Log of Revisions

Dates of issue for original and revised pages:	Date and sign of approval:
1st Edition (Chapter 4 & 5 only) ..... 1. March 2011	EASA MAJOR CHANGE APPROVAL N° 10034512 ..... 8. April 2011
2nd Edition (Complete Manual except Chapter 4 & 5) ..... 1. March 2011	Approved under the authority of DOA N° EASA.21J.073 ..... 20. May 2011
2nd Edition, Revision 1 ..... 13. September 2013	EASA MAJOR CHANGE APPROVAL N° 10046661 ..... 9. October 2013
2nd Edition, Revision 2 ..... 17. March 2014	The technical content of this document is approved under the authority of DOA ref. EASA.21J.073. (FAA Validation Process AT00672CE-A with EASA CSV Proj. N° 0010009466) ..... 19. May 2014
2nd Edition, Revision 3 ..... 14. August 2015	The technical content of this document is approved under the authority of DOA N° EASA.21J.073 ..... 7. September 2015
2nd Edition, Revision 4 ..... 4. March 2016	The technical content of this document is approved under the authority of DOA N° EASA.21J.073 ..... 23. March 2016
2nd Edition, Revision 5 ..... 15. March 2017	The technical content of this document is approved under the authority of DOA N° EASA.21J.073 ..... 17. May 2017
2nd Edition, Revision 6 ..... 26. March 2021	The technical content of this document is approved under the authority of DOA N° EASA.21J.073 ..... 5. July 2021

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STRUCTURES

PROPELLER

POWER PLANT

MISCELLANEOUS

03-10-03 Brake System

Main wheels:	hydraulically operated disc brakes, hydraulic cylinders actuated by brake pedals
Tail wheel:	no brake

03-10-04 Powerplant

Engine

Manufacturer:	TEXTRON LYCOMING Williamsport Division 652 Oliver Street Williamsport Plant 17 701 USA
Type:	AEIO - 580-B1A (6 cyl. air cooled, fuel injection, independent magneto ignition system, inverted flight oil system, special anti-vibration counter weights, retard breaker magneto, Slick Start system) Rated power: 315 hp at 2700 rpm

Propeller

Manufacturer:	MT Propeller Entwicklung GmbH & Co. KG Airport Straubing D-94348 Atting, Germany
Type:	MTV-9-B-C/C 198-25 (3-blade wood composite, hydraulic variable pitch with constant speed regulator, Propeller diameter: 198 cm)
	MTV-14-B-C/C 190-130 (4-blade wood composite, hydraulic variable pitch with constant speed regulator, Propeller diameter: 190 cm)

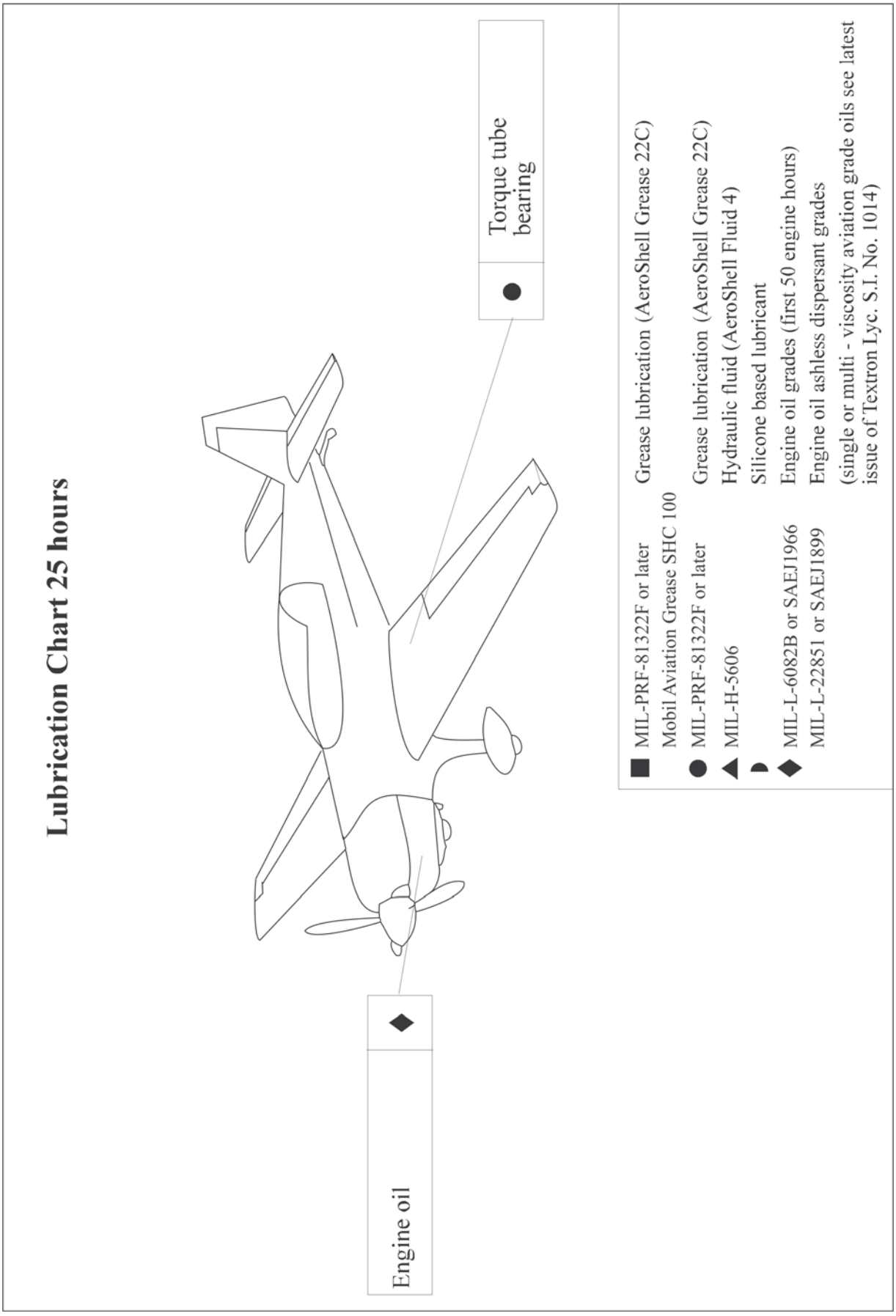


Figure 2 ***Lubrication Chart 25 hours***

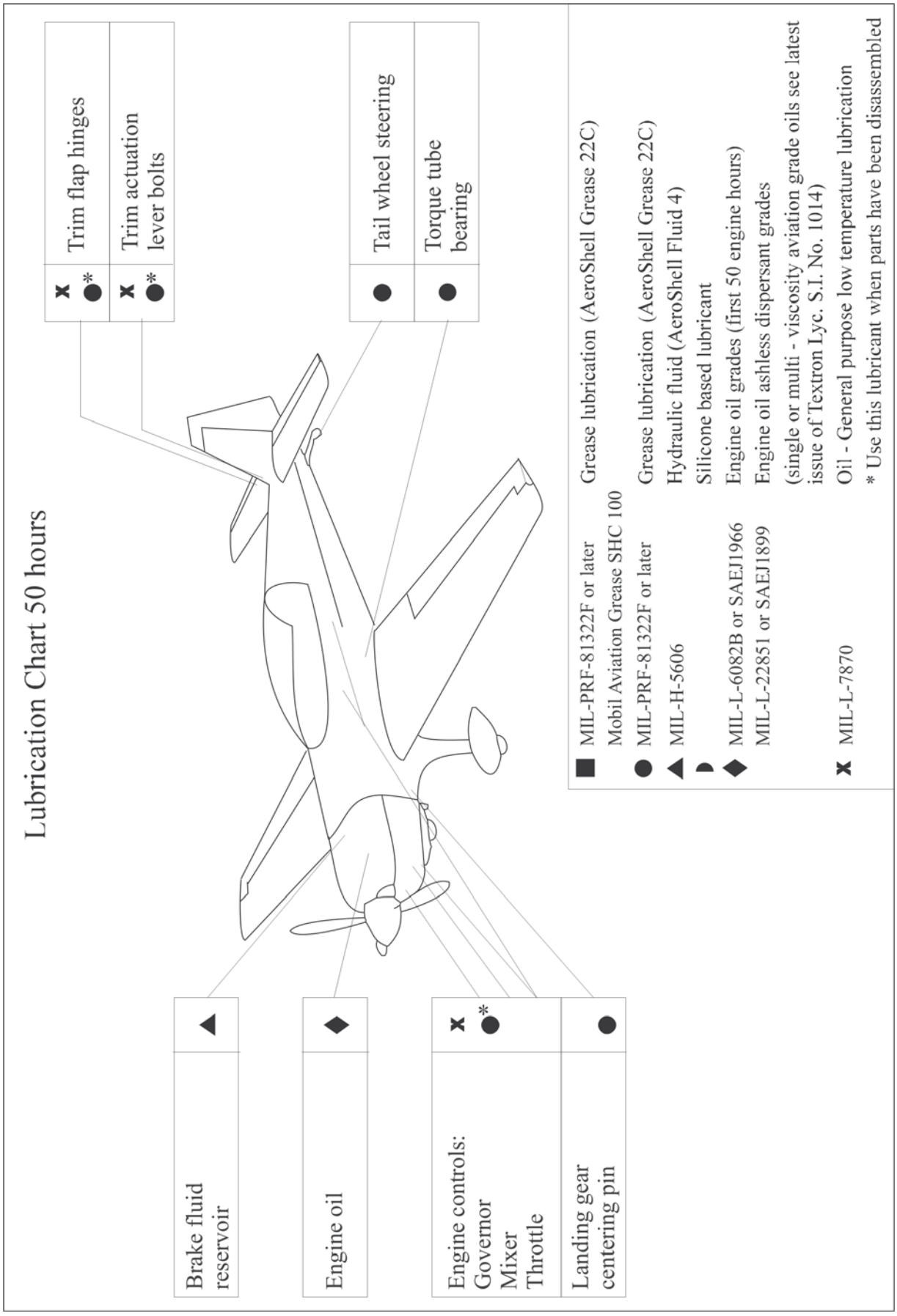


Figure 3 ***Lubrication Chart 50 hours***

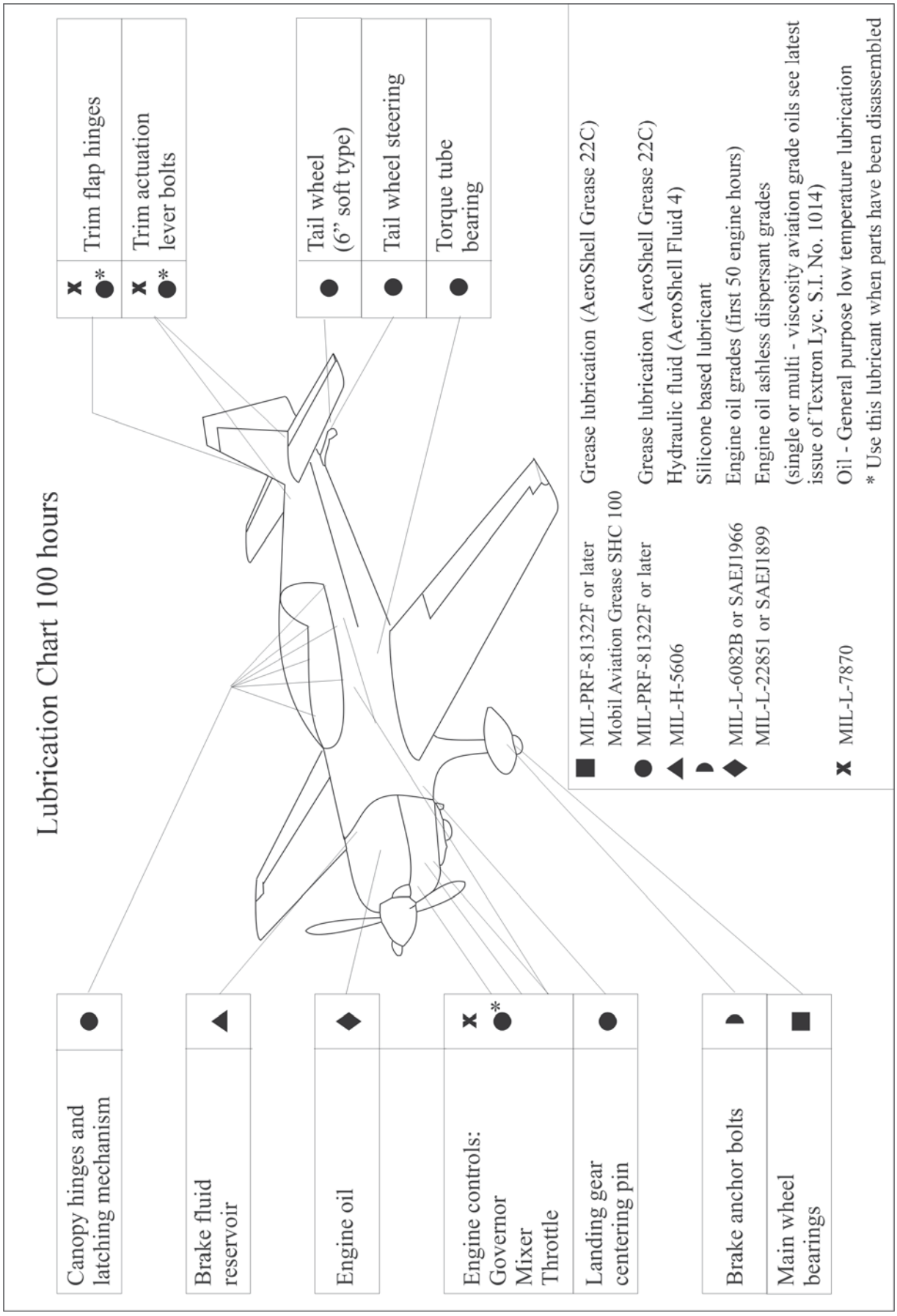


Figure 4 ***Lubrication Chart 100 hours***

05-20-04 Maintenance Checks Schedule

The maintenance checks described in this chapter include all the scheduled checks which must be performed. Use the following schedule and the lubrication charts (figures 2-4).

as specified	each 50 hours	each 100 hours	Inspections	Date: / Serial No.:	Inspector: / Mechanic:
			Operational Checks		
	O	O	1 Start engine (in accordance with the Pilot`s Operating Handbook)		
	O	O	2 Check the fuel quantity indication.		
	O	O	3 Check oil pressure and temperature.		
	O	O	4 Check generator output.		
	O	O	5 Check magneto RPM-drop at 1800 RPM. (Allowed drop is 175 RPM and no greater diff. between L + R than 50 RPM)		
	O	O	6 Check ignition OFF function at 1000 RPM for a short moment.		
	O	O	7 Check response of the engine by power setting changes.		
	O	O	8 Check the propeller response at 1800 RPM when changing pitch.		
	O	O	9 Check idle rpm is between 650 and 750.		
	O	O	10 Check the fuel flow and manifold pressure indication.		
	O	O	11 Check the EGT and CHT indication.		
	O	O	12 Check mixer function per CHT/EGT indication.		
	O	O	13 Check mixture at 1200 rpm.		
	O	O	14 Check the function of the fuel selector valve.		
	O	O	15 Check the radio and any other electronic equipment.		
	O	O	16 Especially, if heating system is installed, a CO detection test is strongly recommended.		
	O	O	17 Shut down engine using mixture lever. Check the alternator warning light and ammeter.		

as specified	each 50 hours	each 100 hours		Inspections	Date: / Serial No.:	Inspector: / Mechanic:
	O	O	18	Check optional electronic g-meter for the maximum g-loading. If extreme value exceeds ±10 G, contact EXTRA-Flugzeugproduktions- und Vertriebs- GmbH.		
	O	O	19	Ignition OFF, main switch OFF, remove ignition key.		
	O	O	20	Check if ignition key is removable in OFF-position only, and if key functions in accordance with the requirements of the Teledyne Continental Service Bulletin No. 636.		
				Propeller		
				(refer to latest edition of MT-Propeller Operation and Installation Manual E-124 and Service Bulletins)		
				⚠ DANGER Ground magneto primary circuit before working on propeller		
		O	1	Remove spinner and inspect for cracks.		
	O	O	2	Check blade shake, max. 3 mm or 1/8 inch.		
	O	O	3	Check blade angle play, max. 2°.		
		O	4	Inspect outside condition of the hub and parts for cracks, corrosion, deterioration.		
		O	5	Inspect high pitch stop check nut for tightness.		
	O	O	6	Check all safety means to be intact.		
	O	O	7	Check flange bolts or stop nuts for tightness.		
		O	8	Check front and rear spinner plate for cracks and fixing.		
	O	O	9	Inspect blade root and hub for oil- and grease leaks.		
		O	10	Check position and condition of counterweights.		
	O	O	11	Inspect blades for cracks in the fiberglass-cover and blade erosion sheet. No cracks allowed. Refer to MT-Propeller SB No. 8.		
O[1]			12	Overhaul propeller or perform a tear-down inspection.		

1 *refer to MT-Propeller Service Bulletin No. 1*

as specified	each 50 hours	each 100 hours	Inspections	Date: / Serial No.:	Inspector: / Mechanic:
	O	O	12 Inspect Christen Inverted Oil System for general condition, leaks, secure mounting and tight connections.		
O[1]			13 Clean and flush the Inverted Oil System with a suitable petroleum solvent, such as Varsol according to Lycoming Operator's and Maintenance Manual.		
O[2]	O	O	14 Service engine with recommended lubricating oil in accordance with chapter 12-10-04.		
	O	O	15 Inspect condition of spark plugs (clean and adjust gap as required, adjust per Lycoming Service Instruction 1042). If fouling of spark plugs is apparent, rotate bottom plugs to upper plugs and vice versa.		
	O	O	16 Inspect spark plug cable leads and ceramics for corrosion and deposits.		
	O	O	17 Perform a hot engine differential compression check in accordance with FAA AC 43.13-1A.		
		O	18 Inspect cylinders for cracked or broken fins.		
	O	O	19 Check cylinders for evidence of excessive heat which is indicated by discoloration.		
		O	20 Check fuel injector nozzles for looseness. Tighten to 6.8 Nm (60 inch-pounds) torque. Check fuel lines for fuel stains which are indicative for fuel leaks.		
	O	O	21 Inspect rocker box covers for evidence of oil leaks. If found, replace gasket; torque cover screws 5.7 Nm (50 inch-pounds).		
O[3]			22 Remove rocker box covers and check for freedom of valve rockers when valves are closed. Look for evidence of abnormal wear or broken parts in the area of valve tips, valve keeper, springs and spring seats.		
		O	23 Inspect ignition harness for general condition, free from fraying or chafing and insulators for high tension leakage and continuity.		

1 each 300 hours
2 each 25 hours
3 each 400 hours

as specified	each 50 hours	each 100 hours		Inspections	Date: / Serial No.:	Inspector: / Mechanic:
		O	24	If Plane Power alternator installed: Remove drive belt and turn alternator rotor to check condition of bearings for abnormal noise or roughness.		
O[1]			25	Overhaul or replace magnetos.		
O[2]		O	26	Inspect magneto and accessories according to Slick Magneto Maintenance and Overhaul Manual.		
		O	27	Inspect SlickSTART, refer to Unison Operation, Maintenance and Troubleshooting Manual.		
		O	28	Check fuel injector for general condition, clean fuel inlet screen.		
	O	O	29	Inspect air intake gaskets and seal rings for leaks and flanges for tightness.		
	O	O	30	Inspect flexible fuel lines, fuel injection lines and fittings for leaks, security, chafing, dents, and cracks; replace or overhaul as required or at engine overhaul. Check fire protection.		
	O	O	31	Check fuel line from gascolator to electrical fuel pump for clearence from heat outlet of heating inlet box.		
O[3]		O	32	Inspect fuel lines (stainless steel tube assy.) and support clamps following Lycoming SB 342 G or later.		
	O	O	33	Check fuel system for leaks.		
O[4]	O	O	34	Remove, clean and inspect gascolator screen and fuel filter bowl.		
	O	O	35	Inspect throttle, mixture, and propeller governor controls for security, travel, and operating conditions. Observe the hints given in the **Inspections**-paragraph of chapter 20-10-09 **Control Cables**.		
O[5]		O	36	Inspect all external exhaust surfaces for signs of leakage.		
O[5]		O	37	Inspect all external exhaust joints, slip joints, clamps, couplings for misalignment, warpage, broken, loose or missing fasteners, clamps, gaskets or seals and abnormal wear.		

1 together with engine
2 each 500 hours
3 refer to Lycoming SB 342 compliance time.
4 clean at least every 90 days
5 at engine replacement

as specified	each 50 hours	each 100 hours		Inspections	Date: / Serial No.:	Inspector: / Mechanic:
O[1]		O	38	Inspect all interior exhaust areas for blockage, restrictions, dents or protrusions into the exhaust flow path.		
O[1]		O	39	Inspect muffler, heat exchanger for general condition.		
O[1]		O	40	Inspect exhaust stack to flange interface for cracks in welds or weld heat affected area, blown out or missing gaskets.		
O[1]		O	41	Inspect all exhaust welds and area adjacent to the weld for cracks or weld separation.		
O[1]		O	42	Inspect bent exhaust areas and turns for erosion, thinning, bulging or burn through.		
O[1]		O	43	Inspect surrounding exhaust structures for heat damage or burning.		
		O	44	Inspect engine crankcase for cracks, leaks, and security of seam bolts.		
	O	O	45	Check engine mounted accessories such as pumps, temperature and pressure sensing units for leaks, secure mounting and tight connections.		
	O	O	46	Inspect engine mount for cracks and loose mountings.		
	O	O	47	Inspect engine baffles for cracks and fraying.		
		O	48	Inspect all wiring connected to the engine or accessories		
	O	O	49	Inspect engine shock mount for deterioration (replace as required).		
		O	50	Inspect firewall seals.		
		O	51	Inspect alternator, cable connections and accessories.		
		O	52	Inspect condition and tension of alternator drive belt		
		O	53	Inspect security of alternator mounting		
		O	54	Inspect starter and starter drive		
	O	O	55	Clean engine if necessary.		
	O	O	56	Lubricate all controls per lubrication chart.		

1 at engine replacement

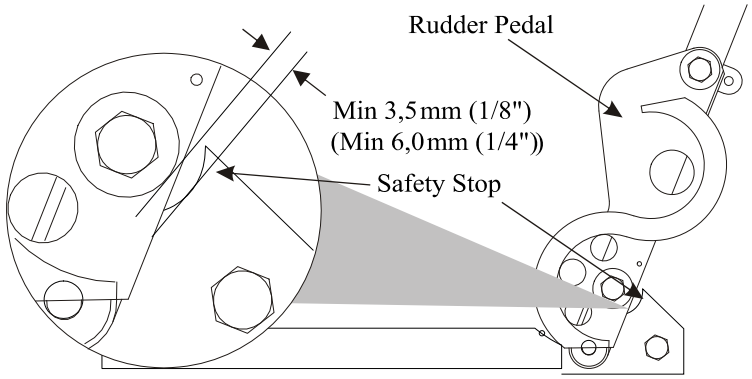
as specified	each 50 hours	each 100 hours	Inspections	Date: / Serial No.:	Inspector: / Mechanic:
O[1]			57 Overhaul or replace propeller governor as required.		
O[2]			58 Complete overhaul of engine or replace with factory rebuilt		
			Fuselage		
	O	O	1 Remove tail fairing, tail side skins, main fuselage cover and landing gear cuffs per chapters 51 and 53.		
		O	2 Remove bottom fuselage cover including exhaust area covering sheet per chapter 53.		
	O	O	3 Inspect main and bottom fuselage cover including exhaust area covering sheet, tail fairing, tail side skins and landing gear cuffs for general condition, dents, cracks and loose screws.		
	O	O	4 Check installed parts for general condition and security of attachment.		
	O	O	5 Inspect fuselage for foreign objects.		
		O	6 Inspect steel tube construction for general condition, corrosion and cracks, above all in areas of load stress (e.g. wing, stabilizer, engine and seat attachments).		
	O	O	7 Visually inspect steel tube construction in the area of horizontal stabilizer attach brackets for cracks. In case of doubt remove horizontal stabilizer and use a dye check penetrant. In case cracks are found contact EXTRA-Flugzeugproduktions- und Vertriebs- GmbH for repair advice.		
	O	O	8 Inspect fabric cover for general condition.		
		O	9 Inspect wooden longerons for damage.		
		O	10 Clean and lubricate canopy hinges and latching mechanism.		
		O	11 Inspect breather line for obstructions and security.		
		O	12 Inspect main and auxiliary wing spar connector for general condition.		
	O	O	13 Inspect seats for security, attachment, proper operation, and condition.		

1 refer to Woodward Service Bulletin No. 33580 or applicable MT-Propeller Instructions
2 *refer to Lycoming Service Instruction No. 1009*

as specified	each 50 hours	each 100 hours		Inspections	Date: / Serial No.:	Inspector: / Mechanic:
	O	O	14	Check first-aid pack for attachment, complete contents and expiration date.		
		O	15	Check heating system (if installed) for condition and correct function.		
				Seat belts		
		O	16	Check seat belts for security, attachment, proper operation, and condition.		
		O	17	Check webbing; inspect for fuzzy edges at the adjusters, inspect whether edges start to fray, inspect whether webbing lost its color (top and bottom sides have a different shades).		
		O	18	Check hardware; inspect for corrosion, check whether buckles mate properly. Check the buckles for easy opening .		
		O	19	Check ratchet assembly; inspect for corrosion, loss of plating, discoloration, slippage and wear; check for ease of operation. If the harness does not pass the check, it has to be reworked or replaced. Contact the harness manufacturer in case of doubt.		
		O	20	Check proper attachment of shoulder harness as per Chapter 25-10-03.		
				Fuel system		
	O	O	21	Inspect the fuel lines for leaks, security, chafing, dents and cracks. Replace fuel lines as required.		
	O	O	22	Inspect fuel selector valve for operation and proper pointer indication. Check integrity as per chapter 28-20-01.		
	O	O	23	Drain fuel system.		
	O	O	24	Check acro- and center tank attachments.		
	O	O	25	Check acro-, center- and both wingtanks for leaks.		
	O	O	26	Check boost pump.		
	O	O	27	Check fuel filler caps and 'O'-rings for security and proper operation.		
	O	O	28	Check proper seat and condition of fuel filler sealing lip.		

as specified	each 50 hours	each 100 hours	Inspections	Date: / Serial No.:	Inspector: / Mechanic:
			Flight Controls		
	O	O	1 Remove wing access panels.		
	O	O	2 Inspect control surfaces for security of attachment, free movement, dents, delaminations and cracks.		
	O	O	3 Check spades visually for general condition. Inspect spade support for corrosion, cracks and deformations. Ensure proper attachment to aileron.		
	O	O	4 Inspect elevator trim system for proper operation and rigging.		
	O	O	5 Inspect hinges, hinge bolts, hinge bearings and self-locking nuts for condition, cracks and security.		
	O	O	6 Visual inspect bonding braid across the hinges for general condition.		
	O	O	7 Check free play in control system: torque tube, control surfaces, control sticks, rod end bearings and travel stops.		
O[1]	O	O	8 Lubricate rear torque tube bearing.		
	O	O	9 Lubricate trim flap hinges and trim actuation lever bolts.		
		O	10 Inspect rudder control cables following the *Inspection Procedure* presented in Chapter 27-20-04.		
		O	11 To exclude any interference between rear rudder pedal assemblies and adjacent structure: Check for chafing signs at S-shape control cable guidance bracket of rear rudder pedals and adjacent fuselage tube structure. Check for positive clearance between rudder pedal assembly (at maximum fwd position.) and fuselage structure even when under side load of 50 N (11 lbs) at brake pedal.		

1 each 25 hours

as specified	each 50 hours	each 100 hours	Inspections	Date: / Serial No.:	Inspector: / Mechanic:
		O	12 Check for minimum 3.5 mm (1/8") clearance of rudder pedal versus safety stop when fully deflected for rudder cables having 50 h flight time minimum. On newly installed rudder cables the minimum spacing is 6 mm (1/4"). This check is to be performed with zero loading on the rudder pedals. 		
		O	13 Rough check of safety stop clearance. With a force of approx. 90 kg (200 lbs) acting on the fully deflected rudder pedal the safety stop shall not be reached. If the stop is reached the control system indicates too much flexibility which needs to be traced. In this case contact EXTRA Flugzeugproduktions- und Vertriebs- GmbH for advice.		
	O	O	14 Inspect all flight control surface ventilation holes for obstruction.		
		O	15 Inspect elevator balance weights for looseness, clearance, condition and interference with the composite structure.		
		O	16 Visually inspect metal push/pull control rods for corrosion, loose or popped rivets, cracks, or other visible damage, especially at their end fittings. In case of suspected cracks, remove push/pull control rod, strip the paint in the suspected area and carry out a detailed inspection using a magnifying glass (x10). Replace the related control rod in case a crack is found otherwise reapply surface treatment and reinstall push/pull control rod.		
		O	17 Visually inspect fiber composite push/pull control rods for cracks, impacts or other visible damage, especially at their end fittings. No gap between aluminum head and rod is allowed. Contact the manufacturer in case a gap is detected.		

as specified	each 50 hours	each 100 hours		Inspections	Date: / Serial No.:	Inspector: / Mechanic:
				Horizontal and Vertical Stabilizer		
	O	O	1	Inspect stabilizers for dents, cracks, stone nicks and delaminations.		
	O	O	2	Inspect main bolts of the stabilizer spars for looseness and check security.		
	O	O	3	Inspect stabilizer auxiliary spars attachment.		
		O	4	Inspect stabilizer ventilation holes for obstruction.		
				Instruments		
		O	1	Inspect panel mounting for security and safety.		
		O	2	Check operation, mounting, and wiring of switches for condition and safety.		
		O	3	Check automatic circuit breaker mounting and wiring for condition and safety.		
		O	4	Inspect stall warner system for condition and security of installation, perform operational check.		
	O	O	5	Check wing-tip position /strobe lights for security and operation. If any one LED fails, the unit must be repaired or replaced. Inspect the lens. Replace if there is excessive scratching, discoloration or cracking.		
	O	O	6	Inspect compass and compass deviation card for proper indication and compensation.		
O[1]			7	Magnetic compass compensation.		
		O	8	Check Pitot/static air pressure lines for condition and leaks, perform operational check.		
O[1]			9	Check ASPEN EFD1000 PFD and 1000 MFD (reversion mode) speed bands for compliance with instrument markings in the Pilot's Operating Handbook. Correct data if necessary per ASPEN Installation Manual.		
O[1]			10	Check ASPEN EFD(s) in accordance with Aspen ICA (Doc. # 900-00012-001 latest Revision).		

1 *Annual, each twelve calendar months*

as specified	each 50 hours	each 100 hours		Inspections	Date: / Serial No.:	Inspector: / Mechanic:
				General		
O[1]	O	O	1	Perform checks given for special equipment installed. Refer to manufacturer instructions and the *Handling, Servicing and Maintenance* paragraphs of the related POH supplements.		
O[1]	O	O	2	Perform checks and maintenance for the ELT. Follow the applicable instructions prepared by the respective ELT manufacturer (Refer to chapter 1) and EASA Service Information Bulletin 2019-09 latest revision.		
O[1]	O	O	3	Reinstall access panels as per chapter 51.		
	O	O	4	Check optional landing light for function.		
O[1]	O	O	5	Aircraft conforms to specifications of respective authority		
O[1]	O	O	6	All required airworthiness directives complied with.		
O[1]	O	O	7	All EXTRA mandatory Service Bulletins complied with.		
O[1]	O	O	8	All vendor Service Bulletins and Service Letters complied with.		
O[1]	O	O	9	Check for proper flight manual.		
O[1]	O	O	10	Aircraft papers in proper order.		

1 *as required*

1000 hours	Date: / Serial No.:	Inspector: / Mechanic:
	Inspections	
	Tail-wheel landing gear	
O	1 Inspect glass fibre spring visually for dents, cracks and delaminations.	
O	2 Inspect mounting bolts and nuts for fretting, wear, damage, stretch and proper torque.	
O	3 Check tail-wheel for general condition and function. Pay attention to the free movement of the rudder.	
O	4 Check connector springs for light precompression.	
O	5 Inspect wheel fork visually for damage, dents, cracks and corrosion.	
O	6 Inspect axle bolt and nut for fretting, wear, damage, and stretch.	
O	7 Check rubber tire for general condition.	
	Engine compartment	
O	1 Remove engine cowling halves.	
O	2 Check firewall for dents, cracks and deformation. Visual inspection of firewall seals for porosity and general condition.	
O	3 Inspect tubular engine mount for dents, cracks and corrosion. Check all bolts for security and condition.	
O	4 Visual inspection of rubber mounts (shock mounts) for porosity and general condition.	
O	5 Inspect flexible hoses for damage and leakage.	
O	6 Check electric wiring for proper connection.	
O	7 If Plane Power alternator installed: Remove alt. field brush assembly and inspect brushes for excess wear. Replace brush assembly if brushes extend less than .250” from edge of brush holder case.	
O	8 Check electrical bonding braids for proper connection.	
O	9 Visual inspection of inverted oil system for general condition according to CHRISTEN 801 instruction. Refer to the applicable TEXTRON LYCOMING Operator`s or Maintenance Manual (refer to chapter 1).	
O	10 Carry out general engine check as instructed by the applicable TEXTRON LYCOMING Operator`s or Maintenance Manual (refer to chapter 1).	
O	11 Visual inspection of cowling for dents, cracks, delamination and smoke marks.	

05-50-03 Engine Fire

IMPORTANT

If a fire extinguisher has been used, clean engine mount and accessories immediately to prevent corrosion.

