2	WASHER—Insulating (*Contact Support Screw*)
2-172	2	SCREW—Fastening (*Contact Support*)
2-176	4	SCREW—Fastening (*1, Cam Oil Wick*) (*1, Cam Oil Wick Retainer*) (*2, Contact Lever Main Spring*)

SERVICE INSTRUCTIONS

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

Types VMN7D, VMN7DF, VMN7DF-5



M-802

Typical VMN7DF Type Magneto

BENDIX SCINTILLA

SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
SIDNEY, NEW YORK, U. S. A.

PRINTED IN U.S.A.

FORM L-103-4

SECTION I

GENERAL DESCRIPTION

These magnetos are single, seven cylinder units driven at ⅞ engine crankshaft speed and are adaptable to radio shielding. They are identical except for the manner of mounting. Type VMN7D is a base-mounted unit. Type VMN7DF employs a three bolt mounting flange. Type VMN7DF-5 employs a two bolt mounting flange.

These magnetos employ a four pole rotating magnet with a four lobe cam to actuate a lever type breaker which can be set for either fixed or variable spark.

The large distributor gear is mounted on an axle which is adjustable for obtaining the proper backlash between the large gear and the pinion gear. Oilers are provided for lubricating all bearings.

The primary and secondary windings of the coil are enclosed in a hard rubber case. The condenser is similarly encased in hard rubber and is mounted on top of the coil.

A laminated brush on the primary bridge of the coil provides a contact with the insulated contact point support. The breaker cage is secured in the magneto housing by a retaining ring and two screws. Two stop screws in the housing establish the limits of the spark advance range and setting of the "E" gap. An oil felt strip in the bottom of the breaker cage provides lubrication for the cam follower.

The distributor cylinder is clamped to the large distributor gear by a snap ring and secured in proper position with a dog screw. The cylinder carries two high tension segments, two booster segments, and a booster collector ring. The distributor blocks are secured between the coil cover and front end plate by the clamp at the top of the magneto. Radio shielding, if used, is secured by two clamping springs which engage suitable latches, and are locked with safety pins.

The small distributor drive gear mounted on the magnet shaft has forty-four teeth and meshes with the large seventy-seven tooth distributor gear carrying the distributor cylinder. Therefore, the distributor cylinder turns at 7/8×4/7, or one-half engine speed.

SECTION II

ELECTRICAL OPERATION

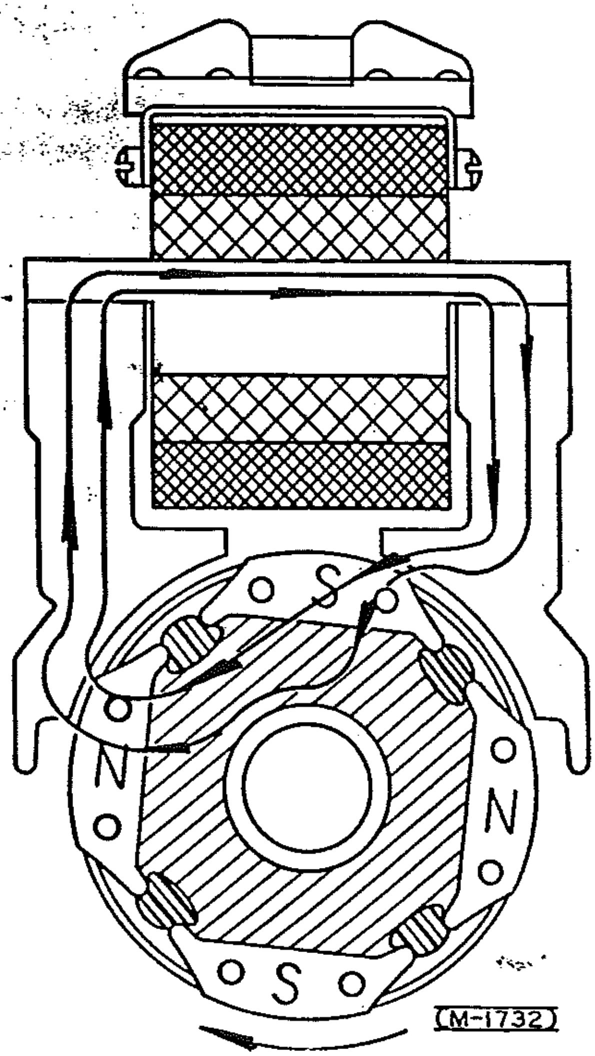
The poles of the rotating magnet are arranged in alternate polarity. The flux passes from a north pole through the coil core and back to a south pole. (See figure 1.) As the magnet is turned the polarity continually changes thereby producing flux reversals in the coil core. The number of flux reversals during one complete revolution of the magnet is equal to the number of poles of the magnet.

The flux reversals induce current in the primary winding when the contact points close. The flow of current in the primary winding stores energy which is released later by the opening of the contact points, thereby producing high voltage in the secondary winding.

One end of the primary winding is connected to ground. The other end is connected to the insulated contact point. When the contact points are closed, the primary current passes to ground. The condenser is connected across the contact points.

The ground terminal of the magneto is electrically connected to the insulated contact point. A wire is connected between the ground terminal and the switch. When the switch is in the "OFF" position, this wire provides a direct path to ground for the primary current. This prevents the primary current being interrupted when the contacts open, and therefore high voltage is not produced in the secondary winding.

One end of the secondary winding is connected to the insulated end of the primary winding. The other end terminates at the high tension insert of the coil. High tension current in the secondary winding is then conducted to the central insert of the distributor cylinder by means of a carbon brush. From here it is conducted to the high tension electrodes on the cylinder and across a small air gap to the electrodes of



Magnetic Circuit

the distributor blocks. High tension cables then carry it to the spark plugs where the discharge or spark occurs for ignition purposes.

The booster electrodes are located so that they trail the high tension electrode on the distributor cylinder to give a retarded spark for starting the engine.

SECTION III

INSTALLATION

Always insure that a magneto has been properly checked and inspected before installing it to an engine.

Timing to the Engine

Install the drive member on the magneto and secure it with its washer, castellated nut, and cotter pin.

Remove the breaker cover, radio shielding, if used, and the distributor blocks. Set the breaker to full advance position by turning it as far as it will go in a direction opposite to forward rotation.

Turn the engine crankshaft until the timing pointer on the engine indexes with the timing disc set for the full advance firing position of No. 1 cylinder. Turn the magneto shaft until the timing marks "A" on the large distributor gear come approximately opposite the timing marks "B" on the inside of the front end plate. (See figure 5.) Install the magneto to the engine as nearly as possible in this position but do not tighten the mounting screws until final adjustment has been made.

Never attempt to adjust engine timing by altering clearance between the breaker contacts, as this would alter the internal timing of the magneto.

By turning magnetos, types VMN7DF and VMN7DF–5 through the range provided by the slots in the mounting flange, or by adjusting the drive coupling of VMN7D, adjust magneto so that contact points just begin to open. Use No. 11–851 timing light or equivalent to determine the position where the contact points start to open.

When the above adjustment is made, tighten and lock the mounting studs.

Wiring

Remove the cable piercing screws from the distributor blocks to avoid any possibility of the high tension cable not being fully seated in the cable holes. Insert the spark plug cable for No. 1 cylinder into the distributor block cable hole marked No. 1, and secure it with the cable piercing screw. Insure that cable piercing screw is tight. Place the spark plug cable for the next cylinder to fire in the distributor block hole marked No. 2, etc. The numerals on the distributor blocks indicate the order in which the sparks are delivered by the magneto and have no relation whatsoever to engine cylinder numbers. It is recommended that the section of cable within the distributor blocks be treated with powdered talc to prevent the cable from fusing to the wall of the hole. Insert the cable from the booster source into the cable hole marked "H" and secure it with the cable piercing screw. No lock washer is required beneath the head of this screw when a booster cable is installed. However, if the magneto is to be operated without the booster cable in place, the screw should be secured with a lock washer.

Before installing radio shields it is recommended that the connections be checked for any short or open circuit and to ascertain whether or not the cables lead to the proper cylinders from the magneto. Either a buzzer or light system or a booster magneto can be used. When using a buzzer or light system, touch the distributor block electrode with one point and the spark plug end of the cable for the proper cylinder with the other. The circuit is complete when the buzzer gives a signal or the lamp lights. If the circuit is not complete, check for a possible open circuit or wrong connection of the cable. To check for a short-circuit due to faulty insulation of the cable, a booster magneto is used. The high tension terminal of the booster magneto is connected to the distributor block electrode. The spark plug end of the cable is held about 1/4" from a grounded object. If no spark occurs, check the cable for faulty insulation.

In installing the radio shields, allow enough slack in the cable to prevent extreme sharp bends. Install the breaker cover, radio shields, and distributor blocks on the magnetos.

SECTION IV

INSPECTION AND MAINTENANCE

Breaker Contacts

Inspection of Breaker Contacts.

At regular inspection intervals remove the breaker cover and check the clearance between the contact points when held wide open by the cam. The clearance should never be less than .012" nor more than .014" (See figure 2).

To Adjust Clearance of Contact Points.

Loosen the lock nut on the long contact screw with wrench No. 11–490. Adjust long contact screw so that there is .012" clearance between the contact points. After adjustment, tighten the lock nut.

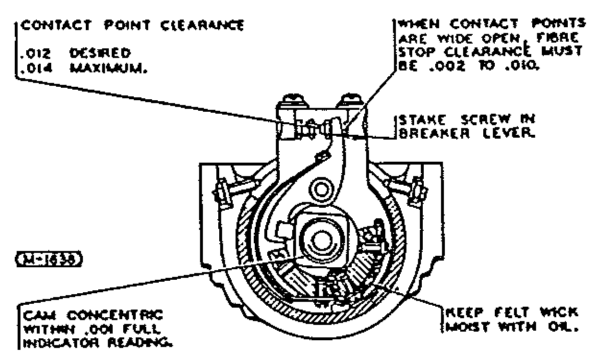


Figure 2
Checking the Breaker

Lubrication

Each magneto has two oil cups. One on the front end plate lubricates the distributor gear axle and the bearing on the drive shaft end of the rotating magnet. The one on the coil cover lubricates the breaker end ball bearing of the rotating magnet.

At regular inspection intervals put 20 to 30 drops of S.A.E. No. 40 oil, or equivalent grade under Army and Navy specifications into the oil cup on the front end plate and 5 to 8 drops only into the oil cup on the magneto coil cover. Excess oil in the front end plate will drain away through the hole in the magneto base.

Avoid over-oiling at the magneto coil cover oiler as excess oil in the breaker end bearing will enter the breaker compartment and cause fouling of the contact points.

Examine the felt wick at the bottom of the contact breaker to make sure it is moist with oil. If oil appears on the surface of the felt when it is squeezed with the fingers, no additional lubricant is needed. If it is dry, however, moisten it with S.A.E. No. 40 oil, or equivalent grade under Army and Navy specifications.

SECTION V

DISASSEMBLY AND INSPECTION

Contact Breaker

Remove breaker cover and advance lever. Take out the two screws which hold the breaker securing ring. Place one of these screws in the tapped hole in the center of the breaker assembly and lift out the breaker and retaining ring. Take out the friction spring ring in the recess behind the breaker assembly.

Check the breaker lever bushing for looseness on its axle. If it is loose, the bushing is probably worn thus requiring replacement of the breaker lever. Inspect the contact points. Should the surfaces need dressing, remove contact screws and place them in the No. 11-1248 contact point block for redressing with the special No. 11-1256 file and No. 11-1269 stone. To do this remove main spring securing screw from breaker housing, the breaker lever axle lock screw, the axle, and the lever assembly and use socket wrench No. 11-1033 to remove the short contact screw from lever. Some care should be taken as the screw is staked to the lever. Use wrench No. 11-490 to remove the long contact screw from the support. Always be sure to restake the short contact screw to the lever after replacing the screw in the lever. The contact point on the long screw should always be redressed when a new breaker lever assembly is installed. If new parts are installed it may be necessary to add or remove shims under the contact support to obtain alignment of the contact points. This may be done by removing the two screws which secure the support to the breaker.

Clean the breaker assembly thoroughly before reassembling.

Check breaker lever tension with gauge No. 11-1864. Tension should be from 16 to 32 oz. If tension is low, it can be usually increased by installing a new long reinforcing spring.

Coil Cover and Distributor Blocks

Remove the safety pin from the clamp screw on top of the distributor blocks. Loosen the screw and remove the clamp assembly and the distributor blocks. Remove the two long screws which hold the coil cover and lift off the cover.

Clean the electrode surfaces in the distributor blocks. Make sure that all electrodes and screws are in good condition. If any electrodes are burned or worn excessively, replace with new ones. Staking tool No. 11-1098 is used to expand new electrodes slightly to hold them in the block when installing for the first time. Place the tool over the electrode and strike it several light quick blows with the mallet. After expanding the electrode, insert and tighten the cable piercing screw. Check height of electrode with No. 11-1078 gauge, removing metal from the top of the electrode with a file, if necessary, until the tip of the electrode will just touch the surface of the gauge.

The booster electrode securing screw does not pierce the booster cable. Accordingly, this screw need be loosened only when replacement of the booster electrode is necessary. Since this does not often occur, the screw is of the half cut type, to prevent inadvertent loosening of the screw when servicing the other electrodes. However, when necessary to tighten or loosen this screw, the No. 11-1083 slotted screwdriver is used. The booster cable fastening screw is located in the hole nearest the booster electrode.

Coil and Primary Condenser

Remove the two screws and lock washers and clamps which secure the coil to the pole shoes. Compress carbon brush and lift off the coil and condenser.

Examine the coil and condenser carefully to be sure there are no breaks or cracks in the dielectric material. For electrical test of the coil and condenser, see Section VII entitled, "Magneto Test Procedure".

Front End Plate, Rotating Magnet and Magneto Housing

Remove the front end plate after having taken out its two screws and the four lock nuts. Use a 3/8" socket wrench for the lock nuts. Tap each side of the front end plate lightly with a rawhide mallet to remove it from the housing.

Remove distributor cylinder after prying out its lock ring with a screwdriver.

Take off the split lock ring on distributor gear axle. Lift off large distributor gear. Make sure the shim washers are kept together for reassembly purposes to maintain the correct adjustment between gear and axle.

Do not loosen the four special screws which secure the axle to the front end plate unless replacement is necessary. The original gear backlash adjustment will then be retained.

Remove rotating magnet from housing and place it in a clean place. Take off insulating plate located in front of pole shoes of the housing. Remove breaker cam using No. 11–1060 puller.

Inspect the distributor gears for burrs or excessive wear. If either gear needs replacement, replace both the pinion and large distributor gears.

Examine the distributor cylinder for cracks or burns. Clean cylinder electrodes with a piece of fine emery cloth. If the cylinder electrodes are worn down to the level of the dielectric at any point, replace the cylinder. Check carbon brush to make sure it operates smoothly without sticking or binding.

Replacement of Drive Shaft and Breaker End Ball Bearings

If any one part of a ball bearing is defective and needs replacement, the COMPLETE BEARING MUST BE REPLACED.

The outer ball races are insulated from the magneto by insulating strips and are also backed by washers of the same material as used in the insulating strips.

Remove the outside race from the front end plate with puller No. 11–1002 and remove the inside race from the magnet with puller No. 11–1065.

Remove the outside ball race from the housing with puller No. 11–992 and the inside race from the magnet with puller No. 11–1049.

Before installing new races in the front end plate and housing, first put in the flat insulating washer in the bottom of the recess for the bearing so that the cut in it will line up with the oil recess. Then spread a few drops of oil evenly over one side of the insulting strip. Bend the strip in a circular form with the oiled side inside and overlap the ends enough to allow the strip to fit loosely into the recess for the outer race. When it is released, it will expand against the walls and the ends will overlap slightly in the recess cut for them. Press in the outside ball race for the front end plate with tool No. 11–976 and the outside ball race for the housing with tool No. 11–970. Cut off the surplus part of the insulating strip.

Press on the inside ball race for the drive shaft end bearing with tool No. 11–1032 which is also used for pressing on the small distributor gear. The small distributor gear can be removed with puller No. 11–1037

Press on the inside ball race for the breaker end bearing with tool No. 11–1036.

Tool No. 11–1350 is used to support magnet in arbor press when pressing on the inner bearing races.

SECTION VI

REASSEMBLY

Before reassembling the magneto make sure that all parts are clean and free from chips or foreign particles.

Front End Plate

Moisten felt wicks with S.A.E. No. 60 oil or equivalent grade under Army and Navy specifications.

Place large distributing gear in position using the original shim washers which were removed so as to insure correct adjustment. Secure gear with a new split lock ring, using tool No. 11–1099. The gear must turn freely on its axle with the minimum perceptible end play.

Place paper washer in position on face of gear. Install distributor cylinder which is located in position with a dog screw. Secure cylinder with its lock ring.

Housing

Make sure that the housing is free from burrs. Install insulating plate.

Rotating Magnet

There are two breaker cam keyways located on the magnet shaft extension of the standard rotating magnet. One keyway is marked "R" and the other "L". Place the cam key in keyway marked "R" for clockwise rotation or in keyway marked "L" for anti-clockwise rotation.

Secure cam in position using keyway marked "D" for clockwise rotation and keyway marked "G" for anti-clockwise rotation.

Recharge magnet using the No. 11–1301 magnet charger which operates on 110 volts D.C. or the 11–1302 magnet charger which operates on 36 volts D.C. Clean and inspect the ball bearings. If satisfactory, repack with ANDOK "C" grease. Make sure that all chips or foreign particles have been removed from the magnet. Place a light coating of oil on the pole pieces of the magnet.

Place the rotating magnet in the front end plate being sure to mesh the chamfered tooth of the small distributor gear with the tooth on the large distributor gear marked "R" for clockwise and "L" for anti-clockwise rotation. (See figure 3). Place the housing over the magnet and secure it to the front end plate with the two screws, two lock washers, and four nuts.

Make sure the rotating magnet turns freely and does not bind at any place. Check the clearance between each pole piece and the pole shoes of the housing. The clearance must not be less than .0015" for any pole piece of the magnet.

Adjustment of Rotating Magnet Bearings

Adjustment of end play is obtained by placing steel spacing washers back of the inner ball races of the magnet shaft. These washers are available in thicknesses of .0025", .004", .005", 008", .010", and .012". If the inner races are removed, always keep the spacing washers which are already installed in the same position.

If the original spacing washers are kept in place, it will be rarely necessary to adjust the rotating magnet bearings. If either or both of the bearings have been removed or replaced they should be adjusted following the procedure as given below.

Remove one of the inside bearing races and remove about one-half of the steel spacing washers. Replace the race and install the rotating magnet in the housing and front end plate. Determine the amount of end play by using an indicator. Install steel spacing wash-

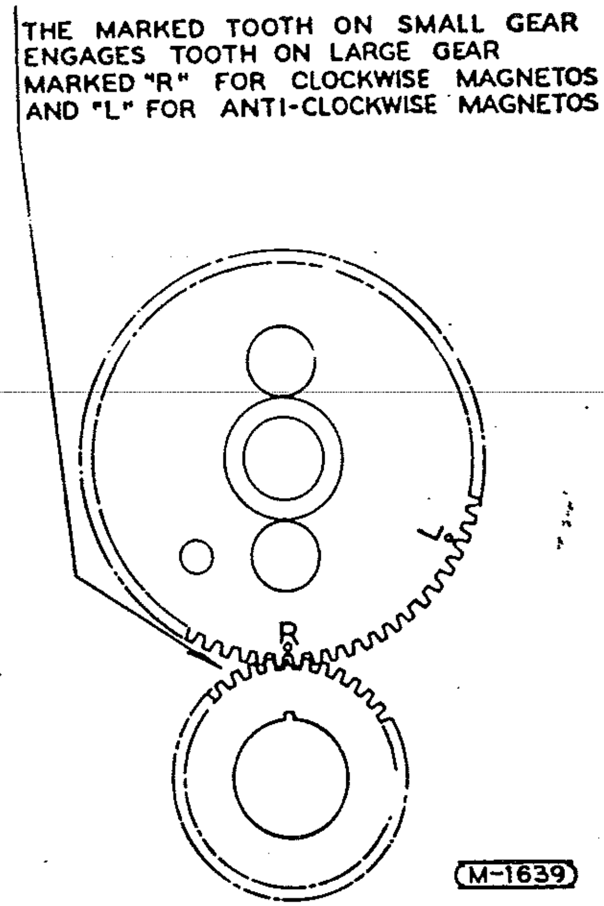


Figure 3
Relation of Timing Marks when Meshing Gears

ers equal to the amount of end play plus .001". (For example, rotating magnet end play .004"+.001"= .005" or amount of steel spacing washers to be added.) Replace inner bearing race and reassemble. This adjustment gives the bearings the correct amount of preload, which should be .001" to .0015".

Adjusting Backlash of Distributor Gear

It will be rarely necessary to adjust the backlash of the gears if the position of the distributor gear axle has not been changed. If a new gear is installed, however, it will be necessary to adjust the backlash of the gears as given in the following paragraphs.

If new gears have been installed, the distributor cylinder should be omitted from the assembly procedure until after the backlash of the gears has been properly adjusted. Adjustment is made by loosening the four screws which hold the distributor axle to the front end plate. Use No.11-1081 screwdriver. Turn the axle slightly with a screwdriver to the right to raise the large gear (loosen mesh) or to the left to lower large gear (tighten mesh). The correct amount of backlash between the large distributor gear and the small distributor gear is .002" to .003" and is measured with indicator No. 11-1221. If the gears have not been replaced, a service tolerance of .010" backlash is allowed. After adjustment is made, tighten and lock the four screws holding the distributor gear axle. Reinstall the distributor cylinder and apply ANDOK "C" grease evenly on the teeth of the large distributor gear.

Contact Breaker

Check the cam with the No. 11-1221 indicator. The lobes of the cam should run true within .001", full indicator reading. It is permissible to tap the cam lightly using a fibre drift to fulfill above requirements.

Insert the spring tension ring in the recess in the breaker housing and install the breaker assembly, securing it with the retaining ring and two screws. Check the clearance between the contract lever and the fibre stop on full contact opening. (See figure 2.) A clearance of .006" is desirable. Replacement of the fibre stop is not necessary however, unless the clearance exceeds .010", nor is it necessary to file the stop down unless the clearance is less than .002".

Internal Timing

Set the clearance between the contact points to .012" using the contact wrench and feeler gauge assembly No. 11-490.

Check the "E" gap of the magneto which is the number of degrees that the magnet turns past neutral in its normal rotation to the place where the contact points begin to open. If variable spark is used, the breaker must be placed in full advance position when measuring the "E" gap.

The "E" gap is measured with the No. 11-1100 timing disc. A suitable pointer must be provided to be used in conjunction with the timing disc. Place timing disc on magnet shaft and place magnet in its neutral position. Note the reading on the timing disc. Then turn magnet in direction of normal rotation until the

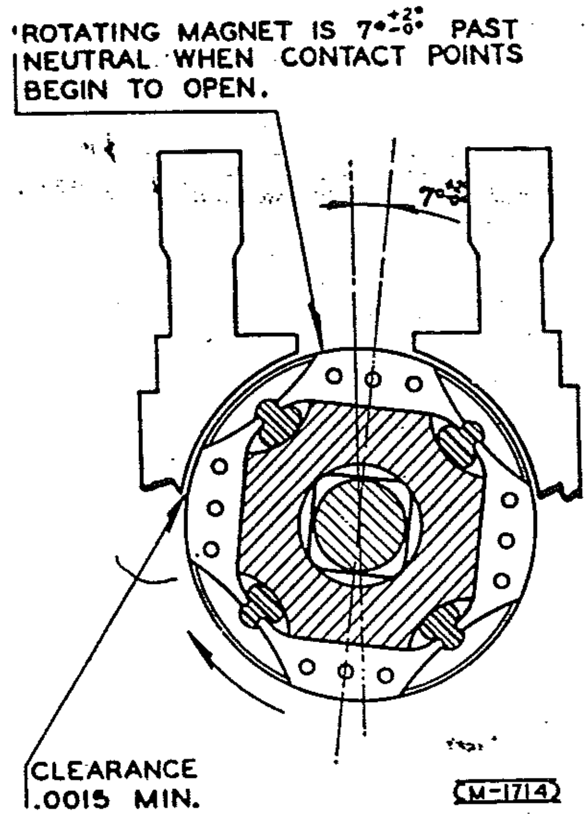


Figure 4
"E" Gap

contact points just begin to open and record the reading. The difference between the two readings is the actual "E" gap which should be from 7° to 9°. (See figure 4.) If reading is outside these limits, adjust breaker stop screws until correct reading is obtained. Socket wrench No. 11-1395 is used for the breaker stop screw lock nuts.

Use No. 11-851 timing light or equivalent to determine the position where the contact points start to open.

With the breaker in full advance position, the timing marks "A" on the large distributor gear (See figure 5) should be opposite the timing marks "B" on the inside of the front end plate.

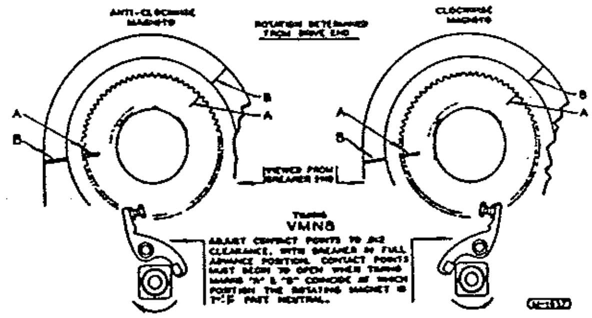


Figure 5
Location of Timing Marks

Completion of Assembly

Remove contact breaker and install coil and condenser.

Reinstall contact breaker. Install coil cover, distributor blocks and breaker cover.

SECTION VII

MAGNETO TEST PROCEDURE

Mount the magneto on the No. 11-790 or equivalant test stand.

Connect the high tension cables to the 7 mm three point spark rack. Run magneto for two or three minutes. Observe mechanical operation.

Check the coming-in speed with the contact breaker in the full advance position. The magneto should spark consistently at 135 R.P.M. If a variable spark magneto is being tested, also check the coming-in speed with the breaker in full retard position at which position sparks should occur consistently at 250 R.P.M.

Increase the speed to 2500 R.P.M. Observe the spark closely. If missing occurs, it may be caused by:

Improper breaker adjustment.
Dirty contact points.
Defective coil.
Defective condenser
(If contacts arc excessively).

Check the ground connection. No spark should occur at the spark rack when the magneto is short-circuited through the ground wire terminal screw.

Connect the cable from the source of booster current to the booster connection in the magneto. Run the magneto at 150 R.P.M. and observe the booster spark at the spark rack. The booster spark always trails the secondary spark.

Rotating Magnet

Operate the magneto for about five minutes at 3500 R.P.M. During this run, short-circuit the primary current several times. Then operate magneto at 400 R.P.M. (This speed must not vary more than 10 R.P.M.) Hold contact points open by inserting a piece of insulating material between them. Connect ammeter 11-1538 in parallel or across the open contact points. The ammeter should not read below 1.7 amperes. If reading is below 1.7 amperes recharge the rotating magnet. (See section VI) Repeat ammeter test. If reading is still below, repeat test with a new coil before rejecting the magnet.

Coil

Before installing the coil in the magneto check the continuity of the secondary winding with the No. 11-2602 (or equivalent) ohmmeter. The actual value of resistance obtained is not of great importance as long as proper continuity is indicated. If the secondary shows an open circuit reject the coil.

The final test of the coil must be made an actual running test of the magneto on the test bench. Also, as heat from the engine affects the insulating materials of the coil, the final test should be made at an elevated temperature. This is done by directing a reflector type heater on the magneto while it is being run on the test bench. When the temperature of the coil has reached approximately 165°F the spark gaps should be increased by means of the adjustable panel from 7 mm to 9 mm. At 2000 R.P.M. the coil must spark consistently at this temperature and spark gap. Increase the gaps to 10 mm. If consistent sparking occurred with the 9 mm gap, intermittent missing with the 10 mm gap will not be sufficient cause to reject the coil.

It may be found that the coil produces consistent sparking at room temperature with 7 mm gaps, however, if the coil does not spark consistently at the elevated temperature with 9 mm gaps, it should not be used for further service.

Primary Circuit Condenser

The condenser should be tested before it is installed on the magneto. At locations where 110 Volt, 60 cycle, alternating current is available, use the No. 11-1767 Primary Condenser Tester, in accordance with the instructions furnished with this tool.

Numerical Service Tool List

Tool No.	*Description*	*Application*
11-490	Contact Point Wrench	To adjust contact points.
11-700	Test Stand	For running test of magneto.
11-851	Timing Light	To determine the position where the contact points open.
11-970	Pressing Tool	To install outside race breaker end ball bearing.
11-976	Pressing Tool	To install outside race drive end ball bearing.
11-992	Puller	To remove outside race of breaker end ball bearing.
11-1002	Puller	To remove outside race of drive end ball bearing.
11-1032	Pressing Tool	For pressing on inside ball race.
11-1033	Socket Wrench	Contact point wrench.
11-1036	Pressing Tool	To install inside race breaker end ball bearing.
11-1037	Puller	To remove small distributor gear.
11-1049	Puller	To remove inside race of breaker end ball bearing.
11-1060	Puller	To remove breaker cam.
11-1065	Puller	To remove inside race of drive end ball bearing.
11-1078	Gauge	To check height of distributor electrodes.
11-1081	Screwdriver (special)	For safety head screws securing distributor gear axle.
11-1083	Screwdriver	To tighten booster electrode screw.
11-1098	Staking Tool	To expand electrodes in distr. block.
11-1099	Pliers	For installing lock ring on distr. axle.
11-1100	Timing Disc.	To check contact point opening at proper time.
11-1221	Indicator	To check back lash of gears.
11-1248	Contact Point Dressing Kit (Includes No. 11-1256 File and No. 11-1269 Stone)	To hold contact points while dressing.
11-1256	File	To smooth rough contact points.
11-1269	Stone	To polish the contact points.
11-1301	Magnet Charger	To magnetize rotating magnet. (Operates on 110 Volts D.C.)
11-1302	Magnet Charger	To magnetize rotating magnet. (Operates on 36 Volts D.C.)
11-1350	Sleeve	To support magnet in arbor press.
11-1395	Socket Wrench	Contact point lock nut.
11-1538	Ammeter	To check magnetic strength by measuring primary current.
11-1767	Primary Condenser Tester	To test primary condenser.
11-1864	Gauge	To check breaker main spring tension.
11-2602	Ohmmeter	To check coil, secondary, resistance.

ALTERNATOR SYSTEM TEST

Some Detail Tests

1. System Voltage Tests

To aid in trouble shooting an alternator system or to check out a new installation, the following voltage measurements, monitored at application system locations, will define to the operator proper system performance prior to start-up. To insure reasonable results, the operator should use a voltmeter which is within calibration limits.

The schematics in Figures 1 through 4 depict the location of voltmeter in the system to monitor the applicable voltage levels. The voltage readings indicated are for referenced purposes, as actual values are dependent upon the level or storage state of your battery. By using the battery voltage (V_1) as the reference level, the remaining voltage measurements should be in the same relative relationship as those used in the sample measurements shown in Figures 1 through 4.

The following delineates the applicable figures to use as a reference based on the alternator system under test:

SYSTEM CAPACITY	SYSTEM CONTROL CONFIGURATION	FIGURE NO.
12 Volt, 50 Amps	Regulator and Separate Suppressor	1
12 Volt, 70 Amps	" " " "	1
12 Volt, 100 Amps	" " " "	1
12 Volt, 50 Amps	Controller (Reg. and Suppressor Combined)	2
12 Volt, 70 Amps	" " " " "	2
12 Volt, 100 Amps	" " " " "	2
24 Volt, 50 Amps	Regulator and Separate Suppressor	3
24 Volt, 70 Amps	" " " "	3
24 Volt, 100 Amps	" " " "	3
24 Volt, 50 Amps	Controller (Reg. and Suppressor Combined)	4
24 Volt, 70 Amps	" " " " "	4
24 Volt, 100 Amps	" " " " "	4

Some Detail Tests (cont.)

When performing the measurement tests, the following conditions should exist:

1. Engine stopped,
2. Battery switch closed,
3. Alternator/Field switch closed.

2. IS the suppressor shorted?

To check for a shorted suppressor or protector, disconnect the protector and observe system function. Proper operation indicates a defective protector. On units with combined regulator/protector, simply disconnect the orange lead. Resistance between the orange and black leads should not be less than 1500 Ω.

3. IS the alternator defective?

   1. Turn master switch of the aircraft to the "Off" position.
   2. Disconnect both the voltage regulator and the voltage protector. Some installations have a combination voltage regulator and a voltage protector packaged in one housing. In this case, it is only required to disconnect the combined unit.

      CAUTION

      Failure to disconnect the voltage regulator, voltage protector or the voltage controller (regulator and protector combined) will result in damage to these units. Failure to comply with this requirement voids warranty.

   3. Turn off all accessory equipment (all electrical loads).
   4. Connect a jumper wire from a battery voltage source directly to the

field lead to the alternator. Be sure this connection makes a direct circuit to the alternator field terminal. What you are doing is effectively by-passing the voltage regulator and preparing to operate the alternator in an unregulated mode.

5. Turn the master switch to "On" position and start the engine.
6. Increase engine RPM to ensure the alternator shaft speed is over 3000 rpm.

CAUTION

System damage can result if the alternator is operated for over 45 seconds with the jumper wire connected.

7. Full current output rating of the alternator should occur, and 2 to 3 times the system voltage should occur. If not, then the alternator is defective. If full output is observed, the alternator is good and the regulator is probably defective.

12V, 70 AMP. SYS. WITH REG. & SUPPRESSOR

12V, 100 AMP. SYS. WITH REG. & SUPPRESSOR.

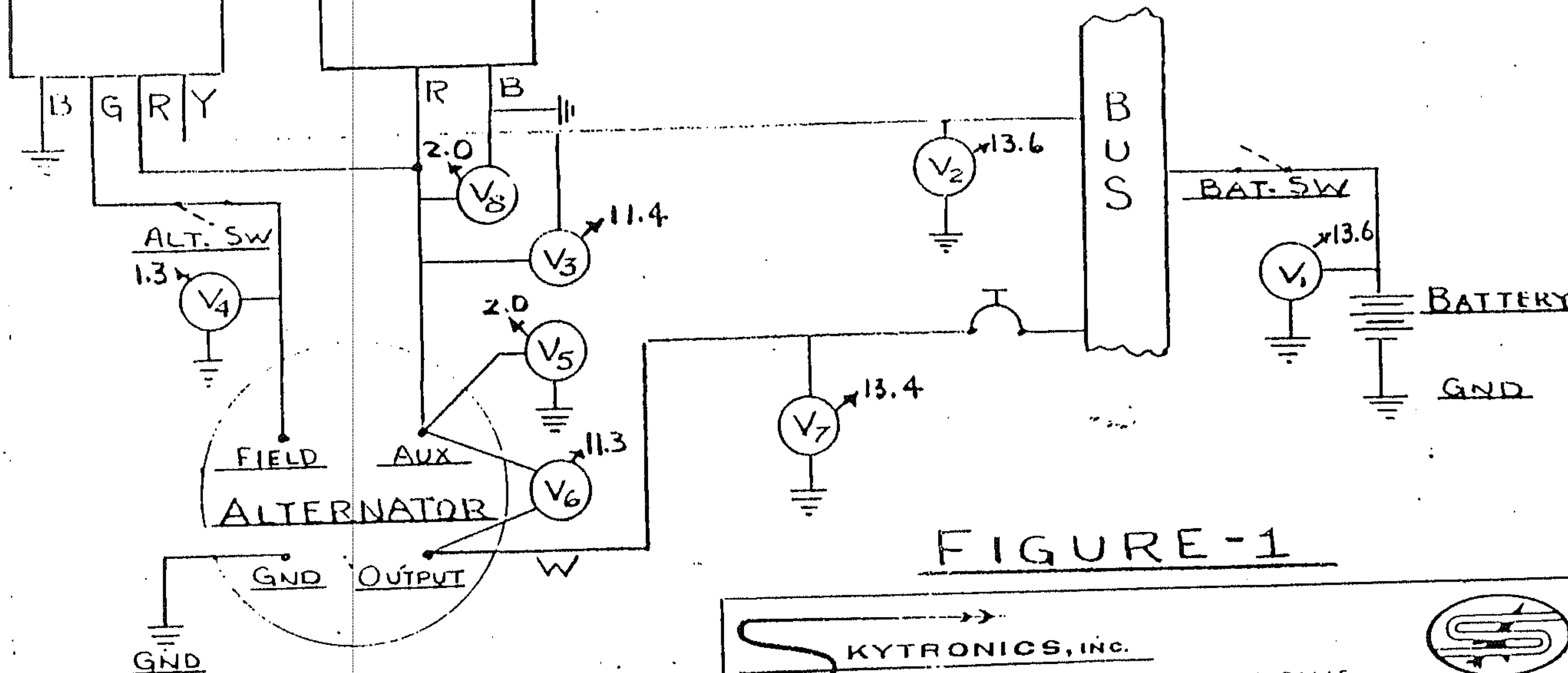


FIGURE - 1

LEGEND

Vx = VOLTMETER, LOCATION FOR FIELD TROUBLE SHOOTING MEASUREMENTS

SKYTRONICS, INC.
EL SEGUNDO, CALIF

MATERIAL N.A.	DATE 12-17-81	DWN. BY JES
SPEC N.A.	SCALE N.A.	APPR BY
FINISH N.A.		

VOLTMETER LOCATIONS FOR TROUBLE SHOOTING

12V, 50 AMP SYSTEM WITH CONTROLLER

12V, 70 AMP SYSTEM WITH CONTROLLER

12V, 100 AMP SYSTEM WITH CONTROLLER

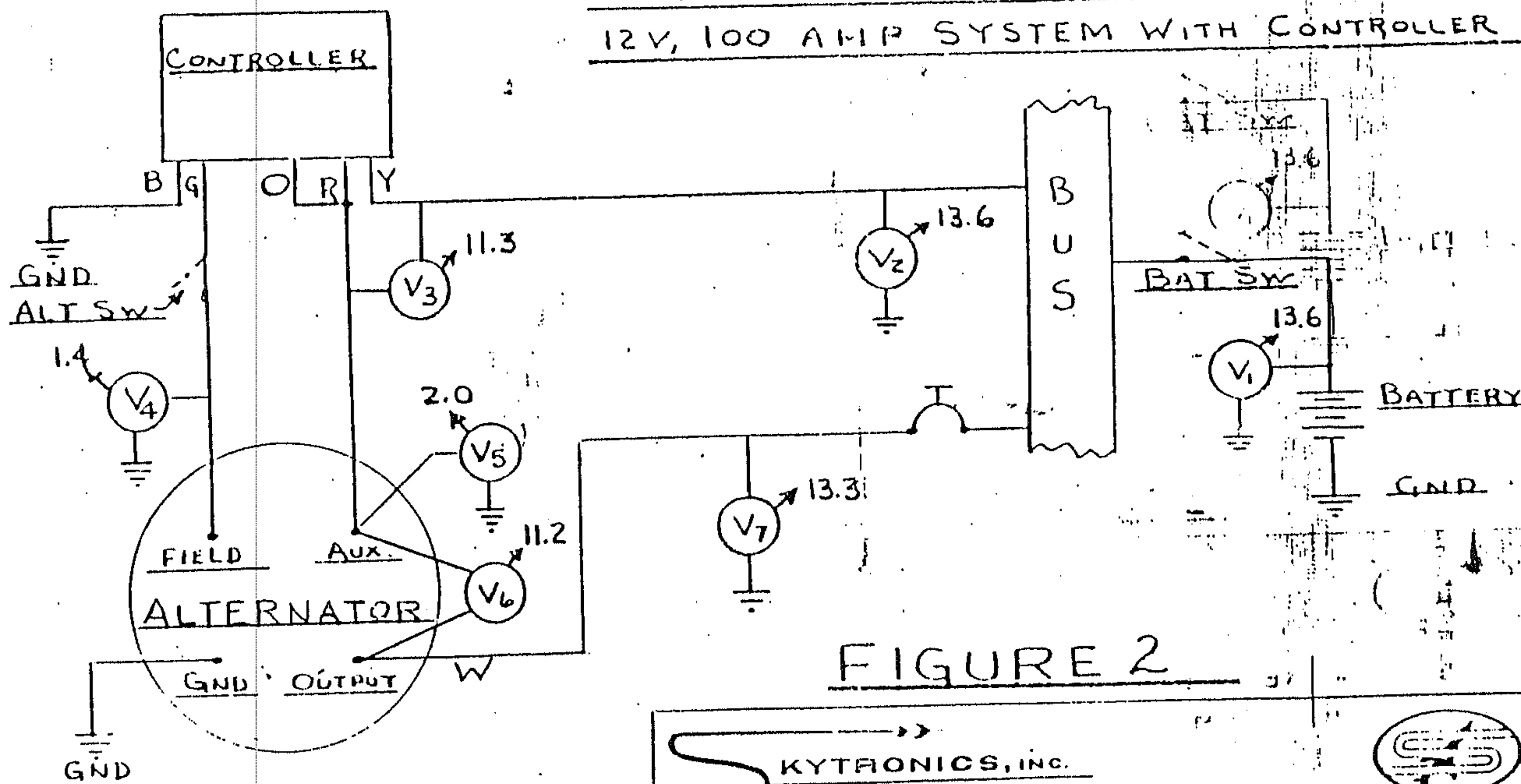


FIGURE 2

LEGEND

V_x = VOLTMETER, LOCATION FOR TROUBLE SHOOTING MEASUREMENTS.

SKYTRONICS, INC.

MATERIAL N.A		DATE 12-16-81	DWN BY JES
SPEC N.A		SCALE N.A	APPR BY
FINISH N.A			

VOLTMETER LOCATIONS FOR TROUBLE SHOOTING MEASUREMENTS

24V, 50 AMP. SYS. WITH REG. & SUPPRESSOR

24V, 70 AMP. SYS. WITH REG. & SUPPRESSOR

24V, 100 AMP. SYS. WITH REG. & SUPPRESSOR

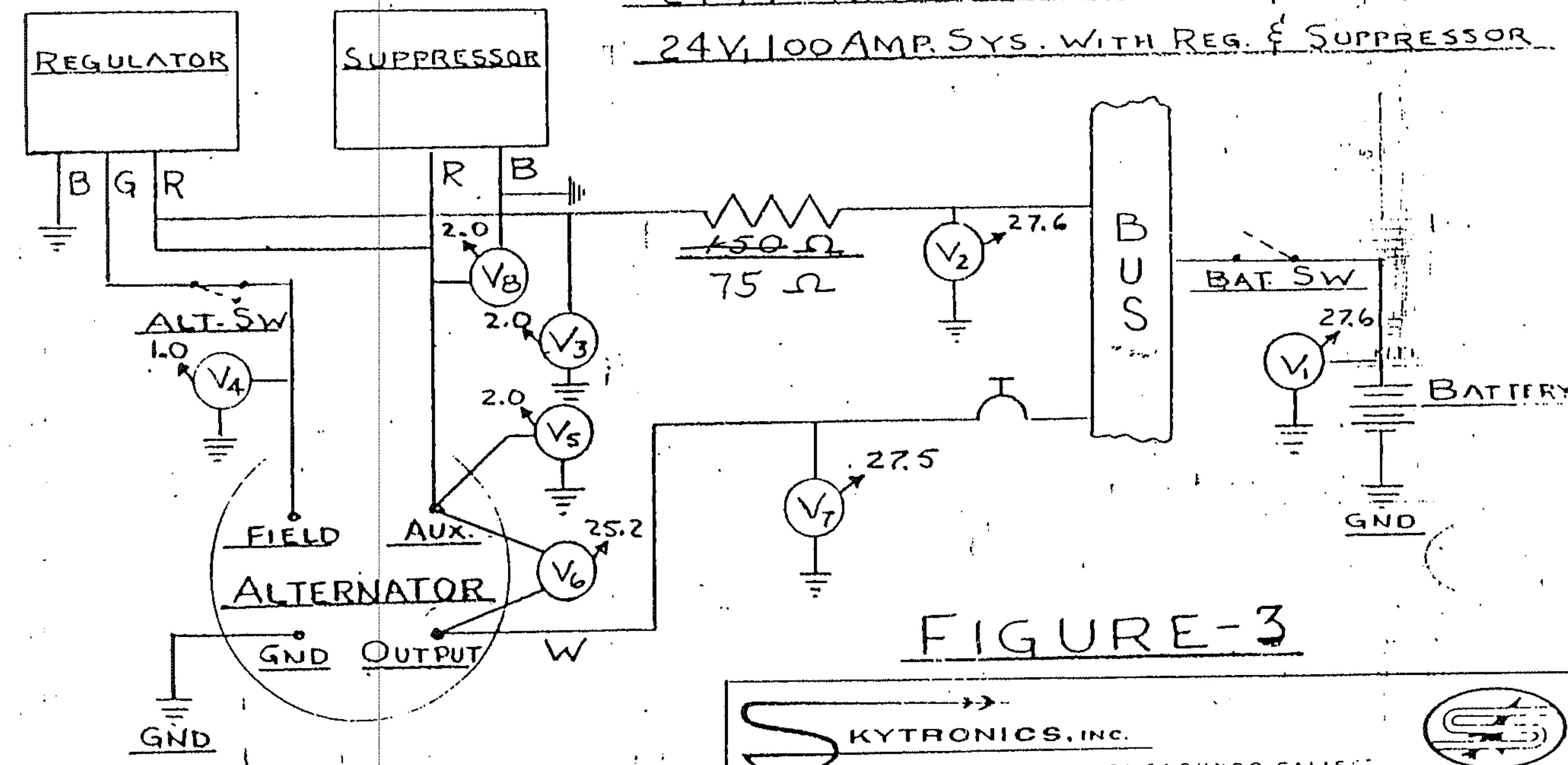


FIGURE-3

LEGEND

(Vx) = VOLTMETER, LOCATION FOR FIELD TROUBLE SHOOTING MEASUREMENTS

SKYTRONICS, INC.
EL SEGUNDO, CALIF.

MATERIAL N.A	DATE 12-17-81	DWN BY JES	
SPEC N.A.	SCALE N.A	APPR BY	
FINISH N.A			

VOLTMETER LOCATIONS FOR TROUBLE SHOOTING

24V, 50 AMP. SYSTEM WITH CONTROLLER
24V, 70 AMP. SYSTEM WITH CONTROLLER
24V, 100 AMP. SYSTEM WITH CONTROLLER

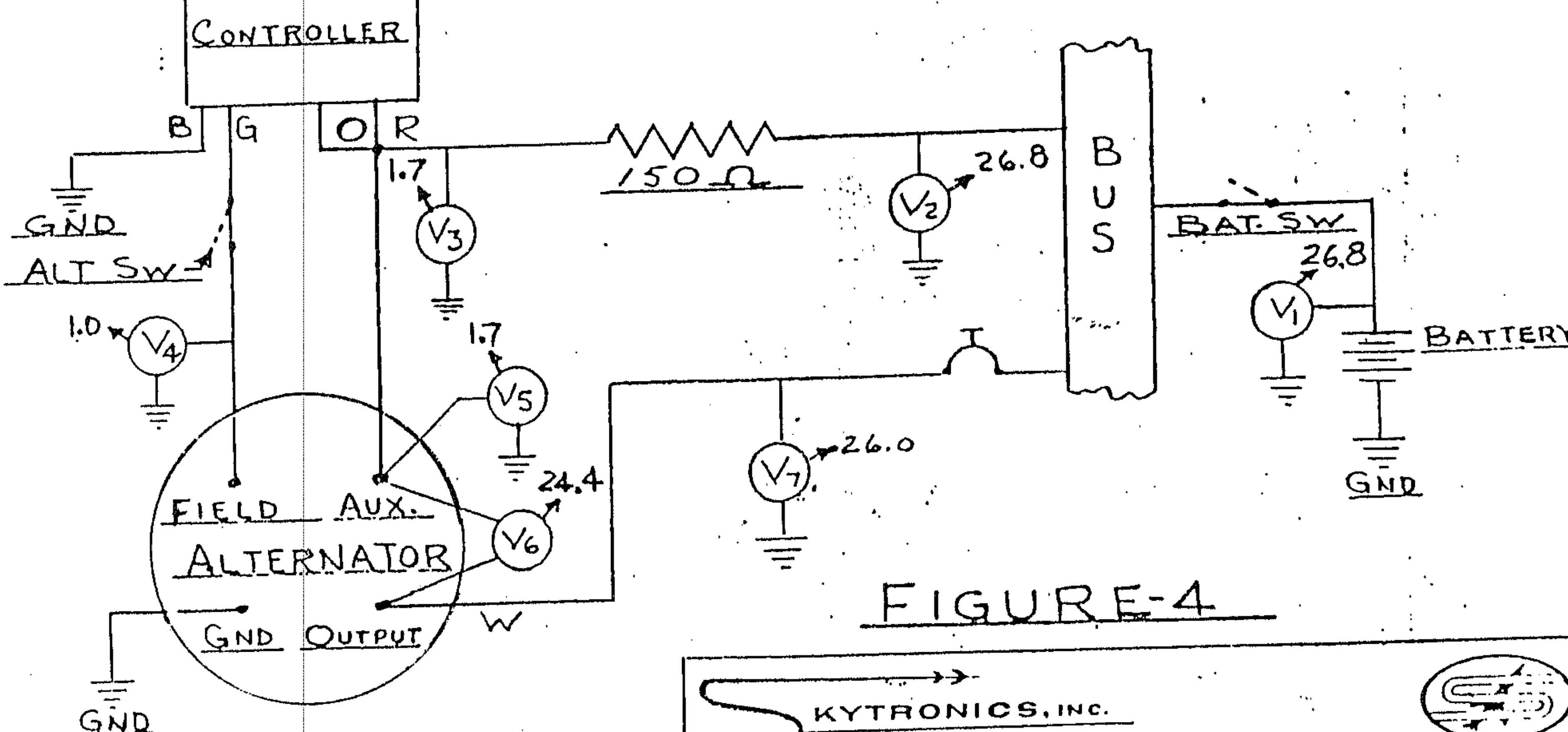


FIGURE-4

LEGEND

V_x = VOLTMETER, LOCATION FOR FIELD TROUBLE SHOOTING MEASUREMENTS

SKYTRONICS, INC.
EL SEGUNDO, CALIF.

MATERIAL	N.A	DATE 12-17-81	DWN. BY JES
SPEC	N.A.	SCALE N.A.	APPR BY
FINISH	N.A		

VOLTMETER LOCATION FOR TROUBLE SHOOTING MEASUREMENTS

BRACKETT AIR FILTER DOCUMENT I-194

PLACE IN AIRCRAFT RECORDS

CONTINUED AIRWORTHINESS INSPECTION
REQUIREMENTS AS PER FAR 23.1529
AND GENERAL PROCEDURES OF PART 43

INSPECTION INTERVALS: Pre-flight inspections, engine backfire inspection, 100 hour inspections, annual inspections, filter element replacements.

INSPECTION PROCEDURES

A. Pre-flight inspection: Per Pilots Operating Handbook, check filter assembly for security, damage or 50% contamination of element face. If found report to maintenance personnel prior to flight.

B. Engine start-up backfire inspection: Prior to flight, check the entire intake system for security or damage. If a fire was present, the downstream face of the foam element will show erosion. If any irregularities are found see Chart I and also refer to the Aircraft Maintenance Manual for the intake system.

C. At element replacement intervals: With the element removed, inspect the filter grill, filter frame, filter mountings and entire intake system for security, wear and any deformation. Note: On filter assemblies with gaskets, visually inspect inside and outside of frame for any signs of gasket looseness, movement or deterioration. If found refer to Chart I or the proper maintenance manual for your aircraft or component.

PART	REPLACE	REWORK	INSTRUCTIONS
FRAME	X		COMPLETE NEW ASSEMBLY
GASKET	X		ON FILTER FRAME, REMOVE OLD NEOPRENE GASKET AND ALL TRACES OF ADHESIVE DOWN TO A CLEAN ANODIZED FRAME SURFACE. USE ADHESIVE 3M#847 OR DOW CORNING RTV-732. COAT ENTIRE MATING SURFACE (GASKET TO FRAME). APPLY ADHESIVE FOLLOWING MANUFACTURER'S LABEL DIRECTIONS. WHEN FRAME AND GASKET ARE PLACED TOGETHER, CLAMP OR WEIGHT DOWN AT .75 LB./SQ. IN. OF CONTACT AREA. ALLOW TO CURE 24 HOURS PRIOR TO INSTALLATION. PRIOR TO REINSTALLATION OF FILTER, CHECK AIRBOX MATING SURFACE FOR IRREGULARITIES. IF FOUND, CORRECT PER MANUFACTURER'S REQUIREMENTS. UPON REINSTALLATION CHECK THAT THE GASKET MAKES 100% CONTACT. THE GASKET SHOULD BE COMPRESSED 50% FOR OPTIMUM SEAL.
GRILL	X		REPLACE WITH NEW GRILL
HARDWARE	X		REPLACE UNSERVICEABLE WITH NEW
SCREEN	X		COMPLETE NEW ASSEMBLY
SCREEN/GASKET	X		COMPLETE NEW ASSEMBLY (ASSEMBLIES USING SCREEN GASKETS PRE 1981; BA-4106, BA-5110 AND BA-8110.)
ELEMENT	X		REPLACE ELEMENT

DATE: 3-16-94

CHART 1

BRACKETT AIR FILTERS

INSTRUCTIONS

ASSEMBLY PART NO. BA-2710

APPROVED ON AIRCRAFT MODELS: SEE FAA APPROVED APPLICABILITY LIST ON REVERSE SIDE.

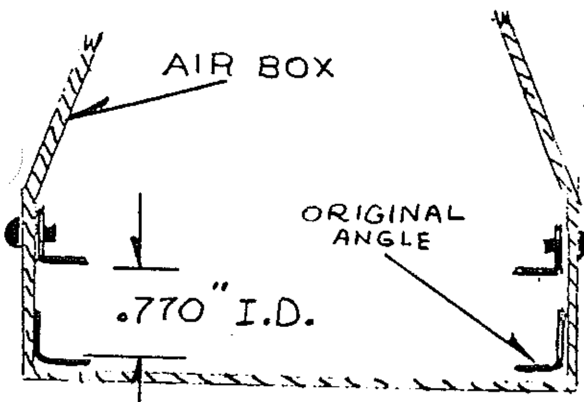
REPLACES: CESSNA PN 52294

FAA APPROVAL DATA: STC-SA71GL List No. 1
FAA-PMA Supplement No. 1

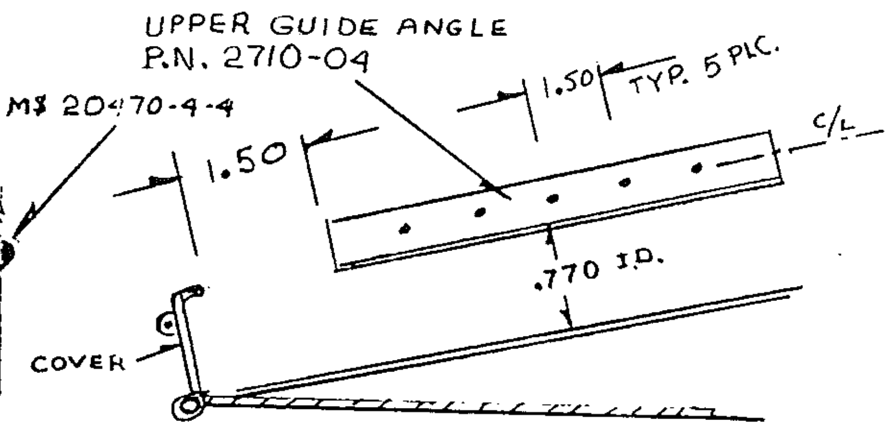
Your new polyurethane air filter element has been designed to give maximum dust collecting efficiency, good air flow, lightweight and economical replacement. The element has been treated with a special treatment called a wetted agent and is approximately 98% efficient. The special wetted agent is the secret to the efficiency of capturing dust and repelling water. The element has also been treated with a fire retardant. DO NOT WASH AND REUSE.

Servicing: Under normal conditions, replace filter element PN BA-2705 after 100 hours use or 1 year intervals. Under severely dusty conditions, check daily and replace when element is 50% covered with foreign material.

Step 1. Installing upper guide angles. These angles are to be installed so the filter is retained in between and can be slid in and out for servicing.



CROSS SECTION FRONT VIEW



CROSS SECTION SIDE VIEW

Kit includes:

2 EA PN 2710-04 GUIDE ANGLES.
10 EA MS20470-4-4 RIVETS.

NOTE: An easy method to keep the angles aligned while installing is to leave the original filter in the air box and place the angles in position on top of the filter for drilling.

Step 2. Remove element PN BA-2705 from bag. Squeeze out excess wettant and install element between the frame. Make sure the element notches fit the frame tabs.

Step 3. Install filter into the cowl using the same procedure as with the original filter.

Step 4. Apply service decal to the outside of the filter door. PLACE SO IT IS READABLE.

Instruction Sheet
Part No. BA-2710-02
Date: 1-20-86

Mfg. by:
Brackett Aircraft Co., Inc.
Kingman, AZ

A

MAINTENANCE PROCEDURE

FOR THE

40-223/30-176

WHEEL AND BRAKE ASSEMBLIES

USED ON THE WACO YMF-5

Dated July 31, 1985

1. MAINTENANCE

1.1 Wheel Maintenance

1.1.1 Inspect wheel half flanges for cracks and corrosion.

1.1.2 Inspect brake disc assembly for cracks, excessive wear or scoring, rust and corrosion. Disc should be replaced when worn to a thickness of .163 in. See Figure 4.

1.1.3 Check for loose bolts and nuts and retighten or replace if necessary.

-NOTE-

No repair or replacement is recommended while equipment is on aircraft.

1.2 Brake Maintenance

1.2.1 Visually check the brake for hydraulic leakage.

1.2.2 If brake pedal is not firm, bleed brakes again.

1.2.3 Check for loose bolts and nuts and retighten or replace as necessary.

1.2.4 Visually check lining for excessive wear or edge chipping. Linings should be replaced when worn to a thickness of .100 in. See Figure 4.

1.2.5 Recommended wear limits for discs and linings - See Section 2.2.5.

2. OVERHAUL

2.1 Wheel Overhaul

-NOTE-

Should be accomplished only while wheel is removed from aircraft.

July, 1985

2.1.1 Dismounting

2.1.1.1 Deflate tire. Back plates must be removed from brake before wheel removal. Remove hub cap, axle nut and outboard spacer. Remove wheel and tire assembly from axle as a unit. Remove snap ring, grease seal, and bearing cone from inner wheel half.

2.1.1.2 Break tire beads away from wheel flange with a bead breaker or pneumatic tire dismounter.

-CAUTION-

DO NOT USE TIRE IRONS. THEY MAY DAMAGE THE WHEEL FLANGES OR TIRE BEADS.

2.1.1.3 Remove nine (9) nuts, washers, and bolts from the wheel assembly and remove brake disc.

2.1.1.4 Separate the wheel halves and remove the tire and tube.

-NOTE-

Bearing cups are shrunk fit into the wheel halves and should not be removed unless replacement is necessary. If a bearing cup is to be replaced, heat the wheel half to 149 degrees C (300 degrees F) maximum for 20 minutes before trying to remove the cup. Support the wheel hub while removing the bearing cup shown in the following Figure 1.

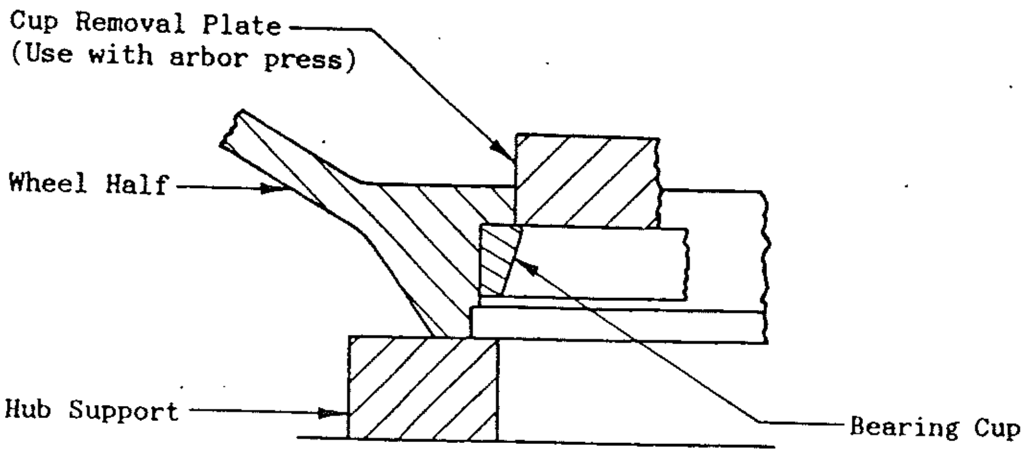


Figure 1 Supporting Wheel Hub

July, 1985

2.1.2 Cleaning

2.1.2.1 Clean all metal parts in a suitable solvent and dry with a lint free cloth.

2.1.2.2 Wipe bearing grease seal clean with dry cloth. Do not use cleaning solvents on rubber components used in this wheel assembly.

2.1.2.3 Wash bearing cones in uncontaminated cleaning solution, rotate the bearing cones by hand while submerged in the solution. Repack bearings with grease immediately after inspection to prevent corrosion and place in a clean, closed container.

-CAUTION-

DO NOT SPIN DRY BEARINGS OR HANDLE WITH BARE HANDS.

2.1.2.4 Parts requiring fluorescent inspection are to be completely stripped using acetone or equivalent. Air dry parts after stripping is completed.

2.1.3 Inspection

-NOTE-

Inspect bolts and wheel halves after the fifth tire change, and then after the third subsequent tire change, for a total of twenty tire changes, and then at each and every tire change thereafter

2.1.3.1 Magnaflux wheel bolts for cracks and breaks.

2.1.3.2 With dye penetrant, inspect wheel halves for cracks and breaks. Note in particular the bead seat, tube well, and web junction areas.

2.1.3.3 Visually inspect all metal parts for pitting, corrosion, cracks, breaks, uneven wear, and other surface defects.

2.1.3.4 Inspect bearing grease seal felt for cuts and other defects. Replace as necessary.

2.1.4 Repair and Replacement

2.1.4.1 Repair scratches, nicks, corrosion, and other surface blemishes on wheel halves by sanding with emery cloth, removing as little material as possible. Polish repaired surfaces with 400 grit emery cloth.

2.1.4.2 Paint repaired areas with two of coats zinc chromate primer, and one coat of aluminum lacquer.

-CAUTION-

NEVER PAINT WORKING SURFACES OF BEARING CUPS.

2.1.4.3 Replace all parts worn or damaged beyond limits of repair.

2.1.4.4 To replace bearing cups, proceed as follows:

2.1.4.4.1 Heat wheel halves to 149 degrees C (300 degrees F) maximum and cool cups to -18 degrees C (0 degrees F).

2.1.4.4.2 Support wheel hub and paint the ID of the hub with zinc chromate primer. Then press cup into wheel half as shown in Figure 2.

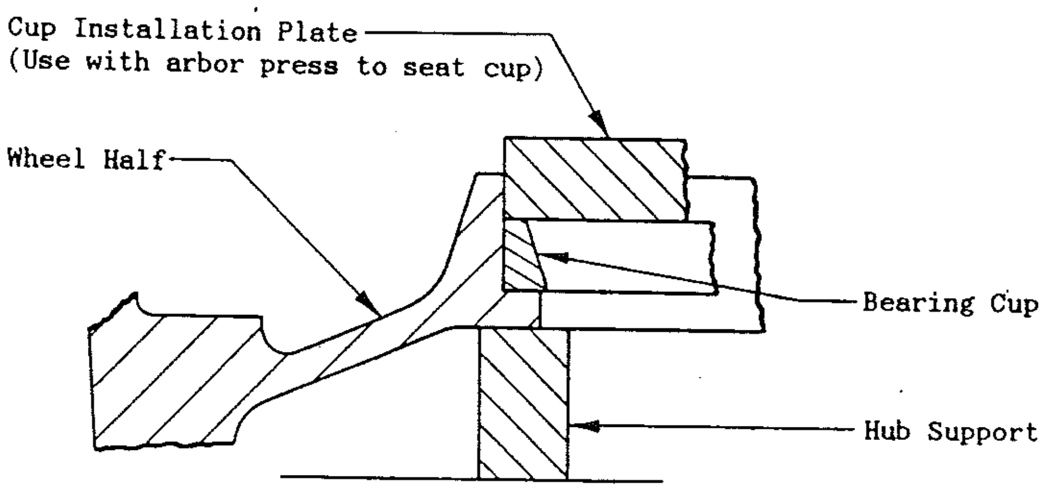


Figure 2 Supporting Wheel Hub

-NOTE-

The wet zinc chromate primer lubricates the parts to be pressed together and acts as protection against galvanic corrosion between the parts.

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2.1.5 Lubrication

2.1.5.1 Pack Mobilux EP2 or equivalent into bearing cones and smear grease on ends of rollers. Do not over lubricate. Spread a thin coat of grease on the surface of the bearing cups.

2.1.5.2 Lubricate threads of bolts and nuts and face of washers with thread compound.

2.1.6 Reassembly

2.1.6.1 Position disc and wheel half on a flat surface with register side up.

2.1.6.2 Place a serviceable tire & tube over inner wheel half and then place outer wheel half in the tire, making sure to properly align inner and outer wheel registers.

2.1.6.3 Slide tie bolts through wheel assembly. Install washers and nuts on tie bolts and torque to 90 in-lbs.

2.1.6.4 Inflate tire to proper pressure in a safety cage.

2.1.6.5 Install bearing cones to inner wheel half and outer wheel half.

2.1.6.6 Install grease seal, hub cap and snap ring into the inner and outer wheel halves.

2.2 Brake Overhaul

2.2.1 Dismounting

-NOTE-

It is not necessary to remove the wheel from the aircraft to disassemble and service brake assembly

2.2.1.1 Remove and cap hydraulic line.

2.2.1.2 Remove the cylinder tie bolts and remove back plates.

2.2.1.3 Remove the brake cylinder assembly from the torque plate (the torque plate will remain mounted to the axle).

2.2.1.4 Remove the pressure plate assembly, inlet fitting, and bleeder fitting.

2.2.1.5 The pistons may be removed by applying a slight amount of air pressure to the inlet or outlet ports of the cylinder.

2.2.1.6 Remove the O-rings from cylinder.

2.2.1.7 If necessary, the anchor bolts may be removed by using a holding fixture and arbor press. If possible, place the anchor bolts into the holding fixture so that the anchor bolt is piloted while being removed.

-CAUTION-

CYLINDER MUST BE SQUARE WITH ARBOR IN STEPS A AND B SO THAT THE ANCHOR BOLTS DO NOT COCK.

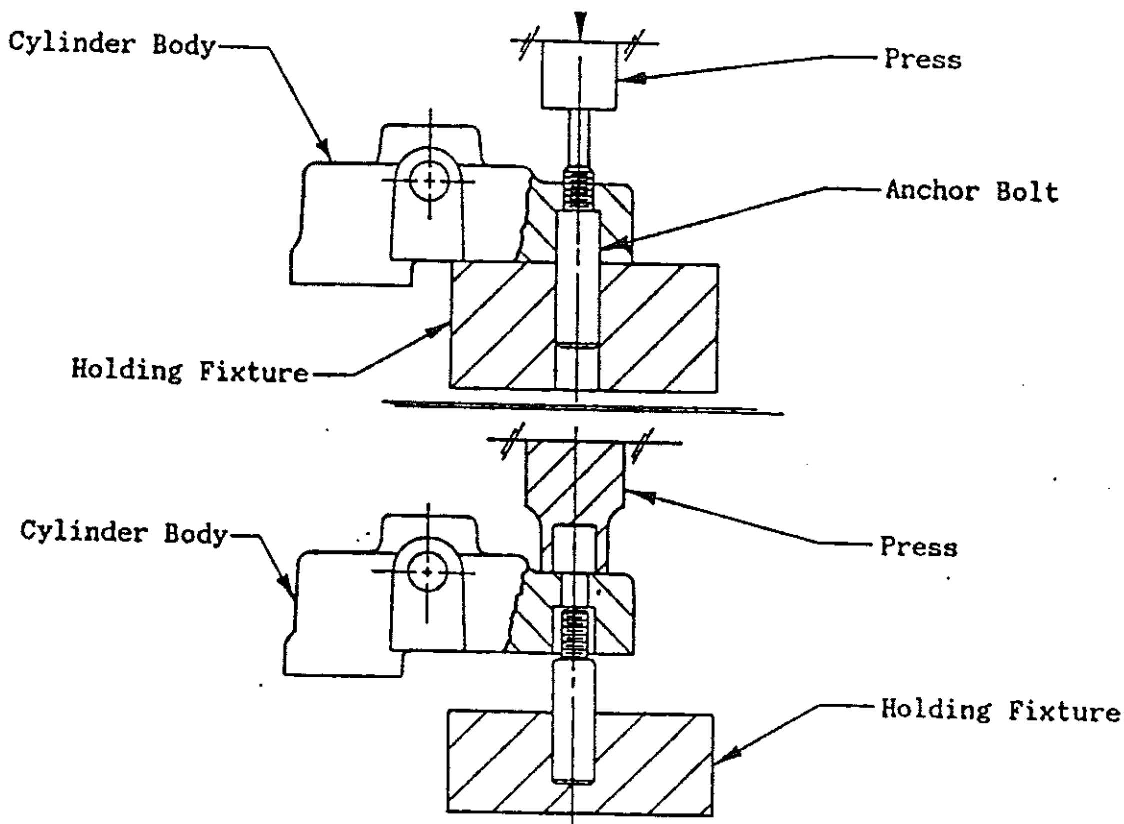

Figure 3 Anchor Bolt Removal

July, 1985

2.2.2 Cleaning

2.2.2.1 Clean all metal parts in alcohol or suitable solvent.

2.2.2.2 Discard all O-ring seals.

2.2.3 Inspection

2.2.3.1 Inspect brake cylinder for cracks, especially in the lug area around the anchor bolts. Cracks in this area necessitate cylinder replacement.

2.2.3.2 Small nicks and light corrosion may be blended and removed with emery or sand paper. Any area from which the protective coating is removed should be thoroughly cleaned, and repainted with one coat of zinc chromate primer, and one coat of aluminum lacquer.

2.2.3.3 Inspect the fitting ports and piston bores for contamination. Light scratches or nicks in the piston bores, pilot bores, or on the chamfered surfaces within these bores may be polished out with #600 grit emery. NOTE: Nicks and burrs in the pilot bore area can prevent the pistons from properly retracting, resulting in brake drag.

2.2.3.4 Thoroughly clean out any residue upon completion of step 2.2.3.3. Any external surfaces around the piston bores from which the protective coating has been removed should be cleaned, and painted with one coat of zinc chromate primer and one coat of aluminum lacquer.

-NOTE-

Do not paint internal surfaces of piston bores.

2.2.3.5 Inspect pistons for nicks or burrs. Remove nicks or burrs by polishing with #600 grit emery. Thoroughly clean before reinstallation.

2.2.3.6 Inspect brake lining for radial cracks around rivets and surface deterioration. See section 2.2.5 for wear limits.

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2.2.3.7 Lining replacement can be accomplished by drilling out rivets, using a 5/32 inch drill. Install new linings in place, using 105-00200 rivets.

-NOTE-

If the linings are changed, but the pistons are not removed from the cylinder, clean the exposed surfaces of the pistons before displacing the pistons back into the cylinder.

2.2.3.8 Inspect pressure plate and back plates for cracks or warpage. Replace if cracked or severely deformed.

-NOTE-

Slightly warped pressure plates with relief slots can be fixtured in a vise and straightened when laid on a flat surface, flatness should be within .010 TIR. Warped pressure plates can cause brake drag.

2.2.3.9 Inspect anchor bolt holes in torque plate for internal corrosion or contamination. If present, clean with emery and apply a light coat of dry lube.

-NOTE-

For best service life, the cylinders must slide freely in the torque plate.

Check the anchor bolt hole and mounting bolt hole areas for elongation or cracks. Badly elongated or cracked parts should be replaced with new parts of corresponding part number. Minor corrosion on the torque plates may be removed with #600 grit emery.

-NOTE-

Surfaces from which the protective coating is removed should be painted with one coat of zinc chromate primer, and one coat of aluminum lacquer.

2.2.3.10 Inspect tie bolts for cracks, thread damage, or corrosion and replace if necessary.

2.2.4 Reassembly

2.2.4.1 If removed, press anchor bolts (ref. Figure 3) into brake and install washers and nuts. Torque nuts to 85-90 in-lbs.

2.2.4.2 Install inlet and bleeder fitting.

2.2.4.3 For piston installation, lubricate the piston, O-ring, and piston bore with a small amount of MIL-H-5606 hydraulic fluid. Place piston in bore and rotate to seat drag ring and insure that piston and seal are in proper alignment. Tap the piston with a wooden or plastic mallet while alternately rotating. If considerable effort is required, remove piston and inspect bore and pilot bore area for damage. If the bore is damaged, check the corresponding area of the piston for damage. Repair, if necessary, and repeat the above procedure.

2.2.4.4 Install pressure plate assembly by aligning anchor bolt holes with anchor bolts and slide onto cylinder. The pressure plate must float freely on the anchor bolts.

2.2.4.5 Install brake assembly to torque plate by aligning anchor bolts with torque plate holes and sliding brake assembly onto torque plate (it must slide freely).

2.2.4.6 Install washers and tie bolts. Install back plate assemblies between brake disc and wheel flange, and align with tie bolts. Torque bolts to 85-90 in-lbs.

2.2.4.7 Reconnect hydraulic lines and bleed system. Check pedal for proper feel and travel.

A

2.2.5 Wear Limits

2.2.5.1 Maximum wear limits for brake linings and discs are shown in the following sketch. Disc warpage should not exceed .015 in.

