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MAINTENANCE MANUAL FOR THE LAK-19 SAILPLANE

Type:	LAK-19
Serial Number:	_____
Registration:	_____

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This sailplane is to be operated in compliance with the information and limitations contained herein. Translation of this maintenance manual has been done by best knowledge and judgment. In any case the original text in Lithuanian language is authoritative.

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Record of revisions

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SECTION 1

General

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1.1 Introduction

This Maintenance Manual contains an information for pilots, technicians and mechanics about safe and proper maintenance of a sailplane LAK-19. An information is given in accordance with requirements of JAR22.1529.

1.2 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes used in the flight manual.

Warning: Means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.

Caution: Means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of the flight safety.

Note: Draws the attention on any special item not directly related to safety by which is important or unusual.

1.3 Description of sailplane

The LAK-19 is a new generation of FAI standard class and 18m class sailplane designed according to JAR-22 requirements.

The sailplane has, T-shaped tail, retractable main gear wheel, water ballast tanks 180 liter of capacity in wings and water ballast tank 8 liter of capacity in fin.

The sailplane is made of composite materials. Wing shell is of three-layer construction (composite material – foam - composite material). Carbon rods GRAPHLITE SM 315 have been used in spar construction.

The airbrakes are located on the upper part of wing. The fuselage is of monocoque construction. Pilot seats and pedals of rudder control are adjustable. Cockpit canopy opens forward together with instrument panel. In case of emergency the canopy is ejected.

Main landing gear has a wheel of 5.00-5 size and a shock absorber.

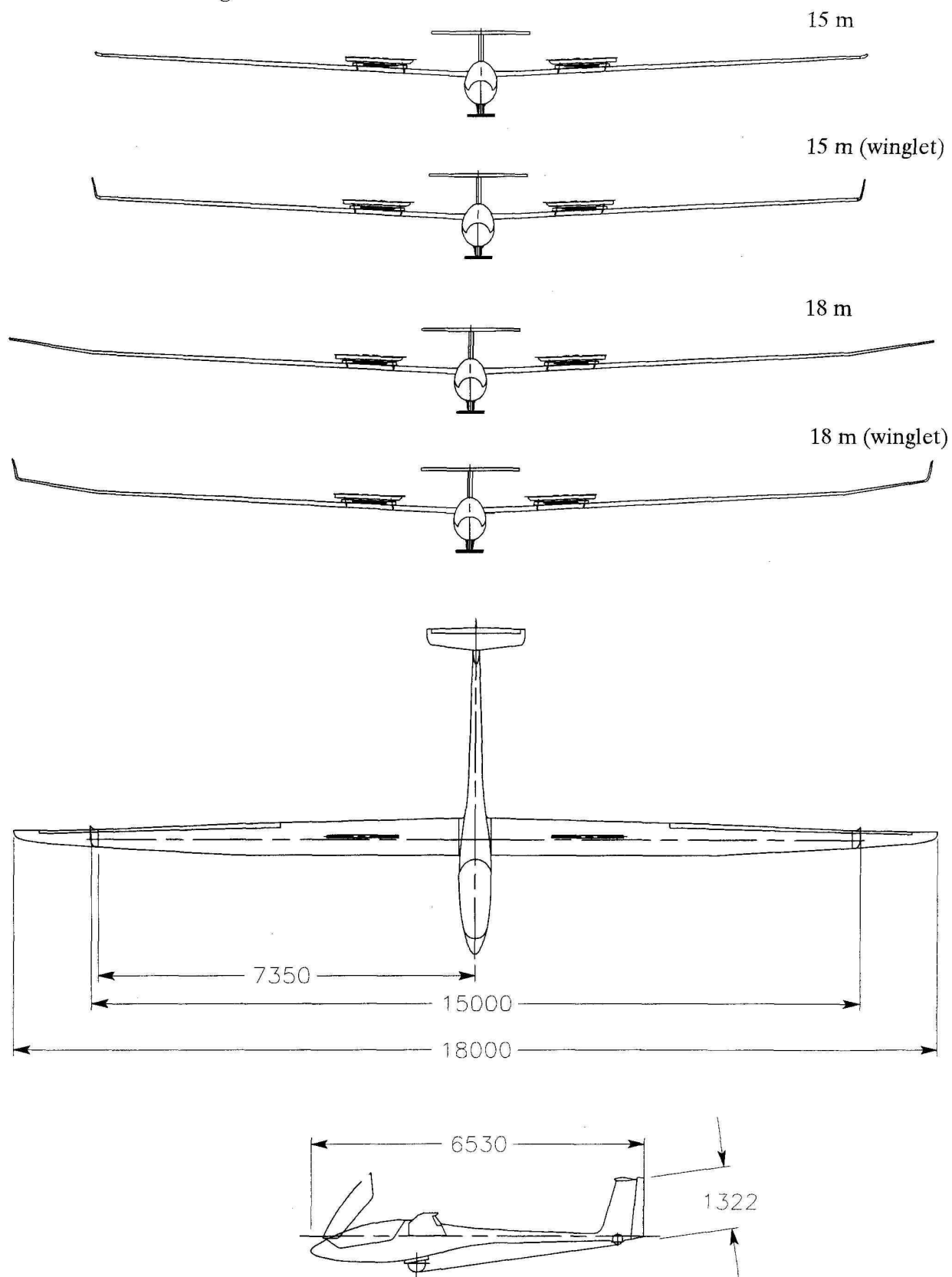
The tow release is mounted near the main landing gear and (or) in front of pilot cockpit at the bulk head.

Technical data	b=15 m	b=18 m
Wing span	15.0	18.0
Wing area, m ²	9.06	9.8
Wing aspect ratio	24.8	33.06
Wing dihedral angle, degrees	3°	3°
Fuselage length, m	6.53	6.53
Height, m	1.29	1.29
Max airspeed in calm air, km/h	275	275
Max airspeed in rough air, km/h	205	205
Max flight mass, kg	480	500
Max wing loading, kg/ m ²	53	51
Min wing loading, kg/ m ²	31.5	30.1
Min sink rate, m/s	0.53	0.49
Best L/D without ballast at 95 km/h	46	49
Best L/D with ballast at 115 km/h	47	50
g limits without water ballast	-2.65/+5.3	-2.65/+5.3
g limits with water ballast	-2.65/+5.3	-2.65/+5.3

1.4 Abbreviations

Abbreviations used in this document:

A - ampere,
 Ah - ampere hour,
 °C - degree Celsius,
 C.G. - center of gravity,
 cm - centimeter,
 daN - decanewton,
 g - gram,
 h - hour,
 kg - kilogram mass,
 kG - kilogram force,
 km - kilometre ,
 ltr - litre,
 m - meter,
 mm - millimeter,
 MPa - megapascal,
 V - volt.

1.5. Three view drawing

SECTION 1

General

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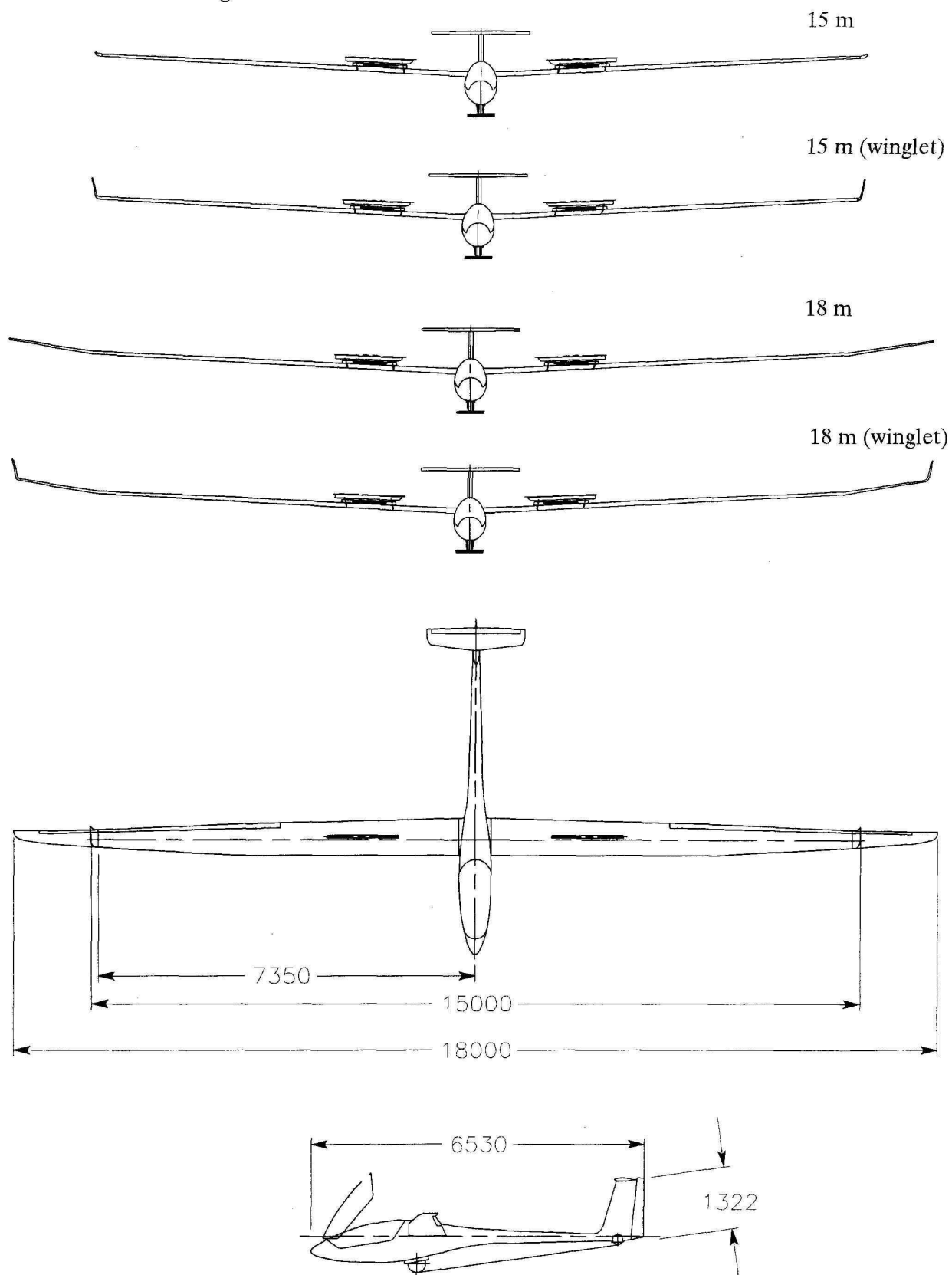
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1.4 Abbreviations

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 ltr - litre,
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 mm - millimeter,
 MPa - megapascal,
 V - volt.

1.5. Three view drawing

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2.1 Introduction			
<p>In this section there is given description of sailplane aggregates, systems, equipment, tables and markings and an information about proper sailplane maintenance.</p>			
2.2 Airframe construction			
2.2.1 Wing			
<p>Sailplane wings (fig. 2-1a, fig. 2-1b) made of composite materials consist of four parts: right wing (pos. 1), left wing (pos. 2) and two wing tips connected at distance of 7350 mm from wing symmetry axis. The wing tips are of two different lengths. For wing span 18 m of length the wing tips 1650 mm of length (pos. 3) are used with or without winglets and for span 15 m of length the wing tips 150 mm of length (pos. 4) or winglets are used.</p> <p>The wing (pos. 1, pos. 2) is a combination of three trapeziums with airfoils: LAP92-130/15 mod, LAP92-130/15 and LAP92-150/15.</p> <p>The wing tip b=1650 mm (pos. 3) is also a combination of three trapeziums with airfoils: LAP93-147, LAP93-148.</p> <p>Construction of wing and wing tips is of one spar monocoque type. Their spars (pos. 5, 6 and 7) are 2-T shape in section. Carbon rods GRAPHLITE SM 315 are used for spar shelves. Wing shells are stuck of two parts: an upper and lower shell parts (pos. 8 and pos. 9). The shell is of three-layer construction. External and internal shell layers are made of carbon and glass fiber. Between them there is foam. Thickness of foam of wings shells is 6 mm. Thickness of foam of wing tip shells is 3 mm.</p> <p>Spars of right and left wings are joined together with the help of two pins. Spar panel of right wing is cut off pyramid-shaped. Spar panel of left wing is fork-shaped. A wing tip (pos. 3 or pos. 4) is connected to the wing with the help of wing tip spar (pos. 7), pins (pos. 14) and fix (pos. 13).</p> <p>There are an adjustable hubs (pos. 15) in wing root ribs to fasten wings to the fuselage. Wings have ailerons. Their shells structure is analogical to the wing shells structure.</p>			
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<p>Length of an ailerons (pos. 11) is 3.55 m, area 0.265 m². With wing span of 18 m an aileron is extended to 4.7 m. Its area then is 0.315 m². As wing tip (pos. 3) is connected to the wing the part of an aileron on the wing tip (pos. 12) is connected to an aileron (pos. 11) on the wing automatically.</p> <p>On an upper part of wing shell there are covers (pos. 16) of airbrakes. Their contour coincides with the wing surface.</p> <p>2.2.2 Fuselage</p> <p>Sailplane fuselage (fig. 2-2a, 2-2b) is made of composite materials, construction is monocoque. The fuselage is oval-shaped in section (fig. 2-2b), slightly narrowing at top and turning into circle at the fuselage end part. The fuselage end part is cone-shaped turning into fin.</p> <p>Fuselage shell is glued of two symmetric parts, right and left (fig. 2-2b, pos. 2,3). Shell glueing seams are in vertical plane (in upper and lower shell parts).</p> <p>Glass and carbon fiber are used in shell construction. Kevlar is used in pilot cockpit zone.</p> <p>The fuselage is reinforced by metal girder (fig. 2-2b, pos. 4) at wing attachment to the fuselage zone. Landing gear (fig. 2-2a, pos. 5) is fastened to it. The gear is fully retractable. Its recess has hermetic hood in order to avoid getting of dirt and dust inside the body. As the gear is retracted recess door is closed.</p> <p>Tail wheel (fig. 2-2a, pos. 6) is fixed at the fuselage end part. Pilot cockpit is covered with a canopy (fig.2-2a, pos.1) which opens upward.</p> <p>2.2.3 Vertical tail</p> <p>Vertical tail (fig. 2-3) consists of a fin (pos. 1) and a rudder (pos. 2).</p> <p>The fin is made together with the fuselage. Fin shell is of monocoque three-layer construction. Its internal and external layers are moulded of composite materials and between them there is foam 6 mm of thickness. Frame of the fin consists of a spar (pos. 3) of three-layer construction., a rear wall moulded together with right fin shell (pos. 4) and 3 ribs going from nose till the spar, an upper, middle and lower (pos. 5, pos. 6, pos. 7).</p> <p>Water ballast tank (pos. 8) of capacity 8 ltr is fitted inside the fin between nose and spar and between lower and middle ribs.</p> <p>Along the spar from fore side a container for batteries (pos. 9) is mounted between middle and an upper ribs.</p> <p>Radio aerial (pos. 10) is fixed to the left inner side of the fin shell behind fin spar (pos. 3).</p> <p>An elevator push-pull rod (pos. 12) is in the space between fin spar and rear wall.</p> <p>A rudder (pos. 2) is hanged up on the right fin shell with 3 suspended brackets of composite materials with bronze hubs (pos. 13). Shells of the rudder like ones of the fin are of three-layer construction (an external layer, foam 3 mm of thickness, an internal layer).</p> <p>Wall of the rudder (pos. 14) is of three-layer construction, as well.</p> <p>2 pins (pos. 15) are mounted on the upper part of the fin spar to connect the fin to horizontal tail (stabilizer) and a special hub with thread (pos. 16) is on the upper fin rib to fix the joined stabilizer with a pin.</p> <p>2.2.4 Horizontal tail</p> <p>Horizontal tail (fig. 2-4) consists of a stabilizer (pos. 1) and an elevator (pos. 2 and pos. 3).</p> <p>The stabilizer is made of composite materials and construction of its shell is similar to wings shell construction.</p> <p>The elevator consists of two parts: left (pos. 3) and right (pos. 2). Control surfaces are partially balanced and made of composite materials. Each part of the elevator is fastened to the stabilizer with 3 pins.</p>			
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The horizontal tail is attached onto the upper fin part (fig. 3-3a).
The elevator is joined to control system automatically.

2.2.5 Landing gear

Landing gear consist of retractable main wheel (fig.2-2a, pos.5) and tail wheel (fig.2-2a, pos.6).

Landing gear main wheel type TOST 055191 with Cleveland disk brake is attached to metal girder (fig. 2-2b, pos. 4) with the help of stands (fig. 2-11, pos. 6, pos. 7) and a shock absorber (fig. 2-11, pos. 8). Wheel recess is covered with a hood (fig. 2-11, pos. 9) . It protects the fuselage internal space from dust and dirt.

Mechanical wheel brake system is optional.

With main wheel up the recess door is closed.

Tail wheel (fig. 3-12) 6x1 1/4" (or 200x50) of size is attached to fuselage shell with help of an axis (pos. 4), bolt (pos. 3) and washer (pos. 1).

2.3. Control systems

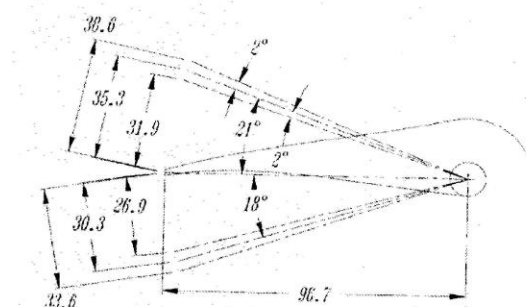
Warning: Sailplane main control systems are adjusted during adjustment of determined repairs works for sailplane.

2.3.1 Ailerons and control system

In order to ensure required rigidity and to reduce unsteadiness, ailerons contro system is made of metal rods and levers (fig. 2-5a and 2-5b).

Movement from the control stick (pos. 1 fig. 2-5a) by rods and intermediate levers (pos. 2, pos.3) is transmitted to a shaft (pos. 4) which in its turn with help of automatic connection transmits the movement to the shaft (fig. 2-5b pos. 5) in the wing. The lever (pos. 6) turns rotational movement into sliding one and by help of rods and levers (pos. 7) the aileron is deflected in required direction.

In order to ensure rigidity the central rod in wing is supported by ball guides (pos. 8). Deflection angles of the ailerons are:



2.3.2 Elevator's control system

An elevator control system (fig. 2-6) consists of metal rods and bellcranks. In order to ensure rigidity the main rod in the fuselage is supported by guide roller (pos. 5).

Movement from stick (pos. 1) by help of rods and intermediate bellcranks (pos. 2, pos. 3 and pos.4) is transmitted to the elevator and deflects it in required direction.

Deflection angles of the elevator are:

Elevator deflection angles	
in °	in mm
-1°	22,8 mm
18°	24,2 mm
+1°	25,5 mm

2.3.3 Trimmer control system

An adjustable trimmer of an elevator (fig. 2-7) takes over long-lasting loads on control stick from pilot and levels the sailplane in all range of airspeeds, C.G. positions.

The trimmer is mounted on the left side of a cockpit in trimmer box (pos.1). It consists of:

- a handle (pos. 2) with a hub welded, a fixing edge and a plate for springs,
- a bronze bar (pos. 3) the handle is moving along,
- a ring (pos. 4) screwed to the elevator's rod,
- a fixing plate with teeth (pos. 5) rivetted on trimmer box side,
- two springs of the same tension $\phi 16 \times 1.6$ mm (pos. 6). The front spring connects the trimmer handle to a plate (pos. 7) on control stick shaft and the end spring – the handle with a ring (pos. 8) on the elevator's rod.

The trimmer has two inspection hatches (pos. 9) covered with glass fiber lid (pos. 10) and fastened screw M4 (pos. 11).

Max motion of the trimmer handle is 80 mm. As the handle moves it pulls or pushes the stick in the same direction.

The trimmer's handle has a drop-shaped tip (pos. 12) painted in green.

The trimmer forces (force measuring place on stick -hand holding center):

Trimmer position	Force on control stick, daN
forward	2.0 ÷ 2.5
backward	2.0 ÷ 2.5

2.3.4 Rudder control system

Rudder control system (fig. 2-8a, fig. 2-8b) is of combined type: steel cable from pedals to a bellcrank in the middle part of fuselage and steel rod $\phi 16 \times 1$ mm, from the bellcrank till the rudder.

Pedals are adjustable according to a pilot height. The control handle of pedals is mounted on the right side of cockpit, on the ailerons control rod hood.

Pedals junction (pos. 1) is mounted on longitudinal pipe with holes for fixing drilled on it. Pedals cross pipe leans upon cockpit floor by textolite disks. The disks are fixed with wire pins at the ends of the cross pipe.

The control rod (pos. 8) in cylinder-shaped fuselage part is supported by two guides (pos. 9) moulded on frames. An adjustable rod tip is connected to the rudder.

Rudder control cables (pos.4) are stretched by two tenders (pos.3) of non-standard construction.

A motion of the rudder is restricted by a bellcrank (pos.6) in the fuselage which is supported by two non-adjustable supports (pos. 7) mounted at the centreplan girder.

Rudder deflection angles	
in °	in mm
-1°	127,9 mm
30°	132,2 mm
+1°	136,5 mm

2.3.5 Airbrakes control system

An air brakes control system (fig.2-12a and fig.2-12b) consists of control handle (fig.2-12a pos.1), fastened to the left side of a cockpit, rigid rods and levers. Movement from the control handle by an intermediate lever (pos. 2) is transmitted to the shaft (pos. 3) which in its turn transmits movement by help of automatic connection to the shaft (fig.2-12b pos. 12) in wing. The lever (pos. 13) converts rotational movement to sliding one and by help of intermediate levers transmits it to lifting mechanism, consisting of the bellcrank 2 (pos. 14) and arm's (pos. 15, pos.16).

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<p>Brakes in closed position are fixed by cinematic lock which protects against spontaneous opening of brakes. The lock turning-point is regulated by bolt of fixer (pos. 17).</p> <p>Control system of air brakes is connected with control system of landing gear brake. Landing gear brake operates just in the end part of movement of air brake handle.</p> <p style="text-align: center;">2.3.6 Water ballast control system</p> <p>Water ballast control system (fig. 2-9a and fig. 2-9b) of a sailplane consists of wing tanks 180 liter of capacity, a fin tank 8 liter of capacity and ballast control system. The tank valves for wing and fin is open simultaneously with one handle. Optionally, this system can be separate in two independent control systems (fig.2-9d, fig.2-9e).</p> <p>With pulling a handle (pos. 1) on the right side of a pilot cockpit backward movement by help of the rod (pos.2) is transmitted to the cross rod (pos. 3).</p> <p>The cross rod (pos. 3) rotating by help of the coupling (pos. 4), the shaft (pos. 5), the coupling (pos.6) and the bellcrank (pos. 7) opens valves (pos. 8) in the left and right wings water ballast tanks (pos. 10). The valves (pos. 8) have rubber sealings (pos. 9).</p> <p>When the handle (pos. 1) is returned to initial position valves (pos. 8) are being closed.</p> <p>The shaft (pos. 5) is fastened in supports (pos. 16 and pos. 17) which keep it from moving in axial directions. The shaft (pos. 5) connection with the support (pos. 17) is hermetized with a rubber pipe.</p> <p>Water ballast is poured into wing tanks through valves (pos. 8) by help of a special equipment.</p> <p>Water ballast is poured into a fin tank through an opening (pos. 12) and a pouring pipe (pos. 13).</p> <p>Water is poured out from the fin tank after a valve (pos. 25) is open (fig. 2-9c).</p> <p>The wing and fin water ballast tanks have drainage systems and openings for drainage (pos. 19 and pos. 20).</p> <p>Warning: Before filling up the water tanks check up the drainage openings for stopping up.</p> <p style="text-align: center;">2.3.7 Tow Release control system</p> <p>A towing hook (fig. 2-10, pos. 6) is arranged in central part of fuselage at the main frame and (or) in pilot cockpit at the bulkhead. If mounted both towing hooks - operating is with one handle.</p> <p>Movement from the control handle (pos. 1) on the left side of a cockpit by steel cable (pos. 2) is transmitted to the shoulder (pos. 5) which opens the hook. The cable loosenings are eliminated by an adjustment junction which comprises the junction (pos. 3) and fixing nut (pos. 4).</p> <p style="text-align: center;">2.3.8 Main landing gear control system</p> <p>Landing gear control system (fig. 2-11) controls retracting and releasing of the main wheel. It consists of a control rod (pos. 1) on the right side of cockpit , an intermediate rod (pos. 2) and a bellcrank (pos. 3). A gas spring (pos. 4) makes easier to retract the wheel. The control handle in retracted and released positions is fixed in cuts of plate (pos. 5).</p> <p style="text-align: center;">2.3.9 Landing gear brake control system</p> <p>Landing gear brake is of hydraulic type, connected to air brakes control system (fig. 2-12a) and it is controlled with help of air brakes handle (pos.1). Movement from the handle is transmitted to the lever (pos. 5) just in the end part of handle movement due to cutout in the tip (pos. 10) of the rod (pos.4). The lever (pos. 5) while turning presses onto piston of cylinder (pos. 6) and causes pressure in the system. Liquid within hose (pos. 9) under pressure flows into brake cylinder (pos. 7) which, in its</p>			
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<p>turn, being under pressure causes braking of wheel disk of gear.</p> <p>Hydroliquid is poured into reservoir (pos. 8) and by hoses (pos.9) flows into aggregates of hydrosystem.</p> <p>The mechanical wheel brake system is optional (Fig. 2-12). The main wheel brake is controlled by a handle (fig. 2-12, pos. 1) arranged on the control stick. Movement from the handle to the brake shoulder (pos. 5) is transmitted by the steel cable (pos.2). In order to eliminate loosening of the cable the adjustment junction is mounted on the cockpit floor under the pilot seat. The junction consists of cable support (pos. 3) and fixing nut (pos. 4).</p>			
<h2>2.4 Equipment and systems</h2>			
<h3>2.4.1 Pitot and static system</h3>			
<p>Pitot and static system of the sailplane is shown in fig. 2-13. The system consists of:</p>			
<p>1. Static pressure receiving ports (pos. 9) which are located at a two sections on a fuselage skin from the inside (distances from sailplane nose to the ports is given at fig. 2-13). Static pressure receivers consists of a glass fiber tanks with air inlet as a holes drilled through the fuselage skin.</p>			
<p>There is static pressure lines are S1 and S2. The air gets from three receivers located on the fuselage skin every 120°.</p>			
<p>Warning: During a sailplane preflight inspection the holes of static pressure receiver on the fuselage sides shall be checked for cleanliness.</p>			
<p>2. Pitot (pos. 10) is a steel pipe mounted in the fuselage nose and right against the air flow. This line is marked by the letter D.</p>			
<p>3. Compensated pressure receiver (pos. 11) is a special Nix pipe mounted in fin. This line is marked by the letter N.</p>			
<p>4. Flexible polyvinylchloride pipes of different colors transmit air pressure from receivers to corresponding measuring instruments on the sailplane instrument panel. Each separate pressure line has pipes of different colors :</p>			
<ul style="list-style-type: none"> - red – for total pressure line (D), - yellow – for static pressure lines (S1 and S2), - green – for compensated pressure line (N). 			
<h3>2.4.2 Flight and navigation instruments</h3>			
<p>These flight and navigation instruments as option are mounted in the sailplane:</p>			
OPTION A		OPTION B	
1) air-speed indicator LUN-1106, scale 50-300 km/h, with range markings		1) air-speed indicator WINTER 6 FMS 421	
2) altimeter BD-10K or VB-10PS with altitude corrector		2) altimeter WINTER 4 FGH 20	
3) mechanical variometer LUN-1141		3) variometer BOHLI	
4) side-slip indicator LUN-1211		4) electronic variometer FILSER LX5000 or FILSER LX7000	
5) compass KI-13		5) fly computer display FILSER LX5000 or FILSER LX7000	
		6) side slip indicator LUN 1211	
		7) radio Becker AR 4201 or Filser ATR 600	
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<p>All the instruments, except for the compass KI-13, are mounted on the instrument panel. The compass is attached to canopy glass or on instrument panel.</p> <p>There is room left in the instrument panel for an electronic variometer and a radio station (fig. 2-14).</p> <p>It is possible to use another analogical flight and navigation instruments and change instruments position on the instrument panel (fig.2-14). These instruments must correspond with national regulations.</p> <p>Max instrument panel weight in flight - 4.1 kg.</p> <p style="text-align: center;">2.4.3 Electric and radio equipment</p> <p>A sailplane electric system is shown in fig. 2-15a. A sailplane might be equipped with other instruments (GPS or board computer) and an existing scheme enables to connect them easy. Electric wiring (wire of cross section 0.34 mm², type MSŠV 0.35) is installed along the left sailplane side till sailplane forepart and further to the lift-able instrument panel.</p> <p>In order to increase a sailplane safety a possibility is foreseen to replace the accumulator feeding the radio station by other one which feeds instruments by help of a switcher.</p> <p>Accumulator batteries of two types are used in sailplane. One of them consisting of three accumulators NP 2.1-12 is fitted in a special container. The container is located in a fin. Another battery NP 7-12 is located in baggage compartment (fig.2-15b).</p> <p>The accumulators NP 2.1 and NP 7-12 are dry and hermetized, they don't outlet any toxic and explosive gas. During recharging any dangerous gas doesn't appear. The accumulators shall be recharged outside the sailplane. The possible places to mount aerials for GPS, transponders, ELT are indicated in fig 2-20.</p> <p>Warning: Fin battery is compulsory in flight.</p> <p style="text-align: center;">2.4.4 Cockpit ventilation system</p> <p>Cockpit ventilation system (fig. 2-16) creates required micro climate for a pilot and optimal working conditions in a sailplane cockpit. Air through an opening (pos. 1) in sailplane forebody and channels (pos. 2) on the right and left fuselage sides gets into a cockpit and blows over the front part of canopy thus protecting it from covering with dew. Amount of air is valve-controlled, the valve (pos. 3) is located in ventilation opening. The valve is handle-controlled, the handle (pos. 4) is attached to an instrument panel. The handle can be fixed in any position.</p> <p style="text-align: center;">2.4.5 Cockpit canopy and its emergency jettison system</p> <p>Cockpit canopy and its emergency jettison system is shown in fig. 2-18a, fig. 2-18b and 2-18c. Cockpit canopy is fastened to a holder (pos. 8) by help of fixator (pos. 2).</p> <p>The fixator is controlled by the cockpit canopy emergency jettison handle (pos. 1). It is located in the upper part of the instrument block.</p> <p>The cockpit canopy is fixed in position 'closed' by two handles (pos. 5) located on the left and right sides of canopy frame.</p> <p>The cockpit canopy is ejected emergency by one pull up movement of the emergency jettison handle (pos. 1). The fixator (pos. 2) sets free a cockpit canopy spring. The spring (pos. 3) throws the front part of the canopy upwards. The cockpit canopy on an influence of air stream turns and touches the support (pos. 9.1) with its end part and detaches from the fuselage finally. The pin (pos. 9.2) not allowed the canopy to slide aside.</p> <p>Warning: The handle (Fig.2-18a, pos.4) must be in working position in flight.</p>			
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2.4.6 Cockpit equipment

The cockpit equipment is:

- safety belts,
- a pilot seat,
- a pocket of fabric (on the right side) for small things, documents.

The safety belts (4 point static harness restrain system – Carl F. Schroth GmbH. Shoulder belts) are attached to a supporting pipe of a pilot shoulders width at the central fuselage part. Foot belts are attached to the axes located in hoods of rods on the left and right sides

A pilot seat is made of glass fiber reinforced plastic with cuttings for a head supporter, a pipe glued for pulling through of an adjustment cable and a pipe for fixing of the seat in sockets which are in hoods of cockpit rods.

A back supporter of the seat is may be moved “forward-backward” on the earth and its inclination angle can be changed in flight by help of a fixable adjustment cable.

There are three positions at the upper part of a seat for adjustment of the head supporter according to pilot height

A small pocket of the same decorative material as cockpit sides is on the right side to keep small things.

2.4.7 Fastening of baggage

Baggage is fastened in central fuselage part on a partition wall above landing gear recess and is fixed by rubber absorbers. Max allowed baggage weight is 7 kg.

2.5 Tables and control markings

Each cockpit control (with exception for the primary flight controls) is marked (fig. 2-19a, 2-19b, 2-19c) according to their purpose and operation mode.

A table of limitations is shown in fig. 2-19d.

Layout of tables inside a sailplane is shown in fig. 2-19a.

2.6 Data for rigging

2.6.1 Allowed clearances in connections of aggregates

Allowed clearances for connections of wing and fuselage, wing and wing tip, wing spars are given in fig. 2-20a, fig. 2-20b, fig. 2-20c, fig. 2-20d.

Max allowed gaps in connections of aggregates between openings and diameters of pins are given in table 2-2.

Connection	Connected parts	Max allowed gap (mm)
Wing - fuselage	Spars connection pin (pos. 1)-spar hub (pos. 2)	0.32
Wing - fuselage	Fuselage lateral pin (pos. 3) - wing hub (pos. 4)	0.27
Stabilizer – fuselage	Fin pin (pos. 5) – stabilizer hub (pos. 6)	0.055
Stabilizer – fuselage	Stabilizer fixing pin (pos. 7) – fin hub (pos. 8)	0.055
Wing – wing tip	Wing lateral pin (pos. 10) – wing tip hubs (pos. 9)	0.046
Wing – wing tip	Clearance of opening of wing tip holder (pos. 11)	0.015

2.6.2 Allowed clearances in control systems

Clearances for stick are defined according to schemes a) and b) of fig. 2-21 by measuring motion of a stick upper part. An elevator, ailerons shall be fixed in neutral position.

Clearances for ailerons and an elevator are defined according to scheme c) of fig. 2-21 by measuring motions of their rear edges (the root section of corresponding control). A control stick shall be fixed in neutral position.

Allowed motions are shown in table 2-3.

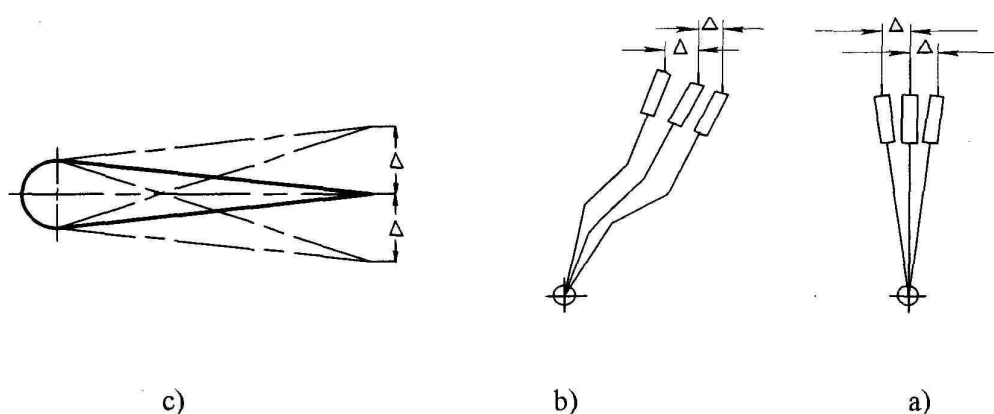


Fig. 2-21. Free play setting

Table 2-3

Pos. No	Measured motion	Motion Δ (mm) less than
1	Stick, forward - backward	2.0
2	Stick, left - right	2.0
3	Edge of left aileron	2.0
4	Edge of right aileron	2.0
5	Edge of left elevator	2.0
6	Edge of right elevator	2.0
7	Edge of rudder	1.5

2.6.3 Allowed forces in control systems

Allowed forces in control systems are given in table 2-4.

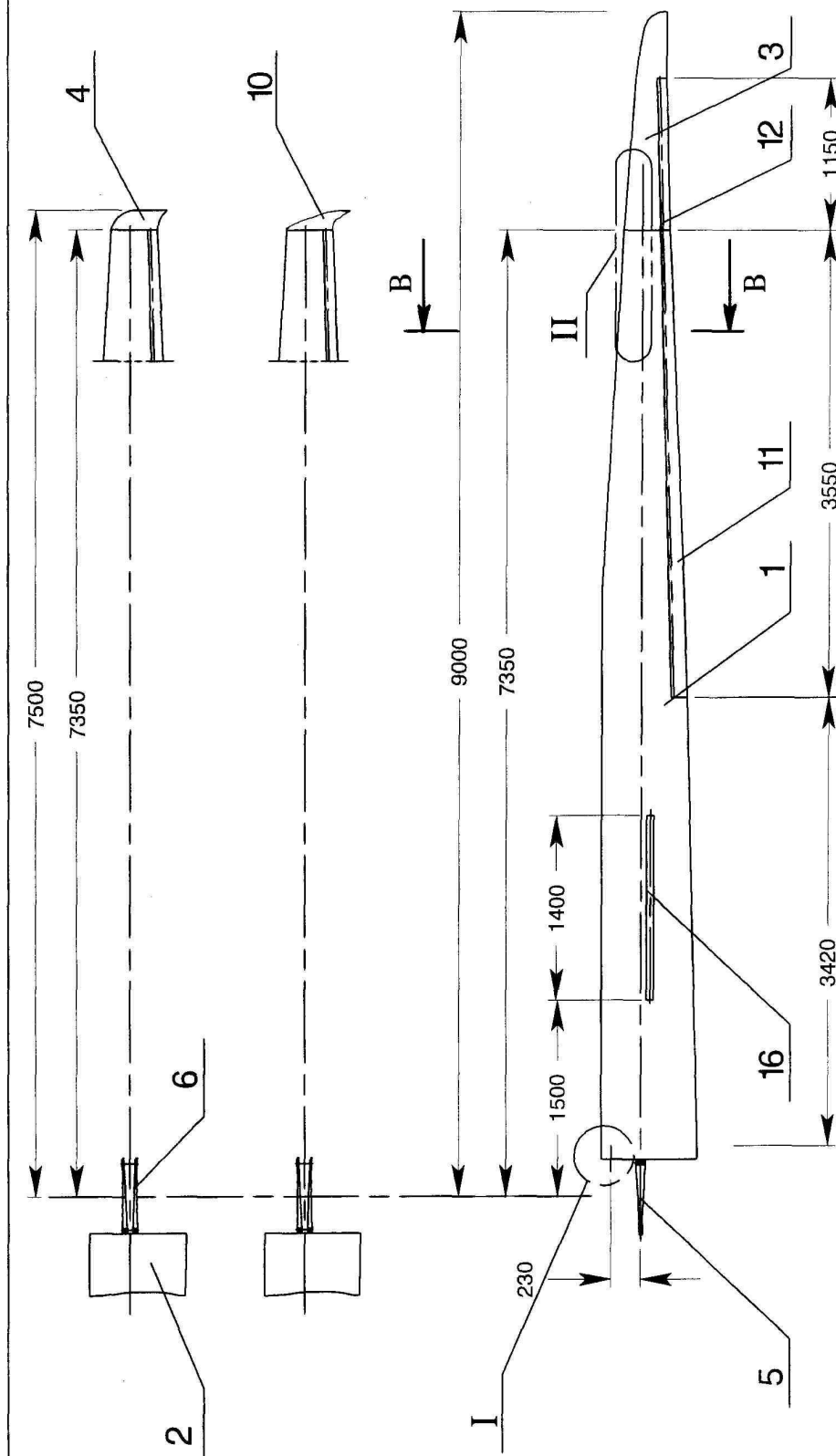
Forces are measured by checked dynamometers.

Note: Force of an elevator control system is measured with trimmer control handle in neutral position.

Table 2-4

Control system	Force measuring place	Force, kg
Elevator	On stick – hand holding centre	max 0.3
Ailerons	On stick – hand holding centre	max 0.5
Rudder	On pedal upper cross pipe centre	max 2.0
Airbrakes- airbrakes opening	On airbrakes control handle – hand holding centre	max 15
Airbrakes- airbrakes closing	On airbrakes control handle – hand holding centre	max 18
Towing hook – without loading	On towing hook opening handle	max 10
Cockpit canopy emergency jettison	On canopy emergency jettison handle – hand holding centre	min 5 max 13
Landing gear – releasing	On gear control handle - hand holding centre	max 20
Landing gear – retracting	On gear control handle - hand holding centre	max 14

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<p>2.7 Illustrations</p>			
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- 1. Right wing
- 2. Left wing
- 3. Right wing tip L = 1650mm
- 4. Right wing tip L = 1500mm
- 5. Right wing spar
- 6. Left wing spar
- 7. Spar of wing tip
- 8. Wing skin upper
- 9. Wing skin lower
- 10. Winglet
- 11. Aileron
- 12. Aileron of wing tip
- 13. Fixator
- 14. Lateral pin
- 15. Adjustable hub
- 16. Air brake

Fig 2 - 1a. Wing

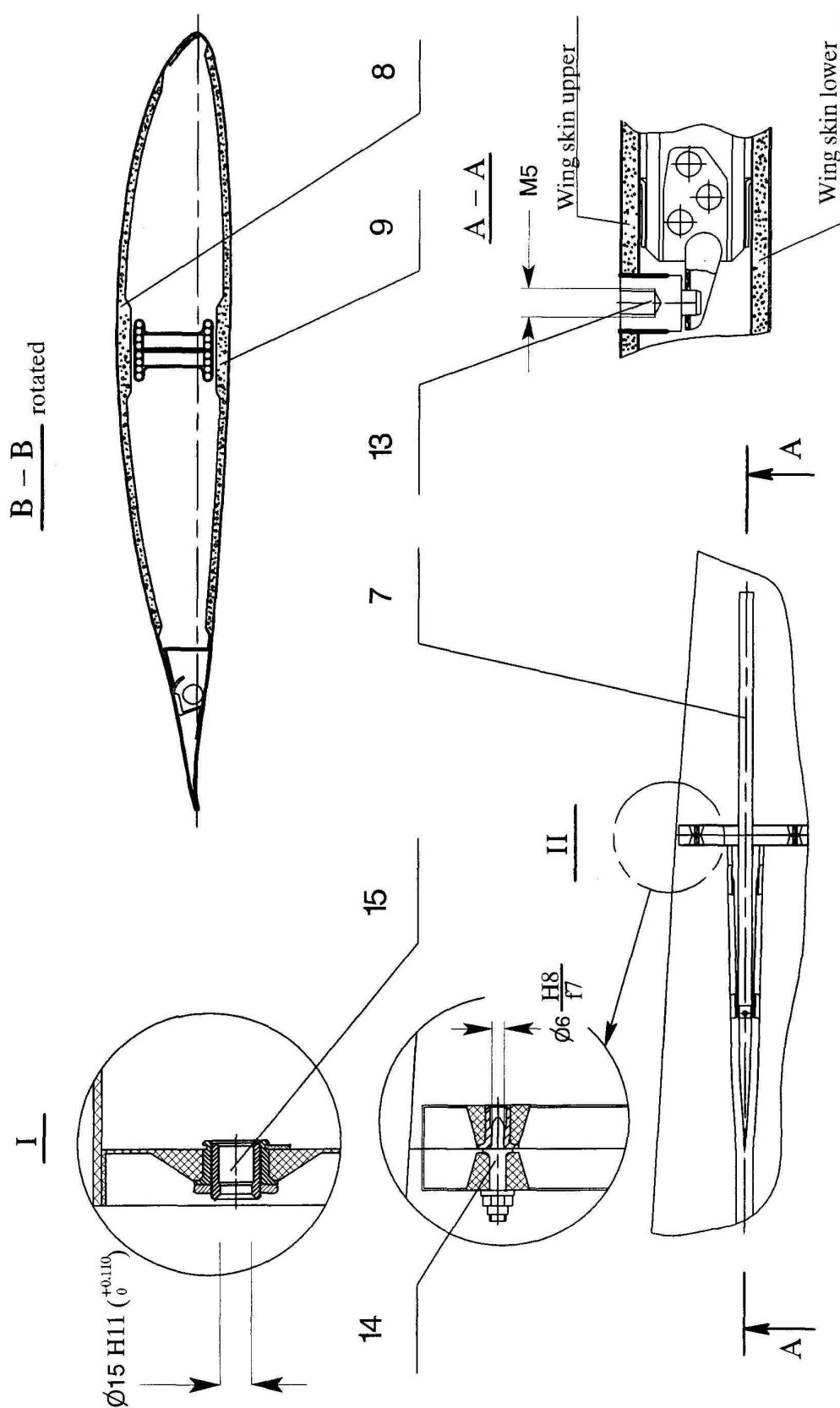
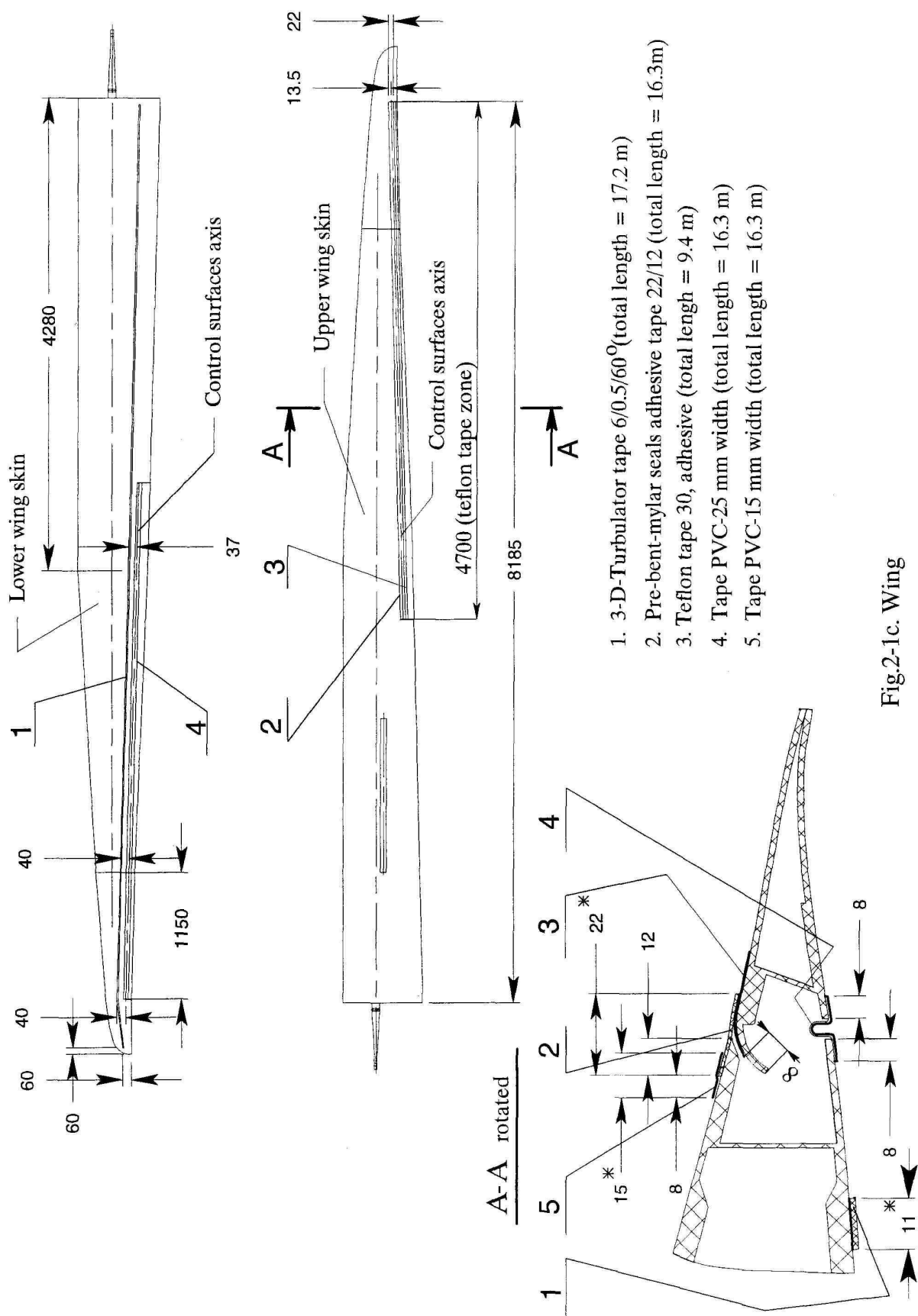
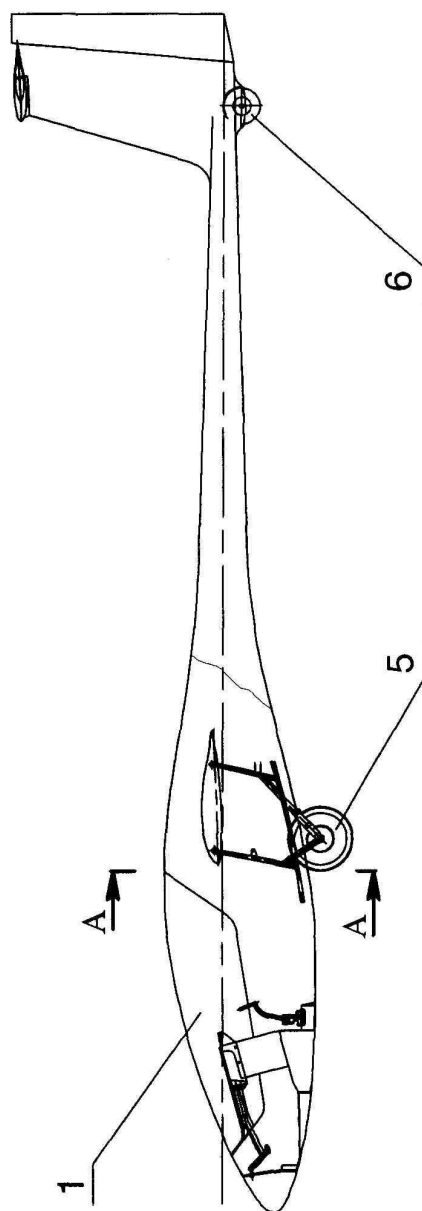


