



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
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STRUCTURES

Group Chairman's Factual Report

ERA16LA209

**Attachment 2 – Manufacturer Information
(133 pages)**

PZL M-18 Description and Service Manual
Section 4.2



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL-MIELEC”

AIRPLANE DESCRIPTION AND SERVICE MANUAL

4.2. CORROSION CONTROL

The aircraft is of all-metal construction. It is protected against corrosion through the application of epoxy priming and painting with epoxy paints, and, final painting with polyurethane enamels. Operational inscriptions are painted with black paint. In all repairs involving re-finishing proceed as follows:

1. Sand the damaged area to bare metal using a fine grade paper, then clean thoroughly with solvent and allow to dry for 15 to 20 min.
2. Apply one coat of epoxy primer with hardener, allow to dry, then apply the first coat of epoxy paint of appropriate colour and allow to dry.
3. Apply smoothly and evenly the next coats of epoxy paint allowing adequate drying time.
4. Final painting of the aircraft with polyurethane enamels/drying time - about 72 hours in normal ambient temperature/.

Duralumin elements are protected by anodizing.

The parts which are anodized are:

- a/c control system push rods,
- control system levers,
- engine induction system elements
- various elements of skins and ribs
- fuselage side panels.

The mating surfaces of engine induction system elements and control levers should be protected by provisional measures if the protective coating is found to be damaged. Other elements should be primed.



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL - MIELEC”

AIRPLANE DESCRIPTION AND SERVICE MANUAL

4.2.1. Anti-corrosion protection of parts made of magnesium alloy.

Corrosion removing.

Before starting to remove corrosion define its character, i.e., whether it is surface or spot one:

- for surface corrosion it is characteristic that after removing the tarnish with abrasive paper the mirror-like surface reflexes light;
- spot corrosion is characterized by blisters visible after applying abrasive paper.

Remove the surface contamination with steel rod and check for corrosion. Corroded places should be visible.

NOTE: If spot corrosion affects the wheel hub replace the whole part.

In the case of surface corrosion proceed as follows:

- 1/ Remove the enamel coat from the corroded place and within 3-10 mm zone.
- 2/ Remove corrosion with abrasive paper No 180-220.
- 3/ Wash the contaminated surface with B-70 gasoline.
- 4/ Places contaminated and greased, wash with water solution of selen acid H_2SeO_7 and potassium dichromate $K_2Cr_2O_7$ in order to obtain oxygen film.

Here is the selen acid solution composition:

20 g of selen acid H_2SeO_7

10 g of potassium dichromate $K_2Cr_2O_7$

All works should be conducted in ambient temperature not lower than $12^{\circ}C$.



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL - MIELEC”
AIRPLANE DESCRIPTION AND SERVICE MANUAL

NOTE: During oxidation take care of uncovered parts of body.
Oxygen film should be dried in the air up to the
moment it achieves golden colour.

- 5/ Dried places cover with thin coat of epoxy primer 7429-659-130
and dry in temperature:
18-35°C for not less than 24 hours
12-17°C for not less than 36 hours
- 6/ Put on another coat and dry in the same way.
- 7/ Primed surface paint with 2 coats of green epoxy enamel
7469-722-440 and dry in the same way as in the case of primer.

In order to speed up drying, disassemble the given part and
dry it in temperature 60°C for 6,5 hour, 70°C for 5 hours,
80°C for 4 hours.

PZL M 18



WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL-MIELEC” AIRPLANE DESCRIPTION AND SERVICE MANUAL

Cleaning

Regular and thorough cleaning of both the interior and exterior of the aircraft is a major part of corrosion control. All areas of the aircraft are accessible for cleaning by removal of quick release panels.

The following cleaning procedure is recommended for general purposes:

1. Wash all exterior surfaces of the aircraft with plain water and any commercial soap or detergent. Soap and detergent are themselves organic chemicals and it is important that all traces be removed by flushing with water.

NOTE: Some chemicals cannot be effectively removed by detergent solutions and special cleaning fluids are available for this purpose. Chemical manufacturer or suppliers will advise on the best fluid for a particular job.

2. Detach all removable panels from the aircraft.

Wash the rear fuselage /aft of the wing leading edge/ per it.1 above. Particular attention should be paid to tube joints, skin bends, etc. Remove excess moisture after flushing.

The forward fuselage and engine section should not be cleaned with water as it could cause the removal of lubricants, and rusting of components and hardware. General purpose, non corrosive cleaning fluids should be used in these areas.

PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL - MIELEC”

AIRPLANE DESCRIPTION AND SERVICE MANUAL



Particular attention should be given to wing fittings, gear fittings and the attachments of oil cooler, hopper and engine mount.

3. Hopper cleaning should be accomplished at the end of each working day. A good commercial detergent should be used, followed by a thorough flush with water.

4.3. LIFTING AND JACKING

Two jack points are provided on center wing spar located on the RH and LH sides of the fuselage. When using the jack points to lift the aircraft, all hopper loads should be removed.

A jack point is also provided in the rear part of the fuselage at the tail wheel fitting. To remove a main wheel automotive bumper jack can be used and it should be put under piston rod which the axle presses into. To remove the tail wheel, a standard equipment jack can be used. In order to lift the rear part of the fuselage to the flight level use a special lengthening device added to the jack.

PZL M-18 Description and Service Manual
Section 4.27



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

4.27. NON-DESTRUCTIVE AIRFRAME FITTING STRUCTURAL CONTINUITY INSPECTION METHODS

During inspection of the airframe fittings for absence of cracks it is recommended to use one of the below inspection methods:

- magnetic particle inspection;
- fluorescent penetrant inspection;
- eddy-current inspection.

The inspection shall be conducted by qualified personnel with suitable professional experience.

/1/ Magnetic particle inspection

This method enables to detect surface defects of 0,001 mm width, down to the depth of 3 mm under the surface of parts made of ferromagnetic materials.

- a/ Surface condition - the surface must be clean. Clean the surface using petrol or other degreasing agent. If paint is chipping, clean the affected places with abrasive paper;
- b/ Residual magnetism measurement - to be conducted on new part and to check the correctness of demagnetizing after previous inspections.

NOTE: In exceptional cases it is allowed to check using a chain of small paper clips - whether they react or not when approaching the checked part.



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

c/ Apparatus - magnetic flaw detector developing magnetic flux of 8.000 Wb, and minimum magnetic field intensity of 2,400 A/m.

The design of the apparatus shall be such as to enable the pole shoes to approach the whole surface of the inspected fittings. It is recommended to use a magnetic flux flaw detector of the DMS-11 type, proved in practice, supplied by DC of 24V, developing 5,000 A/m magnetic field intensity in parts of cross section of 5 cm² or less.

d/ Magnetic slurry

- magnetic powder in transformer oil; or
- magnetic powder in kerosene-oil.

Recommended ratio:

- ferro-ferric oxide, 25[±]5 g per 1 dm³ of oil;
- ferro-ferric oxide, 10 g per 3/4 dm³ of kerosene and 1/4 dm³ of transformer oil.

e/ Inspection procedure

- check the surface condition of the fitting.
The surface condition shall conform to the requirements specified in item /a/.
- magnetize and apply the magnetic slurry.

Magnetize in two mutually perpendicular directions covering the surface to be inspected with the prepared magnetic slurry.



PZL M18

WYTWÓRNIĄ SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

- inspect the fitting for absence of defects:

The painted surface to be inspected visually during magnetizing, and the remaining surface after the slurry has dripped.

Pay particular attention to places especially liable to cracking.

Acceptance conditions:

- no cracks are allowed;
- no scratches are allowed on transitions and radii less than 2 mm from the hole or recess edges;
- scratches on remaining surfaces:
surfaces less than 50 cm² - up to 2; 3 mm long scratches of 5 mm total length are allowed;
surfaces of 50 - 100 cm² - up to 3; 3 mm long scratches of 8 mm total length are allowed.

- demagnetize

Demagnetize using any device having the necessary capability to demagnetize the whole fitting surface. It is recommended to use the DMS-11 demagnetizer with rubber washers;

- check the correctness of demagnetizing;

Check the degree of demagnetizing by measuring the residual magnetism with magnetic field meter. The residual magnetism shall not exceed 1,2 mT. It is recommended to use the TH-26 teslameter. In exceptional conditions it is allowed to use paper-clip chain.



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

/2/ Fluorescent penetrant inspection.

This method allows to detect capillary surface defects in various materials.

Sensitivity-slit-type defects 0,03 + 0,04 mm deep and 0,001mm wide with surface finish of $Rz_{\sqrt{40}}$ and less.

a/ Surface condition - the surface must be clean. The paint shall be removed, if possible, to pure material. Any contamination such as grease, fat or dirt shall be cleaned.

b/ Necessary materials:

- petrol, acetone or other degreasing agent;
- red penetrant defectozole;
- white penetrant defectozole;
- paint remover;
- spindle or transformer oil;
- flannel cloth.

It is recommended to use the "001" or "002" red penetrant defectozole, the "A" white developing defectozole and the "Z-1" remover.

c/ Inspection procedure.

The surface must meet the conditions specified under item /a/; directly before the inspection it shall be degreased in petrol or acetone using a brush or cloth.



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

- application of red penetrant defectozole:

Apply the white penetrant defectozole by amply sprinkling the whole inspected surface of the fitting three times.

Sprinkle in 1-2 minute intervals.

- removal of red defectozole:

Remove the red penetrant defectozole immediately after the application of the last layer by sprinkling with the remover or wiping with cloth wetted in the remover, spindle or transformer oil.

- application of white developping defectozole:

Apply a uniform layer of white developping defectozole onto the whole inspected surface by amply sprinkling.

- visual evaluation of the inspected surface:

Inspect visually the whole surface. In the case of the fuselage-to-centerwing fittings use a mirror. During the inspection of the above fittings pay particular attention to welds. Acceptance conditions as specified under item /1//e/.

- cleaning of the surface after inspection:

Remove the white developping defectozole with dry cloth or brush.



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC«
AIRPLANE DESCRIPTION AND SERVICE MANUAL

/3/ Eddy-current inspection:

This method allows to detect surface defects of the crack type and other. Sensitivity - defects 0,001 mm wide and below ~0,1 mm deep. The above sensitivity applies to smooth surface uncovered by any protective coats.

a/ Surface condition - the surface must be clean, free of contamination such as grease, fat or other dirt, Presence of paint coating decreases the sensitivity of the inspection.

b/ Apparatus - flawmeter or other eddy-current device with appropriate probe set.

Probes of adequate shapes and dimensions allow to inspect the whole surface of various geometry fittings.

It is recommended to use the MP3 flaw detector.

c/ Inspection procedure:

- inspection of the surface condition:

The fitting surface to be inspected must meet the criteria specified under item a/; if painted, check the quality and uniformity of the paint coating.

- contact movement of the probe on the whole surface.

When moving the probe on the whole surface of the inspected fitting ensure constant geometrical position of the probe with respect to the inspected surface /e.g. perpendicular direction/. This is possible when using appropriate probe set.

- interpretation of the indications.

Complicated geometry of the fittings makes it difficult to interpret the instrument indications. Due to its shape, presence of weld and difficult probe access the inspection of the fuselage-to-centerwing fittings is particularly difficult.

If suitable probe is lacking it is recommended to inspect these fitting using other method, e.g. fluorescent penetrant or magnetic particle inspection.

Acceptance conditions – as specified under item 1(e).

4.27a. Inspection of the main centerwing-to-outboard wing attach fittings

Complete a detailed inspection of the main centerwing-to-outboard wing attachment fittings for:

- Corrosion in the expansion mandrel holes and at external surfaces of the joints;
- Cracked lugs, with particular attention paid to surfaces of the expansion mandrel holes in the wing lower joints;
- Wear-out at the hole and expansion mandrel surfaces.

Inspect the fittings for cracks by a magnetic rack detection method with the expansion mandrels removed.

Service Bulletin E/02.170/2000 provides information on the inspection and procedures to follow if any of the above conditions are found.

4.27b. Anti-corrosion protection of the main centerwing-to-outboard wing attach fittings (corrosion protection of the expansion mandrel holes)

Ensure anti-corrosion protection by application of DINITROL AV-30; proceed as follows:

- Remove locking cotter pin from one of the joints (either upper or lower (one), undo the nut, remove the washer, threaded bolt and the conical bushing (ref. the figure 6.4-1, Section 6);
- Raise and support the wing to ease up the load in the centerwing-to-outboard wing attach joints;
- Pull out the expansion bushing so that it extends mid-length;

NOTE

The expansion bushing must not be hammered out unless the conical bushing has been previously removed.

- Apply DINITROL AV-30 over the extending length of the expansion bushing and the exposed surfaces of the hole in the fittings;
- Position the expansion bushing with the notch facing up (if installed notch-down);

PZL M-18 Description and Service Manual
Section 5



PZL M18

WYTWÓRNIA SPRZĘTU KOMUNIKACYJNEGO »PZL – MIELEC«
AIRPLANE DESCRIPTION and SERVICE MANUAL

SECTION 5

MAINTENANCE SCHEDULE

CONTENTS	PAGE
5.1. GENERAL	5-1
5.2. PRE-FLIGHT INSPECTION	5-7
5.3. FINAL WORK	5-12
5.4. SPECIAL INSPECTION	5-13
5.5. PERIODIC WORK	5-15

The Section is approved by
POLISH AIRWORTHINESS AUTHORITY (GICA)



PZL M18

WYTWÓRNIĄ SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

SECTION 5

MAINTENANCE SCHEDULE

5.1. General Principles of Technical Servicing

1. This schedule is the basic document determining the scope and frequency of periodical work connected with maintenance of airframe, power plant, board and agricultural equipment. Proper and time-due execution of these duties ensures the maintenance of the required level of a/c reliability its airworthiness, and efficiency of agricultural equipment.
2. The technical servicing of the a/c should be executed by a group of engineers knowing construction, operational capabilities of the M18 airplane, this schedule, and engineering instructions concerning the execution of work.
3. This schedule includes the following kinds of airplane maintenance.

(a) Routine maintenance:

Pre-flight Inspection performed:

- before first flight at the beginning of flight day after night parking;
- after completing the work covered by periodic duty scope.

Inspection before take-off - conducted directly prior to each flight.

The scope of work to be done is described under Sub-section 4.1, AFM.

Special Inspection - required in specific cases associated with special conditions or events which call for immediate inspection of the airplane to ensure its safety.



PZL M18

WYTWÓRNIA SPRZĘTU KOMUNIKACYJNEGO »PZL – MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

/b/ Periodic maintenance:

- work after every 50 ± 5 hours of flight
 - work after every 100 ± 10 hours of flight
 - work after every 500 ± 50 hours of flight.
4. The maintenance schedule is realized on the basis of hours flown by the aircraft from the beginning of its operation or since last overhaul during scheduled periods of 50, 100, 500 hours independently of tolerance with which the previous periodical work had been executed.
5. All work included in this schedules and other additional duties on the a/c should be executed acc. to the mandatory instruction, M18 servicing manuals, ASz-62IRM18 engine log book as well as the bulletins edited by the airplane and engine manufacturer.

NOTE

All nuts centre-punched to prevent their undoing can be removed only by manufacturer or authorized repair station.

6. After the work connected with replacing and adjusting the part, assemblies or accessories in a/c control system, power plant or dispersal equipment, check proper movements of levers and travel of movable surfaces.
7. Any defects found by the flight crew during flight or maintenance must be obligatorily removed.
8. For all kind of airplane maintenance and all additional work done on the a/c any records to the engineering documentation are made acc. to the mandatory regulations.



PZL M 18

WYTWÓRNIĄ SPRZĘTU KOMUNIKACYJNEGO „PZL - MIELEC”

AIRPLANE DESCRIPTION and SERVICE MANUAL

9. During all kinds of servicing check the number of operating hours of the engine, oil level and all accessories with limited service life in order to determine their condition or the possibility of prolonging their service.
10. Load the a/c with chemicals and carry out disinfection after finishing agro operations acc. to hygiene and safety requirements obligatory for these operations.
11. Precautions during servicing airborne equipment.
When servicing the aircraft and its accessories observe the following guidelines:
 1. Upon entering the cockpit check:
 - if all switches are in neutral and off position,
 - if all levers, handles and knobs are in neutral position,
 - if there are seals in the secured places.
 2. Start and check the engine in the place designed for this purpose with efficient brakes, and chocks positioned under wheels.
 3. Remember that during engine operation it is prohibited to come close to the propeller /not nearer than 33 ft /10 m//.
 4. Before work connected with de-sealing of the pressurized part of the hydraulic system reduce pressure therein to zero.
 5. Carry out all electrical equipment inspection and servicing with the power supply switched off.

PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL - MIELEC”



AIRPLANE DESCRIPTION and SERVICE MANUAL

6. Check the presence of voltage in the board mains only with the help of instruments.
7. For checking live radio and electrical equipment the ground start receptacle must be used.
8. All ends of electrical wiring must be insulated.
9. Live connecting boxes, electrical plates and terminal strips cannot be left open.
10. Do not solder near places cleaned lately with gasoline.
11. Select fuses acc. to electrical schematic.
12. During aerial application follow local instructions concerning work organization, operational safety regulations, handling chemicals depending on their class and individual instructions on the package.
In addition to the above principles observe also the following:
 - use protective clothing, gloves, goggles, fresh air masks or respirators,
 - avoid toxic materials contacting the body,
 - avoid inhalation of toxic materials,
 - upon finishing dispersing flight wash yourself with warm water and soap and change clothing,
 - if symptoms of poisoning appear /headaches, indisposition/ visit a doctor at once and give him the description of the chemicals which were being dispersed.



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL-MIELEC”

AIRPLANE DESCRIPTION and SERVICE MANUAL

WARNING: 1. REMEMBER! ALL CHEMICALS ARE OFTEN POISONOUS
AND DANGEROUS TO YOUR HEALTH.

2. DURING ALL OPERATIONS INVOLVING SPREADING
PESTICIDES AND FERTILIZERS OBSERVE SAFETY
AND HYGIENE REGULATIONS .



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL – MIELEC”

AIRPLANE DESCRIPTION and SERVICE MANUAL

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PZL M18

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5.2. Pre-flight Inspection

Airframe

1. Check flight book and if any defects are registered repair them.
2. Check if fire fighting means are near a/c, if there are chocks under wheels and if the a/c is grounded. On the airplanes serial number 12013-01 and subsequent the grounding cable terminal is exchangeable. If the terminal is worn it should be replaced. Two spare terminals are included in the spare parts kit.
3. Remove covers from the aircraft and the power plant.
4. Make sure that the magnetos are off and remove tiedowns.
NOTE: When the O.A.T. is $+5^{\circ}$ or below warm the engine and oil cooler.
5. In cold weather remove all accumulation of frost, ice or snow from a/c surface, propeller, windshields, control surfaces, wheels, shock struts and connections.
6. Remove controls locks.
7. Check if fuselage, wings, control surfaces and fairing skins are in good condition. Check that all peepholes are closed and that the doors are sealed. Check if drain holes in the fuel tank are clean.
8. Check and clean the exposed region between outer and center wings behind rear spar from the accumulated contamination.

Cockpit

1. Make sure all power switches are off.
2. Inspect the cockpit, make sure that all equipment is present and that it is clean.



PZL M 18

WYTWÓRNA SPRZETU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRPLANE DESCRIPTION AND SERVICE MANUAL

3. Check the pressure in flap control and brake hydraulic system.
4. Check for smooth control stick and rudder bar movement and proper deflection of control surfaces.
5. Check the instruments and placards.
6. Check the pilot seat and make sure that:
 - the seat is not damaged
 - the seat belts and shoulder harness are not damaged
 - the quick disconnect buckle is efficient

Power plant

1. Check propeller for damage.
2. Check engine for oil and fuel leaks. Remove the heat muff oil sump or unscrew the exhaust manifold plug /whichever is installed/ and drain the accumulated oil.
3. Inspect engine cowlings and oil cooler duct. Make sure there is no external damage.
4. Inspect fuel and oil drain and vent lines. Check for contamination. In winter, check for obstruction with snow or ice. Drain fuel from the drain system through drain valves in under wing skin. Drain fuel sump from the header tank through the drain valve.
5. Check fuel level and refill, if needed. Ten minutes after filling drain 0,13 - 0,26 US gal /0,11 - 0,22 Imp.gal; 0,5 - 1 l/ of fuel from the header tank and check if it contains no water or mechanical damage.
6. Check Fuel Gauge Operation. /Pointer deflection after switching on the gauge/.



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO PZL-MIELEC AIRPLANE DESCRIPTION AND SERVICE MANUAL

7. Check oil quantity and fill if necessary.
8. Check oil filter connections for leaks and security.
9. Check the engine for oil and fuel leaks and the wings in the region of fuel tanks for fuel leaks.
10. Once a week grease external movable elements of the fuel filler lock with CIATIM-201 Lubricant, etc.
11. Drain oil sediment from the tank in summer 0,26 US gal (0,22 Imp., gal ; 1 l), in winter 0,52 US gal (0,44 Imp.gal; 2 l).
12. Make sure that engine exhaust valves are tight.
13. Clean the engine, oil cooler and cowlings. Clean the propeller with a piece of cloth.
14. Prepare the engine for starting. Start and check the engine acc. to "Flight Manual".

WARNING: WHEN THE AIRCRAFT HAS NOT BEEN OPERATED FOR MORE THAN THREE DAYS, BEFORE STARTING ENGINE UNSCREW FORWARD SPARK PLUGS No.1, 2 and 9. POUR ABOUT 30-40 G /2-3 pdl/ OF MS-20, MK-22, AERO SHELL OIL /100W OR OTHER EQUIVALENTS TO THE CYLINDERS. SCREW IN SPARK PLUGS.

NOTE: Before starting engine remove all unnecessary objects in front and behind the aircraft and clear the propeller.

15. After engine check:

- inspect engine and cowlings for fuel or oil leaks from the fuel and hydraulic systems;
- check the accessories, plumbing and engine controls connections for condition and security;
- check propeller for damage.



