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MAINTENANCE AND INSPECTION PROCEDURES

for Light Sport Airplane

BRISTELL TDO

REGISTRATION MARK: **N593BL**

SERIAL NUMBER: **093/2014**

This Manual contains information necessary for operation and maintenance of the airplane in accordance with the European CS-VLA, International ASTM LSA, and Czech UL – 2 airworthiness requirements.

0. CHAPTER – DOCUMENT CHANGES

0.1 Record of revisions

Rev. No.	Reason for revision	Affected Pages	Date of Issue	Date and Signature
-	Initial Issue	All	04/2016	Petr Javorský

0.2 List of effective pages

Chapter	Page	Rev	Date	Chapter	Page	Rev	Date
	Cover page		04/2016				
0	0-1		04/2016				
	0-2		04/2016				
	0-3		04/2016				
	0-4		04/2016	5	5-1		04/2016
	0-5		04/2016		5-2		04/2016
	0-6		04/2016		5-3		04/2016
					5-4		04/2016
1	1-1		04/2016		5-5		04/2016
	1-2		04/2016		5-6		04/2016
	1-3		04/2016		5-7		04/2016
	1-4		04/2016		5-8		04/2016
	1-5		04/2016				
	1-6		04/2016				
	1-7		04/2016	6	6-1		04/2016
	1-8		04/2016		6-2		04/2016
					6-3		04/2016
2	2-1		04/2016		6-4		04/2016
	2-2		04/2016		6-5		04/2016
	2-3		04/2016		6-6		04/2016
	2-4		04/2016		6-7		04/2016
	2-5		04/2016		6-8		04/2016
	2-6		04/2016		6-9		04/2016
	2-7		04/2016		6-10		04/2016
	2-8		04/2016		6-11		04/2016
	2-9		04/2016		6-12		04/2016
	2-10		04/2016		6-13		04/2016
	2-11		04/2016		6-14		04/2016
	2-12		04/2016		6-15		04/2016
	2-13		04/2016		6-16		04/2016
	2-14		04/2016		6-17		04/2016
					6-18		04/2016
3	3-1		04/2016		6-19		04/2016
	3-2		04/2016		6-20		04/2016
	3-3		04/2016		6-21		04/2016
	3-4		04/2016		6-22		04/2016
	3-5		04/2016				
	3-6		04/2016				
	3-7		04/2016				
	3-8		04/2016				
	3-9		04/2016				
	3-10		04/2016	7	7-1		04/2016
					7-2		04/2016
4	4-1		04/2016		7-3		04/2016
	4-2		04/2016		7-4		04/2016
	4-3		04/2016				
	4-4		04/2016				
	4-5		04/2016				
	4-6		04/2016				
	4-7		04/2016				
	4-8		04/2016				

Chapter	Page	Rev	Date	Chapter	Page	Rev	Date
8	8-1		04/2016		10-17		04/2016
	8-2		04/2016		10-18		04/2016
	8-3		04/2016		10-19		04/2016
	8-4		04/2016		10-20		04/2016
	8-5		04/2016		10-21		04/2016
	8-6		04/2016		10-22		04/2016
	8-7		04/2016		10-23		04/2016
	8-8		04/2016		10-24		04/2016
	8-9		04/2016		10-25		04/2016
	8-10		04/2016		10-26		04/2016
	8-11		04/2016		10-27		04/2016
	8-12		04/2016		10-28		04/2016
	8-13		04/2016				
	8-14		04/2016				
	8-15		04/2016				
	8-16		04/2016				
				11	11-1		04/2016
					11-2		04/2016
					11-3		04/2016
					11-4		04/2016
					11-5		04/2016
					11-6		04/2016
9	9-1		04/2016		11-7		04/2016
	9-2		04/2016		11-8		04/2016
	9-3		04/2016		11-9		04/2016
	9-4		04/2016		11-10		04/2016
	9-5		04/2016				
	9-6		04/2016				
	9-7		04/2016				
	9-8		04/2016				
				12	12-1		04/2016
					12-2		04/2016
10	10-1		04/2016		12-3		04/2016
	10-2		04/2016		12-4		04/2016
	10-3		04/2016		12-5		04/2016
	10-4		04/2016		12-6		04/2016
	10-5		04/2016		12-7		04/2016
	10-6		04/2016		12-8		04/2016
	10-7		04/2016				
	10-8		04/2016				
	10-9		04/2016				
	10-10		04/2016				
	10-11		04/2016	13	13-1		04/2016
	10-12		04/2016		13-2		04/2016
	10-13		04/2016		13-3		04/2016
	10-14		04/2016		13-4		04/2016
	10-15		04/2016		13-5		04/2016
	10-16		04/2016		13-6		04/2016

Chapter	Page	Rev	Date	Chapter	Page	Rev	Date
14	14-1		04/2016	16	16-1		04/2016
	14-2		04/2016		16-2		04/2016
	14-3		04/2016		16-3		04/2016
	14-4		04/2016		16-4		04/2016
					16-5		04/2016
					16-6		04/2016
					16-7		04/2016
15	15-1		04/2016		16-8		04/2016
	15-2		04/2016		16-9		04/2016
	15-3		04/2016		16-10		04/2016
	15-4		04/2016				
	15-5		04/2016				
	15-6		04/2016	17	17-1		04/2016
	15-7		04/2016		17-2		04/2016
	15-8		04/2016		17-3		04/2016
	15-9		04/2016		17-4		04/2016
	15-10		04/2016		17-5		04/2016
	15-11		04/2016				
	15-12		04/2016				
	15-13		04/2016				
	15-14		04/2016				
	15-15		04/2016				
	15-16		04/2016				
	15-17		04/2016				
	15-18		04/2016				
	15-19		04/2016				
	15-20		04/2016				
	15-21		04/2016				
	15-22		04/2016				

Table of contents

0. CHAPTER – DOCUMENT CHANGES 0-1
1. CHAPTER - GENERAL 1-1
2. CHAPTER - LIMITATIONS / MAINTENANCE CHECKS 2-1
3. CHAPTER - FUSELAGE 3-1
4. CHAPTER - WING 4-1
5. CHAPTER – TAIL UNIT 5-1
6. CHAPTER - CONTROLS 6-1
7. CHAPTER – EQUIPMENT 7-1
8. CHAPTER – LANDING GEAR 8-1
9. CHAPTER – FUEL SYSTEM 9-1
10. CHAPTER– POWER UNIT 10-1
11. CHAPTER – ELECTRICAL SYSTEM 11-1
12. CHAPTER – PITOT–STATIC SYSTEM / INSTRUMENTS 12-1
13. CHAPTER – VENTILATION / HEATING 13-1
14. CHAPTER – AIRPLANE HANDLING 14-1
15. CHAPTER – AIRPLANE REPAIRS 15-1
16. CHAPTER – WIRING DIAGRAMS 16-1
17. CHAPTER – SUPPLEMENTS 17-1

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1. CHAPTER - GENERAL

1.2 Airplane classification 1-2
1.2.1 Power unit 1-2
1.2.2 Main technical data 1-3
1.3 Airplane manufacturer and type certificate holder 1-5
1.4 Chapter order 1-5
1.4.1 Page numbering 1-5
1.5 Warnings, Cautions, and Notes 1-5
1.6 Definitions and abbreviations 1-6

1.1 Introduction

BRM Aero, Ltd., the manufacturer of BRISTELL TDO airplanes, provides in accordance with the CS-VLA, ASTM LSA, and UL – 2 airworthiness requirements, information necessary to maintain airworthiness of BRISTELL TDO airplanes. Information are also contained in the following manuals issued by the airplane manufacturer and by manufacturers of equipment installed in individual airplane:

- BRISTELL TDO Aircraft Operating Instructions
- BRISTELL Spare Parts Catalog
- Operator's Manual for ROTAX 912 series engine
- Maintenance Manual for ROTAX 912 series engine
- Technical description and operation instructions for the propeller

This Maintenance Manual contains technical description of the airplane, information on operation, maintenance, and repairs, description of airplane particular systems and their functions.

1.2 Airplane classification

BRISTELL TDO airplane is two-seat, single engine, low-wing, all-metal airplane with fixed conventional gear with castering tail wheel.
The airplane is designed for basic and advanced training and for leisure time flying .

1.2.1 Power unit

The power unit standardly consists of:

- Rotax 912 ULS, 4-stroke, 4-cylinder engine, Max.takeoff power 73.5 kW / 100 HP at 5800 RPM
- Fiti Eco Competition, 3-bladed, ground adjustable, composite propeller

Optional power unit consist of:

Engines:

- Rotax 914 “Turbo”, 4-stroke, 4- cylinder, max.takeoff power 84.5 kW / 115 HP at 5800 RPM
- Rotax 912 iS Sport, 4-stroke, 4- cylinder, electronically controlled fuel injection, max. takeoff power 73.5 kW / 100 HP at 5800 RPM
- Jabiru 2200, 4-stroke, 4- cylinder, max.takeoff power 60 kW / 80 HP at 3300 RPM
- Jabiru 3300, 4-stroke, 6- cylinder, max.takeoff power 90 kW / 120 HP at 3300 RPM

Optional propellers

- Fiti Eco Competition 3LRSE 158, 170 in-flight electrically variable, 3-bladed, composite propeller
- Neuform CR3-V-70-R2, in flight electrically variable with Constant speed module, 3-bladed, composite propeller
- DUC Inconel Flash, ground adjustable, 3-bladed, composite propeller
- Sensenich 2A0J5R64Z, 2 bl., composite propeller

BRISTELL TDO, S/N 093/2014 is fitted with:

- Rotax 912 ULS 2 engine
- Fiti Eco Competition 3LR 158, 3-bladed, on-ground adjustable propeller with composite blades.

1.2.2 Main technical data

Wing

• Span	8.13	m	26.65	ft
• Area	10.5	m^2	113.02	sq ft
• Mean aerodynamic chord (MAC)	1.367	m	53.8	in
• Wing loading				
MTOW 450 kg (UL category, no parachute)	42.86	kg/m^2	8.78	lb/sq ft
MTOW 472.5 kg (UL, with parachute)	45.00	kg/m^2	9.22	lb/sq ft
MTOW 600 kg (CS-VLA, LSA)	57.14	kg/m^2	11.68	lb/sq ft
• Aileron area	0.276	m^2	2.97	sq ft
• Flap area	0.7275	m^2	7.83	sq ft

Fuselage

• length	6.45	m	21.16	ft
• width	1.30	m	4.27	ft
• height	1.629	m	5.34	ft
• cockpit width	1.30	m	4.27	ft

Horizontal tail unit (HTU)

• Span	2.9	m	9.51	ft
• HTU area	2.28	m^2	24.54	sq ft
• Elevator area	0.695	m^2	7.48	sq ft

Vertical tail unit

• Height	1.08	m	3.54	ft
• VTU area	0.93	m^2	10.01	sq ft
• Rudder area	0.41	m^2	4.41	sq ft

Landing gear

• Wheel base	3.975	m	13.04	ft
• Wheel spacing	1.88	m	6.17	ft
• Main whel diam.	355	mm	13.98	in
• Tail whell diam.	200	mm	7.87	in

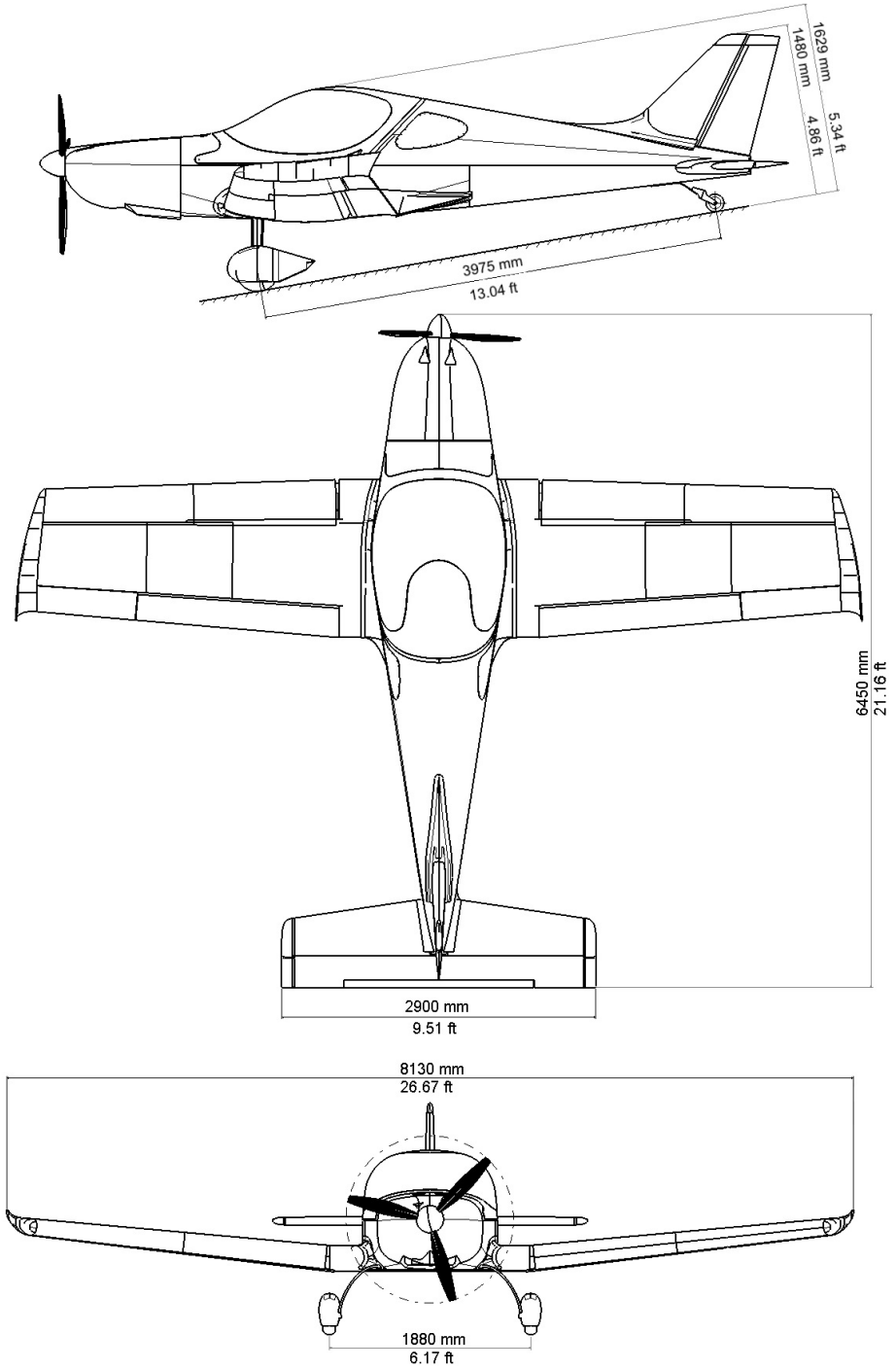

Fig. 1-1
Three-view drawing

1.3 Airplane manufacturer and type certificate holder

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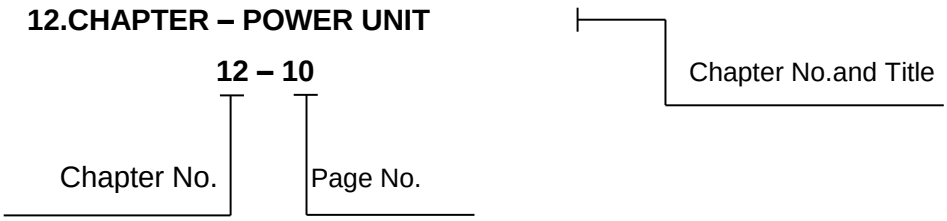
1.4 Chapter order

Chapters in this manual are ordered in ascending sequence from No. 1. Every chapter describes one system or assembly .

1.4.1 Page numbering

Example:



1.5 Warnings, Cautions, and Notes

WARNING
Means that non-observation of the corresponding operating instruction, inspection or maintenance procedure can lead to injury or death of persons.

CAUTION
Means that non-observation of the corresponding operating instruction, inspection or maintenance procedure can lead to damage or destruction of device.

NOTE
Means that the corresponding operating instruction, inspection or maintenance procedure is considered to be important.

1.6 Definitions and abbreviations

ACCU	Accumulator
ALT	Altimeter
ATC	Air Traffic Control
bar	pressure unit (1 bar = 14,5037 psi)
BEACON	anti-collision beacon
°C	temperature in degree of Celsius (1°C = (°F - 32) / 1,8)
CAS	Calibrated Airspeed
COMM	Communication transmitter
EFIS	Electronic Flight Instrument System
ELT	Emergency Locator Transmitter
EMS	Engine Monitoring System
°F	temperature in degree of Fahrenheit (1°F = (°C x 1.8) + 32)
ft	foot / feet (1 ft = 12 in = 0,3048 m = 304.,8 mm)
ft/min	vertical speed in feet per minute
GPS	Global Positioning System
hp	power unit (1 hp = 0.7457 kW)
HTU	Horizontal Tail Unit
IAS	Indicated Airspeed
IC	Intercom
IFR	Instrument Flight Rules
in	inch (1 in = 25.4 mm)
ISA	International Standard Atmosphere
KCAS	Calibrated Airspeed in Knots
kg	kilogram (1 kg = 2.2046 lb)
KIAS	Indicated Airspeed in Knots
km/h	speed in kilometer per hour
knot	speed in NM per hour
kW	power unit (1 kW = 1,341 hp)
l	liter (1 l = 0.22 UK gal = 0.264 US gal)
lb	pounds (1 lb = 0,4536 kg)
lbf	force unit (1 lbf = 4.45 N)
m	meter (1 m = 1000 mm = 3.28 ft = 39.37 in)
mm	milimetre (1 mm = 0,03937 in)
MAC	Mean Aerodynamic Chord
max.	maximum
min.	minimum or minute
mph	speed in statute miles per hour
N	Newton - force unit (1 N = 0.225 lbf)
NM	Nautical Mile (1 NM = 1852 m)
OAT	Outside Air Temperature
OFF	system is switched off or control element is in off-position

ON	system is switched on or control element is in on- position
POH	Pilot Operating Handbook
psi	pressure unit - pounds per square inch (1psi = 0.0689bar)
rpm	revolutions per minute
sec.	second
SM	Statute Mile (1SM = 1,609 m)
US gal	US gallon (1 US gal = 0.83 UK gal = 3.785 l)
V	Volt
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VSI	Vertical Speed Indicator
VTU	vertical tail unit
V_A	maneuvering airspeed
V_{FE}	maximum flap extended speed
V_{NE}	never exceed speed
V_{NO}	maximum structural cruising speed
V_{SO}	stall speed with wing flaps in extended position
V_{S1}	stall speed with wing flaps in retracted position
V_X	best angle of climb speed
V_Y	best rate of climb speed
XPDR	secondary radar transponder

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2. CHAPTER - LIMITATIONS / MAINTENANCE CHECKS

2.1 General 2-2

2.2 Airframe life limitation 2-2

2.3 Engine life limitation 2-2

2.3.1 Engine parts with limited life 2-2

2.4 Life limitation of other items 2-2

2.5 Ordering spare parts 2-3

2.6 Terms and list of aircraft regular maintenance works 2-3

2.6.1 General 2-3

2.6.2 Tables of inspection tasks 2-4

2.7 Lubrication plan 2-12

2.8 Maximum variation to inspection intervals 2-13

2.1 General

This chapter contains information about:

- airframe life limitations
- engine life limitations
- terms and list of aircraft regular maintenance works
- lubrication plan

2.2 Airframe life limitation

Initial airframe life is 5000 flight hours.

2.3 Engine life limitation

Time to overhaul of ROTAX 912 engine is 2000 flight hours or 12 years whichever is the sooner or with completed SB-912-057 2000 flight hours or 15 years whichever is the sooner. Jabiru recommend a TBO of 2000 hours for engines and a top end overhaul at 1000 hours interval or when engine condition indicates the need for overhaul earlier.

2.3.1 Engine parts with limited life

Cooling liquid must be exchanged every two years.
The following parts must be exchanged every 5 years:

- air-bleeding hoses of carburetors
- all rubber hoses of engine cooling system
- all rubber hoses of engine oil system
- carburetor flanges
- carburetor diaphragms
- rubber hoses of the compensation tube connecting carburetors
- fuel pump including fuel hoses

2.4 Life limitation of other items

The airplane is supplied with the documentation as obtained from the supliers/manufacturers of installed avionics, equipment, etc. Refer to this documentation for life limitation of installed avionics, equipment, etc.
Another source of information is internet. Visit web pages of manufacturers of installed installed avionics, equipment, etc. to get latest information, to download manuals (some manufacturers do not supply printed manuals), and to find information of life limitation if exist.

- Propeller
  General inspection of the Fiti Eco Competition 3LR 158 propeller is required after 2000 flight hours or 6 years. Refer to the Operating Instructions and Technical Descripiton of Fiti Eco Competition Ground adjustable two-and three-blade propeller more details.
- Ballistic recovery parachute (if installed)
  Refer to the documentation supplied with installed parachute. Usual interval is 5 to 6 years depending on parachute type/model.
- ELT battery (if ELT installed)
  Refer to the documentation supplied with installed ELT for battery replacement interval.
- Backup battery for EFIS (if installed).
  Refer to the documentation supplied with installed EFIS backup battery for battery replacement interval.

2.5 Ordering spare parts

Order spare parts through the Airplane Failures Card, see 17.4.

2.6 Terms and list of aircraft regular maintenance works

2.6.1 General

Maintenance system serves to maintain flight airworthiness of BRISTELL TDO airplane .
Maintenance system is composed of periodic inspections, which must be performed at least in the following intervals :

CAUTION

The intervals of engine inspections and the list of works are shown in Maintenance Manual (Line Maintenance) for installed engine. The intervals of propeller inspections and the list of works are shown in Technical description and operation instructions for the installed propeller. If the periodical inspection is performed before reaching the specified time interval, then the following inspection must be performed at the latest within the specified time interval from this inspection (e.g. if the first 100-hour inspection is performed after 87 flight hours then the following 100-hour inspection must be performed at the latest after 187 flight hours).

(a) preflight inspection is performed within the scope given in Flight Manual, section 4

(b) propeller inspection after first 5, 20 and 50 flight hours (see Operating Instructions and Technical description for FITI ECO COMPETITION Ground adjustable, two- and three-blade propellers).

NOTE

To be performed with a newly installed propeller or with the propeller that was dismantled and reinstalled on the airplane.

(c) Inspection after the first 25 flight hours - engine inspection.

CAUTION

Inspection after the first 25 flight hours to be performed with the new engine or with the engine after overhaul.

(d) Periodical inspection after 50 flight hours - inspection of engine and propeller, or follow Fiti Maintenance manual for 158/3R propeller.

(e) Periodical inspection after 100+5 flight hours - airframe and propeller inspections, engine inspection according to maintenance system, which is described in Maintenance Manual (Line Maintenance) for installed engine.

CAUTION

100-hour term can be exceeded max. by 5 hours providing that this exceeding will be just to finish flight which started before reacting 100-hour term or for flight with the purpose to reach a place where the inspection will be carried out. Operation time, which exceeded 100-hour interval, must be included as a time flown for determination of the next 100-hour inspection.

(f) Annual inspection contains works of 100-hour inspection and other specified works (inspections of airframe, engine and propeller).

2.6.2 Tables of inspection tasks

Tables of inspection tasks include the list of all works, which are performed during inspection. Number of chapter is indicated in the first column of this Maintenance Manual where you can also find more detailed information for performing individual works.
The description of works, which are performed during inspection, is indicated in the second column.

CAUTION
All defects found out during aircraft inspections must be eliminated !

PERIODICAL INSPECTION AFTER FIRST 25 FLIGHT HOURS

Aircraft S/N.: …… **Total flight hours:** ……

Registration mark: …… **No. of takeoffs:** ……

Chpt.	Prescribed works	Made by	Checked by
10	**Engine and propeller**		
	List of performed operations for engine is shown in Maintenance Manual (Line Maintenance) for installed engine		
	List of performed operations for propeller is shown FITI ECO COMPETITION Ground adjustable, two- and three-blade propellers.		
	Remove and check engine cowlings for evident signs of heat damage or cracks.		
	Inspect and check tightening and securing bolts on the engine brackets and the engine mount.		
	Check the engine mount for occurrence of cracks.		
	Check the exhaust system (and its attachment) for occurrence of cracks on the exhaust system and welds (see. 10.4.5).		
	Inspect and clean the fuel filter insert.		

Notes:

Date: ..... Signature: .....

PERIODICAL INSPECTION AFTER 50 FLIGHT HOURS

Aircraft S/N.: …… **Total flight hours:** ……

Registration mark: …… **No. of takeoffs:** ……

Chpt.	Prescribed works	Made by	Checked by
10	**Engine and propeller**		
	List of performed operations for the engine is shown in Maintenance Manual (Line Maintenance) for installed engine.		
	List of performed operations for propeller is shown FITI ECO COMPETITION Ground adjustable, two- and three-blade propellers.		
	Remove and check engine cowlings for evident signs of heat damage or cracks.		
	Inspect and check tightening and securing bolts on the engine mount and the engine brackets.		
	Check the engine mount for occurrence of cracks.		
	Check the exhaust system (and its attachment) for occurrence of cracks on the exhaust system and on welds (see 10.4.5).		
	Remove and clean or replace the fuel filter insert.		

Notes:

Date: ..... Signature: .....

ANNUAL PERIODICAL INSPECTION OR INSPECTION AFTER 100 FLIGHT HOURS

Aircraft S/N.: …… **Total flight hours:** ……

Registration mark: …… **No. of takeoffs:** ……

Type of inspection: ……

Chpt.	Prescribed works	Made by	Checked by
	AIRFRAME		
3	**Fuselage**		
	Visually check surface condition including fiberglass parts - loosened rivets, deformation, cracks and some other damage.		
	Check condition of fuselage-wing fairings.		
	Check condition and attachment of the tailskid.		
	Check condition and attachment of the canopy.		
	Check condition and functions of vents.		
	Check condition of the canopy locks.		
	Check condition and completeness of emergency equipment.		
	Check condition of rubber sealing of the cockpit.		
	Check condition of canopy struts.		
4	**Wing**		
	Visually check surface condition - loosened rivets, deformation, cracks and some other damage.		
	Check play in the wing attachments.		
	Check condition and attachment of the wing tips.		
	Check condition of the position lights.		
	Check conductive wing-fuselage connection.		
	Aileron		
	Visually check surface condition - loosened rivets, deformation, cracks and some other damage.		
	Check for free travel.		
	Check hinges.		
	Check for conductive connection and securing control links.		
	Flap		
	Visually check surface condition - loosened rivets, deformation, cracks and some other damage.		
	Check for free travel.		
	Check hinges.		
	Check condition of the control rods and servo		
	Check conductive connection.		
5	**Tail unit**		
	HTU		

ANNUAL PERIODICAL INSPECTION OR INSPECTION AFTER 100 FLIGHT HOURS

Chpt.	Prescribed works	Made by	Checked by
5	Check horizontal stabilizer attachment and securing.		
	Visually check surface condition - deformation, cracks and some other damage.		
	Check condition and attachment of the wing tips.		
	Check suspension and free travel of the elevator.		
	Visually check condition and suspension of the trim tab.		
	Visually check condition and securing of the elevator control pull rod and the trim tab control servo.		
	VTU		
	Visually check surface condition -loosened rivets, deformation, cracks and some other damage.		
	Check hang and securing of the rudder lower hinge.		
	Check for free travel of the rudder.		
	Check attachment and securing of rudder cables.		
	Check conductive connection.		
6	**Control**		
	Manual control		
	Check for free travel of control (see 6.4.2).		
	Check plays (see 6.4.1).		
	Check securing of links and conductive connection.		
	Check condition of the stops.		
	Foot control		
	Check free play of control (see 6.4.2).		
	Check plays (see 6.4.1).		
	Check securing of links and conductive connection.		
	Check condition of the stops on the control cables.		
	Check condition and tension of cables (see 6.4.5).		
	Flap control		
	Check for free travel of the control lever.		
	Check securing of links and conductive connection.		
	Check function of control servo.		
	Control of the elevator trim tab		
	Check the control servo.		
	Check plays (see 6.4.1).		
	Check securing of links and conductive connection.		
	Check trim tab neutral position adjustment.		
	Check trim tab position indicator.		
7	**Equipment**		
	Check completeness and validity of documentation.		
	Check general condition and attachment of the instrument panel.		

ANNUAL PERIODICAL INSPECTION OR INSPECTION AFTER 100 FLIGHT HOURS

Chpt.	Prescribed works	Made by	Checked by
7	Check condition and attachment of instruments.		
	Check function and condition of switches and circuit breakers.		
	Check function and condition of throttle controller, choke, Andair valve, heating and ventilation		
	Check condition of labels.		
	Check cleanness and condition of upholstering.		
	Check condition of seats.		
	Check condition, damage, function and attachment of safety harnesses.		
8	**Landing gear**		
	Main landing gear		
	Check condition of landing gear legs and attachment points.		
	Check lubrication and securing of movable links.		
	Check condition and attachment of wheel pants.		
	Check condition, wear and inflation of tires.		
	Check condition of the wheel disk for occurrence of cracks.		
	Check securing of bolts.		
	Check wheels for free rotation.		
	Check function of brakes and parking brake.		
	Check condition and attachment of brake hoses.		
	Check condition and wear of brake hoses (minimum admissible thickness of brake pad is 2 mm) and brake disk.		
	Check brake fluid leakage - brake fluid hoses, brake pumps, brake cylinders. Replenish brake fluid as needed (see 8.5.4).		
	Exchange brake fluid - **applied for annual inspection only** (see 8.5.4).		
	Tail wheel landing gear		
	Check condition and attachment of the tail wheeel landing gear to the fuselage.		
	Check condition and inflation of tire.		
	Check condition of wheel disk and for occurrence of cracks.		
	Check self locking nuts of the bolts.		
	Check wheel free rotation.		
	Check condition of tail wheel landing gear springs.		
9	**Fuel system**		
	Drain fuel tanks and gascolator (see 9.5.2)		
	Remove fuel filter inserted in gascolator and clean it.		

ANNUAL PERIODICAL INSPECTION OR INSPECTION AFTER 100 FLIGHT HOURS

Chpt.	Prescribed works	Made by	Checked by
9	Check condition and integrity of fuel pumps and hose sleeves in the engine compartment.		
	Visually check for fuel system tightness.		
	Check tightness and condition of fuel pump for occurrence of cracks on the pump body (see 9.4.2)		
10	**Engine and propeller**		
	List of performed operations for the engine according to engine maintenance system, which is contained in Maintenance Manual (Line Maintenance) for installed engine.		
	List of performed operations for the propeller is shown in Technical description and operation instructions for installed propeller.		
	Remove and check engine cowlings for evident signs of heat damage or cracks.		
	Inspect and check for tightening and securing the bolts on the engine brackets and the engine bed.		
	Check the engine bed for occurrence of cracks.		
	Check the exhaust system (and its attachment) for occurrence of cracks on the exhaust system and on welds (see 10.4.5)		
11	**Electrical system**		
	Check attachment and condition of battery.		
	Check level of battery charge.		
	Check condition and integrity of wiring.		
	Check condition and securing of plug/socket outlets.		
	Check condition of conductive connection.		
12	**Pitostatic system**		
	Check condition (at every second annual inspection) and pitot tube attachment.		
	Check cleanness of air inlet holes of pitot tube.		
	Check attachment and securing of hoses to the instruments.		
	Check function of the pitot tube.		
	Check for pitot-static system tightness (see 12.4.1)		
13	**Heating and ventilation system**		
	Check cleanness and passage of air inlet holes.		
	Check line and integrity of the heating and ventilation system hoses.		
	Check condition and attachment of the heat exchanger.		

ANNUAL PERIODICAL INSPECTION OR INSPECTION AFTER 100 FLIGHT HOURS

Chpt.	Prescribed works	Made by	Checked by
	Navigation/Communication		
	Visually check condition of navigation and communication instruments.		
	Check function of navigation and communication instruments - **applied for annual inspection only**		
	Check altimeter function - **applied for annual inspection only**		

Notes:

Date: ..... Signature: .....

2.7 Lubrication plan

Unit	Area of lubrication	After first 25 hours	Every 100 hours	Lubricant
Engine	Throttle control cable on the inlet into terminal (in the engine compartment).	X	X	Engine oil
	Choke control cable on the inlet into terminal (in the engine compartment).	X	X	Engine oil
Tail wheel landing gear	Grease-cup at wheel fork vertical axle.	X	X	Lubrication Grease
Main landing gear	Brake pad pins.	X	X	Lubrication Grease
Ailerons	Hinges.	X	X	Lubrication Grease
	Rod end bearings of the control tubes.	X	X	Lubrication Grease
	Two-arm control lever in the outer wing and control lever in the center wing.	X	X	Lubrication Grease
	Torque tube bearings in center console in fuselage.	X	X	Lubrication Grease
Flaps	Hinges.	X	X	Lubrication Grease
	Rod end bearings on actuator.	X	X	Lubrication Grease
HTU	Elevator hinges.	X	X	Lubrication Grease
	Rod end bearing of the elevator control tubes.	X	X	Lubrication Grease
VTU	Rudder hinges.	X	X	Lubrication Grease
	Cable shackles on the rudder control cables.	X	X	Lubrication Grease
Trim tab	Tab hinges.	X	X	Engine oil
Manual control	All movable links in the cockpit.	X	X	Lubrication Grease
Foot control	All movable links in the cockpit.	X	X	Lubrication Grease
	Cable shackles of rudder control.	X	X	Lubrication Grease

2.8 Maximum variation to inspection intervals

Items Controlled by Flying Hours.	Maximum Variation
5,000 flying hours or less	10%
More than 5,000 flying hours	500 flying hours
Items Controlled by Calendar Time	**Maximum variation**
1 year or less	10% or 1 month, whichever is the lesser
More than 1 year but not exceeding 3 years	2 months
More than 3 years	3 months
Items Controlled by Landing/Cycles	**Maximum Variation**
500 landings / cycles or less	10% or 25 landings / cycles whichever is the lesser
More than 500 landings / cycles	10% or 500 landings / cycles whichever is the lesser
Items Controlled by More Than One Limit	
For items controlled by more than one limit, e.g. items controlled by flying hours and calendar time or flying hours and landings/cycles, the more restrictive limit shall be applied.	

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3. CHAPTER - FUSELAGE

3.1 General 3-2

3.2 Description and operation 3-2

3.2.1 Front part of the fuselage 3-2

3.2.2 Rear part of the fuselage 3-2

3.2.3 Cockpit 3-4

3.2.4 Luggage compartment 3-4

3.2.5 Crew canopy 3-4

3.2.5.1 Canopy 3-4

3.2.5.2 Rear fixed canopy windows 3-4

3.3 Removal / Installation 3-5

3.3.1 Canopy removal 3-5

3.3.2 Canopy installation 3-6

3.3.3 Strut rempoval 3-6

3.3.4 Strut installation 3-7

3.3.5 Removal of canopy lock 3-8

3.3.6 Canopy lock installation 3-9

3.4 Check / Adjustment 3-9

3.1 General

BRISTELL TDO fuselage is a semimonocoque structure formed by stiffeners and aluminum sheets. The fuselage consists of the front part with the cockpit and the rear part, the integral part of which is the fin.

This chapter describes the following:

- front part of the fuselage
- rear part of the fuselage
- cockpit (crew compartment)
- luggage compartment
- cockpit canopy

3.2 Description and operation

3.2.1 Front part of the fuselage

The front part of the fuselage consists of bulkheads No.1 to 7 (see Fig. 3-1). Cockpit with adjustable seats is located between bulkheads No.1 and 7. The luggage compartment is located behind the seats. Center section of wing (2) consists from the main spar attachments located as bulkheads No.3 and the rear spar attachments located on the bulkhead No.5, main landing gear attachment points (3) are located behind main center wing spar, top engine mount attachment points (4) are located on the cross channel behind bulkhead No.1, bottom attachment points are located on the cockpit floor and connected with reinforcement channels under the floor.

3.2.2 Rear part of the fuselage

The rear part of fuselage is located between bulkheads No.8 and No.14 (see Fig. 3-1). It is a semimonocoque structure formed by stiffeners and aluminum skins. The rear part of fuselage is of elliptic section covered by aluminum sheets. The fin with rudder attachments (5) and stabilizer attachments (6) is an integral part of the rear part of the fuselage. The bulkheads No.13 and 14 form the stabilizer attachment points. The tail wheel landing gear is attached to the rear part of fuselage.

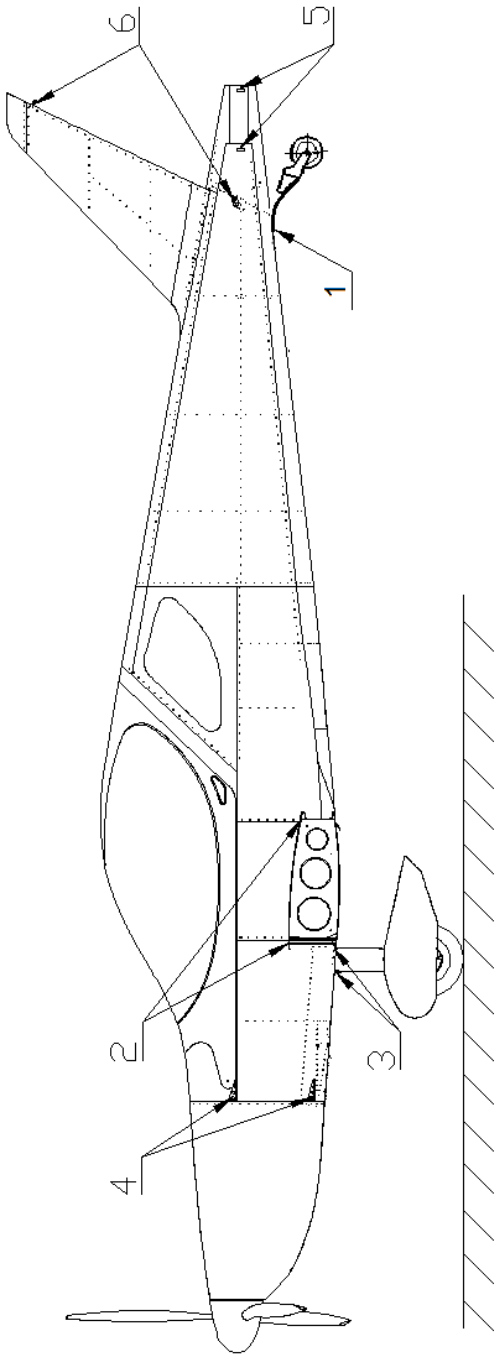

Fig. 3-1
Fuselage monocoque

1 - Tail wheel land.gear attachment
2 – Center section of wing
3 - Main landing gear attachments
4 - Engine mount attachments
5 - Stabilizer attachments
6 - Rudder attachments

3.2.3 Cockpit

The cockpit (see Fig. 3-1) is located in the front part of the fuselage between the bulkheads No.1 and 5. The instrument panel is located on the bulkhead No.2. In the middle of the cockpit there is a middle console with control elements. The cockpit is equipped with two adjustable seats..

3.2.4 Luggage compartment

Luggage compartment is located between the seats and the bulkhead No.7. Max. luggage weight transported in the luggage compartment is 15 kg (33 lbs.).

3.2.5 Crew canopy

The crew canopy consists from fixed frame and opening canopy bubble.

3.2.5.1 Canopy

The canopy (see Fig. 3-2) has a semidrop shape and enables access to the cockpit. The canopy consists of carbon frame on which the windscreen is attached. The canopy is suspended in two swivel hinges on front sides of the composite fixed frame. The canopy can be opened forward and is lightened by a gas strut each side which keep it in the opened position. The canopy lock is placed on the left side of fuselage below the cockpit frame. The locking levers are installed inside the fixed frame. The opening lever (in cockpit) is placed on a console between seats.

3.2.5.2 Rear fixed canopy windows

The rear fixed canopy windows (see Fig. 3-2) consists from two symmetrical windows (6) riveted and glued on the fuselage side skins.

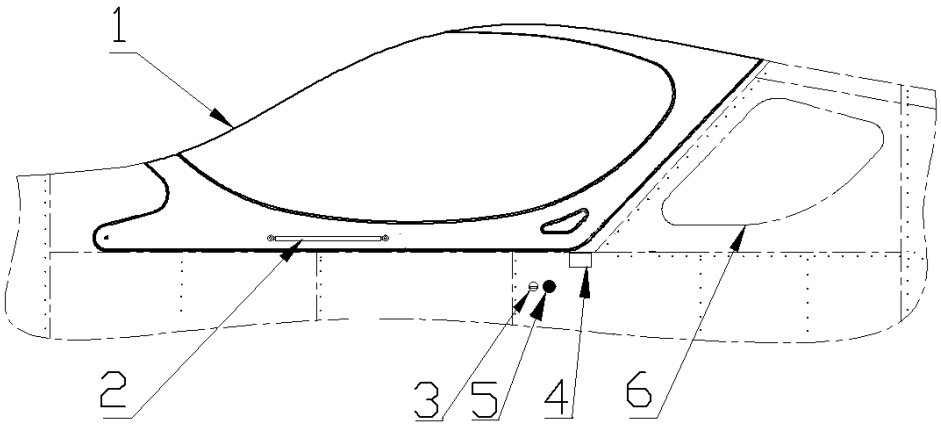

Fig. 3-2
Canopy, rear windows

1 - Canopy
2 – Gas strut
3 – Canopy key lock
4 - Canopy lock (left and right)
5 - Outside button to unlock canopy
6 - Canopy rear window

3.3 Removal / Installation

3.3.1 Canopy removal

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- socket wrench 7/16”
- screwdriver
- pliers

Follow the Fig. 3-3 at removing of the canopy :

(a) Open the canopy (1).
(b) Remove securing springs from the gas strut rod ends (2)
(c) Disconnect gas struts (3) on both sides of canopy (1).
(d) Disconnect hinge bolt nuts (4).
(e) Remove the hinge bolts (5).
(f) Remove the canopy (1) and store it in a safe place so that windscreen damage cannot occur .