Fig2 - 1b. Wing





1. Cockpit canopy
2. Right skin half
3. Left skin half
4. Girder
5. Landing gear wheel
6. Tail wheel

Fig.2 - 2a. Fuselage

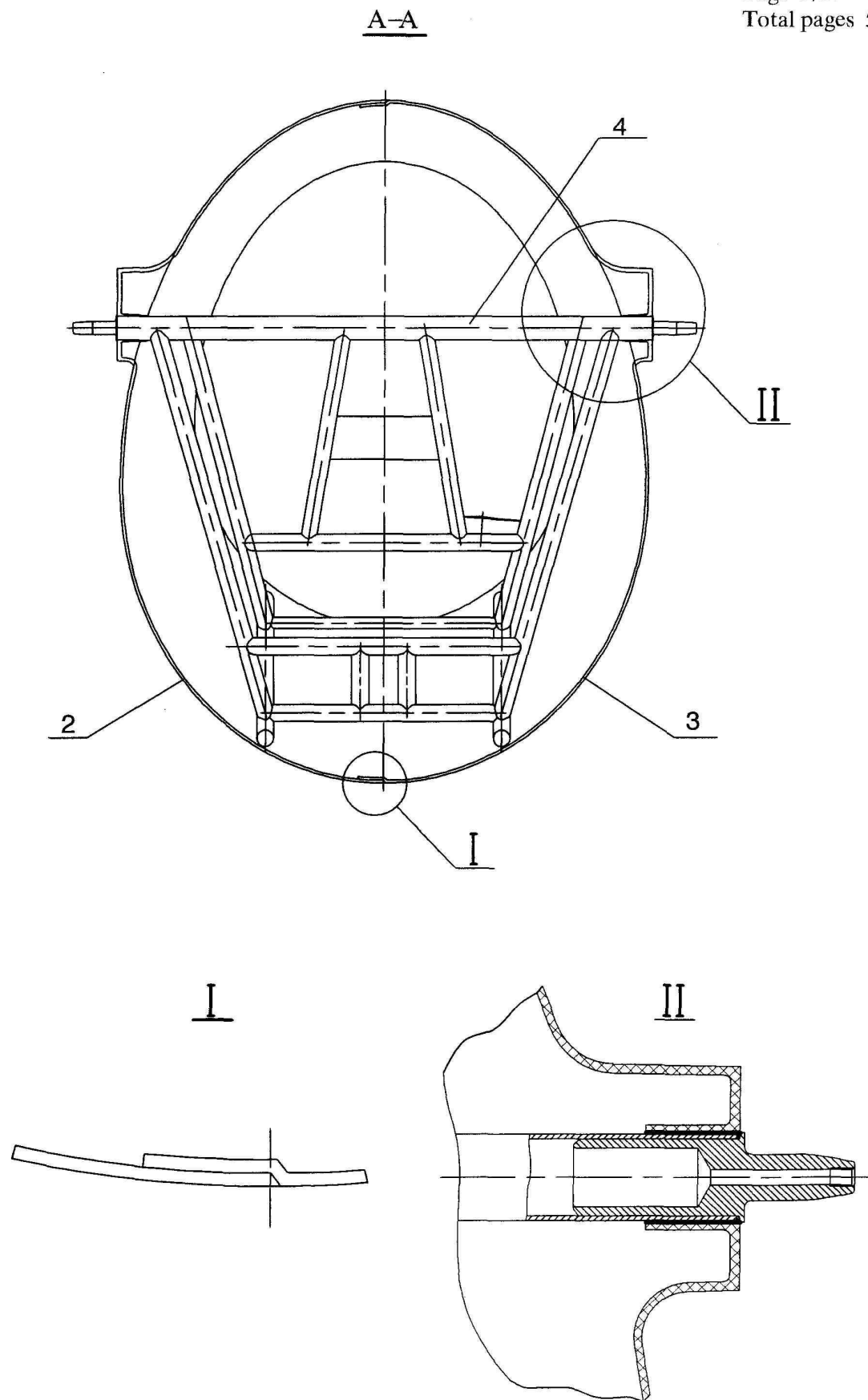
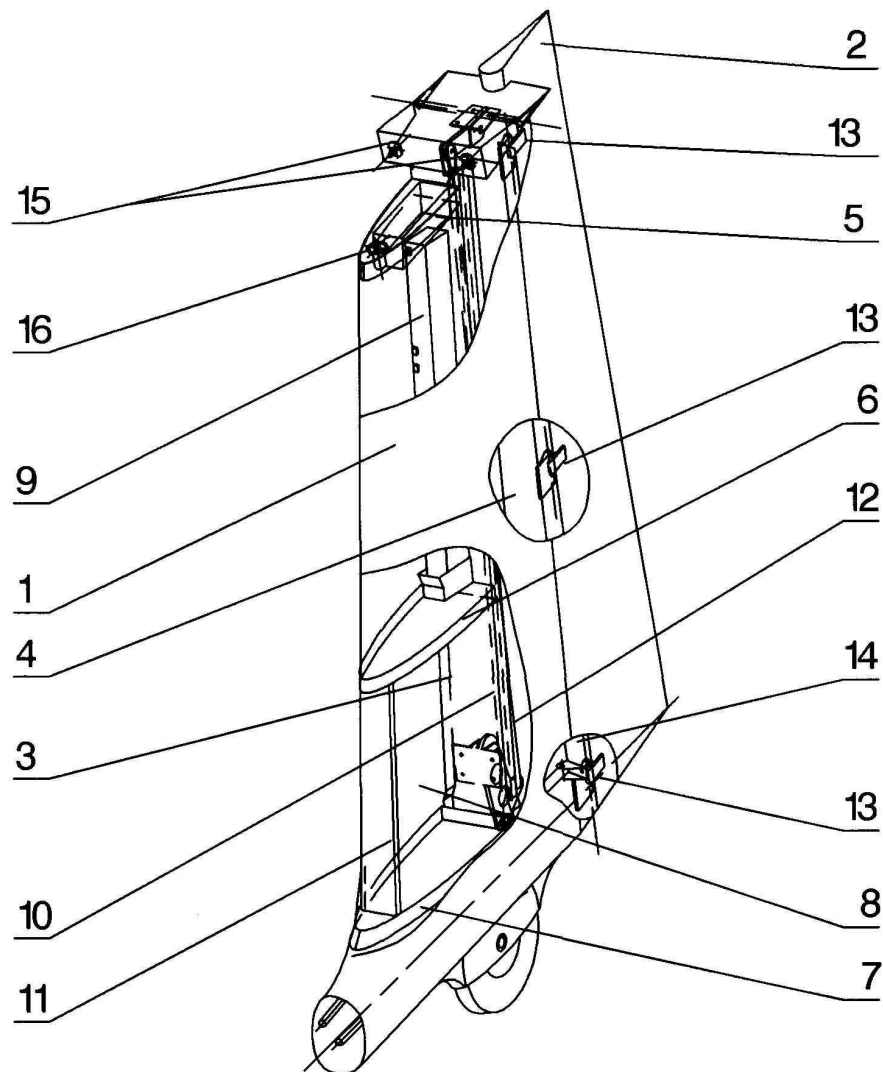


Fig.2 - 2b. Fuselage



- | | |
|-----------------------|-----------------------------------|
| 1. Fin | 10. Radio aerial |
| 2. Rudder | 11. Wall |
| 3. Spar of fin | 12. Elevators control rod |
| 4. Rear wall | 13. Ruders hinges |
| 5. Upper rib | 14. Rudder wall |
| 6. Middle rib | 15. Connection pins of stabilizer |
| 7. Lower rib | 16. Stabilizer fixing hub |
| 8. Water ballast tank | |
| 9. Battery container | |

Fig.2 - 3. Vertical plane

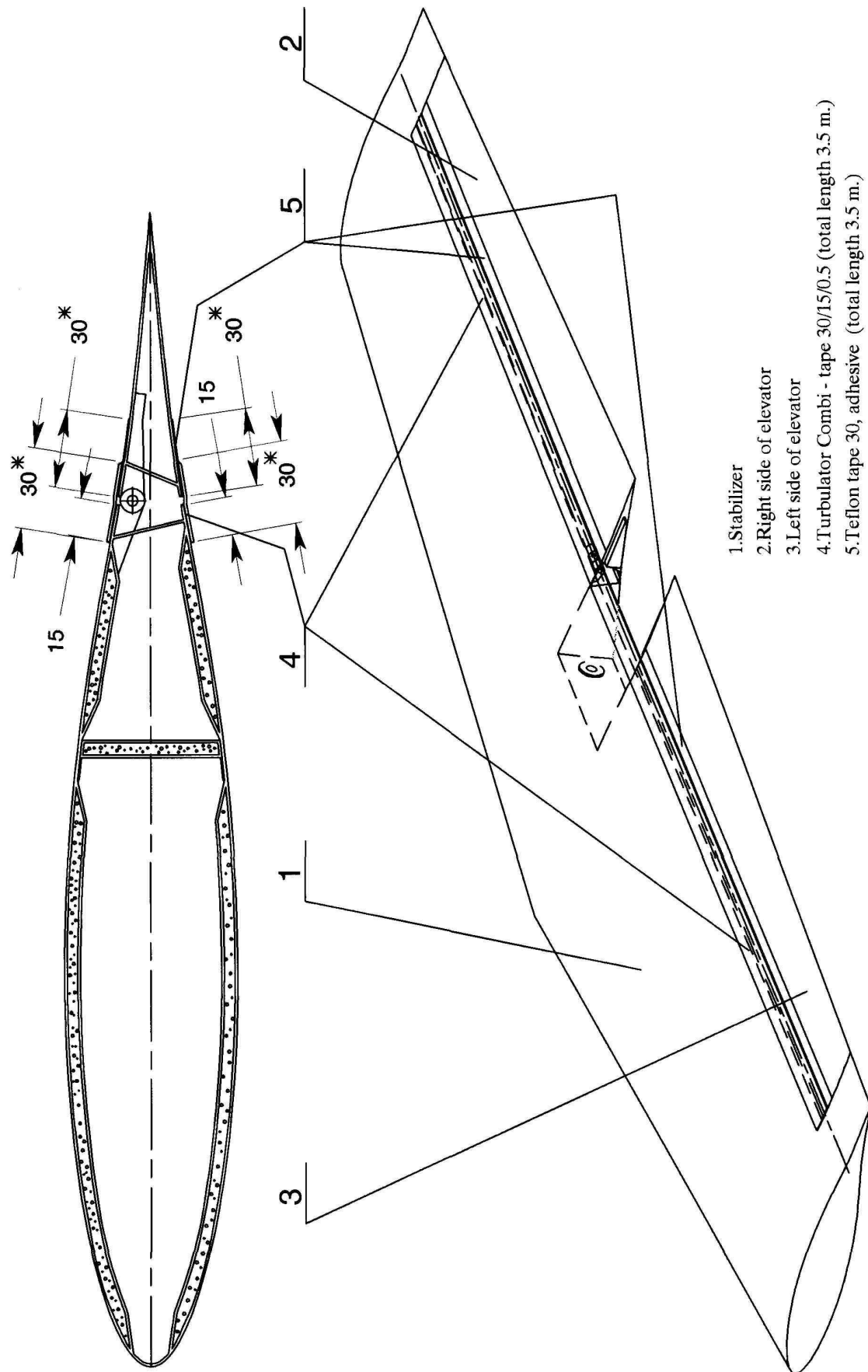
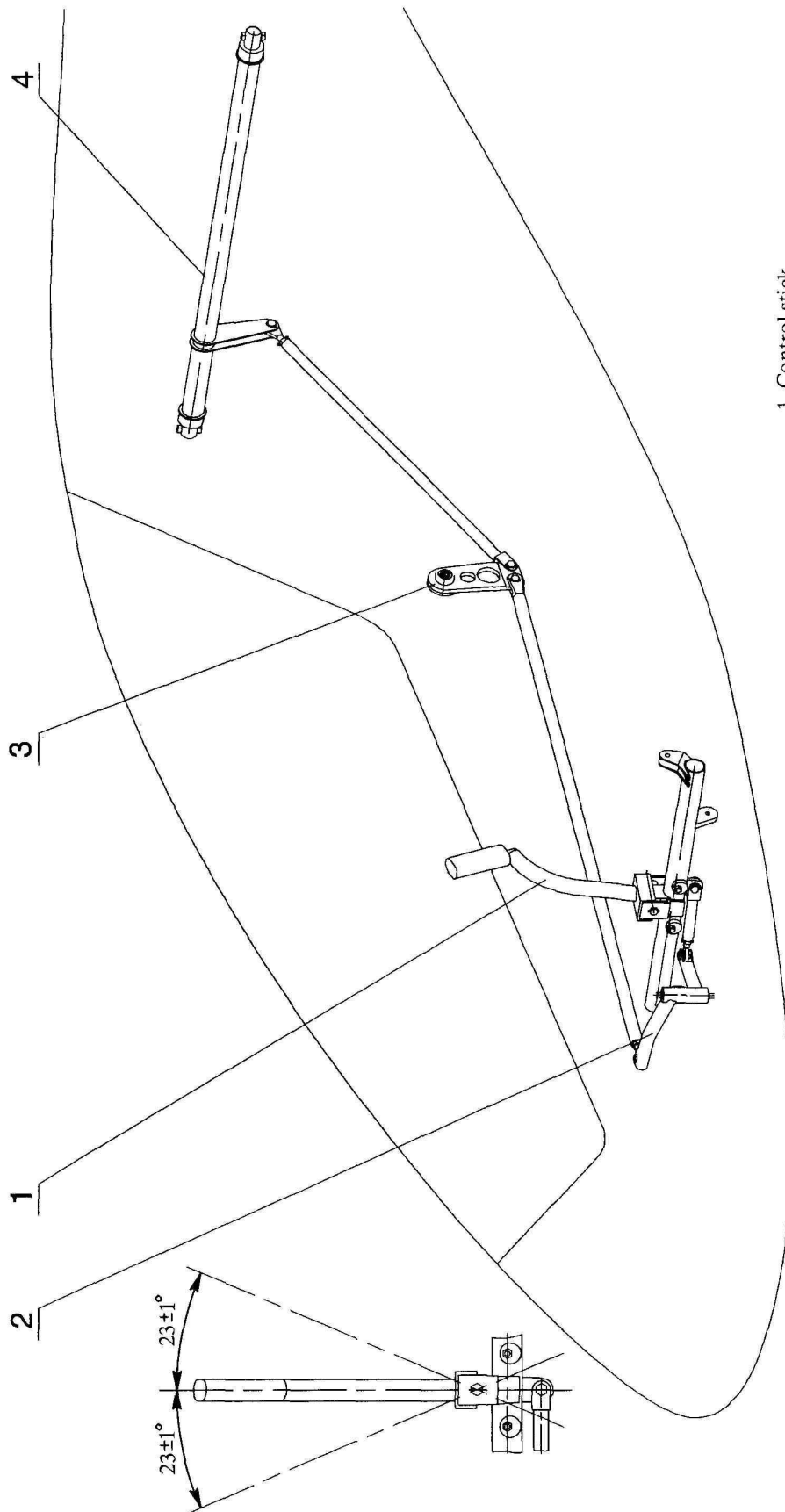


Fig.2-4. Horizontal plane



1. Control stick
2. Ailerons bellcrank 1
3. Ailerons bellcrank 2
4. Ailerons shaft

Fig.2 - 5a. Control system of ailerons

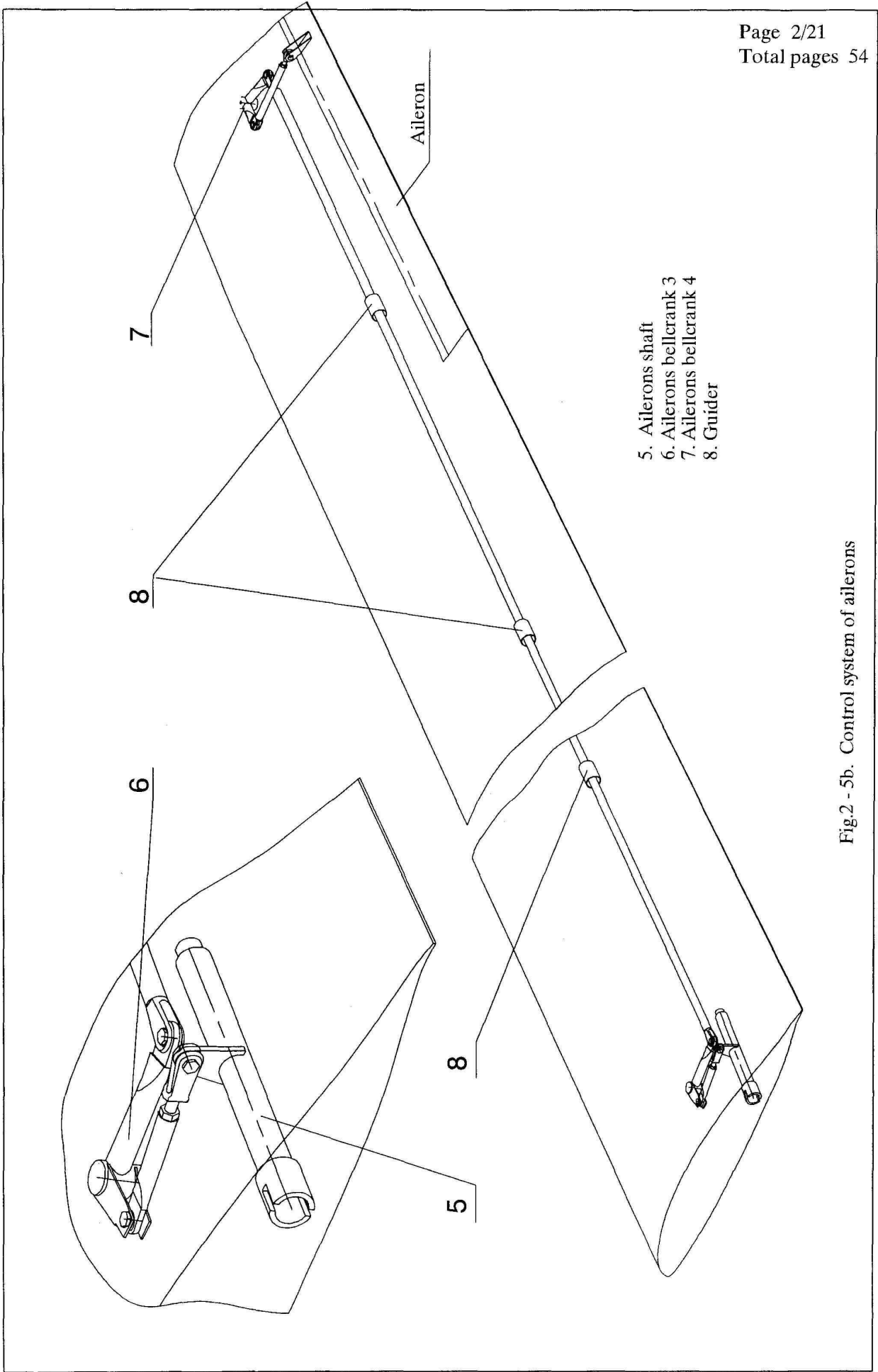
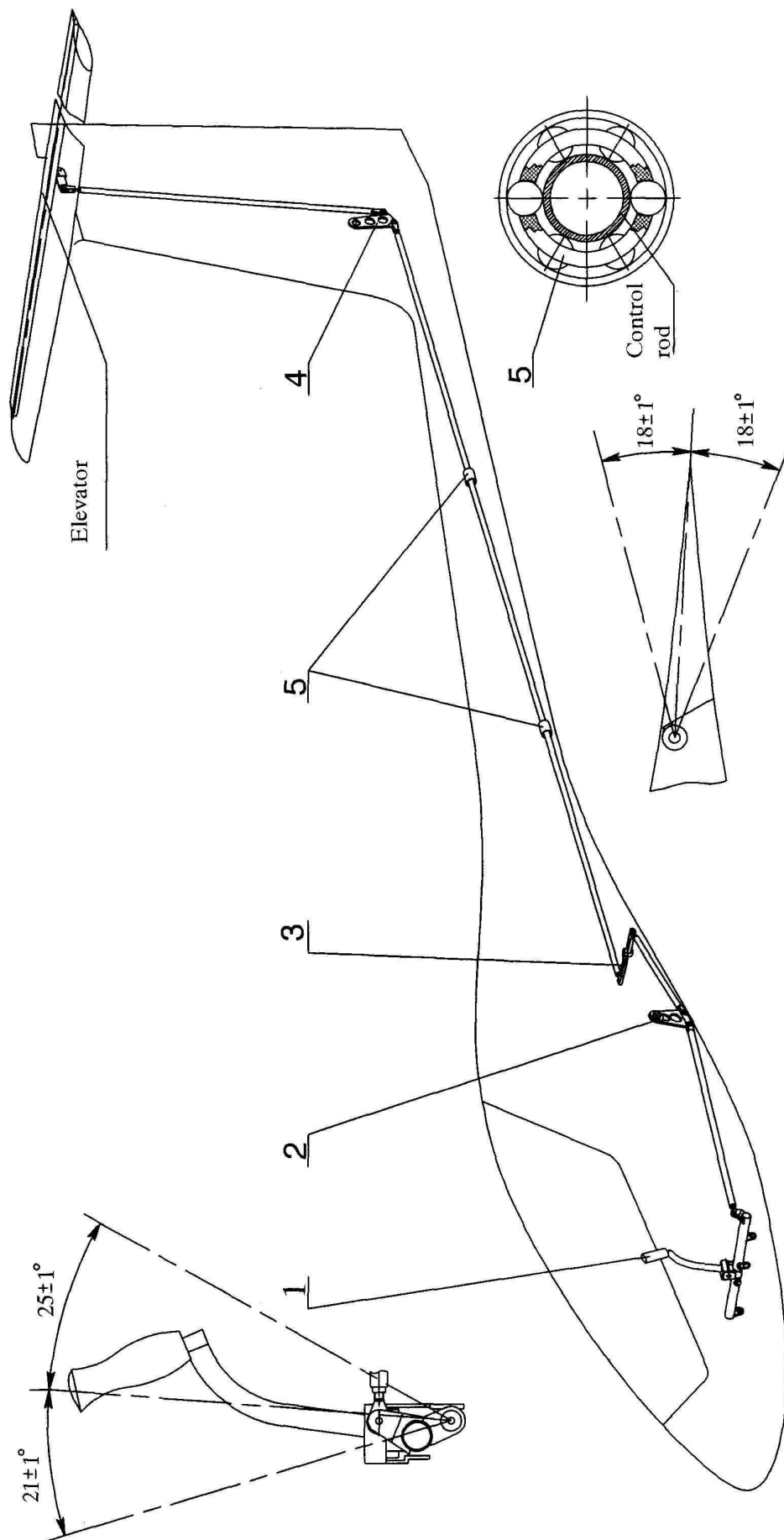


Fig.2 - 5b. Control system of ailerons



- 1. Control stick
- 2. Bellcrank 1
- 3. Bellcrank 2
- 4. Bellcrank 3
- 5. Guider

Pav.2 - 6. Elevator control

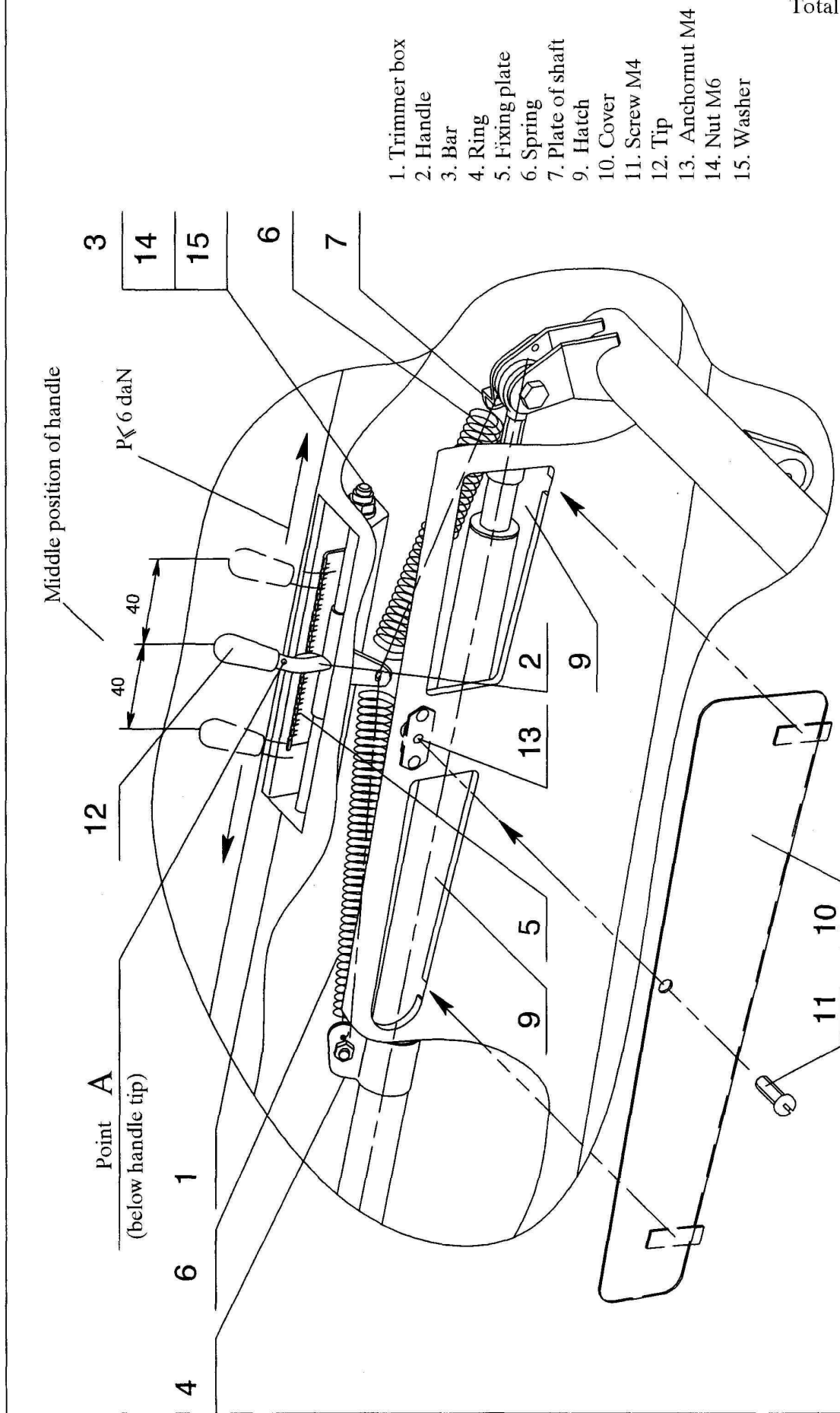
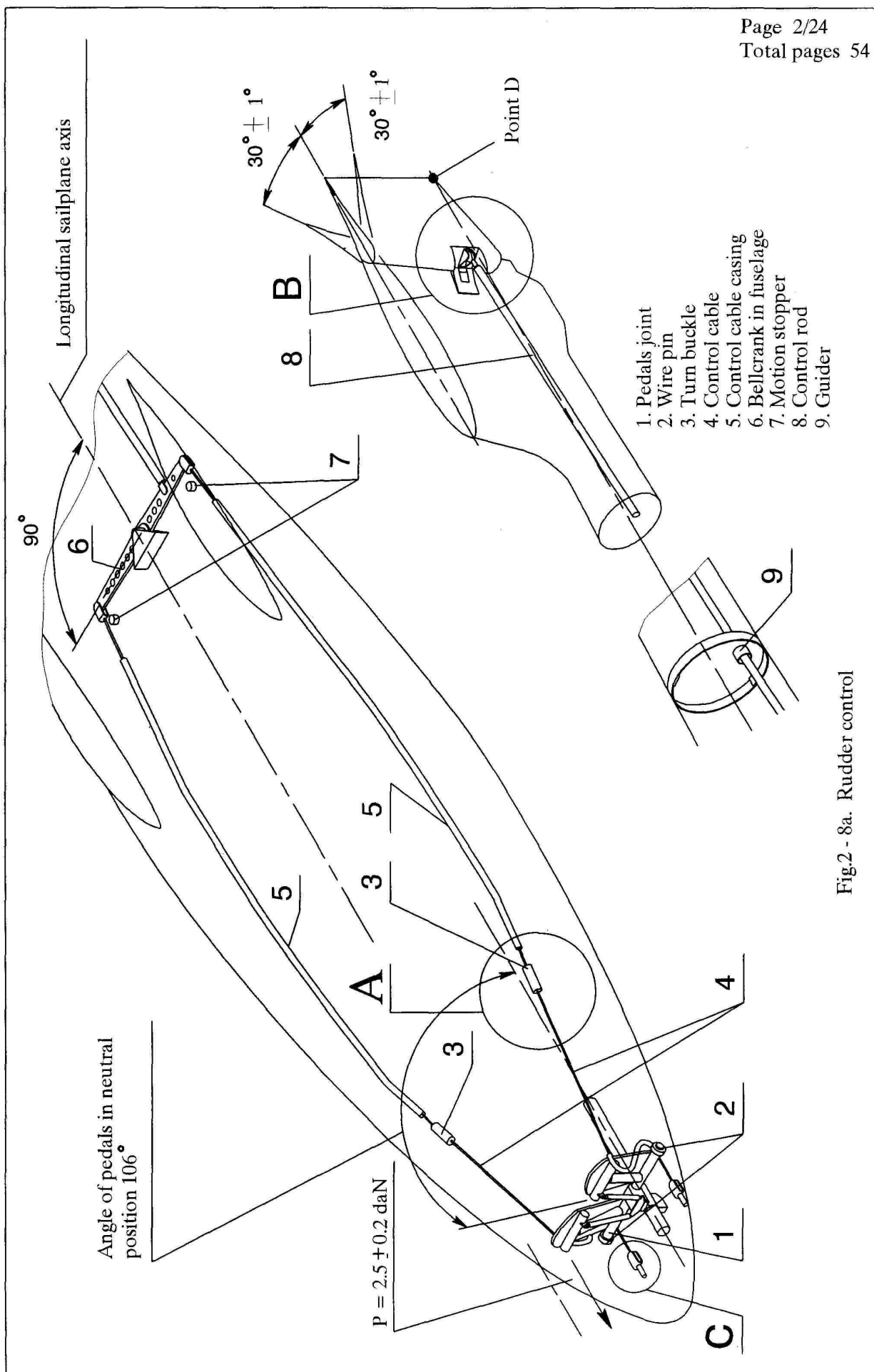


Fig.2 - 7. Trimmer control



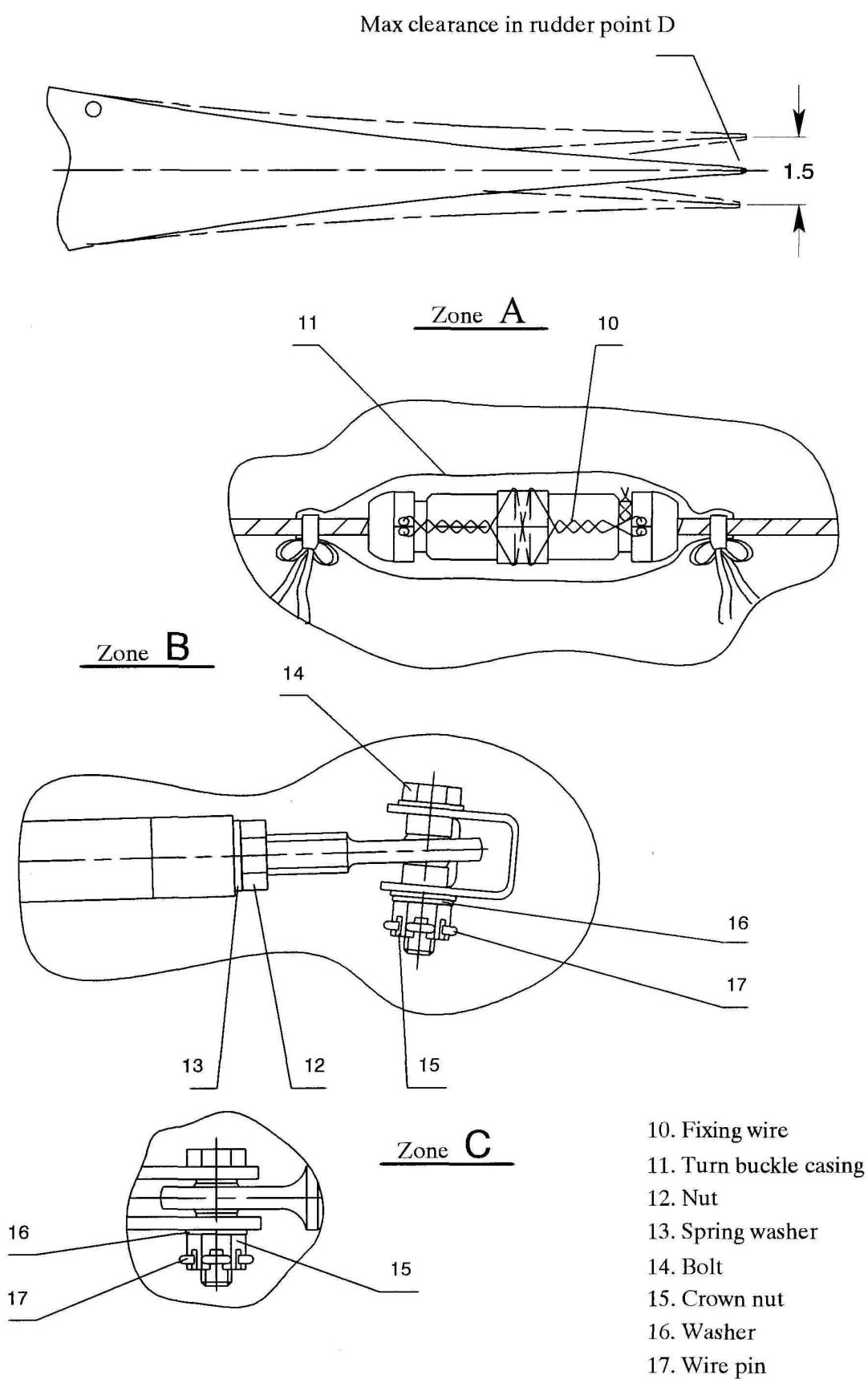


Fig.2 - 8b. Rudder control

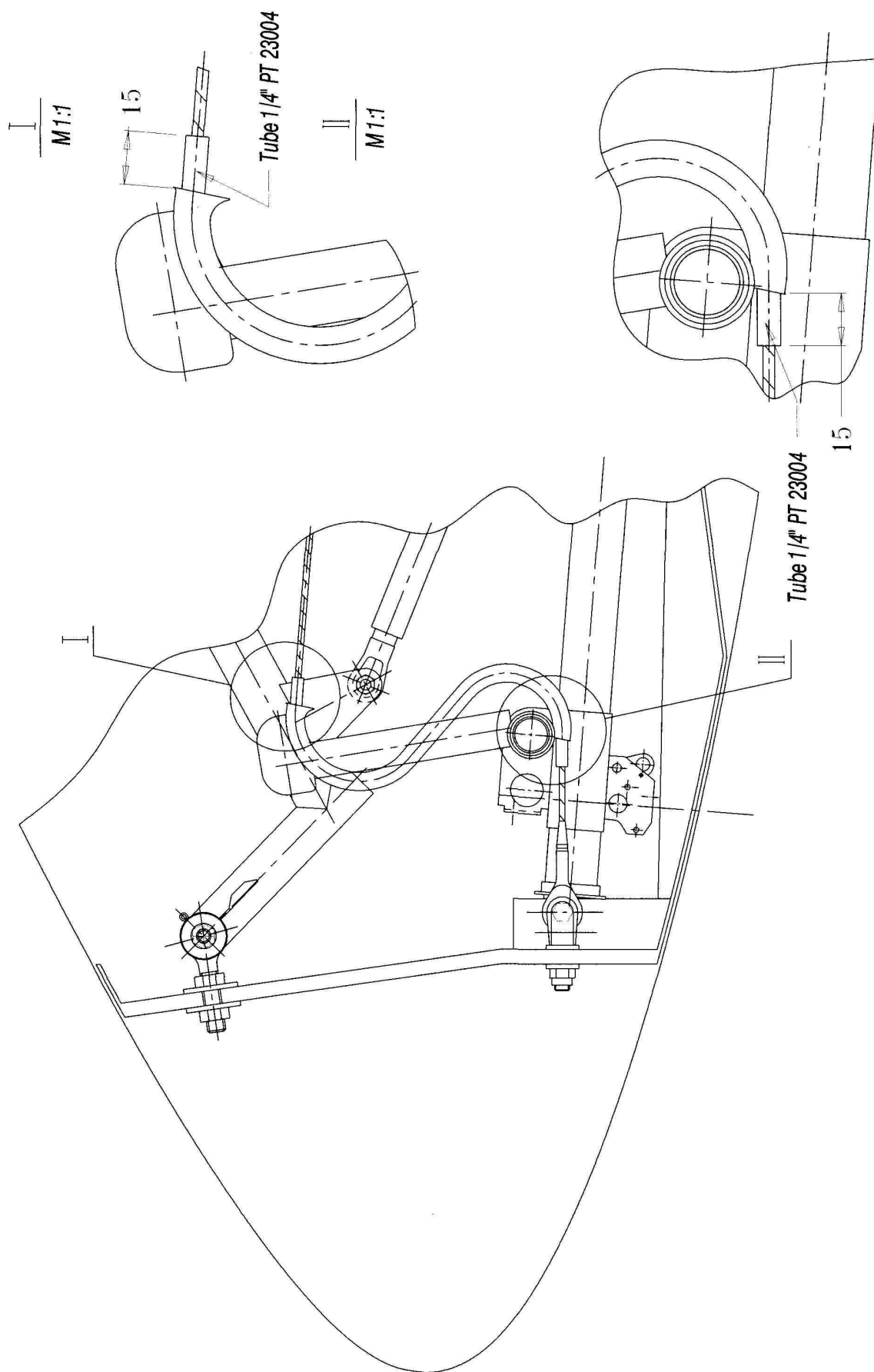


Fig 2-8c. Rudder control.