For damage evaluation consult the manufacturer, before the aircraft is put back into service.

After an engine fire, perform a check as described in the following:

	Date:	Inspector:	
	Serial No.:	Mechanic:	
	Inspections		
O	1 Check all cables and hoses, replace when necessary.		
O	2 Clean engine and engine compartment.		
O	3 Check engine according to the Lycoming Manual		
O	4 Inspect firewall and engine cowling for damage by high temperatures (e.g. signs of blisters on the protective paint). If necessary renew firewall seals and, on GFRP cowlings, reapply the fire protection paint (N56582/T508) and the lacquer 4243-0303 or "HENSOTHERM 410KS" with clear coat Glasurit 923-335; refer Chapter 51-30-01).		
O	5 Inspect engine cowling for delaminations by coin tapping.		

05-50-04 Lightning Strike

In the event of a lightning strike in flight or on ground (actual or suspected) check the following:

		Date:	Inspector:
		Serial No.:	Mechanic:
		Inspections	
O	1 Check engine according to Lycoming Service Bulletin 401.		
O	2 Check the skin of the strike area for burns and melting.		
O	3 Inspect bolts and fasteners for burns and melting.		
O	4 Check the electrical system, with running engine, for correct operation.		
O	5 Check the avionics and antennas for correct operation. Refer to the respective manufacturer Maintenance Manuals (see Chapter 01).		
O	6 Check the magnetic compass for correct readings.		
O	7 Overhaul magnetos according to Magneto Maintenance and Overhaul Manual (see Chapter 1).		

05-50-05 Flightline Inspections

These checks include pre-flight and postflight checks, as they are described in Sections 3 and 4 ("EMERGENCY PROCEDURES" and "NORMAL PROCEDURES") of the PILOT´S OPERATING HANDBOOK. When the aircraft is in operation, perform these checks daily.

Table of Contents

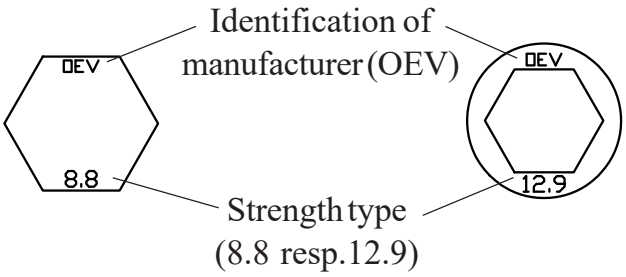
Example: DIN 931, M10 x 80 - 8.8

Bolt Head Identification

Standard hex head bolt
Metric thread size M10
Length 80mm (3.15")
Strength type 8.8

Bolt Head:

DIN 931/933: DIN 912:



20-10-02 Width Across Flats for Metric Bolts

Thread diameter	Width across flats
M4	7 mm
M5	8 mm
M6	10 mm
M8	13 mm
M10	17 mm
M12	19 mm
M16	24 mm
M20	30 mm
M24	36mm

20-10-03 Torque Values

Nuts, except of counter nuts are mainly stop nuts according to LN 9348 or selflocking nuts according to AN 365 (MS 21044).

a) Standard torque values allowed for nuts according to DIN and LN must be adhered to as follows:

Metric thread size	Torque value (Nm)	(in.lbs)
M4	1,8	16
M5	3.9-4.3	35-38
M6	6.2-6.8	55-60
M8	15.2-16.8	144-148
M10	29.5-32.5	261-287
M12x1.5	51-57	452-504

b) Standard torque values allowed for nuts according to MS must be adhered to as follows:

Inch thread size	Torque value (Nm) (in.lbs)	
1/4 -28	3,5-4,5	30-40
5/16 -24	6,7-9,5	60-85
3/8 -24	10,7-12,5	95-110
7/16 -20	30,5-33,9	270-300
1/2 -20	32,8-46,3	290-410
9/16 -18	88,1-67,8	480-600

c) Standard torque values allowed for aluminium fitting nuts must be adhered to as follows:

Nut Size	Torque Value	
	(Nm)	(in.lbs)
-04	4.5 - 7.3	40 - 65
-06	8.5 - 14.1	75 - 125
-08	16.9 - 28.2	150 - 250
-10	22.6 - 39.5	200 - 350
-12	33.9 - 56.5	300 - 500

d) Standard torque values allowed for steel fitting nuts must be adhered to as follows:

Nut Size	Torque Value	
	(Nm)	(in.lbs)
-04	15.3 - 16.9	135 - 150
-06	30.5 - 33.9	270 - 300
-08	50.8 - 56.5	450 - 500
-10	73.4 - 79.1	650 - 700
-12	101.7 - 113.0	900 - 1000

IMPORTANT

On all bolt connections, the specified torque and locking method must be observed. Do not reuse stop nuts if they can be run up finger tight!

20-10-04 Special Torque Values

Special torque values for the following items must be adhered to:

Item	Torque value (Nm)	(in.lbs)
Top Half of the Main Landing Gear Mounting Clamp (Bolt LN9037-10054)	10	89
Brake Back Plate Bolts (Cleveland)	Refer to Cleveland Maintenance Manual	
Wheel Assembly Bolts (Cleveland)		
Engine Mounting (Bolts AN7-50A / Metal Stop Nut AN 363C-720 or MS 21046 C7)	55	480
Engine Mount to Fuselage (Bolt Din 912, M12-12.9 / Stop Nut DIN 985, M12-8-B2C)	80	720
Longeron Cutout Bridge (Bolt DIN 912 M8-8.8 / Stop Nut LN 9348-08)	18	160
Horizontal Stabilizer Front Spar Bolts (Bolt LN 9037-10054 / Stop Nut LN 9348-10)	33	292
Horizontal Stabilizer Rear Spar Bolts (Bolt LN 9037-10046 / Stop Nut LN 9348-10)	33	292
Vertical Stabilizer Rear Spar Bolt (Bolt LN 9037-10065 / Stop Nut LN 9348-10)	38	336
Wing Main Spar Safety-Bolts (Bolt LN 9038 K-08020)	15	133
Torque for Engine	Refer to Lycoming Overhaul Manual	
Torque for Propeller	Refer to MT-propeller Installation Manual E-124	

20-10-05 Measuring Techniques

When using stop nuts, the safety torque (friction torque or braking torque) should be added to the table standard values. This value is indicated on the dial of the torquemeter, before the nut contacts the attachment surface.

Always torque nuts for fastening, if possible. When bolts are torqued there might be an additional torque value due to shaft friction. This torque can be determined by a torquemeter before the bolt head contacts the attachment surface and should be added to the table value.

20-10-06 Coin Tapping

Inspection for damage is more critical for composite structure than for conventional structures. A large washer or similar object is a valuable tool for detecting debonds in the airframe surface. When a large washer is lightly bounced against a solid structure, a clear metallic ring should be heard. If delamination is present, a dull thud will be heard. This procedure is shown in the following Figure 1:

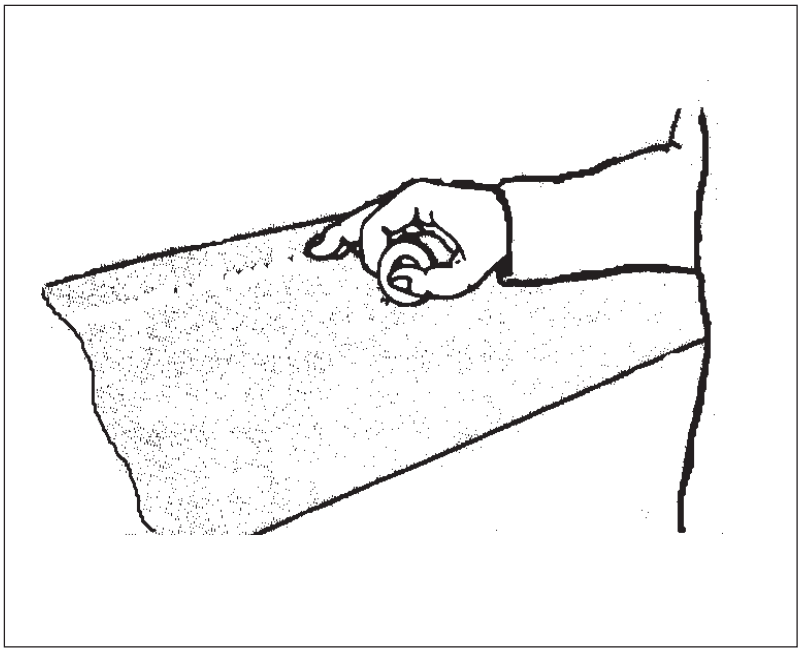


Figure 1 Coin Tapping

20-10-07 Flexible Hose

For the oil and fuel systems aft of the firewall the EXTRA 330LX is equipped with PTFE-hoses.

For the brake system generally PA hoses (high tensile synthetic fibre hoses) are used, which are also installed as sense lines for engine instruments. The connection types of those hoses are outlined in Figure 2.

In the engine compartment PTFE hoses with integrated fire sleeves are used as fuel, lubrication oil, smoke oil and sensing lines.

Replacement of Flexible Hose

External forces can significantly reduce hose life or cause failure. Mechanical loads, which must be considered include those caused by:

- excessive flexing, twisting, kinking
- tensile or side loads
- too small bend radius and
- vibration.

Any hose that has been kinked or bent to a radius smaller than the minimum bend radius, and any hose that has been cut or is cracked or is otherwise damaged should be removed and discarded.The entire hose assembly must be replaced, if damage or failure occurs within a flexible hose assembly.

Visual Inspection Hose/Fitting

Any of the following conditions require replacement of the hose assembly:

- Fitting slippage on hose,
- Cracked or damaged fittings;
- Leaks at fitting or in hose;
- Hard, stiff, heat cracked, or charred hose;
- Kinked, crushed, flattened or twisted hose;

- Damaged, cracked, cut or abraded cover (any reinforcement exposed);
- Blistered, soft, degraded, or loose cover.

Installation of Flexible PTFE Hose Assemblies

In general hose assemblies should be handled with care to prevent excessive bending, twisting and kinking since this reduces the life of the hose assembly considerably. Particular attention must be given to preclude hoses from wear, snagging, kinking, bending smaller than minimum bend radius and cutting, any of which can cause premature hose failure. Large diameter hoses and very short hose assemblies are more prone to kinking. Special care must be taken to prevent twisting of hose assemblies that do not incorporate assembly fittings with spanner flats to counteract while the nut is turned to the connection fitting (e.g. Parker/Statoflex PTFE hose type 101). Twisting of the hose can be determined from the identification markings running along its length.

The flexible hose should be installed so that it will be subject to a minimum of flexing during operation.

Installation of PA Hose with Hoerbiger HS3AM Axial Plug

1 Install the plug-in screw into the adapter (e.g. firewall, brake) (see Figure 2, Sheet 2).

2 Simply insert the axial plug into the plug-in screw until it is snapped as outlined in Figure 2, Sheet 2.

Removal of PA Hose with Hoerbiger HS3AM Axial Plug

1 Screw out the plug-in screw together with the snapped axial plug (see Figure 2, Sheet 2).

2 Disconnect the plug-in screw from the axial plug by inserting a sleeve (7 x 30 x 0.5 mm) as outlined in Figure 2, Sheet 2.

Installation of PA Hose with Hoerbiger H31A Axial Plug

1 Install the plug coupling M into the adapter (e.g. firewall, brake) (see Figure 2, Sheet 2).

2 Insert the plug coupling W into plug coupling M until it is snapped as outlined in Figure 2, Sheet 2.

Removal of PA Hose with Hoerbiger H31A Axial Plug

1 Disconnect the plug coupling W from the plug coupling M by bending the clamps as outlined in Figure 2, Sheet 2.

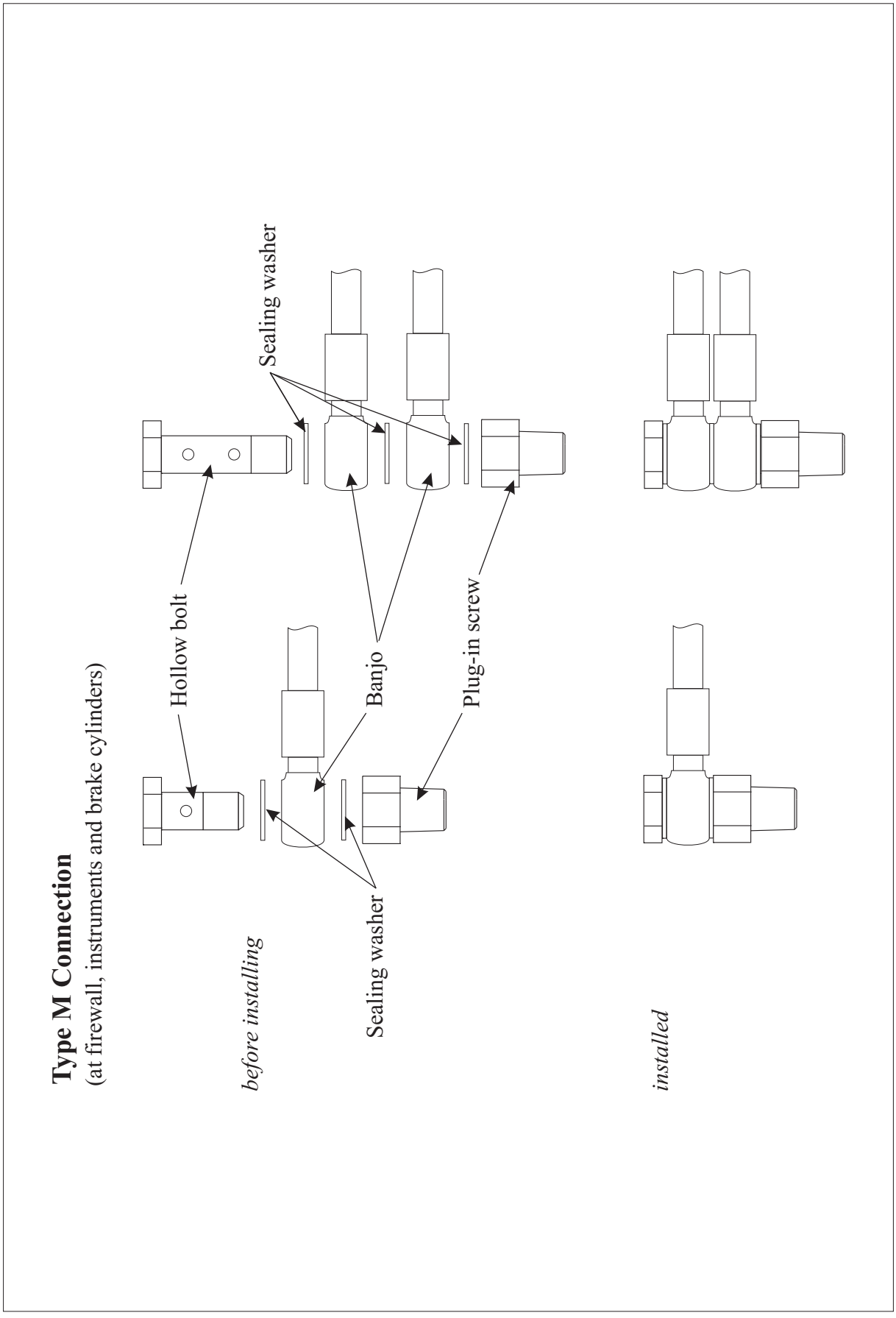


Figure 2, Sheet 1 ***Connection Types PA Hoses***

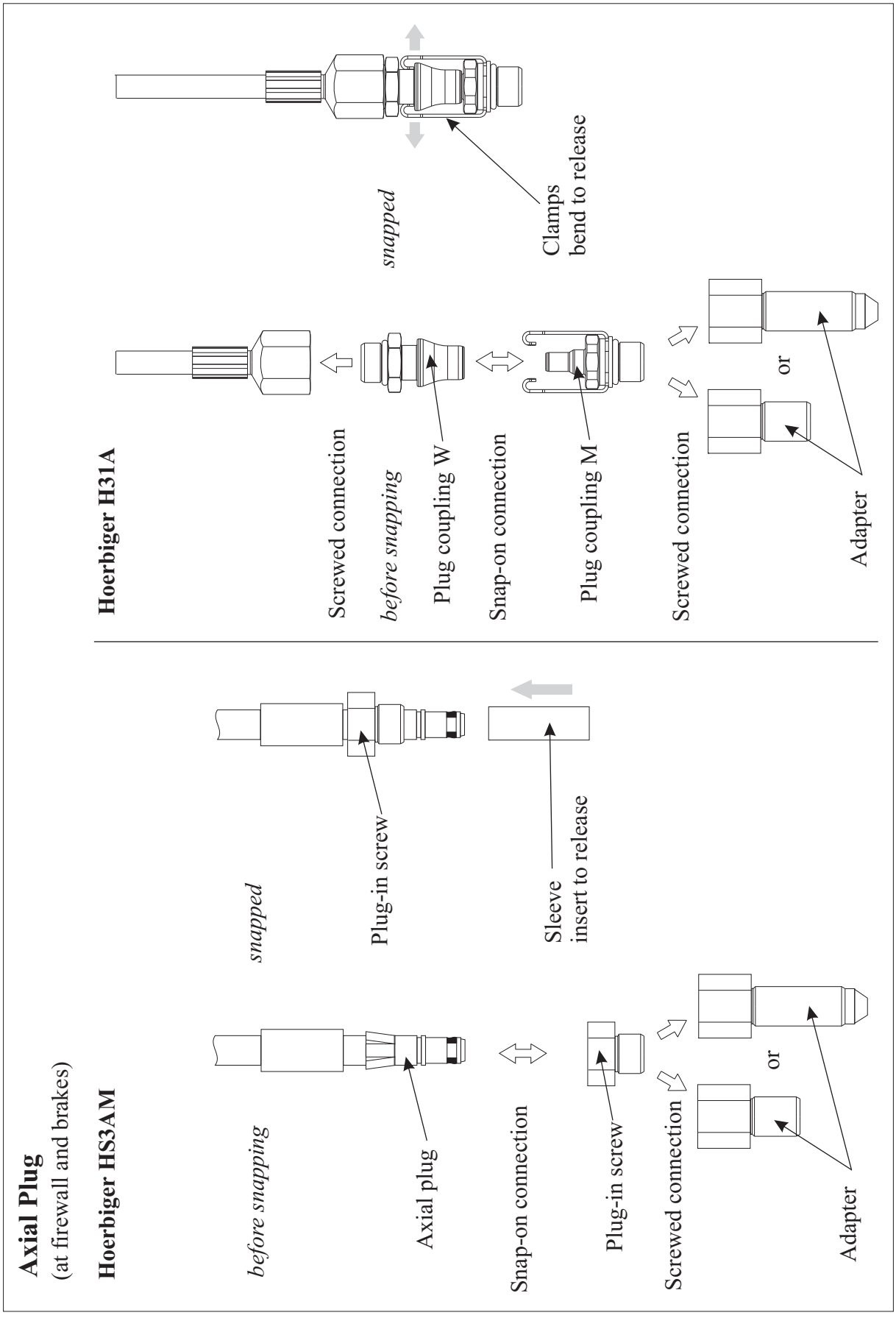


Figure 2, Sheet 2 ***Connection Types PA Hoses***

20-10-08 Fittings

Generally AN-fittings are used in the EXTRA 330LX for the oil lubrication and the fuel system. All these fittings are made of aluminium alloy and are colored blue for identification purposes. The dash number following the AN number indicates the size of the hose for which the fitting is made, in 16ths of an inch. This size measures the inner diameter (I.D.) of hose. The material code letter (Aluminum alloy: code D) follows the dash number.

Example: Elbow AN 822-8D

N O T E

Apply Loctite 577 on all National Pipe Threads (NPT) before installation.

20-10-09 Control Cables

Control cables are used for the following systems of the EXTRA 330LX:

- Engine (Throttle, Mixture and RPM)
- Trim
- Heating (optional)

Consider the following information when working on engine control cables. Refer to Figure 3:

Hard and abrupt power control inputs may impose high dynamic peak loads to the related sliding parts at reaching the travel stops of the engine fuel injector servo. Repeating peak loads may result in unacceptable additional wear and free play at the pivot points. Once the free play of the pivot point would increase the swivel angle of the sleeve might increase beyond limits. An increased swivel angle in combination with an unacceptable high friction of sliding parts may result in a kink occurring at the pivot point and the end of the swivel sleeve while pushing the control lever forward from idle to full throttle position. Finally the solid wire might be forced to bend at the pivot point and at its terminal connection, which would result in a failure because it is not designed to withstand a significant bending load.

A bent nickel-plated brass swivel sleeve as well as wear and excessive free play at the pivot (swivel) points and sliding parts are an indication of misalignment and/or hard and abrupt control inputs. Those signs should be found early within the regular maintenance. This is a clear indication of an unacceptable control cable condition, which might result in a malfunction.

As soon as a control cable becomes difficult to operate, the reason should be identified. An increase in no-load (cable free and unattached) friction or an increase in travel length of a control cable are a good indication of pending performance problems and/or control cable failure.

The following notes, cautions and warnings describe application and installation information

WARNING

Do not install the control cable with the power on or the engine running. Serious injury or death could result.

NOTICES

Protect the cable from contaminants such as fuel, oil, water, dirt and chemicals, which may damage the control cable.

Protect the control cable from physical damage by paint, kinking, vibration, etc., which may damage the control cable.

NOTES

A gradual or sudden increase in the no-load (cable free and unattached) friction of a control cable is a good indication of pending performance problems and/or control cable failure. Serious injury or death may result. Replacement is required.

A gradual or sudden decrease in the stroke (travel) length of the control cable is a good indication of pending performance problems and/or control cable failure. Serious injury or death may result. Replacement is required.

Control cables which have moisture inside of them or have frozen, must be replaced. Do not apply heat to attempt to remove the moisture. Applying heat will not remove the moisture. Serious injury or death may result. Replacement is required.

N O T E S

Installation should be accomplished by a licensed “A” and/or “P” mechanic.

Control cables are designed to be non-repairable. Do not perform any repairs to this control cable.

Cables are designed to be contaminant resistant; not contaminant proof.

The usable stroke must be centered within the available travel.

The swivel angle must be centered within the available swivel angle.

The minimum bend radius is 6".

Control cables are lubricated for the life of the control cable. Do not remove the seals or lubricate the control cable.

Inspections

Observe the following hints when performing inspections on the control cables:

A cable must be replaced whenever:

- excessive free play is felt at the control even after all cable connections have been verified as in good working order.
- visual inspection shows chafing, breakage or bent, loose or worn parts.
- evidence of moisture is found inside (or control cable has frozen).
- a gradual or sudden decrease in the stroke (travel) length of the control cable has been detected.
- a gradual or sudden increase in the no-load (cable free and unattached) friction of a control cable has been detected.

Correct routing of the control cable whenever:

- misalignment, unacceptable high internal friction due to bends below minimum radius of 6" or malfunction of sliding elements has been detected.
- the usable stroke is not centered within the available travel.
- the swivel angle is not centered within the available angle.

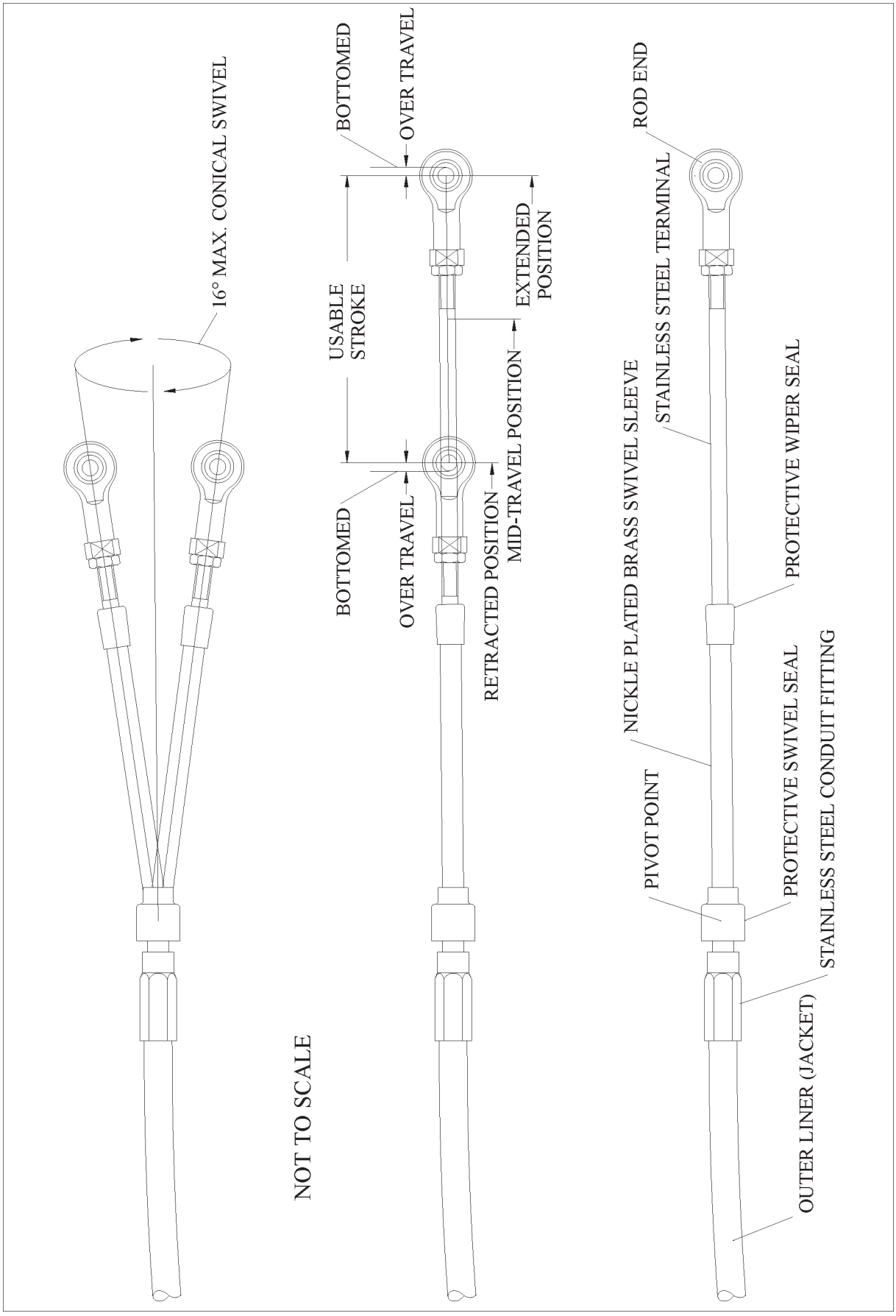


Figure 3 ***Control Cables***

20-10-10 Firewall Sealant

For firewall sealing various products can be used (refer to Chapter 51-30-04).

Replacement

1 Before using any product, read and understand the applicable Technical Data Sheet (TDS) and Material Safety Data Sheet (MSDS).

2 To ensure proper sealing and to avoid unintended chemical reactions with other products always remove old firewall sealant completely prior to application of new sealant.

3 Apply new firewall sealant with a thickness of 3 mm (1/8 inch).

20-10-11 PR-812

Application

Also refer to PR-812 Technical Data Sheet (TDS) and Material Safety Data Sheet (MSDS)

IMPORTANT

Proper mixing and correct proportions are extremely important to obtain required results.

1 Prepare PR-812 firewall sealant by mixing brown part A with black part B with weight ratio 2.5:100.

2 Clean the surfaces to be sealed with solvents.

3 Immediately thereafter, dry these areas with a new dry cloth.

4 Seal the gap between the firewall and the respective component with PR-812 firewall sealant. Minimum sealant thickness on firewall side is 3 mm (1/8 inch).

Cure time @ 25°C (77°F), 50% RH for a fillet 3 mm (1/8 inch) thick:

- tack free: approx. 24 hours
- to tough rubber: approx. 72 hours
- to performance properties: approx. 14 days

20-20-00 ASSEMBLY INSTRUCTION

20-20-01 General

N O T E

Make appropriate logbook entry of compliance with this Assembly Instruction after Container Shipping.

In case of the aircraft is delivered in a container it has to be assembled on arrival.

For assembly of aircraft main components follow the instructions as outlined in the chapter 20-20-02.

These instructions can not replace the skill, craftsmanship and sound technical knowledge of qualified personnel. In case of doubt or lack of information, the manufacturer of the respective component should be contacted for advice.

Unless otherwise specified all bolts and connections should be torqued as listed in chapter 20-10-03. At some locations special torque values are considered necessary. Refer to chapter 20-10-04. The stated directions "Front" and "Rear" are to be considered in respect of pilot`s seating direction.

20-20-02 Assembly Instruction after Container Shipping

Complete each step of the assembly procedure in the order shown below.

1 Check the condition of fastening of the aircraft components in the container. Note any damage.

2 Remove the fuselage/engine assembly from the container. Prevent the aircraft from nosing over by keeping down the tail.

3 Weight the tail as per chapter 7.

4 Remove the aircraft components out of the container. Small parts, hardware, spinner dome and the wheel fairings you find in the cockpit.

5 Inspect all removed items for damage prior to assembly. Damaged items have to be replaced or if possible repaired according to chapter 51.

WARNING

In order to prevent the aircraft from nosing over the assembly has always to start with the empennage.

6 Prior to assembly remove engine cowlings, canopy, main fuselage cover including the rear support angle as per chapters 51 and 53.

NOTE

In contrast to the instructions given in the respective chapters don‘t reinstall these items before completion of the whole assembly.

7 Remove provisional attached rudder and vertical stabilizer as per chapters 27 and 55.

8 Install horizontal stabilizer with elevator as per chapter 55. The procedure described there is also applicable to the installation of the complete horizontal tail. Remember to connect the ground bonding lead of the elevator too.

9 Connect elevator push pull rod actuator lever as per chapter 27-00-01.

10 Connect trim wire to the tab actuator lever using fitted clamp.

11 Inspect for full travel and elevator deflection in relation to stick movement.

12 Inspect for full travel and trim tab deflection in relation to trim switch activity.

13 Install the vertical stabilizer as per chapter 55.

14 Reinstall rudder to the vertical stabilizer as per chapter 27-20-01.

15 Inspect for full travel and rudder deflection in relation to rudder pedal movement.

16 Install the wing as per chapter 57.

17 Install navigation/strobe lights as per chapter 33-40-01.

18 Install propeller in accordance with MT-Propeller installation instructions E-124 latest revision.

19 Remove tail weight.

20 Check if all switches are in Off-position and connect battery.

21 Perform operational check of electrical equipment. Shut-off BATTERY and ALTERNATOR switches after completion.

22 Perform operational check and rigging of control system.

23 Inspect fluid filled lines for leaks.

24 Check security of main spar bolts.

25 Install wheel fairings, main fuselage cover and rear support bracket, canopy, engine cowlings, and access panels (refer to chapter 51-00-01 and 53).

26 Check all control surfaces for freedom of movement and security.

27 Perform a compass compensation according to „Aircraft Inspection and Repair FAA AC 43.13“.

28 Check correct servicing of aircraft.

29 Perform an engine run up. Refer to chapter "05-20-04 Scheduled Maintenance Checks". Start the engine in accordance with the Pilot’s Operating Handbook and Airplane Flight Manual (POH).

30 Inspect aircraft for foreign objects.

31 Final inspection by licensed aircraft inspector.

IMPORTANT

After first flight check fuselage interior/exterior for fuel leaks. Check all bolts on fairings and cover sheets for tight fit.

7 Remove the four heating boxes attachment bolts (6).

8 Remove the inlet box (9).

9 Install in reverse sequence of removal.

21-40-02 Distribution Box

Removal/Installation

Refer to figure 2.

1 Remove engine cowlings as per chapter 71.

2 Remove bottom fuselage cover as per chapter 53.

3 Loosen the hose clamp (3).

4 Disconnect the hose (1) from the distribution box.

5 Loosen the Bowden cable attachment bolt (4).

6 Disconnect the Bowden cable (5) from the linkage.

NOTE

When removing the distribution box, the inlet box is also unfastened. Both boxes are attached by the same bolts.

7 Remove the four heating boxes attachment bolts (6).

8 Remove the distribution box (2).

9 Install in reverse sequence of removal. Seal contact areas of boxes with firewall with firewall sealant (see Chapter 51-30-04).

21-40-03 Main Bowden Cable

Refer to chapter 20 for general information about handling of control cables.

Removal

Refer to figure 3.

1 Remove engine cowlings as per chapter 71.

2 Remove main and bottom fuselage cover as per chapter 53.

3 Disconnect Bowden cable from the inlet box actuator arm (14).

4 Remove clamp sheet (12, 15) attachment bolts on the firewall.

5 Loosen hose clamp (11).

6 Mark main Bowden cable (4) routing and remove the attachment self-clinching plastic straps (5).

7 Remove attachment nut and washer (7) of the main control unit (1).

8 Pull the main control unit (1) with the complete Bowden cable (4) aft to remove from aircraft. Secure label plate (8), clamp sheets (12, 15) and attachment nut and washer (7).

Installation

Refer to figure 3.

1 Thread the Bowden cable (4) end through the respective attachment tube (6).

2 Thread the attachment nut and washer (7) on the Bowden cable

3 Ensure nut (9) is fastened.

4 Place label plate (8) and align.

5 Attach the main control unit (1) and the label plate (8) by means of its attachment nut and washer (7).

6 Position the Bowden cable (4) along the prior marked routing.

7 Fasten the Bowden cable (4) with self-clinching plastic straps (5) in place.

8 Thread the Bowden cable end through the hoseclamp (11).

9 Thread the Bowden cable through the firewall.

10 Renew the sealing of the clamp sheets (12, 15). Use firewall sealant (see Chapter 51-30-04).

24-60-00 DC ELECTRICAL LOAD DISTRIBUTION

(Refer to figure 2) The bus bar powers the electrical equipment and accessories furnished on the aircraft. From the main bus, which physically corresponds to the bus bar, the electrical load is distributed through circuit breakers and switches.

