AVIATION ARTUR TRENDAK & SON

AIRCRAFT MAINTENANCE MANUAL

GYROCOPTER

TERCEL

SERIAL NUMBER: **T&S J22015S**

REGISTRATION NUMBER:

NUMBER ON FILE:

THE MANUAL WAS APPROVED WITH A DECISION OF PRESIDENT OF THE CIVIL AVIATION AUTHORITY

DATED …… NO. ……

"ULTRALIGHT" CATEGORY

THIS GYROCOPTER CAN BE USED IN THE "ULTRALIGHT" CATEGORY FOR LEISURE, SPORTS AND DISPLAY PURPOSES AS WELL AS OTHERS, EXCLUDING AIR TRANSPORT.

USING THIS GYROCOPTER FOR TRAINING AND PRACTICE TO OBTAIN A CERTIFICATE OF QUALIFICATIONS OF AN ULTRALIGHT GYROCOPTER PILOT AS WELL AS HAVE QUALIFICATIONS ENTERED IN THIS CERTIFICATE CAN BE DONE SOLELY IN A CERTIFIED TRAINING CENTRE.

THE GYROCOPTER MUST BE USED ACCORDING TO THE RESTRICTIONS AND INFORMATION STATED IN THIS INSTRUCTION MANUAL.

THIS MANUAL MUST ALWAYS BE AVAILABLE WHEN PERFORMING MAINTENANCE ACTIVITIES ON THE GYROCOPTER.

The manual has been developed as per the requirements of the regulations in Annexe No. 5 “Ultralight Aircraft” - of the Decree of the Minister of Infrastructure dated 25 April 2005 on Excluding the Application of Some of the Laws of the Act on Air Law for Some Sorts of Aircraft as well as Defining the Conditions and Requirements concerning the Use of this Aircraft (Official Journal 107 section 904) with subsequent amendments.

It is not allowed to make any entries and supplements in this “Aircraft Maintenance Manual” without the consent of the Civil Aviation Authority.

In case this Manual is lost, you should notify the Civil Aviation Authority instantaneously, and when outside the border of your country - an equivalent institution.

Any person to find this manual is requested to send it in instantaneously to Urząd Lotnictwa Cywilnego (Civil Aviation Authority), 02-247 Warszawa, ul. Marcina Flisa 2, Poland, and when outside the border of your country to an equivalent institution.

Chapter 0 Organizational Information

0.1 Register of Changes

If necessary AVIATION ARTUR TRENDAK will issue updates for this manual and will publish it in the form of bulletins on its website.

Any changes of this manual must be instantaneously entered and written in the table below as well as be approved by the Civil Aviation Authority (CAA).

A new or revised text in changed pages must be marked with a black vertical line on the margin and a change number. The number of the last change in a given page and its date must be placed in the page footer. Every time a change is entered, the pages listed in the table below must be mentioned.

Change no.	Description of change	Pages Affected	Entry date	Signature

Change no.	Description of change	Pages Affected	Entry date	Signature

0.2 List of Up-to-date Pages

Chapter	Page	Date	Chapter	Page	Date
	Title	14.11.2013	4	4-1	14.11.2013
	Reverse	14.11.2013		4-2	14.11.2013
0	0-1	14.11.2013		4-3	14.11.2013
	0-2	14.11.2013		4-4	14.11.2013
	0-3	14.11.2013		4-5	14.11.2013
	0-4	14.11.2013		4-6	14.11.2013
1	1-1	14.11.2013	5	5-1	14.11.2013
	1-2	14.11.2013		5-2	14.11.2013
	1-3	14.11.2013		5-3	14.11.2013
	1-4	14.11.2013		5-4	14.11.2013
2	2-1	14.11.2013		5-5	14.11.2013
	2-2	14.11.2013		5-6	14.11.2013
	2-3	14.11.2013		5-7	14.11.2013
	2-4	14.11.2013		5-8	14.11.2013
	2-5	14.11.2013	6	6-1	14.11.2013
	2-6	14.11.2013		6-2	14.11.2013
	2-7	14.11.2013		6-3	14.11.2013
	2-8	14.11.2013		6-4	14.11.2013
	2-9	14.11.2013	7	7-1	14.11.2013
	2-10	14.11.2013		7-2	14.11.2013
	2-11	14.11.2013	8	8-1	14.11.2013
	2-12	14.11.2013		8-2	14.11.2013
3	3-1	14.11.2013		8-3	14.11.2013
	3-2	14.11.2013		8-4	14.11.2013
	3-3	14.11.2013		8-5	14.11.2013
	3-4	14.11.2013		8-6	14.11.2013
	3-5	14.11.2013		8-7	14.11.2013
	3-6	14.11.2013		8-8	14.11.2013
	3-7	14.11.2013	9	9-1	14.11.2013
	3-8	14.11.2013		9-2	14.11.2013
	3-9	14.11.2013	10	10-1	14.11.2013
	3-10	14.11.2013		10-2	14.11.2013
	3-11	14.11.2013			
	3-12	14.11.2013			
	3-13	14.11.2013			
	3-14	14.11.2013			