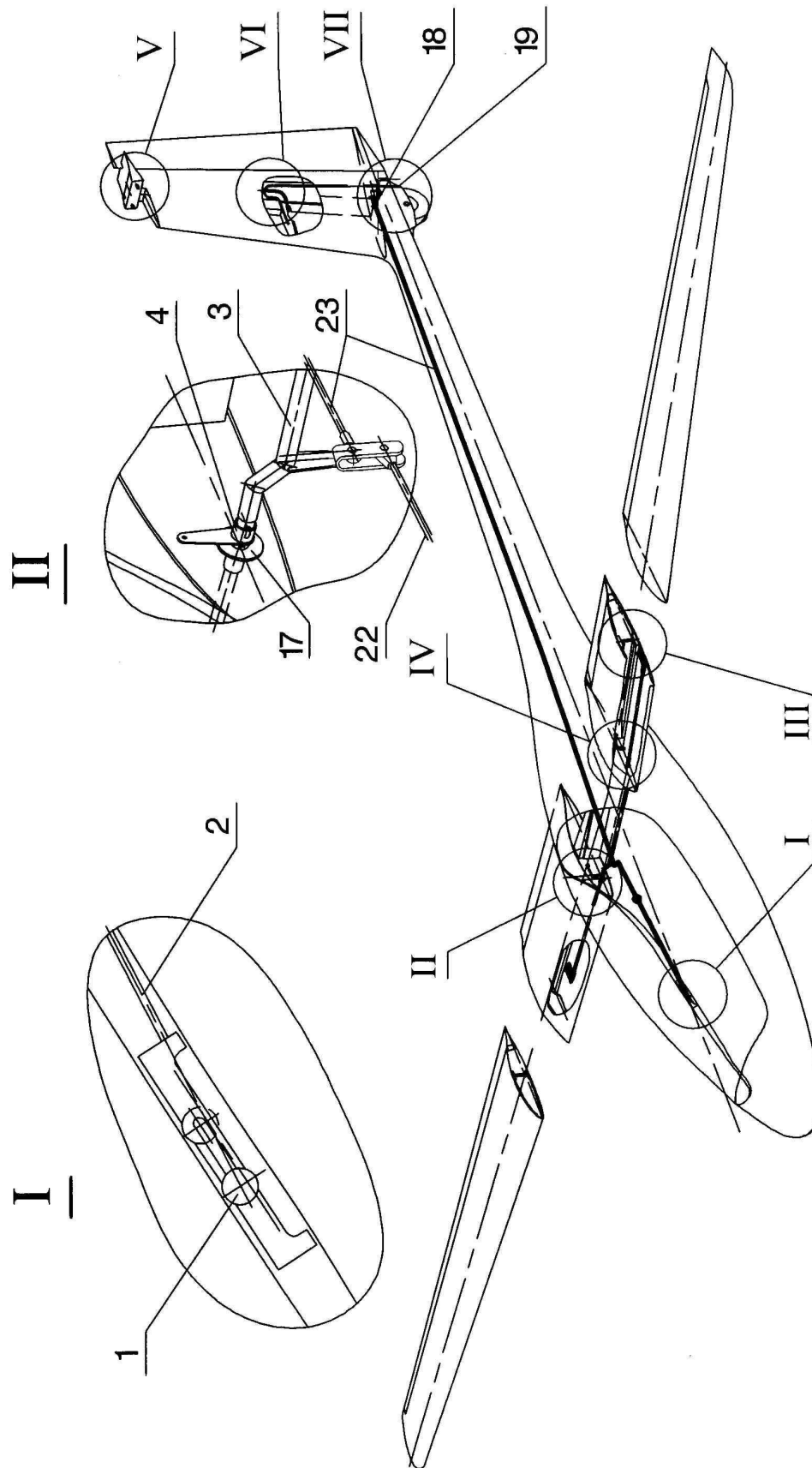


Fig.2 - 9a. Water ballast control system

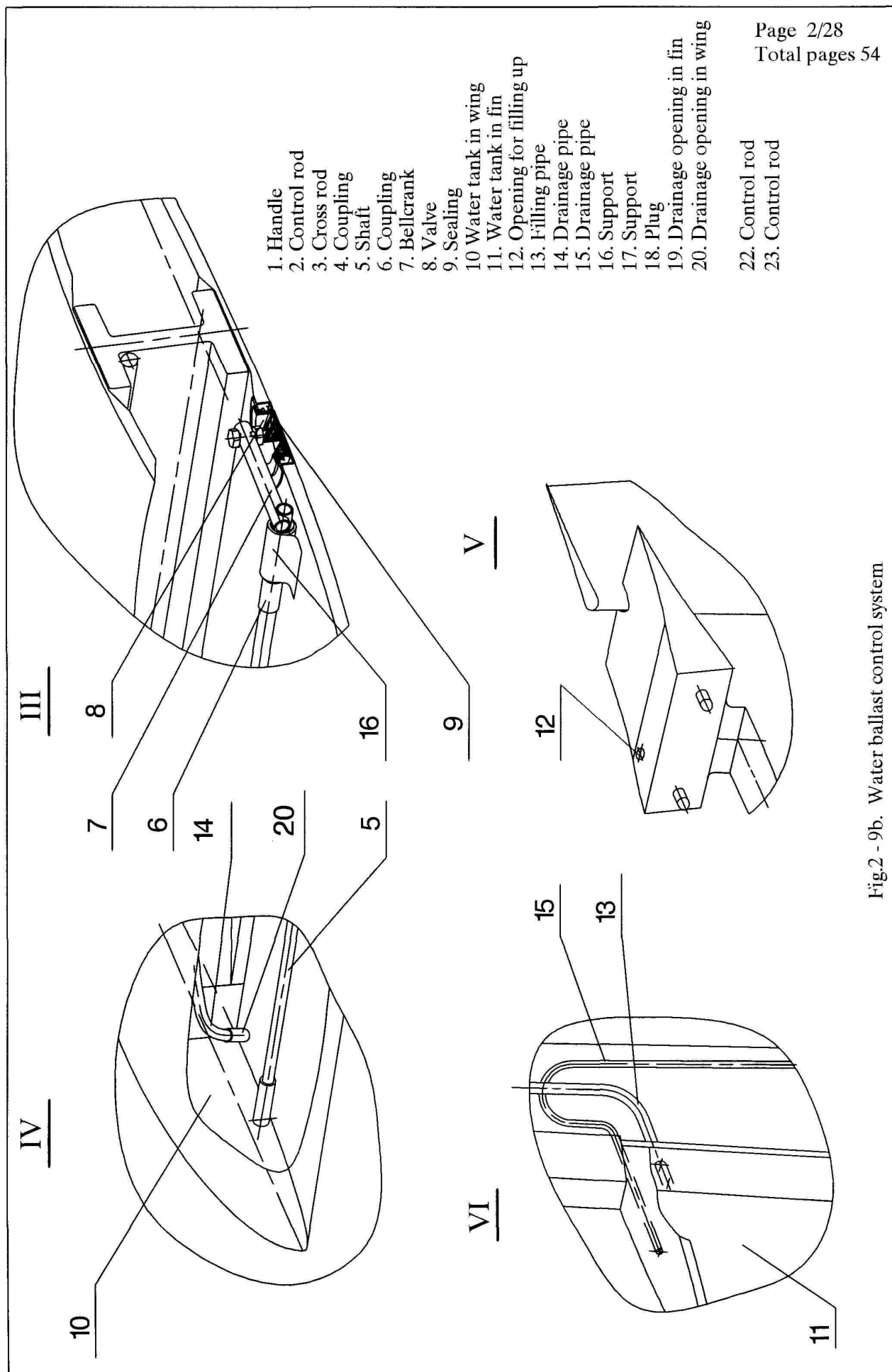
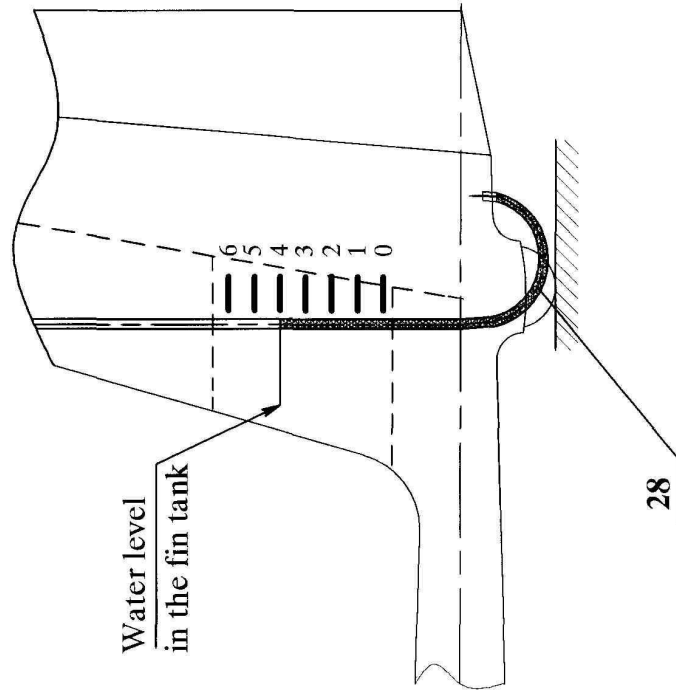
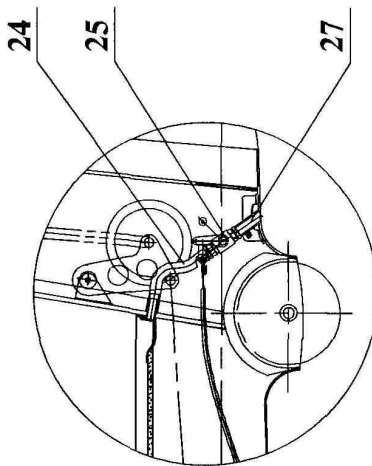


Fig.2 - 9b. Water ballast control system



VII



24. Pouring pipe
25. Valve

27. Support
28. Water level indicator

Fig.2 - 9c. Water ballast control system

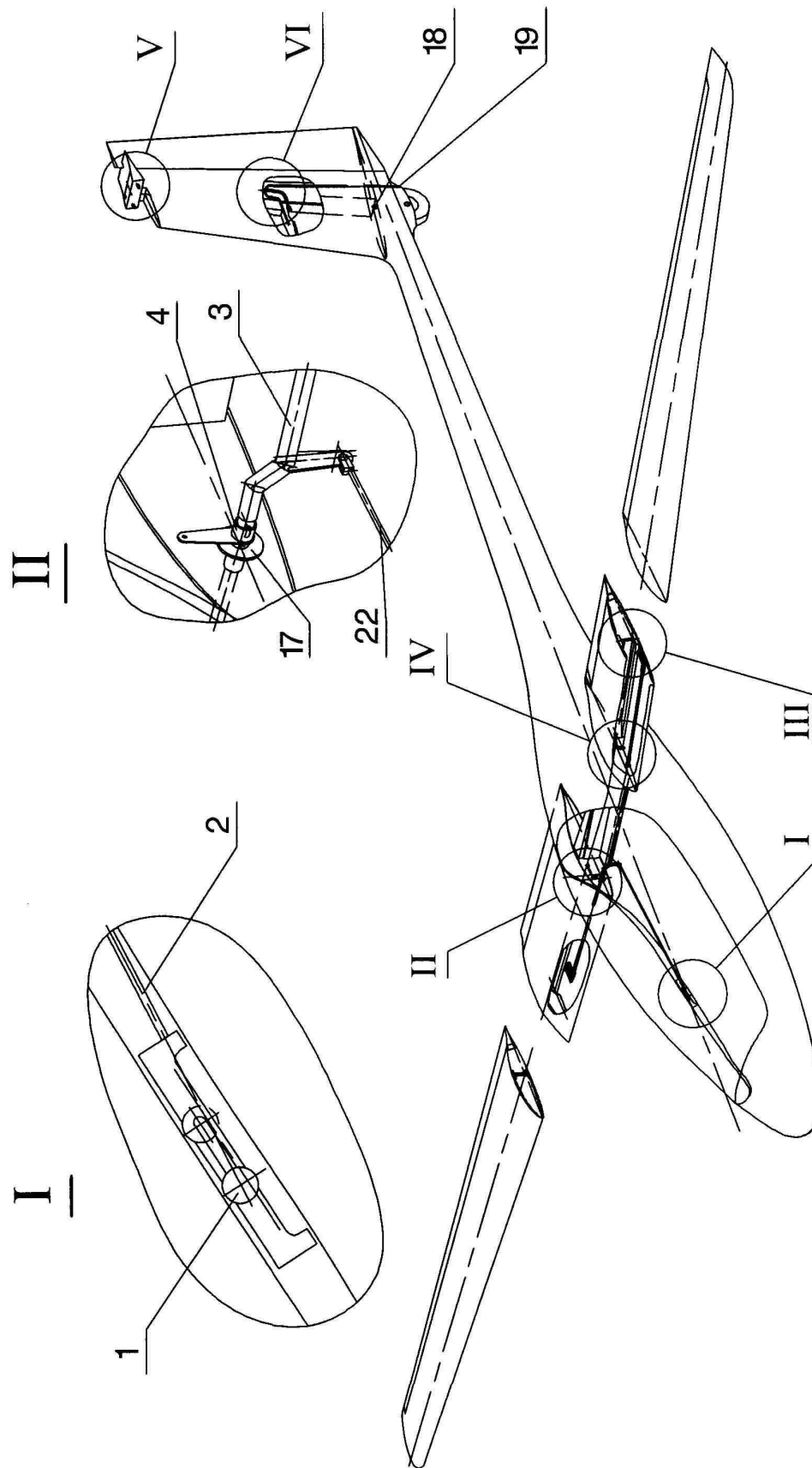


Fig.2 - 9d. Water ballast control system (option - wing tanks)

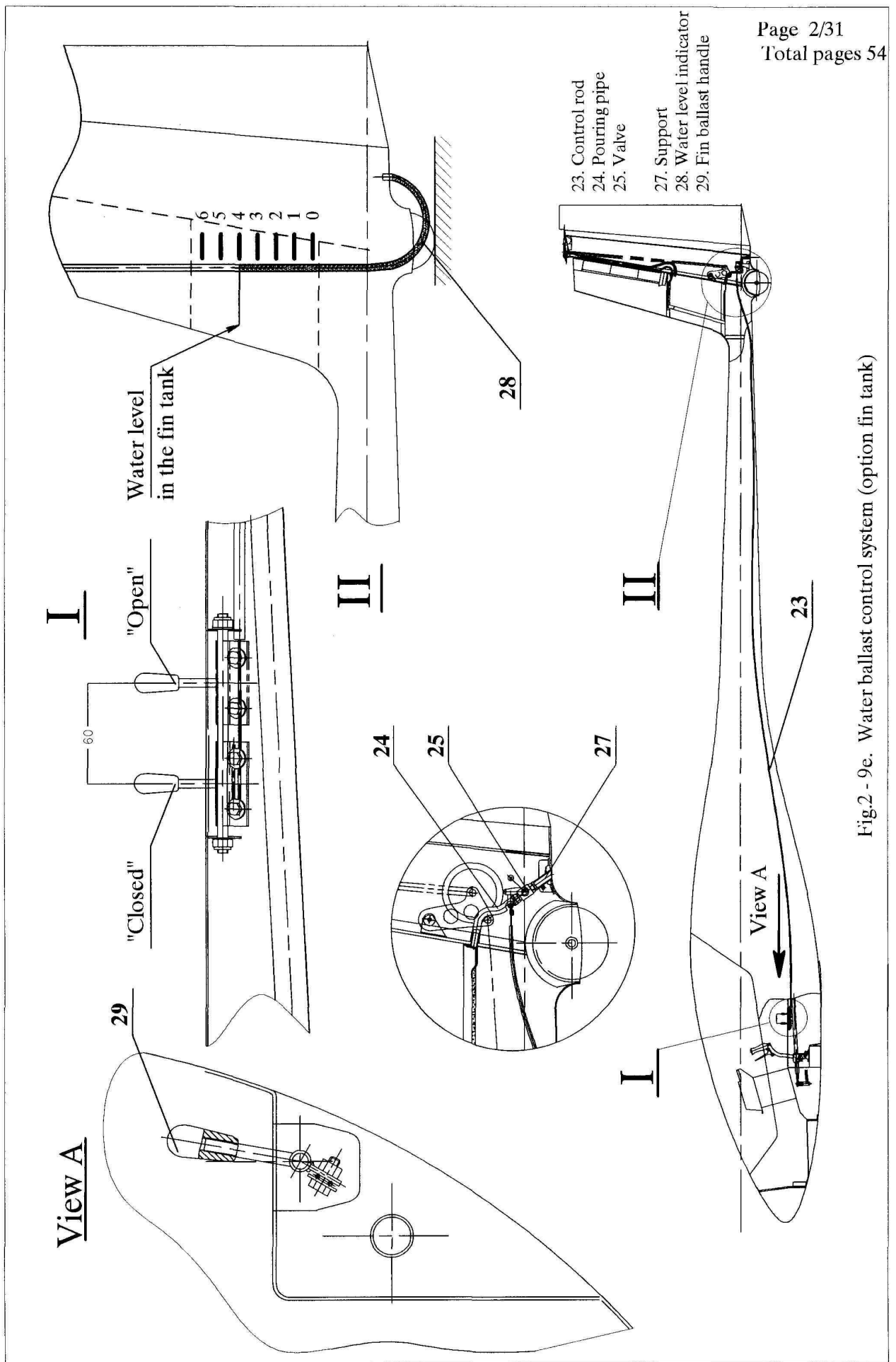
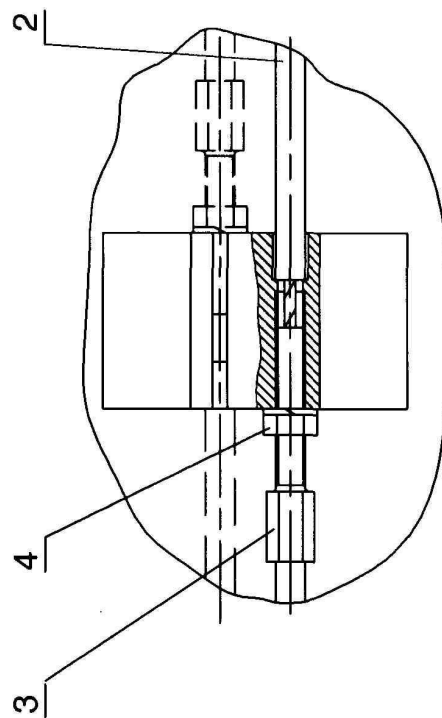
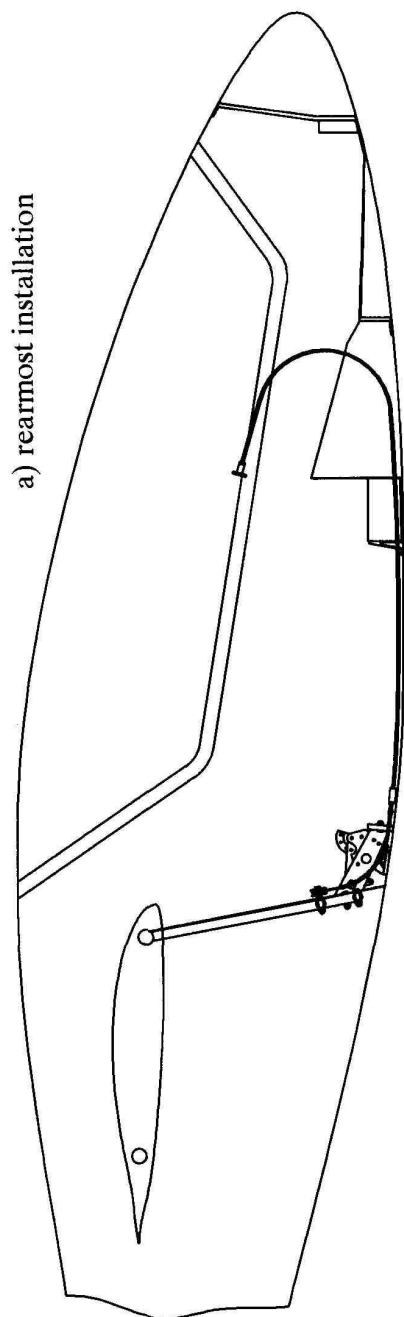


Fig.2 - 9e. Water ballast control system (option fin tank)

a) rearmost installation



- 1. Control handle
- 2. Cable
- 3. Support
- 4. Nut
- 5. Arm
- 6. Towing hook

b) forward installation

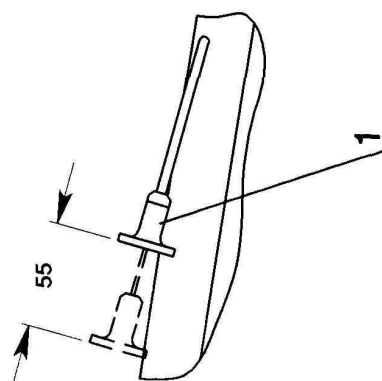
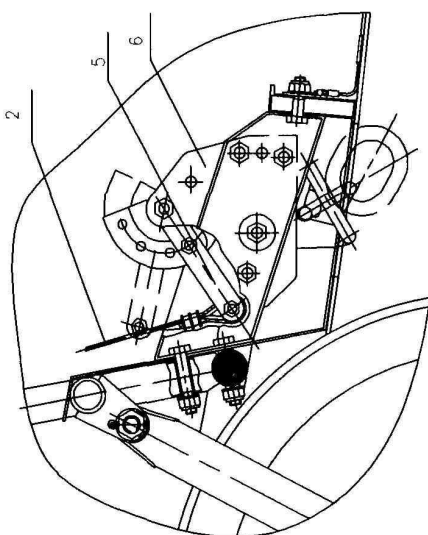


Fig.2 - 10. Towing hook control

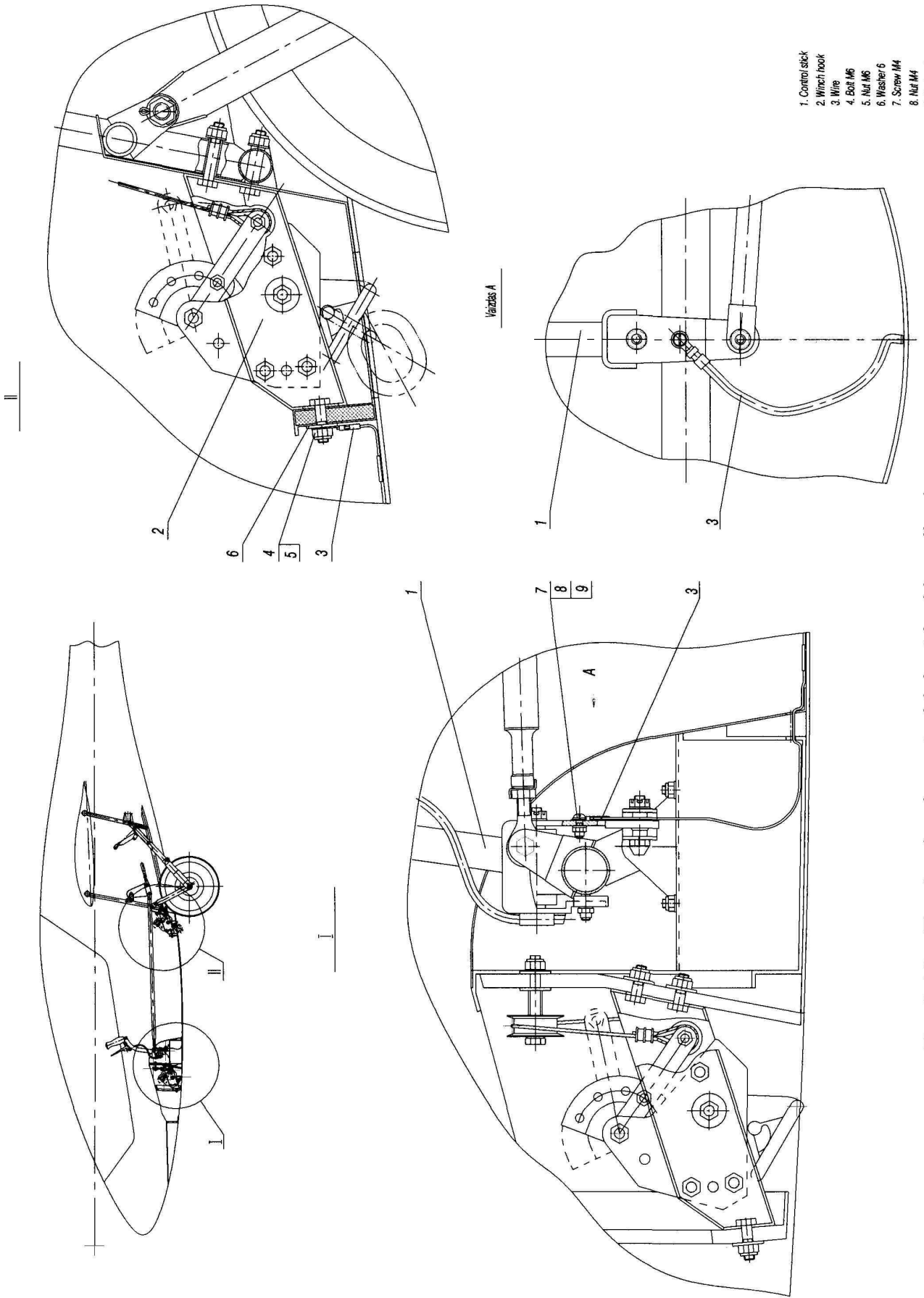


Fig. 2-10a. Towing hook control (electrical bonding)

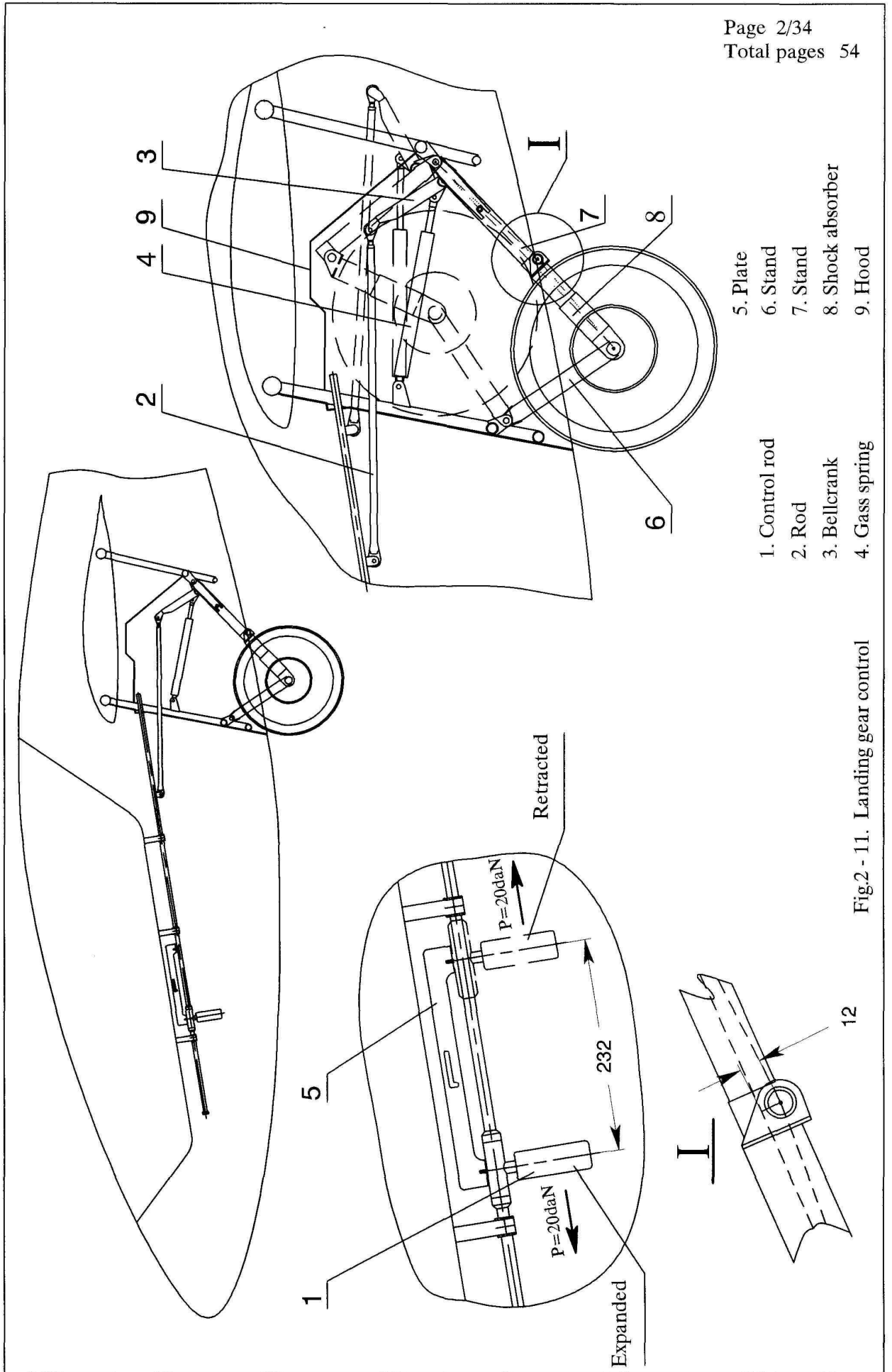


Fig.2 - 11. Landing gear control

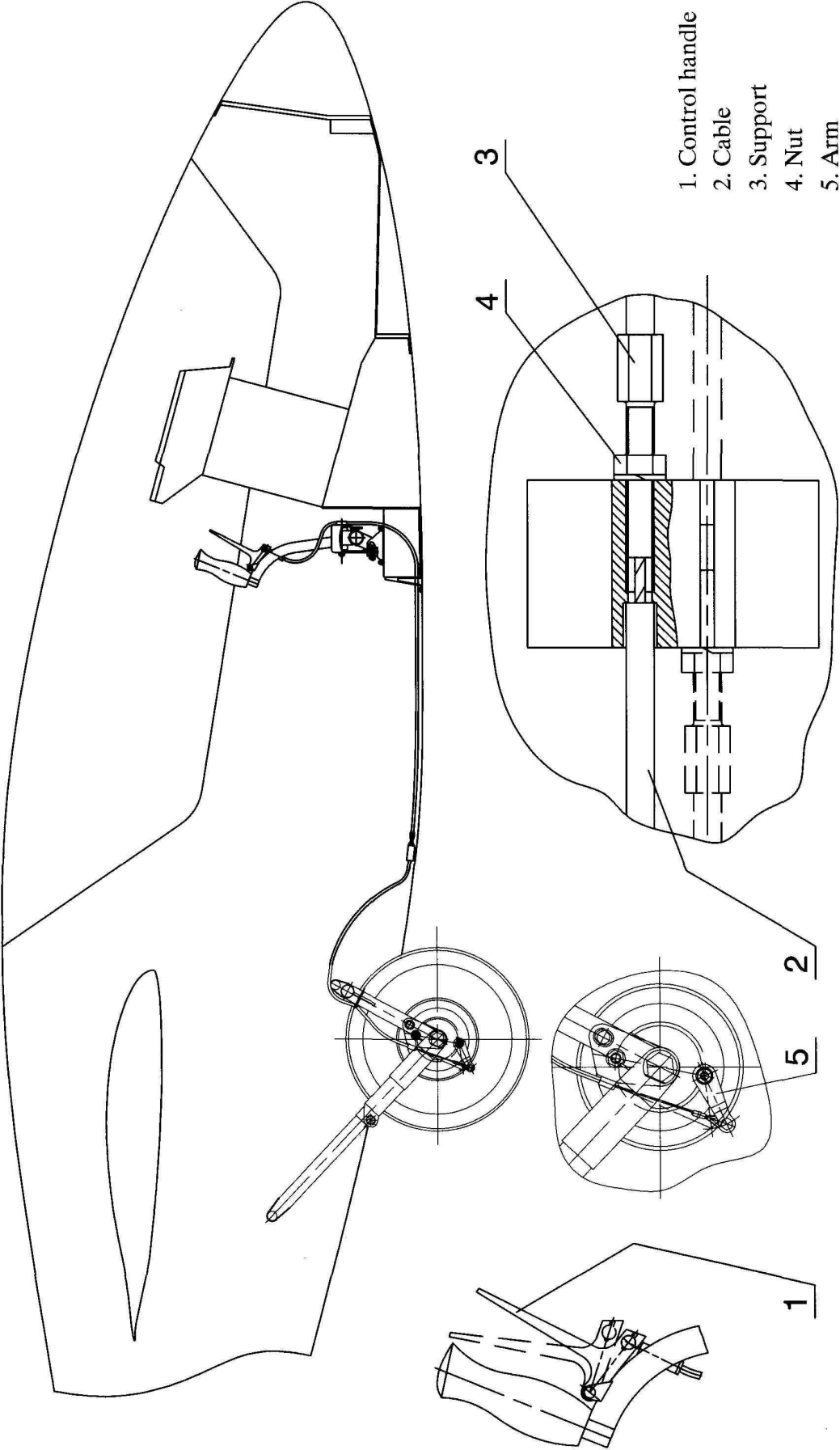


Fig.2 - 12. Mechanical wheel brake control

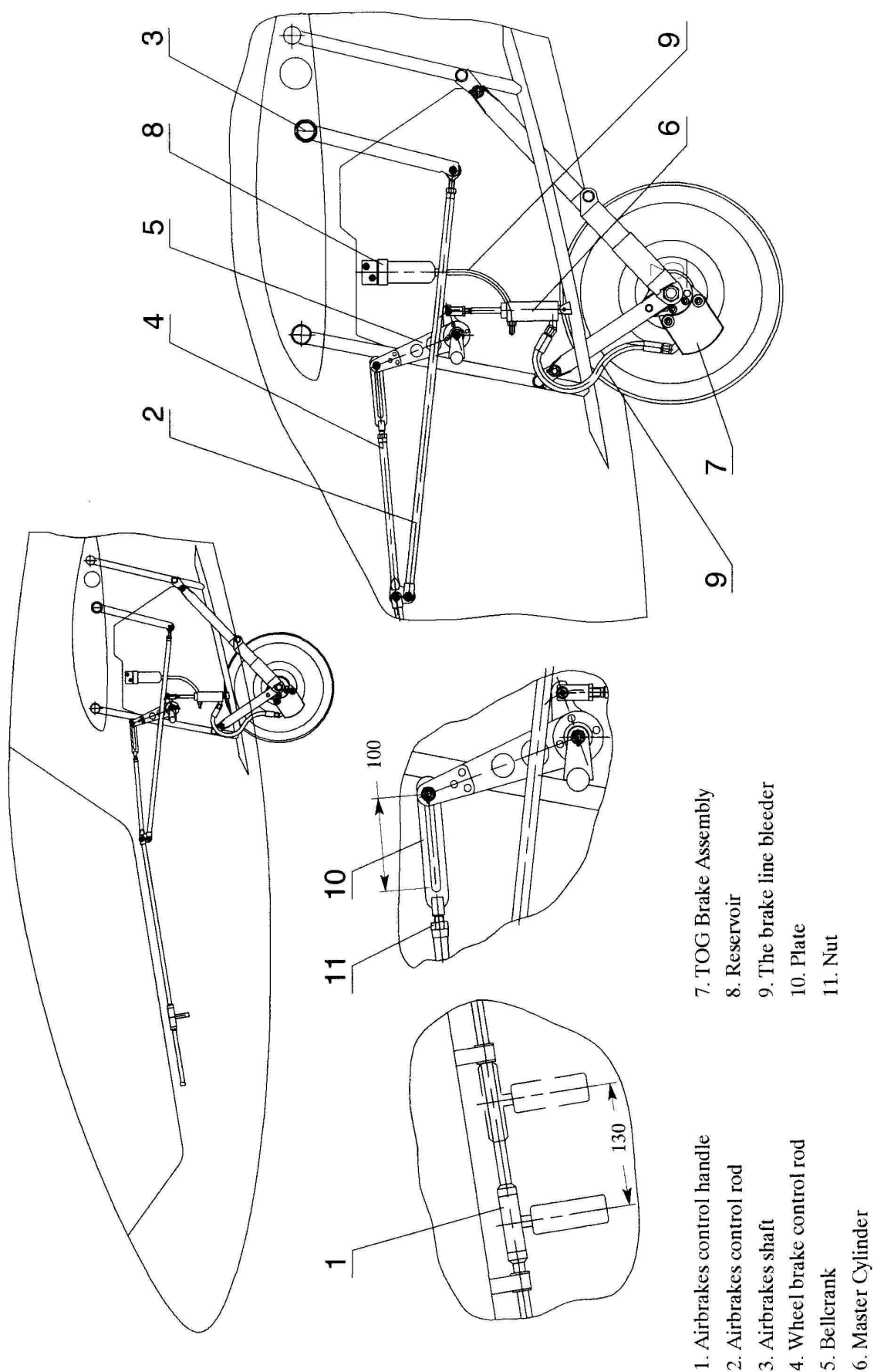


Fig.2 - 12a. Control system of airbrakes and wheel brake

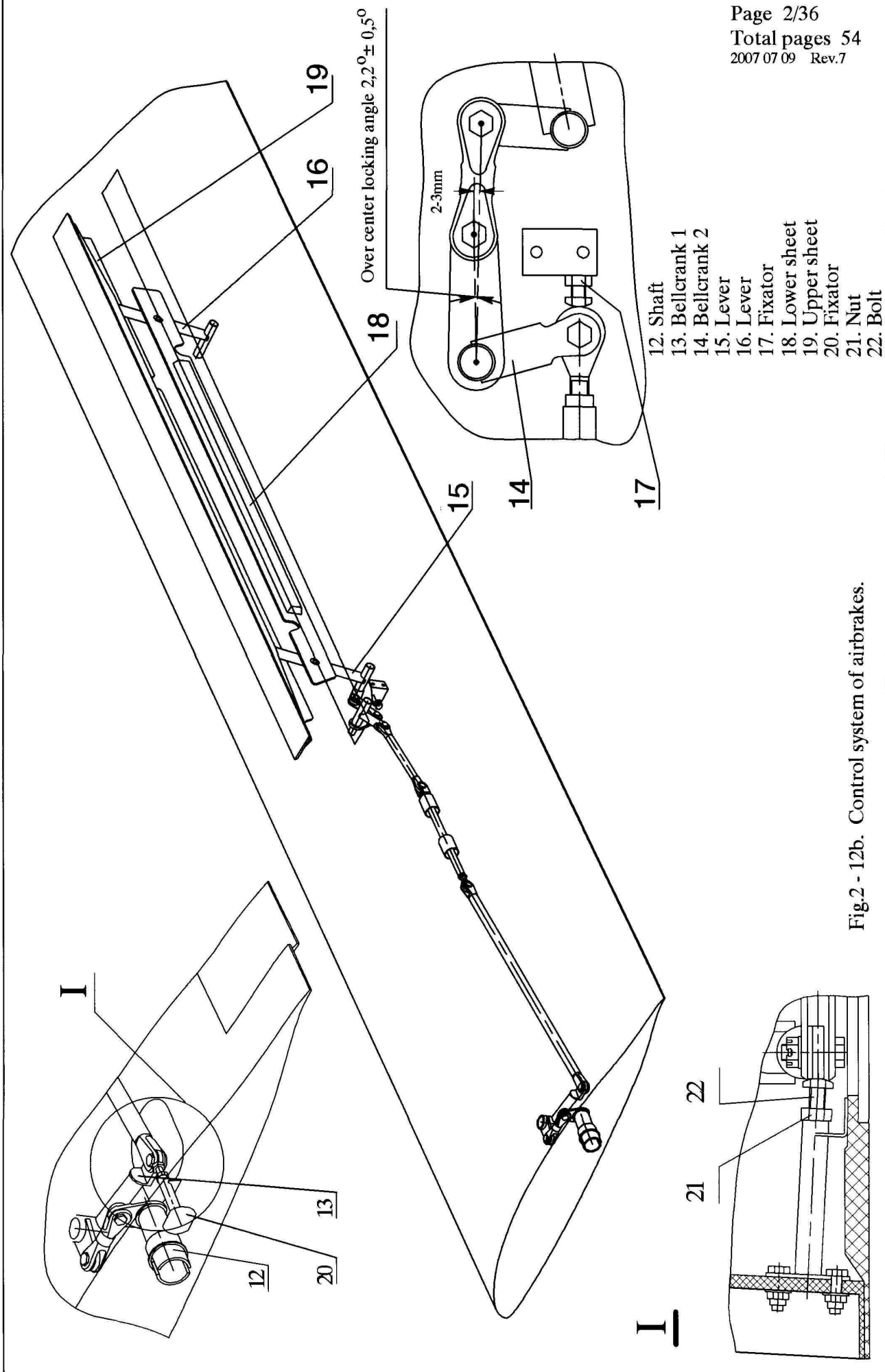


Fig.2 - 12b. Control system of airbrakes.

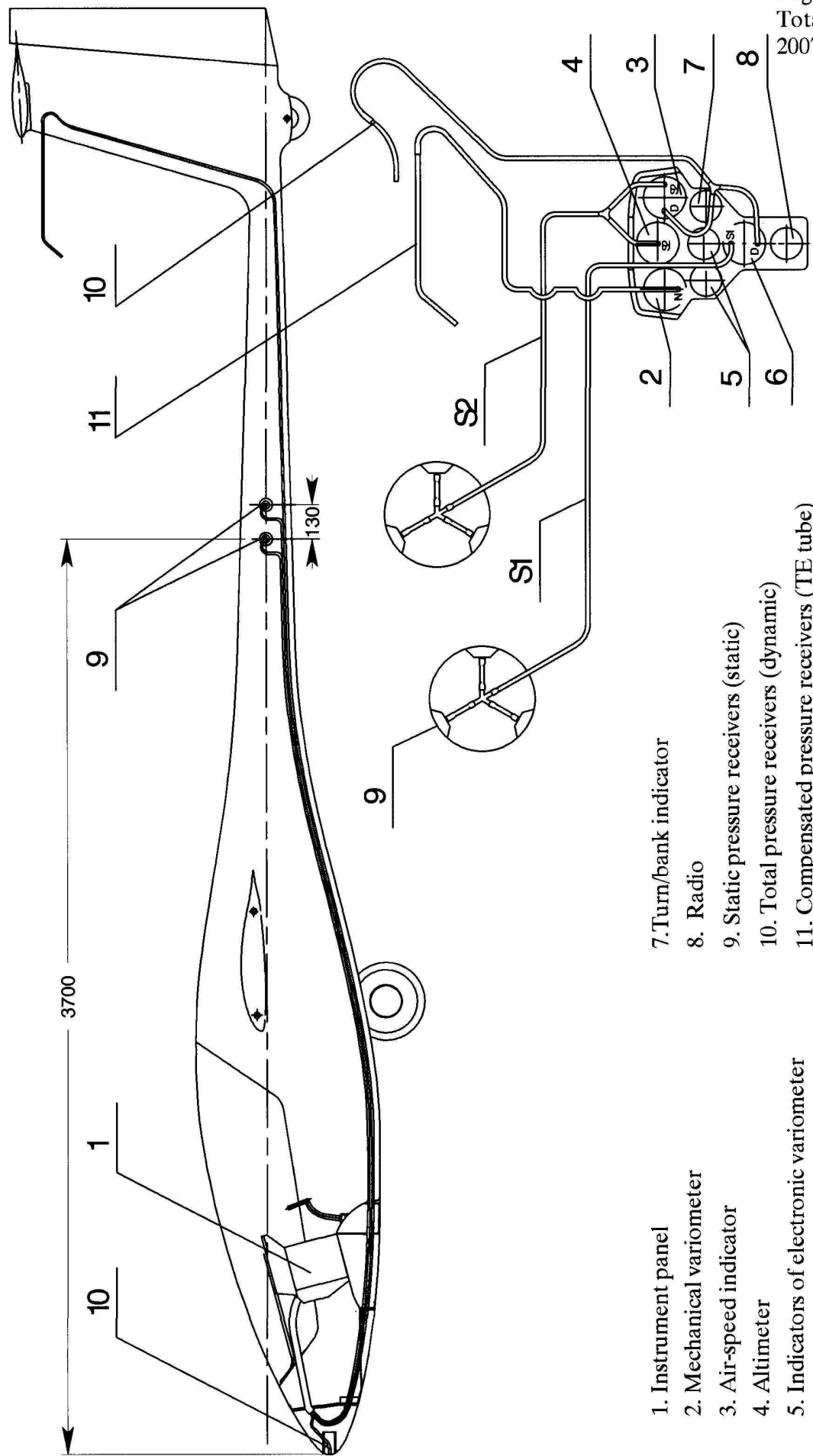
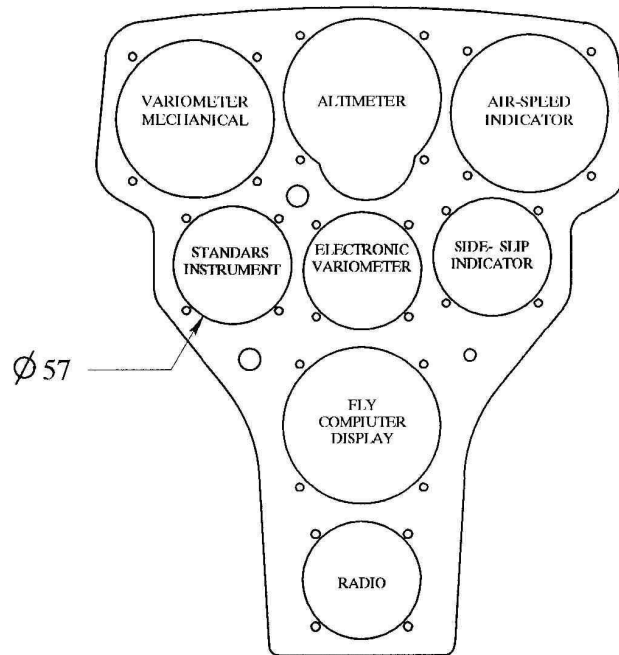


Fig.2 - 13. Sailplane static and dynamic pressure system

INSTRUMENT PANEL

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OPTION A



OPTION B

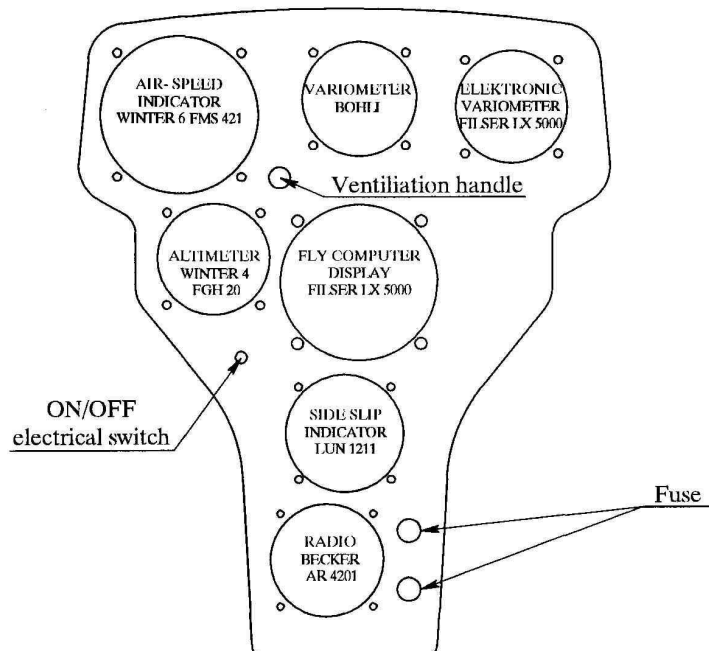


Fig.2 - 14. Options of flight control and navigation instrumets

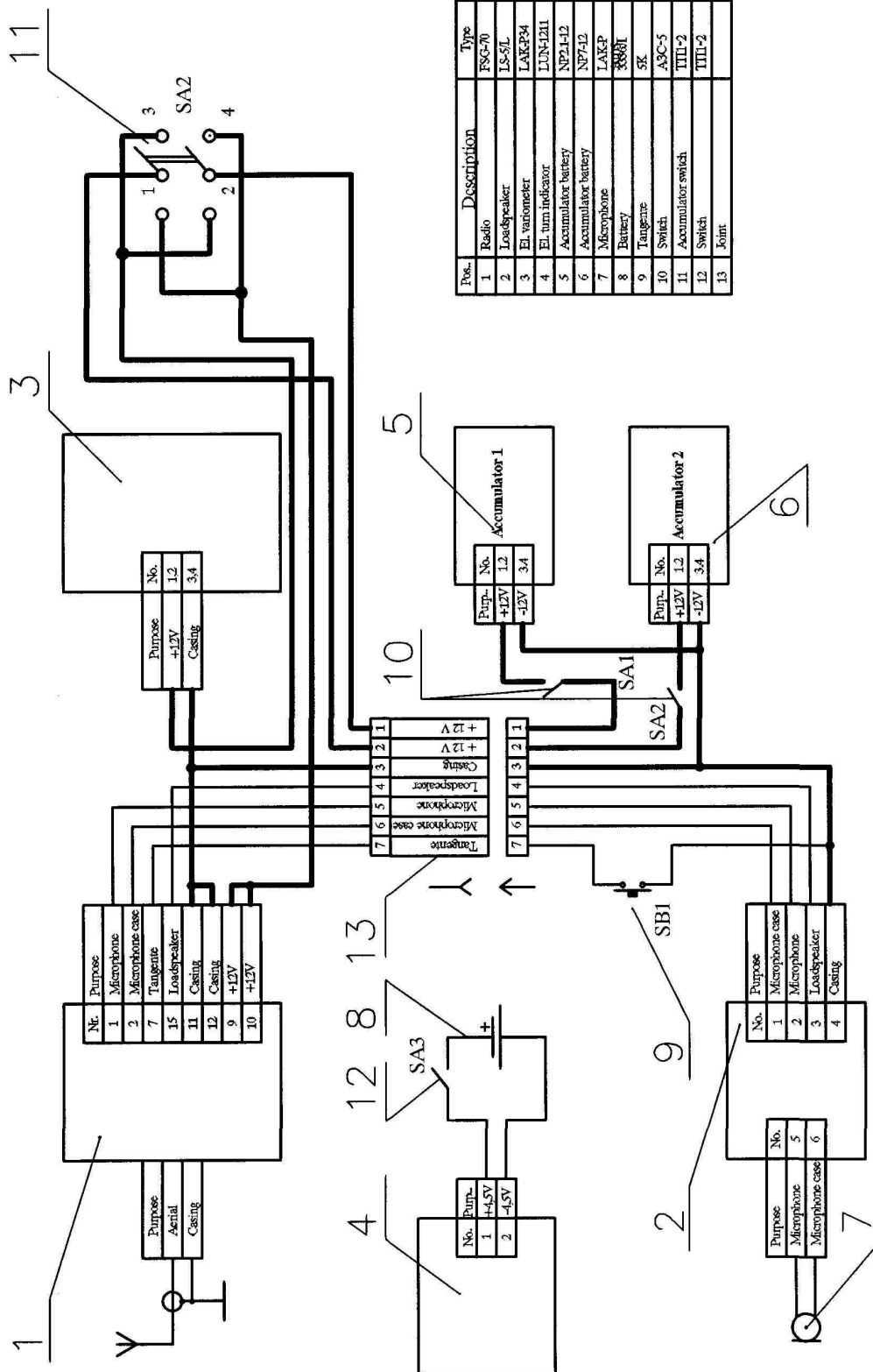


Fig.2 - 15a. Electric and radio system

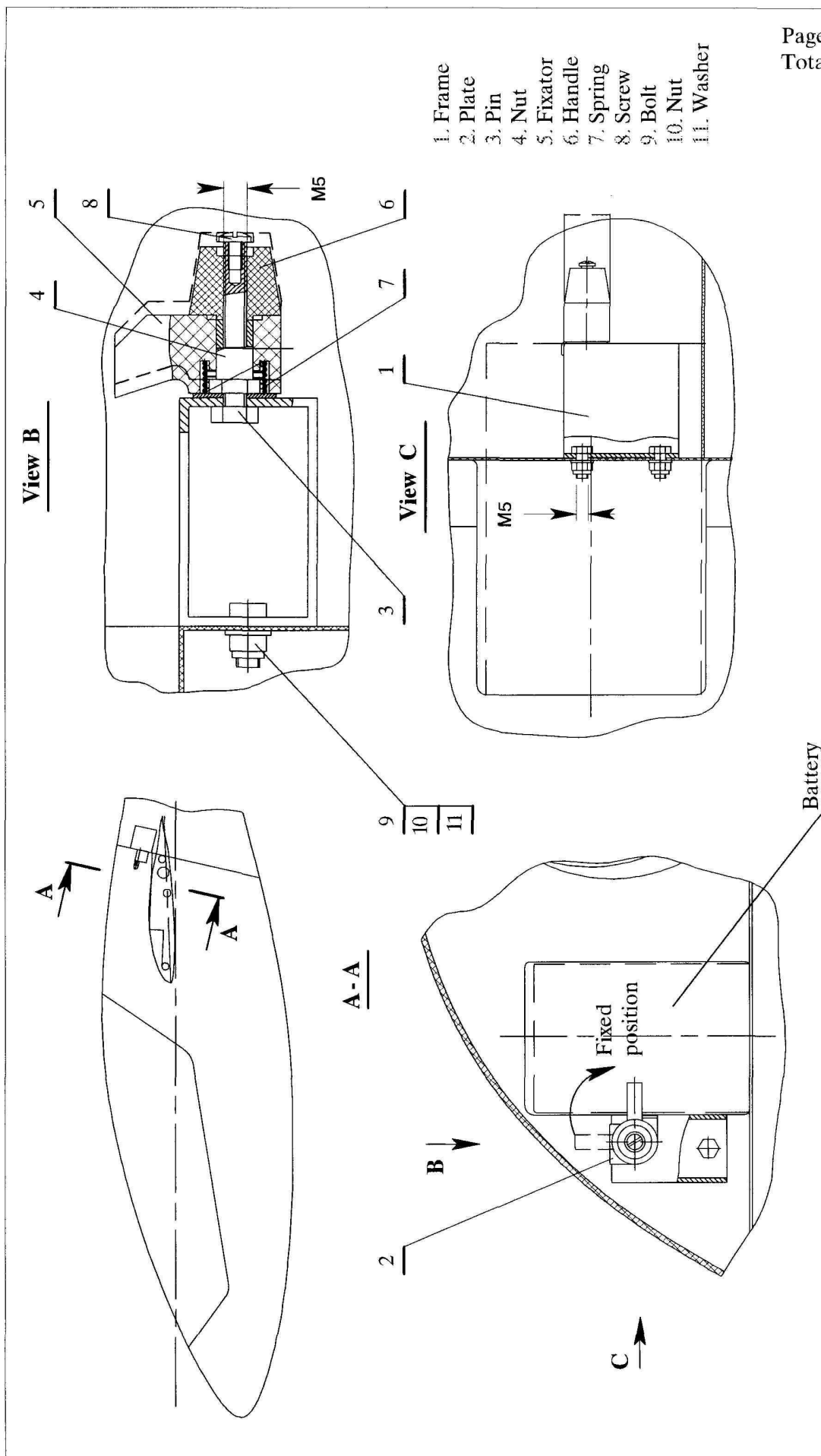
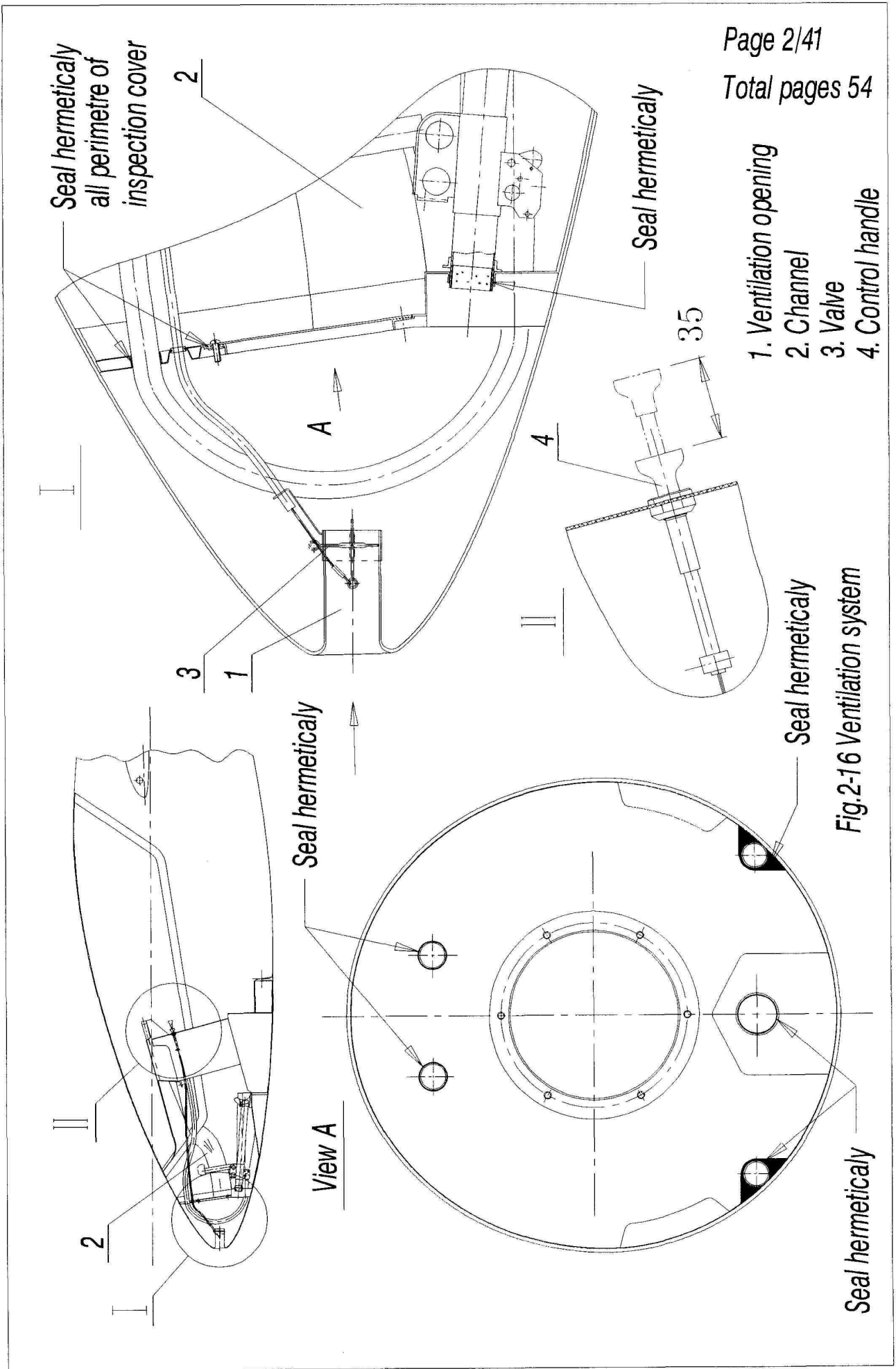