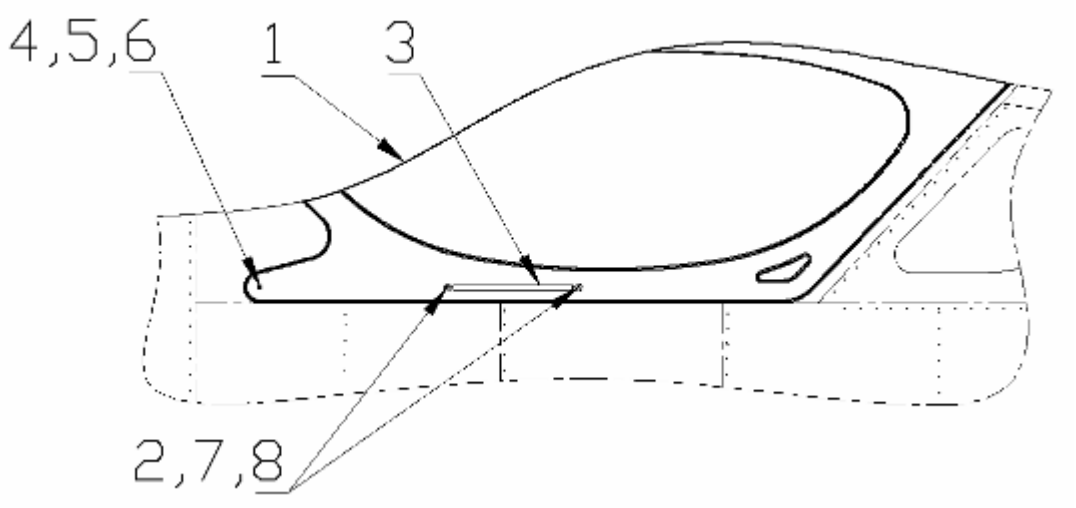

Fig. 3-3
Removal of the foldable canopy

1 - Canopy
2 – Gas strut rod end
3 – Gas strut
4 – Hinge bolt nut
5 - Hinge bolt with bushing and washer
6 - Canopy hinge
7 - Gas strut ball joint
8 - Securing spring

3.3.2 Canopy installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- socket wrench 7/16”
- screwdriver
- pliers

At installation of the canopy, follow the Fig. 3-3:

(a) Set the canopy on the airplane fuselage.

(b) Insert the bolts and the nuts into the hinges (6) of the canopy (1). Tighten up the joint .

(c) Insert ends of gas strut in to the pin (7) in the fix frame of the canopy and on the foldable frame, secure it with the securing spring (8).

3.3.3 Strut rempoval

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver
- pliers

At removing of the gas strut, follow the Fig. 3-3:

(a) Open the canopy and fix it against closing after gas strut removal.

(b) Remove the securing spring (8) from the gas strut pin (7) on foldable canopy frame and on the fixed frame.

(c) Remove the gas strut. Beware of canopy closing!

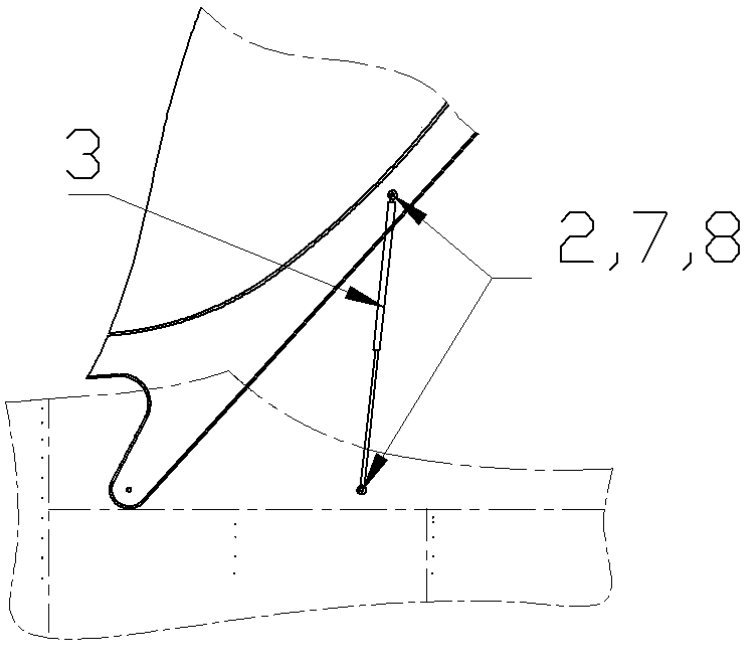

Fig. 3-4
Removal of the gas strut

2 - Gas strut rod end
2 - Gas strut
7 - Gas strut ball joint
8 - Securing spring

3.3.4 Strut installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- pliers

At installation of the gas strut follow Fig. 3-3 and Fig. 3-4:

(a) Inspect the strut whether it is not damaged.

(b) Insert top rod end on the gas strut pin (7), bottom rod end on the pin on the fixed frame and secure it with securing springs (8).

3.3.5 Removal of canopy lock

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- Allen wrenches

Follow the Fig. 3-5 and Fig. 3-6 when demounting canopy lock:

(a) Remove from the cockpit a backrest from that seat on which side you intend to replace the lock (there are two locks of the canopy, on the left, and on the right side). There is a covered access hole behind the seat.

(b) Demount the access hole cover (3) – use allen wrench to unscrew the screws (4), which attach the cover to a composite structure behind the seats.

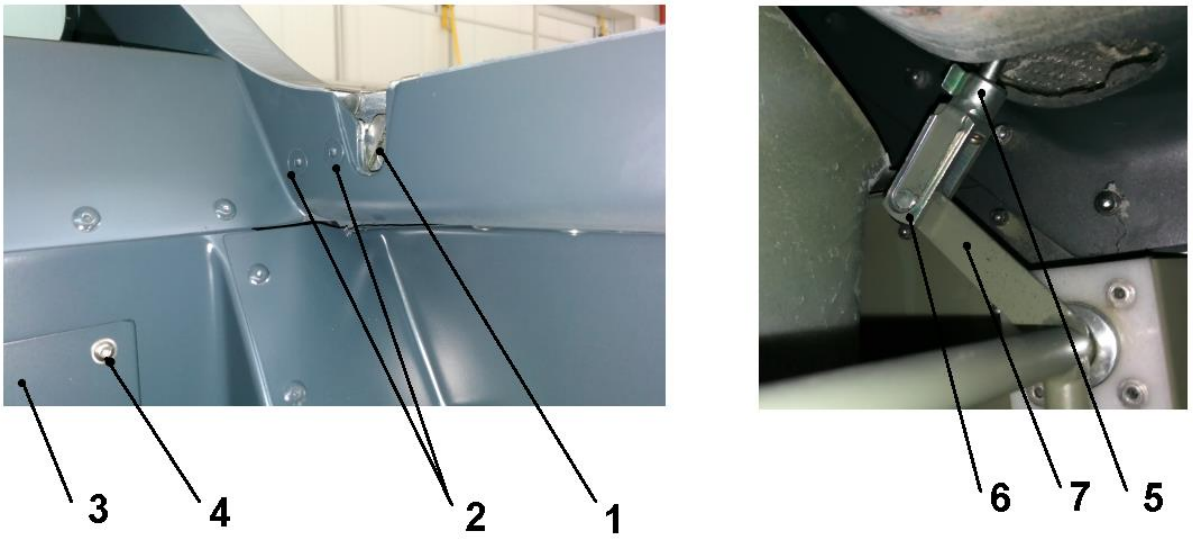

Fig. 3-5
Canopy lock (left)

1 - Canopy lock (left)
2 - Lock screws
3 - Cover behind seat backrest
4 - Cover screws
5 - Rod pin safety spring
6 - Lock rod fork
7 - Lever

(c) Put your hand inside the access hole and release spring of the rod pin (5). Turn the spring to remove the pin. This will disconnect rod (6) from lever (7).

(d) Use allen wrench to unscrew two screws (2), which fix the lock mechanism to the fuselage side.

(e) Remove the lock mechanism through a cutout from behind the luggage compartment.

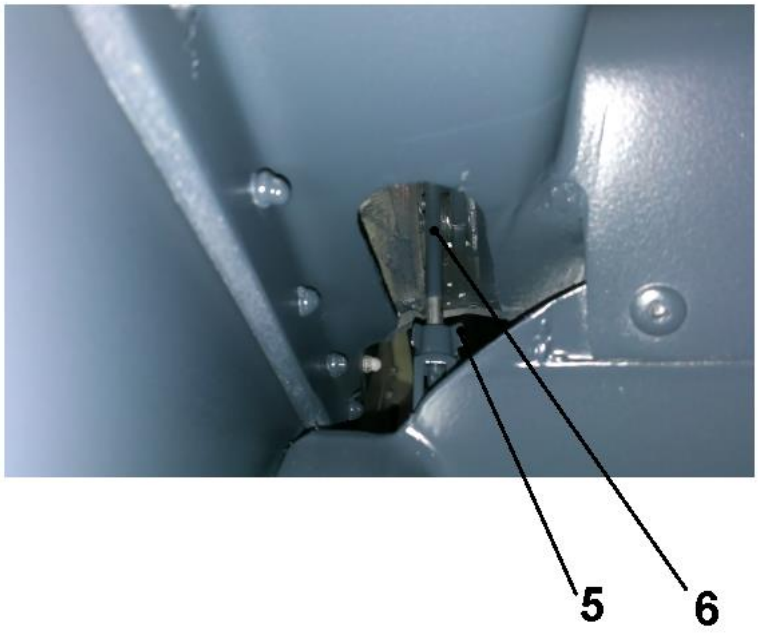

Fig. 3-6
Canopy lock rod (a rear view through a cutout in the luggage compartment)
5 - Rod pin safety spring 6 - Lock rod

3.3.6 Canopy lock installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver

Follow the Fig. 3-5 and Fig. 3-6 at installation of the canopy lock:

(a) Insert the lock (1) with rod (6) from behind through a cutout in the luggage compartment front at the fuselage side .
(b) Connect the rod (6) using pin safety spring (5) with the lever (7) .
(c) Screw the lock to the fuselage side using two hexagon socket-head bolts (2)
(d) Check lock mechanism function – press outside button which should unlock the mechanism
(e) Re-install the access hole cover (3) and screw down the attachment screws (4).

3.4 Check / Adjustment

No procedures included.

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4. CHAPTER - WING

4.1 General 4-2

4.2 Description and operation 4-2

4.2.1 Wing 4-2
4.2.2 Wing flaps 4-3
4.2.3 Ailerons 4-3
4.2.4 Fuel tanks 4-4
4.2.5 Wing lockers 4-4

4.3 Removal / Installation 4-4

4.3.1 Wing removal 4-4
4.3.2 Wing installation 4-5
4.3.3 Wing flap removal 4-6
4.3.4 Wing flap installation 4-6
4.3.5 Aileron removal 4-7
4.3.6 Aileron installation 4-7

4.4 Check / Adjustment 4-7

4.5 Exchanges / Service information 4-7

4.1 General

BRISTELL TDO wing is an aluminum structure and is equipped with flaps, ailerons and fuel tanks .

This chapter describes the structure of:

- wings
- wing flaps
- ailerons
- fuel tanks

4.2 Description and operation

4.2.1 Wing

The wing of the airplane is formed from center section of wing made as main and rear spar, which is integrated part of fuselage (Fig. 3-1), and from outer wings placed between ribs No.4 and 12, which have trapezoid shape (Fig. 4-1). The wing is of all-metal main spar structure with a rear spar. In the outer wings are installed between ribs No.5 and 7 leading edge fuel tanks (1), on the rear spar there are hinged ailerons (2) and flaps (3). The winglets (4), produced from fibreglass, are riveted on the wing ribs No.12. On winglets are installed the position lights and anticollision beacons (5). The outer wing is attached to the center section by means of three main attachments (6) (positioned on the main spar) and the rear attachment (7) (positioned on the rear spar). The aileron control push rods are lead between the spars. The aileron trim tab (8) is installed on the left aileron. The trim tab actuator is installed inside of left aileron. The flap control actuator is installed in the fuselage between the seats under the glove box.

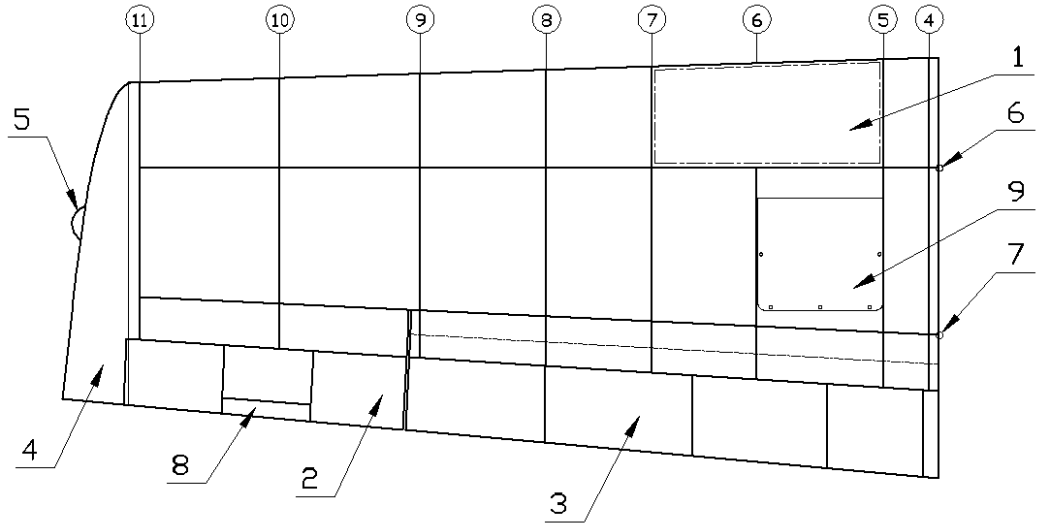

Fig. 4-1
Wing (left)

1 - Fuel tank
2 - Aileron
3 - Flap
4 - Winglet
5 - Position/strobe light
6 - Main upper and lower attachments of the wing
7 - Rear attachment of the wing
8 - Aileron trim tab
9 – Wing locker

4.2.2 Wing flaps

Flaps (Fig. 4-2) are of all-metal structure consisting of the skin (1) aluminum sheet metal, spar (2) and ribs (3) which are connected by means of riveting. Flaps are suspended on the rear spar by means of three hinges (4). There is a control plate (5) on flap root rib where is the flap control pin connected.

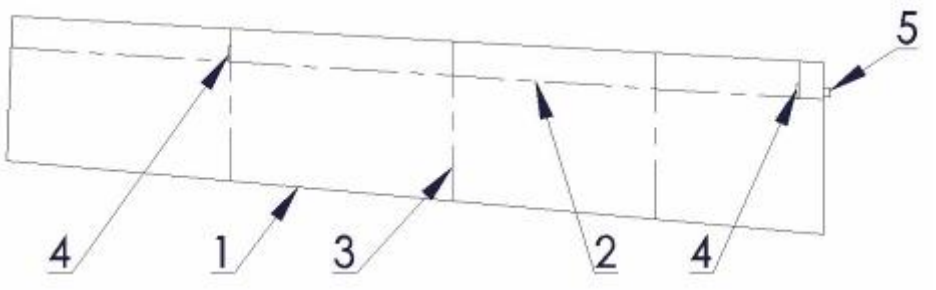

Fig. 4-2
Wing flap (left)

1 – Flap skin
2 – Flap spar
3 – Flap ribs
4 – Flap hinges
5 – Control pin

4.2.3 Ailerons

Ailerons (Fig. 4-3) are of aluminum structure consisting of the aluminum skin (1) and ribs (2) which are connected by means of riveting. Ailerons are suspended on the rear spar by means of piano hinges (3). Moreover the trim tab (4) is installed on the left aileron serving the lateral balance of airplane. Control lever (5) is installed on the root aileron rib.

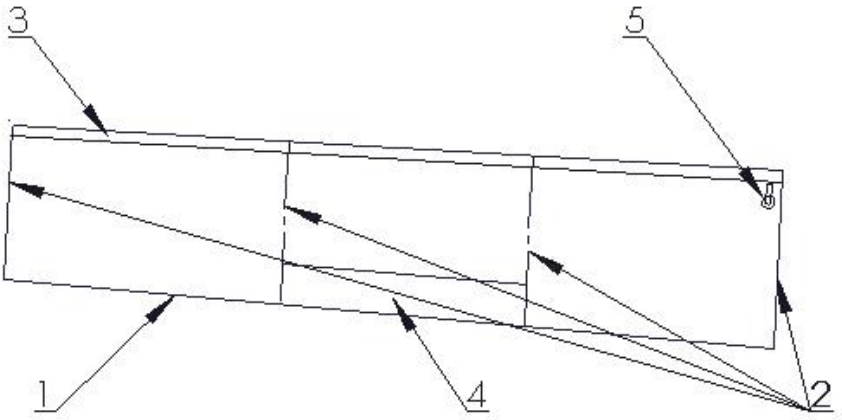

Fig. 4-3
Aileron (left)

1 – Aileron skin
2 – Aileron ribs
3 – Aileron piano hinge
4 – Aileron trim tab
5 - Aileron control lever

4.2.4 Fuel tanks

Fuel tanks (Fig. 4-4) are of integrated all-metal structure consisting of aluminum sheet metal skin (1) and four ribs (2). There are on each tank filler neck (3), fuel level sender (4), ventilating tube (5), finger screen (6) and drain valve (7).

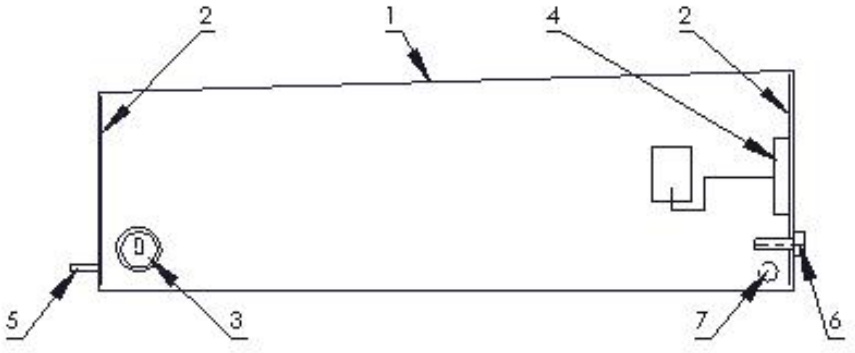

Fig. 4-4
Fuel tank (left)

4.2.5 Wing lockers

Wings are equiped optionaly with wing lockers (9) (Fig. 4-1) placed between ribs No.5 and 6 behind main spar. Capacity of each wing locker is 20 kg (44 lbs). Access doors installed on two hinges are locked per lock with two pins.

4.3 Removal / Installation

4.3.1 Wing removal

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/8 in, 3/4 in, 1/2 in, 7/16 in
- screwdriver
- cutting pliers
- hammer

Removal of the wing according to the following procedure:

(a) Remove the access cover plates between outer and center wing.

(b) Disconnect whole 3 nuts from the attachment bolts on the main spar and remove one bottom attachment bolt.

(c) Disconnect aileron control push rod on the control lever between ribs No.3 and No.4

(d) Extend the flaps to 35 degree and disconnect rear attachment bolts on rear spar and flap control push rods.

(e) The first person will hold the wing on the wing tip,

(f) One person hold the wing on the winglet side, the second person by the root on the leading edge side remove first bottom attachment bolt from the main spar, the third person hold the wing by the root on the trailing edge.

(g) One person hold the wing on the winglet side, the second person by the root on the leading edge side and remove top attachment bolt from the main spar, the third person hold the wing by the root on the trailing edge.

(h) Move the wing about 4 in out from the fuselage and disconnect fuel lines, cable plugs, sockets of electrical systems and on left wing also pitot tube and trim tab wire.

(i) Release the wing by slight lifting the wing tip upwards.

(j) By pulling the wing in direction from the fuselage, disconnect the outer wing from the center wing.

(k) Position the disconnected wing in such a way that its damaging cannot occur .

4.3.2 Wing installation

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/8 in, 3/4 in, 1/2 in, 7/16 in
- screwdriver
- pliers
- hammer

Install the wing according to the following procedure:

(a) Before installation clean the attachments and bolts of the outer and center wing from dirt. Preserve bolts and attachments by means of lubricating grease.

(b) Set the wing about 4 in to the fuselage side. The first person will hold the wing on the wing tip, the second person near the root on the leading edge and the third person near the root on the trailing edge.

(c) Connect wiring.

(d) Connect fuel hoses, trim tab wire and pitot hose on the left wing.

(e) Set the outer wing carefully with the wing attachments on the center wing so that the attachments on the outer wing and on the center wing are centric.

(f) The person keeping the wing on the leading edge will insert the first bolt into the upper main attachment (the bolt head is oposite to flight direction) and shift it by means of slight hammering to the stop (shifting can be facilitated by slight moving the wing tip up and down). Then insert the bolts into the lower main attachment and shift them by slight hammering to the stop.

(g) Insert the bolt into the rear attachment of the wing and screw it to the stop.

(h) Put the washers on all of 3 main attachment bolts of the wing and screw the nuts on them.

(i) Connect the aileron control push rod on control lever between the ribs No.3 and No.4.

(j) Connect flap control push rods.

(k) Perform check the trim tab operation, flaps and ailerons deflections (viz 6.4.3.1), possibly adjusting of theirs deflections (see 6.4.4.1).

4.3.3 Wing flap removal

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 7/16 in

Removal of the wing flap according to the following procedure:

(a) Open the flap in full position.
(b) Disconnect control push rod on the flap side
(c) Disconnect all three flap hinges.
(d) Remove the flap from the wing.
(e) Store the removed flap on a safe place and prevent it from damage.

4.3.4 Wing flap installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 7/16“

Install the wing flap according to the following procedure:

(a) Set the flap in to the hinges.
(b) Insert the bolts in to the hinges and screw the nuts on them.
(c) Connect control push rod.
(d) Close the flap in the zero (up) position.
(e) Perform check the wing flaps operation and their deflections (see 6.4.3.2).

4.3.5 Aileron removal

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in
- cutting pliers

Removal of the aileron according to the following procedure:

(a) Disconnect the control rod with control lever.
(b) Remove the cover (1) from the hole (2) for access to trim tab actuator (6) on left aileron (see Fig. 6-8).
(c) Disconnect (on right aileron) trim tab actuator wires (3) (Fig. 6-8).
(d) Remove piano hinge pin.
(e) Remove the aileron from the wing.
(f) Store the removed aileron on a safe place so that it cannot be damaged.

4.3.6 Aileron installation

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in
- pliers

Install the wing flap according to the following procedure:

(a) Set the aileron on the wing in to the piano hinge.
(b) Insert trim tab actuator wires (3) (see Fig. 6-8) going out from wing to the aileron.
(c) Insert piano hinge pin.
(d) Connect the control rod with aileron control lever.
(e) Connect trim tab actuator wires (3) on the left aileron (see Fig. 6-8).
(f) Close the access hole (2) with cover.
(g) Perform check of the trim tab operation (see 6.4.3.5), check aileron deflection (see 6.4.3.1), adjust if needed (see 6.4.4.1).

4.4 Check / Adjustment

No procedures included.

4.5 Exchanges / Service information

No procedures included.

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5. CHAPTER – TAIL UNIT

5.1 General 5-2

5.2 Description and operation 5-2

5.2.1 Horizontal stabilizer 5-2
5.2.2 Elevator with trim tab 5-2
5.2.3 Fin 5-3
5.2.4 Rudder 5-3

5.3 Removal / Installation 5-4

5.3.1 Horizontal stabilizer removal 5-4
5.3.2 Horizontal stabilizer installation 5-4
5.3.3 Elevator removal 5-5
5.3.4 Elevator assembly 5-5
5.3.5 Trim tab removal 5-5
5.3.6 Trim tab installation 5-6
5.3.7 Rudder removal 5-6
5.3.8 Rudder installation 5-6

5.4 Check / Adjustment 5-7

5.5 Exchanges / Service information 5-8

5.1 General

The BRISTELL TDO tail unit is of mixed structure and is composed of:

- All metal horizontal stabilizer
- Metal elevator with trim tab
- Metal fin surface
- Carbon rudder

5.2 Description and operation

5.2.1 Horizontal stabilizer

Horizontal stabilizer (1) (see Fig. 5-1) is of the all-metal structure consisting from two aluminum spars, eight ribs and aluminum skins. The elevator is attached to the rear spar by means of piano hinge (4). The horizontal stabilizer is mounted on the fuselage by means of front and rear attachments (5) (see Fig. 5-1). The front attachments consist of two pins, which are riveted on bulkhead No. 13 and bushings riveted on front stabilizer spar. The rear attachments consist of four hinges bolted on top and bottom part of bulkhead No. 14 and riveted on rear stabilizer spar.

5.2.2 Elevator with trim tab

Elevator (2) (see Fig. 5-1) is all-metal structure and consists from aluminum skin and ribs. Individual parts are assembled by riveting. Control lever is riveted between middle elevator ribs. Fiberglass elevator tips (5) are riveted at the both elevator ends. The elevator is equipped with the trim tab (3), which is hinged by means of the piano hinge on the rear spar close to the trailing edge of the elevator. The trim tab is made from aluminum sheet.

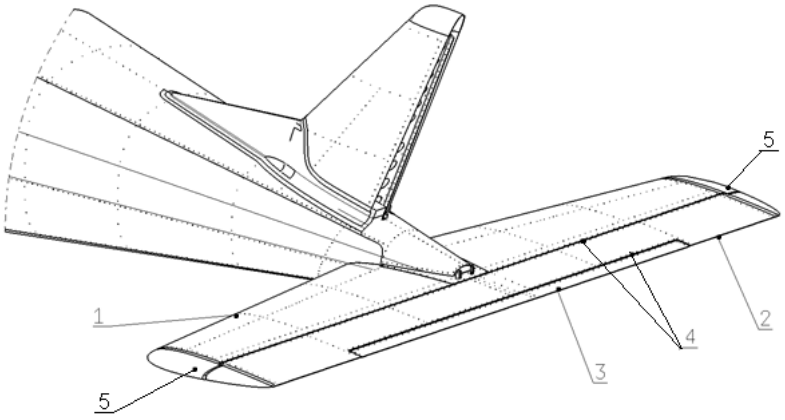

Fig. 5-1
Horizontal stabilizer with elevator

1 - Horizontal stabilizer
2 - Elevator
3 - Trim tab
4 - Piano hinge
5 - Fiberglass tips

5.2.3 Fin

Vertical fin (1) is an aluminum structure and is an integral part with rear part of fuselage. Fin consists of stiffeners, spar, ribs and aluminum skin. Individual parts are assembled by riveting. Fin tip is made from fibreglass. On the spar are two rudder hinges, bottom one (3) which is integral part of control lever and upper one (4).

5.2.4 Rudder

Rudder (2) is a fiberglass sandwich structure and consists of spar, ribs and sandwich skin. Individual parts are glued together by resin. Bottom attachment is glued on root rudder rib. Top attachment (4) is located on the spar.

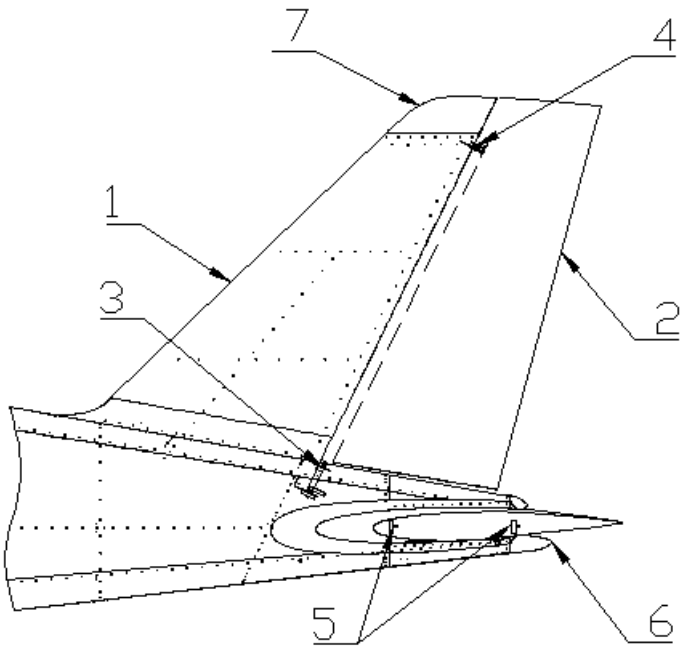

Fig. 5-2
Fin with rudder

1 - Fin
2 - Rudder
3 - Bottom rudder hinge
4 - Upper rudder hinge
5 - Stabilizer attachments
6 - Fibreglass cover
7 - Fin tip

5.3 Removal / Installation

5.3.1 Horizontal stabilizer removal

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 3/8 in, 7/16 in
- screwdriver
- wire nippers

(a) Remove the screws from top and bottom side of composite cover between fuselage and stabilizer.
(b) Remove bolts connecting rear side attachments on the bulkhead No. 14.
(c) Disconnect trim tab actuator wires (3) (see Fig. 6-8) located between stabilizer and fuselage.
(d) Remove fibreglass covers (6) (see Fig. 5-2).
(e) Disconnect elevator control rod end.
(f) Pul out the stabilizer in horizontal direction of the attachments and store it in such a way that a damage cannot occur.

5.3.2 Horizontal stabilizer installation

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 3/8 in, 7/16 in
- screwdriver
- pliers

(a) Clean attachments on the fuselage and apply lubricant grease on it.
(b) Put the horizontal stabilizer from behind to the fuselage so that it slides on two pins on bulkhead No. 13 and in the rear part on four bolts.
(c) Connect the trim tab actuator wires (3) (see Fig. 6-8) located between the stabilizer and fuselage.
(d) Put washers on bolts and screw the nuts.
(e) Connect the elevator control rod with the control lever.
(f) Install the fibreglass covers (6) on bulkhead No.14 (see Fig. 5-2).
(g) Screw back the screws on top and bottom side of fibreglass cover between fuselage and stabilizer.
(h) Perform check the trim tab operation and elevator deflections (see 6.4.3.3), possibly adjusting of elevator deflections (see 6.4.4.3).

5.3.3 Elevator removal

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in
- wire nippers

(a) Remove the cover (1) from the access hole (2) (see Fig. 6-8).
(b) Disconnect the trim tab actuator wires (3).
(c) Remove the fibreglaas cover (6) (see Fig. 5-2).
(d) Disconnect the elevator control rod.
(e) Disconnect piano hinge (4) (see Fig. 5-1).
(f) Remove the elevator from the stabilizer.
(g) Store the elevator so that its damage cannot occur.

5.3.4 Elevator assembly

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in
- pliers

(a) Put the elevator in the piano hinge on the stabilizer.
(b) Insert the trim tab actuator wires (3) (see Fig. 6-8) going from the stabilizer to the elevator.
(c) Insert pin in piano hinge (4) (see Fig. 5-1).
(d) Connect elevator control rod with control lever.
(e) Connect the trim tab actuator wires (3).
(f) Install the fibreglass covers (6) (see Fig. 5-2).
(g) Perform check the trim tab operation and elevator deflections (see 6.4.3.3), possibly adjusting of elevator deflections (see 6.4.4.3).

5.3.5 Trim tab removal

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- pliers, wire nippers
- electric drill, drill bit diam. 3.2 mm (1/8 in)

(a) Disconnect control rod end from the trim tab.
(b) Drill out the rivets conecting the piano hinge with elevator.
(c) Remove the trim tab with piano hinge from elevator .

5.3.6 Trim tab installation

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- pliers, wire nippers
- riveting pliers

(a) Insert the trim tab with piano hinge into the elevator.
(b) Rivet piano hinge into the elevator.
(c) Check for free rotation of the trim tab.
(d) Connect control rod end to the trim tab lever. Secure the pins with cotter pin. At installation follow instructions in para 6.3.1.
(e) Perform check (see 6.4.3.5), adjuts trim tab deflections if needed (see 6.4.4.5).

5.3.7 Rudder removal

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 3/8 in, 7/16 in

(a) Remove horizontal stabilizer (see 5.3.1).
(b) Remove the nuts from bolts on both hinges of the rudder .
(c) Remove top bolt from the hinge and lift the rudder from lower hinge.
(d) Remove the rudder and store it in such a way that the damage cannot occur.

5.3.8 Rudder installation

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 3/8 in, 7/16 in

(a) Inspect the attachments on the rudder, clean them and apply lubricant grease on them. Do the same for the attachments on the fin .
(b) Set the rudder to the hinges on the fin .
(c) Put the bolt on top hinge and screw the nut .
(d) Connect bottom hinge to the rudder control lever .
(e) Perform check (see 6.4.3.4), and adjustment of deflections if needed (see 6.4.4.4).
(f) Install horizontal stabilizer (see 5.3.2).

5.4 Check / Adjustment

No procedures included .

5.5 Exchanges / Service information

No procedures included

6. CHAPTER - CONTROLS

6.1 General 6-3

6.2 Description and operation 6-3

6.2.1 Lateral control (aileron control) 6-3

6.2.2 Longitudinal control (elevator control) 6-4

6.2.3 Directional control (rudder control) 6-4

6.2.4 Elevator trim tab control 6-5

6.2.5 Wing flap control 6-5

6.3 Removal / Installation 6-6

6.3.1 General principles for work on control system 6-6

6.3.1.1 Push-pull rod adjustment 6-6

6.3.1.2 Orientation of bolts and cotter pins 6-6

6.3.1.3 Lubrication 6-6

6.3.2 Control sticks removal 6-6

6.3.3 Control sticks installation 6-7

6.3.4 Removal of wing flap control actuator 6-8

6.3.5 Installation of wing flap control actuator 6-8

6.3.6 Removal of the trim tab control actuator 6-9

6.3.7 Installation of the trim tab control actuator 6-9

6.3.8 Removal of aileron control lever behind main center wing spar 6-10

6.3.9 Installation of aileron control lever behind main center wing spar .. 6-10

6.3.10 Removal of aileron control bellcrank in the wing 6-11

6.3.11 Installation of aileron control bellcrank in the wing 6-12

6.3.12 Removal of bail arm under the luggage compartment 6-12

6.3.13 Installation of bail arm under the luggage compartment 6-13

6.3.14 Removal of bail arm in rear fuselage 6-14

6.3.15 Installation of bail arm in rear fuselage 6-15

6.4 Check / Adjustment 6-15

6.4.1 Check of plays in control 6-15

6.4.1.1 Measuring procedure 6-15

6.4.1.2 Longitudinal control 6-16

6.4.1.3 Lateral control 6-16

6.4.1.4 Plays in foot control pedals 6-16

6.4.1.5 Play in trim tab control 6-16

6.4.1.6 Play in wing flap control 6-16

6.4.2 Check for friction in control system 6-16

6.4.2.1 Friction in the longitudinal control system 6-17

6.4.2.2 Friction in lateral control system 6-17

6.4.2.3 Friction in directional control system 6-17

6.4.3 Checking control surface deflections 6-17

6.4.3.1 Measuring aileron deflections 6-17

6.4.3.2 Measuring wing flap deflections 6-18

6.4.3.3 Measuring elevator deflections 6-18
6.4.3.4 Measuring rudder deflections 6-18
6.4.3.5 Measuring trim tab deflections 6-18
6.4.4 Adjustment of control surface deflections 6-18
6.4.4.1 Adjusting aileron deflections 6-19
6.4.4.2 Adjusting wing flap deflections 6-19
6.4.4.3 Adjusting elevator deflections 6-19
6.4.4.4 Adjusting rudder deflections 6-19
6.4.4.5 Adjusting trim tab deflections 6-19
6.4.5 Checking condition and tension of rudder control cables 6-19
6.5 Exchanges / Service information 6-20
6.5.1 Exchange of rudder control cable 6-20

6.1 General

BRISTELL TDO airplane is equipped with dual controls which enables pilot training. Airplane control includes:

- lateral control (aileron control)
- longitudinal control (elevator control)
- directional control (rudder control)
- aileron trim tab control
- elevator trim tab control
- wing flap control

6.2 Description and operation

6.2.1 Lateral control (aileron control)

Ailerons are controlled by control sticks. Movement of control sticks is synchronized by push rod lead between them inside of torque tube. From control sticks lead two push rods installed behind main wing spar. This two push rods lead to the control levers installed on the main center wing spar. Deflection from the control lever is transferred by means of the push rods to the bellcrank installed on main wing spar next to rib No. 9 in outer wing. Bellcrank is connected per push rod with aileron control lever. Push rods have adjustable terminals with spherical bearings on the ends enabling aileron deflection adjustment. Lateral control stops are located on the torque tube in the cockpit.

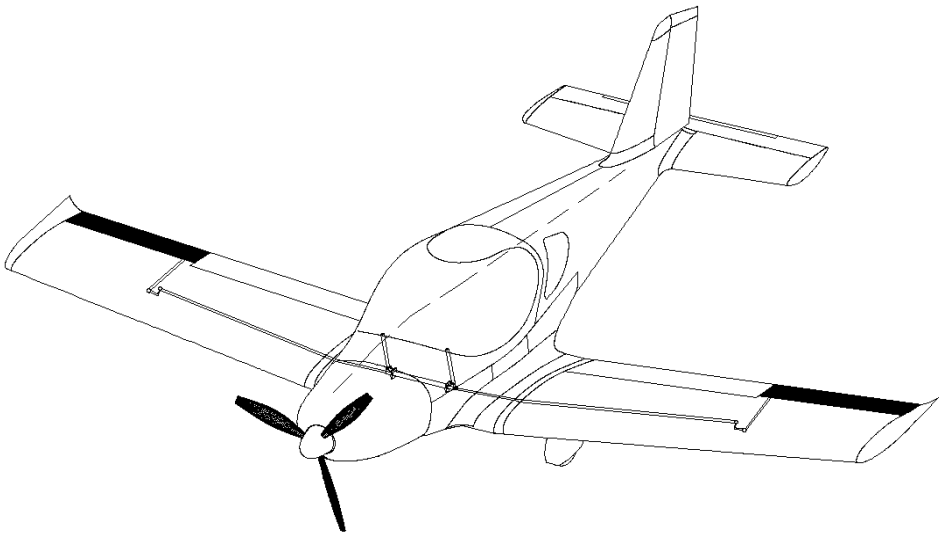

Fig. 6-1
Lateral control scheme

6.2.2 Longitudinal control (elevator control)

The elevator is controlled by control sticks. Movement of control sticks is transferred by system of transmission levers and push rods to the elevator. Forward and backward movement of the control stick is transferred by the push rods lead through the central channel between seats to the two-arm lever which is located on the fin spar. Lever deflection is transferred to the movement of the push rod in the rear part of fuselage to the elevator. Push rods have adjustable terminals with spherical bearings on the ends enabling elevator deflection adjustment.

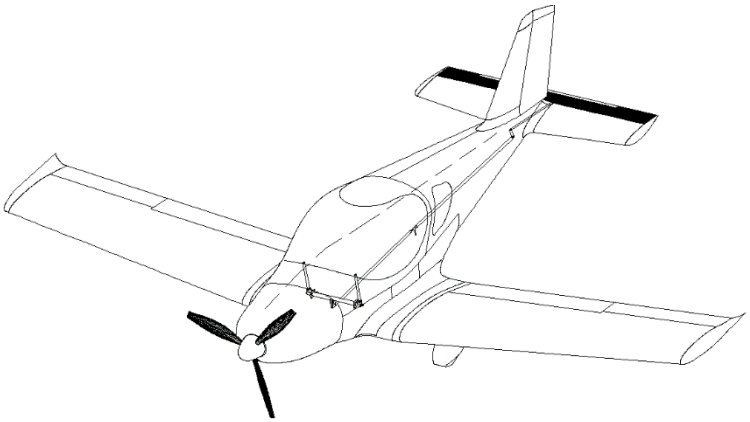

Fig. 6-2
Longitudinal control scheme

6.2.3 Directional control (rudder control)

The rudder control is controlled by means of foot control pedals. Pedal deflections of foot control are transferred by means of steel cables to the rudder. Steel cables are lead through middle channel of the fuselage. Cable ends are bent over the pulleys installed on fin spar riveted on bulkhead No. 12 and attached to the rudder control lever installed on fin spar back. Other cable end is connected with foot control pedals.

Foot control pedals are setting to three positions (back,middle and front) by means of control lever located on the side wall of fuselage under instrument panel.

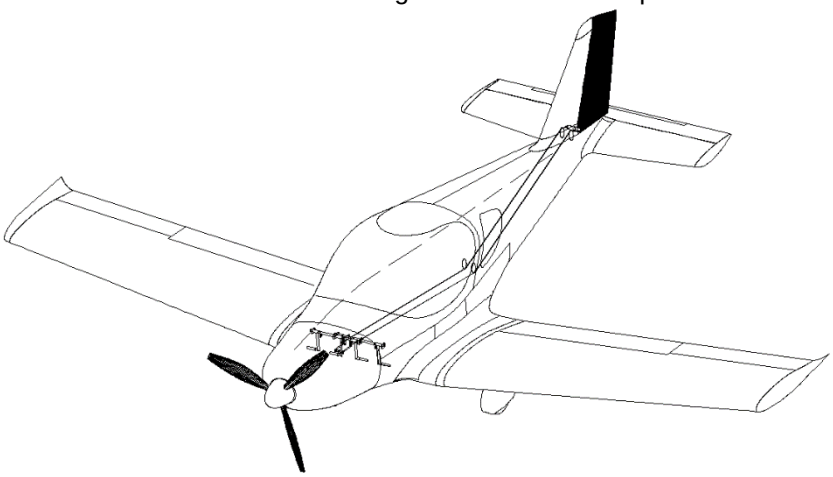

Fig. 6-3
Directional control

6.2.4 Elevator trim tab control

The elevator trim tab is controlled by the electrical actuator installed in elevator and connected per threaded rod with trim tab. Control switches are integrated part of grip on the left control stick (option on both control sticks). A LED position indicator is installed on the instrument panel.