The bus bar is located at the back side of the circuit breakers, the circuit breakers themselves are located at the rear instrument panel such as the toggle switches. Subminiature push-button switches for the radio resp. intercom are mounted on the control sticks and the throttle controls.

IMPORTANT

If replacement of wiring passing the firewall is necessary, renew the sealing of the bushing grooves and gaps at the engine side of the firewall. Use firewall sealant as presented in Chapter 51-30-04.

24-60-01 Circuit Breaker

Removal/Installation

NOTICE

Disconnect battery

1 Remove the instrument panel cover per chapter 31.

2 Disconnect the tubing from the resp. instruments.

3 Remove the instrument panel attachment screws.

4 Turn down the panel.

5 Loosen the bus bar attachment screws and remove bus bar if necessary.

6 Disconnect wiring.

7 Remove the attachment nut at the front side of the instrument panel.

8 Remove the circuit breaker.

9 Install in reverse sequence of removal.

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27-20-03 Bottom Hinge Bellcranks

Removal/Installation

1 Remove the rudder per chapter 27-20-01.

2 Loosen the attachment bolts.

3 Remove the bottom hinge bellcranks.

4 Install in reverse sequence of removal.

27-20-04 Control Cable

General

The control cables installed have a diameter of 1/8 inch and are built in a 7 x 19 construction. Both galvanized and stainless steel control cables are used. The stainless steel version must not be lubricated.

Control cable tension is ensured by retracting springs connected to each pedal, keeping the pedals in most forward position.

The thimble-eye splices on each cable end fitting and the cable to cable connections for the reart pedals are swaged on. They are covered with a shrinking sleeve.

The cable sections at the S-shaped pedal adjustment cable guide and at the fuselage skin penetration are covered with a PTFE-hose. The fuselage skin penetration PTFE hose is held in place by means of a shrinking sleeve.

For detailed explanations concerning control cables refer to *AC 43.13-1B, chapter 7, section 8. Inspection and Repair of Control Cables and Turnbuckles.*

Inspection Procedure

Refer to the *Control Cable Replacement Criteria* Paragraph.

1 Visually inspect the structure and other components located next to fairleads for cracks and traces of lubrication splashes caused by control cable wires sticking out. Those evidences can indicate a damaged control cable.

2 Perform the following inspection item with the pedal adjusted first to the foremost and later to the rearmost position in order to get access to the control cable inside the S-shaped cable guide.

3 Visually inspect the PTFE-hoses in the areas of the fuselage skin penetration and of the S-shaped cable guide of the pedal adjustment for wear and other damage.

NOTE

Intact PTFE-hoses render a close inspection of the control cable inside the hose unnecessary.

4 Inspect shrinking sleeves fixing the fuselage skin penetration PTFE-hose for function and damage.

5 Inspect shrinking sleeves at the control cable end fittings and at the cable to cable connections for wear and other damage.

NOTE

Intact shrinking sleeves render a close inspection of the control cable inside the sleeve unnecessary.

6 Disconnect the control cable from the rudder to relieve cable tension. Refer to *Removal Paragraph.*

7 Move the rudder control cables during inspection to ensure that the entire cable run including areas of fairleads is visible respectively accessible.

CAUTION

Risk of injuries due to broken wires possible. Wear protective gloves.

8 Closely inspect control cables by passing a cloth over them to snag on broken wires.

9 Visually inspect each flight control cable exterior and interior along its entire length for evidence of broken wires, corrosion, fraying or other damage. Visual inspection may

be via direct sight, mirror and flashlight or borescope. Bend and twist cable for proper inspection.

10 Inspect cable retracting springs connected to the pedals for correct installation, corrosion or damage.

11 Check swaged terminal reference marks for an indication of cable slippage within the fitting. Inspect the fitting assembly for distortion and/or broken strands at the terminal.

12 Reattach the control cable to the rudder as per *Installation* Paragraph.

13 Examine cable runs for incorrect routing, fraying, twisting, or wear at fairleads, antiabrasion strips, and guards.

14 Inspect fairleads for wear, breakage, alignment, cleanliness, and security. Examine cable routing at fairleads to ensure that deflection angles are no greater than 3° maximum.

15 Inspect cable systems for binding, full travel, and security of attaching hardware.

16 Visually check for proper routing along entire length of cable. Make sure that cables and attaching sectors are free and clear of airframe structure and other components.

17 Lubricate critical control cable areas with a light coat of grease or general purpose, low-temperature oil (galvanized cable only!).

Rudder Control Cable Replacement Criteria

EXTRA has defined the following replacement criteria when inspecting the rudder control cables:

- Any cable assembly that has one single broken wire must be replaced.
- Replace cable when worn areas on the individual wires in each strand appear 40% or more (as depicted in Figure 15).
- Replace cable when corrosion on the outer or interior strands has been detected.
- Replace cable when a PTFE-hose is damaged.
- Replace cable when a shrinking sleeve is damaged.

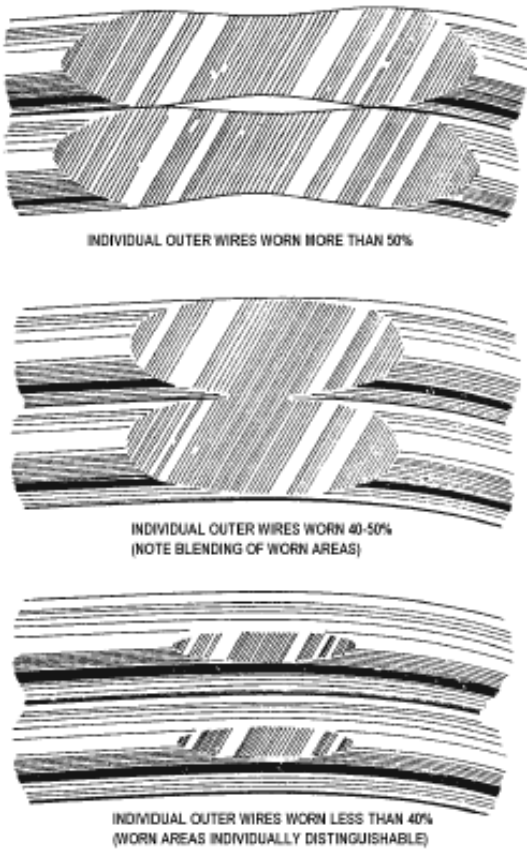

Figure 15 Cable Wear Patterns.

Removal

1 Remove the respective access panels

2 Remove the cable to fuselage attachment bolts.

3 Remove the cable to rudder bellcrank attachment bolts.

4 Cut the control cables behind the front shrinking sleeves and behind the cable to cable connection.

5 Remove the control cable parts by pulling out to the back.

Installation

Use only control cables manufactured by EXTRA Flugzeugproduktions- und Vertriebs- GmbH. Those cables are prepared for simple installation.

1 Remove the respective access panels as per chapter 51.

2 Secure the rudder (4, Figure 14) in 0°-position.

3 Mount the pre-assembled eye end of the longer control cable to the LH cable fastening (8).

4 Check that the 550 mm teflon protective hose is on the pre-assembled control cable.

5 Thread the cable through the "S"-shaped tube at the pedal and the pulley (7).

6 Adjust rear rudder pedals (1) in rearmost position.

7 Let the front end of the protective hose extend to 20 mm in front of the pedal "S"-tube.

8 Slip 2 NICOPRESS (National Telephone Supply Co., Cleveland Ohio) 18-3-M or 28-3-M sleeves (5) and 100 mm 771095 shrinking sleeve on the control cable.

9 Thread the free end of the control cable through the rear fairleads (6) and the hole in the fabric to the tail.

10 Slip 80 mm 771095 shrinking sleeve and 850 mm teflon protective hose on the control cable end. The protective hose should extend 120 mm beyond the first fairlead inside the fuselage.

11 Adjust rear pedals 78 mm aft of the foremost position.

12 Fix rear pedals in neutral position (80° relative to the foot-rest using a template as shown in Figure 16).

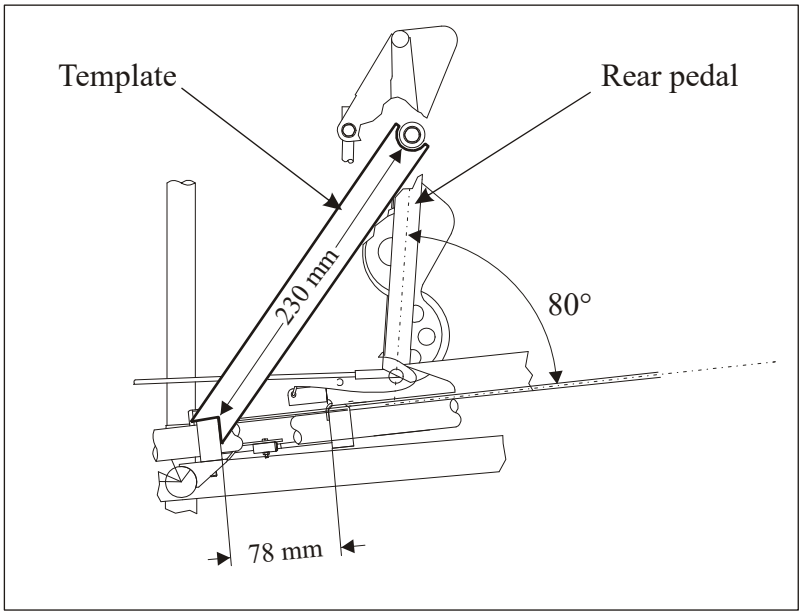

Figure 16 Rear Pedal Template

13 Pre-install the LN9037-06030 bolt, the DIN 125-8,4 washers (one on both sides of the thimble and one below the tailwheel steering attachment bracket), the DIN 125-6,3 washers, the bushing, the LN9348-06 nut and the thimble to the bottom hinge bellcrank.

14 Slip the 80 mm 771095 shrinking sleeve and a NICOPRESS 18-3-M or 28-3-M sleeve on the control cable end.

15 Move the cable around the thimble and stretch the control cable with a force that is equivalent to the tractive effort of the rear pedal retracting spring.

IMPORTANT

Clamping has to be performed in accordance with the Service Bulletin 300-1-93 and the Instruction No. 32 of the National Telephone Supply Co., Cleveland Ohio.

16 Consider to let a distance of 1 mm between the thimble and the sleeve and clamp the sleeve.

17 Cut the free end of the cable 20 mm in front of the sleeve.

18 Slip the 80 mm 771095 shrinking sleeve on the cable end and the protective hose, center on the protective hose end and heat up with a heat gun.

19 Slip the other 80 mm 771095 shrinking sleeve on the front end of the protective hose, center on the protective hose end and heat up with a heat gun.

20 Remove the rear pedal template.

21 Mount the pre-assembled shorter control cable to the front pedal using the shackle.

22 Thread the free end of the control cable through the pulley, the front fairleads and the pre-installed NICOPRESS 18-3-M or 28-3-M sleeves.

23 Fix the front pedal in almost vertical position (92° relative to the footrest using the template as shown on Figure 17).

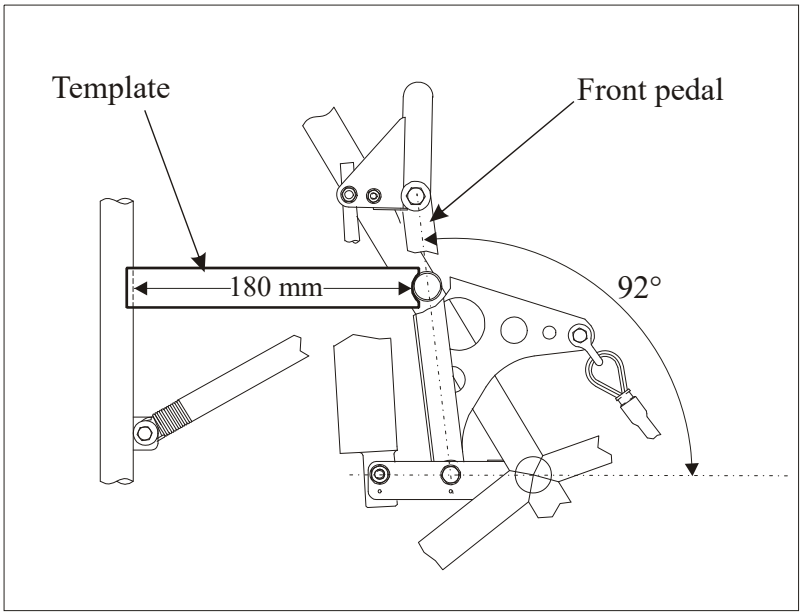

Figure 17 Front Pedal Template

24 Stretch the shorter control cable with a force that is equivalent to the tractive effort of the front pedal retracting spring.

IMPORTANT

Clamping has to be performed in accordance with the Service Bulletin 300-1-93 and the Instruction No. 32 of the National Telephone Supply Co., Cleveland Ohio.

IMPORTANT **To prevent the cables from twisting, clamp the sleeves in the same plane.**

25 Consider that the clamping area shall be 195 mm aft of the rear pulley and clamp the sleeves.

26 Cut the free end of the cable (20 mm behind the sleeve).

27 Slip the shrinking sleeve on the rear sleeve and heat up with a heat gun (the front sleeve can be left free for visual control of the cable-to-cable connection).

28 Remove the front pedal template.

29 Follow the steps 3 to 28 for the RH control cable.

30 Remove rudder securing devices.

31 Check free travel of rudder.

27-20-05 Fairlead

Removal/Installation

1 Remove the fairlead retaining clip.

2 Pull the fairlead halves out of the sleeve.

3 Reverse procedure to install the fairlead.

27-30-00 ELEVATOR CONTROL

Refer to Figure 18.

The two control sticks (1, 4) are connected by a push-pull rod (3) inside the torque tube (2). The control movements are transferred from the rear control stick (2) to the elevator (11) by push-pull rods (3), a bellcrank (14) and the elevator actuator arm (12). The bellcranks have two sealed ball bearings. The elevator is mounted at five points in spherical bearings pressed into aluminium hinge arms. For lightning protection reasons each hinge arm is grounded to the corresponding attachment bracket at the elevator by bonding leads. The travel stops (15) are located at the torque tube.

Mass balance weights (9) are mounted to the elevator tips extending into the horizontal stabilizer when the elevator is in neutral or downward position. An additional mass balance weight (13) is mounted to the elevator actuator arm (12).

An access panel is located at the right side of the rear fuselage.

Trim Tab

Pitch trim is done by means of the trim tab (10) on the right elevator trailing edge which is mounted by two piano hinges. It is operated by a trim servo (7) with rod (6), a trim lever (5) and a Bowden cable mechanism (8).

Refer to chapter 20 for general information about handling of control cables.

The elevator trim control switch is located on the control stick and the trim position indicator on the rear instrument panel.

The trim tab is not mass balanced.

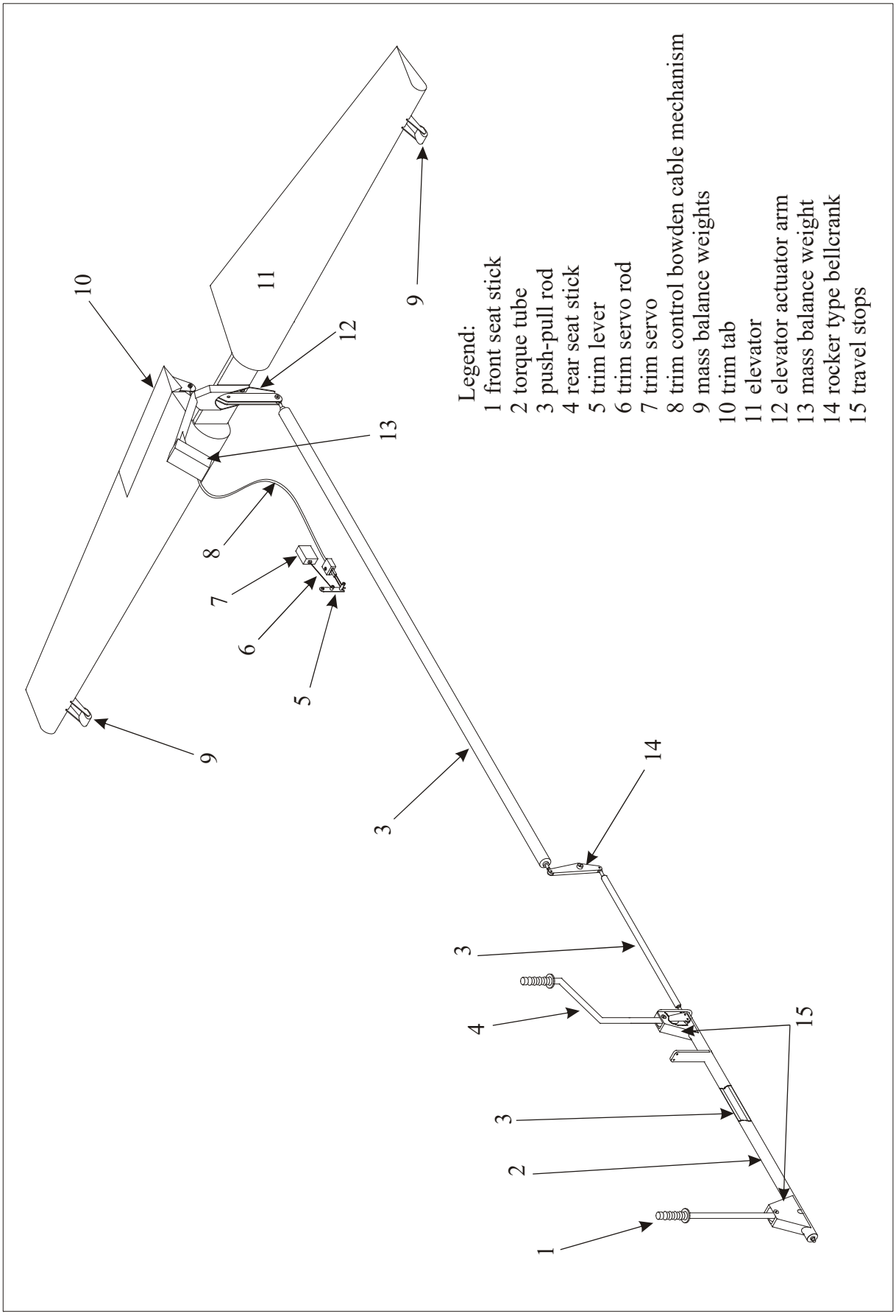

Figure 18 ***Elevator and Trim Tab Control***

27-30-01 Elevator

Removal/Installation

Before the removal of the elevator, the vertical stabilizer has to be disassembled.

1 Remove the respective access panels.

2 Remove the rudder as per chapter 27-20-01

3 Remove the vertical stabilizer as per chapter 55-30-00.

4 Loosen the Bowden cables from the trim tab. If a replacement is necessary order new cable.

5 Disconnect the elevator actuator arm from the push-pull rod.

6 Loosen the hinge bolts and the ground bonding leads and remove the bolts.

7 Install in reverse sequence of removal. Observe the second note of chapter 27-00-00.

Rigging

IMPORTANT

Before beginning any adjustments, inspect control rods, levers and hinges for signs of wear or damage and check if control rod lengths correspond with the measurements given in chapter 27-00-01. Replace parts and correct lengths if necessary as per chapter 27-00-01.

1 Remove the canopy and the main fuselage cover as per chapter 53 and the seats as per chapter 25.

2 Secure the rear control stick in the neutral position. (Vertical back plane of the torque tube parallel to the control stick like shown in Figure 19).

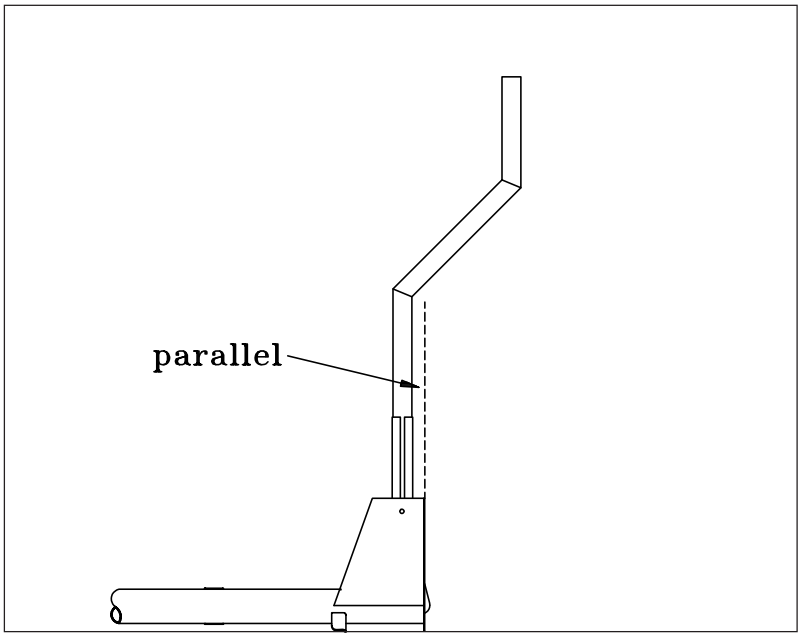

Figure 19 Neutral Position of the Rear Control Stick

3 Check if the elevator is in 0°-position. (Elevator trailing edge aligned to the stabilizer tip trailing edge.)

4 If necessary adjust the length of the aft control rod as per chapter 27-00-01.

5 Check if the elevator travel is within the given tolerances (up 25° ±2°, down 25° -2°). Use a conventional protractor.

6 Adjust the travel stops if necessary.

7 Check if the rear control stick travel is symmetrical.

8 If it is not, check correct installation of rocker type bell-crank; refer to chapter 27-00-02.

27-30-02 Trim Tab

Removal/Installation

1 Loosen Bowden cables. If a replacement is necessary order new cable.

2 Disconnect the safety cotter pins and remove the hinge pins.

3 Install in reverse sequence of removal.

Rigging

Refer to Figure 20.

1 Secure the rear control stick in neutral position (See Figure 18).

2 Adjust trim to slightly below middle position. 6th LED on trim position indicator illuminates (1).

3 Check trim lever (4) is in neutral position (angle of 11°, (tolerance ±2°) to the firewall plane or 79° to upper longerons). If it is not, proceed as follows:

a Remove the trim servo rod (2) from the trim servo (3) and the trim lever (4) by removing the clevis pins with cotter pins and washers.

b Loosen the counternut from the adjustable rod end and screw the rod end out or in as necessary to adjust the fuselage bellcrank in neutral position (default measurement is 147 mm). Ensure rod end is screwed in for min. 10 mm.

c Fasten the counternut.

d Renew locking varnish.

e Reconnect the rod end. Use new cotter pins.

4 Bring the trim tab (8) in 0°-position (upper surfaces of elevator (7) and trim tab (8) are in the same plane) by replacing the linkage bolts (5 and/or 9).

5 Trim to extreme positions and check if trim tab travel is up 35° and down 27° (tolerance ±2°). If it is not, check free travel of the trim lever (4) and Bowden cable (6).

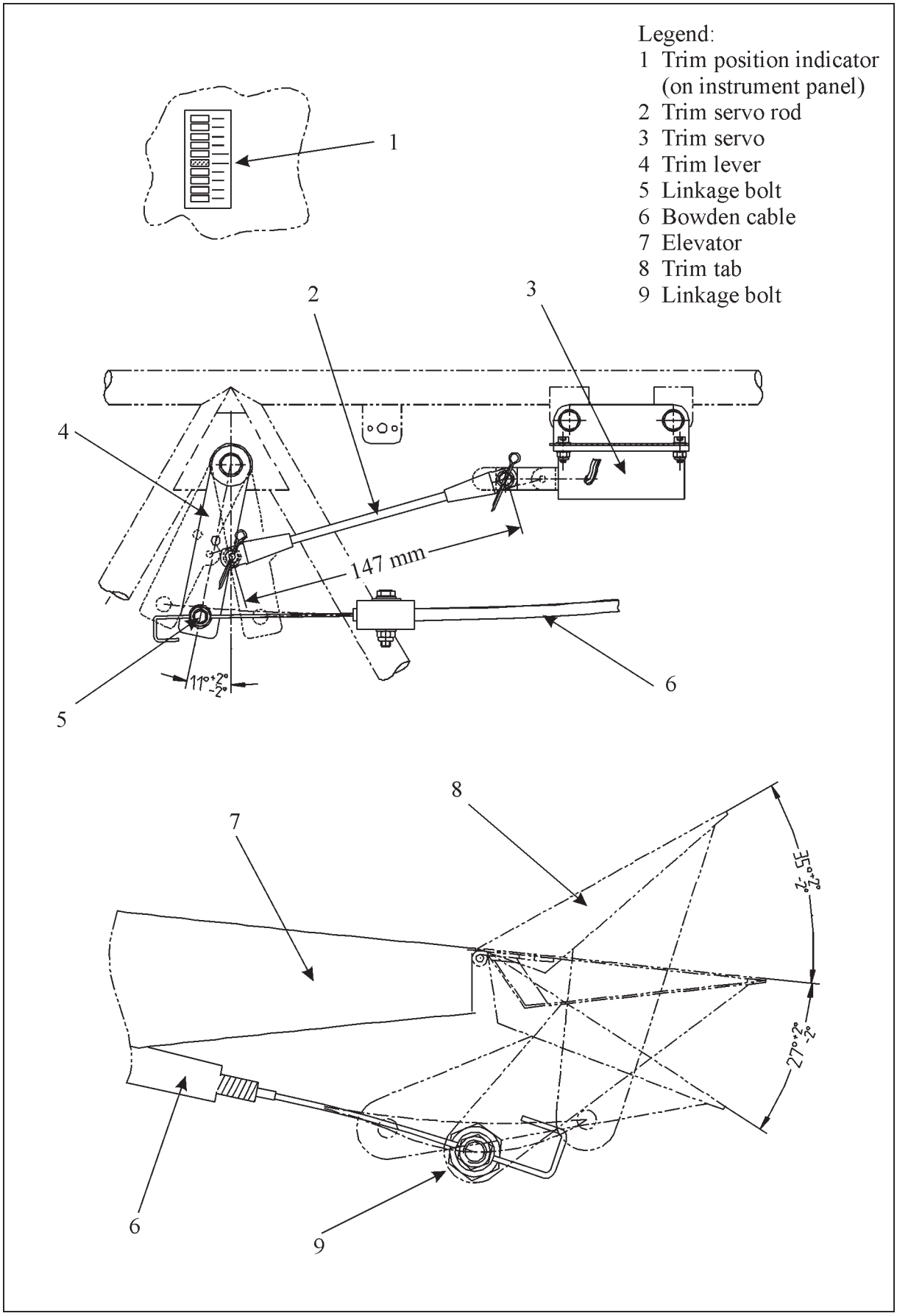

Figure 20 ***Trim Tab Rigging***

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28-10-10 Wing Tank

Re-Sealing Procedure

The first option to solve a fuel leakage problem is to re-seal the wing fuel tank compartment from the inside with Scotch Clad 776 (refer to Chapter 51-30-04). It is not necessary to remove existing Scotch Clad 776 prior to re-sealing. When using Scotch Clad 776, be sure to follow the manufacturer's precautions and directions for use for handling this material. Refer to the applicable technical and safety data sheets.

The procedure is prepared for the use of a spray gun (flow gun).

1 Drain both wing fuel tanks as per Chapter 12.

2 Remove the wing from the fuselage as per Chapter 57.

NOTICE

Damage to the wing possible.
Ensure wing and especially the trailing edge is held by two persons or supported otherwise when not in safe vertical position.
Use cushioned supports (3) if applicable.

3 Place the wing (2, Figure 4) on an appropriate support (1) allowing rotations as shown in Figure 5.

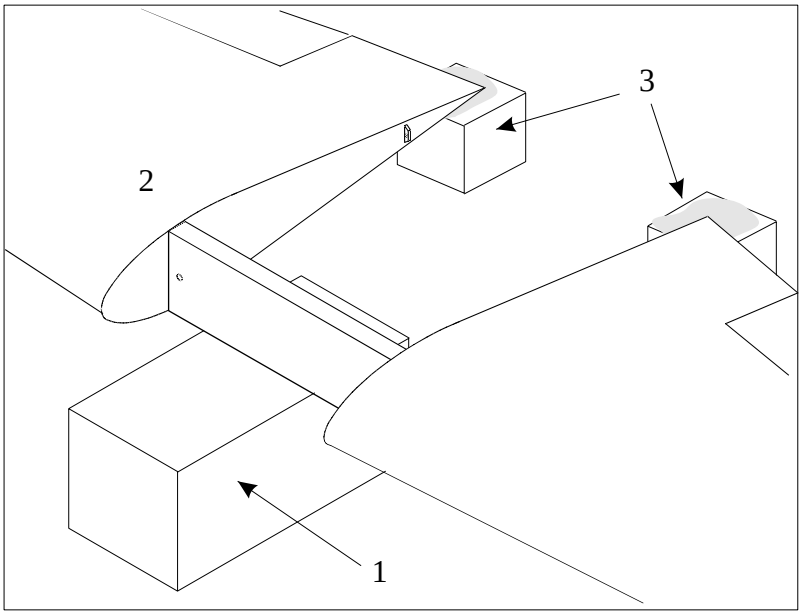


Figure 4 Wing Supports

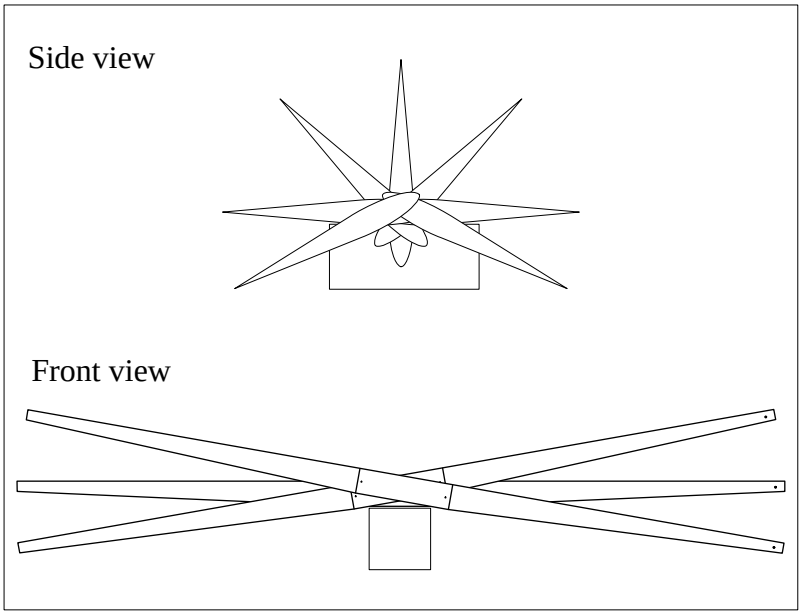


Figure 5 Wing Positions

For totally drying the wing tank to be sealed and to eliminate any fuel vapor:

4a Remove the fuel filler cap.

4b Remove the wing tank inspection door as per Chapter 28-10-11.

4c Leave the fuel tank compartment open for an appropriate time.

4d Discharge moderate dry shop-air through the wing tank compartment as applicable.

5 Cover fittings or tubes in the area of leak with caps or tape.

6 Place and secure the wing in a position in which the leak to be sealed is (as far as possible) at the bottom.

7 Cover fuel tank installations like filler neck sealing lip, tubes, strainers, fittings etc. if next to the affected area with caps or tape.

WARNING

Scotch Clad 776 is dangerous for eyes, skin and respiratory system.
Wear protection goggles, respiratory mask, and safety gloves.
Follow the instructions of Scotch Clad 776 safety data sheet.

8 Prepare an elongated spray gun for the use of Scotch Clad 776.

9 Apply a cohesive film of Scotch Clad 776 through the inspection hole of the tank root rib (Figure 6) by using the spray gun.

10 Rotate the complete wing around its pitch and/or roll axis step by step to ensure that the Scotch Clad 776 is dispersed all-over the leak area.

11 When applying multiple sealant coats allow a minimum of 20 minutes between coats.

12 Place and secure the wing again in the position in which the leak to be sealed is (as far as possible) at the bottom.

13 Let the sealant dry at elevated room temperature.
Under normal atmospheric conditions the sealant becomes tack free in about 40 minutes and is thoroughly dry in 24 to 48 hours. Drying of sealant might be supported by an air hose inserted into the fuel tank compartment to help provide air circulation for proper drying.

14 Uncover fuel tank installations if applicable.

15 Reinstall the wing tank inspection door as per Chapter 28-10-11.

16 Reinstall the fuel filler cap.

17 Perform a leak test to ensure that the shell is completely sealed.

28-10-11 Wing Tank Inspection Door

Removal/Installation

1 Drain the fuel system per Chapter 12-10-02.

2 Disconnect the ground bonding leads and if necessary the electrical wiring of the lever-type tank unit (3, Figure 6).

3 Remove the inspection door bolts.

4 Remove the inspection door flange (1).

5 Push the inspection door (2) into the tank, then turn and remove.

WARNING

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

6 Clean the sealing surfaces mechanically and with Acetone.

7 Install in reverse sequence of removal after applying Scotch Clad 776 (see Chapter 51-30-04) to the sealing surfaces (inspection door and tank root rib).