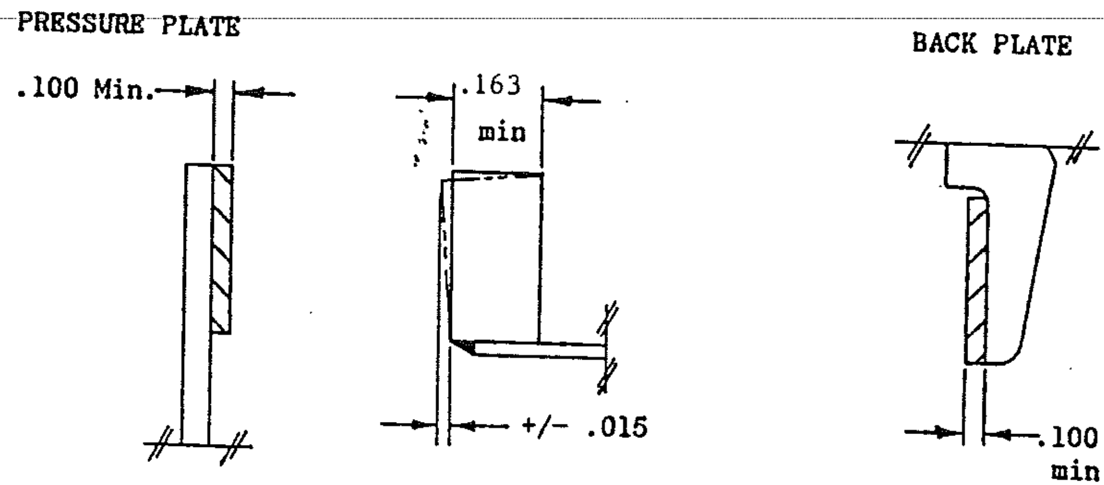
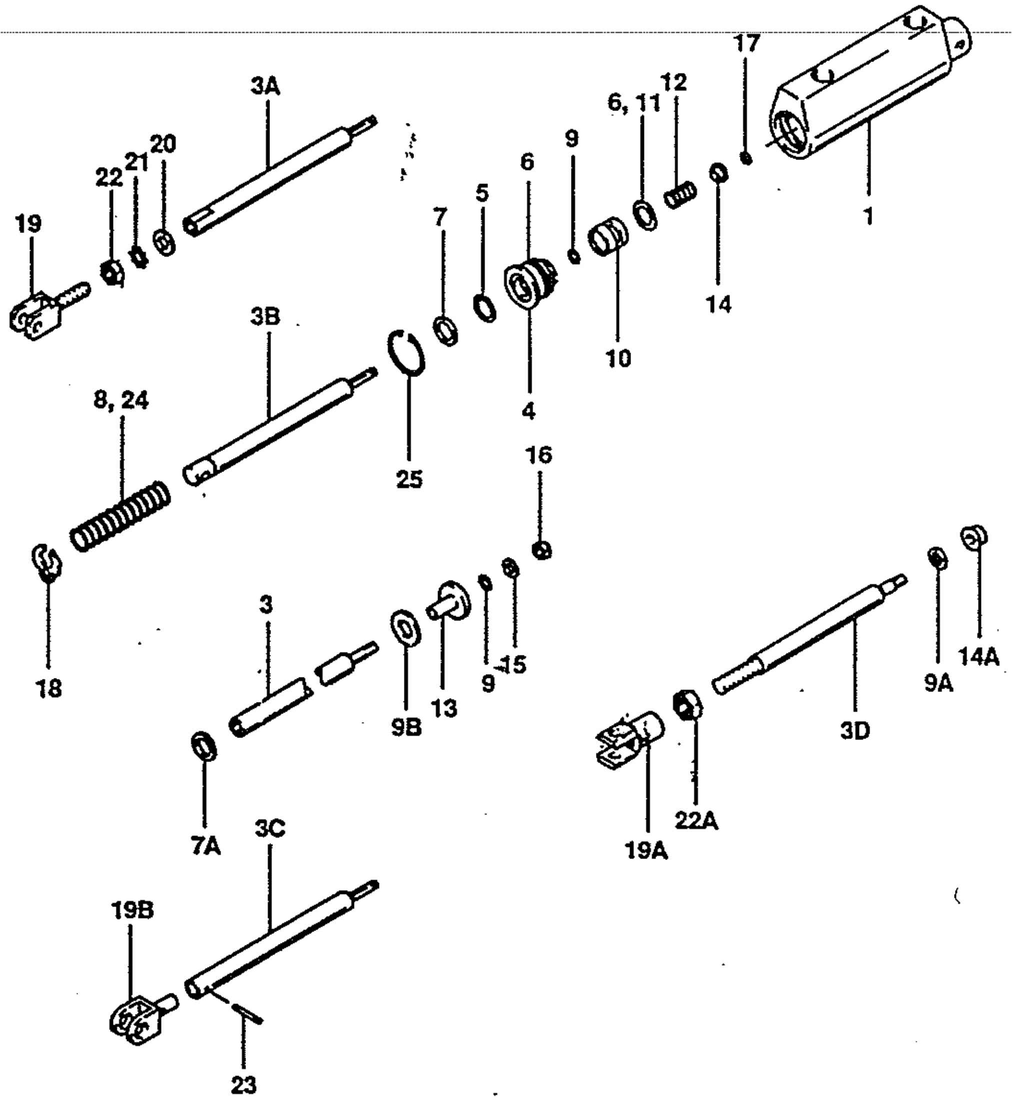


Figure 4
Lining and Disc Wear Limits

July, 1985

Hydraulic
Master Cylinders
Nonreservoir Type

10-23A, 10-23C, 10-24B, 10-24C, 10-30, 10-30A,10-67, 10-70, 10-70A, 10-70B



Rev. F
July 31, 1991

Master Cylinders
Nonreservoir Type

10-23A, 10-23C, 10-24B, 10-24C, 10-24D, 10-30, 10-30A, 10-67, 10-70, 10-70A, 10-70B

FIG.	PART NUMBER	DESCRIPTION	QTY. PER ASSY. A	B	C	D	E	F	G	H	I	J	K
1	144-32	Cylinder Body			1					1		1	1
	144-36	Cylinder Body	1								1		
	144-37	Cylinder Body		1		1							
	144-62	Cylinder Body					1						
	144-68	Cylinder Body						1					
	144-73	Cylinder Body							1				
2	182-20	Piston Rod Assy.		1		1							
	182-22	Piston Rod Assy.			1					1			
	182-24	Piston Rod Assy.	1								1		
	182-31	Piston Rod Assy.					1						
	182-42	Piston Rod Assy.						1	1				
	182-72	Piston Rod Assy.										1	
3	142-7	Rod-Piston	1								1		
3A	142-37	Rod-Piston		1		1						1	1
3B	142-39	Rod-Piston			1					1			
3C	142-74	Rod-Piston					1						
3D	142-79	Rod-Piston						1	1				
4	141-8	Gland-End	1								1		
	141-12	Gland-End		1		1							
	141-25	Gland-End			1		1			1		1	1
	141-44	Gland-End						1	1				
5	101-7	O-Ring (AN6227-7)	1	1		1							
	101-50110	O-Ring (MS28775-110)			1		1			1		2	
	101-50342	O-Ring (MS28775-012)						1	1				
6	101-50113	O-Ring (MS28775-113)		2	1	1	1	2	2	1		1	
	101-11	O-Ring											1
	101-14	O-Ring (AN6227-14)	2								2		
7	95-13	Washer-Wiper		1	1	1	1			1		1	1
7A	95-106	Washer-Wiper	1								1		
8	82-9	Spring-Return			1					1		1	1
	82-19	Spring-Return	1								1		
	82-21	Spring-Return	1	1	1	1	1	1	1	1	1	1	
	82-52	Spring-Return		1									
	82-70	Spring-Return					1						
9	101-50006	O-Ring (MS28775-006)		1	1		1			1		1	
	101-50008	O-Ring (MS28775-008)	1										
	101-3	O-Ring (MS28775-008)									1		
9A	95-26	Stat-O-Seal (600-001-10)						1	1				
9B	95-251	Washer-Seal (5615-36-62)	1								1		
10	148-23	Piston		1		1							
	148-25	Piston			1					1		1	1
	148-26	Piston	1								1		
	148-38	Piston						1	1				
	148-43	Piston					1						
11	101-8	O-Ring-Piston (AN6227-8)			1					1			2
	101-50111	O-Ring-Piston (MS28775-111)					1						
12	82-10	Spring-Piston	1								1		
	82-21	Spring-Piston		1	1	1	1			1		1	1
	82-56	Spring-Piston						1	1				
13	146-5	Valve	1								1		
14	145-58	Bushing		1	1	1	1			1		1	1
14A	145-65	Spring Guide						1	1				
15	95-101	Washer											1
	95-103	Washer (AN960-10)	1								1		
	95-156	Washer										1	1
16	94-102	Nut-Lock (AN364-1032)	1								1		
	94-30	Nut (AN316-4)				1						1	1
17	155-48	Snap Ring (TS304-15)		1	1	1	1			1		1	1
18	155-50	Snap Ring Rod (TS304-37)			1					1			
19	143-9	Clevis-Rod		1		1						1	
19A	143-13	Clevis-Rod						1	1				
19B	143-18	Clevis-Rod					1						
20	95-101	Washer (AN960-616L)		1		1						1	1
21	95-156	Washer-Star (#1214)		1									
22	94-30	Nut-Check (AN316-4)		1		1							1
22A	94-43	Nut-Check (AN316-5)						1	1				
23	223-23	Roll-Pin (79-022-094-375)					1						
24	82-74	Spring-Return						1	1				
25	155-11	Snap Ring (RR3000-10CD)	1								1		
	155-12	Snap Ring (5000-81)		1									
	155-47	Snap Ring (5000-86)			1		1			1		1	1
	155-48	Snap Ring (TS304-15)	1	1	1	1	1	1	1	1	1	1	
	155-55	Snap Ring (5000-100MD)						1	1				
	140-33	Fitting-Inlet					1						
	101-50342	O-Ring-Gasket					1						
	104-47	Fitting Assy. (Parker TFD 4V50X-S)					1						
	199-508	Repair Kit, O-Rings (Ref.)	1										
	199-510	Repair Kit, O-Rings (Ref.)		1									
	199-512	Repair Kit, O-Rings (Ref.)			1	1				1			
	199-520	Repair Kit, O-Rings (Ref.)					1						
	199-521	Repair Kit, O-Rings (Ref.)						1	1				

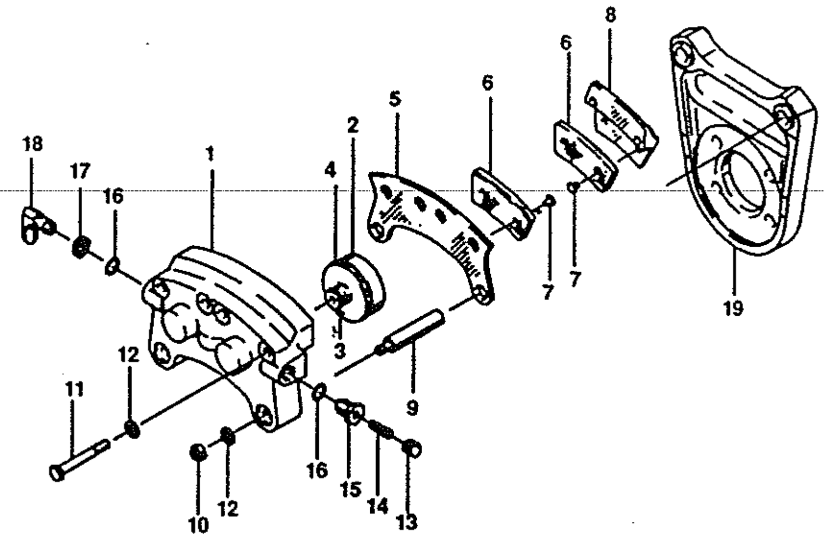
Assy. Number

- A) 10-23A
- B) 10-24B
- C) 10-24C
- D) 10-24D ← WACO F5 & F5C
- E) 10-30
- F) 10-67
- G) 10-70
- H) 10-70A
- I) 10-70B
- J) 10-23C
- K) 10-30A

Rev. F
July 31, 1991

Brake Assemblies -- 10"
Single Caliper
Dual Piston

30-67, 30-67A, 30-67B, 30-67C, 30-67D, 30-67X, 30-176, 30-195, 30-195A



Organic Lining

FIG.	PART NUMBER	DESCRIPTION	A	B	C	D	E	F	G	H	I
			QTY. PER ASSY.								
	91-30	Cylinder Assy.	1			1	1			1	
	91-30A	Cylinder Assy.						1			1
	91-31	Cylinder Assy.		1					1		
	91-49	Cyoinder Assy.			1						
1	61-28	Cylinder	1		1	1	1	1		1	1
	61-29	Cylinder		1					1		
	92-16	Piston Assy.	2	2		2	2		2	2	1
	92-21	Piston Assy.			2						
	92-71	Piston Assy.						2			
2	62-15	Piston	2	2		2	2	2	2	2	1
	62-19	Piston			2						
3	82-20	Friction Spring			2						
4	101-27	O-Ring (MS28775-222)	2	2	2	2	2		2	2	
	101-231	O-Ring						2			2
	73-15	Press. Plate Assy.	1	1	1	1	1	1	1	1	1
5	63-15	Plate-Pressure	1	1	1	1	1	1	1	1	1
6	66-108	Lining	2	2	2	2	2	2	2	4	4
7	105-2	Rivet	4	4	4	4	4	4	4	8	8
	74-13	Back Plate Assy.	2	2	2	2	2	2	2	2	2
8	64-18	Plate-Back	2	2	2	2	2	2	2	2	2
6	66-108	Lining	2	2	2	2	2	2	2	4	4
7	105-2	Rivet	4	4	4	4	4	4	4	8	8
9	69-4	Bolt-Anchor	2	2	2	2	2	2	2	2	2
10	94-103	Nut (AN365-428)	2	2	2	2	2	2	2	2	2
11	103-116	Bolt		4					4		
	103-117	Bolt	4		4	4	4	4		4	4
12	95-104	Washer (AN960-416)	6	6	6	6	6	6	6	6	6
13	183-1	Cap-Bleeder	1	1	1	1	1	1	1	1	1
14	79-3	Screw-Bleeder	1	1	1	1	1	1	1	1	1
15	81-2	Seat-Bleeder	1	1	1	1	1	1	1	1	1
16	101-7	O-Ring (MS28775-012)	1	1	2	1	1		1		
	101-230	O-Ring						1			
17	94-905	Nut			1						
18	104-23	Elbow Fitting (AN833-4D)			1						
19	75-41	Torque Plate Assy.	1								
	75-42	Torque Plate Assy.		1		1					
	75-72	Torque Plate Assy.			1				1		
	75-100	Torque Plate Assy.					1				
	75-103	Torque Plate Assy.						1			
	75-174	Torque Plate Assy.								1	1
	65-168	Torque Plate								1	1
	145-17	Bushing								1	1

Assy. Number

A) 30-67
B) 30-67A
C) 30-67B
D) 30-67C
E) 30-67D
F) 30-67X
G) 30-176 ← WACO F5 & F5C
H) 30-195
I) 30-195A

NOTE:

(1) This brake uses automotive brake fluid.

REV F
July 31, 1991

Wheel Assembly
7.50 - 10
Main Wheel

40-101, 40-101A, 40-129, 40-134
40-134A, 40-223, 40-234, 40-179

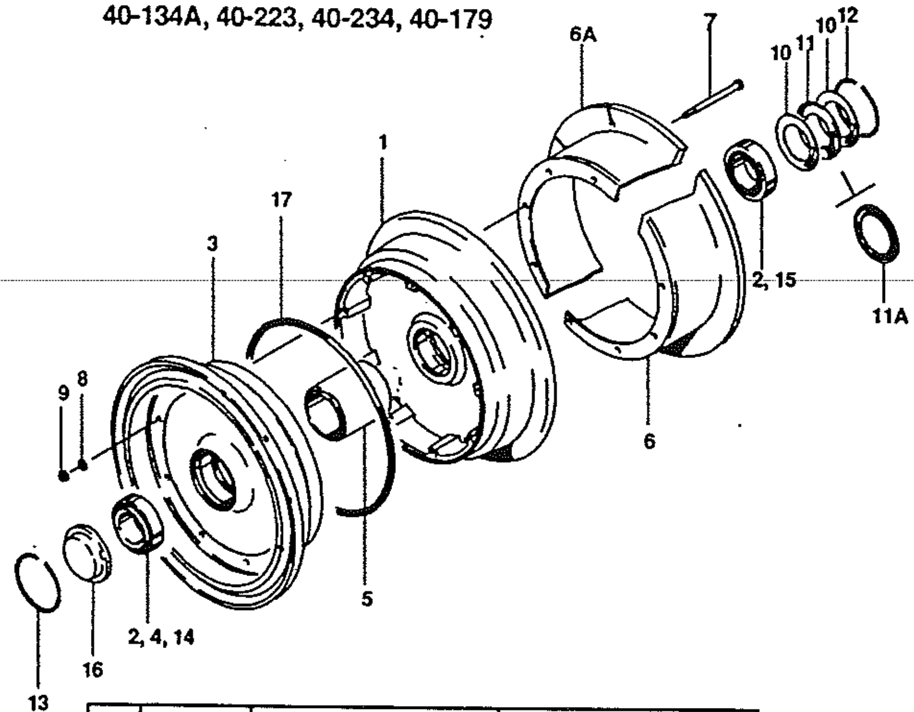


FIG.	PART NUMBER	DESCRIPTION	A	B	C	D	E	F	G	H
			QTY. PER ASSY.							
1	161-36	Inner Wheel Half Assy.	1	1				1	1	
	161-57	Inner Wheel Half Assy.			1					
	161-63	Inner Wheel Half Assy.				1	1			
	161-128	Inner Wheel Half Assy.								1
2	214-13	Cup-Bearing (LM29710)	1	1	1	1	1	1	1	1
3	162-34	Outer Wheel Half Assy.	1	1				1	1	
	162-54	Outer Wheel Half Assy.			1					
	162-59	Outer Wheel Half Assy.				1	1			
	162-118	Outer Wheel Half Assy.								1
4	214-9	Cup-Bearing (07196)			1	1	1			
2	214-13	Cup-Bearing (LM29710)	1	1				1	1	1
5	67-6	Spacer			1	1	1			
	67-11	Spacer	1	1				1	1	
	67-63	Spacer								1
6	164-30F	Brake Disc Assy.	1							
	164-31F	Brake Disc Assy.		1				1		
	164-56F	Brake Disc Assy.			1				1	
	164-222A	Brake Disc Assy.								1
6A	164-63F	Brake Disc Assy. (Slotted)				1	1			
7	103-113	Bolt (AN4-40A)	9	9	9			9	9	
	103-208	Bolt (AN5-41A)				9	9			
	103-223	Bolt (AN5-40A)								9
8	95-104	Washer (AN960-416)	9	9	9			9	9	
	95-107	Washer (AN960-516L)				9	9			9
9	94-103	Nut (AN365-428)	9	9	9			9	9	
	94-104	Nut (AN365-524)				9	9			9
10	153-9	Ring-Grease Seal	2	2				4	2	
	153-16	Ring-Grease Seal			2	2	2			
11	154-14	Felt-Grease Seal	1	1				2	1	
	154-16	Felt-Grease Seal			1	1	1			
11A	154-30	Molded Grease Seal								2
12	155-1	Ring-Snap	2	2	1	1	1	2	2	2
13	155-6	Ring-Snap			1	1	1			
14	214-10	Cone-Bearing (07100)			1	1	1			
15	214-14	Cone-Bearing (LM29749)	2	2	1	1	1	2	2	2
16	158-3	Cap-Hub	1	1					1	
	158-8	Cap-Hub			1	1	1			
	139-58	Hub Cap Assy.					1			
17	101-97	O-Ring (MS28775-269)				1	1			
18	160-9	Air Valve Assy.*				1	1			
19	67-67	Spacer (outboard)*								1

Assy. Number

A) 40-101(1)
B) 40-101A(1)
C) 40-129(1)
D) 40-134(2)(3)(4)
E) 40-134A(3)(4)
F) 40-223(1) ← WACO F5 & F5C
G) 40-234
H) 40-179

NOTES:

(1) Use Tube-type Tires.
(2) Use Tubeless Tires.
(3) Has a Slotted Disc.
(4) 40-134A supersedes 40-134.
* Not illustrated

REV F
July 31, 1991

Wheel Assembly
10 x 3.50 - 4
Tail Wheel

40-199, 40-199A

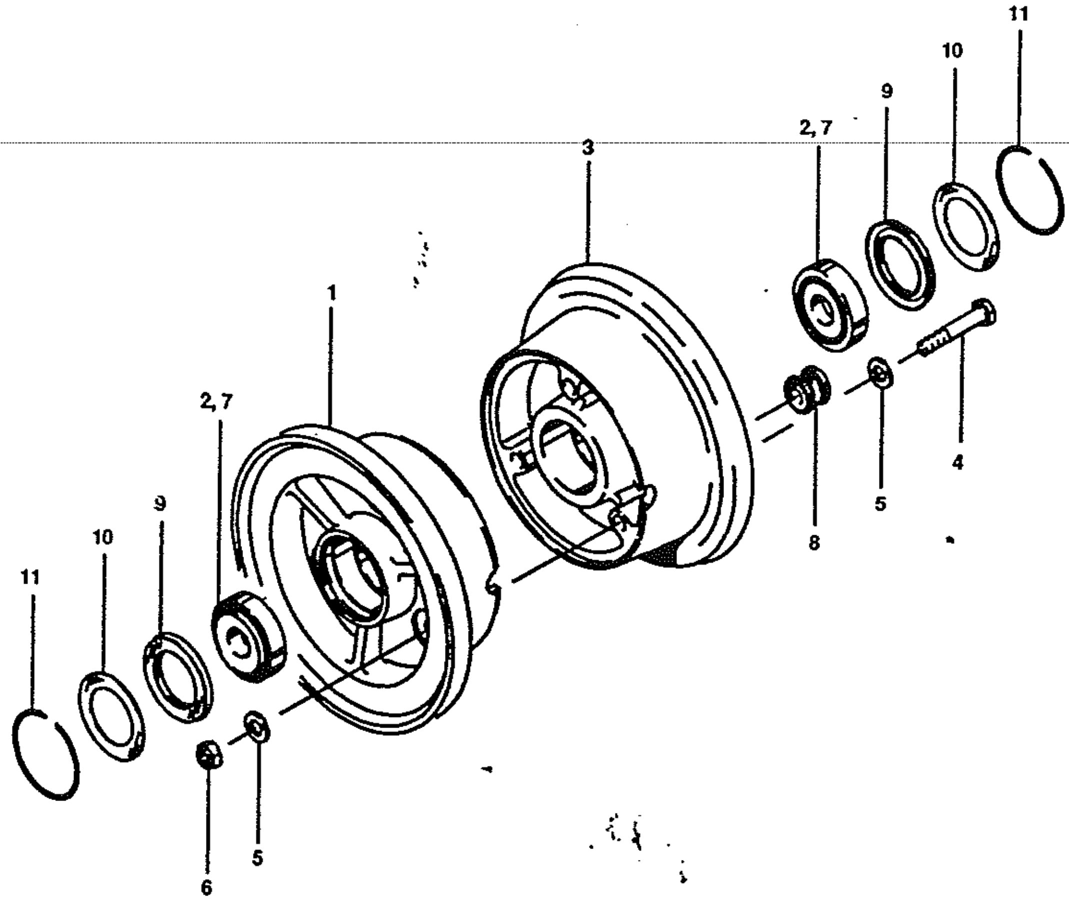


FIG.	PART NUMBER	DESCRIPTION	QTY. PER ASSY. A	QTY. PER ASSY. B
1	161-122	Inner Wheel Half Assy.	1	
	161-144	Inner Wheel Half Assy.		1
2	214-5	Cup-Bearing (L21511)	1	
	214-827	Cup-Bearing (A4138)		1
3	162-112	Outer Wheel Half Assy.	1	
	162-132	Outer Wheel Half Assy.		1
2	214-5	Cup-Bearing (L21511)	1	
	214-827	Cup-Bearing (A4138)		1
4	103-106	Bolt (AN4-23A)	3	3
5	95-104	Washer (AN960-416)	6	6
6	94-103	Nut (MS21044-N4)	3	3
7	214-6	Cone-Bearing	2	
	214-828	Cone-Bearing (A4050)		2
8	217-1	Grommet (AN931-8-13)	1	1
9	226-1	Grease Seal	2	2
10	153-11	Seal Ring	2	2
11	155-8	Ring-Snap	2	2

Assy. Number

A) 40-199

B) 40-199A ◄── WACO F5 & F5C

NOTES:

(1) Uses Tube-type Tires.
(2) Additional tire sizes:
4.10/3.50-4, 2.80/2.50-4, 8 x 3.00-4

REV F
July 31, 1991

Hydraulic Parking Valves

60-3A, 60-3C

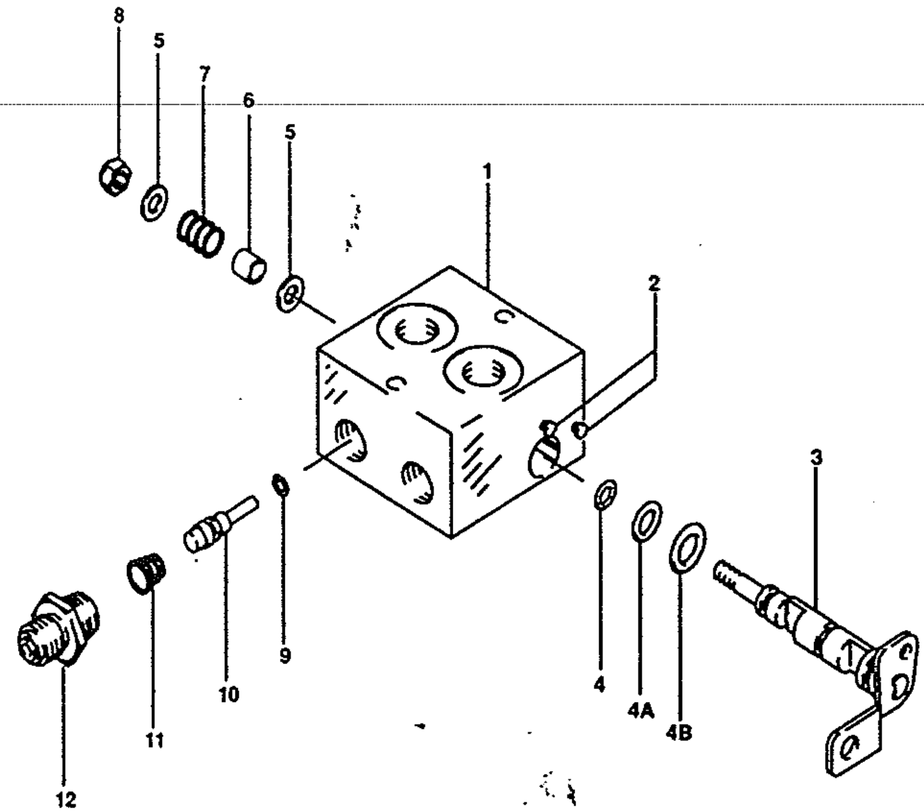


FIG.	PART NUMBER	DESCRIPTION	QTY. PER ASSY.	
			A	B
1	195-4	Body-Valve	1	1
2	177-2	Pin	2	2
3	181-3A	Camshaft Assy.	1	1
4	101-3	O-Ring, Camshaft (MS28775-008)	1	1
4A	101-5	O-Ring, Camshaft (MS28775-010)	1	1
4B	101-6	O-Ring, Camshaft (MS28775-011)	1	1
5	95-103	Washer (AN960-10)	2	2
6	145-7	Bushing	1	1
7	82-10	Spring	1	1
8	94-102	Nut (AN364-1032)	1	1
9	101-1	O-Ring, Valve (MS28775-006)	2	2
10	146-2	Valve	2	2
11	82-44	Spring	2	2
12	104-8	Fitting, Tube (AN816-3D)		2
	104-3	Fitting, Tube (AN816-4D)	2	
	199-526	O-Ring, Replacement Kit	1	1

Assy. Number

A) 60-3A ← WACO F5 & F5C

B) 60-3C

REV F
July 31, 1991

WACO CLASSIC

SERVICE LETTER SL02-1
DATE: June 19, 2002

TITLE
ELEVATOR CONTROL CABLE INSPECTION

TO
ALL OWNERS OF CLASSIC AIRCRAFT CORP. AND WACO CLASSIC AIRCRAFT CORP. YMF AIRCRAFT SERIAL NUMBERS F5001 THROUGH F5C100

MODELS AFFECTED
ALL WACO YMF, CLASSIC YMF F5 AND F5C MODELS AND WACO CLASSIC YMF F5C MODELS

DISCUSSION
There has been a report from one YMF WACO operator of elevator cable damage found in the rear fuselage/epennage area. Due to the serious nature of the existence of any damage to flight control cabling, WACO Classic Aircraft requests that you inspect your aircraft at this time. Requested inspection is to be performed per standard practices and to that which is performed at all 100 hour and annual inspections as identified in the "CLASSIC AIRCRAFT INSPECTION REPORT" as provided in the aircraft service manual.

MATERIAL
No special materials are required to comply with this service letter.

COST
Upon notification of completion of the inspection, by returning the attached Compliance Notification Form, the owner will be reimbursed $24.00 to assist in covering the expected labor costs. If the aircraft is brought to Battle Creek, Michigan, Service Letter SL02-1 will be accomplished free of charge.

INSTRUCTIONS FOR INSPECTION
As per CLASSIC AIRCRAFT INSPECTION REPORT paragraph D: 1, 7, 13, and 17:

1. Remove inspection covers and fairings
2. Inspect rudder, elevator and stabilator trim cables, turnbuckles, fairleads, pulleys and attachments for safety, condition, and operation.
3. Verify that there are no frays, broken strands, or other irregularities present in control cables. Immediately report any irregularities to WACO Classic Aircraft Corp. and replace cable.
4. Check rudder and elevator travels.
5. Reinstall inspection covers and fairings.
6. Make a log book entry that Service Letter SL02-1 has been complied with.
7. Notify WACO Classic Aircraft Corporation of compliance by completing and returning the attached form.

If you have any questions regarding the above, please contact Mr. Carl Dye at 616.565.1000.

WACO CLASSIC AIRCRAFT CORPORATION

Waco Classic Aircraft Corporation

P.O Box 1229 • Battle Creek, MI 49016-1229 • Phone 616.565.1000 • Fax 616.565.1100 • E-Mail flywaco@wacoclassic.com

WACO CLASSIC

Service Alert

June 3, 1996

TO: ALL OWNERS AND OPERATORS OF CLASSIC YMF AIRCRAFT

SUBJECT: CABANE STREAMLINE WIRE FAILURE

The wings of the Classic Waco rely on the truss formed by the spars, struts and streamline wires to support the aircraft and also to keep the wing panels rigged to the proper relationship with the other parts of the aircraft. It was brought to our attention that the pilot of an original Waco F2 experienced a virtually uncontrollable aircraft after the failure of one of the cabane wires.

Classic Aircraft recommends checking your aircraft to be sure that the wires are not notched or scratched where they pass through the combing and also where the wires cross below the combing. Any notching or scratches is cause for rejection and should be replaced immediately (Ref.: Service Alert letter of 2-27-92 Corrosion of Flying Wires in your service manual).

We also recommend opening the holes in the combing to 1/4 inch clearance completely around the wires to assure the wires will never touch. Be sure to shield the wire when working on enlarging the holes as any scratch will render the wire unusable.

We recommend that this letter be inserted into your Waco's service manual, next to the other service letters, so that this information is available to the mechanics doing future inspections.

If you have any questions about this matter, feel free to call.

Best regards,

Bob Edelstein

Robert Edelstein
General Manager

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 ◉ Phone 517-321-7500 ◉ Fax 517-321-5845

WACO CLASSIC

May 17, 1996

TO: ALL OWNERS AND OPERATORS OF CLASSIC WACO YMF AIRCRAFT

SUBJECT: OVERHEATING OF EXHAUST PIPES WITHIN THE HEAT EXCHANGERS

Some Classic WACOS have shown indications of the exhaust pipe within the heat exchanger muffs running at above normal temperatures. Running at higher temperatures tends to cause distortion and shortens the service life of the exhaust pipe. When carb. heat is in use, the pipe is cooled by the induction air flowing through the muff, but when carb. heat is off, the cooling of the pipe relies on ram pressure of the air within the cowl to cause an air flow through the muff and out through an outlet in the bottom of the carb. airbox.

The outlet hole in the bottom of the airbox is small for the amount of air trying to flow through the muffs. A simple modification to enlarge the outlet hole, as shown on Classic print 51041 (Carb. Airbox Mod.), will help relieve this restriction. We recommend that this modification be made to all classic WACOS at your convenience as it should result in a longer service life for your heat exchangers.

To accomplish this modification, saw off the flange flush with the bottom of the airbox. Then locate the center point of the 2" hole, as shown on Classic print 51041, and drill a pilot hole to match the hole saw to be used. Using a 2" hole saw with a short pilot, (so as not to damage the internal parts of the airbox), saw a hole through the bottom of the airbox. Clean all chips from the airbox and repaint the raw edges of the airbox to prevent corrosion.

If you have any questions about this matter, please feel free to call.

Best regards,

Robert Edelstein

Robert N. Edelstein
General Manager

Enclosure - Classic Print 51041

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 • Phone 517-321-7500 • Fax 517-321-5845

WACO CLASSIC

April 17, 1996

TO: ALL OWNERS AND OPERATORS OF CLASSIC WACO YMF AIRCRAFT

SUBJECT: PROPELLER MOUNTING BOLT TORQUE REQUIREMENTS

A wood aircraft propeller as used on the Classic WACO has the driving torque transmitted from the hub to the prop primarily by the friction between the hub front and rear flanges pressing against the front and rear faces of the prop. This friction is controlled by the tension in the prop hub bolts and is measured by the torque applied to the prop hub nuts. It is imperative that the proper torque be maintained on the hub nuts, as any slippage between the prop and hub will result in damage to the prop with the possibility of separation of the prop from the aircraft.

A characteristic of wood is that it expands and contracts as the moisture content within the wood varies. It is this characteristic that affects the tension in the hub bolts in that as the prop wood dries out, the prop shrinks and the bolts loose their tension. The moisture content of the wood is affected by such things as climatic changes or moving the aircraft from a humid location to a dry location.

Classic Aircraft Corporation recommends checking the prop nut torque, (per the Sensenich installation and maintenance instructions in your aircraft's Service Manual), every few weeks after a change in humidity until it is determined that the wood has stabilized again and, also, with every routine aircraft inspection. Hub bolts with 7/16 threads should be torqued 250 to 300 inch-lb., and hub bolts with 5/8 threads should be torqued 300 to 350 inch-lb.

We recommend that this letter be inserted into your WACO's Service Manual, next to the other service letters, so that this information is available to the mechanics doing future inspections.

If you have any questions about this matter, please feel free to call.

Best regards,

Bob Edelstein

Robert N. Edelstein
General Manager

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 ◉ Phone 517-321-7500 ◉ Fax 517-321-5845

WACO CLASSIC

December 5, 1995

TO: ALL OWNERS AND OPERATORS OF CLASSIC WACO YMF-5 AIRCRAFT

SUBJECT: COMPLIANCE WITH PROPER DOCUMENTATION OF ENGINE MANUFACTURING INSPECTION REQUIREMENTS

It has been brought to our attention that an operator of a Jacobs powered aircraft, not a Classic build WACO, received a citation and was fined for non-compliance with a Jacobs inspection procedure. In this case the pilot made a safe precautionary off-airport landing with no damage or harm to anyone. The problem which prompted the precautionary landing was found to be the separation of a cylinder from the crankcase due to failed cylinder hold-down studs.

During the FAA investigation it was noted that the aircraft records did not show compliance with the requirements of Jacobs Operators Manual, page 50, paragraph 6, which requires engine nuts to be checked for tightness every 100 hours, with reference made to the table of limits for proper tightening touque where specified. (Note in the Jacobs Torque Chart, Ref. No. T202 - Cylinder Hold-Down Nuts 250-300 in. lbs.)

I would also like to point out that in the Classic Aircraft Corporation WACO Inspection Report, Section B Powerplant, Item 26 does address cylinder nuts and if this form is used, properly executed and made a part of the aircraft records, it should be satisfactory documentation of compliance with this item. A sample of this inspection form is in your Classic WACO Service Manual.

The purpose of this letter is to remind you of the requirement to inspect your engine to the Jacobs recommendations in your Operators Manual and also to provide you with a copy of the Torque Limit chart copied from the Jacobs Overhaul Manual.

We recommend that the torque chart be inserted into your WACO Service Manual immediately following the sample inspection form and that this letter be inserted next to the Flying Wire Service Letter, so that this information is available to the mechanics doing future inspections.

If you have any questions about this item, please feel free to call.

Best regards,

Bob Edelstein

Robert N. Edelstein
Service Manager

Enclosure

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 • Phone 517-321-7500 • Fax 517-321-5845

JACOBS ENGINE SPECIFIED

TORQUE LIMITS

Ref. No.	Chart No.	Description	Torque Limits
T200	1	Crankshaft Clamp Bolt	Stretch to 0.012 in. min. or next cotter hole
T201	1	Crankcase Bolt Nuts	325-350 in. lbs.
T202	1	Cylinder Hold-Down Nuts	250-300 in. lbs.
T203	1	Rocker Shaft Nuts	120-130 in. lbs.
T204	1	Rocker Cover Stud Nuts	40-50 in. lbs.
T205	1	Spark Plugs	300-360 in. lbs.
T206	1	Thrust Nut	550-650 ft. lbs.
T207	1	Nut - 5/8 in.-18, special (cam drive pinion shaft)	400-600 in. lbs.
T208	1	Valve Clearance Adjusting Screw Locknut	300-325 in. lbs.
T209	1	Fuel Pump Nuts (on rear case)	100 in. lbs.
		Exhaust Port Nuts	100-120 in. lbs.

Reprinted from: Jacobs Aircraft Engine
Models R755A and R755B Overhaul Manual

WACO CLASSIC

February 27, 1992

TO: ALL OWNERS AND OPERATORS OF CLASSIC WACO YMF-5 AIRCRAFT

SUBJECT: CORROSION OF STAINLESS STEEL FLYING WIRES

Classic Aircraft has received a second report of an inflight failure of a streamline flying wire. In both cases, the laboratory analysis of the break determined the failure resulted from a fatigue crack which originated from a very small region of pitting on the surface of the wire and then progressed until the wire failed. Streamline flying wires are made from type 316 stainless steel, which is slightly susceptible to chlorine corrosion pitting when in contact with substances such as salt or chlorine bleach. Both of the subject aircraft have been operating in a salt air environment.

It is the recommendation of the wire manufacturer and Classic Aircraft Corporation that the wires on all aircraft be cleaned and inspected immediately for condition and that a thorough cleaning and inspection of the wires be made a part of all future inspections of the aircraft. The corrosion pitting appears as a dull gray spot on the shiny polished wire surface and the associated pitting is evident when viewed through a magnifying glass. Any wires found to be pitted should be replaced immediately.

After cleaning and inspecting, the application of a coat of oil or wax will help prevent contact of corrosive elements with the stainless steel.

Please notify Classic Aircraft Corporation of any wires found to be corroded. If you have any questions in regard to your Classic WACO, please contact the Service Manager at Classic Aircraft Corporation.

Please insert this letter into the Service Manual of your aircraft so that the people maintaining it will have this information.

Best regards,

CLASSIC AIRCRAFT CORPORATION

Robert Edelstein

Robert N. Edelstein
Service Manager

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

WACO CLASSIC

December 18, 1991

SERVICE ALERT

TO: All owners and operators of Classic Waco YMF-5 aircraft

SUBJECT: Inspection of stabilizer front spar

During a routine inspection of a Classic Waco YMF-5, a crack was found in the upper and lower surfaces of the front stabilizer spar, approximately 3/8 inch from the aircraft center line. Due to the serious nature of a total spar failure, Classic Aircraft Corp. requests that you inspect your Aircraft as soon as possible to assure integrity of your spar.

The area to be inspected is visible with the aid of an inspection mirror and a flashlight by looking through the front spar slot in the fin fairing. The best view of the upper surface is with the stabilizer trimmed with the leading edge down and then retrimmed to leading edge up to view the lower surface. Examine the area thoroughly on both top and bottom sufaces. If no cracks are found, the aircraft may continue in service. If a crack is found, it must be repaired before further flight. The repair is to stop drill (.098 hole) the crack ends and then weld the crack and holes closed. This repair will allow the aircraft to return to service. Classic Aircraft recommends that inspection of this area be made a part of each preflight inspection, or at a minimum of each 10 hours of operation until the stabilizer has been reinforced with a finger patch (Classic part No. 50996) on both the upper and lower surfaces. Classic Aircraft will be providing each aircraft owner with a reinforcement kit within the next few weeks.

Please notify the Service Manager of Classic Aircraft Corp. (517/321-7500) of the results of your inspection.

Best regards,

Bob Edelstein

Bob Edelstein
Service Manager

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

WACO CLASSIC

May 21, 1991

TO: ALL OWNERS AND OPERATORS OF CLASSIC WACO YMF-5 AIRCRAFT

SUBJECT: EQUALIZE FIT OF LOWER COWL

Due to the angle of the #5 cylinder exhaust rocker box cover, this cowling felt pad takes most of the pressure of the bottom cowl. To equalize the cowl fit, add another felt pad to the five remaining pads in the bottom cowl. This will let all felt pads rest against the engine cylinders.

Clean the old felt pads and glue the new felt pads to the existing pads centered in the rocker box cavity.

Best regards,

Lloyd M. James

Lloyd M. James
Service Manager

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

WACO CLASSIC

November 5, 1990

TO: ALL OWNERS AND OPERATORS OF CLASSIC WACO YMF-5 AIRCRAFT

SUBJECT: CORROSION OF STAINLESS STEEL FLYING WIRES

The operator of a Classic WACO YMF-5 experienced an in-flight failure of a streamline flying wire. That wire was returned to the manufacturer for a laboratory analysis of the break. The conclusion was that the failure occurred due to a small region of pitting on the leading edge of the tie rod, which provided an initiation site for a fatigue crack, which progressed until the wire failed. The report points out that streamline tie rods are made from type 316 stainless steel, which is slightly susceptible to corrosion pitting when in contact with substances such as sea water or chlorine bleach. The subject aircraft has been operating in a salt air environment.

It is the recommendation of the wire manufacturer and Classic Aircraft Corporation that the wires on all aircraft be cleaned and inspected immediately for condition and that a thorough cleaning and inspection of the wires be made a part of all future inspections of the aircraft. The corrosion pitting appears as a dull gray spot on the shiny polished wire surface and the associated pitting is evident when viewed through a magnifying glass. Any wires found to be pitted should be replaced immediately.

After cleaning and inspecting, the application of a coat of oil or wax will help prevent contact of corrosive elements with the stainless steel.

Please notify Classic Aircraft Corporation of any wires found to be corroded. If you have any questions in regard to your Classic WACO, please contact the Service Manager at Classic Aircraft Corporation.

Best regards,

Lloyd M. James

Lloyd M. James
Service Manager

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

WACO CLASSIC

September 25, 1989

TO: All owners of Classic WACO Serial No. F5001 thru F5022

SUBJECT: Cockpit Ventilation

Some aircraft operating in warmer climates were found to be warm in the front cockpit. Classic Aircraft has incorporated some changes in its later aircraft which help this condition. These changes are readily retrofitable to all earlier aircraft and does reduce the temperature in both cockpits.

The changes consist of baffle fabric seals installed at the lower firewall sides to stop the flow of warm air from the rear cowl area, back through the wing fairings to the cockpit area, (see Sketch 50905M); and, the addition of two vent holes in the cockpit divider panel to allow cooler air to flow from the rear cockpit into the lower pressure area of the front cockpit, thus providing air flow through both cockpits, (see Sketch 50097M). Under certain conditions it is desirable to close the vent holes, therefore Classic has available a hole cover which is held in place with a single quarter turn fastener.

The conditions for opening or closing the vent holes are as follows:

<u>Warm weather with front cockpit open</u> - open vents to provide air flow between cockpits.

<u>Warm weather with front cockpit covered</u> - close vents to prevent warm air flowing from front cockpit aft to lower pressure area of rear cockpit.

<u>Cold weather with front cockpit open</u> - close vents to prevent flow of cold air between cockpits.

<u>Cold weather with front cockpit covered</u> - open vents to allow warm air to flow from front cockpit to rear cockpit.

The vent kit is identified as Kit #50097M and is priced at $67.85. The firewall seal kit is identified as Kit #50905M and is priced at $48.40.

If your aircraft is not already equipped with the above items, either or both kits may be ordered from the Service Department of Classic Aircraft Corporation.

Best regards,

Lloyd M. James

Lloyd James
Service Manager

Enclosures

Classic Aircraft Corporation

INSTRUCTIONS FOR INSTALLATION OF FIREWALL SEAL

KIT #50905M

The purpose of this firewall seal is to stop the flow of warm air from the area forward of the firewall back through the landing gear fairing to the cockpit area. The opening to be sealed is located at the forward end of the landing gear fairing and can be seen by opening the cowl side door and looking down and back through the door opening. Notice that the opening is widest at the back and tapers to a point at the front.

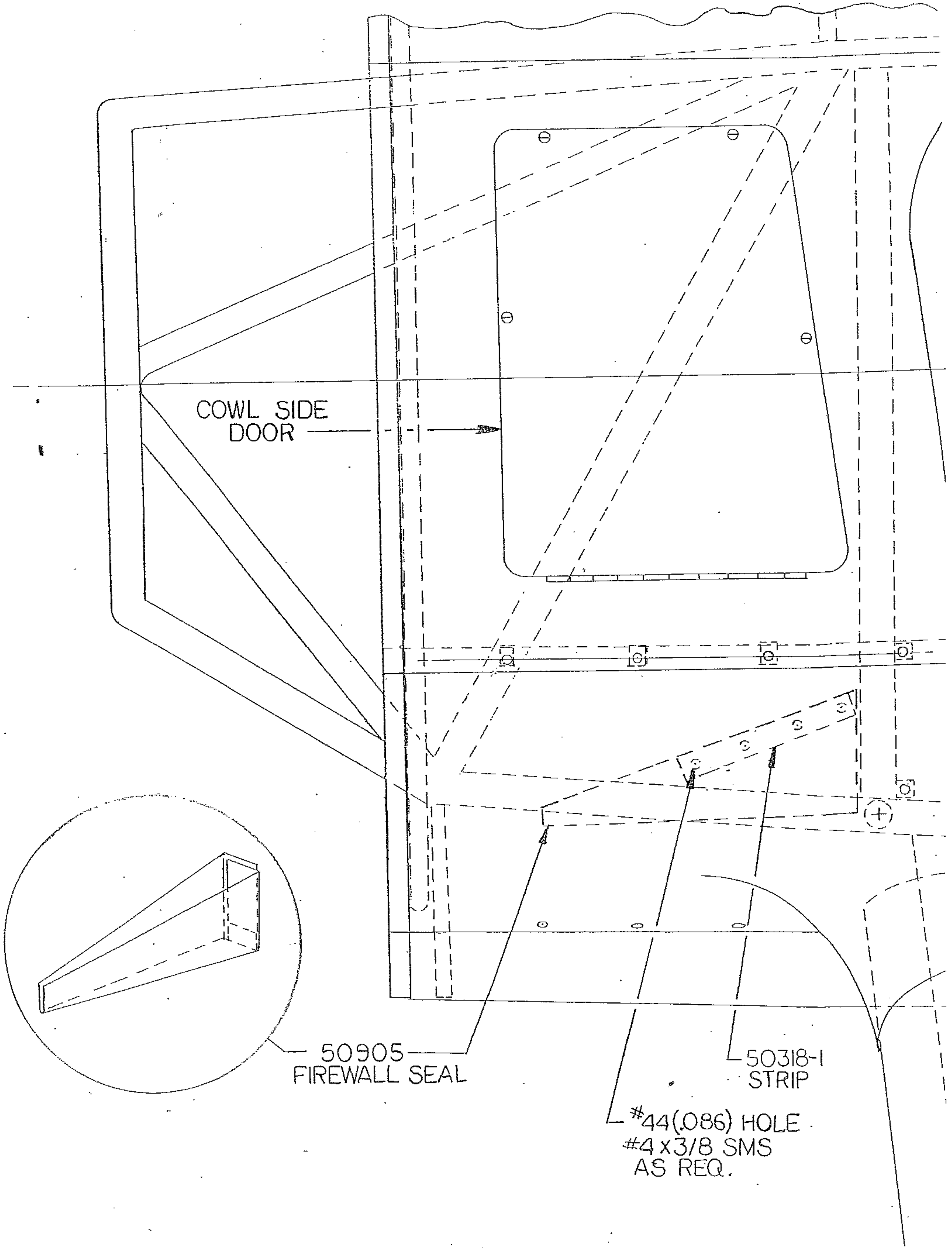
Thoroughly clean the firewall area where the seal will be positioned to assure good adhesion of the cement to hold the seal in place.

Fold the baffle fabric seal to form a triangular shaped open top box and slide into place with the heel of the box against the rear firewall and the point forward. Push the point down far enough to completely close the opening into the fairing. When the seal is properly positioned, cement the top edge and rear tabs of the seal to the firewall only, using 3M #8046 adhesive. When the cement has set, secure the inboard upper edge of the seal to the firewall with the 50318-1 strip, attaching it with #4 x 3/8 sheet metal screws as shown on the attached sketch. It may be necessary to trim the length of the strip to fit. Securing the seal only to the firewall allows removing the belly skin and fairings without disturbing the seal installation.

Repeat the above procedure to install the seal on the other side of the firewall. Make appropriate log book entry to complete the installation.

Kit Contents:

1 Instruction Sheet
1 Sketch 50905M
2 50905 Firewall Seal
2 50318-1 Strip
8 #4 x 3/8 Sheet Metal Screws



COWL SIDE DOOR
50905 FIREWALL SEAL
50318-1 STRIP
#44(.086) HOLE
#4 x 3/8 SMS
AS REQ.

INSTRUCTIONS FOR INSTALLATION OF COCKPIT DIVIDER VENT

Kit #50097M

The purpose of this modification is to provide a route for air to flow between the cockpits through the cockpit divider thus venting both cockpits. The modification consists of adding a vent hole in both lower corners of the cockpit divider panel just forward of the pilot's rudder pedals. This work can be accomplished from the rear cockpit by lowering the seat to the bottom position and removing the seat bottom cushion. The rudder pedals can be tied back to provide more working space.

Prepare a template for locating and drilling pilot holes for the vent hole end radius and Camloc receptacle. If a chassis punch is to be used to make the vent holes, then only the center holes need to be located. If the hole is to be routed out, then it will be desirable to have the hole outline traceable. The template can be made by contact cementing the paper pattern included in this kit to a piece of flat sheet stock, trimming to the pattern outline and drilling the pilot holes.

Locate the template on the lower outboard corner of the cockpit divider as shown on attached sketch 50097M. Using a #40 drill, drill one pilot hole and secure template with a cleco. Then drill remaining pilot holes and trace hole outline. Do the same to the other side of the divider. Enlarge the Camloc center hole to 1/2 inch. Enlarge the vent pilot holes to match the chassis punch to be used. Use the chassis punch to punch the end radius on each end of the vent holes. Route out the remaining material and deburr to complete the hole preparation.

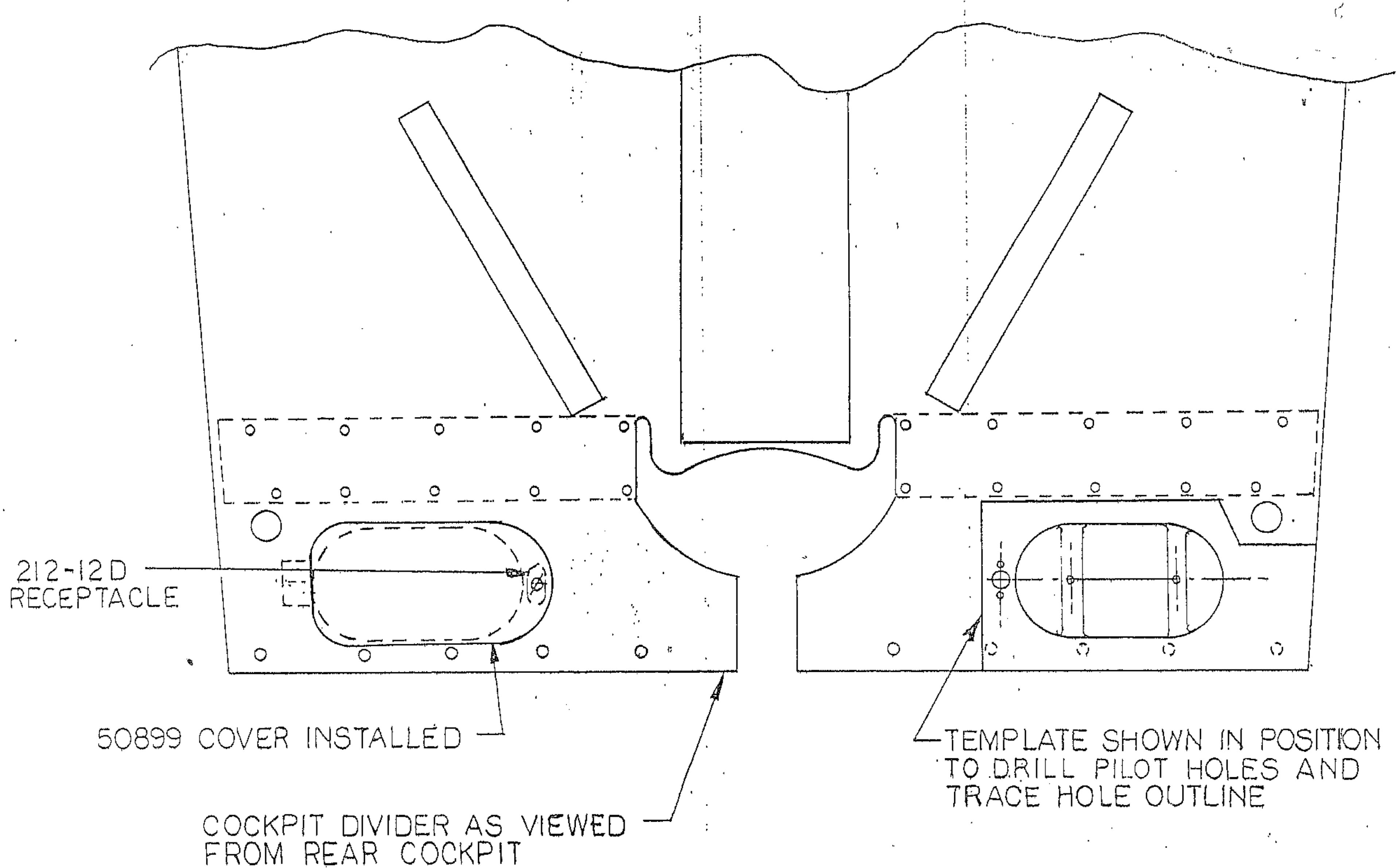
Using two (2) AN426AD3-4 rivets, rivet the 212-12D Camloc receptacle to the forward side of the divider so that the Camloc on the hole cover can be installed from the rear cockpit. The 50899 hole covers can now be installed by inserting the cover tab through the vent hole and engaging the Camloc. Thoroughly clean the area of metal chips, etc., untie the rudder pedals and replace the seat cushion to complete the installation.

To complete the modification, insert the new page describing the operation of the vents into the flight manual and make an appropriate log book entry.

Kit Contents:

1 Instruction Sheet
1 Sketch 50097M
1 Vent Hole Template
2 50899 Cover
2 212-12D Camloc Receptacle
4 AN426AD3-4 Rivet

COCKPIT DIVIDER VENT LOCATION



SKETCH 50097M

REV. A

WACO CLASSIC

June 29, 1989

To All Classic F-5 Owners:

The brake pedal for the Classic F-5 WACO has been restyled to provide a more comfortable foot position under all conditions. This restyled pedal is retrofitable to all earlier aircraft in both the front and rear cockpits. Changing of the pedal is a simple bolt in replacement using all of the existing hardware.

Classic Aircraft Corporation will provide retrofit parts on a no cost exchange basis to all Classic F-5 owners. If you would like to order the replacement pedal kit, contact Lloyd James, Service Manager at Classic Aircraft Corporation. When the kits are shipped, you will be billed $85.00 for each pair needed. When the exchange pedals are received by Classic Aircraft Corporation, a credit will be issued for the same amount.

Best regards,

Lloyd M. James

Lloyd James
Service Manager

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

WACO CLASSIC

MAINTENANCE NEWS LETTER

2-16-89

To: All Aircraft Owners and Maintenance Personnel

Subject: WACO YMF-5 Fuel Gascolator Plumbing

It has been brought to our attention that the gascolator used on the WACO is almost symmetrical and can be installed backward with no apparent difference in operation. The difference is that when installed backward, the sediment is trapped inside the screen and cannot be drained or cleaned without removing the screen and the sediment can be injested into the priming system.

We request that you inspect your aircraft to assure correct plumbing. The following details will aid you with the inspection. The gascolator is located on the forward lower left side of the firewall and can be inspected from the bottom vent hole or through the left side access door. The gascolator top casting has the ports identified with "IN" and "OUT" cast into the top of the respective ports at the mounting lugs. The fuel supply lines are on the left side of the gascolator and attach to a "T", which should be screwed into the "IN" port of the gascolator. The right hand port should be the "OUT" port with a hose leading to the carburetor.

Another way to identify the correct installation is the position of the primer supply fitting boss on the top casting. When installed correctly, this fitting is forward of the gascolator center line and easily visible from the left access door.

If you find your gascolator assembled wrong or if you have questions, please call Classic Service Manager, Lloyd James, at 517-321-7000.

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

WACO CLASSIC

April 18, 1989

To: WACO Owners through Serial No. 18

Subject: Optional Remote Oil Strainer Installation

Classic Aircraft Corporation has incorporated a firewall mounted remote oil strainer as a product improvement on it's later model WACO F-5 aircraft. A kit is being made available to owners of earlier aircraft for updating their aircraft if they so desire. This installation provides a more accessible point to drain the oil and clean the screen.

This oil strainer kit is identified as Kit #50890M and is priced at $628.96. It may be ordered from the Service Department of Classic Aircraft Corporation.

Best regards,

Lloyd M James

Lloyd James
Service Manager

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

WACO CLASSIC

April 18, 1989

To: WACO Owners through Serial No. 21

Subject: WACO F-5 Service Manual Supplement and Inspection Form

Skytronics has provided an alternator system test procedure which will help in determining the cause of alternator malfunctions. A copy is enclosed to include in your WACO F-5 Service Manual.

Please replace the contents page of your manual with the revised page provided and place the test procedure supplement into the back of your manual.

Classic Aircraft Corporation has developed an inspection form designed especially for the WACO F-5. Several copies are enclosed for your use. More copies are available from Classic Aircraft Corporation when you need more.

Best regards,

Lloyd M. James

Lloyd James
Service Manager

Enclosures

Classic Aircraft Corporation

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

ALTERNATOR SYSTEM TEST

Some Detail Tests

1. System Voltage Tests

To aid in trouble shooting an alternator system or to check out a new installation, the following voltage measurements, monitored at application system locations, will define to the operator proper system performance prior to start-up. To insure reasonable results, the operator should use a voltmeter which is within calibration limits.

The schematics in Figures 1 through 4 depict the location of voltmeter in the system to monitor the applicable voltage levels. The voltage readings indicated are for referenced purposes, as actual values are dependent upon the level or storage state of your battery. By using the battery voltage (V_1) as the reference level, the remaining voltage measurements should be in the same relative relationship as those used in the sample measurements shown in Figures 1 through 4.

The following delineates the applicable figures to use as a reference based on the alternator system under test:

SYSTEM CAPACITY	SYSTEM CONTROL CONFIGURATION	FIGURE NO.
12 Volt, 50 Amps	Regulator and Separate Suppressor	1
12 Volt, 70 Amps	" " " "	1
12 Volt, 100 Amps	" " " "	1
12 Volt, 50 Amps	Controller (Reg. and Suppressor Combined)	2
12 Volt, 70 Amps	" " " " "	2
12 Volt, 100 Amps	" " " " "	2
24 Volt, 50 Amps	Regulator and Separate Suppressor	3
24 Volt, 70 Amps	" " " "	3
24 Volt, 100 Amps	" " " "	3
24 Volt, 50 Amps	Controller (Reg. and Suppressor Combined)	4
24 Volt, 70 Amps	" " " " "	4
24 Volt, 100 Amps	" " " " "	4

Some Detail Tests (cont.)

When performing the measurement tests, the following conditions should exist:

1. Engine stopped,
2. Battery switch closed,
3. Alternator/Field switch closed.

2. IS the suppressor shorted?

To check for a shorted suppressor or protector, disconnect the protector and observe system function. Proper operation indicates a defective protector. On units with combined regulator/protector, simply disconnect the orange lead. Resistance between the orange and black leads should not be less than 1500 Ω.

3. IS the alternator defective?

1. Turn master switch of the aircraft to the "Off" position.
2. Disconnect both the voltage regulator and the voltage protector. Some installations have a combination voltage regulator and a voltage protector packaged in one housing. In this case, it is only required to disconnect the combined unit.

<u>CAUTION</u>

Failure to disconnect the voltage regulator, voltage protector or the voltage controller (regulator and protector combined) will result in damage to these units. Failure to comply with this requirement voids warranty.

3. Turn off all accessory equipment (all electrical loads).
4. Connect a jumper wire from a battery voltage source directly to the

field lead to the alternator. Be sure this connection makes a direct circuit to the alternator field terminal. What you are doing is effectively by-passing the voltage regulator and preparing to operate the alternator in an unregulated mode.

5. Turn the master switch to "On" position and start the engine.
6. Increase engine RPM to ensure the alternator shaft speed is over 3000 rpm.

CAUTION

System damage can result if the alternator is operated for over 45 seconds with the jumper wire connected.

7. Full current output rating of the alternator should occur, and 2 to 3 times the system voltage should occur. If not, then the alternator is defective. If full output is observed, the alternator is good and the regulator is probably defective.

12V, 7C .MP. SYS. WITH REG. & SUPPRESSOR

12V, 100 AMP. SYS. WITH REG. & SUPPRESSOR

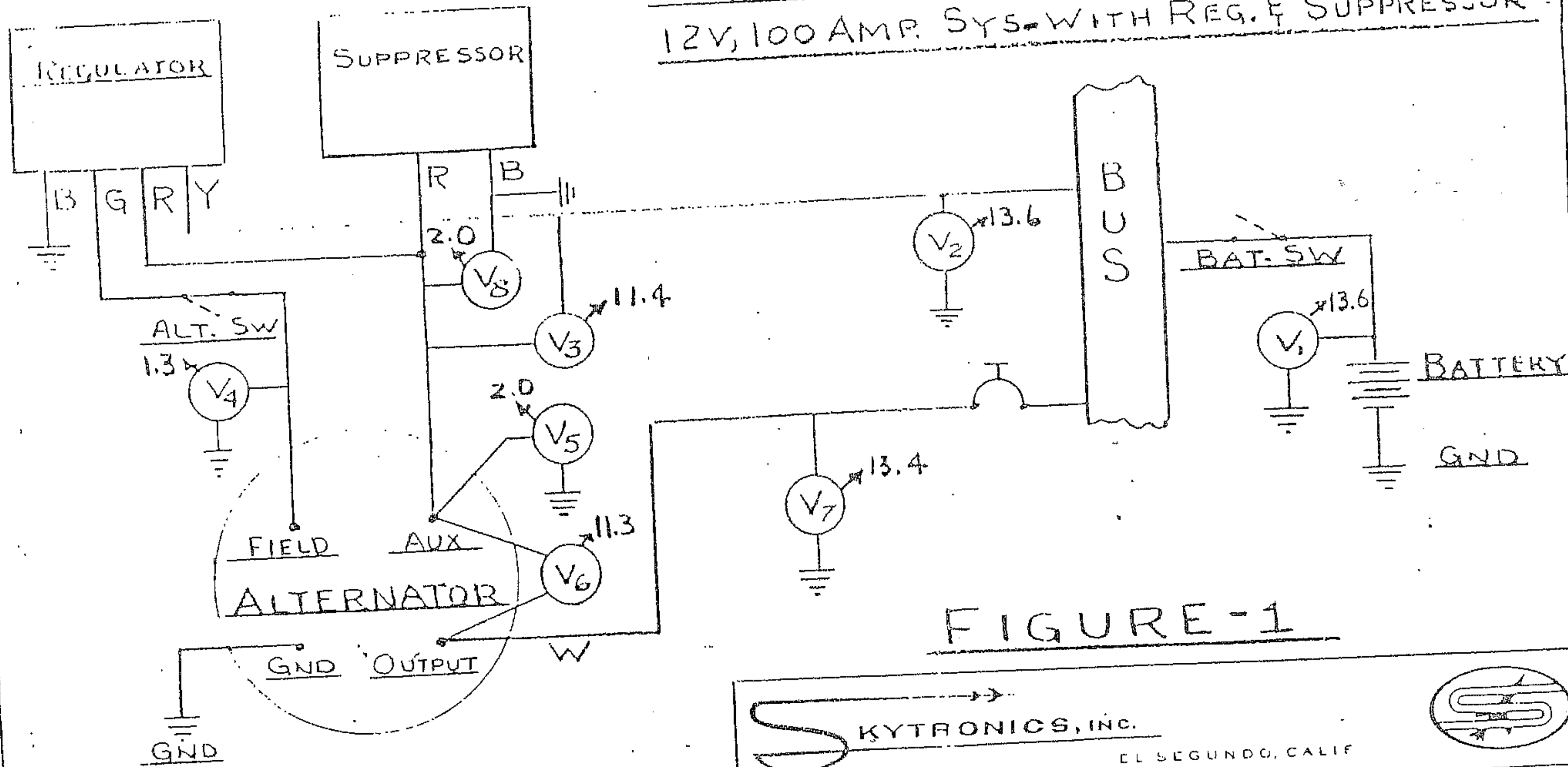


FIGURE-1

LEGEND

Vx = VOLTMETER, LOCATION FOR FIELD TROUBLE SHOOTING MEASUREMENTS

SKYTRONICS, INC.
EL SEGUNDO, CALIF

MATERIAL N.A.		DATE 12-17-81	DWN. BY JES
SPEC. N.A.		SCALE N.A.	APPR BY
FINISH N.A.			

VOLTMETER LOCATIONS FOR TROUBLE SHOOTING

12V, 50 AMP SYSTEM WITH CONTROLLER

12V, 70 AMP SYSTEM WITH CONTROLLER

12V, 100 AMP SYSTEM WITH CONTROLLER

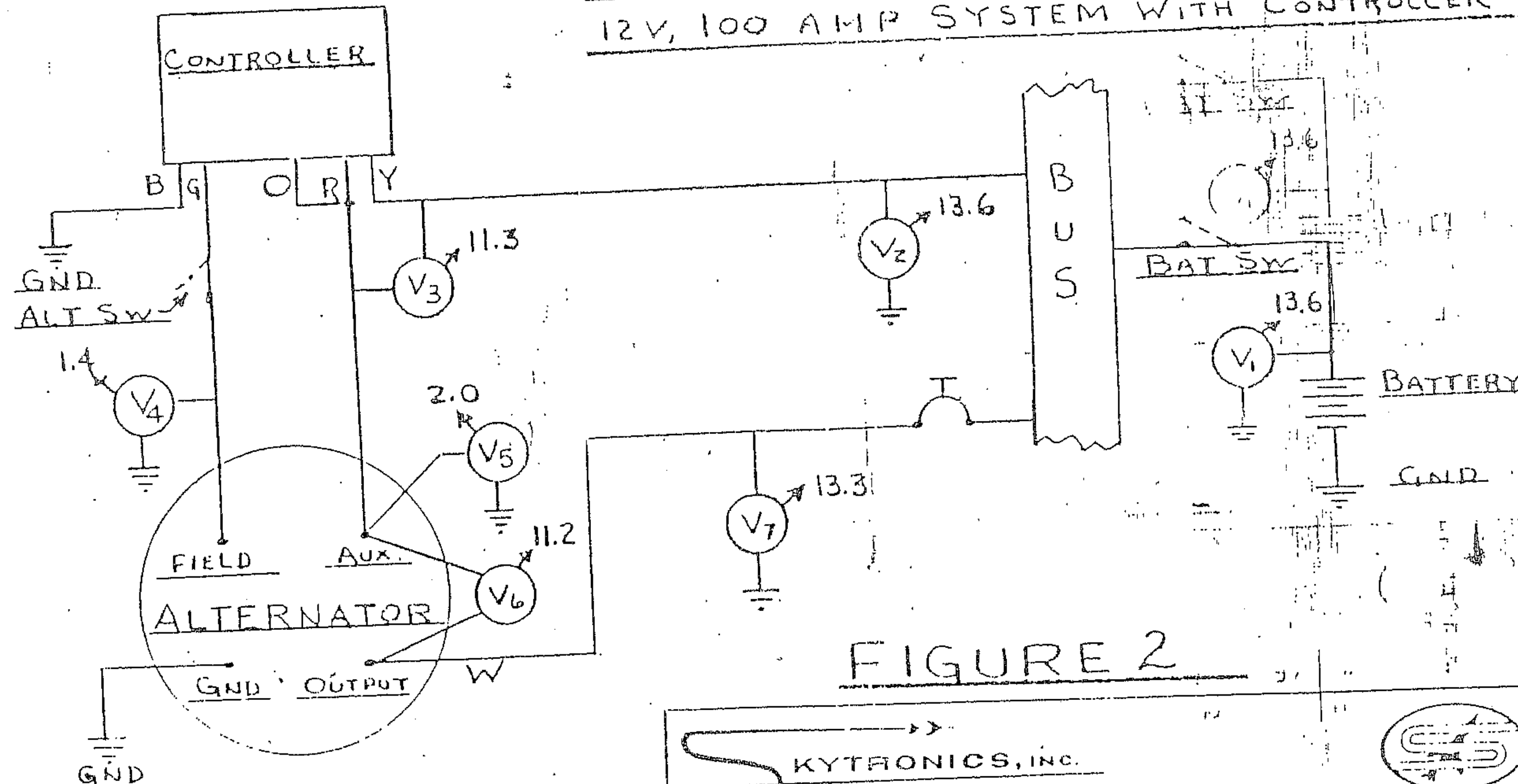


FIGURE 2

LEGEND

(Vx) = VOLTMETER, LOCATION FOR TROUBLE SHOOTING Measurements.

SKYTRONICS, INC.

MATERIAL	N.A	DATE 12-16-81	DWN BY JES
SPEC	N.A	SCALE N.A	APP'D BY
FINISH	N.A		

VOLTMETER LOCATIONS FOR TROUBLE SHOOTING MEASUREMENTS

24V, 50 AMP. SYS. WITH REG. & SUPPRESSOR
24V, 70 AMP. SYS. WITH REG. & SUPPRESSOR
24V, 100 AMP. SYS. WITH REG. & SUPPRESSOR

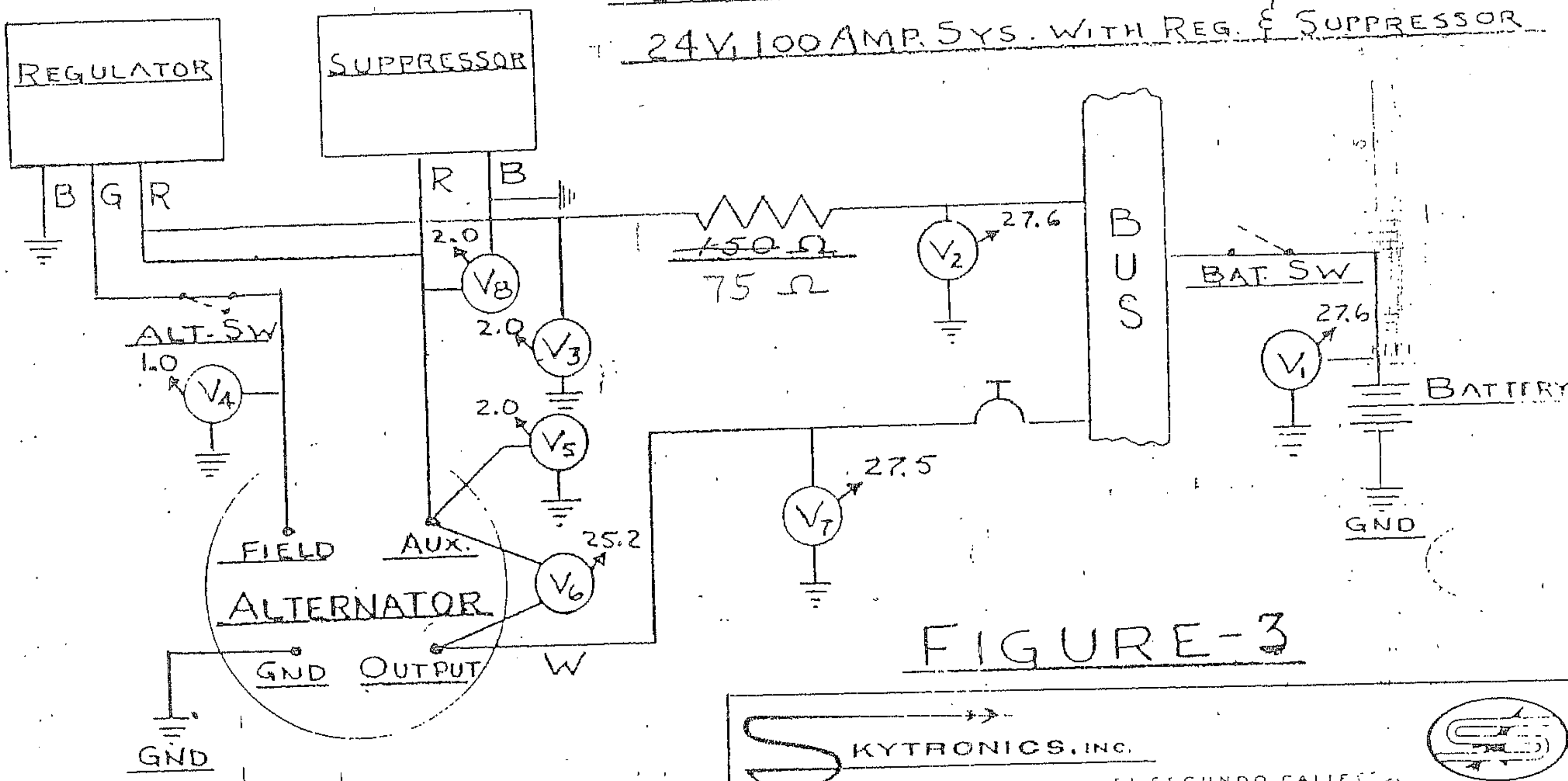


FIGURE-3

LEGEND

(Vx) = VOLTMETER, LOCATION FOR FIELD TROUBLE SHOOTING MEASUREMENTS

SKYTRONICS, INC.
EL SEGUNDO, CALIF.

MATERIAL N.A	DATE 12-17-81	DWN BY JES	
SPEC N.A.	SCALE N.A	APPR BY	
FINISH N.A			

VOLTMETER LOCATIONS FOR TROUBLE SHOOTING

24V, 50 AMP. SYSTEM WITH CONTROLLER
24V, 70 AMP. SYSTEM WITH CONTROLLER
24V, 100 AMP. SYSTEM WITH CONTROLLER

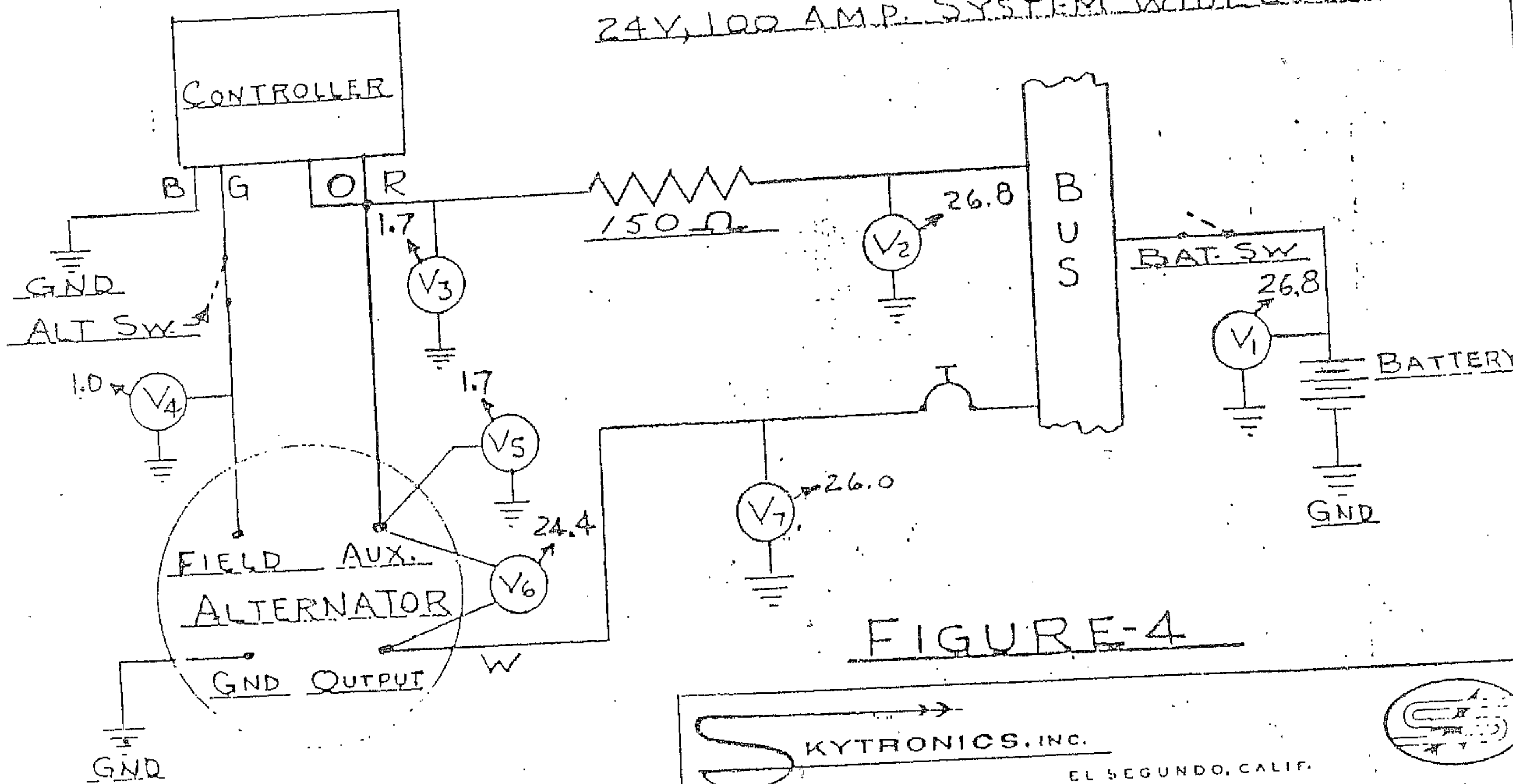


FIGURE-4

LEGEND

V_x = VOLTMETER, LOCATION FOR FIELD TROUBLE SHOOTING MEASUREMENTS

SKYTRONICS, INC.
EL SEGUNDO, CALIF.

MATERIAL N. A	DATE 12-17-81	DWN. BY JES	
SPEC N. A.	SCALE N.A.	APPR BY	
FINISH N. A			

VOLTMETER LOCATION FOR TROUBLE SHOOTING MEASUREMENTS

WACO CLASSIC

SERVICE LETTER SL92-2

DATE: March 16, 1992

TITLE

CABIN AIRBOX INSPECTION AND MODIFICATION

TO

ALL OWNERS OF CLASSIC WACO F5 AND F5C AIRCRAFT SERIAL NUMBERS F5001 THRU F5C044 WHICH ARE EQUIPPED WITH CABIN HEAT SYSTEMS

MODELS AFFECTED

ALL WACO YMF, CLASSIC F5 AND F5C AIRCRAFT SERIAL NUMBERS F5001 THRU F5C044 EQUIPPED WITH FACTORY INSTALLED CABIN HEAT SYSTEMS

DISCUSSION

During a routine inspection of a Classic YMF-5, the valve stop angle from the cabin heat valve box was found loose in the bottom of the carburetor air box. The separation of this stop angle has the potential of becoming a serious problem if it were ingested into the carburetor, possibly causing a power loss. Due to the serious consequences of an unexpected power loss, Classic Aircraft Corporation requires inspection and modification if necessary of your cabin heat valve box to assure integrity of the stop angle within the next five (5) hours of operation.

COST

Upon notification of completion of the inspection or inspection and modification if required, by returning the attached Compliance Notification Form, the owner will be reimbursed $22.00 for the inspection or $44.00 for the inspection and modification to help cover the labor cost. If the aircraft is returned to Lansing, Michigan, the Service Letter SL92-2 work will be accomplished free of charge.

INSTRUCTIONS FOR INSPECTION AND MODIFICATION

1. Set the cabin heat control in the "OFF" position.
2. Working through the bottom opening in the inner cowl, remove the air hose from the bottom of the cabin air box which is located on the lower right firewall.
3. With the aid of a mirror and flashlight, determine if the valve stop angle is attached to the box by 3 rivets or 3 small rosette welds. The flat bucked ends of the rivets inside of the box make the rivets easily discernible. (See attached sketch for location.)
4. If the angle is attached with rivets, no modification is required.

Capital City Airport, Lansing, MI 48906 — Phone 517-321-7500

5. If the angle is rosette welded in place, the box must be modified by the addition of 2 AN470AD4-4 rivets equally spaced between the rosettes on the rosette center line. It will be necessary to remove the bottom engine cowl to provide access for installing the rivets.

6. Reinstall the hose onto the air box and reinstall the engine cowl if removed.

7. Make a log book entry that Service Letter SL92-2 has been complied with.

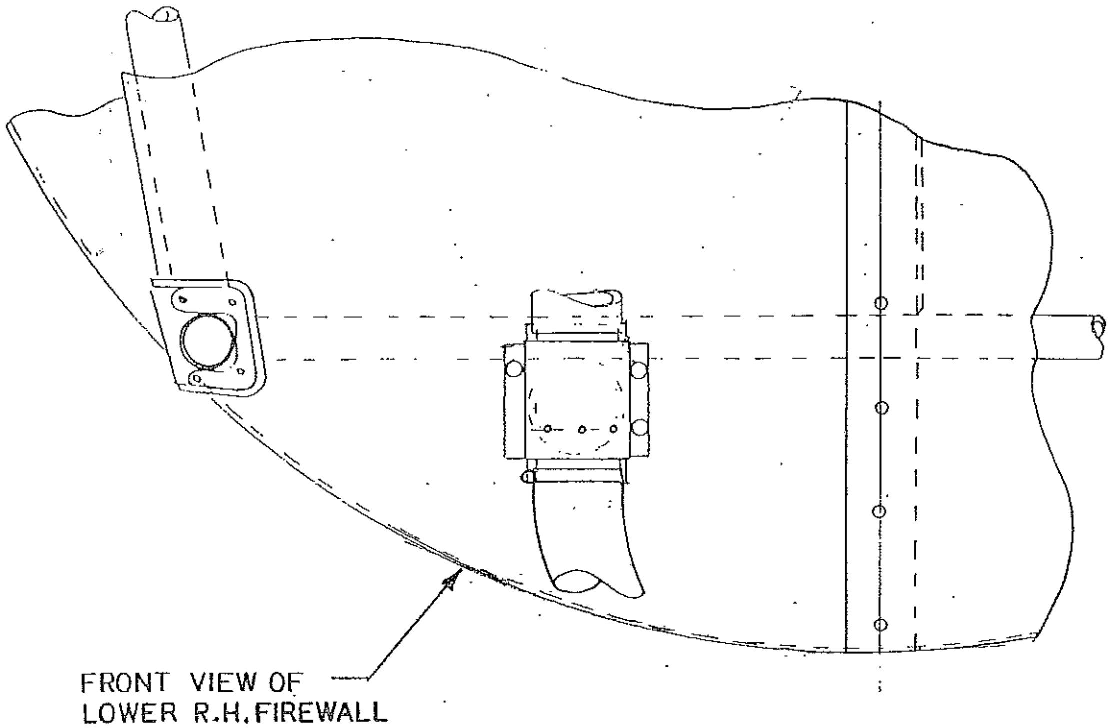
8. Notify Classic Aircraft Corporation of compliance by completing and returning the attached form.

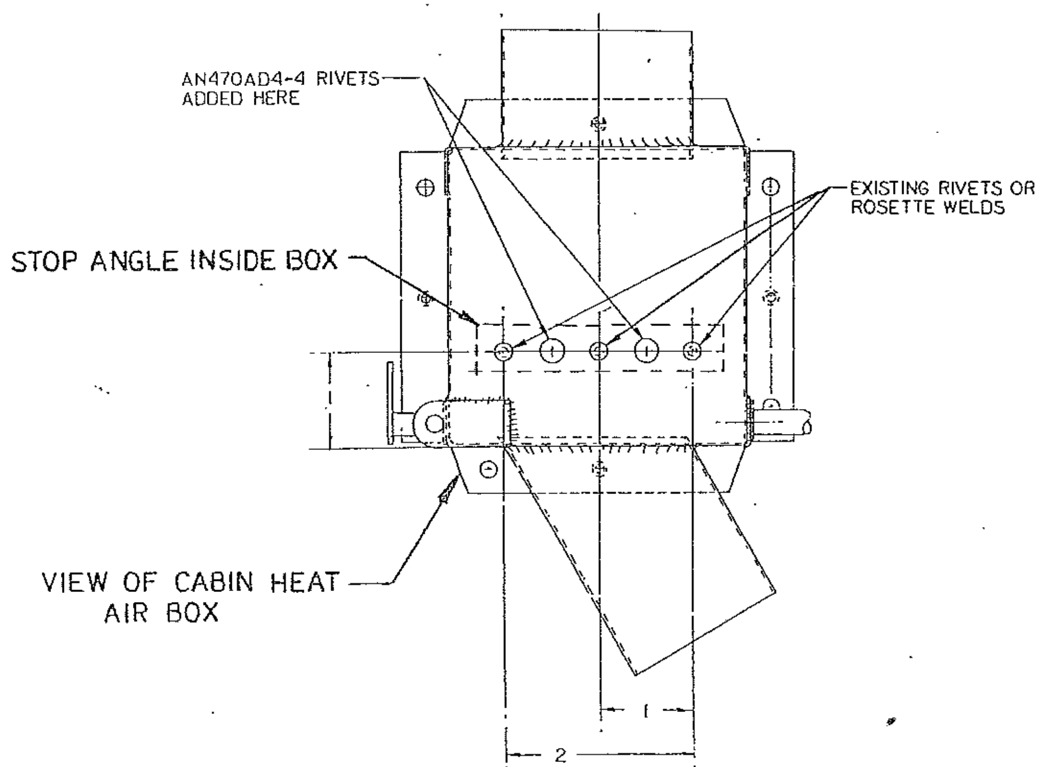
If you have any questions regarding the above, please contact the Service Manager.