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

Dispersal equipment

1. Clean thoroughly the dispersal equipment from the remains of chemicals paying particular attention to elements with corrosion hazard. Preserve all movable connections with lubricant.
2. Inspect the equipment for general condition, make sure that the gate is closed tight, the attachment is reliable and the components of the equipment are clean.
3. Check the plumbing for stoppage, the controls for correct operation and atomizer brake for efficiency.
4. Check the atomizers revolution turning them by hand. They should revolve smoothly without braking and seizures.
5. To check ag pump fan brake operation, release it and after a lapse of several seconds engage it again.
6. Check the agitator drive reduction gear and replace oil therein.

NOTES: 1. Use the Hipol 15 or Hipol 15F oil for the reduction gear.

2. At first replace oil after 10 hours and then every 50 hours of agitator operation.

3. If any leaks are found in the reduction gear, remove covers and shims and lubricate their mating surfaces with sealing compound, then re-assemble them.

7. Check attentively all ag equipment connections. Make sure they are not damaged. Pay particular attention to spreader leading edge, gate rubber gaskets, attach joints, pump and atomizer fan blades.

Landing gear

1. Examine landing gear shock struts for cracks, deformation and scratches. Check connections for security and shock struts for deflection. Be sure if there are no oil leaks from the brake hydraulic system and shock struts.



2. Check landing gear wheels. Check the tires for damage, local bulging, punctures, seizures or tire shift. Check tire inflation.
3. Inspect shock absorbers suspension fittings. Check for cracks, deformation and security.
4. Inspect main wheel brake installation for damage, leaks, reliability of attachment and security. Check brake friction lining wear by measuring the clearance between the piston case and the lining with the brake set ON. The max. clearance is 5 mm. If it is more carry out readjustment.
5. Check the reliability of parking brakes.

HYDRAULIC SYSTEM

1. Check hydraulic system units and plumbing. Check for leaks, damage and reliability of attachment.
2. Check out an amount of oil in hydraulic tank the level of which should be visible in the "eye" of control window of the tank at a min. pressure in emergency hydraulic system equal to 135 kg/cm^2 (2130 psi).
Make up to the mark if necessary.

3. Check the FM-3 filter contamination signalling device.

AIRCRAFT CONTROLS

1. Inspect suspension fittings of ailerons and flaps. Check for corrosion, cracks and free play, inspect also connections and their protection against damage.
2. Check visually weld seams on the lever in the rear fuselage part.

AIR CONDITIONING SYSTEM

1. Check the valve switching on fresh air supply to the cockpit for proper functioning.



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC«

AIRPLANE DESCRIPTION AND SERVICE MANUAL

5.3. FINAL DUTIES

Upon completion of the flight day proceed by the following steps:

1. Clean and wash the airplane structure and landing gear in water with additives such as a soap or detergents to remove contamination caused by chemical action.
2. After drying, apply LT-47 grease or its substitutes on all the landing gear joints, main and tail landing gear shock absorber piston rods, as well as on the locks and fasteners being outside the airplane.
3. Remedy the troubles observed in the flight and secure the airplane for parking per section 4.7 and 4.8.

5.4. SPECIAL INSPECTIONS

Special inspection to be conducted after pilot report of hard landing or flight under high air turbulence conditions.

5.4.1. Post-flight inspection after flight in high air turbulence or storm:

- a) inspect the control elements (tail surfaces, ailerons, flaps) for general condition; check the push-rods and levers for signs of deformation or damage;
- b) inspect the engine, wing and tail attachment fittings for signs of deformation or cracks;
- c) inspect the skin, locks, rivets and load carrying elements in the region of landing gear, wing, hopper and tail unit attachment for deformation, cracks or weakening; check for signs of lightning;
- d) check the radio-electro-navigation equipment for proper operation;
- e) if there is any liability that the structural elements of the airplane could change their position, level the airplane.

5.4.2. Inspection after hard landing

- a) inspect the landing gear, engine, wing, hopper and tail unit attachment fittings; check the skin and load carrying elements in the region of the landing gear, wing and tail unit for signs of damage, deformation or cracks; check for absence of fuel leaks;
- b) inspect accessory blocks, shock-absorbing frames and shock-absorbers for mechanical damage; check hopper for signs of leaks;
- c) if there is any liability that the structural elements of the airplane could change their position, level the airplane.

PZL M18
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC"
AIRPLANE DESCRIPTION and SERVICE MANUAL

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5.4.3. Verifying inspection after every 3000⁺³⁰⁰ flying hours

(Performed after every 3000⁺³⁰⁰ flight hours, i.e. on airplanes which reach in succession 3000, 6000 and 9000 flight hours).

Preliminary work

- (1) Prepare the aircraft for the inspection, remove fairings and panels and open all covers over peep-hole and hatches.
- (2) Depreserve airframe and equipment if earlier preserved with temporary protection means.
- (3) The airframe and engine shall be washed clean before inspection.
- (4) Perform periodical work specified in Technical Service Schedule after 500 flying hours.
- (5) Incorporate all the mandatory bulletins on the airplane and review and supplement the descriptive-operational documentation.

Verifying inspection scope

- (1) Evaluation of center-and-outer wings:
 - a) remove centerwing and outer wings from the aircraft;
 - b) test joint fitting structure continuity centerwing-to-outer wings and centerwing-to-fuselage attach joints using non-destructive inspection method (particle inspection);
 - c) pay attention to the condition of brackets D22.200.21.1L/P in outer wing at the outer-to-center wing attach joints;
 - d) measure diameters of particular holes with a view to their battering;
 - e) inspect wing skin, nose skin particularly in the centerwing middle section and lower skin in the region of main and rear spar for lack of cracks and loose rivets.
- (2) Evaluation of main and tail landing gear:
 - a) dismantle main and tail landing gear;
 - b) examine the condition of landing gear attach joints and main landing gear attach seats both visually and means of a magnifying glass;
 - c) measure diameters of holes and bolts. If clearance is found, install repair bolts;



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRPLANE DESCRIPTION AND SERVICE MANUAL

magnifying glass;

c/ measure diameters of holes and bolts. If clearance is found, place repair bolts;

3. Evaluation inspection of engine attach joints and vertical/horizontal empennage:

a/ remove engine with frame and vertical and horizontal empennage;

b/ examine the condition of particular joints both visually and with 5 x magnifying glass;

c/ inspect visually engine frame;

d/ measure diameters of engine and empennage attach joints as well as diameters of joints attaching rudder and elevator to stabilizers /fin and tail plane/. Should dimensions exceed values given in Repair Manual, place repair bolts;

e/ make sure if there are no cracks on rudder and elevator skin.

4. Evaluation of fuselage:

a/ remove fuselage skin;

b/ inspect the truss paying attention to the condition of brackets attaching skin panels, accessories and assemblies;

c/ check the skin panels in the area of their attachment to the fuselage brackets for cracks;

d/ examine Camlocks for security of attachment;

e/ remove corrosion and make paint touches on coating finish if required.

5. Protection and preservation of the airplane:

a/ protect the aircraft with anti-corrosive temporary protection means.

The list of recommended protection means and their application methods are specified under Section 4, it.4.28 of the "M18 DROMADER Airplane Description and Service Manual".



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC« AIRPLANE DESCRIPTION AND SERVICE MANUAL

NOTES

1. While checking use five-fold magnifying glass.
2. Test joint structure continuity using non-destructive inspection method e.g. magnetic particle inspection or fluorescent penetrant inspection.
3. Non-destructive inspection methods and their requirements are stated under Section 4, "Servicing and Inspection" of the "M18 Airplane Description and Service Manual".
4. Conduct structure continuity test of the fittings mentioned under it.1 on each aircraft, while the remaining fittings shall be checked only in cases of possible presence of cracks.
5. Measure diameters of holes with a view to their battering in two perpendicular directions using a measuring gauge of 0.01 mm minimum graduation.
6. Hole dimensions and their tolerances /degree of their wear/ should be kept within limits given in the M18 Repair Manual issued May 1981, attached to each aircraft and updated by the airplane Manufacturer by sending some copies of revisions for information.
7. Perform typical repairs of movable connections and remedy defects found during verifying inspection per instructions given in Sections I and II of the a/m manual.

Final duties

1. Assemble the airplane, adjust and check all the power plant and flight control systems for proper functioning.
2. Check levelling, weighing and balance of the airplane.
3. Perform test flight.



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL - MIELEC”

AIRPLANE DESCRIPTION and SERVICE MANUAL

5.5. Periodic Work

"+" Mark indicates that a given work should be done in the specified period of time.

Item	Kind of work	Approximate flying hours between inspections		
		50	100	500
1	2	3	4	5
	PRELIMINARY WORK			
1	Check the flight book and in case of registered defects repair them. Ask the crew about engine operation and possible defects found during flight.	+	+	+
2	Make sure that the magnetos and the battery are off, that fuel cut off valve /fire protection valve/ is in the closed position and that the wheel brakes are engaged.	+	+	+
3	Check the engine for oil and fuel leaks and fuel tanks for fuel leaks.	+	+	+
4	Clean the engine, cowlings and oil cooler. Clean the propeller with a clean cloth.	+	+	+
5	Clean the landing gear, a/c skins, dispersal equipment, cockpit and baggage compartment.	+	+	+
6	Check the a/c paint coat. If there are defects remove them.	+	+	+



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL – MIELEC”

AIRPLANE DESCRIPTION and SERVICE MANUAL

1	2	3	4	5
	AIRFRAME			
	Check bonding conductor for damage	+	+	+
	<u>Fuselage Skins</u>			
1	Inspect all panels, cowlings and hopper for cracks, chafing, and security of fasteners.		+	+
	<u>Framework</u>			
1	Inspect the fuselage framework for signs of corrosion or cracks, particularly around welds and in hopper area.		+	+
	<u>Cockpit</u>			
1	Check condition of markings and inscriptions on instruments and placards		+	+
2	Check instrument power lines for tightness security, chafing and attachment.		+	+
3	Check engine, fuel system and dispersal equipment control levers condition.		+	+
4	Check operation of the emergency door jettison.		+	+

PZL M18
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC"
AIRPLANE DESCRIPTION and SERVICE MANUAL

1	2	3	4	5
5	Check security and condition of seat belt and shoulder harness.		+	+
6	Check seat for security and proper adjustment and check cushions for general condition.		+	+
7	Check windshields and window for cracks, crazing or scratches and missing screws.		+	+
8	Check doors for security of hinges and correct operation of door locks.		+	+
	<u>Dispersal Equipment</u>			
1	Inspect dispersal equipment according to Section 4.24 of this manual.	+	+	+
	<u>Wing</u>			
1	Inspect the wings for cracks and check ailerons attach brackets for cracks and security.		+	+
2	Inspect wing skins for cracks and loose rivets, and pay particular attention to centerwing i.e.: -upper skin of the front part; -skin and cover plate at front spar at the bottom part; -bracket D22.200.21.1L/P connecting outer wing fittings with rib no. 1.		+	+
3	Check spray booms attach points for security (if installed).		+	+

It.	Kind of work	Approximate flying hours between inspections		
		50	100	500
4.	Inspect centerwing to fuselage and centerwing to outwing attach fittings for signs of cracks, corrosion and deformation.		+	+
4a.	On airplanes with total flight time below 2500 hours, during each 500-hour periodic maintenance, apply anti-corrosion protection to the expansion mandrel holes in the main wing attach fittings (centerwing-to-outboard wing attachment), as defined in Sec. 4, para 4.27b)			
4b.	On airplanes with total flight time of over 3000 hours perform as follows: -at least once a year inspect the wing main attach fittings (centerwing-to-outboard wing attachment) for corrosion; -during each 500-hour periodic maintenance inspect in detail the wing main attach fittings (centerwing-to-outboard wing attachment), as defined in Sec. 4, para 4.27a.			
5.	Check the jack points for condition.		+	+
	<u>Ailerons and Flaps</u>			
1.	Check ailerons and flaps for: - smooth deflection - deflection angle	+	+	+
2.	Inspect extreme ribs and all aileron and flap skins for general condition, cracks and loose rivets.		+	+
3.	Check the aileron attach hinge for visible deformation and cracks.			+
4.	Inspect flap push rods, mounting brackets and bearings for general condition.		+	+
5.	Inspect flap actuator jack, jack attachment and levers for general condition.		+	+
6.	Check the flap and aileron axial and radial clearance per section 4, item 4.18.4.		+	+
7.	Check rocker clearance in the aileron control system in centerwing in accordance, with section 4, item 4.18.5.		+	+



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL – MIELEC« AIRPLANE DESCRIPTION and SERVICE MANUAL

1	2	3	4	5
	Tail Empennage			
1	Check elevator, rudder and trim for: - smooth movement - deflection angles.	+	+	+
2	Inspect the connection of stabilizer for general condition and security.	+	+	+
3	Check skins for cracks, dents and general condition.	+	+	+
4	Check control surface suspension for excessive clearance and wear. Axial clearance is not allowable. Elevator radial clearance is 0,28 in (7 mm), rudder radial clearance is 0,39 in (10 mm). Allowable rudder tab axial clearance is 0,04 in (1,0 mm), radial clearance is 0,06 in (1,5 mm). Elevator tab radial clearance is 0,06 in (1,5 mm). Elevator tab axial clearance is not allowed.	+	+	+
5	On airplanes up to S/N 1Z010-30 check for cracks of elevator control system lever (D51.110.00.2) in fuselage rear part, with regard to the zone where 2 vertical pipes are connected to upper horizontal one.			+
	Landing Gear			
1	Inspect tires for damage, cracks, punctures, local bulging and displacement of tire with respect to wheel hub (acc. to test stip).		+	+
2	Inspect main gear brake lines for damage and leaks, for reliability of attachment and security.		+	+
3	Check brake lining for wear by measuring the clearance between brake cylinder and lining with the brake engaged. It should be maximum 1/5" (5 mm). If it is greater, adjust the clearance.		+	+

PZL M18
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC"
AIRPLANE DESCRIPTION AND SERVICE MANUAL

It.	Kind of work	Approximate flying hours between inspections		
		50	100	500
4.	Inspect welds on the main shock struts, rockers, cylinder, and tail landing gear for cracks, deformation, deep scratches or traces of corrosion. Pay particular attention to area of welding the pipe and the tail landing gear rocker.		+	+
5.	Lift the aircraft on jacks and check if there is no excessive clearance in landing gear articulated joints.		+	+
6.	Remove main wheels and tail wheel. Examine them for cracks, deformation and traces of corrosion. Check the bolts connecting wheel hub halves for completeness and security of attachment. Clean main wheel brakes and their place of attachment from contamination. Check the bolts connecting brake elements to torque plate for condition and security.		+	
7.	Check tire pressure.		+	+
8.	Check nitrogen pressure in shock struts.		+	+
9.	Examine the tail gear attach bolts, bearings and axle for wear and any traces of corrosion.		+	+
10.	Inspect the lock mechanism in the tail gear for wear. Check wheel centring springs and locking cables for wear, corrosion and proper functioning.		+	+



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC«
AIRPLANE DESCRIPTION and SERVICE MANUAL

1	2	3	4	5
11	Check parking and main brakes for proper operation.		+	+
	Control Systems			
1	Check turnbuckles for corrosion and proper lockwiring.		+	+
2	Check cables for proper tension and technical condition. On the M18B airplane a correct tension is determined by measurement of spring length in the rudder control system and simulation systems.	+	+	+
3	Check all push rods for loose bearing and defects.		+	+
4	Check idlers and bellcranks for clearance and deformation.		+	+
5	Inspect rudder pedals and support brackets for general condition.		+	+
6	Inspect clearance and attachment of control stick to main torque tube.		+	+
7	Inspect control stick stops for tightness.		+	+
8	Check aileron control stops for tightness and condition of fittings.		+	+
9	Inspect check nut on control push rod bearings.		+	+
10	Inspect trim systems for general condition and correct operation.		+	+



PZL M 18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO „PZL-MIELEC”

AIRPLANE DESCRIPTION and SERVICE MANUAL

1	2	3	4	5
	<u>Check of the places Hard Accessible</u>			
1	Elements to be checked: - center and outer wing spars - horizontal and vertical stabilizer spars - center and outer wing, horizontal and vertical empennage attach joints - ailerons, flaps, rudder and elevator spars The check should be carried out through peep-holes /after securing texture has been removed/. Use a lamp and a mirror.			+

PZL M18
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC"
AIRPLANE DESCRIPTION and SERVICE MANUAL

It.	Kind of work	Approximate flying hours between inspections		
		50	100	500
	HYDRAULIC SYSTEM			
1	Check hydraulic lines and accessories for general condition, proper attachment, leaks and chafing.	+	+	+
2	Check the hydraulic system for leaks and proper operation.		+	+
3	Check nitrogen pressure in hydraulic accumulator. It should be 853±71 psi (60±5 kG/cm ²).	At least once a month		
4	Evaluate cleanliness of FM-3 filter elements acc. to the position of mechanical index of hydraulic filter. Rinse filter elements if needed.	+	+	+
	POWER PLANT			
	NOTE: Carry out all work on the power plant group acc. to ASz-62IRm18 Engine service instructions and Propeller service instructions.			
1	Check and clean air filter inserts in engine induction system.	+	+	+
2	Replace air filter inserts in engine induction system (if takeoffs are conducted from very dusty airstrips more frequent exchanges are recommended, judging by condition of inserts).	After each 200±10 eng. operating hours		
3	Check air heater and exhaust manifold.	Once per year		
4	Check the nuts of engine – mount ring attach bolts for security. Nuts tightening torque - see section 6 para 6.12.3.	After each 500 flight hours not less than once per year		
5	Tighten the nuts (it. 14 – Fig. 6.4) attaching the shock-absorber frame to the fuselage with 12-15 kGm (1040-1300 in.lbs) torque. After tightening, secure the nuts with protective wire secure each nut in two points.	After each 500 flight hours not less than once per year		
6	Inspect technical condition, attachment and protection of the engine control all elements.	+	+	+
7	Apply CIATIM-201 grease to the engine mount-to-fuselage framework attach fittings.	+	+	+
8	During engine installation on the airframe, following each engine overhaul after first 1200, and then each 1000 engine operating hours, replace shock mounts (7) and rings (11) – ref. Sec. 6, Fig. 6.4.			

PZL M18
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC"
AIRPLANE DESCRIPTION and SERVICE MANUAL

It.	Kind of work	Approximate flying hours between inspections		
		50	100	500
	FUEL SYSTEM			
1.	Check fuel system for general condition, leaks from accessories and fuel flow from drains.		+	+
2.	Check accessory lines and conditions for security of attachment.	+	+	+
3.	Check fuel gauges and efficiency of the fuel residue signaling (if installed).		+	+
4.	Check fuel filter for cleanlines and header tank for proper attachment.		+	+
5.	Check cleanliness of paper cartridge in fuel fine strainer mounted on the fire-wall.	+	+	+
6.	Check fuel venting system.	+	+	+
7.	Conduct fuel gauge calibration by draining fuel in case of faulty indications or replacement of gauge sender.	As required		
	ELECTRICAL SYSTEM			
1.	Check electrolyte level and battery charging.	+	+	+
2.	Check relays, regulator, fuses, switches, etc. for security	+	+	+
3.	Check all electrical harnesses for possible chafing and security of attachment.		+	+
4.	Check electrical junctions for security of attachment and corrosion.		+	+

PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC" AIRPLANE DESCRIPTION AND SERVICE MANUAL

It.	Kind of work	Approximate flying hours between inspections		
		50	100	500
5.	Blow the battery vent hoses through with compressed air. Check for damage and security of attachment.		+	+
6.	Check starter mounting for security. Check commutator for excessive wear or bridging.		+	+
7.	Check generator mounting for security.		+	+
8.	Insert magneto switch for contamination (dust), corrosion and accumulation of moisture. Wash metal elements of the switch with kerosene or aviation petrol (without ethyl additives) and next dry them. Textolite plate with contacts secured shall be cleaned with RC-01; RDW or other commonly used solvent and then blown through with compressed air.		+	+
FLIGHT INSTRUMENTS				
1.	Inspect visually the cockpit instruments for security of attachment. Make sure that the instrument and warning light face glasses are not damaged.		+	+
2.	Inspect from the back the instruments attached to consoles and panels and check them for damage, security of attachment as well as proper condition of their connections.		+	+
3.	Check shock absorbers for proper operation.		+	+
4.	Check the compass pointer neutral position. Make sure there are no signs of chafing on compass rose. The neutral position should not exceed $\pm 1^\circ\text{C}$.	+	+	+
5.	Disconnect Pitot tube lines from the instruments. Clean the system with compressed air from the side of the disconnected lines. Check the instruments supplied from Pitot tube and the stall warning sensor for proper operation. Remove water from the sumps.	+	+	+

PZL M18
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC"
AIRPLANE DESCRIPTION AND SERVICE MANUAL

It.	Kind of work	Approximate flying hours between inspections		
		50	100	500
6.	Check Pitot tube heat for correct functioning.	+	+	+
7.	Check the below - mentioned instruments using a test-measurement device of X-S-1 type or similar: - pressure input system (Pitot tube); - stall warning system		+	+
8.	Perform in-flight check of the KI-13AK magnetic compass for correct indications at four basic headings by conducting the test flight over the determined direction of airstrips. If indications are faulty make compensation or forward it to a laboratory. After each replacement of compass carry out compensation of deviation.	At least every 18 months		
9.	Test the stall warning system for proper operation as set forth in Section 4: - para 4.23.7, for the system using the stall sensor of the SFI type; - para 4.23.8, for the system using the LUN type airspeed indicator and SA-01 speed warning device	At least once a year		
COCKPIT EQUIPMENT				
1.	Check the verification date of the fire extinguisher bottle.		+	+
2.	Check the first aid kit.		+	+
AIR CONDITIONING				
1	Check the filter insert, and replace it, if necessary	For ag. flights at 100 hrs intervals, provided the interval is not longer than 8 months.		