0.3 Table of Contents

Chapter 1 General Information

1.1 Introduction

This manual has been written to provide pilots and engineers with information that is essential for correct operation and proper maintenance of the TERCEL gyrocopter in order to ensure its airworthiness and safe and effective operation.

The gyrocopter should be operated in accordance with this manual and the applicable regulations. The conformity with the manual and regulations is the owner/operator responsibility.

The gyrocopter can be operated only when it is technically operative and has a valid authorization to perform flights. An authorization to perform flights is entered in the ultralight aircraft book, which is a document identifying an ultralight aircraft and its subassemblies as well as containing data on the record of usage.

Any modifications to the gyrocopter, made without the consent of the manufacturer and the proper aviation authority, will render this manual invalid for the modified model.

1.2 Basis for Acknowledging Airworthiness

TERCEL gyrocopter meet BUT Requirements - German Requirements regarding construction of the ultralight gyrocopters.

1.3 Directives and Announcements of Airworthiness

All applicable directives of airworthiness or other documents (notes, regulations) issued by civil aviation authorities must be observed. Compliance with the directives should be recorded in the Ultralight Aircraft Book (Gyrocopter Book) or approved in an equivalent manner.

1.4 Responsibility

The user is responsible for conducting overhauls and proper maintenance at the right time as described in this manual.

The deadlines for inspection and maintenance actions should follow those recommended by Aviation Artur Trendak. The Civil Aviation Authority can order to change the deadlines by issuing bulletins or safety information notices.

Persons that certify maintenance should use their engineering knowledge and skills to specify the extent of the necessary repairs and checks and other issues which can affect the airworthiness of the gyrocopter.

The repairs and inspections of the gyrocopter should be registered (with a listing of all defects, shortages and additional maintenance resulting from the execution of the work schedule) in the form of reports and recorded in the Gyrocopter Book. Maintenance attestants are responsible for keeping these records. Every subsequent repair or inspection should be conducted after previous familiarization with the history of repairs and inpections.

Maintenance information (bulletins, notices etc) published by Aviation Artur Trendak should be assessed and taken into consideration by the user/owner to ensure security and reliability during operation. Complying with the recommendations of maintenance information should be recorded in the Gyrocopter Book.

The page is left blank deliberately

Chapter 2 Description of the Gyrocopter and its Systems

Table of Contents

2.1 General Description

TERCEL is a two-seat ultralight gyrocopter. The main structural component is the fuselage which is constructed with composite material. Two metal tail booms are attached from the lower part of the fuselage to a twin vertical tail unit. This consist of twin stabilizers and rudders on which a horizontal stabilizer is attached complete with winglets of constructed composite material. A metal mast is affixed to the fuselage structure, on which the control head with the rotor is mounted.

The two-blade rotor of metal structure is manufactured and delivered as a set (blades plus a hub) by the AVIATION Artur Trendak Company. The blades, made from drawn aluminium, are entirely anodized and perfectly balanced.

The *TERCEL* is powered with a **AAT&S CA 912 ULT** engine. It is a Rotax 912 UL engine, modified by the AVIATION ARTUR TRENDAK Company by adding an Iveco turbocharger. It is equipped with a three-blade composite propeller DUC FC-R INCONEL.

The undercarriage is a stationary three-wheel one in a set with the front wheel. The main legs are elastic and made of composite. The front leg is dampened with a wheel pneumatic unit. The undercarriage is made with wheels with a diameter of 450mm.

The spacious cabin with a width of 136 cm is accessible through a large door on the left and right sides. Rich glazing ensures optimum visibility. Two ergonomic seats can be set up. Each chair is equipped with adjustable four-point belts.