CLASSIC AIRCRAFT CORPORATION

Robert Edelstein

Robert N. Edelstein
Service Manager


FRONT VIEW OF
LOWER R.H. FIREWALL


AN470AD4-4 RIVETS
ADDED HERE
EXISTING RIVETS OR
ROSETTE WELDS
STOP ANGLE INSIDE BOX
VIEW OF CABIN HEAT
AIR BOX
1
2

To: Robert Edelstein, Service Manager
Classic Aircraft Corporation
Capital City Airport
Lansing, MI 48906

Subject: Compliance Notification Form
Service Letter SL92-2 - Cabin Heat Box Inspection

I certify that the modification described in Classic Aircraft Corporation Service Letter SL92-2 has been completed and that the proper log book entry has been recorded noting compliance with Classic Aircraft Corporation Service Letter SL92-2.

Model: WACO YMF, Classic WACO F5 & F5C

Serial Number ______________

Owners Name ____________________________________

Total Aircraft Hours ______________

☐ Stop angle was rivited in place.

☐ Stop angle was rosette welded in place.

Date SL92-2 completed ____________________

Modification accomplished by:

Agency's name ____________________________________

Address ____________________________________

____

Signature of Authorized Mechanic:

____

Certificate No. ____________

CLASSIC AIRCRAFT CORPORATION

SERVICE LETTER SL92-1

DATE:

TITLE

STABILIZER SPAR INSPECTION AND REINFORCEMENT

TO

ALL OWNERS OF CLASSIC WACO F5 AND F5C AIRCRAFT SERIAL NUMBERS F5001 THRU F5C044

MODELS AFFECTED

ALL WACO YMF, CLASSIC F5 AND F5C AIRCRAFT MANUFACTURED TO STC1000GL

DISCUSSION

During a routine inspection of a Classic YMF-5, a crack was found in the upper and lower surfaces of the front stabilizer spar, next to the weld on the aircraft center line. Due to the serious nature of a total spar failure, Classic Aircraft requests that you inspect your aircraft before further flight to assure integrity of your spar. Classic Aircraft requires that inspection of this area be made a part of each preflight inspection, or at a minimum of each 10 hours of operation until the stabilizer has been reinforced with a 50996 finger patch on both the upper and lower surfaces, per the instructions of this service letter. After compliance with this service letter, a normal inspection schedule may be resumed. It is recommended that a thorough inspection of the suspect area be made a part of all future inspections.

MATERIAL

The material to accomplish this modification is included with this service letter and consists of two (2) of the 50996 reinforcement.

COST

The 50996 reinforcements are being made available without cost to registered owners. Upon notification of completion of the modification, by returning the attached Compliance Notification form, the owner will be reimbursed $400.00 to help cover the labor costs, or if the aircraft is returned to Lansing, Michigan, the Service Letter 92-1 work will be accomplished free of charge.

INSTRUCTIONS TO INSPECT FOR CONTINUING FLIGHT

This inspection is to be made by a qualified mechanic. With the aid of an inspection mirror and a flashlight, look through the front spar slot in the fin fairing and examine the area where the 1 3/8 inch front spar tubes are butt welded together. The best view of the upper surface is with the stabilizer trimmed with the leading edge down, and then retrimmed with the leading edge up to view the lower surface. Examine the area thoroughly for cracks on both top and bottom surfaces. If no cracks are found the aircraft may continue in service, but the inspection must be repeated at intervals not to exceed 10 hours of operation until installation of the reinforcements is accomplished.

If a crack is found, it must be repaired and reinforced before further flight.

INSTRUCTIONS FOR REPAIR AND/OR REINFORCEMENT

1. Remove top fin fairings.

2. Disconnect top elevator cable from elevator horn. (Having a helper apply some forward force to the control stick while holding the elevator up will usually allow the clevis bolt to be removed without loosening the turnbuckle.)

3. Remove both elevators.

4. Remove the six (6) screws from the trim actuator ball nut socket and clevis pin from stabilizer guide.

5. Remove front fin attach bolt and support tube.

6. Remove fin spar to fuselage tail post attachment bolt.

7. Remove stabilizer rear spar attachment bolt.

8. Remove both outboard tail brace wire lug to stabilizer attachment bolts. (It is not necessary to change the tail brace wire length to remove these bolts and when the bolts are retightened, the wire should return to it's original tension.) Rotate the fin just enough to allow removal of the stabilizer.

9. Turn the trim actuator ball nut so that the alignment pin is to the same side as to which the fin is rotated.

10. Tilt the stabilizer to allow the stabilizer to be lifted off of the ball pin and lift the stabilizer off of the airplane. Tie the tail brace wires together and secure to the fuselage to keep them from getting bent or damaged while the stabilizer is being worked on.

11. Remove the paint and clean the area where the reinforcement will be welded onto the front spar. (See attached sketch.)

12. Inspect the area for cracks.
    IF THE SPAR IS CRACKED;
    Stop drill the crack ends with a 3/32 drill. Weld the crack and stop drill holes closed. (Gas or tig welding is acceptable.)

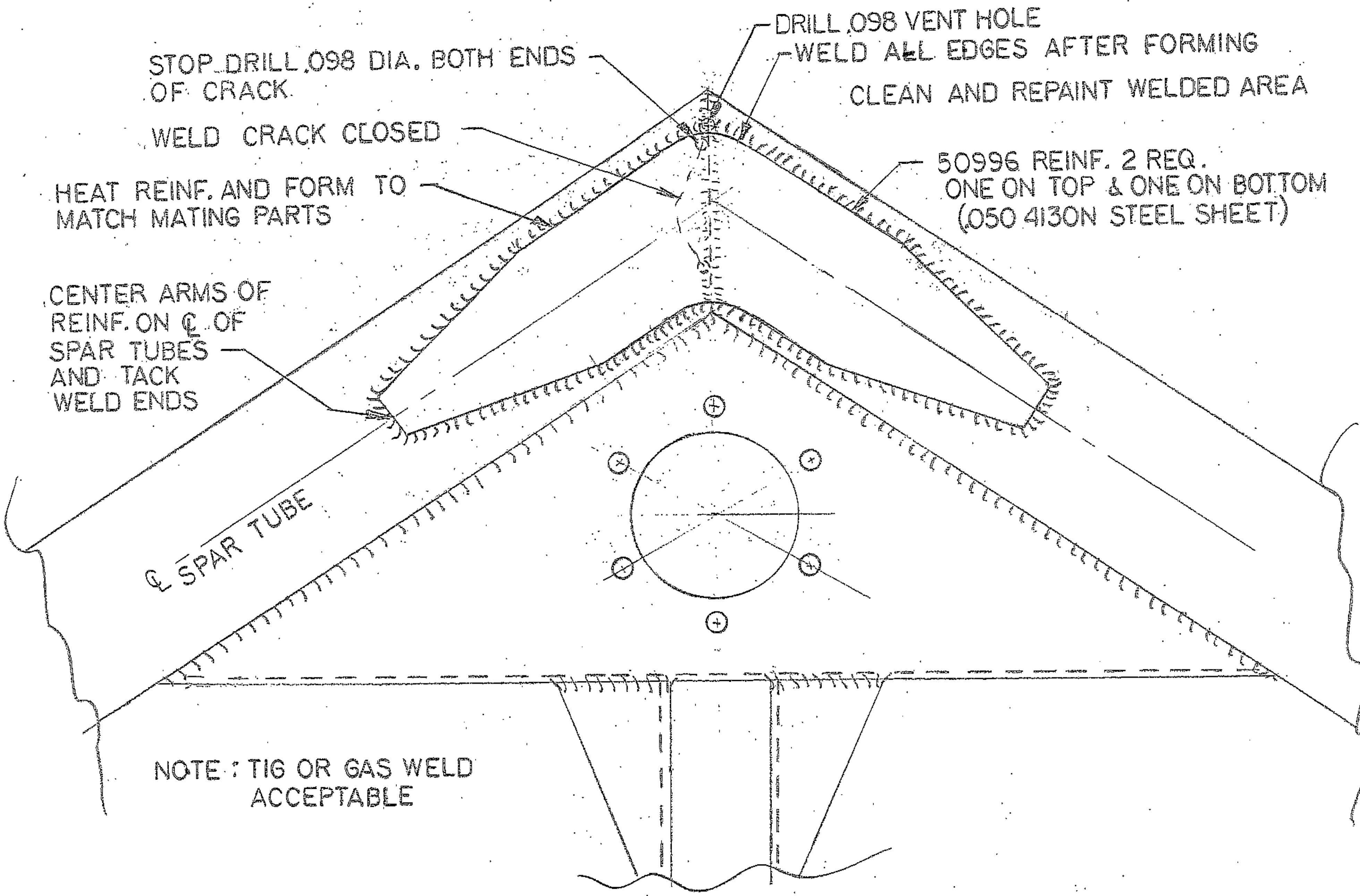
13. AFTER THE CRACK IS REPAIRED OR IF THE SPAR IS NOT CRACKED:
    Center the arms of a 50996 reinforcement on the center line of the top of the spar tubes. (See attached sketch.) Drill a .098 vent hold in the spar tube at the reinforcement leading edge center line. Tack weld the ends to hold the reinforcement in place while forming. Position another reinforcement on the bottom surface and tack weld in place. Heat the reinforcements red hot and carefully form to match mating parts. Weld all of the edges of the reinforcements to the spar tubes using a welding sequence which will finish with welding the vent hole closed. All welding is to be done in accordance with AC 43.13-1A Chapter 2, Section 2.

14. Clean, prime and repaint the welded area.

15. Reinstall the stabilizer by reversing the removal procedure. After the reinstallation is complete, recheck all safeties, cable and wire tensions and proper operation of the trim and elevator systems.

16. Make a log book entry that Service Letter SL92-1 has been complied with. The weight and balance change is negligible.

17. Notify Classic Aircraft Corporation of compliance by completing and returning the attached compliance form.



REPAIR AND/OR REINFORCEMENT OF
WACO YMF CLASSIC F-5 AND F-5C
STABILIZER FRAME 19415-0 OR -20

CLASSIC AIRCRAFT CORP.
SERVICE LETTER SL92-1

To: Classic Aircraft Corporation
Capital City Airport
Lansing, MI 48906

Subject: Compliance Notification Form
Service Letter SL92-1 - Stabilizer Inspection & Reinforcement

I certify that the modification described in Classic Aircraft Corporation Service Letter SL92-1 has been completed and that the proper log book entry has been recorded noting compliance with Classic Aircraft Corporation Service Letter SL92-1.

Model: WACO YMF, Classic WACO F5 & F5C

Serial Number ____________

Owners Name ____

Total Aircraft Hours ______________

If the spar was cracked, please describe the crack.

Date SL92-1 completed ______________________

Modification accomplished by:

Agency's Name ____

Address ____

____

Signature of Authorized Mechanic:

____

Certificate No. _________________

WACO CLASSIC

November 8, 1991

To All Classic F-5 Owners:

The brake system on the current production WACO F-5 has been changed to incorporate an alternate brake master cylinder. This new cylinder has a larger bore which reduces the sensitivity by requiring more foot force to obtain equivalent braking action.

The new cylinders are retrofitable to all earlier aircraft in both the front and rear cockpits. Changing of the cylinders is a simple bolt in replacement using all of the existing hardware and then rebleeding the brake hydraulic system.

Classic Aircraft Corporation will provide retrofit cylinders on a no cost exchange basis to all Classic F-5 owners. If you would like to order the replacement cylinders, contact the Service Manager at Classic Aircraft Corporation. When the cylinders are shipped you will be billed $232.16 for each cylinder. When the exchange cylinders are received by Classic Aircraft Corporation, a credit for the same amount will be issued.

Please feel free to call if you have any questions.

Very truly yours,

CLASSIC AIRCRAFT CORPORATION

Lloyd M. James

Lloyd L. James
Service Manager

CLASSIC AIRCRAFT CORPORATION

SERVICE LETTER SL91-1

DATE: NOVEMBER 12, 1991

TITLE

ALTERNATE BRAKE MASTER CYLINDER INSTALLATION

TO

ALL OWNERS OF WACO SERIAL NUMBER F5001 thru F5042

MODELS AFFECTED

WACO YMF, CLASSIC F5 PER STC SA1000GL

DISCUSSION

The brake system on the current production WACO F-5 has been changed to incorporate an alternate brake master cylinder. This new cylinder has a larger bore which reduces the sensitivity by requiring more foot force to obtain equivalent braking action. The new cylinders are retrofitable to all earlier aircraft in both the front and rear cockpits. Changing of the master cylinders is a minor bolt in replacement using all of the existing hardware and then pressure bleeding the brake hydraulic system.

MATERIAL

010-02404 Master Cylinder - 2 or 4 as required

COST

The master cylinders are to be provided on a no cost exchange basis. However, when the cylinders are shipped you will be billed $232.16 for each cylinder shipped. A credit will be issued for the same amount when the exchange cylinders are received by Classic Aircraft Corporation.

INSTALLATION INSTRUCTIONS

1. Drain hydraulic fluid from reservoir.
2. Remove hoses from master cylinder fittings.
3. Remove bolts from top and bottom of cylinder.
4. Adjust fork fitting in the new cylinder to make the length between pivot bolts match the old cylinders.
5. Move the hose fittings to the new cylinders being careful to match the alignment in the original cylinders.
6. Install the cylinders with the pivot bolts and resafety.
7. Reinstall the hoses onto the fittings and operate pedals to check for free travel and hose clearance.

8. Lubricate each pivot bolt with a drop of oil.
9. Bleed the hydraulic system using a pressure bleeder from the wheel cylinder upward.
10. Check brakes for proper operation.
11. Make log book entry that Service Letter SL91-1 has been complied with. The weight and balance change is negligible.
12. Notify Classic Aircraft Corporation of compliance by returning the enclosed form.
13. Return the exchange cylinders for credit.

To: Classic Aircraft Corporation
Capitol City Airport
Lansing, MI 48906

Subject: Compliance Notification Form
Service Letter SL91-1

I certify that the modification described in Classic Aircraft Corporation Service Letter SL91-1, has been completed and that the proper log book entry has been recorded noting compliance with Classic Aircraft Corporation Service Letter SL91-1. Cylinders were changed in front cockpit___, rear cockpit___.

Model: WACO YMF, Classic WACO F5 and F5C

Serial Number ____________________

Owners Name ____

Date SL91-1 completed______________________

Modification accomplised by:

Name ____

Address ____

____

Signature of Authorized Mechanic

____

CLASSIC AIRCRAFT CORPORATION

SERVICE LETTER

DATE: JUNE 30, 1989 SL89-2

TITLE

ALTERNATE RUDDER PEDAL INSTALLATION

TO

ALL OWNERS OF WACO SERIAL NUMBERS F5001 THRU F5023

MODELS AFFECTED

WACO YMF, CLASSIC F5 PER STC SA1000GL

DISCUSSION

The brake pedal for the Classic F5 WACO has been restyled to provide a more comfortable foot position under all conditions. This restyled pedal is retrofitable to all earlier aircraft in both the front and rear cockpits. Changing the pedal is a simple bolt in replacement using all of the existing hardware.

MATERIAL

a. Brake Pedal - Classic Part No. 50102-2 (2 req.)
b. AN381-2-8 Cotter Pin (6 req.)

COST

This kit is provided on a no cost exchange basis. However, when the kits are shipped you will be billed $85.00 for each pair needed. A credit will be issued for the same amount when the exchange pedals are received by Classic Aircraft Corporation.

INSTALLATION INSTRUCTIONS

1. Remove the bolt from the brake master cylinder top fork.
2. Remove both brake pedal pivot bolts.
3. Replace pedal with new pedal and reinstall pivot bolts and master cylinder fork bolt.
4. Resafety all bolts with new cotter pins provided.
5. Lubricate each bolt with a drop of oil.
6. Repeat above procedure for opposite side of aircraft.
7. Make Log Book entry that Service Letter SL89-2 has been complied with. Weight and balance change is negligible.
8. Notify Classic Aircraft Corporation of compliance, and indicate which pedals were replaced, by returning the enclosed form.
9. Return the exchange pedals for credit.

To: Classic Aircraft Corporation
Capital City Airport
Lansing, MI 48906

Subject: Compliance Notification Form
Service Letter SL89-2

I certify that the modification described in Classic Aircraft Corporation Service Letter SL89-2, has been completed and that the proper log book entry has been recorded noting compliance with Classic Aircraft Corporation Service Letter SL89-2. Pedals were changed in front cockpit ____, rear cockpit ____.

Model: WACO YMF, Classic WACO F5

Serial Number ____________________

Owners Name ____

Date SL89-2 completed __________________

Modification accomplished by:

Name ____

Address ____

____

Signature of Authorized Mechanic

____

CLASSIC AIRCRAFT CORPORATION

SERVICE LETTER

SL89-1

Date: June 29, 1989

TITLE

FUEL LINE CHAFE PROTECTION

TO

ALL OWNERS OF CLASSIC WACO SERIAL NUMBERS F5001 THRU F5023

MODELS AFFECTED

WACO YMF, CLASSIC F5, PER STC 5A1000GL

DISCUSSION

It has been found that in some aircraft with the deluxe interior, the upholstery panel in the front cockpit is close enough to contact the fuel supply line. To preclude the possibility of chafeing of the fuel line, install the split hose provided as an antichafe protector.

MATERIAL

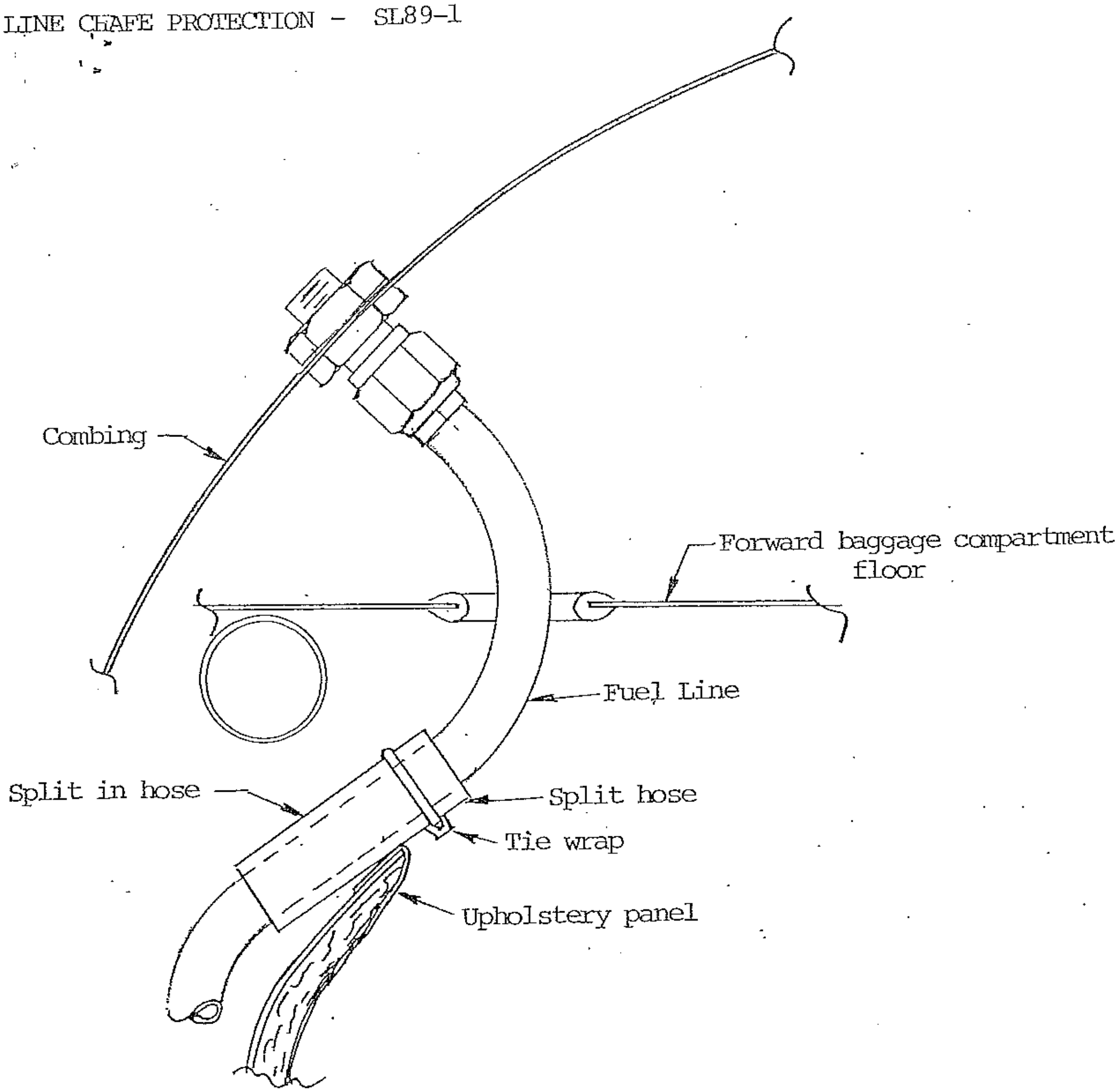
a. Split Hose - Classic Part No. 50877 (2 req.)
b. Tie Wrap (2 req.)

COST

This kit is being made available to registered owners without cost.

INSTALLATION INSTRUCTIONS

1. Wipe the fuel line clean.
2. Spread the split hose sides and coat the inside with trim cement.
3. With the hose spread open, slip the hose onto the fuel line and slide behind the upholstery panel until approximately 3/4 inch remains exposed.
4. Be sure the split side of the hose is away from the upholstery panel.
5. Secure the top of the hose tightly with tie wrap provided.
6. Repeat the above procedure for the opposite side of the aircraft.
7. Make Log Book entry that Service Letter SL89-1 has been complied with, weight and balance change is negligible.
8. Notify Classic Aircraft Corporation of compliance by returning the enclosed form.



Section Through Fuel Line Area

To: Classic Aircraft Corporation
Capital City Airport
Lansing, MI 48906

Subject: Compliance Notification Form
Service Letter SL89-1

I certify that the modification described in Classic Aircraft Corporation Service Letter SL89-1, has been completed and that the proper log book entry has been recorded noting compliance with Classic Aircraft Corporation Service Letter SL89-1.

Model: WACO YMF, Classic WACO F5

Serial Number ____________________

Owners Name ____

Date SL89-1 completed ____________________

Modification accomplished by:

Name ____

Address ____

____

Signature of Authorized Mechanic

____

CLASSIC AIRCRAFT CORPORATION

SERVICE LETTER

SL88-3

Date: October 3, 1988

TITLE

SAFETY WIRE INSTALLATION ON OIL VALVE

TO

ALL OWNERS OF CLASSIC WACO F5, SERIAL NUMBERS F5001 THRU F5015

DISCUSSION

The oil drain valve was not safety wired on the factory installation. Although in many cases a pipe threaded fitting does not require a safety it has been determined that this oil drain valve does require a safety wire to assure security. Some of the drain valves used on these aircraft have been drilled for a safety wire, others have not. The lack of a safety wire may result in the valve coming loose with the resultant loss in engine oil and possible severe damage to the powerplant, aircraft and occupants.

INSTRUCTIONS

The oil valve is located at the aft, bottom center of the engine and may be seen, with aid of a flashlight and inspection mirror, without removing the cowl by looking through the aft cowl side access doors and by looking up between the inner cowl and firewall.

Look at the photographs on page 2 of this service letter to see the location of the safety hole on the oil drain valve.

Examine your valve to see if it has been drilled for a safety hole.

If your valve has a drilled safety hole:

a. Check that the valve is properly seated into the bushing.
b. Install a safety wire around the tee fitting (see photograph).
c. Make proper log book entry recording compliance with Service Letter SL88-3.
d. Notify Classic Aircraft Corporation of compliance by returning the enclosed form for reimbursement of $16.00 to cover costs.

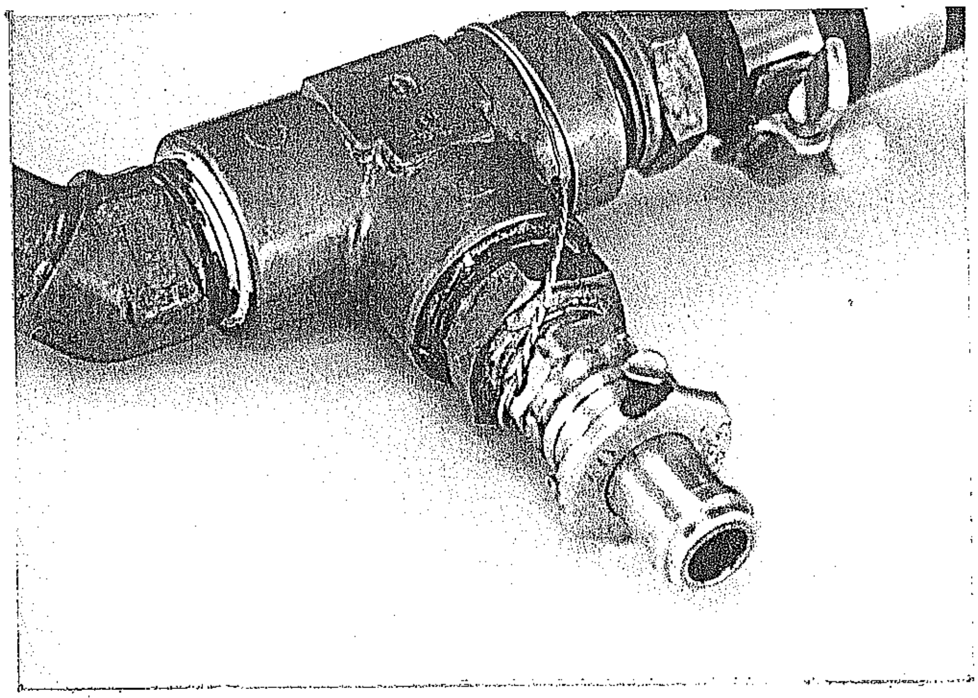
If your valve does not have a drilled safety hole:

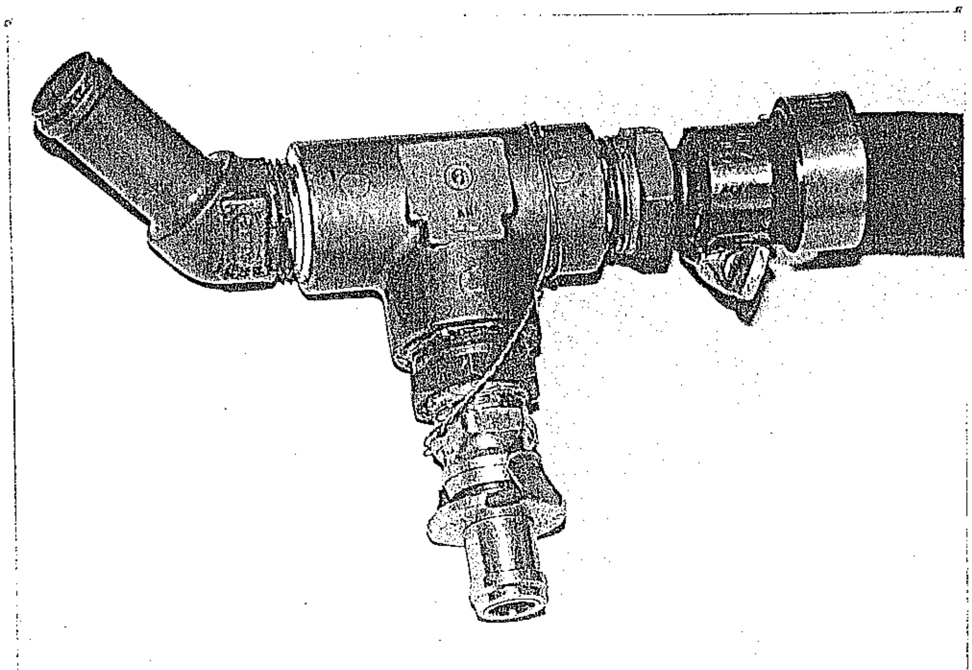
a. Check that the valve is properly seated into the bushing.
b. Notify Classic Aircraft Corporation by phone: Service Manager, Lloyd James, phone number (517) 321-7000, that you have an undrilled valve.
c. Classic Aircraft Corporation will supply you with a drilled valve at no expense.

d. When you receive the drilled valve, replace the valve and install the safety wire. Send the undrilled valve back to Classic Aircraft Corporation along with the enclosed form for reimbursement of $32.00 for labor costs.

e. Make proper log book entry recording compliance with Service Letter SL88-3.

PHOTOGRAPHS:





CLASSIC AIRCRAFT CORPORATION

SERVICE LETTER

SL88-2

Date: July 5, 1988

TITLE

RETROFIT OF OIL SCAVENGE LINE AND SAFETY PINNING OF EXHAUST SYSTEM

TO

ALL OWNERS OF CLASSIC WACO F5, SERIAL NUMBERS F5001 THRU F5013

MODELS AFFECTED

WACO YMF, CLASSIC WACO F5, STC1000GL

DISCUSSION

The changing of the metal oil scavenge line to a hose with a fire sleeve and the pinning of the exhaust system components is done to reduce the fire hazard potential resulting from a failure of an exhaust system component or a component support structure.

MATERIAL

The material to accomplish the subject retrofit and modification consists of:

KIT NO. 88-2A
88-2B
INSTRUCTIONS NO: KIT 88-2 INSTRUCTIONS

COST

The kits are being made available without cost to registered owners. Upon notification of installation, by returning the enclosed form, the owner will be reimbursed $64.00, or if the aircraft is returned to Classic Aircraft Corporation in Lansing, Michigan, the Service Letter 88-2 work will be accomplished free of charge.

CLASSIC AIRCRAFT CORPORATION

RETROFIT OF OIL SCAVENGE LINE AND SAFETY PINNING OF EXHAUST SYSTEM

INSTALLATION INSTRUCTIONS: KIT 88-2
Reference: Classic Aircraft Corporation SL88-2

PART A: INTRODUCTION

A.1 Presentation of Instruction:
The installation instructions for the oil scavenge line and the modification instructions for the exhaust system, consists of four parts:

PART A: INTRODUCTION
PART B: OIL SCAVENGE LINE RETROFIT
PART C: EXHAUST SYSTEM MODIFICATIONS
PART D: GENERAL INSTRUCTIONS

A.2 Initial Procedure:
a. Carefully read the complete instructions before starting the retrofit or modification.
b. Inventory the kits to verify that all the parts required to complete the retrofit and modifications are included.
c. Remove cowl.
d. Remove inner cowl, left side.

INSTALLATION INSTRUCTIONS: KIT 88-2

PART B: OIL SCAVENGE LINE RETROFIT

B.1 General: These instructions consist of the following parts:

a. Identification of Parts
b. Retrofit Instructions

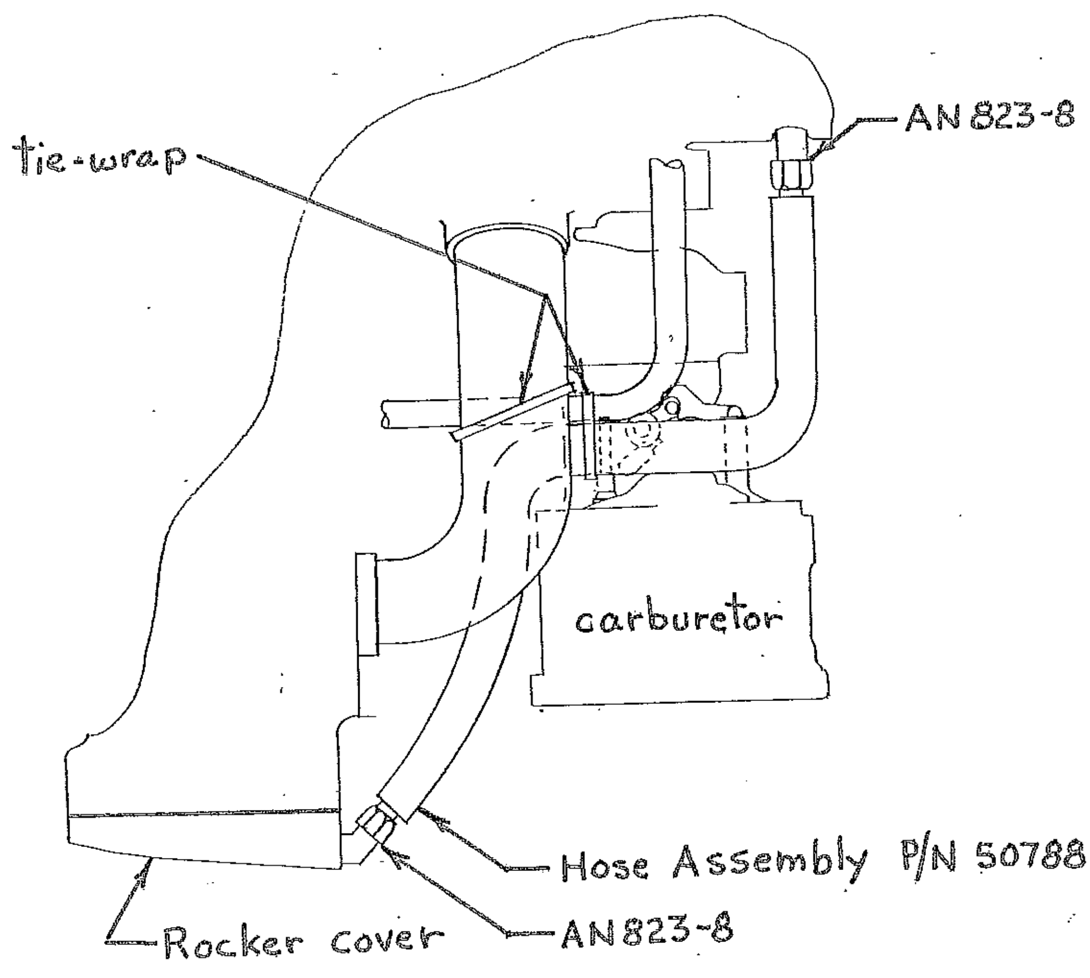
B.2 Identification of Parts: The following parts are included in KIT NO. 88-2A:

a. Hose Assembly, Classic Part No. 50788, (1 req.)
b. Fitting, AN823-8, (2 req.)
c. Tie Wrap, (2 req.)

B.3 Installation Instructions:

a. Reference Figure B-1, Oil Scavenge Line Installation.
b. Identify and remove the metal oil scavenge line, Classic Part No. 50539, including the short section of flexible hose and the end fittings.
c. The rocker cover may have a 3/8NPT threaded hole with a bushing or may have a smaller size hole without a bushing. If it has a bushing, remove it. If it does not have a bushing, remove the rocker cover and drill and tap for a 3/8 NPT thread. Be careful, the rocker cover is cast and is easily broken. Reinstall rocker cover.
d. Install the hose assembly, Classic Part No. 50788, using the AN823-8 fittings. Route as shown in Figure B-1.
e. Use tiewraps (2 places), as shown in Figure B-1, to keep the subject hose assembly from interfering with the carburetor controls.
f. Inspect for proper security and safeties.

Figure B-1: Oil Scavenge Line Installation Left Side of Powerplant



INSTALLATION INSTRUCTIONS: KIT 88-2

PART C: EXHAUST SYSTEM MODIFICATION

C.1 General: These instructions consist of the following parts:

a. Identification of Parts
b. Modification Instructions

C.2 Identification of Parts: The following parts are included in KIT NO. 88-2B:

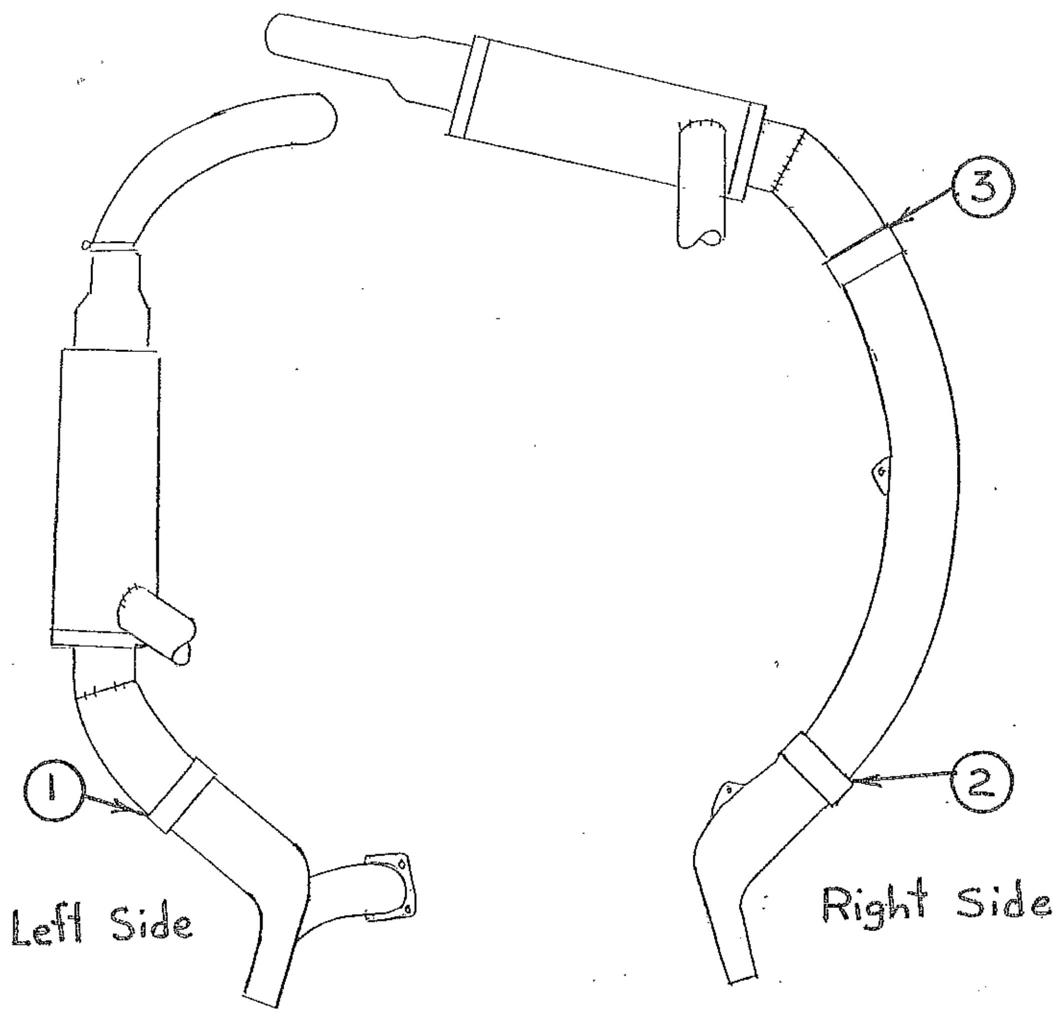
a. Pin Assemblies: Classic Part No. 50866, (6 req.)
b. Clamp, 3¼ inch worm drive clamp, (3 req.)
c. Drill Tool, (1 req.)

C.3 Modification Instructions:

a. Reference Figure C-1, -2, Exhaust System Modification.
b. Inspect exhaust system components for cracks or failure and repair or replace components as required.
c. Locate and drill two sets of holes for each joint as follows:

(1) Location 1 and 2 of Figure C-1
  (a) Reference Figure C-2.
  (b) Drill a 0.191 inch diameter hole 5/16 inch from top edge of spade and one inch outboard and forward of aft weld seam line. See Figure C-2 (A) and (B).
  (c) Drill a 0.191 inch diameter hole 5/16 inch from top edge of spade and located $180^{\circ} \pm 10^{\circ}$ from hole drilled in step (b), see Figure C-2 (B).
  (d) Using drill jig as shown in Figure C-2 (C), drill a 0.191 inch hole one inch above each of the holes drilled per (b) and (c).
  (e) Install a pin assembly in each set of holes and secure with clamp. See Figure C-2 (D).

(2) Location 3 of Figure C-1.
  (a) Reference Figure C-2.
  (b) Remove Scat hose from Oil Cooler. (If installed)
  (c) Locate and drill a 0.191 inch diameter hole 5/16 inch below the joint edge and located as convenient on the inboard side of the stack.
  (d) Locate and drill a 0.191 inch diameter hole 5/16 inch below the joint edge and located $180^{\circ} \pm 10^{\circ}$ from the hole drilled per step (c).
  (e) Using the drill jig as shown in Figure C-2 (C), drill a 0.191 inch diameter hole one inch above each of the holes drilled per steps (c) and (d).
  (f) Install a pin assembly in each set of holes and secure with clamp. Reference Figure C-2 (D).
  (g) Replace Scat hose removed per step (b).



Joints to be pinned; 1, 2, 3.

Figure C-1

Location of Pinned Joints

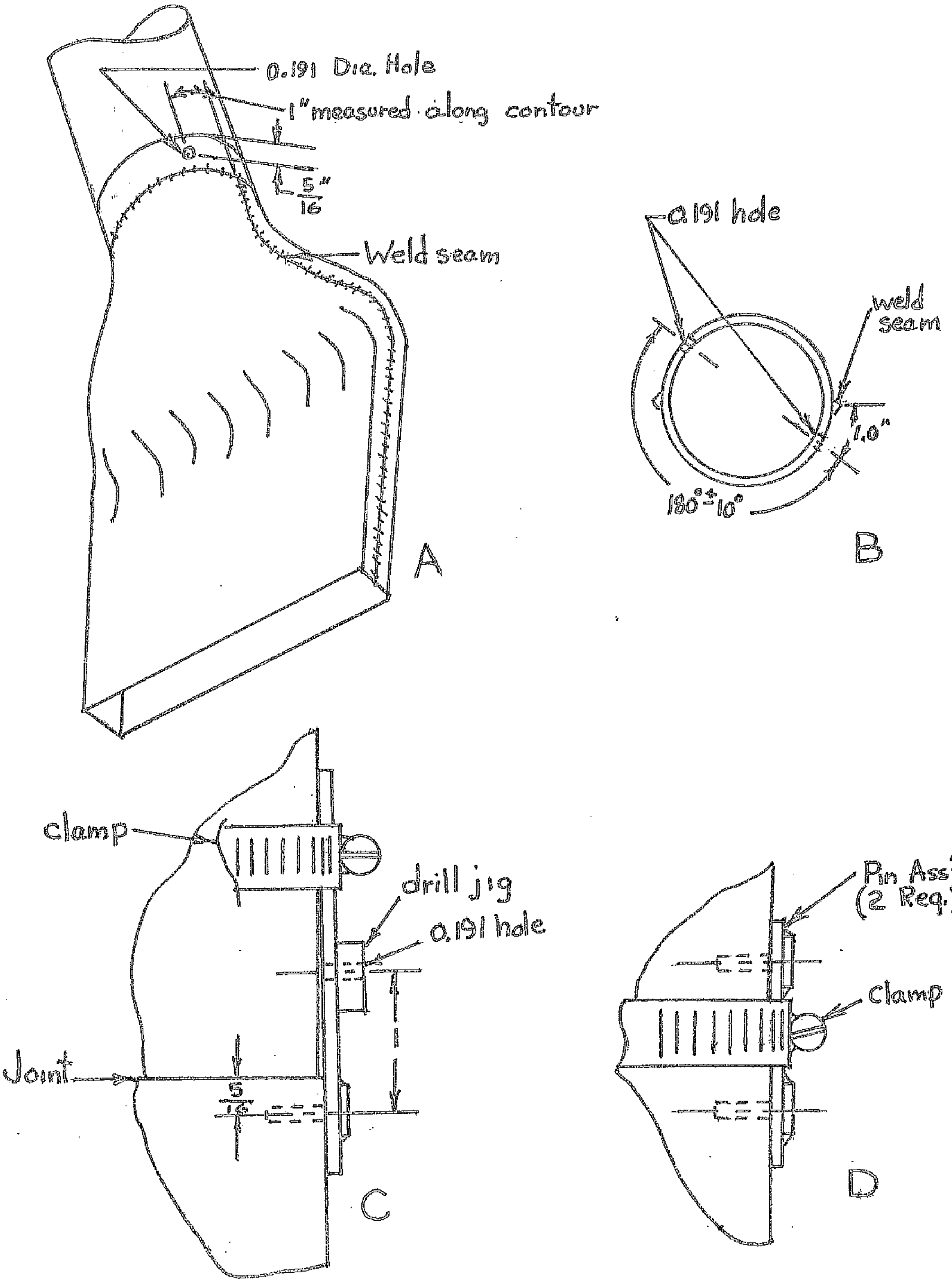


Figure C-2

Pinned Joint Details

CLASSIC AIRCRAFT CORPORATION

INSTALLATION INSTRUCTIONS: KIT 88-2

PART D: GENERAL

D.1 Instructions:

a. Inspect all attachments for proper security and safeties.
b. Install inner cowl.
c. Install cowl.
d. Make proper log book entry recording compliance with this Service Letter, SL88-2. Weight and balance change negligible.
e. Notify Classic Aircraft Corporation of compliance by returning the enclosed form.

SL 88-1 was mailed to

S/N 02
04
05
06
07
08

on May 3rd 1988

The inst. had previously been made on S/N 03.

S/N 09 has a special system that needs not to be revised.

S/N 01 is different and will be done by General (Classic) some time in the future.

CLASSIC AIRCRAFT CORPORATION

SERVICE LETTER

SL88-1

Date: May 2, 1988

TITLE

RETROFIT OF THROTTLE AND MIXTURE CONTROLS

TO

ALL OWNERS OF CLASSIC WACO F5, SERIAL NUMBERS F5001 thru F5009

MODELS AFFECTED

WACO YMF, CLASSIC WACO F5, STC 1000GL WITH STANDARD POWERPLANT CONTROL SYSTEM INSTALLATION

DISCUSSION

The design of the throttle and mixture control cables is such that the throttle and mixture control cables are in tension to apply power. This retrofit revises the subject control systems so that the cables are in compression to apply power.

With the retrofit installed, the pilot will be able to apply power in the event of an internal separation of the control cable.

Compliance with the modifications prescribed in this service letter will preclude possible Airworthiness Directive action by the Federal Aviation Administration.

MATERIAL

The material to accomplish the subject retrofit consists of:

KIT NO.: KIT 88-1
INSTRUCTIONS NO.: KIT 88-1 INSTRUCTIONS

COST

The kit is being made available without cost to registered owners. Upon notification of installation, by returning the enclosed form, the owner will be reimbursed $512.00, or if the aircraft is returned to Classic Aircraft in Lansing, Michigan, the Service Letter 88-1 work will be accomplished free of charge.

CLASSIC AIRCRAFT CORPORATION

THROTTLE AND MIXTURE CONTROL RETROFIT

INSTALLATION INSTRUCTIONS: KIT 88-1

Reference: Classic Aircraft Corporation SL88-1

PART A: INTRODUCTION

A.1 Presentation of Instructions:
These installation instructions for the throttle and mixture control retrofit, Classic Aircraft Corporation SL88-1, consists of four parts:

PART A: INTRODUCTION
PART B: THROTTLE CONTROL RETROFIT
PART C: MIXTURE CONTROL RETROFIT
PART D: GENERAL INSTRUCTIONS

A.2 Initial Procedure
a. Carefully read the complete instructions before starting retrofit.
b. Inventory the kit to verify that all the parts required to complete the retrofit are included.
c. Remove cowl.
d. Remove inner cowl, both right and left sides.

INSTALLATION INSTRUCTIONS: KIT 88-1

PART B: THROTTLE CONTROL RETROFIT

B.1 General: These instructions consist of the following parts:

- a. Identification of Parts
- b. Throttle Control Revision at Carburetor
- c. Throttle Control Revision in the Front Cockpit
- d. Rigging Instructions

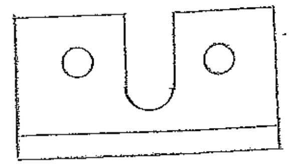
B.2 Identification of Parts: The following parts are included in KIT NO. 88-1.

a. Manufactured Parts (Reference Figure B-1)
- (1) Throttle Bracket A
- (2) Throttle Bracket B
- (3) Bracket Clamp A
- (4) Bracket Clamp B
- (5) Throttle Cable Spacer

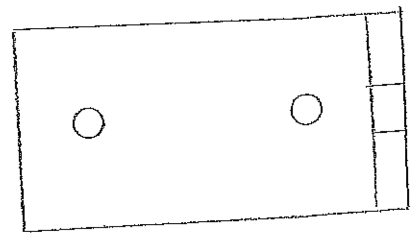
b. Hardware Parts:
- (1) Machine Screws AN526C
  - (a) -632 x 1.125 inch long (2 req.)
  - (b) -632 x 0.5 inch long (2 req.)
  - (c) -832 x 0.5 inch long (2 req.)
  - (d) -832 x 0.75 inch long (2 req.)
- (2) Nuts
  - (a) -632 (4 req.)
  - (b) -832 (4 req.)
- (3) Cotter Pins
  - (a) 3/32 (2 req.)
  - (b) 1/16 (2 req.)

Figure B-1: Throttle Control Retrofit Parts.

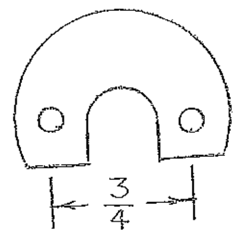
(1) Throttle Bracket A



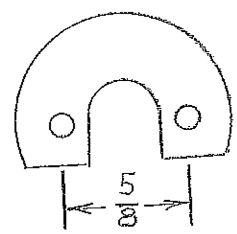
(2) Throttle Bracket B



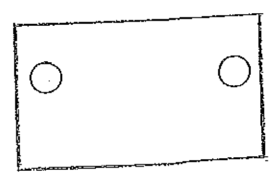
(3) Bracket Clamp A



(4) Bracket Clamp B



(5) Throttle Cable Spacer



B.3 Throttle Control Revision at Carburetor:

a. Remove throttle cable from carburetor throttle lever.
b. Remove throttle cable from bracket.
c. Install throttle cable spacer and throttle bracket A to existing bracket, using 1.125 inch long -632 machine screw and nut (2 required).
d. Rotate throttle lever on carburetor. (Lever to be below pivot)
e. Install throttle cable to throttle lever using existing hardware.
f. Assemble throttle cable to throttle bracket A using bracket clamp A with 0.50 inch long -632 machine screw and nut (2 required).
g. Reference Figure B-2.

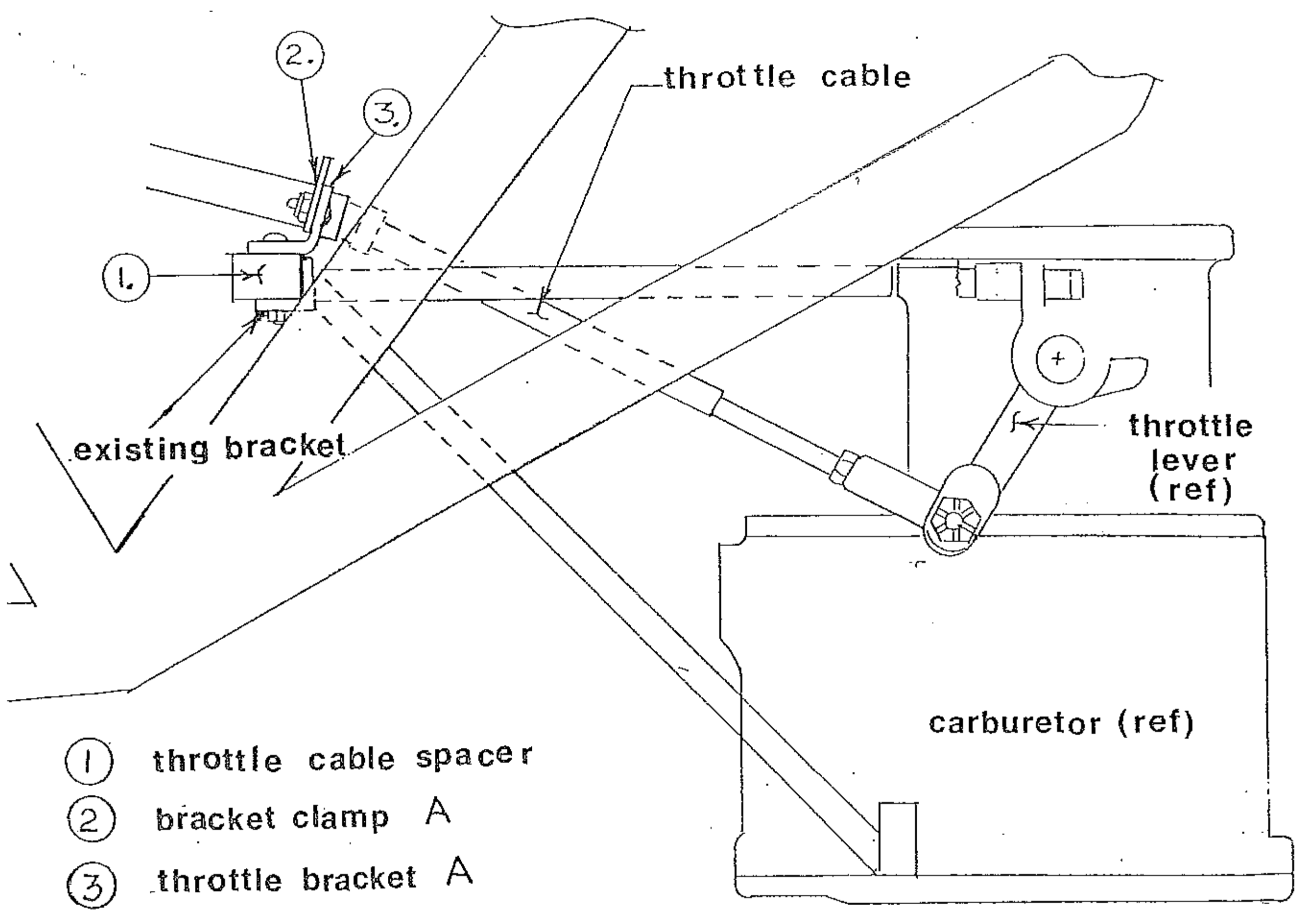


Figure B-2: Throttle Control Revision at Carburetor.

B.4 Throttle Cable Revision in the Front Cockpit:

a. Disconnect throttle cable and throttle cable rod from quadrant throttle lever.
b. Remove face of quadrant (4 screws).
c. Remove quadrant (4 screws).
d. Remove upper trim panel.
Caution: There is a one-half inch bushing back of the panel between the quadrant and the quadrant mounting plate on each quadrant bolt. Do not lose.
e. Drill two 0.166 inch diameter holes in trim extrusion and quadrant mounting plate. See sketch for location. Install 0.50 inch long -832 screws and nuts in newly drilled holes to fasten the extrusion to the quadrant mounting plate.
f. Locate position for throttle bracket B on trim extrusion.
(i) Replace quadrant.
(ii) Attach throttle cable to existing hole in throttle lever above fulcrum with existing hardware.
(iii) Pull throttle lever to full closed position (aft).
(iv) Assemble throttle bracket B to throttle cable with bracket clamp B and cotter pins.
(v) Locate throttle bracket B on extrusion with one mounting hole on either side of the extrusion centerline rib and such that the cable is at full extension less 1/16 of an inch.
(vi) Mark location of throttle bracket B on extrusion.
(vii) Remove throttle cable from the quadrant lever and the throttle bracket B.
(viii) Drill extrusion to match holes in throttle bracket B.
(ix) Assemble throttle bracket B to extrusion using 0.75 inch long -832 screws and nuts.
(x) Remove quadrant.
g. Reassemble trim panel.
h. Install quadrant (4 screws). Use one-half inch bushings on each quadrant screw between quadrant and quadrant mounting plate.
i. Assemble push rod to throttle lever on quadrant with existing hardware.
j. Assemble throttle control cable to quadrant lever using existing single hole in throttle lever above fulcrum.
k. Assemble throttle cable to throttle bracket B with bracket clamp B and AN381-3 cotter pins.
l. Inspect all attachments for proper security and safeties.
m. Install face of quadrant (4 screws).
n. Reference Figure B-3.

B.5 Throttle Cable Rigging Instructions:

a. Adjust cable to provide 1/16 inch lever springback with the throttle lever hitting the carburetor stops both forward and aft.

b. Inspect all attachments for proper security and safeties.

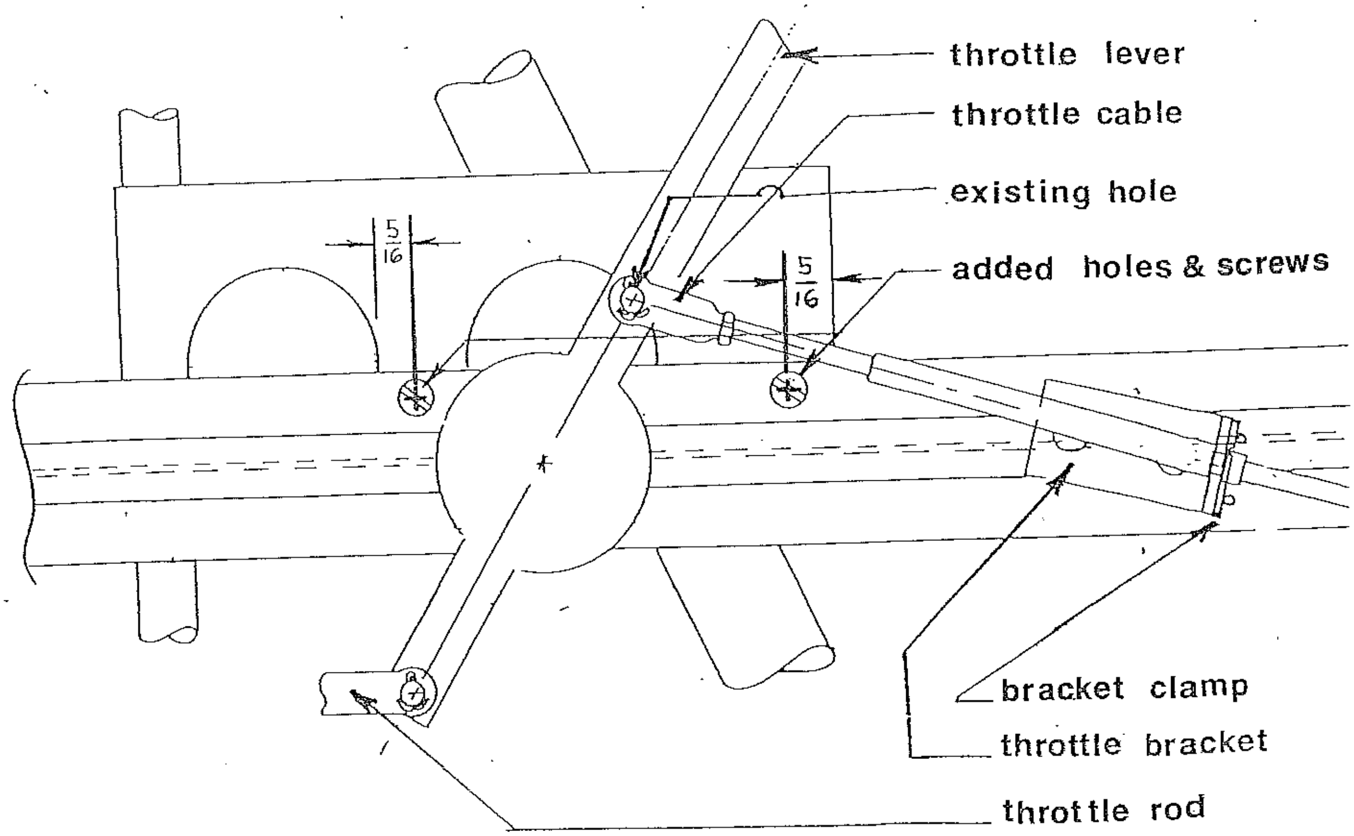


Figure B-3: Throttle Cable Revision in Front Cockpit.

CLASSIC AIRCRAFT CORPORATION

INSTALLATION INSTRUCTIONS: KIT 88-1

PART C: MIXTURE CONTROL RETROFIT

C.1 General: These instructions consist of the following parts:

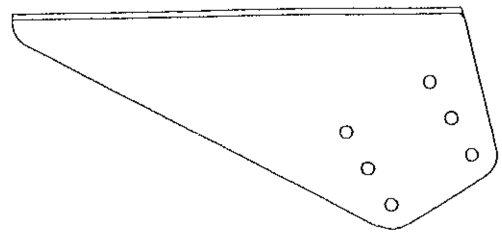
a. Identification of Parts
b. Mixture Control Revision at Carburetor
c. Mixture Control Revision in the Rear Cockpit
d. Rigging Instructions

C.2 Identification of Parts: The following parts are included in Kit 88-1.

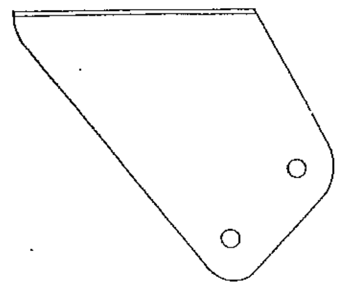
a. Manufactured Parts (Reference Figure C-1)
   (1) Mixture Control Bracket C
   (2) Mixture Control Bracket D
   (3) Mixture Quadrant Bracket E
   (4) 50193-2 Guide (2 req.)
   (5) 50194 Clamp (2 req.)
   (6) Spacer Block
b. Hardware Parts:
   (1) Machine Screws AN526C
      (a) -632 x 0.50 inch long (6 req.)
      (b) -1032 x1.125 inch long (2 req.)
      (c) -1032 x 0.50 inch long (2 req.)
   (2) Nuts
      (a) -632 (6 req.)
      (b) -1032 (4 req.)
   (3) Cotter Pin
      (a) 1/16 (3 req.)
   (4) Tie-wraps (3 req.)
   (5) Washers
      (a) AN940-416 (2 req.)

Figure C-1: Mixture Control Retrofit Parts.

(1) Mixture Control Bracket C
(Scale 1:2)

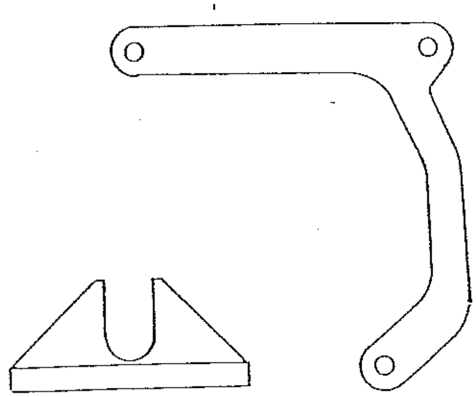


(2) Mixture Control Bracket D
(Scale 1:2)

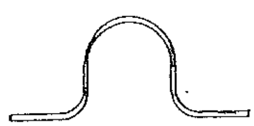


(3) Mixture Quadrant Bracket E
(Scale 1:2)

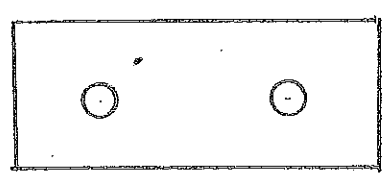
(4) 50193-2 Guide



(5) 50194 Clamp



(6) Spacer Block
(See note page 10)



C.3 Mixture Control Revision at Carburetor:

a. Remove mixture control cable from carburetor arm.
b. Remove mixture control cable from bracket.
c. Remove inboard rear gascolator support and cable guide.
d. Install mixture control bracket C using existing hardware. Use AN940-416 washers as required.
e. Rotate carburetor mixture control arm 180°. Recommended torque 15 in-lb. plus the additional torque required to safety.
f. Assemble mixture control cable to mixture control bracket C with50193-2 Guide and 50194 Clamp using 1/2 inch long -632 machine screws and nuts. Suggest initial location of clamp and guide in the most aft set of mounting holes.
g. Attach cable to carburetor arm using existing hardware.
h. Reference Figure C-2.

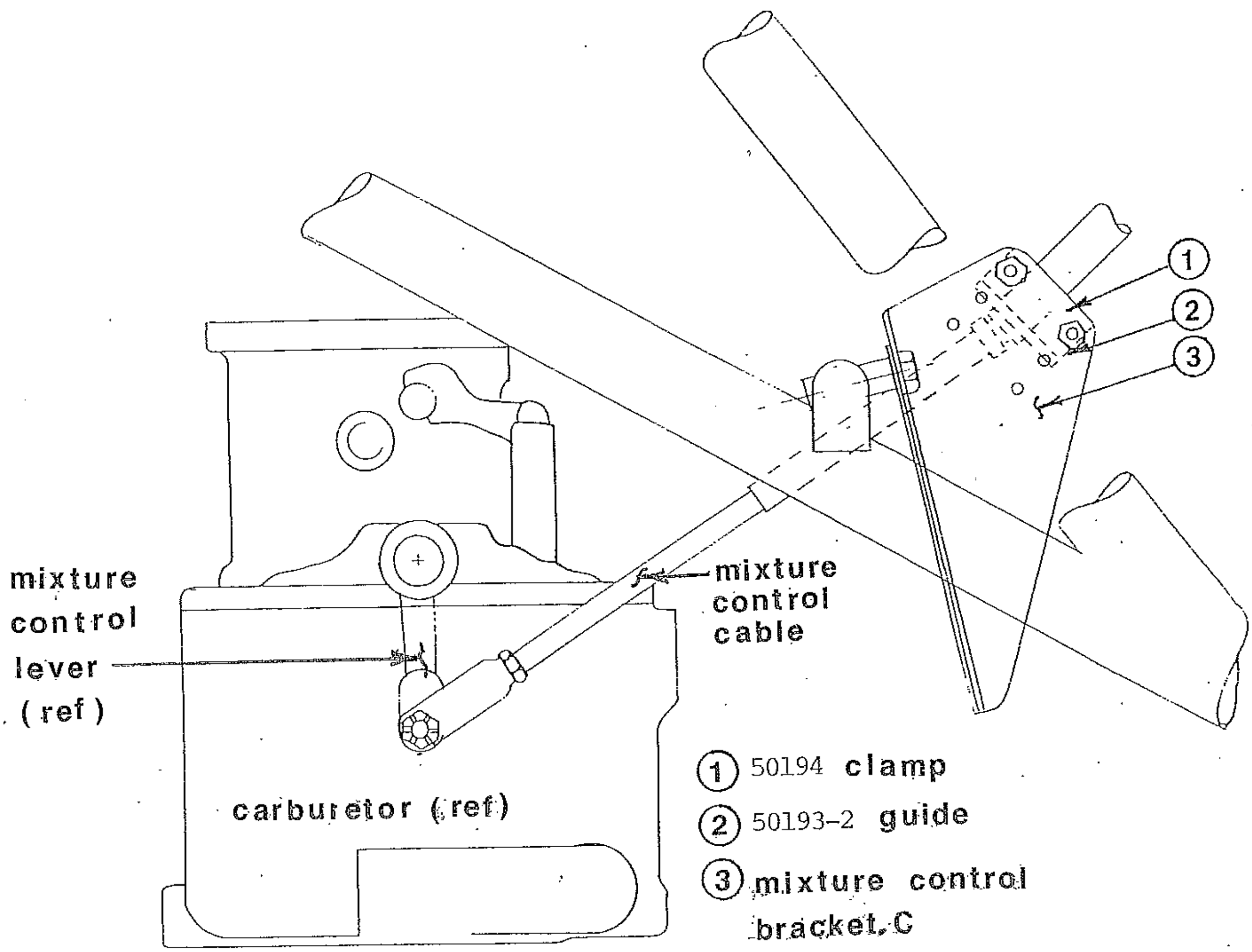


Figure C-2: Mixture Control Revision at Carburetor.

C.4 Mixture Control Revision in the Rear Cockpit:

a. Remove cover plate on quadrant (4 screws).
b. Remove mixture control cable from quadrant.
c. Remove carburetor heat control cable from quadrant.
d. Remove mixture control and carburetor heat control cables from cable retainer.
e. Remove cable retainer (and spacer block, if applicable)*.
f. Install spacer block, mixture control bracket D and cable retainer using -1032 screws 1.125 inch long and nuts (2 req.).
g. Remove interior trim side kick panel.
h. Reroute mixture control cable to inboard side of trim panel divider strip. Provide proper bend radius in mixture control cable and cut slot in kick panel to allow entrance for cable. (Reference Figure C-4)
   Note: May have to cut existing cable ties to allow for re-routing. Tie cable with tie-wrap after repositioning.
i. Install carburetor heat control cable to original position on the quadrant lever and to cable retainer using existing hardware.
j. Install quadrant bracket E to quadrant lever using existing holes in quadrant lever using -1032 screws 1/2 inch long and MS20365 elastic stop nut (2 req.).
k. Install mixture control cable to quadrant bracket E using existing hardware.
   Note: The cable had a maximum bend in each direction of 4 degrees (8 degrees total).
l. Install mixture control cable to mixture control bracket D using 50193-2 Guide and 50194 Clamp using 1/2 inch long -632 machine screw and nut.
   Note: Position screws with heads towards aft side of bracket and the nuts adjacent to the clamp.
m. Inspect all attachments for proper security and safeties.
n. Reinstall cover plate on quadrant.
o. Reference Figure C-3.
p. Mixture control bracket D may partially hide the parking brake placard. Move placard as required. Please use drill stop when relocating holes for placard installation.

*Note: Spacer block may be present in some aircraft. The spacer block is included in this kit.

C.5 Rigging of Mixture Control Cable:

Adjust cable to provide 1/16 inch lever spring back when the lever is in the full rich position (forward).

Note: Bracket No. C at the carburetor end of the cable has three sets of attachment holes. Position clamp to enable proper rigging to be obtained.

Inspect all attachments for proper security and safeties.

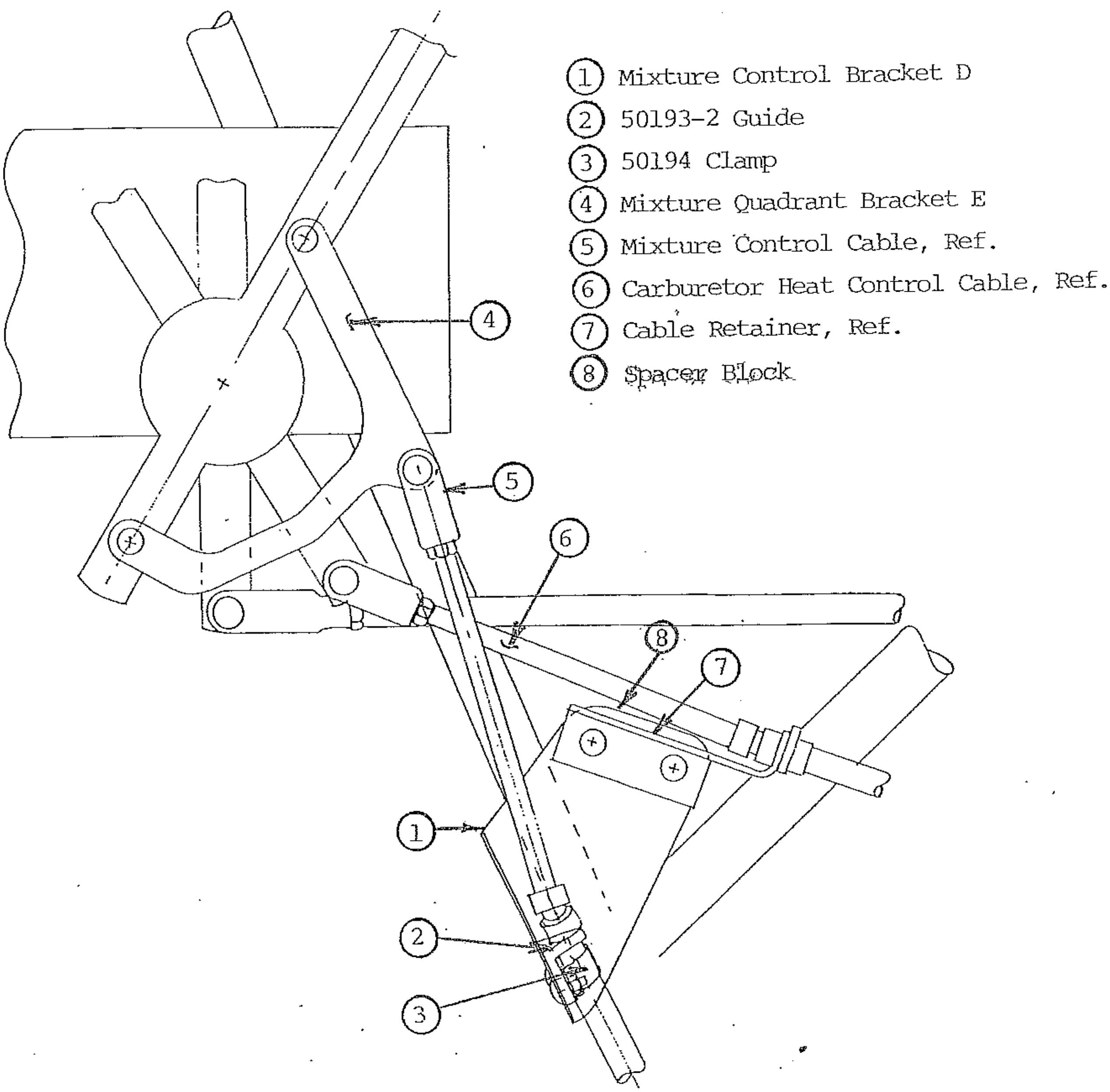


Figure C-3: Mixture Control Revision in Rear Cockpit

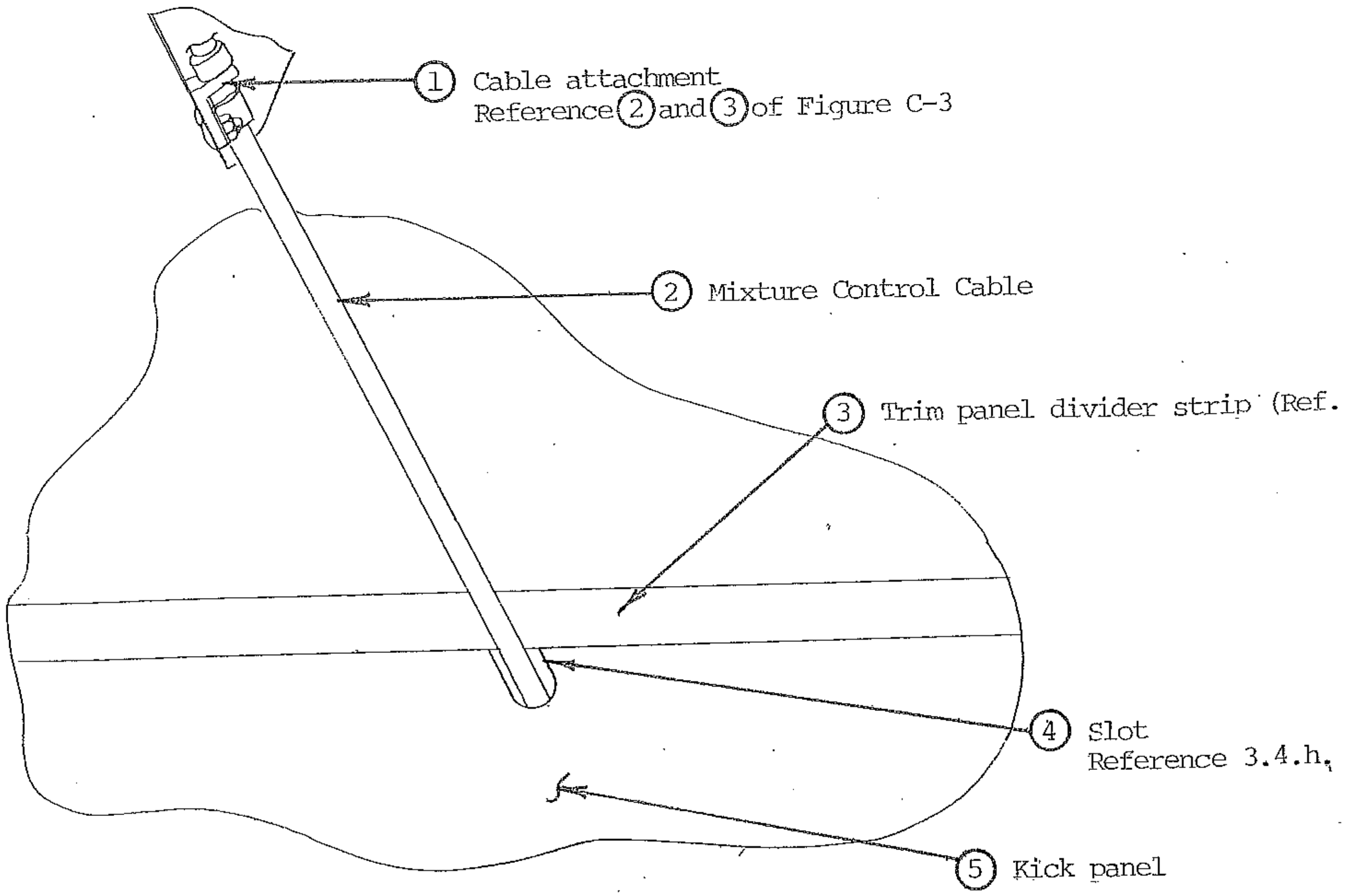
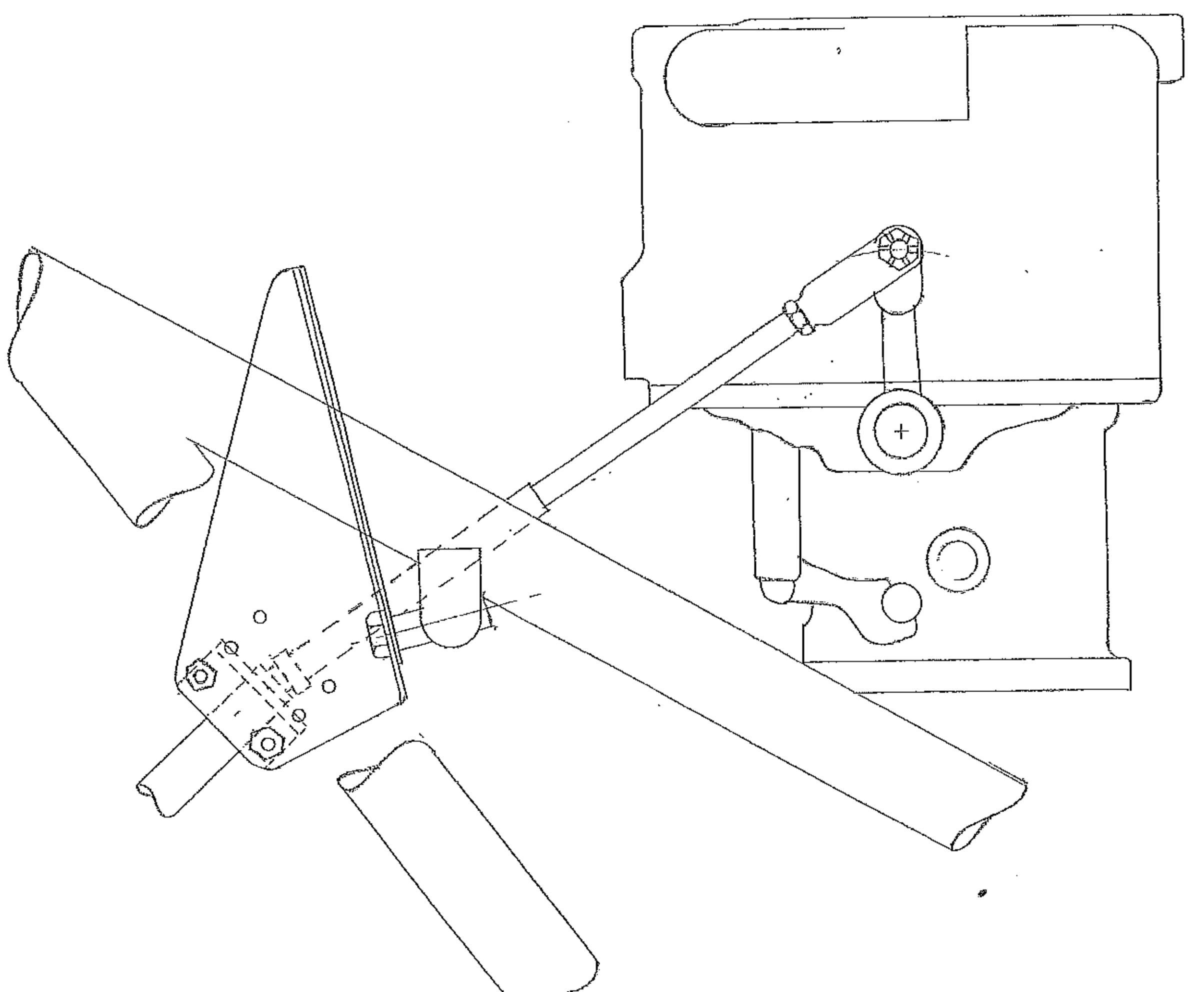


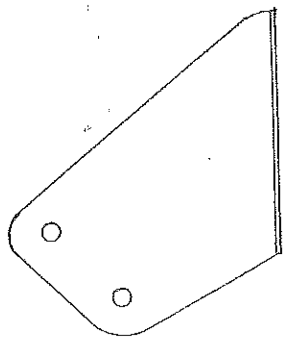
Figure C-4: Kick Panel Modification for Mixture Control Cable Revision in Rear Cockpit.