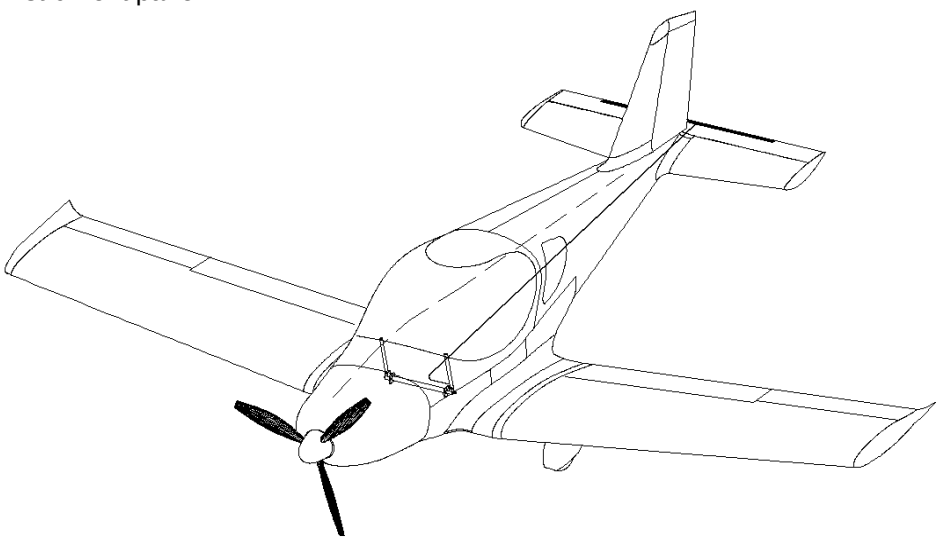

Fig. 6-4
Trim tab control

6.2.5 Wing flap control

Wing flaps are controlled by an electric flaps actuator connected with flaps per torque tube with push rods on each end. The flaps actuator is located in center channel of fuselage between the seats and is controlled by programable control unit and three positions switch located on instrument panel. A LCD indicator is installed in control unit for easier programing of the positions. It is possible to set the wing flaps to 3 or 4 positions in range from 0° to 30°. Company setting is 0°, 10°, 20° and 30°.

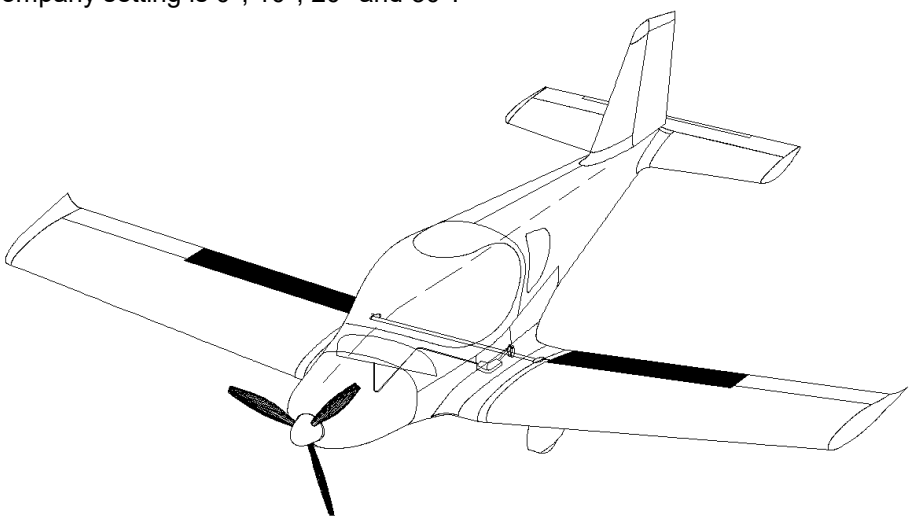

Fig. 6-5
Wing flap control

6.3 Removal / Installation

6.3.1 General principles for work on control system

6.3.1.1 Push-pull rod adjustment

Type of maintenance: heavy

Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in

Set the push rods to the prescribed length before assembling, tighten the nuts slightly, do not secure them for the time being. It is necessary to keep the following principles :

(a) Terminal thread must overlap the inspection hole in the push rod

(b) Terminals of all push rods must be uniformly screwed for setting the neutral position that serve for adjustment of control .

Grease bearings with lubricant grease before installing the push rods into airplane unless otherwise stated by the bearing manufacturer. Do not grease nor rinse the bearings with permanent filing that are covered by metal or plastic covers. Do not rinse bearings and articulated joints with technical gasoline. Mechanically remove contaminated lubricant grease carefully and refill the clean one.

6.3.1.2 Orientation of bolts and cotter pins

Put the bolts to the joint on the basis of “top-down” rule or “From the front to the back" with regard to the flight direction. This rule decreases possibility of spontaneous bolt falling out of the clamp joint in case that nut unlocking and falling out occurs in the course of operation. Follow the same rule also in case of securing nuts by securing pins or by cotter pins, with the exception of those cases when it is not possible to install the bolt for design or operation limitation reasons.

6.3.1.3 Lubrication

At assembling parts grease al joints and friction surfaces (bolts, pins, threads) after mechanical or chemical cleaning by lubricant grease.

6.3.2 Control sticks removal

Type of maintenance: heavy

Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in, 3/8 in
- wire nippers

Removal of the control sticks of manual control is shown on Fig. 6-6.

Disconnect push rod (1) of elevator control tube and fork on torque tube (2).

(a) Disconnect push rods (3) of aileron control tubes on sticks (4).

(b) Disconnect electric wire (5) for trim tab switches and PTT on the sticks.

(c) Remove bolts (6) and bushings (7) from torque tube hinges (8) on the main center wing spar (9).

(d) Remove the control sticks assembly (10) from the cockpit.

(e) Remove the bolt (11) from the stick (4).

(f) Remove the stick (4) from the torque tube (2).

6.3.3 Control sticks installation

Type of maintenance: heavy

Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in, 3/8 in
- pliers

Installation of the control sticks is shown on Fig. 6-6.

(a) Put the stick (4) in the torque tube (2).

(b) Insert the bolt (10) in to the torque tube and stick.

(c) Put the control stick assembly (10) in the hinges (8) on the main wing spar (9).

(d) Insert the bolts (6) and bushings (7) in to the torque tube hinges (8).

(e) Connect electric wire (5) for trim tab switches and PTT.

(f) Put aileron control tube push rods (3) on the sticks (4).

(g) Put elevator control tube push rod (1) in to the torque tube fork (2).

(h) Insert bolt in the control tube fork (2) and screw the nut.

(i) Check aileron deflections (see 6.4.3.1) and check plays in control (see 6.4.1.3).

(j) Check elevator deflections (see 6.4.3.3) and check plays in control (see 6.4.1.2).

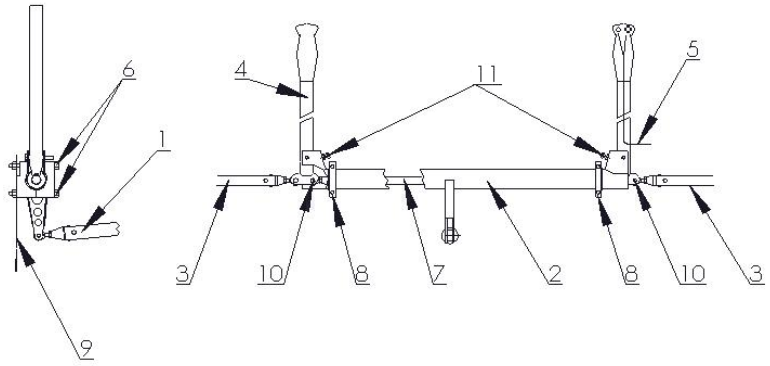

Fig. 6-6
Removal / Installation of the control sticks
View against flight direction

1 – Elevator control rod
2 – Transmission tube
3 – Aileron control rods
4 – Control stick
5 – Electric wire
6 – Connection bolts of transmission tube hinges on the main center wing spar
7 – Connection rod
8 – Transmission tube hinges
9 – Main center wing spar
10 – Connection bolts of control sticks and push rods
11 – Aileron control stop

6.3.4 Removal of wing flap control actuator

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 7/16 in, 1/2 in,
- screwdriver

Removal of the flap control actuator is shown on Fig. 6-7.

(a) Open the glove box cover on center console (1) between the seats .
(b) Disconnect flap lever (3) from the flap actuator (4).
(c) Disconnect flap actuator wire (5).
(d) Disconnect the flap actuator (4) from the actuator hinge (6).
(e) Remove flap actuator (4).

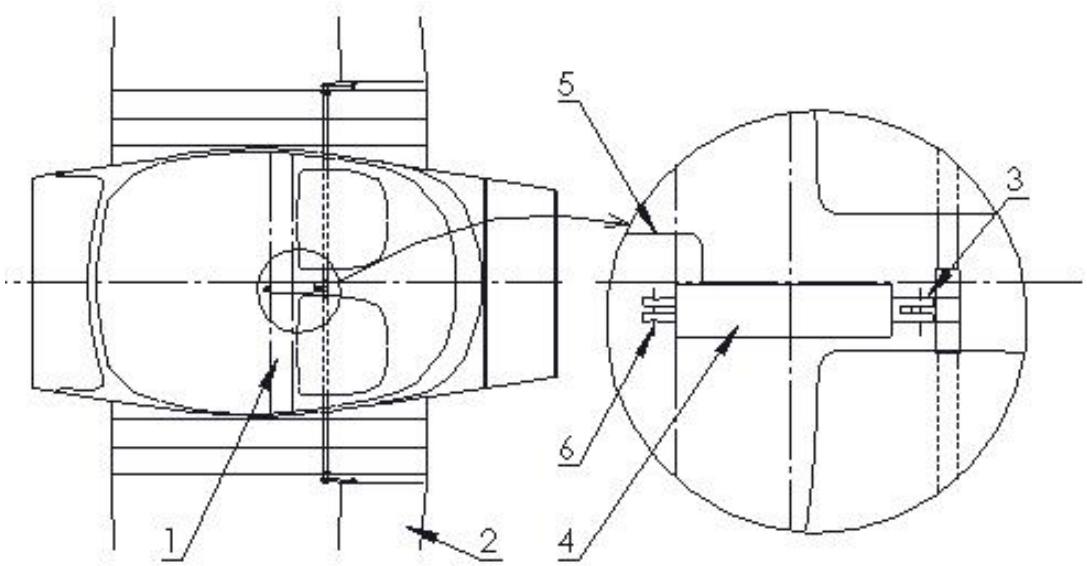

Fig. 6-7
Disassembly/Assembly of wing flap control actuator

1 ... Center console
2 ... Flap
3 ... Flap lever
4... Flap actuator
5 ... Actuator wire
6 ... Actuator hinge

6.3.5 Installation of wing flap control actuator

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 7/16 in, 1/2 in,
- screwdriver

Installation of flap control lever is shown on Fig. 6-7.

(a) Insert flap actuator (4) in to the actuator hinge (6).
(b) Connect actuator wire (5).
(c) Connect the flap actuator (4) with the flap lever (3).
(d) Check the flap operation and deflections (see6.4.3.2).
(e) Insert glove box in the center console .

6.3.6 Removal of the trim tab control actuator

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 5
- screwdriver
- wire nippers, pliers

The trim tab control actuator is located in the elevator and the left aileron (see Fig. 6-8).

(a) Remove the cover (1) from the access hole (2).
(b) Disconnect the trim tab actuator wires (3).
(c) Disconnect the actuator rod end (4) from the trim tab lever (5).
(d) Disconnect the actuator (6) from the elevator or aileron skin.
(e) Remove the actuator (6) from the elevator or aileron through access hole (2).

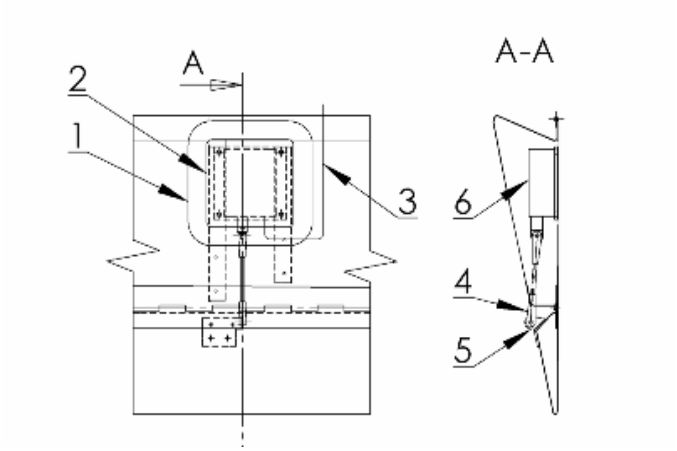

Fig. 6-8
Trim tab control actuator

1 – Cover
2 – Access hole
3 – Trim tab actuator wires
4 – Actuator rod end
5 – Trim tab lever
6 – Trim tab actuator

6.3.7 Installation of the trim tab control actuator

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 5
- screwdriver
- pliers

(a) Insert trim tab actuator (6) in to the elevator or aileron through access hole (2).
(b) Connect the actuator (6) from the elevator or aileron skin .
(c) Connect the rod end (4) with the trim tab lever (5).
(d) Connect the actuator wires (3).
(e) Check correct trim tab operation and adjustment of trim tab deflections (see 6.4.3.5).
(f) Close the access hole with cover (1).

6.3.8 Removal of aileron control lever behind main center wing spar

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in

(a) Remove access hole cover on bottom skin .
(b) Disconnect both push rods (5) from the control lever (1) (see Fig. 6-9).
(c) Disconnect the control lever – unscrew the nut .
(d) Remove control lever from the bolt (4).

6.3.9 Installation of aileron control lever behind main center wing spar

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in

(a) Insert the control lever (1) on the bushing (3) (see Fig. 6-9).
(b) Connect the nut (2) on bolt (4).
(c) Connect control push rod (5) with control lever.
(d) Close access hole cover .

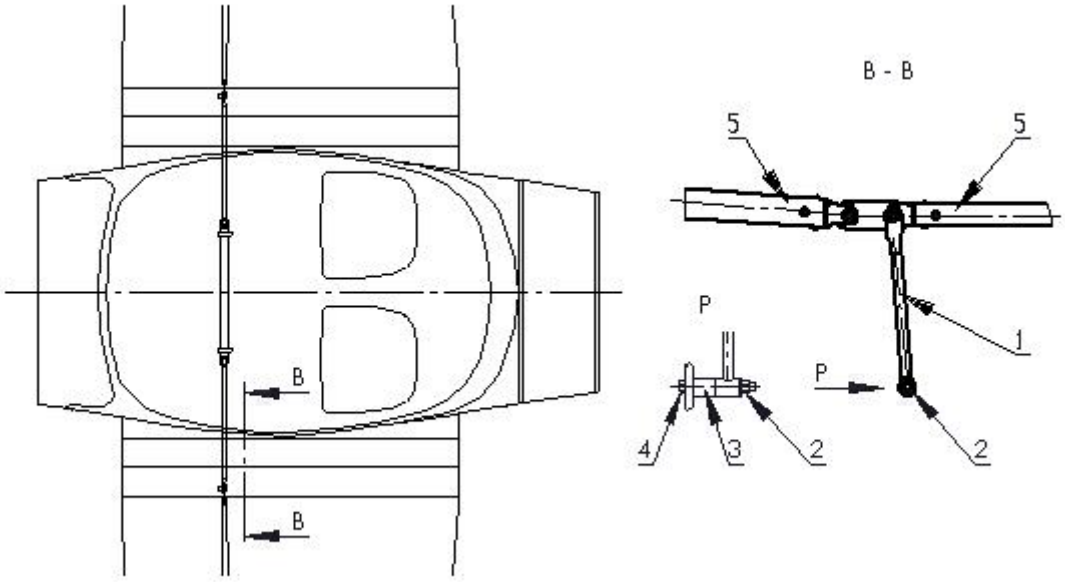

Fig. 6-9
Control lever of aileron control behind the main center wing spar

1 – Control lever
2 – Nut
3 – Bushing
4 – Lever bolt
5 – Push rods

6.3.10 Removal of aileron control bellcrank in the wing

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in
- screwdriver

The bellcrank is located on the bracket in the position of the main sper next to the rear rib No. 9.
Disassembly is identical for the left and the right wing (see Fig. 6-10).

(a) Remove the cover (1) from access hole on the lower side of the wing .

(b) Remove the rods (3) and (4) from the bellcrank arm – unscrew the nuts and remove the bolts (5) and (6).

(c) Remove the bellcrank (7) from the wing – unscrew the nut and remove the bolt (8).

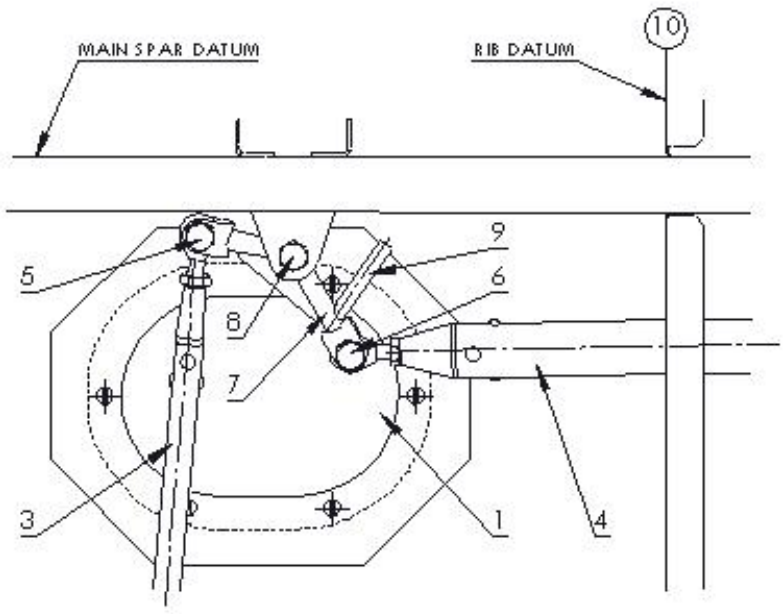

Fig. 6-10
Bellcrank of aileron control

1 – Cover	3,4 – Push rods
5,6 – Rod end bolts	7 – Bell crank
8 – Bellcrank bolt	9 – Aileron control stop

6.3.11 Installation of aileron control bellcrank in the wing

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in
- screwdriver

Installation of the aileron control bellcrank (7) is identical for the right and for the left wing.

(a) Check condition and lubrication of bellcrank bearings. If the bearings are contaminated, then carefully eliminate the contamination and grease them with lubricant oil.

(b) Set the bellcrank (7) to the position (see Fig. 6-10), insert the bolt (8) to the hole in the bellcrank and brackets and secure it with self locking nut.

NOTE

The bellcrank must not show axial play after installing and its travel must be continuous without dragging .

(c) According to the Fig. 6-10 connect push rods (3) and (4) to the bellcrank .

(d) Check aileron deflections (see 6.4.3.1) and check plays in the control (see 6.4.1.3).

6.3.12 Removal of bail arm under the luggage compartment

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in
- screwdriver
- pliers

Bail arm attachment is shown on Fig. 6-11.

(a) Remove the access hole cover on the bottom fuselage skin under the luggage compartment (1).

(b) Disconnect push rod ends (2) from the bail arm (3).

(c) Disconnect bail arm lever (3) and lever hinge (4) – remove the cotter pin, unscrew the castle nut, put out the bolt.

(d) Remove the bail arm lever (3).

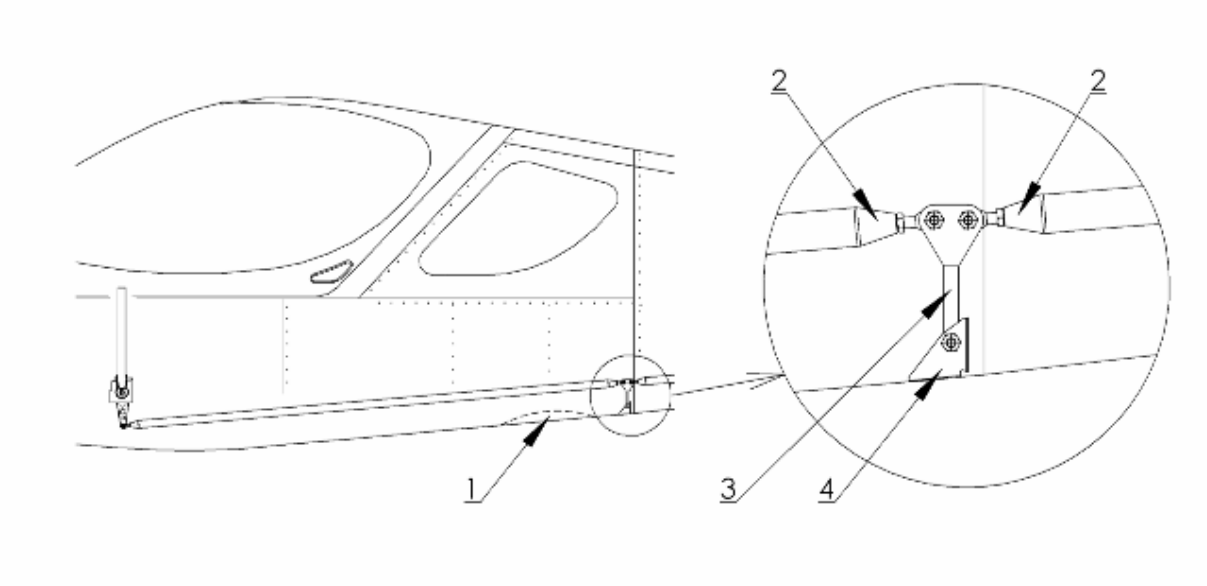

Fig. 6-11
Two–arm lever – front fuselage
1 – Cover on the bottom skin 2 – Push rod end
3 – Bail arm lever 4 – Bail arm lever hinge

6.3.13 Installation of bail arm under the luggage compartment

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in (11)
- screwdriver
- pliers

Attachment of the bail arm lever is shown in Fig. 6-11.

(a) Check condition and lubrication of bail arm lever bushings. If the bushing is contaminated, then carefully remove contamination and grease it with lubricant grease.

(b) Set the bail arm lever (3) to the position (see Fig. 6-11), insert the bolt into the hole in the lever and the hinge (4) and secure it with the castle nut and cotter pin. Tighten the nut slightly.

NOTE

The lever after installing must not show axial play and its travel must be smooth without hitching.

(c) Connect both push rod ends (2) with the bail arm lever (3).

(d) Close the access hole on the bottom skin under the luggage compartment .

(e) Check elevator deviations (see 6.4.3.3) and check control plays (see 6.4.1.2).

6.3.14 Removal of bail arm in rear fuselage

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in (11)
- Phillips screwdriver
- pliers

Attachment of bail arm is shown in Fig. 6-12.

(a) Unscrew the access hole cover (1) attachment screws on the starboard side of the fuselage in front of the fin spar.

(b) Disconnect push rod ends (2) from the arm (3) – unscrew the nuts and remove the bolts (4).

(c) Remove arm (3) from bracket (5) – remove cotter pin (8), unscrew the castle nut (7), and remove bolt (6).

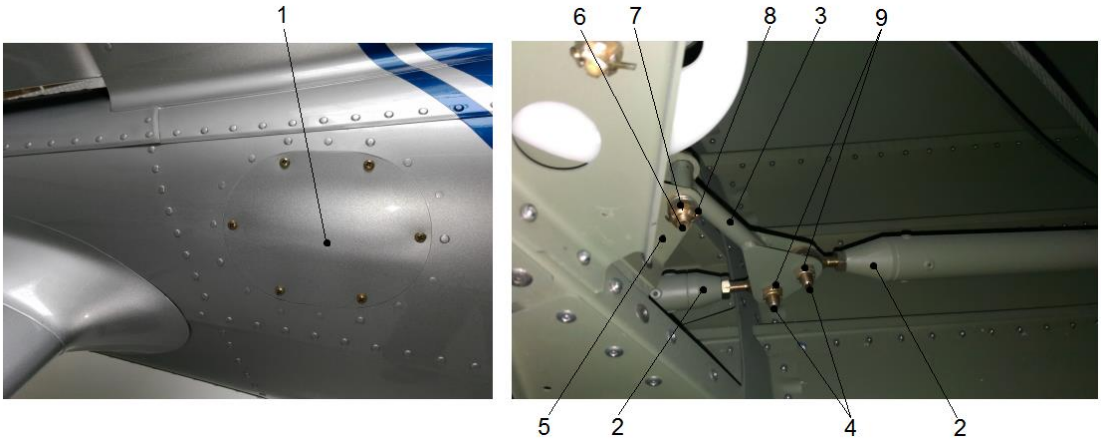

Fig. 6-12
Bail arm in rear fuselage

1 – Access hole cover
2 – Rod end
3 – Bail arm
4 – Bolt
5 – Bracket
6 – Bolt
7 – Castle nut
8 – Cotter pin
9 – Nut

6.3.15 Installation of bail arm in rear fuselage

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 7/16 in (11)
- screwdriver
- pliers

Attachment of bail arm is shown in Fig. 6-12.

(a) Check condition of the lever (3). Clean the bushing, grease it with lubricant grease and assemble the lever with lever bracket (5). Tighten the nut slightly and secure it with the cotter pin.

NOTE
The arm must not show after installing any axial play and its travel must be continuous without hitching.

(b) Connect both push rod ends (2) with the lever (3).

(c) Close the access hole by cover (1).

(d) Check elevator deflections (see 6.4.3.3) and check plays in control (see 6.4.1.2).

6.4 Check / Adjustment

6.4.1 Check of plays in control

Admissible plays in control are mentioned in the following table::

Control	Admissible playe	Area to measure play
longitudinal	max. 4 mm *5/32 in*	at the end of the control stick in longitudinal axis of the airplane
lateral	max. 4 mm *5/32 in*	at the end of the control stick in lateral axis of the airplane
directional	max. 5 mm *3/16 in*	on pedals in longitudinal axis of the airplane
trim tabs	max. 3 mm *1/8 in*	at the end of the trim tab
wing flaps	max. 5 mm *3/16 in*	at the end of the wing flap

CAUTION
If the measured plays exceed values mentioned in the table then eliminate the cause of it and repeat measuring.

6.4.1.1 Measuring procedure

(a) Measure all plays three times and write down average values .

(b) Perform measuring with the blocked control surfaces. Before measuring it is necessary to push down the control surface by hand several times (max force of 5 kg (11 lbs)) in the direction of the control surface deflection, so that the control system is unblocked and plays can be more easily identified.

(c) Push on the control stick or the pedal by force of 3 kg (*6,6 lbs*). Deflect the controlling element to one side and read the deflection. Then push the control stick to the other side and read the deflection. Sum of deflections presents plays in control.

6.4.1.2 Longitudinal control

Measure play at the end of the control stick at the blocked elevator in the neutral position. The total play must not exceed 4 mm (*5/32 in*) at the top end of the control stick (see Fig. 6-13).

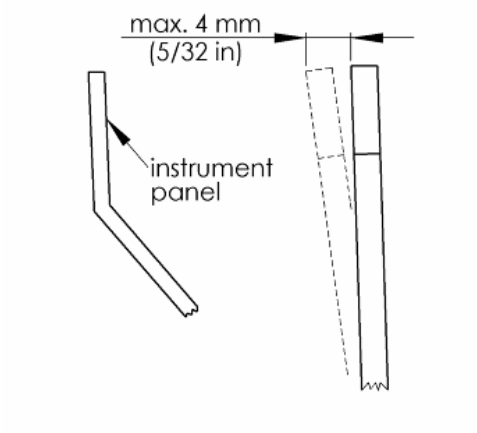

Fig. 6-13
Play in longitudinal control

6.4.1.3 Lateral control

Measure play at the end of the control stick by the measuring instrument from the fuselage side at blocked ailerons in the neutral position. First block the right aileron and measure play on the control stick, then measure play at the blocked left aileron. Total play of the control stick must not exceed 4mm (*5/32 in*) at the top end of the control stick.

6.4.1.4 Plays in foot control pedals

Measure play at the end of pedals by the measuring instrument from the inner wall of the bulkhead No.1 at the blocked rudder at neutral position and with the blocked nose landing gear wheel against lateral slewing. Mutual total play between pedals must not exceed 5 mm (*3/16 in)* on the pedal tube.

6.4.1.5 Play in trim tab control

Measure play in elevator neutral position. Set the balance tab to position “max on head" and measure play at the end of the trim tab. Max play of the trim tab measured at the end of the trailing edge must not exceed 3 mm (*1/8 in)*.

6.4.1.6 Play in wing flap control

Measure play in individual position of wing flaps (0°, 10°, 20° and 30°). Set the flap actuator to individual positions. Measure play in wing flap control on the wing flap trailing edge. Max play of the wing flap measured on the trailing edge must not exceed 5 mm (*3/16 in)*.

6.4.2 Check for friction in control system

Control system must function smoothly within the whole scope of deflections. There must not be excessive friction or hitching in the control system. In case of failure detection, find out the cause and eliminate the defect.

6.4.2.1 Friction in the longitudinal control system

(a) Balance elevator through the pulley to get it to neutral position.

(b) Measure force at the moment of elevator deflection from neutral position by the dynamometer attached on the end of the control stick. Max force can be 1.5 kg (*3.3 lbs*).

6.4.2.2 Friction in lateral control system

(a) Set ailerons to neutral position.

(b) Measure force at the moment of aileron deflection from neutral position by the dynamometer attached on the end of the control stick. Max force can be 1.5 kg (*3.3 lbs*).

6.4.2.3 Friction in directional control system

(a) Set rudder to neutral position .

(b) Act in direction of control force (pilots feet) by means of the spring scale attached to the foot control pedal. Measure force at the moment of rudder deflection from the neutral position. Max force can be 4 kg (*8.8 lbs*).

6.4.3 Checking control surface deflections

The control surface deflections are shown in the following table:

Aileron	24° ± 2° up
	16° ± 2° down
Rudder	30° ± 2° right
	30° ± 2° left
Elevator	30° ± 2° up
	15° ± 2° down
Wing flap	10° ± 2°
	20° ± 2°
	30° ± 2°
Difference between L/R flap deflections	± 0.5°
Elevator trim tab	15° ± 2° up
	25° ± 2° down
Aileron trim tab	15° ± 2° up
	20° ± 2° down

Tab. 6-1
Deflections of control surfaces

For measuring deflections use protractor with deflecting pointer that will be attached to an appropriate control surface by means of the clamp.

6.4.3.1 Measuring aileron deflections

(a) Attach the protractor with the deflecting pointer on the upper skin of the aileron by means of the clamp.

(b) Set the aileron to neutral position.

(c) Set the protractor to 0° – starting value for measuring.

(d) Deflect aileron to the lower (possibly upper) extreme position and read the deflection value.

(e) Check deflection values according to the Tab. 6-1.

6.4.3.2 Measuring wing flap deflections

(a) Attach the protractor with the deflecting pointer on the upper flap skin by means of the clamp.

(b) Set the wing flap to the 0°position.

(c) Set the protractor to 0° – starting value of measuring.

(d) Extend the flaps by means of the flap actuator to individual positions and read the deflection.

(e) Check deflection values according to the Tab. 6-1.

6.4.3.3 Measuring elevator deflections

(a) Set the protractor with the deflecting pointer on the trailing edge of the elevator by means of the clamps.

(b) Set the elevator to neutral position.

(c) Set the protractor to 0° – starting value of measuring.

(d) Deflect the elevator to extreme positions by means of the control stick and read the deflection.

(e) Check values of deflections according to the Tab. 6-1.

6.4.3.4 Measuring rudder deflections

The airplane manufacturer uses a special jig for measuring rudder deflections that is slid on the vertical tail unit and it is possible directly to read the rudder deflection. If you do not have this special jig, use the alternative procedure:

(a) Set the rudder to neutral position.

(b) Put the rod to the trailing edge of the rudder and mark the lower margin of the rudder trailing edge.

(c) Deflect the rudder to extreme positions and with the rule measure distance from the sign to the lower margin of the rudder trailing edge.

(d) Calculate angle and compare it with the value mentioned in the Tab. 6-1.

6.4.3.5 Measuring trim tab deflections

(a) Set the protractor with the deflecting pointer to the trailing edge of the trim tab by means of the clamp.

(b) Set the trim tab to neutral position.

(c) Set the protractor to 0° – starting value of measuring.

(d) By means of the trim control actuator deflect the trim tab to extreme positions and read the deflection.

(e) Check values of deflections according to the Tab. 6-1.

6.4.4 Adjustment of control surface deflections

Adjustment of control surface deflections to be made to the values shown in the Tab. 6-1. At adjusting the airplane control, neutral position of the control surfaces is taken as the starting point.

CAUTION

After adjustment of control surface deflections, push rod terminals overreach the inspection hole in the push rod.

6.4.4.1 Adjusting aileron deflections

(a) Range of deflections is adjusted by means of rod adjustable ends.

(b) Adjust aileron neutral position by setting the terminal of the push rod in the center wing or outer wing.

(c) It is possible to adjust the aileron differentiation, i.e. difference in the lower and the upper deflection of the aileron, by means of the terminal on the push rod leading from the control lever in the fuselage to the bellcrank in the wing or by means of the terminal of the push rod leading from bellcrank to the control lever on the aileron. The terminal is accessible on the aileron lower side after lifting the aileron.

6.4.4.2 Adjusting wing flap deflections

Wing flap deflections are given by the torque tube and actuator positioning in the fuselage. It is possible to adjust flap deflection by means of the terminals on push rods conected flaps with control torque tube. The terminal is accessible on fully deployed flaps.

6.4.4.3 Adjusting elevator deflections

Range of elevator deflections is given by setting the push rod terminals in the fuselage. At adjusting elevator deflections, proceed as follows:

(a) Remove the choosed push rod from the bellcrank.

(b) Adjust the upper deflection as needed by means of the push rod terminal (or by means of push rod terminal on the elevator lever).

(c) Put push rod end back and check if the deflections corresponds to the values mentioned in the Tab. 6-1.

6.4.4.4 Adjusting rudder deflections

Rudder deflections are given by setting the stops on the rudder control lever installed on fin spar.

(a) Set the foot control pedals to neutral position and check if the rudder is in the neutral position.

(b) Carry out correction of rudder deflection setting by adjusting the turnbuckles on the foot pedal side in cockpit.

6.4.4.5 Adjusting trim tab deflections

Trim tab deflections are given by control actuator and they are fixed.

6.4.5 Checking condition and tension of rudder control cables

(a) Carefully inspect the control cable especially on the following areas:

- in the area of cable attachment on the rudder control pedals
- in the area of cable attachment on rudder lever
- in the area of cable inlet on rear fuselage

(b) Check for the following defects on the cable:

- burst cable wires
- evidence of sleeves deformation and damage on cable surface
- evidence of cable corrosion
- cable distortion

(c) Check cable tension by cable tensioner

- prescribed cable stress in the operation is 15 ± 0,5 kg (*33 ± 1 lbs*).

NOTE

Set cable stress according to the need by adjustable turnbuckles on the side of the rudder pedals.

(d) Exchange the cable in cases as follows:

- broken broken any wire
- wear of cable surface resulted in permanent deformation of cable section.
- it is not possible to tension the cable to the prescribed value (see (d))
- it is not possible to set the rudder to neutral position (see 6.4.4.4)

(e) Check rudder deflections (see 6.4.3.4).

6.5 Exchanges / Service information

6.5.1 Exchange of rudder control cable

(a) Cut the control cable (1) in the cockpit behind the rudder pedals.

(b) Remove cables on the rudder side from the fuselage.

NOTE

Grease the new cable with lubricant grease before installing it to the fuselage.

(c) Insert the new cable from the rudder side into the fuselage.

(d) Set nicopress sleeve (4) on the cable end in cockpit (4).

(e) Bend the cable end in cockpit around the cable thimble (5), insert the turnbuckle eye to the cable thimble, set nicopress sleeve (4) close to the cable thimble and press nicopress sleeve by Nicopress pliers (see 15.10).

(f) Connect new cable with turnbuckle (6) installed on rudder pedal (7).

(g) Set the rudder and the pedal and secure them in neutral position.

(h) Set on rear end of cable thimble (5) and connect it with rudder lever (2).

(i) Fit the clamp on the cable end and stretch the cable by force of 15 ± 0,5 kg (*33 ± 1 lbs*). Mark on the cable the position of its free end with an felt tip pen .

(j) Remove the cable from the rudder lever, cut the cable end to fit to the marked length and by means of Nicopress pliers (see 15.10) install the nicopress sleeve (4).

(k) Connect the cable with rudder lever and secure it with the bolt and nut with the cotter pin.

(l) Check and adjust the cable tension, see 6.4.5.

(m) Check (see 6.4.3.4) and adjust (see 6.4.4.4) rudder deflections.

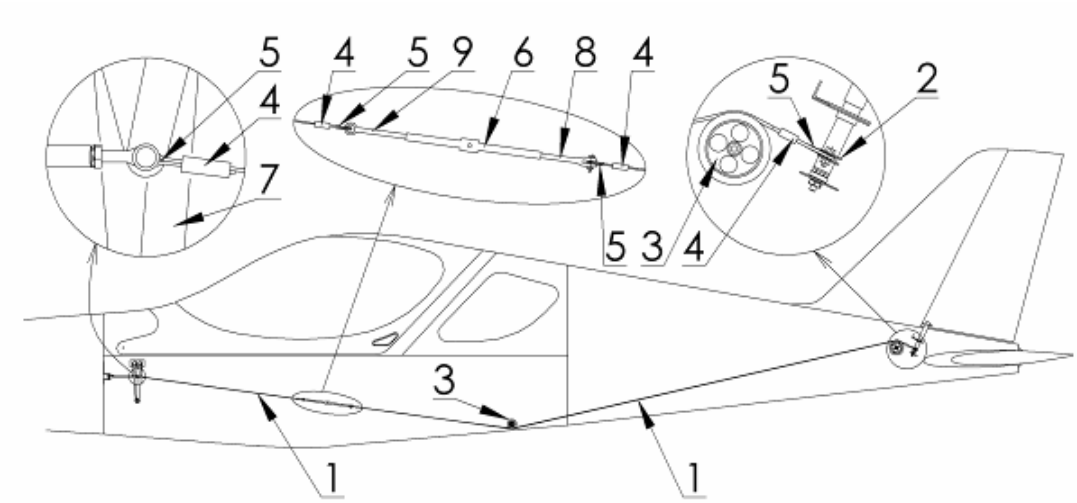

Fig. 6-14
Rudder control

1 – Control cable
2 – Rudder control lever
3 – Pully
4 – Nicopress sleeve
5 – Cable thimble
6 – Turnbuckle
7 – Rudder pedal
8 – Turnbuckle fork
9 – Cable eye

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7. CHAPTER – EQUIPMENT

7.1 General 7-2

7.2 Description and operation 7-2

7.2.1 Seats 7-2

7.2.2 Safety harness 7-3

7.3 Removal / Installation 7-3

7.3.1 Removal of seats 7-3

7.3.2 Removal of safety harness 7-3

7.3.3 Installation of safety harness 7-3

7.4 Check / Adjustment 7-4

7.4.1 Checking of safety harness 7-4

7.5 Exchanges / Service information 7-4

7.5.1 Cleaning seat covers and uphostery 7-4

7.1 General

This is a two–seat cockpit with the side–by–side seat arrangement. The seats are adjustable, the rudder pedals are adjustable. The seats are equipped with safety harnesses. The luggage compartment is located behind the seats.
The equipment of BRISTELL TDO airplane includes:

- seats
- safety harnesses
- tow bar

7.2 Description and operation

7.2.1 Seats

Seats (1) of the BRISTELL TDO airplane are attached to the gear channel on Velcro and are equipped with an upholstered cushions. The seat backs (2) are attached on Velcro to the bulkhead No.5. For adjusting of seats and seat backs are used fiberglass sandwich boxes (3) attached on Velcro.

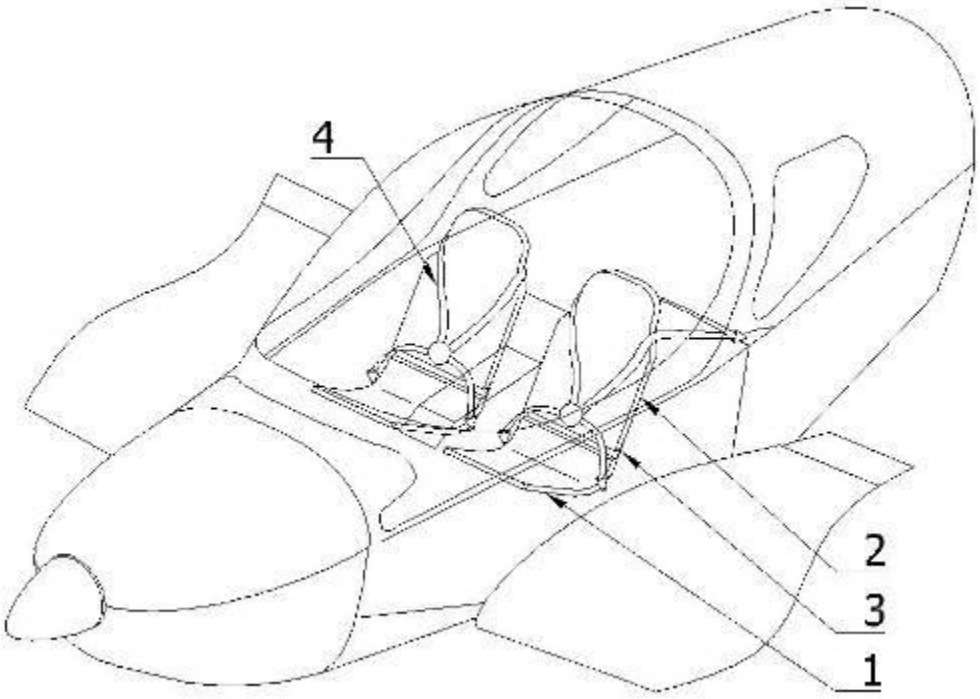


Fig. 7-1
BRISTELL TDO cockpit

1 – Seat
2 – Seat back
3 – Sandwich boxes
4 – Safety harnesses

7.2.2 Safety harness

Seats are equipped with safety harnesses (4). Safety harnesses consist of two lap straps, two shoulder straps and a safety harness lock. Length of the lap straps and the shoulder straps is adjustable.

7.3 Removal / Installation

7.3.1 Removal of seats

(a) Remove the seats from the velcro

7.3.2 Removal of safety harness

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 1/2 in

(a) Remove shoulder harnesses from the top attachment brackets (1) in luggage compartment (see Fig. 7–2). Remove the nut with distance washer and the bolt (2).

(b) Remove the side harnesses from the side attachment brackets (4) – remove snap–hook (3).

7.3.3 Installation of safety harness

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 1/2 in

(a) Install the side harnesses (see Fig. 7-2) – put snap–hooks (3) into side attachment brackets (4) on the gear channel.

(b) Install the shoulder harnesses – put on the bolt (2) distance washer and insert the bolt (2) into the top attachment bracket (1) in luggage compartment and screw the nut.