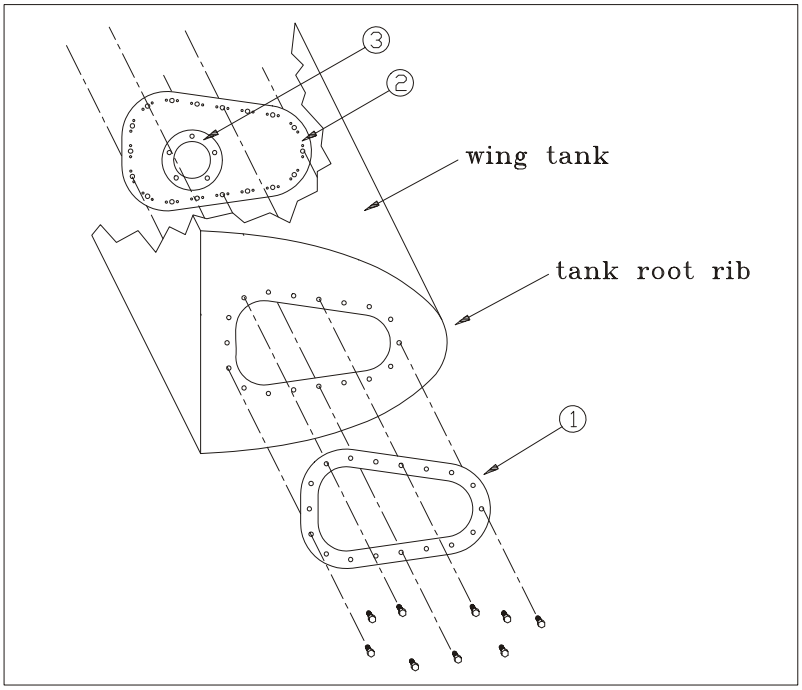


Figure 6 Inspection Door Removal/Installation

28-10-12 Wing Tank Outlets

Removal/Installation

1 Remove the inspection door (1, Figure 7) per Chapter 28-10-04.

2 Remove the union nuts (2) and the elbow tubes (3).

3 Remove AN 924 nut and washers and remove AN 832 fitting.

WARNING

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

4 Clean sealing surfaces mechanically and with Acetone.

5 Install in reverse sequence of removal after applying Scotch Clad 776 (see Chapter 51-30-04) to the sealing surfaces (fitting to tank root rib). Ensure that the outlet end positions are in the upper- resp. undermost edge of the wing tank (see Figure 7 below).

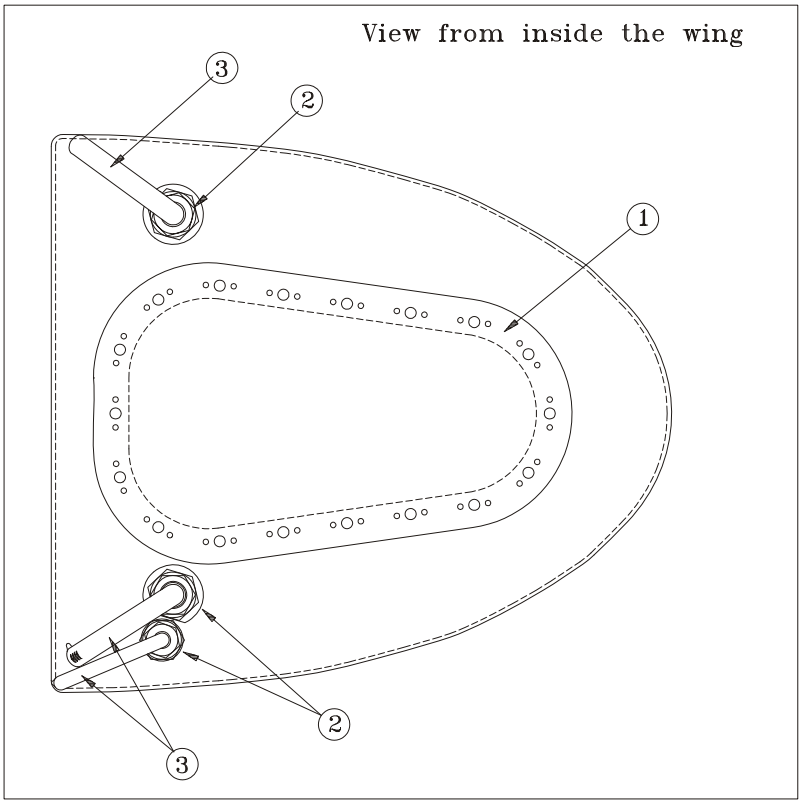


Figure 7 Wing Tank Outlets Removal/Installation

28-10-13 Center Tank Filler Neck

Removal/Installation

1 Remove the main fuselage cover as per Chapter 53.

2 Completely drain the center tank as per Chapter 12.

3 Loosen the lower hose clip.

4 Remove the filler neck.

5 Install in reverse sequence of removal.

28-10-14 Wing Tank Filler Neck

Removal/Installation

1 Completely drain the fuel system per Chapter 12.

2 Remove wing tank inspection door per Chapter 28-10-11.

3 Unscrew filler neck lock ring (4, Figure 8) with sealing lip (5) using a tool as shown in Figure 8.

4 Remove filler neck (3) with filler cap (1) and O-ring (2).

WARNING

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

5 Clean all sealing surfaces with Acetone.

6 Install in reverse sequence of removal after applying Scotch Clad 776 (see Chapter 51-30-04) to the sealing surfaces (wing/filler neck).

28-10-15 Filler Neck Sealing Lip

Replacement

1 Carefully drill out the body-bound rivets (7, Figure 8).

2 Install the new sealing lip driving in new washers (6) and body-bound rivets.

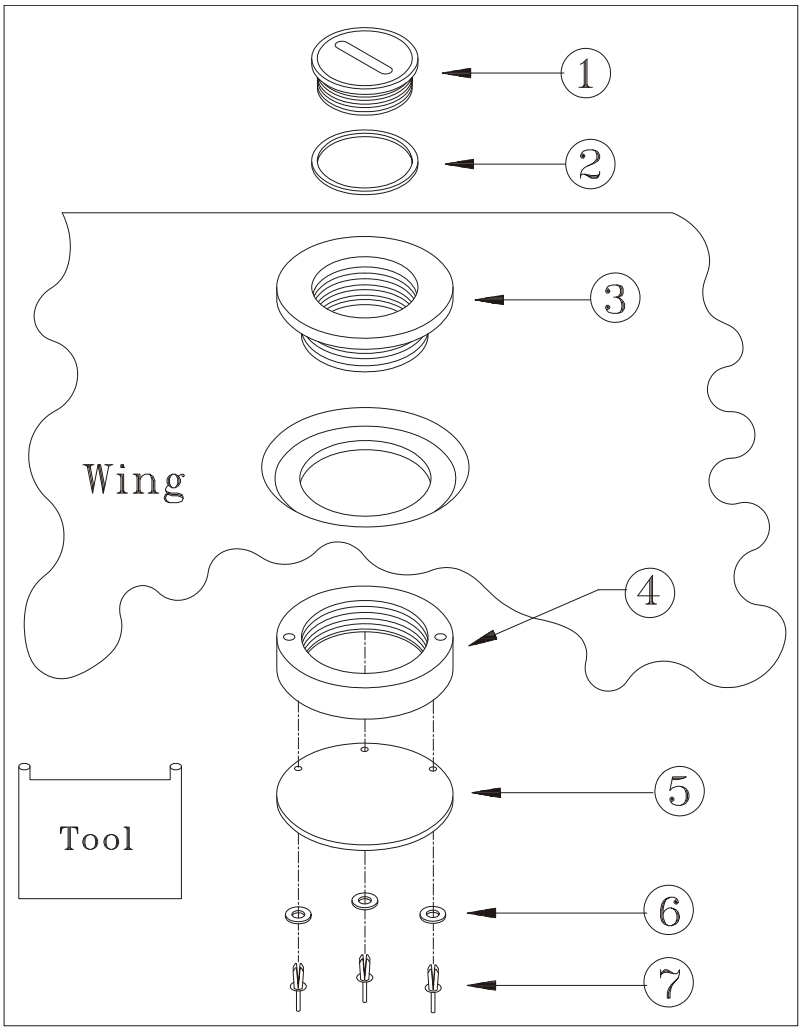


Figure 8 Filler Neck and Sealing Lip Removal/Installation

28-10-20 Ventilation Line

Replacement

General information concerning fittings is given in Chapter 20-10-08.

28-20-00 DISTRIBUTION

(Refer to Figure 9) Flexible hoses and aluminium tubes (A-L) connect the particular components of the fuel system. The fuel lines connecting the wing tanks (D) meet at a T-fitting (7) in the bottom center of the fuselage.

In addition to the engine driven fuel pump (6), an electrically driven auxiliary pump (5) having sufficient capacity to feed the engine at take-off power is fitted as a safety device against failure of the engine driven pump. The auxiliary pump switch is located on the rear instrument panel. A gascolator (3) is installed between the fuel selector valve and the auxiliary fuel pump at the firewall (engine side). A fuel selector valve of an Allen 6S122 type (1) is located at the right side of the front cockpit behind the main spar on a separate support. A control rod connects the selector valve to the control handles (2). The fuel selector valve is marked by the letters "WT" (Wing Tank), "E" (Engine), and "CT" (Center Tank) to ensure correct installation of fuel lines (Refer to "Detail A" of Figure 10).

The EXTRA 330LX has three drain valves (4) for drainage of moisture and sediment. One fuel drain valve labelled WING TANK DRAIN is located on the left underside of the fuselage. The fuel drain valve for the center and acro tank (CENTER TANK DRAIN) is located on the right underside of the fuselage. Another fuel drain valve which is connected to the fuel gascolator is located at the right under side of the firewall (GASCOLATOR DRAIN).

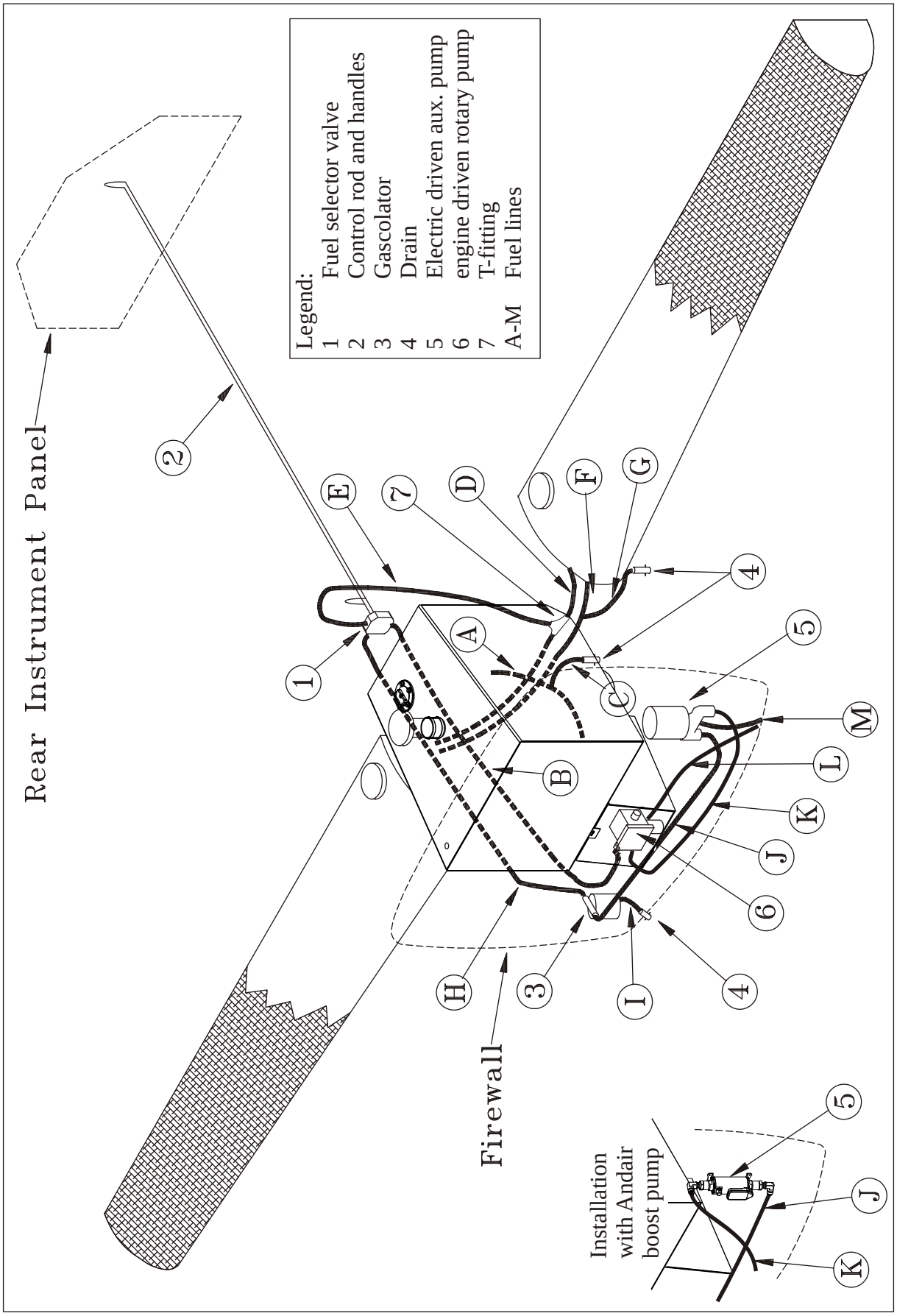


Figure 9 ***Distribution***

28-20-01 Fuel Selector Valve

NOTICE **Check fuel selector valve only when removed.**

NOTICE **Do not use more than 15 PSI hydraulic or pneumatic pressure.**

NOTICE **Do not change fuel selector position while applying hydraulic or pneumatic pressure to the fuel selector valve. This could damage the O-ring.**

The fuel selector valve can be checked for leak tightness by applying not more than 15 psi hydraulic or pneumatic pressure.

Integrity Test

1 Completely drain wing tanks.

2 Fuel selector position: WING TANKS

3 Completely fill center tank.

4 Leave aircraft stationary for a minimum of three hours.

5 If fuel is found in the wing tanks, the fuel selector valve must be repaired or replaced.

Removal/Installation

(Refer to Figure 10)

1 Drain the fuel system as per chapter 12-10-02.

2 Disconnect the fuel lines on the selector valve.

3 Remove the control rod attachment bolts (5).

4 Remove the attachment screw (4) if reasonable.

5 Remove the control bracket (3).

6 Remove the selector valve attachment bolts (2).

7 Remove the selector valve (1).

IMPORTANT

Ensure LOCTITE 243 cannot get into the selector valve. The selector valve could lock.

8 Install in reverse sequence of removal. Use LOCTITE 243 when installing the selector valve attachment bolts (2) and the attachment screw (4).

28-20-02 Selector Valve Control Rod

Removal/Installation

(Refer to Figure 10)

1 Remove the rear control rod connection bolt (11).

2 Pull the control rod (12) to the rear.

3 Remove the control rod attachment bolts (5).

4 Remove the front control rod connection bolt (7).

5 Remove the washers (8) and the spring (9), the front (6) and the middle control rod (10).

6 Install in reverse sequence of removal.

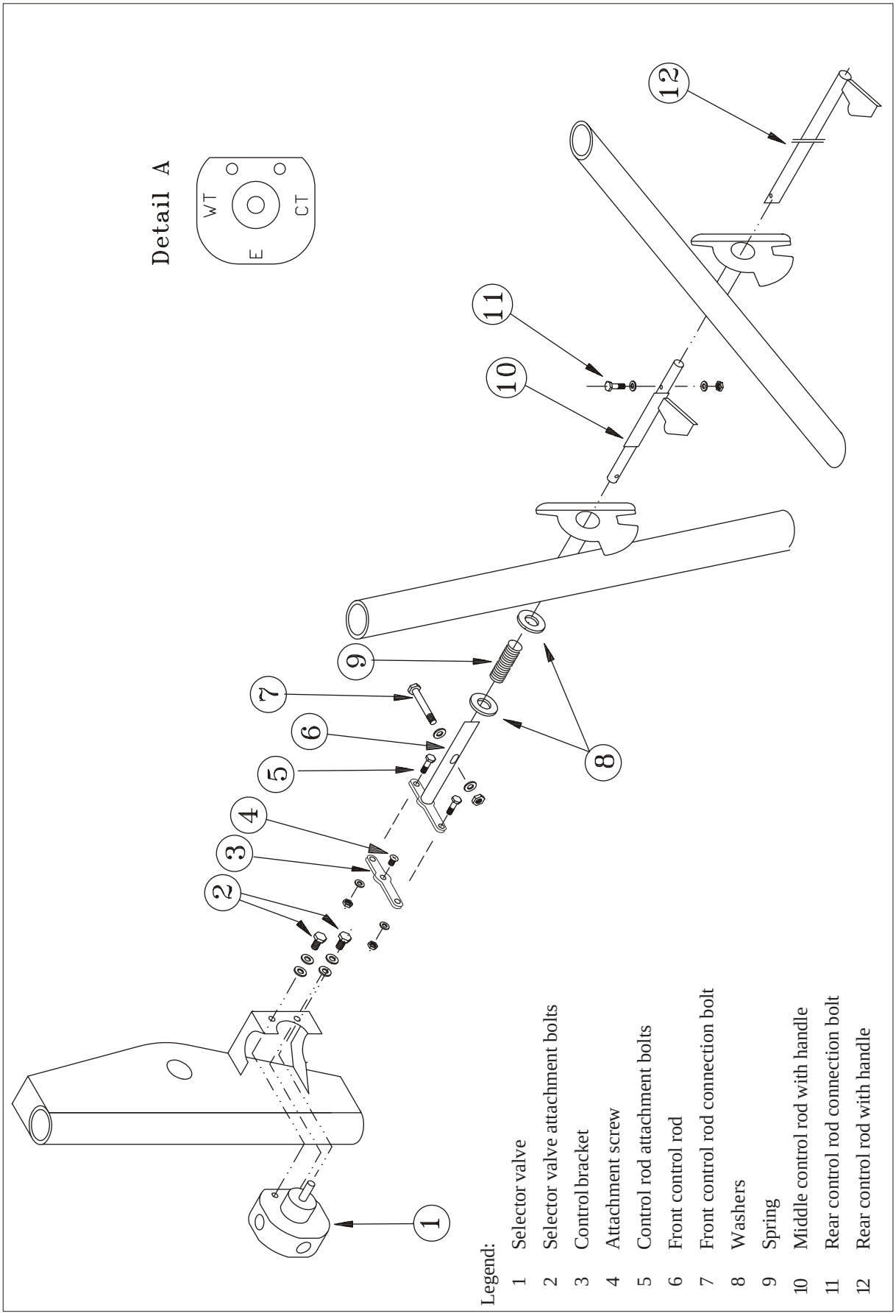


Figure 10 ***Fuel Selector Valve and Control Rod***

28-20-03 Gascolator

The gascolator (1, Figure 11) is positioned in the engine compartment, mounted with a bracket on the forward side of the firewall. It is installed in the fuel line between the fuel selector valve and the electric driven boost pump.

It is an all metal gascolator with screen, 2-1/2" diameter cadmium plated steel bowl with connection to a fuel drain line to the downward positioned quick fuel drain (3).

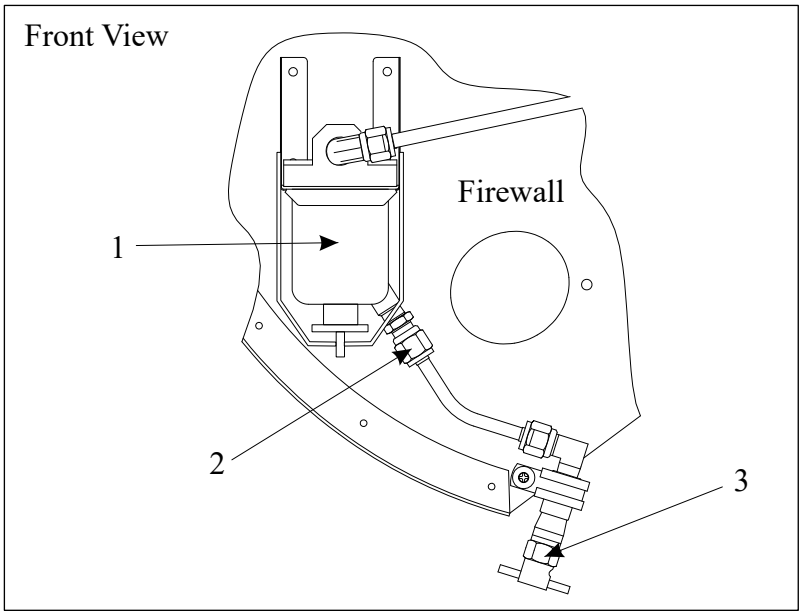


Figure 11 Gascolator and Drain

Inspection

1 Remove cowling.

2 Make sure that the aircraft is powered off (MASTER SWITCH in OFF position).

3 Confirm that the fuel selector valve is in the OFF position.

4 Place a suitable container under the gascolator drain. Operate the fuel drain to empty fuel in the gascolator bowl (3, Figure 11).

5 Disconnect the fuel drain tube connection from the gascolator bowl (1) by loosening the coupling nut (2).

6 Cut away and discard existing safety wire from the gascolator.

7 Loosen the bail nut (1, Figure 12), move the bail wire (2) to the side and remove the bowl (3).

8 Remove the gasket (4) and screen (5) from the strainer housing (6).

9 Clean and inspect the screen (5), gasket (4), bowl (3), strainer housing (6), bail wire (2) and bail nut (1). Replace any worn or damaged components.

10 Reinstall gasket (4) and screen (5).

11 Position the gascolator bowl (3) and bail wire (2). Tighten the bail nut (1) by hand, then continue tightening an additional one nut flat (i.e., 60 degrees) with a wrench. Do not over tighten.

12 Position the fuel drain line. Tighten the coupling nut of the fuel drain tube connection to the gascolator bowl.

13 Safety the gascolator bail nut (1) to bail wire (2) and bowl (3), bail wire (2) to the gascolator bracket with MS20995-C32 Safety Wire, using the “double twist” method, as described in FAA Advisory Circular AC 43.13-1B CHG 1, Chapter 7, Section 7, “SAFETYING”.

14 Place MASTER SWITCH to ON position.

15 Operate the fuel system and check for leaks.

16 Reinstall cowling.

CAUTION

Fire hazard due to spilled fuel after draining.

Pick up any amount of fuel before starting the engine.

Removal/Installation

1 Drain the fuel system per Chapter 12-10-02.

2 Disconnect the fuel lines from the gascolator.

3 Loosen the knurled nut (1, Figure 11).

4 Remove the mounting bracket (2).

5 Remove the fuel reservoir (3) and the sealing ring (4).

6 Remove the strainer (5) and the gascolator cover (6).

7 Install in reverse sequence of removal.

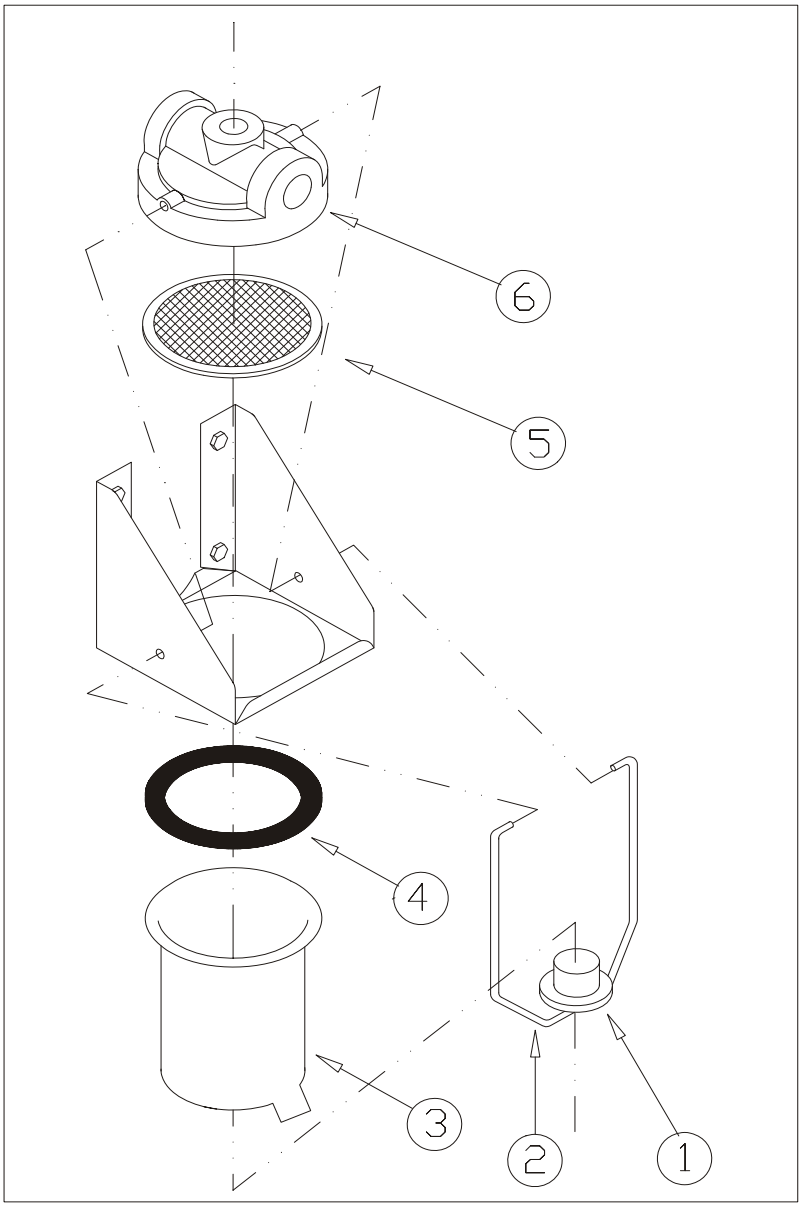


Figure 11 Gascolator Removal/Installation

28-20-04 Weldon Boost Pump

Removal/Installation

1 Drain the fuel system as per chapter 12-10-02.

2 Disconnect the plug (1, Figure 12) and the fuel lines from the boost pump.

3 Loosen the screw clamps (2).

4 Remove the boost pump (3).

5 Install in reverse sequence of removal.

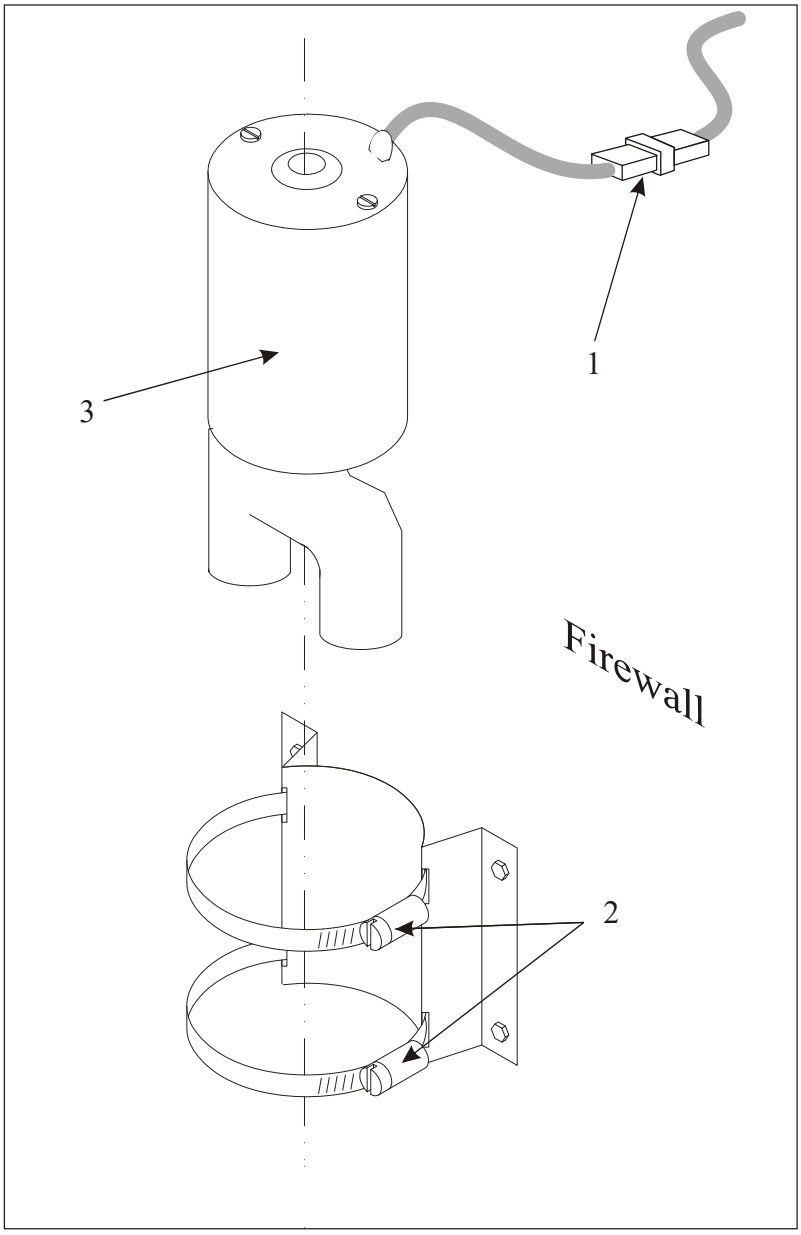


Figure 12 Weldon Boost Pump Removal/Installation

28-20-05 Andair Boost Pump

Removal/Installation

1 Drain the fuel system as per chapter 12-10-02.

2 Disconnect the plug (1, Figure 13) and the fuel lines from the boost pump.

3 Remove the Allen screws (2).

4 Remove the boost pump (3).

5 Install in reverse sequence of removal.

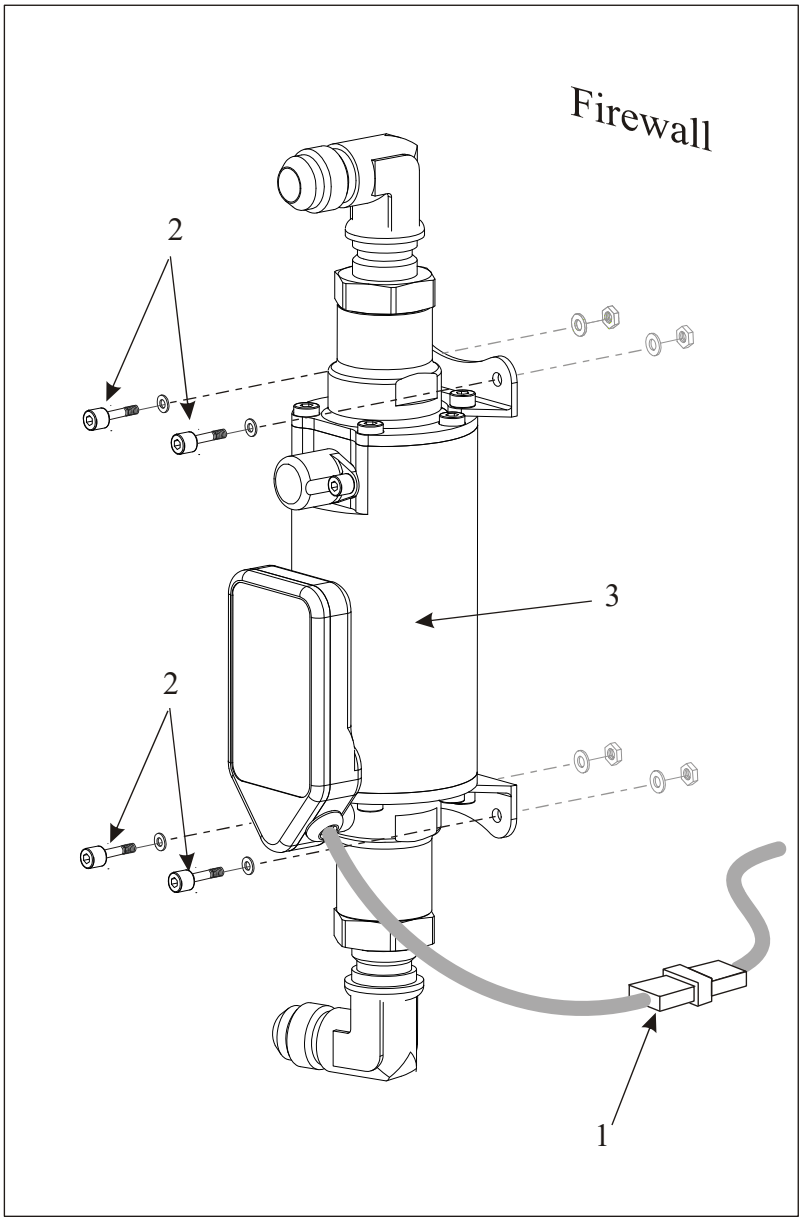


Figure 13 Andair Boost Pump Removal/Installation

28-20-10 Fuel Lines

Replacement

General information concerning hoses and fittings you find in chapter 20-10-07/08.

IMPORTANT

If replacement of fuel lines passing the firewall is necessary, renew the sealing of the rubber grommet grooves and gaps at the engine side of the firewall. Use firewall sealant as presented in Chapter 51-30-04.

28-40-00 INDICATING

(Refer to Figure 14) For fuel contents indicating the center tank is equipped with a tubular fuel quantity transducer (1) and the left wing tank with a lever-type fuel quantity transducer (2).

If the optional MVP-50P is installed the right wing tank is also equipped with a lever-type fuel quantity transducer (refer to chapter 77-40).

They transmit the fuel levels to the respective fuel quantity indicators at the instrument panel (3). In contrast to the fuel quantity indicator of the center tank the one of the wing tank is not adjustable. If the indication is inexact the float wire of the tank unit has to be adjusted (refer to chapter 28-40-05).