PZL M18

WYTWÓRNIA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRPLANE DESCRIPTION AND SERVICE MANUAL

1	2	3	4	5
	PROPELLER			
1	Inspect the propeller visually for damage	+	+	+
2	Check the propeller for oil leaks under the cylinder nut, under the rear cone and under the packing of the blade sleeve. If any leaks are found forward the propeller to a repair shop.	+	+	+
3	Check the cables and tie rods connecting the governor with the control lever for condition. Make sure that there are no plays in the governor control system.	+	+	+
4	Inspect visually the constant speed governor for external damage and oil leaks from joints. Remove immediately the trouble if found.	+	+	+
5	Check blade attachment for security and blade pitch for correct setting in accordance with the scale on the blade root. The blade setting angle should be 17° or 18° /see NOTE subsection 4.14, page 4-15/		+	+
6	Check the blades for runout. The max. permitted runout is 0.0787 in /2 mm/ as measured at the radius of 39.37 in /1000 mm/ at the blade trailing edge, the propeller being set to fine pitch.		+	+
7	Check the tightening of nuts with attach the governor to the engine.		+	+

PZL M-18 Description and Service Manual
Section 8



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC«
AIRPLANE DESCRIPTION and SERVICE MANUAL

SECTION 8

AIRWORTHINESS LIMITATIONS

CONTENTS	PAGE
8.1. SERVICE LIFE OF AIRPLANE ASSEMBLIES AND ACCESSORIES	8-1
8.2. MANDATORY INSPECTIONS	8-1
8.3. SPECIAL INSPECTION	8-1

THE AIRWORTHINESS LIMITATIONS SECTION IS FAA APPROVED UNDER THE PROVISION OF 14 CFR SECTION 21.29 AND SPECIFIED MAINTENANCE REQUIRED UNDER SECTION 43.16 AND 91.163 OF FEDERAL AVIATION REGULATIONS UNLESS AN ALTERNATIVE PROGRAM HAS BEEN FAA APPROVED.

SECTION 8

AIRWORTHINESS LIMITATIONS

8.1. SERVICE LIFE OF AIRPLANE ASSEMBLIES AND ACCESSORIES

The service lives of airframe, engine, propeller, accessories and rubber lines are specified in the M18 Aircraft Repair Manual.

The Repair Manual also covers procedures to follow after expiration of validity of service life for the above units.

8.2. MANDATORY INSPECTIONS

"It is required to conduct the airplane inspection once a year within the scope of 500-hour periodic work with the participation or on approval of local Airworthiness Authority. For the scope of 500-hr work refer to Section 5.5."

8.3. SPECIAL INSPECTION

Verifying inspection after every 3000⁺³⁰⁰ flying hours

All the airplanes that reach the life limit of in turn 3000, 6000, 9000 flown hours should be subject to a verifying inspection supervised by local Airworthiness Authority.

The scope of verifying inspection is described under Section 5.4., para 5.4.3.

PZL M-18 Aircraft Repair Manual
Section III

III. SERVICE LIVES

THIS SECTION IS APPROVED BY POLISH AIRWORTHINESS
AUTHORITY (GICA)

P Z L M 1 8
WYTWÓRNIĄ SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC"
INSTRUKCJA NAPRAW + AIRCRAFT REPAIR MANUAL

III. RESURSY TECHNICZNE

III. SERVICE LIVES

1. PŁATOWIEC
1. AIRFRAME

- resurs techniczny	10000 godz. lotu
- service life	10000 flight hours

UWAGA: Resurs płatowca dla wersji przeciążo-
nej podano w punkcie 7 niniejszego
rozdziału.

NOTE: Service live of the airframe for
overload version is specified
in para. 7 of this Section.

2. SILNIK ASz-62IRm18
2. ASz-62IRm18 ENGINE

- Ogólny resurs techniczny	6200 godz. pracy silnika
- Engine service life	6200 engine operation hours

- resurs do I remontu	1200 godz. pracy silnika	- resurs międzyremontowy	1000 godz.pracy silnika
- time to first overhaul	1200 engine running hours	- time between overhauls	1000 engine running hours

3. ŚMIGŁO AW-2-30 SERIA 02
3. AW-2-30 PROPELLER, SERIES 02

- Ogólny resurs techniczny	8000 godz. pracy silnika
- Engine service life	8000 engine operation hours

- resurs do I remontu	2000 godz. lub 6 lat	- resurs międzyremontowy	1500 godz.pracy silnika lub 6 lat
- time to first overhaul	2000 fl. hours or 6 years	- time between overhauls	1500 engine running hours or 6 years

P Z L M 1 8
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO "PZL-MIELEC"

INSTRUKCJA NAPRAW + AIRCRAFT REPAIR MANUAL

5. CZĘŚCI I ZESPOŁY STRUKTURY SAMOLOTU Z OGRANICZONYM RESURSEM TECHNICZNYM.
5. AIRPLANE PARTS AND ASSEMBLIES WITH LIMITED SERVICE LIFE.

Lp. No.	Numer rysunku lub normy Drawing or Std No.	Nazwa Name	Ilość na s-t Quantity per a/c	Resurs techniczny części lub podzesp. /godz. lotu/ Service life or part or sub-assembly /fl. hrs/	Uwagi Notes
1	2	3	4	5	6
1	D21.530.00.1L	Okucie tylne lewe LH rear fitting	1	3000 ⁺³⁰⁰	Technologia wymiany okucia D21.530.00.1L patrz rozdz. I str. 1-43 ÷ 1-45 Procedures for replacement of D21.530.00.1L fitting See Section I, sheet 1-43 ÷ 1-45

7. AIRFRAME SERVICE LIFE IN OVERLOAD VERSION

The service life is established for the airplane takeoff weight of 10,340 Lbs (4700 kG).

Increase in T-O weight up to 11,700 Lbs (5300 kG) causes higher fatigue wear and drop of service life by 1.35 times.

Thus, the recorded flown time with the weight ranged from 10,340 Lbs (4700 kG) to 11,700 Lbs (5300 kG) shall be multiplied by 1.35 coefficient and the obtained result is to be regarded as a basis for calculating the service life of the airplane.

An exemplary calculation of the airplane flying time:

Flying time at $Q \leq 4700 \text{ kG}$ 2,000 h
Flying time at $4700 \text{ kG} < Q \leq 5300 \text{ kG}$ 1,000 h

Flying time calculation:

$$2000 \text{ h} + (1000 \text{ h} \times 1.35) = 3350 \text{ h}$$

PZL M-18 Service Bulletin E/02.159/97

362
p.1

**AVIATION COMPANY
"PZL-MIELEC" LTD**

APPROVED BY:
Technical Director
Aviation Company

()

CONCURRED WITH:
GICA - CAIB

()

**NON-MANDATORY
SERVICE BULLETIN**

No E/02.159/97

For: PZL M18 "DROMADER" Airplanes

**Reference: Protection against corrosion after
many years of the airplane operation**

This bulletin contains 10 type written pages plus 2 sketches.

I. PURPOSE

In the 1-st quarter of 1997 the PZL M18 airplane operator in Greece requested our help to remove corrosion in the region of the outer wing main fittings. The airplanes: 1Z010-28, 1Z011-02, 1Z011-27, 1Z012-05 which had been operated for 13 years were presented for evaluation.

According to the Greek party the manufacturer's representatives were to develop the technique to further protect the airplanes against corrosion on the basis of the above airplanes.

The Greek party has 24 airplanes in operation.

After having removal the wings from the airplane it was found that the airplanes did not have the "temporary" protection recommended in section 4.28 of the Service Manual.

Corrosion signs were found on the spar flanges between the spar wall and the fitting and on the side surfaces of the wing fittings.

Corrosion was found on the wing fittings in the region of the lightening holes (4 pcs) made in the spar flanges.

II. APPLICABILITY

The bulletin has been prepared at the request of the Greek party and may be incorporated on all the airplanes operated by the Greek operators. The airplane manufacturer will make the bulletin available for all the remaining operators at their request free of charge.

III. PROCEDURES

1. Evaluation of the corrosion

The condition of the corrosion in the region of the outer wing fittings may be evaluated after screwing out the "fairings" (2 pcs) between the centre-wing and the outer wings through the inspection hole in the extreme nose rib. Addition information on the condition of the corrosion in this area may be obtained after removing the hermetic protection between the fitting and the brackets and the wing skin.

In the case of clear signs of corrosion further progress of which may not be presented using the temporary protection means proceed as indicated in the further part of the bulletin. If no corrosion signs are found on the wings proceed as follows:

- (a) remove the hermetic protection in the region of the upper and lower fitting to prevent the gathering of water and its deposit for long periods if the airplane is not kept in a hangar;
- (b) wash the region of the wing fittings and protect the area using temporary protection means made by DINOL and designated "DINITROL" AV-30. The minimum preservation temperature is +18°C.

NOTE: The address of the DINITROL AV-30 distribution in Poland:

SWEDISH TECHNICAL BUREAU LTD Co.
ul. Floriana 3/5
04-664 Warsaw, POLAND
Ms Ewa Janiszewska
fax. 48 22 153 116
48 3912 0468 Komertel
tel. 48 22 61 30012
48 3961 1375 Komertel

CORROSION REMOVAL PROCEDURES

If the wing is qualified for corrosion removal with simultaneous removal of the upper fitting D.22.200.35.1 and the lower fitting D.22.200.36.1 proceed as follows:

- remove the wing from the airplane and position it on a truck;
- protect the fuel lines and the vent lines against contamination;
- unrivet the D.22.400.20.1^L_P rib assy;
- remove the bolts connecting the fittings with the spar flange;
- unrivet the rivets connecting the D.22.400.32.1^L_P upper cover plate and the D.22.400.23.1^L_P lower cover plate (sketch No. 1).

NOTE: Do not unrivet the rivets in the region connecting the cover plates to the spar wall, in the area of the tight fuel tank zone.

NOTE: Remove the bolts using threaded expanders.

- remove the bolts connecting the fitting with the D.22.200.24.1 bracket and with the spar wall;
- remove the rivets from the spar wall as required to disassemble the fitting;
- lubricate the region of the fittings and the flanges 3 times with the WD-40;
- remove the fittings using duralumin drive pins;
- mark the fittings and the other remaining elements with the airplane number on a tag attached to the fitting;
- bend the cover plates D.22.400.32.1_P and D.22.400.33.1_P gently;
- clean the fittings of the paint, clean the corroded places with abrasive paper or mechanically using an abrasive tool (drill + abrasive disk).

NOTE: Corrosion pits on the inside fitting surfaces in the region of the four lightening holes in the spar flange should be "locally" cleaned. The allowable clearing depth is 1 mm (max.).

- sand blast the fittings with fine sand;
- apply a layer of cadmium ~ 0.010 [mm];
- check for cracks using a flaw detector;
- apply anticorrosive and decorative paint coatings except the surfaces mating the flange, the holes under the bolts (5 pcs), the $\phi 36H8$ hole, and the side surfaces around the $\phi 36H8$ hole;
- lubricate the spar flanges with the WD-40;
- clean the corroded places with abrasive paper;
- polish the four lightening holes in the spar flange;
- it is allowable to clean the corrosive locally up to 1 [mm] in the region shown in sketch No. 2.

NOTE: IT IS FORBIDDEN TO USE CHEMICAL ANTICORROSIVES REQUIRING WASHING IN ORDER TO REMOVE CORROSION.

- make an inspection hole in the lower surface of the nose per sketch No. 1 and install the D.21.414.00.1 framing;
- cut the pipe shielding the D.22.400.29.1 electrical conductors ~ 30 mm from the rib No. D.22.400.22.1 $\frac{L}{P}$ using a pipe cutter;
- unrivet the clamp attaching the pipe from the dismantled rib D.22.400.20.1 $\frac{L}{P}$;
- wrap the electrical harness with a flexible shield to protect against damage;
- make an additional drain hole as shown in sketch No. 1.

- degrease the areas in the region of the upper and lower fittings;
- protect the flange surfaces mating the fitting by gluing a tape and prime (ground) the spar zones two times;
- after drying remove the protective tapes;
- fill the four lightening holes $\phi 9$ (2 pcs) and $\phi 11$ (2 pcs) with the G-354 "GREASE" per MIL-G-23827B AM1 as shown in sketch No. 2;
- lubricate the spar flange, spar wall and fitting surfaces with the "DINITROL" AV-30 preventive,
- install the fittings on the lubricated flange surfaces;
- lubricate the holes in the flange and fitting and the bolts with the AV-30;
- install the new bolts per sketch No. 1 and protect them by "punching" - two times.

NOTE: It is allowable to reinstall (use again) the bolts and nuts attaching the fitting to the spar after having calibrated the thread.

The bolts and nuts have the thread respectively M8, M14x1,5; M16x1,5; M18x1,5.

After calibrating the bolts should be cadmium plated.

To above note applies to the airplanes per section I page 3.

- install a "rubber shield" in the unriveted rib No. D.22.400.20.1 $\frac{L}{P}$ into the hole through which the electrical harness passes;
- it is allowable to install steel bolts in the spar wall - sealed with the PR-1422 leak stopper in the place of the removal rivets;
- perform the final preservation of the fitting zone;
- install the D.22.400.20.1 $\frac{L}{P}$ rib;
- install the D.22.400.24.1 bracket;
- clean the fuel tank;
- install the wing on the airplane;
- check the fuel gauges for leaks and proper operation;
- install the control system;
- perform the test flight of the airplane.

NOTE: 1. During wing installation lubricate the $\phi 36$ holes and the expanders with the DINITROL AV-30.

2. Do not install the a) 3024A-8-74 bolt

b) D.22.200.37.1 insert

c) D.22.200.47.1 insert

passing through the recess in the lower fitting to enable free water drain.

IV. LIST OF PARTS NECESSARY FOR THE OVERHAUL (per one airplane)

No.	Dwg or Std. No.	Description	Q-ty	Remarks
1	D.22.400.40.1	Screw	4	
2	D.22.000.10.0	Bolt	4	
3	D.22.000.11.0	Bolt	4	
4	D.22.000.12.0	Bolt	4	
5	D.22.000.13.0	Bolt	4	
6	3374A-8	Nut	4	
7	3315A-12x1,5	Nut	4	
8	3315A-14x1,5	Nut	4	
9	3315A-16x1,5	Nut	4	
10	3315A-18x1,5	Nut	4	
11	3560A-3-6	Rivet	200	
12	3501A-4-20	Rivet	20	
13	3501A-5-22	Rivet	20	
14	NAS-1398B4-1	Rivet	15	
15	mat. PA7=0,4	Shield	2	Make the item 15 on the D.32.000/06.8 press-forming die.
16	3374A-10	Nut	8	
17	D.21.414.00.1	Framing	2	
18	D.21.400.27.1	Cover	2	
19	3560-3-7	Rivet	32	
20	3175A-4-12	Screw	16	

V. AVAILABILITY OF PARTS

The parts necessary to incorporate the bulletin are delivered by WSK PZL Mielec at the cost of the orderer.

VI. EXECUTOR

This bulletin may be incorporated by the service team of WSK PZL Mielec after an order is placed or by technical organizations authorized to perform.

VII. Record the accomplishment of the bulletin in the Airframe Log Book.

Signatures of the approving authorities are contained in Polish Bulletin No. E/02.159/97.

This is a true translation from the original bulletin No. E/02.159/97.

For conformity of translation:

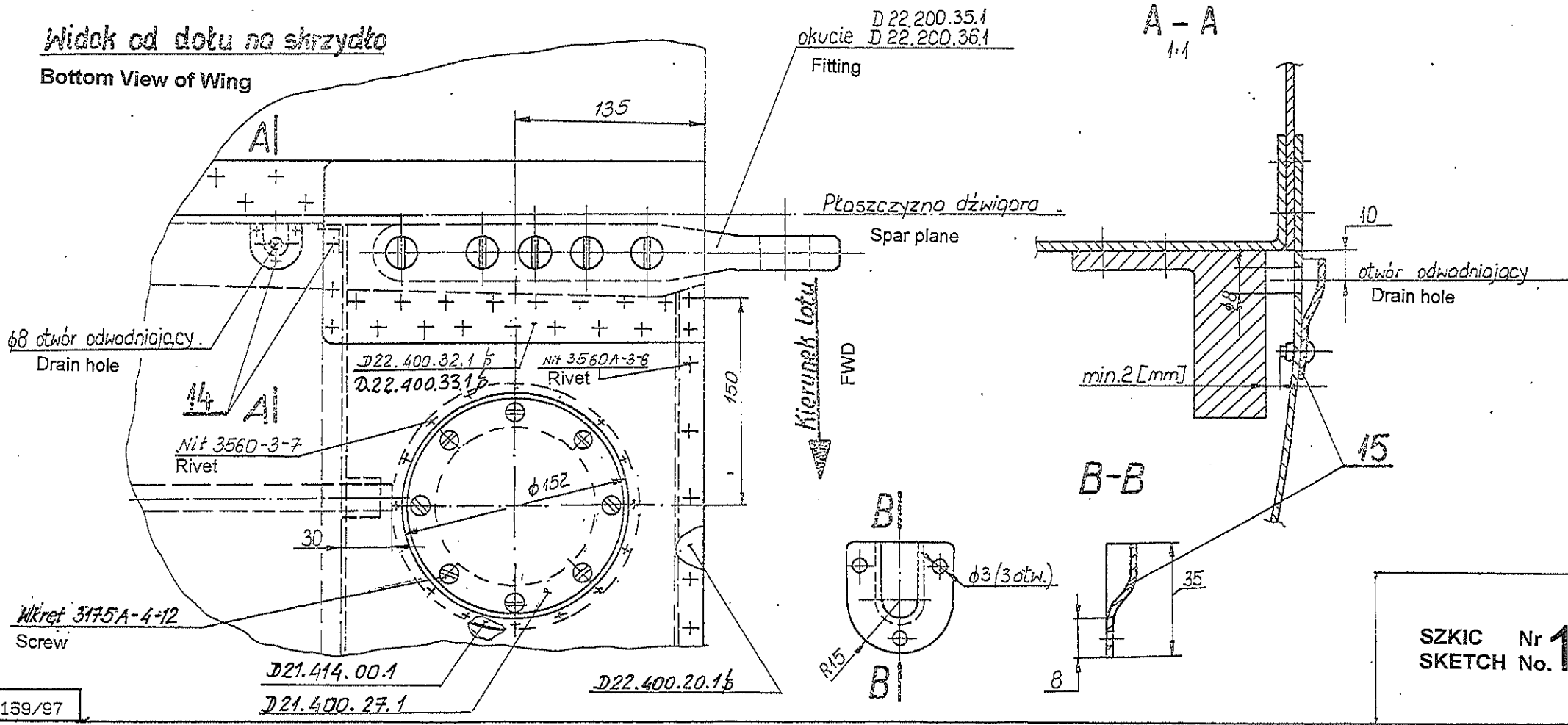
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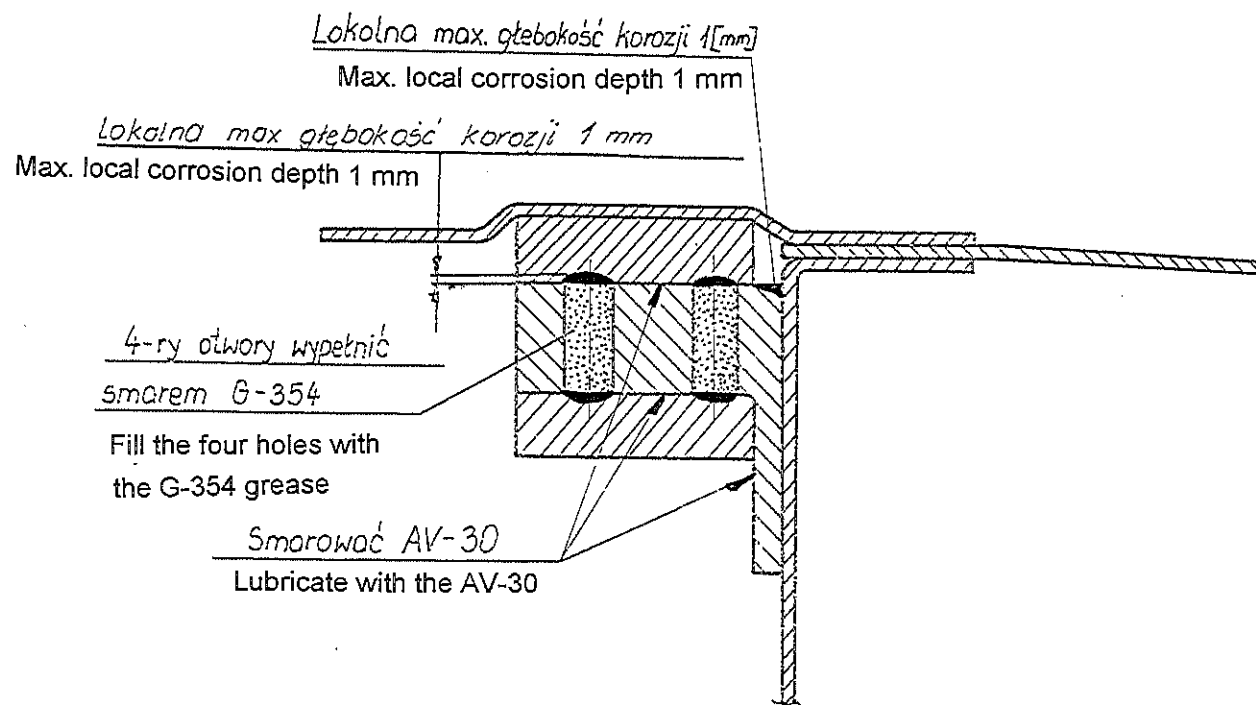
362
p.1

Widok od dołu na skrzydło

Bottom View of Wing



SZKIC Nr 1
SKETCH No. 1



SZKIC Nr
SKETCH No. 2

PZL M-18 Service Bulletin E/02.170/2000

POLSKIE ZAKŁADY LOTNICZE Co. Ltd.

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Civil Aircraft Inspection

Board Certificate No. P-008/1

APPROVED BY:

Factory Manager in Charge

(_____)

Date

APPROVED BY:

GICA General Inspector

(_____)

Date

SERVICE BULLETIN No. E/02.170/2000

TYPE / MODEL: M18 "DROMADER" Airplane

SERIAL NOS. AFFECTED: AIRCRAFT OF ALL MODELS

SUBJECT: Procedure for dealing with corrosion, when reaming or replacing the wing main (centerwing-to-outboard wing) attachment joints.

COMPLIANCE DATE: AS REQUIRED

PREPARED BY:

M18 Chief Designer

(_____)

(Signature, date)

AGREED:

CAIB District VI

(_____)

(Signature, date)

Mielec, 08.03.2000

This Bulletin contains eighteen (18) pages of type-written text plus 10 figure pages.