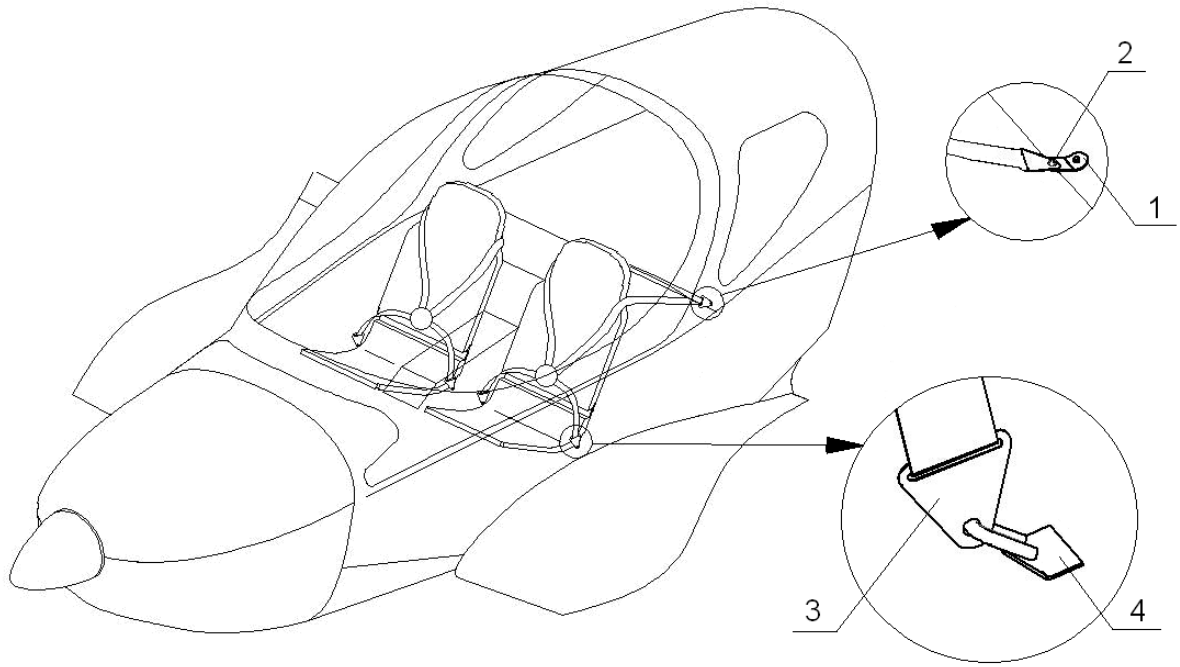


Fig. 7-2
Removal/Installation of safety harnesses
1 – Top attachment bracket 2 – Bolt
3 – Snap–hook 4 – Side attachment bracket

7.4 Check / Adjustment

7.4.1 Checking of safety harness

Check harnesses surface for any damages. Check the lock system function. Check the attachment points of shoulder and side harnesses for any damages or corrosion.

7.5 Exchanges / Service information

7.5.1 Cleaning seat covers and uphostery

(a) Take upholstered seats and seat backs out of the airplane.

(b) Brush impurities, possibly clean with warm water with addition of a suitable detergent.

(c) Before reinstalling upholstered seats in the airplane, let it thoroughly dry.

8. CHAPTER – LANDING GEAR

8.1 General 8-2

8.2 Description and operation 8-2

8.2.1 Main landing gear 8-2

8.2.1.1 Main wheel 8-3

8.2.2 Tail wheel 8-4

8.2.2.1 Tail wheel 8-5

8.2.3 Brake system 8-5

8.2.3.1 Parking brake 8-5

8.2.4 Wheel pants 8-6

8.3 Removal / Installation 8-6

8.3.1 Removal of wheel pants 8-6

8.3.2 Installation of wheel pants 8-6

8.3.3 Removal of main landing gear wheel 8-6

8.3.4 Installation of main landing gear wheel 8-7

8.3.5 Removal of tail wheel 8-7

8.3.6 Installation of tail wheel 8-7

8.3.7 Removal of the main landing gear leg 8-8

8.3.8 Installation of the main landing gear leg 8-8

8.3.9 Removal of tail landing gear leg 8-9

8.3.10 Installation of tail landing gear leg 8-10

8.3.11 Removal of brake pumps 8-11

8.3.12 Installation of brake pumps 8-12

8.4 Check / Adjustment 8-12

8.5 Exchanges / Service information 8-13

8.5.1 Exchange of main wheel tyre 8-13

8.5.2 Exchange of tail wheel tyre 8-14

8.5.3 Exchange of brake pads 8-15

8.5.4 Refilling / exchanging brake fluid 8-16

8.5.4.1 Draining brake fluid from brake system 8-16

8.5.4.2 Filing brake fluid into brake system 8-16

8.5.4.3 Refilling brake fluid into brake system. 8-16

8.1 General

The BRISTELL TDO airplane is fitted with a conventional landing gear consisting of the main landing gear and tail wheel. The tail wheel is castering. The main landing gear wheels are equipped with hydraulic disk brakes .

Type and dimension of main wheels :

- Wheel rim – Matco mfg MHE51B – 5 inch, altern. 6 inch
- Tyre and tube – Air Trac – 5,00–5 inch, altern. 6,00–6

Type and dimension of tail wheel:

- Wheel rim – Matco WHLT– 8LD
- Tyre and tube – Kenda 200 x 50 (8 x 2 inch)

This chapter provides information on:

- main landing gear
- tail landing gear
- brake system
- wheel pants

8.2 Description and operation

8.2.1 Main landing gear

The main landing gear (see Fig. 8-1) consists of the composite landing gear legs (2), wheel axle and wheel (1) equiped with disc brakes (3). The landing gear legs are inserted in the gear channel under the seats, where they are attached by two bolts (4) and stirrup (3) (seeFig. 8-7).

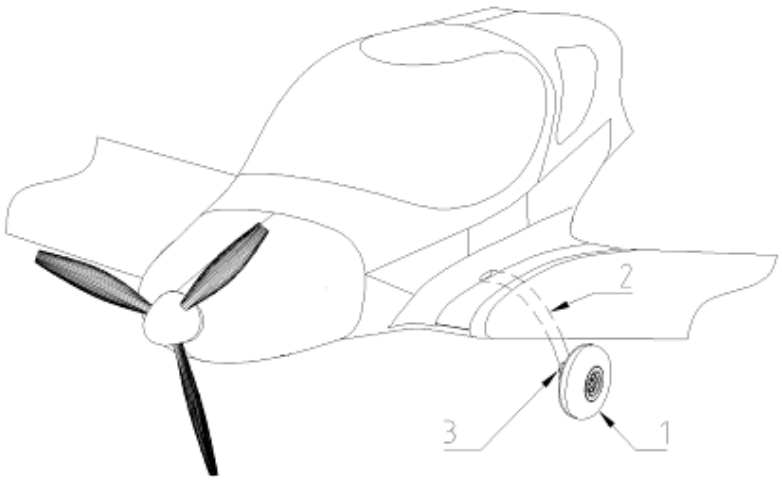


Fig. 8-1
Main landing gear scheme

1 – Wheel
2 – Landing gear leg
3 – Disc brake

8.2.1.1 Main wheel

(see Fig. 8-2)

Main landing gear wheel rims (1, 2) are pressed of aluminum. Wheel rims are split in order to facilitate assembly and disassembly of tires. Both halves are joined by bolts (6). Main landing gear wheels are equipped with the brake discs (9) which are attached to the inner half of the wheel rims. Wheels are equipped with tires and tubes.

Fig. 8-2
Main wheel

1 – Outer rim	2 – Main inner rim
3 – Reinforcement washer	4 – Hub
5 – SS Nyloc nuts	6 – SS bolts
7 – SS spring washers	8 – Spring washers
9 – Brake disc	10 – Brake disc bolts
11 – Brake caliper	12 – Wheel bearings

8.2.2 Tail wheel

The BRISTELL TDO tail wheel landing gear is castering and consists of a leg formed by the two steel springs, screwed down to the bottom of rear fuselage, and a tail wheel asembly Matco WHLT–8LD (see Fig. 8-3), consisting of a tail wheel base, fork, wheel and centering springs.

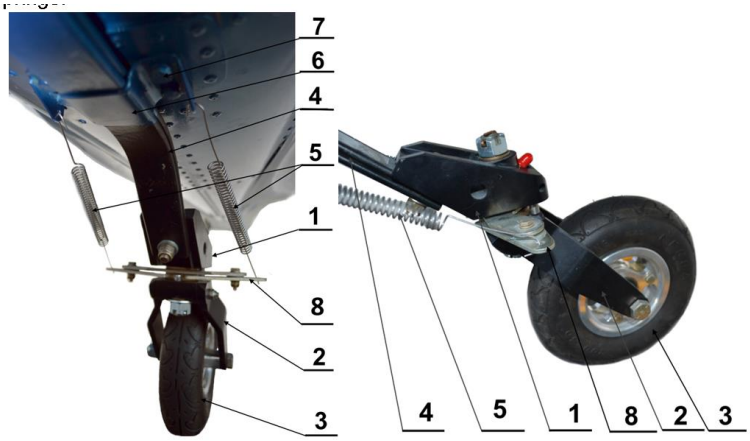


Fig. 8-3
Tail landing gear

1 -Tail wheel base
2 - Wheel fork
3 - Tail wheel
4 - Landing gear leg – (2 springs)
5 - Centering coil springs
6 - Leg (spring) stirrup
7 - Stirrup bolts
8 - Wing

8.2.2.1 Tail wheel

There is installed standardly Matco WHLT–8LD tail wheel assembly. The wheel rim is aluminium casting. The rim is splitted to allow installation and replacement of tyre. Both wheel rim halves are bolted together.

ITEM #	Part Number	Description	QTY.
1	MSC.11x1.5COTTERPI	PIN, COTTER ZINC	2
2	MSC.62-18HEXNUT/SL	NUT, HEX SLOTTED	2
3	MSC.625SAE	WASHER, 5/8	2
4	MSCU625-0210	WASHER, CURVED	2
5	MSC.62-18X4.35(A)	AXLE, VERTICAL TAILWHEEL	1
8	WHLTW-19	BUSHING, HAT	3
9	MSCMC7-4	FITTING, GREASE	1
10	WHLBSP4	SPACER, 4"/UL BRAKE	2
11	MSCAN960-10	WASHER, AN960	6
12	WHLTW-4	WASHER, BRONZE	1
13	MSCAN3-6	BOLT,HEX DRILLED	2
14	MSC.25-20x.50SHCS	BOLT, SHCS .25-20X.50	1
15	MSCB0375-020	WASHER, BELLEVILLE	2
16	WHLT-02	ARM, TAIL WHEEL	1
17	MSC.750X.443X.062W	Washer, Nylon	2
18	WHLT-03	Wing, Tail Wheel	2
19	MSCAN310-3	NUT, CASTLE	2
20	MSC.0625X.50COTTER	PIN, COTTER ZINC	2
21	WHLTW-21	BUSHING	1
22	WHLTWD-8LF	ASSEMBLY, FORK T-8LD	1
23	MSC.50-13X4.50HH	BOLT, HEX	1
24	WHLA7DSL	SPACER, T7D	2
25	WHLTW37	WHEEL, TAIL 3.7"	1
26	WHLT6SL	SLEEVE, TAIL T-6P	1
27	MSCAN960-816L	WASHER	1
28	MSC.50-13NYLOCK	NUT, NYLOCK	1
29	TIRT200x50	TIRE, 200x50	1
30	TIRTU200x50	TUBE, 200x50	1
31	WHLTWBE1.5	BASE, TAIL WHEEL	1
32	MSC.234-X.50IL	CAP, DUST	1

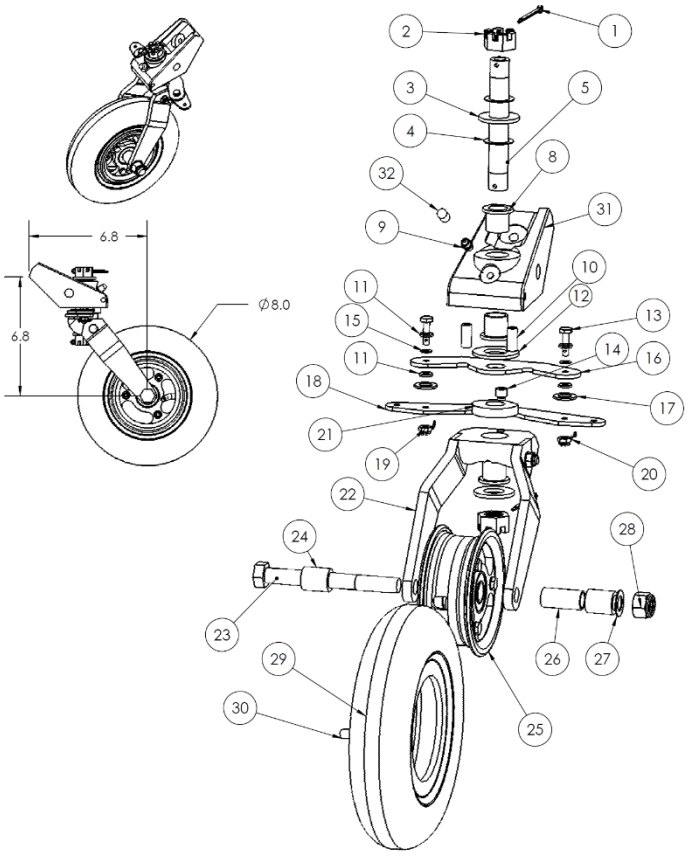


Fig. 8-4
Matco WHLT–8LD tail wheel assembly

8.2.3 Brake system

The BRISTELL TDO airplane is equipped with hydraulic disc brakes on the main landing gear wheels. Brake system consists of the brake pedals (part of rudder control pedals, see Fig. 8–7), brake pumps, hoses for brake fluid supply, brake calipers and brake pads. By depressing pedals, brake pumps are compressed and pressure generated in the brake circuit and the calipers pushes the brake pads onto the brake disks. Braking pressure can be controlled by force of brake pedal depressing

8.2.3.1 Parking brake

Airplane is optionally equipped with the hydraulic manually controlled parking brake. The **PARKING BRAKE** controller is located on the middle channel in the cockpit. The parking brake controller is mechanically connected with the stop valve. By depressing the brake pedals and by turning the controller from “OFF” to “ON” position the brake hoses are locked and the pressure hold brake pads pressed on brake discs

8.2.4 Wheel pants

The airplane is optionally equipped with composite wheel pants which reduce air drag and improve aerodynamic properties of the airplane. The wheel pants are installed on the brackets per bolts

8.3 Removal / Installation

8.3.1 Removal of wheel pants

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver

Wheel pants are attached on the brackets by means of bolts .

(a) Remove bolts attaching the wheel pants to the brackets .
(b) Remove wheel pants.

8.3.2 Installation of wheel pants

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver

(a) Position the wheel pants on the brackets and screw them down to the brackets by bolts .

8.3.3 Removal of main landing gear wheel

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- socket wrench vel. 1 1/2 in
- Allen wrench size 3/16 in
- pliers

The main landing gear wheel assembly consists of the wheel rim, the tube, the tire, the brake disc and the brake.
At removing proceed according to Fig. 8-2:

(a) Jack and support the airplane (see 14.2)
(b) Disassemble wheel pant (see 8.3.1) and remove the wheel pant bracket .
(c) Unscrew two bolts attaching the wheel rim with brake disc.
(d) Remove the cotter pin securing nut (3) on wheel axle.
(e) Remove the wheel (2) from the wheel axle (4).

8.3.4 Installation of main landing gear wheel

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- socket wrench vel. 1 1/2 in
- Allen wrench size 3/16 in
- pliers

Follow Fig. 8-2 at installation:

(a) Clear the wheel axle (4) of impurities and apply slight layer of grease on it .
(b) Put the wheel (2) on the axle.
(c) Apply securing liquid (blue Loctite 243) on the screw threads and attach with it the wheel rim and brake disc.
(d) Screw and tighten the nut (3) on the wheel axle.
(e) Secure the nut (3) with the new cotter pin.
(f) Install the bracket and then wheel pant (see 8.3.2).

8.3.5 Removal of tail wheel

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 19

Follow Fig. 8-4 at removal:

(a) Lift the fuselage tail to raise the tail wheel above the ground and support the fuselage fuselage under the tail landing gear leg.
(b) Unscrew the self–locking nut (28)
(c) Remove bolt (23) from wheel fork.
(d) Remove wheel from the fork.

8.3.6 Installation of tail wheel

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 19

Follow Fig. 8-4 at installation:

(a) Support the airplane fuselage under the tail landing gear leg so that to allow tail wheel installation into the fork.
(b) Clear wheel axle from impurities – bolt (23), spacer (24), sleeve (26). Slightly grease whell axle – bolt (23) using lubricant grease.
(c) Insert from one side the bolt (23) into the fork (22), put on it the spacer 24), wheel rim (25) with already installed tyre and tube (29+30), then sleeve (26) and opposite spacer (24), then push the bolt through second arm of the fork.

(d) Put washer (27) on bolt end and screw a new self–locking nut (28). There is a risk of tail wheel release and even its lost when using original self–locking nut!

(e) Tighten the nut so that to ensure wheel free rotation but no lateral play.

8.3.7 Removal of the main landing gear leg

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 9/16 in, 1/2 in

Follow Fig. 8-5 at removal:

(a) Jack and support the airplane (see 14.2).

(b) Disconnect the brake line (1).

(c) Disconnect main gear leg (2), stirrup (3) and attachment bolts (4).

(d) Remove the bolts (4) and stirrup (3) from the gear channel (5).

(e) Remove the landing gear leg (2) from the attachment channel and put it on a suitable place.

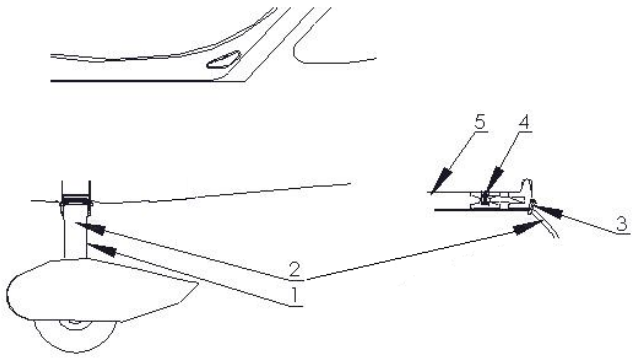


Fig. 8-5
Removal / Installation of the main landing gear leg

1 – Brake line
2 – Main gear leg
3 – Stirrup
4 – Attachment bolt
5 – Gear channel

8.3.8 Installation of the main landing gear leg

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 9/16 in, 1/2 in

Follow Fig. 8-5 at installation:

(a) Check outer surface of the composite landing gear leg for occurrence of cracks and whether the axle connection is not damaged before installing the landing gear leg.

(b) Insert the landing gear leg (2) into the gear channel (5) on fuselage.

(c) Put the bolts (4) and stirrup in gear channel, tighten the bolts slightly.

(d) Connect the brake lines (1).

(e) Fill brake system with brake liquid and deareate it (see 8.5.4)

8.3.9 Removal of tail landing gear leg

Type of maintenance: line

Authorisation to perform:

- Pilot or mechanic

Tools needed:

- 2 wrenches size 7/16 in (bolt AN6)
- Phillips screwdriver

Follow Fig. 6-12 and Fig. 8-6 at removal.

(a) Lift the fuselage tail to raise the tail wheel above the ground and support the airplane under a fuselage bulkhead in front of the tail landing gear leg

(b) Use a Phillips screwdriver to unscrew the attachment screws of an inspection hole cover located on the fuselage starboard side in front of the fin spar (see Fig. 6-12) and then remove the cover .

(c) Use wrench size 7/16 in to unscrew from outside the selflocking nut screwed on AN4 bolt attaching the tail leg to the fuselage bottom. It is needed to use at the same time another wrench of 7/16 in size to prevent that bolt head from rotation; the bolt head is accessible through opened inspection hole. Remove that bolt from the fuselage once the nut and washer are removed from it or screw on the bolt a nut to prevent the bolt from disappear inside fuselage.

(d) Unhook the centering coil springs (5) from the tail wing (8) Fig. 8-6 and then also take the springs down the stirrup (6) .

(e) Use wrench size 7/16 in to release and remove 4 bolts (7), which attach the leg stirrup (6) to the fuselage tail section bottom.

(f) Remove the leg stirrup (6) from the fuselage together with the tail wheel leg, fork and wheel.

(g) If needed to demount the whole tail wheel assembly from the tail leg, then unscrew the selflocking nut and remove the bolt which attach the tail wheel base to the tail leg.

(h) Place demounted parts on a suitable place.

8.3.10 Installation of tail landing gear leg

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- 2 wrenches size 7/16 in (bolt AN6)
- Phillips screwdriver

Follow Fig. 6-12 and Fig. 8-6 at installation.

(a) If the tail wheel assembly was demounted from the tail leg, then re–install to the leg (4) the tail wheel base (1). Use a new selflocking nut to do that; use of the original nut could cause its release and possible lost in operation.

(b) Set the leg (4) into the stirrup (6) and attach the stirrup to the fuselage tail bottom using 4 bolts (7). Keep the bolts not fully tightened for now.

(c) The tail leg front side is attached to the fuselage by means of a bolt and nut. The bolt shall be inserted from inside the fuselage through the inspection hole on the fuselage starboard side in front of the fin, see Fig. 6-12. Insert the bolt from inside the fuselage into a hole through the fuselage bottom and simmultaneously through a hole made through the front side of the tail leg.

(d) Then put a washer on the bolt end and screw a new selflocking nut.

(e) Prevent the bolt head from rotation from inside the fuselage using the wrench 7/16 in and tighten the nut from outside using another 7/16 wrench. Do not forget to remove the wrench from fuselage after that.

(f) Use 7/16 in wrench to tighten 4 bolts (7) attaching the leg stirrup (6) to the fuselage bootom.

(g) Hook the centering coil springs (5) onto the stirrup (6) and opposite end of the springs hook on the tail wing (8).

(h) Tighten the inspection hole cover on the fuselage starboard side with the attachment screws (see Fig. 6-12).

(i) Check re–installed tail landing gear.

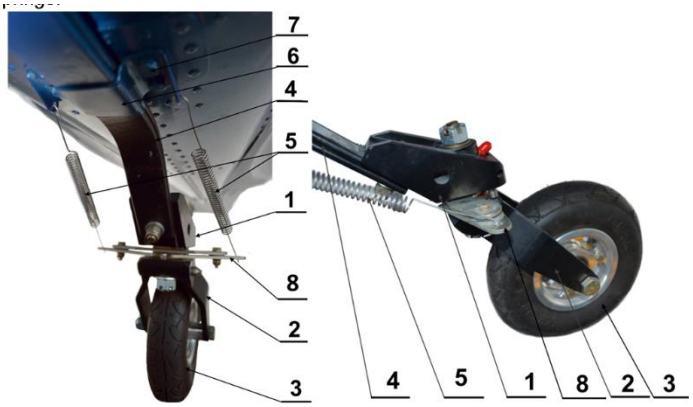


Fig. 8-6
Removal / Installation of tail landing gear leg

1 – Tail wheel base
2 – Wheel fork
3 – Tail wheel
4 – Landing gear leg – (2 springs)
5 – Centering coil springs
6 – Leg (spring) stirrup
7 – Stirrup bolts
8 – Wing

8.3.11 Removal of brake pumps

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 1/2 in, 3/8 in

Follow Fig. 8-7 at removal.

(a) Drain brake fluid from the brake system. Disconnect the brake system hose from the brake cylinder on the main landing gear wheel and let brake fluid drain to a previously prepared can from that system line in which you want to remove the brake pump.

(b) Disconnect the brake system hose (2) from the brake pump (1).

(c) Remove bolts (3) from the brake pump and rod end eye.

(d) Release the pump from the bracket (4) on the cross channel.

8.3.12 Installation of brake pumps

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 1/2 in, 3/8 in

Follow Fig. 8-7 at installation.

(a) Install the brake pump (1) acording to Fig. 8-7 to the Bracket (4) on the cockpit floor and assemble the fitting (3) to connect brake hose.

(b) Connect rod end of the brake pump (1) to the Rudder pedal bracket (5) using the bolt (6), secure with a nut.

(c) Re–connect brake hose (2) to the brake pump (1) and to the brake cylinder on main landing gear.

(d) Re–fill the brake system with brake liquid and deareate the system (see 8.5.4)

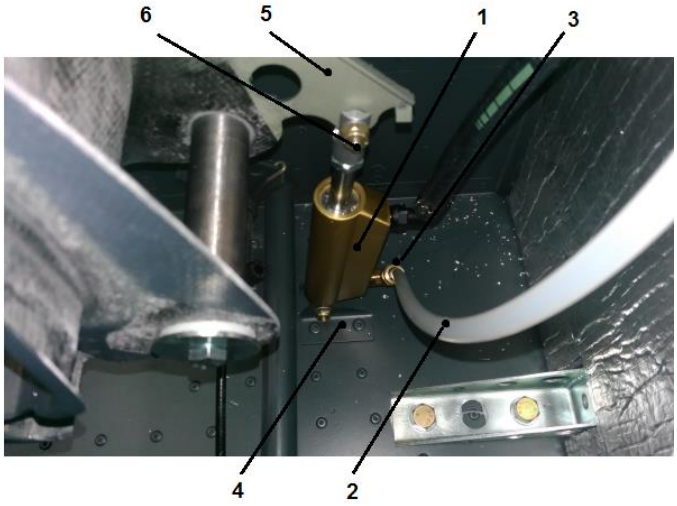


Fig. 8-7
Removal / Installation of brake pumps

1 – Brake pump	2 – Brake hose
3 – Fitting	4 – Bracket
5 – Rudder pedal	6 – Bolt, washer, nut

8.4 Check / Adjustment

No procedures included.

8.5 Exchanges / Service information

8.5.1 Exchange of main wheel tyre

Type of maintenance: line
Authorisation to perform:
Pilot or mechanic
Tools needed:

- wrench size 1/2 in
- Allen wrench size 1/4 in

(a) Jack and support the airplane (see 14.2).
(b) Remove the wheel fairing (see 8.3.1).
(c) Remove the main landing gear wheel (see 8.3.3).
(d) Deflate the tire .
(e) Unscrew bolts (1) (see Fig. 8-8).
(f) Set apart both halves of the rim and remove the tyre with the air tube.
(g) Exchange the air tube or the tyre if needed .
(h) Put the air tube into the tyre and inflate it slightly.
(i) Put the inner tube on that half of the rim having the the hole for valve.
(j) Put the other half of the rim on this unit. Join both halves of the rim with bolts – torque moment 1.15 kg.m (100 lbs.in).
(k) Inflate tyre to prescribed pressure:
– main wheel: 180+20 kPa *(26.1 + 2.9 psi)*
(l) Mark position of the rim and the tyre by redline overreaching about 10 mm (3/8 in) in to the rim and the tyre (serves for checking the tire slewing against the wheel rim in operation).

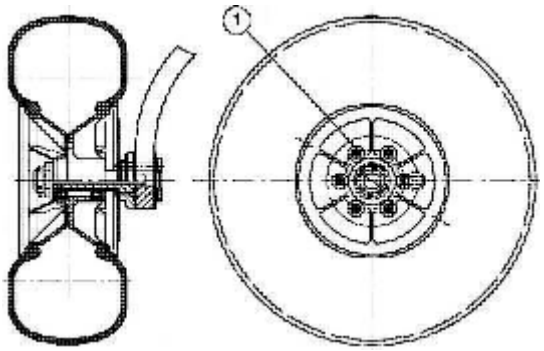


Fig. 8-8
Tyre change
1 – Rim bolts

8.5.2 Exchange of tail wheel tyre

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 19
- wrench size 3/8 in

Follow Fig. 8-9 to replace tail wheel tyre.

(a) Lift the fuselage tail up so that to raise the wheel above the ground and support the fuselage under the tail leg attachment to the fuselage.

(b) Use wrench size 19 to release self–locking nut (4).

(c) Remove bolt (3) from wheel fork.

(d) Remove the wheel from fork.

(e) Deflate tyre.

(f) Unscrew the 3 self–locking nuts (5) from the bolts connecting both halves of the wheel rim.

(g) Break appart wheel rim halves (1) and remove tyre and tube

(h) Replace tyre (2) or tube if needed.

(i) Insert tube into the tyre and slightly inflate.

(j) Set the tyre with tube on one half of the rim, valve into the hole.

(k) Attach opposite half of rim. Bolt both wheel rim halves together, use 3 new self–locking nuts and tighten them using 3/8 in size wrench.

(l) Inflate tyre to prescribed pressure:
– tail wheel: 50–80 kPa *(7.25 – 11.6 psi)*

(m) Mark position of the rim and the tyre by redline overreaching about 10 mm (3/8 in) in to the rim and the tyre (serves for checking the tire slewing against the wheel rim in operation).

(n) Install the wheel back into the fork 8.3.6.

Fig. 8-9
Tail wheel tyre/tube exchange

1 – Wheel rim
2 – Tyre tube
3 – Bolt/wheel axle
4 – Axle nut
5 – Nuts of bolts connecting both wheel rim halves

8.5.3 Exchange of brake pads

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 7/16 in

CAUTION

Always replace both brake pads!

Follow Fig. 8-10 at brake pads replacement.

(a) Jack and support the airplane (see 14.2)

(b) Demount the main wheel (see 8.3.3) if needed.

(c) Unscrew the bolts holding the brake pads (2) on the brake caliper (3) a remove the brake pads and brake disc.

(d) Insert new pads, insert the brake disc and screw it down to the caliper (3).

(e) Re–install main wheel if demounted (see 8.3.4).

(f) Check brake function.

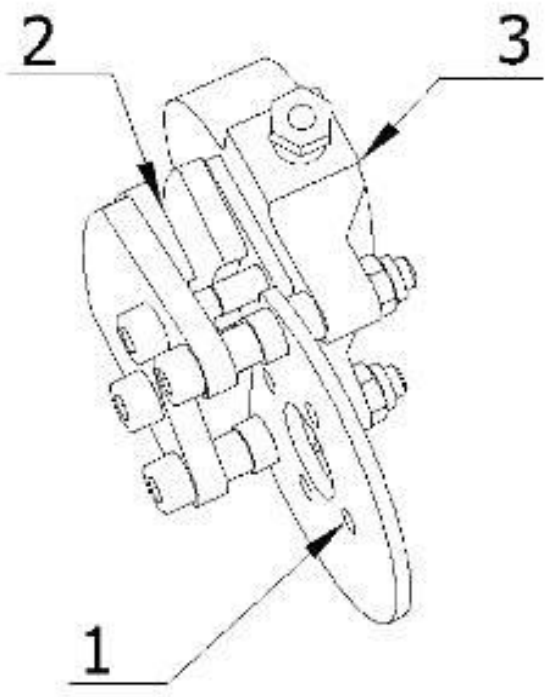


Fig. 8-10
Brake pads replacement

1 – Attachment holes 2 – Brake pads
3 – Brake caliper

8.5.4 Refilling / exchanging brake fluid

8.5.4.1 Draining brake fluid from brake system

Type of maintenance: line

Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 7/16 in
- plastic hose
- a compressible brake fluid filler (or a bigger syringer is also suitable)
- brake fluid

(a) Disconnect the brake hose from the brake pump and let brake fluid to run out into a before prepared can.

(b) Depress appropriate brake pedal to make brake fluid run–out faster.

8.5.4.2 Filing brake fluid into brake system

NOTE

Refer to the paragraph 17.5 to see brake fluid used by the airplane manufacturer

(a) Re–connect brake hose to the brake pump.

(b) Release a bleed screw on the brake pump No.1. Put a plastic hose on the released screw and use a compressible brake fluid filler to fill the system with brake fluid. This way of re–filling minimises risk of air intake into the brake system.

(c) Bleed the brake system after refilling.

8.5.4.3 Refilling brake fluid into brake system.

(a) Refill brake fluid into the brake system through a hole in brake pump (at foot control pedals). Air intake into the system is more probable when this way of filling is used.

9. CHAPTER – FUEL SYSTEM

9.1 General 9-2

9.2 Description and operation 9-2

9.2.1 Fuel storage 9-2

9.2.2 Fuel distribution 9-2

9.2.3 Indication of fuel quantity and pressure 9-3

9.3 Removal / Installation 9-3

9.3.1 Fuel tank removal 9-3

9.3.2 Fuel tank installation 9-4

9.3.3 Removal of the finger screen 9-4

9.3.4 Installation of the finger screen 9-4

9.3.5 Fuel level sender removal 9-5

9.3.6 Fuel level sender installation 9-5

9.3.7 Fuel drain valve removal 9-6

9.3.8 Fuel drain valve installation 9-6

9.4 Check / Adjustment 9-7

9.4.1 Checking fuel system tightness 9-7

9.4.1.1 Checking airplane fuel system tightness by air 9-7

9.4.1.2 Checking airplane fuel system tightness by fuel 9-7

9.4.2 Fuel pump check 9-7

9.4.2.1 Check for cracks 9-7

9.4.2.2 Checking fuel leakage 9-7

9.5 Exchanges / Service information 9-8

9.5.1 Fuel tank filling 9-8

9.5.1.1 Safety instructions for filling fuel into the airplane tanks 9-8

9.5.1.2 Procedure of fuel tank filing 9-8

9.5.2 Draining fuel system 9-8

9.5.2.1 Draining procedure 9-8

9.1 General

Fuel system works for storing fuel in the airplane and its delivering to the engine. The fuel system of BRISTELL TDO aerplane consists of the following parts: two fuel tanks, fuel tubing, selector valve, gascolator with integrated fuel filter, mechanical fuel pump (located on the engine), back up electrical fuel pump, fuel level gauges, fuel pressure gauge and drain valves on the fuel tanks.

9.2 Description and operation

9.2.1 Fuel storage

Fuel is stored in airplane in two fuel tanks. The fuel tanks are integrated part of the wing from Aluminum sheet and their volume is 60 litres (15.85 US gal, 13.2 UK gal) each. The tanks are located in the outer wings between ribs No.5 and 7 infront of the main spar. Each fuel tank has a filler neck (1) with flush head filler cap (2), venting tube (3), finger screen (4) and drain valve (5). Fuel is filled into the each tank through the filler neck (1), which is located on the top skin close to rib No.7. Fuel drain from the tank is possible through the drain valve (5) located in the rear corner of bottom skin close to the root fuel tank rib.

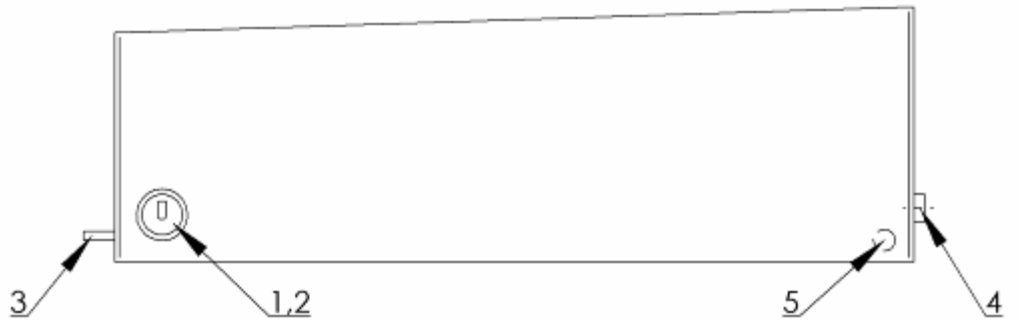


Fig. 9-1
Fuel tank

1 – Filler neck 2 – Filler cap
3 – Venting tube 4 – Finger screen
5 – Drain valve

9.2.2 Fuel distribution

Fuel flows from the tank (1) and (2) through finger screens (3) to the ANDAIR selector valve (4) and from there to the gascolator (5), electrical fuel pump (6) to the mechanical fuel pump (7) located on the engine. From there it is supplied through the fuel distributor lines to carburetors.

The ANDAIR selector valve (4) works also for interruption of fuel supply in case of engine fire or for airplane long–time parking. The ANDAIR selector is located on the middle console between the seats in the cockpit. The gascolator (5) is located on the firewall in lowest point of fuel system. The electrical fuel pump (6) is located on the firewal above the gascolator.

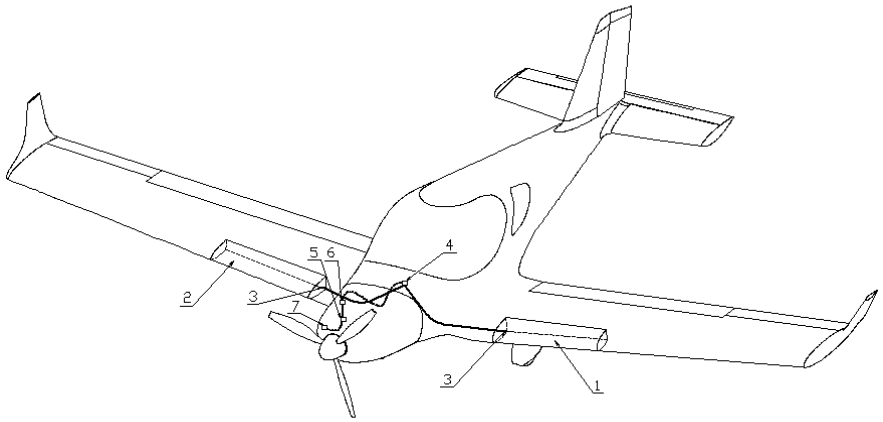


Fig. 9-2
Fuel system scheme

1 – Fuel tank left
2 – Fuel tank right
3 – Finger screen
4 – Andair selector valve
5 – Gascolator
6 – Electrical fuel pump
7 – Mechanical fuel pump

9.2.3 Indication of fuel quantity and pressure

Scheme of fuel quantity is shown in Fig. 9-4.
Fuel quantity is measured by the fuel float gauges. The float position is converted to an electrical signal and fuel quantity in the tank is indicated on the fuel indicator on the instrument panel.

9.3 Removal / Installation

9.3.1 Fuel tank removal

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 8, 1/2 in,
- screwdriver
- drill bit diam. 1/8 in, 5/32 in
- electric drill
- cutting pliers, pliers

(a) Disconnect the battery.
(b) Drain fuel from the fuel system by the tank drain valve.
(c) Unscrew the filler cap. Use hot air gun to preheat the filler cap thread, because it is sticked on Loctite for leakage protection.
(d) Remove the wing (see Chapter 4.3.1) and put it on the table.
(e) Drill out the top half of the leading edge skin.
(f) Disconnect wiring from fuel level sender.

(g) Disconnect fuel line.
(h) Carefully remove the tank and store it. Seal the tank holes as needed.

9.3.2 Fuel tank installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 8, 1/2 in,
- screwdriver
- rivetting pliers
- cutting pliers, pliers

(a) Remove any hole seals from the tank.
(b) Set the tank to the position between the ribs No.5 and 7. Before installing the tank, check the cork bands for completeness and damage. Change them if needed.
(c) Insert the finger screen – use LOCTITE 565 or equivalent sealant.
(d) Close the leading edge skin on the wing and fit it to the spars and ribs per clecos each second hole with help of securing harnesses.
(e) Rivet the skin on the ribs and spar.
(f) Screw back filler cap – use LOCTITE 565 to seal the thread and silicon to make connection of filler cap flange and wing skin watertight.
(g) Install fuel level sender and connect the wire.
(h) Install the wing (see 4.3.2).
(i) Check the fuel system (see 9.4.1).
(j) Connect the battery ground.

9.3.3 Removal of the finger screen

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver

At removing proceed according to Fig. 9-3.
The finger screen is located on the root tank rib.

(a) Drain fuel from the fuel system.
(b) Remove the wing – see 4.3.1.
(c) Disconnect the fuel hose (3).
(d) Remove the finger screen (2).

9.3.4 Installation of the finger screen

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver

At installing proceed according to Fig. 9-3.

(a) Screw the finger screen (2) into the root tank rib – use LOCTITE 565 or equivalent sealant.

(b) Connect fuel hose (3) on the finger screen.

(c) Install the wing – see 4.3.2.

(d) Check fuel system tightness (see 9.4.1).

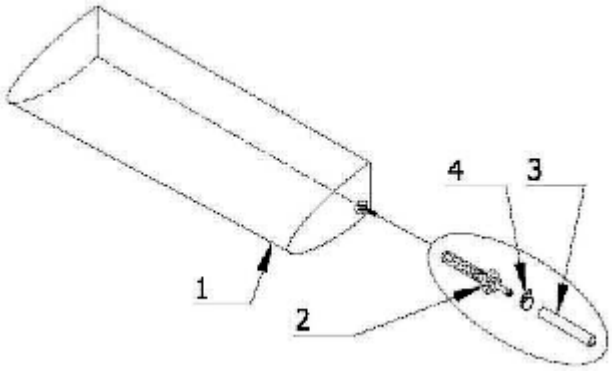


Fig. 9-3
Removal / Installation of the finger screen
1 – Fuel tank 2 – Finger screen
3 – Fuel hose 4 – Clamp

9.3.5 Fuel level sender removal

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- electric drill
- drill bit diam. 3.2 mm (1/8 in)
- screwdriver
- cutting pliers, pliers

(a) Remove the wing – see 4.3.1.

(b) Disconnect fuel level sender wire.

(c) Unscrew bolts and remove fuel level sender from root fuel tank rib.

9.3.6 Fuel level sender installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 8
- screwdriver
- rivveting pliers
- cutting pliers, pliers

(a) Set sealing on the fuel tank flange.
(b) Set position and length of the fuel level sender lever according to Fig. 9-4.
(c) Carefully put the fuel level sender into the tank and attach it using bolts with washers – use LOCTITE 565 or equivalent sealant on bolts thread.
(d) Connect electrical wires to the fuel level sender (electrical connection – see 16.CHAPTER – WIRING DIAGRAMS).
(e) Check fuel system tightness (see 9.4.1).
(f) Connect the battery and check fuel gauge function.
(g) Install the wing (see 4.3.2).

Fig. 9-4
Float mechanism

9.3.7 Fuel drain valve removal

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 1/2 in

(a) Drain the fuel from the tank or gascollator.
(b) Remove drain valve from the tank or gascollator – unscrew it.
(c) Check “O” ring and the spring.

9.3.8 Fuel drain valve installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 1/2 in

(a) Set drain valve in the tank or gascollator – use LOCTITE 565 or equivalent sealant.
(b) Fill the tank with fuel and check drain valve tightness.