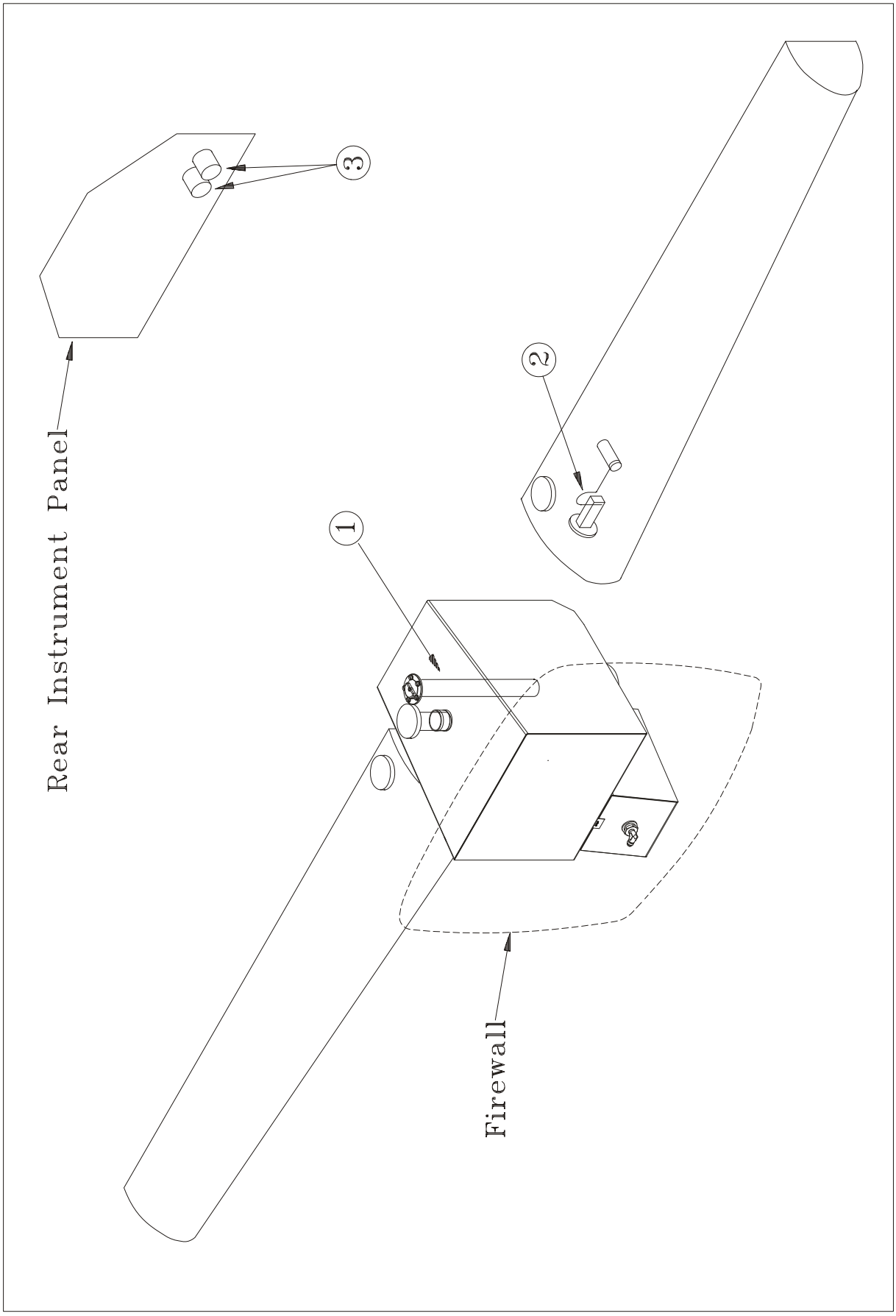
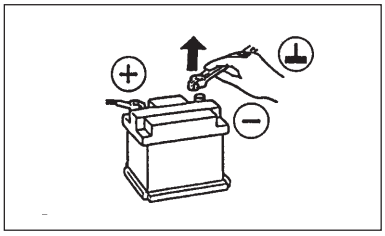


Figure 14 ***Indicating***

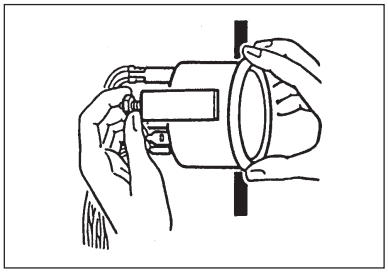
28-40-01 Fuel Quantity Indicator

Removal/Installation

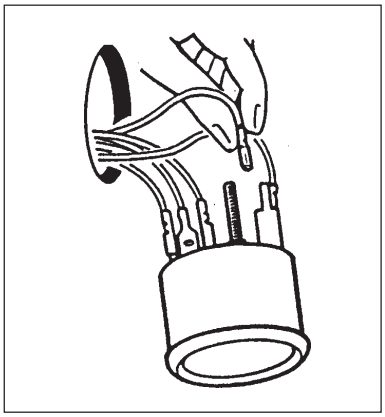
1 Disconnect battery.



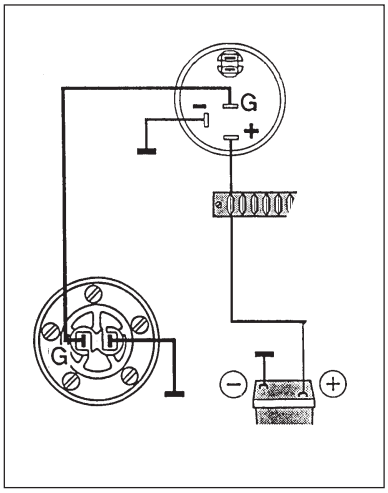
2 Loosen the nuts, remove the mounting bracket and remove the fuel quantity indicator.



3 Disconnect the wiring (the lamp is not used).



4 Install in reverse sequence of removal observing the wiring diagram.

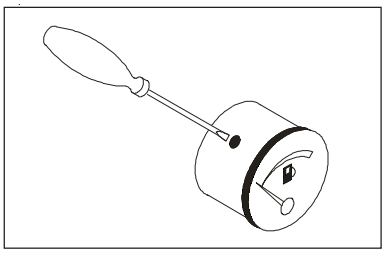


Calibration (Center Tank)

1 Drain the fuel system (refer to Chapter 12-10-02).

2 Remove the fuel quantity indicator following step 2 of Chapter 28-40-01.

3 Bring indicator to „0“-position by turning the adjustment screw.



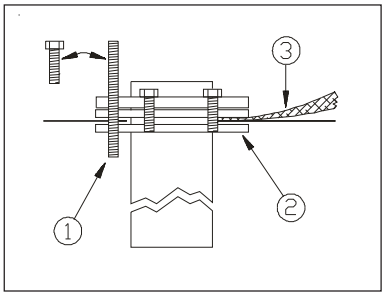
4 Reinstall the fuel quantity indicator.

28-40-03 Fuel Quantity Transducer (Center Tank)

Removal/Installation

1 Drain the fuel system as per Chapter 12-10-02.

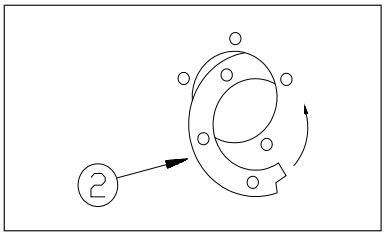
2 Loosen one bolt and replace by a M5 threaded rod (1) for securing the slotted retainer ring (2).



3 Remove the other bolts and the ground bonding lead (3).

4 Remove the transducer and the sealing ring while holding the threaded rod.

5 Remove the threaded rod and turn out the slotted retainer ring (2).



WARNING

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

6 Clean sealing surfaces mechanically and with Acetone.

7 Install in reverse sequence of removal after applying Scotch Clad 776 (see Chapter 51-30-04) for sealing to both sides of the sealing ring.

28-40-04 Fuel Quantity Transducer (Wing Tank)

Removal/Installation

(refer to Figure 15)

1 Disconnect the electrical wiring.

2 Remove inspection door as per chapter 28-10-04

3 Remove tank unit bolts (1).

4 Remove the retainer ring (3) the tank unit (4) and the sealing ring (2).

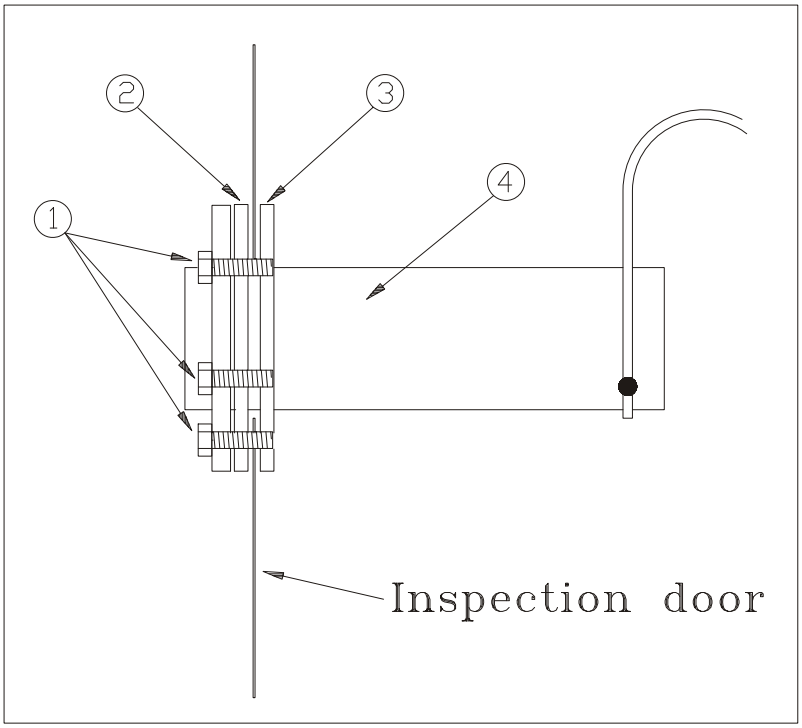


Figure 15 *Fuel Quantity Transducer (Wing Tank) Removal/Installation*

WARNING

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

5 Clean sealing surfaces mechanically and with Acetone.

6 Install in reverse sequence of removal after applying Scotch Clad 776 (see Chapter 51-30-04) for sealing to both sides of the sealing ring and the grooves inside the tank.

7 Check proper shape and installation of float wire as per paragraph 28-40-05.

28-40-05 Float Wire

Adjustment

1 Remove the lever-type tank unit as per Chapter 28-40-04.

NOTE

Figures 16 and 17 are mirror inverted also valid for the float wire in the RH wing tank if the optional MVP-50P is installed.

2 Remove the float wire and bend it in form like shown in the following Figure 16:

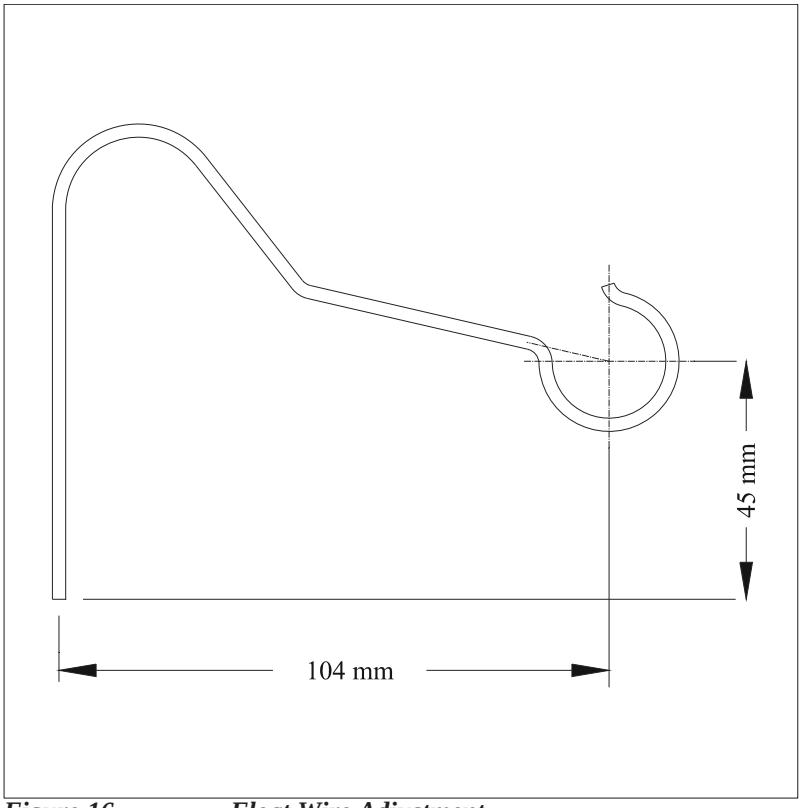


Figure 16 Float Wire Adjustment

3 Reinstall the float wire observing the dimensions shown in Figure 17, pay attention to a proper alignment and tighten well the attachment bolt.

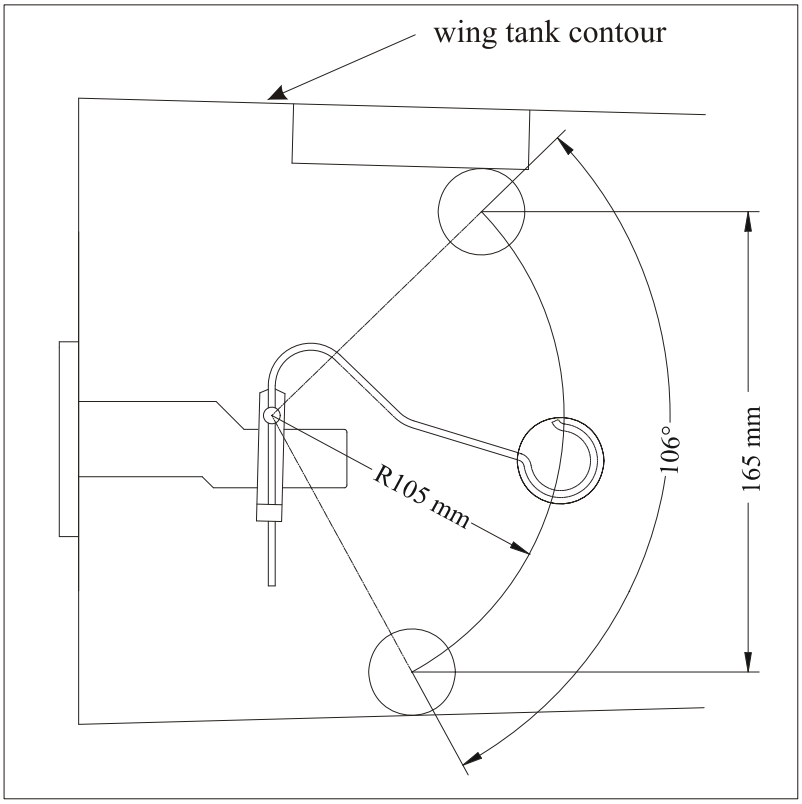


Figure 17 Float Wire Installation

4 Reinstall the lever-type tank unit as per chapter 28-40-04.

Table of Contents

32-40-00 WHEELS AND BRAKES

General

This chapter provides maintenance personnel with necessary procedures to accomplish both on-aircraft and off-aircraft maintenance of Cleveland design wheel and brake assemblies. Such maintenance shall include inspection, removal, servicing, refinishing, and installation of assemblies.

The main wheels have standard brand 500x5 rims, six-ply rated 5.00-5-tyres with tubes, according to FAA Standard TSO-C62. Cleveland 40-151 wheels with 30-164 brake assemblies are used. The main wheels are covered with carbon fibre designed fairings of which figure 5 shows the layer sequence.

The tailwheel consists of a 5 inch tire and an aluminium rim.

The Cleveland design features an external brake in which the disc is external to the wheel with the brake caliper floating over the disc.

The brake system (refer to Figure 6) consists of a brake assembly located at the inner side of the wheel, a master cylinder (1) at the front and rear rudder pedals each, and a brake fluid reservoir (2) mounted at the engine side of the firewall. The master cylinders are mounted in line, so that the front cylinder looses his efficiency, when the rear cylinder has been actuated. The particular parts of the brake system are interconnected by brake lines consisting of aluminium tubes and flexible KNAPP hoses.

The tail wheel has no brake.

I M P O R T A N T

Test brakes after maintaining the brake system. Actuated brakes shall keep the aircraft standing with engine running at 1.800 rpm and maximum propeller angle of attack. With applied brakes and powersetting above 1800 rpm the wheels may slide on grass.

N O T E

For further information concerning main wheels and brakes refer to Cleveland Wheels and Brakes Component Maintenance Manual AWBCMM0001 und Technician's Service Guide AWBTSG0001.

32-40-01 Main Wheel

Removal

Refer to Figure 4.

1 Shore the aircraft as per Chapter 07-20-01.

2 Remove bolts (6) with washers (7), brake back plate (4) with lining, and insulator shim (5).

3 Remove cotter pin and axle nut (1).

4 Remove wheel (3) with spacer rings (2).

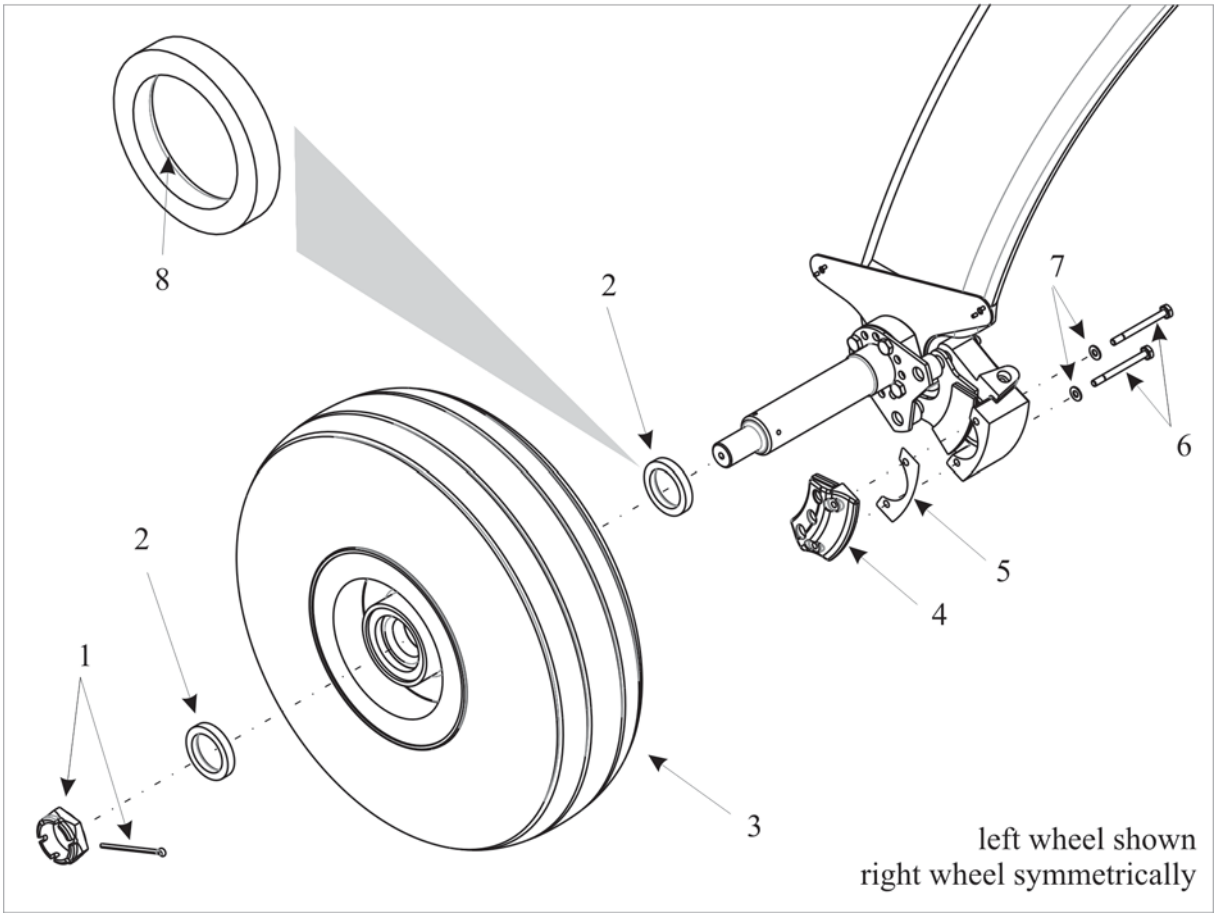


Figure 4 ***Main Wheel Removal/Installation***

Installation

Refer to Figure 4.

1 Install the inner spacer ring (2), place the rounded edge (8) inboard).

2 Install the wheel (3).

3 Install the outer spacer ring (2), place the rounded edge (8) inboard).

4 Install the axle nut with cotter pin (1).

5 Install brake back plate (4) with lining, insulator shim (5), and bolts (6) with washers (7). Secure bolts with safety wire.

32-40-02 Wheel Fairing

The wheel fairings are made from glass fiber. The layer sequence is shown on Figure 5.

Removal/Installation

The wheel fairings are screwed on.

32-40-03 Tail Wheel

Disassembly/Assembly

Refer to Figure 3.

1 Shore the tail as per chapter 07-20-02.

2 Remove the attachment bolt, washers, and stopnut (10).

3 Remove the tailwheel.

4 Disassemble the bearings (11), the wheel halves (12), the spacer sleeve (13), and the solid rubber tire (14).

5 Reverse procedure for assembly.

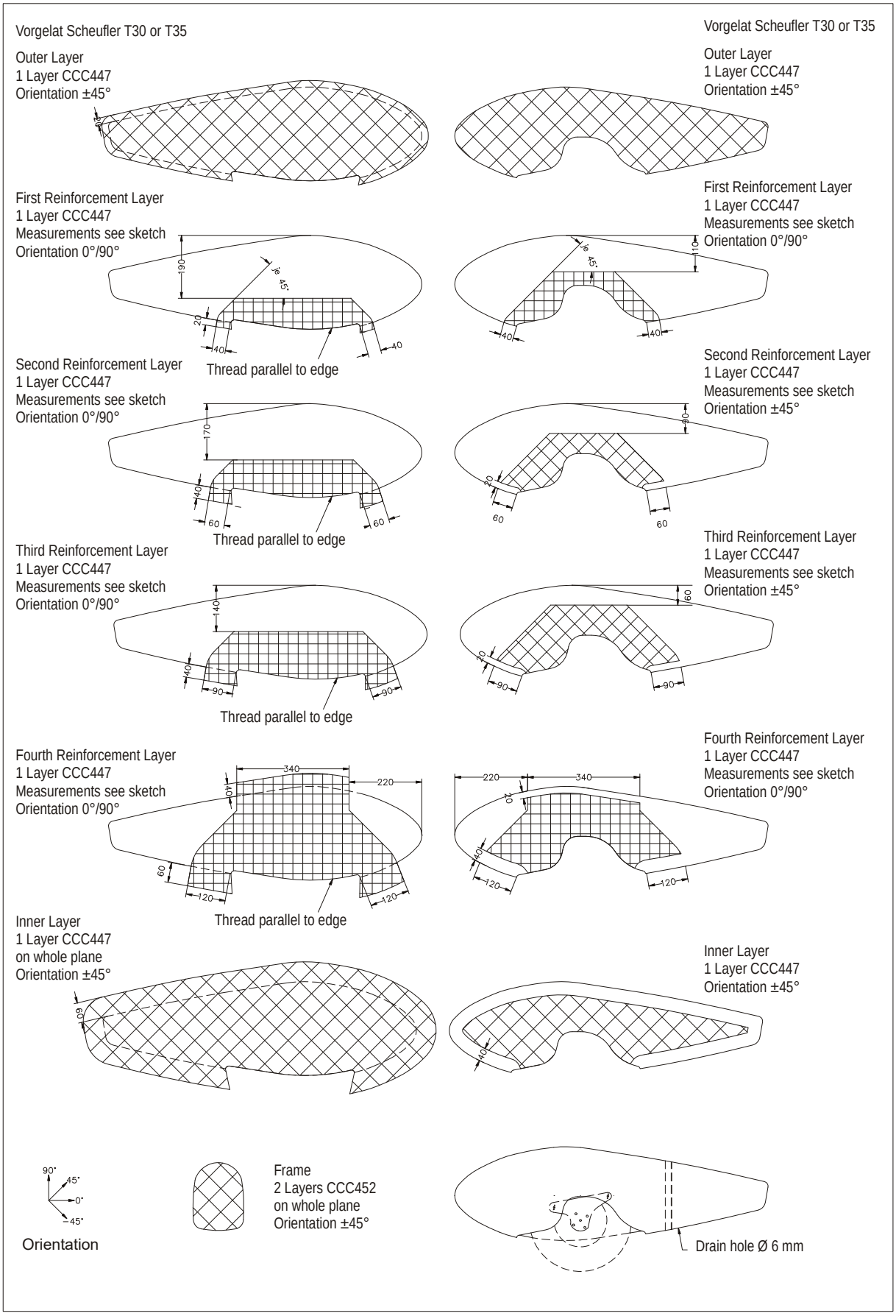


Figure 5 ***Layer Sequence Wheel Fairing***

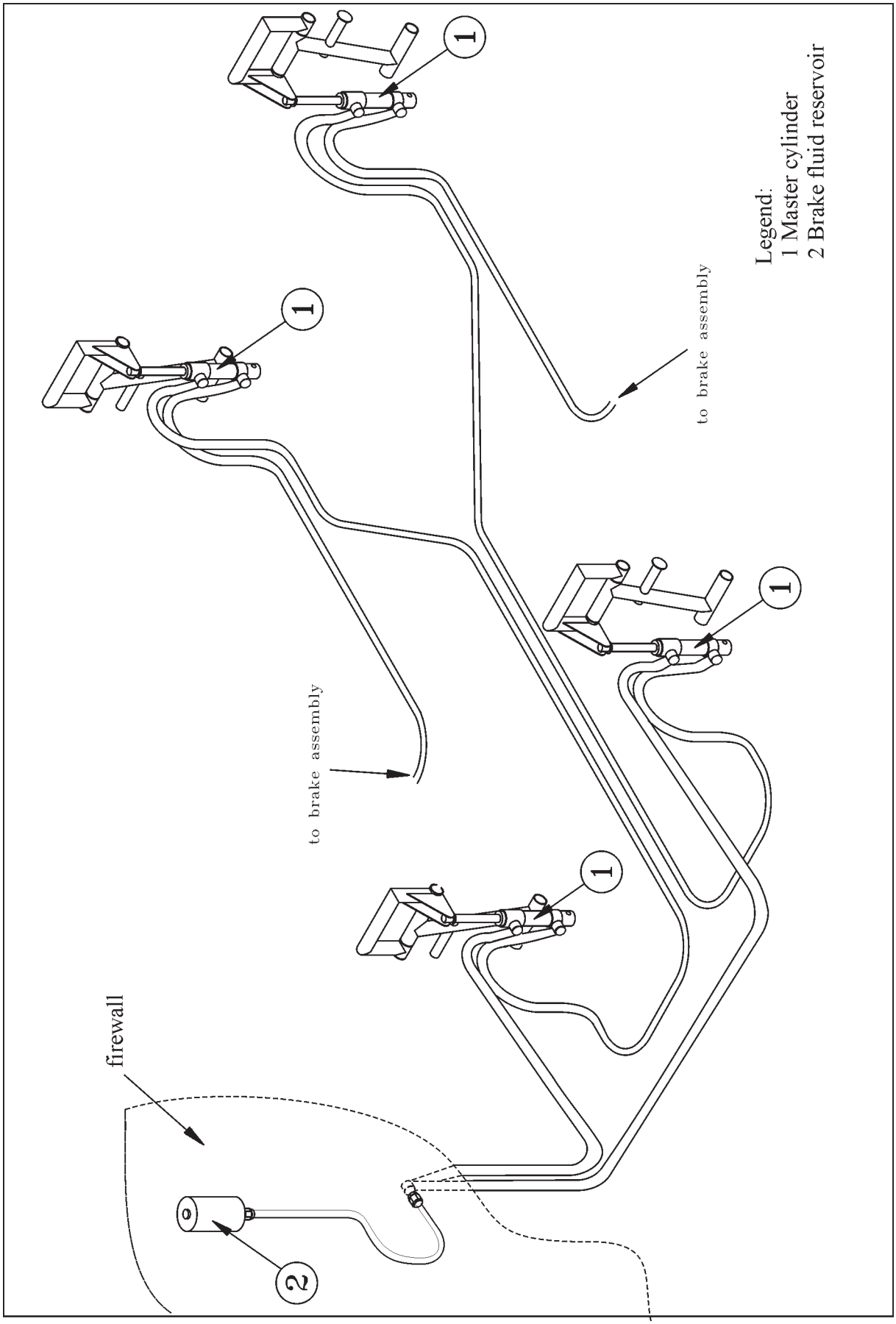


Figure 6 ***Brake System***

32-40-04 Master Cylinder

Removal/Installation

1 Drain the brake system.

2 Disconnect the brake lines.

3 Remove the attachment bolts.

4 Remove the master cylinder.

5 Install in reverse sequence of removal.

Removal/Installation

1 Remove the instrument cover per chapter 31-10-03 (rear airspeed indicator only).

2 Remove the vinyl tubing.

3 Remove the attachment bolts and clip nuts.

4 Remove the airspeed indicator.

5 Install in reverse sequence of removal. Observe correct installation of vinyl tubing: "Stat. Druck" = static pressure, "Meßdruck" = Pitot pressure.

6 Perform an operation test.

34-10-04 Pitot-Static Tube

Removal/Installation

The pitot-static tube consists of an inner aluminium tube, an outer aluminium tube and a top cap which are screwed together.

1 Unscrew the top cap.

2 Unscrew the outer aluminium tube.

3 Unscrew the inner aluminium tube.

4 Install in reverse sequence of removal applying silicone in the gap between the outer aluminium tube and the hole of the wing leading edge.

34-10-05 Pitot-Static Tube Attachment Block

Removal/Installation

1 Remove the pitot-static tube per Chapter 34-10-04.

2 Remove the LH wing tip fairing following the *Removal/ Installation* procedure of Chapter 33-40-11/21 up to step 3 and observing step 9.

3 Remove the attachment stop nuts and the washers from the pitot-static tube attachment block.

34-50-00 DEPENDENT POSITION DETERMINING

34-50-01 Transponder

Various transponders can be installed in the EXTRA 330LX. A transponder is a radio transmitter and receiver that fulfills the role of the airborne beacon equipment according to the requirements of the Air Traffic Radar Beacon System (ATCRBS). It operates on radar frequencies, receiving ground radar interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz.

Removal/Installation

1 Remove instrument cover if transponder has to be installed in the instrument panel from the rear. Refer to Chapter 31-10-03.

2 Remove transponder following the Removal/Installation Instructions of the respective manufacturer.

3 Install in reverse sequence of removal.

4 Perform an operation test.

34-50-02 Blind Encoder ACK A-30

When a blind encoder is used it is installed under the left upper longeron just in front of the rear instrument panel. A mounting tray is attached to the steel tube frame by two bolts. The digitizer (1, Figure 2) is slid into the mounting tray and then fixed by a knurled screw (6). The knurled screw is secured by a wire. The static port of the digitizer is connected to the aircraft static system by a hose (5) ending at a T-fitting (4). The electrical wiring (2) is connected via a plug (3).

Removal/Installation

1 Ensure transponder is off.

2 Disconnect the electrical wiring from the digitizer (1, figure 2) by pulling the plug (3).

3 Disconnect the hose (5) from the digitizer static port.

4 Remove the safety wire of the knurled screw (6).

5 Loosen the knurled screw and remove the digitizer (1).

6 Install in reverse sequence of removal. Use new safety wire. Perform an operation test.

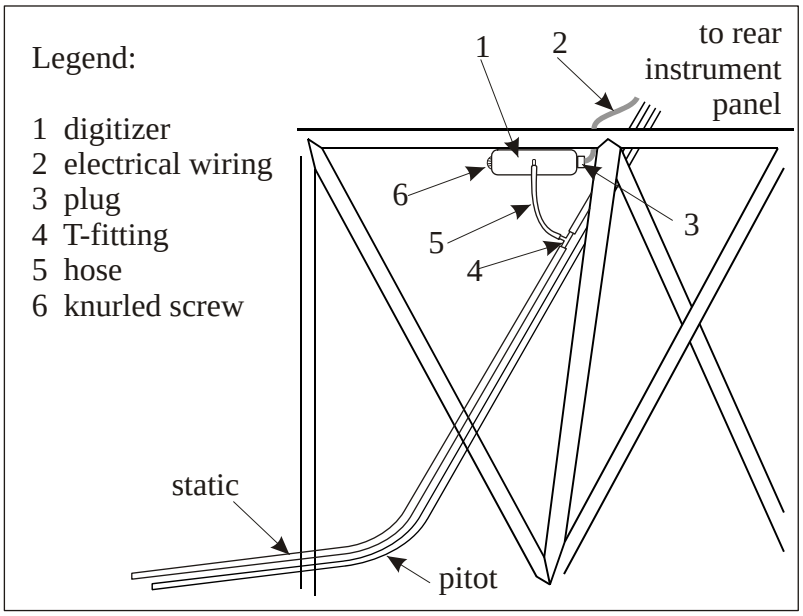


Figure 2 Blind Encoder Removal/Installation

34-50-03 Garmin GTN 625/635/650

The Garmin GTN 625/635/650 can be used as a position source for the for the Garmin GTX 3X5R. If both units are installed, any time the GTN 625/635/650 is replaced or modified, perform an ADS-B Out Test as described in the GTX 33X and GTX 3X5 ADS-B Maintenance Manual (see Chapter 01).