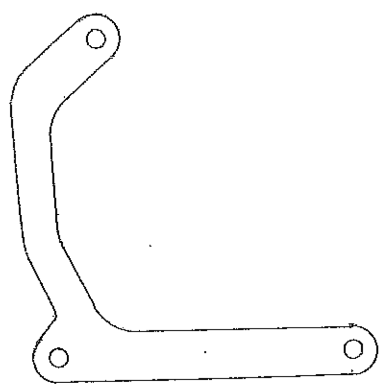
INSTALLATION INSTRUCTIONS: KIT 88-1

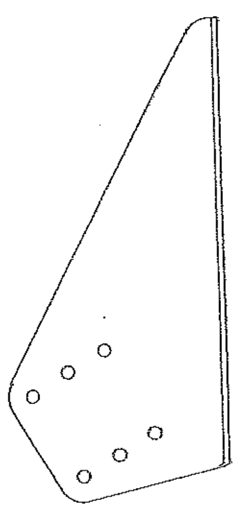
PART D: GENERAL

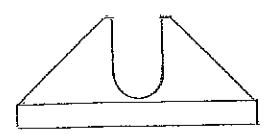
a. Install inner cowl.
b. Install cowl.
c. Make proper log book entry recording compliance with this service letter. Weight and balance change negligible.
d. Notify Classic Aircraft Corporation of compliance by returning enclosed form.



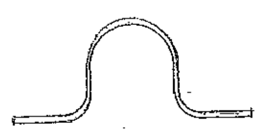




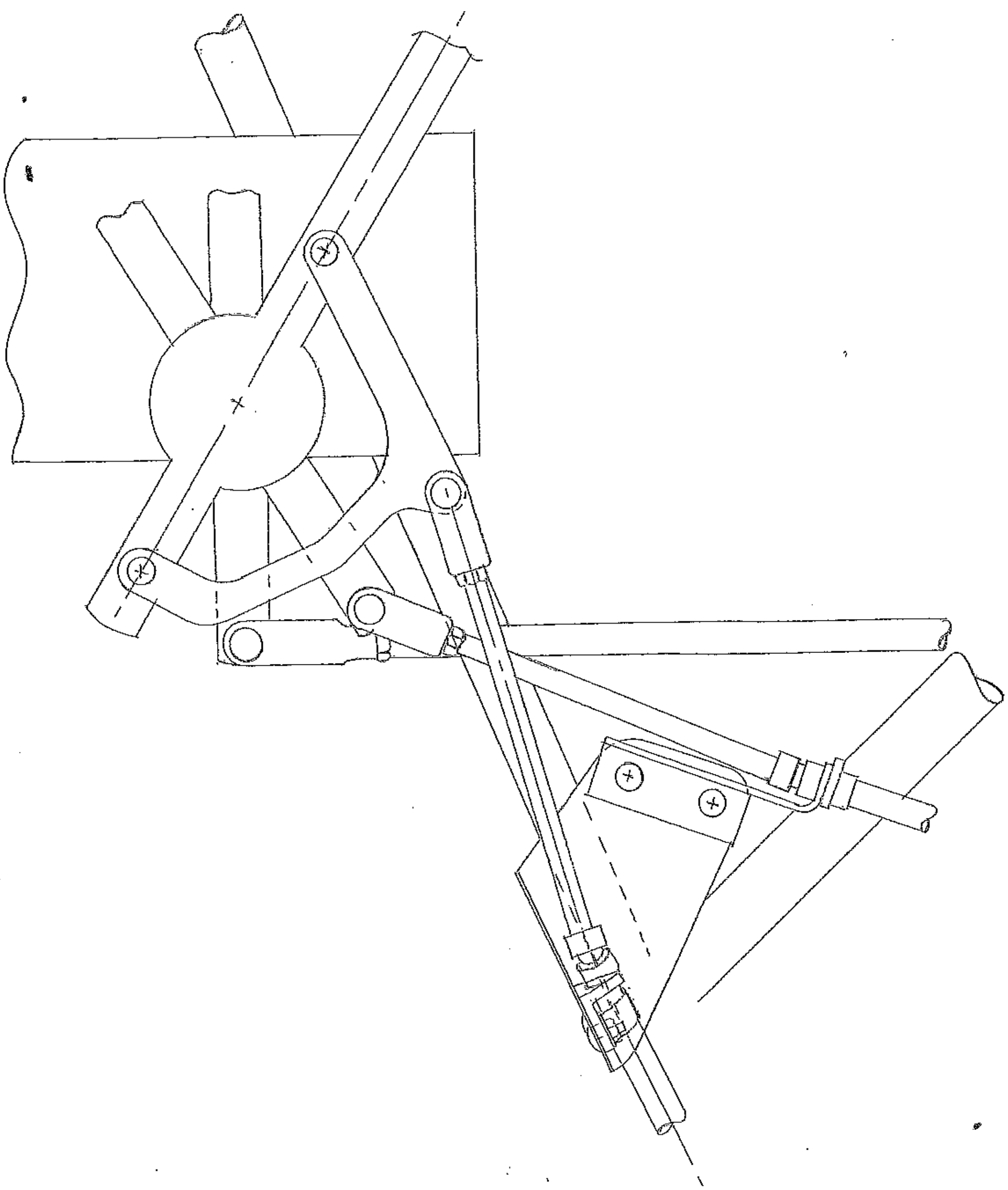


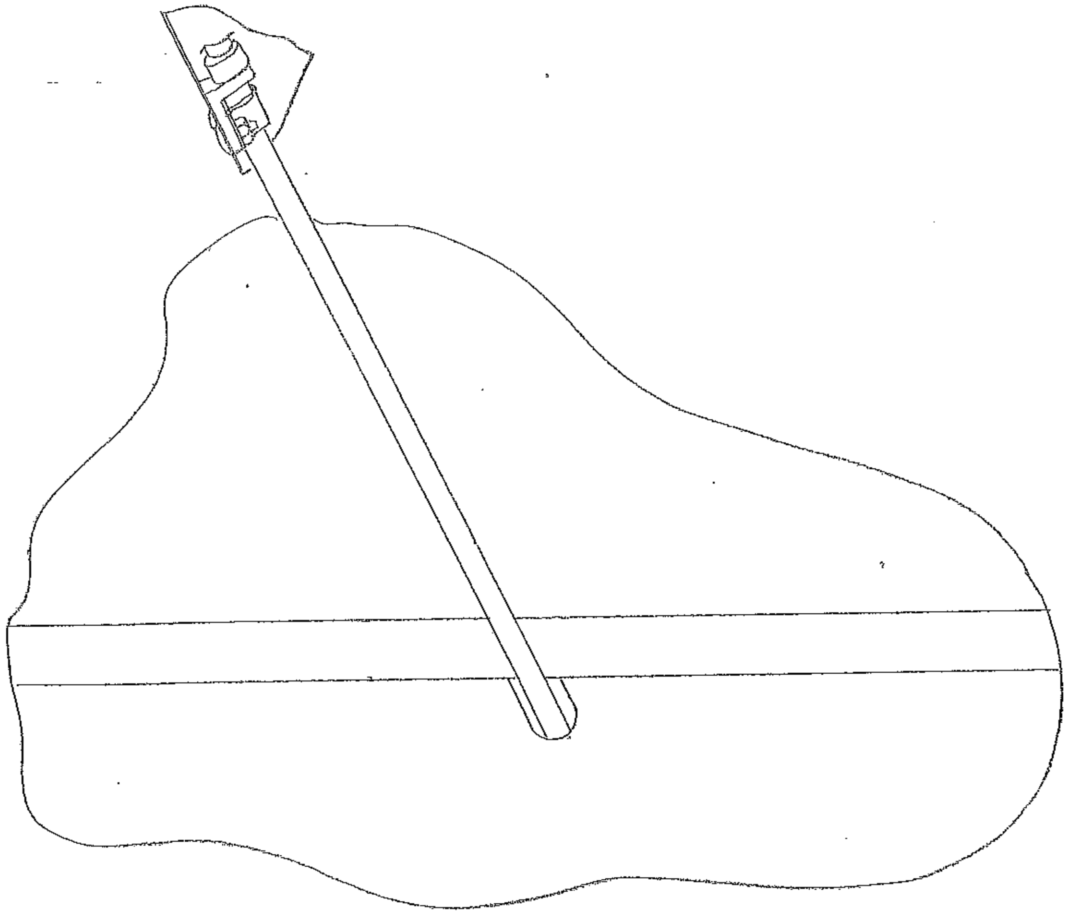


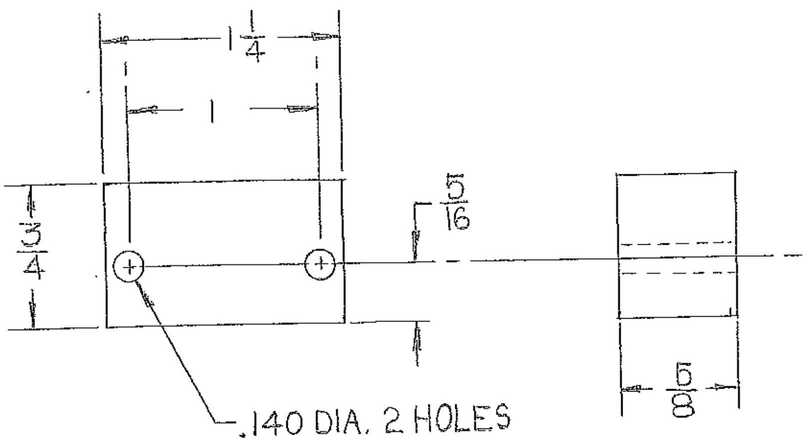
50193-2 GUIDE



50194 CLAMP






1 1/4
1
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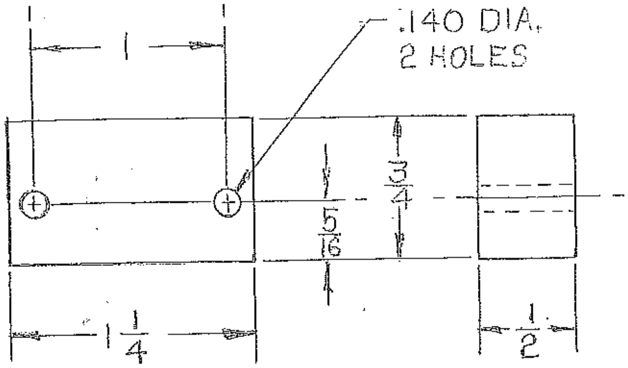
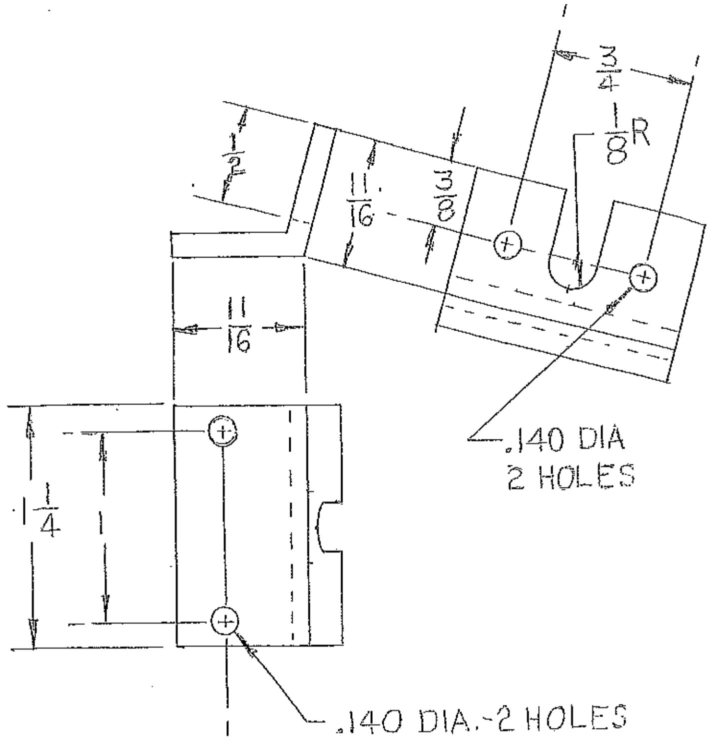
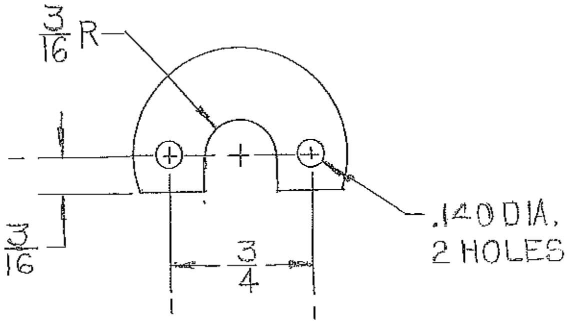
.140 DIA. 2 HOLES
5/8



THROTTLE CABLE SPACER

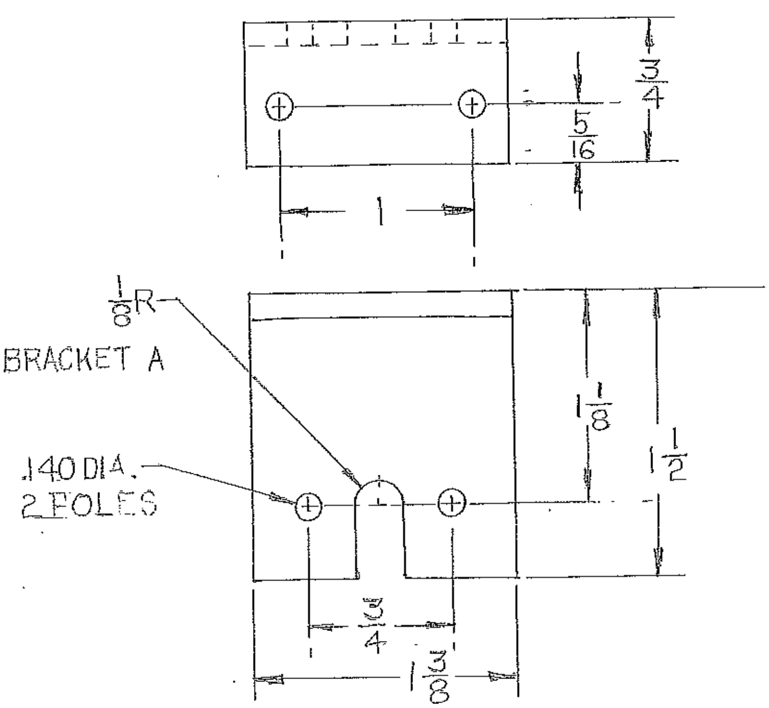


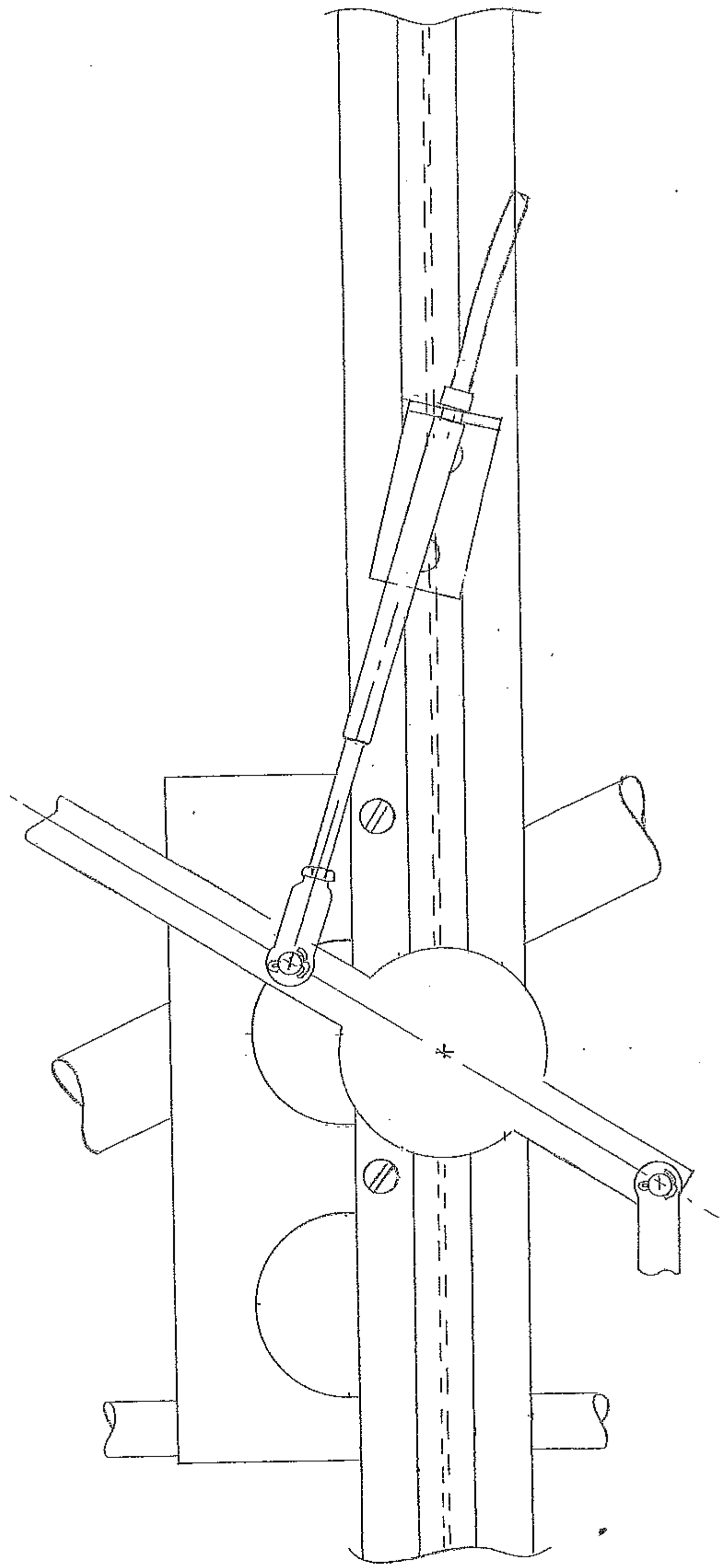
THROTTLE BRACKET A

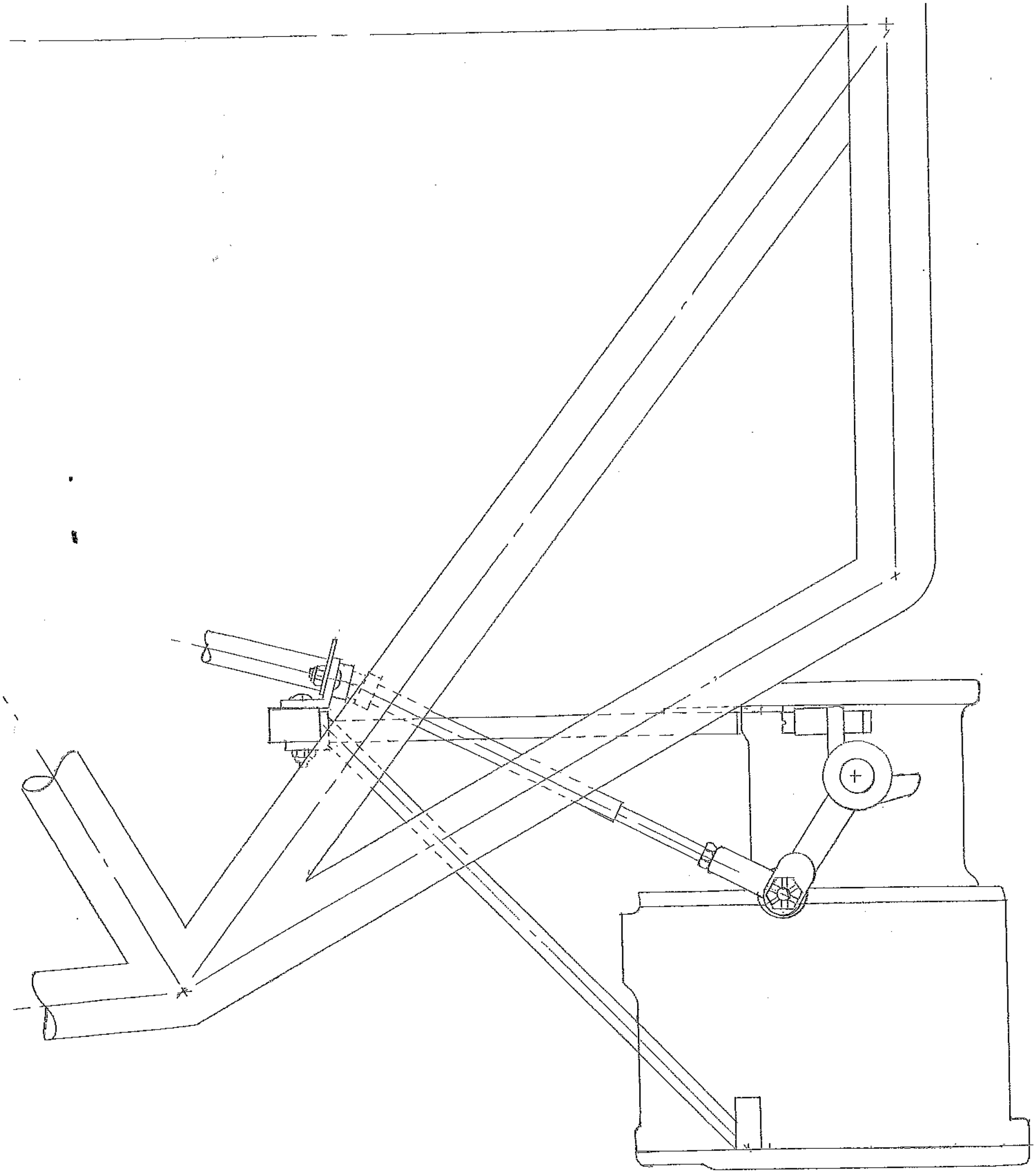


BRACKET CLAMP A

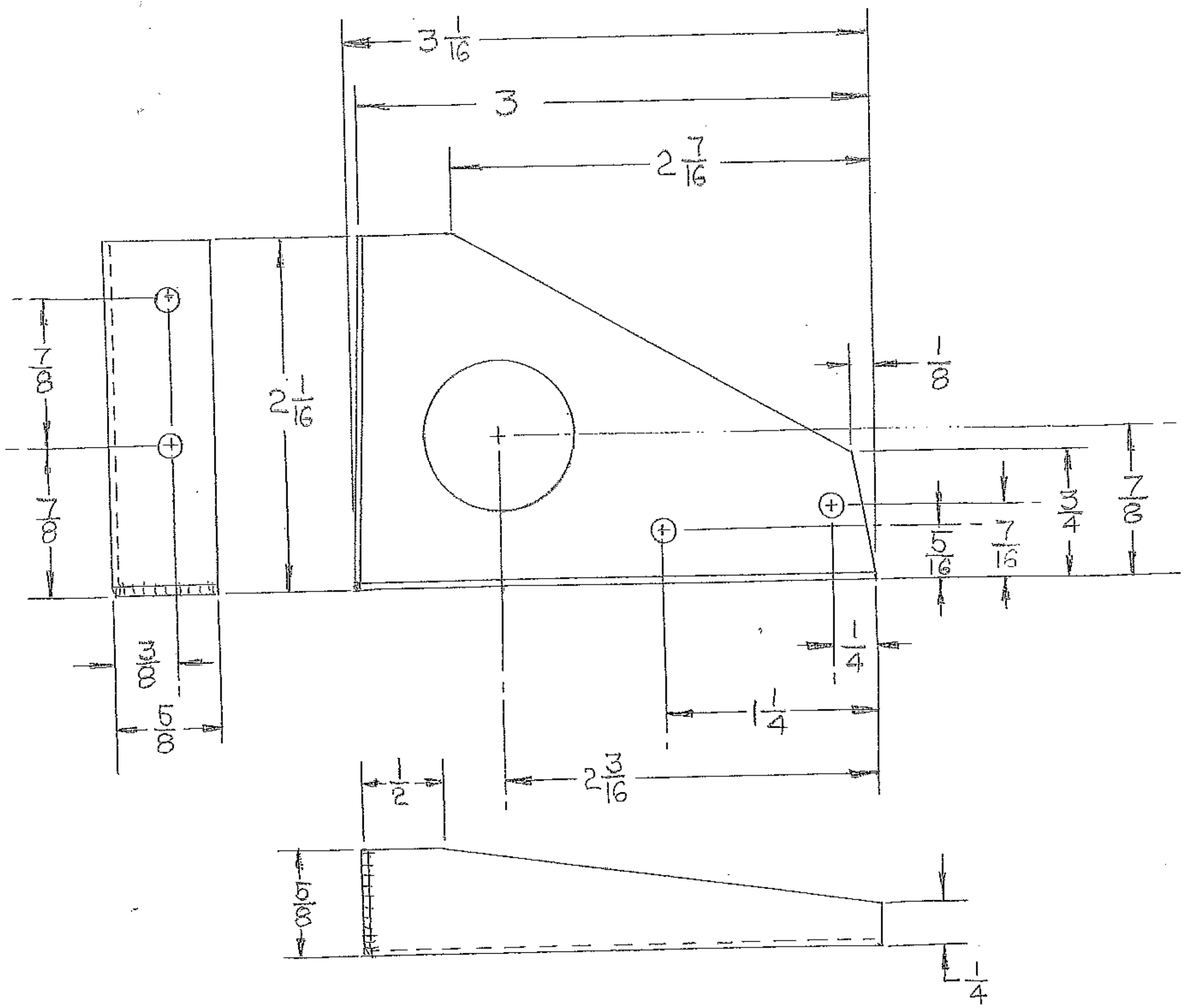
MIXTURE BRACKET A



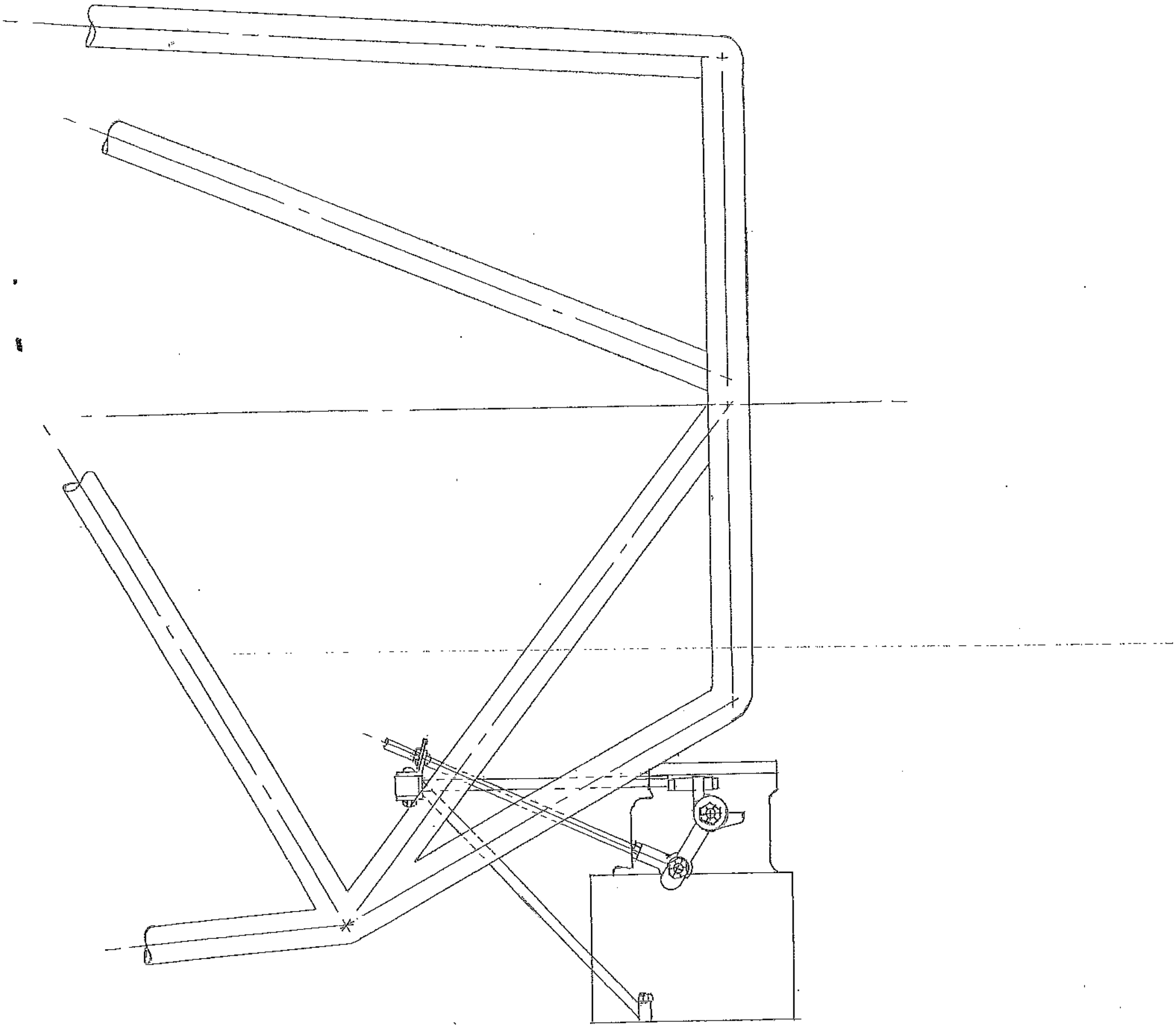




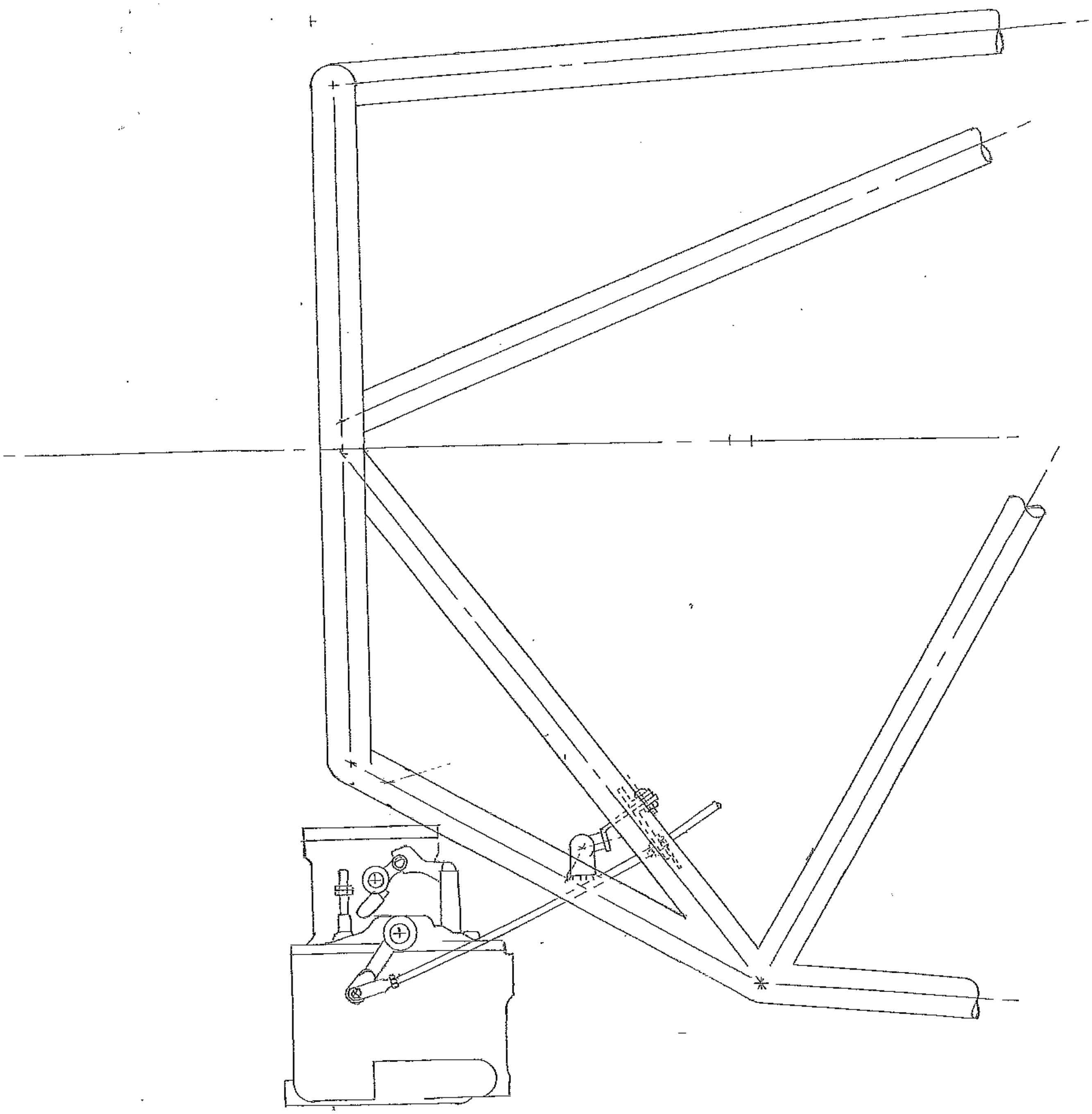
THROTTLE PUSHROD INSTL.



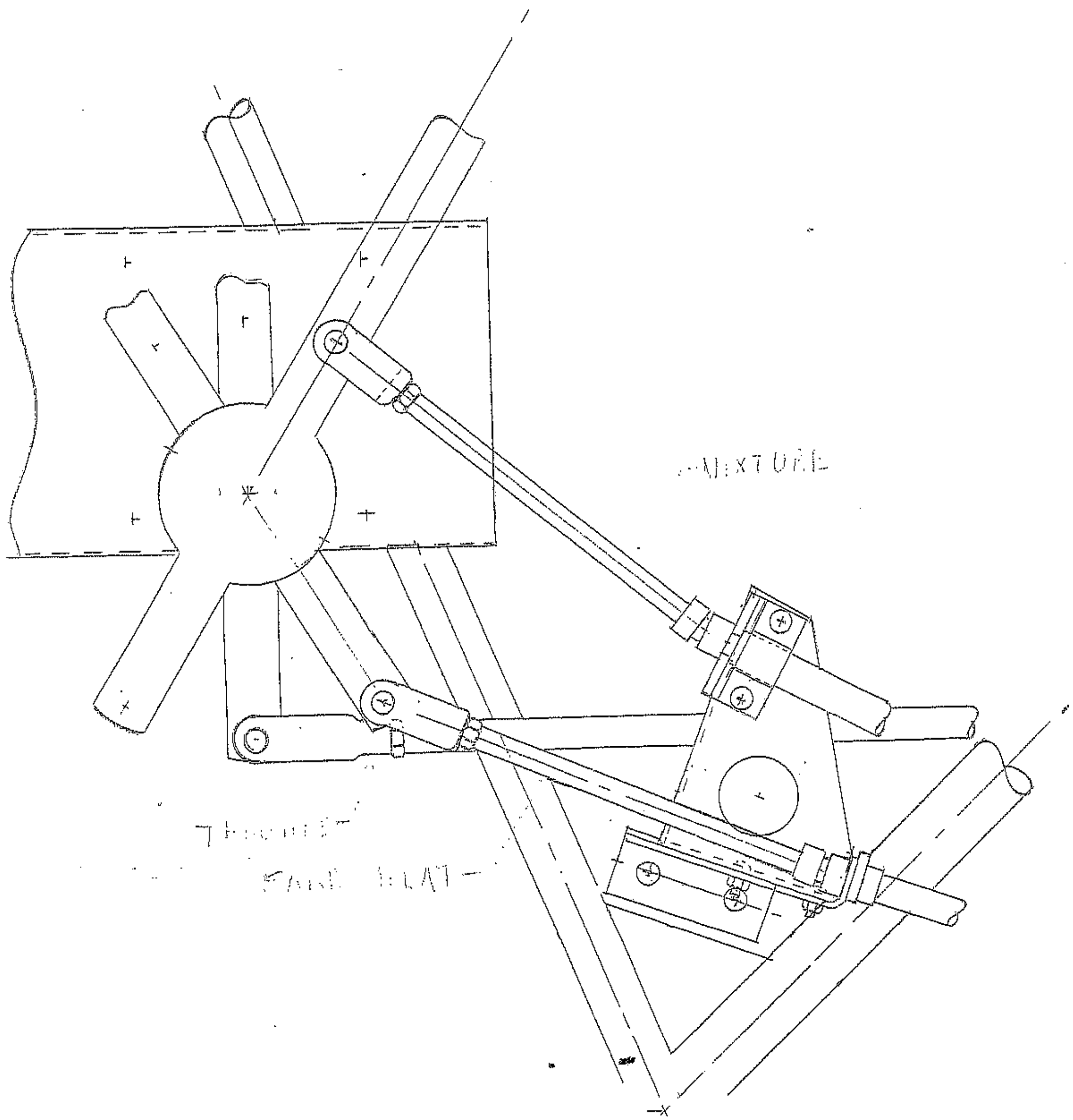
MIXTURE BRACKET B
.032 STEEL AISI 1018



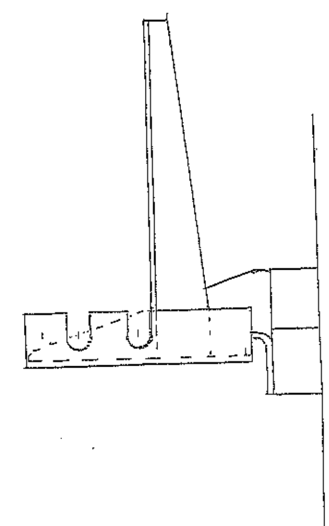
THROTTLE INSTL.

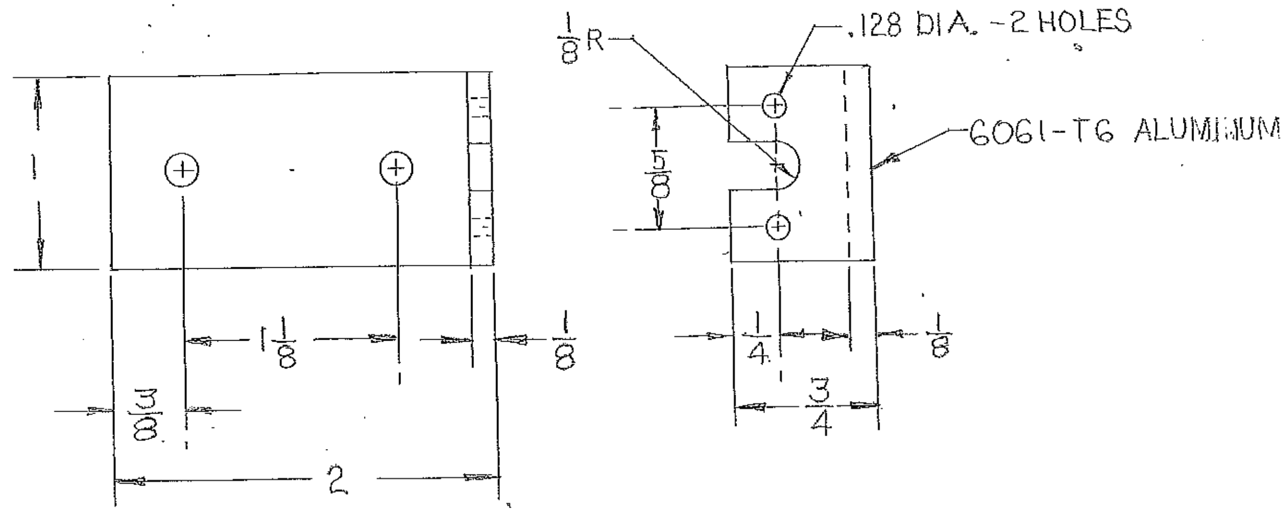


MIXTURE PUSH ROD INSTL.

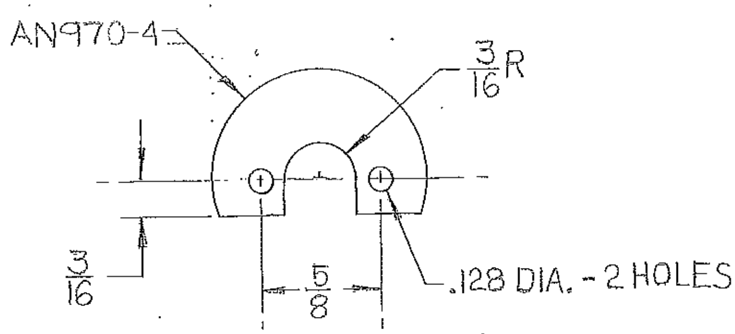


MIXTURE
THROTTLE
CARB HEAT

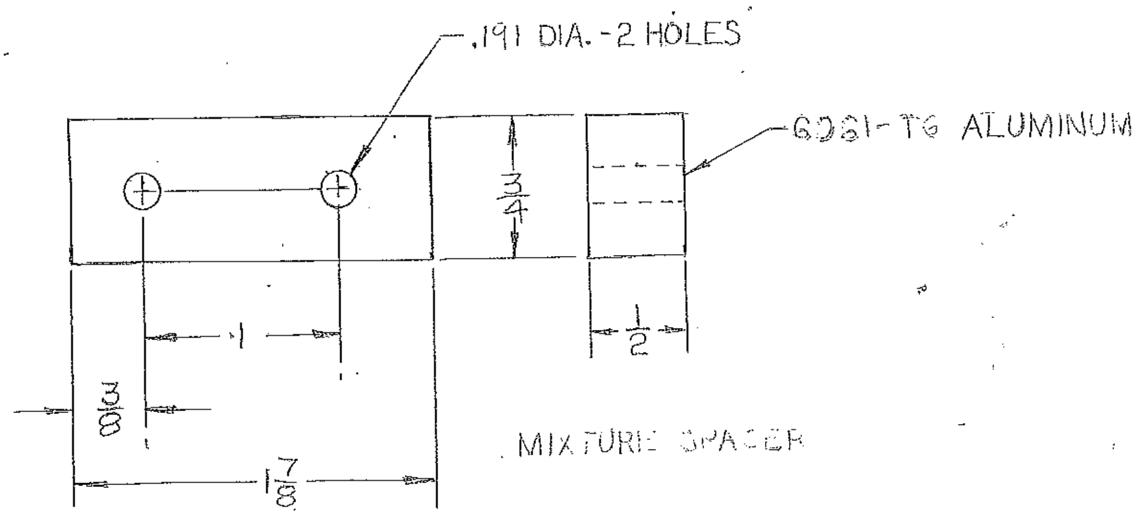




THROTTLE BRACKET B



BRACKET CLAMP B



MIXTURE SPACER

CLASSIC AIRCRAFT CORPORATION

SERVICE LETTER

Date: November 16, 1987 SL 87-1

TITLE

EXTERNALLY MOUNTED I.D. PLATES

TO:

ALL OWNERS OF CLASSIC WACO F5, S/N F5001 to F5008

MODELS AFFECTED

WACO YMF, CLASSIC WACO F5, STC SA1000GL

DISCUSSION

As the result of a recent FAA ruling, all aircraft will be required to have externally mounted I.D. plates by March 9, 1988.

In order to standardize the location on all Classic Aircraft Corporation built aircraft and to facilitate your meeting this requirement, we are providing you with a new I.D. Plate to be mounted in an FAA approved location.

At your option, the internally mounted I.D. Plate now located in the aft cockpit may be retained or removed after the completion of the installation of the externally mounted I.D. Plate per this Service Letter.

MATERIAL

The material to accomplish the external mounting of the I.D. Plate consists of:

KIT NO.: KIT 87-1
INSTRUCTIONS NO.: KIT 87-1 INSTRUCTIONS

COST

The kit is being made available without cost to registered owners.

CLASSIC AIRCRAFT CORPORATION

KIT 87-1

Parts of Kit:

1. Metal Inspection Plate
2. Screws, 440, AN526C4R (4 req.)
3. Nuts, AN365-440, (4 req.)
4. Instruction Sheet

KIT 87-1 INSTRUCTIONS

1. Examine the I.D. Plate supplied with this kit and verify that the aircraft serial number is correct for your airplane.

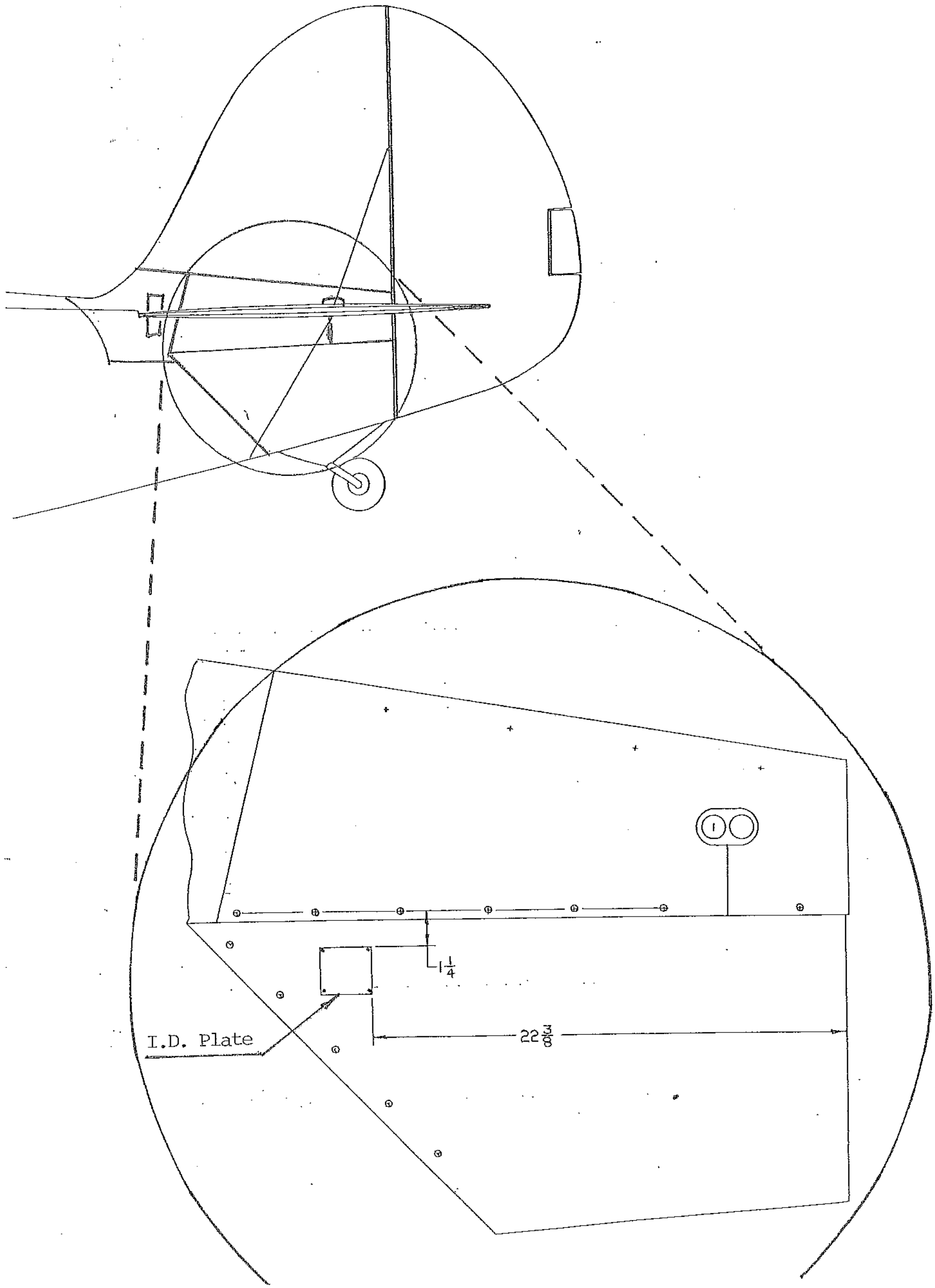
2. Locate I.D. Plate on lower tail fairing as shown in Figure 1 of these instructions.

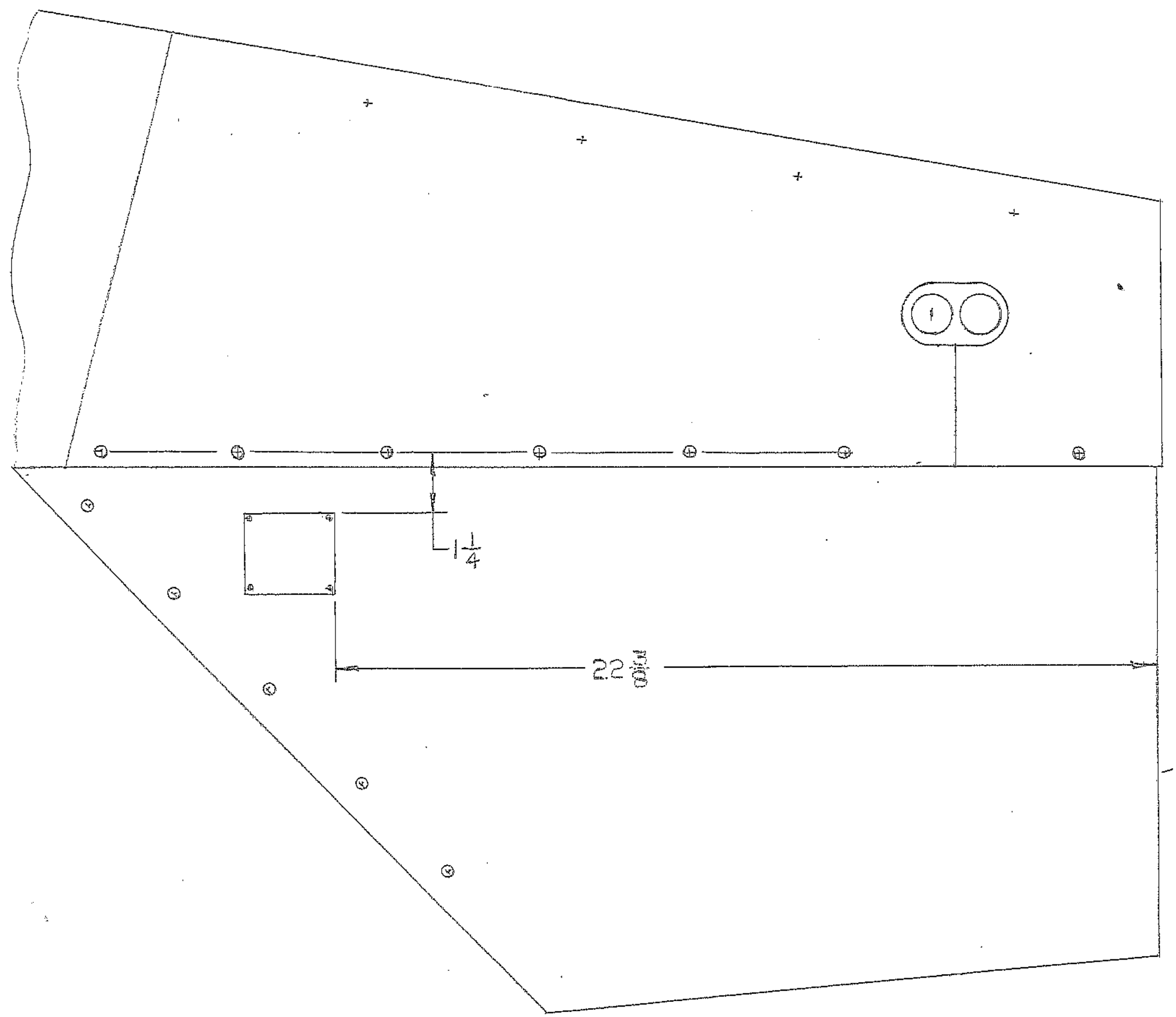
3. Mark and drill holes to match the I.D. Plate. (Four 0.112 inch diameter holes.)

4. Install I.D. Plate with four AN526C4R screws and AN365-440 nuts.
   Note: Blind rivets (not included in kit) may be utilized to attach I.D. Plate if desired.

5. Inspect I.D. Plate installation.

6. Make proper Log Book entry recording compliance with this Service Letter.


1
$1\frac{1}{4}$
I.D. Plate
$22\frac{3}{8}$



$1\frac{1}{4}$
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WACO Classic Aircraft Corp.
2850 Territorial Rd. West
Battle Creek, MI 49015

SERVICE BULLETIN

WACO CLASSIC CONSIDERS COMPLIANCE MANDATORY

SB10-01

SUBJECT:	**ELEVATOR CABLE WEAR DUE TO CABLES BECOMING SLACK**
MODELS AFFECTED:	**SERIAL NUMBERS AFFECTED:**
YMF WACO F5A	F5001 thru F5009
YMF WACO F5B	F5010 thru F5036
YMF WACO F5C	F5C040 thru F5C122

COMPLIANCE TIME:

Initial compliance before the next flight by inspection as described in Instruction #1 below. At the next 100 Hr or Annual Inspection, compliance with Instruction #2. Following compliance with Instruction #2, no further action is required.

APPROVAL:

The technical content of this Service Bulletin has been shown to comply with the applicable Federal Aviation Regulations and is FAA approved.

PURPOSE:

The down elevator cable of a YMF WACO F5C has been found to be worn and frayed resulting from a lack of adequate cable tension. It has been determined that due to the in flight forces on the elevator cable system, inadequate cable tension can result in the down cable becoming slack allowing it to come into contact with the stainless steel guard located below the pulley set at aircraft station 212 (see Fig. 1) located approximately 50 in forward of the rudder hinge line in the lower aft fuselage. Although, when properly tensioned, the cable is unlikely to come in contact with the guard, an unsafe condition can develop without the operator being aware. Because this is a possibility, all affected aircraft are to be inspected and modified in accordance with this service bulletin. To prevent possible damage to the elevator cables, a new pulley guard is available that incorporates a Delrin rub strip between the pulley rim and the stainless steel bracket. This rub strip will prevent cable wear should the cable tension not be properly maintained allowing the cables to sag.

Fig. 1
Elevator Cable Pulleys at Station 212

INSTRUCTIONS:

1. Determine if elevator cable tension is within safe limits. The simple test described by Instruction 1(a) can be accomplished by the owner or pilot to make a determination. A record of the test and the result is to be entered in the aircraft records and signed by the person making the finding.

(a) With the stabilizer trim in the full nose down position, clamp the elevator in the neutral position using small wooden blocks protected with foam or other suitable material to prevent marring the paint finish as shown in Fig. 2.

(b) Using a rule as shown in Fig. 3, gently move the control stick fore and aft to measure the amount of free play in the elevator control system taking care not to apply so much pressure as to move the elevator or to dislodge the clamp. The purpose is to determine if the cable system tension is adequate to prevent the elevator cables from contacting the pulley guards on the Station 212 pulleys (Fig. 1). Any movement that can be determined to be in the stick socket or torque tube linkage may be disregarded for the purpose of this test. If the free travel of the stick is in excess of one half (1/2) inch, not including the aforementioned movement, prior to further flight, compliance with Instruction 1(c) by a certified mechanic is required. If the free travel is less than ½ inch, no additional action is required prior to flight or before the next 100 Hr or Annual Inspection.

(c) If free travel exceeds that allowed by Instruction 1(b), the elevator cables must be inspected as described in paragraph 2(a) of this instruction. If no defect is found by inspection, set cable tension to 25 +/- 5 lbs and record compliance with this instruction in the aircraft maintenance record. If the inspection finds worn or frayed cables, installation of new cables (ref. Manual YMFAMM-1) and compliance with Instruction #2 is required prior to further flight.

Fig. 2

Fig. 3

INSTRUCTIONS: continued

2. **(a)** Access the aft fuselage by removing the saddle fairing forward of the vertical fin, inspect elevator cables in accordance with FAA AC 43.13-1B paragraph 7-149 and replace if necessary (ref. WACO Classic Maintenance Manual YMFAMM-1, paragraph 6.3).

(b) Remove the existing 50197-4 pulley guards (2) on the pulleys at station 212 as indicated in Fig. 4.

Fig. 4

(c) Install new one piece dual pulley guard Part Number 50197-7 as shown in Fig. 5.

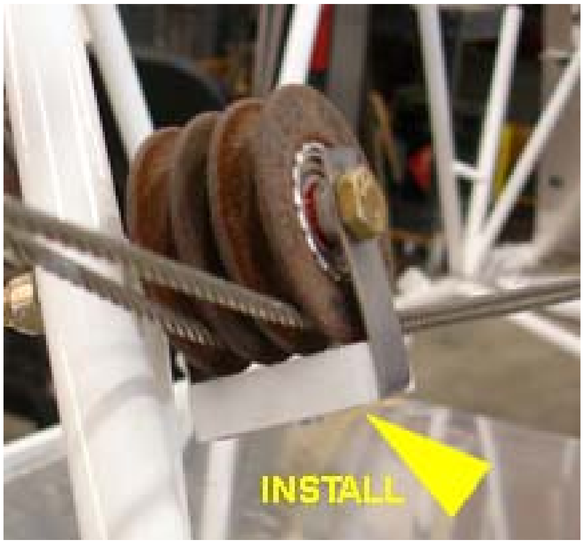

Fig. 5

(d) Set cable tension to 25 +/- 5 lbs. in accordance with WACO Classic Maintenance Manual YMFAMM-1.

(e) Record compliance with this Service Bulletin in the aircraft maintenance record.

MATERIAL REQUIRED:

50197-7 Dual Pulley Guard (1)
50191-9 Elevator Cable (as required)
50893 Elevator Cable Pulley (as required)

AVAILABILITY of PARTS:

The 50197-7 Dual Pulley Guard is available at no cost (shipping charges apply) from WACO Classic Aircraft Corporation by visiting our web site at www.wacoclassic.com and selecting the Parts and Accessories link.

EFFECTIVE DATE:

This Service Bulletin is effective as of the date released.

CONTACT INFORMATION:

Please direct all inquiries to:
Customer Service
(269) 565-1000 Voice
(269) 565-1100 Fax
flywaco@wacoclassic.com email
Please include this Service Bulletin Number with your inquiry

NOTE: Please notify the factory of any corrections to address or ownership. Changes should include aircraft model, serial number, registration number and current owner's name and address.

mt-propeller

ATA 61-01-24
(E-124)

BETRIEBS- UND EINBAUANWEISUNG
OPERATION AND INSTALLATION MANUAL

HYDRAULISCHE VERSTELLPROPELLER
HYDRAULICALLY CONTROLLED VARIABLE PITCH PROPELLER
(CONSTANT SPEED PROPELLER)

MTV - 5 - ( )
MTV - 6 - ( )
MTV - 9 - ( )
MTV - 11 - ( )
MTV - 12 - ( )
MTV - 14 - ( )
MTV - 15 - ( )
MTV - 16 - ( )
MTV - 21 - ( )
MTV - 22 - ( )
MTV - 25 - ( )
MTV - 27 - ( )

Ausgabe 61: 18. Sepember 2017
Issue 61: September 18, 2017

Der technische Inhalt dieses Dokuments ist aufgrund von
DOA Nr. EASA.21J.020 zugelassen.
The technical content of this document is approved under authority of
DOA No. EASA.21J.020.

EASA DE.21G.0008
EASA.21J.020

Warning

People who fly should recognize that various types of risks are involved; and they should take all precautions to minimize them, since they cannot be eliminated entirely. The propeller is a vital component of the aircraft. A mechanical failure could cause a forced landing or create vibrations sufficiently severe to damage the aircraft.

Propellers are subject to constant vibration stresses from the engine and airstream, which are added to high bending and centrifugal stresses.

Before a propeller is certified as being safe to operate on an airplane, an adequate margin of safety must be demonstrated. Even though every precaution is taken in the design and manufacture of a propeller, history has revealed rare instances of failures, particularly of the fatigue type.

It is essential that the propeller be properly maintained according to the recommended service procedures and a close watch be exercised to detect impending problems before they become serious. Any grease leakage (see chapters 5, 6, and 7) or oil leakage, unusual vibration, or unusual operation should be investigated and repaired as it could be a warning that something serious is wrong.

As a fellow pilot, I urge you to read this Manual thoroughly. It contains a wealth of information about your new propeller.

The propeller is among the most reliable components of your airplane. It is also among the most critical to flight safety. It therefore deserves the care and maintenance called for in this Manual. Please give it your attention, especially the section dealing with Inspections and Checks.

Thank you for choosing a MT-Propeller. Properly maintained it will give you many years of reliable service.

Gerd R. Mühlbauer
President
MT-Propeller Entwicklung GmbH

Betriebs- und Einbauanweisung für hydraulische Verstellpropeller

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MT-Propeller Lufttüchtigkeitsinformation

Jeder Besitzer sollte in Kontakt mit seinem MT-Propeller Verkäufer oder Vertreter und den zertifizierten MT-Propeller Service Centern stehen, um die neuesten Information die die Propellerbaugruppe betreffen zu erhalten. MT-Propeller möchte Ihnen weiterhin einen Propeller bieten, der möglichst effizient genutzt werden kann und sich in einem technisch einwandfreien Zustand befindet. Aus diesem Grund veröffentlicht MT-Propeller gelegentlich Service Bulletins, Service Letters und Handbücher. **Service Bulletins sind von besonderer Bedeutung; die dort zu lesenden Anweisungen sollte möglichst schnell umgesetzt werden.** Neue Service Bulletins werden an die Händler, Vertreter und an den zuletzt bekannten Kunden geschickt. Service Letters beschreiben das Vorgehen, die die Wartung betreffen. Diese werden an Händler, Vertreter und unter Umständen an den zuletzt bekannten Besitzer geschickt.

Falls ein Besitzer seinen Propeller nicht bei einem MT-Propeller zertifizierten Service Shop oder bei der Gerd Mühlbauer GmbH in Deutschland warten gelassen hat, sollte von Zeit zu Zeit einen MT-Propeller Händler oder Vertreter kontaktieren, oder auf der Homepage von MT-Propeller nachsehen, um die neuesten Informationen zu seinem Propeller zu erhalten. Die Liste der veröffentlichten MT-Propeller Handbücher, Service Bulletins, Lüfttüchtigkeitsanweisung sowie die neueste Ausgabe kann von der MT-Propeller Hompage (www.mt-propeller.com) heruntergeladen werden. Kopien davon können auch von MT-Propeller Deutschland oder MT-Propeller USA angefordert werden.

Im Falle von Änderungen zu den Informationen zur Aufrechterhaltung der Lufttüchtigkeit wird die Änderungsliste in Kapitel 10 geändert.

MT-Propeller Airworthiness Information

Every owner should stay in close contact with his MT-Propeller dealer or distributor and Authorized MT-Propeller Service Shop to obtain the latest information pertaining to his propeller and its installation. MT-Propeller takes a continuing interest in having the owner get the most efficient use of his propeller and keeping it in the best mechanical condition. Consequently, MT-Propeller from time to time issues Service Bulletins, Service Letters and Manuals relating to the propeller and its installation. **Service Bulletins are of special importance and should be complied with promptly.** These are sent to dealers, distributors and latest registered owners. Service Letters deal with products improvements and service hints pertaining to the propeller and its installation. These are sent to dealers, distributors and occasionally (at the factory`s discretion) to latest registered owners.

If an owner is not having his propeller serviced by an Authorized MT-Propeller Service Shop or MT-Propeller USA or MT-Propeller Germany, should periodically check with a MT-Propeller dealer or distributor or the MT-Propeller`s homepage to find out the latest information to keep his propeller up to date. The list of valid MT-Propeller manuals, service bulletins, AD´s and their latest revisions can be downloaded from the homepage of MT-PROPELLER (www.mt-propeller.com). Hardcopies can also be obtained from MT-Propeller Germany and MT-Propeller USA.

If any changes to the ICA have been made, the appropriate list of revisions in Chapter 10 will be revised.

1.0 ALLGEMEINES

1.0.1 Zweck dieses Handbuchs

Dieses Handbuch enthält Informationen bezüglich Betrieb, Einbau und Wartung einfach wirkender hydraulischer MT-Verstellpropeller.

Außer dem Propeller ist auch das Reglersystem in diesem Handbuch beschrieben.

Daten für An- und Abbau, Betrieb und Fehlerbeseitigung sind in diesem Handbuch enthalten. Zusätzlich sollten die technischen Unterlagen des LFZ-Herstellers benutzt werden.

1.0.2 Weitere verfügbare Unterlagen

Neben diesem Handbuch sind folgende Unterlagen für Reparatur und Überholung erforderlich:

E-220:	**Propeller – Überholungshandbuch**
E-699:	**Hydraulischer Propeller - Regler P-41( )-( ), P-42( )-( ), P-43( )-( ), P-44( )-( ) Serie**
E-1048:	**Hydraulischer Propeller - Regler P-8( )()-( ) Serie**

1.0 GENERAL

1.0.1 Statement of purpose

This publication provides operation, installation and line maintenance information for the MT hydraulically variable pitch propeller with single acting system.

In addition to the propeller assembly, the propeller governing system is addressed in this manual.

Installation, removal, operation and trouble shooting data is included in this publication. However, the airplane manufacturer's manuals should be used in addition to this information.

1.0.2 Additional available publications

In addition to this manual the following applicable publications should be used for repair and overhaul:

E-220:	**Propeller - Overhaul Manual**
E-699:	**Hydraulic Propeller Governor P-41( )-( ), P-42( )-( ), P-43( )-( ), P-44( )-( ) series**
E-1048:	**Hydraulic Propeller Governor P-8( )() -( ) series**

MT-Propeller Serviceunterlagen sind zu beziehen bei:

MT-Propeller Entwicklung GmbH
Flugplatzstr. 1
94348 Atting

Tel.: 09429-9409-0
Fax: 09429-84 32

E-mail: sales@mt-propeller.com
Internet: www.mt-propeller.com

Für Propellerregler anderer Hersteller ssowie Enteisungsanlagen ist das jeweilige Herstellerhandbuch zu verwenden (siehe Technische Unterlagen von Fremdherstellern).

For MT-Propeller service literature contact:

MT-Propeller Entwicklung GmbH
Flugplatzstr. 1
94348 Atting / Germany

Tel.: XX49-9429-9409-0
Fax: XX49-9429-8432

E-mail: sales@mt-propeller.com
Internet: www.mt-propeller.com

Consult the manufacturers' manuals for other propeller governor and de-icing systems (see Vendor Publications).

1.0.3 Technische Unterlagen von Fremdherstellern
(als zusätzliche Information!)

TAE-125 Regler Manual No. CSUM-02-01

Thielert Aircraft Engines GmbH
Helbingstr. 64 – 66
D - 22047 Hamburg

Propeller Governor Handbook No. 33092

Woodward Governor Company
5001 North Second Street
P.O. Box 7001
Rockford, Illinois 61125-7001
USA

Manual No. 130 B

Hartzell Propeller Inc.
Piqua, Ohio 45356
USA

Service Manual 780401 (Regler)
Service Manual 830415 (Enteisung)

McCauley Accessory Division
3535 McCauley Drive
Vandalia, Ohio 45377
USA

Manual No. ATA 30-60-02 (68-04-712-D)

B.F. Goodrich De-Icing Systems
1555 Corporate Wood Parkway
Uniontown, Ohio 44685
USA

1.0.3 Vendor Publications
(for additional information only!)

TAE-125 Governor Manual No: CSUM-02-01

Thielert Aircraft Engines GmbH
Helbingstr. 64 – 66
D - 22047 Hamburg

Propeller Governor Handbook No. 33092

Woodward Governor Company
5001 North Second Street
P.O. Box 7001
Rockford, Illinois 61125-7001
USA

Manual No. 130 B

Hartzell Propeller Company
Piqua, Ohio 45356
USA

Service Manual 780401 (Governors)
Service Manual 830415 (De-Icing)

McCauley Accessory Division
3535 McCauley Drive
Vandalia, Ohio 45377
USA

Manual No. ATA 30-60-02 (68-04-712-D)

B.F. Goodrich De-Icing Systems
1555 Corporate Wood Parkway
Uniontown, Ohio 44685
USA

1.0.4. Abkürzungen:

TBO	Time Between Overhaul
TT	Total Time
TSO	Time Since Overhaul
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers
UNF	Unified National Fine Thread Series
TCDS	Type Certificate Data Sheet
PU	Polyurethane
MAP	Manifold Pressure
AFM	Airplane Flight Manual
IPS	Inch per Second
FAA	Federal Aviation Administration
ICA	Instruction for Continued Airworthiness
TSN	Time Since New
STC	Supplement Type Certificate

Note: Unter TSN /TBO versteht man die kumulierte Zeit zwischen dem Abheben und dem Landen des Flugzeuges (Betriebsstunden)

1.0.3 Abbreviations:

TBO	Time Between Overhaul
TT	Total Time
TSO	Time Since Overhaul
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers
UNF	Unified National Fine Thread Series
TCDS	Type Certificate Data Sheet
PU	Polyurethane
MAP	Manifold Pressure
AFM	Airplane Flight Manual
IPS	Inch per Second
FAA	Federal Aviation Administration
ICA	Instruction for Continued Airworthiness
TSN	Time Since New
STC	Supplement Type Certificate

Note: TSN/TSO is considered as the time accumulated between aircraft lift off and aircraft touch down, i.e., flight time.

1.0.4 Fachwörter und Definitionen:

Blattwinkel:	Gemessener Winkel des Blattprofils in Abhängigkeit des Propellerradius.
Constant Speed:	Ein System, das die Motordrehzahl unabhängig vom Ladedruck konstant hält.
Riss:	Ein durch Überbeanspruchung entstandener Riss im Material.
Delamination:	Ablösung einer Laminatschicht des Compositematerials.
Erosion:	Abnutzung der Oberfläche
Feathering:	Ein Propellerblatt das so gedreht wird, dass das Blattprofil parallel zur anströmenden Luft steht, um den Luftwiderstand zu reduzieren.
Überholung:	Das periodische Zerlegen, Inspizieren, Reparieren und Zusammenbauen der Propellerbaugruppe, um eine fortwährende Lufttüchtigkeit zu gewährleisten.
Überdrehzah:l	Zustand, bei dem die Drehzahl des Propellers oder des Motors eine maximale Grenze überschreitet.
Anstellwinkel:	Winkel zwischen der Richtung der anströmenden Luft und der Profilsehne des Propellerblattes
Windmilling:	Eine Rotation des Propellers, obwohl der Motor keine Leistung abgibt

1.0.4 Terms and Definitions:

Blade Angle:	Measurement of blade airfoil location described by propeller rotation
Constant Speed:	A propeller system which employs a governing device to maintain a selected engine RPM
Crack:	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface
Delamination:	Internal separation of layers of a composite material
Erosion:	Gradual wearing away or deterioration due to action of the elements
Feathering:	A propeller with blades that may be positioned parallel to the relative wind, thus reducing aerodynamic drag
Overhaul:	The periodic disassembly, inspection, repair, refinish and reassembly of a propeller assembly to maintain airworthiness
Overspeed:	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine or propeller RPM is higher than the RPM selected by the pilot through the propeller control lever
Pitch	Same as “Blade Angle”
Windmilling	The rotation of an aircraft propeller caused by air flowing through it while the engine is not producing power.

1.1 Definition von Lebensdauer und Wartung

1.1.1 Grundüberholung

Grundüberholung stellt einen periodischen Vorgang dar und beinhaltet folgende Schritte:

- Zerlegen
- Prüfung der Teile
- Überarbeiten der Teile
- Zusammenbau

Das Überholungsintervall ist abhängig von Betriebszeit und Kalenderzeit.

Beachte:

Eine Blattbeschädigung durch Fremdkörper oder Bodenberührung bei *rotierendem* Propeller *erfordert in jedem Falle eine Überholung* wenn es sich um eine Blattbeschädigung handelt, die das Limit einer In-Field-Reparatur übersteigt.

Eine Boden- oder Fremdkörperberührung bei nicht rotierendem Propeller erfordert keine Überholung; es bedarf lediglich einer Blattreparatur oder den Wechsel des Blattes.
Durch Bodenberührung oder Einwirkung eines Fremdkörper bei nicht rotierendem Propeller kann die Propellernabe nicht beschädigt werden, weshalb keine Überholung erforderlich ist.

In somit festgelegten Zeitabständen muß der Propeller vollständig zerlegt und auf Risse, Korrosion, Abnutzung sowie sonstige Auffälligkeiten untersucht werden. Wie vorgeschrieben, müssen bestimmte Teile nachgearbeitet oder ersetzt werden.

Die Grundüberholung muß entsprechend der neuesten Ausgabe der Überholungshandbücher Nr. ATA 61-15-19 (E-519) durchgeführt werden. Die Überholungsintervalle sind in Service Bulletin Nr. 1.-( ) festgelegt.

1.1 Definition of Component Life and Service

1.1.1 Overhaul

Overhaul is a periodic process and contains the following items:

- Disassembly
- Inspection of parts
- Reconditioning of parts
- Reassembly

The overhaul interval is based on hours of service (operating time) or on calendar time.

Note:

A blade damage by a foreign object (FOD) or a ground strike with a rotating propeller always requires *an Overhaul if the blade damage is beyond the limitation of an in-field repair*.

A groundstrike or a foreign object damage (FOD) with a non-rotating propeller does not require an overhaul, it only needs a blade repair or a blade exchange.

A ground strike or a FOD with a non-rotating propeller cannot damage the propeller hub and therefore does not require an overhaul.

At such specified periods, the propeller assembly should be completely disassembled and inspected for cracks, wear, corrosion and other unusual or abnormal conditions. As specified, certain parts should be refinished, and certain other parts should be replaced.

Overhaul is to be accomplished in accordance with the latest revision of the Overhaul Manuals No. ATA 61-15-19 (E-519) The overhaul interval for the propellers is shown in Service Bulletin No. 1( ).

1.1.2 Reparatur

Eine Reparatur stellt eine Instandsetzung geringfügiger Schäden wie sie im Normalbetrieb auftreten können, dar. Diese Maßnahme wird nach Bedarf durchgeführt.
Siehe Service Letter 32 ( ) letzte gültige Ausgabe!

1.1.2.1 Eine Reparatur ist keine Grundüberholung.

1.1.2.2 Die Größe des Schadens ist dafür maßgeblich, ob eine Reparatur ohne Grundüberholung durchgeführt werden kann. Eine Blattbeschädigung durch Bodenberührung erfordert immer eine Überholung.

Beachte!
Eine Blattbeschädigung durch Fremdkörper oder Bodenberührung bei *rotierendem* Propeller *erfordert in jedem Falle eine Überholung* wenn es sich um eine Blattbeschädigung handelt, die das Limit einer In-Field-Reparatur übersteigt.

Eine Boden- oder Fremdkörperberührung bei nicht rotierendem Propeller erfordert keine Überholung; es bedarf lediglich einer Blattreparatur oder den Wechsel des Blattes.
Durch Bodenberührung oder Einwirkung eines Fremdkörper bei nicht rotierendem Propeller kann die Propellernabe nicht beschädigt werden, weshalb keine Überholung erforderlich ist.

1.1.2 1.1.2 Repair

Repair is correction of minor damage caused during normal operation. It is done on an irregular basis, as required.
See Service Letter 32 ( ) latest issue!

1.1.2.1 A repair does not include an overhaul.

1.1.2.2 Amount, degree and extent of damage determines whether or not a propeller can be repaired without overhaul. A blade damage due to a ground strike always requires an overhaul.

<u>Note:</u>
A blade damage by a foreign object (FOD) or a ground strike with a <u>rotating</u> propeller always requires *an Overhaul if the blade damage is beyond the limitation of an in-field repair*.

A groundstrike or a foreign object damage (FOD) with a non-rotating propeller does not require an overhaul, it only needs a blade repair or a blade exchange.

A ground strike or FOD with a non-rotating propeller cannot damage the propeller hub and therefore does not require an overhaul.

1.1.3 Betriebszeit

Die Betriebszeit wird ausgedrückt in "Gesamtbetriebszeit" (TT) und in "Betriebszeit seit der Grundüberholung" (TSO).

Beide Daten sind erforderlich, um die Betriebszeit eines Bauteils zu definieren. Ein Bauteil kann lebensdauerbegrenzt sein, was bedeutet, daß es nach einer festgelegten Betriebszeit ersetzt werden muß.

Eine Grundüberholung führt dazu, daß das Bauteil oder die Baugruppe auf 0 Stunden TSO gebracht wird, die Gesamtbetriebszeit wird dabei jedoch nicht verändert.

1.2 Die hydraulisch verstellbaren Propeller MTV-5, MTV-6, MTV-9, MTV-11, MTV-12, MTV-14, MTV-15, MTV-16, MTV-21, MTV-22, MTV-25 und MTV-27 sind für Flugzeuge mit einer Triebwerksleistung bis ca. 880 kW entwickelt worden.

Die Verstellung der Blätter erfolgt über einen Propellerregler, der den Propeller in einer einmal vorgewählten Drehzahl bei Veränderung von Geschwindigkeit oder Leistung hält, was als Constant Speed bezeichnet wird. Mechanische Anschläge für kleine Steigung und große Steigung begrenzen den Verstellweg. Fällt der Öldruck des Propellerreglers aus, verstellen sich die Blätter automatisch auf kleine Steigung oder, wenn sie mit Fliehgewichten ausgerüstet sind, auf große Steigung. Damit ist es möglich, den Flug fortzusetzen. Der Öldruck des Reglers ist einfach wirkend.

Bei den Propellern MTV-5, MTV-6, MTV-9, MTV-12, MTV-14, MTV-16, MTV-21, MTV-25 und MTV-27 ist Segelstellung als Option möglich.

Beim Propeller MTV-21( )-MF wird Öldruck zur Steigungserhöhung benutzt und die Segelstellung mechanisch betätigt.

1.1.3 Component Life

Component life is expressed in terms of total hours of service (TT, or Total Time) and in terms of hours of service since overhaul (TSO, or Time Since Overhaul).

Both references are necessary in defining the life of the component. Occasionally a part may be "life limited", which means that it must be replaced after a specified period of use.

Overhaul returns the component or assembly to zero hours TSO (Time Since Overhaul), but not to zero hours TT (Total Time).

1.2 The hydraulically variable pitch propellers MTV-5, MTV-6-, MTV-9-, MTV-11-, MTV-12-, MTV-14-, MTV-16, MTV-15-, MTV-21, MTV-22 MTV-25 and MTV-27 are designed for airplanes with engines of up to 1200 hp.