9.4 Check / Adjustment

9.4.1 Checking fuel system tightness

NOTE

Tightness is checked by pressurized air or fuel. When performing a specific tightness check, outside temperature fluctuations must not be bigger than ±13°C (8°F). Reseal found out leakage by a suitable method – by tightening, by using a suitable sealing.

9.4.1.1 Checking airplane fuel system tightness by air

(a) Connect an appropriate device to the filing neck for pressurizing.

(b) Blind the fuel filter by plugs. Blind the fuel tank venting with the rubber plug (or from a similar material) and secure it with locking wire.

(c) ANDAIR selector valve – **ON** position – choose the tank.

(d) Supply air pressure of 24 kPa (3.48 psi) to the system by means of the pressurization equipment.

(e) Shut the air pressure supply. During 15 minutes there must not be any loss in pressure. Find out leakage by listening to and by soap water.

(f) ANDAIR selector valve – **OFF** position.

9.4.1.2 Checking airplane fuel system tightness by fuel

(a) Fill up the fuel tanks with fuel.

(b) Connect the pressurization equipment to the filler neck.

(c) Blind the fuel filter and the fuel return line bushing by plugs – or interconnect it with the fuel hose. Blind the fuel tank venting by rubber plug (or from another suitable material) and secure it with locking wire.

(d) ANDAIR selector valve – **ON** position – select the tank.

(e) Supply air pressure of 3,48 psi to the system by means of the pressurization.

(f) During 15 minutes there must not be any loss in pressure. There must not be any leakage. Checked joint is considered hermetic unless any evidence of fuel leakage is detected on the checked surface during tests.

(g) ANDAIR selector valve – **OFF** position.

9.4.2 Fuel pump check

9.4.2.1 Check for cracks

Check the fuel pump body for cracks, including the inlet and the outlet hose. If cracks are detected, immediately exchange the fuel pump with new pump.

9.4.2.2 Checking fuel leakage

Perform engine inspection and check the fuel pump body, including inlet and outlet hose, for fuel leakage. In case of fuel leakage, find out the reason and if necessary exchange the fuel pump for the new pump.

9.5 Exchanges / Service information

9.5.1 Fuel tank filling

CAUTION

When filling fuel in the airplane, use only approved kinds of fuel mentioned in this Manual, par. 10.2.1.3, or in the POH Chapter 2, or in Rotax engine Operator's Manual–Section 10.2.2 and 13 or Service Instruction SI–912–016.

9.5.1.1 Safety instructions for filling fuel into the airplane tanks

(a) The fuel tanks can be filed with fuel only by persons who are fully instructed and familiarized with safety instructions.

- during rain and storm
- in a closed space
- when the engine is operating or with electric system switched on

(b) A person filling the fuel tank must not be wearing polyester clothing or any clothing from a material which creates static electricity.

(c) It is prohibited to smoke or handle with open fire.

9.5.1.2 Procedure of fuel tank filing

(a) Ground the airplane. The airplane ground point is located on the nose landing gear leg.

(b) Open the fuel tank filler cap.

(c) Fill necessary quantity of fuel.

CAUTION

When filling fuel into the airplane, avoid the contact of fuel with the airplane surface – it would cause damage on surface treatment of the airplane.

(d) When the airplane is filled with fuel, wipe the filler neck of the rest of fuel and close the fuel neck filler cap.

(e) Remove conductive interconnection between the filling device and the airplane.

(f) Drain the fuel tank.

9.5.2 Draining fuel system

Perform draining the fuel tanks and gascolator after every filling the tank with fuel before the first flight of the day. The fuel tank draining points are on bottom side of the wings and on the firewall.

9.5.2.1 Draining procedure

(a) Open the drain valve by pressing up.

(b) Drain required quantity of fuel.

NOTE

Draining serves for elimination of impurities and sediments from fuel. Drain so long unless clean fuel flows from the drain valve.

(c) Close the drain valve by releasing pressure.

10. CHAPTER– POWER UNIT

10.1 General 10-3

10.2 Description and operation 10-3

10.2.1 Engine 10-3

10.2.1.1 Technical data of the engine 10-3
10.2.1.2 Coolant type 10-4
10.2.1.3 Fuel type 10-5
10.2.1.4 Oil type 10-6
10.2.1.5 Engine mount 10-7
10.2.1.6 Engine cowling 10-7
10.2.1.7 Engine control 10-8
10.2.1.8 Engine instruments 10-8
10.2.1.9 Engine cooling system 10-8
10.2.1.10 Engine lubrication system 10-8
10.2.1.11 Air inlet system of the engine 10-9
10.2.1.12 Exhaust system 10-10
10.2.1.13 Ignition system 10-10

10.2.2 Propeller 10-11

10.3 Removal / Installation 10-12

10.3.1 Removal of the engine from the airplane 10-12
10.3.2 Installation of the engine on the airplane 10-12
10.3.3 Removal of the propeller 10-14
10.3.4 Installation of the propeller 10-15
10.3.5 Air intake system removal 10-16
10.3.6 Air intake system installation 10-17
10.3.7 Exhaust system removal 10-18
10.3.8 Exhaust system installation 10-18
10.3.9 Oil cooler removal 10-19
10.3.10 Oil cooler installation 10-19
10.3.11 Removal of the radiator 10-19
10.3.12 Installation of the radiator 10-20
10.3.13 Removal of the throttle and choke control levers 10-21
10.3.14 Installing of the throttle and choke control levers 10-21
10.3.15 Removal of the carburetor heating knob 10-22
10.3.16 Installing the carburetor heating knob 10-22

10.4 Check / Adjustment 10-23

10.4.1 Engine test 10-23
10.4.2 Adjusting throttle control 10-26
10.4.3 Adjusting choke control 10-26
10.4.4 Adjusting carburetor heating control 10-26
10.4.5 Checking exhaust system 10-26

10.5 Exchanges / Service information 10-27

10.5.1 Exchange / Refilling oil 10-27

10.5.1.1 Oil volume 10-27

10.5.1.2 Oil draining 10-27

10.5.1.3 Refilling oil 10-27

10.5.1.4 Venting of the lubrication system 10-27

10.5.2 Exchange / Refilling cooling liquid 10-27

10.5.2.1 Cooling liquid volume 10-27

10.5.2.2 Drainage of cooling liquid 10-28

10.5.2.3 Refilling cooling liquid 10-28

10.5.3 Exchange / Check of oil filter 10-28

10.5.4 Exchange / Check of air filter 10-28

10.1 General

The standard power unit of BRISTELL TDO airplane consists of ROTAX 912 ULS engine and Fiti Eco Competition 3LR 158 ground adjustable propeller.

10.2 Description and operation

10.2.1 Engine

The engine ROTAX 912 ULS is a four-stroke, four-cylinder, opposed - cylinder engine, central cam shaft and OHV - mechanism with maximal power of 73.5 kW (*98.6 hp)* at 5 800 RPM.

10.2.1.1 Technical data of the engine

Engine Model:		**ROTAX 912 ULS 2**
Engine Manufacturer:		**Bombardier-Rotax GMBH**
Power	***Max Take-off:***	**100 hp at 5800 rpm, max.5 min.**
	Max. Continuous:	**92.5 hp at 5500 rpm**
	Cruising:	**68.4 hp at 5000 rpm**
Engine RPM	***Max. Take-off:***	**5800 rpm, max. 5 min.**
	Max. Continuous:	**5500 rpm**
	Cruising:	**5000 rpm**
	Idling:	**~1400 rpm**
Cylinder head temperature (CHT) Older engines S/N without Suffix -01	***Minimum:***	**50 °C (122 °F)**
	Maximum:	**135 °C (275 °F)** **conventional coolant** - permanent monitoring of coolant temperature and CHT is necessary **Waterless coolant** - permanent monitoring of CHT is necessary
	Optimum:	**80 – 110 °C (176-230 °F)**
Coolant temperature (CT) New engines S/N with Suffix -01	***Minimum:***	**50 °C (122 °F)**
	Maximum:	**120 °C (248 °F)** only conventional coolant allowed
	Optimum:	**80 – 110 °C (176-230 °F)**
Oil temperature	***Minimum:***	**50 °C (122 °F)**
	Maximum:	**130 °C (266 °F)**
	Optimum:	**90 – 110 °C (190-230 °F)**
Oil pressure:	***Minimum:***	**0.8 bar (12 psi) -** ***below 3500 rpm***
	Maximum:	**7 bar (102 psi) - cold engine start**
	Optimum:	**2 - 5 bar (29 – 73 psi) -** ***above 3500 rpm***
Exhaust gases temp.	***Maximum:***	***880 ° C* (1616 °F)**

10.2.1.2 Coolant type

General note

NOTICE Obey the latest edition of Service Instruction SI-912-016 for the selection of the correct coolant.

Conventional coolant

Conventional coolant mixed with water has the advantage of a higher specific thermal capacity than water-less coolant.

Application

When correctly applied, there is sufficient protection against vapor bubble formation, freezing or thickening of the coolant within the operating limits.

Use the coolant specified in the manufacturers documentation.

Mixture

NOTICE Obey the manufacturers instructions about the coolant.

Applicable for engine S/N without Suffix -01.

	mixture ratio %	
designation	**concentrate**	**water**
conventional e.g. BASF Glysantine anticorrosion	50*	50
waterless e.g. Aero Cool 180°	100	0

* coolant component can be increased up to max. 65%.

Applicable for engine S/N with Suffix -01.

	mixture ratio %	
designation	**concentrate**	**water**
conventional e.g. BASF Glysantine anticorrosion	50*	50

* coolant component can be increased up to max. 65%.

WARNING

The coolant concentrate (propylene glycol) may not be mixed with conventional (glycol/water) coolant or with additives.

CAUTION

Conventional glycol/water coolant reduce to apply the maximum permissible cylinder head temperature.

Type of coolant used by aircraft manufacturer is shown in 17.5.

10.2.1.3 Fuel type

(refer to the ROTAX Engine Operator's Manual, Service Instructions SI–912–016, or POH chapter 2.4)

General note

NOTICE Obey the local codes and the latest edition of Service Instruction SI-912-016 for the selection of the correct fuel.

NOTICE Use only fuel suitable for the respective climatic zone.

NOTE: Risk of vapour formation if using winter fuel for summer operation.

Knock resistance

The fuels with following specifications can be used:

Fuel specifikationen		
	Usage/Description	
Knock resistance	**912 A/F/UL**	**912 S/ULS**
	Min. RON 90 (min. AKI* 87)	Min. RON 95 (min. AKI* 91)

* Anti Knock Index (RON+MON)/2

MOGAS

	Usage/Description	
Mogas	**912 A/F/UL**	**912 S/ULS**
European standard	EN 228 Normal	
	EN 228 Super	EN 228 Super
	EN 228 Super plus	EN 228 Super plus

AVGAS

AVGAS 100LL places greater stress on the valve seats due to its high lead content and forms increased deposits in the combustion chamber and lead sediments in the oil system.

	Usage/Description	
AVGAS	**912 A/F/UL**	**912 S/ULS**
Aviation Standard	AVGAS 100 LL (ASTM D910)	AVGAS 100 LL (ASTM D910)

Due to higher lead content in AVGAS, the wear of the valve seats and deposits in the combustion chamber will increase. Therefore, use AVGAS only if you encounter problems with vapor lock or if the other fuel types are not available.

10.2.1.4 Oil type

General note	**NOTICE** Obey the manufacturers instructions about the lubricants. If the engine is mainly run on AVGAS more frequent oil changes will be required. See Service Information SI-912-016, latest edition.
Oil type	For the selection of suitable lubricants refer to the Service Information SI-912-016, latest edition.
Oil consumption	Max. 0.06 l/h (0.13 liq pt/h).
Oil specification	- Use only oil with API classification **"SG"** or higher! - Due to the high stresses in the reduction gears, oils with gear additives such as high performance motor cycle oils are required. - Because of the incorporated overload clutch, oils with friction modifier additives are unsuitable as this could result in a slipping clutch during normal operation. - Heavy duty 4-stroke motor cycle oils meet all the requirements. These oils are normally not mineral oils but semi- or full synthetic oils. - Oils primarity for Diesel engines have **insufficient high temperature properties and additives which favour clutch slipping, and are generally unsuitable.**
Oil viscosity	Use of multi-grade oils is recommended. NOTE: Multi-viscosity grade oils are less sensitive to temperature variations than single grade oils. They are suitable for use throughout the seasons, ensure rapid lubrication of all engine components at cold start and get less fluid at higher temperatures.

Type of oil used by aircraft manufacturer is shown in 17.5.

10.2.1.5 Engine mount

The engine mount conects the power unit to the airplane. It is welded from 4130 steel tubes and is attached to the firewall and to the engine by means of bolts. The engine mount is installed on the firewall by four attachments through rubber shock absorbers. The scheme of engine mount attachment to the firewall and to the engine is shown in the Fig. 10-1.

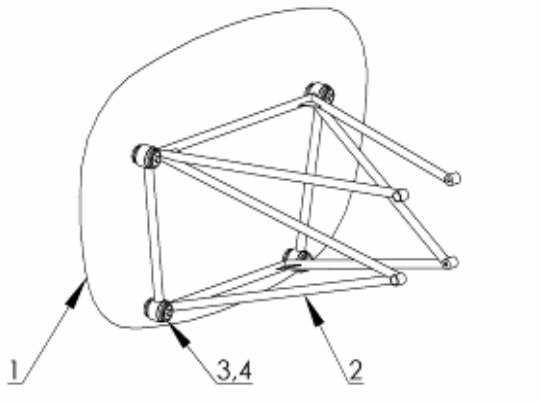


Fig. 10-1
Rotax engine mount

1 – Firewall
2 – Engine mount
3 – Attachment bolts with shock absorbers
4 – Nyloc nut

10.2.1.6 Engine cowling

Engine cowling (Fig. 10-2) consists of two parts: upper cowling and lower cowling. The upper cowling (1) is attached by means of quick fasteners (4) to the firewall and to the lower cowling (2). Unlock the quick fasteners by turning the bolt by 90° counter–clockwise. The acces cover (5) which is located on the upper cowling on the left side infront of the firewall enables to check oil quantity in the oil tank without removing the upper cowling.

The lower cowling (2) is attached by means of quick fasteners (4) to the firewall and to the upper cowling (1). There is in the front part of the lower cowling (2) an oval hole (3) for air inlet to the oil radiator. In the bottom part of the lower cowling (2) is NACA inlet for air intake to the water cooler.

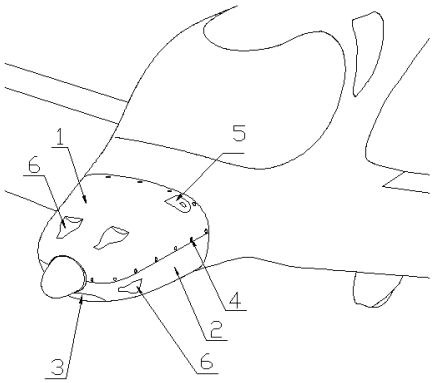


Fig. 10-2
Engine cowlings

1 – Upper engine cowling
2 – Lower engine cowling
3 – Air inlet hole for oil radiator
4 – Quick fasteners
5 – Access door
6 – Fresh air NACA inlets

10.2.1.7 Engine control

Engine power is controlled by means of the **THROTTLE** control lever which is positioned on the middle channel between the seats and which controls engine power from idle up to max. take–off power. Engine power control lever is mechanically connected (by cable) to the carburettors.

If the control lever is fully pushed, this position corresponds to max. take–off power of the engine. If the control lever is fully pulled, this position corresponds to idle. Changes in the engine power setting can be made by moving of the control lever forwards and backwards.

10.2.1.8 Engine instruments

The engine manufacturer recomends following instruments for engine run checking:
RPM indicator, Cylinder head thermometer, Oil thermometer, Oil pressure gauge, option – Fuel pressure gauge.
Instruments colour marking and description is mentioned in 12.2.3.

10.2.1.9 Engine cooling system

Engine cooling is combined, cylinder heads are liquid cooled, cylinders are air cooled. Cooling circuit of cylinder heads is made as a closed system containing the pump, expansion tank with the pressure cap, radiator and the overflow bottle. The scheme of cylinder head cooling system is shown in Fig. 10-3.

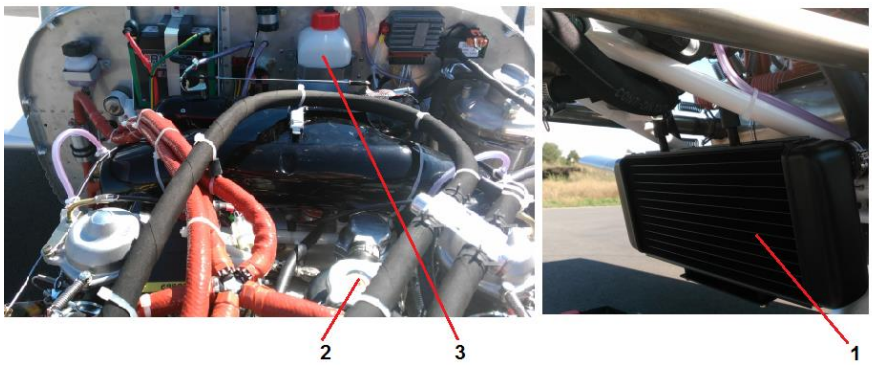


Fig. 10-3
Cooling system

1 – Radiator 2 – Expansion tank
3 – Overflow bottle

10.2.1.10 Engine lubrication system

Engine lubrication system (see Fig. 10-4) is made with the dry sump. Engine lubrication system is equipped with the mechanically driven oil pump (1) which ensures oil supply from the oil tank (4) located on the firewall through the oil cooler (5) and the oil pump with oil filter (1) to the lubricated points on the engine. The oil pump is equipped with the pressure regulator and with the pressure transmitter. The oil tank is ventilated by the hose (6) which leads under the airplane. Oil pressure and temperature are indicated on the round analalog instruments in the right section of the instrument panel.

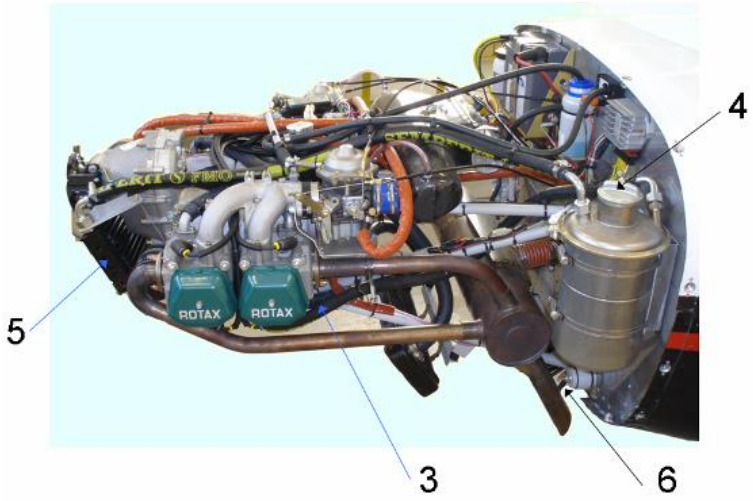


Fig. 10-4
Oil cooling system

Fig. 10-5
Oil cooling system

1 – Oil pump with oil filter
2 – Oil inlet into the oil pump
3 – Oil outlet from the engine
4 – Oil tank
5 – Oil cooler
6 – Oil tank venting

10.2.1.11 Air inlet system of the engine

Engine air inlet system ensures supply of sufficient air volume to the engine. Air is supplied to the engine by the hole located on NACA inlet for water cooling, through the air filter (5) to the airbox (1). Heated air from the heat exchanger (2), which is attached to the muffler is controlled by flap on the firewall. The heating control flap is controlled by CARB HEAT knob (6) on the instrument panel.

10.2.1.12 Exhaust system

Exhaust system of BRISTELL TDO airplane consist of four exhaust pipes (1) which lead exhaust gases from individual cylinders to the muffler (2). The muffler works at the same time as a silencer. Exhaust gases lead from there by the exhaust pipe (3) down the airplane.
On the muffler is heat exchanger (5) from which is taken warm air for the carburettor preheating and for the cockpit.
The whole exhaust system is welded from the stainless steel sheets and pipes.

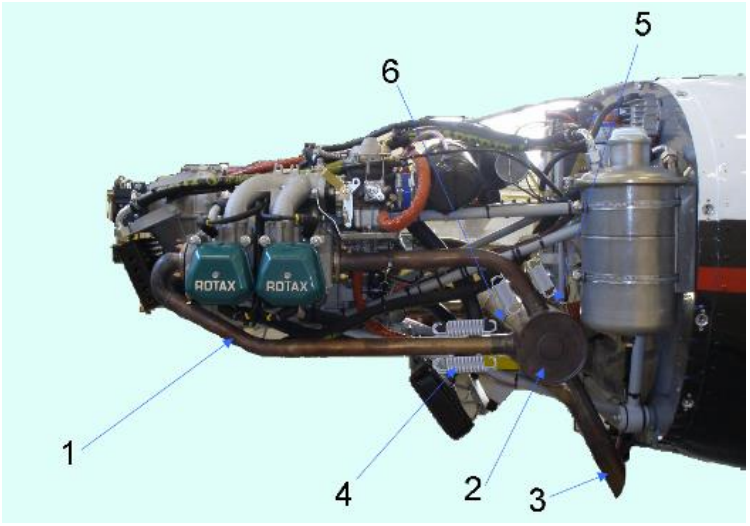


Fig. 10-6
Exhaust system

1 – Exhaust pipes 2 – Muffler
3 – Outlet exhaust pipe 4 – Spring
5 – Heat exchanger 6 – Spring

10.2.1.13 Ignition system

Engine is equipped with the double contactless ignition system. Every ignition circuit has its source of energy, control unit, 2–ignition coils and 4–spark plugs. It is fully independent on the other circuit and battery. High voltage current is distributed to the spark plugs by means of high voltage cables. The sequence of individual cylinder ignition of the engine is as follows: 1–4–2–3.
Ignition circuits are controlled by the ignition switch on the instrument panel..

There are the following positions of the switch box key:

OFF Engine ignition is OFF
R Only Right ignition circuit ON
L Only Left ignition circuit ON
BOTH Both circuits ON
START Both circuits ON and the starter is running up the engine

Fig. 10-7
Ignition box

10.2.2 Propeller

FITI ECO COMPETITION 3 LR 158 is on ground adjustable, 3-bladed propeller with the composite blades. The propeller is designed for Rotax 912 (80 HP) and Rotax 912 ULS (100 HP) engines. Maximum allowed RPM is 2900 rpm.

The propeller hub consists of two halves, holds the steel shanks of the blade roots, using M6 screws..

The propeller is delivered with a spinner and fixing screws.

Refer to the Operating Instructions and Technical Description for more details.

Fig. 10-8
Fiti 3LR propeller

10.3 Removal / Installation

10.3.1 Removal of the engine from the airplane

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 8, 9, 3/8 in, 7/16 in, 9/16 in
- Allen wrench size 4
- screwdriver
- cutting pliers, pliers
- Cobra pliers (for clamps)

(a) Remove engine cowling.
(b) Disconnect and remove the board battery.
(c) Remove the propeller (see 10.3.3).
(d) Disconnect all electrical system wires and bondings between the engine mount and the firewall.
(e) Shut the fuel selector valve (possibly drain fuel from the fuel installation).
(f) Drain oil from the engine (see 10.5.1) and cooling liquid (see 10.5.2).
(g) Disconnect hoses of the oil and the cooling system.
(h) Remove the oil cooler (see 10.3.9) and the radiator (see 10.3.11).
(i) Disconnect control of carburettors and carburettors heating.
(j) Remove air intake (see 10.3.5).
(k) Remove the exhaust system (see 10.3.7).
(l) Blind all the holes on the engine so that no impurity can get into the engine.
(m) Cut of the wire securing the screw heads (3).
(n) Remove screws (3) and washers (4) attaching the engine to the engine mount.
(o) Take the engine away from the engine mount by the crane or with help 2 assistants.
(p) Store the removed engine on a safe place on a suitable support and prevent it from damage.

10.3.2 Installation of the engine on the airplane

Type of maintenance: heavy
Authorisation to perform:

- LSA mechanic or A&P mechanic (Airframe and Powerplant)

Tools needed:

- wrench size 8, 9, 3/8 in, 7/16 in, 9/16 in
- Allen wrench size 4
- screwdriver
- cutting pliers, pliers
- Cobra pliers (for clamps)

Install the engine on the engine mount according to Fig. 10-9:

(a) Put the engine on the engine mount by the crane or with 2 assistants and attach it by the screws (6) with washers (7). Tighten up applying torque moment 4.146 kg.m *(30 lbf)*.

(b) Secure the screw heads by cotter pins (8).

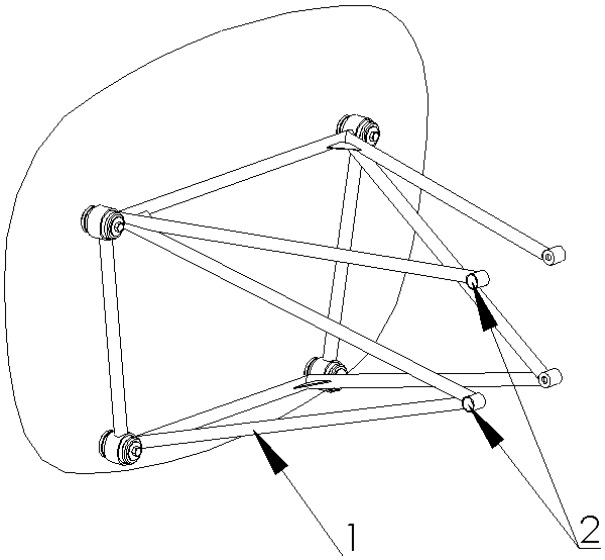


Fig. 10-9
Engine mount attachment to the engine and firewall
1 – engine mount 2 – Screws (holes for screws)

(c) Install the exhaust system (see 10.3.8).

(d) Connect wiring according to the wiring diagrams (see 16.CHAPTER – WIRING DIAGRAMS).

(e) Install oil cooler (see 10.3.10).

(f) Install water radiator (see 10.3.12).

(g) Connect and secure oil system hoses.

(h) Connect and secure fuel system hoses.

(i) Install air intake of the engine (see 10.3.6).

(j) Connect control cable of the carburettor preheating flap.

(k) Connect control cables of the choke and the throttle on the carburetor control levers according to the Fig. 10-10. Adjust the throttle control (see 10.4.2) and the choke control (see 10.4.3).

(l) Connect air hose from the heat exchanger for heating of the airplane cockpit.

(m) Fill the prescribed amount of oil and cooling liquid quantity.

(n) Check fuel system tightness (see 9.4.1).

(o) Install the propeller (see 10.3.4).

(p) Install and connect the battery.

(q) Install engine cowlings.

(r) Perform engine test (see 10.4.1).

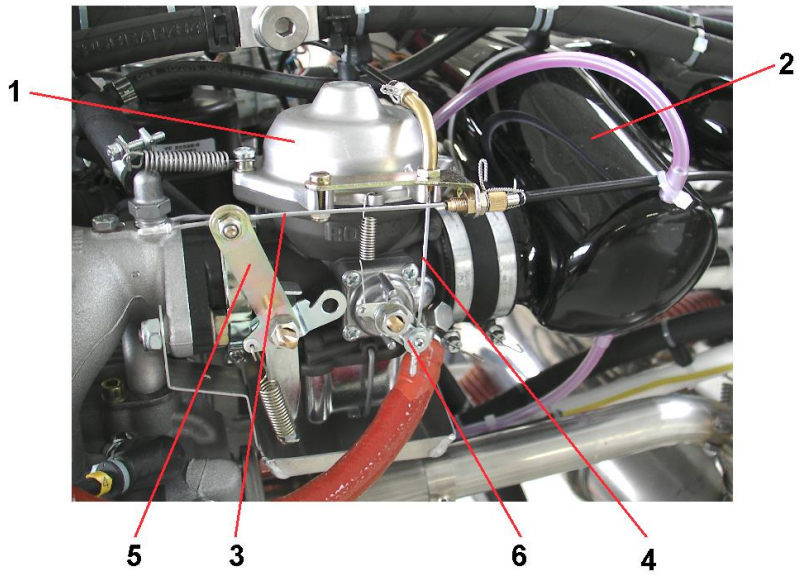


Fig. 10-10
Throttle and choke control

1 – Carburettor
2 – Airbox
3 – Throttle control cable
4 – Choke control cable
5 – Throttle control lever
6 – Choke control lever

10.3.3 Removal of the propeller

Type of maintenance: line
Authorization to perform:

- Sport pilot or LSA mechanic

Tools needed:

- wrench size 13, No. 16 (5/8 in)
- Allen wrench size 6
- Screwdriver
- Cutting pliers, pliers

NOTE
For the Fiti 3LR propeller DISASSEMBLY refer to the OPERATING INSTRUCTIONS AND TECHNICAL DESCRIPTION OF FITI ECO COMPETITION, ON-GROUND ADJUSTABLE PROPELLER.

(a) Disconnect the board battery and remove upper line of spark plugs from the engine.
(b) Remove the propeller spinner (1).
(c) Cut of the wire securing the bolt heads (7).
(d) Unscrew nuts (8), remove bolts (7) and take out the propeller along with other parts from the flange.
(e) Put the protective covers on the propeller blades and store the propeller on a safe place so that no damage can occur.

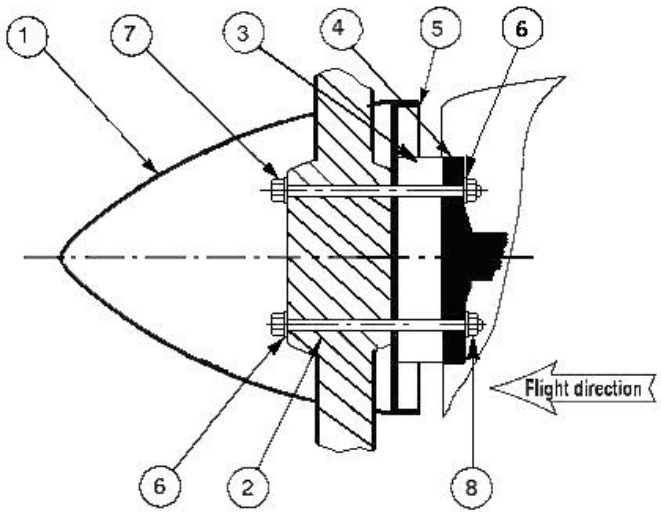


Fig. 10-11
Removal / Installation of propeller

1 – Propeller spinner
2 – Propeller hub
3 – Spacer
4 – Propeller flange on the engine
5 – Propeller spinner flange
6 – Washer
7 – Bolt
8 – Nut

10.3.4 Installation of the propeller

Type of maintenance: line
Authorization to perform:

- Sport pilot or LSA mechanic

NOTE

For the Fiti 3LR propeller installation refer to the OPERATING INSTRUCTIONS AND TECHNICAL DESCRIPTION OF FITI ECO COMPETITION, ON-GROUND ADJUSTABLE PROPELLER.

-

Tools needed:

- wrench size 13, No. 16 (5/8 in)
- Allen wrench size 6
- Screwdriver
- Cutting pliers, pliers

(a) Check the contacting areas of the flange of the reducer propeller shaft and the propeller. Clear off all impurities.

(b) Remove protective covers from the propeller blades and carry out visual check of the propeller integrity.

(c) Attach the propeller hub (2) and spinner flange (5) to the propeller flange on the engine (4) by bolts (7), washers (6) and nuts (8).

(d) Tighten bolts (7) gradually according to the Fig. 10-12:

- 1st step – torque moment 0.511 kg.m (3.7 lb.ft)
- 2nd step – torque moment 1.023 kg.m (7.4 lb.ft)
- 3rd step – torque moment 1.631 kg.m (11.8 lb.ft)

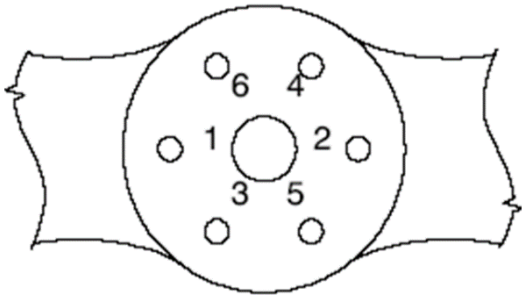


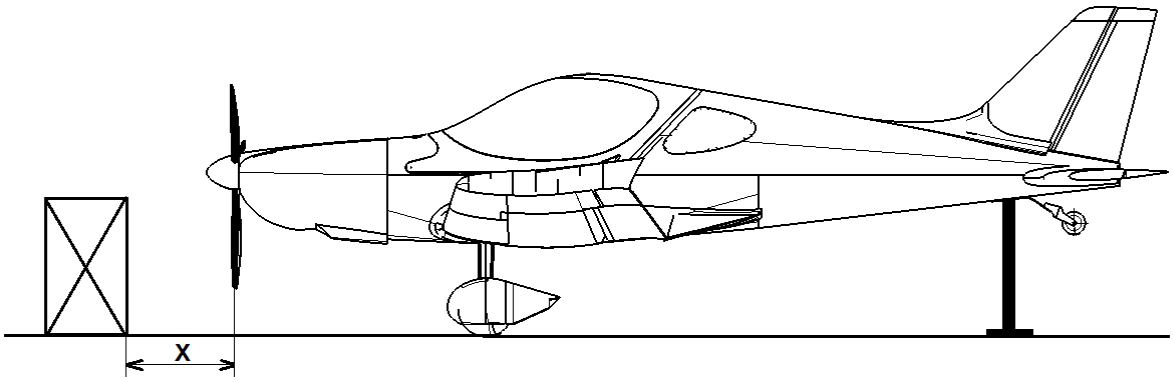
Fig. 10-12
Bolt tightening sequence

(e) Remove spark plugs of the engine and secure the airplane against its movement (see 14.5).

(f) Check out, possibly adjust the blades pitch of propeller according to the propeller manual.

(g) Tighten up bolts (7) gradually according to the Fig. 10-12, for torque moments refer to the propeller manual, and measure the difference in distance of individual blade tips from marking (see Fig. 10-13).

(h) The difference can be max. 1.5 mm (0.06 in). Possible bigger differences can be corrected by repetition of the procedure from point (d) or (f).



X ... distance of the propeller tip from the marking

Fig. 10-13
Check of axial propeller running–out

(i) Secure bolt heads (7) by locking wire (see 15.8.2).

(j) Put the propeller spinner (1) on the propeller and attach it with bolts.

(k) Install spark plugs on the engine. Tigten up with torque 2.073 kg.m *(15 lb.ft)*.

10.3.5 Air intake system removal

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- Wrench size 8, 10
- Screwdriver

see Fig. 10-14.

(a) Remove the upper engine cowling.

(b) Disconnect the control cable (6) from the air intake changeover lever (4) and from the holder.

(c) Disconnect hoses connecting airbox with the carburettors (7), drain hoses, air hoses (9) and (10).

(d) Remove the strut.

(e) Remove the hose fastener between carburettors and the airbox.

(f) Remove the airbox from the engine and store it.

10.3.6 Air intake system installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 8, 10
- screwdriver

see Fig. 10-14.

(a) Attach the outlet pipe of the airbox (1) to the carburettor inlet necks by means of hose fasteners.

(b) Fix the airbox by means of the strut and the silentblock to the engine mount.

(c) Connect the air intake hoses to the airbox, one from the air filter (9) and the other one from the heat exchanger (10).

CAUTION

Do not confuse these hoses!

(d) Connect drain hoses to the airbox and the drain hoses to the trays under carburettors – lead them on the engine mount in direction down the airplane (fix them by draw band on the engine mount).

(e) Connect up the airbox by means of hoses (7) with carburettors.

(f) Connect the cable of carburettor heating flap control (6) adjust function of carburettor heating knob.

(g) Install the upper engine cowling.

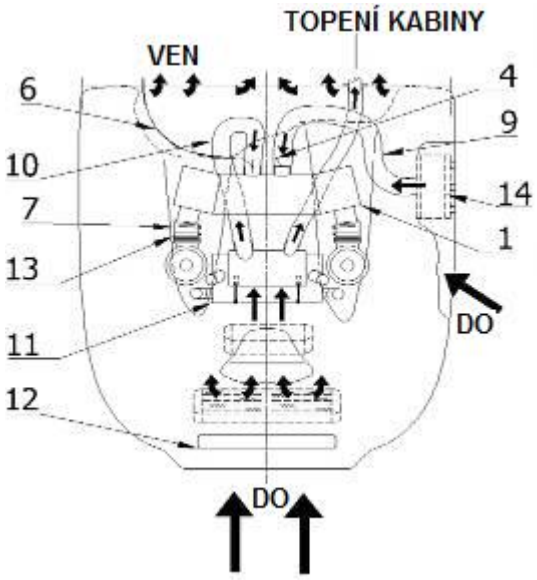


Fig. 10-14
Removal / Installation of air intake system

1 – Airbox
4 – Air intake changeover lever
6 – Control cable
7 – Hose interconnecting airbox and the carburettor
9 – Air hose – cold air
10 – Air hose – preheated air
11 – Muffler
12 – Lower engine cowling
13 – Hose fastener
14 – Air filter

10.3.7 Exhaust system removal

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 13
- pliers
- small wire hook (spring removal/assembly jig)

see Fig. 10-6.

(a) Remove the springs (4) from the exhaust pipes (1) attaching to the muffler (2).
(b) Remove individual pipes from the necks on the engine.
(c) Remove springs (6) and release the heat exchanger (5) from the muffler (2).

10.3.8 Exhaust system installation

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 13
- pliers
- small wire hook (spring removal/assembly jig)

see Fig. 10-6.

(a) Install the exhaust pipes (1) to the engine necks. Mind a proper arrangement, each pipe is designed for specific necks. Put the washers and screw the nuts on the bolts of the engine exhaust necks, do not tighten the nuts.

(b) Install the muffler (2) to the exhaust pipes (1) and secure the tubes by means of springs (4).

(c) Gradually tighten all nuts of the flanges on the engine necks.

NOTE

Ensure the sufficient space between the exhaust pipes and the other installed parts.

10.3.9 Oil cooler removal

Type of maintenance: line

Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 19, 30

see Fig. 10-15.

(a) Remove the upper and lower engine cowling.

(b) Drain oil from the oil system (see 10.5.1).

NOTE

It is also possible to pump oil from the cooler to the oil tank. You can do it by manual running the engine by means of the propeller, whereas from the oil tank you will remove the hose leading to the oil cooler. Engine ignition must be switched off!

(c) Remove hose fittings from the oil cooler necks. After that it is possible to remove nuts from the cooler necks attaching the cooler to the brackets on the engine.

10.3.10 Oil cooler installation

Type of maintenance: line

Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 19, 30

see Fig. 10-15.

(a) Set the oil cooler to the bracket on the engine and on the cooler necks gradually install and tight the nuts. Install the fittings with oil hoses, screw the fitting nuts.

(b) Fill the oil system with oil (see 10.5.1) and check oil system tightness.

(c) Install the lower and upper engine cowling.

10.3.11 Removal of the radiator

Type of maintenance: line

Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 10, 17

- screwdriver

see Fig. 10-15Fig. 10-4Fig. 10-15.

(a) Remove the upper and lower engine cowling.
(b) Drain the cooling liquid from the cooling system (see 10.5.2.2).
(c) Disconnect hoses from the radiator outlets.
(d) Remove four bolts attaching the radiator to the upper and lower brackets.
(e) Remove the radiator.

10.3.12 Installation of the radiator

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 10, 17
- screwdriver

see Fig. 10-15.

(a) Install the radiator on upper and lower brackets.
(b) Install hoses on the outlets from the radiator and secure them with hose fasteners.
(c) Fill the cooling system with cooling liquid (see 10.5.2.3) and check system tightness.
(d) Install the lower and upper engine cowling.

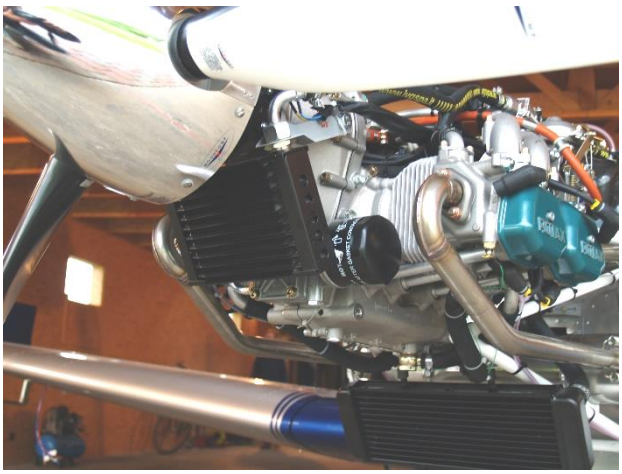


Fig. 10-15
Attachment of the radiator on the engine

10.3.13 Removal of the throttle and choke control levers

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 14
- Allen wrench size 2
- Screwdriver
- Cutting pliers

see Fig. 10-16.

(a) Remove the cover of the throttle (1) and choke (2) control levers from the middle channel.

(b) Remove the upper engine cowling.

(c) Disconnect the throttle (3) and choke (4) cables from carburettors and from the throttle (1) and choke (2) control levers.

(d) Remove the throttle and choke control levers from the middle channel .

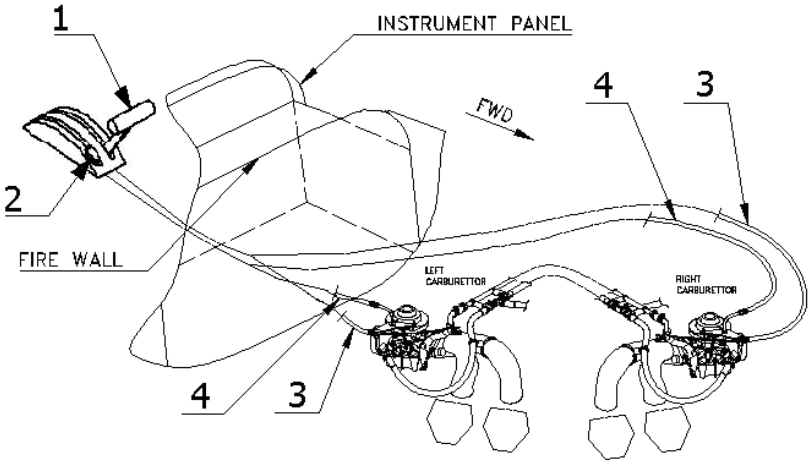


Fig. 10-16
Throttle control lever
1 – Throttle handle 3 – Throttle cable
2 – Choke handle 4 – Choke cable

10.3.14 Installing of the throttle and choke control levers

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 14
- Allen wrench size 2
- Screwdriver
- Cutting pliers

see Fig. 10-16.