I. PURPOSE

The M18 "DROMADER" aircraft have been operated since 1979. The operating conditions prevailing in AG flights increase corrosive incidence rate, especially after many years of service.

The airplane Manufacturer hereby intends to stress the need and necessity of anti-corrosion means application for periodic corrosion protection. Also, it is essential that all inspections and periodic maintenance be performed as prescribed in the aircraft Maintenance Manual.

It is particularly critical to maintain good condition of the centerwing-to-outboard wing attachment joints.

Recently, there were two major accidents in the USA which involved M18 airplanes with high (~5000) number of hours flown (no correction for overload-configuration flights incorporated). Inspection completed on another airplane revealed defects that could have resulted in a similar disaster. The accidents were found to have been caused by corrosion in the wing lower attach joints and the resulting fitting lug rupture.

In one case discovered in Greece, limit loads were exceeded, resulting in plastic deformation of the outboard wing main fitting lug (expansion/ovalization of about 0.8 mm).

Taking all the above into consideration, the airplane Manufacturer issued this Bulletin to remind Operators of the necessary periodic corrosion protection and, if defects similar to those described above occur, eliminate the same immediately.

II. EFFECTIVITY

This Bulletin is effective for all "DROMADER" airplanes (Models M18, M18A, M18AS, M18B, M18BS).

III. TYPES OF FAILURES CONSIDERED

1. Corrosion in the main (dia. 36 mm) holes, lugs, and on external surfaces of the centerwing-to-outboard wing attach joints: Proceed as prescribed in Sec. IV.3; IV.4; and IV.5.
2. Cracks in the lugs (especially in the dia. 36 mm hole), with pitting corrosion showing in the centerwing-to-outboard wing attach joints: Proceed in accordance with the instructions of Sec. V.
3. Ovalization of the main (dia. 36 mm) holes: Proceed as defined in Sec. VI.

IV. EXECUTION PROCEDURES: JOINT INSPECTION, CORROSION ELIMINATION AND ANTI-CORROSION PROTECTION

1. Inspection of the joints:

- Prior to elimination of corrosion, all joints found to be corrosion-affected must be inspected for possible cracks;
- The only acceptable inspection method is magnetic cracks detection;
- Any corrosion-elimination proceedings (to return the joints to service) may be undertaken only for the joints found to be free from cracks;
- Joints found to exhibit cracks are subject to mandatory replacement;
- The critical area of the joints include lower surfaces of the expansion mandrel holes (dia. 36 mm) in the wing lower attach joints;
- Surfaces of the dia. 36 mm holes can be inspected by magnetic cracks detection method with no need for outboard wing removal upon expansion mandrels removal (make sure to properly support the wing for operation). When checking the lower holes, upper expansion mandrels remain installed, and the other way round;
- If expansion mandrels are found to be worn-out replace with new D21.535.00.0 mandrels.

2. Types of corrosion

- Minor (surface) corrosion: Proceed as defined in Sec. IV, para. 3;
- Pitting corrosion: Proceed as defined in Sec. IV, para. 4;
- External corrosion of the joints and spare caps in the joints' area: proceed as defined in Sec. IV, para. 5.

3. Minor (surface) corrosion: If only minor (surface) corrosion is found on the insides of a dia. 36 mm hole (expansion mandrel holes), proceed as follows:

- Inspect the hole by magnetic crack detection method – no cracks are allowable;
- Using fine-grain sand-paper, polish to remove traces of corrosion (no corrosion pits to show afterwards);
- Visually inspect external surfaces of the mandrel and wing holes: no cross scratches or notches are allowable;
- Install the mandrels, preserving with DINITROL AV-30 along the mandrel's upward cutting line, as detailed in Sec. VI, para. 5÷9. Follow with preservation of the adjoining area with AV-30 (Use nominal-diameter expansion mandrels $\phi 36.0$).

4. Pitting corrosion: If the dia. 36H8 hole has been affected by pitting corrosion and the corrosion cannot be easily eliminated (unlike para. 1 above), proceed as follows:

- Inspect with magnetic cracks detector (no cracks allowable);
- Ream to dia. 36.3H8 with No. 021.340.018931 reamer, fitting installed in No. 021.431/018929 fixture;

NOTE: *If the fitting surfaces are found (upon reaming) to exhibit uneven surface clean-up (pits), replace the fitting.*

- Blunt-off edges of the dia. 36.3H8 (0.4 mm/45°) hole with 021.331.013376 spotter;
- Apply DINITROL AV-30 for preservation of the fitting and adjoining spar cap area;
- Install the mandrels as detailed in Sec. VI, para. 5÷9 (Use oversize expansion mandrel dia. 36.3 – D21.535.000.0R1).

5. External corrosion joints and spar caps: If the condition of the main dia. 36 joint hole in the outboard wings has been found to be satisfactory, while corrosion shows on external surfaces in the fittings and spar cap zone, the following procedure is recommended:

- Inspect the hole by magnetic crack detection method – no cracks are allowable;
- Execute provisions of Bulletin E/02/159/97 (fittings zone preservation);

- During installation, preserve the mandrels and the wing attach fittings as determined in Sec. VI, para. 5÷9.
- If the expansion mandrel surfaces clearly show considerable wear, replace with new D21.535.00.0 mandrels.

V. WING ATTACH JOINTS REPLACEMENT REQUIRED: PROCEDURE

1. General

If one of the attach fittings has been qualified for replacement the other fitting of the pair (centerwing – outboard wing) has to be replaced as well. In order to avoid frequent inspections, if the centerwing-to-LH outboard wing attach joints are replaced, those on the RH side (i.e. centerwing-to-RH outboard wing attach joints) should be also replaced. The foregoing generally applies to lower joints. The wing upper attach joints are not subject to removal, unless showing corrosion or cracks.

2. Airplane preparation for fittings replacement

- Remove outboard wings from the airplane.

NOTE: *Proceed with the wing attach mandrel removal as shown in Fig.E/02.170/2000-1.*

- Protect fuel and vent lines against contamination.
- Centerwing remains installed on the airplane.

NOTE: *Do not remove both upper and lower fittings at the same time. One of the remaining fittings serves as a reference datum for reaming – See Fig. E/02.170/2000-8.*

3. Replacement of outboard wing lower attach fittings

- Remove rivets attaching D22.400.20.1L/P inboard-most nose rib;
- Unscrew the bolts using E/02.170/2000-2 screwdriver;
- Remove the fittings-to-spar caps attach bolts using the "expander" tool – ref. Fig. E/02.170/2000-3;
- Remove rivets attaching D22.400.33.1L/P lower straps;

NOTE: *Do not remove the rivets used for the strap-to-spar wall attachment in the tank area. Deflect the strap gently for access.*

- Remove the rivets in the spar wall as required for the fitting removal;
- Identify the fittings with the airplane number and letter symbol "L" or "P", i.e. LH and RH, respectively.

NOTE: *Fittings identification is necessary for production of a new fitting, i.e. to maintain the hole spacing when boring identical to that of the existing holes in the wing spar caps.*

- New fittings featuring lead holes for drilling shall be directed to final production, along with the removed "L+P" fittings – only for the bolt holes engaging with the spar cap, as shown in the figure and determined in the Notes of Fig. E/02.170/2000-4.

NOTE: *Do not bore dia. 34 mm hole (lead hole for dia. 36H8). The hole will be produced finally after fittings installation on the spar cap, and reamed in a special 021.431/018929 fixture, as shown in Fig. E/02.170./2000-8.*

- Clean up the spar caps to remove corrosion.

NOTE: *a) Local clean-ups of the cap up to ~1 mm deep are allowable. Use sand paper and WD-40 cleaner – ref Fig. E/02.170/2000-5.*

b) No chemical rust removers that require rinsing or may react with al-alloy components of the structure are allowed.

- Clean up the four (4) lightening holes;
- Drill all holes to engage with the spar wall and brackets – ref. Fig. E/02.170/2000-10 (blunt off edges of the holes for the brackets and spar wall attachment).
- Install lt. 18 ÷ 21 bolts, Spec. No. 2 or No. 4, in place of the rivets removed from the spar wall (ref. Fig. E/02.170/2000-6), applying PR 1422 leak stopper.
- Remove the fitting from the spar cap to apply preservation.
- Preserve the cap with "DINITROL AV-30".
- Fill up the four (4) cap holes with G-354 grease – ref Fig. E/02.170/2000-5.
- Calibrate the thread on the bolts (threading dies Spec. No. 5). The bolts may not show any traces of corrosion.
- Install the fittings on the spar cap, applying "DINITROL AV-30" for preservation of the bolts, holes, and fitting surfaces.
- Install the bolts in the holes.
- Punch the nuts with bolts once.
- Ream dia. 34 hole to dia 36H8 in No. 021.431.018929 fixture, using reamers 021.340.000433 (6 pcs); and 021.340.018930 (3 pcs) in the order of appropriate diameters.
- Blunt off edges of the dia. 36H8 hole using 021.331.013376 (0.4 mm/45°) spotter.
- Apply preservation to the joint assy.
- Follow with installation of the expansion mandrels as prescribed in Sec. VI, para. 5÷9; Instal nominal diameter 36.0 mm mandrels with the cut side up.
- Rivet-attach the inboard nose rib and D22.400.33.1L/P strap previously removed.

NOTE: *Should the holes in the fitting and those in the spar cap fail to converge, ream the same for installation of "over-size" (diameter 0.2 mm larger) bolts.*

4. Replacement of centerwing lower attach fittings

- Remove rivets attaching the outboard-most D21.400.20.0L/P nose rib.
- Unscrew the bolts with E/02.170/2000-2 screw-driver.
- Remove the bolts of the fitting-to-spar caps attachment using E/02.170/2000-3 "expander" device.
- Remove rivets attaching D21.400.42.0L/P straps in the fittings area.
- Identify the fittings with the airplane numbers.

NOTE: *Fitting identification is necessary for production of a new fitting, i.e. to ensure hole spacing for boring in accordance with that **of the existing holes in the spar caps.***

- Direct new fittings with leading holes for final drilling, along with the removed "L+P" fittings, only with respect to the bolt holes engaging with the spar cap, as shown in the figure and defined in the Notes of Fig. E/02.170/2000-7.

NOTE: *Do not ream dia. 34 mm (lead hole for dia 36H8). The hole will be finally produced after the fittings' installation on the spar cap and reamed in special fixture No. 021.431.018929, as shown in Fig. E/02.170/2000-8.*

- Remove corrosion from the spar cap in the fitting area.
- Clean up the four (4) lightening holes in the spar caps.
- Drill all holes for the fitting attachment to the brackets and spar wall.
- Remove the fitting from the spar cap (blunt off the hole edges).
- Apply DINITROL AV-30 for the spar cap preservation.
- Fill up the holes (4+4) in the spar cap with G-354 grease (both LH & RH).
- Drill all holes engaging with the spar wall – ref. Fig. E/02.170/2000-9.
- Calibrate the bolt thread (threading dies – Spec.No. 5).

- Install the fitting on the spar cap, preserving the bolts, holes, fitting and spar cap surfaces with DINITROL AV-30.
- Install the bolts in the holes.
- Punch the nuts with bolt once.
- Ream dia. 34 hole to dia. 36H8 in No. 021.431.018929 fixture, using reamers 021.340.000433 (6 pcs) and 021.340.018930 (3 pcs) in the order of appropriate diameters.
- Blunt off edges of the dia. 36H8 hole with 021.331.013376 (0,4 mm/45°) spotter.
- Apply DINITROL AV-30 for preservation of the joint assy.

NOTE: *Should the holes in the fitting and spar cap holes fail to converge, ream the same for installation of "oversize" (diameter 0.2 mm larger) bolts.*

- Re-install the outboard-most nose rib and D21.400.42.0L/P (rivet attachment).

5. Replacement of outboard wing upper attach fittings:

- Follow the replacement procedure outlined in Sec. V.3,
- Order the parts required for the replacement according to Specification No. 4,
- Tools and devices (fixtures, jigs) as for the lower joints replacement.

6. Replacement of centerwing upper attach fittings:

- Follow the procedure outlined in Sec. V.4,
- Order the parts required for replacement according to Specification No. 3,
- Tools and devices as for the lower joint replacement.

VI. ELIMINATION METHOD FOR OVALIZATION IN THE WING MAIN JOINT HOLES

1. Ovalization of 36H8 ($36^{+0.039}_{0,0}$ mm nominal) main holes can result from:
 - the airplane extremely high aerodynamic overload over the approved limit;
 - very high number of takeoff/landings (normal wear);
2. If the hole ovalization present in each of the lower fittings does not exceed dia. 36.2 mm (dia. 1.425 in), proceed with reaming the same in 021.431.018929 fixture, using 021.340.018931 reamer, up to dia. 36.3H8.
3. After the holes reaming, blunt off the hole edges, producing a 0.4 mm (0.016 in) chamfer with 021.331.013376 spotter.
4. Keep nominal hole diameter of upper holes in the joints if free from corrosion and/or ovalization (do not ream).
5. Install the centerwing-to-outboard wing attachment mandrels cut-side up (ref. Fig. E/02.170/2000-9).
6. Install repair mandrels D21.535.00.0R1 in the dia. 36.3H8 (1.429 in) enlarged-diameter holes. (Mandrels to be ordered from airplane Manufacturer according to Spec. No. 1).
7. Prior to installation, apply DINITROL AV-30 to the surfaces of the fittings, holes in the fittings and spar cap, as well as the mandrels. Leave to dry for about half and hour.
8. Torque the expansion mandrels to 3.0 ± 0.5 KGm (260 ± 45 in.Lbs) – ref. Fig. E/02.170/2000-1 .
9. After the installation, apply DINITROL AV-30 for preservation of the complete joint.

NOTE: *Expansion mandrels contain individually-fitted elements which must not be replaced. All component elements must bear the same number.*

VII. PARTS & TOOLS REQUIRED FOR THE BULLETIN COMPLIANCE**Specification No. 1 - Parts required for replacement of centerwing lower attach fittings.**

It.	P/N	Description	Q-ty per A/C	Notes
1	D21.200.49.0	Fitting, lower	2	
2	D21.400.38.0R1	Bolt	2	
3	D21.400.39.0R1	Bolt	2	
4	D21.400.41.0R1	Bolt	2	
5	D21.400.22.1R1	Bolt	2	
6	D21.200.65.0R1	Bolt	2	
7	D21.200.64.0R1	Bolt	2	
8	D21.400.79.1R1	Bolt	2	
9	3017A-8-22	Bolt	6	
10	3017A-8-26	Bolt	2	
11	3017A-8-28	Bolt	2	
12	3315A-16	Nut	2	
13	3315A-18	Nut	2	
14	3315A-14	Nut	2	
15	3315A-12	Nut	2	
16	3373A-8	Nut	2	
17	3355A-12	Nut	2	
18	3374A-8	Nut	12	
19	D21.535.00.0	Expansion mandrel	2	
20	D21.535.00.0R1	Expansion mandrel	2	Oversize dia. 36.3 - Order only if fittings are to be reamed
21	3549A-3-7	Rivet	80	
22	3517A-3-13	Rivet	40	
23	3558A-3,5-7	Rivet	40	
24	3558A-3,5-8	Rivet	80	

Specification No. 2 – Parts required for replacement of lower fittings in outboard wings

It.	P/N	Description	Q-ty per A/C	Notes
1	D22.200.36.1	Fitting, lower	2	
2	D22.000.13.0R1	Bolt	2	
3	3315A-16	Nut	2	
4	D22.000.12.0R1	Bolt	2	
5	3315A-18	Nut	2	
6	D22.000.11.0R1	Bolt	2	
7	3315A-14	Nut	2	
8	D22.000.10.0R1	Bolt	2	
9	3315A-12	Nut	2	
10	D22.400.40.1R1	Bolt	2	
11	3374A-8	Nut	2	
12	D22.200.60.1R1	Bolt	2	
13	3374A-10	Nut	4	
14	D22.200.61.1R1	Bolt	2	
15	D22.200.62.1R1	Bolt	2	
16	3374A-8	Nut	6	
17	D22.200.63.1R1	Bolt	2	
18	3083A-5-22	Bolt	5	
19	3083A-5-24	Bolt	3	
20	3024A-5-24	Bolt	2	
21	3024A-5-22	Bolt	3	
22	3373A-5	Nut	13	
23	3402A-0,5-5-10	Washer	10	
24	3402A-1,5-5-10	Washer	10	
25	3560A-3-8	Rivet	60	
26	3560A-4-11	Rivet	20	
27	3517A-3-13	Rivet	40	
28	3560A-3-6	Rivet	40	
29	3560A-3-7	Rivet	20	

Specification No. 3 – Parts required for replacement of upper fittings in centerwing

[illegible]

Specification No. 4 – Parts required for replacement of upper fittings in outboard wings

It.	P/N	Description	Q-ty per A/C	Notes
1	D22.200.35.1	Fitting, upper	2	
2	D22.000.13.0R1	Bolt	2	
3	3315A-16	Nut	2	
4	D22.000.12.0R1	Bolt	2	
5	3315A-18	Nut	2	
6	D22.000.11.0R1	Bolt	2	
7	3315A-14	Nut	2	
8	D22.000.10.0R1	Bolt	2	
9	3315A-12	Nut	2	
10	D22.400.40.1R1	Bolt	2	
11	3374A-8	Nut	2	
12	D22.200.60.1R1	Bolt	2	
13	3374A-10	Nut	4	
14	D22.200.61.1R1	Bolt	2	
15	D22.200.62.1R1	Bolt	2	
16	3374A-8	Nut	6	
17	D22.200.63.1R1	Bolt	2	
18	3083A-5-22	Bolt	5	
19	3083A-5-24	Bolt	3	
20	3024A-5-24	Bolt	2	
21	3024A-5-22	Bolt	3	
22	3373A-5	Nut	13	
23	3402A-0,5-5-10	Washer	10	
24	3402A-1,5-5-10	Washer	10	

Specification No. 5 – Tools & devices required for Bulletin E/02.170/2000 (1 set.)

It.	P/N	Description	Q-ty per A/C	Notes
1	021.431.018929	Reaming device	1	
2	021.340.000433	$\phi 34,5H8$ $\phi 35,0H8$ $\phi 35,5H8$ $\phi 35,8H8$ $\phi 35,95H8$ $\phi 36,0H8$	1	Complete set of serial reamers
3	021.340.018930	$\phi 34,2H8$ $\phi 34,7H8$ $\phi 35,2H8$	1	Extra set of serial reamers
4	021.340.018931	$\phi 36,25H8$ $\phi 36,3H8$	1	Set for oversize holes
5	021.331.013376	Spotter	1	
6	021.514.000096	Holder	1	For reamers It. 2, 3, and 4
7	E/02.170/2000-3	Expander	1	
8	E/02.170/2000-2	Screwdriver	1	For fitting bolts
9		Reamers holder	1	
10		Reamers holder	1	
11	NRTH	$\phi 8H8$ Reamer	1	
12	NRTH	$\phi 8,2H8$ Reamer	1	
13	NRTH	$\phi 9,0H8$ Reamer	1	
14	NRTH	$\phi 10,1H8$ Reamer	1	
15	NRTH	$\phi 11H8$ Reamer	1	
16	NRTH	$\phi 12,2H8$ Reamer	1	
17	NRTH	$\phi 13H8$ Reamer	1	
18	NRTH	$\phi 14,2H8$ Reamer	1	
19	NRTH	$\phi 16,2H8$ Reamer	1	
20	NRTH	$\phi 18,2H8$ Reamer	1	
21	NHMA	M8 Threading die	1	
22	NHMA	M12x1,5 Threading die	1	
23	NHMA	M14x1,5 Threading die	1	
24	NHMA	M16x1,5 Threading die	1	
25	NHMA	M18x1,5 Threading die	1	
26		M8 Threading die holder	1	
27		M12÷M14 Threading die holder	1	
28		M16÷M18 Threading die holder	1	
29		$\phi 7,7$ Drill	1	
30		$\phi 8,7$ Drill	1	
31		$\phi 12,7$ Drill	1	
32		Transportation box	1	

VIII. EXECUTOR

1. This Bulletin shall be executed by Manufacturer's Product Support Service team, based on an Operator-issued order and his cost.

2. Provisions of this Bulletin can be also executed by authorized repair shops if properly trained by Manufacturer's Product support service.

IX. LABOR CONSUMPTION

Labor consumption of the Bulletin execution depends on the actual extent of work that has to be completed. When the complete set of lower attach joints are replaced, labour consumption is estimated at 200 hours per one airplane.

X. COMPLIANCE DATE

Provisions of the Bulletin shall be complied with upon receipt of the Bulletin (depending on the actual situation).

XI. FINAL PROVISIONS

Upon compliance with the Bulletin, executor shall make the following entry in the Airframe Logbook:

"Bulletin E/02.170/2000 complied with"

.....
(Signature)

.....
(Date)"

Signatures of the approving authorities are contained in Polish Bulletin No. E/02.170/2000.

This is a true translation from the original bulletin No. E/02.170/2000.