Fig.2 - 15b. Electric and radio system (battery fixing)



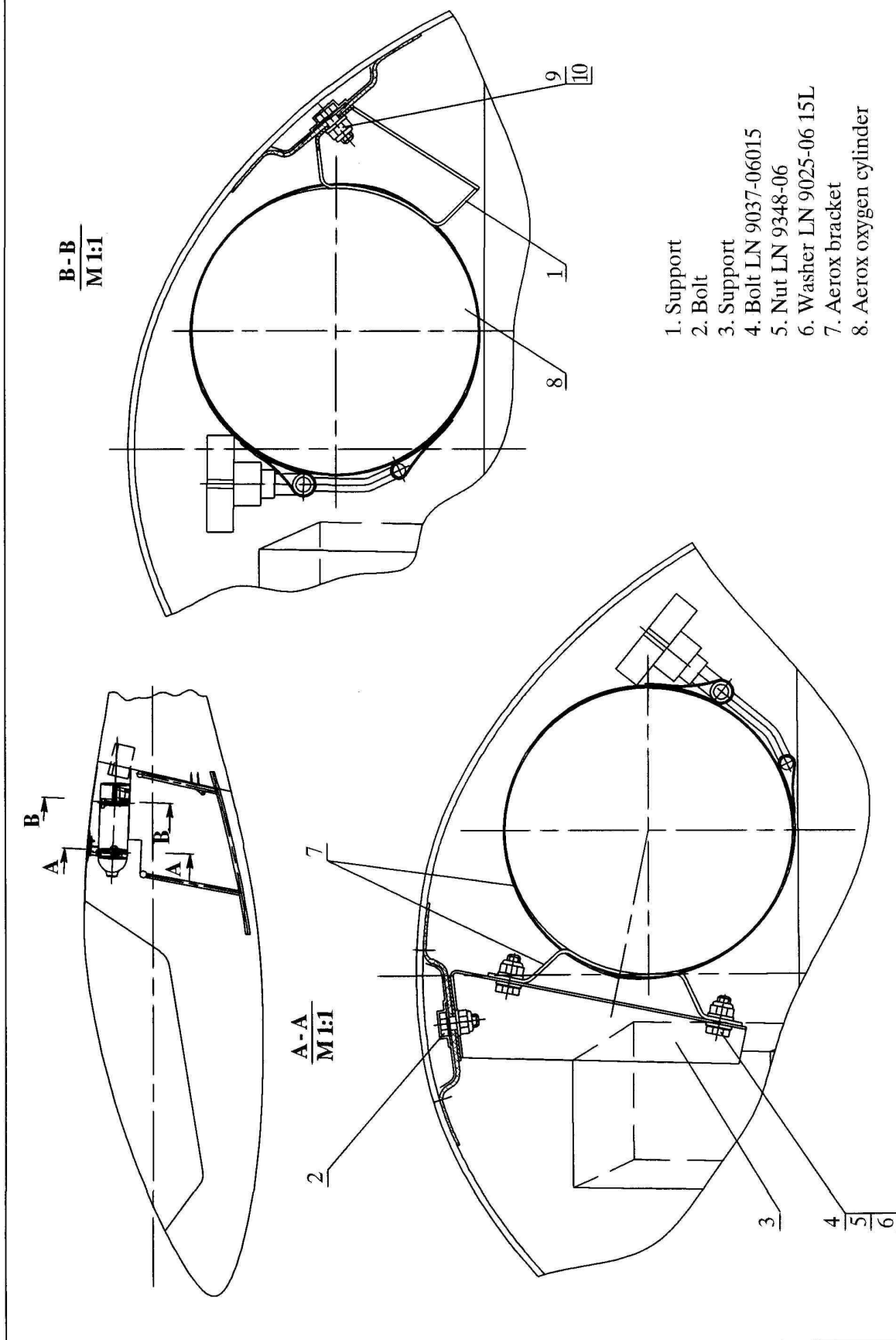
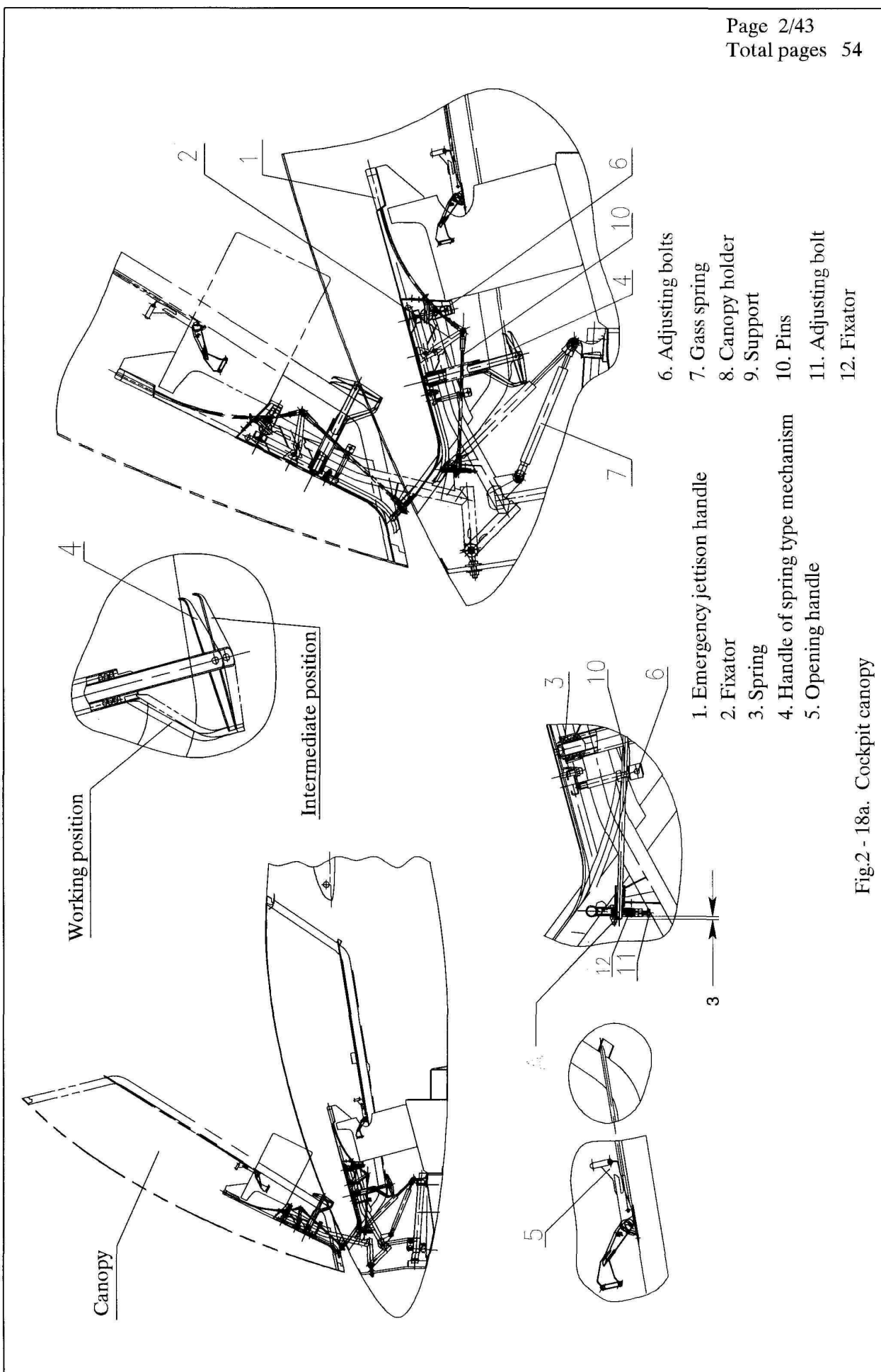


Fig.2-17. Oxygen system installation



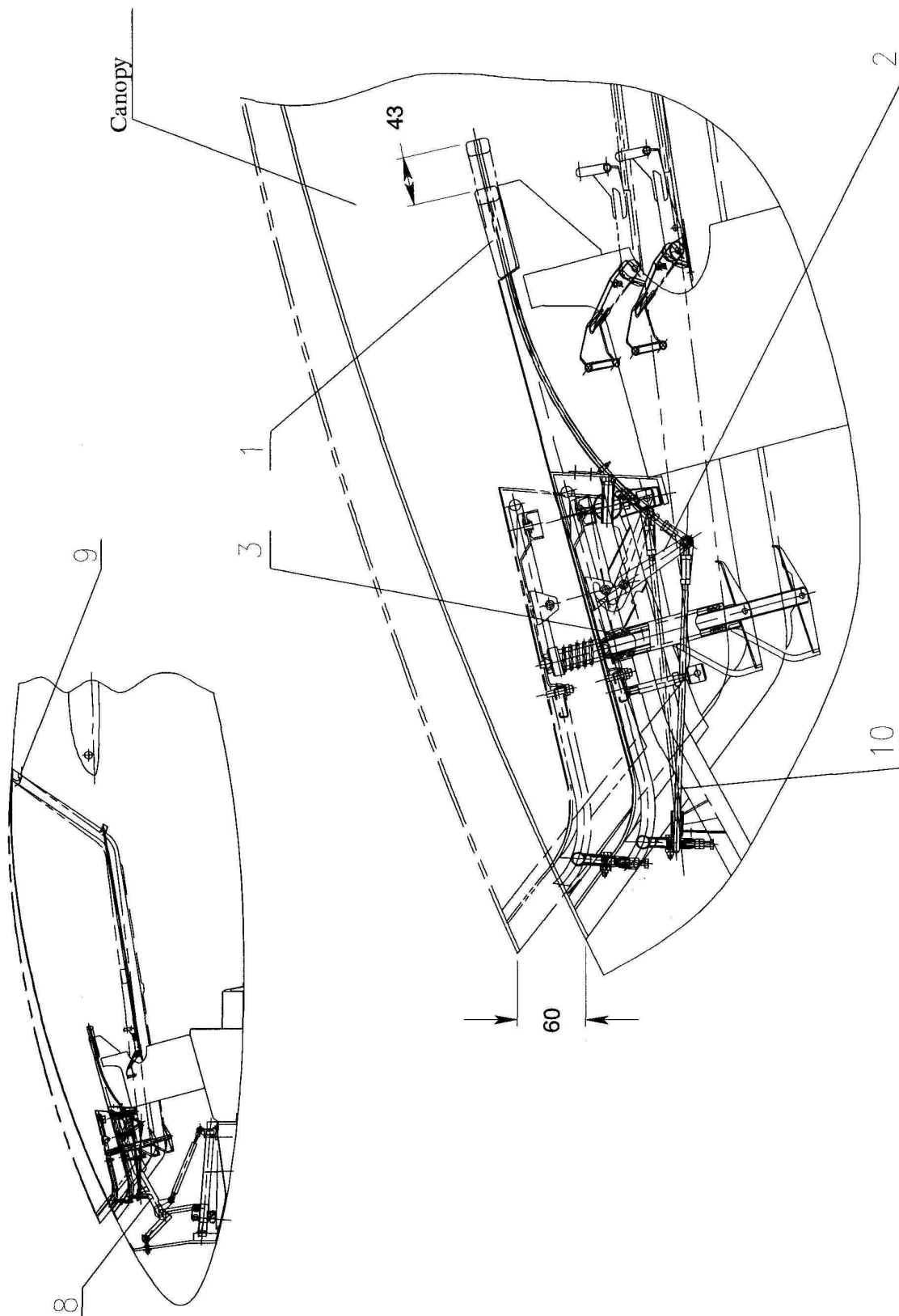


Fig.2 - 18b. Cockpit canopy

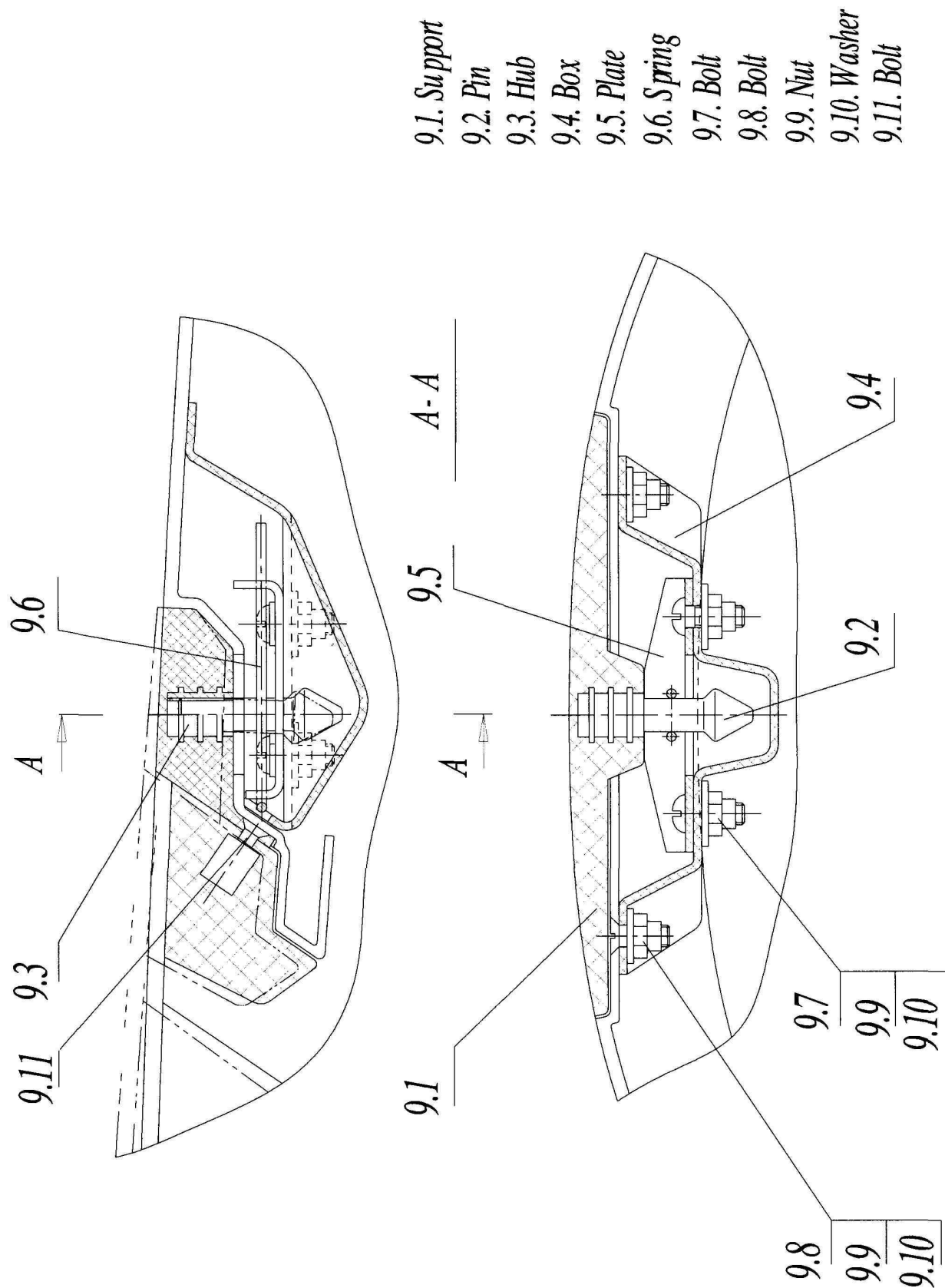


Fig 2-18c. Cockpit canopy

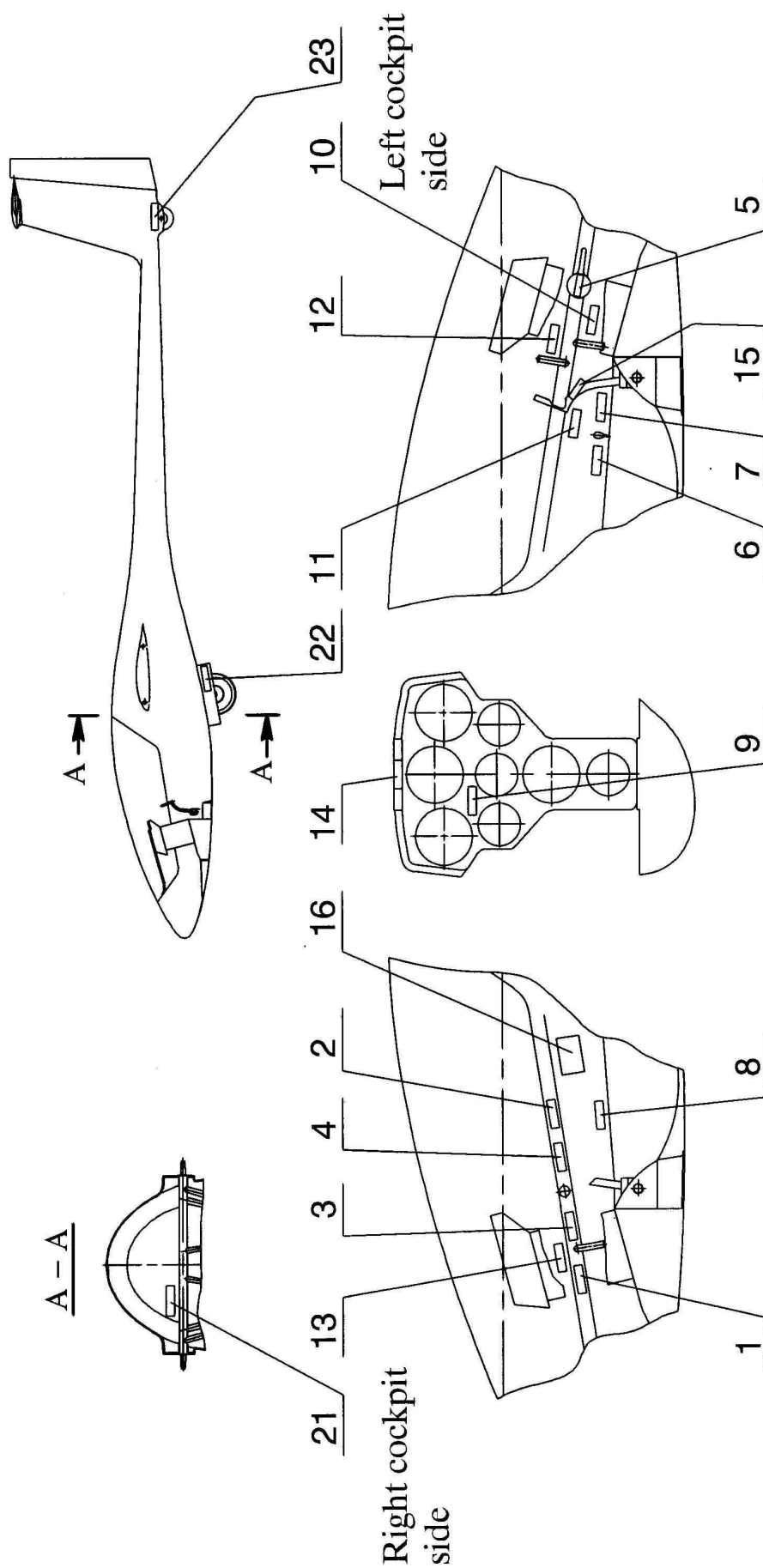


Fig.2 - 19a. Tables and marking of controls

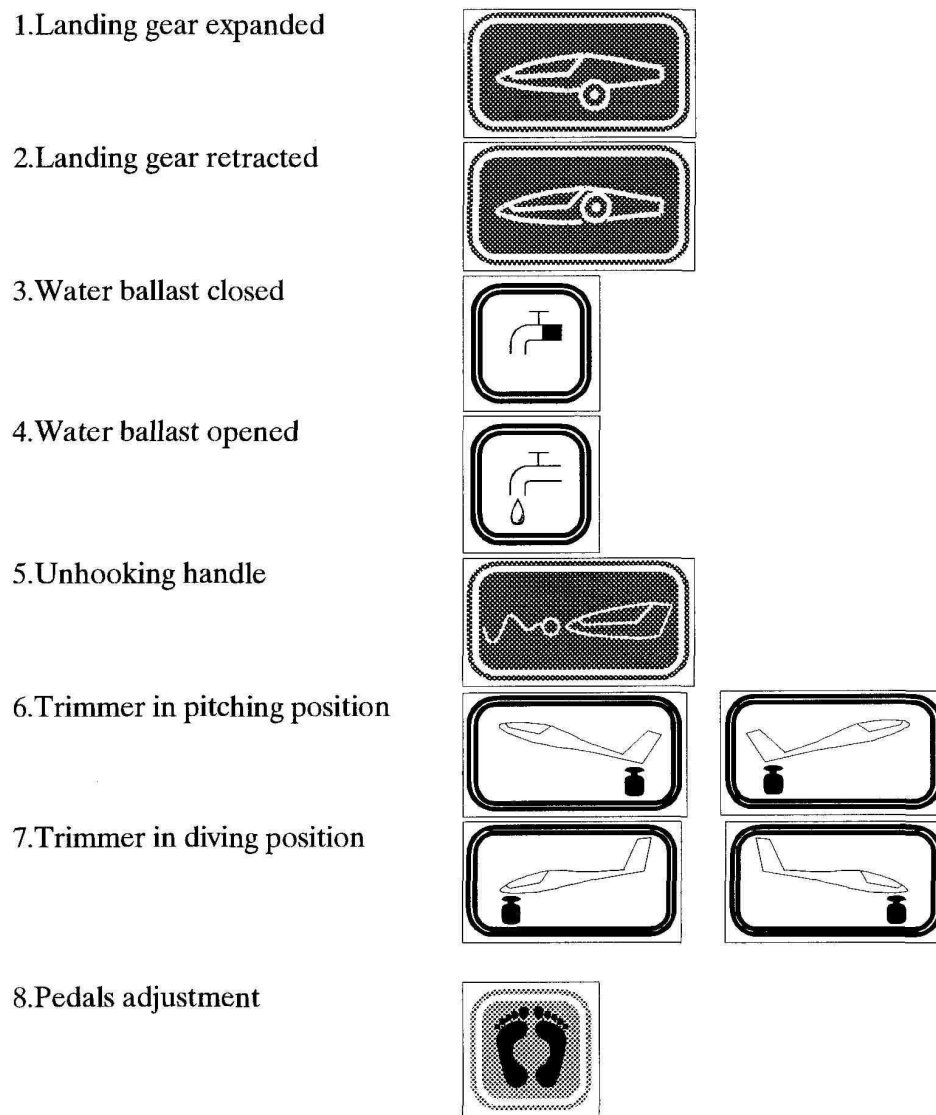
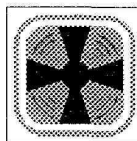
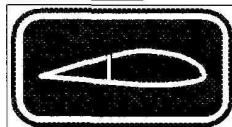


Fig.2 - 19b. Placards and marking of controls

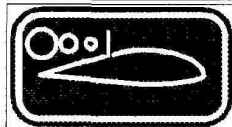
9. Cockpit ventilation



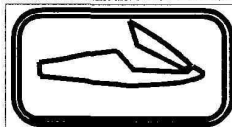
10. Air brakes retracted



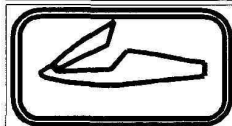
11. Air brakes expanded



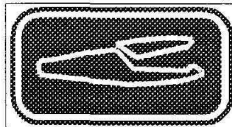
12. Canopy opening handle



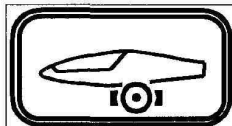
13. Canopy opening handle



14. Canopy emergency jettison



15. Main landing gear brake



16. Before Take Off Check List

Before takeoff check list

1. Preflight inspection completed?
2. Tail dolly removed?
3. Lead or water ballast [for correct cockpit weight]?
4. Parachute worn properly?
5. Seat back and rudder pedals adjusted?
6. Safety harness secured?
7. All controls in reach?
8. Positive control check?
9. Altimeter set?
10. Air brakes closed and locked?
11. Trim set?
12. Canopy closed and latched?
13. Wind direction?

The "Check List" placard must be located in the cockpit in view of pilot.

Fig.2 - 19c. Placards and marking of controls

20. Table of operational limitations

Joint Stock Company: “SPORTINĖ AVIACIJA”					
Model: LAK-19		Date of manufacture:		Serial No.	
AIR SPEED DATA AND LOADING PLACARD 15m/18m					
MAXIMUM AIR SPEEDS		km/h			
Never exceed	[V _{NE}]	275			
Rough air	[V _{RA}]	205	Maximum mass		
Manoeuvring	[V _A]	205	including water ballast	480/500	kg
Aerotow	[V _T]	160	Maximum cockpit load	110	kg
Winch-launching	[V _W]	140	Minimum cockpit load	70	kg
Landing gear	[V _{LO}]	205	Recommended weak link	6500	N
The aerobatic manoeuvres are not permitted.					

21. Baggage limitation table

Max baggage weight 7 kg

22. Table of main wheel tyre pressure

Pressure in main wheel tyre
from 2.3 to 2.5 bar

23. Table of tail wheel tyre pressure

Pressure in tail wheel tyre
from 1.8 to 2.0 bar

24. The airspeed limitation placard

Altitude, m	V _{NE} indicated, km/h
3000	275
4000	275
5000	260
6000	245
8000	220
10000	195

Fig.2 – 19d. Tables and marking of controls

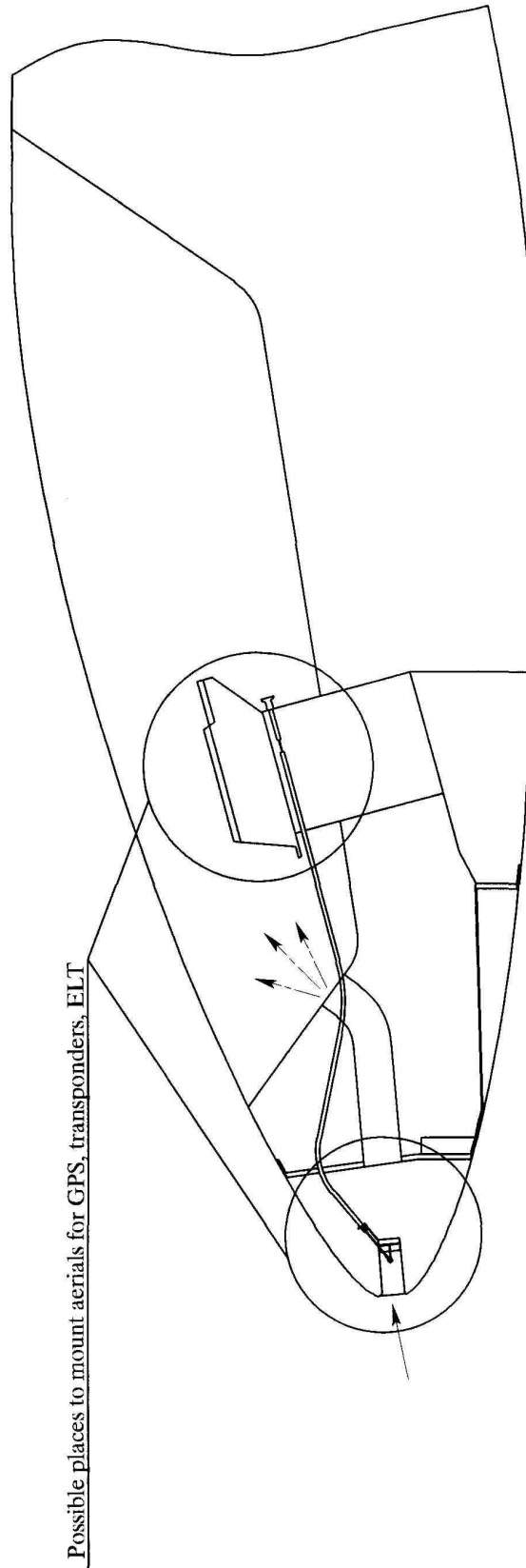


Fig.2 - 20. Possible places to mount aeriels for GPS, transponders, ELT

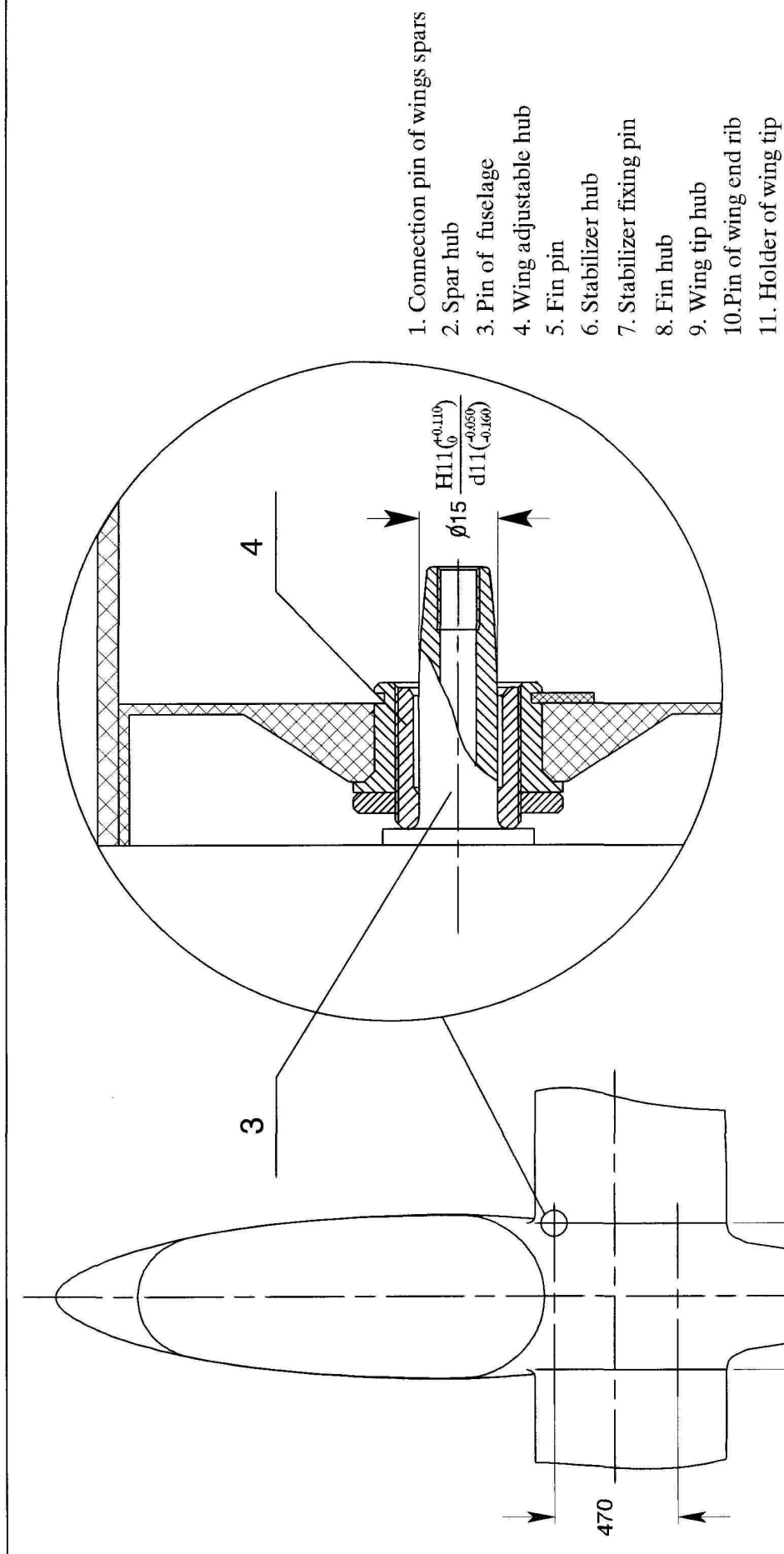


Fig.2 - 20a. Allowed clearances of connection of sailplane aggregates

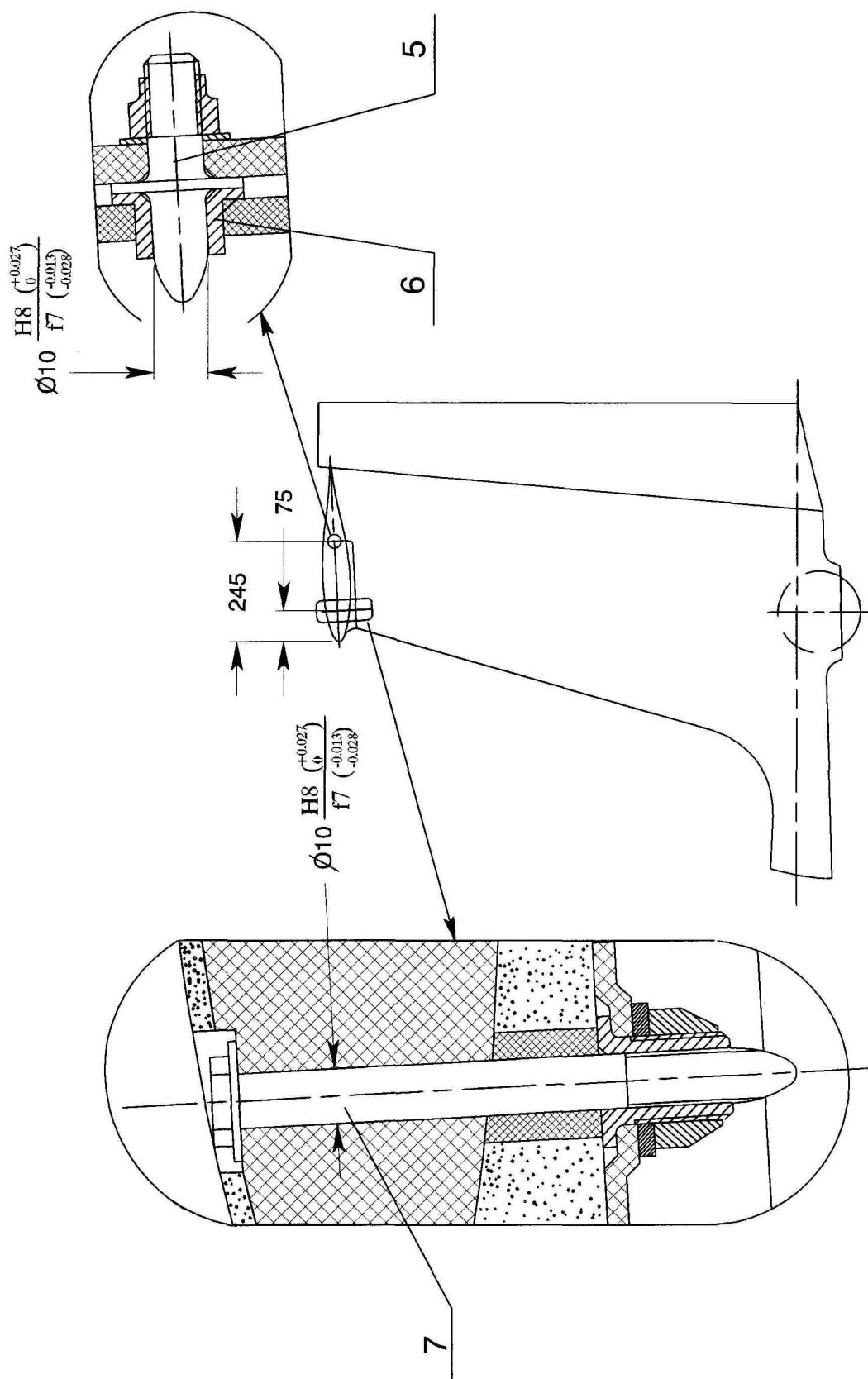


Fig.2 - 20b. Allowed clearances of connections of sailplane aggregates

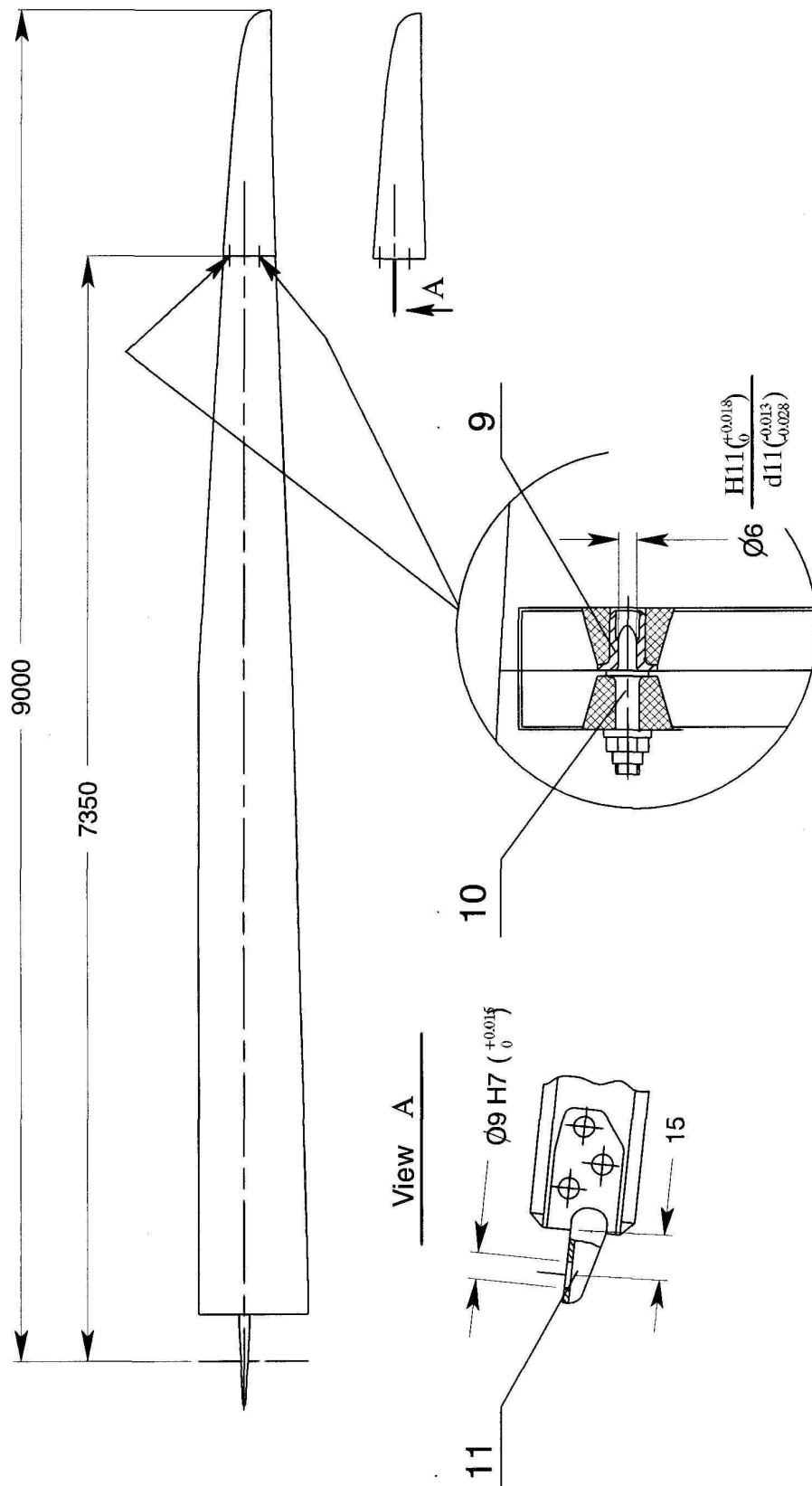
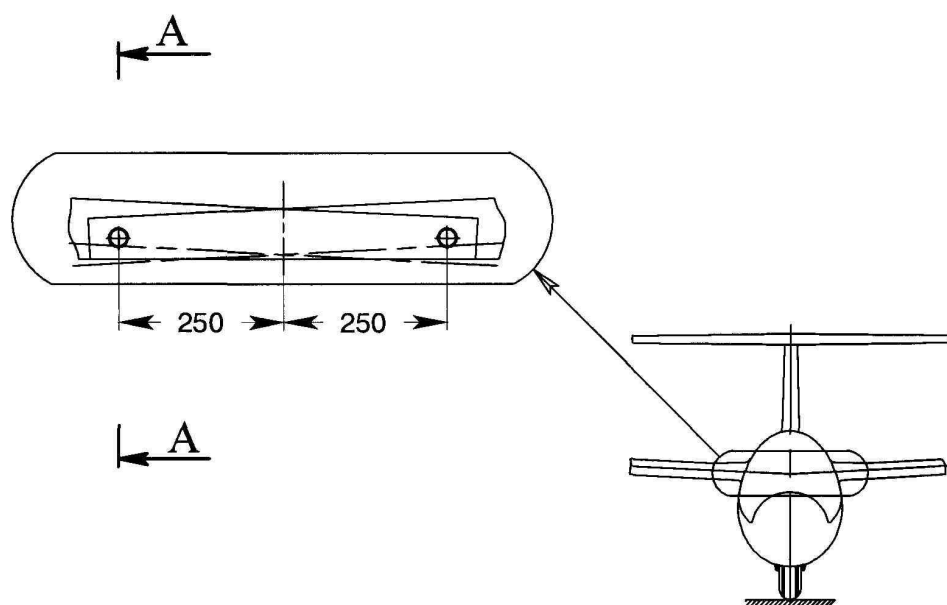


Fig.2 - 20c. Allowed clearances of connections of sailplane aggregates



A - A typical

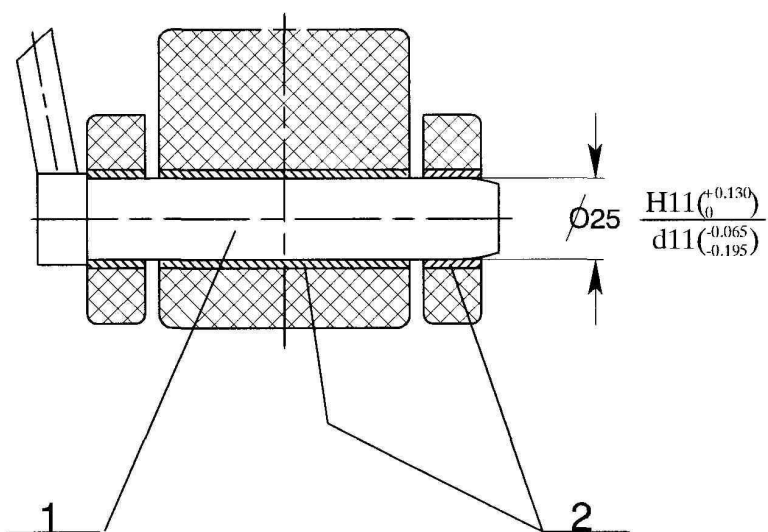


Fig.2 - 20d. Allowed clearances of connections of sailplane aggregates

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3.1 Sailplane current maintenance

3.1.1 Daily inspection

Note: check up sailplane technical log-book and airworthiness certificate.