(a) Install the control levers of throttle (1) and choke (2) into the middle channel.
(b) Connect the throttle (3) and choke (4) cables to the throttle (1) and choke (2) control levers and to the carburettors.
(c) Install the cover of throttle and choke on the middle channel.
(d) Install the upper engine cowling.
(e) Check for continuous travel of the throttle and choke control lever.
(f) Adjust the throttle control (see 10.4.2)

10.3.15 Removal of the carburetor heating knob

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- Wrench size 8, 14
- Screwdriver
- Cutting pliers

see Fig. 10-17.

(a) Remove the upper engine cowling.
(b) Disconnect the control cable on the changeover lever of the air intake (4) (see Fig. 10-14).
(c) Remove the inner nut (1) and pull out the knob (2) with the flexible housing (3) from the firewall and instrument panel.

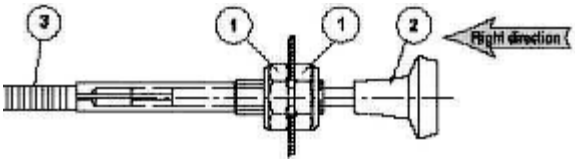


Fig. 10-17
Carburettor heating knob
1 – Nut 3 – Flexible housing
2 – Knob

10.3.16 Installing the carburetor heating knob

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 8, 14
- Screwdriver
- Cutting pliers

see Fig. 10-17.

(a) Put the flexible housing (3) with knob (2) into the hole in the instrument panel and firewall. from behind and fasten it from both sides of the instrument panel by the nuts (6).
(b) Fasten the knob from both sides of the instrument panel by the nuts (1).

(c) Connect the control cable with the changeover lever of the air intake (4) (see Fig. 10-14).

(d) Adjust carburettor heating control (see 10.4.4).

10.4 Check / Adjustment

10.4.1 Engine test

CAUTION

The person performing the engine test must be mechanic with a valid certificate and with registered engine type ROTAX 912 S. In the course of the whole test an aircraft mechanic who is familiarized with the aircraft type BRISTELL must be present.

(a) Perform the test out of the buildings at the place assigned for performing engine tests in broad daylight.

(b) Test place must be equipped with extinguisher which is suitable for extinguishing burning liquids and electrical installation.

(c) Brake the airplane and put the chocks under the landing gear wheels.

(d) Before performing engine test cary out preflight check of the engine and the propeller in the range shown in the AOI of BRISTELL TDO (Par. 4.3) and and Rotax engine Operator's manual (Chapter 10.3).

(e) Start the engine according to the AOI of BRISTELL TDO (Par. 4.4) and Rotax engine Operator's manual (Chapter 10.3).

- activate starter for max.10 sec. only, followed by a cooling period of 2 min.
- as soon as engine runs, adjust throttle to achieved smooth running at approximate 2500 rpm
- check if oil pressure has risen within 10 sec. and monitor oil pressure

NOTE

If oil pressure does not rise within 10 sec. above min. pressure 0.8 bar (12 psi), switch off the engine. Is admissible max. oil pressure 7 bar (102 psi) for a short period at cold start. Fuel pressure have be in range from 0.15 to 0.4 bar (2.2 to 5.8 psi)..

(f) Engine warm up according to the AOI of BRISTELL TDO (Par. 4.4) and Rotax engine Operator's manual (Chapter 10.3).

As soon as oil pressure will be in range from 2 to 5 bar (29 to 73 psi) start warming up period at 2000 rpm for approx. 2 minutes, continue at 2500 rpm, duration depending on ambient temperature, until oil temperature reaches 50°C (122°F).

(g) Choke – during engine warm up – SWITCH OFF

NOTE

Watch engine instruments and record the values of oil pressure, oil temperature and head cylinder temperature into the Engine test report, see the Tab. 10–1.

(h) Ignition check:

Engine speed .....4000 RPM
Ignition switch .....switch from position **BOTH** to **L**, record RPM drop
Ignition switch .....switch from position **BOTH** to **R**, record RPM drop

NOTE

RPM drop between position BOTH and L or R must not exceed 300 RPM. Mutual difference between ignition circuits L and R must not exceed 115 rpm. Write down results into the engine test report, see the Tab.10–1.

(i) Test of max. RPM on the ground:
Throttle lever fully forward for maximum power

NOTE

Record max. RPM into the engine test report, see the tab Tab.10–1.

ENGINE TEST REPORT					
Aircraft	***BRISTELL TDO***	**Registration**		**S/N**	
Engine	***ROTAX***	**Type**	***912 ULS***	**S/N**	

	Activity	Set down values	Measured values
	Starting up the engine		
1.	Min. oil pressure up to 10 sec.	0.8 bar (12 psi)	
2.	Max. oil pressure*	7 bar (102 psi)	
3.	Min. fuel pressure	0.15 bar (2.2 psi)	
4.	Increase RPM as soon as oil pressure reaches	2 bar (29 psi)	
5.	Warming up the engine at 2000 – 2500 RPM	smooth running	
6.	Voltage	12.4 – 15.1 V	
	Engine test		
7.	Min. oil temperature	50°C (122°F)	
8.	Oil pressure	2–5 bar (29–73 psi)	
9.	Max. cylinder head temperature ***	120/135°C (248/275°F)	
10.	RPM drop between ignition position **BOTH** and **L**/**R** at 4000 RPM	max. 300 (115 RPM **)	
11.	Acceleration	2 – 3 sec.	
12.	Max. RPM on the ground	5200 ± 100 RPM	
13.	Idle	Approx. 1400 RPM	

Defects:

*	During cold start for a short term only
**	RPM drop between ignition position **BOTH** and position **L** or **R** must not exceed 300 RPM. Mutual difference between left (**L**) and right (**R**) ignition circuit must not exceed 115 RPM.
***	Max. cylinder head temperature depend on the type of coolant used in the engine – see Rotax engine Operato's manual para 10.2.1, Installation manual para 11.6.1 and 11.6.2, Service Instruction SI–912–016, POH section 2.4 and this Manual, paragraphs 10.2.1.2 and 17.5.

Conclusion	**Complying – Noncomplying** Complying if the measured values are not out of the range of the prescribed values.

Elaborated by:	Signature:	Date:
Checked by:	Signature:	Date:

Tab. 10–1: Engine test report

10.4.2 Adjusting throttle control

(a) Pull the throttle control to the stop. The throttle lever on the carburettor (5) must be on the stop (see Fig. 10-10). The bowden must be supported in the terminals.

(b) Release the nut on the control lever (5) and take up any slack on the cable and tighten up the nut.

CAUTION

Control cable should not be too tight for the reason of a possible deformation of the control lever on the carburettor.

(c) Check again whether the controller and the lever on the carburettor are on the stops. If not, perform adjusting by means of adjustable terminals on bowdens.

(d) In order to prevent the bowdens at the carburettor from shifting out from the terminals, secure the bowdens with locking wire. Mark all bolted joints with red paint.

10.4.3 Adjusting choke control

(a) Set the choke lever to the stops position and put it back about 3 mm *(1/8 in)*. The lever of choke control on the carburettor (6) must be on the stop (see Fig. 10-10). The bowden must rest on the terminals.

(b) Release the bolt on the lever of choke control (6), slightly loosen the cable and tighten up the bolt.

(c) Check again if the choke lever and the lever on the carburettor are on the stops. If not, carry out adjustment by adjustable bowden terminals.

(d) To prevent the bowdens at the carburettor from shifting out of the terminal, secure the bowden with locking wire. Mark al bolted joints with red paint.

10.4.4 Adjusting carburetor heating control

(a) Push in the carburetor heating knob to the stop and pull it out by about 3 mm (*1/8 in*). The changeover lever (4) on the air intake must be on the stop (see Fig. 10-14). The bowden must rest on the terminal.

(b) Release the bolt on the changeover lever (4), slightly stretch the cable and tighten up the bolt.

(c) Check again whether the knob and the lever on the air intake are on the stops. If not, carry out adjustment by adjustable bowden terminals.

(d) To prevent the bowdens from shifting out of the terminal, secure the bowden with locking wire. Mark bolted joints with red paint.

10.4.5 Checking exhaust system

WARNING

Check of exhaust system very carefully. The burst or leaky exhaust can expose the crew to danger presented by carbon monoxide or can result in engine power loss, possibly fire.

Check the exhaust system for cracks. Pay special attention to the following areas:

- muffler in the area of the input and the output pipe and the collector head
- all welds and their immediate surrounding
- carefully check al areas showing local overheating caused by exhaust gases.
- remove the heat exchanger and check muffler area located under it.
- check the whole exhaust pipe between the engine and the muffler including its attachment to the engine.

- check outlet pipe from the muffler.

10.5 Exchanges / Service information

10.5.1 Exchange / Refilling oil

Refer to the Rotax engine Maintenance manual Chapter 12–00–00 para 5

NOTE

Recommended kinds of oil are mentioned in para 10.2.1, in the POH para 2.4, in the Rotax engine Operator's manual para 10.2.3, in Service Instructions SI–912–016 and SI–18–1997 R5.
Type of oil used by aircraft manufacturer is shown in 17.5.

10.5.1.1 Oil volume

Total oil volume in the lubrication system of Rotax 912 ULS engine is approximately 3.8 litres (1 US gal, 0.84 UK gal).

Check oil volume preferably after running the propeller by hand in the sense of engine rotation so that oil can fill in the engine space or operate the engine for 1 minute in idle mode.

WARNING

Switch OFF ignition before manually turning the engine!

The oil tank is located in the engine compartment and oil dipstick is accessible after opening the lid on the upper engine cowling (see 10.2.1.6). Oil level must lie between min and max marks (flattening) on the dipstick and must not drop below "MIN" line.

10.5.1.2 Oil draining

Drain oil from the oil tank by unscrewing the plug (wrench size No.17) on the lower side of the oil tank. It is possible to drain oil from the engine after unscrewing the plug in the lower part of the engine at the hose of the return branch of oil flow. It is recommended to drain oil immediately after engine test or after finishing the operation when oil is sufficiently hot and better flows both from the engine and from the tank. Clean the tank before filing it with new oil – see Maintenance Manual for ROTAX Engine.

10.5.1.3 Refilling oil

Refill oil in the oil tank that is located on the firewall.

10.5.1.4 Venting of the lubrication system

After short idling , stop engine and replenish oil to max. mark on dipstick. Never overfill, otherwise oil would escape throughthe vent tube during operation. At oil level inspect, do not exceed the max. mark.

10.5.2 Exchange / Refilling cooling liquid

Refer to the Rotax engine Maintenance manual Chapter 12–00–00, para 3.

NOTE

Recommended types of coolant are shown in para 10.2.1, in the POH para 2.4 or in the Rotax engine Operator's manual para 10.2.1 and Installation manual para 11.6.1 and 11.6.2.

Type of coolant used by aircrafts manufacturer is shown in 17.5.

10.5.2.1 Cooling liquid volume

Total volume of coolant in the engine is approximately 2.6 litres (0.7 US gal).

10.5.2.2 Drainage of cooling liquid

Disconnect the hose supplying liquid from the radiator to the pump (at the lowest point of the system) and drain cooling liquid into the prepared vessel.

10.5.2.3 Refilling cooling liquid

Refill cooling liquid into the expansion tank in the engine compartment. In addition to this there is a overflow bottle which collects cooling liquid in case of engine overheating and is attached to the firewall.

10.5.3 Exchange / Check of oil filter

Refer to the Rotax engine Maintenance Manual Chapter 12–00–00 para 5.

NOTE

Carry out at every oil exchange.

(a) Remove the oil filter.

(b) Remove the filter insert, cut of the upper and the lower lid of the insert. Remove the middle part of the insert, disassemble and check for metal chips, foreign corpuscles and contamination.

CAUTION

If you detect an increased quantity of metal particles (brass or bronze chips or bearing abrasive), find out the reason and eliminate it.

(c) Install the new oil filter. Slightly lubricate the sealing ring of the new filter with engine oil and tighten it up manually by a normal force.

10.5.4 Exchange / Check of air filter

(a) Remove the hose fastener and the bracket attaching the air filter to the left side lower engine cowling and remov the air filter.

(b) Inspect the air filter and if contaminated, clean it according to instructions in the Rotax engine Maintenance manual Chapter 12–00–00 para 2.4.

(c) Attach the cleaned or the new filter to the hole on the left side of lower engine cowling by means of the bracket and hose fastener.

11. CHAPTER – ELECTRICAL SYSTEM

11.1 General 11-2

11.2 Description and operation 11-2

11.2.1 Switches, circuit breakers 11-3

11.2.2 Fuses 11-4

11.2.3 Generator 11-4

11.2.4 Onboard battery 11-5

11.2.5 Lighting 11-5

11.2.5.1 Optional instrument lighting 11-5

11.2.5.2 Optional external lighting 11-5

11.3 Removal / Installation 11-6

11.3.1 Removal of the onboard battery 11-6

11.3.2 Installation of the onboard battery 11-6

11.3.3 Removal of the optional strobe/position lights 11-6

11.3.4 Installation of the optional strobe/position lights 11-6

11.3.5 Removal of the optional landing light 11-7

11.3.6 Installation of the optional landing light 11-7

11.4 Check / Adjustment 11-8

11.4.1 Adjusting the optional landing light 11-8

11.5 Exchanges / Service information 11-9

11.5.1 Charging the battery 11-9

11.5.2 Exchange of the optional position light lamp 11-9

11.5.3 Exchange of the optional strobe light discharge tube 11-9

11.5.4 Exchange of the optional landing light lamp 11-9

11.1 General

Electrical system of BRISTELL TDO airplane serves for supplying electrical current to the instruments .

11.2 Description and operation

The airplane is equipped with 14V DC electrical installations with grounded negative pole. Primary source of electrical energy is formed by the generator. The secondary source of electrical energy is the battery 12V, which is located on the firewall. It is used for starting the engine and in the case of generator failure as an back–up source of electric energy.

DC voltage is distributed to the individual systems by means of the main busbar. Systems are protected by circuit breakers which are permanently ON and switches–circuit breakers which are turning ON as needed. If some of the circuits is overloaded, then the circuit breaker disconnects the circuit.

After switching the **MASTER SWITCH** ON and by turning the ignition key to the position **START** the starter is activated. The starter is supplied from the battery before starting the engine. After starting up the engine and reaching the idle RPM, the generator starts supplying current to the electrical network.

Information about voltage in the main busbar is indicated by low voltage red light on the instrument panel.

11.2.1 Switches, circuit breakers

The switches serve for switching ON/OFF individual electrical circuits. There are two kinds of switches:

(a) switches–circuit breakers

- switching ON/OFF and protecting the electrical circuit from overloading together

(b) switches

- the classical for avionics circuit (no circuit breakers)
- the rocker for flaps
- the buttons for trims

Every switch is marked with a placard with designation of the circuit (see Tab. 11-1). The switches are located on the instrument panel and on the middle chanel. The buttons for ailerons and elevator trim are on the grip of control stick. Wiring diagrams are shown in 16.CHAPTER – WIRING DIAGRAMS.

Vypínače	
Designation	**Description**
MASTER	Main switch.
ALTERNATOR	Alternator switch
FUEL PUMP	Fuel pump switch
PANEL POWER	Switch on radio, transponder, flaps, trims, GPS, Sockets, Trutrak EFIS GP, Trutrak EDM, Trutrak AH
NAV LITES	Nav lites switch
STROBE LITES	Strobe lites switch
LAND LITES	Land lites switch
IGNITION 1	Ignition 1 switch
IGNITION 2	Ignition 2 switch

Tab. 11-1
Switches

11.2.2 Fuses

Fuses serve for protecting individual electrical circuits from overloading. Every fuse is marked by the placard with a fuse designation (see Tab. 11-2). Fuses are located on the right instrument panel. Wiring diagrams are shown in 16.CHAPTER – WIRING DIAGRAMS.

NOTE

There are not used classical fuses in the aircraft.

Fuses		
Designation	**Description**	**Current rating**
ALTERNATOR	Fuse of alternator	35A
ENG INSTR	Fuse of engine instruments	3A
PANEL INSTR	Fuse of panel instruments	5A
NAV LITE	Fuse of nav lites	10A
STROBE LITE	Fuse of strobe lites	10A
LAND LITE	Fuse of land lite	15A
FUEL PUMP	Fuse of fuel pump	10A
RADIO 1	Fuse of radio 1	5A
RADIO 2	Fuse of radio 2	5A
XPONDER	Fuse of transponder	3A
GPS	Fuse of GPS	3A
AVIONICS	Fuse of avionics	5A
SPARE	Spare fuse	10A

Tab. 11-2
Fuses

11.2.3 Generator

The generator is a part of the engine which supplies electric current through the rectifier. Regulator supplies electric current of 14V voltage to onboard network.

Technical parameters of generator:

Maximum output power: 12V/20A at 5000 rpm

Technical parameters of rectifier – regulator:

Type: electronic
Output voltage: 14 ± 0.3 V (from 1000 ± 250 rpm)
Range of operation temperatures: min. – 25° C *(–13 °F)*
max. +90° C *(+194 °F)*

Weight: 0.3 kg *(0.66 lbs)*

11.2.4 Onboard battery

The battery is installed in a bracket located on the firewall, inside the engine compartment.

CAUTION

Refer to the documentation supplied with the battery for instructions on the maintenance, proper charging, care, etc.

11.2.5 Lighting

Airplane lighting consists of optional instrument lighting and external lighting.

11.2.5.1 Optional instrument lighting

Instruments on the instrument panel can be equipped with light rings which in the case of need can be switched on by the switch **INSTR LITE** on the instrument panel.

11.2.5.2 Optional external lighting

External lighting consists of optional position and strobe lights which are located in the wing tips and of the optional landing light which is located on bottom engine cowl. Navigation lights are switched by the switch **NAV LITE** (together with instrument lighting) and strobe lights are switched by the switch **STROBE LITE**. The landing light is switched by the switch **LAND LITE**. Wiring diagram of external lighting is shown in 16.CHAPTER – WIRING DIAGRAMS.

11.3 Removal / Installation

11.3.1 Removal of the onboard battery

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver
- wrench size according to installed battery

(a) Remove engine cowlings
(b) Disconnect the contacts from the battery.
(c) Disconnect the draw band of the battery and remove the battery from the airplane.

11.3.2 Installation of the onboard battery

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver
- wrench size according to installed battery

(a) Install the battery into the bracket on the firewall.
(b) Fasten it with draw band so that the battery cannot move in the bracket.
(c) Grease the battery contacts with lubricating grease and install the clamps on them from the onboard electrical network.
(d) Install the engine cowlings.

11.3.3 Removal of the optional strobe/position lights

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver

(a) Remove bolts attaching the cover glass of strobe/position lights.
(b) Remove bolts attaching the strobe/position lights to the wing tip, thus releasing the lights.
(c) Remove strobe/position light and disconnect the wire.

11.3.4 Installation of the optional strobe/position lights

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver

(a) Connect the strobe/position lights wire.
(b) Set the strobe/position light to the wing tip and fasten it with bolts.

NOTE
Before installing the strobe/position light thoroughly clean the contacting surfaces on the light and on the wing tip of the putty residues.

(c) Install the covering glass of the strobe/position lights .
(d) Seal the position light edges by polyurethane sealer to prevent water from in leaking under the position light.

11.3.5 Removal of the optional landing light

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- Wrench size 7/16 in

(a) Unscrew the side screws from the landing light bracket.
(b) Remove the bulb and disconnect the wires on the rear side of it.

11.3.6 Installation of the optional landing light

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- screwdriver

(a) Set the wires into the light connector from the rear side of the bulb.
(b) Set the headlight into the case and screw on the attachment bracket.
(c) Adjust the landing light (see 11.4.1).

11.4 Check / Adjustment

11.4.1 Adjusting the optional landing light

(a) Unscrew ¼ turn bolts on the bulb bracket.

(b) Do adjustment in the horizontal direction according to Fig. 11-1 in such a way that the light axis is directed towards the airplane axis about 45m (150 ft) before the fuselage nose.

(c) Tight unscrewed bolts on the bulb.

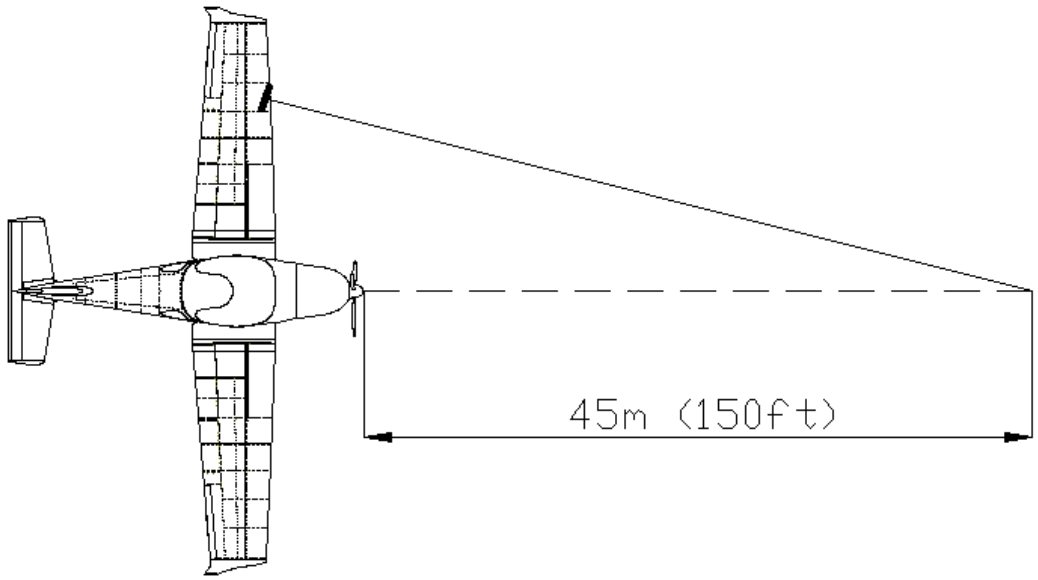


Fig. 11-1
Setting the optional landing light

11.5 Exchanges / Service information

11.5.1 Charging the battery

CAUTION

Refer to the documentation supplied with the battery for instructions on the maintenance, proper charging, care, etc.

11.5.2 Exchange of the optional position light lamp

(a) Remove the cover of the position lights including the cover glass.

(b) Slightly push in the front lamp and turn it counter–clockwise (bayonet closure) and exchange it for the same type.

(c) Remove the rear lamp and exchange it for the same type.

CAUTION

Don't touch the new lamps with bare hands. Use the cloth gloves or a cloth.

11.5.3 Exchange of the optional strobe light discharge tube

(a) Remove the strobe/position light (see 11.3.3).

(b) Exchange the discharge tube for the same type.

CAUTION

Do not touch the new discharging tube with bare hands. Use the cloth gloves or a cloth.

(c) Install the strobe/position light (see 11.3.4)

11.5.4 Exchange of the optional landing light lamp

(a) Unscrew the bolts from the attachment bracket.

(b) Remove the bulb from the case.

(c) Pull out the bulb. Disconnect wires on the rear side of the bulb.

(d) Install the new bulb of the same type.

CAUTION

Do not touch the new bulb with bare hands. Use a cloth gloves or a cloth.

(e) Connect wires of electrical system according to the scheme (see 16.CHAPTER – WIRING DIAGRAMS).

(f) Put the bulb into the case.

(g) Install assembled landing light on the bracket.

(h) Screw back the bolts on attachment bracket.

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12. CHAPTER – PITOT–STATIC SYSTEM / INSTRUMENTS

12.1 General 12-2

12.2 Description and operation 12-2

12.2.1 Pitot–static system 12-2

12.2.2 Flight instruments 12-3

12.2.2.1 Airspeed indicator – ASI 12-3

12.2.2.2 Altimeter – ALT 12-3

12.2.2.3 Vertical speed indicator – VSI, optional item 12-3

12.2.2.4 Inclinometer 12-3

12.2.2.5 Magnetic compass 12-3

12.2.3 Engine instruments 12-4

12.2.3.1 Tachometer 12-4

12.2.3.2 Cylinder head thermometer 12-4

12.2.3.3 Oil thermometer 12-4

12.2.3.4 Oil pressure gauge 12-4

12.2.3.5 Fuel pressure gauge, optional item 12-4

12.2.3.6 Fuel quantity gauge 12-4

12.3 Removal / Installation 12-4

12.3.1 Removal of the pitot–static tube 12-4

12.3.2 Installation of the pitot–static tube 12-4

12.4 Check / Adjustment 12-6

12.4.1 Check of pitot–static system tightness 12-6

12.4.2 Magnetic compass compensation 12-6

12.4.2.1 Rules for doing compensation of the magnetic compass 12-6

12.4.2.2 Compensation procedure 12-6

12.1 General

This chapter provides information about pitot–static system and instruments.

12.2 Description and operation

12.2.1 Pitot–static system

The pitot tube to sense total pressure is located under the wing tight half. The total pressure is sensed through the hole in the pitot–tube face. Static pressure port is located inside the fuselage, under the luggage compartment. Pressure distribution to individual instruments is performed by means of flexible plastic hoses.

Static pressure is lead to the altimeter (ALT), airspeed indicator (ASI), vertical speed indicator (VSI), and to the altitude encoder. The total pressure is connected just to the ASI.

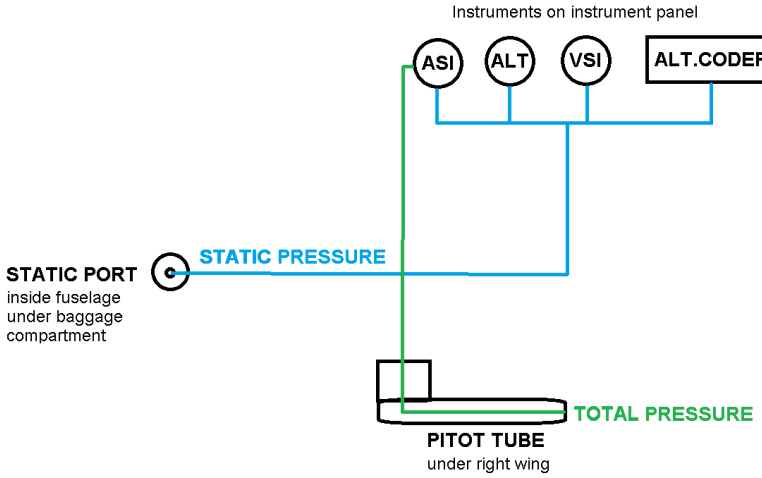

Fig. 12-1
Scheme of pitot-static system

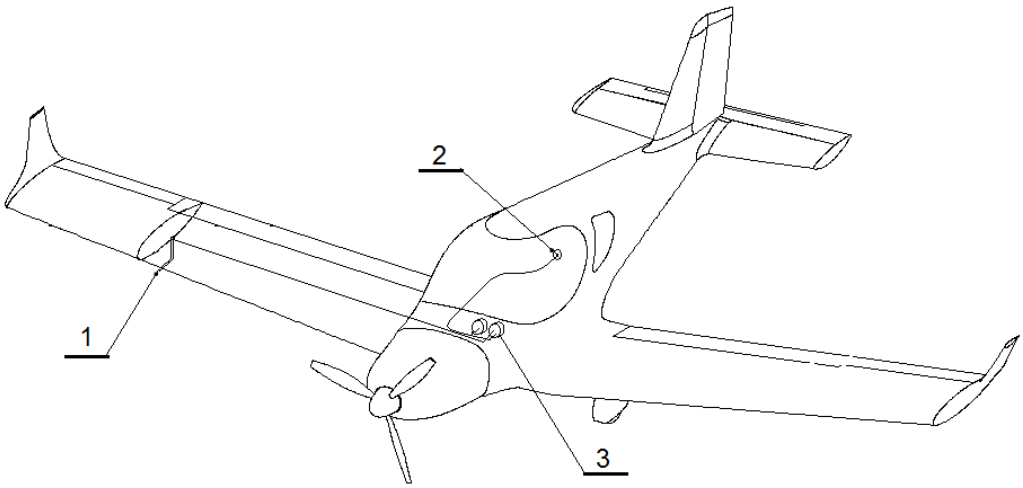

Fig. 12-2
Pitot–static system scheme
1 – Pitot tube 2 – Static pressure port
3 – Instruments

12.2.2 Flight instruments

12.2.2.1 Airspeed indicator – ASI

The airspeed indicator located on the left side of instrument panel is classical analogue round pressure gauge.
The airspeed indicator color range marking is shown in the valid Aircraft Operating Instructions .

12.2.2.2 Altimeter – ALT

The altimeter located on the left side of instrument panel is classical analogue round pressure gauge. Range of measure is up to 20,000 ft (6,000 m).

12.2.2.3 Vertical speed indicator – VSI, optional item

The vertical speed indicator located on the left side of instrument panel is classical analogue round pressure gauge. Range of measure is up to 2,000 fpm i.e. 10 m/s.

12.2.2.4 Inclinometer

The inclinometer located on the left side of instrument panel is a classical construction – a ball in liquid filled tube.

12.2.2.5 Magnetic compass

NOTE

The magnetic compass is not required by ASTM F 2245 valid for the Light sport category airplanes.

The magnetic compass is designed to determine magnetic course of the airplane. The magnetic compass is positioned on the upper edge of the instrument panel and consists of the vessel filed with nonfreezing liquid with the little window in the front wall. The compass rose is positioned on the rotary and swinging pivot inside the compass.

12.2.3 Engine instruments

The engine instruments located on the right side of instrument panel serve for engine run checking. Color marking of the engine instruments is shown in the Aircraft Operating Instructions, Section 2.

12.2.3.1 Tachometer

The RPM indicator is electrical and is controlled by the signal from the RPM sensor on the generator. Working range of the RPM indicator is from 0 to 7000 RPM.

12.2.3.2 Cylinder head thermometer

Cylinder head temperature sensor measures temperature of the cylinder No.3. Working range of the cylinder head thermometer is 50 to 150 °C *(120 to 300 °F)*.

12.2.3.3 Oil thermometer

Oil temperature on the inlet to the engine is measured by the sensor which is located behind the oil pump. Working range of the oil thermometer is 50 to 150 °C *(120 to 300 °F)*.

12.2.3.4 Oil pressure gauge

Oil pressure on the inlet to the engine is measured by the sensor which is located behind the oil filter. Oil pressure gauge measure range is 0 to 10 bar *(0 to 150 psi)*.

12.2.3.5 Fuel pressure gauge, optional item

Fuel pressure on the outlet from the fuel pump can be checked by the classical analogue round pressure gauge. Range of measure is 0 to 2 bar (0 to 29 psi).

12.2.3.6 Fuel quantity gauge

Fuel quantity in the fuel tank is measured by the fuel level sender with float. Float position is converted to the electrical signal and fuel quantity in the tank is indicated on the fuel quantity gauge.

12.3 Removal / Installation

12.3.1 Removal of the pitot–static tube

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- Electric drill
- drill bit diam. 1/8 in
- pliers, cutting pliers

(a) Drill out rivets attaching the bracket with the pitot tube to the wing and pull out a bit the pitot tube with hose from hole in wing.
(b) Remove the tightening strip from hose. Mark the hose for total pressure by **P** letter.
(c) Disconnect the transparent hose of total pressure from the pitot tube.

12.3.2 Installation of the pitot–static tube

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- Hand rivetter
- pliers, cutting pliers

(a) Connect the hose to the outlet of the pitot tube and secure it with tightening strips.
(b) Insert the pitot tube in the bracket.
(c) Attach the bracket by means of rivet to the lower skin of the wing
(d) Carry out check of pitot–static system tightness (see 12.4.1).
(e) Check, that pitot–tube is parallel to bottom wing skin.

12.4 Check / Adjustment

12.4.1 Check of pitot–static system tightness

(a) In the static pressure system create the under pressure by means of an appropriate instrument corresponding to altitude of 1000 ft. Drop in the indicated altitude per one minute must not exceed 100 ft.

(b) In the system of total pressure create the overpressure corresponding to speed of 140 knots (260 km/h,161 mph) by means of a suitable instrument. Drop in speed during 3 minutes must not exceed 2.3 knots (4.4 km/h, 2.7 mph).

12.4.2 Magnetic compass compensation

12.4.2.1 Rules for doing compensation of the magnetic compass

(a) Compass compensation must be performed on the approved compass bases, which are at least 100 m (300 ft) from steel structures, electric leading or other over ground or underground steel equipment or objects.

(b) If the compass north is westward from magnetic north, the deviation is westward, i.e. negative. If the compass north is eastward from magnetic north, the deviation is eastward, i.e. positive.

12.4.2.2 Compensation procedure

(a) Turn the airplane to "N" heading, eliminate the deviation by "C" screw.

(b) Turn the airplane to "S" heading, reduce the found out deviation to the half–value by "C" screw and write down the rest of the deviation.

(c) Turn the airplane to "E" heading, eliminate the deviation by "B" screw.

(d) Turn the airplane to "W" heading, reduce the found out deviation to the half–value by "B" screw and write down the rest of the deviation.

(e) Turn the airplane by grades indicated in the compensation report (seeTab. 12-1) and write down individual deviations in the table.

(f) After finishing compensation of the magnetic compass fill out the deviation card (see Fig. 12-3) and place it near the magnetic compass in the airplane.

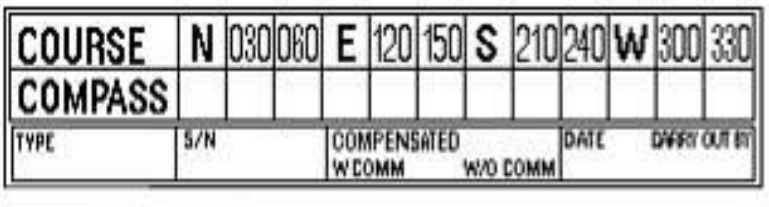

Fig. 12-3
Example of the deviation card

REPORT OF MAGNETIC COMPASS COMPENSATION					
Aircraft		**Registration mark**		**Serial No.**	
Compass Type:					
Compass Serial No.:					
List of Switched–On Radionavigation					

Course	**Engine running**		**Engine stopped**	
	Measured	**Deviation**	**Measured**	**Deviation**
N				
030				
060				
E				
120				
150				
S				
210				
240				
W				
300				
330				

Date:		**Time:**	
Compensation conforming:		YES – NO	
Note:			
Elaborated by:	**Signature:**	**Date:**	
Checked by:	**Signature:**	**Date:**	

Tab. 12-1
Report of magnetic compass compensation

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13. CHAPTER – VENTILATION / HEATING

13.1 General 13-2

13.2 Description and operation 13-2

13.2.1 Venting system 13-2

13.2.2 Heating system 13-2

13.3 Removal / Installation 13-3

13.3.1 Removal of fresh air, hot air and mixture control knob 13-3

13.3.2 Installation of fresh air, hot air and mixture control knob 13-4

13.3.3 Removal of eyeball vents 13-4

13.3.4 Installation of eyeball vents 13-5

13.4 Check / Adjustment 13-5

13.4.1 Adjusting the heating control 13-5

13.1 General

This chapter contains information on crew compartment heating and ventilation system.

13.2 Description and operation

13.2.1 Venting system

Cockpit ventilation is ensured by two eyeball (2) or automotive (3) air vents located in the cockpit on side panels of the instrument panel (see Fig. 13-1). Air inlets – Naca scoops (1) are located on both fuselage sides in front of the canopy. There is a composite part connected to the Naca scoop from inside the cockpit and a flexible hose is used to connect the air vent with the composite part.

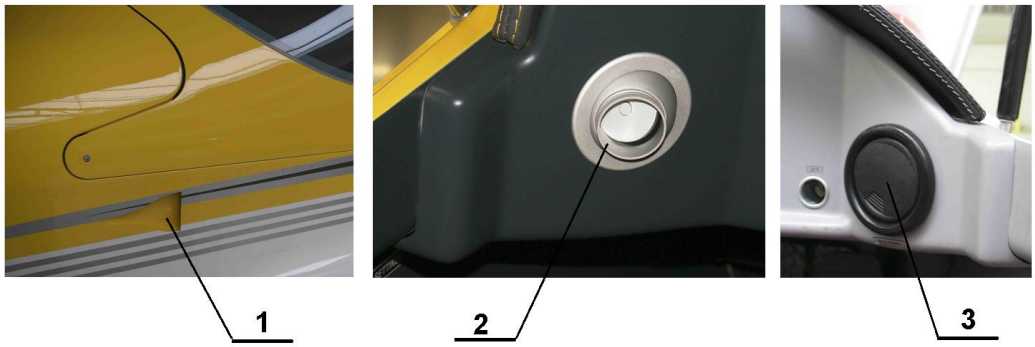

Fig. 13-1
Venting system
1 – Naca scoopt 2 – Eyeball ven
3 – Automotive air vent

13.2.2 Heating system

Cockpit heating is ensured by hot air from the heat exchanger (see Fig. 13-2). The heat exchanger (1) is located on the muffler (2). Ambient inlet air taken by the muffler (2) is heated in the heat exchanger (1) and supplied through control flap (3) located on the firewall into the cockpit by air hose (4). Quantity of hot air is regulated by **HEATING** knob (5) on the instrument panel. Behind the firewall is located mixture flap (6), which devides hot air flowing on the canopy bubble outlet (7) and on the crew legs outlet (8).

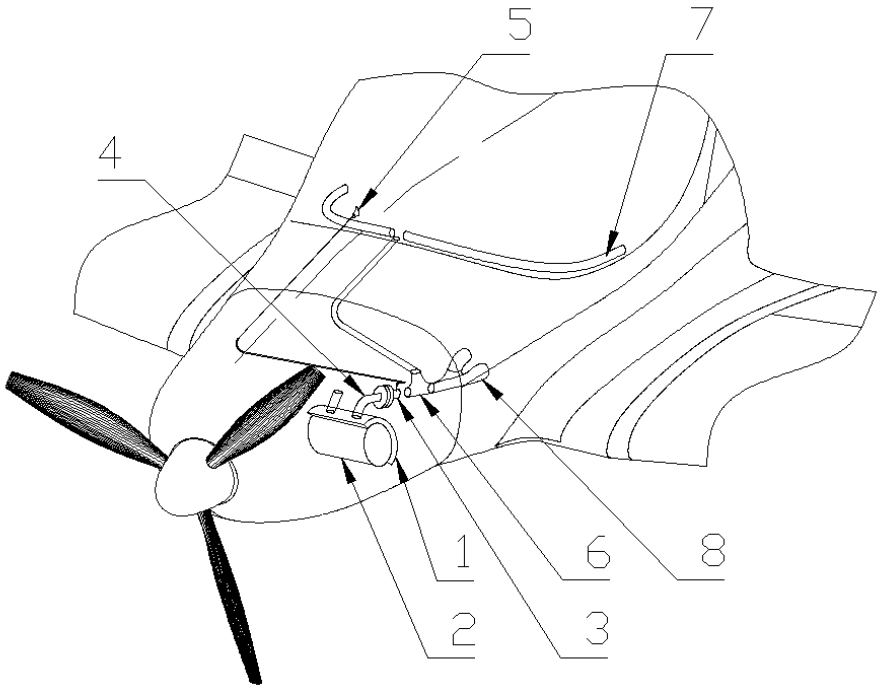

Fig. 13-2
Heating system

1 – Heat exchanger	2 – Muffler
3 – Control flap	4 – Air hose
5 – Heating knob	6 – Mixture flap
7 – Canopy bubble outlet	8 – Crew legs outlet

13.3 Removal / Installation

13.3.1 Removal of fresh air, hot air and mixture control knob

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 14, 9/16 in
- pliers, cutting pliers

see Fig. 13-3.

(a) Disconnect the control cable on the control flap lever (3) (see Fig. 13-1) and mixture flap lever (6) (see Fig.13–2).

(b) Remove the nuts (1) thus releasing the flexible housing (3) with the control knob (2).

(c) Remove the control knob with cable from the flexible housing (3).

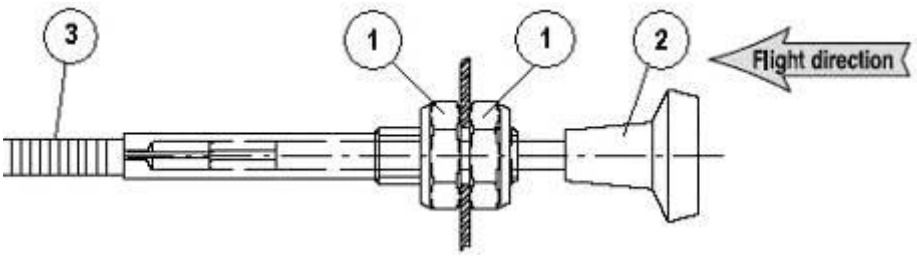

Fig. 13-3
Control knob – typical
1 – Nut 2 – Control knob
3 – Bowden

13.3.2 Installation of fresh air, hot air and mixture control knob

Type of maintenance: line
Authorisation to perform:

- Pilot or mechanic

Tools needed:

- wrench size 14, 9/16 in
- pliers, cutting pliers

see Fig. 13-3.

(a) Insert the control knob (2) into the flexible housing and fasten it from both sides of the instrument panel by means of nuts (1).
(b) Connect the control cable with control flap lever (3) and (6) (see Fig. 13-1, Fig. 13-2).
(c) Adjust fresh air, hot air and mixture control (see 13.4.1).

13.3.3 Removal of eyeball vents

see Fig. 13-4.

(a) Remove glare shield (1) from the instrument panel.
(b) Remove hose (2) from the vent (3).
(c) Unscrew securing nut (4) from the vent (3).
(d) Remove the vent (3) from the instrument panel (5).