For conformity of translation:

O.RATUSIŃSKA

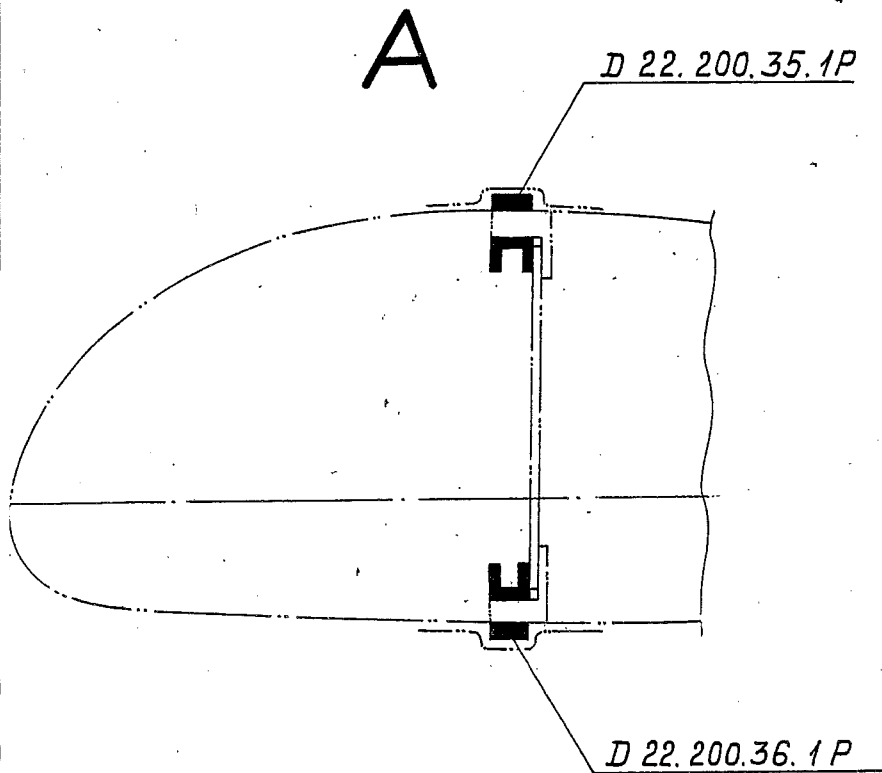
GICA Licensed

Translator in English

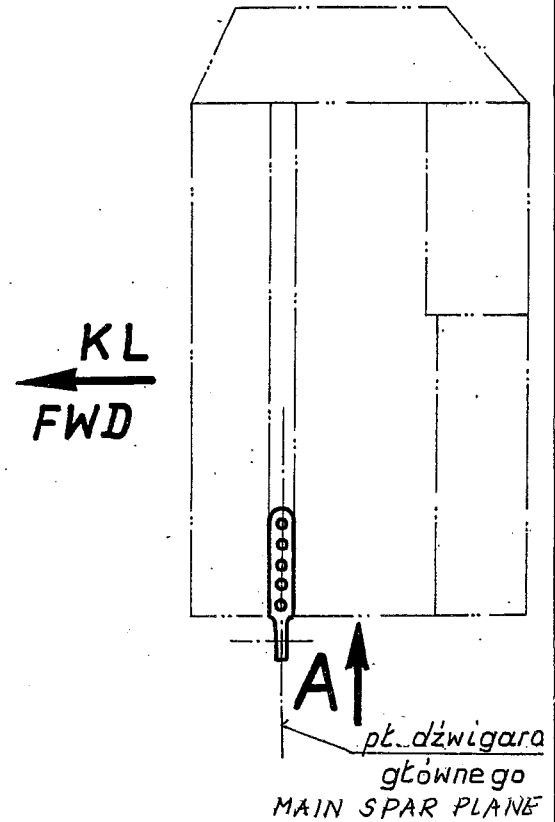
License No. 43C

Olga Ratusińska

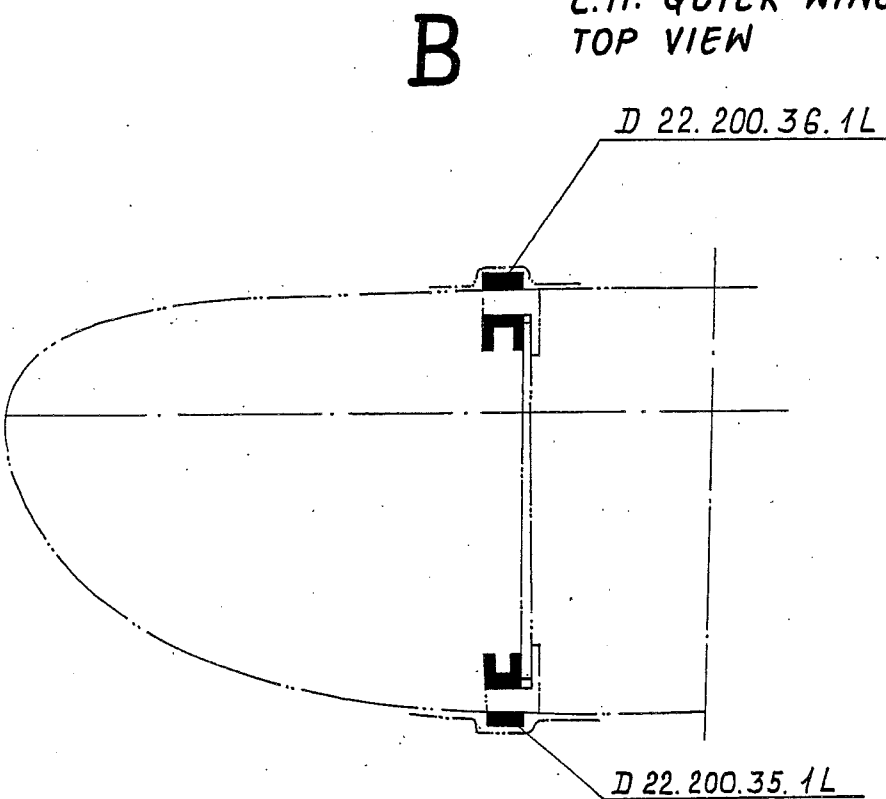
R.H. QUTER WING
TOP VIEW



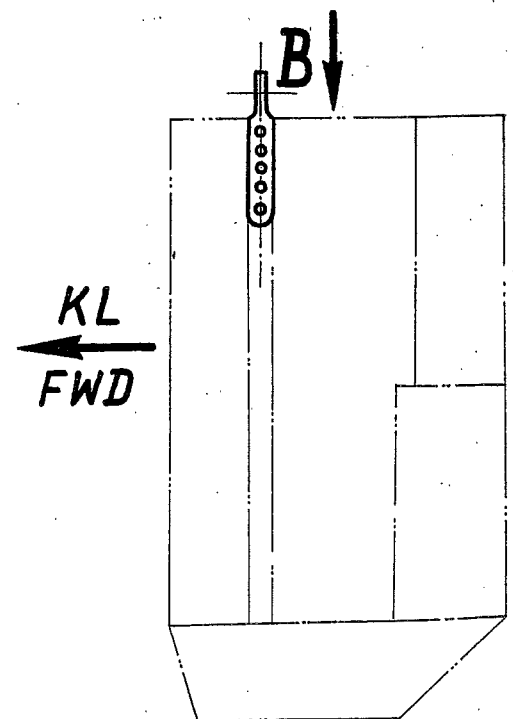
WIDOK Z GORY NA SKRZYDŁO
DOCZEPNE PRAWE



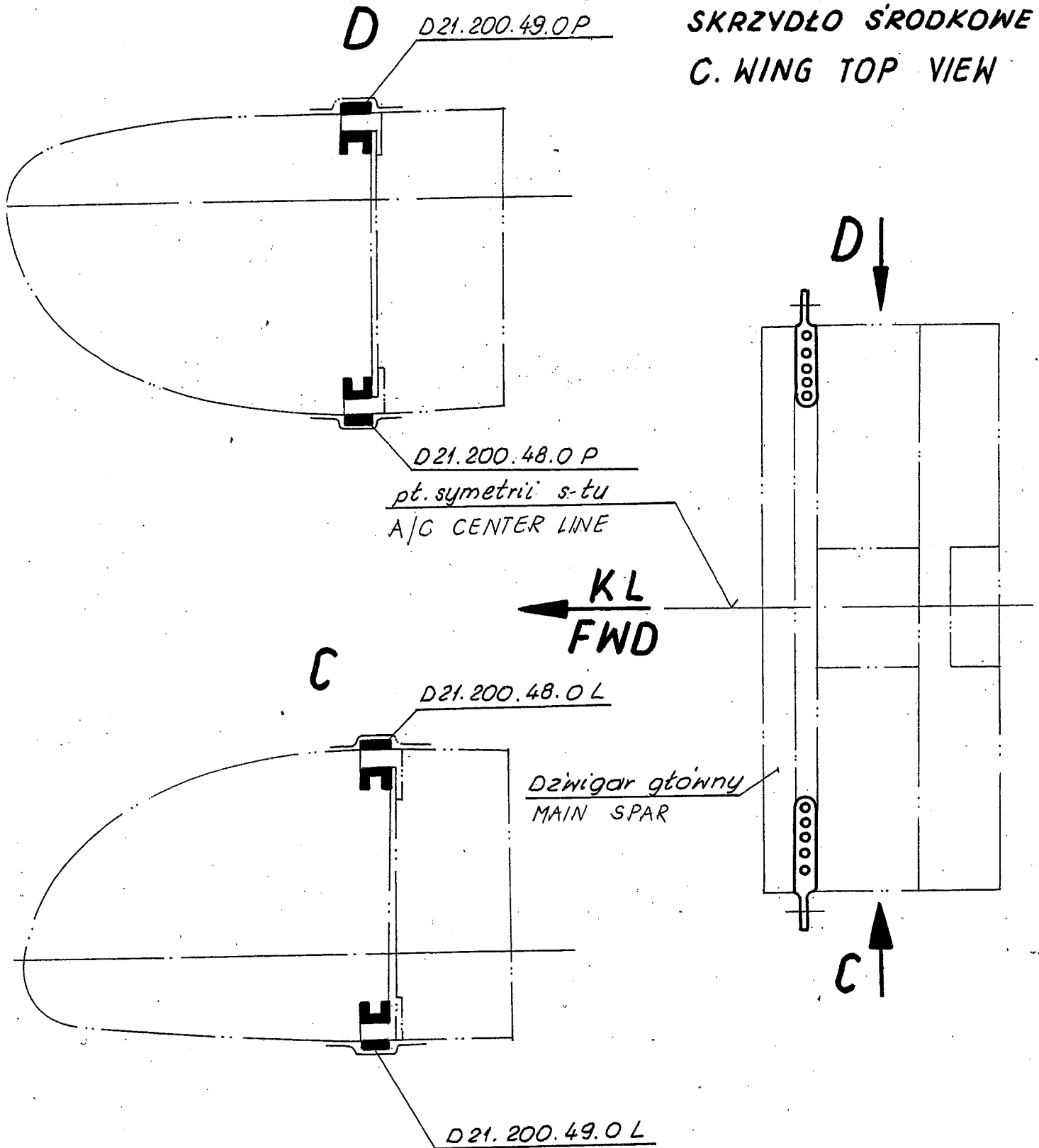
L.H. QUTER WING
TOP VIEW



WIDOK Z GORY NA SKRZYDŁO
DOCZEPNE LEWE



WIDOK Z GÓRY NA
SKRZYDŁO ŚRODKOWE
C. WING TOP VIEW



Demontaż trzpienia rozprężnego D21.535.00.0 z okucia

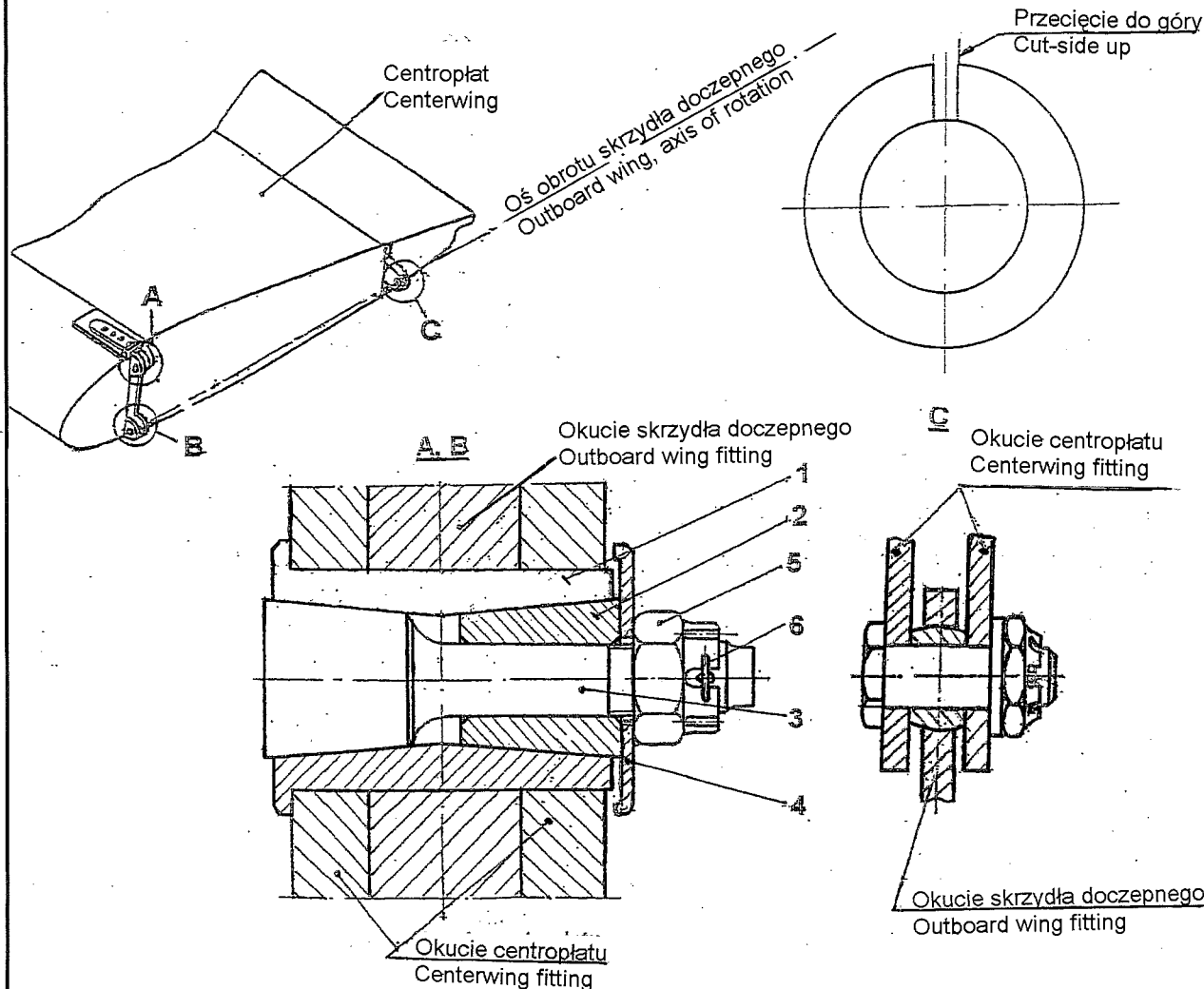
Trzpień przed wybicciem z okucia zalać płynem WD-40

- Zlać paliwo z instalacji paliwowej
- Ustawić pod demontowane skrzydło specjalne podnośniki
- Wyręcić wkręty i zdjąć owiewkę międzyskrzydłową
- Zdemontować elementy aparatury agro
- Odłączyć drążki sterowania
- Rozłączyć przewody instalacji paliwowej i elektrycznej
- Podeprzeć końcówkę skrzydła (odciążyć okucie dolne)
- Odkręcić nakrętkę trzpienia rozprężnego (poz. 5)
- Wymontować sworzeń gwintowany (poz. 3)
- Usunąć stożek (poz. 2)
- Trzpieniem duralowym usunąć trzpień rozprężny (poz. 1)

D21.535.00.0 Expansion Mandrel removal from the fitting

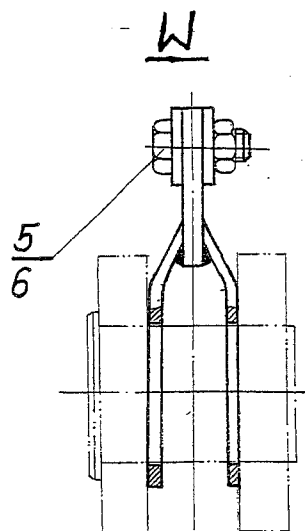
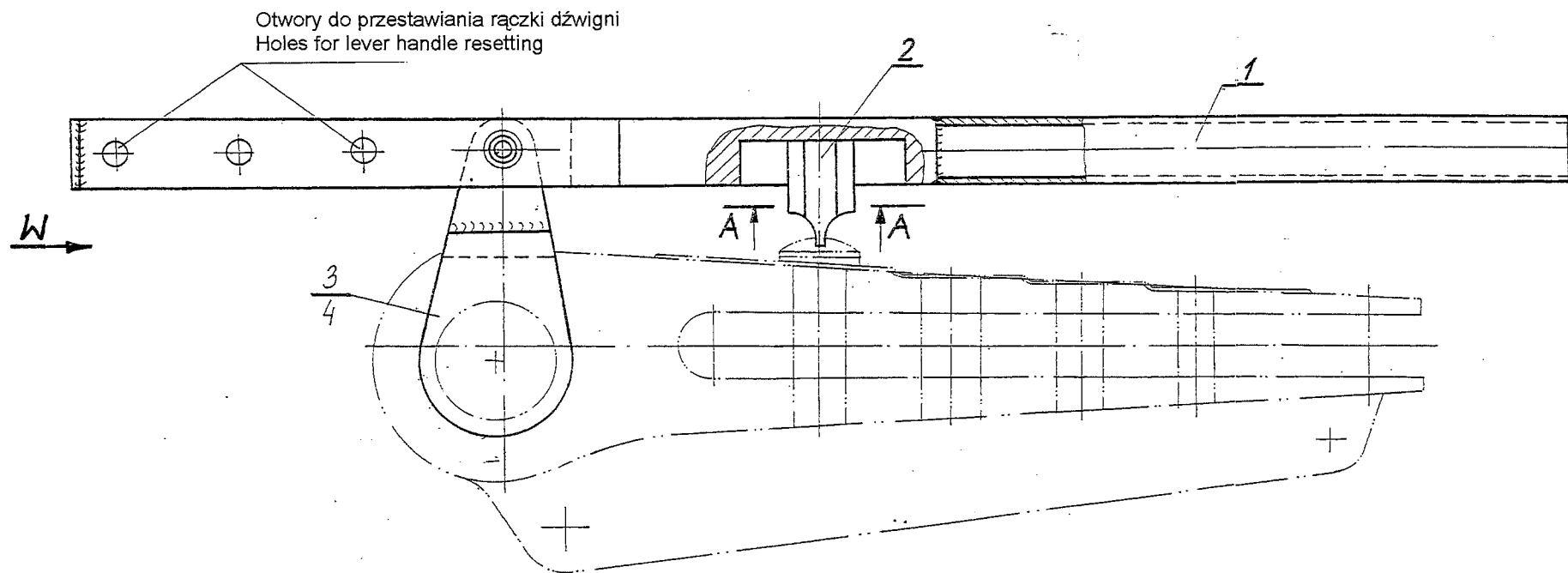
Prior to knocking out of the fitting, pour some WD-40 liquid over the expansion mandrel

- Drain fuel from the fuel system;
- Position special lift jacks under the wing to be removed;
- Undo the screws, and remove the fairing (at centerwing-to-outboard wing connection);
- Remove ag system elements;
- Disconnect control push-rods;
- Disconnect fuel & electric system lines;
- Support the wing tip (relieve load on the lower fitting);
- Undo the expansion mandrel nut (lt. 5);
- Remove the cone (lt. 2);
- Remove the expansion mandrel (lt. 1) with an Al-alloy mandrel.

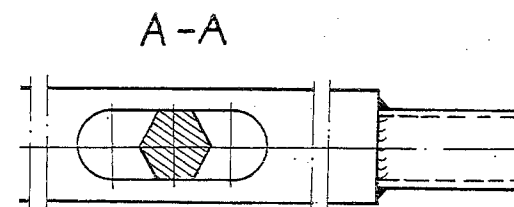


1-trzpień rozprężny; 2-tulejka stożkowa; 3-sworzeń gwintowany; 4-podkładka; 5-nakrętka; 6-zawlecza

1-expansion mandrel; 2-conical bushing; 3-threaded bolt; 4-washer; 5-nut; 6-cotter pin