The pitch change is conducted by a propeller governor. Once an engine rotational speed is selected it will be held constant at variations of airspeed and power. Usually, this is called a constant speed propeller. Mechanical stops for low pitch and high pitch limit the pitch change travel. In case of the oil pressure of the governor to be lost, the blades return automatically to low pitch or, if counterweights are installed, to high pitch, enabling the pilot to continue the flight. The oil pressure is single acting.

With the propellers MTV-5, MTV-6, MTV-9, MTV-12, MTV-14, MTV-16, MTV-21, MTV-25 and MTV-27 feathering is possible as an option.

With the propeller MTV-21-( )-MF oil pressure to increase pitch is used and feathering actuated mechanically.

Beim MTV-5-( )-C-F, MTV-6-( )-C-F, MTV-9-( )-C-F, MTV-12-( )-C-F, MTV-14-( )-C-F, MTV-16-( )-C-F, MTV-21-( )-C-F, MTV-25-( )-C-F und MTV-27-( )-C-F wird Öldruck zur Steigungsverminderung benutzt. Segelstellung ergibt sich durch Verstellen des Reglerhebels auf Segelstellung. Zusätzlich kann eine Sicherungseinrichtung im Propeller eingebaut sein, damit bei hohen Triebwerksdrehzahlen Segelstellung verhindert wird.

Es werden Holz-Composite-Blätter mit faserverstärktem Kunststoffmantel und Edelstahlkantenschutz verwendet. Diese ergeben geringstes Gewicht bei höchster Sicherheit gegen Schwingungen.

Seit 1998 werden auch MT-Propeller Aluminium Blätter hergestellt. Diese Blätter sind ähnlich herkömmlichen Aluminium Blättern, allerdings sind die Blattform und die Profile mit neuesten Entwicklungs methoden ausgelegt worden.

With the MTV-5-( )-C-F, MTV-6-( )-C-F, MTV-9-( )-C-F, MTV-12-( ) C-F, MTV-14-( )-C-F, MTV-16-( )-C-F, MTV-21-( )-C-F, MTV-25-( )-C-F and the MTV-27-( )-C-F oil pressure to decrease pitch is used. Feathering is reached with propeller control being pulled to feathering. Additionally there could be a safety system integrated in the propeller, to avoid unintended feathering with the engine running at high rpm.

Natural composite blades with fiber reinforced Epoxy cover and metal leading edge protection are used to minimize weight at the highest amount of safety against fatigue fractures due to vibrations.

Since 1998 MT-Propeller –Aluminum blades are also in production. These blades are like other common Aluminum blades except the blade shape and airfoils are acc. to the newest design methods.

2.0 KENNZEICHNUNG

2.1 Naben-Kennzeichnung

MTV	-	16	-	1	-	E	-	C	-	( )	( )	( )	( )
1	2	3		4		5		6		7	8	9	10

10 Grossbuchstabe: Änderungen, die die Austauschbarkeit einschränken oder ausschließen.
Kleinbuchstabe: Änderungen, die die Austauschbarkeit nicht betreffen.

9 nur für Reverse-Propeller anwendbar

8 nur für Reverse-Propeller anwendbar

7 F = Segelstellung vorhanden

6 Angaben über Fliehgewichte
ohne = keine oder kleine Fliehgewichte für Verstellkräfte in kleine Steigung
C = Fliehgewichte für Verstellkräfte in große Steigung/Segelstellung

5 Nabenanschlußbezeichnung:
A = Motorseglertriebwerke Bolzen 7/16"-20 UN TK ∅ = 80 mm
AA = Nabeneinsatz für SAE No. 20 Spline
B SAE Nr. 2 mod. Bolzen 1/2"-20 UNF
C = SAE Nr. 2 mod Bolzen 7/16"-20 UNF
D = ARP 502
E = ARP 880
F = SAE No. 1, bolts 3/8 “-24UNF
R = bolt ½”-20 UNF, circle dia 80 mm

4 Baureihe (1 = zutreffend für MTV-5, MTV-16, MTV-25, MTV-27)

3 laufende Zählnummer des Grundmusters
2 Verstellpropeller
1 MT-Propeller (Hersteller)

2.0 MODEL DESIGNATION

2.1 Hub-designation

MTV	-	16	-	1	-	E	-	C	-	( )	-	( )	( )	( )
1	2	3		4		5		6		7		8	9	10

10 Capital letter: modifications, restricting or excluding Interchangeability.
Small letter: modifications, not affecting interchangeability.

9 only applicable for Reverse-Propeller

8 only applicable for Reverse-Propeller

7 F = feathering system installed

6 Letter designation counterweights
blank = none or small counterweights mounted for pitch change moments towards low pitch
C = counterweights mounted for pitch change moments towards high pitch/feathering

5 Code for propeller flange
A = Motorglider engines bolt 7/16" - 20 UNF, circle dia 80 mm
AA = Flange Mount for Adapter to SAE No. 20 Spline
B = SAE No. 2 mod. bolts 1/2"-20 UNF
C = SAE No. 2 mod bolts 7/16"-20 UNF
D = ARP 502
E = ARP 880
F = SAE No. 1, bolts 3/8 “-24UNF
R = bolt ½”-20 UNF, circle dia 80 mm

4 consecutive number of series (1 = applicable for MTV-5, MTV-16, MTV-25, MTV-27)
3 consecutive number of basic type
2 Variable Pitch propeller
1 MT-Propeller (manufacturer)

2.2 Blattkennzeichnung

( ) ( ) 240- 35 c
1 2 3 4 5

5 Kleinbuchstabe für Abweichung der Blattverwindung vom Standardbereich des Herstellers
4 laufende Zählnummer des Grundmusters (beinhaltet die aerodyn. Auslegung)

3 Durchmesser in cm

2 Blattausführung und Einbau
ohne = rechtsgängig (Zug)
RD = rechtsgängig (Druck)
L = linksgängig (Zug)
LD = linksgängig (Druck)

1 Lage der Verstellzapfen
ohne = selbsttätiges Verstellen in kleine Steigung
C = selbsttätiges Verstellen in große Steigung
CF = Segelstellung, selbstt. Verstellen in große Steigung/ Segelstellung

2.3 Die vollständige Propellerbezeichnung besteht aus beiden zusammengesetzten Angaben, z.B. MTV-16-1-E/240-35c. Die Nabenwerknummer beginnt mit dem Baujahr. Unter dieser Nummer werden alle Aufzeichnungen aufbewahrt.

2.4 Ein Propeller für eine bestimmte Flugzeug-Triebwerk-Kombination ist immer definiert durch die Naben-, Blatt- und Spinnerkombination. Für die genauen Einstellungen (Blattwinkel) bezüglich des Flugzeugmusters, ist immer die Gerätelaufkarte bzw. das Propellerlogbuch zu beachten.

2.2 Blade Designation

( ) ( ) 240- 35 c
1 2 3 4 5

5 small letter indicating change of blade twist from std. value given by the manufacturer
4 consecutive number of basic type (includes aerodyn. data)

3 diameter in cm

2 sense of rotation
blank = right hand tractor
RD = right hand pusher
L = left hand tractor
LD = left hand pusher

1 Position of actuation pin
blank = pitch change pin for pitching moments towards low pitch
C = pitch change pin for pitching moments towards high pitch
CF = pitch change pin for feathering, pitching moments towards high pitch

2.3 The complete propeller designation is a combination of both designations, for instance MTV-16-1-E/240-35c. The hub-serial No. starts with the year of manufacture. All records of the propeller are registered in respect to this number.

2.4 The propeller for a certain aircraft-engine combination is always defined according the hub-, blade- and spinner combination. For the actual blade settings, depending on the aircraft model, the propeller-logbook or the „Gerätelaufkarte“ must be considered.

3.0 LEISTUNGSDATEN

Die allgemeinen Leistungsdaten sind dem jeweiligen Propellerkennblatt zu entnehmen.
Für den Betrieb gelten die Angaben im Propellerlogbuch.

Flanschformen:

A = Rotax / Thielert / Limbach / Sauer:	TK=80mm, 7/16"-20UNF
AA = Nabeneinsatz SAE 20	Spline Shaft
B = SAE Nr. 2 mod.:	Bolzen 1/2"-20UNF
C = SAE Nr. 2 mod.:	Bolzen 7/16"-20 UNF
D = ARP 502:	Bolzen 1/2"-20 UNF
E = ARP 880:	Bolzen 9/16"-18 UNF
F = SAE No. 1:	Bolzen 3/8 "- 24 UNF
K = M 14 P/PF:	Bolzen 9/16”-18 UNF
N = PT6A-67A:	Bolzen 9/16” - 18 UNF
P = Rotax 912/14:	Bolzen 1/2" - 20 UNF
R = Austroengine:	Bolzen 1/2" - 20 UNF

3.0 PERFORMANCE DATA

For the general performance data refer to the applicable propeller TCDS.
For operation refer to your Propeller-Logbook.

Type of Flanges:

A = Rotax / Thielert / Limbach / Sauer:	bolt dia. 80 mm, bolts 7/16" - 20 UNF
AA = Hub Insert SAE 20	Spline Shaft
B = SAE No. 2 mod.	bolts 1/2" - 20UNF
C = SAE No. 2 mod.	bolts 7/16" - 20 UNF
D = ARP 502	bolts 1/2" - 20 UNF
E = ARP 880	bolts 9/16 "- 18 UNF
F = SAE No. 1	bolts 3/8 "- 24 UNF
K = M 14 P/PF	bolts 9/16”-18 UNF
N = PT6A-67A	bolts 9/16” - 18 UNF
P = Rotax 912/14	bolts 1/2" - 20 UNF
R = Austroengine	bolts 1/2" - 20 UNF

4.0 BAU- UND FUNKTIONSBESCHREIBUNG

Die Verstellpropeller bestehen aus folgenden Hauptgruppen :

- Nabe mit Blattlagerung und Verstelleinrichtung
- Blätter
- Fliehgewichte (ggf.)
- Spinner
- Propellerregler
- Propeller-Enteisung
- Unfeathering Akkumulator

4.1 Nabe

Der ungeteilte Nabenkörper besteht aus geschmiedeter oder gefräster Leichtmetall-Legierung mit kugelgestrahlter und eloxierter Oberfläche. Die Blattlagerung ist als Schulterkugellager ausgeführt, wobei die Kugeln die Funktion der Halterung des Blattes übernehmen, was eine bedeutende Erhöhung der Sicherheit gegen Blattverlust ergibt. Der Lageraußenring ist in die Nabe eingepreßt und ungeteilt, während der Innenring geteilt ist und auf der Blatthülse sitzt. Die Blattvorspannung wird durch die Dicke einer Kunststoffscheibe eingestellt.

Die Verstellung der Blätter erfolgt durch einen in die Blattwurzel eingepreßten Stift, der in einen Gleitstein eingreift. Der Verstellkolben hat angefräste Flächen, an denen der Gleitstein anliegt. Durch die axiale Bewegung des Kolbens wird damit eine Drehbewegung erreicht. Auf der vorderen Kolbenführung sitzen Rückholfeder und Anschlagbuchse für große (kleine) Steigung.

Außerhalb der Nabe befinden sich Nutmuttern, mit denen die kleine (große) Steigung eingestellt werden kann. Der innere Nabenkörper erfüllt die Funktion des Zylinders. Dadurch ergibt sich eine einfache, leichte Konstruktion. Der vordere Spinnerträger wird zur Befestigung von Wuchtgewichten benutzt.

4.0 DESIGN AND OPERATION INFORMATION

The variable pitch propeller consists of the following main groups:

- Hub with blade bearings and pitch change mechanism
- Blades
- Counterweights (if applied)
- Spinner
- Propeller governor
- Propeller de-icing
- Unfeathering Accumulator

4.1 Hub

The one-piece hub is made from forged or milled aluminum alloy with the outer surface shot-penned and anodized. The blade bearings are special designed ball bearings, whereas the balls act as split retainers in order to hold the blades in the hub, creating an increased safety factor against blade loss. The outer bearing race is a one-piece part and pressed into the hub, while the inner race is split and installed on the blade ferrule. The blade preload is adjusted by the thickness of plastic shims.

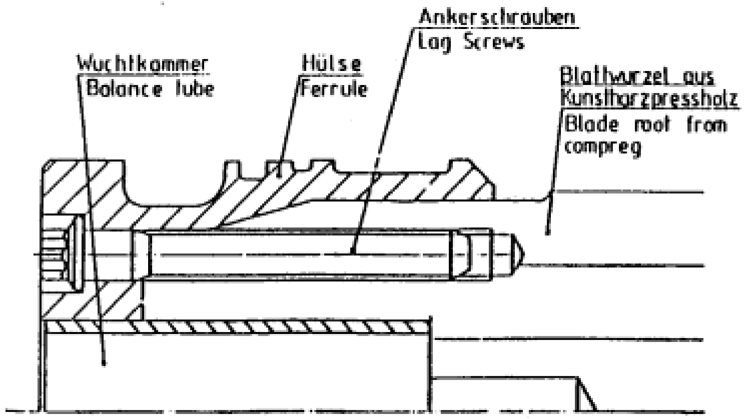
The pitch change of the blades is obtained with a pin in the blade root. A plastic block connects the blade with the piston and the axial movement of the servo piston turns the blades. On the front piston the return spring and the sleeve, which acts as high (low) pitch stop, are installed.

Outside the hub are two check nuts with which the low (high) pitch stop can be adjusted. The inner part of the hub is used as the cylinder for the pressure oil. This arrangement allows a simple and lightweight design. The front spinner support is used to have the balance weights installed.

4.2 Blatt

Die gegenwärtig verwendeten Blätter entsprechen dem natürlichen Verbundwerkstoff mit Kunstharz Preßholz in der Wurzel und Leichtholz im Blattkern. Das Blatt ist mit Epoxy-GFK überzogen und mit Acryllack geschützt. Als Kantenschutz wird im äußeren Bereich des Blattes aufgeklebtes Edelstahlblech (Kantenbeschlag) verwendet. Die Länge des Kantenbeschlages ist ca. 50 cm (20 inch). Der innere Bereich des Blattes ist mit einer selbstklebenden PU-Folie geschützt, des sei denn, das Blatt ist mit einem Enteisungsboot ausgerüstet.

Die Blatthülse ist mittels Spezial-Ankerschrauben mit dem Blatt verbunden, wobei zusätzlich eine Klebung mit Epoxy erfolgt.



4.2.1 Seit 1998 werden auch MT-Propeller Aluminium Blätter hergestellt. Diese Blätter sind ähnlich herkömmlichen Aluminium Blättern, allerdings sind die Blattform und die Profile mit neuesten Entwicklungs methoden ausgelegt worden.

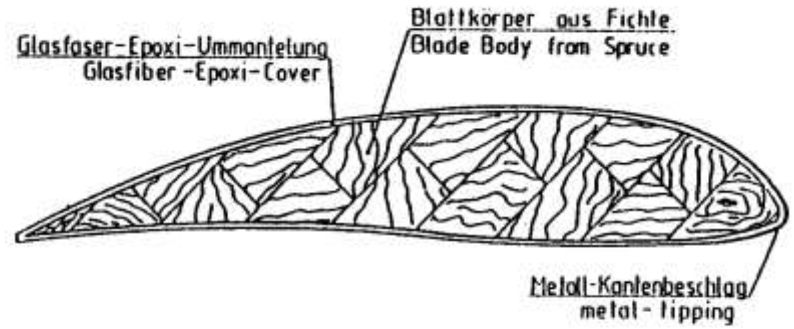
4.3 Fliehgewichte

Propeller für Kunstflugzeuge oder mit Segelstellung haben üblicherweise an den Blattwurzeln angeschraubte Fliehgewichte. Die Verstellzapfen sind in einer anderen Position und die Blätter werden deshalb mit einem "C" bezeichnet, z.B. C200-15. Propellerblätter für Segelstellungspropeller werden mit "CF" bezeichnet.

4.2 Blade

The presently used blades are in natural composite, using high compressed wood in the root and lightweight wood in the remaining body. Epoxy fiberglass covers the entire blade surface and is painted with acryl lacquer. This stainless leading edge is approx. 50 cm (20 inch) long. The outer portion is protected against erosion by a bonded on stainless steel erosion sheath. The inner portion of the blade is protected by a self-adhesive PU-strip, unless the blade is equipped with a de-ice boot.

The blade ferrule is installed with special lag screws on the blade root and is additionally bonded with Epoxy resin.



4.2.1 Since 1998 MT-Propeller Aluminum blades are also in production. These blades are like other common Aluminum blades except the blade shape and airfoils are acc. to the newest design methods.

4.3 Counterweights

Propellers for aerobatic aircraft or with feathering are usually equipped with counterweights on the blade root. The pitch change pin is in a different position and the blades are identified with a "C", for example C200-15. Propeller blades for feathering propellers are identified with "CF".

4.4 Spinner

Der Spinnerdom wird aus aus faserverstärktem Kunststoff oder Leichtmetall-Legierung im Metalldrückverfahren hergestellt. Die Grundplatte ist aus gedrückter oder gedrehter Leichtmetall-Legierung.
Die vordere Spinnerabstützung ist Teil der Nabe. Abdeckbleche verbessern die Steifigkeit an den Ausschnitten. Der Dom ist mit Schrauben an den Trägern befestigt .

4.5 Propellerregler

Triebwerksöl wird über eine Zahnradpumpe im Regler auf den nötigen Servodruck gebracht. Fliehgewichte und die Reglerfeder bewegen einen Steuerschieber der das Servoöl zum oder vom Propeller fließen läßt . Das Servoöl bewegt den Kolben im Propeller und verstellt dadurch die Blätter. Im stabilisierten Zustand fließt kein Öl. Durch den Einstellhebel am Regler wird die Vorspannung der Reglerfeder geändert. Das ergibt dann die Drehzahländerung. Nachfolgende Bilder zeigen das System. Der Propeller hat ein einfach wirkendes Ölsystem, bei dem die natürlichen Verstellkräfte der Blätter immer auf kleine Steigung verstellen. Der Regler liefert dann Öldruck zur Steigungserhöhung. Bei Blättern mit Fliehgewichten für Kunstflugzeuge oder zweimotorige Flugzeuge verstellen diese selbständig auf große Steigung und benötigen Öldruck zur Steigungsverminderung. Das Überdruckventil soll zwischen 270 und 340 psi eingestellt werden.

4.5.1. Propellerregler mit FADEC

Für den Propeller MTV-6, MTV-12 auf dem TAE Triebwerk besteht die Propellerregelung aus einer Zahnradpumpe mit einem Magnetventil, das das Servoöl zu oder vom Propeller fließen lässt. Der maximale Regeldruck beträgt zwischen 270 und 340 psi. Die elektronische Drehzahlregelung wird mit einer FADEC, die nach DO 178B, Level C, entwickelt wurde, geregelt. Die FADEC wurde einem EMV Test nach CAT W und einem HIRF Test nach CAT R, entspricht critically level hazardous, unterzogen.

Die Propellerregelungsbezeichnung ist CSU TAE-125
TAE Nr.: 02 – 6120 - 16 001 R6
FADEC: 02 – 7610 - 55 001 R1

4.4 Spinner

The spinner dome is a one-piece part made from fiber reinforced composite or spinformed aluminum alloy. The bulkhead is spinformed or truncated aluminum alloy.
The front support is part of the hub. Filler plates increase the stiffness of the dome on the cutouts for the blades. The dome is mounted on the supports by means of screws.

4.5 Propeller Governor

The necessary servo pressure of the engine oil is reached by a gear pump in the governor, which increases the oil pressure. Flyweight and a speeder spring move a pilot valve, allowing servo oil flow to and from the piston in the propeller. In on speed condition there is no oil flow. A speed adjusting lever changes the preload of the speeder spring. This results into an engine speed change. The following pictures are showing the system. Please note, that the propeller has a single acting system where the natural twisting forces of the blades always turn them into low pitch position. The governor produces oil pressure to increase pitch. Blades having counterweights installed for aerobatic aircraft or twin engine aircraft always turn them into high pitch position and use oil pressure to decrease pitch.The relief valve pressure should be set between 270 and 340 psi.

4.5.1. Propeller Governor with FADEC

For the propeller MTV-6, MTV-12 installed on the TAE-engine the propeller control contains the following: A gear pump and a magnetic valve , allowing servo oil flow to and from the piston in the propeller. The maximum governor pressure is between 270 and 340 psi. The electronic RPM control is a FADEC system and designed according to DO 178B, Level C. The FADEC system is tested according to EMC test, CAT W and a HIRF test CAT R, equivalent to critically level hazardous.

The governor designation is CSU TAE-125
TAE No.: 02 – 6120 - 16 001 R6
FADEC: 02 – 7610 - 55 001 R1

Table I – HIRF Environment I

FREQUENCY			FIELD STRENGTH / (V/M)	
			PEAK	AVERAGE
10 kHz	-	100 kHz	50	50
100 kHz	-	500 kHz	50	50
500 kHz	-	2 MHz	50	50
2 MHz	-	30 MHz	100	100
30 MHz	-	70 MHz	50	50
70 MHz	-	100 MHz	50	50
100 MHz	-	200 MHz	100	100
200 MHz	-	400 MHz	100	100
400 MHz	-	700 MHz	700	50
700 MHz	-	1 GHz	700	100
1 GHz	-	2 GHz	2,000	200
2 GHz	-	4 GHz	3,000	200
4 GHz	-	6 GHz	3,000	200
6 GHz	-	8 GHz	1,000	200
8 GHz	-	12 GHz	3,000	300
12 GHz	-	18 GHz	2,000	200
18 GHz	-	40 GHz	600	200

4.6 Propeller-Enteisung

Die Propeller können mit einer elektrischen Enteisung ausgestattet sein. Die Enteisungsgummis werden in der üblichen Art auf das Blatt geklebt. Der Rest der Anlage entspricht den üblichen Bauteilen mit Schleifring und Verbindungskabeln.

4.7 Unfeathering Accumulator

Segelstellungspropeller können einen Unfeathering Accumulator haben, der am Regler angeschlossen ist. Dieser ermöglicht dem Propeller mit stehendem Triebwerk aus der Segelstellung zu fahren. Bei einigen Kunstflugpropellern kann ein Unfeathering Accumulator an den Regler angeschlossen sein, um einen Drehzahlabfall bei bestimmten Kunstflugmanövern zu verhindern. Dieser Unfeathering Accumulator kann die Ölversorgung des Propellers, bei kurzzeitigem Ausfall desselben durch das Triebwerk, ca. 5-10 Sekunden aufrecht erhalten.
Der Unfeathering Accumulator ist auf der Luftseite mit 125 +/- 5 psi Druckluft oder Stickstoff gefüllt.

Table II – HIRF Environment II

FREQUENCY			FIELD STRENGTH / (V/M)	
			PEAK	AVERAGE
10 kHz	-	100 kHz	20	20
100 kHz	-	500 kHz	20	20
500 kHz	-	2 MHz	30	30
2 MHz	-	30 MHz	100	100
30 MHz	-	70 MHz	10	10
70 MHz	-	100 MHz	10	10
100 MHz	-	200 MHz	30	10
200 MHz	-	400 MHz	10	10
400 MHz	-	700 MHz	700	40
700 MHz	-	1 GHz	700	40
1 GHz	-	2 GHz	1,300	160
2 GHz	-	4 GHz	3,000	120
4 GHz	-	6 GHz	3,000	160
6 GHz	-	8 GHz	400	170
8 GHz	-	12 GHz	1,230	230
12 GHz	-	18 GHz	730	190
18 GHz	-	40 GHz	600	150

4.6 Propeller De-Icing

The propeller may have electrical de-icing systems installed. The de-ice boots are bonded onto the blades as usual. The rest of the system is equal to existing components, with slipring and wire harness.

4.7 Unfeathering Accumulator

Feathering Propeller may have an unfeathering accumulator installed, connected to the governor. This enables unfeathering without the running engine. An unfeathering accumulator can also be installed to the governor in some aerobatic airplanes, to prevent a decrease of RPM at special aerobatic maneuvers. This unfeathering accumulator maintains the oil supply of the propeller for 5-10 seconds at short loss of oil supply by the engine.
The unfeathering accumulator is on the air side charged with
125 +/- 5 psi using compressed air or nitrogen.

4.7 Unfeathering Akkumulator: Fortsetzung

Für die TAE – Installation:

Unbedingt sicherstellen, dass beim TAE-CSU der korrekte Vordruck eingestellt ist.

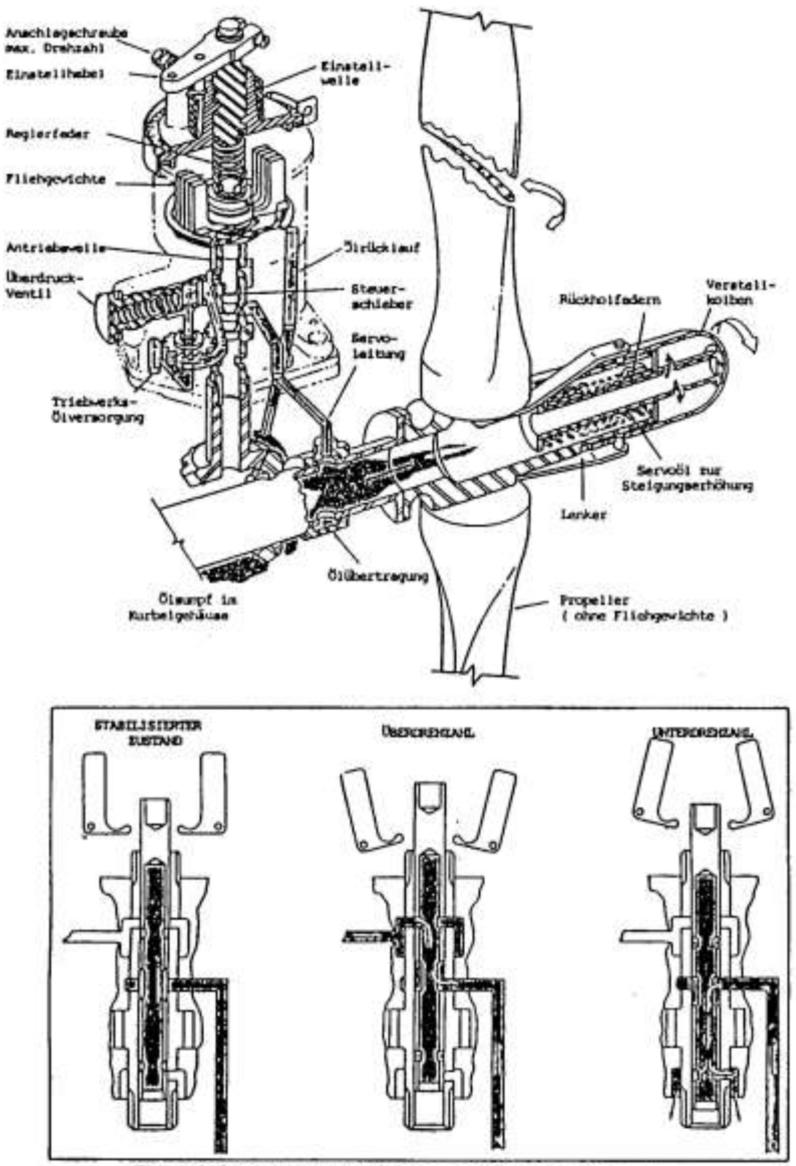
Wenn dieser zu niedrig eingestellt ist, kann sich dadurch der Akkumulator nicht richtig befüllen!

4.7 Unfeathering Accumulator: to be continued:

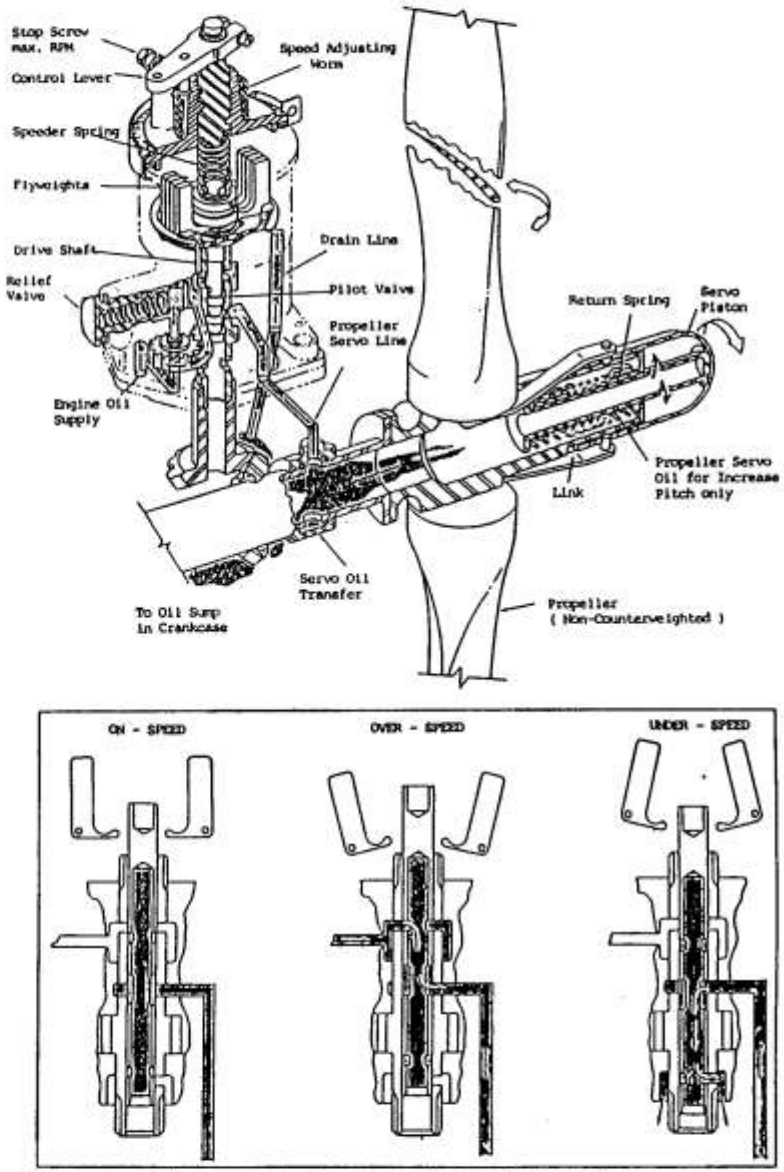
For the TAE – Installation:

Check that the correct pre-pressure on the TAE CSU is set.

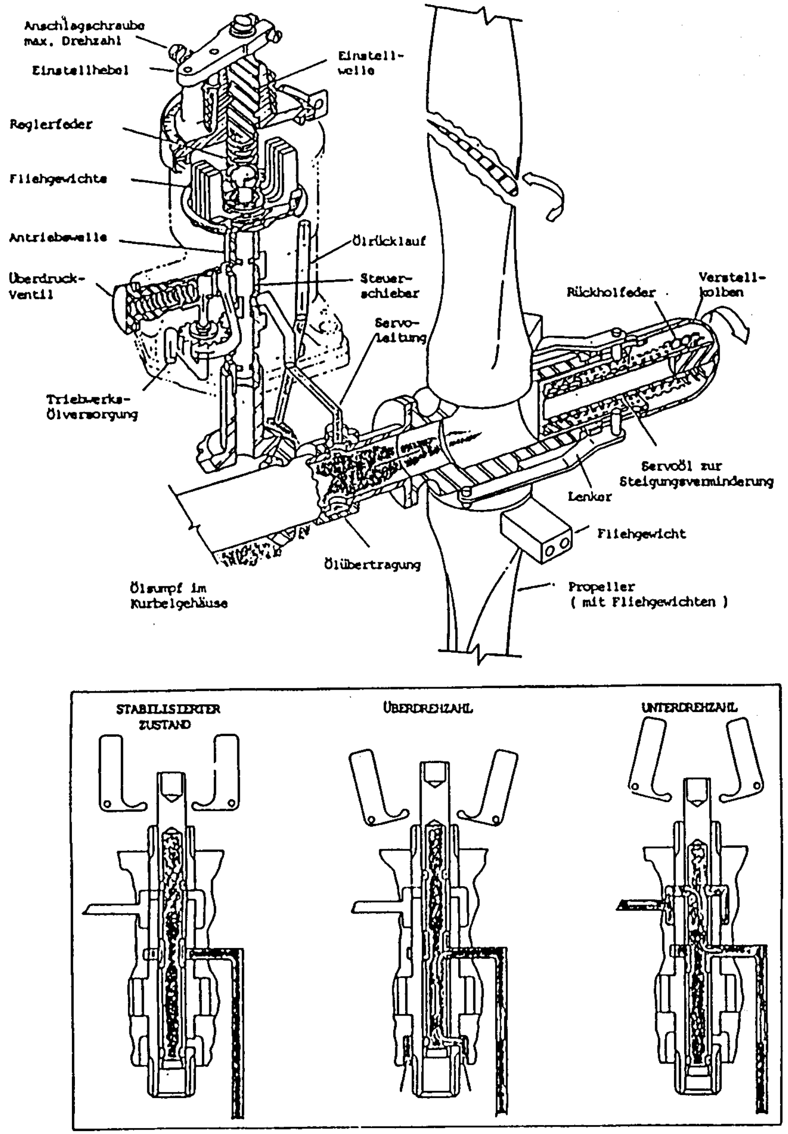
If too low, accumulator will not be charged correctly!



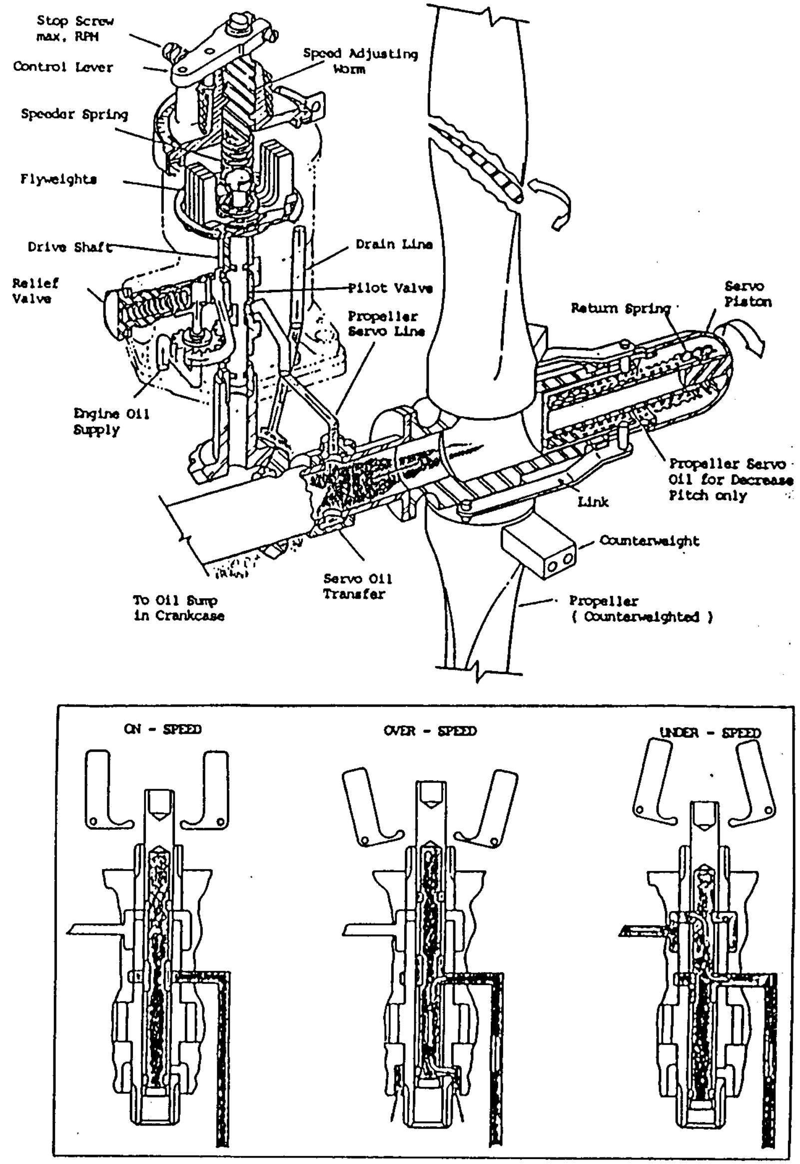
Regleröldruck zur Steigungserhöhung, Einmot.



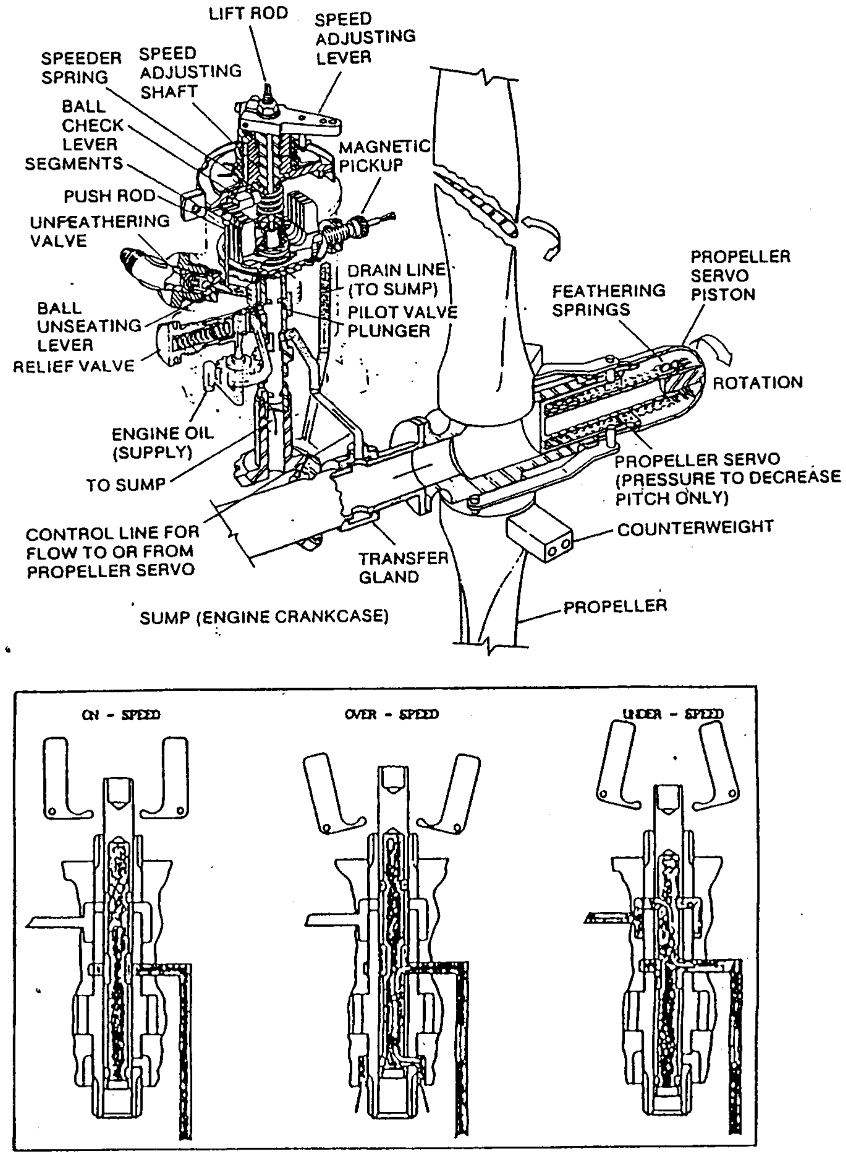
Governor oil pressure to increase pitch, single engine



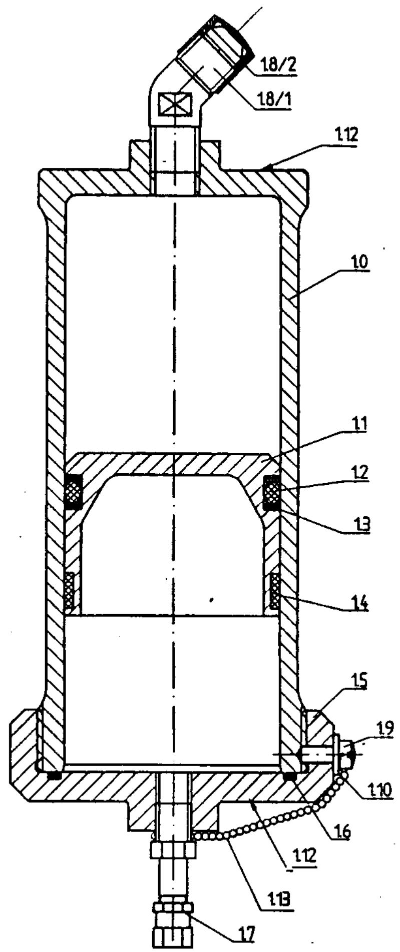
Regleröldruck zur Steigungsverminderung, Einmot.



Governor oil pressure to decrease pitch, single engine



Governor oil pressure to decrase pitch, twin engine



Unfeathering accumulator

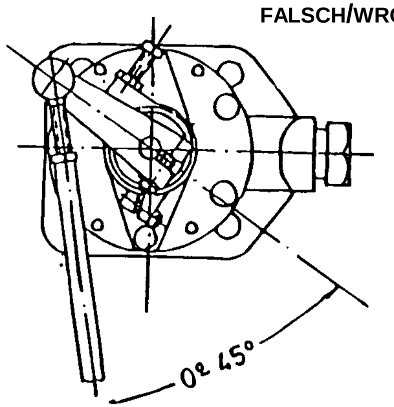
5.0 EINBAUANWEISUNG UND BETRIEB

Achtung: Bei einem TAE-125 Triebwerk ist für den Einbau und Betrieb des Reglers das CSUM-02-01 zu benützen.

5.1 Alle Propeller dieser Muster sind nur zur Befestigung an Triebwerken mit Flanschanschluß geeignet. Der entsprechende Code für die unterschiedlichen Flansche ist aus der Bezeichnung (siehe Kapitel 2) ersichtlich.

5.2 Ein Regler mit entsprechender Wirkungsrichtung des Öldrucks muß am Triebwerk angebaut sein. Der Bedienzug soll wie im Bild dargestellt angebracht sein.

FALSCH/WRONG



5.2.1 Falls zutreffend, den Unfeathering Akku an den Regler anschließen und an den dafür vorgesehenen Stellen befestigen. Luftdruck gemäß Angaben auf dem Akku!

Überprüfung der verschiedenen Akku - Druckanforderungen anhand der jeweiligen Flugzeuganwendung!

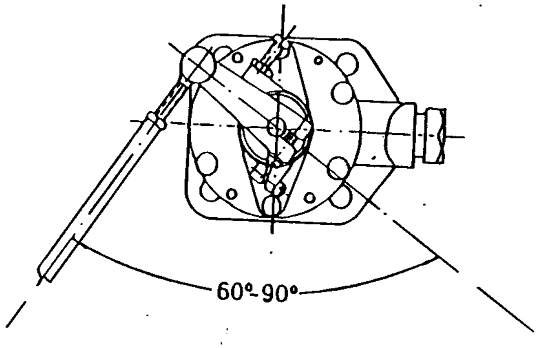
5.0 INSTALLATION AND OPERATION INSTRUCTION

Note: If a TAE-125 engine is installed the CSUM-01-01 must be used for installation and operation of the CSU.

5.1 All propellers of these designs are only suitable for installation on flange type engines. The code for the flange type and size can be seen from the model designation (see chapter 2).

5.2 A governor with suitable oil pressure direction has to be installed on the engine, the control lever being mounted as shown below.

RICHTIG/ACCEPTABLE



5.2.1 If applicable, install the unfeathering akku to the governor and fix it onto the provided positions.
Air pressure according to information on Accu!

Check for different pressure requirements as applicable for the Accu according to the airplane application.

5.2.2 Am TAE-Triebwerk ist die komplette Regeleinheit bereits installiert. Für weitere Informationen siehe CSUM-02-01.

5.3 Propellerenteisung ist wahlweise möglich.
Komplette Anlagen von Goodrich müssen nach Manual 30-60-02 angebaut werden oder sein.
Komplette Anlagen von McCauley müssen nach Manual 830415 angebaut werden oder sein.
Auf Beschränkungen im Bodenbetrieb achten, damit die Enteisungsgummis nicht beschädigt werden (Überhitzung).

5.4 Propeller und Triebwerksflansch mit Benzin o.ä. reinigen.
Flächen müssen zur Kraftübertragung fettfrei und sauber sein.

Transport-Schutzkappen und Schutzhuellen entfernen!

5.5 Prüfen, ob O-Ring im Propellerflansch ist.

Achtung:
Keinen weiteren O-Ring auf die Kurbelwelle schieben.

5.6 Je nach Spinnerkonstruktion entweder die Grundplatte auf die Kurbelwelle stecken oder an der Nabe befestigen.

5.7 Propeller vorsichtig auf die Kurbelwelle schieben, dabei auf die Position der Spinnerplatte mit den Blattausschnitten achten. Falls aus konstruktiven Gründen die Flanschbolzen gleichzeitig mit eingedreht werden müssen, ist darauf zu achten, daß der Propeller nicht mit den Bolzen aufgezogen wird, sondern lose nachgeschoben, um eine Beschädigung des Führungsbunds des Propellers zu vermeiden, die durch Scherspäne zu Undichtheit am O-Ring führen können.
Beim MTV-21-( )-MF muß darauf geachtet werden, daß die triebwerkseitige Betätigungseinrichtung bereits angebaut ist und an den Verstellring angepaßt wird.

5.2.2 On the TAE-engine the CSU is already installed. Refer to the CSUM-02-01.

5.3 Electrical propeller deicing may be used optionally.
Complete Goodrich kits have to be installed according to Manual 30-60-02.
Complete McCauley kits have to be installed according to Manual 830415.
Observe the limitations during ground operation in order to avoid damage of the de-ice boots (overheating).

5.4 Clean engine and propeller flange with solvent of gasoline.
Both surfaces must be dry and clean. Remove all surface defects.

Remove the shipping plugs and protective wrap!

5.5 Check position of O-ring in propeller flange.

Warning:
Do not add an O-ring on the crankshaft.

5.6 Depending on spinner design, install backplate on crankshaft or on propeller hub.

5.7 Install the propeller carefully to the crankshaft. Observe the position of the spinner backplate for the blade position. If the design does not permit installing the flange bolts after the propeller has been fixed on the crankshaft, please observe that the propeller should not be pulled onto the crankshaft with the bolts in order to avoid damage to the hub and to avoid shearing off material causing oil leaks on the O-ring.
When mounting the MTV-21-( )-MF make sure that the engine related actuating kit is installed. Care for proper fit of pitch change ring.

Achtung:
Niemals den Propeller mit den Flanschbolzen auf den Triebwerksflansch ziehen, sondern lediglich nur mit der Hand aufschieben.

Flanschbolzen oder **Stopmuttern** mit Unterlegscheiben gleichmäßig und über Kreuz anziehen. Flanschbolzen paarweise mit 0,8 mm Edelstahldraht sichern.

Anzugsmomente:

3/8"	24 UNF Bolzen		35 - 37 Nm
7/16"	20 UNF Bolzen		55 - 60 Nm
7/16"	20 UNF Stopmuttern		45 - 47 Nm
7/16"	20 UNF Stopmuttern:		
	A-Flansch auf Centurion 2.0 mit 155 HP		55 - 57 Nm
1/2"	20 UNF Bolzen	(≤ 300 PS)	85 - 90 Nm
1/2"	20 UNF Bolzen	(> 300 PS)	120 - 135 Nm
	and SMA SR 305-230		
1/2"	20 UNF Stopmuttern	(≤ 300 PS)	85 - 90 Nm
1/2"	20 UNF Stopmuttern	(> 300 PS)	110 - 115 Nm
9/16"	18 UNF Stopmuttern		135 - 150 Nm
Zentralmutter, SAE No.20 Spline			610- 680 Nm
+ 1/2"	20 UNF Stopmuttern		110 - 115 Nm

Achtung: Werte gelten für ungeschmiertes, leichtgängiges Gewinde.

Anzugsmomente sorgfältig überprüfen, um Beschädigung der Schrauben zu vermeiden!

Attention:
Never pull a propeller onto the engine flange by the bolts, only install by hand.

Mounting bolts or **stop nuts** with washers should be tightened crosswise with equal force. Safety wire flange bolts in pairs with .032" stainless steel wire.

Torque:

3/8"	24 UNF bolts		25 - 27 ftlb
7/16"	20 UNF bolts		41 - 44 ftlb
7/16"	20 UNF stopnuts		33 - 35 ftlb
7/16"	20 UNF stopnuts:		
	A-flange on Centurion 2.0 mit 155 HP		40 - 42 ftlb
1/2"	20 UNF bolts	(≤ 300 HP)	63 - 66 ftlb
1/2"	20 UNF bolts	(> 300 HP)	90 - 100 ftlb
	and SMA SR 305-230		
1/2"	20 UNF stopnuts	(≤ 300 HP)	63 - 66 ftlb
1/2"	20 UNF stopnuts	(> 300 HP)	81 - 85 ftlb
9/16"	18 UNF stopnuts		100 - 110 ftlb
Shaft Nut, SAE No.20 Spline			449 - 502 ftlb
+ 1/2"	20 UNF stopnuts		81 - 85 ftlb

Note: Torque values are valid for dry, free-moving threads only.

Carefully check the torque to avoid overtorque of the bolts!

5.8 Spur der Propellerblätter prüfen.
Max. zul. 3 mm, ca. 10 cm von der Blattspitze an der Austrittskante gemessen.

5.9 Spinner auf die beiden Trägerplatten schieben, dabei auf die Kennzeichnung achten.
Schrauben mit Plastikscheiben mit 4 - 5 Nm anziehen. Schlag des Spinners prüfen. Soll nicht mehr als 2 mm sein.

Beim MTV-21-( )-MF Spinner erst nach der Funktionskontrolle montieren.

5.10 **Elektrische Propellerenteisung anschließen:**
Testläufe von Propellern mit installierter elektrischer Enteisung sind nur mit montiertem Spinner erlaubt, da ansonsten die Enteisungs- anschlüsse beschädigt werden.
Vor dem Standlauf den Boden reinigen, um Steinschläge am Propellerblatt und an den Enteisungsboots zu vermeiden.

Note:
Es ist nicht erlaubt, die vereisten Propellerblätter mit Heissluft über 80° C (176° F) zu behandeln, da diese Art der Enteisung Beschädigungen der Blätter verursachen kann.

5.8 Check track of the blades.
There is max. 1/8 inch allowed, measured approx. 4 inches from the tip on the trailing edge.

5.9 Install spinner on support plates, observe mating marks. Torque screws with plastic washers 35 - 44 inlb. Check runout of the dome. Max. 0,08 inch permissible.

Mount spinner for MTV-21-( )-MF after the functional check.

5.10 **Connect electrical propeller de-icing system**:
Test runs of propellers with installed de-icing system are only allowed with mounted spinner because otherwise the de-icing wiring will be damaged. Before running the engine the ground must be cleaned to avoid stone nicks on propeller blade and the de-icing boots.

Note:
It is prohibited to use heaters or hot air blowers with a temperatur over 80° C (176° F) onto the blades to deice same as such treatment can cause blade damages.

5.10.1. Einbau MTV-9-AA-C / MTV-15-AA-(C) Spline Shaft :
(siehe Zeichnung P-1392 / P-1391-B)

Achtung:
Vor dem Einbau alle Dichtungen mit Motoröl schmieren!

5.10.2 Abstandshalter, Konus und O-Ring C-049-59, in dieser Reihenfolge, auf den Spline Shaft schieben.

5.10.3. Propeller mit vorinstalliertem Shaftadapter, Metallführungsring und Mutter auf Kurbelwelle montieren.
Mutter mit 610-680 Nm (436-486 ftlb) festziehen.
Zur Sicherung der Mutter Sicherungsring verwenden!

5.10.4 Ölübertragungsrohr mit O-Ring C-051-50 in die Mutter Spline 20 einschrauben.
Mit Sicherungsdraht das Ölübertragungsrohr zur Mutter sichern.

5.10.5 O-Ring C-047-90, Federführung und Rückstellfeder(n) auf das Ölübertragungsrohr installieren. Federführung ist der mechanische Anschlag für „Kleine Steigung“.

5.10.6 Mit Hilfe des Werkzeugs T-372-2 Kolben mit den Dichtungen C-429-4 mit den M8 Schrauben C-200-60 für den MTV-9-AA bzw. C-201-40 für den MTV-15-AA bei einem Anzugsmoment von 30-34 Nm (21-24 ftlb); mit Permatex No. 2 befestigen.

5.10.7 Werkzeug T-372-2 entfernen; O-Ring C-047-120 sowie Führungsring C-276 in Kolben einsetzen.

5.10.8 Zylinder mit Spinnerfrontplatte mit den Schrauben C-303-6 auf den Kolben schieben, mit der Nabe mit 9 - 9,4 Nm
(7. 5 - 8.0 ftlb) verschrauben und mit Sicherungsdraht sichern!

Achtung:
Frontplatte mit Kennzeichnung für Blatt Nr. 1 Spinner Position..

5.10.9 Spinnerdome und Abdeckbleche montieren!

5.10.1. MTV-9-AA-C / MTV-15-AA-(C) Spline Shaft Installation:
(see drawing P-1392 / P-1391-B)

Attention:
Lubricate all seals with engine oil before installation!

5.10.2. Install Spacer, Cone and O-Ring C-049-59 in this sequence on the Spline Shaft.

5.10.3. Install Propeller with pre-installed spline adapter, metal guide ring and nut onto the crankshaft.
Torque Nut with 610-680 Nm (436-486 ftlb)
Use safety ring to secure nut.

5.10.4 Screw in oil transfer tube with O-Ring C-051-50 into the Spline 20 nut.
Safety wire oil transfer tube to nut.

5.10.5 Install O-Ring C-047-90 in oil transfer tube and also spring guide and return spring(s). Spring Guide serves as a “low pitch stop”.

5.10.6 Install piston with seals C-429-4 with tool T-372-2 by using Permatex No. 2 on scrws and torque screws M8, i.e.C-200-60 for MTV-9-AA respectively C-201-40 for MTV-15-AA with 30-34 Nm (21-24 ftlb).

5.10.7 Remove tool T-372-2 and install O-Ring C-047-120 and guide ring C-276 in piston groove.

5.10.8 Install cylinder with spinner front plate on piston onto the hub with screws C-303-6 and torque screws with 9 - 9,4 Nm
(7.5 - 8.0 ftlb). Safety wire screws.

Attention:
Front plate is marked for blade No. 1 spinner position!

5.10.9 Install spinner dom and filler plates!

5.11 Stickstoffbefüllung von Akkumulatoren:

- Akkumulatoren ohne Magnetventil:
  Akkumulator mit Stickstoff befüllen bis der am Akkumulator genannte Druck erreicht ist.
- Akkumulatoren mit Magnetventil:
  Vor der Befüllung des Akkumulators mit Stickstoff das Magnetventil mit Strom versorgen, nun mit Stickstoff befüllen bis der Druck den Wert, der auf dem Aufkleber am Akkumulator genannt ist, erreicht wird.

Nach Befüllen Stromversorgung des Magnetventils abschalten!

5.12 Funktionskontrolle durchführen.

Achtung: Motor- und Propellerhersteller empfehlen, Betrieb am Boden mit hohen Drehzahlen möglichst zu vermeiden, weil hohe Triebwerkstemperaturen und Steinschlag-beschädigung der Blätter entstehen können.

Mit dem Leistungshebel ca. 1700 upm vorwählen. Propellerhebel zurück-(heraus-)ziehen, bis Drehzahl um ca. 300-500 upm abfällt. Propellerhebel vorwärts-(hinein-)drücken auf Startstellung und Drehzahlanstieg beobachten. Die Verstellgeschwindigkeit soll in beiden Richtungen etwa gleich sein. Den Vorgang mindestens dreimal wiederholen (entlüften).

Bei einem TAE-125 Triebwerk ist die Funktionskontrolle des Reglers gemäss dem CSUM-02-01 durchzuführen.

5.13 Mit dem Leistungshebel nun ca. 2200 upm einstellen. Propellerhebel zurückziehen, bis Drehzahl um ca. 100 upm abfällt. Wenn Drehzahl stabilisiert ist, Ladedruck um ca. 3 inhg erhöhen und Reg lerfunktion beobachten. Drehzahl muß sich wieder stabilisieren.

5.11 Nitrogen Charge of Unfeather Accumulator:

- Accumulators without magnetic valve:
  Accumulator must be charged to the pressure value as shown outside the accumulator.

- Accumulators with magnetic valve:

Before charging the accumulator with nigrogen, energize the magnetic valve and charge to the pressure value as shown outside the accumulator.

After charging disconnect electric magnetic valve from power supply!

5.12 Carry out a functional check.

Note: Engine and propeller manufacturers recommend not to use high engine speed on ground because it can result in an excessive engine temperature and blade damage.

Adjust power lever for approx. 1700 rpm. Pull propeller lever back (out) until the rpm drops by 300 - 500. Push propeller lever full forward (in) for take off position and observe rpm increase. De-crease and increase of engine speed should have about the same time. Cycle three times to bleed air out of the system.

If A TAE-125 engine is installed the functional check of the CSU must be carried out according to the CSUM-02-01.

5.13 Adjust power lever at approx. 2200 rpm now. Pull propeller lever back until rpm drops about 100 rpm. When the rpm is stabilized, increase manifold pressure by about 3 inhg and observe the go-vernor function. rpm must stabilize.

5.14 Mit dem Leistungshebel Startstellung einstellen. Auf sauberen Boden achten, um Steinschläge zu vermeiden. Die Startdrehzahl soll vom Propeller begrenzt werden und ca. 50 - 100 upm unter dem zulässigen Wert liegen. Siehe Punkt "Störungen" um festzustellen, ob Propeller oder Regler die Drehzahl begrenzen.

Bei einem TAE-125 Triebwerk ist die Funktionskontrolle des Reglers gemäss dem CSUM-02-01 durchzuführen.

5.15 Die Steigungsanschläge wurden bei der Herstellung, entsprechend dem vorgesehenen Einbau der Flugzeug/Triebwerk Kombination, eingestellt. Kleine Steigung (Startstellung) kann durch Verändern der Nutmuttern eingestellt werden. Große Steigung ist im Servicebetrieb veränderbar. Für Propeller mit Fliehgewichten ist es umgekehrt.

5.15.1 Beim MTV-21-( )-MF prüfen, ob nach der Verstellung in Segelstellung die Blätter von Hand in Startstellung gedreht werden können (bis zum Anschlag im Propeller). Bedienzug so einstellen, daß die Bedieneinrichtung des Zugs gerade nicht anliegt (keine Vorspannung der Bedieneinrichtung). Spinner montieren.

5.15.2 Bei den Propellern MTV-()-C-F prüfen ob der Unfeathering Akku funktioniert. Dafür ca. 1400 RPM mit dem Leistungshebel vorwählen, danach Propellerblätter mit dem Propeller Bedienzug in Segelstellung fahren. Triebwerk mit Propellerblätter in Segelstellung abstellen. Einige Minuten warten, danach die Blätter mit stehenden Triebwerk aus der Segelstellung in den Startlock fahren. Siehe auch Seite 23.

5.14 Watch for a clean ground surface to avoid blade damage and advance power lever and propeller lever for take off power and rpm. The static rpm must be limited by the propeller and should be 50 - 100 rpm. lower than max. rpm. See chapter "Trouble shooting" to check, if the propeller or governor limits the rpm.

If A TAE-125 engine is installed the functional check of the CSU must be carried out according to the CSUM-02-01.

5.15 Low and high pitch stops are adjusted during manufacture, according to the requirement of the aircraft/engine combination. Low pitch stop can be adjusted by varying the check nuts. High pitch can only be adjusted in a service station. For propellers with counterweight it is conversely.

5.15.1 With the MTV-21-( )-MF make sure that after positioning into feathering, the blades will be rotated back to low pitch by hand (till the stop in the propeller). Adjust control mechanism to a position, that the thrustplate will just not be touched (avoid preload in the actuating system).
Mount spinner.

5.15.2 Check function of the unfeathering akku at propeller MTV-()-C-F. For this select app. 1400 RPM with the throttle, pull propeller lever into feathering position. Stop engine with with propeller blades in feathering position. Wait a few minutes. Push the propeller lever full forward and the propeller blades must move into the start lock, do that without a running engine. Refer to page 23.

5.15.3 Bei den Propellern MTV-()-C-F prüfen, ob der Unfeathering Akku mit Magnetventil funktioniert. Dazu entsprechend vorgehen:

Propellerblätter in Segelstellung:

1) Drehzahl auf 1400 rpm mit dem Leistungshebel vorwählen.
2) Magnetventil aktivieren; dadurch öffnet Akkumulator (für ca. 5-8 Sekunden), so daß sich dieser mit Öl füllt.
3) Deaktivieren des Magnetventils, dadurch Schliessen des Akkumulators, wodurch Akkumulator Öl speichert.
4) Propeller-Drehzahlhebel in Segelstellung ziehen.

Propellerblätter aus Segelstellung:

1) Vor Anlassen des Motors, Propeller-Drehzahlhebel auf mittlere Drehzahl vorwählen.
2) Magnetventil durch Öffnen des Akkumulators aktivieren, Akkumulator läßt Oel in den Propeller und Propellerblätter fahren aus der Segelstellung heraus in den Startlock.
3) Nachdem Propellerblätter die Segelstellung verlassen haben, Magnetventil deaktivieren und Akkumulator schliessen.

5.15.4 CSU TAE-125 und Austro Engine:

Notwendige Einstellungen werden vom Hersteller entsprechend dem vorgesehenen Einbau der Flugzeug/Triebwerk-Kombination vorgenommen.

Überprüfung der Segelstellung und Einstellung der Drehzahl gemäß den Triebwerks- und Flugzeugherstellern!

5.15.3 Check function of the unfeathering akku with magnetic valve at propeller MTV-()-C-F by doing following steps:

Propeller blades into feathering:

1) Set rpm with power lever to 1400.
2) Activate the magnetic valve (opening accumulator) (approx. 5-8 seconds); accumulator is filled with oil .
3) De-activate the magnetic valve (close accumulator) and accumulator stores the oil.
4) Pull propeller control lever into feather.

Propeller blades out of feathering:

1) Before starting engine, position the propeller control lever in an intermediate position, like standard.
2) Activate the magnetic valve by opening accumulator; accumulator drains into the propeller, propeller blades travel out of feather into the startlock.
3) After the propeller blades are out of feather de-activate the magnetic valve and close accumulator.

5.15.4 CSU TAE-125 and Austro Engine:

Required adjustments are carried out by the manufacturer according to the requirements of the aircraft/engine-combination.

Feathering checks and rpm settings according to the eninge / airframe manufacturer!

5.16 Nach den Standläufen Überprüfung auf Ölleckage, Blattspiel und einwandfreien Zustand der Enteisung prüfen.

ACHTUNG: Fettleckagen

Bei der ersten Inbetriebnahme eines neuen oder überholten Propellers kann Fett an den Blättern und an der inneren Oberfläche des Propellerspinners zu sehen sein. Das ist normal und kein Anzeichen einer dauernden Fettleckage.
Ausgetretenes Fett an den Blattwurzeln oder im Inneren des Spinners ist mit einem milden Lösungsmittel komplett zu entfernen.
Kleinere Fettmengen, sichtbar an einer oder mehreren Blattwurzel(n) sowie am Spinner weiter beobachten, ob eine Verschlechterung eintritt.
Wenn innerhalb von 5 Flugstunden das Fett ausserhalb der Blattwurzel nicht an mehr als 18 cm (7 inches) auf der Blattoberfläche vorhanden ist, wird die Fettleckage als unerheblich eingestuft und sollte lediglich beobachtet werden.
Eine fortbestehende Fettleckage nach 20 Flugstunden ab dem Aufreten der ersten Leckage erfordert eine Reparatur in einem authorisierten Servicebetrieb.
Im Zweifelsfall ist der Hersteller zwecks weiterer Vorgehensweise zu kontaktieren!

5.16 After the ground runs, check for oil leaks, blade shake and condition of the de-ice system.

NOTE: Grease Leakages

The first run-up of a new or overhauled propeller may leave grease on the blades and inner surface of the spinner dome. This is normal and do not mean that it will be a continuing grease leakage.
Remove any grease on the blades or inner surface of the spinner dome by using a mild solvent.
Minor grease leak which can be seen on one or all blade root(s) and spinner should be monitored if it gets worse.
If the grease leak does not spray more than 7 inches (18 cm) on the blade surface from the blade root outside the blade ferrule in 5 hours of operation, it is defined as minor and should be only monitored!
Continued grease leakage after 20 hours of operation from first leakage requires repair at an authorized service repair facility within 5 operating hours.
In case of doubt contact manufacturer!

5.17 Prüfflug durchführen.

5.18 Betrieb

Propeller und Propellerregler sind durch Versuche aufeinander abgestimmt. Der Regler muß konstante Drehzahl ermöglichen. Die Standdrehzahl bei Vollgas muß ca. 50 - 100 upm unter der Solldrehzahl liegen und der Propeller muß die Drehzahl begrenzen. Begrenzt der Regler die Drehzahl muss dieser nachgestellt werden.

Propeller mit Fliehgewichten sowie Propeller mit Segelstellung sind jedoch hiervon nicht betroffen, da im Falle eines Reglerausfalles die Propellerblätter automatisch in Richtung grosse Steigung drehen und demzufolge keine Überdrehzahl möglich ist.

Während des Startvorgangs muß die Drehzahl mit steigender Geschwindigkeit zunehmen, und vom Regler auf die Solldrehzahl begrenzt werden.

Die Drehzahl kann bei jeder Leistungs- und Drehzahleinstellung verändert werden und muß im gesamten Geschwindigkeitsbereich automatisch geregelt werden

Falls bei Ausfall des Öldrucks hohe Fluggeschwindigkeiten anliegen, kann das zu Überdrehzahl führen (Propeller ohne Fliehgewichte), die sofort mit einer Reduzierung der Triebwerksleistung korrigiert werden muß.

Die große Steigung ist so gewählt, daß im Fall einer Blockierung der Rücklaufleitung oder für Propeller mit Fliehgewichten bei Ausfall des Öldrucks ein Weiterflug mit verminderter Leistung möglich ist. Durchstarten ist nur bedingt möglich.

5.17 Perform a Test Flight.

5.18 Operation

Propeller and governor are selected as a result of tests. The governor must allow constant speed. On take off, the static rpm should be approx. 50 - 100 rpm. lower than max. rpm and the propeller must limit this rpm. If the governor limits rpm, it must be readjusted.

This is not applicable for propellers with counterweights and propellers with feathering, because in case of governor failure the propeller blades will turn automatically into direction high pitch and therefore no overspeed is possible.

During the take off run, the rpm must increase with airspeed and the governor must limit max. rpm.

The rpm can be changed at all power and rpm settings and must be held constant automatically within the entire flight envelope.

If oil pressure is lost and high speeds are used, overspeed is possible (none counterweighted propellers) and throttle must be retarded immediately to correct the situation.

High pitch is set to such a value that in case the oil return line is blocked, or for propellers with counterweights installed if the oil pressure fails, it should be possible to continue flight with reduced power. Go around would be from limited to impossible.

Anmerkung:
Grundsätzlich Leistungs- und Drehzahlhebel langsam betätigen, um Überdrehzahlen zu vermeiden.
Die leichten Blätter ergeben schnellere Drehzahl- und Steigungsänderungen als bei Verstellpropellern mit Metallblättern.

Remark:
Move power lever and rpm lever always slowly to avoid overspeed.
The lightweight blades result in faster reaction of rpm and pitch change than usual variable pitch propellers with metal blades.

5.19 Startcheck

Vor dem Start Propellerverstellung mindestens 2 mal betätigen, um das System durchzuspülen. Im Reiseflug können viele Leistungs- und Drehzahlkombinationen eingestellt werden, da die Ansteuerung stufenlos ist. Etwaige Drehzahlbegrenzungen von Triebwerk- oder Propellerhersteller sind zu beachten und der Drehzahlmesser soll markiert sein.

Bei einem TAE-125 Triebwerk ist der Startcheck gemäß dem CSUM-02-01 durchzuführen.

5.19 Pre-flight check

The propeller should be cycled at least twice to spill oil before every flight. In cruise flight an infinite number of power and rpm settings are possible because there is no restriction between the stops. Rpm restrictions from the engine or propeller manufacturer must be observed and the tachometer must be marked.

If a TAE-125 engine is installed the pre-flight check must be performed according to the CSUM-02-01.

5.20 Segelstellung

Beim MTV-21-()-M-F muß nach Abstellen des Triebwerks die separate mechanische Segelstellungseinrichtung betätigt werden. Nach dem Entriegeln des Segelstellungshebels fährt der Propeller in Startstellung. Triebwerk wieder anlassen.

Beim MTV-5-( )-C-F, MTV-6-( )-C-F, MTV-9-( )-C-F, MTV-12-( )-C-F,MTV-14-( )-C-F, MTV-16-( )-C-F, MTV-21-( )-C-F, MTV-25-( )-C-F und MTV-27-( )-C-F muß bei Propellerdrehzahlen um 1500 upm der Propellerverstellhebel auf Segelstellung gewählt werden, um Segelstellung zu erreichen. Dazu muß eine Sicherheitssperre am Verstellhebel überwunden werden.

5.20 Feathering:

With the MTV-21-( )-MF feathering is set with the propeller lever after engine shutdown. When unlatching this lever, the blades move to low pitch and the engine may be restarted.

With the MTV-5-( )-C-F, MTV-6-( )-C-F, MTV-9-( )-C-F, MTV-12-( )-C-F, MTV-14-( )-C-F, MTV-16-( )-C-F, MTV-21-( )-C-F, MTV-25-( )-C-F and MTV-27-( )-C-F feathering is achieved with propeller lever pulled to feathering at about 1500 propeller-rpm. The control must be pulled over a safety step for unintended feathering.

Vor dem Wiederanlassen des Triebwerks im Flug, Verstellhebel auf niedrige Reisedrehzahl wählen, um Überdrehzahlen durch Windmilling zu vermeiden.

Im Landeanflug**,** nach entsprechender Reduzierung von Geschwindigkeit und Leistung, muß der Propellerverstellhebel wieder auf Startstellung gebracht werden, damit im Falle eines Durchstartens die volle Startleistung zur Verfügung steht

Bei Motorseglern zusätzlich die vom Flugzeughersteller vorgegebenen Verfahren im POH beachten.

5.21 Propeller-Enteisung

Prüfe nach dem Einschalten der elektrischen Propeller-Enteisung, ob die Stromstärke am Ammeter die richtige Leistung anzeigt. Bei laufendem Propeller besteht keine Einschränkung der Einschaltdauer. Mit stehendem Triebwerk ist die max. Einschaltdauer der Enteisung auf 60 sec. beschränkt, da ansonsten eine Überhitzung der Enteisung auftritt.

Achtung:

Der Propeller mit elektrischem Enteisungssystem darf Nicht ohne Spinner betrieben werden, da dadurch die Enteisungs - Kabel beschädigt werden.

Before the engine is restarted in the air, move the lever to a low cruise rpm setting in order to avoid overspeed due to windmilling.

During approach after speed and power is reduced accordingly, the propeller lever must be adjusted for take off (max. rpm) in order to have full climb power in case of a missed approach.

For Motorgliders additionally refer to the given procedures in the original POH.

5.21 Propeller De-Icing

Check ammeter reading after switching on the electrical propeller de-ice system. With running propeller, no time limit for "on" is required. With non-running engine the max. switch-on-time of the de-icing system is only 60 sec. Otherwise overheating will occur.

Attention:

Do not operate a propeller with electrical de-icing system without spinner dome as this will cause damage to the de-icing System - Wiring.

6.0 KONTROLLEN

6.1 Tägliche Kontrolle (kann durch den Piloten durchgeführt werden):

Vor jedem Flug Zustand der Blätter und des Spinners prüfen. Blattspitzenspiel bis 3 mm erlaubt (wackeln). Blattwinkelspiel bis 2° zulässig.

Keine unzulässigen Risse in den Blättern (siehe 6.2). Kantenschutz darf nicht lose sein. PU-Band einwandfrei und vorhanden, sonst innerhalb der nächsten 10 Betriebsstunden ab letzter Kontrolle ersetzen. Keine Ölleckage.

Note:
Zwecks Überprüfung der elektrisch beheizten Enteisungsgummis und der Enteisungsgummis für Flüssigkeitsenteisung auf sichtbare Beschädigiungen sowie deren korrekter Verklebung siehe Punkt 6.9.1.

Keine weiteren Überprüfungen an den Teilen der Enteisungsgummis für Flüssigkeitsenteisung erforderlich.

6.1.1 SMA Anwendung (z.B. MTV-9-B-S an SMA SR 305-230 Motor)

Für die SMA Anwendung (z.B. MTV-9-B-S an SMA SR 305-230 Motor) ist kein Blattspitzenspiel erlaubt. Ein Blattwinkelspiel bis 2° ist jedoch zulässig.

ACHTUNG: **Bei Auftreten eines Blattspitzenspieles ist der Propeller an eine zugelassene Werkstatt zu senden, um dort neu justiert zu werden.**

6.0 INSPECTIONS

6.1 Daily Inspection (can be conducted by the pilot):

Before each flight inspect the condition of the blades and spinner. Blade shake is allowed up to 1/8 inch and a blade angle play of 2° is acceptable.

No critical cracks in the blades (see 6.2). Metal erosion sheath may not be loose. PU-strip proper and existing. If not, replace within the next 10 hours after last inspection. No oil leaks.

Note:
For electrothermal- and fluid de-ice boot check for visible damage and proper bonding see also section 6.9.1.

No additional inspection procedures required for the fluid de-ice parts of the propeller!

6.1.1 SMA Application (i.e. MTV-9-B-S on SMA SR 305-230 engine)

On the SMA application (i.e. MTV-9-B-S on SMA SR 305-230 engine) no blade shake is allowed. However, a blade angle play of 2° is acceptable.

CAUTION: **In case of blade shake send the propeller to an authorized service station for re-adjustment.**

ACHTUNG: Fettleckagen

Bei der ersten Inbetriebnahme eines neuen oder überholten Propellers kann Fett an den Blättern und an der inneren Oberfläche des Propellerspinners zu sehen sein. Das ist normal und kein Anzeichen einer dauernden Fettleckage.

Ausgetretenes Fett an den Blattwurzeln oder im Inneren des Spinners ist mit einem milden Lösungsmittel komplett zu entfernen.

Kleinere Fettmengen, sichtbar an einer oder mehreren Blattwurzel(n) sowie am Spinner weiter beobachten, ob eine Verschlechterung eintritt.

Wenn innerhalb von 5 Flugstunden das Fett ausserhalb der Blattwurzel nicht an mehr als 18 cm (7 inches) auf der Blattoberfläche vorhanden ist, wird die Fettleckage als unerheblich eingestuft und sollte lediglich beobachtet werden.

Eine fortbestehende Fettleckage nach 20 Flugstunden ab dem Aufreten der ersten Leckage erfordert eine Reparatur in einem authorisierten Servicebetrieb.

Im Zweifelsfall ist der Hersteller zwecks weiterer Vorgehensweise zu kontaktieren!

NOTE: Grease leakages

The first run-up of a new or overhauled propeller may leave grease on the blades and inner surface of the spinner dome. This is normal and do not mean that it will be a continuing grease leakage.

Remove any grease on the blades or inner surface of the spinner dome by using a mild solvent.

Minor grease leak which can be seen on one or all blade root(s) and spinner should be monitored if it gets worse.

If the grease leak does not spray more than 7 inches (18 cm) on the blade surface from the blade root outside the blade ferrule in 5 hours of operation, it is defined as minor and should be only monitored!

Continued grease leakage after 20 hours of operation from first leakage requires repair at an authorized service repair facility within 5 operating hours.

In case of doubt contact manufacturer!

Kontrollen gemäß

- **Flugzeugwartungsbuch oder**
- **100 Flugstunden, wenn keine zeitlichen Angaben vorhanden.**

6.2.1 Spinnerdom entfernen, auf Risse prüfen. Blattspitzenspiel prüfen, max. 3 mm.

Das Blattspitzenspiel muss IN und GEGEN die Drehrichtung geprüft werden. Gemessen wird 10 cm von der Blattspitze an der Austrittskante.

Beachte:
NICHT in Flugrichtung messen, da sonst auch die Biegung des Blattes mit gemessen wird.

Blattwinkelspiel prüfen, max. 2°. Werden diese Werte überschritten, die Serviceabteilung von MT-Propeller informieren. Äußere Nabenteile auf Risse und Korrosion prüfen. Anschlagmuttern kleine Steigung auf festen Sitz prüfen. Alle Sicherungen auf Funktion prüfen. Flanschbolzen oder Stopmuttern auf Anzug prüfen. Spinnerplatte auf Risse und festen Sitz prüfen. Naben- und Blattwurzelbereich auf Ölundichtheit und Fettleckage prüfen. Position der Fliehgewichte, falls vorhanden, kontrollieren. Enteisungsgummi und Kabel auf Anschluß und Zustand prüfen. Prüfe den Zustand der Kohlen und des Schleifrings.

Bei Propellern mit Segelstellung auf Abnutzungserscheinungen des Startlocks sowie der Führungsstange achten, um eine korrekte Funktion zu gewährleisten.

.

Achtung:
Es ist sicherzustellen, dass die beweglichen Teile des Startlocks vollkommen öl-, fett- und schmutzfrei sind.
Bei Bedarf Teile mit einem Entfetter reinigen!
Ein verschmutztes Startlock führt zur Trägheit und dadurch zur Beschädigung der Führungsstange.

Inspection

- **According to Aircraft Maintenenace Manual or**
- **100 flight hours, if no schedules available**

6.2.1 Remove spinner and check for cracks. Check blade shake, max. 1/8 inch.

The blade shake must be checked IN and OPPOSITE the direction of rotation. Measure blade shake 4 inch from blade tip at the trailing edge.

Note:
DO NOT measure in flight direction, as the blade bending will also be measured.

Check blade angle play, max. 2°. If the check shows values above these tolerances, contact the service department of MT-Propeller. Inspect outside condition of the hub and parts for cracks, corrosion, deterioration. Inspect check nut for low pitch stop for tightness. Check all safety means to be intact. Check flange bolts or stopnuts for tightness. Check front and rear spinner plate for cracks and fixing. Inspect blade root and hub for oil and grease leaks. Check position of counterweights if applicable. Check electric de-ice boots and wire harness for connection and condition. Check brushes and slip ring for condition.

For feathering propellers check for the start lock- and guide rod wear to ensure correct functioning.

Attention:
Make sure that the start lock moving parts are free from oil, grease and dirt.
Clean with a degreaser if needed!
If the start lock is contaminated, it may be sluggish and damage the guide rod.

Überprüfe die Enteisungsgummis der Flüssigkeitsenteisung, die Versorgungsröhren sowie den Versorgungsring der Flüssigkeits-enteisung auf eventuelle Beschädigung.
Überprüfe auch die Enteisungsgummis der Flüssigkeitsenteisung auf korrekte Verklebung (siehe Abschnitt 6.9.1). Falls leichte Ablösung der Verklebung die Grenzen gemäß Abschnitt 6.9.1. überschreitet, müssen die Enteisungsgummis entweder vom Propellerhersteller oder durch entsprechend von MT-Propeller geschultes und zugelassenes Personal wieder aufgeklebt werden.

Das zutreffende Flugzeugwartungshandbuch ist ausserdem zu beachten

6.2.1.1 SMA Anwendung
(z.B. MTV-9-B-S an SMA SR 305-230 Motor)

Spinnerdom entfernen, auf Risse prüfen. Blattspitzenspiel prüfen. Merke: Blattspitzenspiel ist nicht erlaubt! Blattwinkelspiel prüfen, max. 2°. Werden diese Werte überschritten, die Serviceabteilung von MT-Propeller informieren. Äußere Nabenteile auf Risse und Korrosion prüfen. Anschlagmuttern kleine Steigung auf festen Sitz prüfen. Alle Sicherungen auf Funktion prüfen. Flanschbolzen oder Stopmuttern auf Anzug prüfen. Spinnerplatte auf Risse und festen Sitz prüfen. Naben- und Blattwurzelbereich auf Ölundichtheit und Fettleckage prüfen. Position der Fliehgewichte, falls vorhanden, kontrollieren. Enteisungsgummi und Kabel auf Anschluß und Zustand prüfen. Prüfe den Zustand der Kohlen und des Schleifrings.