Table of Contents

51-10-00 INVESTIGATION

51-10-01 Damage Classification

NOTE

All damage of composite parts must first be classified by qualified personnel. In case of doubt with regard to the classification of damage, if a clear definition of the extent of damage is not possible, or if a repair of damage inspite of the valid manufacturer documentation is doubtful, contact EXTRA Flugzeugproduktions- und Vertriebs- GmbH.

NOTE

Only the Damages Classes 2, 3 and 4 may be repaired by qualified personnel. In case of Damage Class 1 it has to be contacted EXTRA Flugzeugproduktions- und Vertriebs- GmbH.

According to the Luftfahrt-Bundesamt (Federal German Aviation Authority) four damage classes are defined:

Damage Class 1:

Large scale destruction requiring a partial reconstruction of the component or large scale repair. Each destruction over 300 mm diameter and each damage of a spar is a large scale destruction. EXTRA Flugzeugproduktions- und Vertriebs-GmbH has to be contacted prior to repair.

Damage Class 2:

Damage to primary structures and to secondary structures to the following extent: Holes and fractures extending through a sandwich component and a scale under 300 mm diameter.

Damage Class 3:

Damage to primary structures and to secondary structures to the following extent: Small holes or fractures in the external covering layers, if not accompanied by damage to supporting layers or internal covering layers.

51-30-00 MATERIALS

This Section describes metallic and non-metallic materials used in the repair of the EXTRA 330LX and gives the sources of supply (manufacturers and supplier).

51-30-01 Composite Parts

IMPORTANT

Only approved materials have to be used for the repair of composite parts.

Epoxy-system

Manufacturer: HEXION
www.hexion.com

Resin: Rütapox L20
EPIKOTE Resin L 20

Hardener: Rütapox SL
EPIKURE Curing Agent 960

Glass fibre fabrics

Manufacturer: P-D Interglas Technologie GmbH
Benzstraße 14,
D-89155 Erbach, Germany

Style	WLB-No.* LN 9169	US-style	weave patterns	weight g/m²
90070	8.4505.60	1610	plain	80
92110	8.4548.60	none	twill 2/2	163
92125	8.4551.60	none	twill 2/2	280
92140	8.4551.60	none	twill 2/2	390

*All glass fabric is made of alkali-free E glass with Volan-A finish or with finish I 550.

Carbon fibre fabrics

Manufacturer: C. Cramer GmbH & Co. KG
Division ECC
Weberstr. 21,
D-48619 Heek-Nienborg, Germany

Style ECC/CCC	WLB-No.* DIN 65147	US-style	weave patterns	weight g/m²
447	8.3507.80	none	plain	160
452	8.3520.80	none	twill 2/2	204
459	-	none	cross-twill	220
490	-	none	plain	120
495	-	none	5HS	120

*WLB: Werkstoff Leistungsblatt, according to German standard DIN-WL

Aramid fibre fabrics

Manufacturer: C. Cramer GmbH & Co. KG
Division ECC
Weberstr. 21,
D-48619 Heek-Nienborg, Germany

Style ECC/CCC	WLB-No.* DIN 65147	US-style	weave patterns	weight g/m²
502	-	none	twill 2/2	158

*WLB: Werkstoff Leistungsblatt, according to German standard DIN-WL

Glass rovings

Manufacturer: GEVETEX Textilglas-GmbH
Postfach 426,
D-5100 Aachen, Germany

Supplier: Lange & Ritter GmbH
Dieselstraße 25,
D-70839 Gerlingen, Germany

Type: Vetrotex EC14 - 2400-P185

Carbon rovings

Manufacturer: Toho Tenax Europe GmbH
Kasinostr. 19-21
D-42103 Wuppertal

Type: TENAX HTS5631 1600tex f24000 t 0
(WLB: 8.3614.1)

Carbon UD-Tape

Manufacturer: J.H. Vom Baur Sohn GmbH & Co. KG
Marktstr. 34
42369 Wuppertal

Type: CF UD tape 30 mm & 50 mm

Core material

a) PVC Foam

Manufacturer: Alcan Airex AG
Industrie Nord 26
CH-5643 Sins, Switzerland

Supplier: Gaugler & Lutz OHG
Habsburger Str. 12
D-73432 Aalen-Ebnat, Germany

Type: Airex C 71.55

b) Honeycomb

Manufacturer: EURO COMPOSITES S.A:
B.P.95, Zone Industrielle,
L-6401 Echternach / Luxembourg

Type: ECA-I-R 4.8-29 and ECA-R 4.8-48

or

Manufacturer: Schütz GmbH & Co. KGaA
Schützstr. 12
D-56242 Selters, Germany

Type: Coremaster C1-4.8-29 OX
Coremaster C1-4.8-48 OX

Filler material for resin

Manufacturer:	EBERHARD Chemie GmbH Olpener Straße 405, D-51109 Köln 91 (Merheim), Germany
Supplier:	STW Schwarzwälder Textilwerke Heinrich Kaukmann GmbH Aue 3 D-77773 Schenkenzell, Germany
Type:	- Cotton flakes
Supplier:	Brenntag GmbH Stinnes-Platz 1 D-45472 Mühlheim, Germany
Type:	- Microballoons BJO - 0930

Coating

Manufacturer:	BASF Coatings GmbH Glasuritstr. 1, D-48165 Münster/Hiltrup, Germany
Supplier:	Wessels & Müller AG Pagenstecherstraße 121, D-49090 Osnabrück, Germany
Type:	
22	Glasurit HS-2K-Decklack
929-91/93/94	Glasurit HS Decklackhärter
352-50/91/216	Glasurit Einstellzusatz
55	Glasurit Zweischicht-Decklack Metallic/Uni/Perleffekt
352-50/91/216	Glasurit Einstellzusatz
90	Glasurit Zweischicht-Decklack Metallic/Uni/Perleffekt
93-E3	Glasurit Einstellzusatz
923-155	Glasurit MS-Klarlack
929-91/93/94	Glasurit HS Decklackhärter
352-50/91/216	Glasurit Einstellzusatz
923-335	Glasurit Klarlack (with Hensotherm 410KS)

285-100 VOC	Glasurit Rapidfüller VOC, weiß
929-55/56	Glasurit HS Füllerhärter
352-91	Glasurit Einstellzusatz
1006-26	Glasurit UP Spritzfüller, grau
948-22	Glasurit Härter
839-53	Glasurit UP-Schnellspachtel
948-36	Glasurit Härterpaste
293-10	Glasurit Einstellzusatz
934-0	Glasurit 1K-Kunststoffhaftprimer
Manufacturer:	PPG Aerospace PRC-DeSoto
Supplier:	Röder Präzision GmbH Am Flugplatz D-63329 Egelsbach, Germany
Type:	Fire protective coating N56582/T508 Clearcoat 4232-0303 Activator N39/1327 Thinner N39/3091
Manufacturer:	Rudolf Hensel GmbH Lauenburger Landstraße 11 D-21039 Börnsen
Type:	Fire protective coating: Hensotherm 410KS (with 923-335 Glasurit Klarlack)

51-30-02 Metal Components

IMPORTANT

Only approved materials have to be used for the repair of metal components.

Steel tubing

Manufacturer: MHP
BENTELER International AG
Residenzstr. 1,
D-33104 Paderborn, Germany

Supplier: CP autosport GmbH
Zeppelinring 1 - 6,
D-33142 Büren, Germany

Type: WLB 1.7734.4
18 mm x 1.0 mm, 20 mm x 1.0 mm,
22 mm x 1.0 mm, 22 mm x 1.5 mm,
25 mm x 1.5 mm

Steel sheet metal

Manufacturer: BÖHLER Edelstahl GmbH
München, Germany

Supplier: Böhler-Uddeholm Deutschland GmbH
Hansa Allee 321,
D-40549 Düsseldorf, Germany

Type: WLB 1.7734.4
1.0 mm, 1.5 mm, 2.0 mm, 3.0 mm

Wire mesh

Manufacturer: Spörl KG
Staudenweg 13,
72517 Sigmaringendorf, Germany

Type: 1.4401, w 0.458 m - d 0.05 mm

Coating

Manufacturer:	BASF Coatings GmbH Glasuritstr. 1, D-48165 Münster/Hiltrup, Germany
Supplier:	Wessels & Müller AG Pagenstecherstraße 121, D-49090 Osnabrück, Germany
Type:	
801-72 VOC	Glasurit Grundfüller EP VOC, grau
965-60	Glasurit Härter EP
352-91/216	Glasurit Einstellzusatz
22	Glasurit HS-2K-Decklack
929-91/93/94	Glasurit HS Decklackhärter
352-50/91/216	Glasurit Einstellzusatz

51-30-03 Aluminium Components

Aluminium sheet metal

Manufacturer:	Kaiser Aluminium & Chem. Corp. Spokane, Washington
Supplier:	Westdeutscher Metallhandel Friedrich W. Hermann GmbH Manderscheidtstr. 76-78, Postfach 104245 45141 Essen
Type:	WLB 3.1364. T3511 or 2024 T3 0.6 mm; 0.8 mm; 1.2 mm

Control rod tubings

Manufacturer:	Aluminium AG CH-5737 Menziken
Supplier:	Karstens & Knauer GmbH&Co Hiligenwarf 9 D-28865 Lilienthal
Type:	WLB 3.1354. T3 ø 25x1mm

Coating

Manufacturer:	BASF Coatings GmbH Glasuritstr. 1, D-48165 Münster/Hiltrup, Germany
Supplier:	Wessels & Müller AG Pagenstecherstraße 121, D-49090 Osnabrück, Germany
Type:	
283-150 VOC	Glasurit Grundfüller EP VOC
352-228	Glasurit Zusatzlösung
352-50/91	Glasurit Einstellzusatz
22	Glasurit HS-2K-Decklack
929-91/93/94	Glasurit HS Decklackhärter
352-50/91/216	Glasurit Einstellzusatz

Aluminium hardware metal (brackets, pedestals, castings, etc.)

Paint:

Manufacturer:	Parker & Anchem, Ambler, PA 19002
Supplier:	Aircraft Spruce
Chem. coating:	Alodine No. 1201 (MIL-C-5541)
Lacquer:	see above

51-30-04 Various Components

Adhesive

Manufacturer: Wacker Chemie

Supplier: Drawin Vertriebs GmbH
Rudolf Diesel Str. 15
85521 Riemerling/Ottobrunn

Type: Silikon Elastosil E14

Manufacturer: 3M
Aerospace and Aircraft Maintenance Department
3M Center, Building 223-1N-14
St. Paul, MN 55144-1000
www.3M.com/aerospace

Supplier: See www.3M.com/aerospace

Type: Scotch-Weld Urethane 3549 B/A

Manufacturer: degussa/Evonic

Supplier: Mecaplex AG
Solothurnstr. 138
CH-2540 Grenchen

Type: ACRIFIX 190/KATALYSATOR 20

Corrosion Preventive Compound

Manufacturer: LEAR CHEMICAL RESEARCH
P.O. Box 1040, Mississauga
L4Y 3W3 Ontario, Canada

Supplier: Global Aviation & Piper Parts GmbH
Flughafen Kassel
D-34379 Calden

Type: ACF-50

Firewall Sealant

Observe Chapter 20-10-10 when working with firewall sealant.

Manufacturer:	PRC-DeSoto International, Inc. 12780 San Fernando Road Sylmar, CA 91342 www.ppgaerodpsce.com
Supplier:	See www.ppgaerodpsce.com
Type:	PR 812 (observe Chapter 20-10-10) P/S 700
Manufacturer:	Chem Seal Products Manuf. By The Flamemaster Corporation 13576 Desmond Street, Pacoima, CA 91331-2315 www.the flamemaster.com
Supplier:	NSL Aerospace 33110 Old Hempstead Rd. Magnolia, TX 77355 www.nslaerospace.com
Type:	CS 1900
Manufacturer:	Cytec Engineered Materials Inc. D Aircraft Products, Inc 1191 N. Hawk Circle, Anaheim, CA 92807
Supplier:	NSL Aerospace 33110 Old Hempstead Rd. Magnolia, TX 77355 www.nslaerospace.com
Type:	Dapco 2200

Fuel Tank Sealant

Manufacturer:	3M Aerospace and Aircraft Maintenance Department 3M Center, Building 223-1N-14 St. Paul, MN 55144-1000 www.3M.com/aerospace
Supplier:	See www.3M.com/aerospace
Type:	Scotch-Weld EC-776 (Scotch Clad 776) Fuel Resistant Coating

Tape

Manufacturer:	3M Aerospace and Aircraft Maintenance Department 3M Center, Building 223-1N-14 St. Paul, MN 55144-1000 www.3M.com/aerospace
Supplier:	See www.3M.com/aerospace
Type:	Polyurethan (PU) tape Scotch 8671

51-60-00 CONTROL SURFACE BALANCING

51-60-01 Weighing and Determination of Control Surface Moments

All weighing of control surfaces is performed with surfaces removed from aircraft. Weighing and determination of control surface moments is necessary after repairs or painting. Weigh the control surfaces including the mass balances in disassembled condition. The aileron weight includes the spade. Copy page 21, enter the values (W, m, r) and check whether the surface weights and moments are within the given tolerances. If they are not, contact the manufacturer for advice.

For the determination of control surface moments follow the steps as described below and use two balancing mandrels like shown in the figure 2:

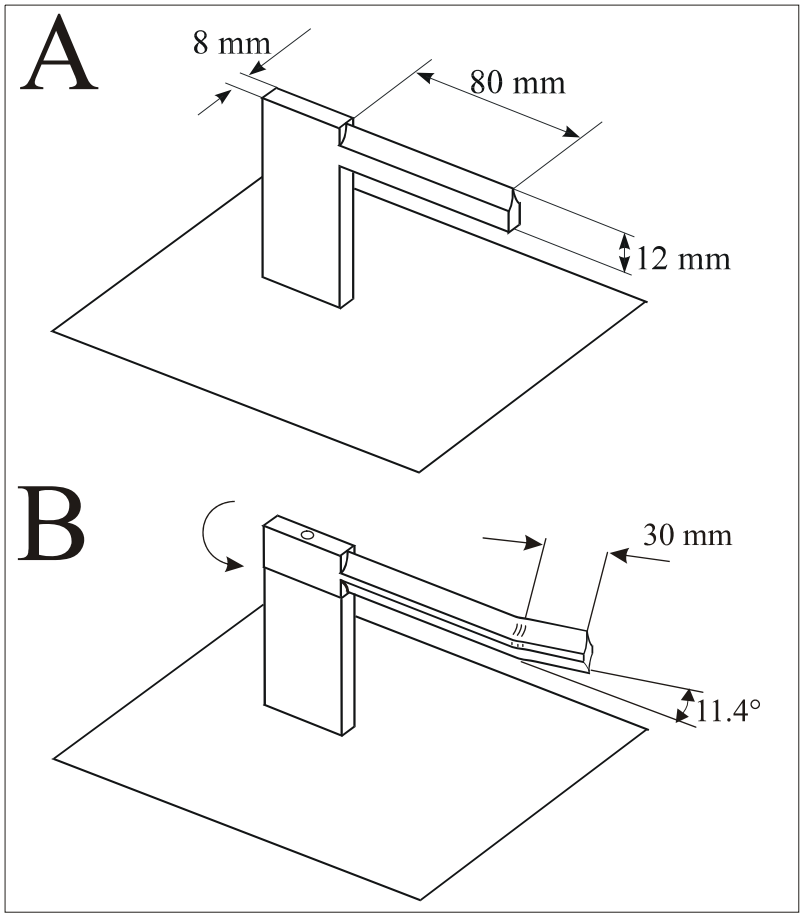


Figure 2 Balancing Mandrels

Procedure

1 Remove the control surface (refer to chapter 27).

2 Reinstall the bolts in two brackets.

3 Put the control surfaces on the balancing mandrels (use a wire for the trim tab).

4 Level control surfaces and weigh by means of a conventional spring balance (kg/g-indication) at the given weighing points (figure 3) and enter the weight (m) in figure 4.

5 Measure distance of hinge center line to weighing point (r) and enter the value in figure 4.

6 Calculate the control surface moment (M) in figure 4.

IMPORTANT

If values exceed the given tolerances in figure 4 contact the manufacturer before modifying of control surfaces.

7 Reinstall the control surfaces.

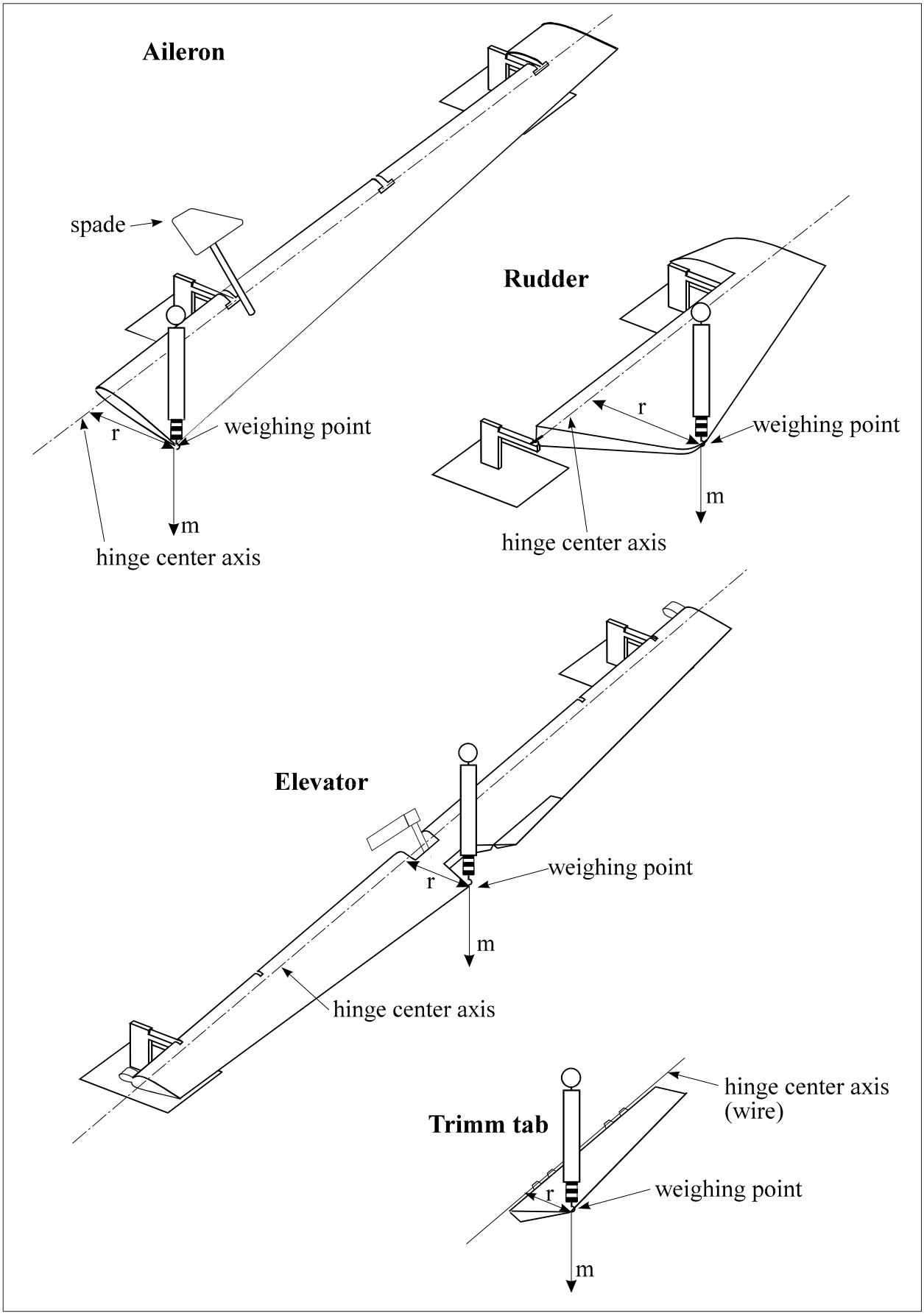
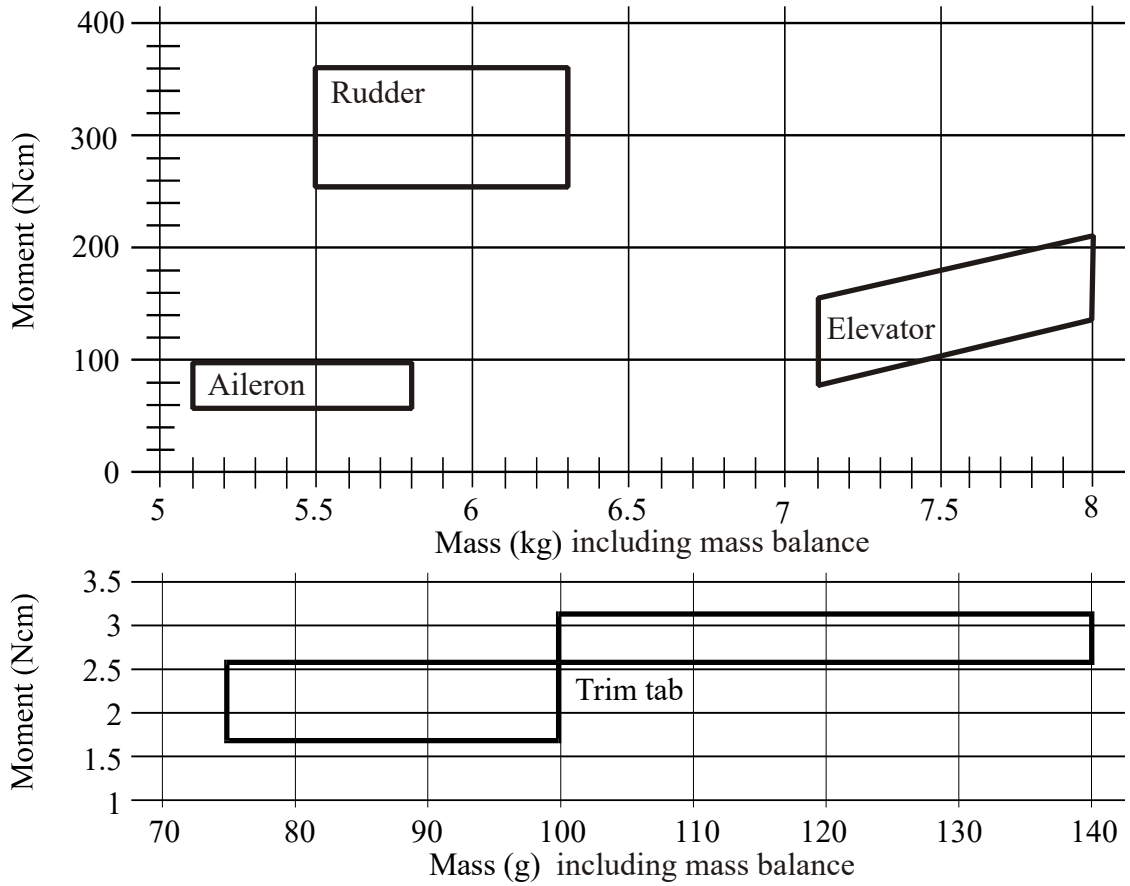


Figure 3 ***Determination of Control Surface Moments***



Weights

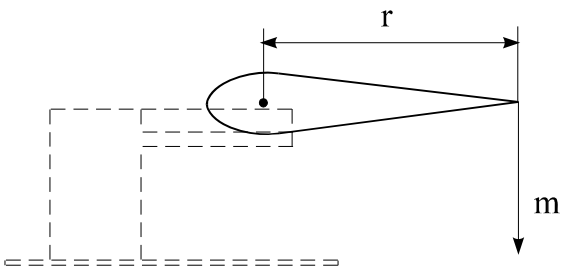
Aileron LH: (W) ..... kg

Aileron RH: (W) ..... kg

Rudder: (W) ..... kg

Elevator: (W) ..... kg

Trim Tab: (W) ..... kg



$$M\ (Ncm) = m\ (kg) \cdot g\ (m/s^2) \cdot r\ (cm)$$

Moments

Aileron LH: (m:) ..... kg · 9.81 m/s² · (r:) ..... cm = (M:) ..... Ncm

Aileron RH: (m:) ..... kg · 9.81 m/s² · (r:) ..... cm = (M:) ..... Ncm

Rudder: (m:) ..... kg · 9.81 m/s² · (r:) ..... cm = (M:) ..... Ncm

Elevator: (m:) ..... kg · 9.81 m/s² · (r:) ..... cm = (M:) ..... Ncm

Trim Tab: (m:) ..... kg · 9.81 m/s² · (r:) ..... cm = (M:) ..... Ncm

Figure 4 ***Control Surface Weights and Moments***

51-70-00 REPAIRS

51-70-01 Repair of Reinforced Glass and Carbon Fibre Components

IMPORTANT

Repair of composite parts has to be carried out only by qualified and authorized personnel.

If the aircraft is damaged, proceed as follows. First conduct a careful visual inspection of the surface and the damaged area. Frequently, the damage extends to further components, sometimes a fracture will continue invisibly beneath the surface.

Perform the repair work with utmost care. The external shell of the wing and empennage is stressed; a failure of this bonded structure can lead to an aircraft crash. In order to eliminate dangerous stress concentrations, avoid changes in cross-sectional areas.

IMPORTANT

The resin-hardener mixture ratio must be precisely maintained (+0.5%). Clean cups and tools must be used. The weight ratio of glass fabric to resin mixture should be approximately 50:50.

Immediately prior to applying the wet laminate, sand and vacuum clean the repair area, so that no dirt and dust could prevent a secure adhesion.

WARNING

Sanding carbon and glass fibre laminates emits a fine dust that may cause skin and/or respiratory irritation unless suitable skin and respiration protection is used.

WARNING

Carbon-tetrachloride or Acetone used for cleaning repair areas are flammable liquids and should be used with proper ventilation and safety equipment.

IMPORTANT

As with plywood grain, the direction of the various fibres (longitudinal or diagonal) is of great importance for the stability.

The number of layers required to restore the stability in the damaged area can be taken from the layer sequence/placement plan (refer to the respective chapters).

It is necessary to know the number and direction of layers in the damaged area, in order to be able to replace them with the original number. In all cases, the thickness of the laminate has to be measured with a vernier calliper for the exact determination of the laminate thickness.

One technique to learn about the number of layers is to burn a small piece taken from the damaged area. The resin will burn off, leaving the glass and/or carbon fabric to be inspected for the number of layers and the type of fabric.

Creating a scarfed overlap takes time. Sand away as much of the old material, so that the new fabric patches do not project beyond the contour.

In order to shorten the curing time, a heater can be used to increase the ambient temperature.

NOTICE

Too high temperatures will cause large air bubbles in the laminate. Local overtemperature can be prevented by using a foil tent which leads the hot air stream.

The curing cycle must be maintained as stated. Use a thermometer to monitor the temperature.

IMPORTANT

After repair of control surfaces, check for proper balance (refer to chapter 27, Flight Controls).

It is recommended to prepare test specimens at the same time as the actual repair is accomplished. These can then be subject to a material test to establish the quality of the laminate in the repaired part. To make this determination valid, the specimens must be assembled with the same style of fabric and resin mixture. Subsequently, the specimens must be subject to the curing pressures, temperatures and times identical with those in the actual repair.

51-70-02 Repair of Sandwich Material

Two types of core materials are used for sandwich on the EXTRA 330LX:

- PVC hard foam
- Honeycomb

both with glass or carbon fibre shells.

The following section describes the repair of both types of sandwich. Different processing techniques for these materials, if necessary, are also described.

a) Minor surface damage

Around a visible crack, the laminate may be separated from the core material. Determine the extent of this area by coin tapping. Remove the separated laminate carefully using a sanding disk, sanding block or a sharp knife. Prepare a scarfed overlap of the laminate around the damaged area. Overlap length per fabric layer min. 20 mm;

IMPORTANT

Ratio (laminate thickness : overlay length) min. 1: 50 (refer to Figure 5).

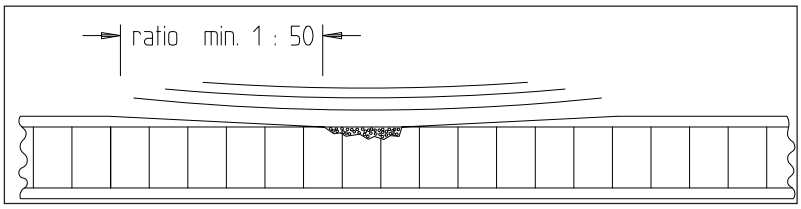


Figure 5 Minor surface damage

After preparing the scarfed overlap, clean the repair area thoroughly as follows:

1 Remove the sanding dust with a pneumatic vacuum cleaner

2 Clean the scarfed overlaps with carbon-tetrachloride or acetone in case of dirt or grease was introduced during the preparation.

Damaged core material has to refilled with a mixture of resin and microballoons (weight ratio 100:15). Apply resin mixture to the repair area and lay on fabric in accordance to the

layer sequence plans. Ensure to use correct style and direction of fabric.

IMPORTANT **Repair area must be clean of dirt, dust and grease!**

Lay out the required number and size of fabric pieces on a piece of colored plastic foil and soak (wet) them with resin mixture, subsequently position them on the repair area.

IMPORTANT **Remove the plastic foil after each positioning process.**

For a repair of honeycomb sandwich parts you have to observe the following: The repair area has to be cured under condition of vacuum bagging.

For vacuum bagging, proceed as follows:

1 Apply peel nylon fabric on the last repair fabric layer

2 Perforate a clean, thin plastic foil with a thick needle (max. spacing of holes: 20mm x 20mm) - mainly in the area of the honeycomb - and lay it on the repair area.

3 Lay a jute cloth (weave) or equivalent bleeder cloth on this perforated plastic foil.

4 Lay an air tight plastic foil upon the jute weave and seal their edges to the surrounding surface using an adhesive tape.

5 Apply suction with a vacuum pump (pressure approx. 0.7 bar/ 10 psi)

6 Apply the thermal curing cycle (refer to figure 3).

7 Following the curing cycle remove vacuum bagging material and peel nylon fabric.

After the pre-curing period at room temperature, the repaired area has to be cured according the temperature cycle as shown on Figure 6.

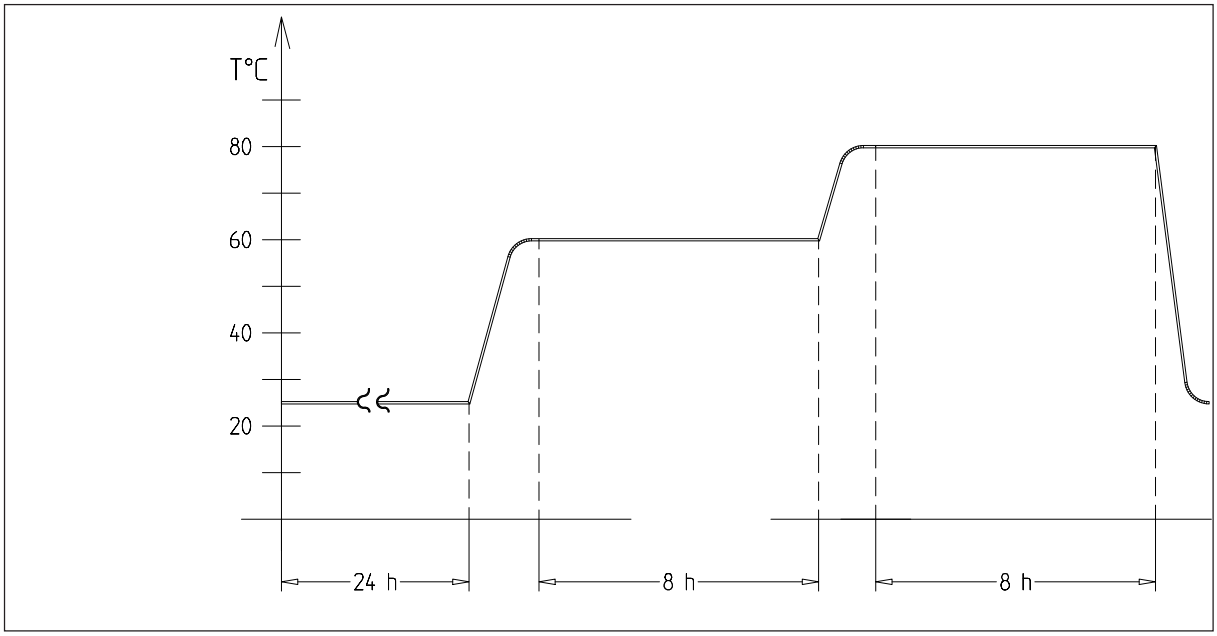


Figure 6 ***Curing cycle resin L20/SL***

After the curing process is completed, the repair area can be sanded level to the surrounding area.

N O T I C E

Sand only the edge thickness of repair laminate (refer to figure 7)**!**

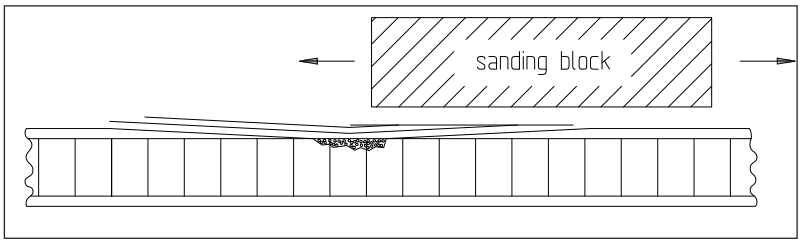


Figure 7 ***Level Sanding of Surrounding Area***

N O T E

For painting of the repair area refer to chapter 51-70-06.

b) Damage of complete sandwich

If the inner laminate is also damaged, first remove the upper laminate within the area, where no secure bond connection to the core material is suspected. Trim out the complete damaged portion of core material to a circular or elliptical shape.