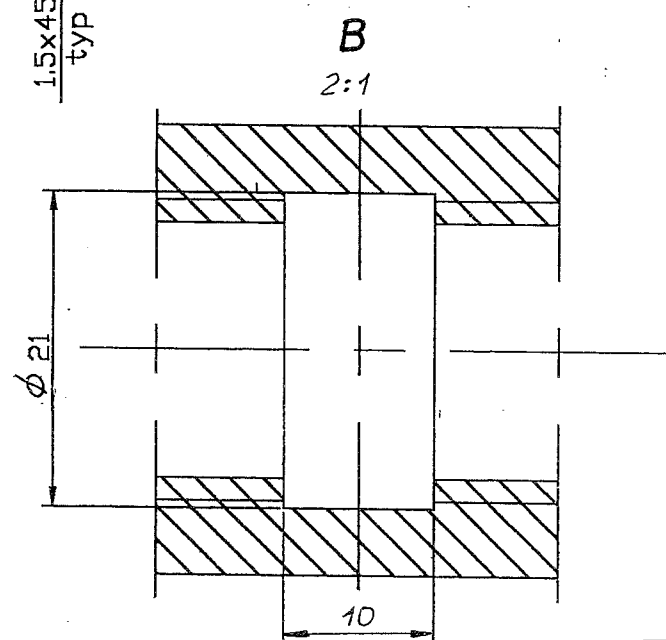
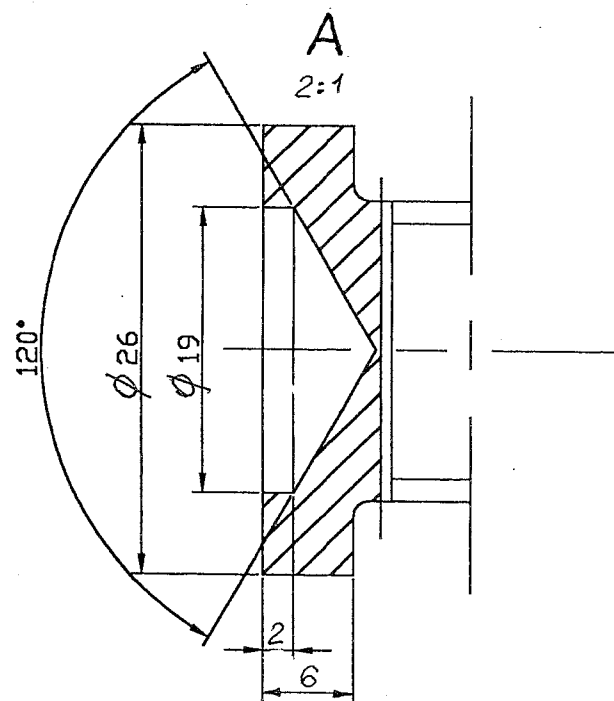
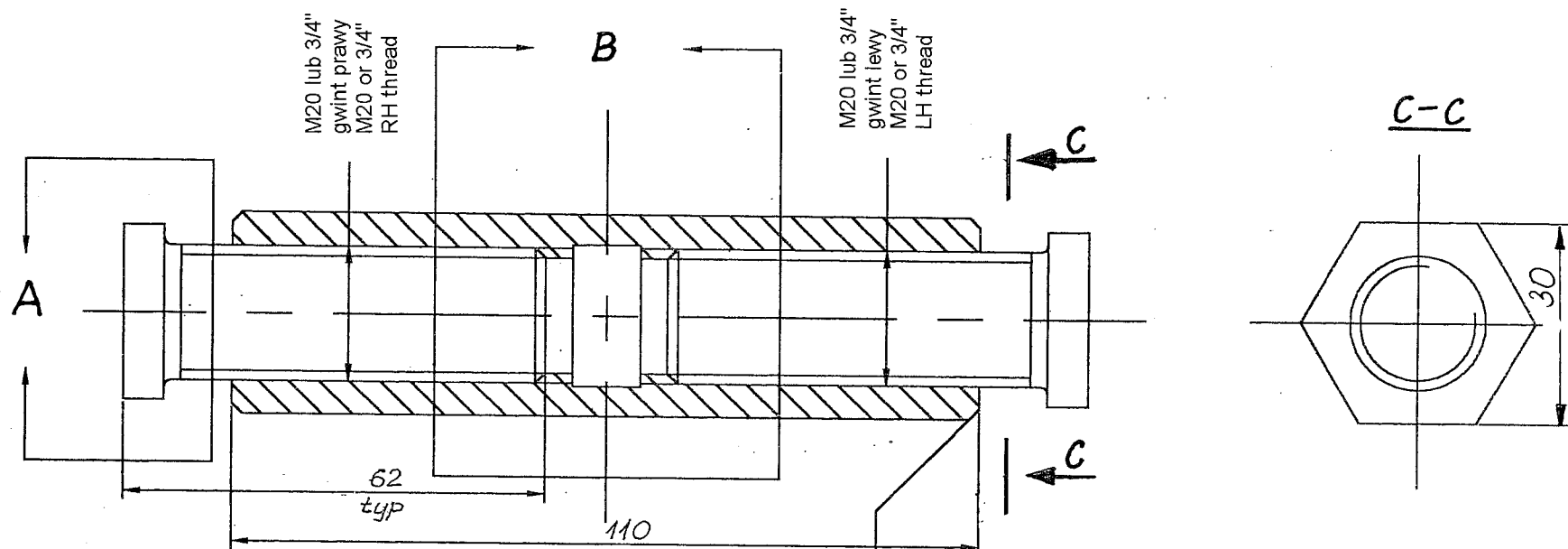


Dla skrzydła doczepnego (For outboard wing)
Dla skrzydła środkowego (For centerwing)



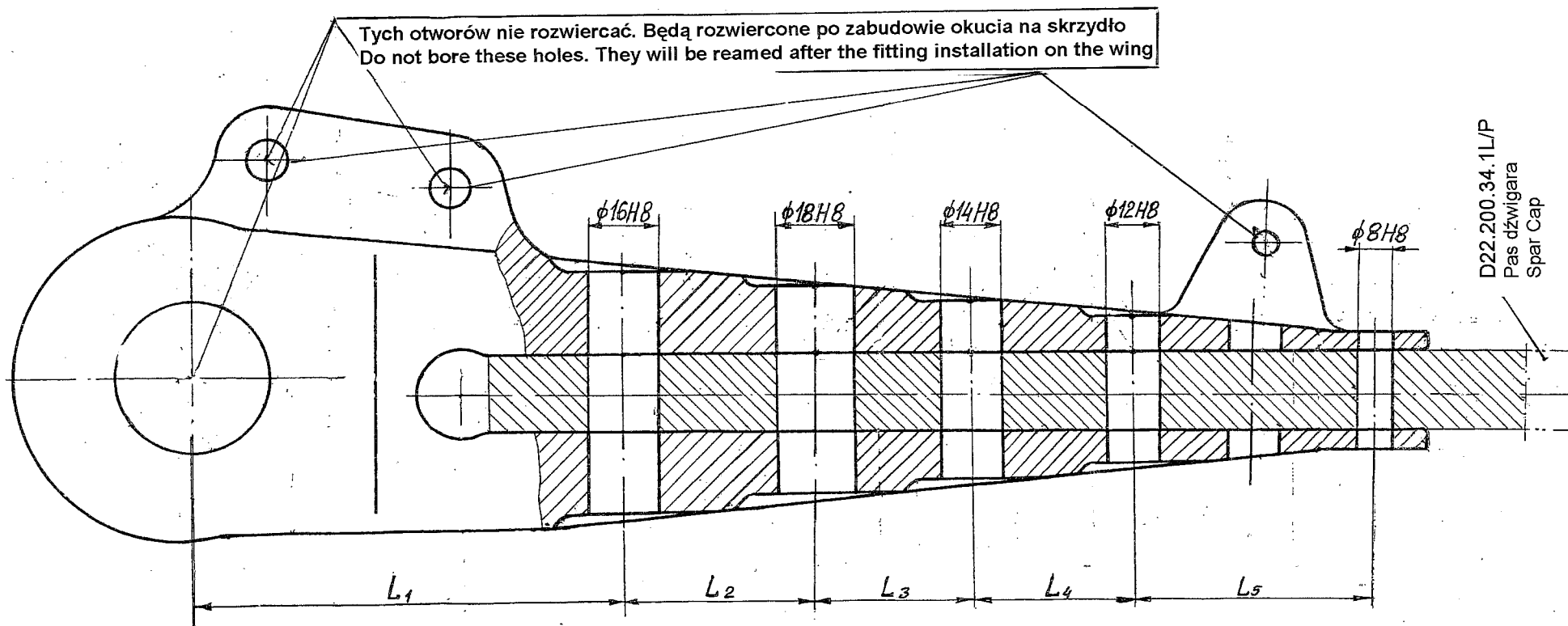
6		Nakrętka (Nut)	1	
5		Śruba (Bolt)	1	
4	E/02.170/2000-1.4	Uchwyt (Holder)	1	
3	E/02.170/2000-1.3	Uchwyt (Holder)	1	
2	E/02.170/2000-1.2	Wkładka (Insert)	1	Zestaw (Kit)
1	E/02.170/2000-1.1	Dźwignia (Lever)	1	Zestaw (Kit)

E/02.170/2000-2
WKRETK SPECJALNY
SPECIAL-PURPOSE SCREWDRIVER



WYTYCZNE DLA PRZENIESIENIA OTWORÓW POD ŚRUBY
Z PASA DŹWIGARA NA NOWY WSPORNIK
(RYS. Nr. D22.200.35.1; D22.200.36.1 SKRZYDŁO ZEWNĘTRZNE)

GUIDELINES FOR PROJECTION OF THE BOLT HOLES FROM THE
SPAR CAP ON A NEW FITTING
(DWG. No. D22.200.35.1; D22.200.36.1 OUTER WING)



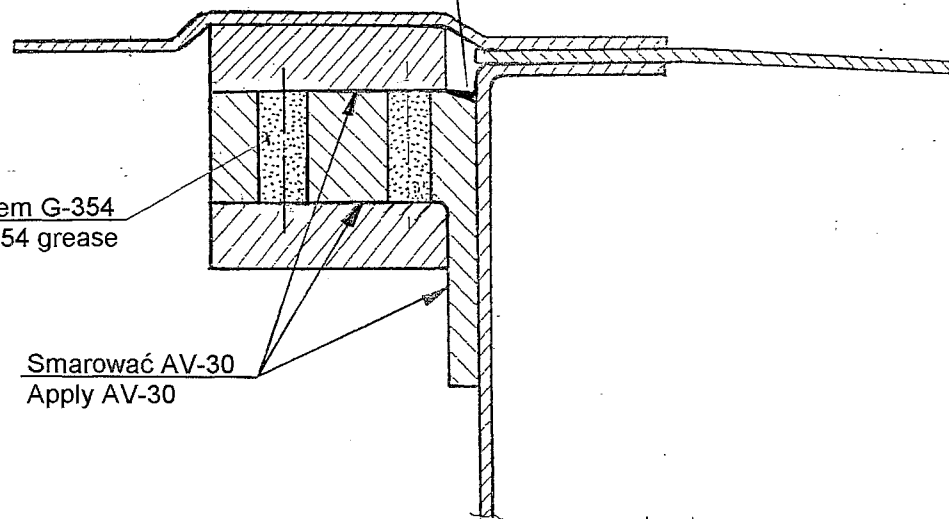
- L₁ - wymiar bazowy do pierwszego otworu φ 16H8 przenieść ze zdemon-
towanego okucia
- L₂ ÷ L₅ - wymiary przenieść ze zdemontowanego okucia. Rozstaw otworów
winien pokrywać się z istniejącymi otworami w pasie dźwigara
(w otworach montowane są śruby pasowane)

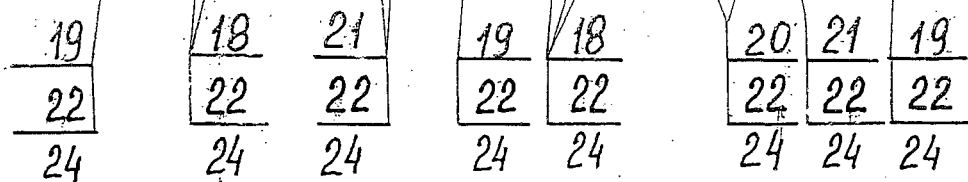
- L₁ - Reference (basic) dimension for first hole.
Project diameter φ 16H8 from the removed fitting.
- L₂ ÷ L₅ - Project the dimensions from the removed fitting. The hole spacing shall
converge with the existing holes in the spar cap. (Tight-fitting bolts are
installed in the holes).

4-ry otwory wypełnić smarem G-354
Fill the four holes with G-354 grease

Smarować AV-30
Apply AV-30

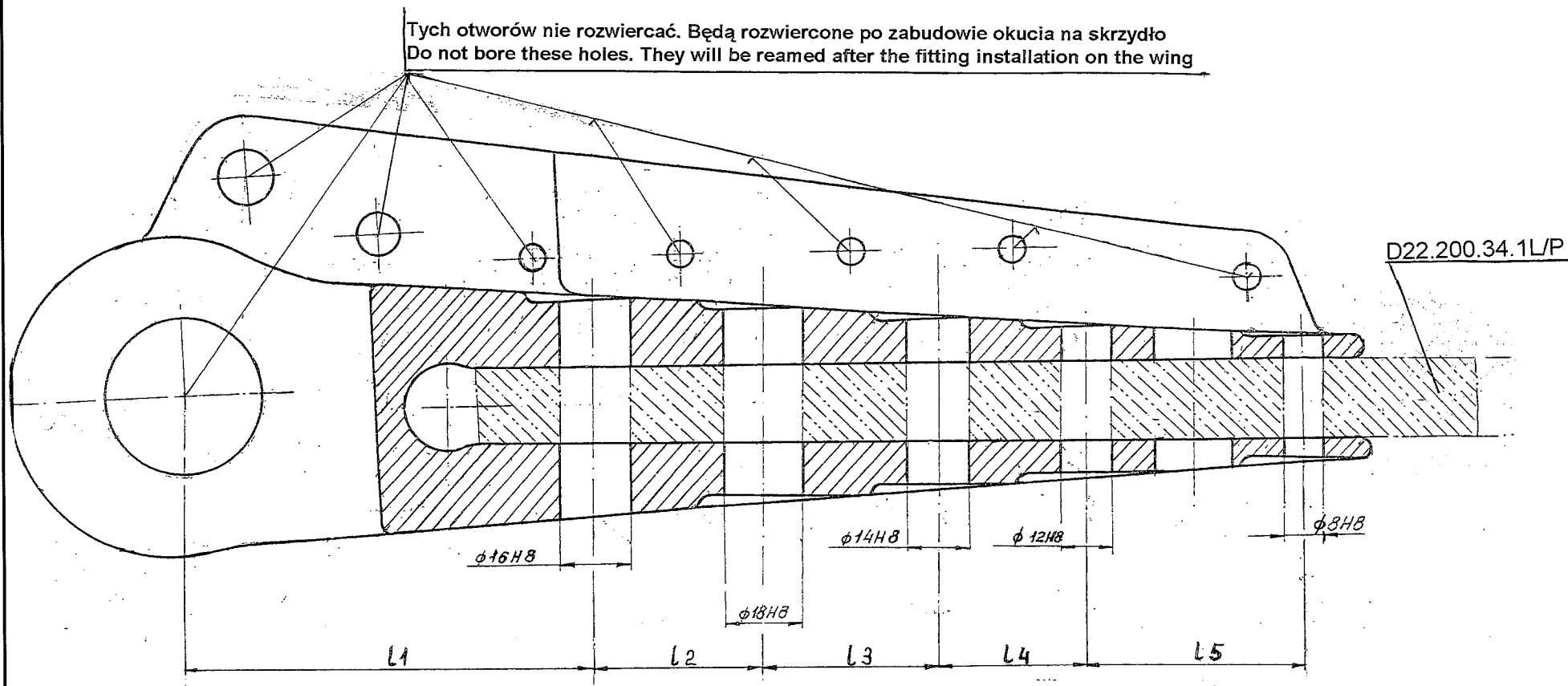
Lokalna max. głębokość korozji 1 mm
Max local corrosion depth: 1 mm





WYTYCZNE DLA PRZENIESIENIA OTWORÓW POD ŚRUBY
Z PASA DŹWIGARA NA NOWY WSPORNIK
(RYS. Nr. D21.200.48.0; D21.200.49.0 CENTROPLAT)

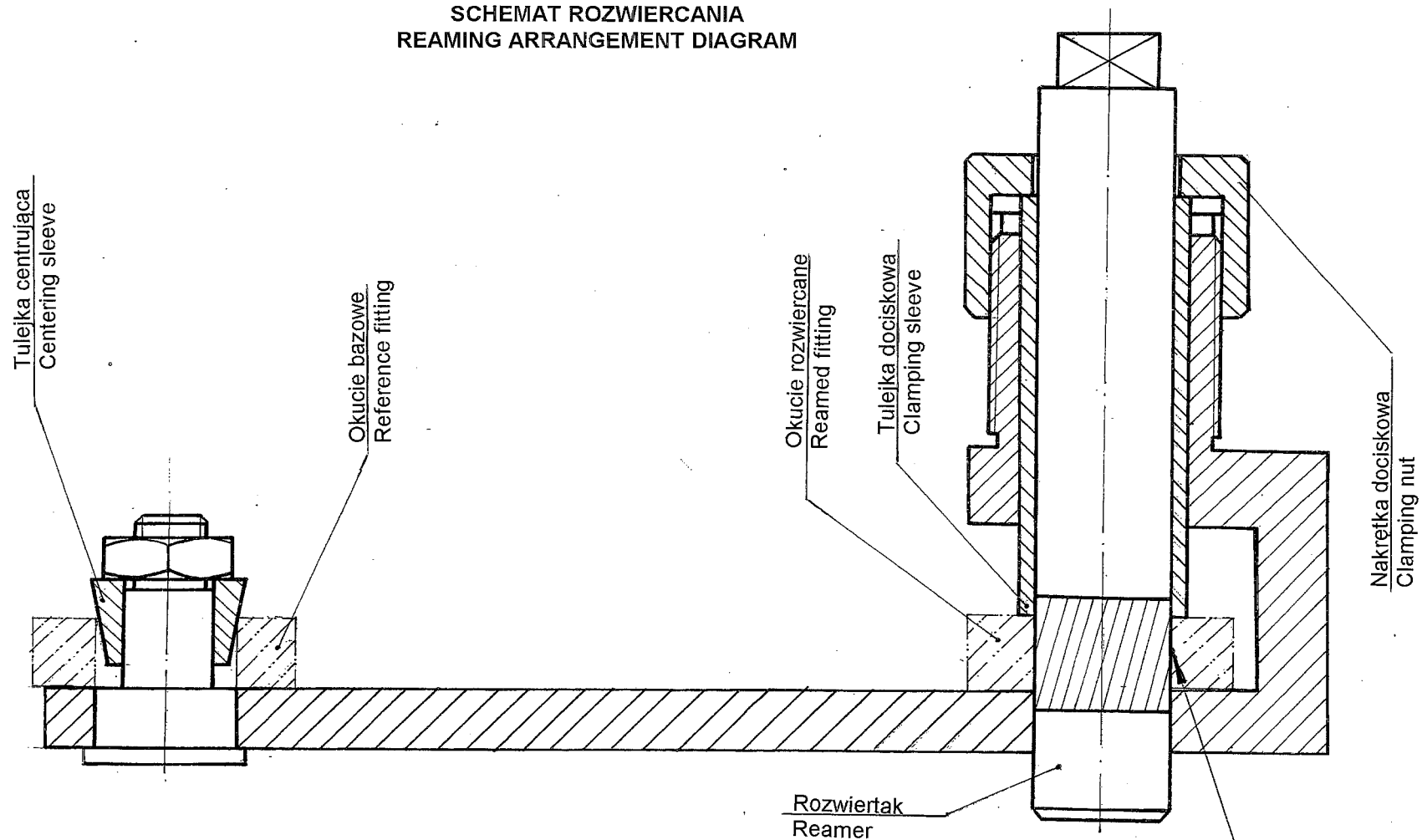
GUIDELINES FOR PROJECTION OF THE BOLT HOLES FROM THE
SPAR CAP ON A NEW FITTING
(DWG. No. D21.200.48.0; D21.200.49.0 CENTER WING)



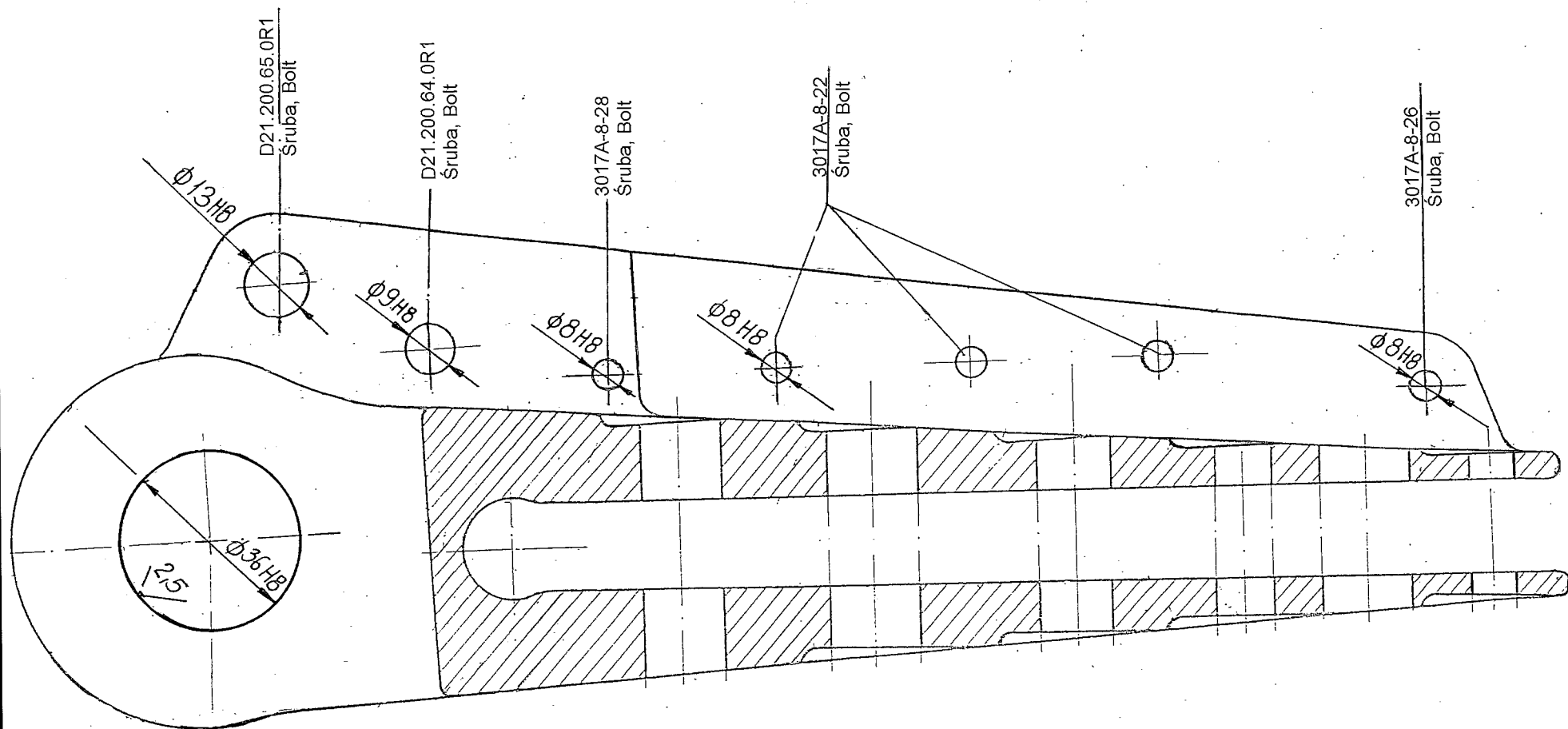
- L_1 - wymiar bazowy do pierwszego otworu $\phi 16H8$ przenieść ze zdemon-
towanego okucia
- $L_2 \div L_5$ - wymiary przenieść ze zdemontowanego okucia. Rozstaw otworów
winien pokrywać się z istniejącymi otworami w pasie dźwigara
(w otworach montowane są śruby pasowane)

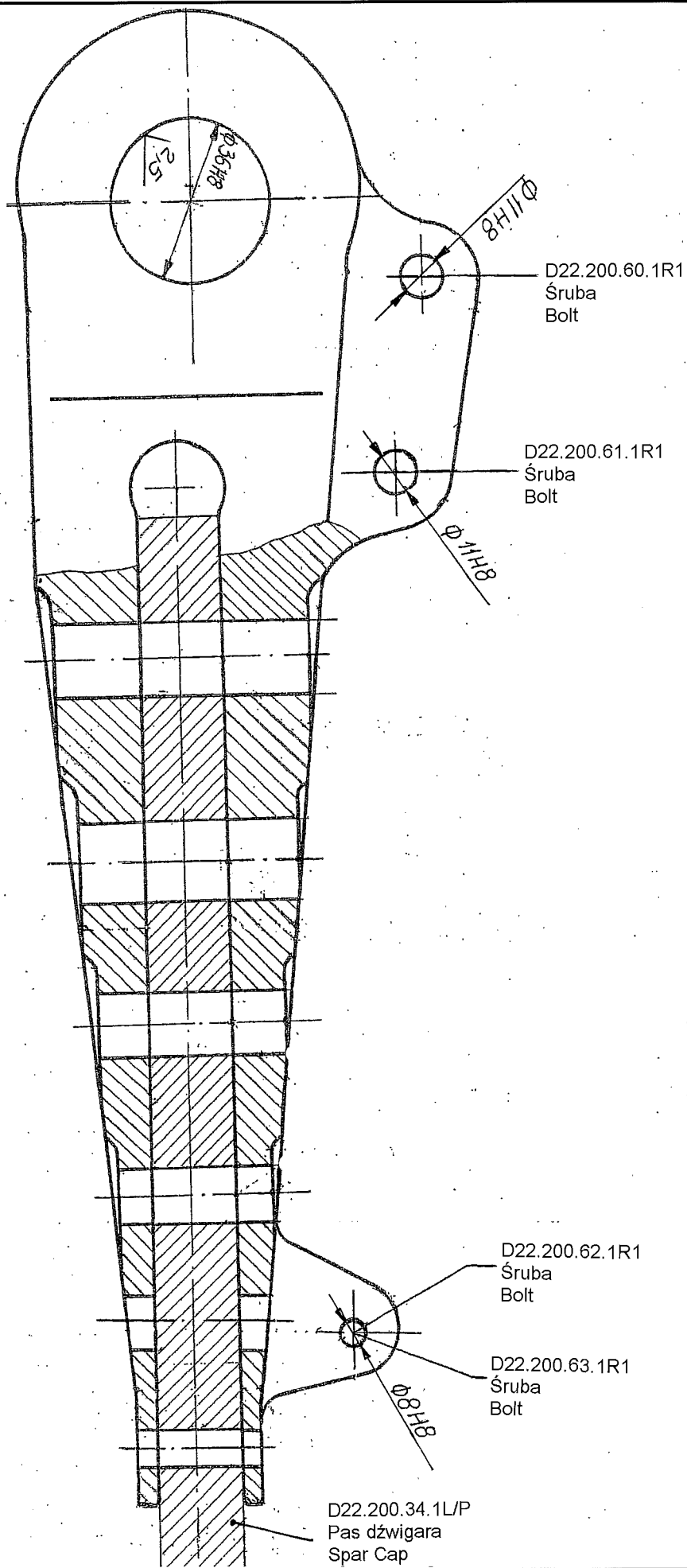
- L_1 - Reference (basic) dimension for first hole.
Project diameter $\phi 16H8$ from the removed fitting.
- $L_2 \div L_5$ - Project the dimensions from the removed fitting. The hole spacing shall
converge with the existing holes in the spar cap. (Tight-fitting bolts are
installed in the holes).