6.2.2.1 Metall Blätter auf Kerben, Furchen oder Kratzer auf der Blattoberfläche oder der Ein- und Austrittskante untersuchen. Sie müssen vor dem Flug entfernt werden. Vor Ort Reparatur von kleinen Kerben und Kratzern kann von qualifiziertem Personal in Übereinstimmung mit FAA Advisory Circula 43.13-1A sowie den Verfahren wie nachfolgend aufgeführt, durchgeführt werden

Check fluid de-ice boots, fluid de-ice nozzles, fluid de-ice slinger ring for damage.
Check fluid de-ice boots for proper bonding. See section 6.9.1. If de-bonding exceeds the limits of Section 6.9.1. the boots must be re-glued by the propeller manufacturer or respective MT-Propeller trained and approved personnel.

Refer also to the appropriate Airplance Maintenance Manual.

6.2.1.1 SMA – Application
(i.e. MTV-9-B-S on SMA SR 305-230 engine)

Remove spinner and check for cracks. Check blade shake.
Note: Blade shake is not allowed! Check blade angle play, max. 2°. If the check shows values above these tolerances, contact the service department of MT-Propeller. Inspect outside condition of the hub and parts for cracks, corrosion, deterioration. Inspect check nut for low pitch stop for tightness. Check all safety means to be intact. Check flange bolts or stopnuts for tightness. Check front and rear spinner plate for cracks and fixing. Inspect blade root and hub for oil and grease leaks. Check position of counterweights if applicable. Check electric de-ice boots and wire harness for connection and condition. Check brushes and slip ring for condition.

6.2.2.1 Check **metal blades** for nicks, gouges, and scratches on blade surface or on the leading or trailing edges of the blade, they must be removed before flight. Field repair of small nicks and scratches may be performed by qualified personnel in accordance with FAA Advisory Circular 43.13-1A, as well as the procedures specified below.

6.2.2.2 Reparatur von Kerben oder Furchen am Metall Blatt

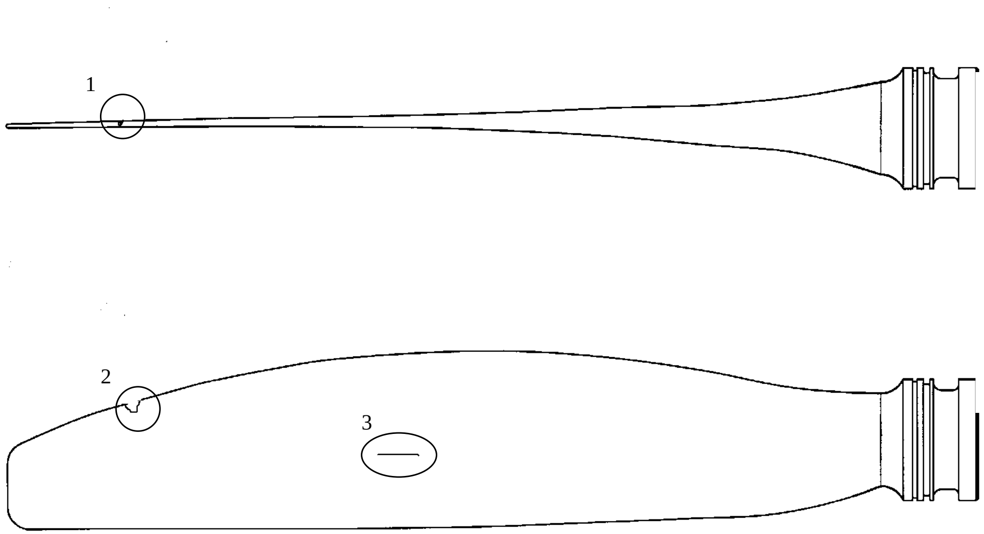
Vor Ort Reparaturen werden mit elektrischen oder Druckluftbetriebenen Schleifgeräten durchgeführt. Schmirgelpapier, Scotch Brite und Poliertuch müssen für die abschließende Oberflächenbehandlung verwendet werden (siehe Zeichnung unten).

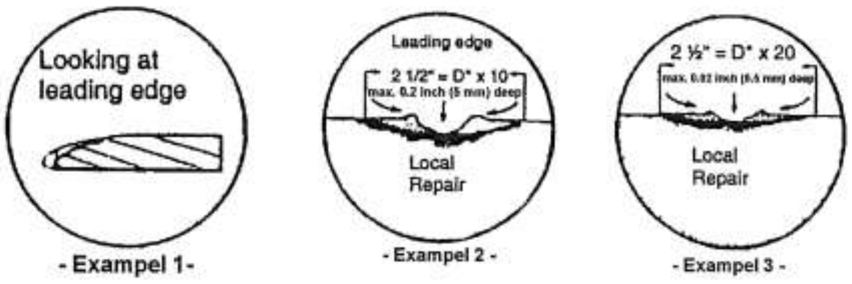
Falls sich jedoch die Beschädigung außerhalb des Reparaturlimits befindet ist der Hersteller zu kontaktieren.

6.2.2.2 Repair of Nicks or Gouges on Metal Blades:

Local repairs may be made using files, electrical or air powered equipment. Emery cloth, scotch brite, and crocus cloth are to be used for final finishing (see drawing below).

Hoever, if damage is beyond above repair limits contact manufacturer for further action.





* = Tiefe der Kerbe oder Furche / Depth of Nick or Gauges

ACHTUNG: Kugelgestrahlte Blätter (zu erkennen an der Oberfläche), die eine Beschädigung in dem gestrahlten Bereich beschädigt wurden mit mehr als 0,38 mm (.015 in) tief auf der Oberfläche oder oder 6,35 mm (0.250 in) auf der Eintritts- oder Austrittskante müssen außer Betrieb genommen werden und die überarbeitete Stelle vor dem Weiterflug wieder gestrahlt werden. Kugelstrahlen muß von einem LBA oder FAA zugelassenen Betrieb in Übereinstimmung mit dem MT-Propeller Überholungs Handbuch Nr. ATA 61-18-09 für Metallblätter durchgeführt werden.

ACHTUNG: Reparaturen, die Kaltverformung des Metalls beinhalten und die beschädigte Stellen verdecken, sind nicht zulässig. Dadurch könnte eine Spannungskonzentration entstehen, welche ein Versagen des Blattes verursachen könnte.

Reparaturen der Ein- oder Austrittskante müssen vollständig ausgeführt werden, indem vom tiefsten Punkt nach beiden Seiten der Beschädigung Material entfernt wird um einen glatten Übergang der Vertiefung in das originale aerodynamische Profil zu erhalten.

Reparaturen an der Blattoberfläche müssen in der gleichen Art und Weise durchgeführt werden wie oben dargestellt. Reparaturen, die eine durchgehende Linie quer über das Blatt (von Eintrittskante zu Austrittskante) erzeugen sind unzulässig.

Der Bereich der Reparatur soll wie folgt ermittelt werden:
An der Ein- und Austrittskante: Tiefe x10
Oberfläche und Profil: Tiefe x 20.

ACHTUNG: Die Eintrittskante beinhaltet the ersten 10% des Profils ausgehende von der Eintrittskante. Die Austrittskante besteht aus den letzten 20% des Profils die an die Austrittskante grenzen.

WARNING: Blades which have been shot peened (as indicated by a “peeble grain” surface) that have damage ***in the shot peened areas*** in excess of 0,38 mm (.015 in) deep on the face or camber or 6,35 mm (0.250 in) on the leading or trailing edges must be removed from service, and the reworked area shot peened before further flight. Shot peening of an aluminum blade must be accomplished by an LBA or FAA approved repair facility in accordance with MT-Propeller Overhaul Manual No. ATA 61-18-09 for metal blades.

WARNING: Rework which involves cold working the metal, resulting in concealment of a damaged area, is not acceptable. A stress concentration may exist which can result in a blade failure.

Repairs to the leading or trailing edge are to be accomplished by removing material from the bottom of the damaged area. Remove material from this point out to both sides of the damage, providing a smooth, blended depression which maintains the original airfoil general shape.

Repairs to the blade thrust or camber should be made in the same manner as above. Repairs that form a continuous line across the blade section (chordwise, blade leading to trailing edge) are unacceptable.

The area of repair should be determined as follows:
Leading and trailing edge damage: Depth of nick x 10.
Face and camber: Depth of nick x 20.

NOTE: Leading edge includes the first 10% of chord from the leading edge. The trailing edge consits of the last 20% of chord adjacent to the trailing edge.

Nach dem Feilen oder Schleifen der beschädigten Stelle, muß diese zuerst mit Schmirgelpapier und anschließend mit Poliertuch poliert werden um alle Reste des Feilens zu entfernen.

Die reparierte Stelle muß überprüft werden, um vor Korrosion zu schützen. Auf die reparierte Stelle chemische Grundierung und zugelassenen Lack auf die reparierte Stelle auftragen, bevor das Blatt wieder eingesetzt wird. Siehe auch Lackierung nach der Reparatur in diesem Kapitel.

6.2.2.3 Reparatur von verbogenen Blättern

<u>ACHTUNG:</u> Nicht versuchen ein Blatt auszurichten bevor es bei einem zugelassenen Propeller Überholungsbetrieb angeliefert wird. Das hätte zur Folge, daß das Blatt verschrottet würde.

Die Reparatur eines verbogenen Blattes ist eine große Änderung. Diese Art Reparatur muß von einem zugelassenen Propeller Überholungsbetrieb innerhalb der zugelassenen Richtlinien durchgeführt werden.

Lackierung nach Reparatur
Propellerblätter werden mit einem speziellen, dauerhaften Lack überzogen, der wiederstandsfähig gegen Erosion ist. Wenn der Lack errodiert ist es notwendig die Blätter neu zu lackieren, um sie vor Korrosion und Erosion zu schützen. Die Lackierung soll durch einen zugelassenen Propeller Überholungsbetrieb in Übereinstimmung mit dem MT-Propeller Überholungs Handbuch Nr. ATA 61-18-09 für Metall Blätter durchgeführt werden.
Es ist zulässig eine Lackierungsauffrischung mit Aerosol Lack in Übereinstimmung mit den Verfahren “Lackierung von Aluminium Blättern im Überholungshandbuch Nr. ATA 61-18-09 für Metall Blätter vorzunehmen.

After filing or sanding of the damaged area, the area must then be polished, first with emery cloth, and finally with crocus cloth to remove any traces of filing.

Inspect the repaired area to prevent corrosion. Properly apply chemical conversion coating and approved paint to the repaired area before returning the blade to service.
Refer to painting after repair in this chapter.

6.2.2.3 Repair of bent blades

<u>CAUTION:</u> Do not attempt to “pre-straighten” a blade prior to delivery to an approved propeller repair station. This will cause the blade to be scrapped by the repair station.

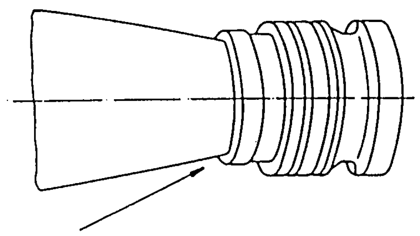
Repair of a bent blade or blades is considered a major repair. This type of repair must be accomplished by an approved propeller repair station, and only within approved guidelines.

Painting after repair
Propeller blades are painted with a durable specialized coating that is resistant to abrasion. If this coating becomes eroded, it is necessary to repaint the blades to provide proper corrosion and erosion protection. Painting should be performed by an authorized propeller repair staion in accordance with MT-Propeller Overhaul Manual No. ATA 61-18-09 for metal blades.
It is permissible to perform a blade touch-up with aerosol paint in accordance with the procedures in Painting of Aluminum Blades see Overhaul Manual No. ATA 61-18-09 for metal blades.

6.2.2.4 **Composite Blätter** einer Sichtprüfung nach 6.2.3 unterziehen. Risse im GFK-Mantel und Kantenbeschlag sind nur bedingt zulässig.

Lackrisse im Blatt und entlang des Kantenbeschlags sowie am Anfang des Beschlags sind zulässig, soweit sie nicht zum Lösen des Beschlags führen bzw. der Schutz gegen Feuchtigkeit für den Blattkörper einwandfrei ist. Blasen oder Delaminationen von bis zu 6 cm² sind zulässig. Im Zweifel die Serviceabteilung von MT-Propeller fragen.

Bilder möglicher Risse im Blatt



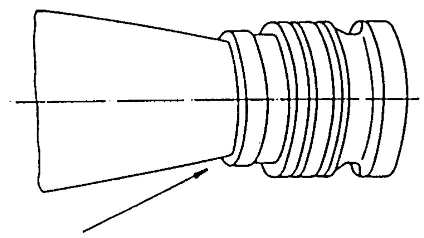
Überprüfe, ob das Silicon das das Blatt zur Blatthülse hin abdichtet, nicht beschädigt ist. Falls eine Beschädigung vorliegt sofort reparieren, damit keine Feuchtigkeit in das Blatt bzw. in die Blatthülse eindringen kann.

Sind Kerben, Einschläge oder sonstige Beschädigungen im Blattkörper vorhanden (z.B. durch Steinschlag), den Blattkörper einer Sichtprüfung unterziehen. Sind keine Risse vorhanden, die Kerbe mit geeignetem Epoxyd-Harz (5 min. Epoxy) zuspachteln. Es ist darauf zu achten, daß die Aerodynamik des Profils nicht zerstört wird. Anschließend die Stelle mit Schleifpapier nachbearbeiten. Danach eine Lackschicht zum Schutz gegen Feuchtigkeit auf die reparierte Stelle auftragen. Zusätzlich ist bei jeder Vorflugkontrolle dieser Bereich des Blattes auf mögliche Risse zu untersuchen. Bei der nächsten Reparatur/Überholung wird dieser Bereich vom Hersteller oder der jeweiligen Servicestation untersucht und fachmännisch repariert.

6.2.2.4 Check **Composite blades**, see 6.2.3, for cracks in the fiberglass cover and blade erosion sheath. There are only certain cracks allowed.

Cracks along the leading edge and on the beginning of the erosion sheath area are allowed as long as the erosion sheath is not loose. Cracks in the painted surface are allowed as long as no moisture can enter the blade core. Blisters or delaminations up to 1 square inch are permissible. In case of questionable conditions please contact the service department of MT-Propeller.

Illustrations of possible cracks in the blade



Check that silicone, sealing the blade to the blade ferrule, is not damaged. If a damage is obvious, repair that no moisture can enter into blade body and blade ferrule.

Perform visual inspection in case of notches, dents, nicks or other damages to the blade body (for example stone nicks). If no cracks exist, fill void with an appropriate Epoxy resin (5 min. Epoxy). The aerodynamic of the airfoil must not be destroyed. Afterwards sand the filled spot with sandpaper. Apply a lacquer layer to protect the repaired spot against moisture. Whenever performing pre-flight inspection, check this area carefully for possible cracks. During the next repair/overhaul at the manufacturer or service station this area will be inspected and repaired by a competent expert.

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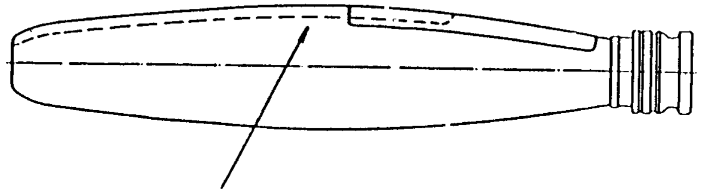
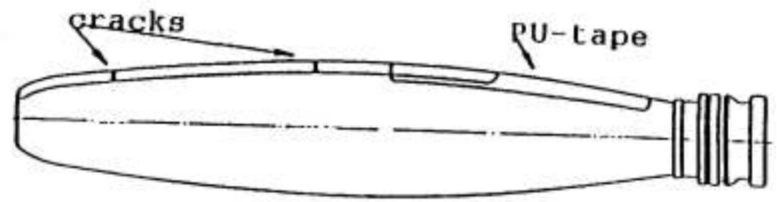
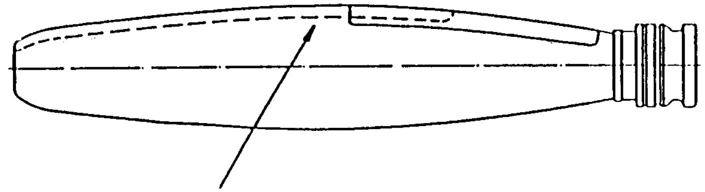


Mögliche Risse entlang des Beschlagblechs. Falls ein Längsriß am Übergang vom Kantenbeschlag zum Blatt auftritt, diesen nach Punkt 6.6 untersuchen. Es liegt eine Delamination in diesem Breich vor.



Gerissener Beschlag muß sofort repariert werden. Falls solche Querrisse sichtbar werden, Propeller zum Hersteller senden. Gelöstes oder beschädigtes PU-Band schnellstens ersetzen.



Possible cracks along the metal erosion sheath. If there is an indication that the erosion sheath gets loose on the transition area to the blade, inspect it according to item 6.6.

Cracked erosion sheath requires immediate repair. If chordwise cracks appear, return propeller to manufacturer.
Replace PU-tape as soon as possible, if loose or damaged.

6.2.3 Mögliche Beschädigungen entlang des Kantenbeschlags

6.2.3.1 Runde Dellen (über 6 mm x 6 mm nicht reparieren, Beschlag wechseln)

6.2.3.2 spitze Dellen (über 6 mm x 6 mm nicht reparieren, Beschlag wechseln)

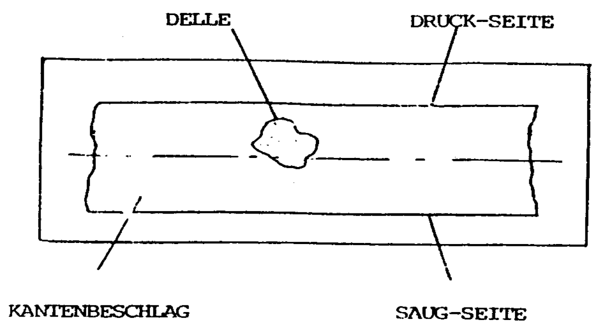
6.2.3.3 Risse (Risse im Beschlag sind nicht erlaubt, Beschlag wechseln)

6.2.3.4 Hohlstellen (max. 2,5 cm², Abstand zwischen den Hohlstellen min. 14 cm, sonst zur Reparatur)

6.2.3.5 Erosion

6.2.3.6 Blitzschlag

6.3 Falls die unter 6.2.3.1 genannten Einschläge im Kantenbeschlag vorhanden sind, untersuchen, ob sie durch den Kantenbeschlag hindurch gehen. Ist dies nicht der Fall kann man diese Dellen mit Epoxy auffüllen und danach bündig abschleifen. Zusätzlich ist dieser Bereich bei jeder Vorflugkontrolle auf mögliche Risse zu untersuchen. Der Beschlag kann bis zur nächsten Reparatur/Überholung bleiben.



6.2.3 Possible Damage along Erosion Sheath

6.2.3.1 Circular dents (more than 0,24 inch x 0,24 inch do not repair, change erosion sheath)

6.2.3.2 Pointed dents (more than 0,24 inch x 0,24 inch do not repair, change erosion sheath)

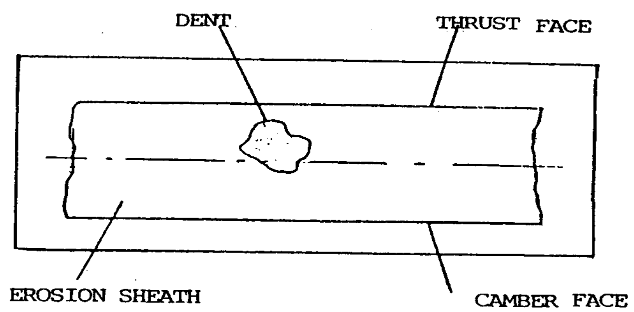
6.2.3.3 Cracks (no cracks allowed in the erosion sheath, otherwise change erosion sheath)

6.2.3.4 Hollow and debonded spots (max. 0,39 square inch, no two spots may occur within 5,5 inch of each other, otherwise blade must be repaired)

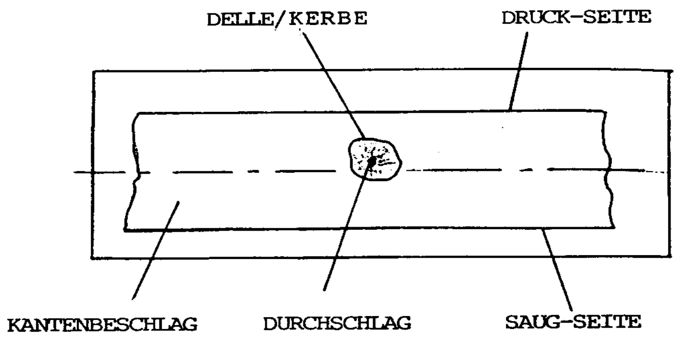
6.2.3.5 Erosion

6.2.3.6 Lightning strike

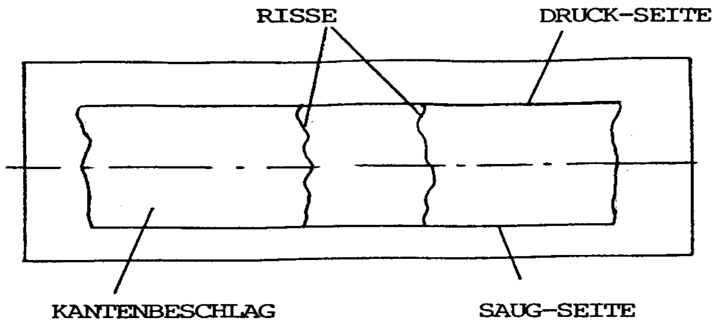
6.3 In case of any impact as mentioned under item 6.2.3.1, check whether it penetrates through the erosion sheath. If not, fill dent with Epoxy and grind off until there is a smooth surface. Check this area carefully for possible cracks whenever performing pre-flight inspection. Erosion sheath may remain until next repair/overhaul will be done.



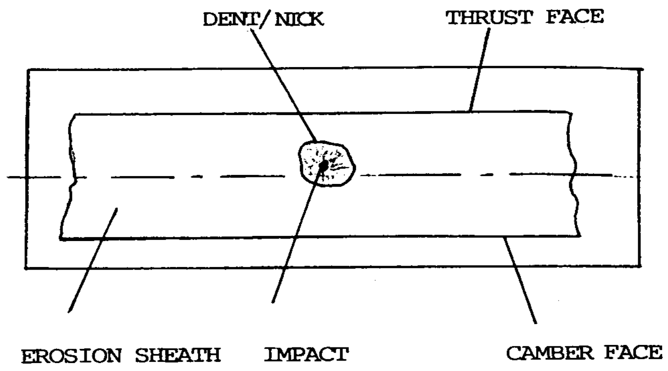
6.4 Falls die unter 6.2.3.2 genannten Einschläge im Kantenbeschlag vorhanden sind, ist der Kantenbeschlag möglicherweise durchgeschlagen. Ist der Beschlag nicht durchgeschlagen, nach Punkt 6.3 vorgehen. Ist der Beschlag durchgeschlagen, den Beschlag auf mögliche Risse untersuchen. Sind keine Risse vorhanden, muß die Delle in jedem Fall mit Epoxy verspachtelt werden, damit keine Feuchtigkeit in den Blattkörper eindringen kann. Zusätzlich ist dieser Bereich des Beschlags bei jeder Vorflugkontrolle genauestens auf neue mögliche Risse zu untersuchen. Der Beschlag ist baldigst zu ersetzen.



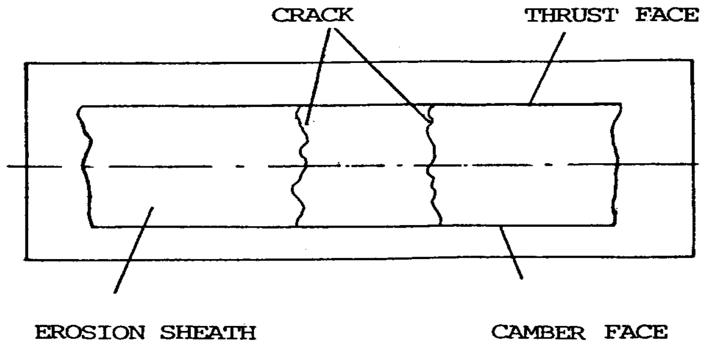
6.5 Falls die unter 6.2.3.3 genannten Querrisse im Beschlag vorhanden sind, muß der Beschlag sofort ersetzt werden, d.h. Propeller zum Hersteller oder zu einer autorisierten Servicestation senden.



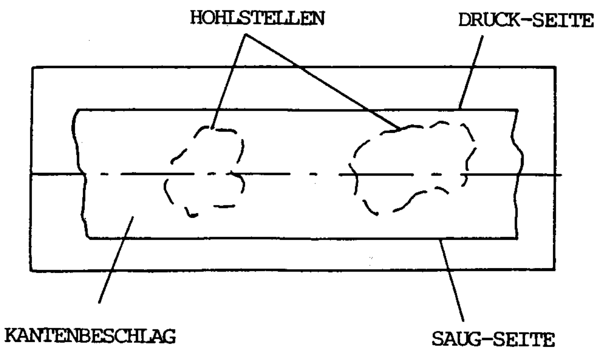
6.4 In case of impacts in the erosion sheath (as mentioned under item 6.2.3.2 the sheath may possibly be penetrated. If not, proceed as described under item 6.3. If yes, check erosion sheath for possible cracks. If there are no cracks, the dent must be filled with Epoxy so that no moisture can enter into the blade body. Check this area carefully for possible cracks whenever performing pre-flight inspection. The erosion sheath must be replaced as soon as possible.



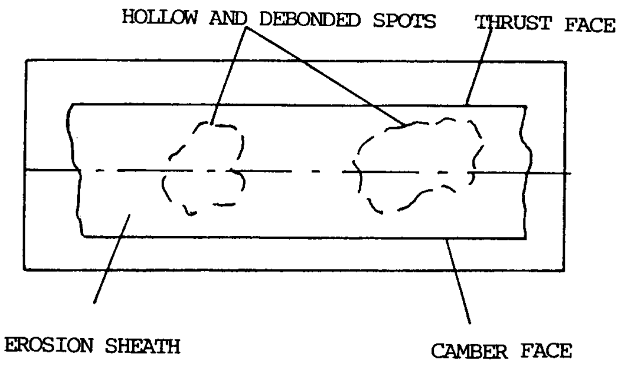
6.5 If there are any cracks (as mentioned under item 6.2.3.3), the erosion sheath must be replaced as soon as possible. The propeller is to be returned to the manufacturer or to an authorized service station.



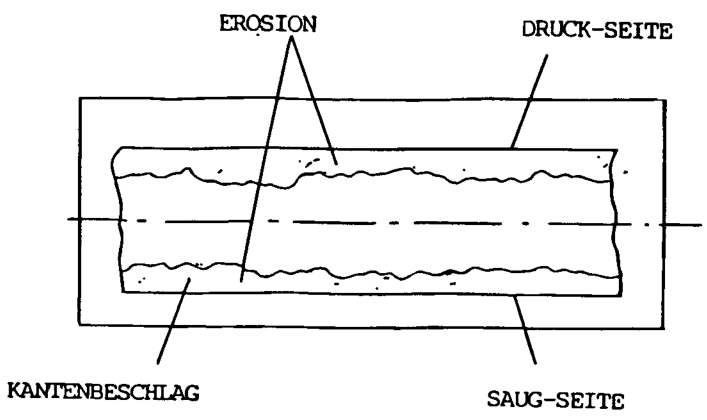
6.6 Falls die unter 6.2.3.4 genannten Hohlstellen vorhanden sind, diese markieren und bei jeder Vorflugkontrolle beobachten, ob weitere Delaminationen entstehen bzw. die vorhandenen Delaminationen sich vergrößern. Diese Kontrolle kann mit einer geeigneten Münze ausgeführt werden (Tab-Test). Die Hohlstellen dürfen auf keinen Fall mehr als 30% der gesamten Fläche des Kantenbeschlags übersteigen (in Längsrichtung max. 2,5 cm erlaubt). Ist dies der Fall muß das Blatt sofort zum Hersteller bzw. einer autorisierten Servicestation zur Reparatur gesandt werden. In jedem Fall muß vor jedem Flug die sichere Befestigung des Kantenbeschlags geprüft werden.



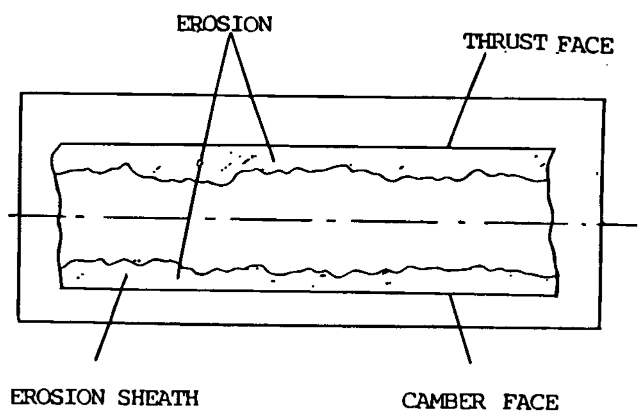
6.6 If any hollow and debonded spots exist (as mentioned under item 6.2.3.4), mark them. Whenever performing pre-flight inspection, monitor whether there are further delamination and/or whether the already existing delamination becomes worse. The inspection can be executed by using an appropriate coin (Tab-Test). The hollow and debonded spots must not exeed 30% of the surface of the erosion sheath at all (lengthwise only 1 inch allowed). Otherwise the blade is to be sent to the manufacturer or to an authorized service station for repair as soon as possible. Check secure fixing of the erosion sheath in any case every time before flight.



6.7 Die unter 6.2.3.5 genannte Erosion, welche die Lackschicht auf dem Kantenbeschlag wegerodiert, ist durch die hohe Umfangsgeschwindigkeit des Propellerblattes ganz natürlich. Es ist jedoch immer darauf zu achten, daß auf keinen Fall die Erosion (über das gesamte Blatt gesehen) so tief ist, daß der GFK-Überzug beschädigt ist und die Möglichkeit besteht, daß Feuchtigkeit in den Blattkörper eindringen kann. Ist das der Fall, muß das Blatt sofort repariert/überholt werden. Gleiches gilt für einen durcherodierten Kantenbeschlag. Ist der PU-Kantenschutz beschädigt, sofort erneuern.



6.7 The erosion mentioned under item 6.2.3.5, which erodes the lacquer layer from the erosion sheath, occurs due to the peripheral speed of the blade and is normal. However, always take care that the erosion never becomes so deep that the FRP-coat is damaged an there is a possibility that moisture may enter into the blade body. In this case the blade must be repaired/overhauled immediately. Return the blades also, if the erosion sheath is eroded through. If the PU-protection tape is damaged, replace it immediately



6.8 Blasen und Delaminationen

Sind Blasen oder Delaminationen vorhanden, diese anzeichnen und weiter beobachten. Blasen von Harzgallen sollen geöffnet werden, damit das Harz ausfließen kann. Die Löcher mit 5-min Epoxy füllen und verschleifen. Größere Blasen müssen geöffnet und das Laminat entfernt werden. Diese Flächen mit neuem Laminat reparieren. Schäden an der Austrittskante können auch auf diese Art repariert werden.

6.8.1 Eingedrückte / gebrochene Austrittskanten

Beschädigte Austrittskanten können mit 5 Minuten Epoxy repariert werden, vorausgesetzt, daß die Beschädigung nicht tiefer als 5 mm (0,20 inches) und nicht breiter als 15 mm (0,60 inches) ist.
Am wichtigsten dabei ist, daß <u>keine Feuchtigkeit</u> in den lasttragenden Blattkern eindringen kann.

Bei größerer Beschädigung Hersteller kontaktieren!

6.8.2. Blattwurzel-Schrumpfung

In seltenen Fällen kann eine Schrumpfung der Blattwurzel auftreten. Der sich dabei wellende Kunststoffmantel ist nur von kosmetischer Natur und wird bei der nächsten Generalüberholung (GÜ) korrigiert.

6.8.3 Kleine Querrisse an der Blattoberfläche

Kleine Querrisse an der Blattoberfläche sind lediglich kosmetischer Natur und bedürfen keiner Reparatur. Jedoch sind diese Querrisse in jedem jeden Fall zu beobachten, ob eventuelle Veränderungen auftreten. Im Zweifelsfalle ist der Hersteller zu kontaktieren.

6.8 Blisters and delaminations

Are blisters or delaminations visible, mark them and check them periodically. Blisters from sap (resin) shall be opened to release the material. Fill void with 5-min Epoxy and sand. Larger delaminations shall be opened and the material be removed. Such areas must be covered with new fiber glass laminate. Damage on the trailing edge can be repaired the same way.

6.8.1 Crunched Trailing Edges

Crunched trailing edges can be repaired by using 5 minute Epoxy if the damage is not deeper than 5 mm (0,20 inches) and not wider than 15 mm (0,60 inches).
Most important is, that <u>no moisture</u> can enter the load carrying blade body.

If damage is bigger contact manufacturer.

6.8.2. Blade Root Shrinkage

In rare cases blade root shrinkage may occur. In such a case the composite layer may create some ripples which are only of cosmetic nature and those ripples will be corrected during next overhaul (OH).

6.8.3 Small Crosswise Paintcracks in Blade Surface

Crosswise paintcracks are just cosmetic and no reason for repair.
In any case, monitor those cracks for possible change.
In case of coubt contact manufacturer.

6.9 Blitzschlag

Falls ein Blatt Anzeichen von Blitzschlag hat, Blatt und Kantenbeschlag nach 6.3 und 6.6 untersuchen sowie einen Bericht zum Hersteller (MT-Propeller) senden.

6.9.1. De-Ice Boots

Installierte De-Ice Boots müssen auf ihre korrekte Verklebung geprüft werden. Falls leichte Ablösungen der Verklebung sichtbar sind (zulässig sind max. 8mm x 8 mm / 0,31 inch x 0,31 inch) können diese mit Sekundenkleber (z.B. Loctite 401) nachgeklebt werden.

Anschliessend den Bereich mit Sealer (z.B. 3M Scotch Seal 800-AF) abdichten, damit keine Feuchtigkeit in den Klebebereich eintritt.
Zusätzlich die reparierte Stelle mit schwarzem Lack überstreichen.

6.9 Lightning Strike

If a blade has an indication of lightning strike, check the entire blade and erosion sheath per item 6.3 and 6.6. Also send a report to the manufacturer (MT-Propeller)

6.9.1. De-Ice Boots

Installed De-Ice Boots must be checked for their correct bonding. In case a delamination is found (maximal allowed are 8 mm x 8 mm / 0,31 inch x 0,31 inch), repair with glue (i.e. Loctite 401).

After repair seal area with sealer (i.e. 3M Scotch Seal 800-AF) to avoid any moisture entering below the boot.
Finally overpaint repaired area with some black varnish.

6.10 PU-Kantenschutz

Falls der PU-Kantenschutz am inneren Teil des Blattes beschädigt oder nicht vorhanden ist, sofort (max. 2 Stunden) ersetzen. Das kann von einer fachkundigen Person gemacht werden. Falls Enteisungsgummis installiert sind, entfällt das PU-Band.

6.11 Sonderkontrollen

Sonderkontrollen können bei Mustern, die noch keine Zulassung der Motor/Propeller Kombination haben, erforderlich sein. Ferner werden Sonderkontrollen bei unkonventionellen Einbauten wie z.B. Druckpropeller erforderlich. Der konventionelle Einbau ist der Zugpropeller. Propeller, die im Wettbewerbskunstflug eingesetzt werden, müssen eine Zerlegekontrolle bekommen, wie im Service Bulletin Nr. 1( ) festgelegt.

6.12 Grundüberholung

Die Zeit zwischen den Überholungen wird in Betriebsstunden und Kalendermonaten nach Auslieferung festgelegt. Die Überholungs-intervalle sind im Service Bulletin Nr. 1( ), letzte Ausgabe, ent halten oder im Propeller Logbuch ersichtlich. In jedem Fall muß eine Kalenderzeit-Inspektion nach längstens 72 Monaten ab Anbau erfolgen, wenn zwischen Herstellung/Überholung und Anbau bei sachgemäßer Lagerung nicht mehr als 24 Monate vergangen sind. Das bedeutet, daß die Kalenderzeit-TBO bis max. 96 Monate betragen kann. Der Umfang der Überholung und der Ersatz von lebensdauerbegrenzten Teilen ist im jeweils zutreffenden Über holungshandbuch festgelegt, siehe Punkt 1.0.2.

Achtung:

Eine Blattbeschädigung durch Fremdkörper oder Bodenberührung bei *rotierendem* Propeller *erfordert in jedem Falle eine Überholung* wenn es sich um eine Blattbeschädigung handelt, die das Limit einer In-Field-Reparatur übersteigt.

6.10 PU-Erosion protection tape

If the PU-tape at the inner portion of the blade is damaged or does not exist any more, replace it immediately (max. 2 hours). This can be done by a qualified person. If electrical de-ice-boots are installed, no PU-tape is used.

6.11 Special Inspections

Special inspections might be required on new installation without approved engine/propeller combinations or unconventional instal-lations such as pusher propellers. A tractor propeller is conven-tional. Propellers used in unlimited competition aerobatic flying should get a teardown inspection as defined in Service Bulletin No. 1( ).

6.12 Overhaul

The time between overhauls is expressed in hours flown and calendarmonths since manufacture or overhaul. The figures are presented in Service Bulletin No. 1.-( ), latest issue. They are also shown in Propeller Logbook. In any case, a calendartime in spection must be performed after a maximum of 72 months from installation, if no more than 24 months have passed since manu-facturing overhaul when properly stored. This means that calen-dartime TBO can be max. 96 months. The extend of the overhaul and the replacement of life-limited parts is ruled in the applicable service manual, see item 1.0.2.

Attention:

A blade damage by a foreign object (FOD) or a ground strike with a rotating propeller always requires *an Overhaul if the blade damage is beyond the limitation of an in-field repair*.

6.13 Überschreiten der höchstzulässigen Drehzahl Überschreiten des höchstzulässigen Drehmomentes

Eine Überdrehzahl liegt vor, wenn die im Flugzeugkennblatt angegebene maximale Drehzahl überschritten wird. Die Gesamtzeit der Überdrehzahl bei einem einzigen Vorkommnis ist ausschlaggebend für die notwendigen Korrekturmaßnahmen, die notwendig sind, um sicherzustellen, daß am Propeller kein Schaden entstanden ist.

Ist der Propeller auf einem Kolbentriebwerk installiert, sind für die Bestimmung der Korrekturmaßnahmen die Überdrehzahlgrenzen des betreffenden Kolbentriebwerkes (Fig. 3.3.1) maßgebend.

6.13 Overspeed / Overtorque

An overspeed has occurred when the propeller RPM has exceeded the maximum RPM stated in the applicable Aircraft Type Certificate Data Sheet. The total time at overspeed for a single event determines the corrective action that must be taken to ensure no damage to the propeller has occurred.

When a propeller installed on a reciprocating engine has an overspeed event, refer to the Reciprocating Engine Overspeed Limits (Fig. 3.3.1) to determine the corrective action to be taken.

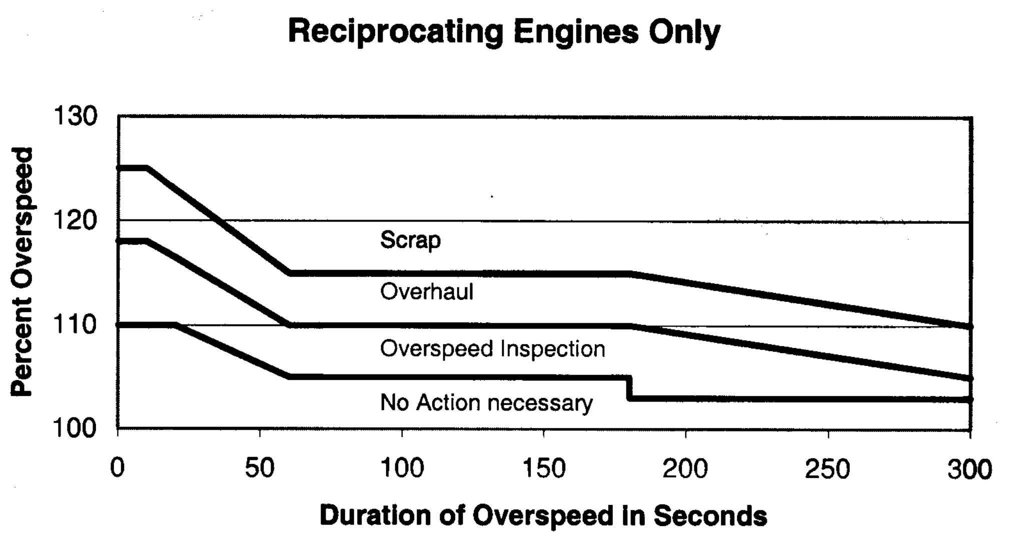


Fig. 3.3.1

Ist der Propeller auf einem Kolbentriebwerk installiert und werden die im Triebwerkskennblatt angegebenen Grenzen für das Drehmoment überschritten, ist entsprechend Fig. 3.3.1.1 bezüglich der Korrekturmaßnahmen zu verfahren.

When a propeller installed on reciprocating engine exceeds the limits published in the engine TCDS, refer to Fig. 3.3.1.1 to determine the corrective action to be taken.

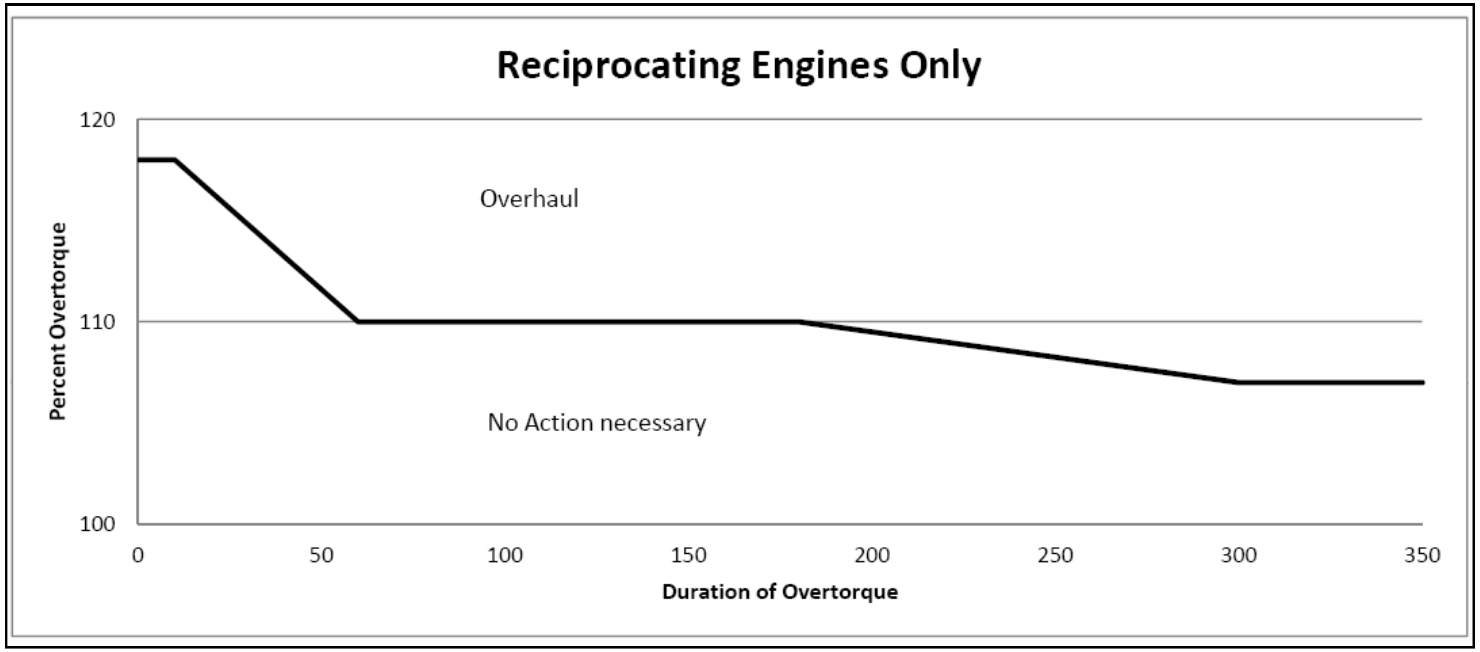


Fig. 3.3.1.1

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Ist der Propeller auf einem Turbinentriebwerk installiert, ist für die Bestimmung der Korrekturmaßnahmen die Überdrehzahlgrenze des betreffenden Turbinentriebwerkes (Fig. 3.3.2) maßgebend.

When a propeller installed on a turbine engine has an overspeed event, refer to the Turbine Engine Overspeed Limits (Fig 3.3.2) to determine the corrective action to be taken.

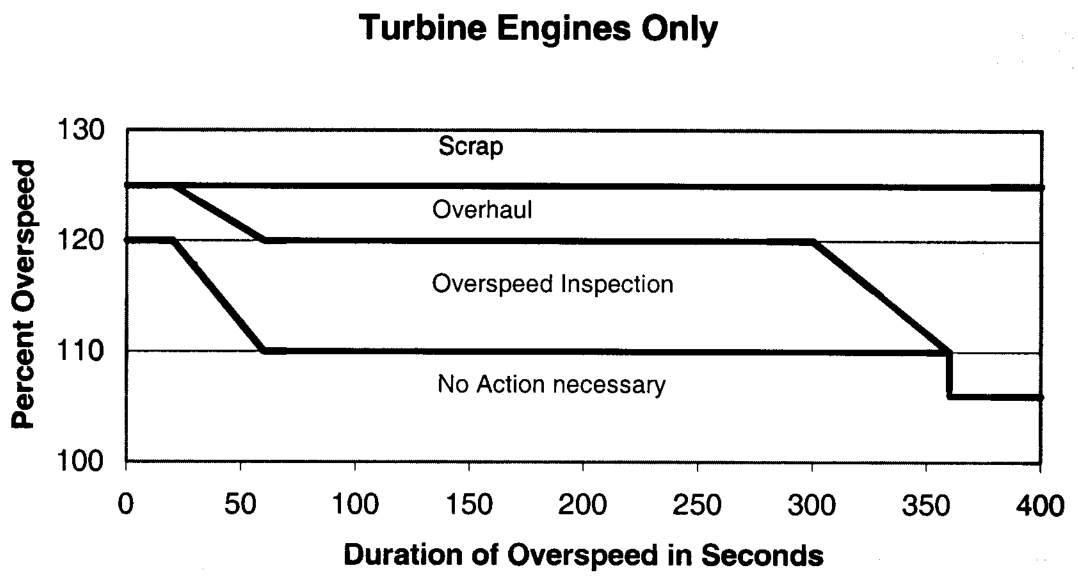


Fig 3.3.2

Ist der Propeller auf einem Turbinentriebwerk installiert, sind für die Bestimmung der Korrekturmaßnahmen die Torquegrenzen des betreffenden Turbinentriebwerkes (Fig. 3.3.3) maßgebend.

When a propeller installed on a turbine engine has an overtorque event, refer to the Turbine Engine Overtorque Limits (Fig. 3.3.3) to determine the corrective action to be taken.

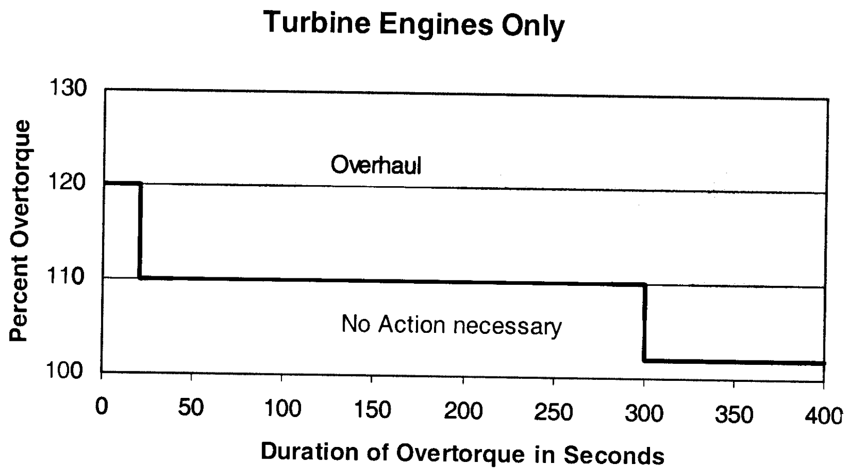


Fig. 3.3.3

Für Triebwerksanbauteile, die von MT-Propeller hergestellt sind (z.B. Regler, Pumpen, Propeller Kontrolleinheiten) gelten folgende Überdrehzahl-/Überdrehmomenteregelungen: Überdrehzahlen/Überdrehmomente von einer Dauer, die eine Inspektion des Propellers notwendig werden lassen, erfordern eine Zerlegung und Inspektion gemäß dem zugehörigen Überholungs- und Instandhaltungshandbuch.

Unabhängig von der Größe des Schadens ist ein Eintrag ins Logbuch vorzunehmen, um dieses Überdrehzahlvorkommnis zu dokumentieren.

For engine mounted accessories (for example, governors, pumps, and propeller control units) manufactured by MT-Propeller, any overspeed at a severity level and /or duration sufficient to require at minimum a search inspection for the propeller, will require the accessory to be disassembled and inspected in accordance with the applicable maintenance manual.

Regardless of the degree of damage, make a log book entry to document the overspeed event.

6.13.1 Korrekturmaßnahmen

Die Korrekturmaßnahme basiert auf der Größe und der Dauer des Überschreitens der einmaligen Drehzahl- bzw. Drehmomentüberschreitung.

6.13.2 Keine Maßnahmen erforderlich

Wenn keine Maßnahme erforderlich ist, muß lediglich sichergestellt werden, daß die Überdrehzahl nicht durch einen mechanischen Defekt verursacht wurde.

6.13.3 Überdrehzahl - Inspektion

Eine Überdrehzahl-Inspektion setzt die Zerlegung des Propellers, gemäß dem aktuellen Instandhaltungshandbuch voraus sowie die Durchführung folgender weiterer Inspektionen:

- Allgemein:
Visuelle Suche nach Anzeichen von ungewöhnlichen Verschleißerscheinungen und/oder Schäden. Bei Vorhandensein von Anzeichen jeglicher Verschleißerscheinungen und/oder Schäden ist das Inspektionskriterium des entsprechenden Instandhaltungshandbuches zugrunde zu legen. Besondere Aufmerksamkeit sind den Bauteilen der Blattlagerung/-befestigung zu widmen.

- Naben aus Aluminium:
Visuelle Begutachtung der Blattlagerbereichs.

- Blätter aus Aluminium:
Visuelle Begutachtung des Blattlager-Radius auf das eventuelle Vorhandensein von Schäden oder vorzeitigem Verschleiß. Dies erfordert das Entfernen der Lagerringe.

- Blätter aus Kunststoff:
Sorgfältige Begutachtung und Abklopftest (mittels geeignetem Werkzeug) der betroffenen Fläche eines jeden Blattes einschließlich der Edelstahl-Kantenbeschläge (Entfernung der Enteisungsgummis ist nicht erforderlich). Ein Drehmomentstest der Ankerschrauben ist durchzuführen.

6.13.1 Corrective Action

The corrective action is based on the severity and the duration of an overspeed or overtorque for a single event.

6.13.2 No Action Necessary

Where no action is necessary, no maintenance is necessary other than to verify that the overspeed was not caused by a mechanical problem.

6.13.3 Overspeed Inspection

An overspeed inspection requires the disassembly of the propeller in accordance with the appropriate propeller overhaul manual and performance of the following inspections:

- General
Visually inspect for signs of abnormal wear and/or damage. Evidence of wear and/or damage should be further evaluated using the inspection criteria from the appropriate propeller or blade overhaul manual. Special attention must be given to blade retention components.

- Aluminum Hubs:
Visually inspect the blade retention area of the blade socket.

- Aluminum Blades:
Visually inspect the blade retention radius for evidence of damage or premature wear. This requires removal of the bearing races.

- Composite Blades:
Perform a thorough visual and coin tap inspection of the exposed portion (de-ice boot removal not required) of each blade including the stainless steel leading edge. Perform a torque test of the lag screws.

6.13.4 Überholung

Sieht die Korrekturmaßnahme eine Überholung vor, so ist diese Überholung gemäß dem zutreffenden Überholungshandbuch durchzuführen.

6.13.5 Ausschuß

Sieht die Korrekturmaßnahme eine Verschrottung des Propellers vor, so ist der Propeller als luftuntüchtig einzustufen.

6.13.4 Overhaul

When an overhaul is the corrective action for an overspeed or an overtorque, the Propeller must be overhauled in accordance with the appropriate overhaul manual.

6.13.5 Scrap

When the corrective action requires scrapping the propeller, the propeller must be removed from service.

7.0 WARTUNG

7.1 Außer den in Punkt 6 beschriebenen Kontrollen sind keine besonderen Wartungsarbeiten vorgeschrieben. Für das Ausbessern von kleinen Schäden im Lack; Blattkörper und an den Kanten dürfen übliche PU- oder Acryllacke und Epoxy-Harze verwendet werden.

7.2 Vom Hersteller wird PU-Lack oder Acryllack verwendet, der gegen fast alle Lösungsmittel beständig ist. Die Blätter können mit den üblichen Kfz-Reinigungs- und Schutzmitteln behandelt werden. Wichtig ist, daß das Eindringen von Feuchtigkeit in den Holzkern mit allen Mitteln verhindert wird. Im Zweifel einen Prüfer mit entsprechender Berechtigung hinzuziehen, der die Reparaturmöglichkeit beurteilt.
Falls Reparaturen selbst ausgeführt werden, die Trockenzeiten von Kunstharz und Lacksystemen beachten.

7.3 Es sind keine Wartungsarbeiten an der Nabe durchzuführen, weil alle beweglichen Teile, die Verschleiß ausgesetzt sind, im Innern der Nabe liegen. Blattlagerung und Verstellteile werden bei Montage mit Spezial-Schmiermitteln gefüllt, die für die Zeit zwischen den Überholungen ausreicht. Ein Korrosionsschutz der Nabe mit verdünntem Triebwerksöl oder entsprechendem Mittel wird empfohlen.

7.4 Reparaturen an Spinnerteilen sind nicht zulässig. Gerissene Spinnerdome und Füllbleche oder Spinnerträger sind durch lufttüchtige zu ersetzen.

7.5 Abgebrochene oder beschädigte Blätter können beim Hersteller repariert werden, wenn mindestens 85 % des Blattkörpers rißfrei vorhanden sind. Beschädigungen z.B. an der Austrittskante können angeleimt werden, die Kunststoffummantelung kann ersetzt werden, ebenso kann ein neuer Kantenbeschlag angebracht werden. Blätter können satzweise oder einzeln ersetzt werden. Immer Propeller-Werk-Nummer angeben.
Im Falle einer Bodenberührung ist die Nabe nur dann noch lufttüchtig, nachdem eine Rißprüfung und eine Überprüfung der Abmessung durchgeführt wurde und diese Überprüfungen keinen Hinweis auf eine Beschädigung ergeben. Bei Unklarheiten müssen sowohl Nabe als auch die gebrochenen Blätter an den Hersteller zur Überprüfung geschickt werden.
Im Falle einer <u>Bodenberührung mit Aluminiumblättern</u> siehe Überholungshandbuch ATA 61-18-09.

7.0 MAINTENANCE

7.1 There is no special maintenance schedule for this propellers beyond the usual inspections as per item 6. For the repair of minor damages in the blade surface and edges, automotive material such as PU or acryl paint and Epoxy resin can be used.

7.2 The surface finish is made with PU lacquer or acryl lacquer. This material is resistant against nearly all solvents. The blades can be cleaned with normal car cleaners and polish. It is important to avoid moisture penetrating into the wooden core. If necessary, please consult an aircraft inspect or for final decision concerning repair.

If the repair is made locally, please observe the curing time of resin and paint systems.

7.3 There are no frequent maintenance works required on the hub because all moving parts are inside the hub and not exposed to the environment. Blade bearings and pitch change mechanism are filled with special lubricants and there is no need to refill between overhauls. A corrosion protection of the hub with thinned engine oil or anticorrosion spray is recommended.

7.4 Repair of spinner parts is not permissible. Cracked spinner domes, filler plates and backplates are to be replaced by airworthy parts.

7.5 Broken tips and damaged blades can be repaired by the manufacturer if a minimum of 85 % of the blade remains without cracks. Damages on the trailing edge can be repaired because the epoxy cover can be replaced and a new erosion sheet can be installed. Blades can be replaced individual or as a complete set. Always tell the serial no. of the propeller.
In case of a ground strike the hub is still airworthy if the crack- and dimensional inspection do not show any signs of a damage.
In case of doubt send the affected hub as well as the broken blades to the manufacturer for evaluation.
In case of a <u>ground strike with Aluminum blades</u> refer to Overhaul Manual ATA 61-18-09 for evaluation.

7.6 DYNAMISCHES WUCHTEN

7.6.1 Allgemein

7.6.1.1 Beim dynamischen Wuchten sind entsprechende Meßgeräte zu verwenden. Auf die Höhe der dynamischen Unwucht zu achten, üblicherweise soll die Rest-Unwucht nach einer solchen Maßnahme unter 0,2 IPS liegen.

7.6.1.2 Es ist den Anweisungen der Geräte-Hersteller für dynamisches Wuchten zu folgen.

7.6.1.3 Ist die festgestellte dynamische Unwucht größer als 1,2 IPS, muß der Propeller abgebaut und erst statisch nachgewuchtet werden

7.6.2 KONTROLLVERFAHREN VOR DEM WUCHTEN

7.6.2.1 Vor dem dynamischen Wuchten ist eine Sichtkontrolle der Propelleranlage durchzuführen, nachdem der Propeller wieder an das Flugzeug angebaut worden ist.

Eventuelle Fettleckagen siehe nächste Seite!

7.6 DYNAMIC BALANCE

7.6.1 Overview

7.6.1.1 Dynamic balance is accomplished by using an accurate means of measuring the amount and location of the dynamic imbalance. After such a undertake the remaining imbalance should be below 0,2 ips.

7.6.1.2 Follow the instructions from the equipment manufacturers for dynamic balance.

7.6.1.3 If the dynamic imbalance is bigger than 1,2 ips, the propeller must be removed and statically rebalanced.

7.6.2 INSPECTION PROCEDURES PRIOR TO BALANCING

7.6.2.1 Visually inspect the propeller assembly after it has been reinstalled on the aircraft prior to dynamic balancing.

Eventual grease leackges see next page!

ACHTUNG:

Bei der ersten Inbetriebnahme eines neuen oder überholten Propellers kann Fett an den Blättern und an der inneren Oberfläche des Propellerspinners zu sehen sein. Das ist normal und kein Anzeichen einer dauernden Fettleckage.

Ausgetretenes Fett an den Blattwurzeln oder im Inneren des Spinners ist mit einem milden Lösungsmittel komplett zu entfernen.

Kleinere Fettmengen, sichtbar an einer oder mehreren Blattwurzel(n) sowie am Spinner weiter beobachten, ob eine Verschlechterung eintritt.

Wenn innerhalb von 5 Flugstunden das Fett ausserhalb der Blattwurzel nicht an mehr als 18 cm (7 inches) auf der Blattoberfläche vorhanden ist, wird die Fettleckage als unerheblich eingestuft und sollte lediglich beobachtet werden.

Eine fortbestehende Fettleckage nach 20 Flugstunden ab dem Aufreten der ersten Leckage erfordert eine Reparatur in einem authorisierten Servicebetrieb.

Im Zweifelsfall ist der Hersteller zwecks weiterer Vorgehensweise zu kontakt

NOTE:

The first run-up of a new or overhauled propeller may leave grease on the blades and inner surface of the spinner dome. This is normal and do not mean that it will be a continuing grease leakage.

Remove any grease on the blades or inner surface of the spinner dome by using a mild solvent.

Minor grease leak which can be seen on one or all blade root(s) and spinner should be monitored if it gets worse.

If the grease leak does not spray more than 7 inches (18 cm) on the blade surface from the blade root outside the blade ferrule in 5 hours of operation, it is defined as minor and should be only monitored!

Continued grease leakage after 20 hours of operation from first leakage requires repair at an authorized service repair facility within 5 operating hours.

In case of doubt contact manufacturer!

7.6.2.2 Vor dem dynamischen Wuchten sind Anzahl und Position der Wuchtgewichte aus der statischen Wuchtung zu notieren.

7.6.2.3 Es wird empfohlen, die Wuchtegewichte an Aluminium-Spinnerträgern, die vorher nicht durchbohrt wurden, radial anzubringen.

7.6.2.4 Die radiale Lage soll außerhalb des Schleif-Rings und innerhalb der Biegung liegen, an der der Spinnerträger die Befestigungsfläche für den Spinnerdom bildet.

7.6.2.5 Es sind Bohrlöcher für die Verwendung von AN3 ( ) Bolzen mit Sicherungsmuttern akzeptabel.

ACHTUNG: Im Chadwick-Helmuth Manual AW-9511-2 „The Smooth Propeller“ sind einige typische Beschreibungen zur Spinnerträger-Nacharbeit enthalten.

7.6.2.6 Alle angebrachten Wuchtgewichte dürfen nicht die Zelle des Flugzeuges (Cowling), die Enteisungsanlage bzw. das Triebwerk beim Rotieren berühren.

7.6.2.7 Falls kein Spinner angebaut ist, sind die Wuchtgewichte an die in der Nabe vorgesehenen Gewinde, die zur Befestigung des Spinnerträgers vorgesehen sind, anzubringen.

7.6.3 ANBRINGUNG DER WUCHTGEWICHTE FÜR DIE DYNAMISCHE WUCHTUNG

7.6.3.1 Vorzugsweise werden die dynamischen Wuchtgewichte am hinteren Spinnerträger befestigt. An der Spinnerstürzplatte sind die statischen Wuchtgewichte angebracht, falls zutreffend**.**

7.6.2.2 Prior to dynamic balance record the number and location of all balance weights from the static balance.

7.6.2.3 It is recommended that placement of balance weights on aluminum spinner bulkheads which have not been previously drilled be placed in a radial location

7.6.2.4 The radial location should be outboard of the slip ring and inboard of the bend at which point the bulkhead creates a flange to attach the spinner dome.

7.6.2.5 Drilling holes for use with the AN3-( ) type bolts with self-locking nuts is acceptable.

NOTE: Chadwick-Helmuth Manual AW-9511-2, „The Smooth Propeller“ specifies several generic bulkhead rework procedures.

7.6.2.6 All hole/balance weight locations must take into consideration, and must avoid, any possibility of interfering with the adjacent airframe, deice and engine components.

7.6.2.7 In case no spinner is installed, mount balance weights in the mounting threads in the hub, where normally the spinner bulkhead is mounted.

7.6.3 PLACEMENT OF BALANCE WEIGHTS FOR DYNAMIC BALANCE

7.6.3.1 The preferred method of attachment of dynamic balance weights is to add the weights to the rear spinner bulkhead. The static balancing weights are installed on the spinner front plate, if applicable.

7.6.3.2 Falls vorhanden, wird durch das Entfernen der dynamischen Wuchtgewichte der Propeller in seine ursprüngliche statische Wucht gebracht. Die statischen Wuchtgewichte dürfen nur ausnahmsweise entfernt werden.

7.6.3.3 Verwenden Sie nur Edelstahl bzw. kadmierte Scheiben als Wuchtgewichte am Spinnerträger.

7.6.3.4 Das maximale Wuchtgewicht an einer Position darf 50 g nicht überschreiten.
Das entspricht in etwa 8 Stück AN970 - ( ) Scheiben.
Wenn mehr Gewicht benötigt wird, dann auf 2 Positionen aufteilen.

7.6.3.5 Die Wuchtgewichte sind mit 10-32 inch-Schrauben anzubringen Die Qualität muß denallgemeinen Flugzeug-hersteller-Standards entsprechen, oder gleichwertige Schrauben.

7.6.3.6 Die Schrauben der Wuchtgewichte müssen nach der Installation mindestens einen Gewindegang und höchstens vier Gewindegänge aus der Stoppmutter herausstehen.

7.6.3.7 Alle dynamisch gewuchteten Propeller müssen am Blatt Nr. 1 einen Aufkleber erhalten. Dieser informiert das Wartungspersonal, daß die installierten Wuchtgewichte nicht der statischen Wuchtung entsprechen.

7.6.3.8 Falls Änderungen durchgeführt wurden, ist die Position der statischen und dynamischen Wuchtgewichte im Propeller-Logbook einzutragen.

7.6.3.2 Subsequent removal of the dynamic balance weights, if they exist, will return the propeller to its original static balance condition. The static balance weights are only allowed to remove exceptionally.

7.6.3.3 Use only stainless or plated steel washers as dynamic balance weights on the spinner bulkhead.

7.6.3.4 Do not exceed maximum weight per location of 50 g.

This is approx. equal to 8 pieces AN970 –( ) style washers.
If more weight is needed split to 2 locations.

7.6.3.5 Weights are to be installed using aircraft quality 10-32 inch screws or similar screws.

7.6.3.6 Balance weight screws attached to the spinner bulkheads must protrude through the self-locking nuts a minimum of one thread and a maximum of four threads.

7.6.3.7 All propellers which have been dynamically balanced must install a decal on blade no. 1. This will alert repair station personnel that the existing balance weight configuration may not be correct for static balance.

7.6.3.8 Record number and location of dynamic balance weights, and static balance weights if they have been reconfigured, in the Propeller Logbook.

8.0 Störungen und ihre Beseitigung

Achtung: TAE-125 Triebwerk
Bei Störungen und deren Beseitigung ist das CSUM-02-01 zu benützen.

8.1 Falsche Drehzahl

Propeller und Regler können im Feld nachgestellt werden. Bevor diese im Werk eingestellten Werte verändert werden, muß unbedingt der Drehzahlmesser geeicht werden.

Üblicherweise treten nur zwei Probleme auf:
- zu niedrige Standdrehzahl und/oder
- zu hohe Flugdrehzahl.

8.1.1 Zu niedrige Standdrehzahl:

Um festzustellen, ob Regler oder Propeller die Drehzahl begrenzen, muß wie nachfolgend beschrieben, vorgegangen werden:

- Reglerhebel ganz auf max. Drehzahl
- Leistungshebel langsam auf Vollgas
- Reglerhebel zurückziehen, bis Drehzahl um ca. 25 upm abfällt.
- Ist großer Weg nötig, um den Drehzahlabfall zu erreichen, begrenzt der Propeller durch die hohe Steigung die Standdrehzahl.

Abhilfe: Steigung an den Nutmuttern verkleinern. Herausdrehen der Mutter um 1/4 Umdrehung wird eine Drehzahlerhöhung von ca. 100 upm ergeben. Dies gilt nur für Propeller ohne Fliehgewichte!

Bei Propellern mit Fliehgewichten oder Segelstellung ist der Anschlag kleine Steigung nur durch Öffnen der Verstelleinrichtung (im Werk) veränderbar. Mit der Nutmutter wird große Steigung/Segelstellung eingestellt.
Das Anzugsmoment zwischen den Kontermuttern beträgt 100 Nm (73 ftlbs).

Fällt die Drehzahl sofort nach der geringsten Betätigung ab, begrenzt der Regler die Standdrehzahl.

8.0 TROUBLE SHOOTING

Attention: TAE-125 Triebwerk
In case of trouble-shooting the CSUM-02-01 must be used.

8.1 Improper rpm

There are means on propeller and governor to adjust pitch and rpm in the field. Before the original adjustments are changed, please calibrate the tachometer.

Usually there are only two kinds of problems:
- static rpm is too low and/or
- rpm in flight is too high.

8.1.1 Static rpm too low:

To find out whether the governor or the propeller limit the engine, proceed as follows.

- Propeller control to max. rpm.
- Power lever to max. power.
- Pull propeller control back until rpm drops approx. 25 rpm.
- If there is a long way necessary to get the rpm drop, the pitch of the propeller will limit the static engine rotational speed.

Remedy: Reduce pitch with the check nuts on the piston guide. Turning loose nut by ¼ turn will increase rpm by approx. 100 rpm. This is only applicable for non-counterweighted propellers!

Low pitch of counterweighted or feathering propellers can be changed only by opening of the pitch change mechanism (in the factory). The checknuts will change coarse pitch only.

The torque between the check nuts is 100 Nm (73 ftlbs).

If the rpm drops immediately after a small movement of the lever, the governor will limit the static rotational speed.

Abhilfe: Reglerdrehzahl durch Herausdrehen der Anschlagschraube am Reglerhebel erhöhen. Eine Umdrehung erhöht die Drehzahl um ca. 25 upm

Wichtig:

Der Bedienzug muß genügend Weg freigeben, daß der Reglerhebel auch die Anschlagschraube berührt. Anschlagschraube sichern.

8.1.2 Flugdrehzahl zu hoch:

Wenn die Standdrehzahl richtig ist, kann nur der Regler Überdrehzahlen zulassen. Im Flug die Drehzahl mit dem Reglerhebel einstellen und nach der Landung die Anschlagschraube des Reglers soweit hineindrehen, bis diese am Reglerhebel anliegt.

Wichtig:
Die Stellung des Reglerhebels im Landeanflug nicht mehr verändern. Anschlagschraube sichern.

8.2 Blattspitzenspiel

8.2.1 Wackeln des Blattes

Ursache: Blattlagerung hat sich gesetzt

Behebung: Bei mehr als 3 mm, Propeller zur Korrektur ins Werk oder eine zugelassene Werkstatt, um die Vorspannung der Blattlagerung zu korrigieren.

Remedy: Increase governor rpm unscrewing the stop screw. One turn on the screw will change rpm by approx. 25 rpm

Important:

The control must be long enough to have the necessary way in order to contact the stop. Secure screw with safety wire.

8.1.2 Rpm in flight too high:

If the static rpm is within the limits, only the governor allows overspeed. Adjust rpm to the desired value in flight an turn the stop screw in after landing until it touches the governor lever.

Important:
Do not change position of the rpm control during final approach. Secure screw with safety wire.

8.2 Blade shake

8.2.1 Fore and aft movement

Cause: Blade bearing loose

Remedy: If more than 3 mm, return propeller to the factory or any approved repair station to correct the pre-load of the blade retention bearing.

8.2.1.1 SMA Anwendung

Ursache: Blattlagerung hat sich gesetzt

Behebung: Blattspitzenspiel ist nicht zulässig. Bei Auftreten eines Blattspitzenspieles ist der Propeller an das Werk oder an die nächste zugelassene Werkstatt zu senden, um dort die Vorspannung der Blattlagerung zu korrigieren.

8.2.2 Verdrehen des Blattes

Ursache: Blattlagerung hat sich gesetzt und/oder Spiel durch Abnutzung in der Verstelleinrichtung (Vertellzapfen, Gleitstein).

Behebung: Bei mehr als 2°, Propeller zur Korrektur ins Werk oder eine zugelassene Werkstatt.

8.2.1.1 SMA Application

Cause: Blade bearing loose

Remedy: NO blade shake is allowed. In case of blade shake return propeller to the factory or any approved repair station to correct the pre-load of the blade retention bearing.

8.2.2 Blade Angle Play

Cause: Blade bearing loose by seating and/or increased play by wear in the pitch change mechanism (pitch change pin, pitch change block)

Remedy: If more than 2°, return propeller to the factory or any approved repair station.

8.3 Träge Verstellung bei Prüfung am Boden

Ursache:
l. Kaltes Öl (zähflüssig)
2. Schwergängigkeit der Verstelleinrichtung

Behebung:
1. Motor ausreichend warm laufen lassen
2. Prüfe durch Drehen der Blätter von Hand. Wenn im Bereich des Blattwinkelspiels Schwergängigkeit festgestellt wird, Werk verständigen.

8.4 Drehzahlschwankungen (An- und Abschwellen)

Ursache:
1. Luft im System
2. Ölschlamm im System
3. Falsche Reglerfeder
4. Falsche Grundeinstellung der Blattwinkel im Propeller
5. Abrupte Betätigung Drehzahlhebels
6. Falsche Vergasereinstellung
7. Pendeln der Tachowelle

Behebung:
1. Durch mehrmaliges Betätigen des Drehzahlhebels bei ca. 1800 upm mit Drehzahlabfall von etwa 500 upm Luft beseitigen.
2. Reinigung der Ölleitungen im Motor, im Verstellzylinder des Propellers und evtl. im Regler
3. Prüfe Reglerbezeichnung mit der Angabe im Flugzeugkennblatt. Wenn die Drehzahl sich nach 5 Perioden nicht stabilisiert, Werk verständigen.
4. Prüfen, ob die Grundeinstellung mit den Angaben im Kennblatt übereinstimmt. Startdrehzahl am Boden feststellen.
5. Reglerhebel gleichmäßig und langsam betätigen.
6. Berichtigen
7. Störung beseitigen.

8.3 Sluggish rpm change

Cause:
l. Oil is cold
2. Excessive friction

Remedy:
1. Run the engine until the green arc of the oil temperature is reached.
2. Move blades by turning them with hands within the angular play. If excessive friction exists, the blade retention system has to be inspected, contact factory.

8.4 Surging rpm

Cause::
1. Trapped air in propeller piston
2. Sludge deposit
3. Wrong speeder spring in the governor
4. Wrong pitch stops in the propeller
5. Abrupt movement of propeller or throttle control
6. Wrong carburetor setting
7. Oscillating tachometer

Remedy:
1. Move propeller control at least twice every time before flying at about 1800 rpm with a drop of about 500 rpm.
2. Clean oil tubes in the motor, in the propeller piston and eventually in the governor (only possible at the manufacturer's).
3. Check that the governor part number corresponds to the aircraft data sheet. If the rpm does not stabilize after 5 periods this is an indication for a wrong speeder spring, contact factory.
4. Compare pitch values to those of the data sheet. Note static rotational speed.
5. Move the controls carefully and slowly.
6. Correct as specified in the engine manual.
7. Check tachometer and drive.

8.5 Drehzahlunterschiede zwischen Steigflug, Reiseflug und Sinkflug bei gleicher Drehzahleinstellung

Bis ± 50 upm normal, systembedingt, darüber:

Ursache:
1. Schwergängigkeit im Propeller
2. Schwergängigkeit im Regler
3. Drehzahlmesser

Behebung:
1. Werk verständigen.
2. Werk verständigen.
3. Gerät austauschen.

8.6 Drehzahlanstieg während des normalen Betriebes ohne Betätigung des Drehzahlhebels

Ursache:
1. Ölleckage äußerlich sichtbar
2. Leckage im Ölübertragungssystem zwischen Regler und Propeller verursacht Verkleinerung des Blatteinstellwinkels.
3. Innere Leckage im Propeller
4. Versagen des Reglerantriebes oder des Überdruckventils im Regler.

Behebung:
1. Dichtungen ersetzen
2. Schaden in Motorüberholungswerkstatt beheben lassen. (Ölübertragung an Propellerwelle, fehlender Zufluß von Motorschmieröl).
3. Werk verständigen
4. Werk verständigen. Regler auswechseln.

8.5 Rpm variations between ascend, cruise and descend although having identical propeller setting

Up to ± 50 rpm normal condition. If more:

Cause:
1. Excessive friction in the hub
2. Excessive friction in the governor
3. Worn rpm tachometer

Remedy:
1. Contact manufacturer.
2. Contact manufacturer.
3. Replace/repair instrument.

8.6 Rpm increase during normal operation without change of propeller lever position

Cause:
1. Oil leakage or hot oil
2. Worn oil transfer system causes a decrease in blade angle of attack.
3. Internal leakage in the propeller.
4. Governor drive failure or broken relief valve spring.

Remedy:
1. Check for oil leaks, replace gaskets, decrease oil temperature with higher airspeeds.
2. If the system works with cold oil and fails at high oil temperature, this will indicate high leakage in the oil transfer system on the propeller shaft. Repair engine.
3. Contact manufacturer.
4. Check governor drive and governor on the test bench.

Achtung:

Tritt Ölleckage plötzlich während des Betriebes auf, Leistung soweit zurücknehmen, daß Propellerblattwinkel am Anschlag kleine Steigung liegt. Dies ist erreicht, wenn sich die Drehzahl mit Leistungsänderung verändert. Jetzt Drehzahlhebel auf Startstellung stellen und mit dem Leistungshebel eine Drehzahl wählen, die mind. 100 upm unter der Startdrehzahl liegt.

Darauf achten, daß die Drehzahl immer niedriger als die eingestellte ist, damit der Regler in Unterdrehzahl bleibt und somit kein Öl vom Regler zum Propeller fließen kann.

8.7 Drehzahlabfall während des normalen Betriebes ohne Betätigung des Drehzahlhebels

Ursache:
1. Versagen der Reglerfeder oder Klemmen des Steuerschiebers im Regler
2. Schmutz im Kraftstoffsystem
3. Störung am Betätigungszug des Drehzahlhebels

Behebung:
1. Werk verständigen, Regler austauschen.
2. Anlage reinigen.
3. Störung suchen, beseitigen.

Achtung:

Der Flug kann fortgesetzt werden mit beträchtlicher Verminderung der Drosselstellung, damit ein unzulässig hoher Ladedruck vermieden wird. Die Drehzahl bleibt niedrig.

8.8 Extreme Trägheit oder Versagen der Verstellung nach Betätigung des Drehzahlhebels (Drehzahl ändert sich mit Änderung des Flugzustandes wie bei einem festen Propeller)

Attention:

If sudden oil leakage occurs, move power lever back until the rpm will decrease. In this condition the propeller goes back to the low pitch stop automatically and no oil pressure is needed. Adjust the propeller control for take off position. Apply power again, no more than required to remain about 100 rpm below take off rpm.

Note that the propeller rpm should be always lower than adjusted with the propeller control This will hold the governor in underspeed condition and no oil pressure will be transferred from the governor to the propeller.

8.7 Rpm decrease during normal operation without change of propeller lever position

Cause:
1. Speeder spring in the governor broken or sticking pilot valve.
2. Dirt in the fuel system or carburetor.
3. Control inoperative.

Remedy:
1. Check governor on the test bench.
2. Clean or repair.
3. Check free movement and positive stop contact.

Attention:

If the cause cannot be found in the fuel system the flight can be continued when throttle setting is reduced, avoiding excessive manifold pressure and overheating of the engine. The rpm will remain low because the propeller pitch is on the high pitch stop.

8.8 Extremely slow pitch change or no pitch change on ground (rpm changes with airspeed like a fixed pitch propeller)

Ursache:
1. Verschlossene Ölleitungen
2. Ölschlammrückstände im Zylinder des Propellers
3. Schäden an der Verstelleinrichtung im Propeller
4. Korrosion in den Blattlagern

Behebung:
1. In Werkstatt Motor reinigen
2. Reinigen von Propeller und Flanschanschluß

Zu 1. und 2.:
Versagen der Verstellung tritt hier nicht, plötzlich auf. Die Funktion verschlechtert sich allmählich. Sollte bei der Vorflugkontrolle festgestellt werden.

3. Werk verständigen.
   Dieser Fehler kann plötzlich auftreten.
4. Propeller zur Reparatur schicken.

8.9 Ölleckage (äußerlich sichtbar oder nicht)

Ursache: Beschädigte Dichtungen

Behebung: Dichtungen ersetzen oder Propeller zur Reparatur.

8.10 Rauher Lauf des Triebwerks, ggf. nur in bestimmtem Drehzahlbereich

Ursache:
1. Schlechte statische Wucht
2. Schlechte dynamische Wucht
3. Betrieb in gesperrtem Drehzahlbereich

Behebung:
1. Statisch auswuchten, Wuchtgewichte an Spinnerstütze anbringen.
2. Dynamisch auswuchten, Wuchtgewichte an Spinnerträger anbringen. Siehe Punkt 7.6.
3. Flughandbuch beachten. Ggf. Anzeige des Drehzahlmessers überprüfen und Gerät reparieren/ersetzen

Cause:
1. Blocked oil line.
2. Sludge deposit in propeller piston.
3. Damaged pitch change mechanism.
4. Corrosion in the blade bearings.

Remedy:
1. Check engine.
2. Clean propeller and crankshaft.

Concerning 1 and 2:
This behavior does not appear at once and gets worse after some time. It should be observed at the preflight inspection.