The damaged area of the inner laminate has to be taken out as well. Make sure not to increase the disbonded area when preparing the hole. Preferably use a hand held milling machine. In case of cutting with a saw, the pulsation stress may peel of the inner laminate (secondary damage). If the extent of the disbonded area on the inner laminate exceeds the prepared cut out, increase the cut out of material and upper laminate.

Prepare a scarfed overlap of laminate around the circular cut out. Overlap length of inner laminate should not be less than 20 mm.

IMPORTANT

Overlap length of the upper laminate should not be less than 1/50; (ratio: laminate thickness / overlap length).

Prepare a replacement block of core material (foam or honeycomb) with equivalent diameter and thickness. Cut it to fit snuggly in the trimmed hole. In case of foam core, coat one side with a mixture of resin and microballoons (ratio 100:15). Apply prelaminated fabric layers required for the inner laminate on this side of the core filler block. Ensure correct style and direction of fabric. After precuring the laminate at elevated room temperature (30°C), scarf the overlap and sand the upper overlapping core material down, up to the surrounding core material.

Subsequently clean the repair area thoroughly as follows:

1 Remove the sanding dust with a pneumatic vacuum cleaner.

2 Clean the scarfed overlaps with carbon-tetrachloride or acetone in case dirt or grease was introduced during the preparation.

WARNING

Carbon-tetrachloride or Acetone used for cleaning repair areas are flammable liquids and should be used with proper ventilation and safety equipment.

IMPORTANT

Repair area must be free of dirt and grease.

Wet all surfaces of the backing plate and the scarfed area with resin mixture. Lay on prelaminated fabric layer in accor-

dance to the layer sequence plan. Ensure correct style and direction of fabric.

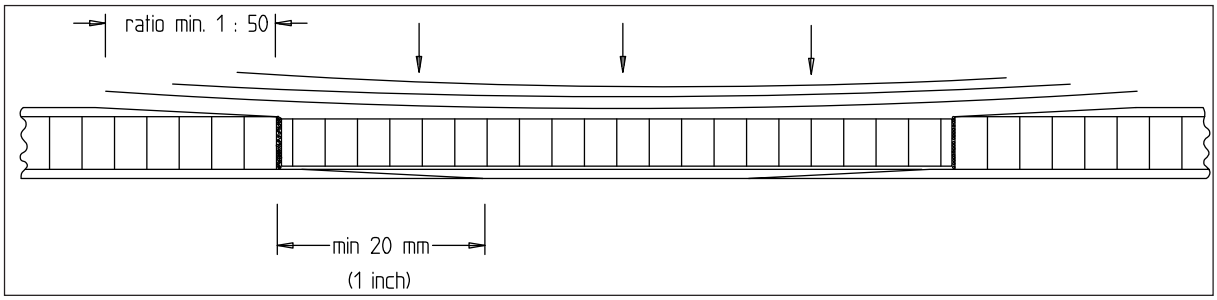


Figure 8 ***Damage of Complete Sandwich***

Lay out the required number and size of fabric pieces on a piece of plastic foil and wet them with resin mixture. Subsequently, position them on the repair area.

IMPORTANT

Remove the plastic foil after each positioning process.

The repair area has to be cured under condition of vacuum bagging. Proceed as follows:

1 Apply peel nylon fabric on the last repair fabric layer.

2 Perforate a clean, thin plastic foil with a thick needle (max. spacing of holes: 20mm x 20mm) - mainly in the area of the honeycomb - and lay it on the repair area.

3 Lay a jute cloth or equivalent bleeder cloth on this perforated plastic foil.

4 Lay a second plastic foil upon the jute weave and seal their edges to the surrounding surface using an adhesive tape.

5 Apply suction with a vacuum pump (pressure approx. 0.7bar / 10psi).

6 Apply the thermal curing cycle.

7 Following the curing cycle carefully remove vacuum bagging material and peel nylon fabric.

NOTE

After the pre-curing period at room temperature, the repaired area has to be cured according the temperature cycle as shown on Figure 6.

After the curing process is completed, the repair area can be sanded level to the surrounding area.

IMPORTANT **Sand only the edge thickness of repair laminate!**

For painting of the repair area proceed like mentioned in chapter 51-70-06.

51-70-03 Repair of Laminates

a) Minor damage

Scarf the edges of the minor damage area with sandpaper. Minimum length of scarf per fabric layer approx. 20 mm; ratio **(laminate thickness : scarf length) approx. 1: 50.**

Following the scarf procedure, clean the repair area thoroughly:

1 Remove the sanding dust with a pneumatic vacuum cleaner.

2 Clean the scarfed overlaps with carbon-tetrachloride or acetone in case dirt or grease was introduced during the preparation.

NOTICE **Repair area must be free of dirt, dust and grease.**

Wet the prepared scarfed areas with resin mixture. Lay on prelaminated fabric layer in accordance to the layer sequence plan. Ensure correct style and direction of fabric. Apply peel nylon fabric on the last repair fabric layer.

NOTE **Lay out the required number and size of fabric pieces on a piece of colored plastic foil and wet them with resin mixture. Subsequently, position them on the repair area.**

IMPORTANT **Remove the plastic foil after each positioning process.**

After the curing process is completed, remove the peel nylon fabric. The repair area can be sanded level with the surrounding area.

NOTICE **Sand only the edge thickness of repair laminate!**

Refinish the surface according chapter 51-70-06.

If the extent of the damaged area exceeds 10 cm (4 inches) a large damage repair is required.

Carefully trim out the damaged portion to a circular or oval shape.

Prelaminate a backing plate from two layers of glass fibre fabric and resin mixture, which must be approx. 20 mm larger than the damaged area. Apply peel nylon fabric as external layer. Sandwich the resin wetted layers between two sheets of plastic foil.

Work the excess resin out and allow the plate to cure at elevated room temperature for 8 hours on a flat surface or a plasticfoil-covered surface of the proper curvature near the damaged area, or the same location on a comparable undamaged part.

Following the curing cycle remove plastic foil and peel nylon fabric. Bond the backing plate to the inside using a mixture of resin and cotton flocks, and adapt to the contour. Cure the bonding at elevated room temperature for 8 hours.

Subsequently scarf the edges of the damaged portion with sandpaper. Minimum length of scarf per fabric layer approx. 20 mm;

IMPORTANT

Ratio (laminate thickness : scarf length) approx. 1: 50.

Following the scarf procedure, clean the repair area thoroughly:

1 Remove the sanding dust with a pneumatic vacuum cleaner

2 Clean the scarfed overlaps with carbon-tetrachloride or acetone in case dirt or grease was introduced during the preparation of the overlap.

IMPORTANT

Repair area must be free of dirt, dust and grease.

Wet all surfaces of the backing plate and the scarfed area with resin mixture. Lay on prelaminated fabric layer in accordance to the layer sequence plan. Ensure correct style and direction of fabric.

NOTE

Lay out the required number and size of fabric pieces on a piece of colored plastic foil and wet them with resin mixture. Subsequently position them on the repair area.

IMPORTANT

Remove the plastic foil after each positioning process.

The repair area has to be cured under condition of vacuum bagging. Proceed as follows:

1 Apply peel nylon fabric on the last repair fabric layer.

2 Perforate a clean, thin plastic foil with a thick needle (max. spacing of holes: 20mm x 20mm) - mainly in the area of the honeycomb - and lay it on the repair area.

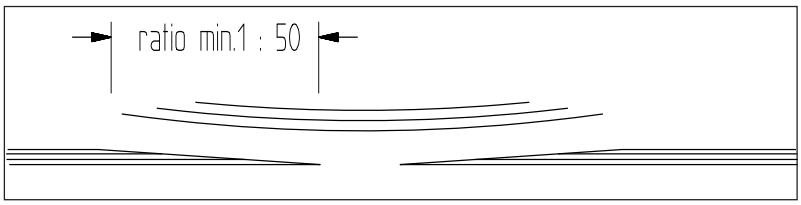


Figure 9 Repair of minor damage

b) Large damage

If the extent of the damaged area exceeds 10 cm (4 inches) a large damage repair is required.

Carefully trim out the damaged portion to a circular or oval shape.

Prelaminate a backing plate from two layers of glass fibre fabric and resin mixture, which must be approx. 20 mm larger than the damaged area. Apply peel nylon fabric as external layer. Sandwich the resin wetted layers between two sheets of plastic foil. Work the excess resin out and allow the plate to cure at elevated room temperature for 8 hours on a flat surface or a plasticfoil-covered surface of the proper curvature near the damaged area, or the same location on a comparable undamaged part.

Following the curing cycle remove plastic foil and peel nylon fabric. Bond the backing plate to the inside using a mixture of resin and cotton flocks, and adapt to the contour. Cure the bonding at elevated room temperature for 8 hours.

Subsequently scarf the edges of the damaged portion with sandpaper. Minimum length of scarf per fabric layer approx. 20 mm;

IMPORTANT

ratio (laminate thickness : scarf length) approx. 1: 50.

Following the scarf procedure, clean the repair area thoroughly:

1 Remove the sanding dust with a pneumatic vacuum cleaner.

2 Clean the scarfed overlaps with carbon-tetrachloride or acetone in case dirt or grease was introduced during the preparation of the overlap.

IMPORTANT

Repair area must be free of dirt, dust and grease.

Wet all surfaces of the backing plate and the scarfed area with resin mixture. Lay on prelaminated fabric layer in accordance to the layer sequence plan. Ensure correct style and direction of fabric.

NOTE

Lay out the required number and size of fabric pieces on a piece of colored plastic foil and wet them with resin mixture. Subsequently position them on the repair area.

IMPORTANT

Remove the plastic foil after each positioning process.

The repair area has to be cured under condition of vacuum bagging. Proceed as follows:

1 Apply peel nylon fabric on the last repair fabric layer.

2 Perforate a clean, thin plastic foil with a coarse needle (max. spacing of holes: 20mm x 20mm) - mainly in the area of the honeycomb - and lay it on to the repair area.

3 Lay a jute cloth or equivalent bleeder cloth on this perforated plastic foil.

4 Lay an air tight plastic foil upon the jute weave and seal their edges to the surrounding surface using an adhesive tape.

5 Apply suction with a vacuum pump (pressure difference approx. 0.7bar / 10psi).

6 Curing cycle.

7 Following the curing cycle carefully remove vacuum bagging material and peel nylon fabric.

After the pre-curing period at room temperature, the repaired area has to be cured according the temperature cycle as shown on figure 3.

After the curing process is completed, the repair area can be sanded level to the surrounding area.

NOTICE

Sand only the edge thickness of repair laminate!

Refinish the surface according chapter 51-10-06.

51-70-04 Repair of Spars

The spars consists of carbon roving caps, glass or carbon fibre webs and PVC foam cores.

IMPORTANT

The spars are highly stressed; a failure of this bonded structure can result in loss of the aircraft! In all cases, the repair of a spar must be considered as a large-scale repair with a Damage Class 1 (Refer to chapter 51-10-01 Damage Classification"). EXTRA Flugzeugproduktions- und Vertriebs- GmbH has to be contacted prior to repair!

51-70-05 Structural Repair of Steel Components

Restoration of a damaged fuselage to its original design strength, shape and alignment involves careful evaluation of the damage, followed by exact workmanship in performing the repairs.

IMPORTANT

Refer to "Aircraft Inspection and Repair FAA AC 43.13-1A" and "Aircraft Alterations Acceptable Methods, Techniques and Practices FAA AC 43.13-2A" for structural repairs.

IMPORTANT

Alterations or repair of the airplane must be accomplished by *licensed* personnel. Consult EXTRA Flugzeugproduktions- und Vertriebs- GmbH in case of doubt about a repair not specifically mentioned there.

WLB 1.7734.4 type steel is used (steel tube measurements are metric). Also refer to Chapter 51-30-02.

NOTE

If welding work must be performed, use only the TIG procedure (Tungsten Inert Gas). Use steel welding wire 1.7734.2 or equivalent for welding additive.

51-70-06 Painting of Composite Parts

WARNING

Coating materials may cause sensitization by inhalation and skin contact. Hardeners and coating materials ready for use can have an irritant and sensitizing effect upon the skin and respiratory tracts and cause allergic reactions.

WARNING

Provide for a continuous supply of fresh air during and also after the application, do not inhale the vapors and wear a breathing mask during the spray application of these materials. Persons suffering from an allergy or being prone to diseases of the respiratory tracts must not get in contact with coating materials.
Refer to the manufacturer technical information sheet!!

After the curing cycle the surface of repaired area can be sanded with sandpaper (80 grade). Indentations are filled with white polyester filler. Subsequently achieve a surface as uniformly rough as possible using a finer dry sandpaper (150 or 320 grade). Prior to paint application, the surface of the

repair area must be cleaned thoroughly of all sanding dust, separation compounds and other foreign materials. Subsequently apply Glassodur Rapid Filler with a spray gun.

NOTE

The Rapid Filler must be completely dry before the covering paint can be applied.

For the final sanding, use 400 grade wet sandpaper to achieve a smooth clean surface. Allow surface to dry. Paint application of two component acryl paint is performed with a spray gun.

Paint can be mixed with small quantities of reducer. After completion of the painting, polish the repair area.

51-70-07 Aluminium and Steel Components Refinishing

Complete procedure necessary to remove existing paint from aluminium and steel components and then to repaint them as described in the following paragraphs.

Degreasing

WARNING

Cleaning solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

NOTICE

Before stripping parts, remove all fittings, O-rings, nuts, bolts, washers, pistons, bearingcups, etc.

1 Clean all metal parts by immersing in a clean degreasing solution. An alkaline based solution is recommended for aluminium and magnesium parts.

2 Hardened dirt or grease may be removed with soft bristle brush, or by soaking in cleaning solution.

3 Where necessary clean bearing cones carefully in a separate container of clean solvent.

NOTICE

Do not spin bearing cones with compressed air.

4 After cleaning, thoroughly dry all metal parts with filtered, dry compressed air.

5 It is recommended that all O-rings, backup rings, and wipers be replaced at each overhaul. However, if necessary, O-rings may be reused, but should be put back into the position from which they were removed.

6 Wipe down O-rings, backup rings, wipers, or other rubber parts with a clean dry cloth. Lubricate with a suitable O-ring lubricant prior to installation.

Paint Removal

Disassemble components to the level required for repainting, then proceed as follows.

WARNING

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

NOTICE

Before stripping parts, remove all fittings, O-rings, nuts, bolts, washers, pistons, bearingcups, etc. Parts must be totally immersed in solvent, to maximize cleaning.

1 Degrease part per degreasing paragraph.

2 Totally immerse part in paint removing solvent. Portions not totally covered by solvent will begin to corrode.

NOTE

Stripping agents are commercially available for removing topcoat and primer. Follow manufacturer's recommendations for use and disposal of stripping solutions.

3 Remove part from solvent and rinse thoroughly with water heated to 160° to 180°F (71° to 82° C). Flush solvent from all cavities and threaded holes where entrapment might occur.

4 Thoroughly dry part with filtered, dry compressed air.

5 Where applicable refer to inspection procedures given in the respective chapters for specific parts to locate possible defects.

N O T E

Refinishing should be completed as soon as possible; unprotected parts will begin to corrode.

Repainting

Paint all surfaces except those which are subjected to friction (bearing surfaces, anchor bolt bores, etc.). Proceed as follows:

1 Parts to be repainted should be cleaned and stripped per instruction in degreasing and paint removal paragraphs.

2 Aluminium parts should have a protective barrier between the topcoat and base metal. It is recommended they be treated with solutions listed in chapter 51-30.

3 For priming follow the procedures given by the coating manufacturers.

4 Paint parts with one coat of lacquer listed in chapter 51-30. Allow to dry thoroughly before reassembly.

51-70-08 Re-Bonding of Bushings

a) Re-bonding of loose bushings in empennage spars

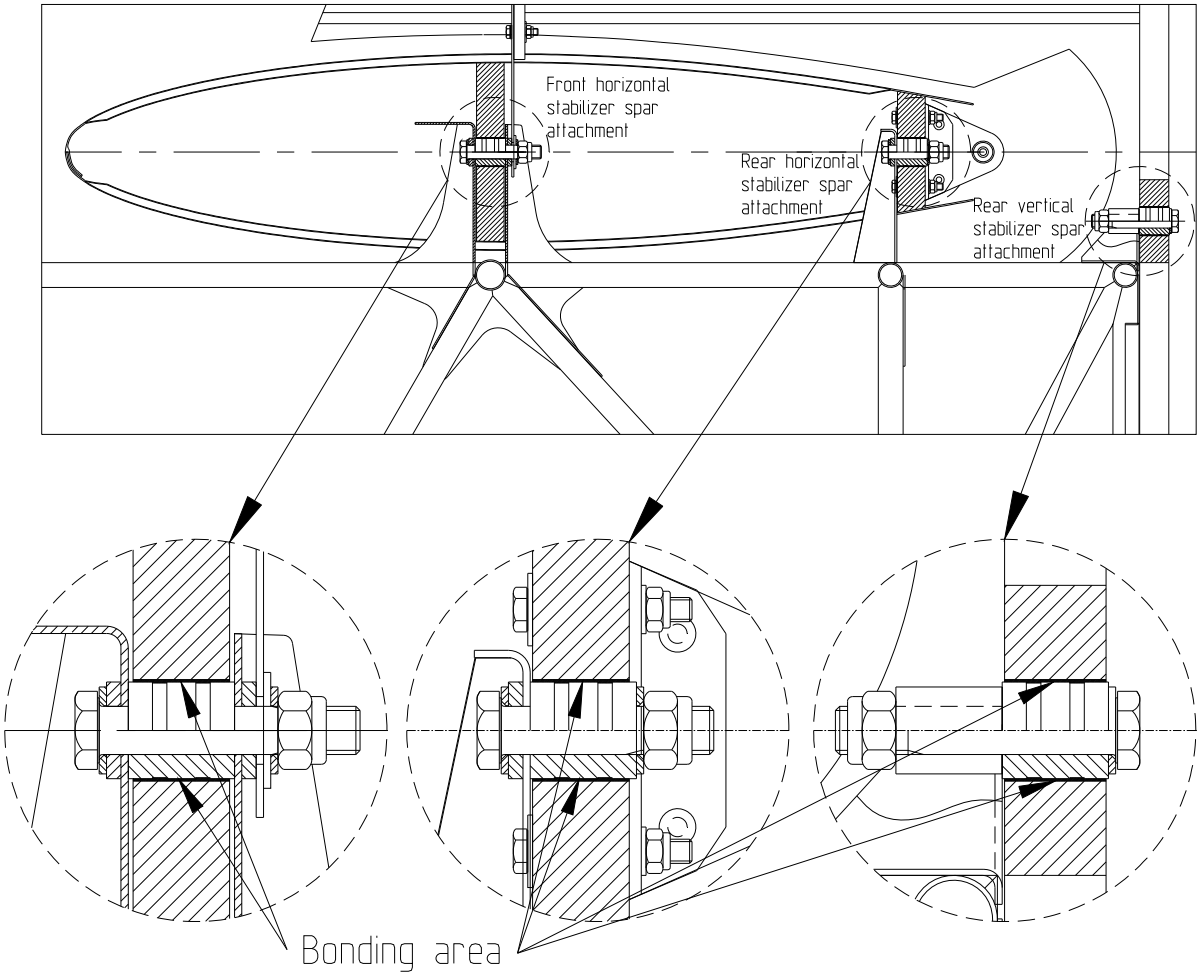


Figure 10 ***Empennage attachment bushings***

Re-bonding of main attachment bushings positioned in the web of the front and rear spar in the horizontal tail as well as in the main spar of the vertical stabilizer is only permissible if the hole in the related spar web is not elongated or has impermissible irregular wear which is evidence of bearing stress exceedance.

In case the bushing fits the hole in the spar web tightly, use epoxy-resin Epikote Resin L20 with Epikure Curing Agent 960 (ref. Chapter 51-30-01). If the gap between bushing and hole in the spar web exceeds 0.5mm (0.02") use a mixture of epoxy resin compound L20/960 and cotton flocks. The weight ratio should be 100 parts L20/960 with 7 up to 15 parts cotton flocks (so called "HB7" and "HB15").

For re-bonding of bushings the related stabilizer has to be removed from the fuselage first. To prevent misalignment, reinstallation is needed at the end of the re-bonding process of the bushings.

1 Remove stabilizer from the fuselage. Refer to the applicable Chapter of this Manual.

2 Carefully remove the loose bushing from the spar. If a tool is needed, handle with care to prevent damage of adjacent composite structure.

3 Visually check the hole in the spar web. In case an elongated hole, a crushed plywood insert or a fuzzy or delaminated surrounding fiber plies are identified, an oversized bushing might be needed. Contact Extra Flugzeugproduktions- und Vertriebs GmbH for advice and repair instructions.

4 Remove any residual resin debris existing on the outer bonding surface of the bushing. Protect the inner surface of bushing and sandblast or use 80-grit sandpaper to rough the outer surface which will be bonded later on (no remaining shiny areas are allowed). Existing grooves on the outer surface (if any) must be free of residual resin.

5 Solvent clean the bushing thoroughly with isopropyl alcohol, carbon-tetrachloride or acetone.

WARNING

Solvents used for cleaning re-bond areas are flammable liquids and should be used with proper ventilation and safety equipment.

6 Take 120-grit sandpaper and sand the surface area of the hole in the spar web where the bushing will be placed later on smooth. Any bulk material (deposits) within the hole must be removed.

NOTICE

Bonding area must be free of dirt, dust and grease.

7 Remove sanding dust with a pneumatic vacuum cleaner and solvent clean the surface area of the hole in the spar web with isopropyl alcohol, carbon-tetrachloride or acetone in case dirt or grease was introduced during the preparation.

8 Prepare a sufficient amount of epoxy resin compound L20/960. The weight ratio is: 100 parts L20 with 34 parts 960

(ref. Chapter 51-30-01). Record quantities of parts to be mixed, ambient air temperature and humidity.

9 Apply a sufficient amount of epoxy resin compound L20/960 to the surface area of the hole in the spar web. Remaining small cavities within the area should be filled with "HB20".

10 Apply a sufficient amount of epoxy resin compound L20/960 to the outer surface area of the bushing.

11 Insert the bushing to the hole. Protruding lenght of bushing out of the front and rear spar web should be equal. Slightly rotate the bushing clockwise or counterclockwise while it is inserted into the hole of the spar web. A continuous movement is required to minimize entrapped air. Avoid partly removing and reapplying, as this will cause air to become entrapped in the bonding gap.

12 Verify epoxy resin compound at entire bond line is continuous and free of gaps.

13 Remove excessive resin compound with cloth damped with isopropyl alcohol.

14 Apply mold-release agent to the related surfaces of the stabilizer mounting brackets of the fuselage and related mounting bolts.

15 Position the stabilizer to the fuselage mounting brackets by related mounting bolts. The related mounting bolts should be installed easily and hold the stabilizer in place for the following cure process (without nuts).

16 Do not apply any pressure on the stabilizer prior to complete cure cycle. Disturbing the stabilizer may create bonding voids.

17 Apply curing procedure (specified time and temperature): At elevated room temperature 25°C (77°F) for 10h followed by 60°C (140°F) for at least 15h (refer to 51-70-02).

18 Reinstall the stabilizer. Refer to the applicable Chapter of this Manual.

b) Re-bonding of loose main wing spar flange bushings

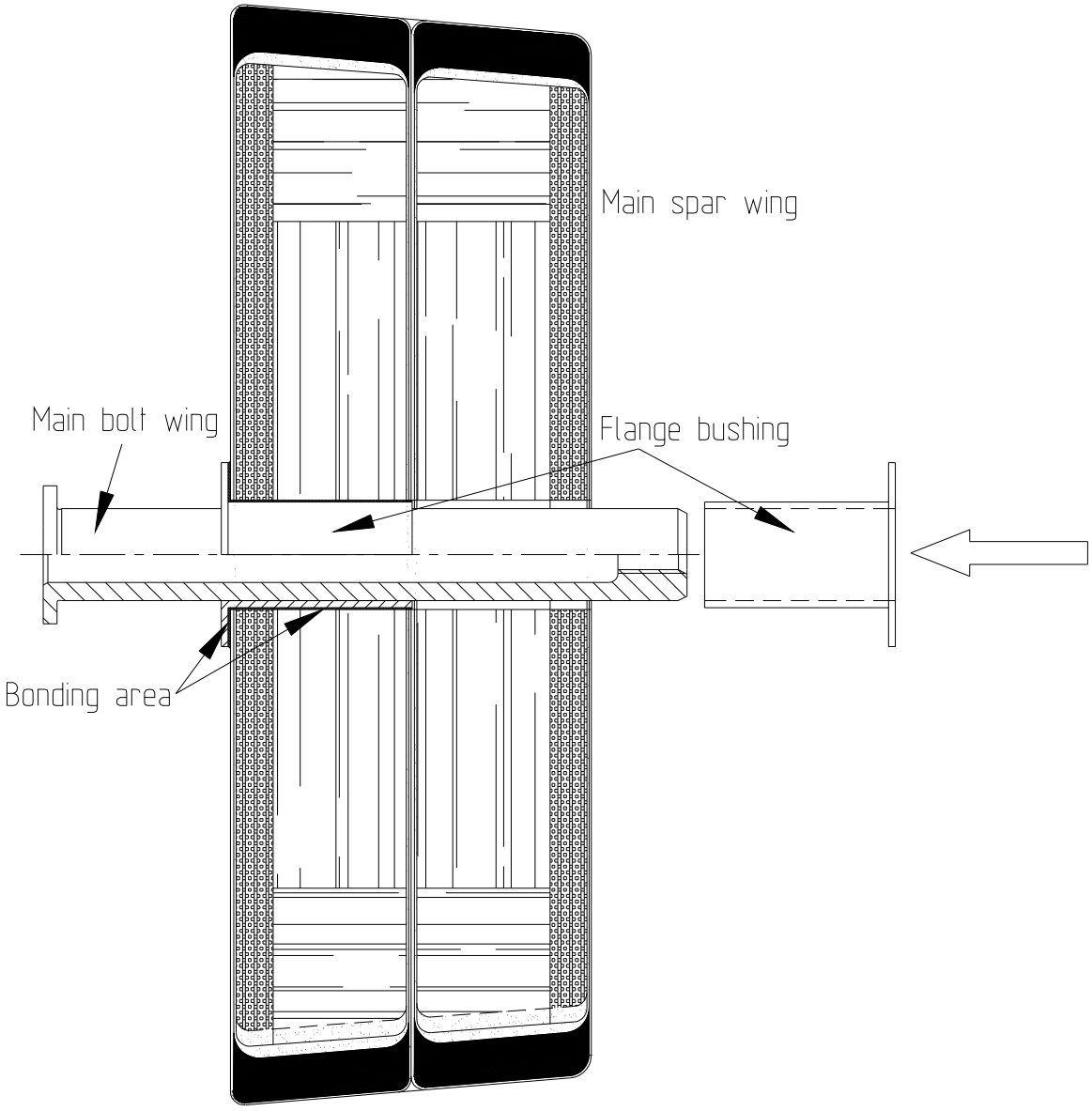


Figure 11 ***Wing main spar attachment flange bushings***

Main attachment bushings positioned in the web of the main wing spar exists of a front and a rear flange bushing. The front and rear flange bushing will be re-bonded one after another. There is a defined bond gap between the flange bushings and the hole in the main spar web.

Re-bonding of main attachment flange bushings positioned in the web of the main wing spar is only permissible if the hole in the related spar web is not elongated or has impermissible irregular wear which is evidence of bearing stress exceedance. In case an elongated hole, a crushed plywood

insert or a fuzzy or delaminated surrounding fiber plies are identified, oversized flange bushing are needed. Contact Extra Flugzeugproduktions- und Vertriebs GmbH for advice and repair instructions.

Use a mixture of epoxy-resign Epikote Resin L20 with Epikure Curing Agent 960 (for mixing ratio ref. Chapter 51-30-01) and cotton flocks. The weight ratio should be 100 parts L20/960 with 7 up to 15 parts cotton flocks (so called "HB7" and "HB15").

For re-bonding of flange bushings the wing has to be removed from the fuselage first.

1 Remove wing from the fuselage. Refer to the applicable Chapter of this Manual.

2 Carefully remove the front or rear loose flange bushing from the main spar at a time. If a tool is needed, handle with care to prevent damage of adjacent composite structure. The remaining flange bushing will be used to align the removed flange bushing during the re-bonding process.

3 Visually check the exposed surface area of the hole in the spar web for any damage.

4 Remove any residual resin debris existing on the bonding surface of the flange bushing. Protect the inner surface of bushing and sandblast or use 80-grit sandpaper to rough the outer surface which will be bonded later on (no remaining shiny areas are allowed).

5 Solvent clean the bushing thoroughly with isopropyl alcohol, carbon-tetrachloride or acetone.

WARNING

Solvents used for cleaning re-bond areas are flammable liquids and should be used with proper ventilation and safety equipment.

6 Take 80-grit sandpaper and sand the exposed surface area of the hole in the spar web where the bushing will be placed later on smooth. Any remaining material from the initial bond within the hole must be removed. Use 120-grit sandpaper to rough the ring surface area of the main spar web where the flange of the bushing will be bonded to later on.

NOTICE

Bonding area must be free of dirt, dust and grease.

7 Remove sanding dust with a pneumatic vacuum cleaner and solvent clean the surface area of the hole in the spar web with isopropyl alcohol, carbon-tetrachloride or acetone in case dirt or grease was introduced during the preparation.

8 Prepare a sufficient amount of epoxy resin compound L20/960. The weight ratio is: 100 parts L20 with 34 parts 960 (ref. Chapter 51-30-01). Record quantities of parts to be mixed, ambient air temperature and humidity.

9 Apply a sufficient amount of epoxy resin compound L20/960 to the exposed surface area of the hole and the ring surface area of the main spar web. Additionally apply "HB15" compound.

10 Apply a sufficient amount of epoxy resin compound L20/960 to the outer surface area of the flange bushing which will be bonded to the spar. Additionally apply "HB15" compound.

11 Apply mold-release agent to the surface of the related wing main bolt. Insert the bolt to the flange bushing which is still fixed in the main spar (opposite side) to provide a guidance for the flange bushing to be bonded to the spar.

12 Insert the flange bushing to the hole. Slide on the main bolt and slightly rotate the bushing clockwise or counterclockwise while it is moved into the hole of the spar web. A continuous movement is required to minimize entrapped air. Avoid partly removing and reapplying, as this will cause air to become entrapped in the bonding gap.

13 Verify epoxy resin compound at the edge of the flange bushing is continuous and free of gaps.

14 Remove excessive resin compound at the flange with cloth damped with isopropyl alcohol.

15 Do not apply any pressure on the flange bushing prior to complete curing cycle. Disturbing the flange bushing may create bonding voids.

16 Apply curing procedure (specified time and temperature): At elevated room temperature 25°C (77°F) for 10h.

17 Remove the main bolt from the flange bushing.

18 Proceed with final curing at 60°C (140°F) for at least 15h (refer to 51-70-02).

19 Repeat the procedure in case the flange bushing on the opposite side has to be re-bonded as well.

20 Reinstall the wing Refer to the applicable Chapter of this Manual.

4 Install bottom fuselage cover attachment screws.

5 Install bottom cowling attachment screws (one on either side) without cowling present (see two outer circles in figure 7).

6 Loosen clamp screws on gascolator drain and fuel pump vent lines for easy access (see inner dotted circles).

7 Prepare firewall sealant (refer to Chapter 51-30-04).

8 Clean areas (from inside and outside) with solvents at four positions pointed out by the arrows in figure 7. Immediately thereafter, dry these areas with a new dry cloth.

9 At the gascolator drain (position A) seal the remaining gap between firewall and bottom fuselage cover from inside and outside with firewall sealant. Minimum sealant thickness approximately 1/8 inch (= 3 mm).

10 Repeat step 9 at positions B, C and D.

11 Observe applicable curing times.

12 Fasten clamp screws on gascolator drain and fuel pump vent lines.

13 Remove the two bottom cowling attachment screws.

14 Reinstall main fuselage cover, landing gear cuffs and engine cowling in accordance with this chapter.

57-00-01 Wing

Removal

1 Ensure wing is completely drained as per Chapter 12.

2 Reverse procedure of installation omitting step 16.

Installation

1 Remove the canopy per Chapter 53, the engine cowlings and the main fuselage cover per Chapter 51.

2 Remove the right front canopy hinge.

3 Loosen the breather line clamps located at the engine side of the firewall and in the main spar area, push the front part of the breather line some centimeters to the front until it is disconnected from the connecting hose (10, Figure 3) and remove the breather line (5) by pulling it to the rear.

4 Fix throttle lever and control sticks in rearmost position.

5 Remove RPM-vernier-control cable per Chapter 61 and bring cable out of the main spar area.

WARNING **Beware not to get jammed between wing and fuselage.**

NOTICE **Ensure that areas in which the wing shall be slid are clear of obstructions.**

NOTICE **Prevent cables and pitot/static lines from damage. Keep them at the rear of the main spar and outside of the upper longerons.**

NOTICE **Attend to the left front canopy hinge, the throttle and mixer cables and the heater lever, when sliding down the wing. These parts and the wing could be damaged.**

6 Slide wing down into fuselage attachment brackets (3).

7 Install LN 9037-08042 auxiliary spar attach bolts (1) from front to rear. Use two DIN 125-M8 washers and LN 9348-08 nuts at each side for fastening.

IMPORTANT

If there is clearance between the main spar and the attachment brackets (1, Figure 2), use shims (3) like shown below which are to be slid in the front gaps (2).