The daily inspection must be performed each day and is essential for flight safety.

1. Check up a sailplane fore part of fuselage.
2. Check up in a pilot cockpit:
 - the pilot cockpit canopy glass,
 - operation of pilot cockpit canopy lock, canopy jettison system,
 - wings connection pins fastening,
 - operation of towing hook,
 - operation of water ballast system
 - operation of control systems of ailerons, an elevator, rudder and airbrakes,
 - operation of control system of pilot cockpit ventilation,
 - operation of a trimmer,
 - operation of flight instruments,
 - radio communication,
 - safety belts.
3. Check up main wheel tyre and operation of wheel brake.
4. Check up on the left wing:
 - upper and lower wing surfaces,
 - leading edge,
 - upper and lower surfaces of ailerons,
 - deflections of ailerons and their clearances,
 - airbrakes for proper function and locking,
 - fixing of ailerons attachment to wing,
 - clearance in respect of the fuselage,
 - winglets or wingtips installed and locked.
5. Check up function of control systems (of an aileron, airbrake), their connections to corresponding control systems in the fuselage.
6. Check up on the fuselage surface.
7. Check fin battery installed.
8. Check up on a stabilizer, an elevator and rudder:
 - surfaces,
 - deflections and clearances of controls,
 - fixing of joint of the stabilizer attachment to the fin,
 - clearance of the stabilizer with respect to the fin.
9. Check up on the right wing (analogically as for the left wing according to p.4).

3.1.2 Post flight inspection

1. Check up on a sailplane according to subchapter 3.1.1 "Daily inspection" items.
2. Make records in a sailplane log-book.

3.1.3 Ground handling

It is necessary on the ground:

- to fasten the stick with pilot's safety belts,
- a glass of closed pilot cockpit canopy shall be covered with cloth.

Ground-towing

- a sailplane is ground-towed by a car with a special rope ~ 10 m of length having metal rings of certain geometry,
- an end of the rope with rings is attached to towing hook,
- max ground-towing speed in aerodrome is 6 km/h,
- during ground-towing the stick shall be fastened with safety belts and a sailplane cockpit canopy shall be closed.

3.1.4 Storing and transportation

During winter season or if a sailplane is not in use for a long time it is recommended to de-rigging it. Sailplane metal surfaces of connection junctions shall be lubricated with oil. A sailplane shall be stored in a hangar or in a trailer.

If a sailplane is stored in a hangar it is recommended to support its wings.

A sailplane shall be transported just by a special purpose trailer. During transportation of a sailplane its joints shall be protected from dust and dirt. A sailplane being stored in a hangar, trailer and transported shall be cloth-covered.

Caution: Make sure that there are no water in the fin and wing tanks before winter season.

3.1.5 Cleaning and clean keeping

A sailplane shall be washed up with clean water using soft cloth. After washing check up drainage openings for dirt.

Caution: Static pressure holes shall be protected from water during washing.

3.1.6 Rigging and de-rigging of a sailplane

1. A sailplane rigging team consists of 2 persons (or 3 - if a special rigging equipment isn't used).
2. Rigging equipment: fuselage supporter (holder), wing tip supporter (holder ~1.2 m of height).
3. Rigging procedures (fig. 3-2a, fig. 3-2b, fig. 3-2c, fig. 3-2d):
 - clean and lubricate all pins, hubs and connection joint of control systems,
 - put the fuselage onto supporters (in case of absence of them one person shall hold the fuselage). Open the cockpit canopy,
 - fit the spar end (fork) of the left wing (pos. 1) into the fuselage window on the left side and push the wing along longitudinal axis so that pins on the fuselage (pos. 2) enter the connection (pos. 3) sockets in the wing rib. During this procedure the stick, control handles of airbrakes and

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<p>water ballast shall be in such position that pins in control shafts of ailerons and in control shafts of airbrakes and water ballast (pos. 7.8.9) turn at an angle which coincide with cuttings of corresponding shafts end in the wing, thus control of ailerons, airbrakes and water ballast in the left wing connects automatically. Support the left wing end (if there is no supporter one person shall hold the wing end),</p> <ul style="list-style-type: none"> - fit the spar end of the right wing (pos. 4) into the fuselage window on the right side and push the wing along longitudinal axis so that the spar end of the right wing enter the fork of the left spar (pos. 1) and pins on the fuselage enter connection sockets in the wing rib. Connection of control systems of ailerons, airbrakes and water ballast is analogical to connection of the left side of the wing, - place both spar fixation pins (pos. 5) into hubs (pos. 6) fully (after adjustment of hubs on the ends of the left and right spar) and fix pins handles with pins-fixators (pos. 10) which are fitted into special forks (pos. 11) on inside board of the fuselage. In order to improve an aerodynamic cleanness of surface a connection slot between fuselage and wing later is glued with sticky tape. <p>Caution: it's not allowed to rigg or de-rigg wings with 18m wingtips or winglets.</p> <p>Note: fixation pins of spars have to enter into spars hubs smoothly by pushing them with hands without applying of any significant force or other devices. If pins stop interrupt assembling and check pins and hubs for proper cleaning and damages of their surfaces.</p> <ul style="list-style-type: none"> - connect left and right wing tips: for this screw bolt M5 into fixator (pos.12) of left and right wing and pull them out until the stop is reached and hold them in lifted position, - fit spars ends of wing tips (pos. 13) into recesses correspondingly in end ribs of left and right wings and push them to the end until hubs in ribs of wings tips (pos. 14) pull on the corresponding them connection pins in end ribs of wings (pos. 15) and coverings of wings tips and wings ends come together without any slots. When connecting of wing tips of 18 m variant it is necessary to hold the ailerons of wings tips and wings in such position that tongues on ailerons ends of wings tips (pos. 17) coincide with corresponding sockets (pos. 16) on the ends of wings ailerons, then ailerons control of wings tip from the main wings ailerons connect automatically. In order to improve an aerodynamic cleanness of surface a connection slot between wings tips and wings later is glued with sticky tape. - push fixators down into the seat flush with the wing surface (wings tips thus fix automatically), unscrew bolts from fixators and tape over the fixator with a sealing tape. <p>Caution: check up the reliability of wings tips connection to wing trying to pull out them by end applying force of 10-20 kg. With fixators down they have to hold the wings tips reliably not allowing any their moves. If any of wings tips came out or the slot between tip and wing in their coverings connection place has increased separate the ends, find out the reason and eliminate it.</p> <ul style="list-style-type: none"> - when the stabilizer is being connected (fig. 3-3a, fig. 3-3b) an elevator shall be set in neutral position, - put on the stabilizer with an elevator so that protrudes on the elevator's left and right sides (pos. 2) enter the recesses of control lever of the elevator (pos. 1) and two hubs in spar of the stabilizer (pos. 4) pull on the pins (pos. 3) fully, thus control of the elevator connects automatically, - set a connection bolt (pos. 6) through an opening in the stabilizer from above and screw it into thread of hub (pos.5) fully with a special spanner. Connecting the stabilizer the fixator (pos. 7) fixes the connection bolt automatically. 			
Date: 2004 09 24	Author: K. Juočas	Rev.6	

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<p>Note: After a sailplane rigging is finished check up an operation of control systems of an elevator, ailerons, airbrakes and water ballast. Also check up wings for loosenings with respect to fuselage in plane of wing chords (forward – backward). If there are loosenings wing shall be separated from fuselage and hubs in wings root ribs (fig. 3-2a, pos. 3) shall be adjusted.</p> <p>4. All the main de-rigging procedures of a sailplane shall be done in the opposite order.</p> <p>Warning: Before unscrew the connection bolt of the stabilizer unfix the bolt (fig. 3-36 pos.7).</p> <h3>3.2 Lubrication system</h3> <p>Lubricants:</p> <ul style="list-style-type: none"> (a) Grease - the greases we recommend are lithium based pressure-resistant anti-corrosion greases like AeroShell Grease 33 or lithium-soap greases (multi-purpose greases for rolling element bearings). The same greases can be used for long time preservation of the components. (b) Oil - in a case if needed, it is recommended to use oils conforming to the SAE 5W-40 requirements. (c) To grease water ballast tank valves use acid free Vaseline. <p>Lubrication scheme is shown in fig. 3-4.</p> <ul style="list-style-type: none"> 1. Stick joint. 2. Pedals joint. 3. The canopy opening and emergency jettison system. 4. Shafts of ailerons, and airbrakes and hinges of rods. 5. Levers and hinges of airbrakes. 6. The wing water ballast tank valve and sealing. 7. Hinges of ailerons hanging up and connection joint of lever. 8. Hinges of hanging up of ailerons of wing tips. 9. Hinges of elevator hanging up and connection joint of lever. 10. Hinges of rudder hanging up and connection joint of lever. 11. Towing hook. 12. Main landing gear. 13. Tail wheel. <p>When re-lubricating, clean old oil or grease before applying new.</p> <h3>3.3 Adjustment</h3> <h4>3.3.1 Adjustment of airbrakes</h4> <p>If airbrakes (fig. 3-5, pos. 1) pump out occurs in flight it is necessary to tighten springs of lids (pos. 2) by help of nuts (pos. 3). Check up on springs proper tightening lifting the lid upward. The lid has to lift up with force not less than 13.5 kg.</p>			
Date: 2004 09 24	Author: K. Juočas	Rev.6	

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3.3.2 Adjustment of main wheel brake control system

Adjustment of control system of landing gear brake (fig. 2-12a) is performed doing these operations:

- disconnect the plate pos. 10 from the lever pos. 5,
- loosen the nut pos. 11,
- turn up the plate pos. 10 into required position,
- fix the plate pos. 10 by screwing the nut pos. 11,
- connect the lever pos. 5.

3.3.3 Adjustment of cockpit canopy emergency jettison system

Cockpit canopy emergency jettison system (fig. 2-18a, fig. 2-18b) is adjusted by help of bolts (pos. 6). By screwing of the bolts frame contour of a cockpit canopy is coincided with contour of frame of cutting of fuselage cockpit canopy. A cockpit canopy has to lay on the fuselage without any protrudes. A slot between a canopy frame and cutting on the fuselage shall be $0.5 \div 1$ mm along side all perimeter.

Force on the handle of canopy emergency jettison (pos. 1) while opening the canopy shall be $5 \div 13$ kG.

3.3.4 Adjustment of rudder control system

Adjustment of wires (fig. 2-8a, fig. 2-8b). Control cables (pos. 4) are adjusted by help of tenders (pos. 3) (zone A). Allowed turns out for each tender tip –no more than 3 thread turns. Stress force of cable after stressing is 1.5 ± 0.1 daN.

After adjustment of cables tenders are fixed with fixation wire $\phi 1.0$ mm (pos. 10). Typical fixing scheme of a tender is shown in fig. 2-8b (zone A).

Inclination angle of pedals in neutral position (106°) is checked with goniometer by pressing its edge against pedal plane.

In order to avoid of differentiation of rudders deflection an axis of the bellcrank in the fuselage (pos. 6) shall be perpendicular to a sailplane axis.

Adjustment of the rod: the rod is adjusted by turning of rod end. After adjustment make sure that the rod end does 't screw out of bounds of control opening. The end nut (pos. 12) shall be screwed up and fixed with spring washer (pos. 13) and crown nut (pos. 15) for connection of the rod to the control shall be fixed with wire pin. Force keeping pedals in control system (with rudder connected) measured by a dynamometer at level of pedals' upper cross pipes and at the initial pedals motion moment has to make up 2.5 ± 0.2 daN. Motion of pedals shall be smooth and even.

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<p style="text-align: center;">3.4 De-rigging and rigging of sailplane parts</p> <p style="text-align: center;">3.4.1 De-rigging and rigging of ailerons</p> <p>An aileron of wing tip L = 1650 mm is de-rigging and rigging doing these operations (fig. 3-6):</p> <ol style="list-style-type: none"> 1. Removal of the aileron: <ul style="list-style-type: none"> - take off wire pins (pos. 3), - take off washers (pos. 2), - take away pins (pos. 1). 2. Setting of an aileron: <ul style="list-style-type: none"> - fit the aileron, - slip pins(pos. 1), - put on washers(pos. 2), - fix the pins with wire pins (pos. 3). <p>Wing aileron is taken away doing these operations (fig. 3-7):</p> <ol style="list-style-type: none"> 1. De-rigging of control: <ul style="list-style-type: none"> - take away a rivet (pos. 1), - take away intermediate hubs (pos. 2). 2. Removal of an aileron: <ul style="list-style-type: none"> - unfix pins of hanging up joints removing wire pins (pos. 5), - take off washers(pos. 4), - take away pins (pos. 3). <p>Wing aileron is set doing these operations:</p> <ol style="list-style-type: none"> 1. Setting of an aileron: <ul style="list-style-type: none"> - fit an aileron into hanging up joints, - push through pins (pos. 3), - put on washers(pos. 4), - fix the pins with wire pins (pos. 5). 2. Connect control: <ul style="list-style-type: none"> - set a rod into control bracket, - fit intermediate hubs (pos. 2), - push through the rivet and riveting it (pos. 1). <p>Note: riveting shall be done according to repair technology.</p> <p style="text-align: center;">3.4.2 De-rigging and rigging of a rudder (fig. 3-9a, fig. 3-9b)</p> <p>Note: full disconnection of rudder from fin is possible just after peeling off tightening tapes (pos. 4, pos. 5, pos. 6).</p> <p>A rudder is removed in such order:</p> <ul style="list-style-type: none"> - peel off tightening tapes (pos. 4, pos. 5), - remove a pin from a rudder control rod, - turn a rudder sideways, peel off plastic tape (pos. 6) from the rudder nose, - remove wire pins from three pins of hanging up of a rudder (pos. 7) and take out them. While removing a wire pin from the third pin keep previous rudder axis, 			
Date: 2003 06 02	Author: K. Juočas		

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<p>- remove the rudder. Assembling of a rudder shall be done in the opposite order. Note: before sticking plastic tape (pos. 6) again surfaces to be glued shall be cleaned off from an old glue remainders. Use glue of 88 H type.</p>			
<h3>3.4.3 De-rigging and rigging of an elevator</h3> <p>1. Operations used for de-rigging of an elevator (fig. 3-10):</p> <ul style="list-style-type: none"> - take away wire pins (pos. 3), - take away washers(pos. 2), - pull out pins (pos. 1). <p>2. Operations used for rigging of an elevator:</p> <ul style="list-style-type: none"> - fit an elevator into joints of hanging up, - push through pins (pos. 1), - put on washers (pos. 2), - fix the pins with wire pins (pos. 3). 			
<h3>3.4.4 De-rigging and rigging of a trimmer</h3> <p>It is possible to de-rigging and rigging a trimmer through an inspection hatch. Taking to pieces of springs is done when they are squeezed as much a possible. Other trimmer parts are not supposed to be de-rigging.</p>			
<h3>3.4.5 De-rigging and rigging of a cockpit canopy</h3> <p>1. De-rigging of a cockpit canopy (fig. 2-18a, fig. 2-18b):</p> <ul style="list-style-type: none"> - unfix a cockpit canopy by pulling a canopy emergency jettison handle (pos. 1) up and keeping it from falling down, - take away the cockpit canopy. <p>2. Rigging of a cockpit canopy:</p> <ul style="list-style-type: none"> - squeeze a spring (pos. 3) by pulling a handle (pos. 4) down and fixing it in intermediate position, - put on the cockpit canopy, - fix the cockpit canopy by a fixator (pos. 2) pushing the canopy emergency jettison handle (pos. 1) forward till support, - correct the cockpit canopy position with adjustment bolts (pos. 6), - unfix the spring (pos. 3) switching the handle (pos. 4) into working position. <p>Warning: after rigging of a cockpit canopy make sure the spring device is switched into working position.</p>			
<h3>3.4.6 De-rigging and rigging of main landing gear wheel</h3> <p>De-rigging of main gear wheel (fig. 3-11) is performed by theses operations:</p> <ul style="list-style-type: none"> -unbend edge of the supporting plate (pos. 1) of gear door from head of the bolt (pos. 2), -unscrew the bolt (pos. 2), -unscrew bolts (pos. 13) of the hydraulic cylinder (pos. 12) and remove the plate (pos. 14), 			
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<p>-remove an axle of gear wheel (pos. 4) removing together hubs (pos. 5, pos. 6) and support plate (pos. 7) of the main gear door,</p> <p>-remove the wheel,</p> <p>-leave the holder (pos. 3) with the hydraulic cylinder (pos. 12) in connected position together with the support (pos. 15),</p> <p>-unscrew bolts (pos. 8) of the rim (pos. 10), remove the disk (pos. 9), disconnect sides of rim body and remove tyre (pos. 11) together with inner tube.</p> <p>Rigging of wheel and fastening of it is performed in opposite order.</p> <p>The main wheel tire pressure is 2,3 ...2,5 bar.</p> <p>Remarks:</p> <ol style="list-style-type: none"> 1. Before screwing up the bolts (pos. 8) which connect the sides of the rim body (pos. 10) and the disk (pos. 8), it is necessary to move the tyre slightly side-ways and superpose marks A on the tyre and the rim. 2. After mounting a wheel check up the gap B between hubs (pos. 5 and pos. 6). The gap B shall be equal to $0,25 \div 0,3$ mm. <p>• Wheel Brake</p> <p>The main wheel brake is a Parker / Hannifin, Cleveland hydraulic disc brake.</p> <p>Brake assembly #30-9A.</p> <p>Disc #164-01700.</p> <p>Lining #66-106.</p> <p>Master cylinder #10-55A.</p> <p>Refer to the Technicians Service Guide. Cleveland Wheels and Brakes from Parker Aerospace for more information.</p> <p style="text-align: center;">Removal and Installation</p> <p>Remove the wheel brake by cutting the safety wire and unscrewing the two 1/4 dia. AN bolts that hold the brake shoe backing plate. Remove the backing plate and slide the brake assembly out of the torque plate. Unless you intend to remove the brake unit completely do not unscrew the hydraulic hose.</p> <p>Note: When the backing plate is removed do not actuate the wheel brake. Doing so will force the brake piston out and hydraulic fluid will be lost.</p> <p style="text-align: center;">Rigging</p> <p>The wheel brake actuation point is adjusted by the threaded rod located on the hydraulic master cylinder. Loosen the jam nut and rotate the threaded rod to lengthen or shorten the linkage as necessary. With proper adjustment the wheel brake should engage with full deployment of the air brakes.</p> <p style="text-align: center;">Wear Limits</p> <p>The minimum replacement thickness for the brake linings is 0.100 in. (2.54 mm).</p> <p>Part number 66-106.</p> <p>The minimum thickness for the disc is 0.171 in. (4.241 mm).</p> <p>Disc part number is 164-01700.</p> <p>The torque of the 1/4 dia. bolts for the brake shoe backing plate is 60 in. lb. (6.8 Nm) Dry torque.</p> <p>See the Technician's Service Guide, Cleveland Wheels and Brakes as referenced in Section 11 for further details.</p>			
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Servicing the Hydraulic Fluid Reservoir

If hydraulic fluid is visible in the hose going from the reservoir to the master cylinder then fluid can be added through the top of the reservoir. Be careful not to block the vent hole in the reservoir cap when reassembling.

If the hydraulic fluid is not visible in the reservoir or in the hose going to the master cylinder it is likely that air has entered the system. The system should then be serviced from the bottom to the top using the following method.

A simple filling device is a funnel with a length of plastic tubing attached that has an inside diameter of 1/4 in.(6 mm). Fill the funnel about 3/4 full with clean brake fluid. Let the fluid push the air out of the hose. Remove the dust cap from the servicing nipple on the brake assembly and slip the hose over it. Unscrew the servicing nipple about 3/4 of a turn. Be very careful that no air enters the line during these steps. Insure there is enough fluid in the funnel. By holding the funnel above the level of the fluid reservoir, hydraulic fluid will flow into the brake lines. Continue filling until the reservoir is about 2/3 full. Tighten the nipple and remove the filling device. Install the dust cap on the nipple.

If there is fluid in the reservoir the following method can be used to bleed air out. Connect a hose from the bleeder nipple on the brake assembly to a clear container with brake fluid in it. Apply pressure to the system via the air brake handle and open the bleeder nipple. Repeat the process of opening and closing the bleed nipple as you apply pressure to the system. If the hose stays submerged in the fluid air should not enter the system. Be sure not to run out of fluid in the reservoir.

An aid to bleeding air from the system is to remove the master cylinder from its mounts but keep the hoses connected. Turn it so the chrome rod is pointing up at about a 45 deg. angle. Compress the chrome rod several times and watch to see if air bubbles come out of the cylinder and travel through the hose toward the reservoir. Continue compressing the rod till no further air is seen.

The system is considered bled when the chrome rod of the master cylinder moves about 3/16 in. (5 mm) before meeting with very high resistance. It may take several bleeding cycles to rid the system of air. If you are not able to meet the 3/16 in. (5 mm) dimension the master Cylinder may be defective.

If the wheel brake becomes "soft" or weak it may be that air has entered the fluid line.

Warning: Use only brake fluid of a mineral oil base. Mil-H-5606 fluid, ESSO UNIVIS J-13 or Aeroshell fluid 4.

It is recommended to change hydraulic fluid every 10 years.

When changing the hydraulic fluid check if the expiry date of the fluid you intend to use is good for the next ten years.

To change the fluid, open the bleeding valve on a brake caliper and let all fluid to go out. Help by actuating brake handle in a cockpit several times.

Fill system with a new hydraulic fluid as it is described above.

Warning: hydraulic fluid is dangerous for the physical health, use with care! Pay attention to the warnings on the container of the fluid. Do not mix different hydraulic fluids. Automobile brake fluids of ester base will quickly destroy the seals. Do not use them!

3.4.7 De-rigging and rigging of tail wheel

A tail wheel (fig. 3-12) is de-rigging doing these operations:

- unscrew the bolt (pos. 3),
- pull out an axle of wheel (pos. 4),
- remove the wheel (pos. 5).

Rigging of the wheel shall be done in opposite order. Tail wheel pressure 1,8 ... 2,0 bar.

3.4.8 Taking out and mounting of an instrument panel

Operations to be done to take out an instrument panel (fig. 3-13):

- unscrew four bolts (pos. 1) attaching an instrument panel (pos. 2) to a cover (pos. 3),
- disconnect pipes from the instrument panel,
- remove the instrument panel (pos. 2).

Mounting of the instrument panel shall be done in opposite order. for pitot and static systems lines coding refer to paragraph 2.4.1.

3.4.9 Taking out and mounting of pilot cockpit floor

Cockpit floor (fig. 3-14) consists of two removable parts: a stick hood (pos. 1) and a hood of cockpit bottom (pos. 2).

Removal of the stick hood:

- unscrew four bolts (pos. 3),
- take away the stick hood.

Removal of the hood of a cockpit bottom:

- separate tapes (pos. 4),
- take away the hood of a cockpit bottom (pos. 2).

Mounting shall be done in an opposite order.

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<div>3.5 Illustrations</div>			
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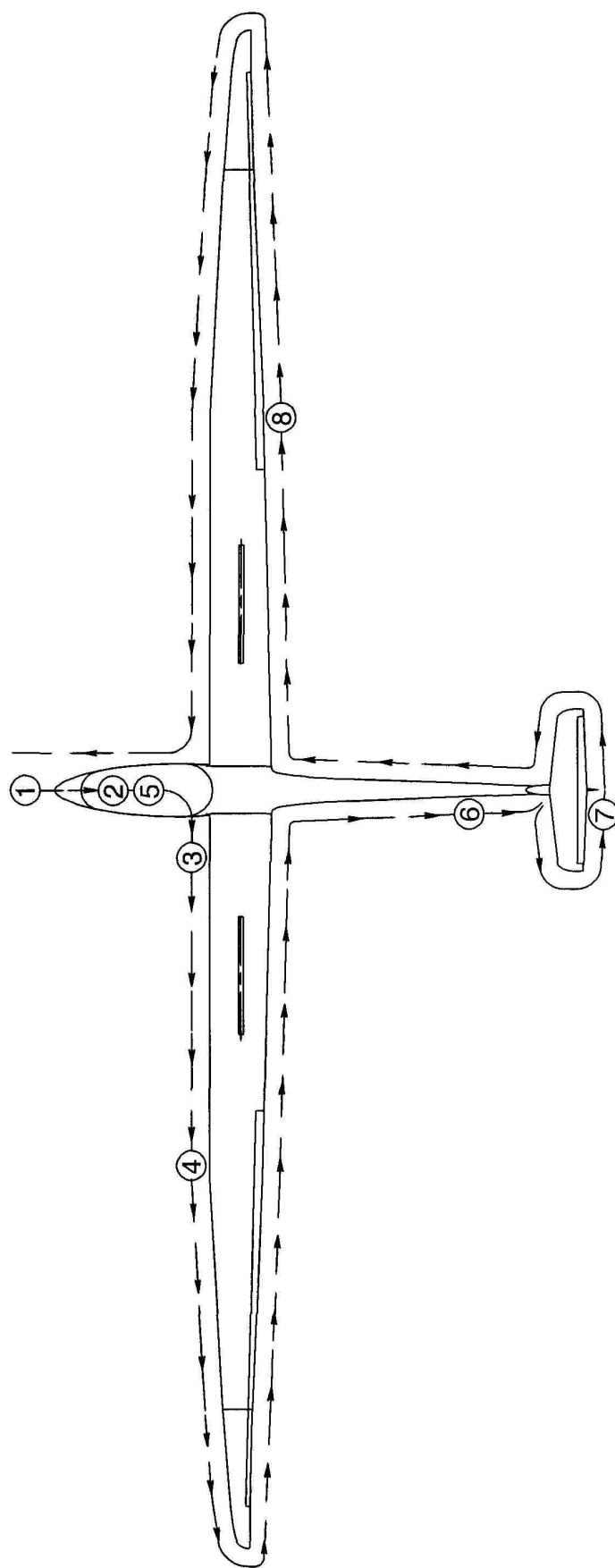


Fig.3 - 1. Scheme of preflight inspection

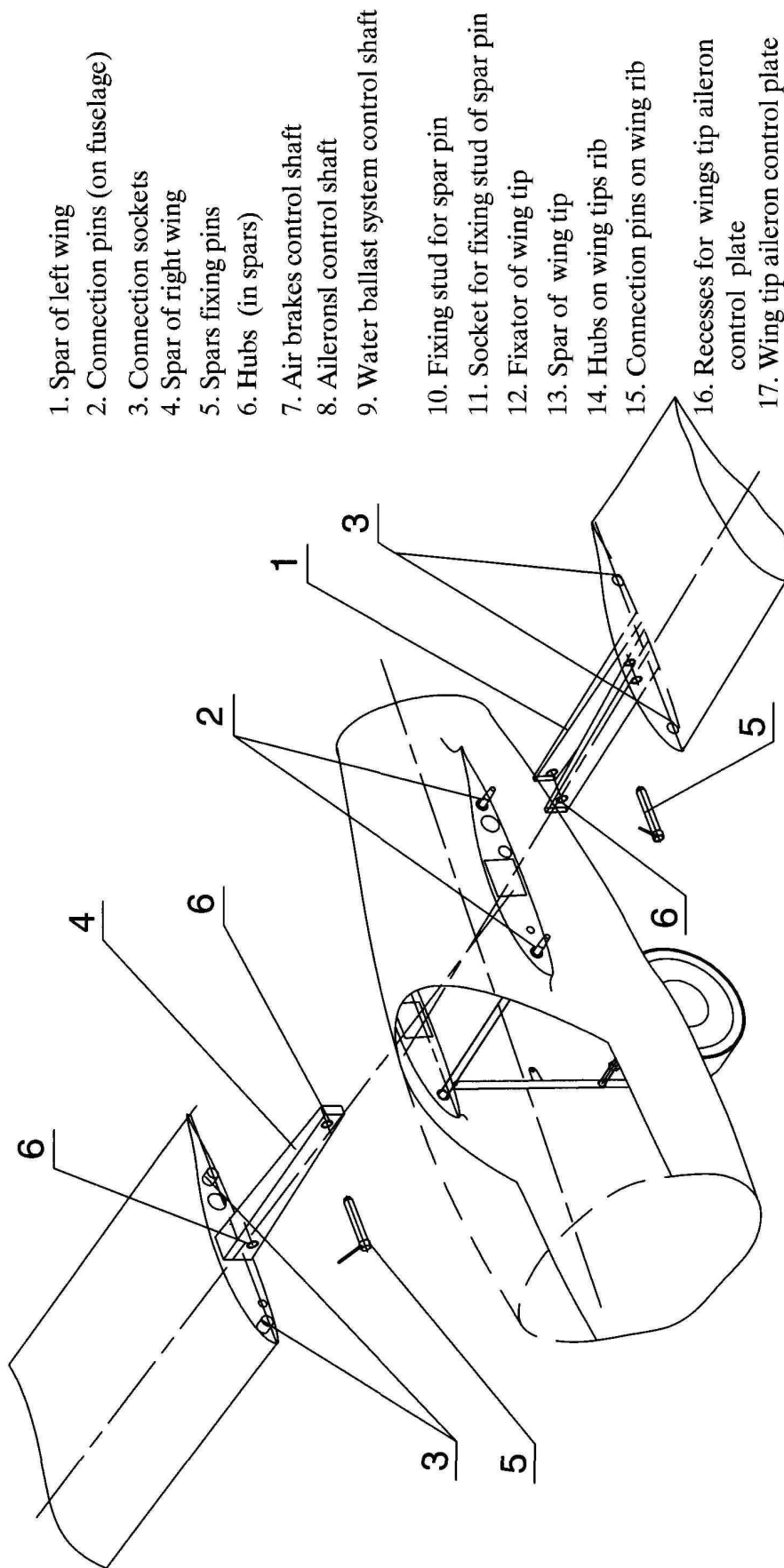


Fig.3 - 2a. Rigging of wing

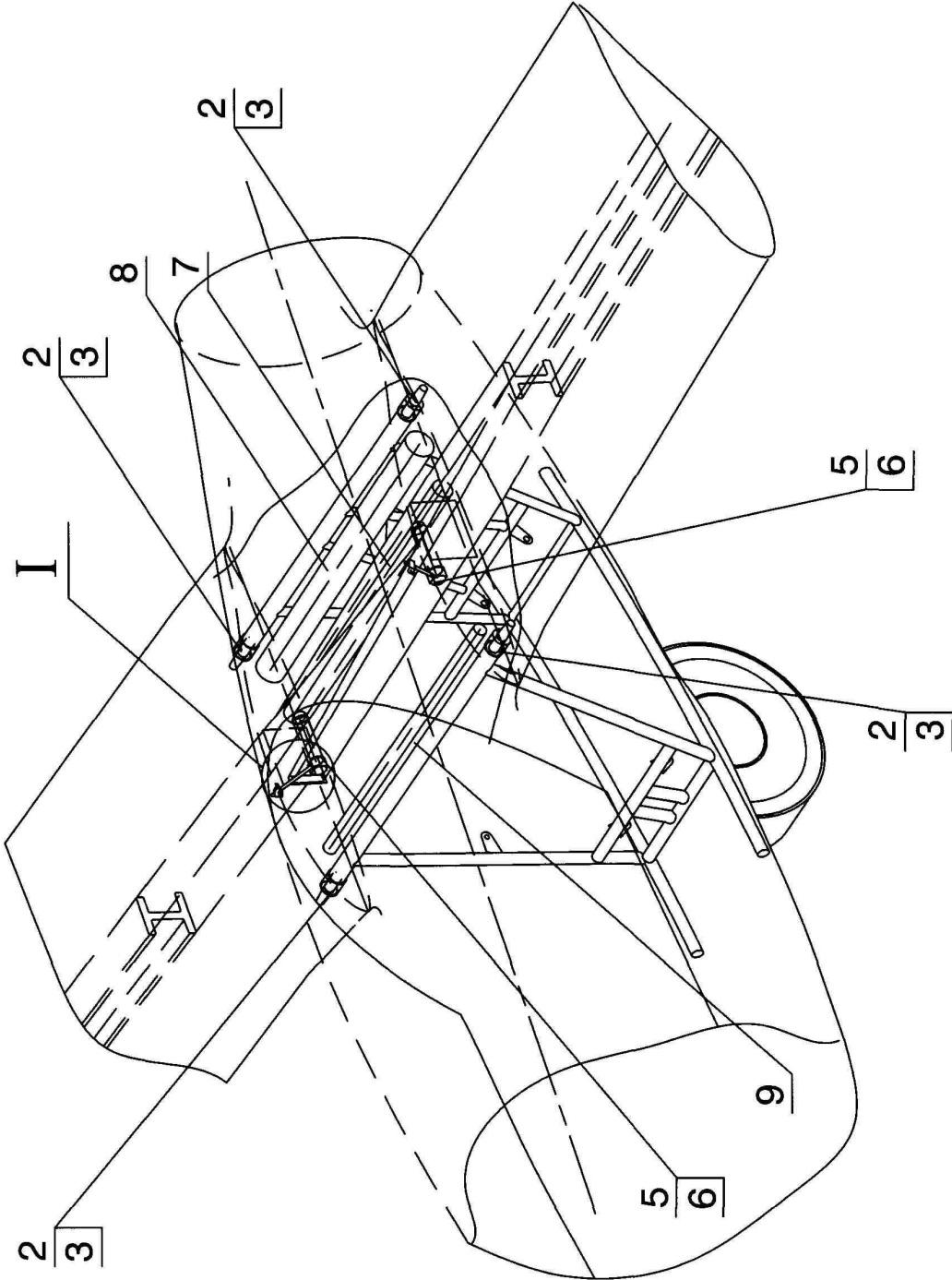


Fig.3 - 2b. Rigging of wing

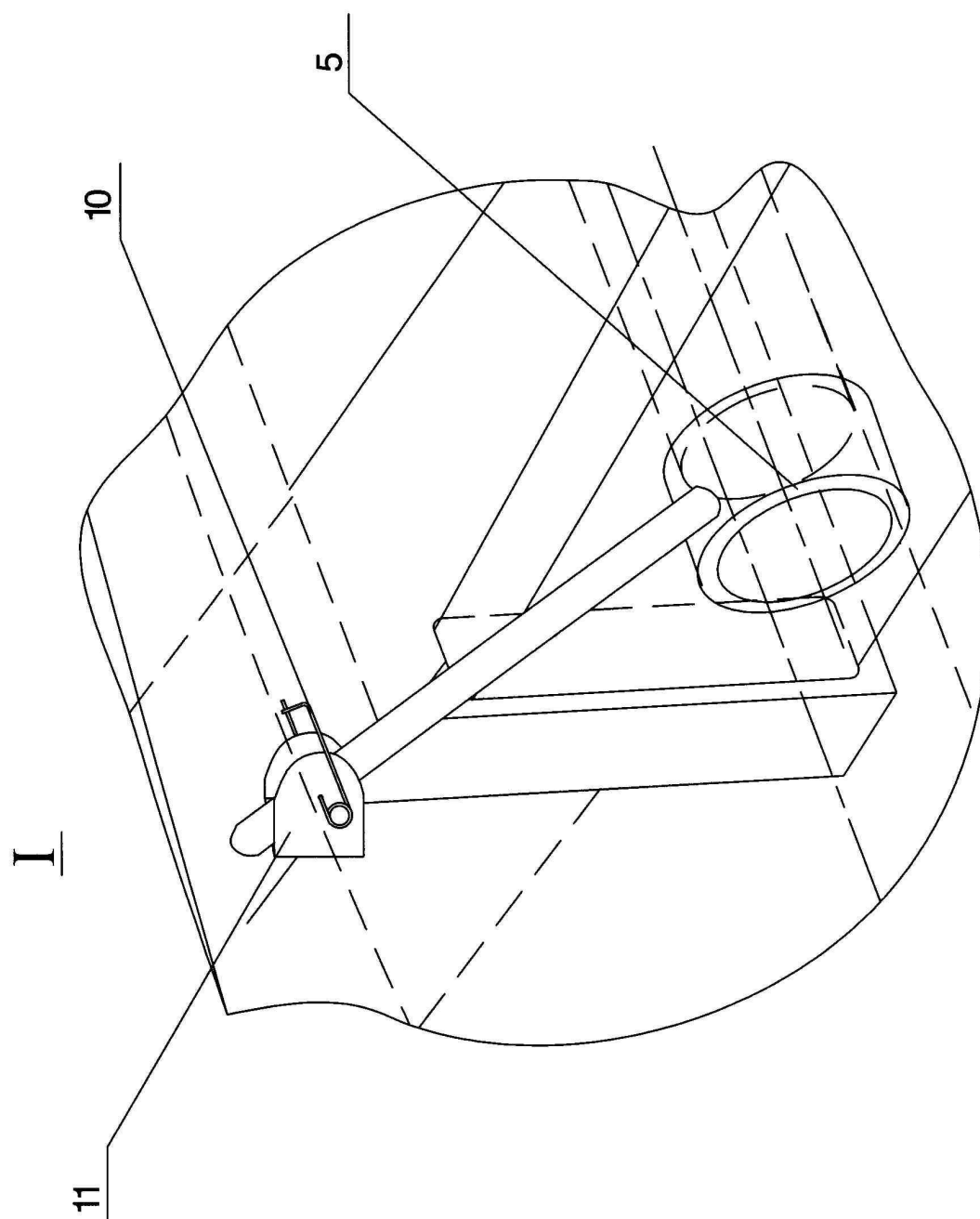


Fig.3 - 2c. Rigging of wing



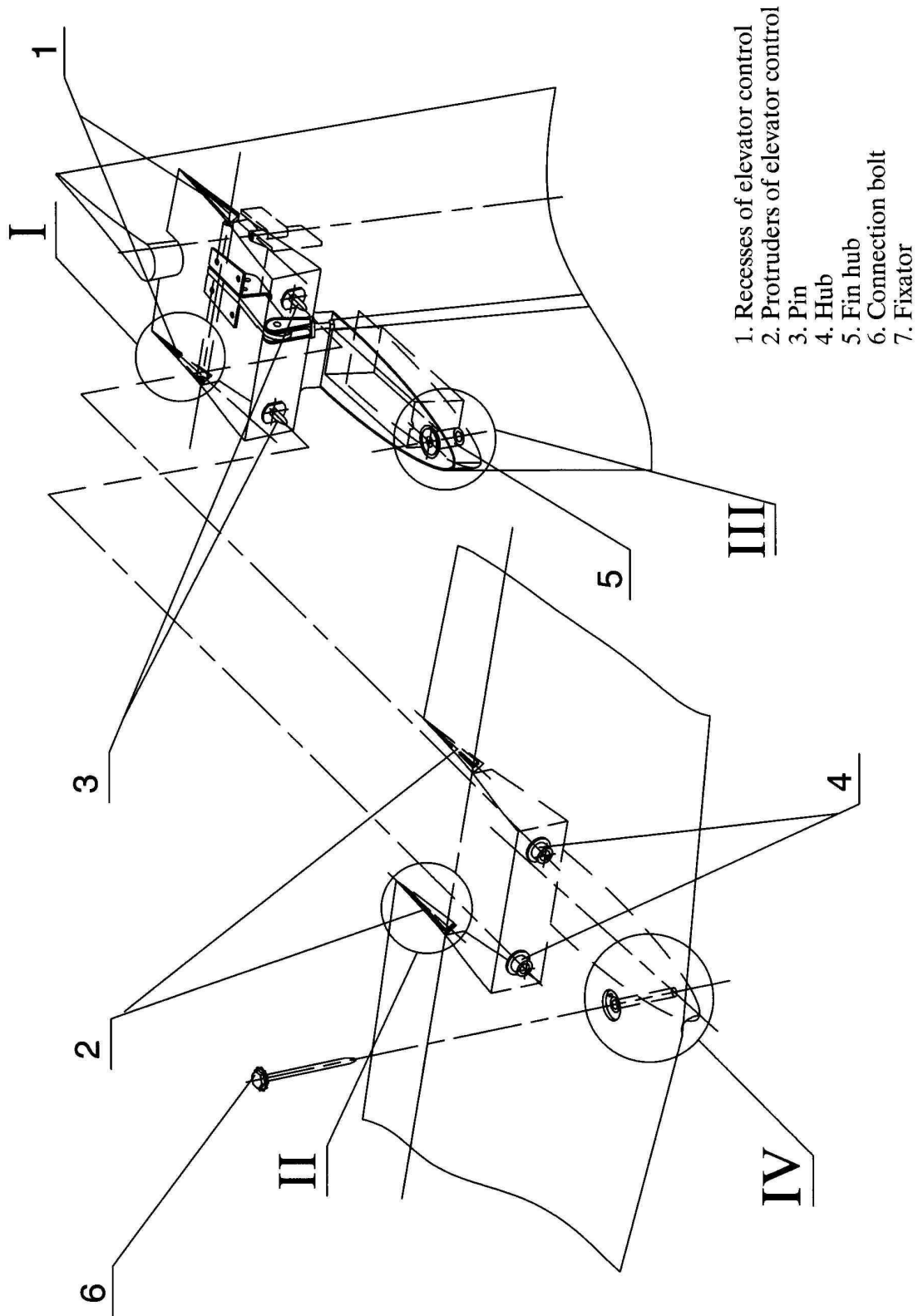
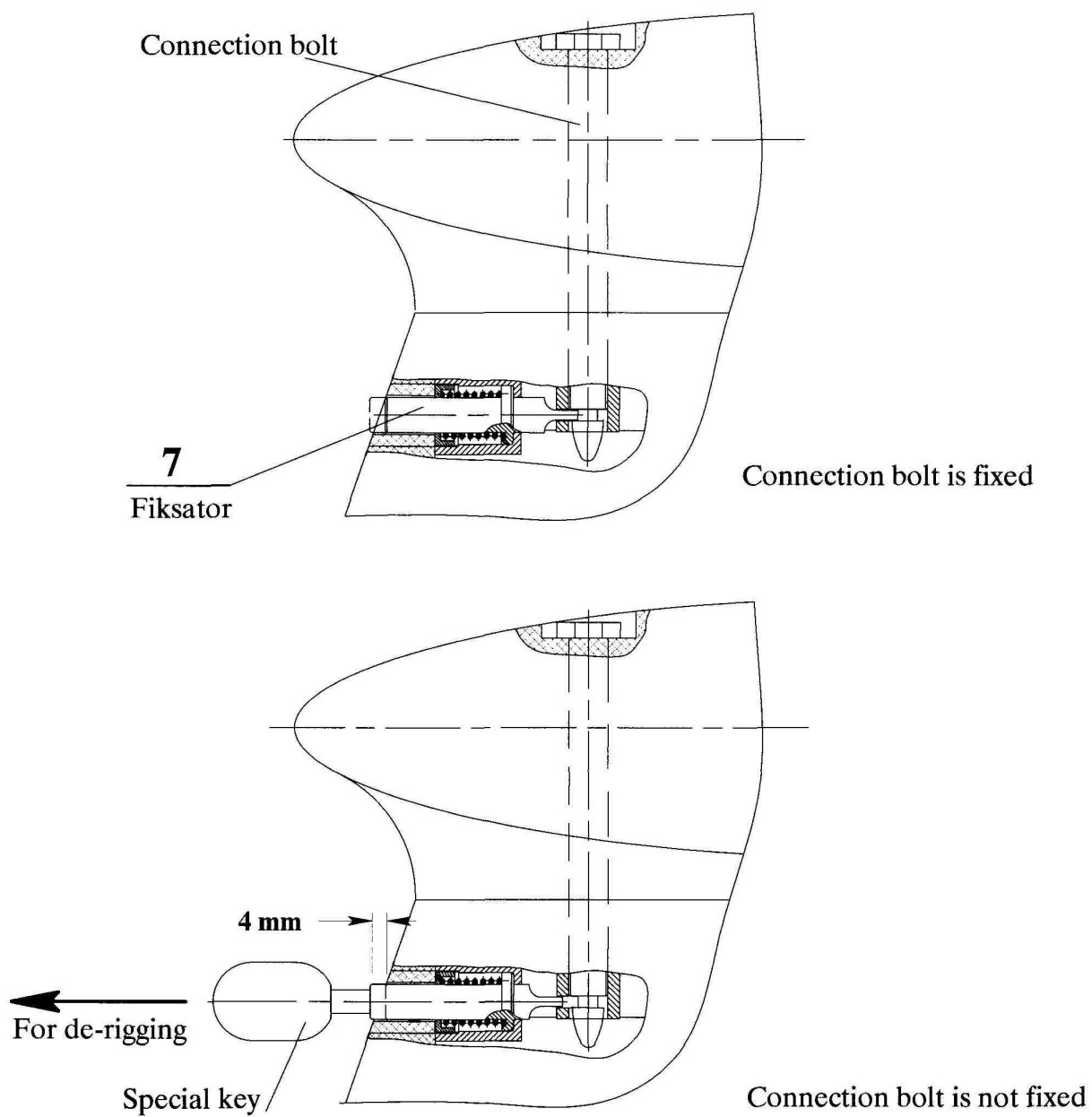