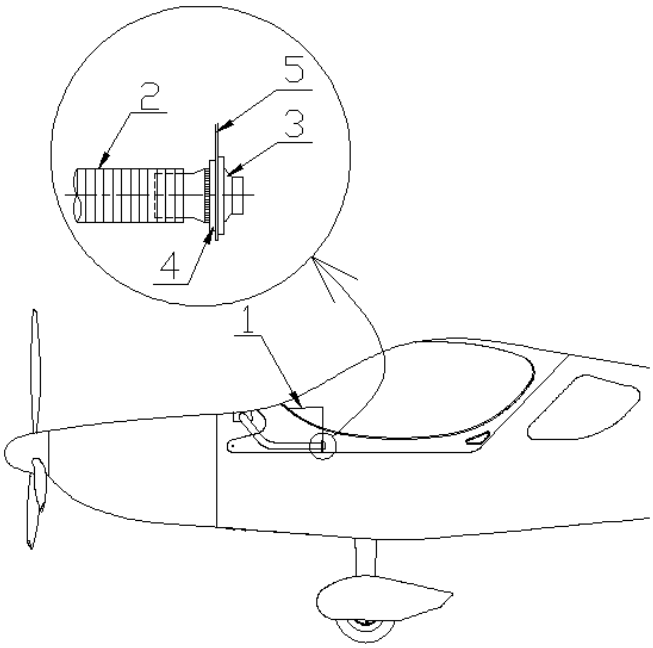

Fig. 13-4
Removal / Installation of the vents

1 – Glareshield
2 – Hose
3 – Vent
4 – Securing nut
5 – Instrument panel

13.3.4 Installation of eyeball vents

see Fig. 13-4.

(a) Insert the vent (3) into the instrument panel (5).
(b) Screw securing nut (4) on the vent (3).
(c) Plug the hose (2) into the vent (3)
(d) Install glareshield (1).

13.4 Check / Adjustment

13.4.1 Adjusting the heating control

(a) Adjust the control by screwing or unscrewing the control cable terminal from the control flap.
(b) After adjustment of the control, mark the mutual position of the control cable terminal and the flap controller with red color .

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14. CHAPTER – AIRPLANE HANDLING

14.1 General 14-2

14.2 Airplane jacking and supporting 14-2

14.3 Airplane towing.....14-2

14.4 Airplane parking.....14-2

14.5 Airplane anchoring 14-3

14.1 General

This chapter contains information on airplane handling – jacking, parking and anchoring.

14.2 Airplane jacking and supporting

The airplane jacking can be carried out by two persons due to relatively low empty weight of the airplane.
There are three supporting points (see Fig. 14-1), two of them are under upper ends of main landing gear legs (1), third one is under the tail wheel leg (2).

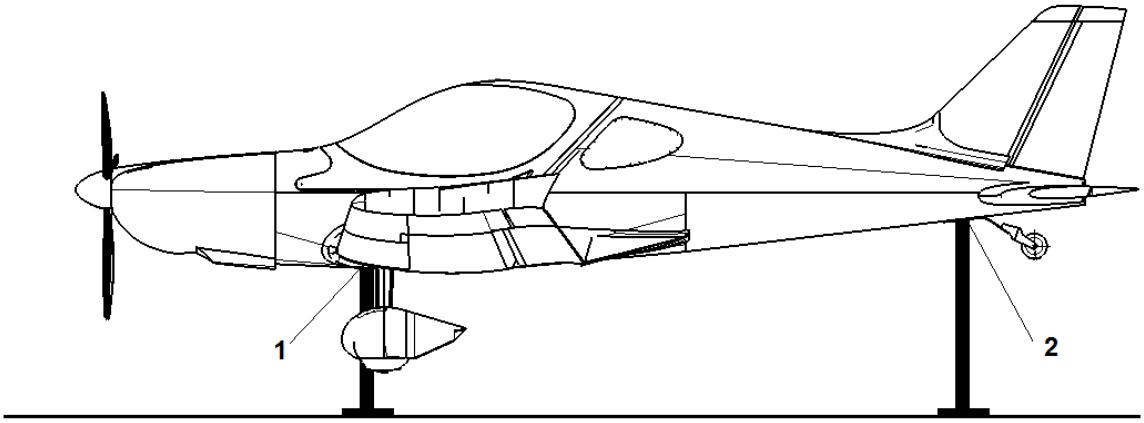

Fig. 14-1
Airplane jack/support points

1 – Main landing gear leg jack/support point

2 – Rear fuselage jack/support point

14.3 Airplane towing

The airplane may be towed by gripping the propeller root (never the blades!) or it is possible to push it forward by open hands pushing on the reinforced wing root , also the main legs may be utilized to move the airplane.

WARNING
Ignition to be switched off before handling the airplane on the ground!

CAUTION
Avoid excessive pressure on the airframe structure, especially on the wing ends, flaps, ailerons, HTU, VTU etc .

14.4 Airplane parking

The airplane should be preferably placed in the hangar, possibly in another covered space with stable temperature, good ventilation, low humidity and dust free environment. In case of parking outside the hangar it is necessary to anchor the airplane and to cover the canopy or the whole airplane with suitable tarpaulins for long–term parking.

CAUTION
Use the parking brake only for short–term parking between flights during the day. When the flight day is over or under low air temperatures, do not use the parking brake and apply the wheel chocks instead.

14.5 Airplane anchoring

When parking, the airplane outside the hangar after flight day, the airplane should be anchored to the ground. It is necessary to anchor the airplane in order to protect it from a possible damaging caused by wind and gusts. For this reason the airplane is equipped with anchoring eyes on the lower side of wings and on rear part of fuselage.

Procedure:

- check the FUEL valve is OFF, switch OFF all switches, ignition and master switch
- block the control stick, e.g. by using safety harnesses
- release the parking brake if it was braked
- close the vents
- close and lock the canopy
- park the aircraft into wind
- insert the airplane wheel chocks
- anchor the airplane to the ground by means of cables pulled through the anchoring eyes on the lower side of the wings and on the rear part of fuselage.

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15. CHAPTER – AIRPLANE REPAIRS

15.1 General 15-3

15.2 Removing rivets 15-3

15.3 Riveting 15-4

15.3.1 General 15-4

15.3.2 Riveting procedure 15-4

15.4 Skin repairs 15-5

15.4.1 Removing damaged skins 15-5

15.4.2 Division of damaging into groups 15-5

15.4.3 Principles for repair method determination 15-5

15.4.4 Angle repair 15-6

15.4.5 Skin repair 15-6

15.4.5.1 Stopping cracks and blinding small holes 15-6

15.4.5.2 Repairing the skins with patches 15-7

15.5 Repair of fiberglass parts 15-10

15.5.1 Damage classification 15-10

15.5.2 General 15-10

15.5.3 Parts of external appearance 15-10

15.5.3.1 Small damage 15-10

15.5.3.2 Medium damage 15-11

15.5.3.3 Major damage 15-12

15.5.4 Structural parts 15-12

15.6 Paint repairs 15-13

15.6.1 Safety rules 15-13

15.6.2 Recommendation for additional surface treatment of airplane surface 15-13

15.6.2.1 Washing and degreasing 15-13

15.6.2.2 Bonding rivet heads, big irregularities and material transitions 15-14

15.6.2.3 Application of primer (paint) 15-14

15.6.2.4 Bonding 15-15

15.6.2.5 Application of top coat 15-15

15.6.3 Small damage 15-16

15.6.3.1 General 15-16

15.6.3.2 Sanding 15-16

15.6.3.3 Degreasing 15-17

15.6.3.4 Application of primer 15-17

15.6.3.5 Application of top coat 15-18

15.7 Torque moments 15-19

15.8 Securing the bolt joints 15-19

15.8.1 General 15-19

15.8.2 Bolt joint securing by locking wire 15-19

15.8.3 Bolt joint securing by cotter pin 15-21

15.9 Bonding repair 15-21

15.9.1 General..... 15-21

15.9.2 Removal / Installation 15-21

15.10 Installing clamps by Nicopress pliers 15-22

15.1 General

This chapter contains information about standard procedures for performing common repairs of the airplane. These repairs can be made by an authorized organization. Other procedures for repairing individual airplane systems you can find in the appropriate chapter describing the system.

NOTE

Before carrying out any structural repairs to contact the relevant airworthiness authority for approval.

This chapter describes the following procedures:

- Removing rivets
- Riveting
- Repair of skins
- Repair of fiberglass parts
- Recommendation for repairing surface protection of the airplane
- Torque moments
- Securing bolt joints and screwed fittings
- Repairs of bonding
- Installing clamps by Nicopress pliers

15.2 Removing rivets

Remove rivets from the side of the rivet, which is more accessible. Drill out the rivet head and drive out the shank.

NOTE

Center-dot heads of solid rivets, which shall be drilled off.

Use a drill bit of 0.5 mm *(0.025 in)* smaller diameter than the rivet shank and drill up to the depth of 2/3 of the total depth riveted parts. Remove the drilled heads with a sharp cuter. Drive out the shank with the soft material mandrel of 0.1 mm *(0.004 in)* smaller diameter than rivet shank. The rivets, which cannot be driven out should be drilled out full depth. When removing rivets be careful that chips and rivets do not fall down to areas were sensitive mechanisms are located, e.g. guides, control bearings etc.

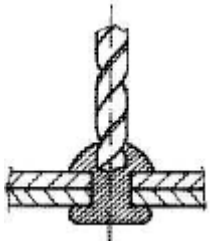


Fig. 15-1
Drilling of rivets (solid rivet shown)

15.3 Riveting

15.3.1 General

Riveted parts are used in design of BRISTELL TDO airplane for whole fuselage, wings, flaps, ailerons and tail unit.
In the following table there is a survey of rivets that are used on BRISTELL TDO airplane structure.

Type of rivets	Designation	Use
AVEX	Aluminium rivet on steel stem	Fuselage, wing, stabilizer, elevator , rudder, flaps, ailerons
MS20426AD	Aluminium rivet with countersunk head	
MS20470AD	Aluminium rivets with universal head	

Tab. 15-1
Survey of rivets used in airplane structure

In case that different replacement rivets are used than shown in Tab. 15-1 then rivet dimensions must be identical with originally used rivets and material of rivets must fulfill the same material characteristics.

15.3.2 Riveting procedure

(a) Fit the parts being connected and drill them together. Hole diameter must be of 0.1 mm (0.004 in) bigger than rivet shank.

NOTE
When drilling, fix by clamps or clecos mutual position of assembled parts. Holes of higher diameters predrill with a drill bit of smaller diameter and then redrill them to the final size.

(b) Disassemble the parts and deburr the holes.

NOTE
For sunk rivets perform conical countersinking of the rivet head by 5° smaller apex angle (e.g. the head with angle of 100° will have countersinking of 95°±1°). After countersinking, the cylindrical part of hole with min. length of 0.3 mm (0.012 in) must remain in material. Countersinking must be performed in such a way that the rivets head overruns the area before riveting max. by0.2 mm (0.008 in), the rivet head must not be under the surface level (sunk).

(c) Before applying the bonding sealant carefully clean the connected parts of impurities and degrease contact surfaces by appropriate agent, e.g. industrial spirit.

NOTE
For cleaning and degreasing use a clean paper towel or cloth. After wiping, the towel or cloth must not show any contamination. For perfect degreasing the whole surface, clean always smaller part of surface, after its perfect cleaning continue on. Cleaning liquid always apply on the cloth only and wipe it of from the surface before its evaporating.

(d) Apply bonding sealant on one of the surfaces, which should be sealed together. Apply the adhesive directly from the packing by means of the extrusion gun, plastic spatula or paintbrush in such a way that the layer of sealant is equally thick and integral, without bubbles or uncovered areas. The optimum thickness of the applied coat is 0.3 mm *(0,01 in)*.

NOTE

The surfaces that are to be connected must be dry and clean before application of bonding sealant.

(e) After applying bonding sealant connect both parts together, fix them by clecos and rivet them.

NOTE

After proper riveting the continual bur of adhesive is created on the edge of connected surfaces. If this bur is big, it is possible to wipe it of with the plastic spatula and finally with cloth dipped in degreasing agent.

(f) After riveting, seal rivet heads, there, where are used pop rivets - see 15.6.2.2.

15.4 Skin repairs

15.4.1 Removing damaged skins

In case that it is necessary to remove bigger part of the skin, ensure reliable support of the structure. Appropriately support the damaged part of the fuselage monocoque or the wing by supports located in the area of fuselage frames or wing ribs. The shape of supports must correspond with the shape of supported place and must be supplemented by cushion (or with other suitable material), so that airplane skin surface cannot be damaged. Remove rivets according to 15.2.

15.4.2 Division of damaging into groups

To determine way of repair, find out by inspection the scope of structural damage, also in case of possible unriveting the skin.

Damage can be divided into the following groups :

(a) Small damage, which do not have to be repaired, such as local small impacts, scratches in the skin not exceeding thickness of the zinc chromated layer, appearance defects of paint coat etc.

(b) Damage, which can be eliminated by airplane operator. Methods of elimination are describer further in the text.

(c) Damage with disturbance of basic structural elements of the aircraft. (Deformation of wing and stabilizer spar, deformation of wing ribs, fuselage bulkheads etc.). These repairs can be made only by BRM AERO as producer or by authorized repair shop - for more detailed information contact BRM AERO.

15.4.3 Principles for repair method determination

When repairing the damaged skin or airplane structure keep the following principles:

(a) Drill of the loose or damaged rivets and replace them with new rivets (see 15.2).

(b) Strength in any section of the repaired place must be as a minimum equal to the strength of the original part.

(c) Use the same material for repairs as the material of a defective area (for survey of used materials see 17.3).

(d) Carry out repair of skin damaging by means of patches having the same thickness as the original skin or higher.

(e) Repair the angle defects with inserted angles with the section by 10 to 20% higher than the section of the damaged angle (see 15.4.4).

(f) Loading from one side of the repaired area must carried through the repair element directly to the other side.

(g) Length of overlapping in the area of repair must be satisfactorily big so that loading can be equally distributed to nondefective part of the structure.

(h) If possible, use existinting holes for the rivets. If these rivets are not able to transfer loading, drill other holes. Rivets around of the repaired area are a criterion for rivet size selection.

(i) Minimum distances of rivets from the edge of sheet metals or inserted bands are shown in Tab. 15-2:

Rivet diameter	Distance of rivet axis from the edge of the sheet metal (angle	
	minimum	recommended
2.4 mm (3/32 in)	5 mm (0.2 in)	7 mm (0.27 in)
3.2 mm (1/8 in)	6 mm (0.24 in)	7 mm (0.27 in)
4.0 mm (5/32 in)	7 mm (0.27 in)	8 mm (0.31 in)

Tab. 15-2
Minimum distance of rivets from the edge

15.4.4 Angle repair

Repair method consists in stiffening the damaged angle by means of the new one. When repairing observe the following instructions:

(a) Determine the section area of the damaged angle S1

(b) Choose S2 = 1.1 S1as section area of the stiffening angle.

(c) Thickness t2 = (1 to 1. 3) t1

(d) Drill of rivets in the area of repair

(e) Choose the same rivet diameter as in the damaged place.

(f) Use at least two rivets on each side from the crack

(g) At riveting follow 15.3

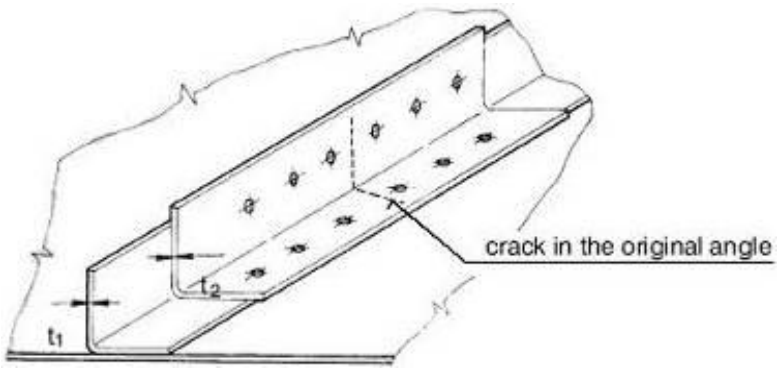


Fig. 15-2
Scheme of angle repair

15.4.5 Skin repair

15.4.5.1 Stopping cracks and blinding small holes

Propagation of small cracks can be stopped by drilling a hole with the drill bit of dia 3.2 mm (1/8 in) at the utmost end of the crack. If propagation continues, repeat the drilling. Support the place of drilling with a wooden block at drilling thin skin and use the sharp drill bit so that it will not drift and will not cause another damage to the skin. Check in the operation whether the crack was successfully stopped.

At drilling the crack of the skin in the area of the flange, supporting stiffener etc., protect these parts before drilling by supporting the drilled place by means of the thin steel band. If the

crack still propagates after repeated drilling, cut out the affected area and repair the skin by means of the patch - see next paragraph.

15.4.5.2 Repairing the skins with patches

CAUTION

The following procedure is intended for skin repairs only with max. area of the patch up to 200 cm^2 (31 in^2) (area of the cut out skin). Before riveting the patch check the adjacent part of the inner structure in the damaged area and find out whether its repair is needed. Place patches on the fuselage so, that the longer patch side lies in the longitudinal plane of the airplane (in flight direction), see Fig.15-3. Place patches on the wing so, that the longer patch side lies in direction of transversal axis of the airplane (parallel with the wing leading edge), see Fig. 15-3.

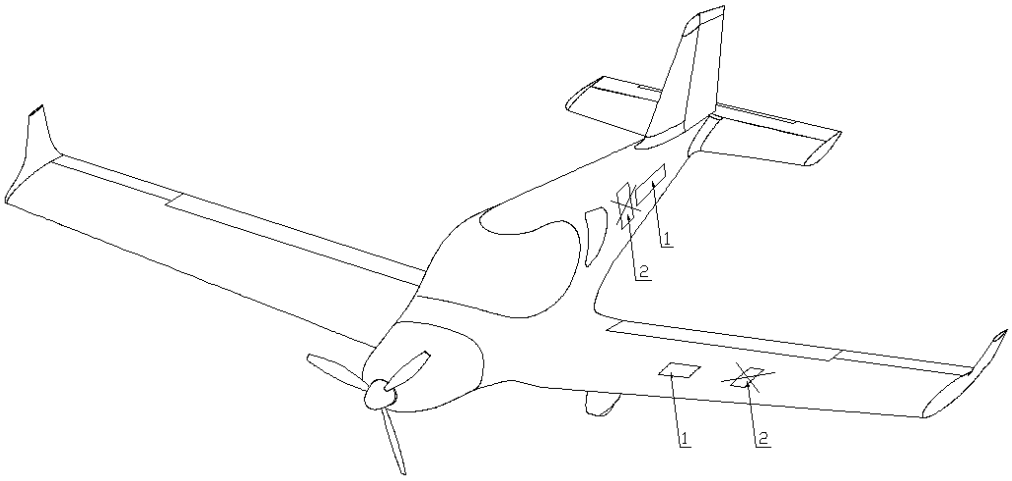


Fig. 15-3
Location of patches on the airplane skin
1 – Correctly located patch 2 – Incorrectly located patch

Mark the damaged surface area (preferably by spirit felt tip) and cut out the most suitable geometrical shape (circle, square, rectangle).

Be careful that all cracks as well as adjacent corroded areas are cutted out. Corners of cut out holes in the skin must have minimum radius of 12.7 mm (0.5 in) and their edges must be smoothly filled off.

Size of patch overlapping depends on the cut out of skin area :

(a) **patch up to the area of 52 cm^2 (8 in^2)** – rivet by one row of rivets, the patch edge must overlap the edge of the cut out hole by minimum 19 mm (0.75 in).

(b) **patch with the area over 52 cm^2 (8 in^2)** – rivet by two rows of rivets, the patch edge must overlap the cut out hole by minimum 32 mm (1.25 in).

Both ways of patching are shown on Fig. 15-5.

If the damaged area is located near the spars and frames, choose such patch dimension so that it covers all these elements of structure and it is possible to rivet it (Fig.15–4).

Types of patches according to their position on the airframe structure.

(a) **Surface patches** - These can be used in the areas where surface smoothness is not important

(b) **Sunk patches** - Use for patches on the wing, tail unit and control surfaces.

(c) **Surface patches across obstacles and stiffeners in the skin** - pay special attention to drilling the patch together with the surrounding structure. Attach the patch in several points and then drill holes for rivets from inner side (if possible). Use original holes in frames and stiffeners.

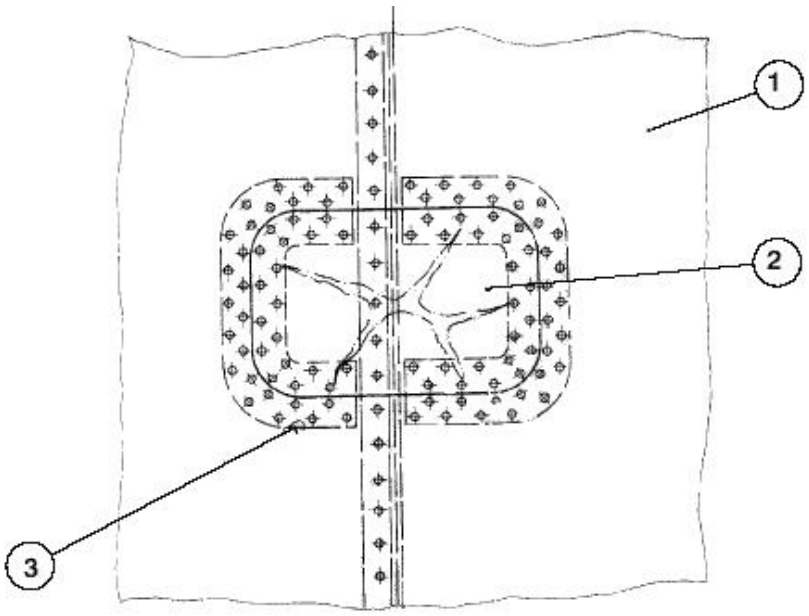


Fig. 15-4
Repair of the punctured skin in the frame area
1 – Skin 2 – Patch
3 – Stiffening frame

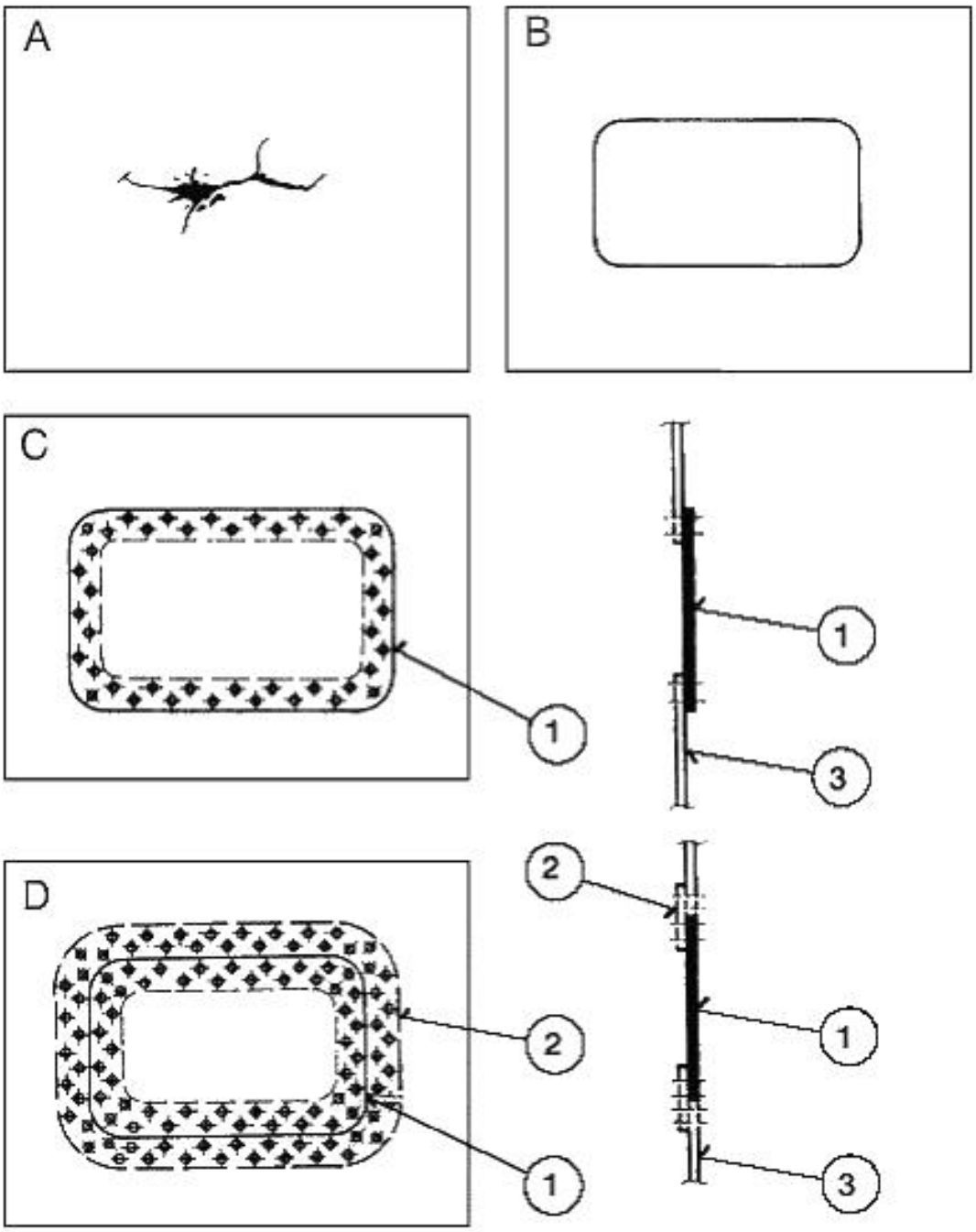


Fig. 15-5
Repair of the punctured skin

A ... Punctured skin
B ... Cutting out and cleaning the damaged skin
C ... Repair with the unsunk patch
D ... Repair with the sunk patch
1 ... Patch
2 ... Frame
3 ... Skin

15.5 Repair of fiberglass parts

15.5.1 Damage classification

Any damage of parts from reinforced plastics with epoxy matrix leads to increased saturation of the matrix with humidity and subsequently to loss of properties. Therefore we recommend carry out their repair as soon as possible after the damage has occurred.
Two kinds of parts are made from these materials in the airplane:

- structural, load-bearing parts (canopy frame)
- design appearance, non load-bearing parts (fairings)

According to the damage size we can divide repairs into:

- small damage (surface defects, not affecting the stiffeners)
- medium damage (not more than 2/3 of stiffener thickness damaged)
- big damage

We recommend carry out repairs by means of epoxy resin and glass or carbon stiffeners.

15.5.2 General

Epoxy resin mixtures are prepared in a given mass ratio by means of weighing (accuracy 1g *(0.002 lb)*.

15.5.3 Parts of external appearance

15.5.3.1 Small damage

Repair of damage just by application of mastic and by varnish repair.

Preparatory grinding

For a good adhesion of repair layers it is necessary to carry out surface sanding at the utmost up to the depth of contact with the stiffener (do not damage). It is necessary to do surface sanding with overrun of 2 in from the damage location smoothly to the top layer. It is suitable to do sanding with grain size of 160. Dry sanding equipment with suction from the sanding area is used. Al2O3 or equivalent (fused corundum) can be used as sanding material.

Dust removing

It is made by wiping with clean and dry brush or by a vacuum cleaner.

Application of smoothing layer

After preparation of mixture (for material recommendation see Tab. 15-3) and its eventual thickening to enhance the noncurtaining capability (for vertical or lower areas) is performed its application onto the repair area by means of a plastic spatula. For better distribution of deposited material on irregular surface it is possible to form it through the laid PE or PP transparent polyethylene. After proper application the layer is without bubbles. Deposit thickness is given by necessary thickness of surrounding layers (leveling) and ranges from 0.2 to 12.7 mm (0.008 to 0.5 in) in one deposit.

manufacturer, name	type	mixing ratio	delay	rate of setting	time of setting	temperature		fillers
MGS, A: L285 B: Hardener 285	epoxy	A:B 100:40	to be processed within 50 min (for 0.2kgs (0.44lbs) mixture)	40%	16hours (32hours)	20-35°C (17-20°C)	68-95°F (62-68°F)	thickening: Aerosil, microballs
				100%	26hours (72hours) (2hours)	20-35°C (17-20°C) (80°C)	68-95°F (62-68°F) (176°F)	

Tab. 15-3
Recommended materials for mixture preparation for application of leveling layer

Sanding

Sanding or eventually sealing the surface is made after setting the mixture and possible tearing of the used polyethylene. It is suitable to start sanding with grain size up to 160 and finish with grain size of at least 400. It is carried out by dry sanding equipment with suction from the sanding area. Al203 or equivalent (fused corundum) can be used as sanding material. Basic material of the part must not be diminished at sanding.

NOTE

Especially in case of C/K (carbon/Kevlar) stiffener in the basic part, sanding through up to the stiffener must not occur (complication - see note about preparatory sanding at medium damage).

Finishing

Refer to 15.6.Paint repairs

15.5.3.2 Medium damage

Repair of damage by replacing the stiffener part, by mastic and varnish repair. At such repair it is necessary to distinguish type of used stiffener (especially for sanding):

- /K (carbon/Kevlar), rovings of fabric of black color (C) take turns with yellowish (K)
- G (glass), rovings from milky white to transparent

Preparatory sanding

For good adhesion of repair layers it is necessary to do sanding up to the depth of damage. It is necessary to do surface sanding from the damage area with overrun at the least 25 mm (1 in) for every damaged stiffener layer smoothly up to the top layer and then about 51 mm (2 in) for finishing and mastic application. It is convenient to do sanding with sanding material having grain size of 160. It is carried out by dry sanding equipment with suction from sanding area. Al203 or equivalent (fused corundum) can be used as sanding material.

NOTE

In case of C/K stiffener K rovings tend to rise up from the surface at sanding - it is difficult to sand them, we recommend to use diamond sanding tool and one-way sanding.

Dust removing
Dust is removed by wiping with a clean and dry brush or by a vacuum cleaner.

Stiffener preparation
For this kind of repairs we recommend the stiffener G (glass) with plain weave, 150 g/m^2 (0.037 lb/ft^2), with surface protection for epoxy resins. Number of needed stiffener layers depends on depth of damage. It is possible to say that each layer of the mentioned fabric represents at proper saturation by matrix resin thickness of 0.5 mm (0.020 in).
Stiffener layers must be prepared (cut out) gradually from the smallest (the lowest) up to the bigger (upper), each with overrun of 19 mm (0.75 in).

Putting layers
After preparing lamination mixture (for recommendation of material see Tab. 15-3), it is applied to the place of repair by means of rigid brush. The first stiffener is laid into the deposit and it is again saturated by brush. Another layer of stiffener is laid and saturated. When putting the last layer it is necessary to pay attention to a proper saturation and compression of stiffeners so that they cannot „come up" to the surface and subsequent useless damage at final grinding. For better saturation of the surface by resin and securing against curtaining it is possible to put PE or PP transparent foil across the surface. When applied properly, the layer is without bubbles. Repair thickness should exceed surrounding surface in this phase by about 0.5 to 1 mm (0,02 in to 0,04 in) for finishing.

Sanding
Carry out sanding and eventually apply mastic on the surface after setting, eventually tearing of the foil (see small damage). It is suitable to begin sanding by abrasive with grain size of 160 and finish by grain size of at least 400. Dry sanding equipment is used with suction from the sanding area. Al2O3 or equivalent can be used as sanding material. It is important not to diminish basic material of the part at sanding.

NOTE
Especially in case of C/K stiffener in the basic part there must not be any sanding through up to the stiffener (complication - see the note about preparatory sanding).

Finishing
Refer to 15.6.Paint repairs.

15.5.3.3 Major damage

At such damage we recommend to change the part or to do this repair in a professional facility. Use instructions in chapter about medium damage as recommendation for used materials.

15.5.4 Structural parts

On these parts we do not recommend to do other as small damages repair. In case of the other damage we recommend to contact BRM AERO as manufacturer.

CAUTION
When repairing, it is necessary to pay attention to timely repair (see the text about low of properties at humidity effect at the beginning of paragraph 15.5.1) !

Small damage
Repairs are made according to instructions with appearance parts.

CAUTION
When repairing, it is necessary to carefully pay attention not to damage the stiffeners!

15.6 Paint repairs

15.6.1 Safety rules

When working with paints, thinners and solvents follow the following safety rules:

- it is necessary to follow safety rules for working with flammable and volatile substances
- working area must be properly aerated
- it is prohibited to smoke and anyway handle with free fire in a working area
- use protective working means such as goggles, gloves, respirator, etc.

15.6.2 Recommendation for additional surface treatment of airplane surface

CAUTION
By applying permanent protective coats weight of airplane is increased and gravity center position is changed. Increase in weight depends on type of coat and its thickness.

15.6.2.1 Washing and degreasing

It is possible to use both organic solvents and solvents based on water.

(a) **Organic solvents** - acetone, metyetylketone (MEK), benzine, toluene, BASF Glasurit 360-4

- Applied by spraying on washed surfaces (e.g. mechanical sprayer, jet ejector) or by wiping with wet (by pouring, not by dipping because it would contaminate the whole volume of solvent) textile wad. After applying it, the agent is wiped of by clean absorbing material before solvent evaporation.
- **Advantages**: fast and reliable evaporation even from the corners and borders without additional warming
- **Disadvantages**: it must be used without other dilution (expensive); not ecological (danger of water contamination); detrimental to health (must be carried out in an aerated area with personal protective means); waste (including dripping from the area) must be eliminated in the incinerating plants.
- **Use**: for Al-alloys surfaces, epoxy fiberglass

CAUTION
These agents must not be used for degreasing parts from plastics (PC -Lexan, PMMA Plexiglass)

(b) **Water-based agents** - emulgation substances, wetting agents

- Applied also by spraying onto washed surfaces or by wiping with wet (by pouring and dipping) textile wad. After applying it, let it act for some time (see manufacturers recommendation) and then it is rinsed with clear water (by means of sponge dipped in ample amount of water or water jet).
- **Advantages**: (different according to the type of product: it is possible to highly dilute with water (cheap); ecological - waste (including dripping from the surface due to ample amount of water it is necessary to contain it) can be generally eliminated after its additional dilution with water in public sewerage; the least detrimental to health.
- **Disadvantages**: slow and unreliable evaporating from corners and borders, additional warming (drying) mostly required imperfect elimination of water results in wrong adhesion of paint coats; imperfect degreasing of fiberglass parts (not possible to use)
- **Use**: for Al-alloys surfaces and plastics

15.6.2.2 Bonding rivet heads, big irregularities and material transitions

CAUTION

In case that airplane surface remains without top coat, carry out just rivet head bonding.

After perfect degreasing carry out bonding of rivet heads, big irregularities and transitions of fiberglass parts with Al-sheet.

Epoxy and polyester bonding agents for car bodies are suitable; moreover for transitions between two types of material with increased elasticity. Recommended bonding agents are shown in Tab. 15-4.

Polyester bonding agents are applied with plastic spatula after being mixed with initiator. Sanding with sanding paper with grain size of 240 is made to smooth surface after drying. Remove dust after sanding and clean with degreasing agent.

Epoxy bonding agent is applied from the special jet with static mixer by means of extruding pistol. Excessive material is wiped off with spatula to final appearance before setting (slight recess is not a defect) - **do not sand**!

surface	manufacturer, name	type	other components	drying (grindable) [min] / 18°C (*65°F*)
Al–alloys	BASF Glasurit 801-703 (base)	polyester	BASF Glasurit 965-53 (initiator)	20
transitions epoxide – fiberglass + Al-alloys	BASF Glasurit 801-703 (base)	polyester	BASF Glasurit 965-53 (initiator)	20
Rivet heads	BASF Glasurit	polyester + styren		20

Tab. 15-4
Recommended bonding agents

15.6.2.3 Application of primer (paint)

In order to reach a uniform resistance to corrosion and smooth surface, we recommend carry out application by means of spraying (air standard gun with the upper vessel, air HVLP gun, airless electric gun). The adjusting of the used gun (given by manufacturer) differs according to the type - air pressure, jet diameter. Primer should be applied in several sprayings (total thickness is not reached at a blow) with defined maximum dwell and total drying time till further treatment or handling. Primer serves especially for anchoring (adhesion to the substrate) the topcoats and can serve also for eliminating irregularities of the surface (function of filer, for sanding). For surfaces from Al-alloys we recommend to use the etch-primers for light metals based on alkyd or materials based on epoxy or polyurethane (2-component paints); specific recommendations according to the Tab. 15-5.

Surface	Manufacturer, name	Type	Further components	Surface mass	Recom. thickness	Drying (between spraying / total) 18°C (*65°F*)
Al-alloys epoxy – fiberglass PC (Lexan), PMMA (Plexiglass)	BASF Glasurit 801-1880 (base)	epoxy	BASF Glasurit 965-35/2 (hardener) Glasurit 965-50 (thinner)	1.6 [kg/mm/m^2] 8.49 [lb/in/sqft]	0.025mm (*0.00098"*) (at 0.05mm (*0.00197"*) it can be also used as filler)	15 min / 12 hours

Tab. 15-5
Recommended primers

15.6.2.4 Bonding

After total drying of basic coat we recommend to carry out total bonding of irregularities including repairs of bonding. Recommended binders are shown in Tab. 15-4. After drying perform sanding with emery paper with grain size of 240 until the surface is smooth. After sanding clean dust and wipe of with grease remover and perform repairing paint coat by primer (1/3 of coat thickness).

15.6.2.5 Application of top coat

In order to reach smooth surface we recommend again carry out the paint coat by spraying (see 15.6.2.3).
Top coat serves especially for creating the coat resistant to weather and external effects for aesthetic rendering of the unit. Considering the higher loading by external effects we recommend to use top materials, exclusively two-component ones, on the acrylic-polyurethane or polyurethane basis, always with guaranteed adhesiveness to the used base coat (according to manufacturer). It is possible to use to advantage some of the coat system for car repairing. In our recommendation (see Tab. 15-6) there are two types of colors: single coat (color shade and protection in one) double coat (one-component color shade is formed by the substrate and protection is ensured by two-component transparent top coat). By single coat paint it is possible to reach the wide spectrum of colors, but it is difficult to do metallic paint coats (we do not recommend them).

Type of color	Manufacturer, name	Type	other items	Surface mass	Recom. thickness	Drying (between spraying / total) 18°C (*65°F*)
single coat	BASF Glasurit R-68 / shade (base)	acrylic – polyurethane	BASF Glasurit 922-36 (standard hardener) Glasurit 352-91 (standard thinner)	1-1.6 [kg/mm/m^2] 5.24-8.38 [lb/inch/ft^2] (by shade)	0.02-0.04mm (*0.00078-0.00157"*)	15 min / 16 hrs
Double coat	base color coat: BASF Glasurit R-55 / shade (base)	acrylic – polyurethane	BASF Glasurit 352-216 (thinner, long)	1.2-1.4 [kg/mm/m^2] 6.29-7.33 [lb/inch/ft^2] (by shade)	0.015-0.02mm (*0.00059-0.00078"*)	10 min / 20 min
	Top coat, bright: BASF Glasurit 923-155 (base)	acrylic – polyurethane	BASF Glasurit 929-93 (standard hardener) Glasurit 352-91 (standard thinner)	0.9 [kg/mm/m^2] 4.82 [lb/inch/ft^2]	0.03-0.04mm (*0.00118-0.00157"*)	5 min / 5 hrs

Tab. 15-6
Recommended paints

15.6.3 Small damage

15.6.3.1 General

Small damage is a deterioration of corrosion resistance. At repair the situation is made more difficult by the fact that the substrate for repair coats is not a compact surface of basic material but mostly al coats of surface protection (after sanding), of which not al are suitable for (in ageing stage) for good adhesion of paint coats. Therefore we recommend to carry out such repairs by a verified system.

Before repairing it is necessary to differentiate the type of the existing topcoat, single coat and two-coat (with the top coat). For repair it is necessary to follow the used type of color.

It is suitable to choose the delimited area (e.g. connection of sheets, wing edge) for the scope of the place, which is being repaired transition, is then better blended. In the case that it is not possible to choose the area in this way, it is necessary to take into consideration the higher difficulty of the procedure as for the uniformity of shade and elaboration of coat transition.

15.6.3.2 Sanding

For good adhesion of the repair coats it is necessary to carry out sanding of the old paint coat at least up to such depth as the depth of damage. Ground area must be larger from 51 to 102 mm (2 to 4 in) than damaged area. With two-coat type of the topcoat it is necessary to add at least 51 mm (2 in) for the run-out of the top coat. Sanding can be started with

abrasive having grain size of max. 160 and finish with grain size of 400. It is made by the sander equipped with the suction from the area of sanding or by manual sanding under water.

CAUTION

Anodized coat can not be destroyed by sanding on the Al-alloy sheet.

15.6.3.3 Degreasing

It is carried out in the same way as in the case of the total spray coat - see 15.6.2.1.

15.6.3.4 Application of primer

For reaching the satisfactory equal adhesion we recommend to carry out a spray coat of the place to be repaired by adhesive interlayer (see.Tab. 15-7).

surface	Manufacturer, name	type	Surface weight	Recomm. thickness	Drying (total) 18°C (*65°F*)
Al-alloys	BASF Glasurit 934-0	single-component	0.8 [kg/mm/m^2] 4.19 [lb/inch/ft^2]	0.005-0.01mm (0.00019-0.00039")	max 15 min
Epoxy fiberglass					
Old paint coats					

Tab. 15-7
Adhesive interlayer

Subsequently the primer is applied according to Tab. 15-5. Paint coat thickness is given by necessary thickness of surrounding coats (leveling).

CAUTION

In case that the primer was not removed by the previous step, it is not necessary to apply the primer again. The original ground primer with adhesive intercoat is enough.

Actual application of primer will be carried out in the same way as for the total spray-coat (see 15.6.2.3).

15.6.3.5 Application of top coat

CAUTION

For repairing it is necessary to choose the identical type (single coat, double coat) of the repair color as on the original surface.

Application of the top coat will be carried out by spraying as for the total spray coat (see 15.6.2.3) with the exception of used thinners and hardeners. Due to the need of smooth transition to the basic surface it is necessary to use so called „spraying into the surface" using longer time of drying initiations for a good result of work. The recommended material is shown in Tab. 15-8.