SCHEMAT ROZWIERCANIA
REAMING ARRANGEMENT DIAGRAM



W przypadku opierania się rozwiertaka $\phi 34,2H8$ o krawędź otworu okucia przy pierwszym rozwieraniu, należy w miejscu opierania okucie rozszlifować.
If dia. 34.2H8 reamer rests against the fitting hole edge during first reaming, grind off at the rest point.





PZL M-18 Service Bulletin E/02.172/2001

POLSKIE ZAKŁADY LOTNICZE Co. Ltd.

39-300 MIELEC

Phone 48 17 788 7921

ul. Wojska Polskiego 3

Fax 48 17 788 7829

Civil Aircraft Inspection

e-mail: pzl@ptc.pl

Board Certificate No. P-008/1

APPROVED BY:

Factory Manager in Charge

(_____)

Date

APPROVED BY:

CAIB Chief Inspector

(_____)

Date

SERVICE BULLETIN No. E/02.172/2001

TYPE / MODEL: PZL M18 "DROMADER"

**SERIAL Nos. AFFECTED: All Model M18, M18A, M18B, M18AS, M18BS aircraft
from S/N 1Z001-01 to (and including) 1Z028-01**

SUBJECT: Service life extension up to 10,000 flying hours

COMPLIANCE DATE: As appropriate, on a current basis

PREPARED BY:

**M18 Chief Designer
in Charge of Type Design**

(_____)

(Signature, date)

AGREED:

CAIB District VI

(_____)

(Signature, date)

Mielec, Jan. 15th, 2001

This Bulletin contains five (5) pages of type-written text

I. INTRODUCTION

The PZL M18 DROMADER aircraft of all models, in service with many countries worldwide are approaching the current service life limit of 6,000 flying hours established by the Manufacturer. The present Bulletin provides a procedure whereby the service life limit can be extended up to **10,000** (ten thousand) flying hours. The basis for the extension is constituted by the following:

- Fatigue test of the airframe structure;
- Inspection of selected aircraft with total flight time of about 6,000 hours;
- Tests and a theoretical analysis for compliance with the requirements of FAR 23.572, Amdt. 16

II. GENERAL

This Bulletin applies to the load-carrying structure of the airframe, its systems, flight and engine control systems of Model M18, M18A, M18B, M18AS, M18BS aircraft, starting from S/N **1Z001-01** to **1Z028-01** (inclusive), that have accumulated flight time of **6000 hours**, and have exhausted the service life limit as established by Bulletins E/02.142/91 and E/02.152/94 and defined in the pertinent service documentation.

Provisions of this Bulletin are not applicable to equipment, rubber components installed on the aircraft or Asz-62IR-m18 engine, along with its accessories, or AW-2-30 propeller constituting the aircraft powerplant, which should be operated subject to the requirements established and still effective for the products.

Bulletins E/02.142/91 and E/02.152/94 continue to be effective for the aircraft S/N 1Z001-01 through 1Z022-26, and the presents Bulletin complements the two first mentioned with respect to the service life extension.

Starting from S/N 1Z028-02 (inclusive) and up, all aircraft will have a Factory-granted service life of 10000 flying hours. The inspection scheme applicable to those aircraft will be outlined in their respective copies of the airplane Service Manual.

III. BULLETIN EXECUTION

Provisions of this Bulletin can be complied with by the aircraft Manufacturer or any organization licensed/approved to complete the M18 overhaul. Bulletin execution by the Manufacturer is supervised by the Polish civil airworthiness authority, while in the other cases the supervising body is a civil airworthiness authority of the country where the organization responsible for the Bulletin execution is located or of the aircraft owner's country.

Execution of the Bulletin shall begin with a special detailed verification inspection of the airplane, as in the 3000⁺³⁰⁰ flight hours' scheduled maintenance, and in compliance with the Operating Limitations, Chapter 8 of the Service Manual. During the inspection, particular attention shall be paid to the following:

- Incorporation of all applicable mandatory bulletins on the airplane subject to the verification inspection;
- Corrosion, cracks and wear in the outboard wing-to-centerwing and the centerwing-to-fuselage truss attach fittings;
- Corrosion and cracks in the steel caps of the outboard wings and centerwing main spars;
- Corrosion and cracks in the fuselage truss;
- Condition of the attach fittings at the horizontal tail and vertical tail attachment to the fuselage truss;
- Excessive free play in the airplane component assys and units attachment joints, in the flight and engine control systems;
- Condition of the skins and internal stiffening members of the centerwing, outboard wings and empennage (tail).

Bulletin E/02.170/2000 determines the criteria for qualification of allowable damage found in the main outboard wing-to-centerwing attach fittings, as well as their replacement procedures.

If corrosion is found at the steel caps of the outboard wings' and centerwing's main spars, it shall be eliminated by use of mechanical tools, then protected by application of ground and epoxy enamel (paint).

If pitting corrosion is found in the main spar steel caps, the maximum allowable depth of a pit is **1 mm (0.04")**. No cracks in the spar caps are allowed. Should replacement of a damaged spar cap be found necessary, the Manufacturer will define the replacement technology depending on the technical capabilities of the entity to complete the job.

Any other damage found shall be eliminated following the instruction of the Repair Manual or by replacement of the damaged parts and assys with new units.

In addition:

- On all aircraft, replace the left aft fitting of the centerwing-to-fuselage truss attachment (D21.530.00.1L), regardless of its actual condition. The fitting replacement technology is detailed in the Repair Manual and in Bulletins E/02.142/91 & E/02.152/94.

➤ On the aircraft S/N **1Z001-01** through **1Z005-12** (inclusive), replace the lower cap of the centerwing main spar, regardless of its actual condition. The Manufacturer will determine the replacement technology depending on the technical capabilities of the entity to perform the replacement.

Upon completion of the inspection, apply anti-corrosion protection to all attach fittings of the airplane component assys and the steel caps of the main centerwing and outboard wing spars. The recommended agent for anti-corrosion protection is DINITROL AV-30 or any other agent of equivalent anti-corrosion properties.

IV. FINAL PROVISIONS

1. Completion of the inspection shall be recorded in the airplane documentation , with appropriate entry made on extension of the service life limit in compliance with this Bulletin.

2. Operator is obligated to perform an annual inspection of the airframe on the with the service life extended hereunder, after each flying season, the inspection corresponding to the 500 flying-hours' maintenance, as defined in the Periodic Maintenance Schedule. Alternatively, the inspection can be conducted after each 500 flying hours. While conducting the inspection make sure to restore anti-corrosion protection if found damaged.

Signatures of the approving authorities are contained in Polish Bulletin No. E/02.172/2001.
This is a true translation from the original bulletin No. E/02.172/20001

For conformity of translation:

O.RATUSIŃSKA
GICA Licensed
Translator in English
License No. 43C

PZL M-18 Airplane Flight Manual
FAA Approved
(Relevant Pages)

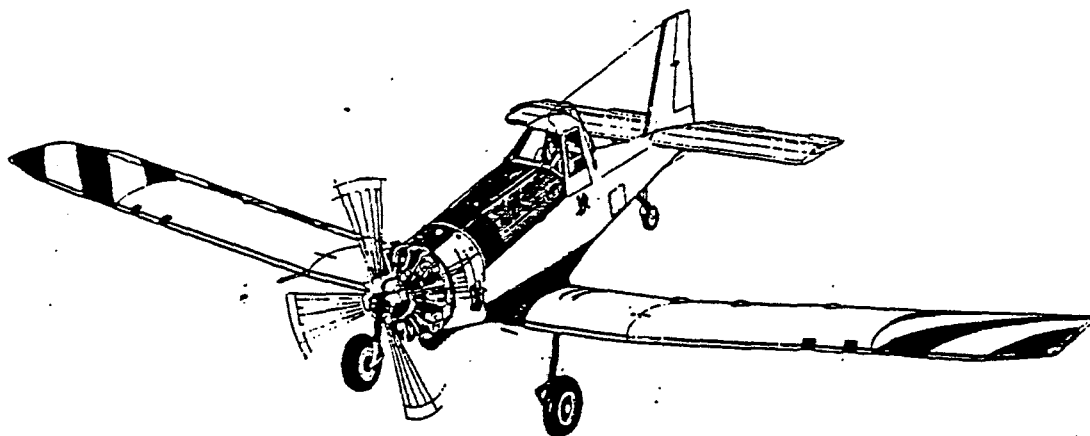


FACTORY OF TRANSPORT EQUIPMENT
" PZL - MIELEC "

AIRPLANE FLIGHT MANUAL

PZL M18A "DROMADER"

equipped with:
ASz - 62IR-M18 ENGINE



THIS AIRPLANE FLIGHT MANUAL IS FAA APPROVED FOR U.S.
REGISTERED AIRPLANES IN ACCORDANCE WITH THE PROVISIONS
OF 14 CFR SECTION 21,29 AND IS REQUIRED BY FAA TYPE
CERTIFICATE DATA SHEET No A47EU . . .

REGISTRATION No _____ MFRS. SERIAL No _____

MIELEC ; MAY - 1987

**AIRPLANE FLIGHT MANUAL
PZL M18A "DROMADER"
equipped with
ASz-62IRm18 ENGINE**

This manual must be always stored in the airplane

MODEL NUMBER : M18A

MFRS. SERIAL No

**Polish version of this manual approved by CACA on May 30. 1987
Foreign language version approved by manufacturer under
delegated authority by CACA.**

Signed by A. Sudół Anna Sudół
authorized manufacturer's representative



PZL M18A
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL – MIELEC«
AIRCRAFT FLIGHT MANUAL

CONTENTS

FAA APPROVED SECTIONS

- SECTION 1. GENERAL
- SECTION 2. LIMITATIONS
- SECTION 3. EMERGENCY PROCEDURES
- SECTION 4. NORMAL PROCEDURES
- SECTION 5. PERFORMANCE
- SECTION 6. WEIGHT AND BALANCE
- SECTION 7. AIRPLANE AND SYSTEMS DESCRIPTION
- SECTION 8. SUPPLEMENTS

INFORMATION - NOT FAA APPROVED SECTIONS

- SECTION 9. NORMAL AGRO PROCEDURES
- SECTION 10. NORMAL FIRE FIGHTING PROCEDURES
- SECTION 11. OPERATIONAL AND OPTIONAL MASS DATA
- SECTION 12. ADDITIONAL INFORMATION
- SECTION 13. SUPPLEMENTS



PZL M18A
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRCRAFT FLIGHT MANUAL

SECTION 2
LIMITATIONS

CONTENTS	PAGE
2.1. APPLICATION	2 - 1
2.2. WEIGHT AND C.G. LIMITS	2 - 1
2.3. POWER PLANT LIMITATIONS	2 - 1
2.4. AIRSPEED LIMITATIONS	2 - 5
2.5. MANEUVERING FLIGHT LOAD FACTORS	2 - 6
2.6. FLIGHT ALTITUDE AND AMBIENT TEMPERATURE LIMITATIONS	2 - 6
2.7. APPROVED OPERATIONS	2 - 7
2.8. PROHIBITED MANEUVERS	2 - 7
2.9. INSTRUMENT MARKINGS	2 - 7
2.10. REQUIRED PLACARDS	2 - 9
2.11. ADDITIONAL LIMITATIONS	2 - 12



PZL M18A
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRCRAFT FLIGHT MANUAL

SECTION 2

LIMITATIONS

2.1. APPLICATION

The M18A airplane is certificated in the Restricted Category for agricultural operations and dispensing fire fighting materials.

Noise abatement : this airplane has not been shown to comply with the noise limits in FAR Part 36, and must be operated in accordance with the noise operating limitations prescribed under FAR Section 91.56.

2.2. WEIGHT AND C.G. LIMITS

- | | |
|---|--|
| (a) Maximum Takeoff Weight | 9260 lbs (4200 kg) |
| (b) Maximum Landing Weight | 9260 lbs (4200 kg) |
| (c) Minimum Weight for Flight | 6160 lbs (2800 kg) |
| (d) Maximum Weight in Hopper | 3300 lbs (1500 kg) |
| (e) Maximum load in baggage compartment | 66 lbs (30 kg) |
| (f) Permitted Range of C.G. Position acc. to fig. 2.1 | |
| - Reference Datum | - Central Wing Leading Edge (see Fig. 6.1) |
| - MAC, Length | - 7.42 ft (2261 mm) |
| - MAC, Station | - 1/6 in (4 mm) aft datum |

2.3. POWER PLANT LIMITATIONS

- | | |
|-------------------|--------------------------------------|
| (a) Engine | |
| - type | ASz-62IRM18, 9 cylinder supercharged |
| - reduction ratio | 0.687 |



PZL M18A
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRCRAFT FLIGHT MANUAL

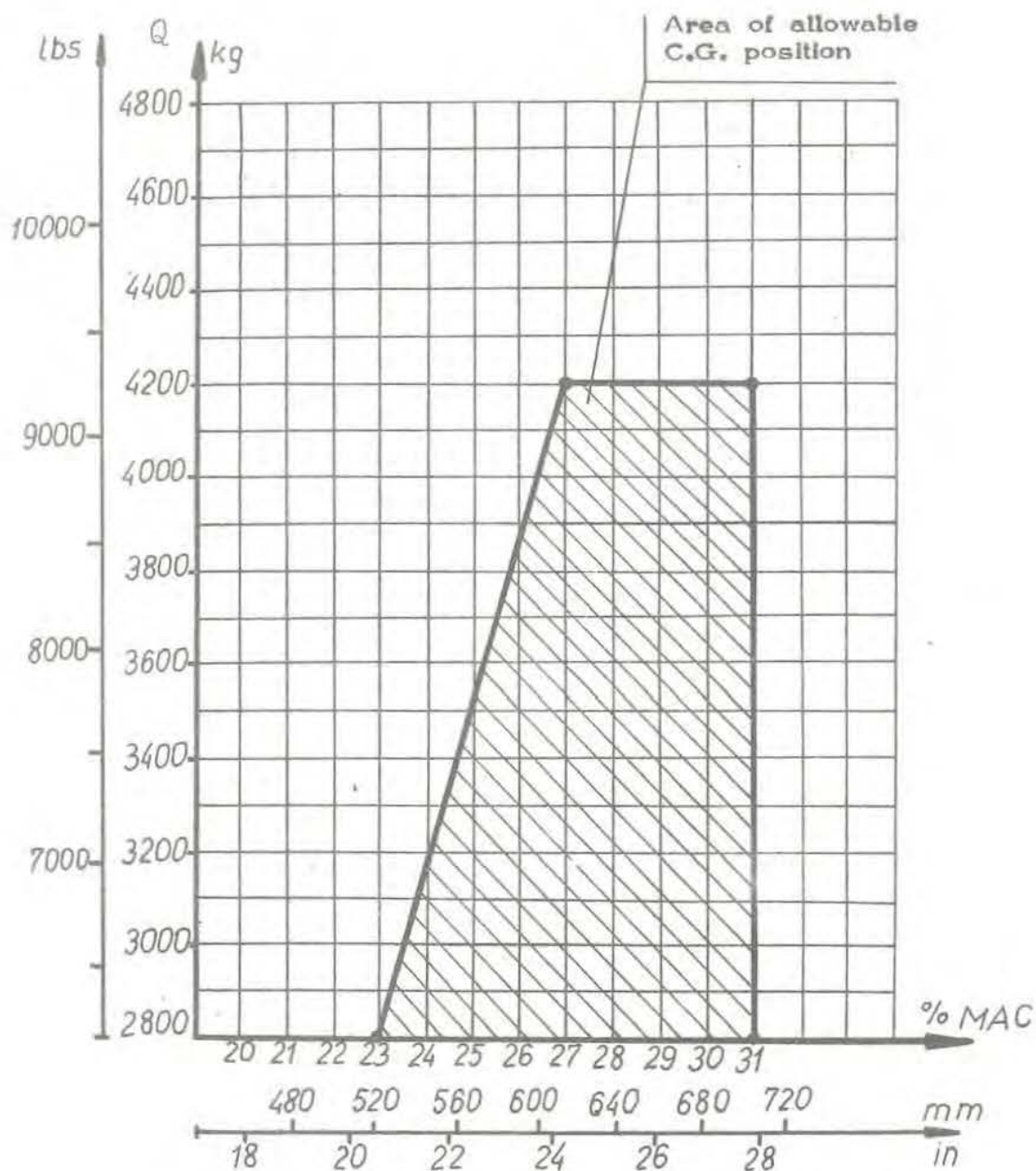


Fig. 2.1. Allowable C. G. position travel in % MAC and in (mm) versus reference datum l.e. wing leading edge for the M18A.



PZL M18A

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«

AIRCRAFT FLIGHT MANUAL

Engine Operating Limitations

Rating	Power	Crankshaft Speed	Manifold Pressure	Altitude
	kW (HP)	RPM	in Hg (mm Hg)	ft (m)
Takeoff	721 (967)	2200	41.3 $\pm$ 1 (1050 $\pm$ 25)	Sea level
Max. Continuous	591 (793)	2100	35.4 $\pm$ 0.4 (900 $\pm$ 10)	Sea level
Max. Continuous	605 (812)	2100	35.4 $\pm$ 0.4 (900 $\pm$ 10)	4922 (1500)

NOTES

1. The ASz-62IRM18 is an altitude engine. The critical altitude at max. continuous power is 4922 ft (1500 m) a.s.l.
2. Takeoff power continuous operation time shall not exceed 5 min.
3. The transition time from idle to takeoff power (movement of the throttle lever) shall not be less than 2-3 sec.

Engine speed

- minimum (idling) 550 RPM
- maximum 2220 RPM

Cylinder Head Temperature

- minimum 248°F (120°C)
- recommended 302 - 419°F (150-215°C)
- Maximum permissible at takeoff power during max. 5 min. and at remaining power levels max. 15 min. 473°F (245°C)



AIRCRAFT FLIGHT MANUAL

Inlet Oil Temperature

- | | |
|-------------------------------------|---------|
| - minimum | 50°C |
| - normal | 60-75°C |
| - max. allowable during max. 3 min. | 85°C |

NOTE

When 120 SUS viscosity oil at 210°F (98,9°C) is used the maximum inlet oil temperature may be 203°F (95°C) during max. 3 minutes.

Carburettor Inlet Fuel Pressure

- | | |
|----------|---|
| - normal | 3,5-5 psi (0,25-0,35 kG/cm ²) |
| - idling | 2,0 psi (min. 0,15 kG/cm ²) |

Mixture Temperature

To prevent carburettor icing at low temperature (below 5°C), high humidity, drizzle or wet snow apply carburettor heat to keep the mixture temperature above min. 3 degrees centigrade.