Fig.3 - 3a. Mounting of stabilizer on fin

III, IV



I,II

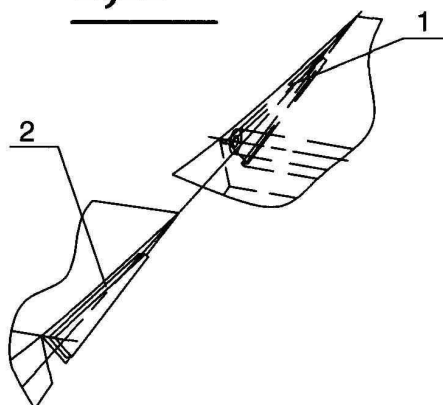


Fig.3 - 3b. Mounting of stabilizer on fin

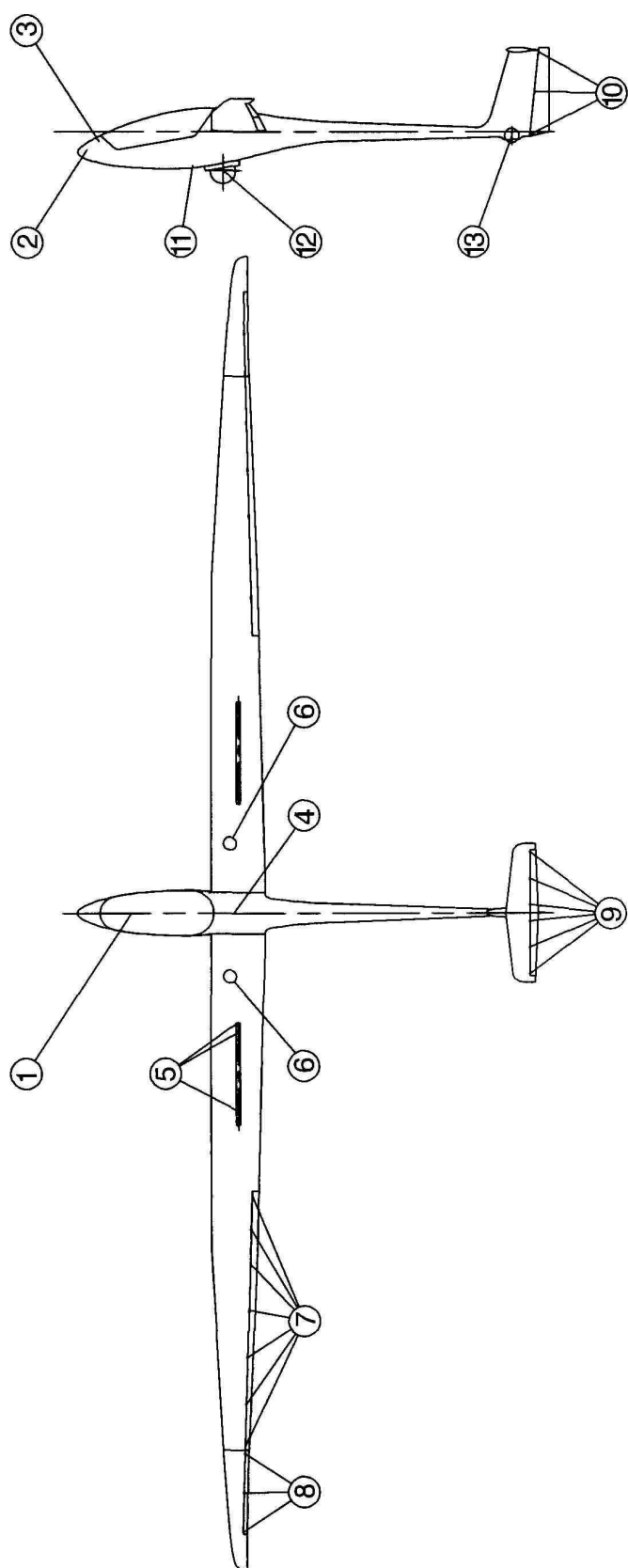


Fig.3 - 4. Lubrication scheme

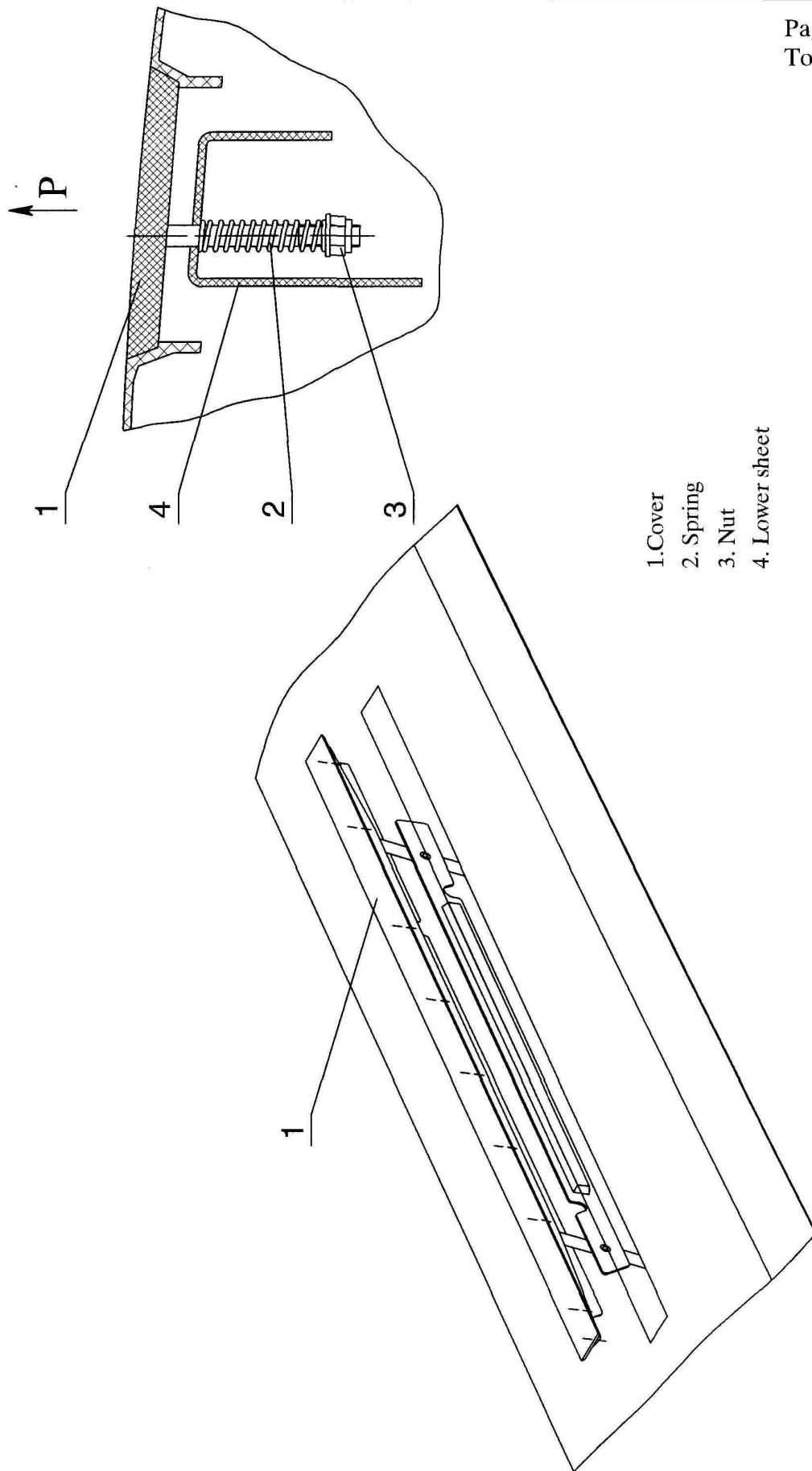


Fig.3 - 5. Adjustment of air brakes covers

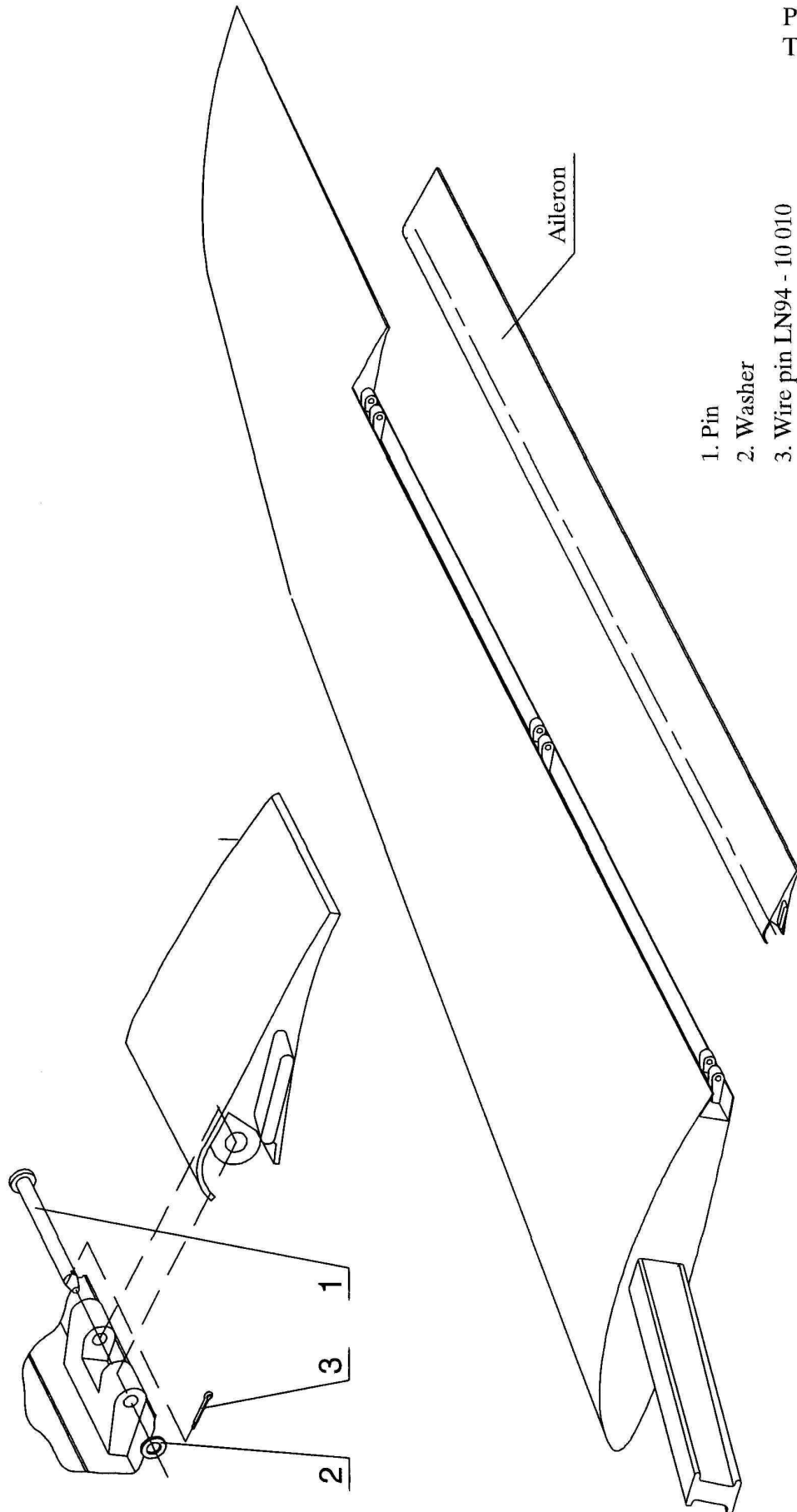


Fig. 3 - 6. Mounting of aileron of wing tip $L=1650$ mm

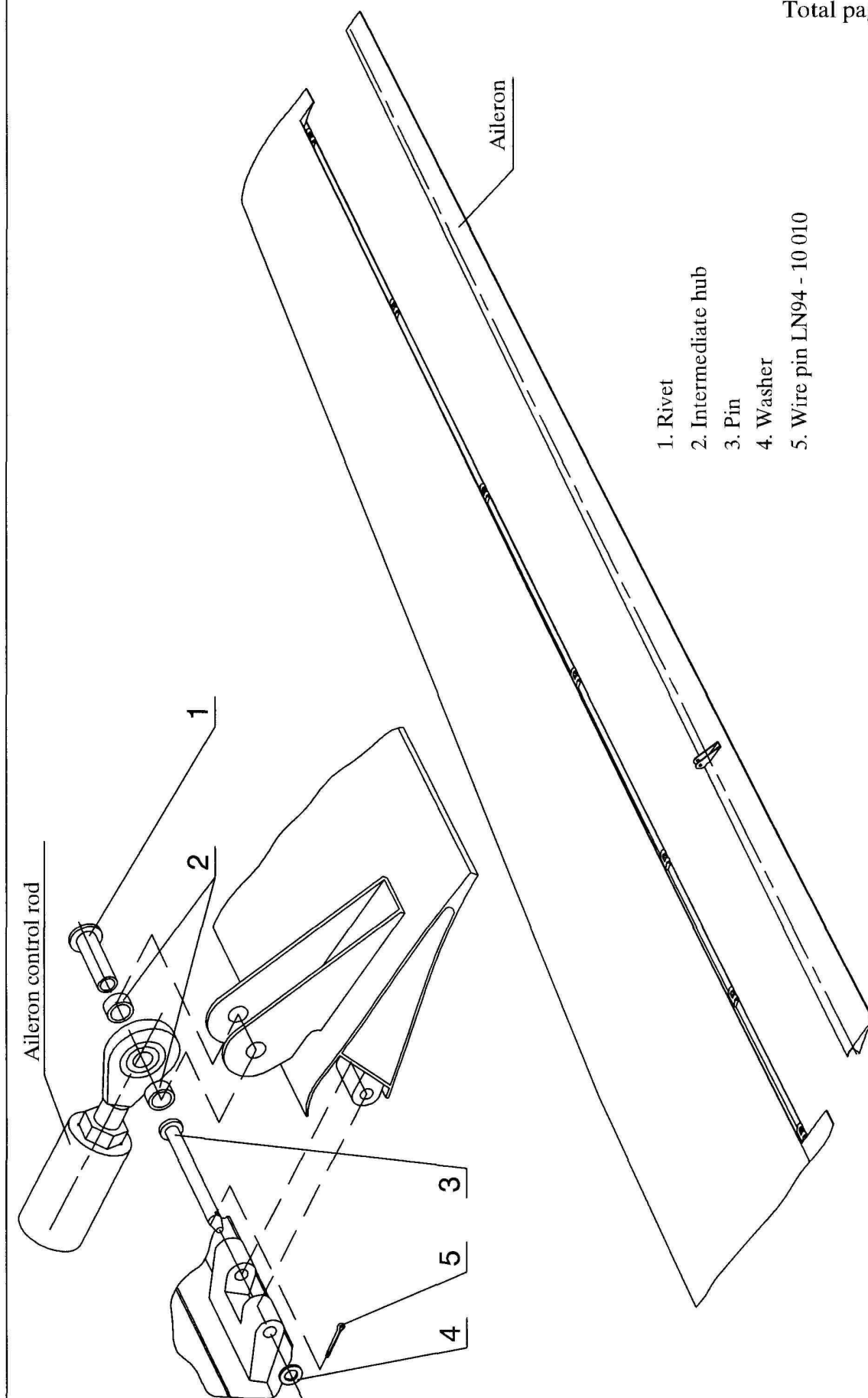


Fig 3 - 7. Mounting of ailerons

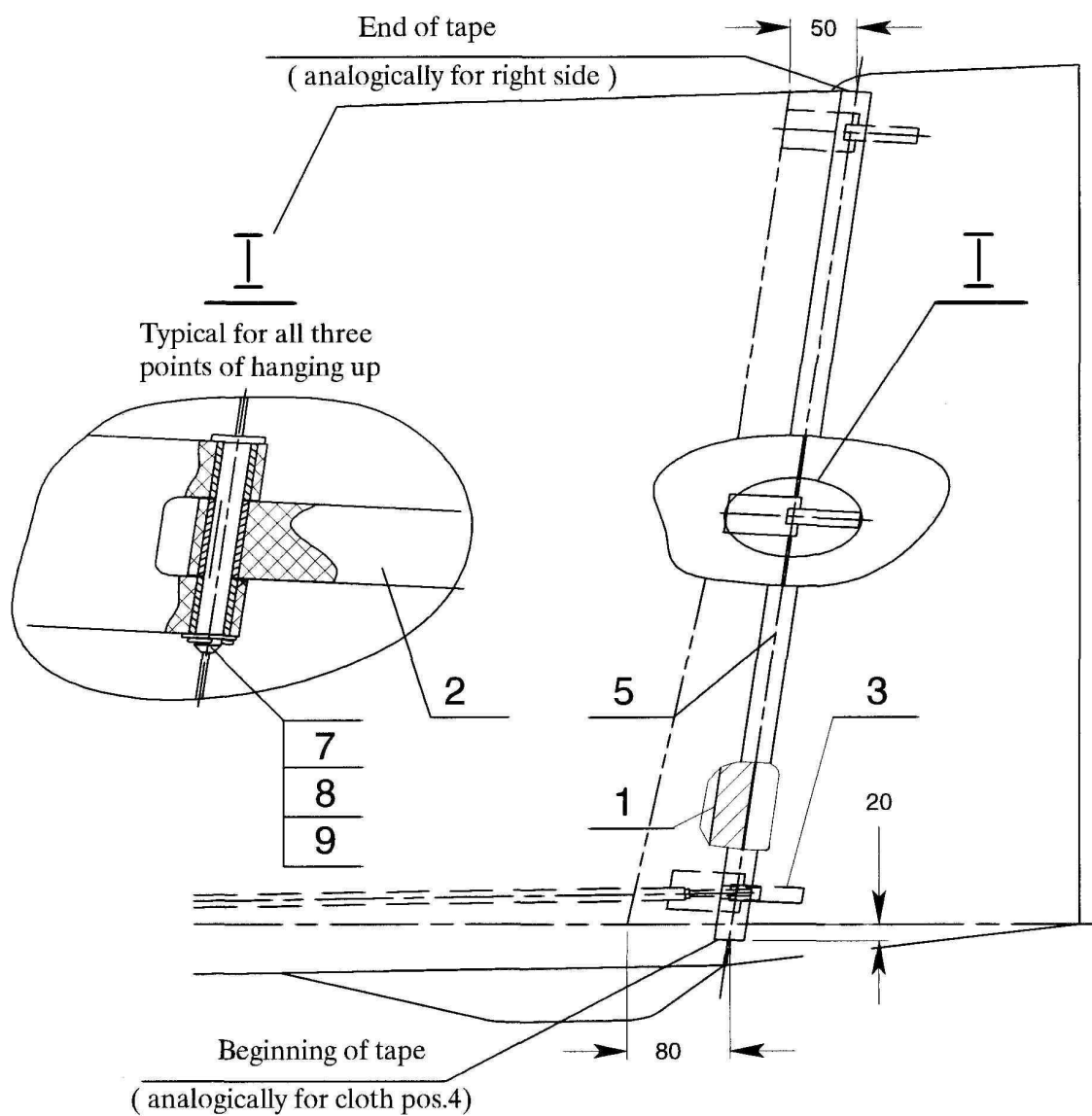


Fig.3 - 9a. Hanging of rudder

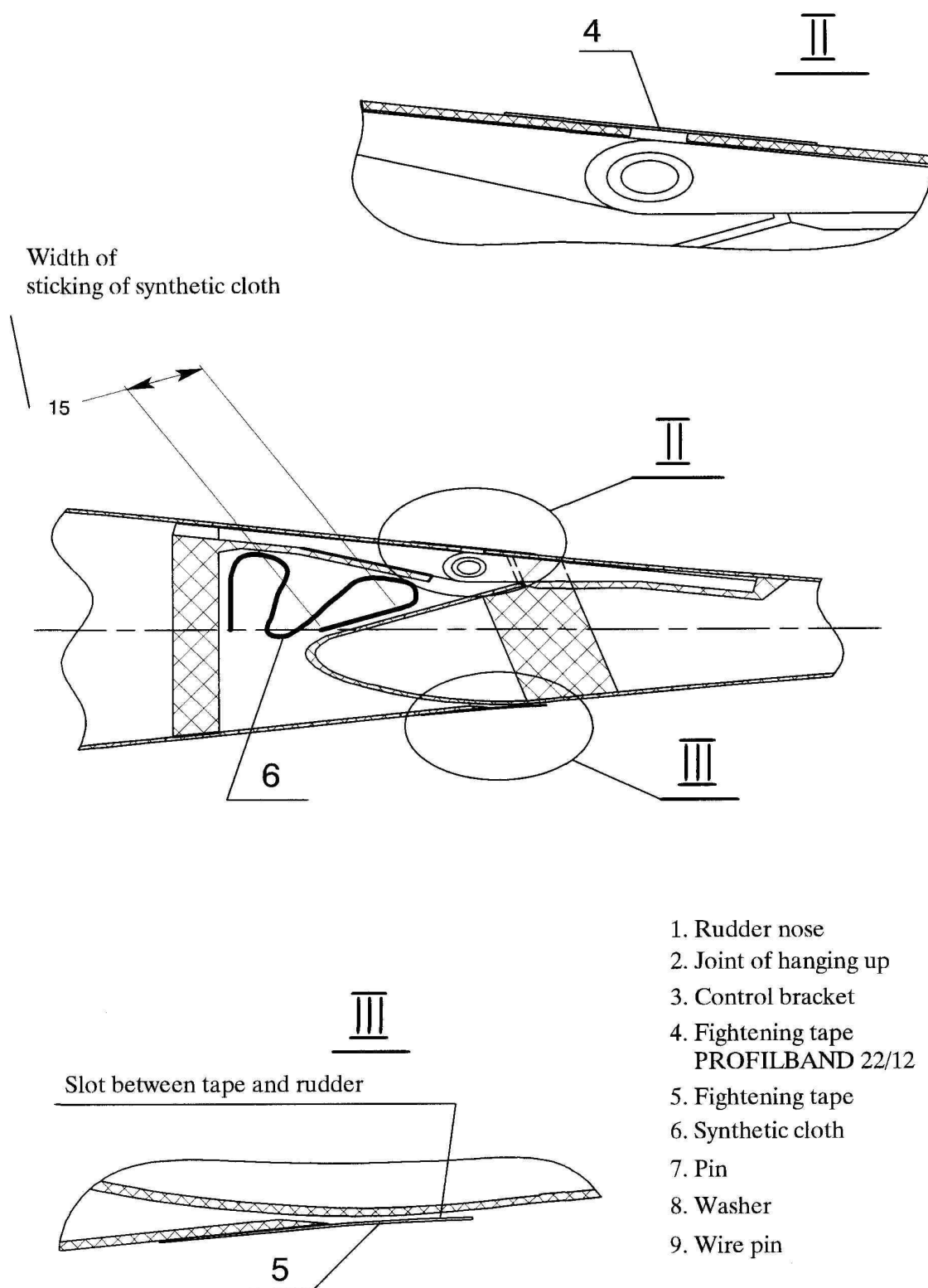
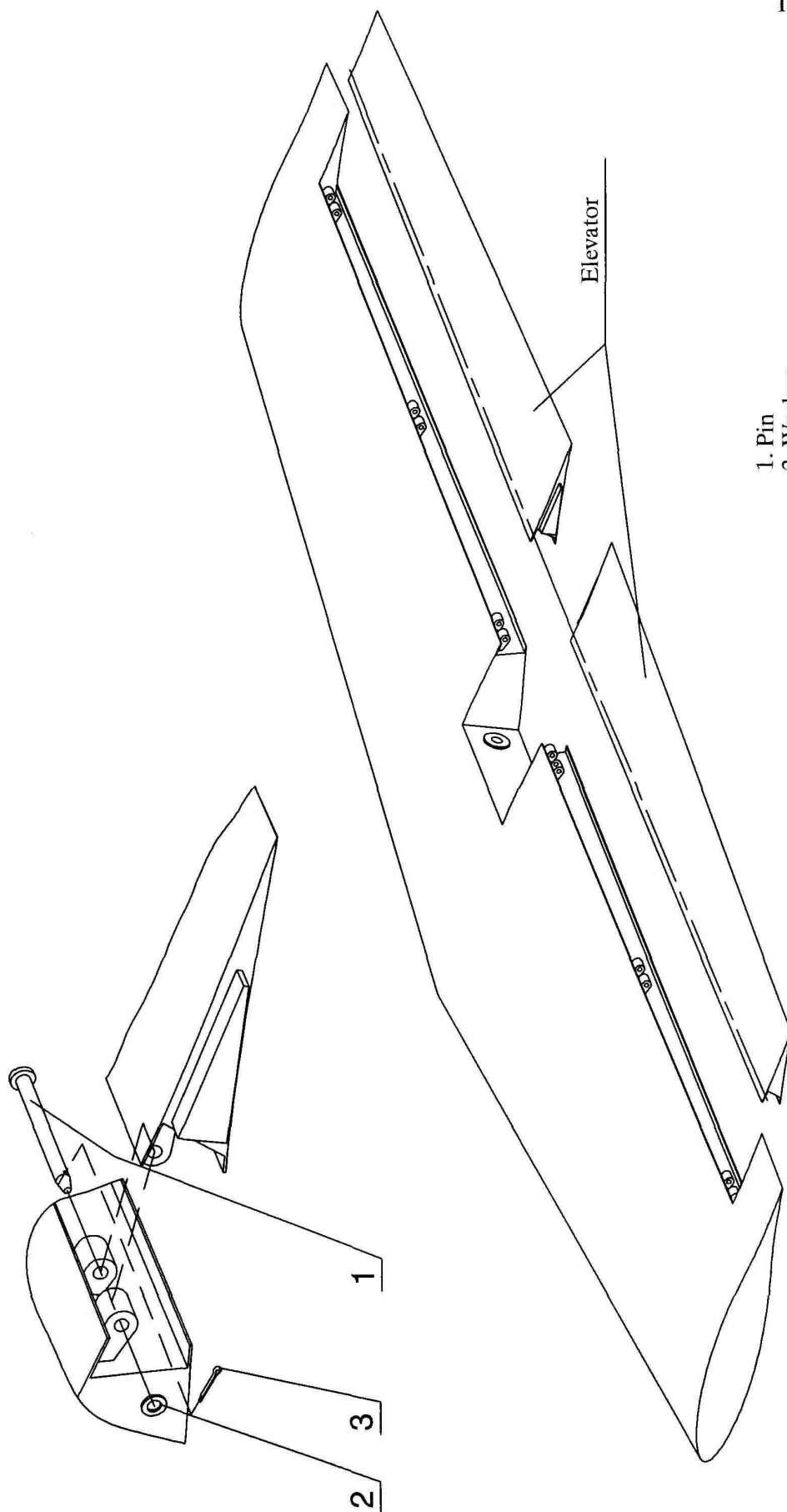


Fig.3 - 9b. Hanging up of rudder



- 1. Pin
- 2. Washer
- 3. Wire pin LN94-10 010

Fig.3 - 10. Mounting of elevator

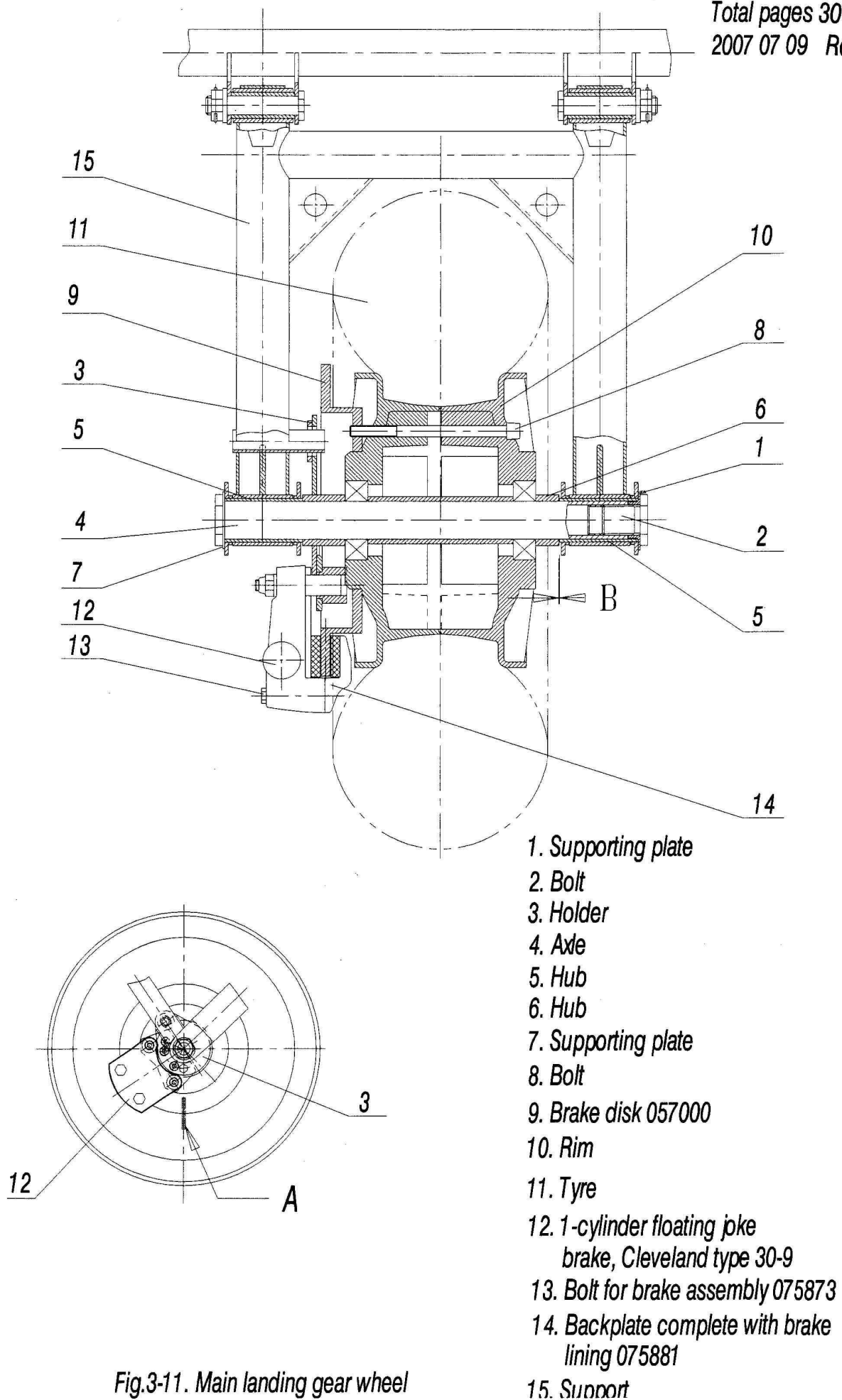
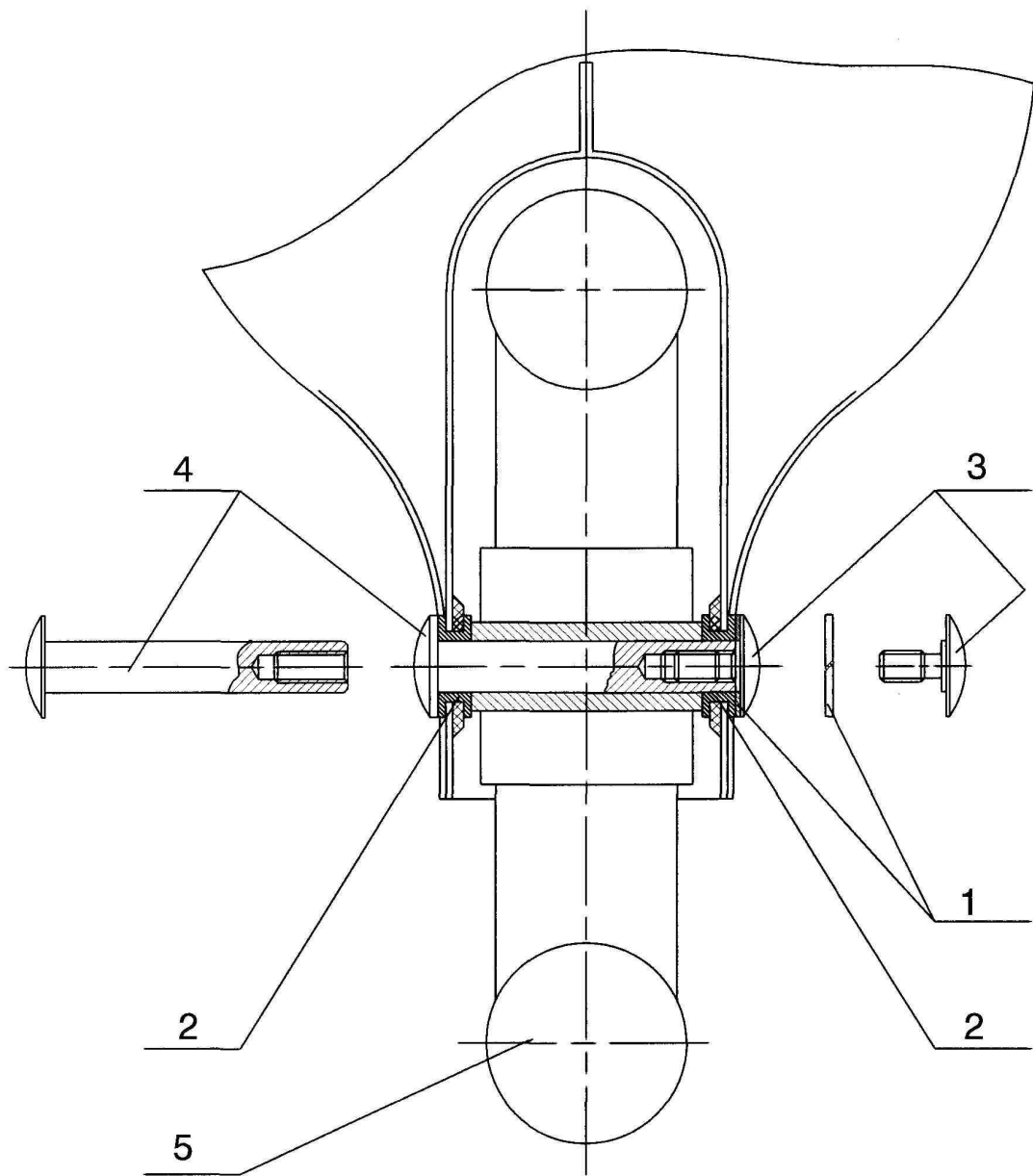


Fig.3-11. Main landing gear wheel



- 1. Washer
- 2. Supporting hub
- 3. Bolt
- 4. Wheel axle
- 5. Wheel

Fig.3 - 12. Rigging and de-rigging tail wheel

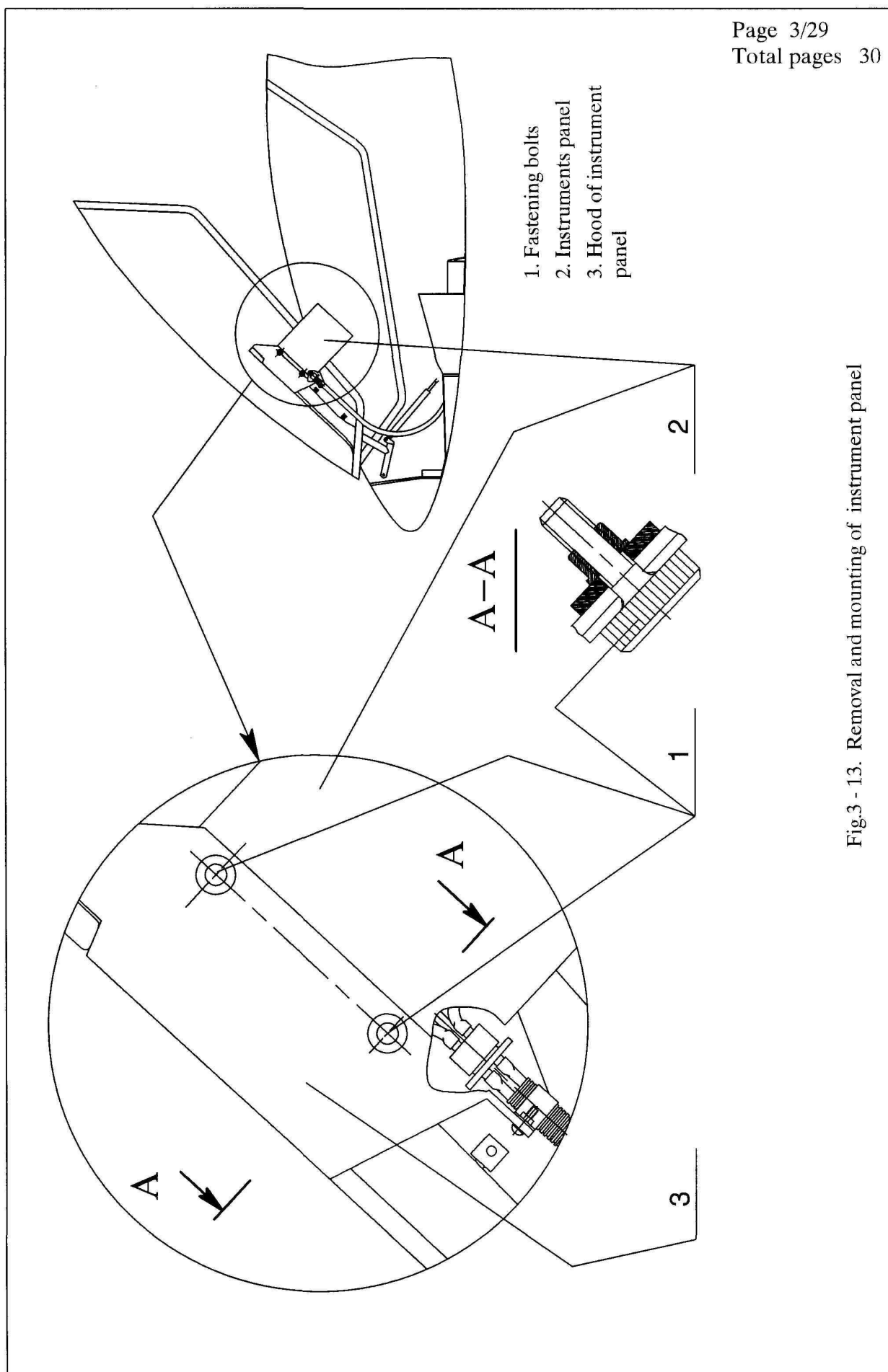


Fig.3 - 13. Removal and mounting of instrument panel

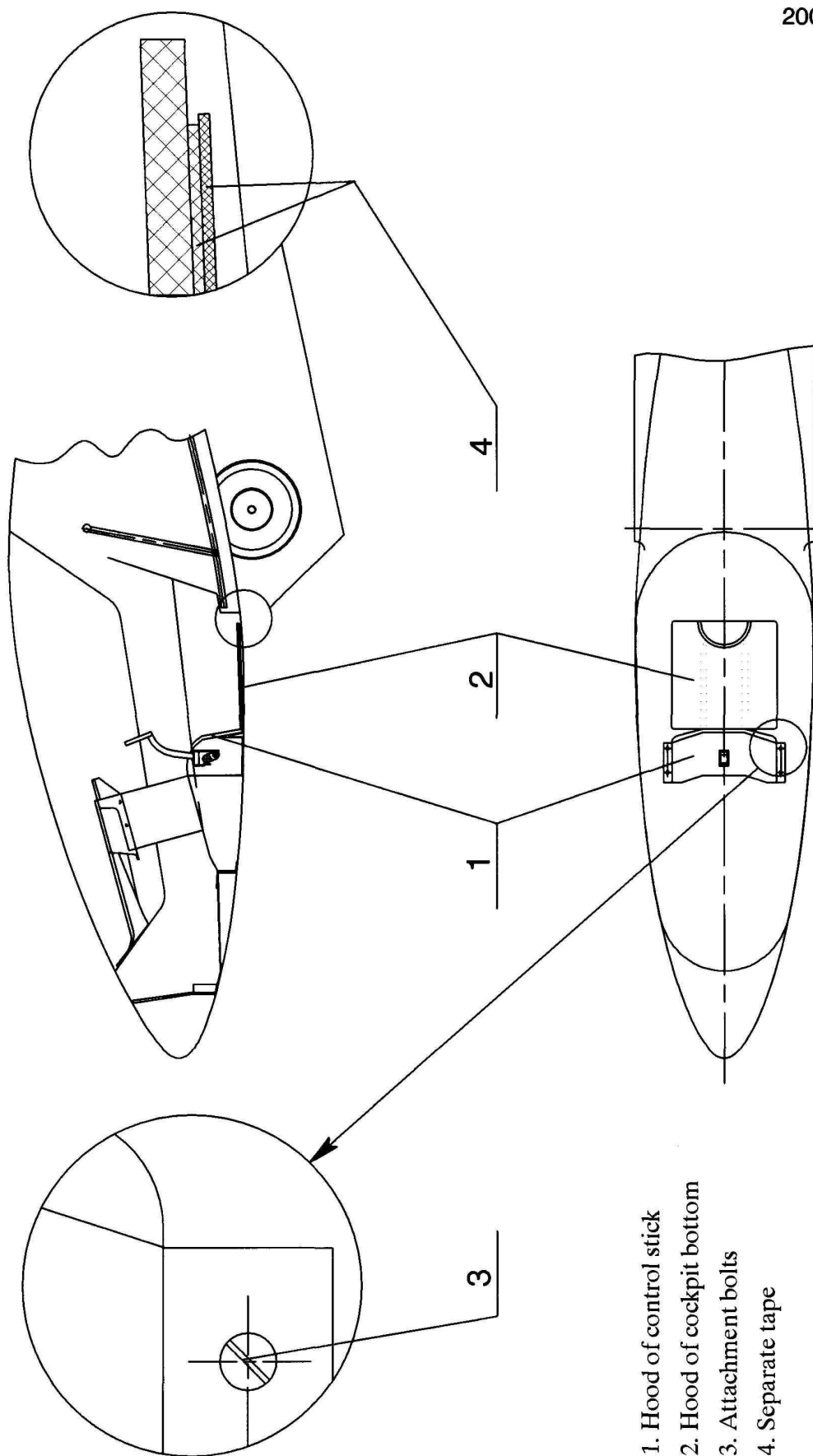


Fig.3 - 14. Taking out and putting in of pilot cockpit floor

SECTION 4

Maintenance of the sailplane instruments and equipment according to their own maintenance documents

4.1 Introduction	Page 1
4.2 List of the sailplane instruments and equipment which service shall be done according to their own maintenance documents	1

4.1 Introduction

Here in this section is given the list of the sailplane instruments and equipment which service shall be done according to their own maintenance documents. Their serving and repair shall be done independently on the sailplane maintenance operational duration and serve.