3. Contact manufacturer.
   This error may appear suddenly.
4. Repair propeller.

8.9 Oil leakage (visible outside or hidden inside)

Cause: Damaged gasket

Remedy: Replace gaskets or repair propeller.

8.10 Rough running engine, possibly in limited rpm range only

Cause:
1. Bad static balance.
2. Bad dynamic balance.
3. Operation in restricted rpm range.

Remedy:
1. Rebalance statically, mount balance weights to forward spinner bulkhead.
2. Rebalance dynamically. Install balance weights to rear spinner bulkhead. See item 7.6.
3. Refer to airplane flight manual. Check rpm gauge for correct reading. Repair or replace if necessary.

8.11 Propeller mit Fliehgewichten oder Segelstellung

Propeller mit Fliehgewichten an den Blattwurzeln verwenden Öldruck zur Steigungsverminderung. Deshalb ist im gesamten Kapitel 8 zu beachten, daß verschiedene Hinweise wegen der umgedrehten Öldruckrichtung entsprechend gedeutet werden müssen.

8.12 Langsame Segelstellung

Falls Segelstellung nicht innerhalb 10 sek. erreicht wird, ist entweder die Verstellung der Blätter schwergängig, die Segelstellungsfeder gebrochen, der Bedienzug zu lang oder die Reglereinstellung falsch. Sind keine offensichtlichen Mängel vorhanden, kann die Anhubstange mittels dem Vierkant und der Kontermutter verändert werden. Herausdrehen nur jeweils ¼ Umdrehung. Zu weit herausgedreht, führt zu früher Segelstellung.

8.13 Unfeathering Akkumulator

Ursache: Akkumulator arbeitet nicht!

Behebung:
1. Bei ungenügendem oder nicht vorhandenen Luftdruck, auffüllen auf 125 +/- 5 oder 150 ± 5 psi (abhängig von der Anwendung)!
2. Bei undichtem Ventil dieses reparieren lassen (Woodward, McCauley)!
3. Bei undichtem oder gestörtem Magnetventil, Akkumulator austauschen!

Bemerkung:
Der Luftdruck im Unfeathering Akkumulator soll, abhängig von der Anwendung, 125 ± 5 oder 150 ± 5 psi betragen, wenn die Blätter im Start-Lock sind (kleine Steigung) sowie mit dem Reglerhebel in Segelstellung (Ölseite leer).

8.11 Propellers with Counterweights or Feathering

Propellers with counterweights on the blade roots use oil pressure to decrease pitch. Therefore the information in chapter 8 has to be converted as a result of the changed direction of oil pressure.

8.12 Slow Feathering

If more than 10 sec. are needed for full feathering, there is one of the following problems: sticking blades or pitch change mechanism, control too long or wrong adjusted governor. If no discrepancies are found during inspection, readjustment of the liftrod/checknut is possible. Turn out lift rod only in steps of ¼ turn. If the lift rod is turned too far out, early feathering is possible and must be corrected.

8.13 Unfeathering Accumulator

Cause: No function of accumulator!

Remedy:
1. Increase or refill air at the accumulator to 125 +/- 5 or 150 ± 5 psi psi (depending on the application)!
2. Repair leaking check valve of the governor (Woodward, McCauley)!
3. Replace accumulator if air pressure is leaking or magnetic valve is not working!

Remark:
The air pressure in the unfeathering accumulator should be, depending on the application, 125 ± 5 or 150 ± 5 psi with the blades in the start-lock position (low pitch position) and the governor control in feathering position (oil side empty).

9.0 VERSAND UND LAGERUNG

9.1 Zum Versand sollte in der Regel die Originalverpackung verwendet werden. Ist diese nicht vorhanden, muß darauf geachtet werden, daß der Propeller an Blättern und evtl. Nabe so gelagert wird, daß eine Beschädigung ausgeschlossen ist.

Es wird empfohlen, alles Zubehör mit in das Werk zu schicken, damit dieses auch überprüft werden kann bzw. wegen Fehlens nicht ersetzt werden muß.

9.2 Soll der Propeller längere Zeit gelagert werden, wird am besten der Originalkarton oder etwas vergleichbares verwendet. Der Lager-raum sollte normales Klima haben (Temperatur - 20°C bis + 35°C, Rel. Luftfeuchte 10 % bis 75 %). Extreme Temperatur- und Feuch-tigkeitsunterschiede oder -schwankungen sind zu vermeiden. Es empfiehlt sich ferner, die Metallteile mit einem Korrosionsschutzmittel zu überziehen. Die Blätter müssen nicht extra geschützt werden, da die Kunstharzlackierung einen ausgezeichneten Schutz bietet.

9.3 Das Überholungsintervall (TBO) beginnt mit dem Einbau in das Flugzeug.
Wenn jedoch seit der Herstellung oder Überholung, unter Voraussetzung sachgemäßer Lagerung, mehr als 24 Monate vergangen sind, beginnt die TBO automatisch nach diesen 24 Monaten bis maximal 96 Monate Kalenderzeit.

9.4 Falls der Propeller länger als 24 Monate gelagert wurde, kann der Propeller vor dem Anbau an das Flugzeug zerlegt und sämtliche Dichtungen gewechselt werden. Dies bringt die Kalenderzeit-TBO wieder auf Null zurück.

9.0 SHIPPING AND STORAGE

9.1 For any shipment of the propeller use original container. If this is impossible it will be very important to fix the propeller at the blades and the hub, if necessary, in a way that avoids damage.

In case of returning the propeller it is furthermore recommended to return all accessories and parts together with the propeller. They will also be inspected and not considered to be missing.

9.2 If the propeller is stored for a longer period of time, preferably use the original container or an equivalent one. Storage only in a con-trolled environment (temperature - 5°F to 95°F, rel. humidity 10 % to 75 %). Avoid extreme temperature/humidity differences or cycles. All metal surfaces should have anti-corrosion protection which is easy to remove. There is no need to protect the blades because its lacquer is sufficient.

9.3 The TBO starts with the installation on the aircraft.

However, if the installation is later than 24 months after new assembly or overhaul and proper storage provided, the TBO automatically starts after this 24 months, up to maximal 96 months calendar time.

9.4 If the propeller is stored for longer than 24 months it can be disassembled before installing to the aircraft and all seals have to be replaced. This will bring calendar time TBO back to zero.

9.5 Langzeitlagerung erfordert zusätzliche Konservierung. Übliche Antikorrosions-/Konservierungsöle sind geeignet, wenn sie die Dichtungen nicht angreifen. Nur Metallteile müssen geschützt werden. Die Holz-Composite-Blätter brauchen keinen speziellen Korrosionsschutz, jedoch muß darauf geachtet werden, daß keine mechanische Beschädigungen auftreten und daß keine Feuchtigkeit in den Holzkörper eindringen kann.

9.6 Propeller, die in aggressiver (korrosiver) Umgebung transportiert oder gelagert werden (wie Nebelgebiete oder Salzwasserumgebung), sollten auf den sichtbaren Metalloberflächen mit einem dünnen Film von Leichtmaschinenöl bestrichen werden.

9.7 Erfolgt der Versand des Propellers in einer Holzkiste, so ist diese Holzkiste nach Erhalt des Propellers zu öffnen. Dadurch wird sichergestellt, dass das mit Chemikalien behandelte Holz der Kiste keinerlei Korrosionen an den Metallteilen des Propellers verursachen kann.

9.8 Akzeptanzprüfung

Begutachten Sie äußerlich die Transportbox auf Transportschäden, speziell an den Kanten der Box. Ein Loch, ein Riss oder eine Quetschung an den Enden der Box (im Bereich der Propellerblattspitzen) deuten auf einen Transportschaden hin. Nach dem Auspacken müssen besonders die Blattspitzen auf Transportschäden geprüft werden.

9.5 Long-term storage could require additional preservation. All standard anti-corrosive preservation oils may be used if they do not affect the seals. Only metal parts have to be protected. The wood-composite blades need no special protection but mechanical damage has to be avoided, so that no moisture may enter the wooden blade core.

9.6 If the propeller is stored or transported in corrosive environment such as salt water or fog, it is recommendable to cover the visible outside surfaces of the metal parts with a thin film of light engine oil.

9.7 If the propeller is delivered in a wooden shipping box, the shipping box must be opened after receipt. By opening the shipping box it is ensured that the chemically treated wood of the shipping box does not create any corrosion on the metal parts of the propeller due to chemicals used to treat the wooden shipping box.

9.8 Acceptance Checking

Examine the exterior of the shipping container for signs of shipping damage, especially at the box ends around each blade. A hole, tear or crushed appearance at the end of the box (at the propeller tips) may indicate the propeller was dropped during shipment, possibly damaging the blades.
After removing the propeller from the shipping container, examine the propeller components for shipping damage.

9.9 Auspacken:

Platzieren sie den Propeller auf einem stabilen Gestell.
Entfernen Sie das Verpackungs- und auslegungsmaterial der Box.

VORSICHT:
Stellen Sie den Propeller niemals auf die Blattspitzen!

Legen sie den Propeller auf ein weiches Gestell.

Entfernen Sie die Kunststoffabdeckung am Propellerflansch, falls vorhanden.

9.10. Lifting:

Um den Propeller zu heben, nehmnen Sie ihn so nah wie möglich an der Blattwurzel.
Nehmen sie den Propeller niemals an der Blattspitze oder der Spinnerplatte.

9.9 Uncrating:

Place the propeller on a firm support.#
Remove the banding and any external wood braching from the cardbvoard shipping container.

CAUTION:
Do not stand the propeller on a blade tip!

Put the propeller on a padded support that supports the entire length of the propeller.

Remove the plastic dust cover cup from the propeller mounting flange, if installed.

9.10. Lifting:

For lifting, take the propeller as near as possible on the blade ferrule.
Do not take the propeller at any other area, specially on the blade tip or the spinner backplate.

10.0 Lufttüchtigkeitsbeschräkungen

Keine Lufttüchtigkeitsbeschränkungen!

Dieser Abschnitt über Lufttüchtigkeitsbeschränkungen ist EASA zugelassen gemäß Part 21A.31(a)(3) und CS-P40(b) und 14 CFR Part 35.4 (A35.4) und JAR-P20(e). Jede Änderung bezüglich der vorgeschriebenen Austauschzeiten, Inspektionszeiträume und sonstiger Vorgänge, die die Lufttüchtigkeitsbeschränkung, die in diesem Abschnitt beinhaltet sind, bedürfen der Genehmigung.

Dieser Abschnitt der Lufttüchtigkeitsbeschränkungen ist FAA zugelassen und spezifiziert Wartungen, die unter §§ 43.16 und 91.403 der 14 CFR erforderlich sind, es sei denn, ein alternatives Programm ist von der FAA zugelassen worden.

Rev. No	Description of Revision

11.0 SPEZIALWERKZEUGE

T-372-2 Werkzeug für AA - Flansch

10.0 Airworthiness Limitations Sections

No Airworhtiness Limitations!

This Airworthiness Limitations Section (ALS) is EASA approved in accordance with Part 21A.31(a)(3) and CS-P40(b) and 14 CFR Part 35.4 (A35.4) and JAR-P20(e), Any change to mandatory replacement times, inspection intervals and related procedures contained in this ALS must also be approved.

The Airworthiness Limitations Section is FAA approved and specifies maintenance required under 14 CFR §§ 43.16 and 91.403 of the 14 CFR unless an alternative program has been FAA approved.

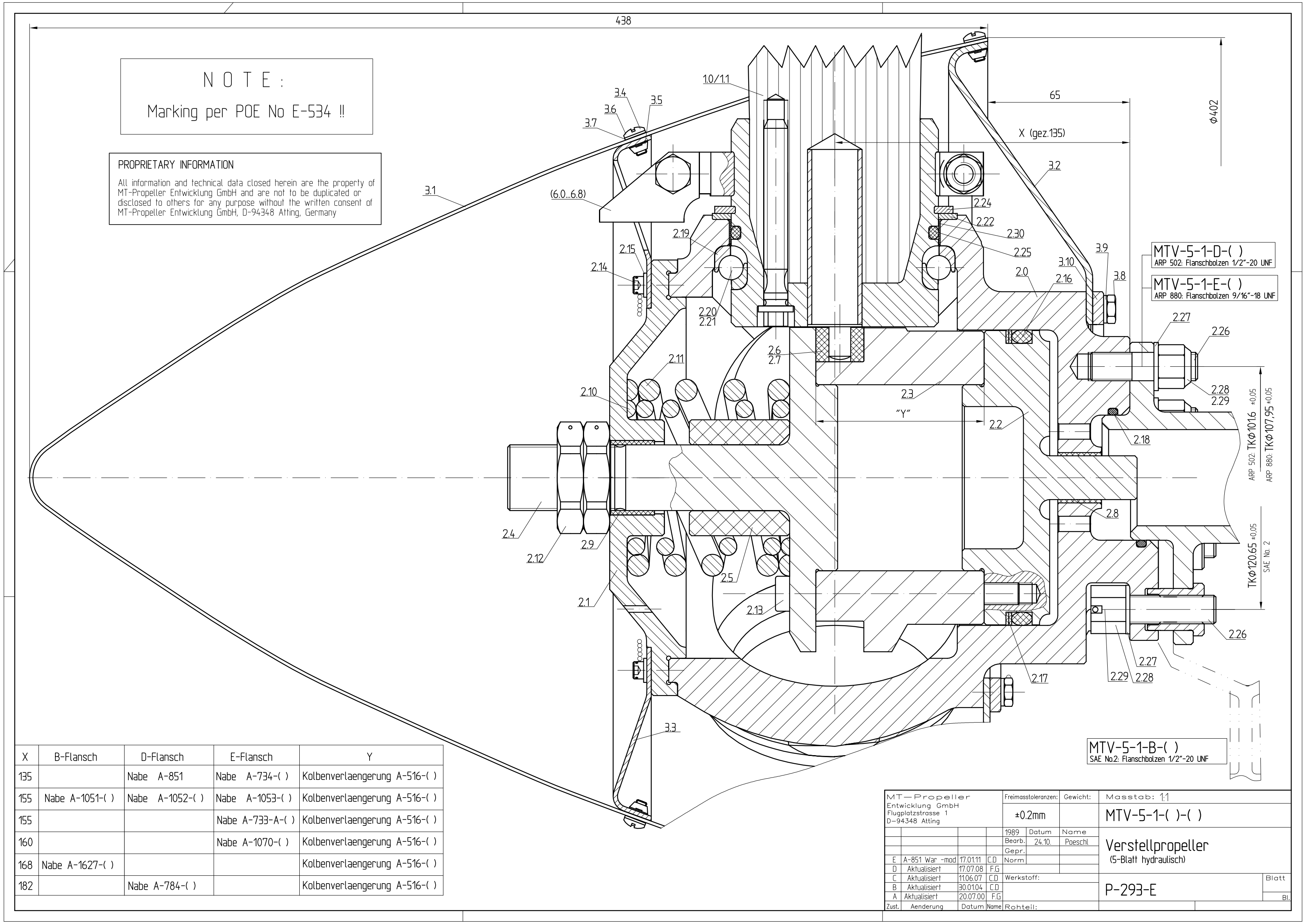
Rev. No	Description of Revision

11.0 SPECIAL TOOLS

T-372-2 Tool for AA - Flange

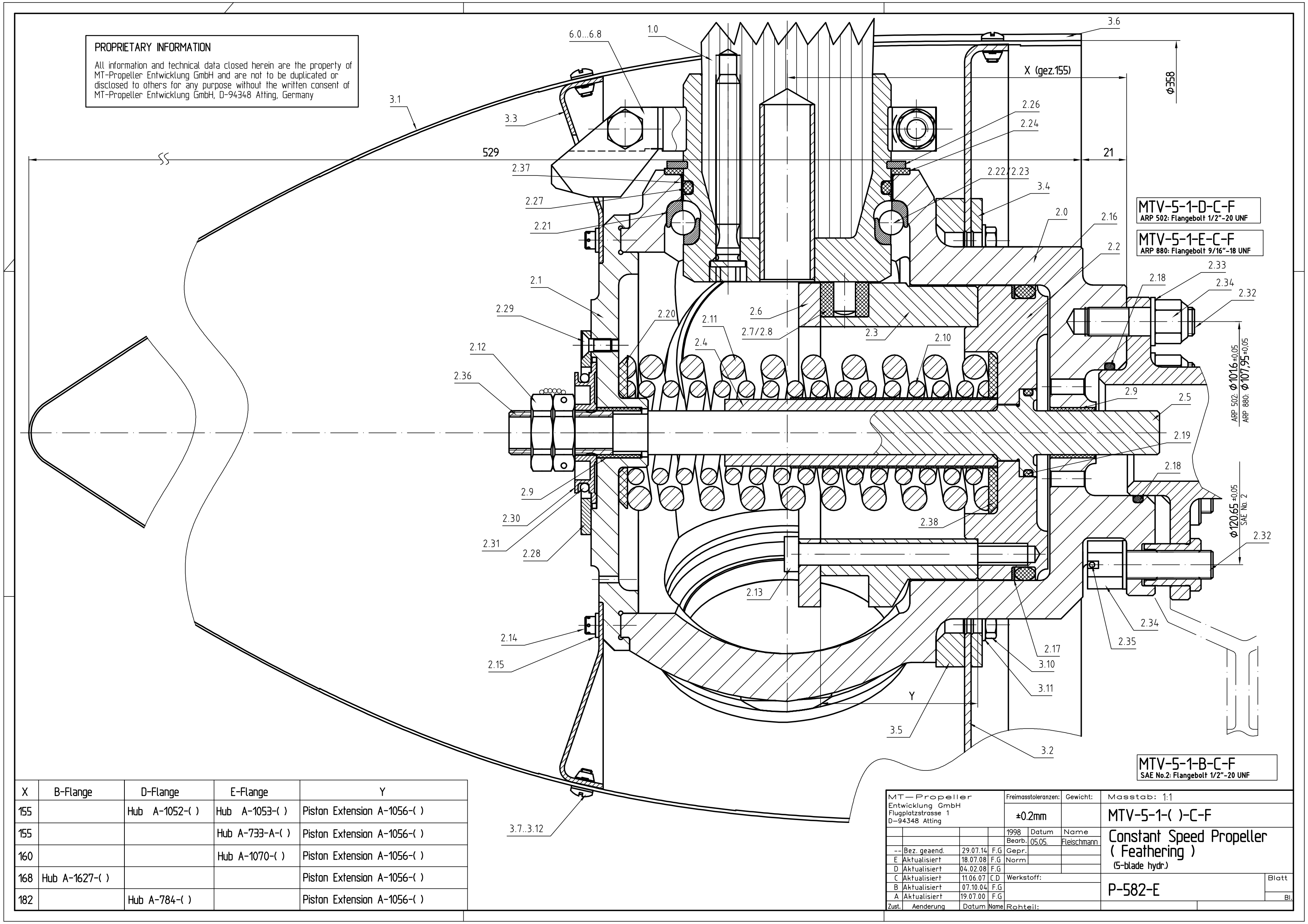
12. Propellerzeichnungen

12.0 Propeller Drawings

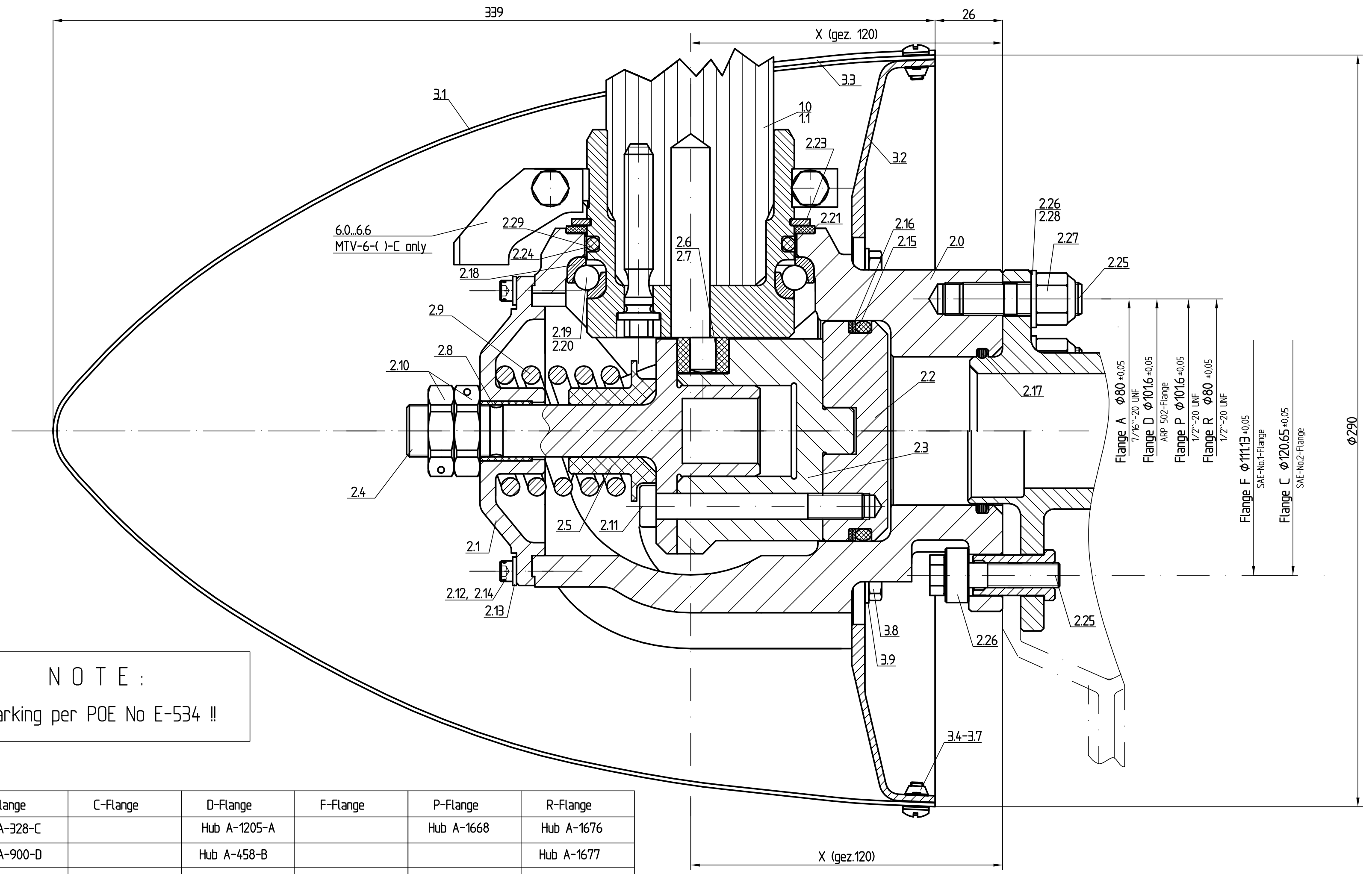


X	B-Flansch	D-Flansch	E-Flansch	Y
135		Nabe A-851	Nabe A-734-( )	Kolbenverlaengerung A-516-( )
155	Nabe A-1051-( )	Nabe A-1052-( )	Nabe A-1053-( )	Kolbenverlaengerung A-516-( )
155			Nabe A-733-A-( )	Kolbenverlaengerung A-516-( )
160			Nabe A-1070-( )	Kolbenverlaengerung A-516-( )
168	Nabe A-1627-( )			Kolbenverlaengerung A-516-( )
182		Nabe A-784-( )		Kolbenverlaengerung A-516-( )

E-124



X	B-Flange	D-Flange	E-Flange	Y
155		Hub A-1052-( )	Hub A-1053-( )	Piston Extension A-1056-( )
155			Hub A-733-A-( )	Piston Extension A-1056-( )
160			Hub A-1070-( )	Piston Extension A-1056-( )
168	Hub A-1627-( )			Piston Extension A-1056-( )
182		Hub A-784-( )		Piston Extension A-1056-( )



NOTE:

Marking per POE No E-534 !!

X	A-Flange	C-Flange	D-Flange	F-Flange	P-Flange	R-Flange
104	Hub A-328-C		Hub A-1205-A		Hub A-1668	Hub A-1676
120	Hub A-900-D		Hub A-458-B			Hub A-1677
120		Hub A-080-F	Hub A-805-C	Hub A-533-D		
145		Hub A-557-B	Hub A-830-B	Hub A-559-B		
176		Hub A-541-B		Hub A-1552		
184	Hub A-1420					
200			Hub A-1442			

PROPRIETARY INFORMATION

All information and technical data closed herein are the property of MT-Propeller Entwicklung GmbH and are not to be duplicated or disclosed to others for any purpose without the written consent of MT-Propeller Entwicklung GmbH, D-94348 Atting, Germany

MT-Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ± 0.2 mm
Gewicht:
Masstab: 1:1

Zust.	Aenderung	Datum	Name
F	zus. Nabe/Div/Aktu	20.03.08	F.G
E	zus. Nabe/Div/Aktu	25.06.04	C.D
D	zus. Nabe/Div	05.09.03	F.G
C	Div. Aend.	22.02.01	F.G
B	CAD/Tab. & Div.	15.06.00	C.H
A	Kolben, F-Flansch	08.01.90	B.P.

1984	Datum	Name
Bearb.	09.03.	H. Riedl
Gepr.		
Norm		

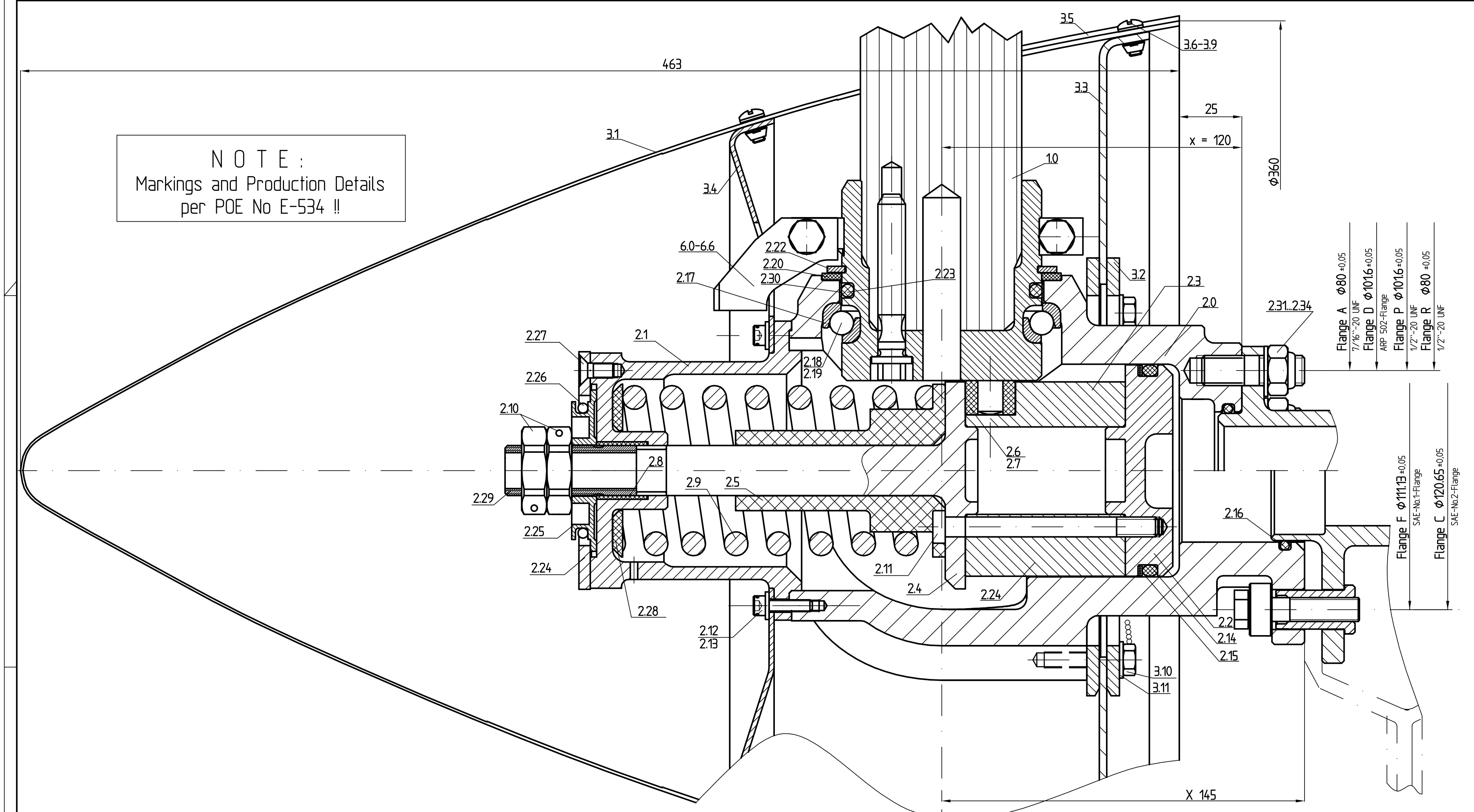
Werkstoff:
Rohteil:

MTV-6-(A C D F P R)-(C)

Constant Speed Propeller
(3-blade hydr.)

P-085-F

Blatt
Bl.



X	A-Flange	C-Flange	D-Flange	F-Flange	P-Flange	R-Flange
120	Hub A-900-I or A-1229-B	Hub A-080-G	Hub A-458-B or A-805-C	Hub A-533-D	Hub A-900mod.	Hub A-1677
145		Hub A-557-C	Hub A-830-B	Hub A-559-C		
176		Hub A-541-B		Hub A-1552		
184	Hub A-1420					
200			Hub A-1442			

MT–Propeller
Entwicklung GmbH
Flugplatzstrasse 1
D–94348 Atting

Freimasstoleranzen: Gewicht: Masstab: 1:1

MTV-6-(A/C/D/F, P/R)-C-F

Constant Speed Propeller
(3-blade hydr.)

P-430-F

Zust.	Aenderung	Datum	Name
F	simplified assembly	17.02.10	F.G
E	zus. Naben/Div.	20.03.08	F.G
D	Aktualisierung	25.06.04	C.D
C	Div. Konstr.aend.	16.04.03	F.G
B	Div. Aend.	22.02.01	F.G
A	Aktualisiert	24.07.00	C.H

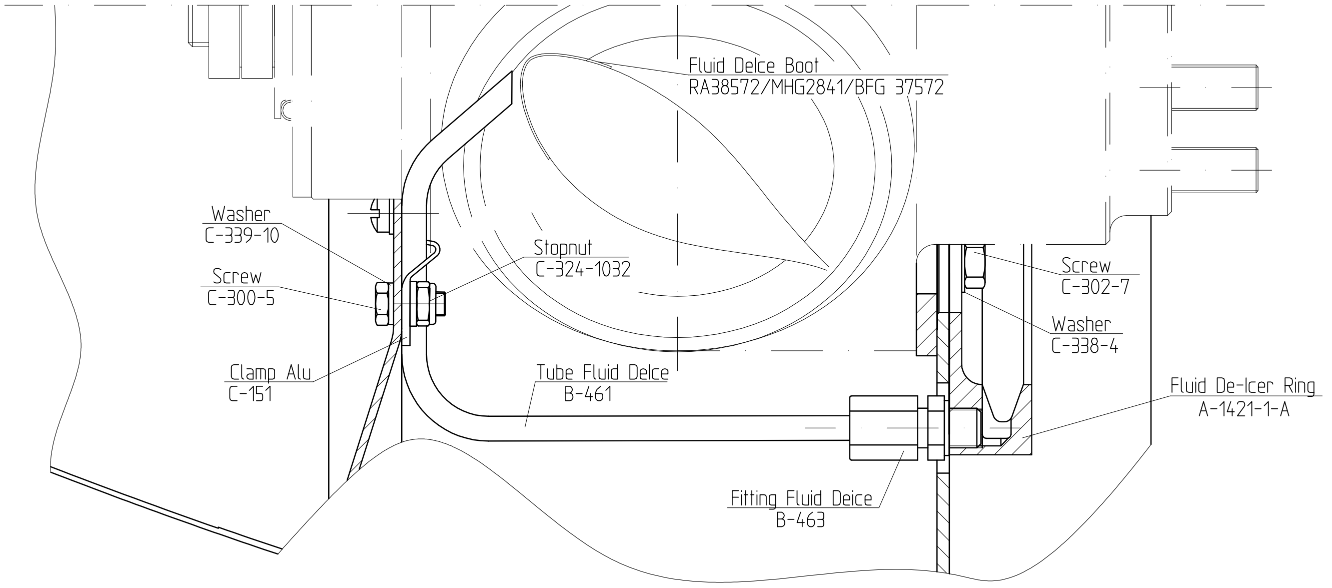
1996	Datum	Name
Bearb.	06.11.	Kühn
Gepr.		
Norm		

Werkstoff:

Rohteil:

Blatt

Bl.



MT—Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: | Gewicht: | Masstab: 1:1

MTV-6-( )

2004	Datum	Name
Bearb.	28.05.	Grum
Gepr.		
Norm		

Fluid Deice Assy

Werkstoff:

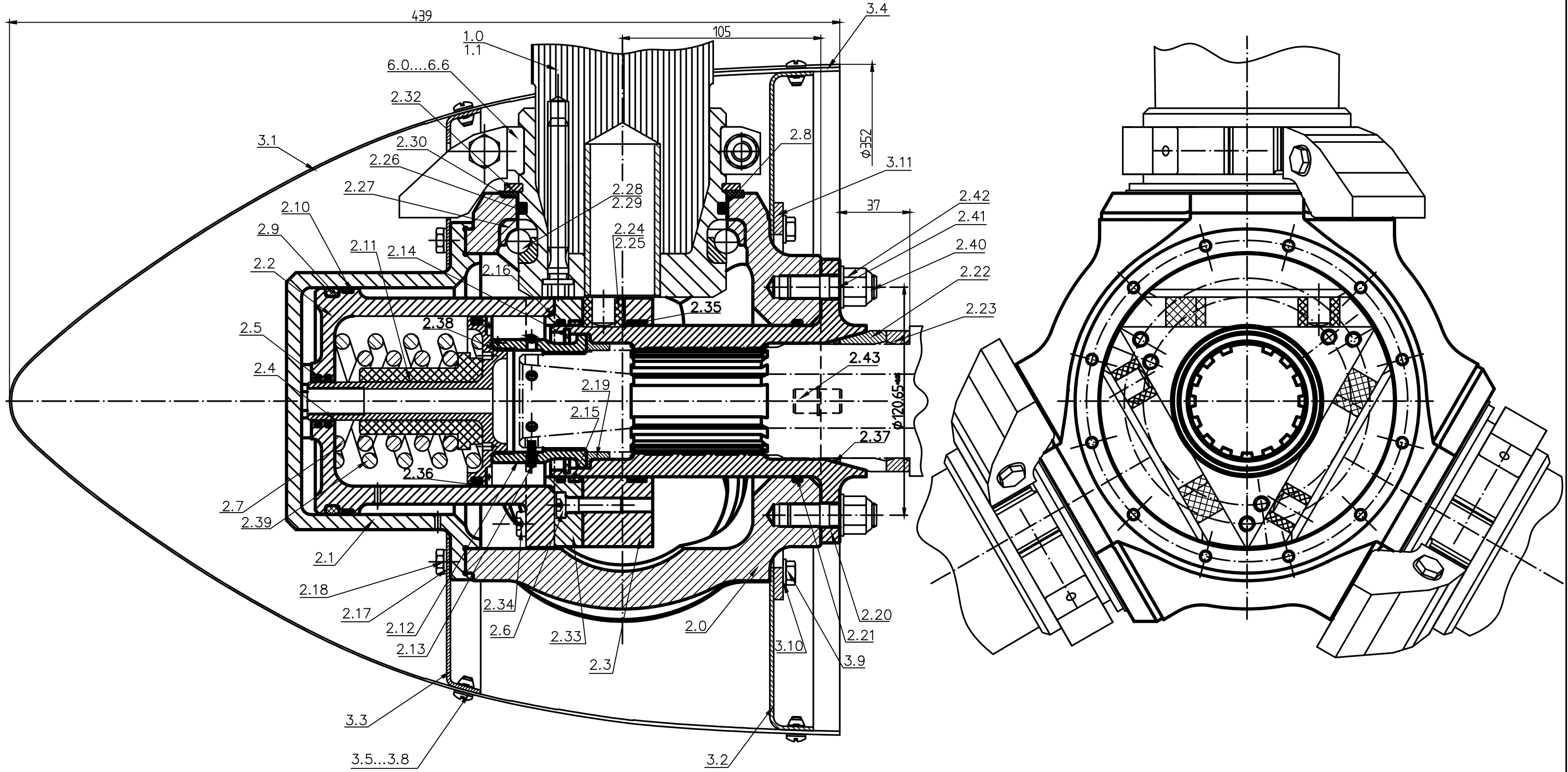
P-909-6

Blatt

Bl.

Zust. | Aenderung | Datum | Name

Rohteil:



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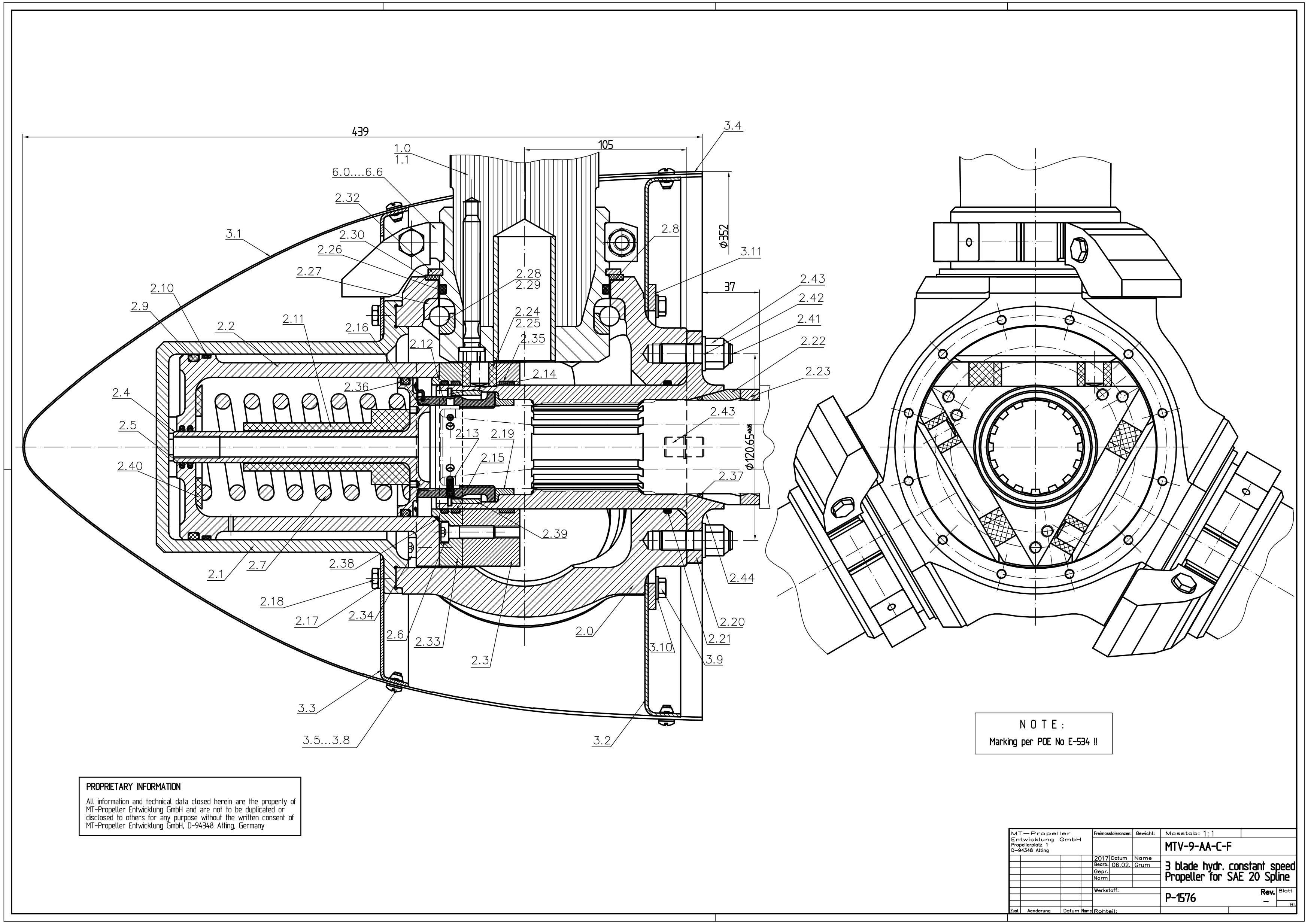
N O T E :

Marking per POE No E-534 II

MT-Propeller Entwicklung GmbH Propellerplatz 1 D-94348 Atting	Freimasstoleranzen:	Gewicht:	Masstab: 1:1
			MTV-9-AA-(C)
	2016 Datum	Name	3 blade hydr. constant speed Propeller for SAE 20 Spline
	Bearb. 27.07.	Grum	
	Gepr.		
	Norm		
	Werkstoff:		P-1392 Rev. – Blatt Bl.
Zust. Aenderung Datum Name	Rohteil:		


439
105
Ø352
37
Ø120.65
1.0
1.1
6.0....6.6
2.32
3.1
2.30
2.26
2.27
2.10
2.9
2.2
2.11
2.16
2.12
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2.39
2.1
2.7
2.38
2.18
2.17
2.34
2.6
2.33
2.3
2.0
3.10
3.9
2.21
2.20
2.44
2.37
2.43
2.23
2.22
2.41
2.42
2.43
3.11
2.8
3.4
3.3
3.5...3.8
3.2
NOTE:
Marking per POE No E-534 !!
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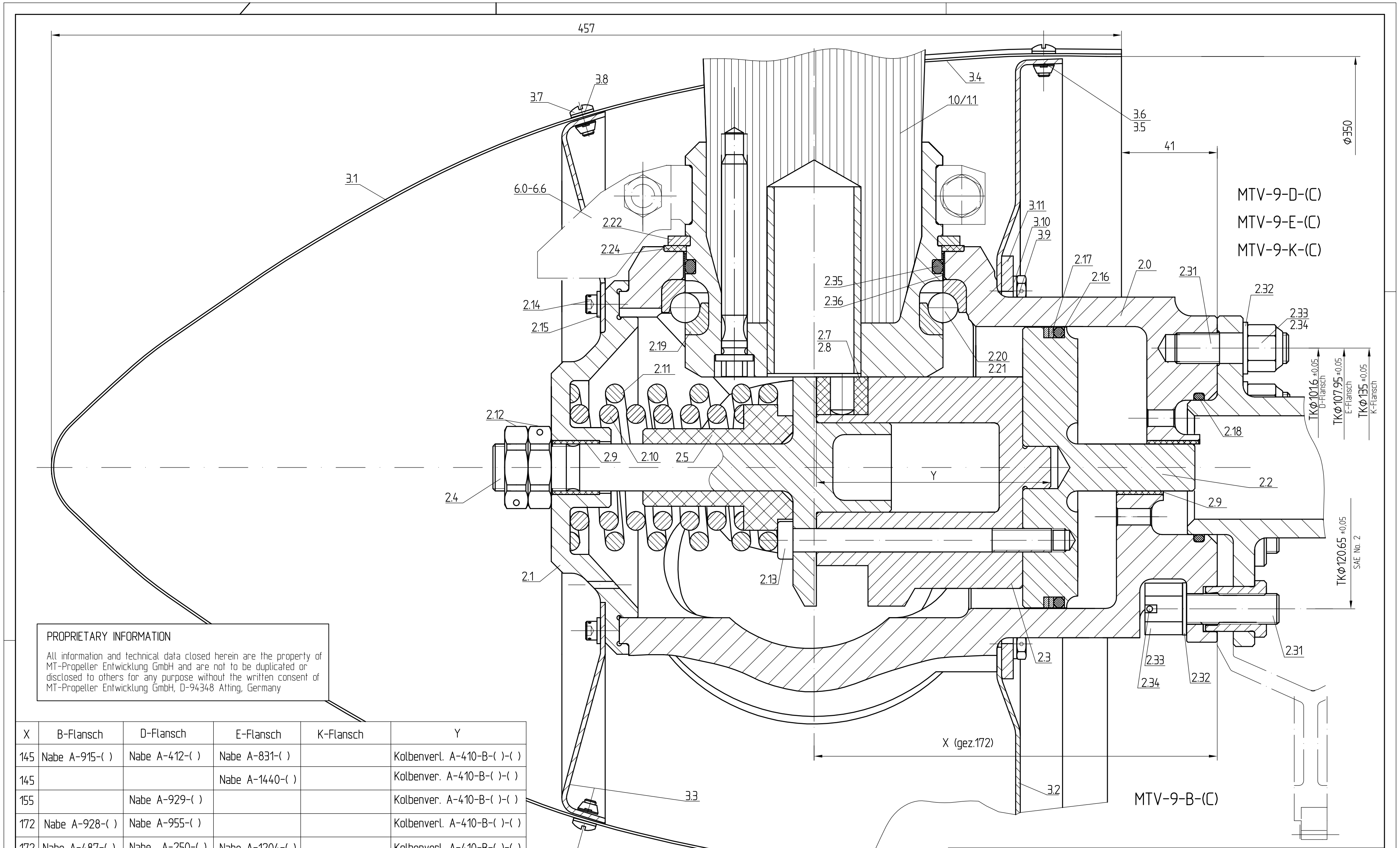
MT-Propeller Entwicklung GmbH
Propellerplatz 1
D-94348 Atting
Freimasstoleranzen:
Gewicht:
Masstab: 1:1
MTV-9-AA-C-F
2017 Datum Name
Bearb. 06.02. Grum
Gepr.
Norm
3 blade hydr. constant speed
Propeller for SAE 20 Spline
Werkstoff:
P-1576
Rev.
-
Blatt
Zust. Aenderung Datum Name
Rohteil:

E-124



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X	B-Flansch	D-Flansch	E-Flansch	K-Flansch	Y
145	Nabe A-915-( )	Nabe A-412-( )	Nabe A-831-( )		Kolbenverl. A-410-B-( )-( )
145			Nabe A-1440-( )		Kolbenver. A-410-B-( )-( )
155		Nabe A-929-( )			Kolbenver. A-410-B-( )-( )
172	Nabe A-928-( )	Nabe A-955-( )			Kolbenverl. A-410-B-( )-( )
172	Nabe A-487-( )	Nabe A-250-( )	Nabe A-1204-( )		Kolbenverl. A-410-B-( )-( )
172		Nabe A-675-( )			Kolbenverl. A-957-( )-( )
172			Nabe A-771-( )		Kolbenverl. A-679-( )-( )
182				Nabe A-1173-A-( )	Kolbenverl. A-410-B-( )-( )
215	Nabe A-839-( )	Nabe A-787-( )			Kolbenverl. A-410-B-( )-( )
235	Nabe A-926-( )				Kolbenverl. A-410-B-( )-( )

MT—Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: | Gewicht: | Masstab: 1:1

MTV-9- B E / D K -(C)

2004	Datum	Name
Bearb.	09.07.	C.Dippold
Gepr.		
Norm		

Verstellpropeller
(3-Blatt hydraulisch)

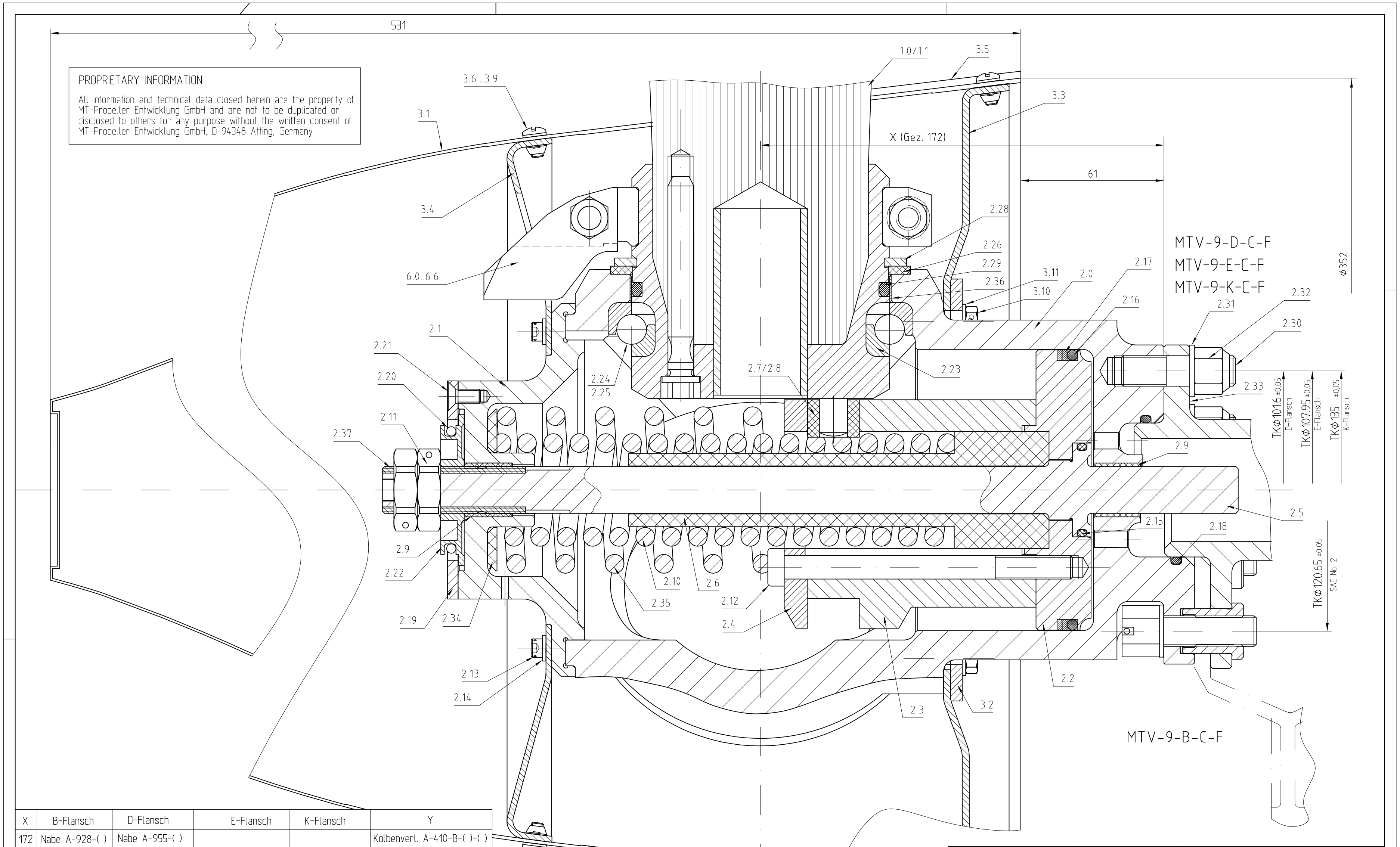
Werkstoff:

P-154-2-A

Blatt
Bl.

A	Akt.	06.02.07	F.G
Zust.	Aenderung	Datum	Name

Rohteil:



X	B-Flansch	D-Flansch	E-Flansch	K-Flansch	Y
172	Nabe A-928-( )	Nabe A-955-( )			Kolbenverl. A-410-B-( )-( )
172	Nabe A-487-( )	Nabe A-250-( )	Nabe A-1204-( )-( )		Kolbenverl. A-410-B-( )-( )
172		Nabe A-675-( )			Kolbenverl. A-957-( )-( )
172			Nabe A-771-( )		Kolbenverl. A-679-( )-( )
182				Nabe A-1173-A-( )	Kolbenverl. A-410-B-( )-( )
215	Nabe A-839-( )	Nabe A-787-( )			Kolbenverl. A-410-B-( )-( )
235	Nabe A-926-( )				Kolbenverl. A-410-B-( )-( )

MT–Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ±0,2mm
Gewicht:
Masstab: 1:1

1997	Datum	Name	
Bearb.	12.05.	Kühn	
Gepr.			
Norm			

Zust.	Aenderung	Datum	Name
F	Div. Mod.	07.03.07	FG
E	Div. Mod.	31.10.06	FG
D	Aktu.	13.07.04	CD
C	Nabe Einsatz/ /Dichtung	10.07.03	CD
B	Änderung Div.	7.05.01	CD
A	Tabelle Div.	6.05.99	CH

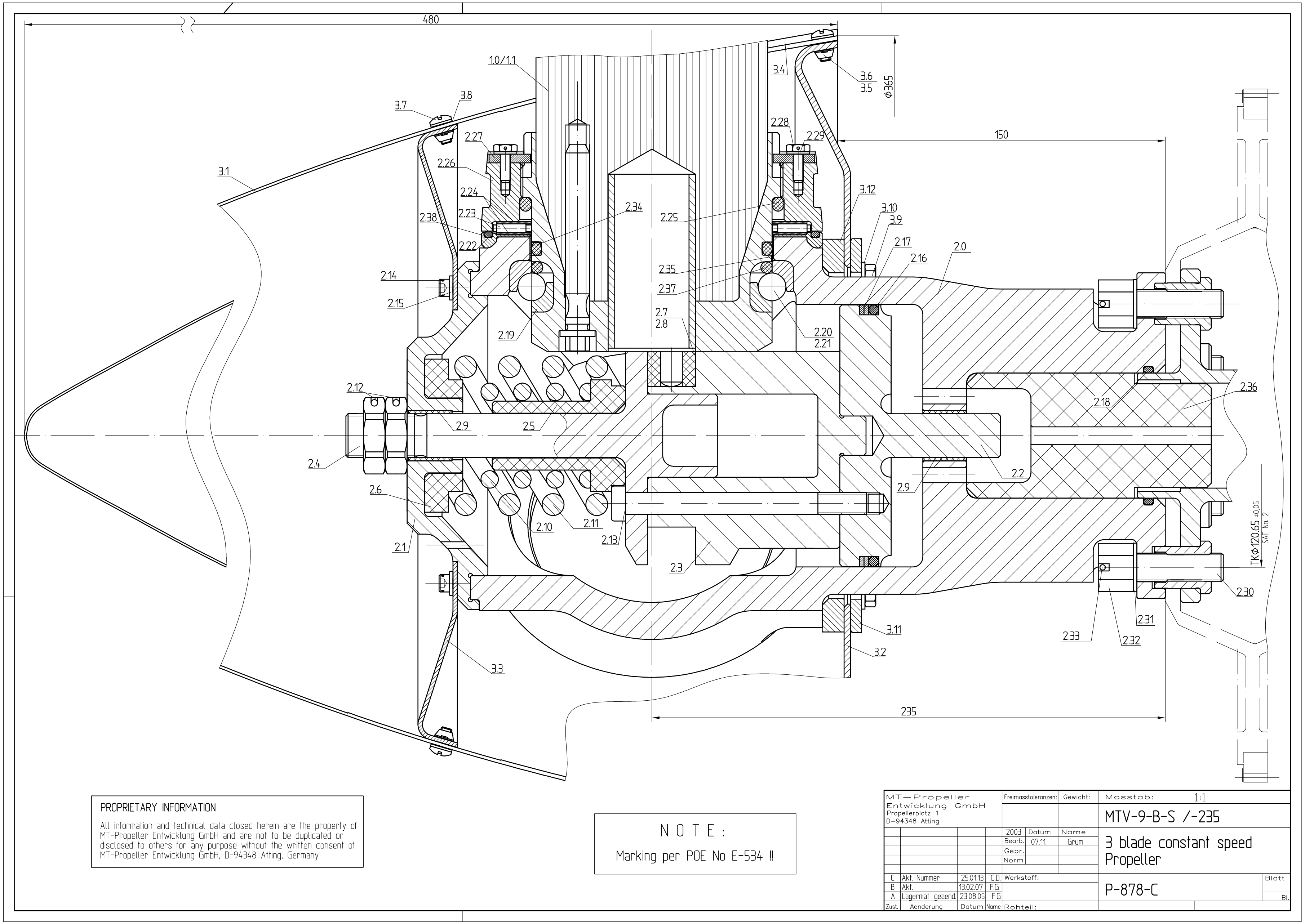
Werkstoff:
Rohteil:

MTV-9-BE/DK-C-F
Verstellpropeller
(Segelstellung)
(3-Blatt hydraulisch)

P-540-F

Blatt
Bl

E-124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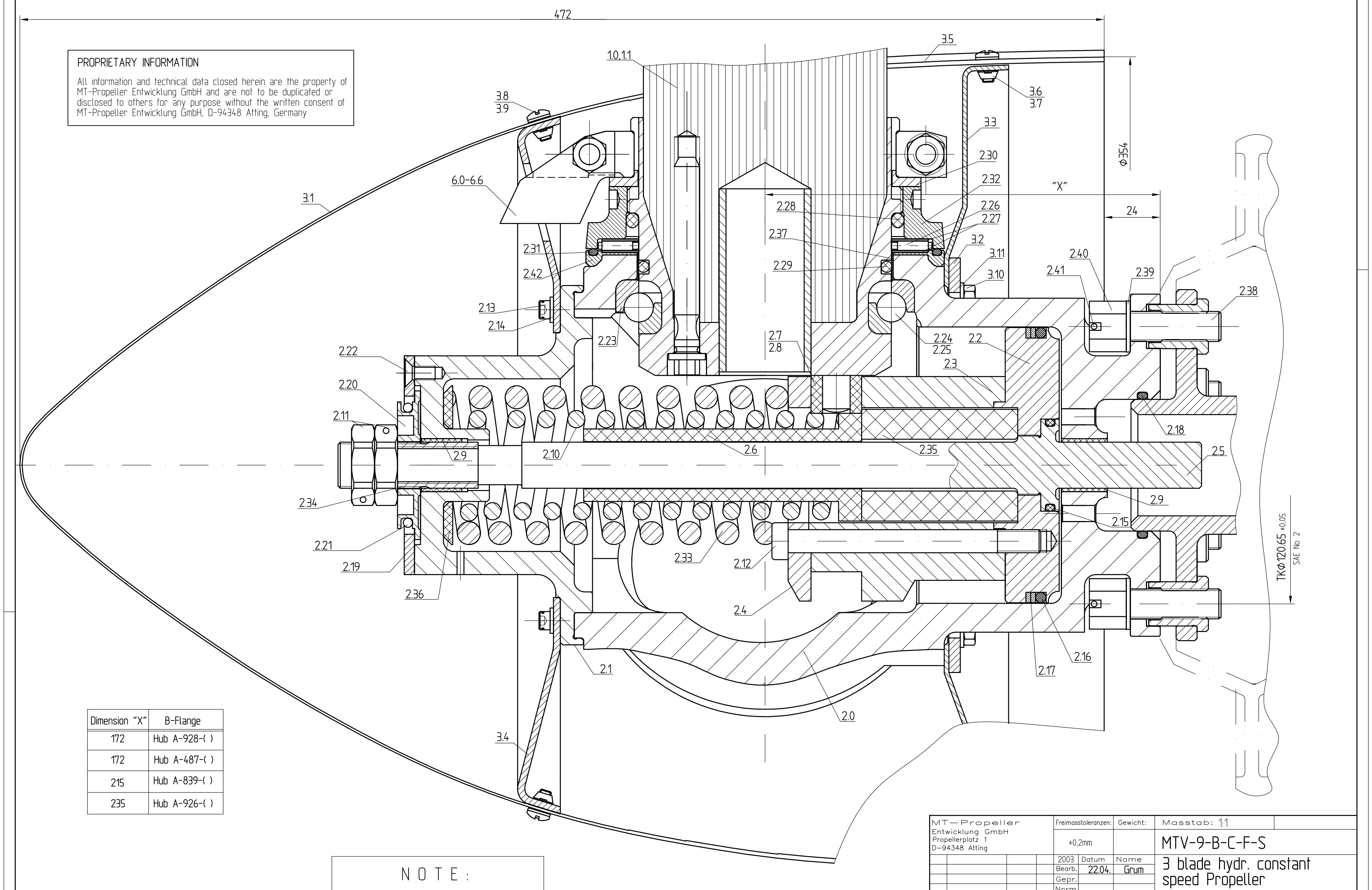
NOTE:
Marking per POE No E-534 !!
MT-Propeller Entwicklung GmbH
Propellerplatz 1
D-94348 Atting
Masstab: 1:1
MTV-9-B-S /-235
3 blade constant speed Propeller
P-878-C

E-124



PROPRIETARY INFORMATION

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Dimension "X"	B-Flange
172	Hub A-928-( )
172	Hub A-487-( )
215	Hub A-839-( )
235	Hub A-926-( )

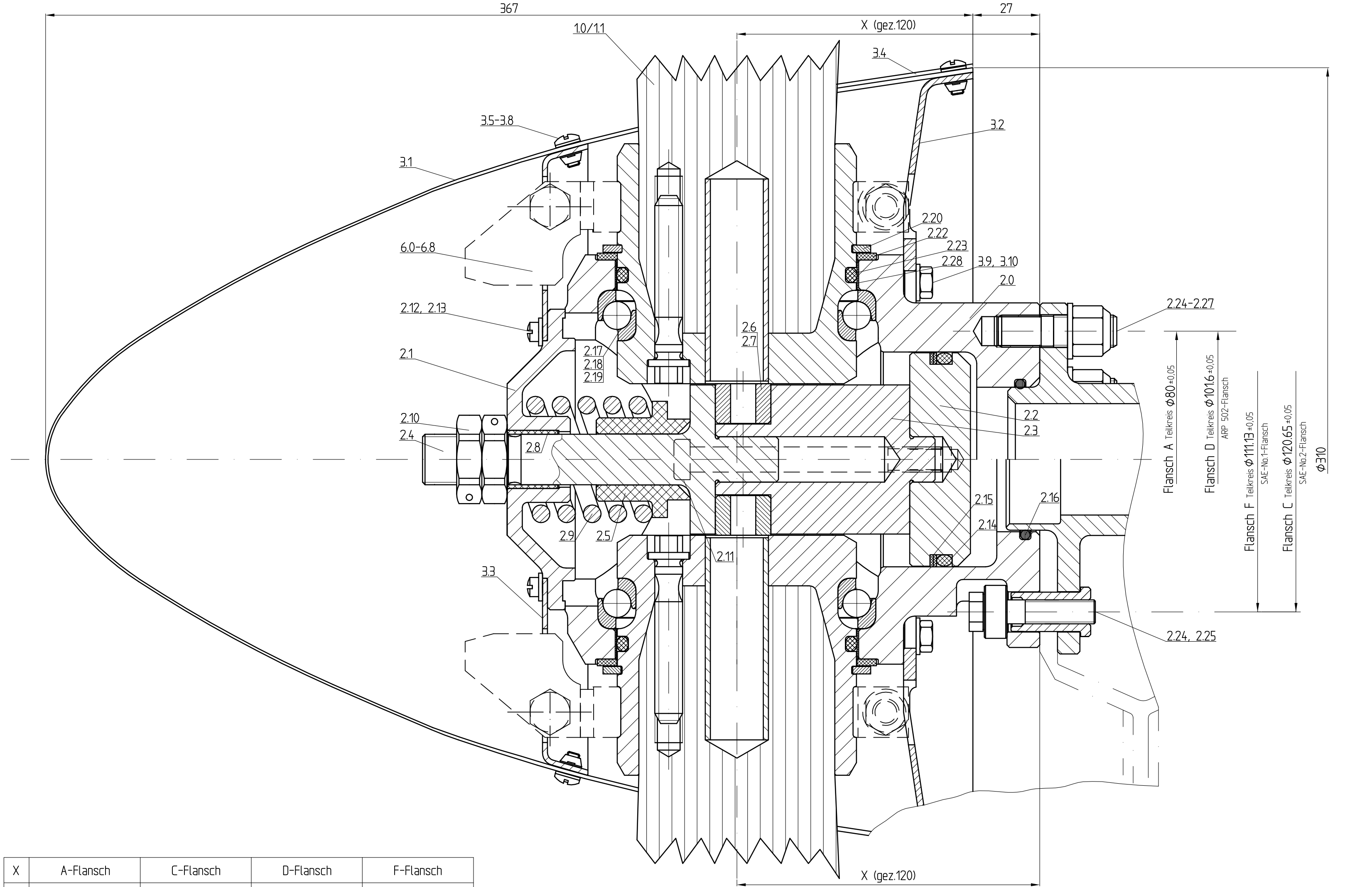
NOTE:

Marking per POE No E-534 !!

MT—Propeller
Entwicklung GmbH
Propellerplatz 1
D-94348 Atting

Freimasstoleranzen: ±0,2mm	Gewicht:	Masstab: 1:1	
2003	Datum	Name	MTV-9-B-C-F-S
Bearb.	22.04.	Grum	3 blade hydr. constant speed Propeller (with feathering)
Gepr.			
Norm			
Werkstoff:			P-826-B
Rohteil:			Blatt / Bl

Zust.	Aenderung	Datum	Name
B	Aktu. Nummer	29.01.13	CD
A	Tabelle	08.07.04	CD



X	A-Flansch	C-Flansch	D-Flansch	F-Flansch
120	Nabe A-1499	Nabe A-323-B	Nabe A-758-A	Nabe A-413-B
135			Nabe A-343-C	
155		Nabe A-341-C		
176		Nabe A-507-D		
200		Nabe A-510-C		

MT—Propeller
Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ± 0.2 mm
Gewicht:
Masstab: 1:1

MTV-11-(A/C/D/F)-(C)

Verstellpropeller
(2-Blatt hydraulisch)

1987	Datum	Name
Bearb.	12.01.	Hoereth
Gepr.		
Norm		

Zust.	Aenderung	Datum	Name
C	Aktualisierung	09.07.04	C.D
--	CAD	30.01.02	A.Z.
B	D - Flansch	26.06.96	M.A.
A	Nabe, Kolben kompl.	12.10.89	B.P.

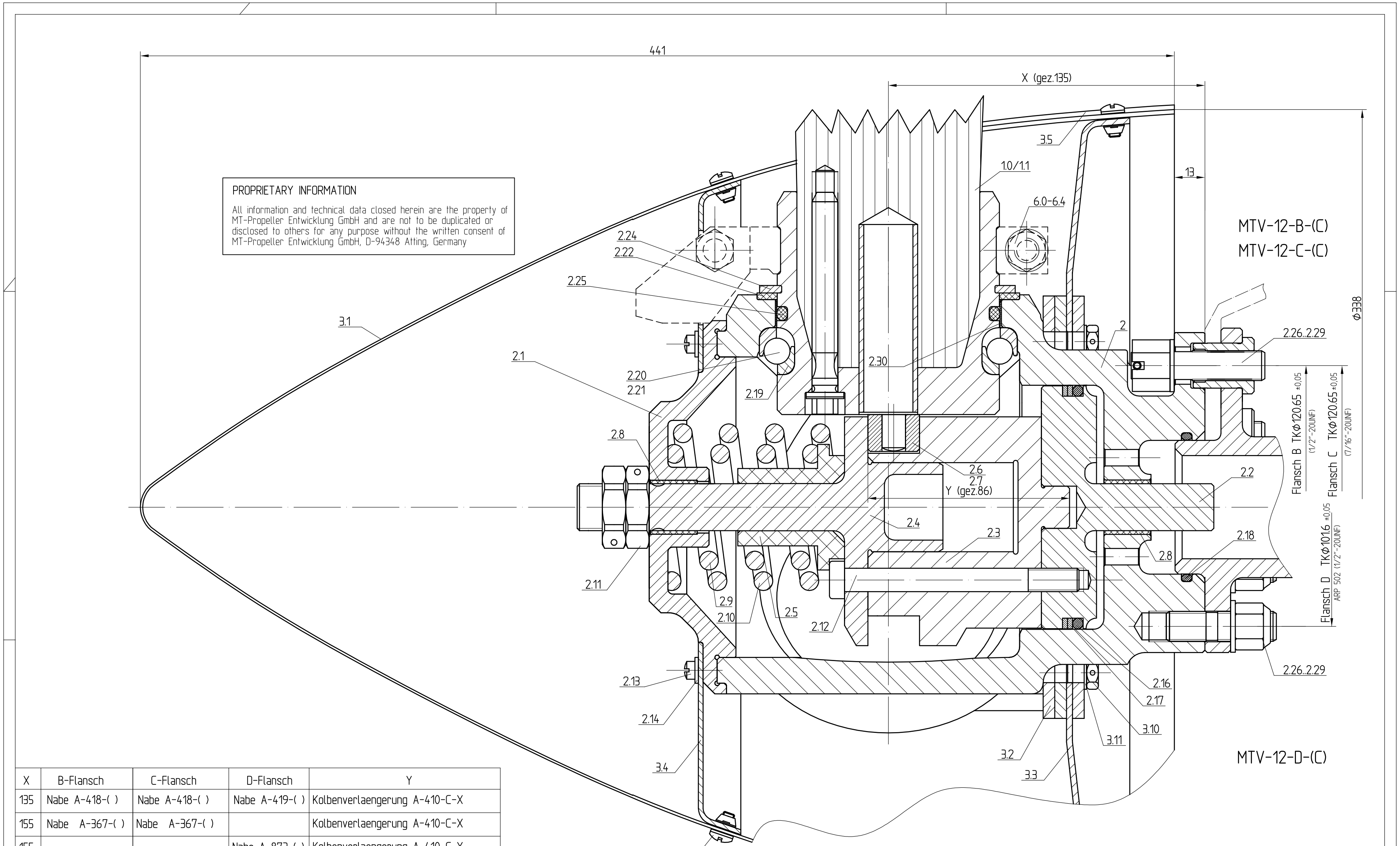
Werkstoff:

Rohteil:

P-184-C

Blatt

Bl.



X	B-Flansch	C-Flansch	D-Flansch	Y
135	Nabe A-418-( )	Nabe A-418-( )	Nabe A-419-( )	Kolbenverlaengerung A-410-C-X
155	Nabe A-367-( )	Nabe A-367-( )		Kolbenverlaengerung A-410-C-X
155			Nabe A-873-( )	Kolbenverlaengerung A-410-C-X
174	Nabe A-606-( )	Nabe A-606-( )		Kolbenverlaengerung A-410-C-X
174			Nabe A-371-( )	Kolbenverlaengerung A-410-C-X
200	Nabe A-698-( )	Nabe A-698-( )		Kolbenverlaengerung A-410-C-X
210			Nabe A-704-( )	Kolbenverlaengerung A-410-C-X
230	Nabe A-576-( )	Nabe A-576-( )		Kolbenverlaengerung A-410-C-X

MT-Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ± 0,2 mm
Gewicht:
Masstab: 1:1

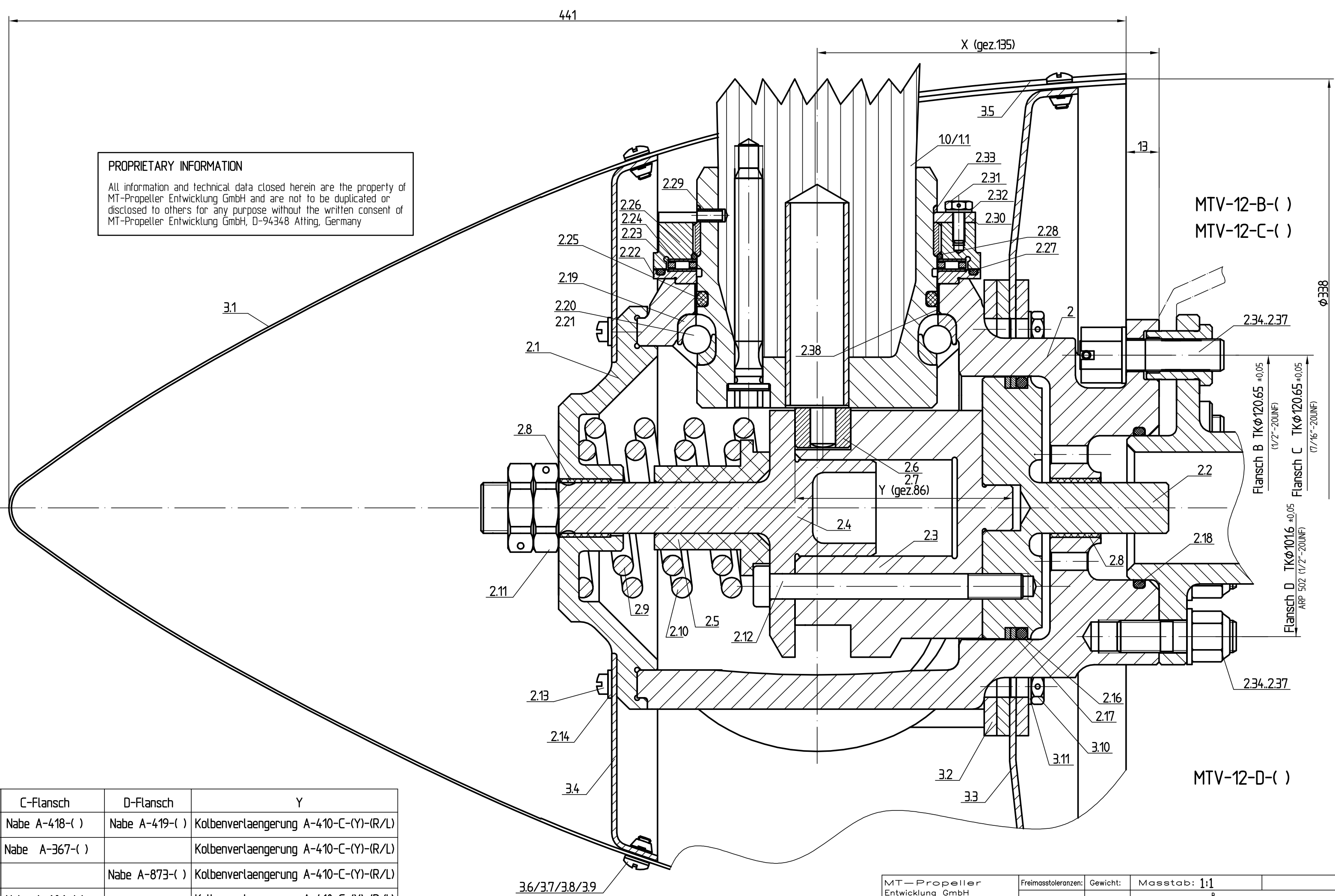
MTV-12-(B/C/D)-(C)
Verstellpropeller
(3 Blatt hydraulisch)

1988	Datum	Name
Bearb.	25.01.88	B.Poeschl
Gepr.		
Norm		

Werkstoff:
Rohteil:
P-199-1-B
Blatt
Bl.

Zust.	Aenderung	Datum	Name
B	Aktu.	02.12.03	CD
A	CAD	4.04.00	CH

E-124

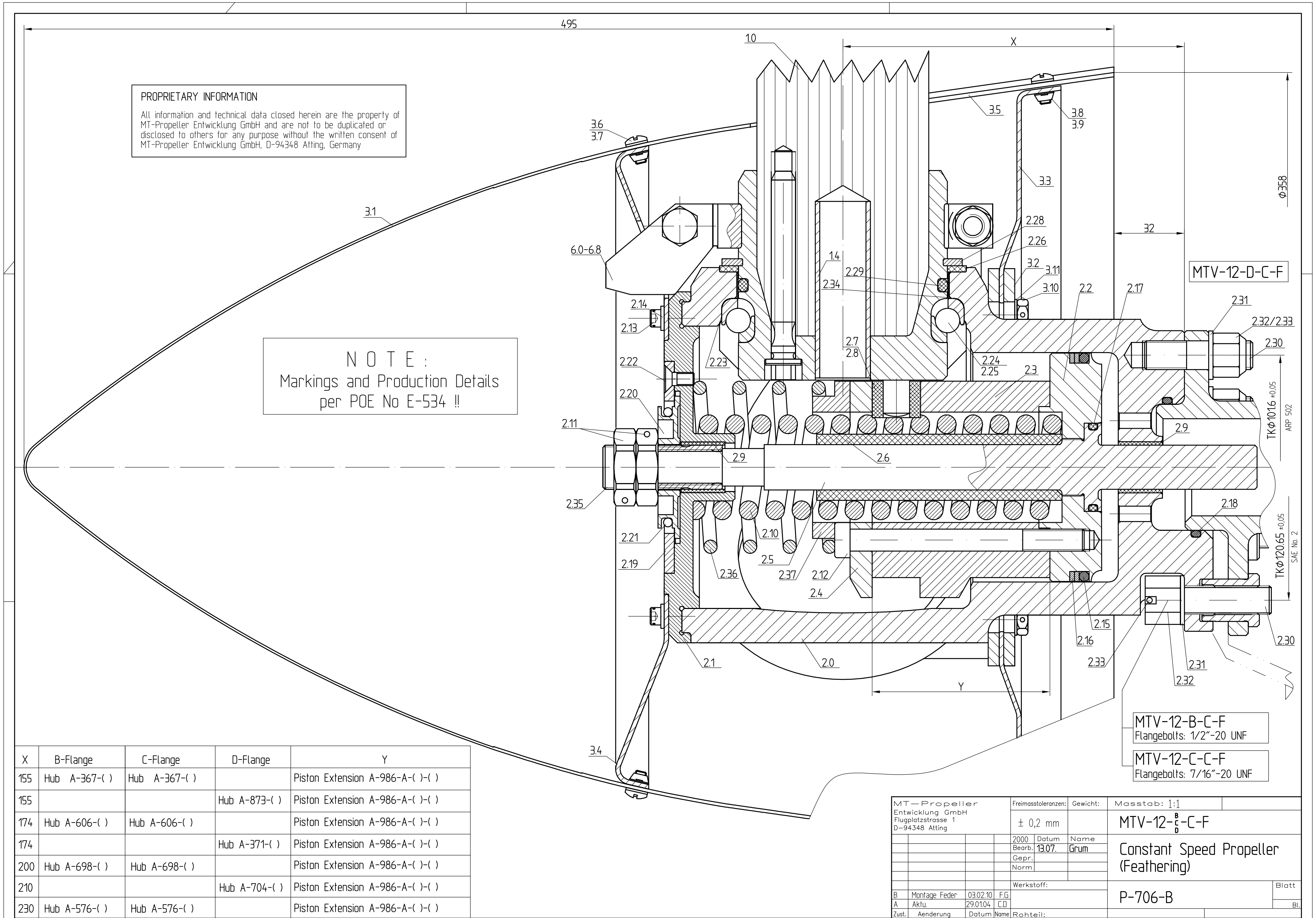


X	B-Flansch	C-Flansch	D-Flansch	Y
135	Nabe A-418-( )	Nabe A-418-( )	Nabe A-419-( )	Kolbenverlaengerung A-410-C-(Y)-(R/L)
155	Nabe A-367-( )	Nabe A-367-( )		Kolbenverlaengerung A-410-C-(Y)-(R/L)
155			Nabe A-873-( )	Kolbenverlaengerung A-410-C-(Y)-(R/L)
174	Nabe A-606-( )	Nabe A-606-( )		Kolbenverlaengerung A-410-C-(Y)-(R/L)
174			Nabe A-371-( )	Kolbenverlaengerung A-410-C-(Y)-(R/L)
200	Nabe A-698-( )	Nabe A-698-( )		Kolbenverlaengerung A-410-C-(Y)-(R/L)
210			Nabe A-704-( )	Kolbenverlaengerung A-410-C-(Y)-(R/L)
230	Nabe A-576-( )	Nabe A-576-( )		Kolbenverlaengerung A-410-C-(Y)-(R/L)

MT–Propeller Entwicklung GmbH
Flugplatzstrasse 1
D–94348 Atting

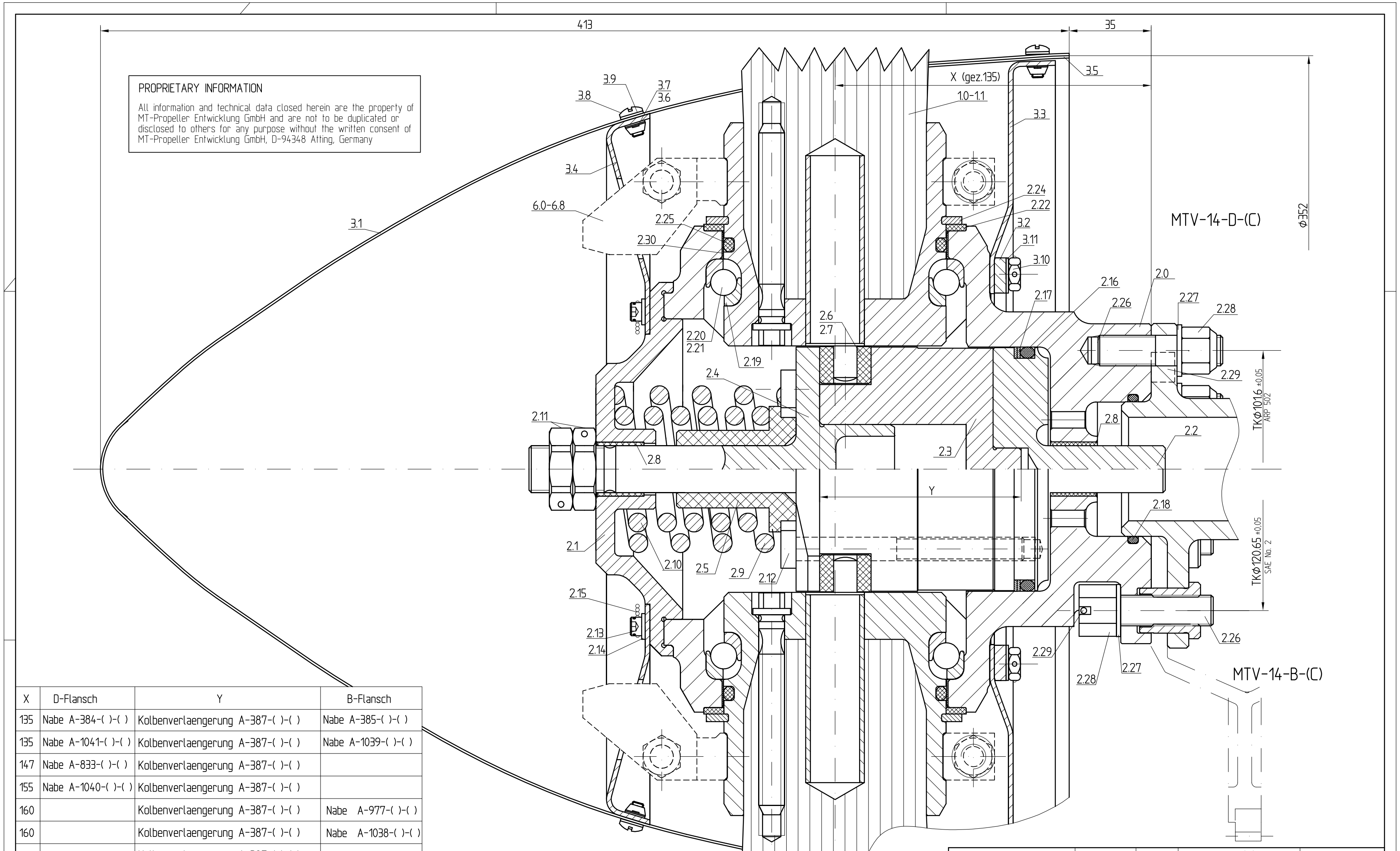
Freimasstoleranzen: ± 0,2 mm	Gewicht:	Masstab: 1:1				
2003	Datum	Name	MTV-12-(B/C/D)			
Bearb.	28.01.	Grum	Verstellpropeller (3 Blatt hydraulisch)	Rev. A		
Gepr.						
Norm						
Werkstoff:			P-199-2-A	Blatt		
Rohteil:				Bl.		