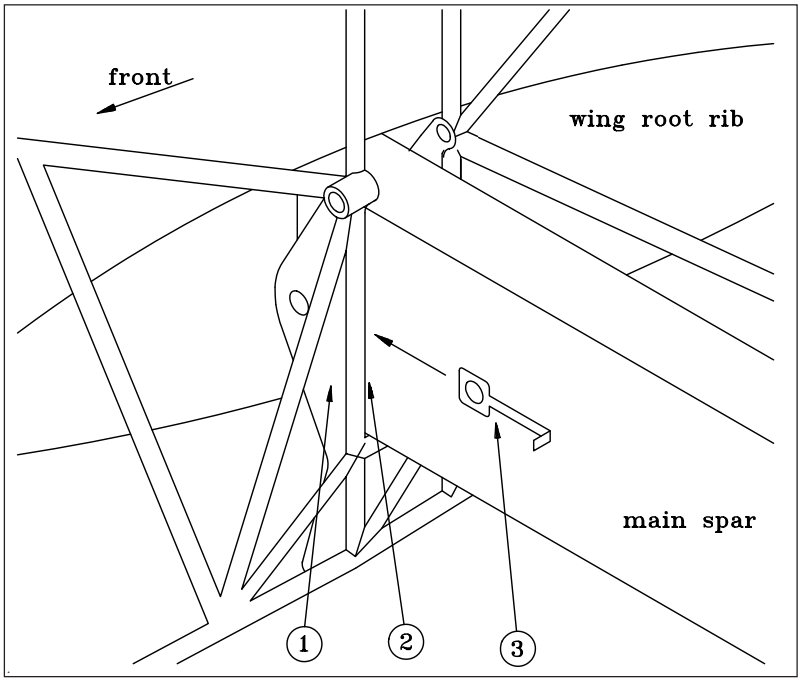


Figure 2 Shims Installation

8 Slide in shims if necessary and install the main spar tubular bolts (4, Figure 3) to the wing flange bushings (11) from front to rear.

9 Secure main spar tubular bolts with LN 9038-08020K (2) bolts or LN 9037-08020K (2), DIN125 M8 washers and special aluminum washers (30x11x4). Torque security bolts for fastening and subsequently safety wire

10 Install upper longeron cutout bridges (7) using at each side 3x DIN912 M8 x 180, 3x DIN125 M8 washers and 3x LN9348-08 stop nuts at the top and 1x DIN912 M10 x 230 bolt, DIN125 M10 washer and LN9348-10 stop nut at the bottom (6). Check cutout bridges for RH and LH marking. Install the bolts from front (firewall) to rear (aircraft tail). Torque stop nuts for fastening.

11 Install the shear connectors (8). Use two DIN 912 M12x220 bolts and safety wire.

12 Reinstall the front canopy hinge.

13 Reinstall RPM-Vernier-control and adjust.

14 Unfix throttle lever and control sticks.

15 Install short aileron push pull rods per Ch. 27-01-01.

61-20-00 CONTROLLING

The propeller blade pitch change is conducted by a governor (refer to Figure 1). Once an engine rotational speed is selected it will be held constant independent of airspeed or power variations.

The governor itself is actuated via a vernier control cable ending on the left side of the rear cockpit (blue control knob; 1, Figure 1 & 8, Figure 2). This cable is routed on the left side of the fuselage, penetrates the firewall, the rear engine baffles and is then routed to the governor. The cable is attached at its front end to the engine by a clamp block and in the cockpit area to the steel tube structure by self-clinching plastic tiedown straps. The RPM vernier control unit is mounted to a fuselage bracket. The firewall and engine baffle penetrations are covered with clamp sheets. The firewall penetration (2, Figure 1) is additionally sealed with firewall sealant (see Chapter 51-30-04).

Mechanical stops for low pitch and high pitch limit the pitch change level. In case the oil pressure is lost, the installed counterweights automatically force the blades into high pitch.

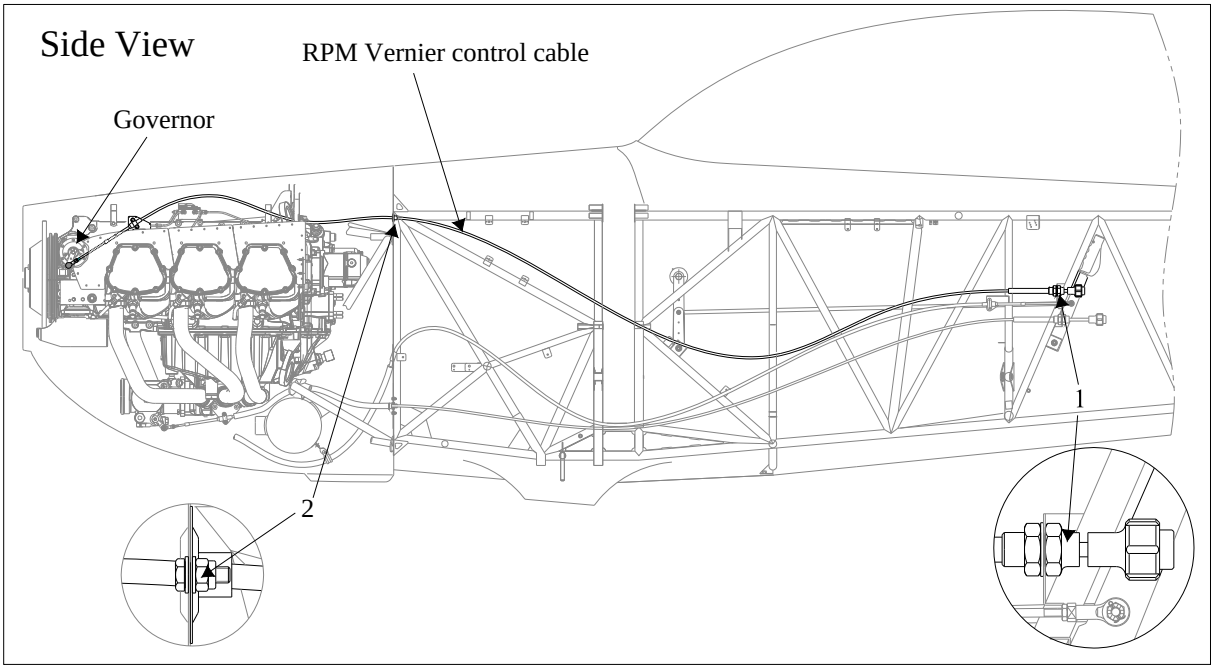


Figure 1 ***Controlling***

10 Remove 2 bolts of the clamp sheet attachment positioned at the firewall break through (10). Disconnect clamp sheet and contained plastic guidance from the rear side of the firewall.

11 Mark vernier control cable routing and remove the self-clinching plastic tiedown straps in the cabin area.

12 Remove attachment nut (9) and washer of the vernier control unit (7).

13 To remove vernier control unit from its bracket, pull the unit slightly aft (about 15cm [0.5ft]) and then to the LH outside direction.

14 Pull complete vernier control cable (6) aft to remove from aircraft. Secure clamp sheets.

Installation

Install in reverse sequence of removal observing the following items:

1 Thread the respective clamp sheets and plastic guidance on the vernier control cable before penetrating the firewall and the rear engine baffle.

2 Install rod end to the vernier control cable terminal. Ensure thread of control cable terminal is visible in the inspection hole.

3 Renew the sealing of the firewall break through at the engine side of the firewall. Use firewall sealant as presented in Chapter 51-30-04.

4 Tighten the castle nut slightly. Ensure movability of governor control lever (2).

Rigging

1 Move vernier control knob (8, Figure 2) to the foremost position.

2 Check that the travel stop at the governor control lever is reached, and the over-travel of 5mm [3/16"] (tolerance +/-1 mm [1/32"]) is ensured at the rpm control knob (see figure 2).

The oil temperature is limited by installation of an oil cooler.

The ignition is a magneto type with 2 independent systems. Additionally a Slick Start System is installed with the AEIO-580-B1A engine.

NOTE

For more information about the engine refer to Lycoming Operator's Manual.

IMPORTANT

If replacement of the engine control cables is necessary, renew the sealing of the bushing grooves and gaps at the engine side of the firewall. Use firewall sealant as presented in Chapter 51-30-04. Cover the control cables with AEROQUIP AE102-6 Fire sleeves inside the engine department.

Removal

NOTE

In many cases it is favourable to remove the complete engine incl. engine mount and all components of the inverted oil system from the firewall. Then remove the engine mount, the exhaust and engine accessories as necessary.

After disconnection of lines and fittings, protect related inlet by appropriate plug or cap. Cut self-clinching plastic straps used for routing of lines and cables as appropriate.

This procedure is described in the following:

WARNING

Before commencing any work, disconnect the battery and short-circuit the magnetos with locking wire or disconnect all ignition cables from the spark plugs.

1 Remove the upper and lower part of the cowling (ref. Chapter 71).

2 Support the engine at its two lifting lugs (ref. Lycoming Maintenance Instructions).

3 Remove the canopy and main fuselage cover (ref. Chapter 53).

20 Disconnect the wiring of the alternator and starter at their electrical connection. Detach the fixation of the wirings (which are covered with a firesleeve) to the oil sump of the engine.

21 Disconnect the smoke oil supply hose at the smoke oil injector nozzle on the exhaust end pipe (if a smoke system is installed).

22 Disconnect the wet sense lines at the firewall connection for engine manifold pressure, fuel pressure and oil pressure.

23 Unbolt the complete engine with engine mount from the airframe at the four attachments points.

24 Lift the complete engine from the airframe.

25 Refer to 71-20-00 for removal of the engine mount from the engine.

Installation

1 Install in reverse sequence. Refer to Chapter 20-10-04 for torque values specified for the mount to the engine and mount to the airframe connection.

2 Apply firewall sealant as presented in Chapter 51-30-04 to the bolt connection to the firewall/airframe. Follow the applicable product instructions (mixing, application and curing instructions).

73-20-00 CONTROLLING

73-20-10 Throttle

Refer to figure 1. The throttle is controlled by means of the throttle control levers located on the left side of the cockpit. These levers are interconnected by the throttle control linkage. The throttle control levers transfer their movements to the throttle by means of the throttle control cable. This cable is routed on the left side of the fuselage, penetrates the firewall and is then routed centrally below the exhaust muffler to the throttle. In the engine compartment this cable is covered with a fire sleeve. The cable is attached to the fuselage using clamp blocks at its ends, self-clinching plastic tiedown straps in the cockpit area, and a cushioned clamp at the exhaust muffler. Rod ends at both terminals of the control cable serve as a means for rigging. The fire wall penetration is sealed with firewall sealant (see Chapter 51-30-04) and covered with clamp sheets.

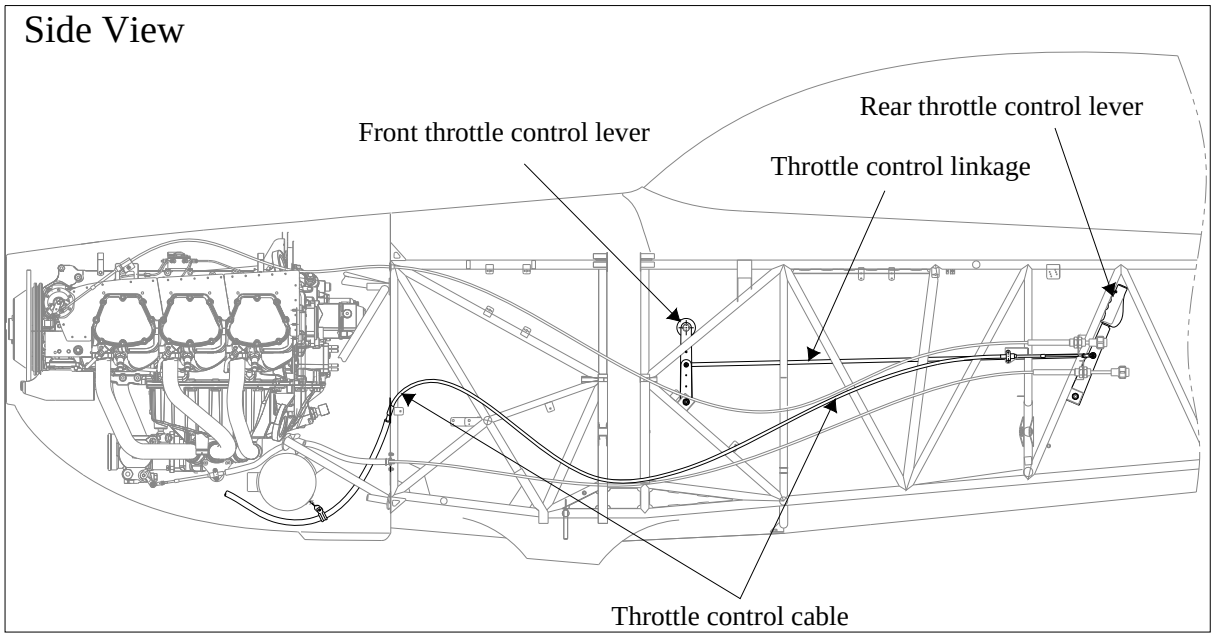


Figure 1 ***Throttle Control***

Installation

Install in reverse sequence of removal observing the following items:

1 Install throttle control cable, ensure distance between clamp sheet and clamp block is 705 mm (refer to figure 2).

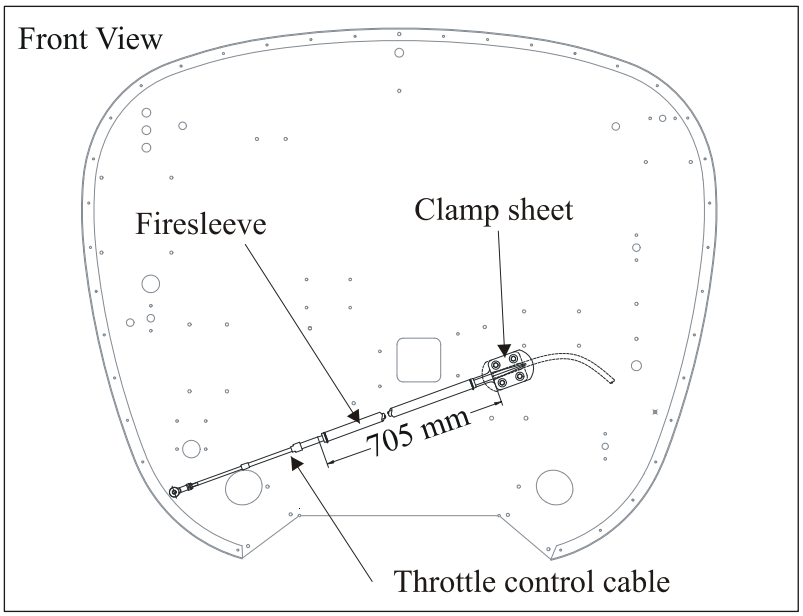


Figure 2 Firesleeve Length

2 Renew the sealing of the firewall break through at the engine side of the firewall. Use firewall sealant as presented in Chapter 51-30-04. Let the sealant slightly cure before thightening the clamp sheet attachment bolts. This will strengthen the clamping.

3 Install both rod ends to the control cable terminals. Ensure thread of control cable terminal is visible in the rod end inspection hole.

4 Tighten the castle nuts at both rod end attachment bolts slightly. Ensure movability of levers.

73-20-20 Mixture

Refer to Figure 5. The mixture of the fuel injector servo is controlled by means of the vernier mixture control cable located on the left side of the cockpit (red control knob). This cable is routed on the left side of the fuselage, penetrates the firewall and is then routed to the mixture control lever. In the engine compartment this cable is covered with a fire sleeve. The cable is attached to the fuselage using a clamp block at its front end and self-clinching plastic tiedown straps in the cabin area. The mixture vernier control unit is mounted to a fuselage bracket. The fire wall penetration is sealed with firewall sealant (see Chapter 51-30-04) and covered with a clamp sheet.

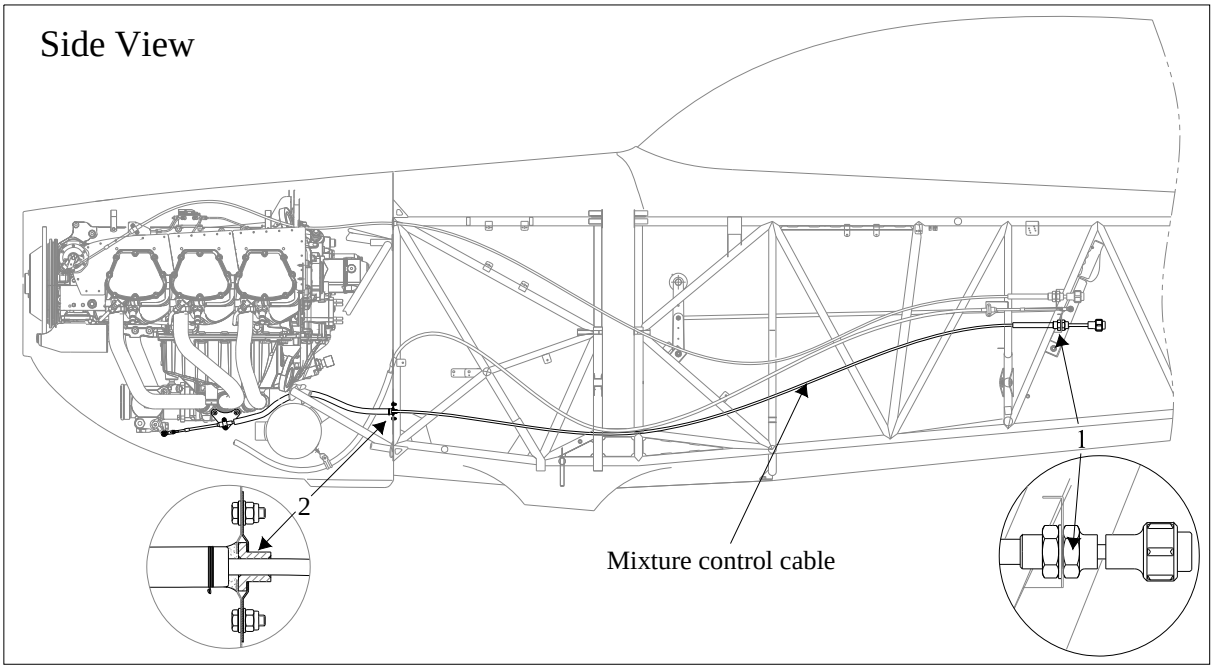


Figure 5 ***Mixture Control***

Installation

Refer to Figure 3 and Figure 4.

1 Install the mixture control unit.

2 Move mixture control knob to the foremost position.

3 Thread the rear clamp sheet and plastic guidance for the firewall break through on the mixture control cable.

4 Install the mixture vernier control cable according to the previously marked routing. Ensure distance between firewall and clamp block is 555 mm (refer to Figure 6).

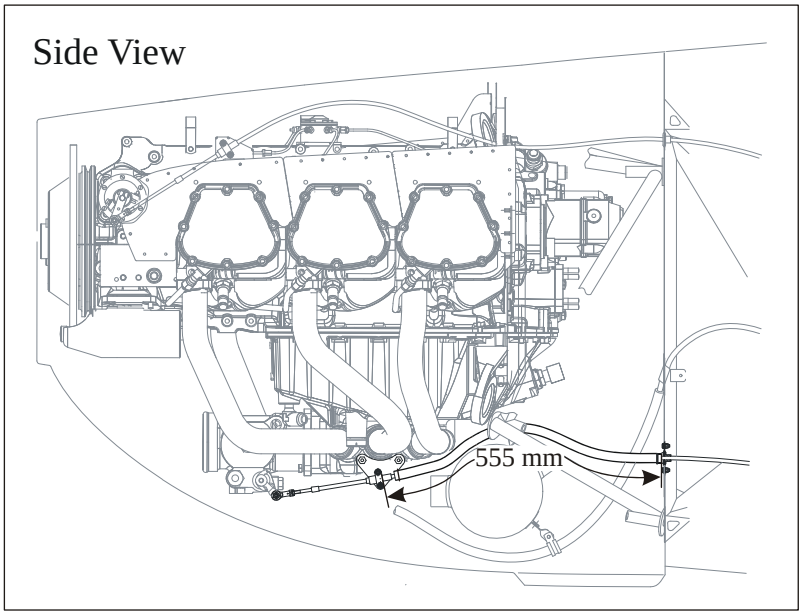


Figure 6 Clamp Sheet to Clamp Block Distance

5 Renew the sealing of the firewall breakthrough at the engine side of the firewall. Use firewall sealant as presented in Chapter 51-30-04.

6 Let the sealant slightly cure before thightening the clamp sheet attachment bolts. This will strengthen the clamping.

7 Install the clamp sheet.

8 Install the cable ties in the cockpit area on positions as marked before.

9 Install the 540 mm firesleeve to the mixture vernier control cable and secure with safety wire at both ends.

10 Install the mixture vernier control cable to the respective bracket by installing the clamp block (1, Figure 8) to the conduit fitting of the control cable.

Chapter 87

Smoke

Table of Contents

87-00-00 GENERAL

Description

On pilot's demand the smoke system produces a trail of smoke by injection of smoke oil (straight paraffin oil) into the engine exhaust. The smoke oil is vaporised by the exhaust gas heat and is visible as dense smoke after leaving the exhaust.

The system consists of (refer to Figure 1):

Main smoke oil tank (1)

Smoke oil acro tank (7)

Ventilation lines (9)

Overpressure/check valve in smoke oil supply line to the nozzle (3)

Refill/Injection pump (2)

Two relais (changeover contact type) for pump control (15)

Smoke switch (ON-OFF type) on the throttle lever (13)

SMOKE REFILL switch in the instrument panel (11)

SMOKE ARM switch in the instrument panel (12)

SMOKE SYSTEM circuit breaker in the instrument panel (14)

Float switch (10)

Filter element in the refill line (4)

Smoke tank drain (5)

Quick connector in the bottom fuselage cover (6)

Injector nozzle (8)

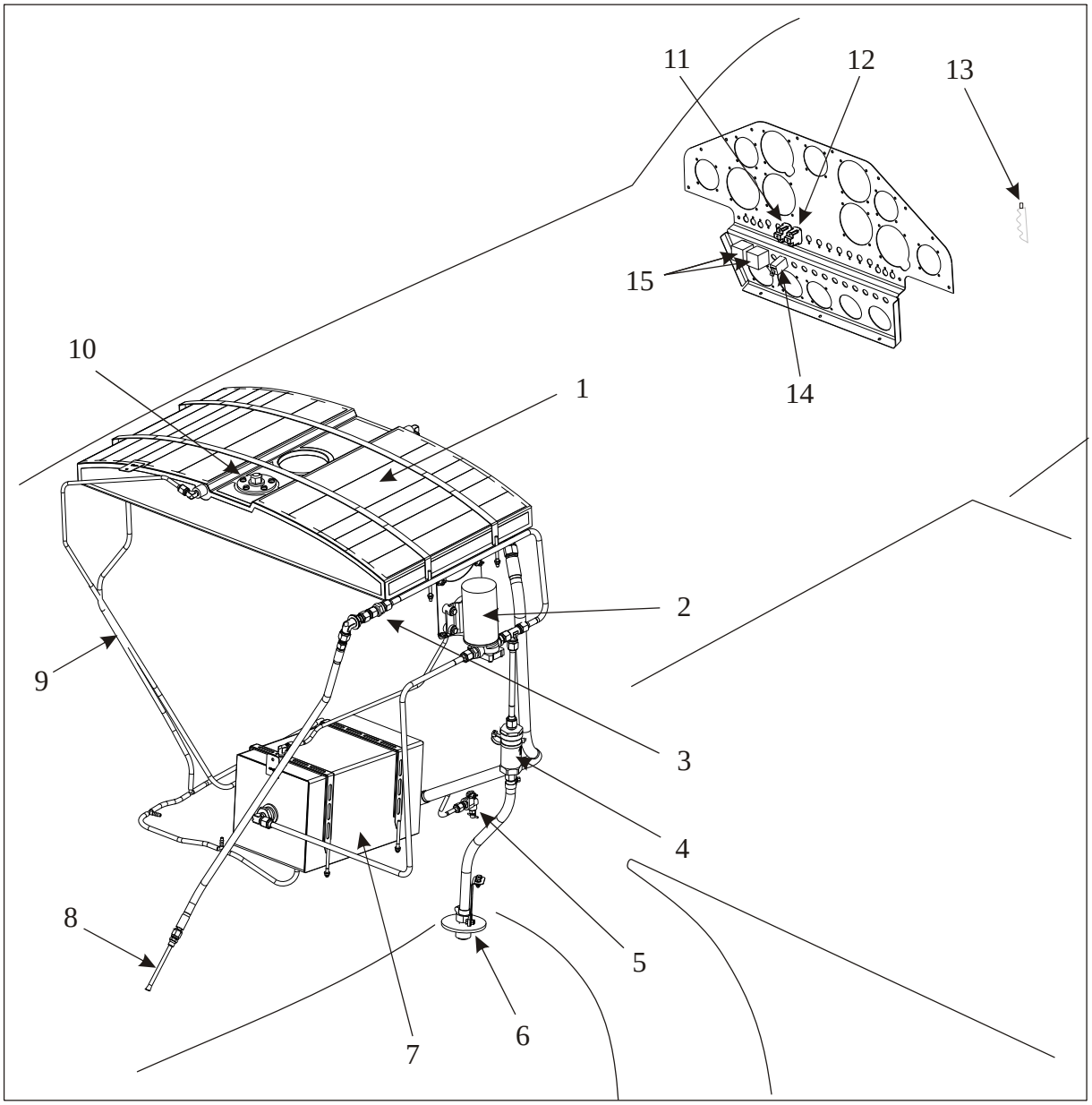


Figure 1 ***Smoke System***

87-10-00 STORAGE

Refer to figure 1. The smoke oil is stored in both the smoke oil main (1) and acro tank (7). The tanks are provided with ventilation lines (9) for adequate venting. The tanks are filled by a pump (2) (reversed polarity) through a quick connector (6) located in the aircraft bottom fuselage cover. This line includes a filter (4) to prevent dirt to enter the smoke system.

For refilling the smoke oil tanks the SMOKE REFILL switch (11) has to be switched to the ON-position. Filled smoke oil tanks are detected by a float switch (10) placed in the main tank which shuts the pump off.

87-10-01 Smoke Oil Main Tank

Removal/Installation

1 Remove canopy, main fuselage cover, instrument cover as per chapter 51.

2 Drain the smoke system.

3 Disconnect the electrical facilities from the smoke oil main tank.

4 Disconnect the smoke oil line from the smoke oil main tank.

5 Disconnect the ventilation line from the smoke oil main tank.

NOTICE

Prevent the drain tube of the GRP tank shell from breaking when handling the smoke oil main tank.

6 Remove the metal attachment belts with the rubber stripes.

7 Remove the smoke oil main tank.

8 Install in reverse sequence of removal.

87-10-02 Smoke Oil Acro Tank

Removal/Installation

1 Remove canopy, main fuselage cover, instrument cover as per chapter 51 and the front seat as per chapter 25.

2 Drain the smoke system.

3 Loosen the center fuel tank and move to the RH side.

4 Remove the battery as per chapter 24.

5 Disconnect the smoke oil lines from the smoke oil acro tank.

NOTICE

Prevent the drain tube of the GRP tank shell from breaking when handling the smoke oil acro tank.

6 Remove the metal attachment belts with the rubber stripes.

7 Remove the smoke tank through the cockpit.

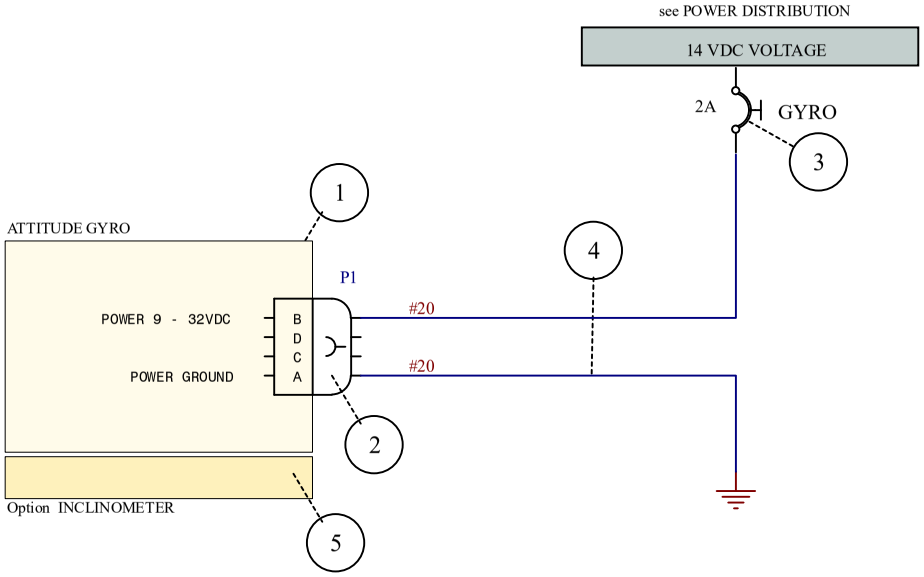
8 Install in reverse sequence of removal.

87-20-00 DISTRIBUTION

Refer to figure 1. The same pump (2) which is used for refilling the tanks (normal polarity) injects the smoke oil from the smoke oil tanks through an overpressure/check valve (3) and the injector nozzle (8) into the hot exhaust gas to generate smoke. The pump is controlled by the SMOKE switches (11, 12) and the relais (15). The smoke system is electrically protected by the SMOKE SYSTEM circuit breaker (14).

For smoke system activation the SMOKE ARM switch (12) has to be switched to the ON-position. Then the smoke ON-OFF toggle switch (13) can be used to control the smoke.

EA-93102.43	Transponder BXP-6401-x & Enc
EA-9C102.44A	Electric Trim System
EA-9D102.46	Aspen EFD 1000 PFD (up to LC017)
EA-9D102.46A	Aspen EFD 1000 PFD (from LC018)
EA-9D102.47	Aspen EFD 500/1000 MFD (up to LC017)
EA-9D102.47A	Aspen EFD 500/1000 MFD (from LC018)
EA-9D102.48	Garmin GNC 420W
EA-96102.49	Attitude Gyro
EA-96102.49A	Attitude Gyro
EA-9D102.51A	Intercom NAT AA 83 (up to LC053)
EA-9D102.51C	Intercom NAT AA 83 (from LC054)
EA-9D102.52A Sheet 1	Digital Indication MVP-50P
EA-9D102.52A Sheet 2	Digital Indication MVP-50P
EA-9E102.53	Landing Light
EA-9D102.54	Garmin GNS 430W (up to LC060)
EA-9D102.54A	Garmin GNS 430W (from LC061)
EA-9D102.55	Clock
EA-9D102.56	12VDC Outlet
EA-9D102.58A	EGT & CHT Indication
EA-93102.59	FLIGHT TIMER
EA-9E102.60	GPSMAP 695
EA-9E102.62A	Garmin GTN 635 (up to LC060)
EA-9E102.62B	Garmin GTN 635 (from LC061)
EA-9E102.63A	Garmin GTN 650/750 (up to LC060)
EA-9E102.63B Sheet 1	Garmin GTN 650/750 (from LC061)
EA-9E102.63B Sheet 2	Garmin GTN 650/750 (from LC061)
EA-9D102.64A	Garmin GTX 33
EA-9D102.65A	Garmin GMA 35
EA-9E102.66	AERA 795
EA-9E102.67	Nav/Strobe Light Ultra Galactica
EA-9D102.68	Paneldock iPad Mini
EA-9C102.69	Kannad 406 AF ELT
EA-9D102.70	Dual USB Charging Port
EA-9D102.73	Garmin G5



*	*	*	*	5	INCLINOMETER	RCA 444-0010-01				1	Stueck		33529
X	X	X	X	4	WIRE AWG20	MIL-W-22759/16-20				0,7	mtr		00775
X	X	X	X	3	CIRCUIT BREAKER 2A	7277-2-2				1	Stueck		31508
X	X	X	X	2	CONNECTOR	MS3116E-4S				1	Stueck		in Pos. 1
1				1	ATTITUDE GYRO 3"	RCA 2610-3-G		102- 0403-01-03		1	Stueck	191g	34924
	1			1	ATTITUDE GYRO 2"	RCA 2610-2-G		102- 0402-01-03		1	Stueck	135g	34923
		1		1	ATTITUDE GYRO 3"	RCA 2610-3		102- 0403-01-01		1	Stueck	191g	34922
			1	1	ATTITUDE GYRO 2"	RCA 2610-2		102- 0402-01-01		1	Stueck	135g	34921
04	03	02	01	Nr	Benennung	Teilekennzeichen	ZF	Werkstoff	Abmessungen	Menge	Einheit	Gewicht	MaWi-Nr.

* POS 5 INCLINOMETER OPTIONAL
OPTION 04 = 3 Inch VERSION
OPTION 03 = 2 Inch VERSION
OPTION 02 = 3 Inch VERSION with pitch Sync feature
OPTION 01 = 2 Inch VERSION with pitch Sync feature

Die Gültigkeitszuordnung von Version zu Flugzeugbaureihe ist der Bauakte bzw. dem jeweiligen Fertigungsauftrag zu entnehmen.

Zuordnung links / rechts wird mit */* in allen Feldern angegeben.

Ver.	Bezeichnung
04	
03	
02	
01	

Letzte Bearbeitung:

Nr.:	Änderung/Mod. Nr.:	Datum	Name
A	ÄM 300-18-03	28.11.18	HW

	Datum	Name
Bearb.:	07.06.09	HW
Gepr.:		
Gepr.:		

EXTRA
Schwarze Heide 21
46569 Hünxe, Germany

Maßstab auf	Projektion
SI.-Klasse	Freimaßtoleranz
Oberflächenschutz	Oberfläche

EA 300/L
ATTITUDE GYRO

EA-96102.49 | **A**

A4 | Blatt 1 von 1

Schutzvermerk nach DIN 34 beachten.

EDV-Kennung: **EA3L0964a**