4.2 List of the sailplane instruments and equipment which are served according to their own maintenance documents

Pos No	Part	Type	Document
1	Air - speed indicator	LUN 1106, WINTER 6 FMS 421	Instrument passport
2	Altimeter	BD-10K, VD-10PS, WINTER4 FGH 20	Instrument passport
3	Mechanical variometer	LUN-1141, BOHLI	Instrument passport
4	Electronic variometer	FILSER LX5000, FILSER LX7000	MM
5	Fly computer display	FILSER LX5000, FILSER LX7000	MM
6	Radio	Becker AR 4201, Filser	MM
7	Compass	KI-13A	Instrument passport
8	Side - slip indicator	LUN-1211	Instrument passport
9	Tow Release	TOST G 88	Certificate, Operating manual
10	4-point static harness restrain system	Carl F. Schroth GmbH	Certificate
11	Main gear wheel with mechanical brake / Tyre	TOST 055191 / Aero Trainer, 6 ply	Wheel passport / Tyre passport
12	Tail wheel	Barum Rubena T3 / V12 or TOST 200x50	Wheel passport

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<div>SECTION 5</div> <div>Periodical inspections</div> <table><tr><td></td><td>Page</td></tr><tr><td>5.1 Introduction.....</td><td>1</td></tr><tr><td>5.2 Sailplane inspection periods.....</td><td>1</td></tr><tr><td>5.3 Inspection after every 100 flight hours.....</td><td>1</td></tr><tr><td>5.4 Annual inspection.....</td><td>5</td></tr><tr><td>5.5 Inspection after rough landings, after ground loop.....</td><td>5</td></tr><tr><td>5.6 Inspection at the end of flight season.....</td><td>5</td></tr><tr><td>5.7 Inspection of the sailplane after every 1000 flight hours.....</td><td>6</td></tr><tr><td>5.8 Inspection of the sailplane after every 3000 flight hours.....</td><td>10</td></tr></table>					Page	5.1 Introduction.....	1	5.2 Sailplane inspection periods.....	1	5.3 Inspection after every 100 flight hours.....	1	5.4 Annual inspection.....	5	5.5 Inspection after rough landings, after ground loop.....	5	5.6 Inspection at the end of flight season.....	5	5.7 Inspection of the sailplane after every 1000 flight hours.....	6	5.8 Inspection of the sailplane after every 3000 flight hours.....	10
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<div>5.1 Introduction</div> <p>In section 5 there is defined a list of inspections ensuring safe the sailplane operation and lifetime.</p> <p>The periodical inspections shall be performed by qualified staff having permission to execution of those works.</p>																					
<div>5.2 Sailplane inspection periods</div> <p>The sailplane inspections shall be performed:</p> <div><div>1)</div>after every 100 flight hours;</div> <div><div>2)</div>annual inspection;</div> <div><div>3)</div>after rough landings, after ground loops;</div> <div><div>4)</div>at the end of flight season or before long storing in a hangar or in a trailer;</div> <div><div>5)</div>after every 1000 flight hours;</div> <div><div>6)</div>after every 3000 flight hours;</div>																					
<div>5.3 Inspection after every 100 flight hours</div> <p>It is necessary to check thoroughly the sailplane after every 100 flight hours. A sailplane shall be checked by qualified staff having a license for those works.</p>																					
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Inspection after every 100 flight hours				Date.....	
No	Checking	Conformity Yes/No	Signature		
101	Flight Manual and Maintenance Manual revision				
102	Sailplane airworthiness certificates revision				
103	Sailplane log-book revision				
104	Sailplane airworthiness bulletins revision				
105	Sailplane technical bulletins revision				
106	Sailplane weight, instruments in the instrument panel list and its' weights revision				
107	Sailplane instruments and equipment which are serviced according to their own maintenance documents revision				
200	Wing, winglets, wing tips 15m and 18m				
201	Surfaces of wings (painting, cracks, comes of) condition				
202	Defects of skin (drive in, holes, etc)				
203	The glue together places state				
204	Drainage and ventilation openings state				
205	Spar ends (cracks, glueing, hubs) state				
206	Root ribs				
207	End ribs				
208	Ailerons, its hinges, pins, clearances of the ailerons, control connections, tip ailerons control plates				
209	Airbrakes, clearances of airbrakes, state of metal parts				
210	Water ballast tanks, ballast control system in the wings				
211	Wing tips fixators				
212	Spars fixing pins, hubs in spars				
213					
300	Fuselage				
301	Surfaces of fuselage (painting, cracks, comes of) condition				
302	Defects of skin (drive in, holes, etc)				
303	The glue together places state				
304	Drainage and ventilation openings state				
305	Attachment of cockpit canopy, cockpit canopy state				
306	Cockpit canopy emergency jettison system state				
307	Static and total pressure receivers state, tightness of connections				
308	Bulkheads, fuselage root ribs, landing gear box state				
309	Seat regulation system, pilot seat state				
310	Connection pins on fuselage state				
311	Fin parts state				
312	Rudder, its hinges, pins, control connection state				
313	Stabilizer and fuselage connection pins, bolt and bolt fixation state				
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Inspection after every 100 flight hours				Date.....	
No	Checking	Conformity Yes/No	Signature		
314	Elevator control unit on the fin top state				
315	Water ballast control system				
316	Condition of external surfaces of accessible metal parts (corrosion)				
317	Outside things in fuselage revision				
318					
319					
320					
321					
400	Horizontal tail				
401	Surfaces of horizontal tail (painting, cracks, comes of) condition				
402	Defects of skin (drive in, holes, etc)				
403	The glue together places state				
404	Elevator root ribs				
405	Stabilizer hubs				
406	Elevator, its hinges, pins, clearances of the elevator, control connections				
407	Elevator and fuselage connection state				
500	Rudder				
501	Surfaces of rudder (painting, cracks, comes of) condition				
502	Defects of skin (drive in, holes, etc)				
503	The glue together places state				
504	Rudder, its hinges, pins, clearances of the rudder, control connections				
505					
600	Landing gear				
601	Stands, shock absorbers, gas-spring and control system state				
602	Main wheel state, pressure in wheel tyre				
603	Main wheel retracting and releasing mechanisms, special attention				
	For inspection bellcrank (pos.3 Fig.2-11 Landing gear control)				
604	Landing gear brakes state				
605	Tail wheel state, pressure in wheel tyre				
700	Control systems				
701	Elevator control system (mowing, friction, clearances, fixings)				
702	Ailerons control system (mowing, friction, clearances, fixings)				
703	Airbrakes control system (mowing, friction, clearances, fixings)				
704	Rudder control system (mowing, friction, clearances, fixings), special attention for inspection control cables in zone pedals joint				
	(pos.4 Fig. 2-8a Rudder control)				
705	Pedals adjust according pilot height system state				
706	Trimmer control system functioning				
707	Tow release control system (mowing, friction, clearances, fixings)				
708	Attachment of cockpit canopy and its emergency jettison system functioning				
709	Canopy ventilation control system				
710	Water ballast control system functioning				
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<div> <div>Inspection after every 100 flight hours</div> <div>Date.....</div> </div>					
No	Checking	Conformity Yes/No	Signature		
711					
712					
713					
800	Instruments				
801	Instrument panel mounting				
802	Air speed indicator system hermeticallity, pipes colour markings				
803	Altimeter system functioning				
804	Accumulators bateries , electric wiring installation				
805	Radio station, navigation instruments mounting, functioning				
806	Radio aerial, cable installation				
807	Microphone, loudspeaker installation, functioning				
808	Towing hook state, its life time according maintenance documents, sprigs, control cable state				
809	Pilot harness restrain system state, its life time according maintenance documents				
810	Baggage compartment state				
811	Tables and control markings state				
812	C.G. data				
813					
814					
900	Sailplane rigged				
901	Wing-fuselage connection reliability, clearances				
902	Horizontal tail- fuselage connection reliability, clearances				
903	All control systems neutral position, controls easy movement				
904	Control surfaces deflections, stops				
905	Friction in all control systems, clearances				
906	Rigged parts fixators state				
907	Main wheel brake functioning				
908	Airbrakes functioning, forces on control handle				
909					
910					
911					
912					
1000	Conclusion checking				
1001	Checking records revision				
1002	Maintenance manual changes revision				
1003	Jobs according airworthiness and technical bulletins revision				
1004	Sailplane log-book records revision				
1005	Lifetime of the components (safety belts, hydraulic fluid etc.)				
1006					
1007					
1008					
1009					
Date: 2004 09 24		Author: K. Juočas		Rev.6	

5.4 Annual inspection

It is necessary to check the sailplane us after every 100 flight hours. Also:

- 1) check water ballast tanks for hermeticallity.
- 2) check technical condition of safety belts and their attachment.
- 3) check technical condition and hermeticallity of static, dynamic pressure pipes and moisture setting tanks.
- 4) check clearance or slackness as indicated in the Section 2, Table 2-2 and Table 2-3.

5.5 Inspection after rough landing, after ground loop

After rough landing, ground loop:

- 1) check up surfaces of sailplane wings, the fuselage, the stabilizer and controls. Pay special attention to wings root ribs, ends of wings spars, technical condition of connection junctions of wings and fuselage, stabilizer and fin;
- 2) check friction forces of all control systems of a sailplane;
- 3) check main landing gear wheel and tail wheel and operation of wheel brake;
- 4) check the sailplane instruments and their operation.

5.6 Inspection at the end of flight season

At the end of flight season or before long storing in a hangar or in a trailer:

- 1) sailplane airworthiness certificate, log-book airworthiness and technical bulletins;
- 2) check condition of external surfaces of accessible metal parts. Pay special attention to surfaces places damaged by corrosion;
- 3) clean up and lubricate with oil bearings and sailplane systems connection places according to requirements of chapter 3.3;
- 4) check water ballast tanks for hermeticallity.

5.7 Inspection of the sailplane after every 1000 flight hours

It is necessary to check thoroughly the sailplane after every 1000 flight hours. A sailplane shall be checked by qualified staff having a license for those works.

It is necessary:

1. To check the sailplane according to i.5.3 "Inspections after every 100 flight hours".
2. To measure existing clearances in connection joints of the fuselage and wings.

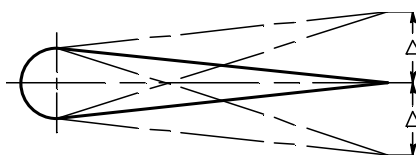
Allowed clearances and tolerances:

- a) between the wings connection pins and openings in spars consoles $\Delta = 0.32$ mm (fig.2-20d);
- b) between the fuselage pins and wing hubs $\Delta = 0.27$ mm (fig.2-20a);
- c) between the hubs of wing tips and lateral pins of wings $\Delta = 0.046$ mm (fig. 2-20c);
- d) tolerance of opening of fixation plate of wing tip spar $\Delta = 0.015$ mm (fig. 2-20c);
3. To measure existing clearances in connection joints of fuselage and stabilizer

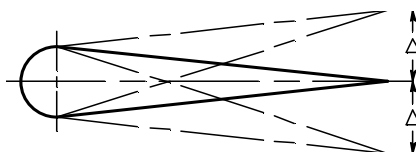
Allowed clearances:

- a) between the fin pins and hubs of the stabilizer $\Delta = 0.055$ mm (fig. 2-20b);
- b) between the stabilizer fixation pin and an opening of stabilizer $\Delta = 0.32$ mm (fig. 2-20b);

4. To measure the elevator's clearance with respect to rear elevator edge at root rib. Allowed clearance is $\Delta = \pm 2$ mm.

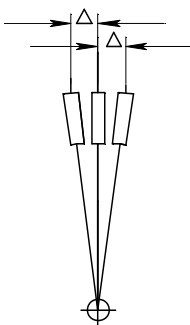


5. To measure clearances of the ailerons with respect to rear controls edges at their root ribs. Allowed clearance is $\Delta = \pm 2$ mm.



6. To measure clearances in hanging up joints of the elevator, rudder, ailerons. Allowed clearance between an opening and axis is $\Delta = 0.1$ mm.

7. To measure clearance in the control stick upper part with an elevator and ailerons fixed. Allowed clearance is $\Delta = \pm 2$ mm.



8. To measure clearance in attachment joint of the landing gear. Allowed clearance between an opening and axis is $\Delta = \pm 0.15 \text{ mm}$.
9. To measure friction forces in the control systems:
 - (a) Ailerons control – 0.5 daN;
 - (b) Elevator control with trimmer in neutral position – 0.3 daN;
 - (c) Rudder control (measure in upper point of pedals) – 2 ... 2.5 daN;
 - (d) Adjustment of pedals according to pilot height – 15 daN;
 - (e) Airbrakes control:
 - at opening – 15 daN,
 - at closing – 18 daN;
 - (f) Ventillation control – 3 daN;
 - (g) Landing gear control:
 - at extending – 20 daN,
 - at retracting – 14 daN;
 - (h) towing hook control:
 - without loading on towing hook – 10 daN,
 - with loading on towing hook – 12 daN;
 - (i) emergency opening of a canopy – 13 daN;
 - (j) water ballast control – 4 daN.

Note:

1. Measurements according i. 4 and 5 are taken with the control stick fixed.
 2. Measurements according i. 4, 5, 6, 7, 8, 9 shall be taken after cleaning and lubrication of movable surfaces of control systems.
10. To check balancing of ailerons, elevator and rudder according to the scheme shown in fig. 7-2 if repair or/and repainting of these control surfaces was done.
 11. To check the trimmer condition.
 12. To check the fuselage girder structure and its attachment to the fuselage. Pay special attention to:
 - splits in glass fiber reinforced plastics,
 - splits in sticking seams,
 - condition of girder welding seams,
 - deformations of the girder pipes,
 - condition of attachment joints of landing gear,
 - condition of attachment joint of the towing hook.
 13. To check glass fiber reinforced plastics for cracks and splits around these metal parts and joints:
 - spar hubs,
 - hubs of wing root ribs,
 - connection joints of stabilizer and fuselage,
 - wingtip fixators and fixator hubs in the upper skin of the wing (fig. 3-2d, pos. 12),
 - control and hinge joints of ailerons, elevator and rudder,
 - attachment joints of safety belts,
 - fastening joints of cockpit canopy.

Splits on glass fiber reinforced plastics shall be repaired.

14. To check surfaces of ends of wing spars (Fig.1), surfaces of external wing root ribs, paying special attention to connection zones of root ribs to spar ends and wing shells. If there are some splits or other damage on glass fiber reinforced plastics it is necessary to repair the damaged place.

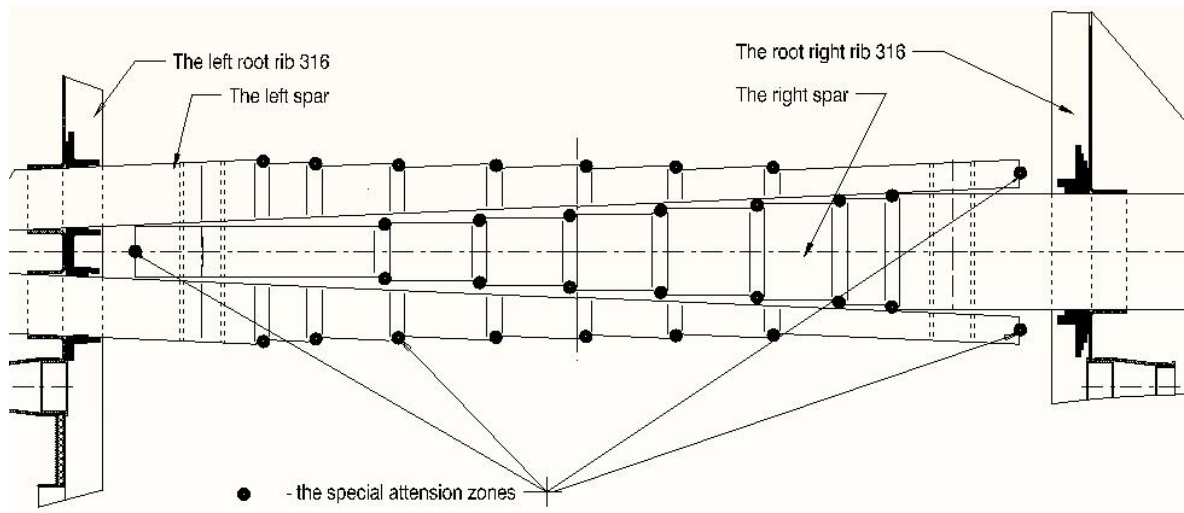
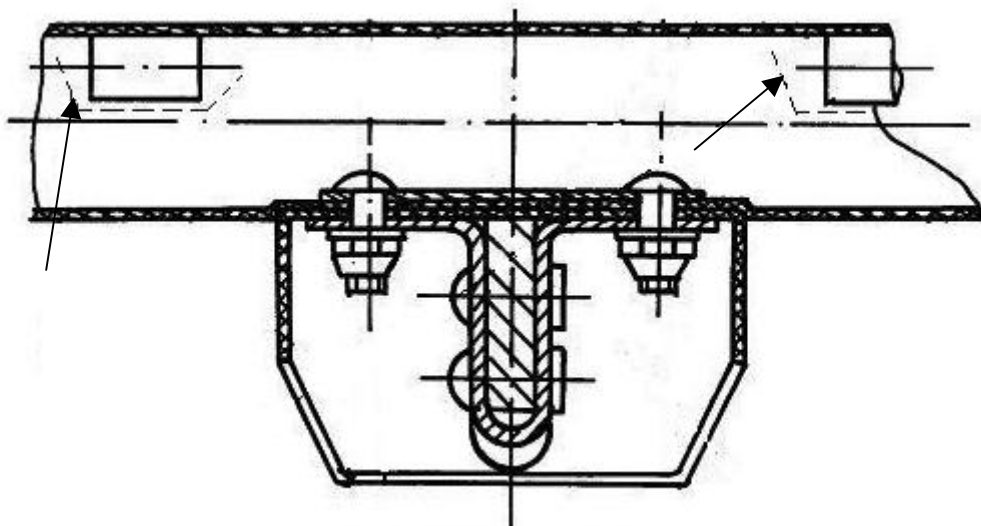


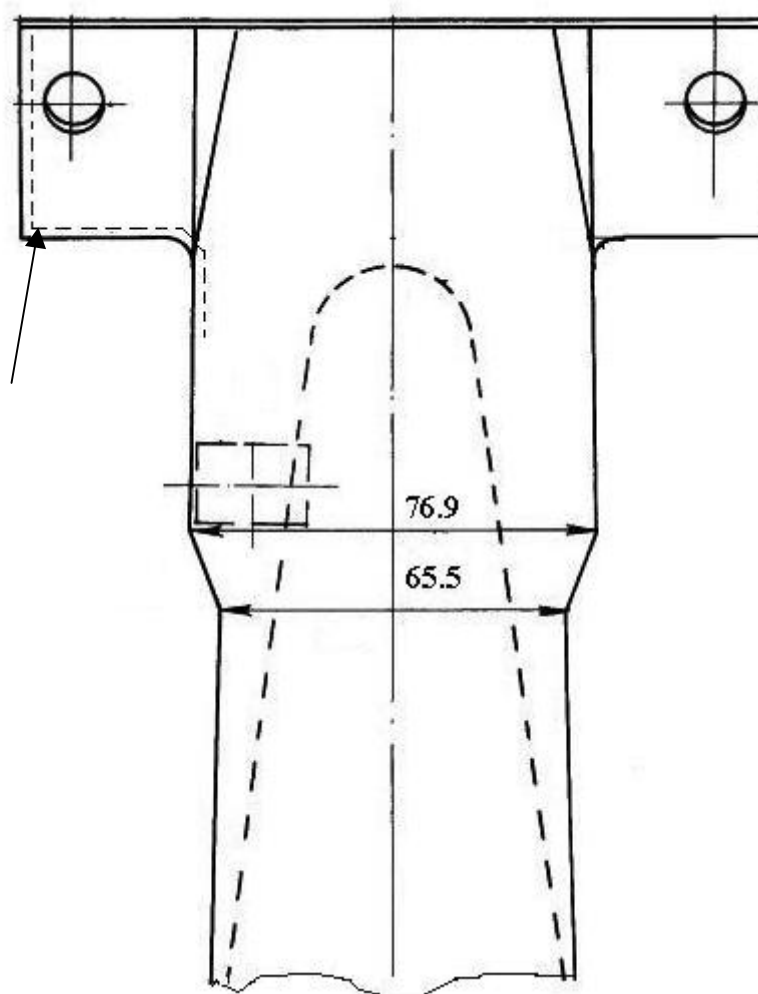
Fig.1. The wing spar.

15. To check external surfaces of wings, ailerons, flaps, fuselage, stabilizer, elevators and rudder. The special attention zones:

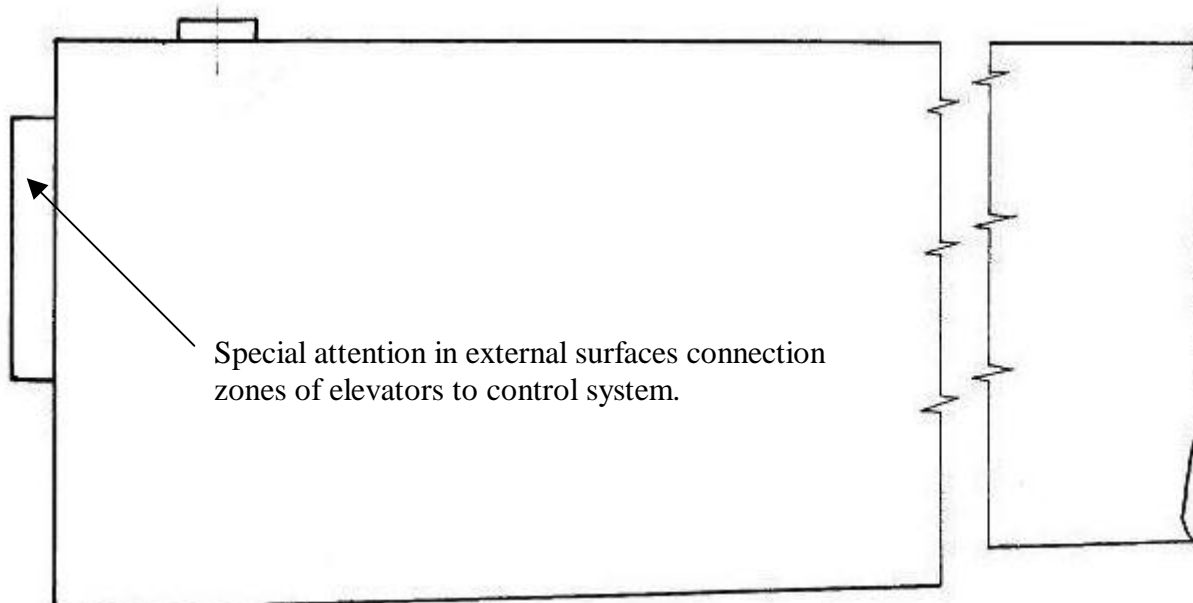
- a) the surfaces around hinge joints of control unit of elevators on the horizontal tail.



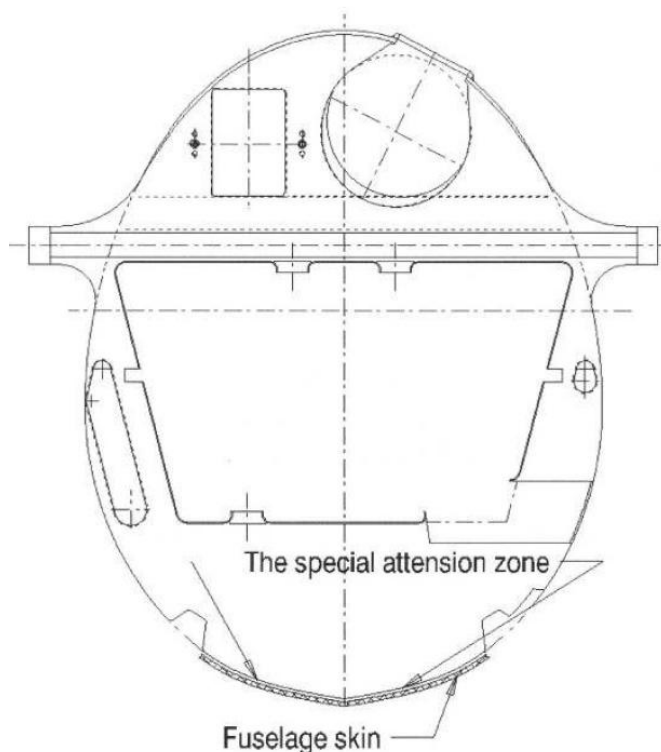
b) the glued zones of the vertical tail spar onto the upper fin part



c) the elevator root rib



d) the fuselage bulkhead



In zones where paint has cracks it is necessary to clean off the paint and check glass fiber reinforced plastic for cracks and if necessary to repair the damage.

Initial clean off of paint shall be done with glass-paper No 180, No 220 finishing with No 320 or even finer.

16. To check external surfaces of galvanized coating of metal parts. Zones with damaged protective galvanized or paint coating if they are not damaged by corrosion reducing strength may be repaired. After careful cleaning off of the surface with glass-paper till metallic glitter and its defatting protective prime and enamel layers are put on following manual and directions of producers of these coatings.
17. To check towing hook, sailplane instruments and additional equipment following corresponding guides of their factories-producers.
18. To check technical condition and tightness of connections of static and dynamic pressure pipes and moisture setting tanks.
19. To check technical condition of instrument markings and placards. Replace them if necessary.
20. Repair shall be done following guides given in Section 8 of this Manual. If damaged isn't included in it repair shall be done according to recommendations of manufacturer of the sailplane.
21. To check water ballast tanks in wings and fin for hermeticallity.
22. After doing all the works the sailplane shall be weighed and C.G. shall be defined.

5.7 Inspections of the sailplane after every 3000 flight hours

It is necessary to check thoroughly the sailplane after every 3000 flight hours. The sailplane shall be checked by qualified staff having a license for those works.

Inspections must be performed according to "LAK-19 Inspection Program To Extend the Service Life", Doc. No. IP/19-3000. Inspection program should be ordered from the manufacturer of the sailplane.

LAK-19	MAINTENANCE MANUAL	Section 6	Page 6/1 Pages 1
<p style="text-align: center;">SECTION 6</p> <p style="text-align: center;">Sailplane life limits</p> <p>The approved lifetime limit of the sailplane LAK-19 is 6000 flight hours.</p> <p>The continued airworthiness of the sailplane is ensured by prescribed inspections and technical maintenance works done during its use:</p> <ol style="list-style-type: none"> 1) annual sailplane inspection before starting the flight season according to requirements of Section 5 of "Maintenance Manual" 2) daily (before every flight day) and preflight sailplane inspection according to requirements of Section 4 of "Flight Manual" and Section 3 of "Maintenance Manual"; 3) special sailplane inspection after a rough landings, ground loops, axceeding of allowed loadings and etc. according to requirements of section 5 of "Maintenance Manual"; 4) inspection and works according to requirement of bulletins issued for the sailplane; 5) inspection and works according to requirements of maintenance documents (Section 4 of "Maintenance Manual") of parts with limited lifetime (towing hook, safety belts, instruments and others); 6) inspection after every 1000 flight hours according to requirements of Section 5 of "Maintenance Manual"; 7) inspection after every 3000 flight hours according to requirements of Section 5 of "Maintenance Manual"; <p>Checking of a sailplane, maintenance and necessary repair works shall only be done by qualified staff having permission to do the work.</p> <p>In the case of damage of the sailplane structure not included in the "Maintenance Manual" the repair shall be agreed to by manufacturer of the sailplane.</p>			
Date: 15 January, 2018	Author: K. Juočas	Rev. 10	

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SECTION 7

Weights and center of gravity

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7.3	Weights of not-lifting parts of the sailplane	4
7.4	Checking of controls weights and balancing	5
7.5	Calculation of loading limits.....	6

7.1 Introduction

An information about weighing of the sailplane, definition of center of gravity is given in this section.

Position of center of gravity is defined as a distance from leading edge of wing root section towards to a sailplane tail.

Positioning scheme of a sailplane during its weighing and definition of C.G. is shown in Fig. 7-1.

Approved in flight C.G. range for both 15m and 18m is:

No	Parameter	Approved limits, mm
1	Foremost and rearmost position of C.G.	182 – 305

Warning: The vertical tail fin battery (weight 3.5 kg) during flight must be install.

The battery in luggage taking out moves C.G. of sailplane forward by approximately 2÷3 mm.

The data of how to find permissible fin water ballast weight depending on glider empty weight, pilot weight is given at the end of this section.

Max weight of the sailplane 480 kg for 15 m wing and 500 kg for 18 m wing shall not be exceeded.

Min pilot weight

- 70 kg.

Max pilot weight

-110 kg.

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Author: K. Juočas

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Center of gravity of sailplane:

$$X_{cg} = \frac{G2^* D}{G_0} + d$$

Go - weight of sailplane. Weight is defined as summary value of sailplane parts. Using two balances - Go = G1 + G2.

Theoretical data of D and d: D = 4007.2 mm; d = 116.1 mm.

Fig.7-1. Sailplane weighthing and Center of gravity definition scheme

The given pilot weight includes weight of the parachute .

Abbreviations used:

DP – reference point (datum point): leading edge of the wing at wing root section,

DL –positioning line (datum line):upper side of fuselage boom placed at slope 1000 : 29.

Theoretical data of D and d: D=4007.2 mm, d=116.1 mm.

7.2 Definition of sailplane weight and C.G.

For definition the sailplane weight and C.G. it is necessary:

1. To weigh the sailplane parts separately:

Pos. No	Sailplane part	Marking	Weight, kg
1	Right wing with controls	Gwr	
2	Left wing with controls	Gwl	
3	Fuselage with rudder	Gfz	
4	Stabilizer with elevator	Gst	
5	Wing tip /15 m right	Gt15r	
6	Wing tip /15 m left	Gt15l	
7	Wing tip /18 m right	Gt18r	
8	Wing tip /18 m left	Gt18l	

In order to define C.G. with a pilot - weigh the pilot and define his weight Gpil.

Empty sailplane weight:

- a) wing of 15 m

$$G_{emp} = G_{emp15m} = Gwr + Gwl + Gfz + Gst + Gt15r + Gt15l,$$

- b) wing of 18 m

$$G_{emp} = G_{emp18m} = Gwr + Gwl + Gfz + Gst + Gt18r + Gt18l.$$

Weight of sailplane including a pilot Go:

- a) wing of 15 m

$$G_o = G_{15m} = G_{emp15m} + G_{pil},$$

- b) wing of 18 m

$$G_o = G_{18m} = G_{emp18m} + G_{pil}.$$

2. To assemble the sailplane.

3. To put up sailplane tail on weighing-machine. To position the sailplane with help of an auxiliary equipment according to requirements of fig. 7-1.

To seat a pilot into a cockpit, if C.G. with pilot is being defined.

4. To define weight of the sailplane tail part and an auxiliary equipment.

5. To measure the distance D (mm) from center of main landing wheel axle to tail wheel axis.

6. To measure the distance d (mm) from center of main wheel axle to reference point DP.

Note: The distances "D" and "d" are measured on the ground according to corresponding projections of measurement points.

LAK-19	MAINTENANCE MANUAL	Section 7	Page 7/4 Pages 19
<p>7. To weigh an equipment of sailplane positioning and determine the weight of sailplane tail G2 by subtracting the weight of an auxiliary equipment from the weight of sailplane tail part with an auxiliary equipment.</p> <p>8. To calculate C.G.:</p> <p>a) C.G. of empty sailplane</p> $X_{cgemp} = \frac{G2 * D}{Gemp} + d, \text{ mm}$ <p>b) C.G. of sailplane with a pilot:</p> $X_{cg} = \frac{G2 * D}{Go} + d, \text{ mm}$ <p>Note: Weights G2, Gemp, Go are assumed for corresponding weighing configuration,</p> <p>9. To check if position of C.G. is within an allowed range.</p> <p>If C.G. is outside the allowed boundaries position the sailplane C.G. shall be corrected by the help of lead ballast weights (Fig. 7-3, Fig. 7-4, Fig. 7-5):</p> <ul style="list-style-type: none"> - required mass of lead for correction of C.G. position could be calculated or determined by actual balancing and checking the sailplane C.G., - lead ballast of required size could be supplied by Joint Stock Company "Sportinė Aviacija", - depending on how position of C.G. shall be corrected lead shall be attached at the fuselage nose ahead of pedals or on rear wall of the fin after removal of rudder. <p style="text-align: center;">7.3 Weight of not-lifting parts of the sailplane</p> <p>Max weight of not-lifting parts of the sailplane includes weight of pilot, fuselage, stabilizer with elevator, rudder, instruments and equipment.</p> <p>Weight of non-lifting parts should not be more as 233 kg.</p> <p>Max sailplane flight weight 480 kg for 15 m wing and 500 kg for 18 m wing shall not be exceeded.</p>			
Date: 2004 09 24	Author: K. Juočas	Rev.6	

7.4 Checking of control weights and balancing

After repairs or repainting of controls their weights and position of C.G. shall be checked.

For this purpose a control being checked shall be removed from lifting surface and positioned horizontally (fig. 7-2) by help of an auxiliary equipment. Friction in supports must be possibly minimal.

A component P of weight, kg, is being defined by help of accurate scales. Shoulder r , mm, - the distance between rotation axis of the control and weighing point is measured by a ruler.

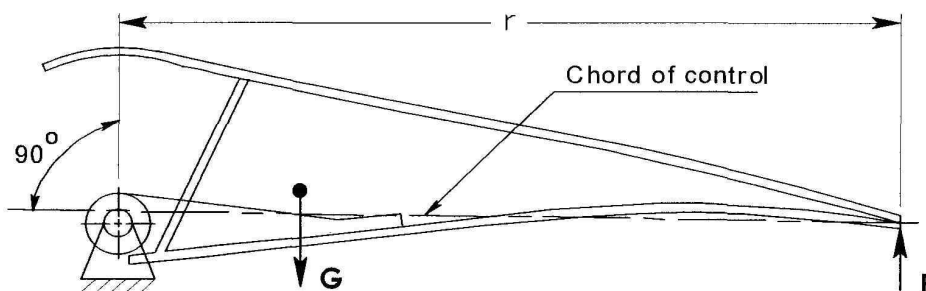


Fig. 7 - 2. Scheme of control positioning and weighing

Static moment of a control $M = P \times r$, kg * mm

Note: reaction P is defined with plane of controls chords positioned horizontally.

Approved boundaries for controls weights and static moments:

Control	Approved boundaries of control weight, kg	Approved static moment of control, kg * mm
Aileron main	1.65	≤ 67
	2.2	≤ 77.4
Wing tip aileron	0.32	≤ 8.9
	0.42	≤ 10.25
Elevator	0.36	≤ 15.8
	0.43	≤ 17.4
Rudder	1.8	≤ 134.2
	2.2	≤ 148.35

If weight and static moment of a control surface are not within the approved limits, you should contact the company JSC "Sportinė Aviacija".

7.5 Calculation of loading limits

Center of gravity position after loading glider (additional instruments, equipment, water ballast, pilot) is defined by:

$$X_{CG} = \frac{\sum_n G_n * X_n}{\sum_n G_n}, \text{ mm}$$

Where: G_n = the glider component mass, kg;

X_n = distance between glider component mass C.G. and datum point (DP), mm;

- distance “-“, if mass C.G. is ahead of datum point;
- distance “+” if mass C.G. is behind of datum point;

n = number of glider component masses;

ΣG_n = sum of glider all components masses;

$\Sigma G_n * X_n$ = sum moments of glider all components mass;

The C.G. calculation table

No	Component	Weight G_n kg	Distance from DP X_n mm	Moment =Weight *Distance $G_n * X_n$ kg * mm
1.	Empty glider			
2.	Pilot			
3.	Battery in baggage compartment		520	
4.	Water ballast in wings		168	
5.	Water ballast in fin		4003	
6.	Instrument N1 in instrument panel		-1010	
7.	Instrument N2 in instrument panel			
8.				
9.				
-				
n-1	Removable ballast in fuselage nose	(1÷5)	-1785	
n	Baggage weight			
		$\Sigma G_n =$		$\Sigma G_n * X_n =$

Note:

- The glider empty weight and empty weight center of gravity is defined by weighting.
- Pilot: real pilot weight with parachute,
distance from DP = -520, when pilot seat is in rearmost position;
distance from DP = -670, when pilot seat is in foremost position.
- Water ballast in the wings: really filled water ballast weight.
- Water ballast in the fin: really filled water ballast in fin tank weight.
- Baggage weight: baggage in baggage compartment weight .

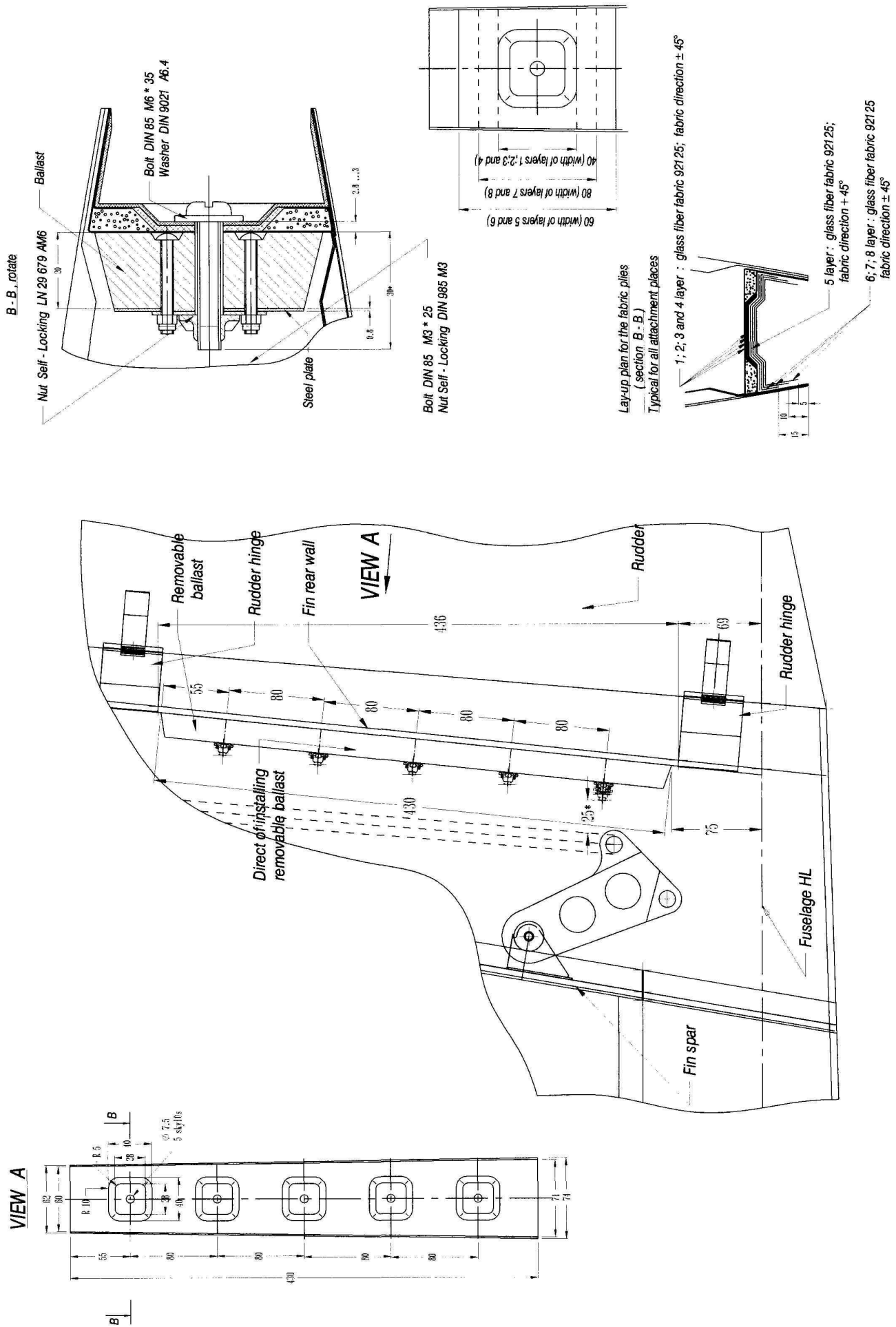


Fig. 7-4. Removable ballast weight fixing in the fin

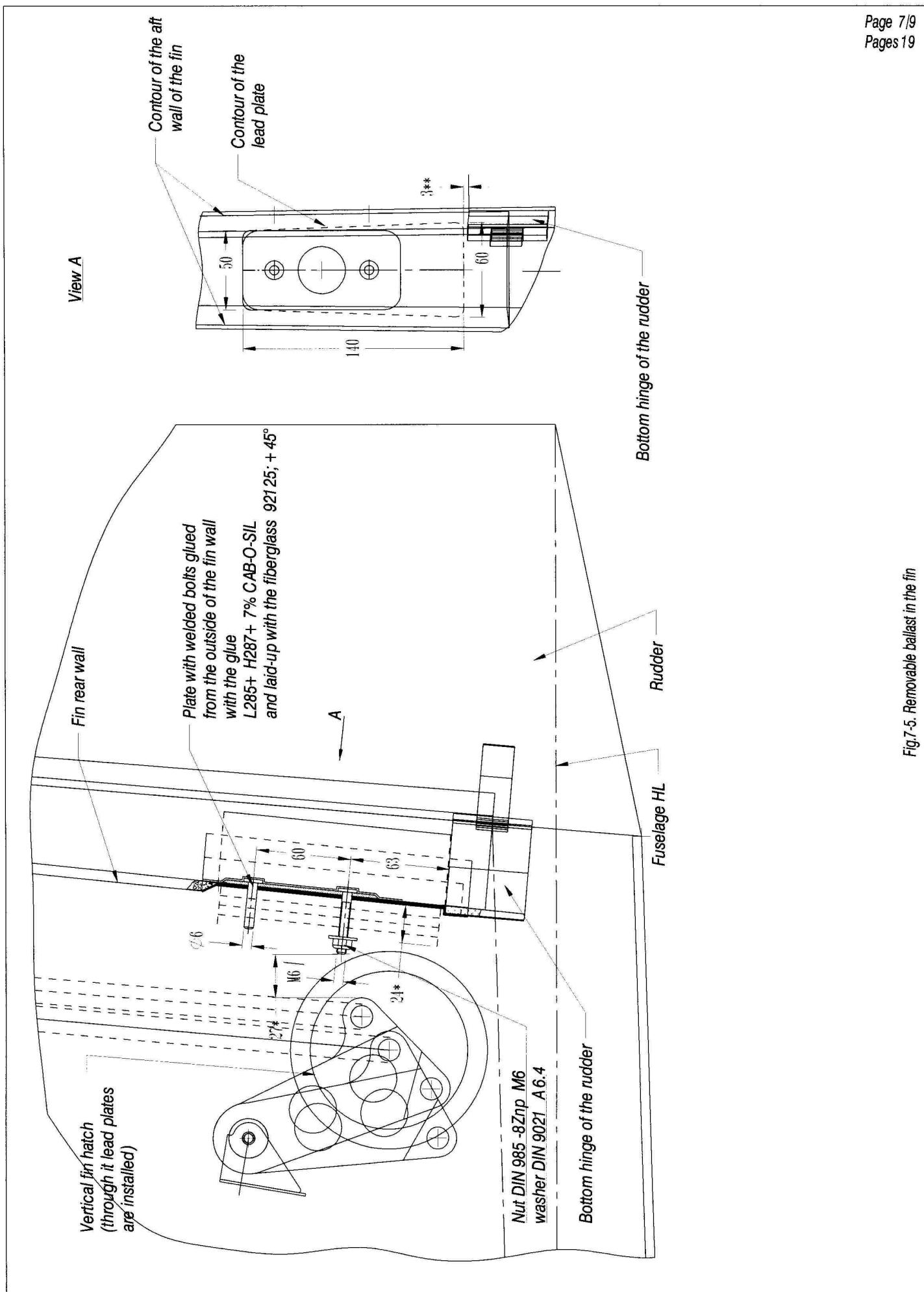
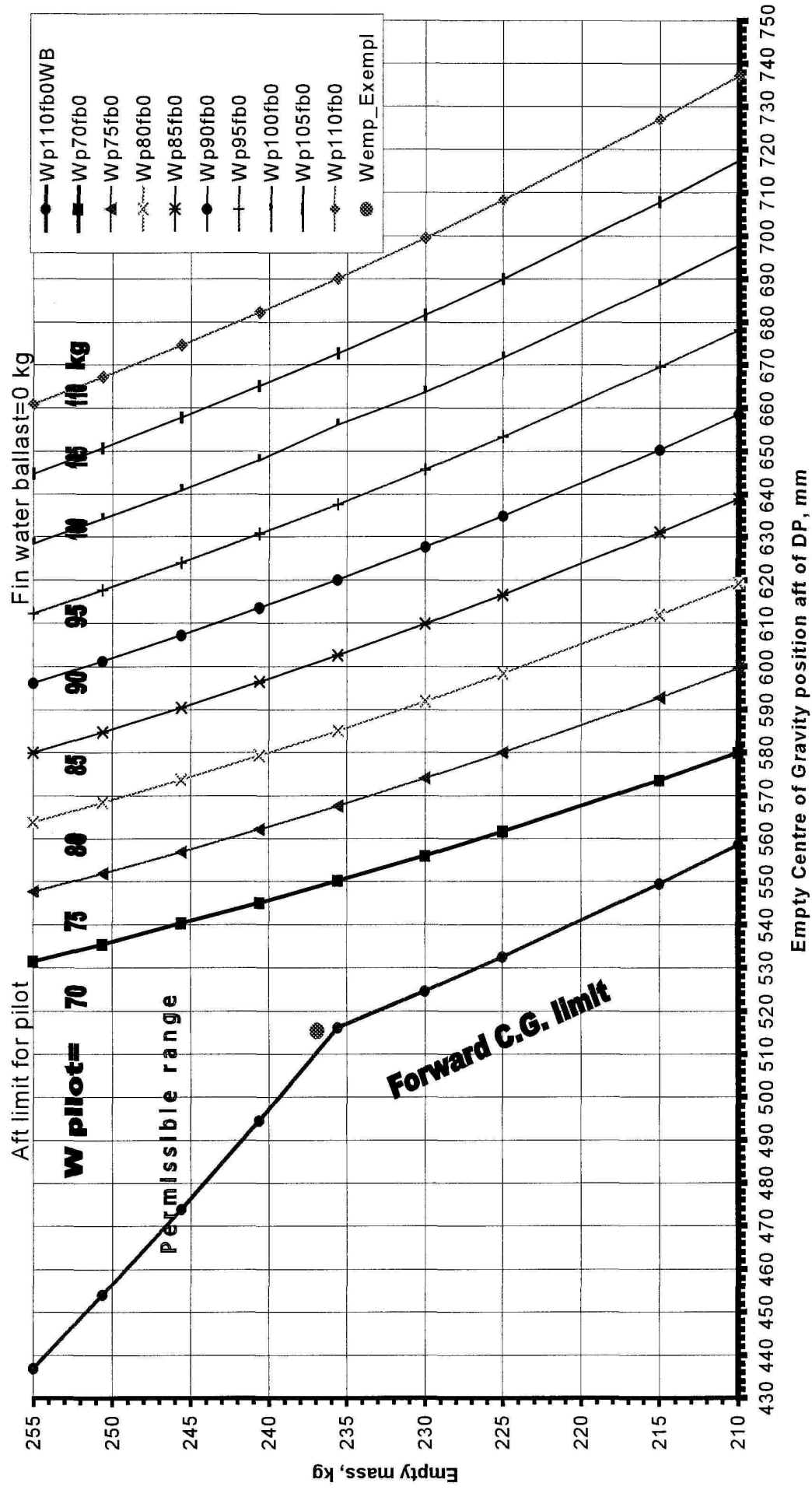
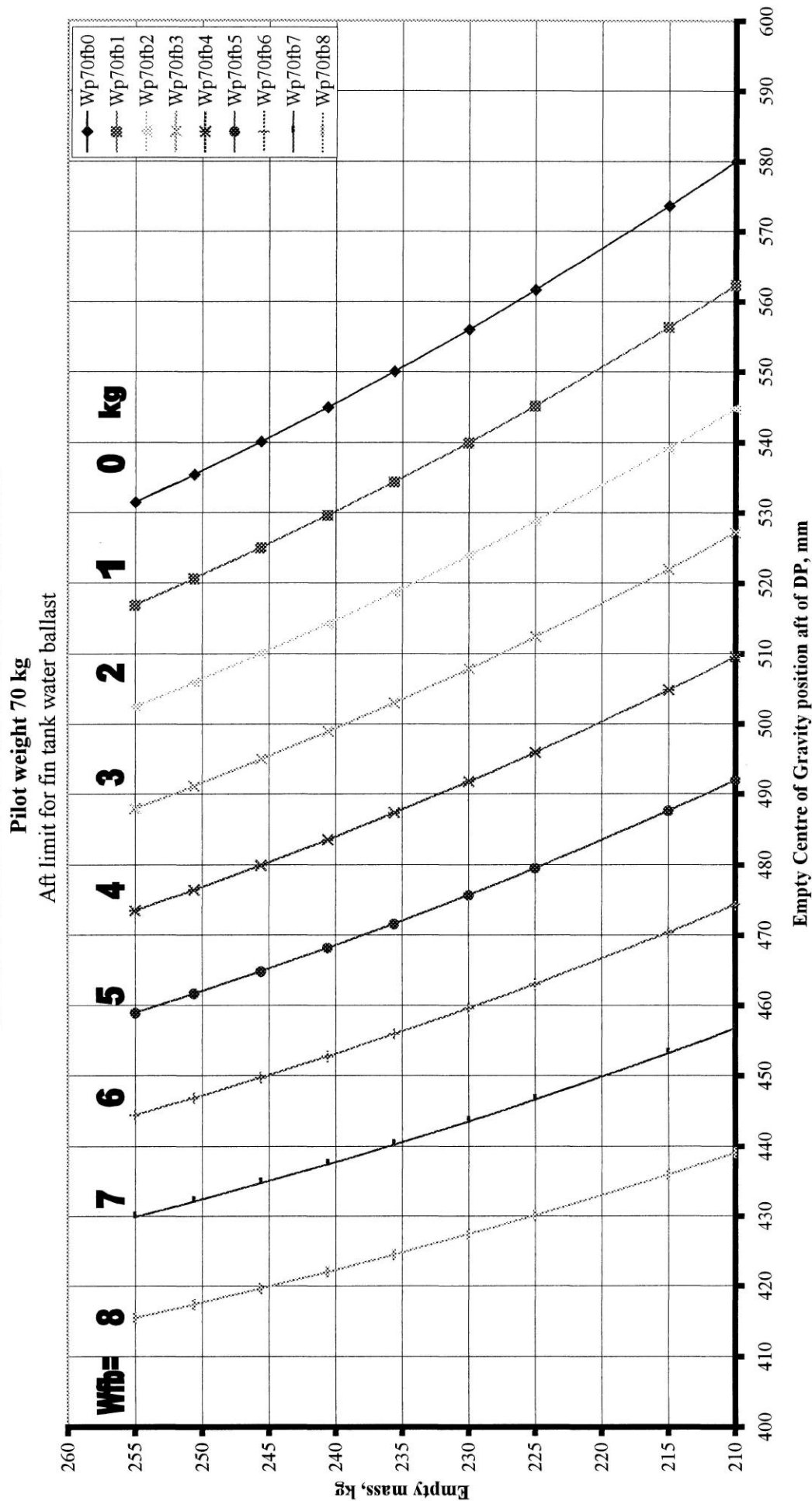