Zust.	Aenderung	Datum	Name
A	Aktu.	17.12.03	C.D



X	B-Flange	C-Flange	D-Flange	Y
155	Hub A-367-( )	Hub A-367-( )		Piston Extension A-986-A-( )-( )
155			Hub A-873-( )	Piston Extension A-986-A-( )-( )
174	Hub A-606-( )	Hub A-606-( )		Piston Extension A-986-A-( )-( )
174			Hub A-371-( )	Piston Extension A-986-A-( )-( )
200	Hub A-698-( )	Hub A-698-( )		Piston Extension A-986-A-( )-( )
210			Hub A-704-( )	Piston Extension A-986-A-( )-( )
230	Hub A-576-( )	Hub A-576-( )		Piston Extension A-986-A-( )-( )

E-124



X	D-Flansch	Y	B-Flansch
135	Nabe A-384-( )-( )	Kolbenverlaengerung A-387-( )-( )	Nabe A-385-( )-( )
135	Nabe A-1041-( )-( )	Kolbenverlaengerung A-387-( )-( )	Nabe A-1039-( )-( )
147	Nabe A-833-( )-( )	Kolbenverlaengerung A-387-( )-( )	
155	Nabe A-1040-( )-( )	Kolbenverlaengerung A-387-( )-( )	
160		Kolbenverlaengerung A-387-( )-( )	Nabe A-977-( )-( )
160		Kolbenverlaengerung A-387-( )-( )	Nabe A-1038-( )-( )
160		Kolbenverlaengerung A-387-( )-( )	Nabe A-1573-( )-( )
174		Kolbenverlaengerung A-387-( )-( )	Nabe A-543-( )-( )
182	Nabe A-028-( )-( )	Kolbenverlaengerung A-387-( )-( )	Nabe A-1127-( )-( )
182	Nabe A-1169-( )-( )	Kolbenverlaengerung A-387-( )-( )	
230		Kolbenverlaengerung A-387-( )-( )	Nabe A-035-( )-( )
235	Nabe A-1519-( )-( )	Kolbenverlaengerung A-387-( )-( )	Nabe A-1031-( )-( )

MT—Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ± 0,2 mm | Gewicht: | Masstab: 1:1

MTV-14-B/D-(C)

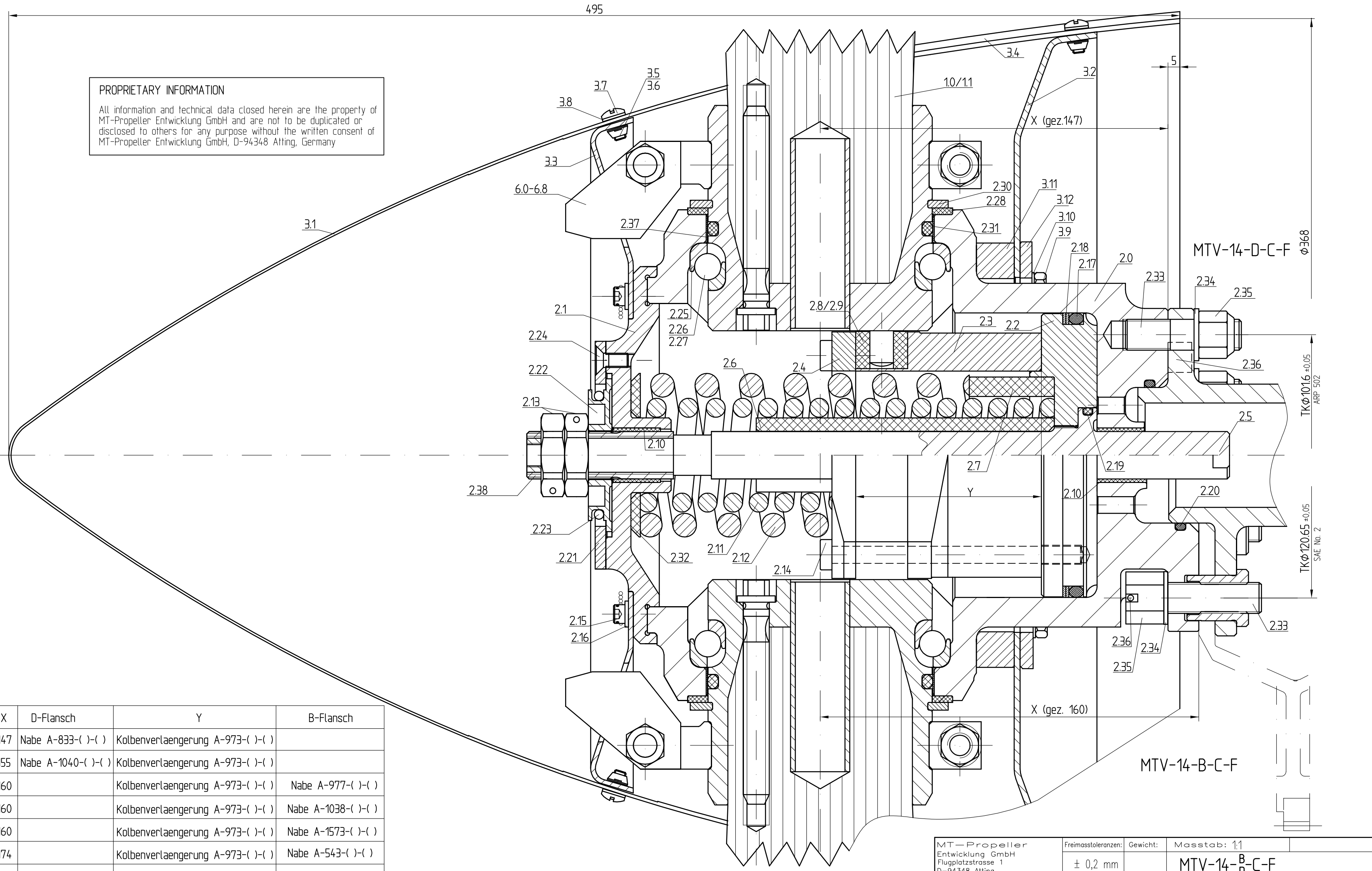
Verstellpropeller
4-Blatt, hydraulisch

P-223-F

Zust.	Aenderung	Datum	Name
F	Aktu. Tab.	12.06.07	C.D.
E	Aktu. Tab.	09.07.04	C.D.
D	Aktu.	09.07.04	C.D.
C	Aktu.	18.06.01	C.D.
B	Naben gek.	04.10.99	F.G.
A	Tabelle	10.05.99	C.H.
---	war P-394	17.07.98	m.a.

1997	Datum	Name
Bearb.	14.05.	Kühn
Gepr.		
Norm		

Werkstoff:
Rohteil:
Blatt
Bl.



X	D-Flansch	Y	B-Flansch
147	Nabe A-833-( )-( )	Kolbenverlaengerung A-973-( )-( )	
155	Nabe A-1040-( )-( )	Kolbenverlaengerung A-973-( )-( )	
160		Kolbenverlaengerung A-973-( )-( )	Nabe A-977-( )-( )
160		Kolbenverlaengerung A-973-( )-( )	Nabe A-1038-( )-( )
160		Kolbenverlaengerung A-973-( )-( )	Nabe A-1573-( )-( )
174		Kolbenverlaengerung A-973-( )-( )	Nabe A-543-( )-( )
182	Nabe A-028-( )-( )	Kolbenverlaengerung A-973-( )-( )	Nabe A-1127-( )-( )
182	Nabe A-1169-( )-( )	Kolbenverlaengerung A-973-( )-( )	
235	Nabe A-1519-( )-( )	Kolbenverlaengerung A-973-( )-( )	Nabe A-1031-( )-( )

MT–Propeller
Entwicklung GmbH
Flugplatzstrasse 1
D–94348 Atting

Freimasstoleranzen: ± 0,2 mm
Gewicht:
Masstab: 1:1

MTV-14-B/D-C-F

1997	Datum	Name
Bearb.	14.05.	Kühn
Gepr.		
Norm		

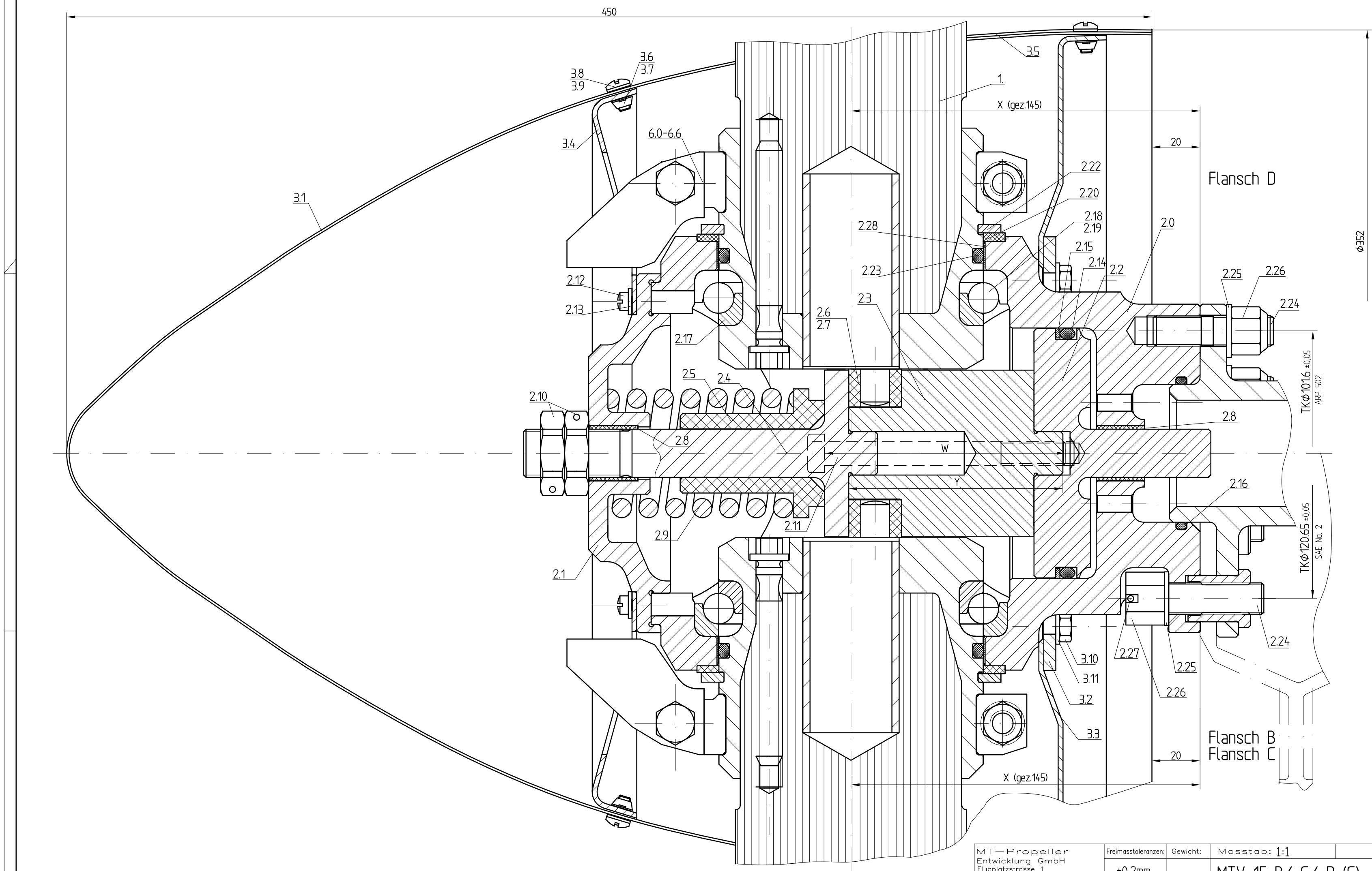
Verstellpropeller
4-Blatt, hydraulisch

Zust.	Aenderung	Datum	Name
F	Aktu.	12.06.07	C.D.
E	Aktu.	12.07.04	C.D.
D	Aktu.	25.06.01	C.D.
C	Fed. zus./Div.	05.07.00	F.G
B	Naben gek.	04.10.99	F.G
A	Tabelle	11.05.99	C.H
---	war P-394	17.07.98	m.a.

Werkstoff:
Rohteil:

P-488-F

Blatt
Bl.



X	D-Flansch	B/C-Flansch	Y	W
145	Nabe A-395-C-( )	Nabe A-921-C-( )	Kolbenverlaengerung A-393-( )-( )	Schraube C-201-X
172	Nabe A-1238-( )	Nabe A-497-B-( )	Kolbenverlaengerung A-393-( )-( )	Schraube C-201-X

MT—Propeller
Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ±0,2mm | Gewicht: | Masstab: 1:1

MTV-15-B/-C/-D-(C)

	Datum	Name
1987		
Bearb.	16.12.87	B.Poeschl
Gepr.		
Norm		

Verstellpropeller
2-Blatt, hydraulisch

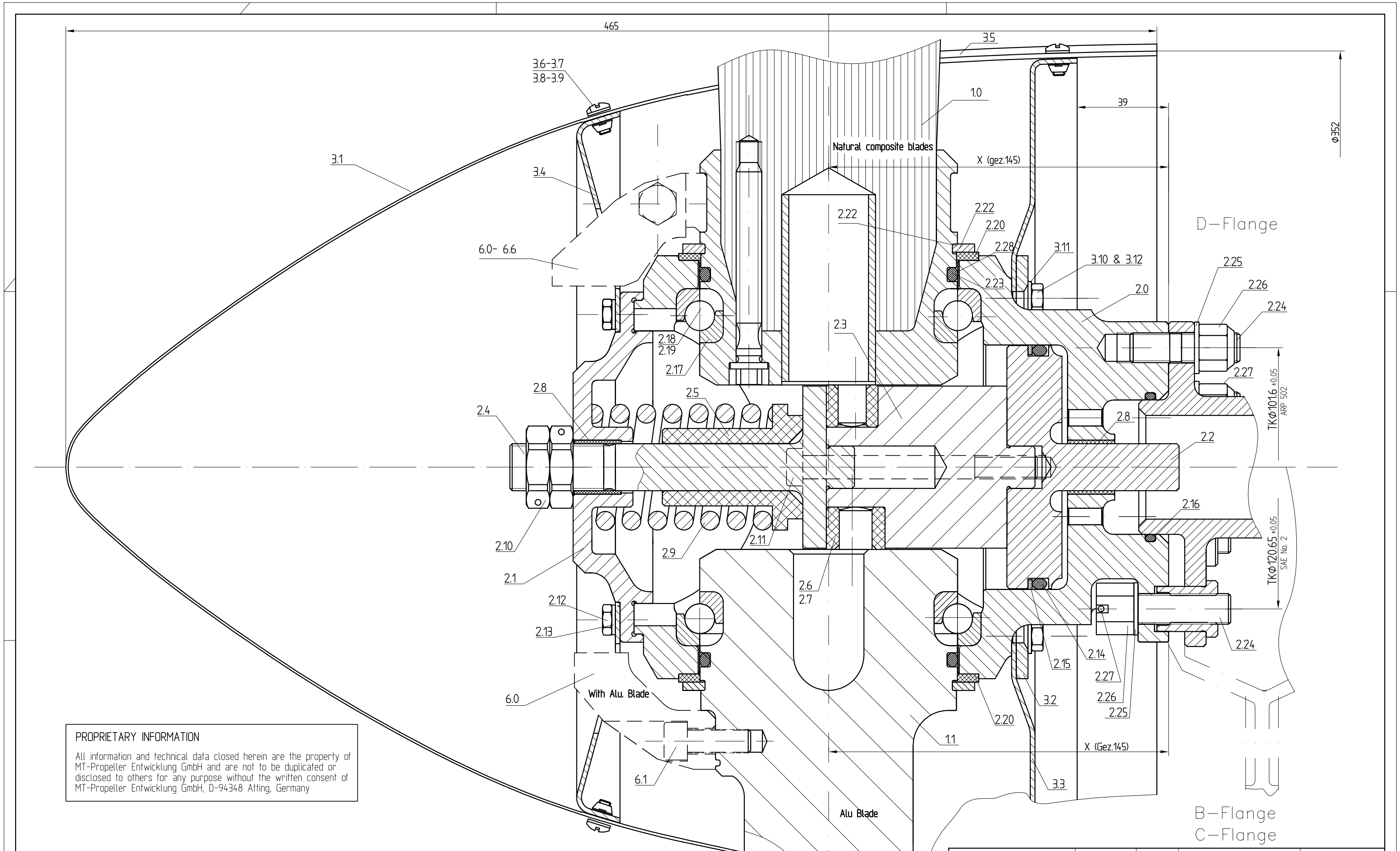
Zust.	Aenderung	Datum	Name
C	Aktu.	19.07.04	CD
B	Div/Tabelle aktu.	12.12.00	CH
A	CAD / Div	7.11.99	CH

Werkstoff:

P-202-C

Blatt

Bl.



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X	B-Flange	C-Flange	D-Flange	Y
145	Nabe A-921-( )	Nabe A-921-( )	Nabe A-395-( )	Piston extension A-393-1
155	Nabe A-1562-( )	Nabe A-1562-( )		Piston extension A-393-1
172	Nabe A-497-( )	Nabe A-497-( )	Nabe A-1238-( )	Piston extension A-393-1

MT–Propeller
Entwicklung GmbH
Flugplatzstrasse 1
D–94348 Atting

Freimasstoleranzen: ±0,2mm
Gewicht:
Masstab: 1:1

MTV-15-B/-C/-D-( )

2 Blade hydr. Variable Pitch Prop.

2000	Datum	Name
Bearb.	24.10.	Grum
Gepr.		
Norm		

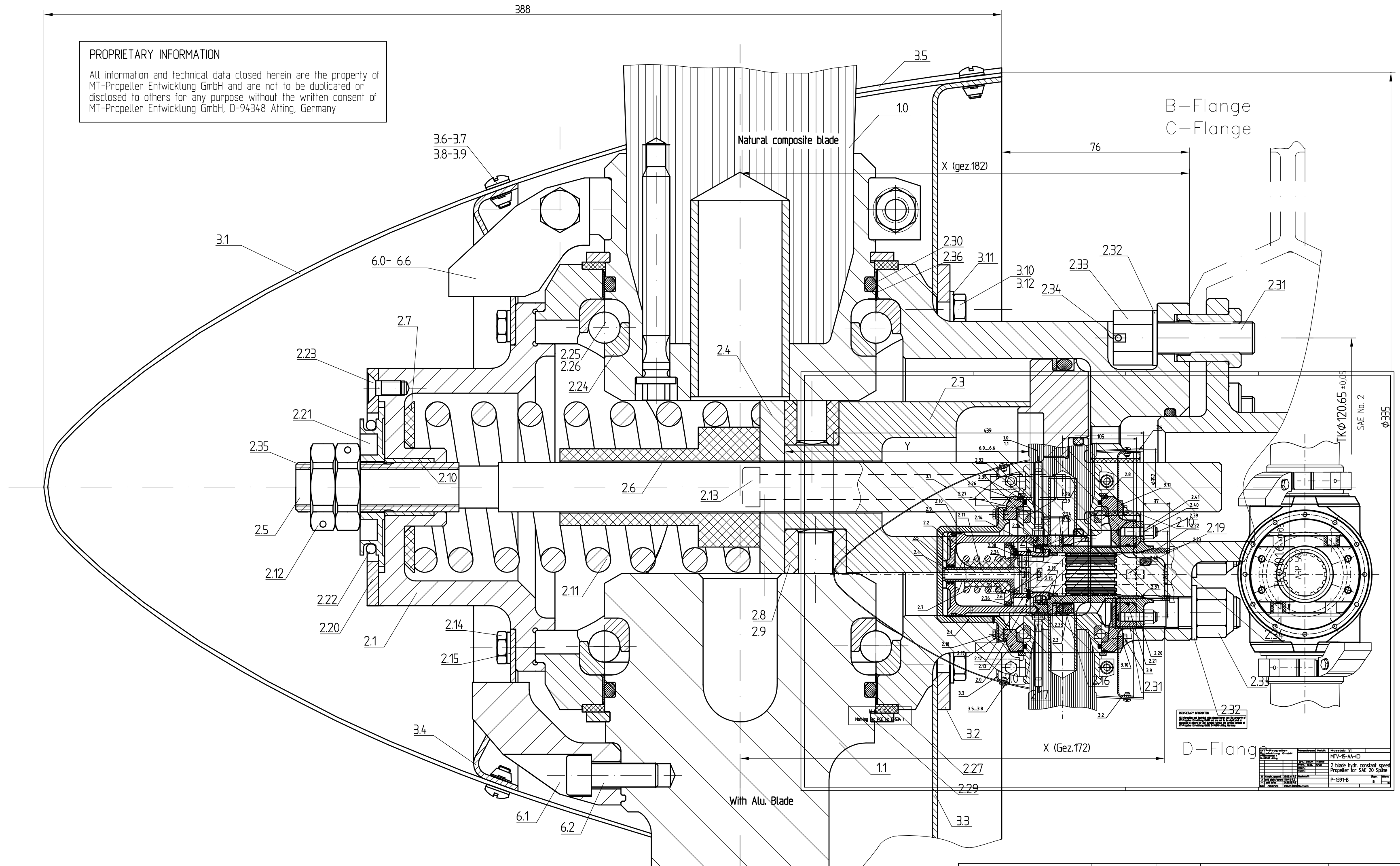
Zust.	Aenderung	Datum	Name
D	Fliehgewicht	01.03.06	C.D.
C	Aktu.	19.07.04	C.D.
B	Spinnertstz./Name	09.10.01	C.D.
A	Tabelle/Flansch/Div	05.04.01	C.H.

Werkstoff:

P–719–D

Blatt

Bl.



X	B-Flange	C-Flange	D-Flange	Y
172	Nabe A-497-( )	Nabe A-497-( )	Nabe A-1238-( )	Piston extension A-1253-X

MT–Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ±0,2mm	Gewicht:	Masstab: 1:1	MTV-15-B/-C/-D-C-F
2000	Datum	Name	Variable Pitch Prop. 2-Blade, hydr.
Bearb.	15.12.00	Grum	
Gepr.			
Norm			

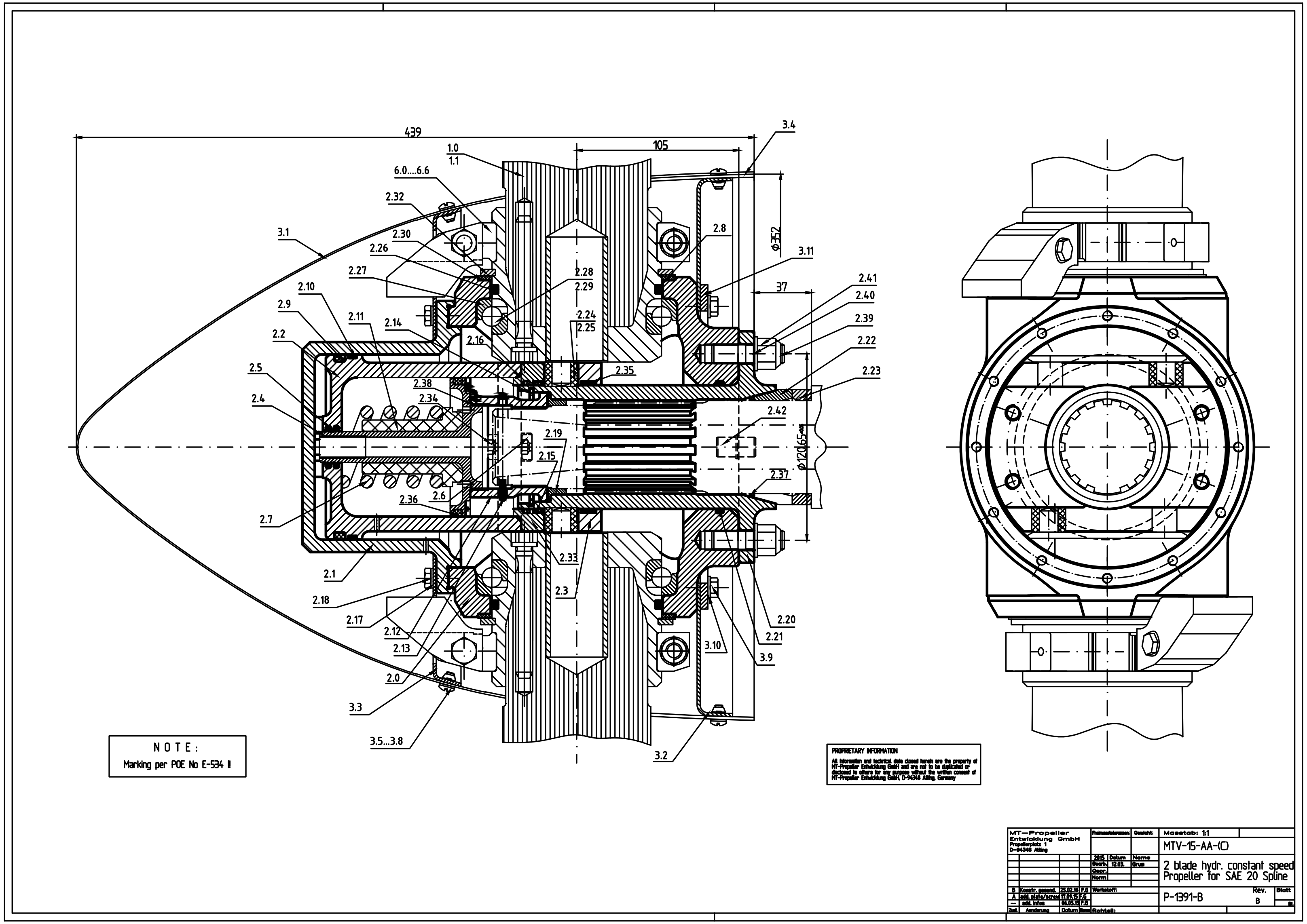
Zust.	Aenderung	Datum	Name
C	Aktu	19.07.04	C.D.
B	Name	05.12.01	C.D.
A	Tabelle/Flansch/Div	05.04.01	C.H.

Werkstoff:

P-725-C

Blatt

Bl.


439
105
1.0
1.1
6.0....6.6
2.32
3.1
2.30
2.26
2.27
2.10
2.9
2.11
2.14
2.2
2.5
2.4
2.7
2.28
2.29
2.24
2.25
2.16
2.35
2.38
2.34
2.19
2.15
2.36
2.6
2.8
3.4
ø352
3.11
37
2.41
2.40
2.39
2.22
2.23
2.42
ø120,65
2.37
2.1
2.18
2.17
2.12
2.13
2.0
3.3
3.5...3.8
2.33
2.3
3.2
3.10
3.9
2.21
2.20
NOTE:
Marking per POE No E-534 II
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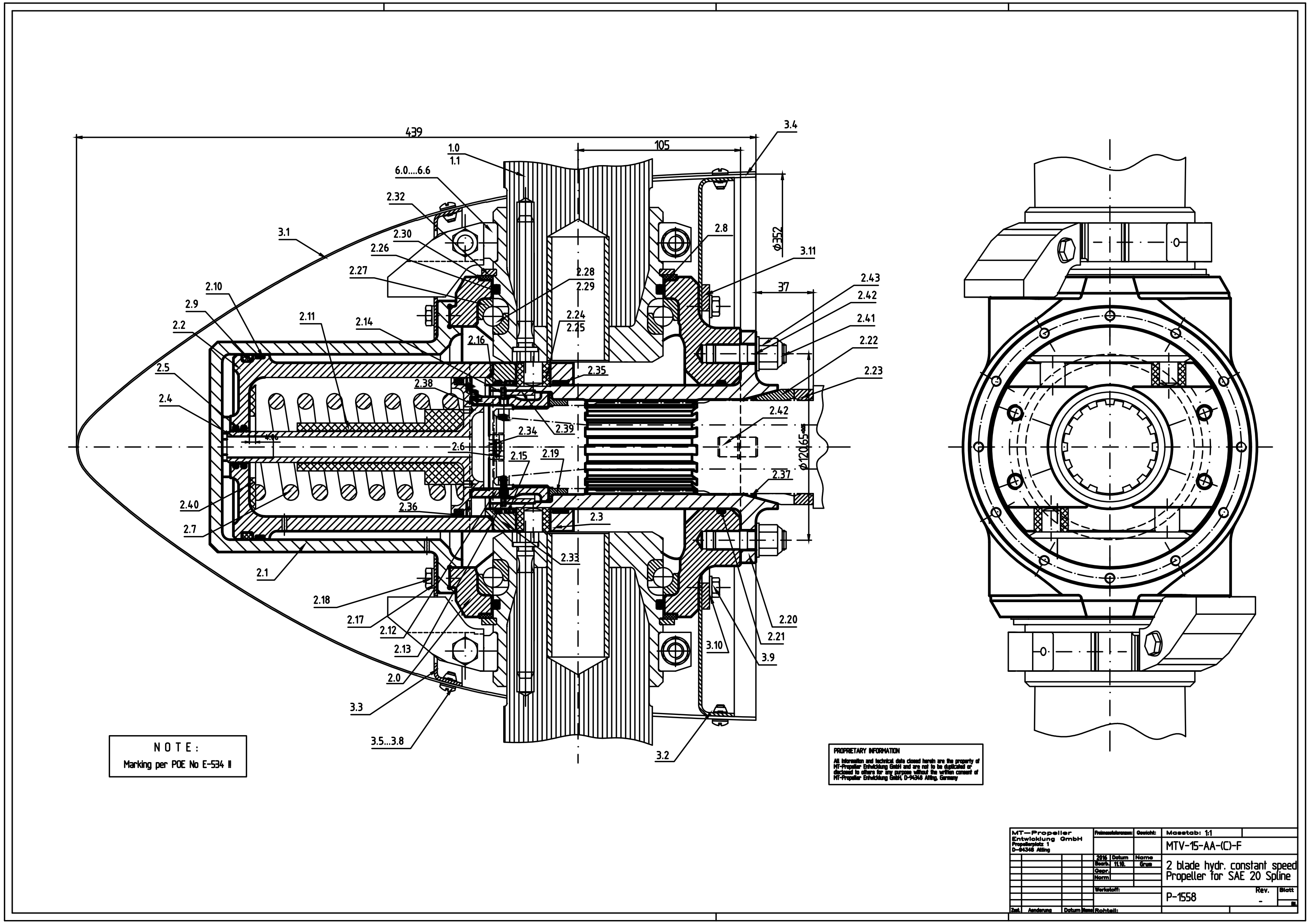
MT-Propeller Entwicklung GmbH
Propellerplatz 1
D-94348 Atting
Freimasstoleranzen:
Gewicht:
Masstab: 1:1
MTV-15-AA-(C)
2015
Datum
Name
Bearb.
12.03.
Grum
Gepr.
Norm
2 blade hydr. constant speed Propeller for SAE 20 Spline
B
Konstr. geaend.
25.02.16
F.G
A
add. plate/screw
17.09.15
F.G
--
add. infos
06.05.15
F.G
Zust.
Aenderung
Datum
Name
Werkstoff:
Rohteil:
P-1391-B
Rev.
B
Blatt
Bl.

E-124


439
105
1.0
1.1
6.0...6.6
2.32
2.30
2.26
2.27
3.1
2.10
2.9
2.2
2.5
2.4
2.11
2.14
2.16
2.28
2.29
2.24
2.25
2.35
2.38
2.34
2.39
2.6
2.15
2.19
2.36
2.40
2.7
2.1
2.18
2.17
2.12
2.13
2.0
3.3
3.5...3.8
2.33
2.3
2.8
3.4
3.11
Ø352
37
2.43
2.42
2.41
2.22
2.23
2.42
Ø120.65
2.37
2.20
2.21
3.10
3.9
3.2
NOTE:
Marking per POE No E-534 II
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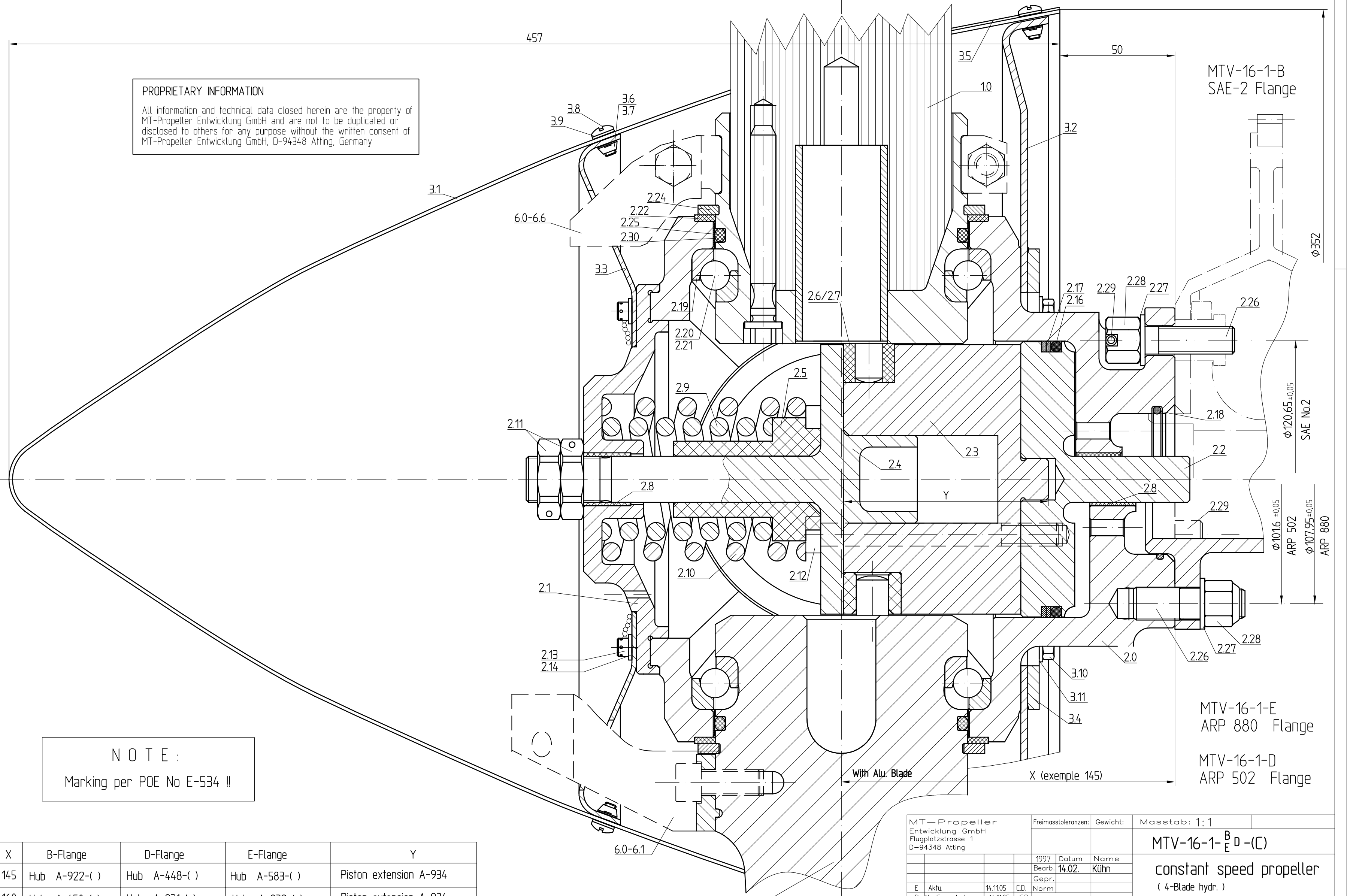
MT-Propeller
Entwicklung GmbH
Propellerplatz 1
D-94348 Atting
Freimasstoleranzen:
Gewicht:
Masstab: 1:1
MTV-15-AA-(C)-F
2016
Datum
Name
Bearb.
11.10.
Grum
Gepr.
Norm
2 blade hydr. constant speed
Propeller for SAE 20 Spline
Werkstoff:
P-1558
Rev.
-
Blatt
Bl.
Zust.
Aenderung
Datum
Name
Rohteil:

E-124



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NOTE:

Marking per POE No E-534 !!

X	B-Flange	D-Flange	E-Flange	Y
145	Hub A-922-( )	Hub A-448-( )	Hub A-583-( )	Piston extension A-934
160	Hub A-450-( )	Hub A-931-( )	Hub A-932-( )	Piston extension A-934
172	Hub A-930-( )		hub A-938-( )	Piston extension A-934

MT-Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: | Gewicht: | Masstab: 1:1

MTV-16-1-B/E D -(C)

constant speed propeller
(4-Blade hydr.)

Zust.	Aenderung	Datum	Name
E	Aktu.	14.11.05	C.D.
D	Nr. Geaendert	14.11.05	C.D.
C	Nabe Einsatz/ Aktu	10.08.04	C.D.
B	Tabelle / Aktu	24.10.01	C.D.
A	neu gezeichnet	14.02.97	T.K.

1997	Datum	Name
Bearb.	14.02.	Kühn
Gepr.		
Norm		

Werkstoff:

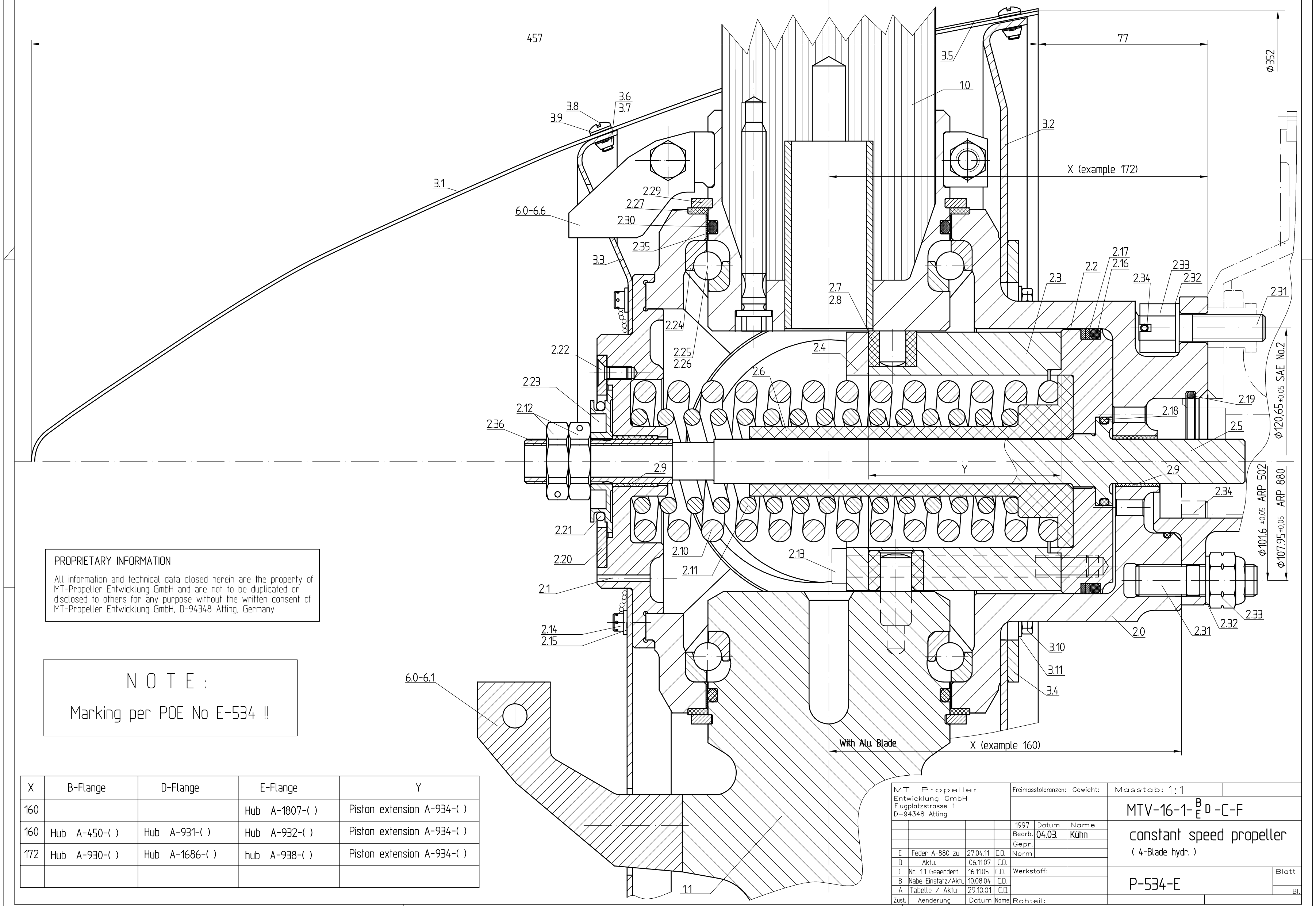
Rohteil:

P-226-E

Blatt

Bl.

E-124



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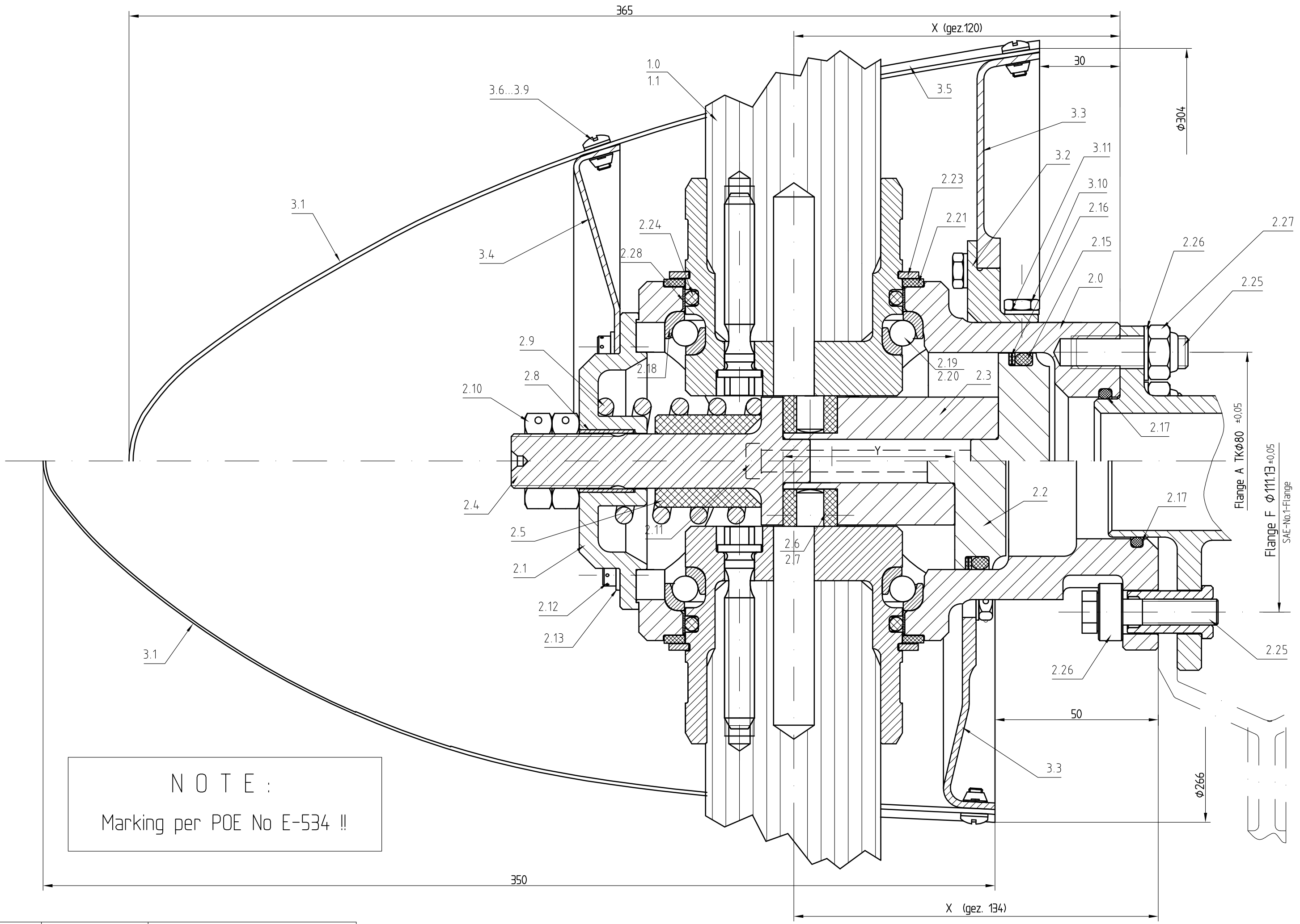
N O T E :

Marking per POE No E-534 !!

X	B-Flange	D-Flange	E-Flange	Y
160			Hub A-1807-( )	Piston extension A-934-( )
160	Hub A-450-( )	Hub A-931-( )	Hub A-932-( )	Piston extension A-934-( )
172	Hub A-930-( )	Hub A-1686-( )	hub A-938-( )	Piston extension A-934-( )



X	A-Flange	F-Flange	Y
104	Hub A-861-( )		Pistonextension A-009-( )-( )
120	Hub A-745-( )		Pistonextension A-009-( )-( )
120	Hub A-008-( )		Pistonextension A-009-( )-( )
134		Hub A-859-( )	Pistonextension A-009-( )-( )
176		Hub A-750-( )	Pistonextension A-009-( )-( )

MT-Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Zust.	Aenderung	Datum	Name
E	Akt.	26.09.08	C.D.
D	Aktualisierung	21.07.04	C.D.
C	Div.	28.07.99	C.H.
B	Div.	27.08.98	F.G
A	Mass 26 wird 36	12.09.94	T.K

Freimasstoleranzen: ±0,2mm
Gewicht:

1994	Datum	Name
Bearb.	12.09.	Kuehn
Gepr.		
Norm		

Werkstoff:
Rohteil:

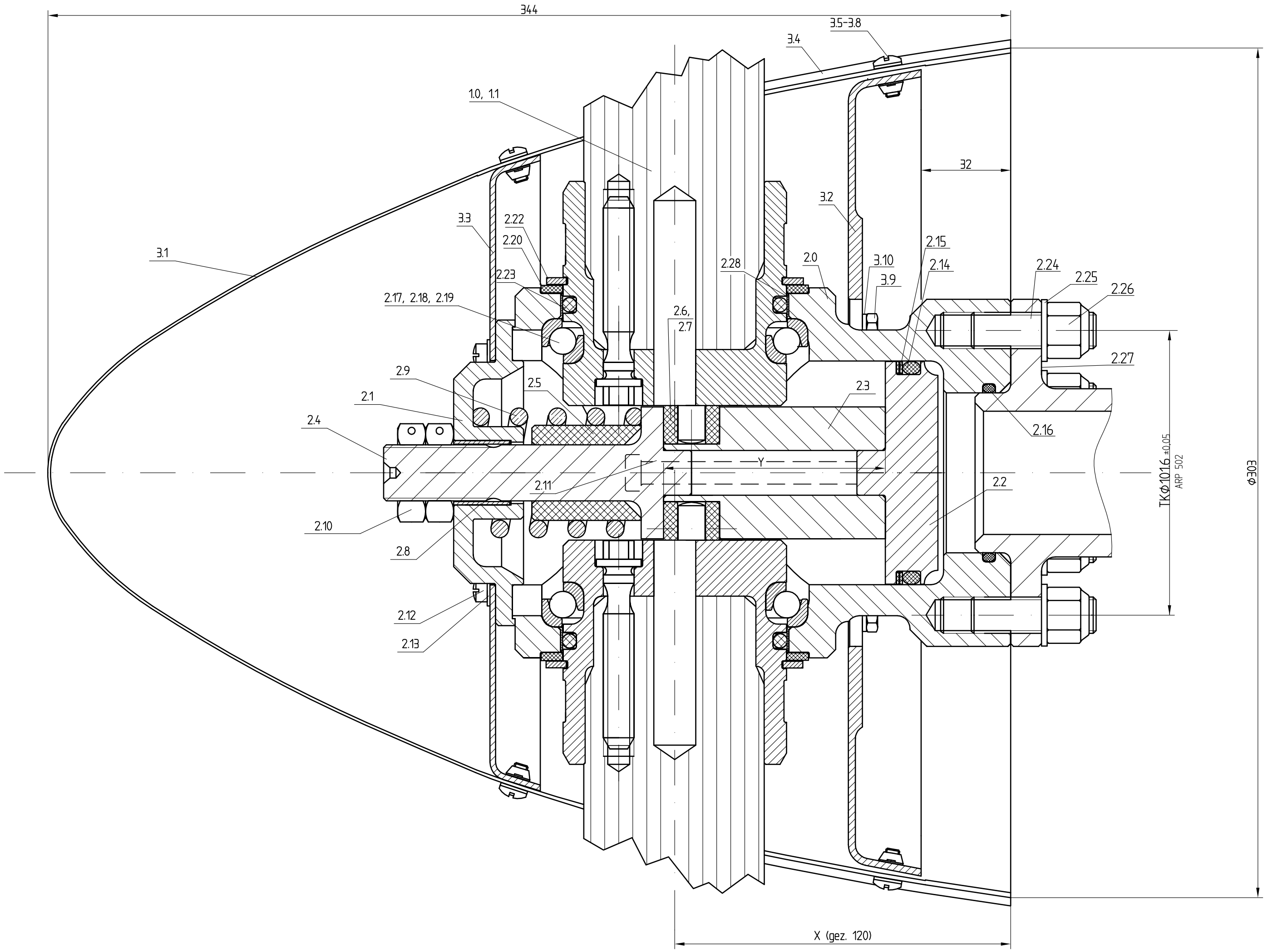
Masstab: 1:1

MTV-21-A/-F

Hydr. Constant Speed
Propeller 2 Blade

P-300-E

Blatt
Bl.



X	D-Flansch	Y
120	Nabe A-643	Kolbenverlaengerung A-009-( )-( )

MT-Propeller
Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ±0,2mm
Gewicht:
Masstab: 1:1

1999	Datum	Name
Bearb.	03.09.	C.Herpin
Gepr.		
Norm		

Werkstoff:

Rohteil:

A	Aktualisierung	21.07.04	C.D.
Zust.	Aenderung	Datum	Name

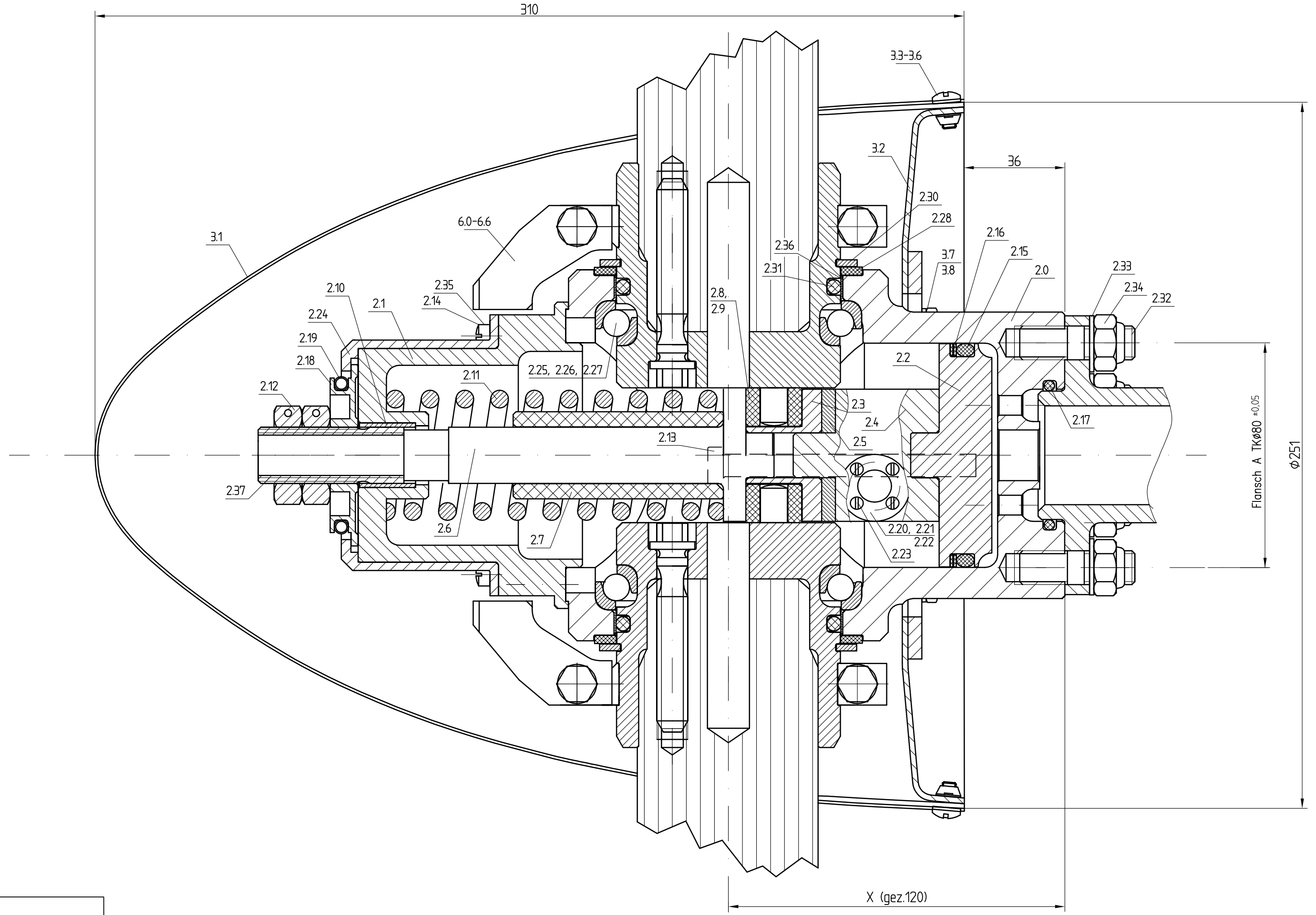
MTV-21-D

Verstellpropeller
2-Blatt, hydraulisch

P-649-A

Blatt

Bl.



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X	A-Flansch	Y
120	Nabe A-745-D	Zwischenstueck A-886-( )-( )
120	Nabe A-008	Zwischenstueck A-886-( )-( )

MT-Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen:	Gewicht:	Masstab: 1:1
± 0,2 mm		MTV-21-A-C-F

1992	Datum	Name
Bearb.	25.07.	Kühn
Gepr.		
Norm		

Verstellpropeller
2-Blatt, hydraulisch

Werkstoff:

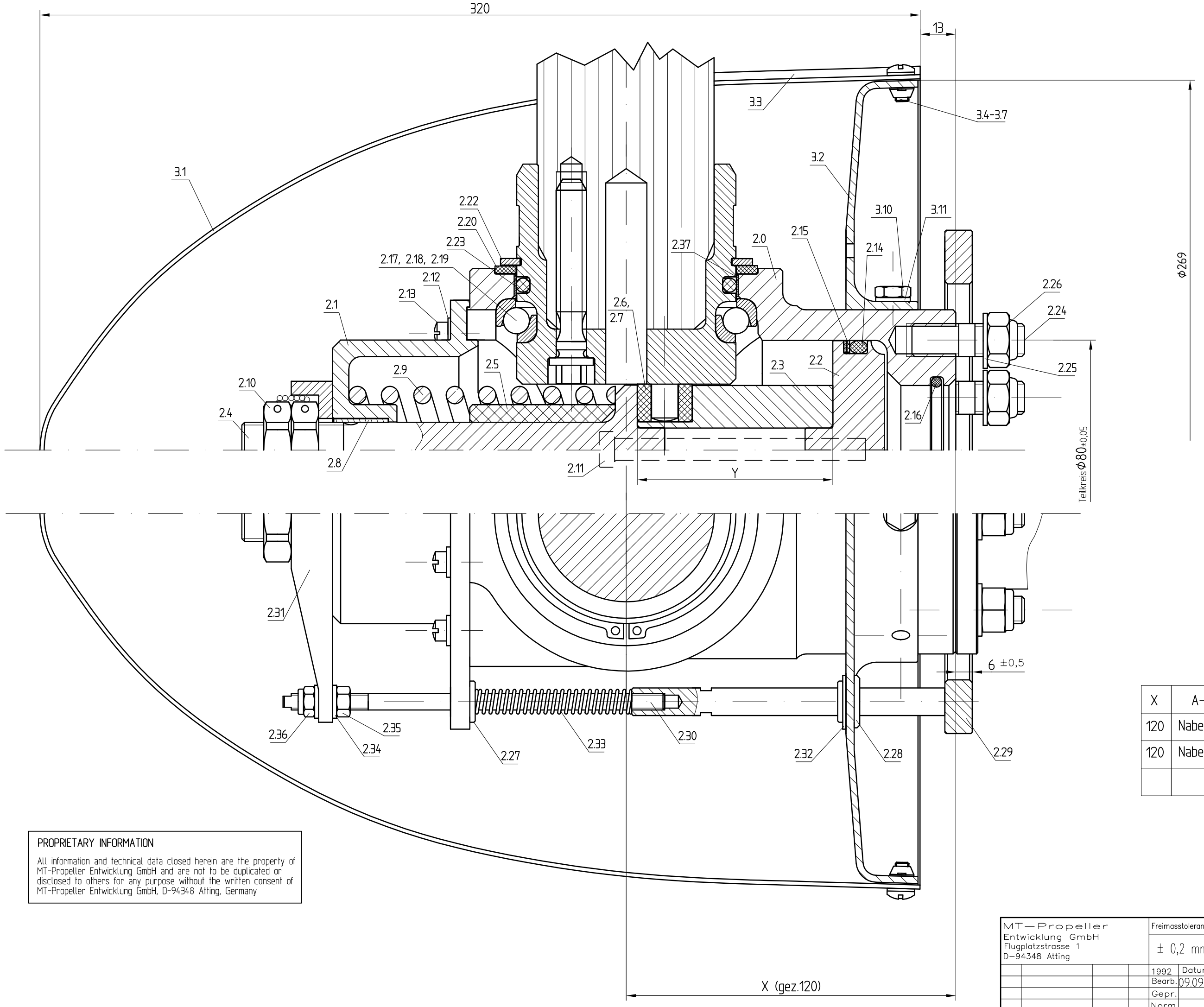
P-439-B

Blatt

Bl.

Zust.	Aenderung	Datum	Name
B	Aktualisierung	22.07.04	CD
A	Aktualisierung	29.07.99	CH

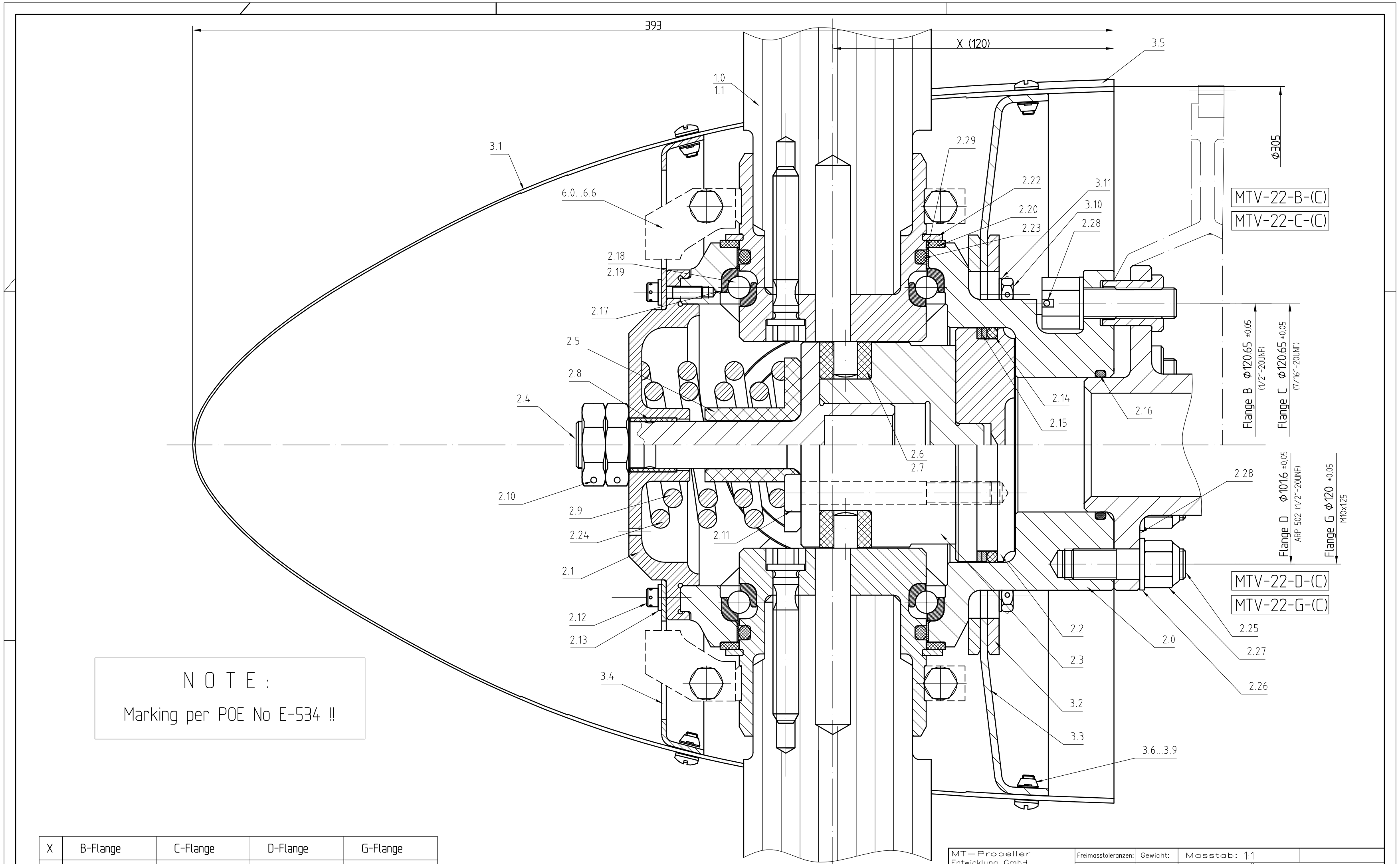
Rohteil:



X	A-Flansch	Y
120	Nabe A-745-D	Kolbenverlaengerung A-009-( )-( )
120	Nabe A-008	Kolbenverlaengerung A-009-( )-( )

MT-Propeller Entwicklung GmbH Flugplatzstrasse 1 D-94348 Atting			Freimasstoleranzen: ± 0,2 mm	Gewicht:	Masstab: 1:1
			1992 / Datum / Name		MTV-21-A-MF
			Bearb. 09.09.94 Kühn		Verstellpropeller 2-Blatt, mechanisch
			Gepr.		
			Norm		
C	Aktualisierung	23.07.04 CD	Werkstoff:		P-443-C
B	Aktualisierung	30.07.99 CH			Blatt
A	Diverses	22.07.97 TK			Bl.
Zust.	Aenderung	Datum Name	Rohteil:		

E-124



NOTE:

Marking per POE No E-534 !!

X	B-Flange	C-Flange	D-Flange	G-Flange
120	hub A-420-( )	hub A-420-( )		hub A-1529-( )
120			hub A-235-( )	
145	hub A-1579-( )	hub A-1579-( )		
200	hub A-593-( )	hub A-593-( )		

MT-Propeller Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: ± 0,2 mm | Gewicht: | Masstab: 1:1

MTV-22-(B/C/D/G)-(C)

Hydr. Constant Speed Prop. 4-Blade

P-225-G

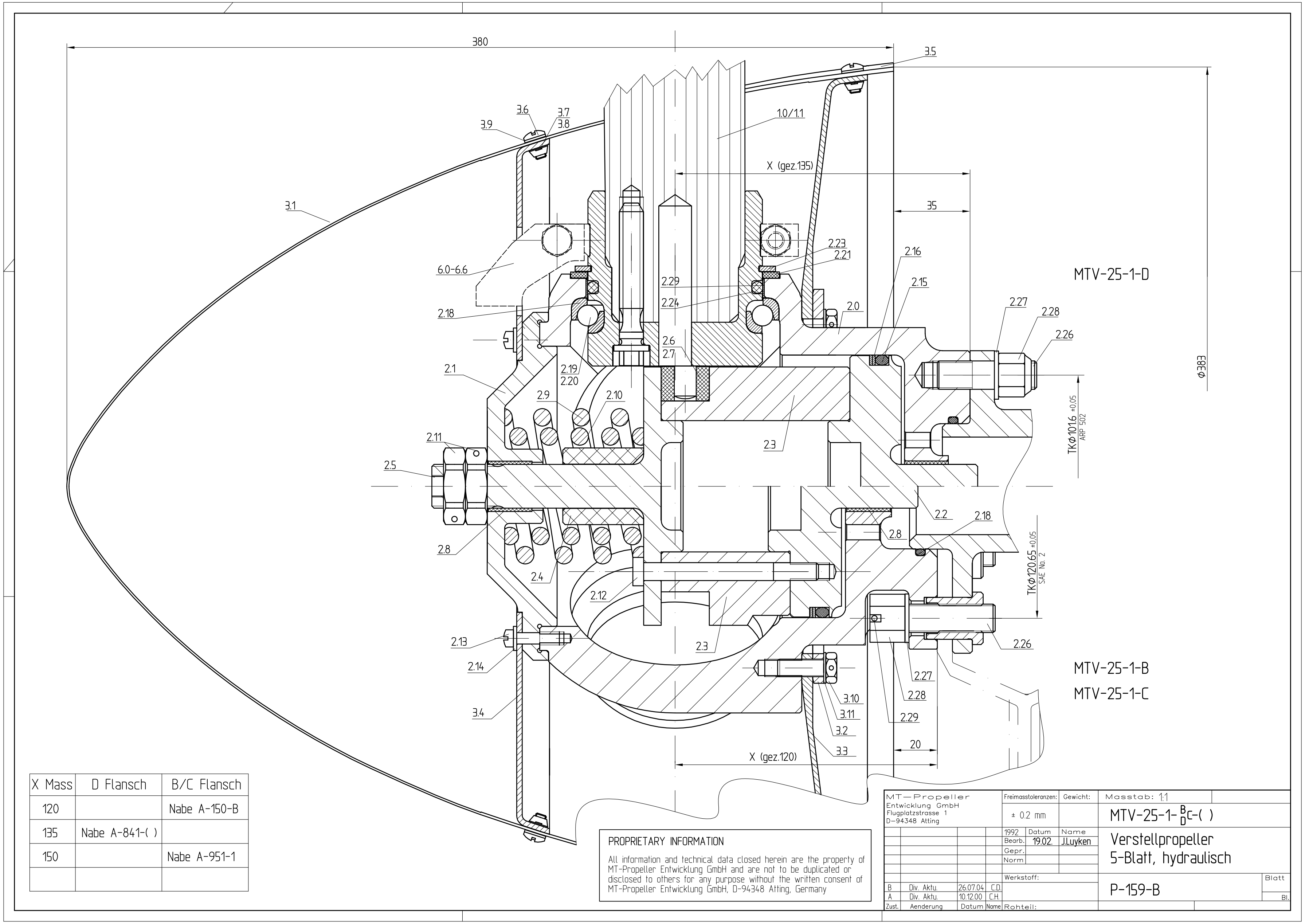
Zust.	Aenderung	Datum	Name
G	Div. Aend.	01.12.08	F.G
F	Div. Aend.	10.03.08	F.G
E	Aktualisierung	29.10.07	C.D
D	Aktualisierung	26.07.04	C.D
C	Div.	28.02.00	F.G
B	2. Zwischenring	09.02.00	C.H.
A	neu gez./Div.	09.02.99	F.G

1988	Datum	Name
Bearb.	17.05.	Poeschl
Gepr.		
Norm		

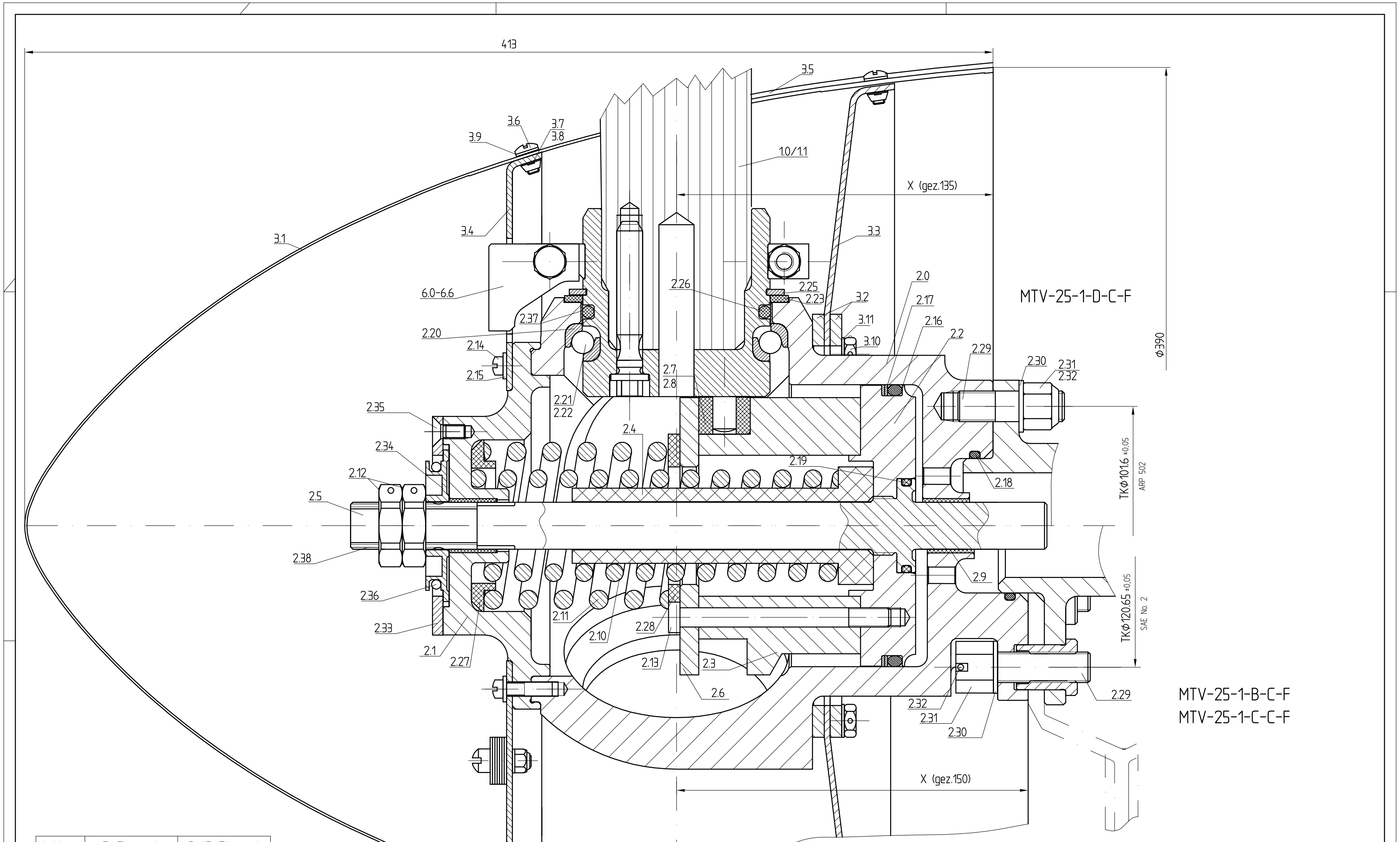
Werkstoff:

Blatt

Bl.



X Mass	D Flansch	B/C Flansch
120		Nabe A-150-B
135	Nabe A-841-( )	
150		Nabe A-951-1



X Mass	D Flansch	B/C Flansch
120		Nabe A-150
135	Nabe A-841-( )	
150		Nabe A-951-1

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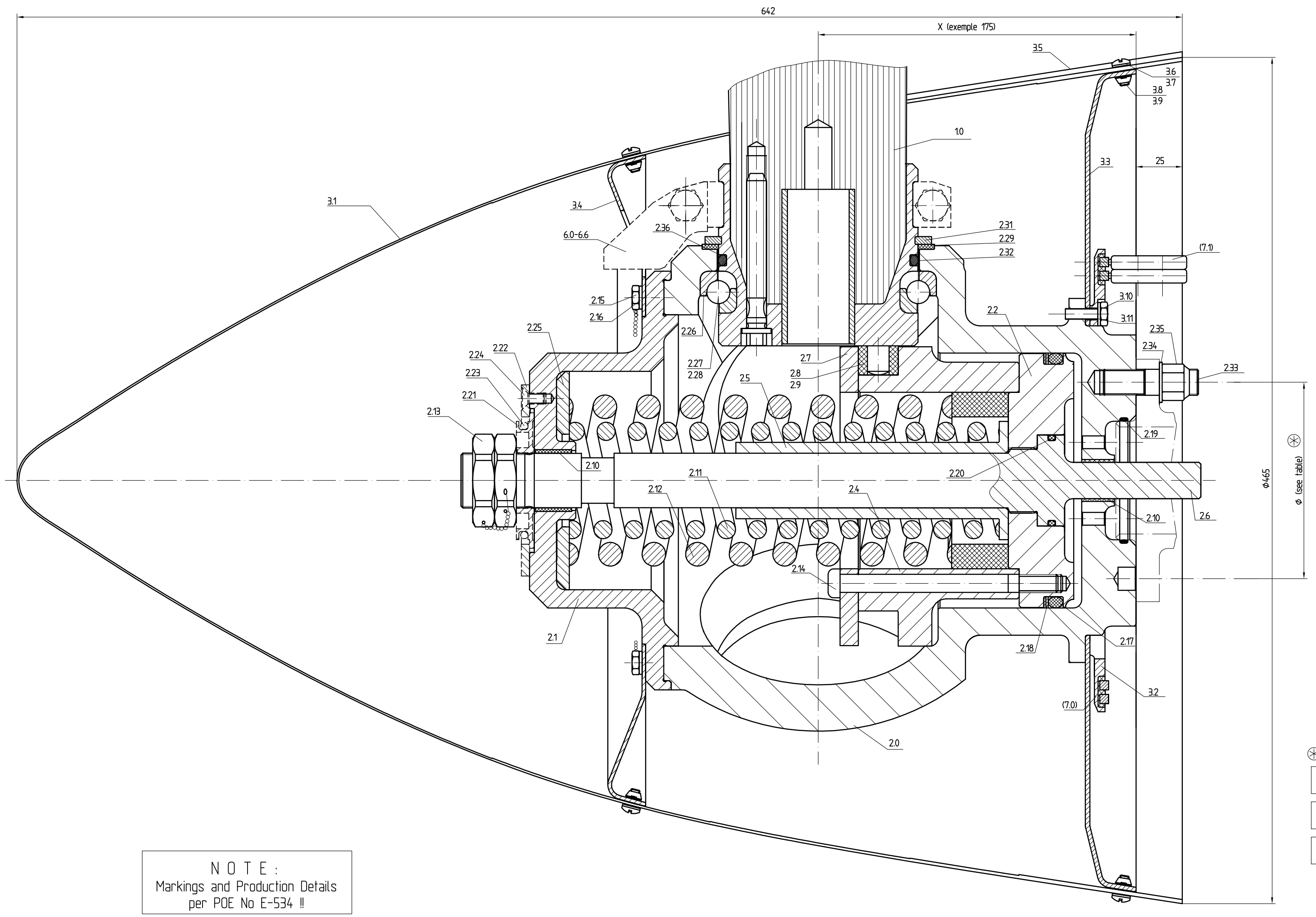
MT-Propeller Entwicklung GmbH Flugplatzstrasse 1 D-94348 Atting	Freimasstoleranzen: ± 0.2 mm	Gewicht:	Masstab: 1:1
	1997 / Datum / Name		MTV-25-1-B/D C-C-F
	Bearb. 19.06. Kühn		Verstellpropeller 5-Blatt, hydraulisch
	Gepr.		
	Norm		
D Aktu. 28.07.04 CD	Werkstoff:		P-546-D
C Div. Aktu. 15.04.03 FG			Blatt
B Div. Aktu. 14.02.03 FG			
A Div. Aktu. 10.12.00 CH			Bl.
Zust. Aenderung Datum Name	Rohteil:		

E-124



⊛

Hub E (ARP 880)
Φ107.95 ±0.05

Hub N (21.25°)
Φ130.18 ±0.05

Hub H (22.5°)
Φ130.18 ±0.05

NOTE:
Markings and Production Details
per POE No E-534 !!

X	E-Flange	N/H-Flange
175	Hub A-1010-( )	
186		Hub A-1597-( )

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MT—Propeller
Entwicklung GmbH
Flugplatzstrasse 1
D-94348 Atting

Freimasstoleranzen: | Gewicht: | Masstab: 1:1

MTV-27-1-E/-H/-N-( )-( )

5 blade hydr. constant speed Propeller

	2001	Datum	Name
Bearb.		04.12.	C.Dippold
Gepr.			
Norm			

Zust.	Aenderung	Datum	Name
D	Huelse / Aktu	02.11.07	C.D
C	Tabelle ⊛	15.02.06	C.D
B	Aktualisierung	30.07.04	C.D
A	Lippen-ring/Aktu	18.09.03	C.D

Werkstoff:

Rohteil:

P-565-D

Blatt

Bl.