Oil Pressure

- | | |
|-----------------|--|
| - normal powers | 57-71 psi (4-5 kG/cm ²) |
| - idling | min. 21 psi (min. 1,5 kG/cm ²) |
| - maximum | 100 psi (7 kG/cm ²) |

Starter Operation

- | | |
|--|---|
| - starter working voltage | 24 V |
| - running time of the electrical starter | 13 sec. |
| - number of allowed startings | max. 4 with min. 20 sec. cooling between starts. After 4 starts minimum cooling time of 30 minutes is required. |

PZL M18A
WYTWORNIA SPRZETU KOMUNIKACYJNEGO "PZL - MIELEC"
AIRCRAFT FLIGHT MANUAL

- b) Propeller
 - type AW-2-30 constant speed four blade
 - min. low pitch setting 17° (ser. no. 12006-20 and preceding)
 18° (ser. no. 12007-01 and subsequent)
- c) Fuel and Oil
- Fuel
 Usable fuel quantity 94 US gal.; (78 Imp. gal; 356 l) in each of the two wing tanks
- Unusable fuel quantity in the system 3.7 US gal.; (3.1 Imp. gal; 14 l)
- Aviation gasoline min. octane 91
- Oil
 Approved grade mineral aviation oil with or without detergent, min. viscosity 20 cST at 100°C, min. viscosity index 80, list of oils to be used is given in the table 1.1.

2.4. AIRSPEED LIMITATIONS

	IAS			CAS		
	MPH	KTS	(km/h)	MPH	KTS	(km/h)
a) Max. never exceed, VNE (clean airplane)	171	148	(275)	174	151	(280)
b) Maneuvering speed V _A	139	120	(223)	142	123	(228)
c) Max. flaps extended speed V _{FE}	120	104	(194)	124	108	(200)
d) Max. cruising speed V _{NO} (clean airplane)	140	121	(225)	143	124	(230)
e) Max. flying speed with dusting spraying or atomizing equipment installed	120	104	(194)	124	108	(200)
f) Max. atomizing switching "ON" speed	114	99	(184)	118	102	(190)
g) Max. emergency dump speed	112	97	(180)	116	100	(186)
h) Max. headwind velocity	34 mph; 29.5 KTS; 15 m/s					
i) Max. cross wind velocity (90°) tested during taxi, take-off and landing.	14.5 mph; 13 KTS; 6.5 m/s					

PZL M18A
WYTWORNIA SPRZETU KOMUNIKACYJNEGO "PZL - MIELEC"
AIRCRAFT FLIGHT MANUAL

NOTE

Airspeed limitation regarding the airplane
equipped with mudguards:

	IAS			CAS		
	MPH	KTS	(km/h)	MPH	KTS	(km/h)
- max. never exceed speed VNE	140	121	225	143	124	320
- max. cruising speed, VNO	120	104	194	124	108	200

2.5. MANEUVERING FLIGHT LOAD FACTORS

- max. with flaps retracted	
positive (+)	3.4
negative (-)	1.4
- max. with flaps extended	15°
positive (+)	2.0
negative (-)	0.0

2.6. FLIGHT ALTITUDE AND AMBIENT TEMPERATURE LIMITATION

The max. approved flight altitude is 13000 ft (4000 m). Allowable ambient temperature on the ground is

-10°C to +40°C for the remaining aircraft.



PZL M18A
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRCRAFT FLIGHT MANUAL

2.7. APPROVED OPERATIONS

The aircraft is approved for day and night operation under VFR conditions.

Flight in icing conditions is prohibited.

2.8. PROHIBITED MANEUVERS

Intentional aerobatic maneuvers including entry into spins are prohibited.

2.9. INSTRUMENT MARKINGS

(a) UKZ-1K engine unit gauge

- oil temperature indicator

50° Red Line MINIMUM
50-60°C Yellow Arc CAUTION
60-75°C Green Arc NORMAL
75-85°C Yellow Arc CAUTION
85°C Red Line MAXIMUM

- oil pressure gauge

21 psi (1.5 kG/cm²)
Red Line MINIMUM
21-57 psi (1.5-4 kG/cm²)
Yellow Arc CAUTION
57-71 psi (4-5 kG/cm²)
Green Arc NORMAL
71-100 psi (5-7 kG/cm²)
Yellow Arc CAUTION
100 psi (7 kG/cm²)
Red Line MAXIMUM

- fuel pressure gauge

2.0 psi (0.15 kG/cm²)
Red Line MINIMUM
2.0-3.5 psi (0.15-0.25 kG/cm²)
Yellow Arc CAUTION
3.5-5 psi (0.25-0.35 kG/cm²)
Green Arc NORMAL
5 psi (0.35 kG/cm²)
Red Line MAXIMUM

(b) Cylinder head temperature indicator

248°F (120°C) Red Line MINIMUM
248-302°F (120-150°C) Yellow Arc CAUTION

PZL M18A
WYTWORNIA SPRZETU KOMUNIKACYJNEGO "PZL - MIELEC"
AIRCRAFT FLIGHT MANUAL

	302-419°F (150-215°C) Green Arc NORMAL
	419-473°F (215-245°C) Yellow Arc CAUTION
	473°F (245°C) Red Line MAXIMUM
(c) RPM Indicator	550 RPM Red Line MINIMUM
	550-2100 RPM Green Arc NORMAL
	2100-2200 RPM Yellow Arc CAUTION
	2200 RPM Red Line MAXIMUM
(d) Manifold Pressure Gauge	42,4 in Hg (1075 mm Hg) Red Line MAXIMUM
(e) Mixture temperature indicator	-5°C Red Line MINIMUM -5°C to +3°C Yellow Arc CAUTION
(f) Airspeed indicator (Indicated Airspeed with zero instrument error)	84 - 140 MPH (73 - 121 KTS; 135 - 225 km/h) Green Arc NORMAL
	78 - 120 MPH (67 - 105 KTS; 125-194 km/h) White Arc FALPS
	140 - 172 MPH (121-148 KTS; 225 - 275 km/h) Yellow Arc CAUTION
	171 MPH (148 KTS; 275 km/h) Red Line NEVER EXCEED SPEED
(g) Hydraulic pressure gauge	1351 psi (95 kG/cm ²) Red Line MINIMUM
	1251-1990 psi (95-140 kG/cm ²) Green Arc NORMAL
	1990 psi (140 kG/cm ²) Red Line MAXIMUM

PZL M18A
WYTWORNIA SPRZETU KOMUNIKACYJNEGO "PZL - MIELEC"
AIRCRAFT FLIGHT MANUAL

- (h) Brake system pressure gauge 1351 psi (95 kG/cm²) Red Line
MINIMUM
1351-1564 psi (95-110 kG/cm²)
Green Arc NORMAL
1564 psi (110 kG/cm²) Red
Line MAXIMUM
- (i) Altimeter 13000 ft (4000 m) Red Line
MAXIMUM
- NOTE: The marking refers to
the small pointer.
- (j) Voltammeter 20 V Red Line MINIMUM
20-24,3 V Yellow Arc CAUTION
24,3-29,7 V Green Arc NORMAL
29,7 V Red Line MAXIMUM

2.10. REQUIRED PLACARDS

- (a) Left hand cockpit wall:

"DO NOT OPEN DOOR IN FLIGHT"

"ALTITUDE CORRECTION"

"SPEED CORRECTION"

- (b) Right hand cockpit wall:

"DO NOT OPEN DOOR IN FLIGHT"

"ENGINE STOP VALVE - OFF"

- (c) Central instrument panel:

"CAUTION - DISC BRAKES"

"ACROBATIC MANEUVERS INCLUDING SPINS ARE NOT APPROVED.
MAXIMUM TIME OF THE ENGINE CONTINUOUS OPERATION AT
TAKEOFF POWER - 5 MIN."

"MAXIMUM AIRSPEED (IAS)	MPH	KTS	km/h
MANEUVERING	139	120	223
FLAPS DOWN	120	104	194
WITH AGRICULTURAL EQUIPMENT	120	104	194

PZL M18A
WYTWORNIA SPRZETU KOMUNIKACYJNEGO "PZL - MIELEC"
AIRCRAFT FLIGHT MANUAL

	MPH	KTS	km/H
MAXIMUM HEADWIND VELOCITY	34	29,5	15 m/s
MAXIMUM CROSSWIND VELOCITY	14,5	13	6,5 m/s
USABLE QUANTITY OF FUEL TANKS IN EACH WING	94 US GAL	78 Imp.gal.	356 l

"NO SMOKING"

Placard effective on airplane with landing lights:

"THIS AIRPLANE OPERATION IS LIMITED TO VFR DAY AND NIGHT FLIGHT. FLIGHT IN ICING CONDITIONS IS PROHIBITED"

Placard effective on airplane without landing lights:

"THIS AIRPLANE OPERATION IS LIMITED TO VFR DAY FLIGHT. FLIGHT IN ICING CONDITIONS IS PROHIBITED"

(d) Left instrument panel:

"DO NOT TURN GENERATOR OFF IN FLIGHT EXCEPT IN CASE OF EMERGENCY"

Placard effective on airplane with anticollision strobe lights:

"WARNING
TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY
OF OTHER AIRCRAFT OR DURING FLIGHT THROUGH
CLOUD, FOG, OR HAZE"

Placard effective on airplane with turn indicator and artificial horizon failure signalling device:

"TURN IND. AND ARTIF. HORIZON FAILURE"

PZL M18A
WYTWORNIA SPRZETU KOMUNIKACYJNEGO "PZL - MIELEC"
AIRCRAFT FLIGHT MANUAL

(e) Right hand instrument panel:

"100 AMP. MAX."

(f) Right instrument panel:

"PULL FOR CABIN AIR"

Placard effective on airplane with fuel gauge D77.146.00.1
or D77.146.00.2:

"DO NOT READ FUEL GAUGE INDICATIONS DURING RADIO
COMMUNICATION"

(g) Aft cockpit wall:
Data plate.

(h) Tail wheel lock bracket:

"LOCKED"

"UNLOCKED"

(i) Parking brake bracket:

"ON"

"OFF"

(j) On wings near fuel inlet:

"FUELING 94 US GAL (78 IMP.GAL; 356 l) MINIMUM OCTANE
No. 91"

(k) Right hand fuselage cowlings:

"OIL TANK - 18,2 US GAL. (15.4 IMP.GAL.; 70 L) MK-22,
MS-20, AERO SHELL OIL/100W"

(l) Mechanic's cabin:

Placards:

"NO SMOKING"

"EMERGENCY DOOR DUMP"

"FASTEN SAFETY BELTS"



PZL M18A
WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRCRAFT FLIGHT MANUAL

2.11. ADDITIONAL LIMITATIONS

(a) It is not allowed to perform the operational flights with any person in the mechanic cabin.

(b) In flight with a mechanic on board, when the baggage and chemical load is carried in the baggage compartment and hopper respectively, it is recommended to adjust mutual ratio of all the above load and max. refuelling due to the possibility of exceeding the allowable rearmost C. G. position.

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PZL M-18 Airplane Flight Manual
EASA Approved
(Relevant Pages)



WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO
„PZL – MIELEC”

**AIRCRAFT
FLIGHT MANUAL
PZL M18 „DROMADER”
equipped with ASz-62IRm18
ENGINE**

REGISTRATION № _____

MFRS. SERIAL № _____

Mielec
DECEMBER 15 1979



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC« AIRCRAFT FLIGHT MANUAL

SECTION 2

LIMITATIONS

2.1. APPLICATION

The M18 aircraft is certificated in the Normal Category of FAR Part 23. It meets requirements of noise standards contained in FAR 36, Appendix F.

This airplane is designed to be used for agricultural and forestry operations including:

- (a) spreading solid materials as dust, powder, granules or seeds;
- (b) spraying chemical aqueous solution and oily fluids;
- (c) fire-fighting.

2.2. WEIGHT AND C.G. LIMITS

- (a) Maximum Takeoff Weight 9260 Lbs (4200 kg)
- (b) Maximum Landing Weight 9260 Lbs (4200 kg)
- (c) Minimum Flying Weight 6160 Lbs (2800 kg)
- (d) Maximum Weight in Hopper 3300 Lbs (1500 kg)
- (e) Maximum load in baggage compartment 66 Lbs (30 kg)
- (f) Permitted Range of C.G. Position acc. to Fig. 2.1.

- Reference Datum - Central Wing Leading Edge (See Fig. 6.1.)
- MAC, Length - 7.42 ft (2.261 m)
- MAC, Station - 1/8 in (4 mm) aft of datum

2.3. POWER PLANT LIMITATIONS

- (a) Engine
 - type ASz-62IRM18, 9 cylinder supercharged



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRCRAFT FLIGHT MANUAL - SUPPLEMENT No.1

SECTION 9

SUPPLEMENTS

SUPPLEMENT No.1

MANUFACTURERS RECOMMENDATIONS CONCERNING THE OPERATION
OF THE M18 "DROMADER" AIRPLANE IN OVERLOAD VERSION
AT THE TAKEOFF WEIGHT OF 10340 Lbs /4700 kg/

SECTION 1

GENERAL

1.1. INTRODUCTION

The following is added:

This supplement presents the necessary data pertaining to the operation of the M18 airplane in overweight version, i.e. with greater takeoff weight. This supplement contains only information which revises or supplements the information given in the M18 Flight Manual issued on December 15.1979.

After this supplement has been approved by the operator's Airworthiness Authority, incorporated into the Flight Manual and the appropriate placard specified under item 2.10. of this supplement installed on the airplane, the airplane will be approved for flights in overload version.



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL - MIELEC«
AIRCRAFT FLIGHT MANUAL - SUPPLEMENT No.1

1.2. SHORT DESCRIPTION

The following is added:

The inertia moments of the airplane in the version with greater takeoff weight, namely 10340 Lbs /4700 kg/ differ slightly from the inertia moments of the airplane with takeoff weight of 9260 Lbs /4200 kg/.

The difference in moments does not exceed 3 percent and the position of the main central axes of inertia does not change more than by 1 degree. This is due to the fact that the only change is the greater load in hopper.

1.3. GEOMETRICAL DATA

Dimensions

No change

Wing

Specific Loading

24 Lbs/sq.ft.

/117,5 kg/m²/

The remaining text does not change

Horizontal Empennage

No change

Vertical Empennage

No change

1.4. ENGINE

No change

1.5. OPERATIONAL DATA

/a/ Weight

- max takeoff

10340 Lbs /4700 kg/

- max landing

9260 Lbs /4200 kg/

/b/ Fuel and oil

No change



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL – MIELEC«
AIRCRAFT FLIGHT MANUAL – SUPPLEMENT No.1

SECTION 2

LIMITATIONS

2.1. APPLICATION

No change

2.2. WEIGHT AND C.G. LIMITS

/a/ Max. Takeoff Weight	10340 Lbs /4700 kg/
/c/ Max. Hopper Load	4180 Lbs /1900 kg/*
/d/ Permitted Range or C.G. Positions	see Fig.2.1. this supplement

For the airplane in atomizing version, with enlarged fuel tanks at the T-0 weight above 9260 Lbs /4200 kg/ the maximum fuel load in the tanks shall not exceed 166 US gal /137 Imp.gal; 630 l/.

The remaining text does not change.

*/ The actual amount of chemical to be loaded into hopper depends on the fuel load and is limited by the maximum T-0 weight.

2.3. POWER PLANT LIMITATIONS

No change.

2.4. AIRSPEED LIMITATIONS

	CAS			IAS		
	km/h	MPH	KTS	km/h	MPH	KTS
/a/ Max. never exceed speed	230	/143/	124	225	/140/	121
/d/ Max. cruising speed V	200	/124/	108	194	/120/	104

The remaining text is not changed.



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL – MIELEC«

AIRCRAFT FLIGHT MANUAL – SUPPLEMENT No. 1

2.5. MANEUVERING FLIGHT LOAD FACTORS

- max. with flaps retracted

positive	3,0
----------	-----

negative	1,2
----------	-----

The remaining text is not changed.

2.6. FLIGHT ALTITUDE AND AMBIENT TEMPERATURE LIMITATIONS.

No change.

2.7. APPROVED OPERATIONS.

No change.

2.8. PROHIBITED MANEUVERS

No change.

2.9. INSTRUMENT MARKINGS.

No change.



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL – MIELEC«
AIRCRAFT FLIGHT MANUAL - SUPPLEMENT No 1

2.10. REQUIRED PLACARDS

The following placard shall appear on central instrument Panel:

"THE AIRPLANE IS APPROVED FOR FLIGHTS IM OVERWEIGHT
VERSION WITH THE FOLLOWING LIMITATIONS:

- MAX. TAKEOFF WEIGHT 10340 Lbs. /4700 kg/
- MAX. LANDING WEIGHT 9240 Lbs. /4200 kg/"



PZL M18

WYTWÓRNIA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC«
AIRCRAFT FLIGHT MANUAL - SUPPLEMENT No. 16

SECTION 9

SUPPLEMENTS

SUPPLEMENT No. 16

OPERATION OF THE M18, M18A, M18AS (WORKING VARIANT) "DROMADER"
AIRCRAFT IN FIRE-FIGHTING OVERLOAD VERSION WITH TAKEOFF WEIGHT
OF 11700 Lbs (5300 kg).

SECTION 1

GENERAL

1.1. INTRODUCTION

Added text:

This supplement contains necessary information regarding the operation of the M18 aircraft in overload fire-fighting version at takeoff weight increased up to 11700 lbs (5300 kg).

Herein is presented only the data which revises or supplements the information given in the M18 Flight Manual issued on April 30, 1979.

After this supplement has been approved by the operator's Airworthiness Authority, incorporated into the Flight Manual and the appropriate placards specified under para 2.10 of this supplement installed in the airplane, the aircraft will be admitted to flights in the fire-fighting overload version.

1.2. SHORT DESCRIPTION

To adapt the airplane to the operation in the overload version at T-0 weight of 11700 lbs (5300 kg), the hopper was fitted with the partition dividing it into two sections: the forward one to house the fire-fighting agent and the rear compartment accomodating the air containers.

The location of the air containers in the rear hopper part is aimed at limiting the airplane C.G. travel rearwards. The limited space for the air containers amounts to 66 Imp. gal (78 US gal; 300 l).

Maximum weight of air containers should not exceed 22 lbs (10 kg), and their diameters should be within 8 - 10 in (150 to 250 mm).

1.3. GEOMETRICAL DATA

Dimensions

No change

Wing

Specific Loading 26,5 lbs/sq. ft (132,5 kG/cm²)

The remaining text - without change.

Horizontal Empennage

No change

Vertical Empennage

No change

1.4. BASIC ENGINE DATA

No change

1.5. AIRPLANE OPERATIONAL DATA

a) Weight

- | | |
|----------------|---------------------|
| - max. takeoff | 11700 lbs (5300 kg) |
| - max. landing | 9260 lbs (4200 kg) |



PZL M18

WYTWÓRNA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC«
AIRCRAFT FLIGHT MANUAL - SUPPLEMENT No.16

/b/ Engine

No change.

SECTION 2

LIMITATIONS

2.1. APPLICATION

No change

2.2. WEIGHT AND C.G. LIMITS

/a/ Max. Takeoff Weight

11700 lbs /5300 kg/

/c/ Max. Hopper Load

4850 lbs /2200 kg/

/f/ Permitted Range of C.G. position

acc. to Fig. 2.1.
herein

The remaining text has not been changed.

*/ The actual hopper load depends on the amount of fuel in tanks and is limited by the maximum takeoff weight.

2.3. POWER PLANT LIMITATIONS

No change

2.4. AIRSPEED LIMITATIONS

	km/h	CAS MPH	KTS	km/h	IAS MPH	KTS
a/ Max. never exceed speed V_{NE}	230	143	124	225	140	121
d/ Max. cruising speed V_{NO}	200	124	108	194	120	104
e/ Max. speed in operational flight	200	124	108	194	120	104
f/ Minimum speed in operational flight	170	106	92	165	103	89

The remaining text is not changed.

2.5. MANEUVERING FLIGHT LOAD FACTORS

- max. with flaps retracted

positive 2.8

negative 1.1

The remaining text without change.



PZL M18

WYTWÓRNIA SPRZĘTU KOMUNIKACYJNEGO »PZL-MIELEC« AIRCRAFT FLIGHT MANUAL - SUPPLEMENT No. 16

2.6. FLIGHT ALTITUDE AND AMBIENT TEMPERATURE LIMITATIONS

No change

2.7. APPROVED OPERATIONS

No change

2.8. PROHIBITED MANEUVERS

Maximum airplane bank in turn amounts to $15^{\circ}50'$

The remaining text unchanged.

2.9. INSTRUMENT MARKINGS

No change

2.10. REQUIRED PLACARDS

The following placard shall appear on the central instrument panel:

"THE AIRCRAFT IS APPROVED FOR FLIGHTS IN OVERLOAD

FIRE-FIGHTING VERSION WITH THE FOLLOWING LIMITATIONS:

- MAXIMUM TAKEOFF WEIGHT 11700 lbs /5300 kg/

- MAXIMUM LANDING WEIGHT 9240 lbs /4200 kg/"

On the LH side wall of the hopper in the area of the hopper lid, the following inscription is provided:

"MAXIMUM LOAD

2200kg"

The remaining text remains unchanged.



PZL M18

WYTWÓRNIA SPRZETU KOMUNIKACYJNEGO »PZL-MIELEC«
AIRCRAFT FLIGHT MANUAL - SUPPLEMENT No. 16

2.11. MANUFACTURER'S REQUIREMENTS

1. Having regard to the specific pilotage of the aircraft in the overload fire-fighting version with the weight of 11700 Lbs (5300 kg), the pilot must have the following qualifications:

- total flown time - 2000 hours;
- authorization to conduct agricultural operations;
- 1000 flown hours in agricultural and fire-fighting operations, including 200 hrs on the PZL M18A;
- authority to perform fire-fighting missions.

The a/m requirements do not apply to the test pilots.

2. The instructor-pilots granting other pilots the authorization to conduct fire-fighting missions must undergo training under supervision of instructor-test pilots at the WSK PZL MIELEC manufacturer's facility.

2.12. INFORMATION REGARDING THE SERVICE LIFE OF AIRPLANE WITH WEIGHT OF 11700 Lbs (5300 kg).

The service life is determined for the airplane takeoff weight of 10340 Lbs (4700 kg). The increase in the takeoff weight up to 11700 Lbs (5300 kg) results in higher fatigue wear and service life drop by 1.35 times.

The recorded flown hours of the aircraft with weight ranged from 10340 Lbs (4700 kg) to 11700 Lbs (5300 kg) shall be multiplied by 1.35 coefficient and the obtained result used for counting the service life.