Fig.7-5. Removable ballast in the fin

SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY



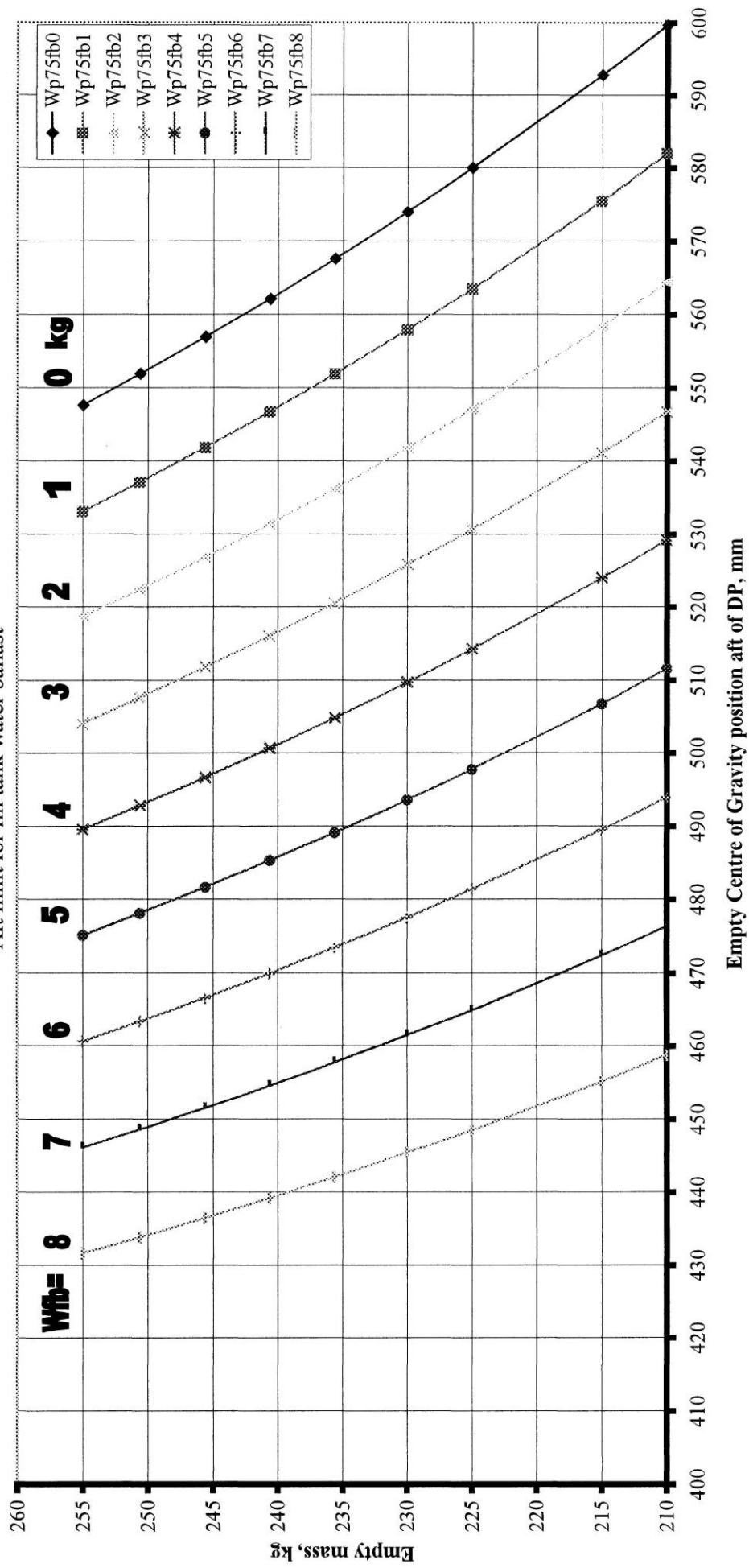
SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY



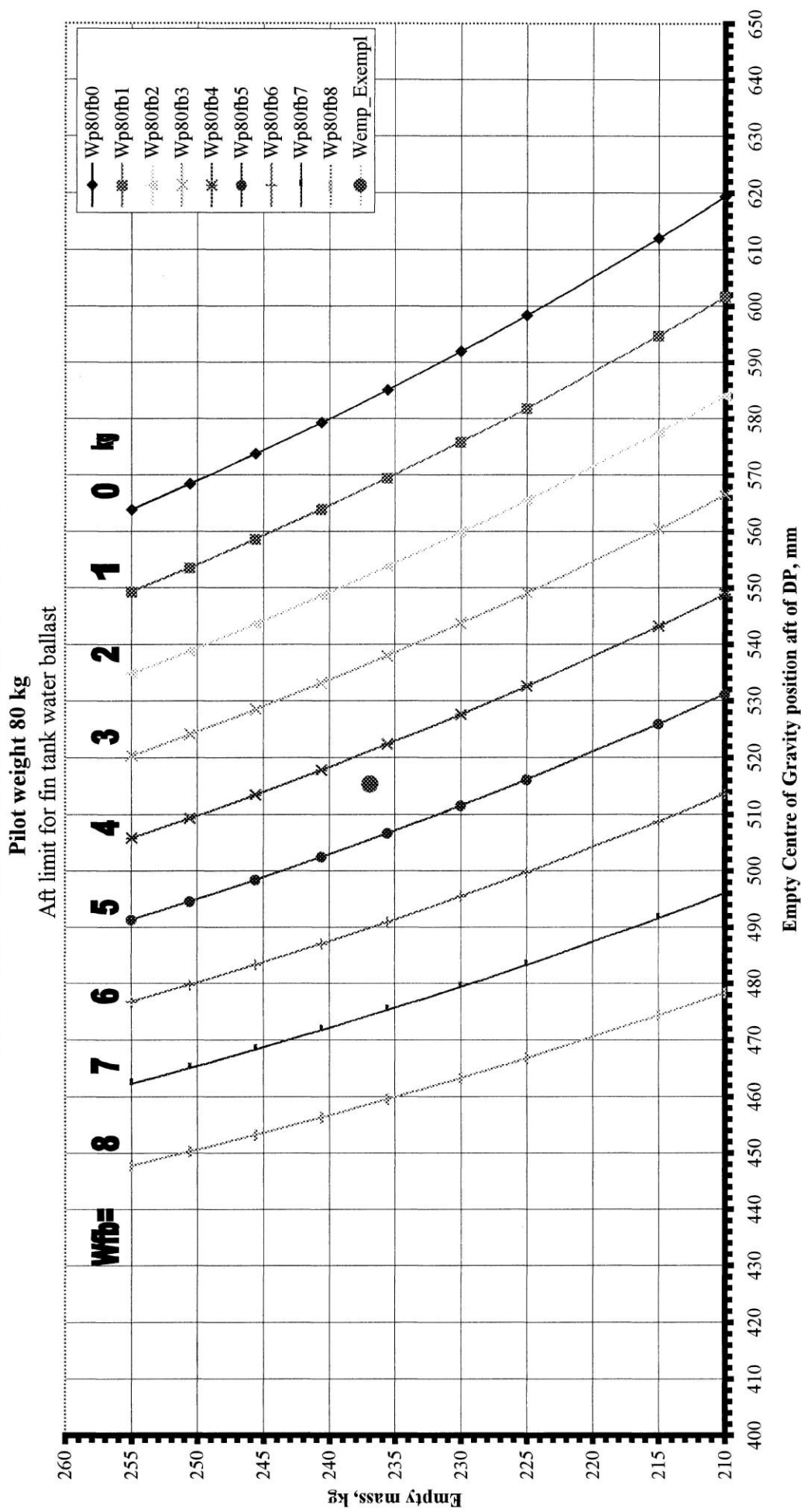
SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY

Pilot weight 75 kg

Aft limit for fin tank water ballast



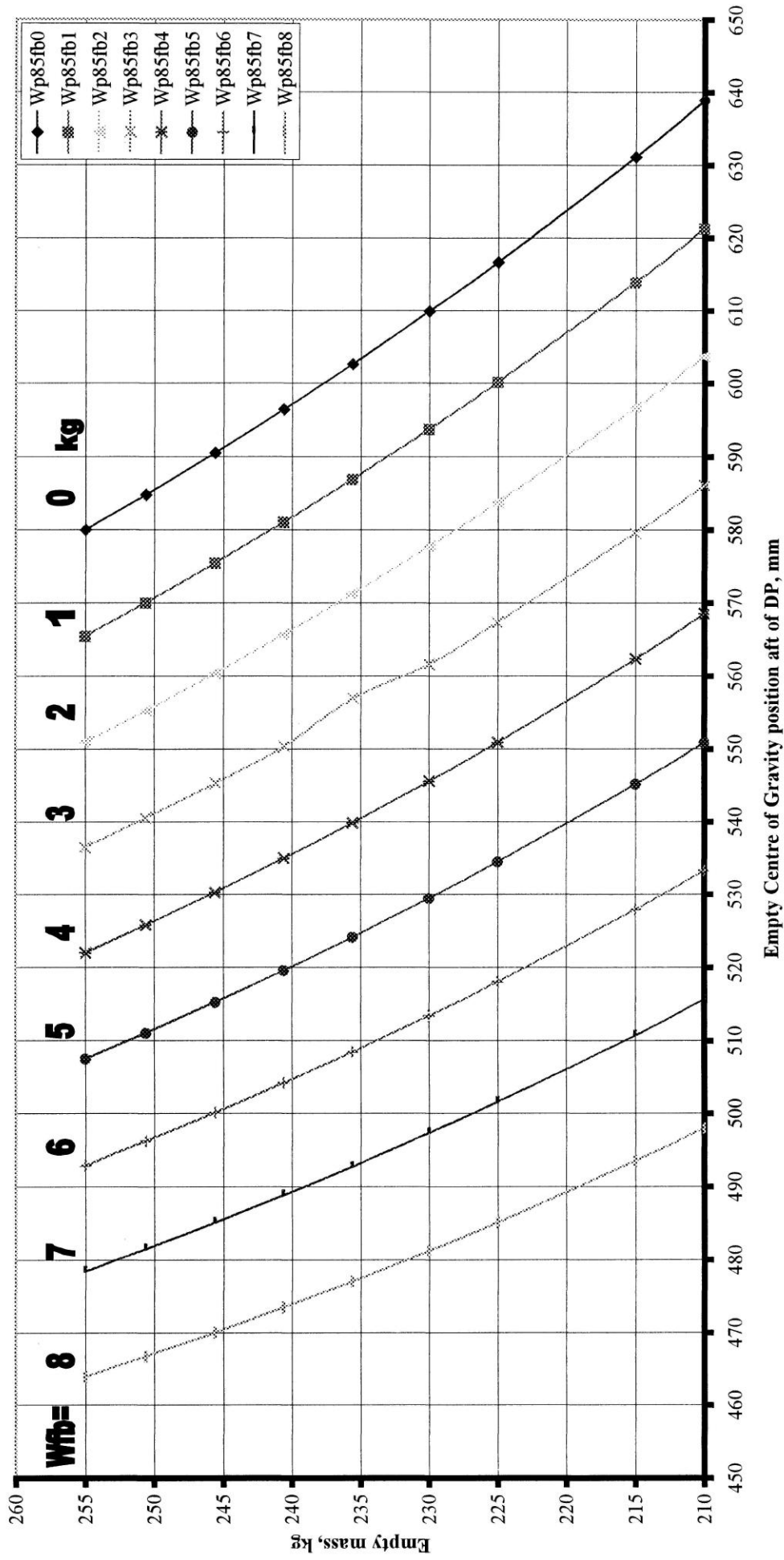
SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY



SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY

Pilot weight 85 kg

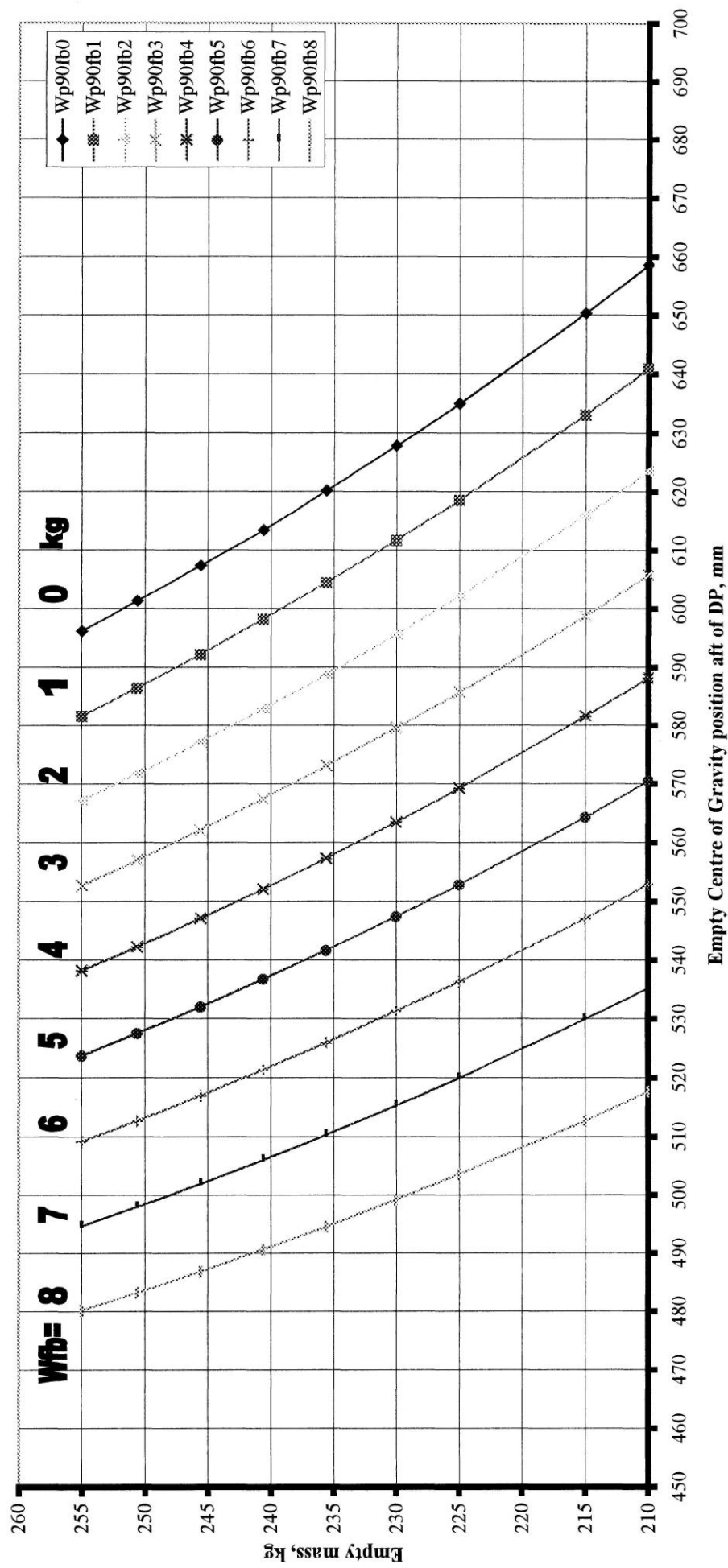
Aft limit for fin tank water ballast



SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY

Pilot weight 90 kg

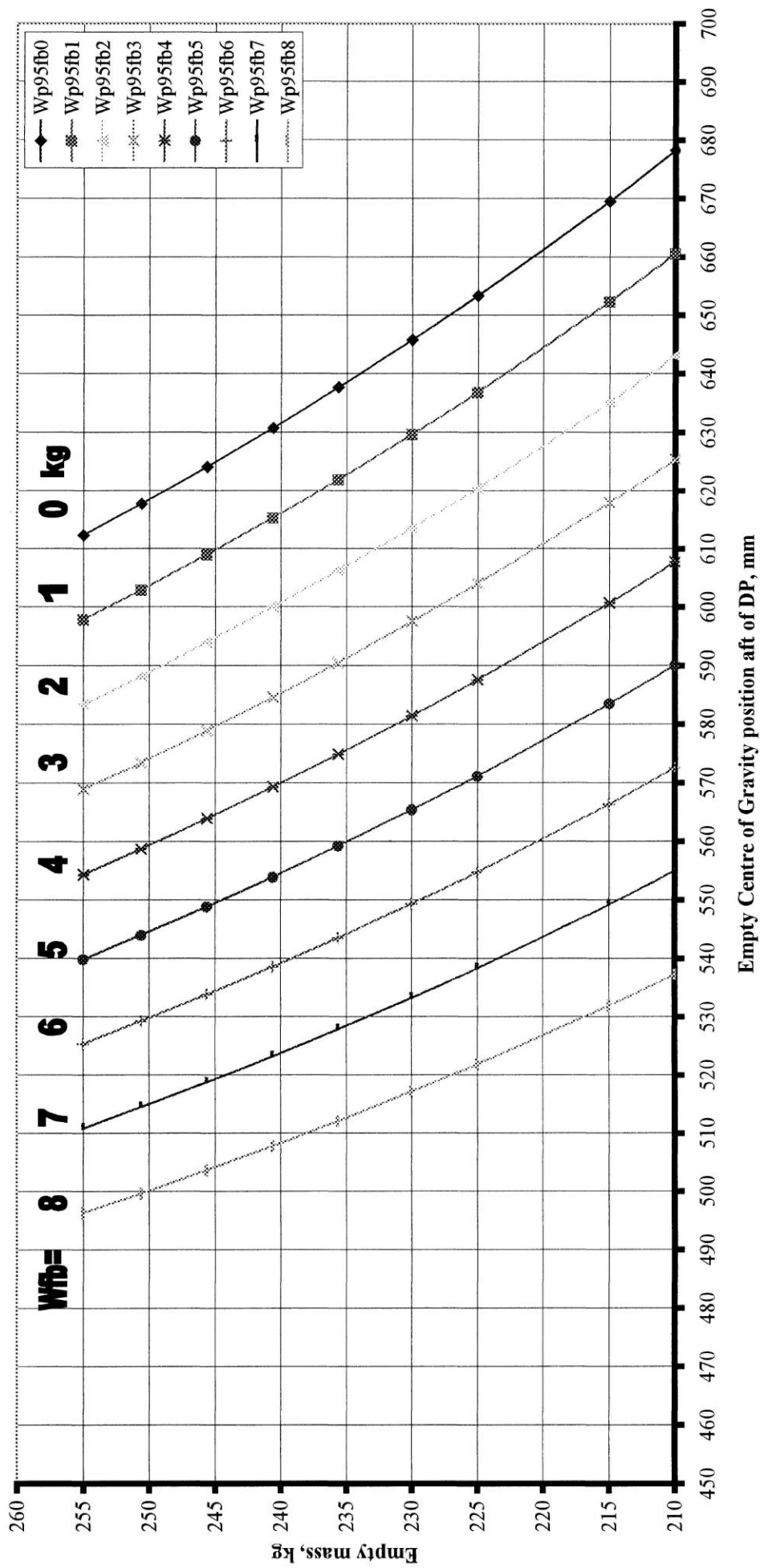
Aft limit for fin tank water ballast



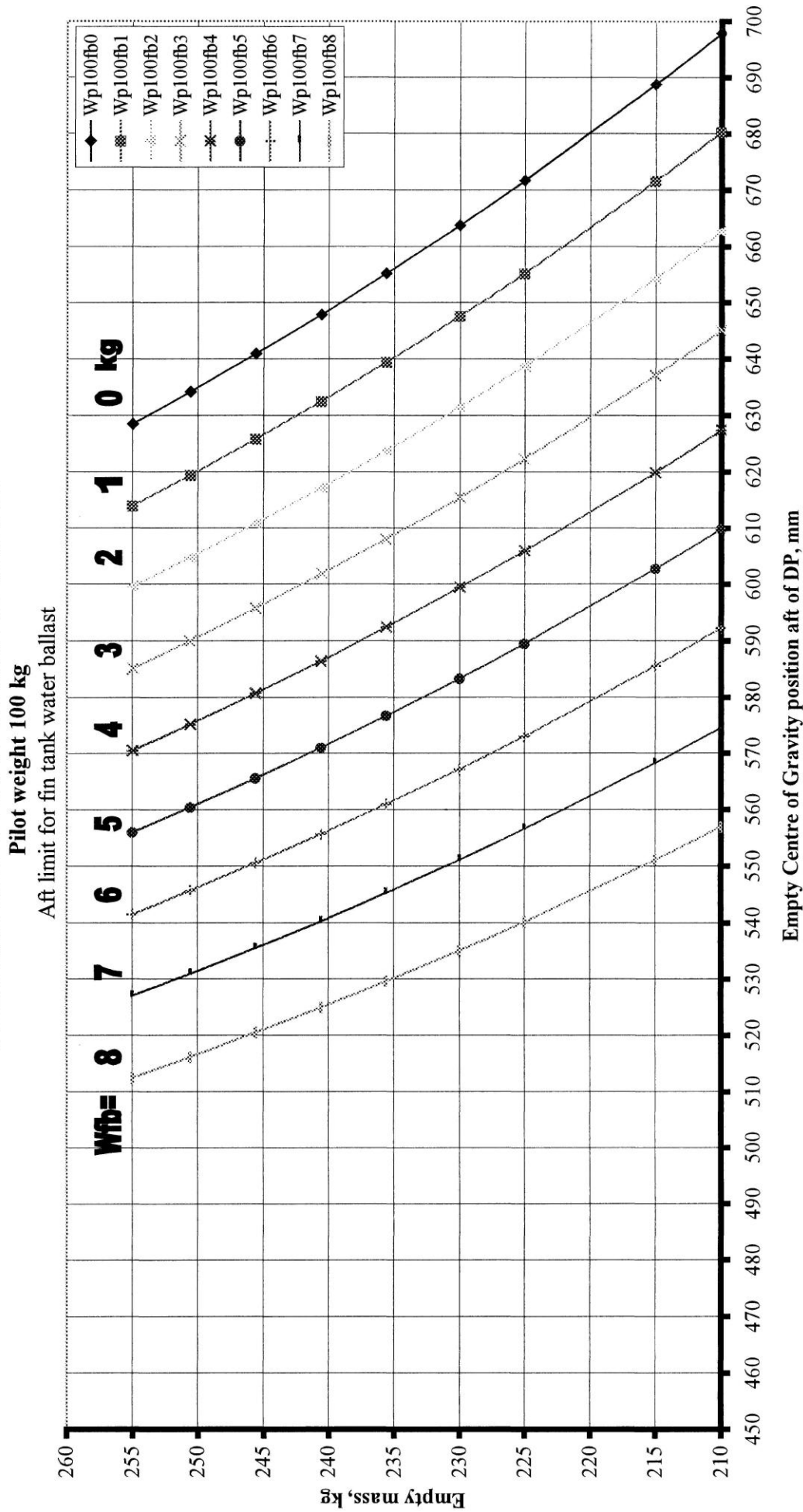
SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY

Pilot weight 95 kg

Aft limit for fin tank water ballast



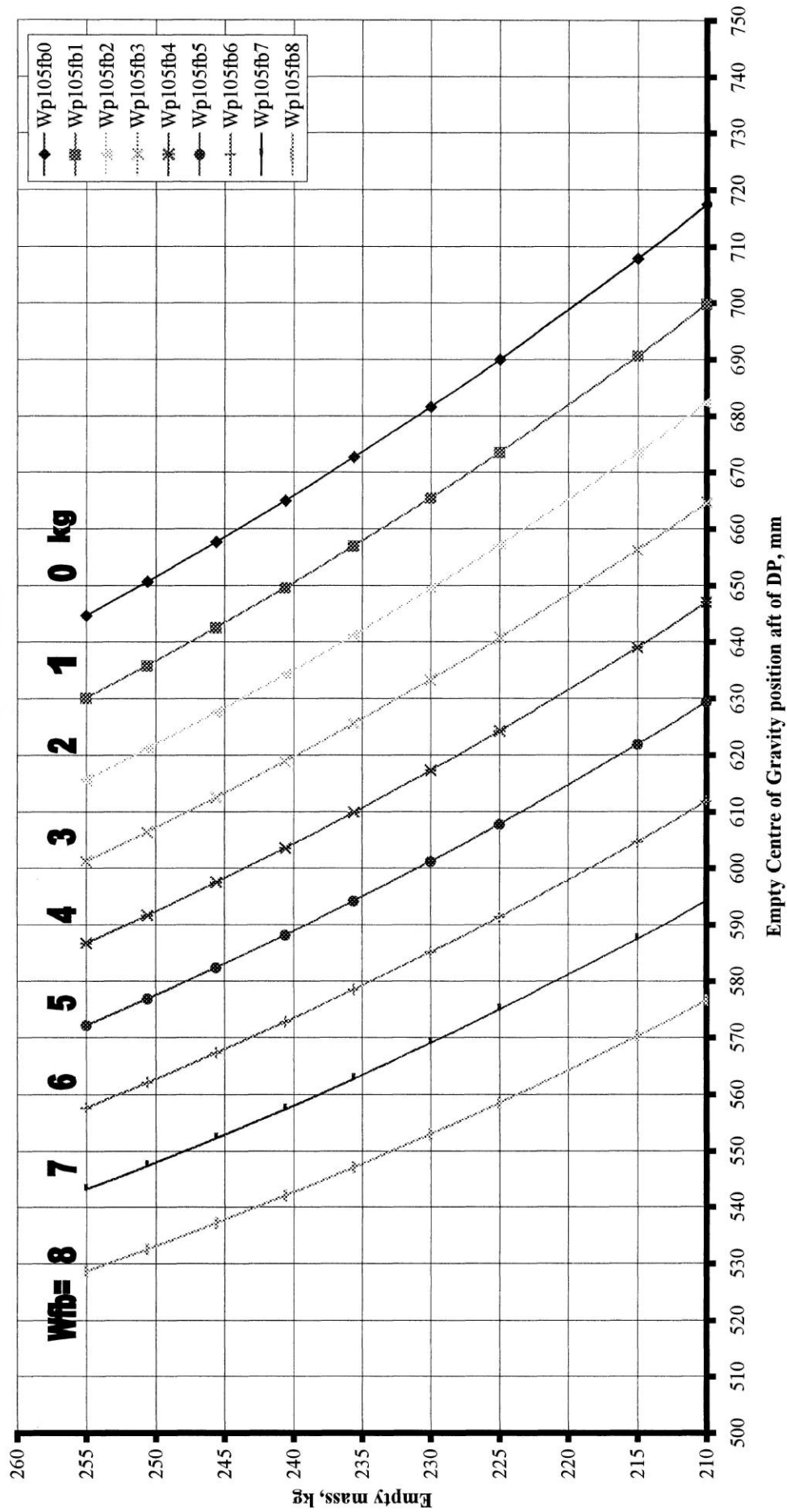
SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY



SAILPLANE LAK-19 EMPTY CENTER OF GRAVITY

Pilot weight 105 kg

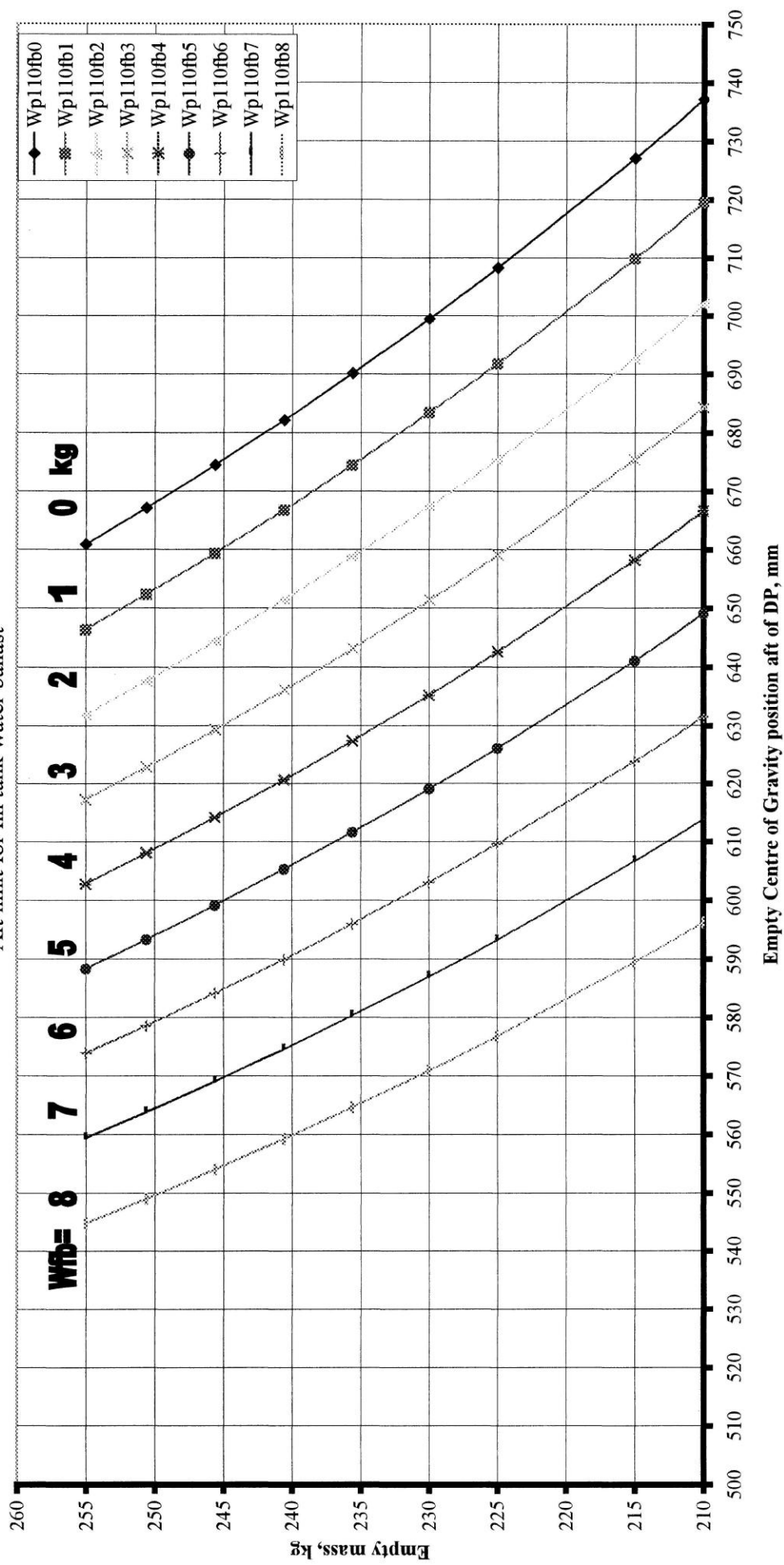
Aft limit for fin tank water ballast



SAILPLANE LAK-19 EMPTY CENTRE OF GRAVITY

Pilot weight 110 kg

Aft limit for fin tank water ballast



SECTION 8**Repair**

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8.3.1	Conditions for repair works	2
8.3.2	Classification of damage	2
8.3.3	Typical repair of sailplane aggregates skins	2
8.3.4	Materials used for repair	3
8.4	Repair of metal parts	4
8.5	Illustrations	4

8.1 Introduction

General requirements for repair of minor sailplane damage are given in this section.

8.2 Main requirements for repair work

1. Repair work shall be performed only by qualified and authorized staff.
2. Major repairs shall be agreed to by local CAA in order to avoid possible sailplane airworthiness violation.
3. If there are some doubts about repair classification (“major” or “minor”) contact the manufacturer of the sailplane.
4. In respect to the sailplane zone being repaired (fig. 8-1a, fig. 8-1b) work may be carried out by:
 - zone 1 – a person having corresponding permission,
 - zone 2 – repair factory certified by local CAA
 - zone 3 – the sailplane manufacturer.
5. After repair of controls, repainting of a sailplane it is necessary to check weights and positions of C.G. of controls having been repaired and C.G. of the sailplane.
6. No additional color marking on the white upper surface is allowed.

8.3 Repair of parts of advanced composites

8.3.1 Conditions for repair works

Premises where repair is carried out must be clean, warm and properly lighted. Temperature during repair must be $\geq + 20^{\circ}\text{C}$ and humidity $\leq 65\%$.

The optimal processing temperature for resin- hardener systems lies in range between 20°C and 25°C . Heat treatment must be performed keeping temperature of $50\text{-}60^{\circ}\text{C}$ for 15 hours.

Advanced composite repairs should only be performed by adequately trained and qualified trained and qualified repair persons.

8.3.2 Classification of damage

The sailplane construction is divided into three zones with allowed sizes of damage in them (fig. 8-1a, fig. 8-1b, table 8-1).

Table 8-1

Pos. No	Repair damage	Zone 1	Zone 2
1	An opening	ϕ 100 mm	ϕ 40 mm
2	Crack (split)	200 mm	100 mm
3	Damage of leading edge	100 mm – for ailerons, flaps 40 mm – for wings	40 mm – for fin, stabilizer
4	Damage of trailing edges	200 mm	
5	Damage of paint coating	Without restrictions	

It is allowed to repair these constructive damages in the certified repair station:

- 1) composite material delamination, cracks at structural joints,
- 2) damage of wing roots and end ribs,
- 3) cracks and fractures of metal constructions,
- 4) cracks and delamination of skins of fuselage, wings, stabilizer, controls, wings tips and damages in a structural parts.

For the above it is necessary to get corresponding technical information and recommendations from the manufacturer of the sailplane.

Damage of wings spars may ONLY be repaired by the manufacturer of the sailplane.

8.3.3 Typical repair of sailplane aggregates skins

Typical repair works of sailplane aggregates skins are shown in fig. 8-2.

If a part of advanced composites is damaged partially not through (fig. 8-2,a) its repair must be performed as follows:

- make round edges of a damaged zone,
- take out foam of opening (fig. 8-2,b) and check the internal layer for damage,
- if an internal layer is not damaged, prepare an upper coating for repair (fig. 8-2,b),
- glue in foam,
- after glue polymerization, sand the repaired zone with sand paper and then lay-up on it the required number of repair layers of cloth at given angle of reinforcement (fig. 8-1a, fig. 8-1b, fig. 8-2,c).

Caution: During repair the required temperatures for processing of the resin- hardener systems must be kept.

If a part of advanced composites is damaged through (fig. 8-2,d) repair must be performed as follows:

- make round edges of a damaged zone,
- take out foam around the opening (fig. 8-2,e),
- prepare an upper coating for repair (fig. 8-2,e),
- glue in a plate on prepared internal layers according to requirements of fig. 8-2,e (if edges of internal layers are flexible, it is necessary to glue technological plate from bottom side),
- after glue polymerization, sand the repaired zone with sand paper and then, lay-up on it the required number of repair layers of cloth at given angle of reinforcement (fig. 8-1a, fig. 8-1b, fig.8-2,f).

Caution: During repair the required temperatures for processing of the resin- hardener systems must be kept.

8.3.4 Materials used for repair

The following fabric types are used for repair of parts of advanced composites:

Table 8-2

Type (Interglass No)	Weaving type	Mass g/m ²	Cloth thickness, mm	Manufacturer
Glass fabric				
90070	Plain	81	0.1	Interglass AG
92110	Twill 2/2	163	0.18	Interglass AG
92125	Twill 2/2	280	0.35	Interglass AG
Carbon fabric				
98131	Twill 2/2	163	0.2	Interglass AG
Kevlar fabric				
98613	Twill 1/3	170	0.35	Interglass AG

For repair work resin- hardener systems Laminating resin L 285 - Hardener 285,286,287 are used.

Caution: Resin and hardener must be stored in carefully sealed containers. Resin and hardener may crystallize at temperatures below +15°C. The crystallization is visible as a clouding or solidification of contents of the container. Before using the resin and the hardener must be heated in order to destroy the crystallization of them. Slow warming till 50°C - 60°C in vessels with water and stirring of them will make the content transparent without los of their quality. Only fully transparent products must be used. Do not heat over an open flame! Use individual protective appliances while stirring (gloves, glasses, respirator).

Preparation of binding material:

Mixture ratios	Resin L-285	Hardener 287/286/287
Parts by weight	100	38 ÷ 40
Parts by volume	100	47 ÷ 50

The given mixing ratio of components must be observed as exactly as possible. More or less hardener will not speed up or slow down the reaction – just cause only partial hardening which will not be corrected any way. Mixture of resin and hardener must be stirred thoroughly until there is no cloudiness in a vessel.

Pay special attention to walls and corners of the vessel.

The optimal processing temperature for resin- hardener systems lies in range between 20° C and 25°C. Higher temperature is possible but it will shorten an effectiveness duration of the resin. Temperature rise by 10°C makes an effectiveness duration twice shorter.

8.4 Repair of metal parts

Damaged galvanized and paint coatings on metallic parts which are not damaged by corrosion, etc. affecting the strength of the part, may be restored by replacing the coating in accordance with manufactures' recommendations. Metallic parts damaged by corrosion, etc. may only be repaired in accordance with instructions obtained from the sailplane manufacture.

8.5 Illustrations

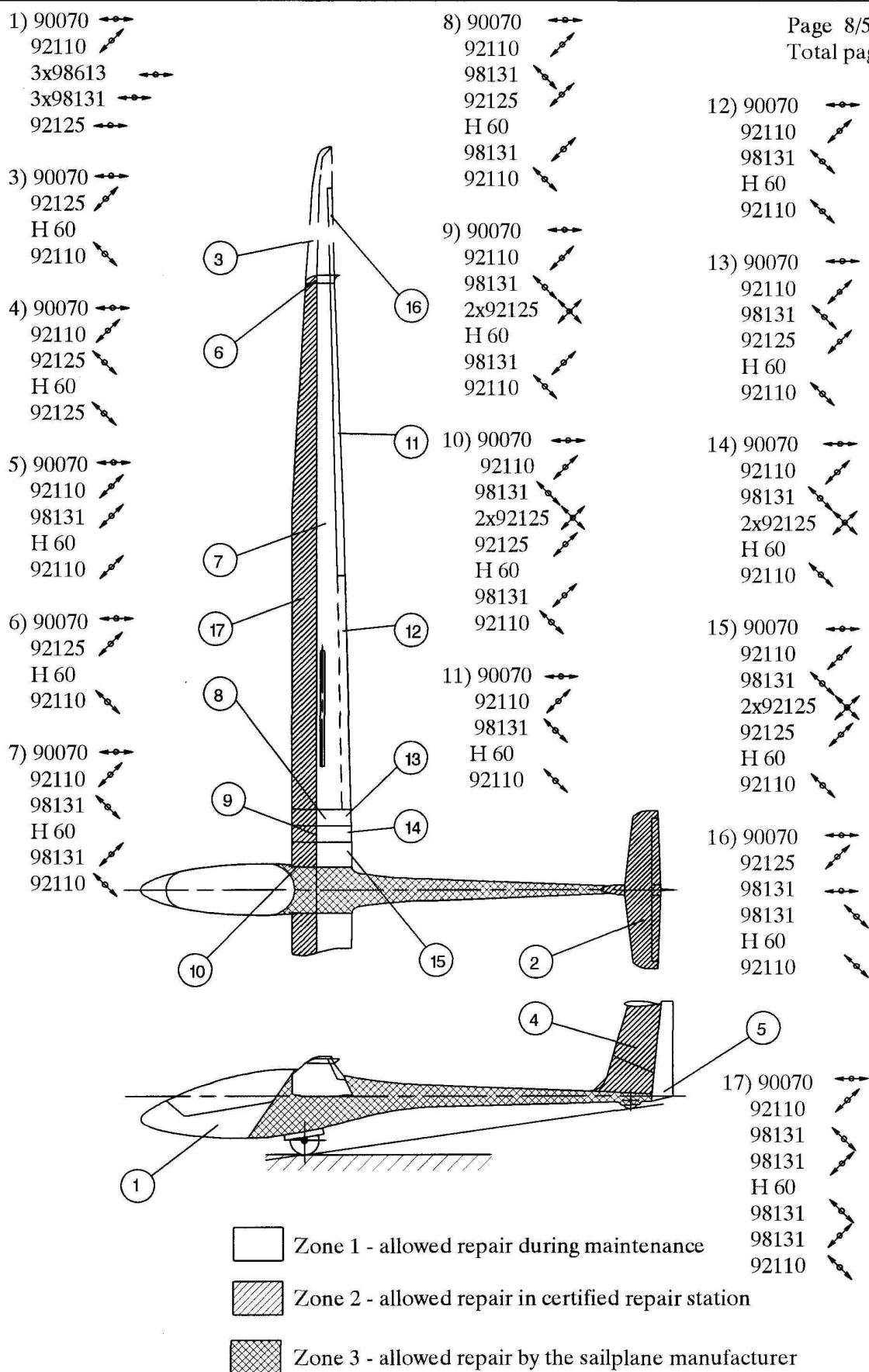
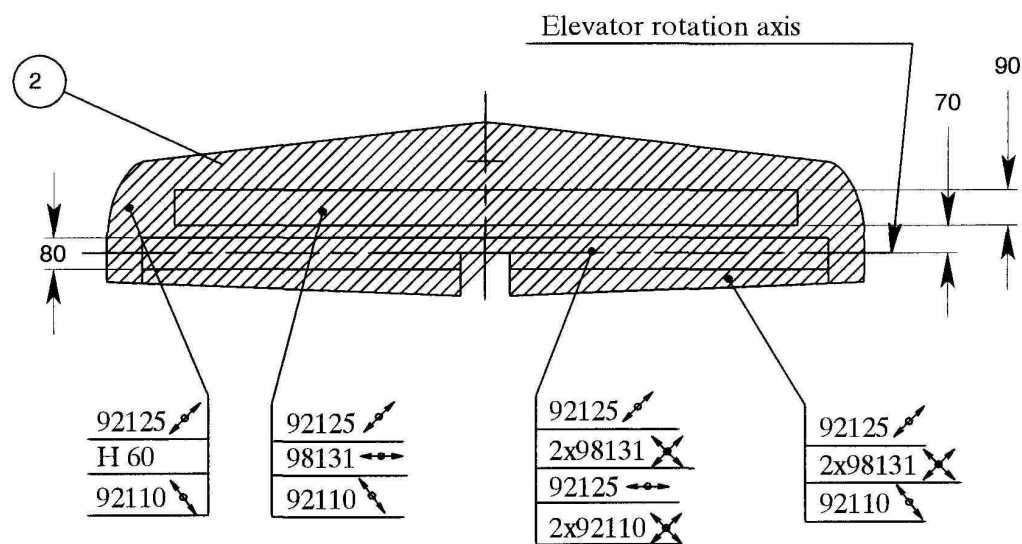


Fig.8 - 1a. Repair zones of sailplane

An upper surface of stabilizer and elevator



A lower surface of stabilizer and elevator

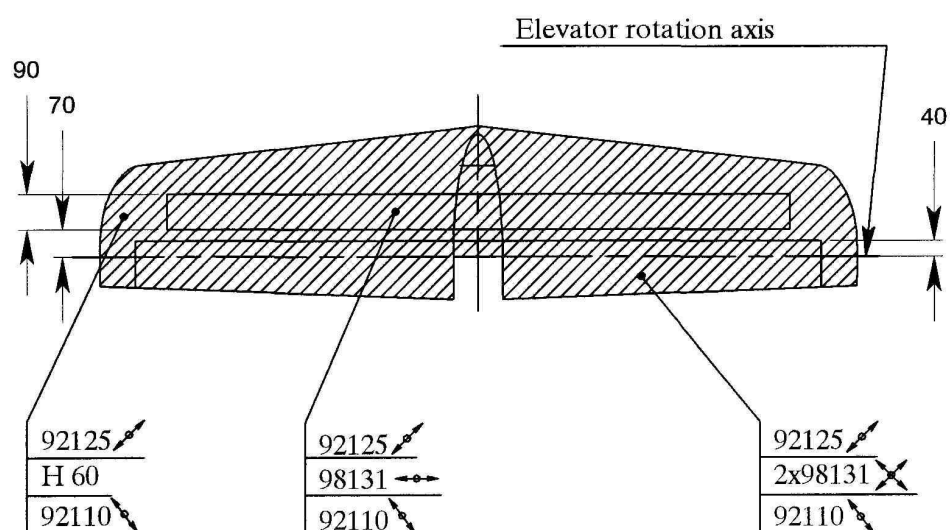
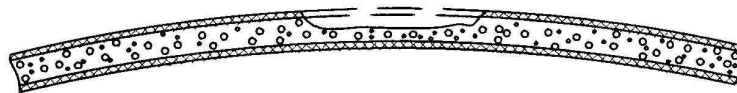


Fig.8 - 1b. Repair zones of sailplane

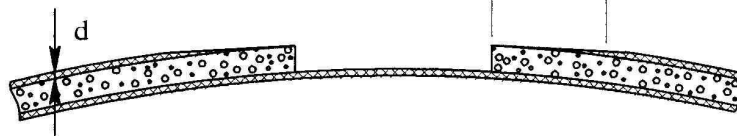
Repair of partially damaged skin

a) partial damage

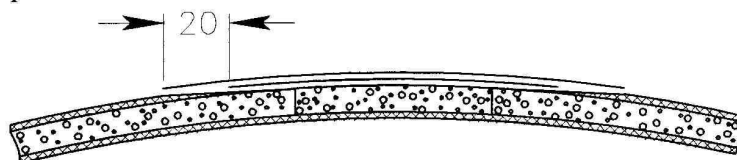


b) preparation for repair

$$l/d = 50$$

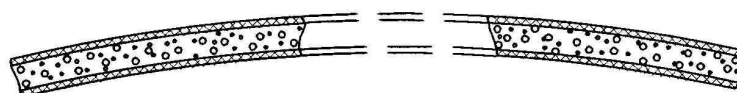


c) repair



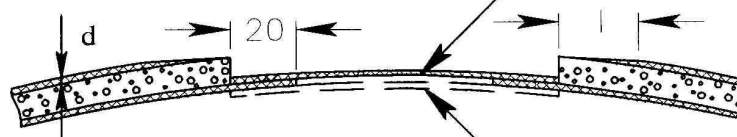
Repair of skin damaged through

d) through damage



e) preparation for repair

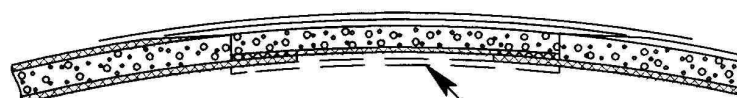
$$l/d = 50$$



Plate

Plywooden support

f) repair



Plywooden support

Fig.8 - 2 Typical repair of skin of sailplane parts

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