Type of color	Manufacturer, name	Type	other components	Surface mass	Recomm. thickness	Drying (between spray coats / total) 18°C (*65°F*)
single coat	BASF Glasurit R-68 / shade (base)	acrylic – polyurethane	BASF Glasurit 922-36 (standard hardener) Glasurit 352-319 (extra long thinner)	1-1.6 [kg/mm/m^2] 5.24-8.38 [lb/inch/ft^2] (according to shade)	0.02-0.04mm (*0.00078-0.00157"*)	15 min / 19 hrs
double coat	basic color code: BASF Glasurit R- 55 / hade (base)	acrylic – polyurethane	BASF Glasurit 352-216 (long thinner)	1.2-1.4 [kg/mm/m^2] 6.29-7.33 [lb/inch/ft^2] (according to shade)	0.015-0.02mm (*0.00059-0.00078"*)	10 min / 20 min
	Glossy top coat: BASF Glasurit 923-155 (base)	acrylic – polyurethane	BASF Glasurit 929-93 (standard hardener) Glasurit 352-400 (extra long thinner)	0.9 [kg/mm/m^2] 4.82 [lb/inch/ft^2]	0.03-0.04mm (*0.00118-0.00157"*)	5 min / 6 hrs

Tab. 15-8
Recommended colors

15.7 Torque moments

Unless otherwise prescribed, the torque moments shown in the following table can be used. When tightening follow several rules:

(a) Unless specifically stated do not grease neither nut nor bolt.

(b) If possible always tighten the nut. If for some space reasons it is necessary to tighten the bolt head and the scope of tightening moment is defined. Use higher moment for tightening.

(c) Maximum moments are used only for the materials and surfaces, which have a sufficient thickness, area and strength resistant to bursting, warping or other damage. Maximum tightening moments must not be exceeded.

Bolt size	Torque limits recomended		Max. allowable torque limits	
	Nm	in lb	Nm	in lb
AN3	2.3 - 2.8	20 - 25	4.5	40
AN4	5.7 - 7.9	50 - 70	11.3	100
AN5	11.3 - 15.8	100 - 140	25.4	225
AN6	18.1 - 21.5	160 - 190	44.1	390
AN7	50.9 - 56.5	450 - 500	94.9	840
AN8	54.2 - 78	480 - 690	124.3	1100
AN9	90.4 - 113	800 - 1000	180.8	1600

Tab. 15-9
Recomended torque values for oil-free, cadmium-plated threads

15.8 Securing the bolt joints

15.8.1 General

Bolt joint securing is used in order to prevent from their loosening due to vibration or force action on the connected parts, which could result in the damage of the connected parts. Three ways of bolt joint securing are used on the airplane: locking wire, cotter pin and locking washer.

15.8.2 Bolt joint securing by locking wire

Procedure of bolt joint securing is shown on Fig. 15-6 and Fig. 15-7. The zinc-coated or stainless steel wire having diameter of 0.8 mm (0.032in) is used for securing.

Fig. 15-6
Ways of bolt joint securing

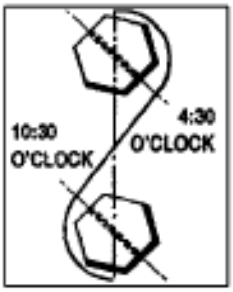
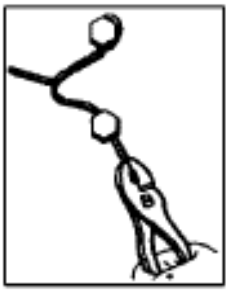
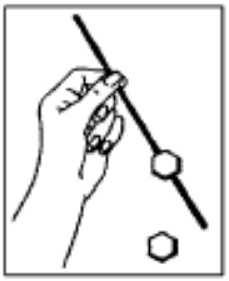
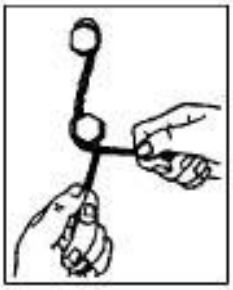
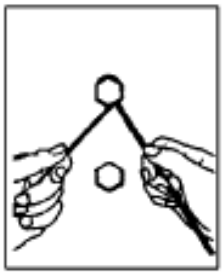
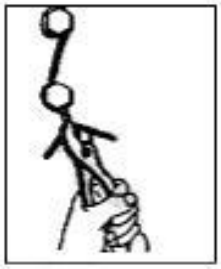
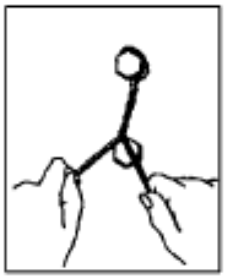
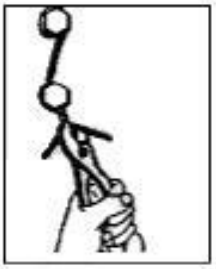
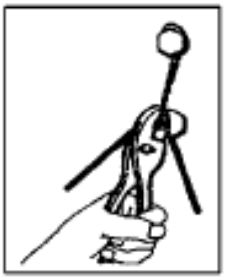
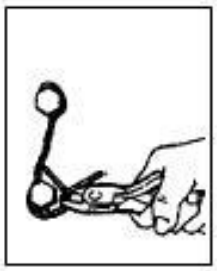
	1. Adjust the correct position of holes for locking wire.		6. Pull the upper wire through the hole in the other bolt. Hold the wire end by pliers tighten it firm.
	2. Pull the locking wire through the hole in one bolt to be secured.		7. Hold the free end of wire by hand, bend it around the bolt head and along with the other end twist it counterclockwise.
	3. Hold the upper end of the wire and wind it around the bolt head and then by the other end of the wire. Make sure that the wire is properly tightened around the head.		8. Hold the twisted end by pliers and twist it tight.
	4. Twist the wire to the hole in the next bolt so tight as possible.		6. Pull the upper wire through the hole in the other bolt. Hold the wire end by pliers tighten it firm.
	5. Tighten the wire and at the same time continue its twisting unless perfectly tightened. The twisted wire can have approximately from 3 to 4 threads on the length of 10 mm (0,4 in).		7. Hold the free end of wire by hand, bend it around the bolt head and along with the other end twist it counterclockwise.

Fig. 15-7
Procedure for securing the bolt joint with locking wire

15.8.3 Bolt joint securing by cotter pin

Securing by cotter pin is used for independent bolt joints where securing by locking wire could not be used. It is used for securing castle nuts. Cotter pin removal is very easy: by means of a flat screwdriver straighten up the bent ends of the cotter pin and take out the cotter pin of the hole by means of pliers.

CAUTION

When securing joints always use new cotter pins.

Shift the new cotter into the hole in the bolt and bent the cotter pin ends according to Fig. 15-8.

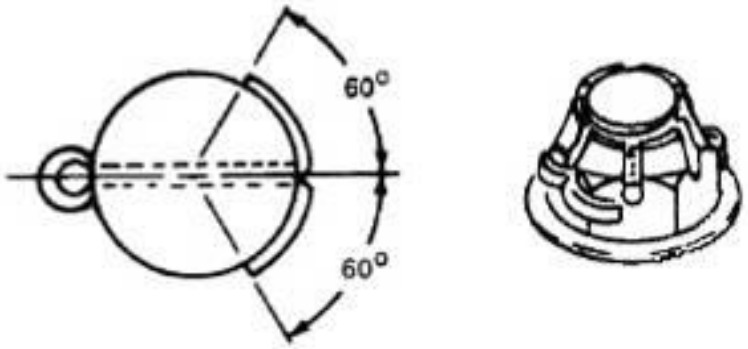


Fig. 15-8
Securing the castle nut by using the cotter pin

15.9 Bonding repair

15.9.1 General

In order to keep the set down values of the transition resistances between some stuctural parts of the BRISTELL TDO airplane structure, the bonding (conductive interconnection) is installed between all important parts of the fuselage structure.

15.9.2 Removal / Installation

Before installing the bonding remove the paint coat which protects the joint. Principles for repeated installation of the bonding:

(a) Carefully clean the whole bonding including the washers, bolts and nuts from all impurities, if necessary degrease the contacting surfaces on the connecting material.

(b) Carefully check whether wires of bonding band are not torn off. Change the damaged band.

(c) Carefully clean and degrease contacting surfaces on the airplane structure. Clean corroded surfaces with emery paper to the metallic luster.

CAUTION

If a new part was installed into the airplane, its surface is provided by non-conductive surface protection (for example anodizing), this surface protection must be removed from the area of bonding installation.

(d) The threaded joints, which fulfill a function of bonding can not be lubricated.

(e) On the same areas of the airplane structure install the same type of bonding which you removed.

(f) After repeated bonding installation coat the remaining metallically clean surface of the contact area, as well as protruding heads of bolts and nuts with protective paint.

15.10 Installing clamps by Nicopress pliers

Procedure of clamp installation by Nicopress pliers is shown on Fig. 15-9.

First pull the cable through the clamp, make a loop around the thumb and pull the cable end back through the clamp. The cable end should overlap by about 32 mm (1.25 in) from the clamp after its puling through. The overlapping will ensure that the cable end will not be pulled back into the clamp during the clamp squeezing. Before actual squeezing the clamp it is also necessary to verify which cable terminal will be used, whether thimble or suspension eye, because some terminals must be put into the cable before actual clamp squeezing.

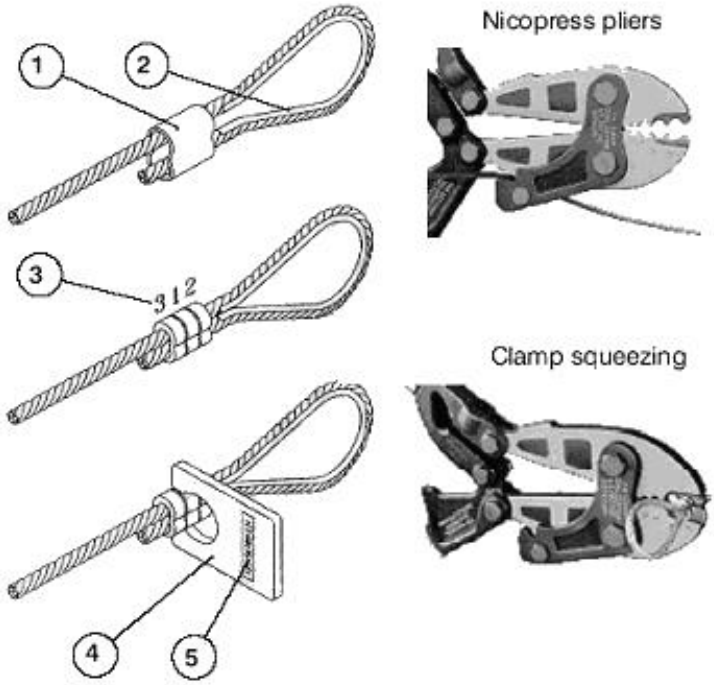


Fig. 15-9
Installation of clamps by Nicopress pliers

1 – Clamp
2 – Eye
3 – Sequence of squeezing
4 – Inspection gauge
5 – Gauge No.

16. CHAPTER – WIRING DIAGRAMS

16.1 General 16-2
16.2 General wiring diagram 16-3
16.3 Wiring diagram of trims.....16-4
16.4 Wiring diagram of flaps 16-5
16.5 Wiring diagrams of the communication system.....16-6
16.6 Wiring diagram of the transponder 16-7
16.7 Wiring diagram of the GPS.....16-8
16.8 Wiring diagram of the socket.....16-8
16.9 Wiring diagram of the lighting system 16-9

16.1 General

This chapter contains typical wiring diagrams of BRISTELL TDO airplane systems, navigation and communication means. Further wiring diagrams, relating to additional equipment of the airplane are included in the documentation supplied with the airplane.

16.2 General wiring diagram

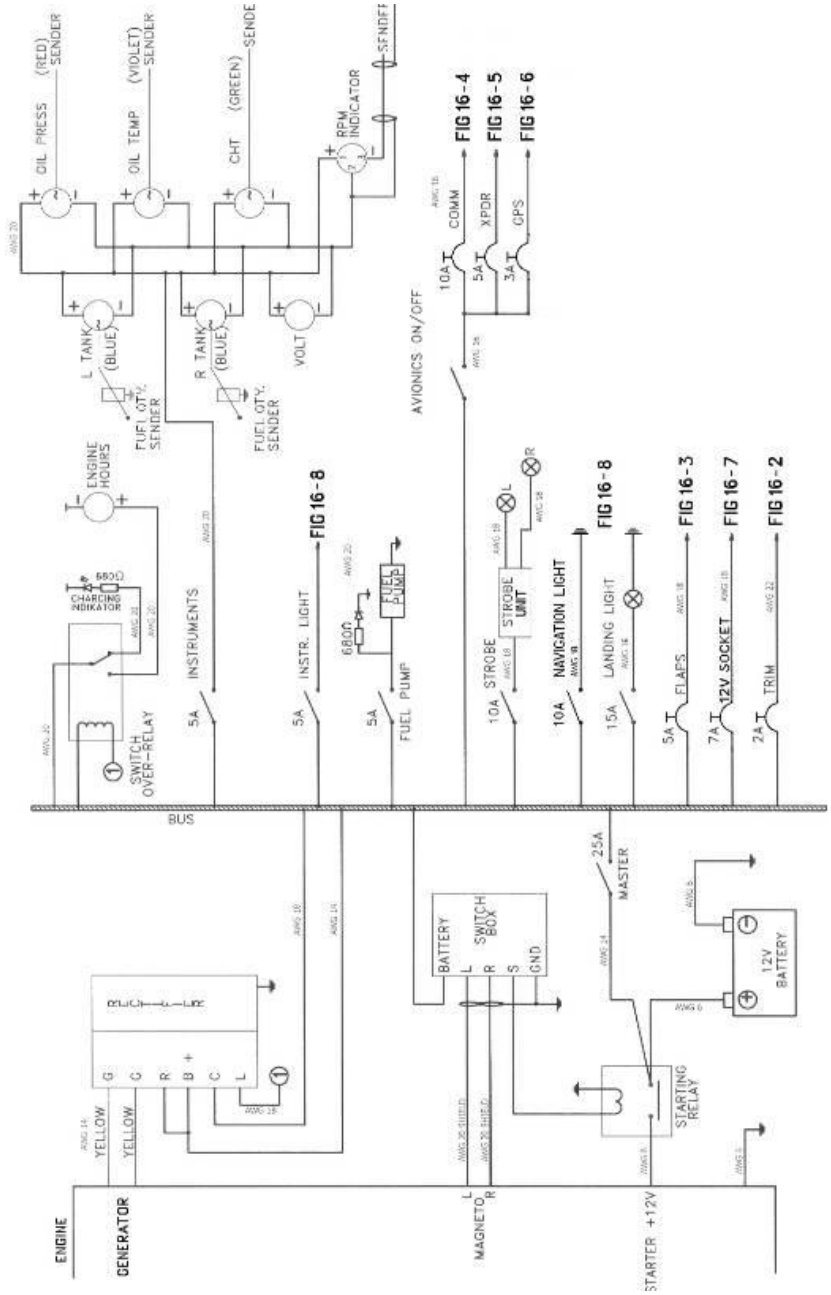


Fig. 16-1
Wiring diagram of BRISTELL TDO aircraft

16.3 Wiring diagram of trims

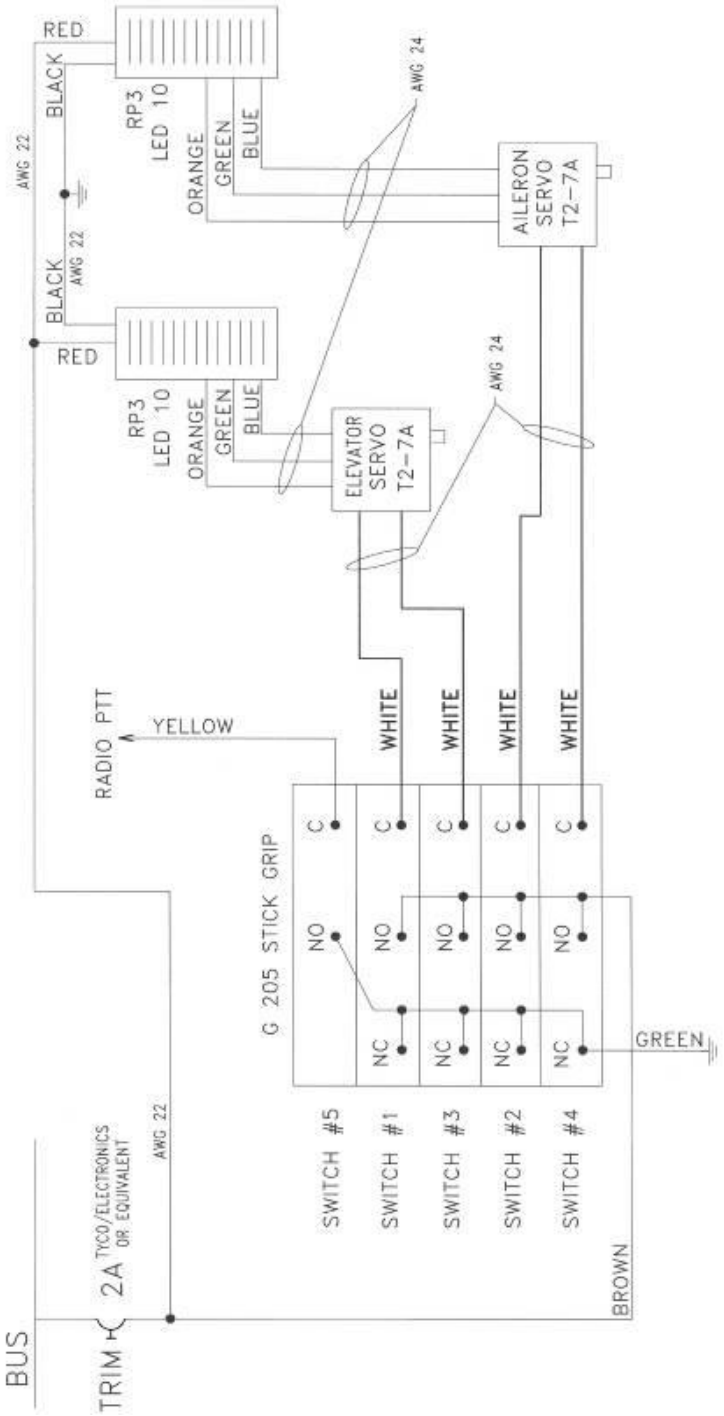


Fig. 16-2
Wiring diagram of the aileron and elevator trim

16.4 Wiring diagram of flaps

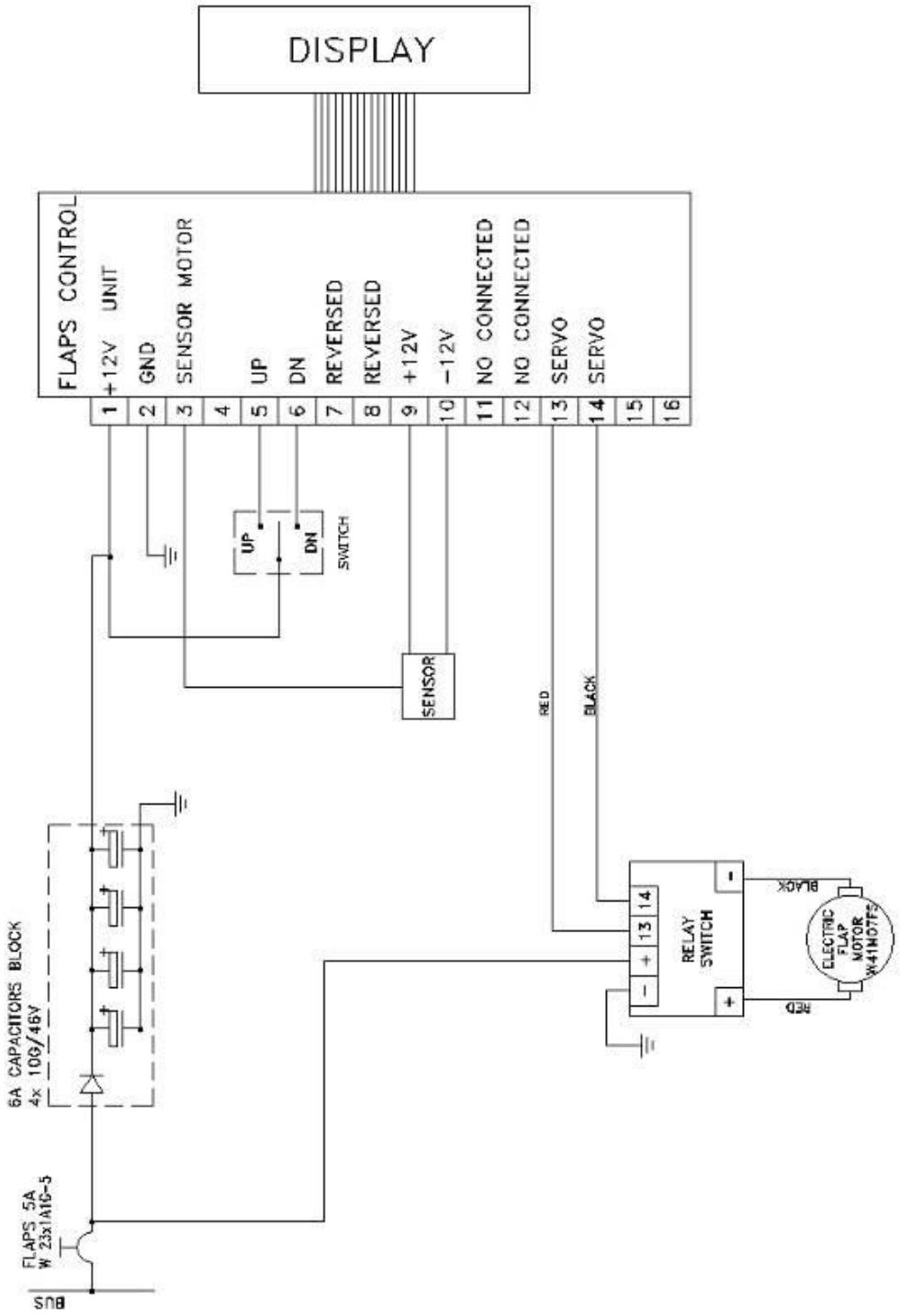


Fig. 16-3
Wiring diagram of flaps

16.5 Wiring diagrams of the communication system

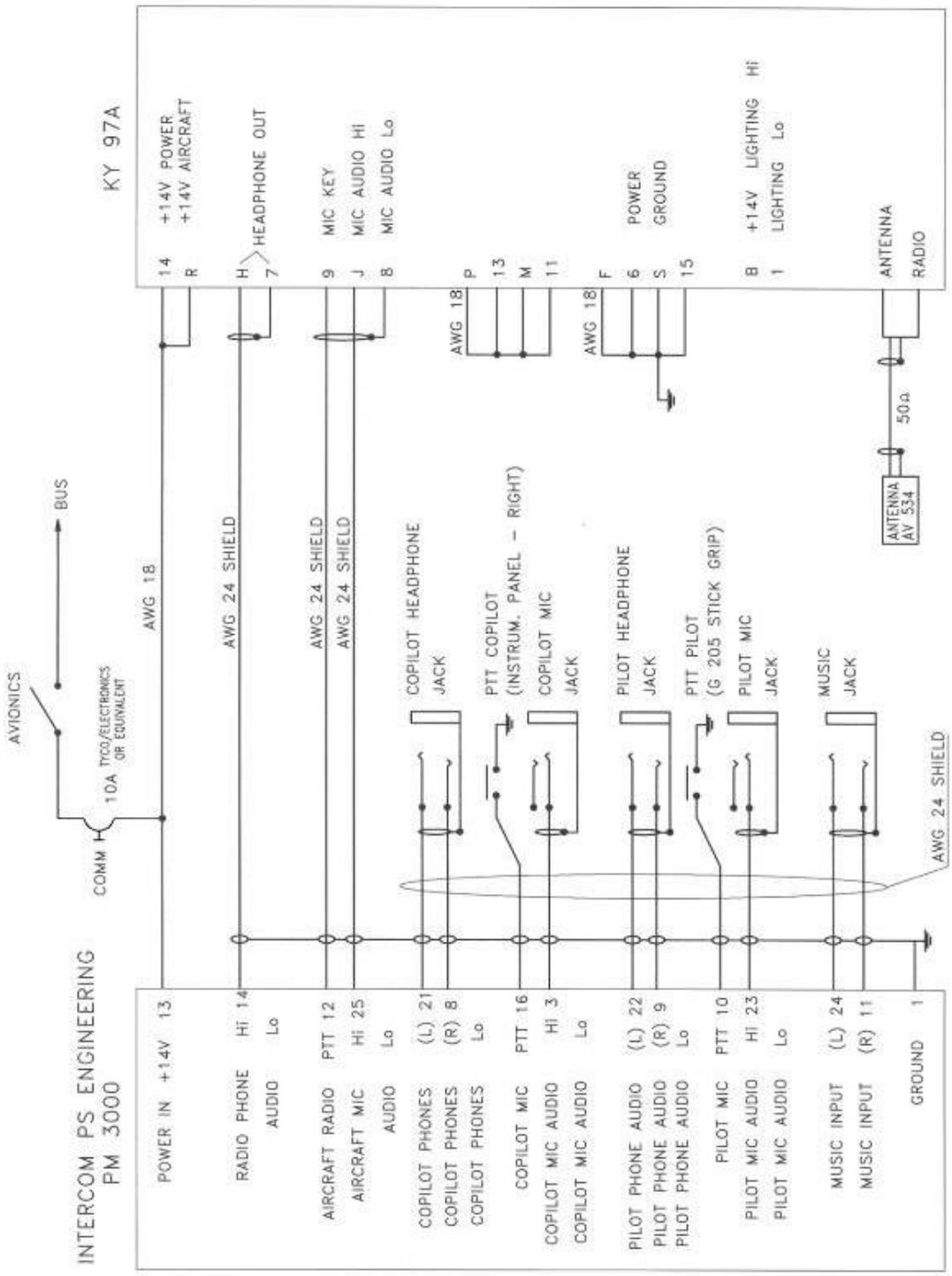


Fig. 16-4
Wiring diagram of the radio and intercom (stereo)

16.6 Wiring diagram of the transponder

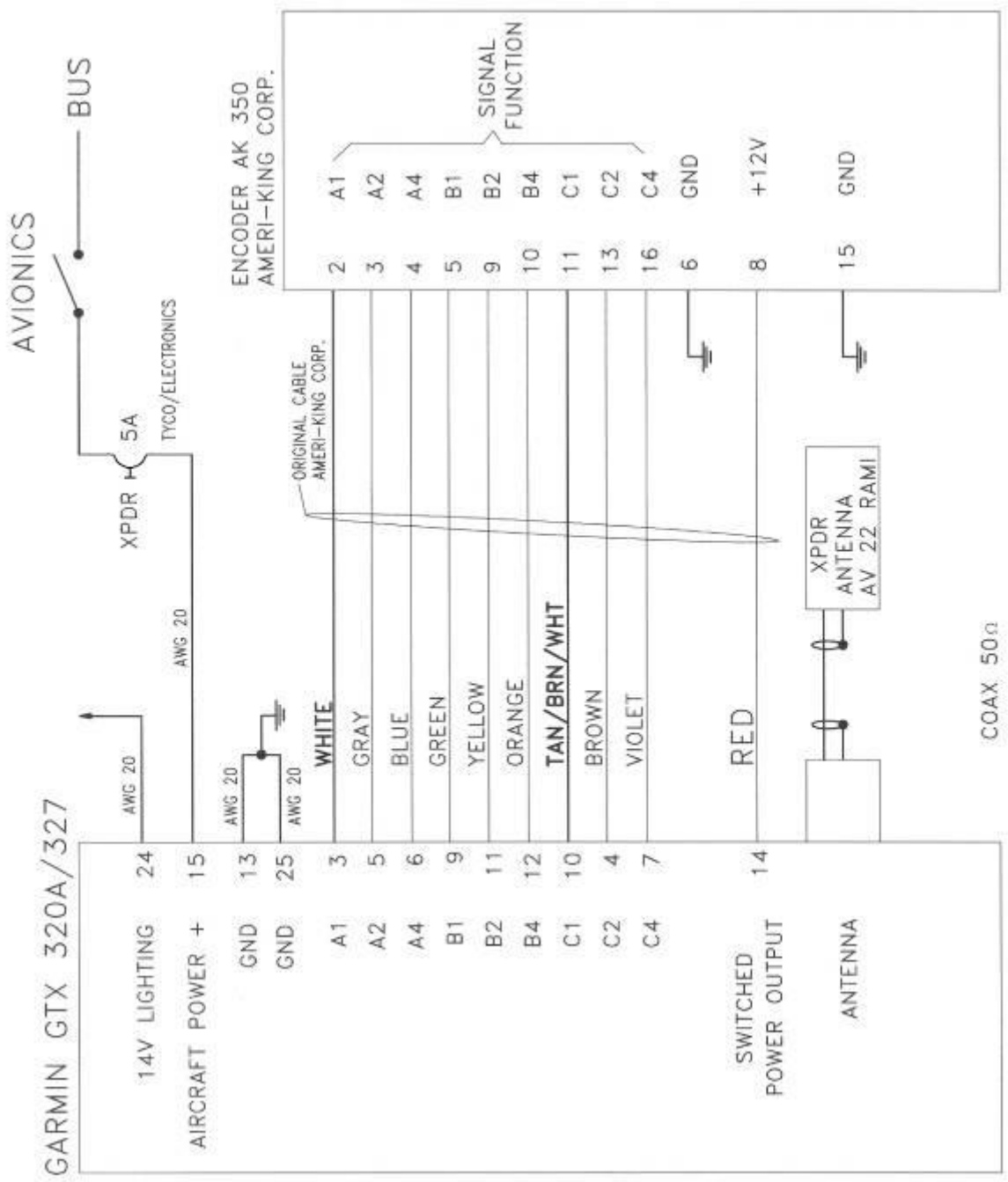


Fig. 16-5
Wiring diagram of the transponder and encoder

16.7 Wiring diagram of the GPS

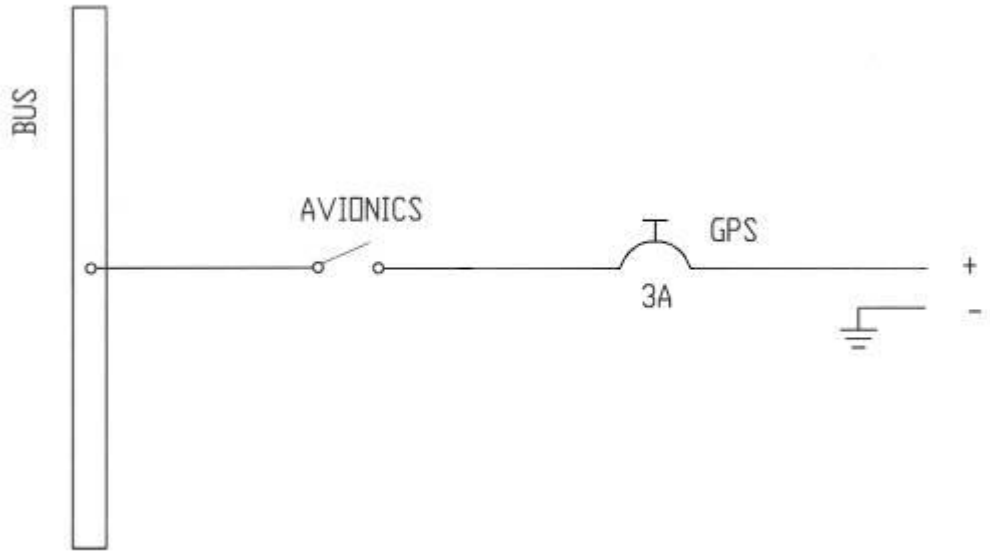


Fig. 16-6
Wiring diagram of the GPS

16.8 Wiring diagram of the socket

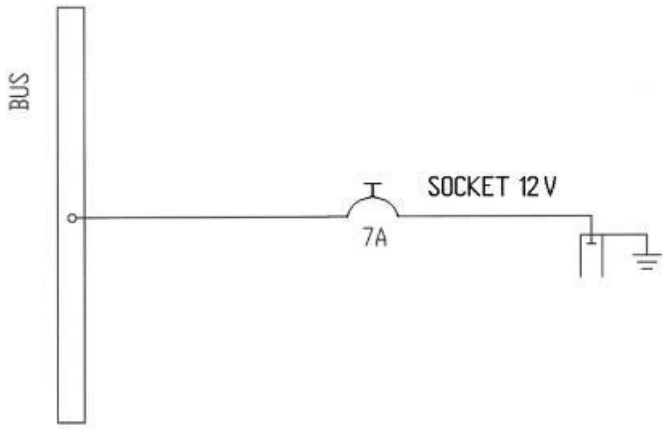


Fig. 16-7
Wiring diagram of the socket

16.9 Wiring diagram of the lighting system

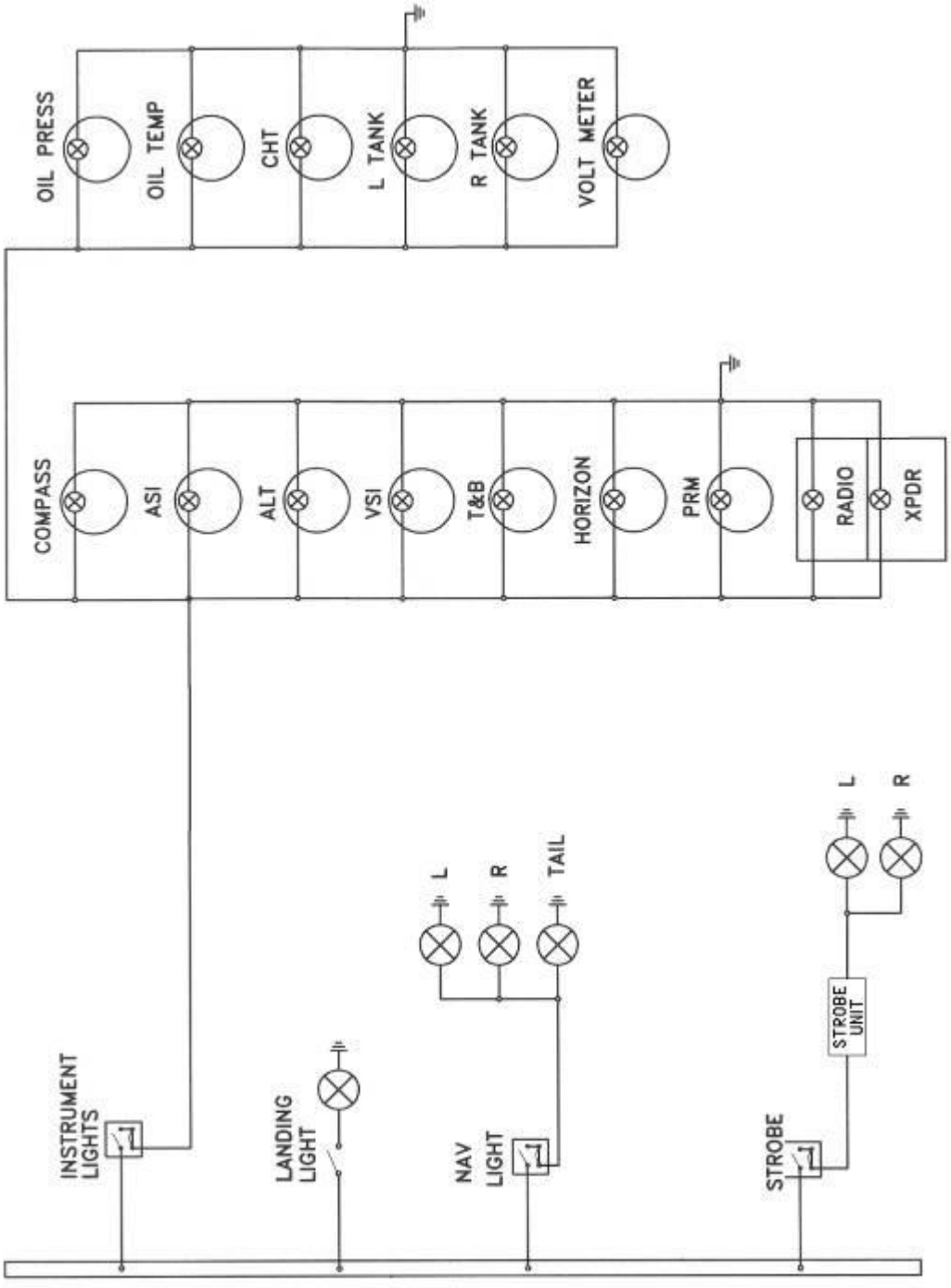


Fig. 16-8
Wiring diagram of the lighting system

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17. CHAPTER – SUPPLEMENTS

17.1 General 17-2

17.2 List of appendices 17-2

17.3 List of used materials for airframe production 17-2

17.4 Airplane Failure Card.....17-3

17.5 Operating liquids 17-4

17.1 General

This chapter contains other information necessary to maintain the BRISTELL TDO airplane in the form of appendices

17.2 List of appendices

No.	Title
17.3	List of used materials
17.4	Airplane failure card
17.5	Operating liquids

17.3 List of used materials for airframe production

Prescribed material	
2024 T351	Duraluminium
6061 T6	Duraluminium
4130 N	Steel
11 353	Steel
17240.4	Stainless steel
D 671	Stainless steel

17.4 Airplane Failure Card

BRM AERO s.r.o. Letecká 255, 686 04 Kunovice, Czech Republic

Airplane Failure Card

Dear customer,
We would like to ask you for your assistance at obtaining information for continuous increasing reliability of airplanes produced by our company. Please fill out the card in case of any failure on your airplane. After filling out, send it to the address mentioned above. By sending us the card, you provide us with valuable data, which enable us to improve reliability of your airplane as well.

Mandatory data

Airplane type: Registration mark: Airplane S/N:

1.	Flight units: flight hours – number of landing	| | | | | : | | | - | | | |
2.	Failure detection date: day – month – year (format: “dd mm yy”)	| | | | | |
3.	Failure has been detected at: (encircle appropriate number)	1. Flight 2. Taxiing 3. Take-off run 4. Take-off 5. Touch down 6. Landing run 7. Daily inspection 8. Periodical inspection 9. Other
4.	Consequences for operation: (encircle appropriate number)	1. No consequences 2. Airplane put out of operation 3. Airplane returned from take-off 4. Flight with damaged aggregates 5. Emergency landing 6. Occurrence on the ground 7. Other
5.	Failure description:	
6.	Identification of the damaged part	

Failed part name	Catalogue number of failed part	Worked out operation units	Serial No.*

Note: State maximum detectable data * fill out if required

7.	Notes, additional data (kind of failure, defect, incorrect activity):

Additional data

8.	Claimed (encircle what applicable): YES - NO	No. of claim:
9.	Order of spare parts (encircle what applicable): YES - NO	

Item	Name of part	Catalogue part No.	No. of pieces

	Owner:	Home airport:	
	Operator:	Date:	Elaborated by:

17.5 Operating liquids

Aircraft manufacturer used this operating liquids:

Brake fluid

Beringer brakes

Castrol brake fluid DOT 4
Protector series
SAE J1703 & J1704;
FMVSS 116 DOT4;
JIS K2233 Class 4;
ISO 4925 Class 4

General information:
http://www.castrol.com/en_au/australia/products/cars/brake-fluids/brake-fluid-dot-4.html

Product data:
http://msdspds.castrol.com/bpglis/FusionPDS.nsf/Files/AF9FDB842F7E528780257A3A002E1EBB/$File/BPXE-8WAHL9.pdf

Safety Data Sheet:
http://msdspds.castrol.com/ussds/amersdsf.nsf/Files/83130CBD26C12EB080257E880052A5EA/$File/BP%20EU%20CLP%20SDS%20-%20Germany%20DE-Lubes%20Europe-Castrol466630-AE02%20AE05%20GB13%20IN12%20MY01%20MY03%20TH01%20TR01%20US65%20X101en-GB.pdf

Matco brakes

AeroShell FLUID 41
Mineral hydraulic fluid for aircraft
AeroShell Fluids 4 and 41 - mineral hydraulic fluids, the latter has superior cleanliness characteristics and is the more widely used grade.
MIL-PRF-5606H
NATO Code: H-515
DEF STAN 91-48 Issue 2 Superclean
DCSEA 415/A; AMG-10;
Joint Service Designation: OM-15

Data Sheet:
https://prodepc.blob.core.windows.net/epcblobstorage/GPCDOC_X_cbe_24855_key_140008284476_201504141143.pdf

Engine oil

AeroShell SPORT PLUS 4
Piston Engine Oil

General Information:
http://www.shell.com/global/products-services/solutions-for-businesses/aviation/aeroshell/products/piston-engine-oils/sports-plus4.html

Data Sheet:
https://prodepc.blob.core.windows.net/epcblobstorage/GPCDOC_GTDS_AeroShell_Oil_Sport_Plus_4_%28en%29_TDS.pdf

Safety Data Sheet:
https://prodepc.blob.core.windows.net/epcblobstorage/GSAP_msds_01054346.PDF

Coolant

Standard

Castrol Radicool NF

General Information:
http://www.castrol.com/en_au/australia/products/cars/antifreeze-and-coolants/radicool-nf.html

Product Data Sheet:
http://msdspds.castrol.com/bpglis/FusionPDS.nsf/Files/3C59D03BDBCFCFB180257EC3002F3E7B/$File/BPXE-A2QEP9.pdf

Safety Data Sheet:
http://msdspds.castrol.com/ussds/amersdsf.nsf/Files/4626548FE641F44580257E1B00528E07/$File/BP%20TransTasman%20CSDS%20-%20Australia%20AU-Lubes%20AsPac-Castrol467186-AE05%20AUXX%20DE40%20ES11%20GB20%20SEXX%20X101en-GB.pdf

Alternative

Velvana G48
concentrated coolant
A concentrated cooling liquid based on ethyleneglycol, it contains highly effective corrosion inhibitors to protect the cooling system.

Product Data (Czech language only):
http://www.velvana.cz/product/fridex-g-48

Retractable landing gear oil

Castrol Transmax Dex III Multivehicle
Automatic Transmission Fluid

Product Data:
http://msdspds.castrol.com/bpglis/FusionPDS.nsf/Files/A64159DEC3443FFA80257C6F004CEBE1/$File/BPXE-8B54LT_0.pdf

Safety Data Sheet:
http://msdspds.castrol.com/ussds/amersdsf.nsf/Files/0DF968E5FE83929480257C9B00580FF0/$File/296947Castrol%20Transmax%20Dex%20III%20Multivehicle.pdf