2.1.1 General Data

Geometric data

Rotor diameter	8.60	m
Rotor surface	60.82	m^2
Rotor blade chord	0.22	m
Overall length (without rotor)	5.04	m
Fuselage width	2.35	m
Track of wheels	2.20	m
Cockpit width	1.36	m
Overall width	2.35	m
Overall height	2.87	m
Wheel diameter	0.45	m

Weight data

	kg	lb
Maximum take-off weight	560	1234
Empty weight*	326	718
Load capacity	265	584

*Empty weight including rotor weight(40kg)

Data of the power unit

Engine type	CA 912 ULT
Power	121 KM at 5800 rpm
Reducer ratio	1 : 2.43
Propeller	DUC FC-R INCONEL
Propeller diameter	1.727 m
Capacity of the fuel tanks	120 litres

2.2 Three side view

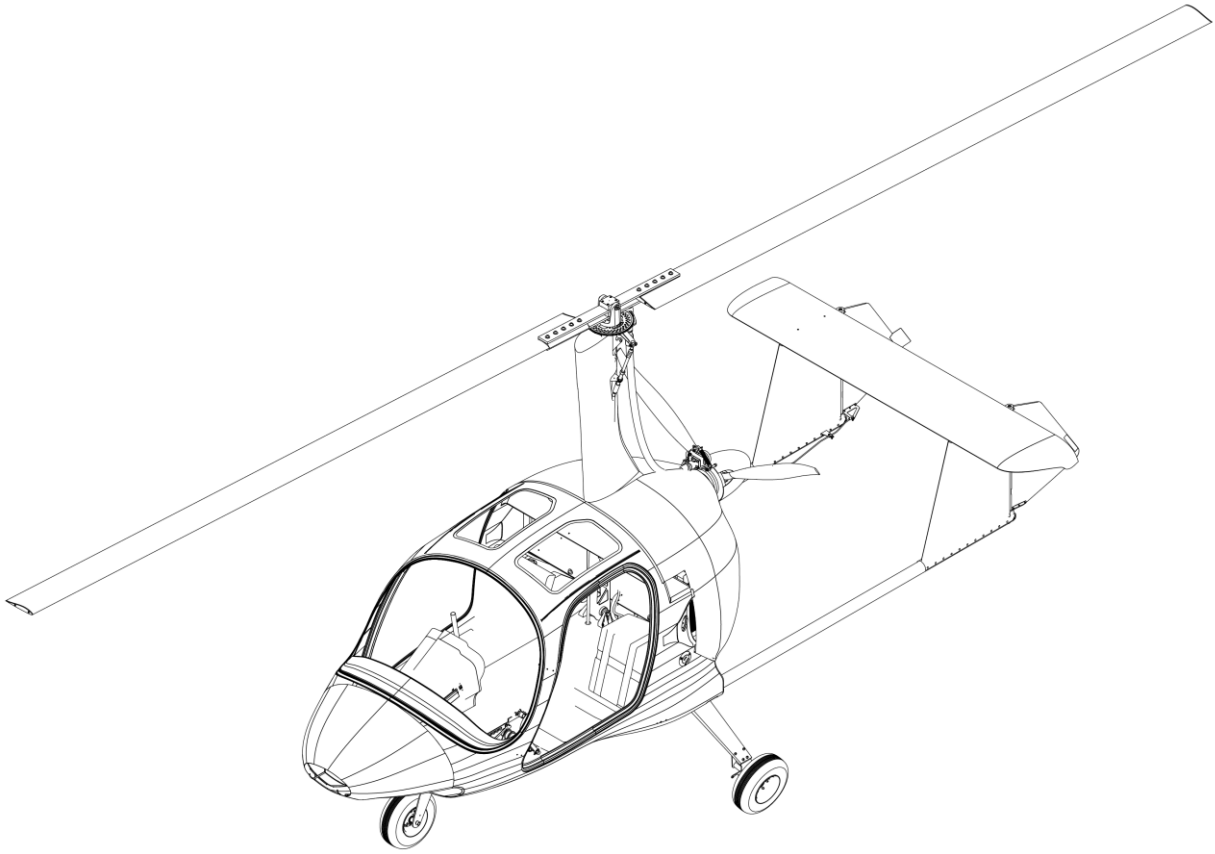


Figure 2. 2-1 Tercel isometric view

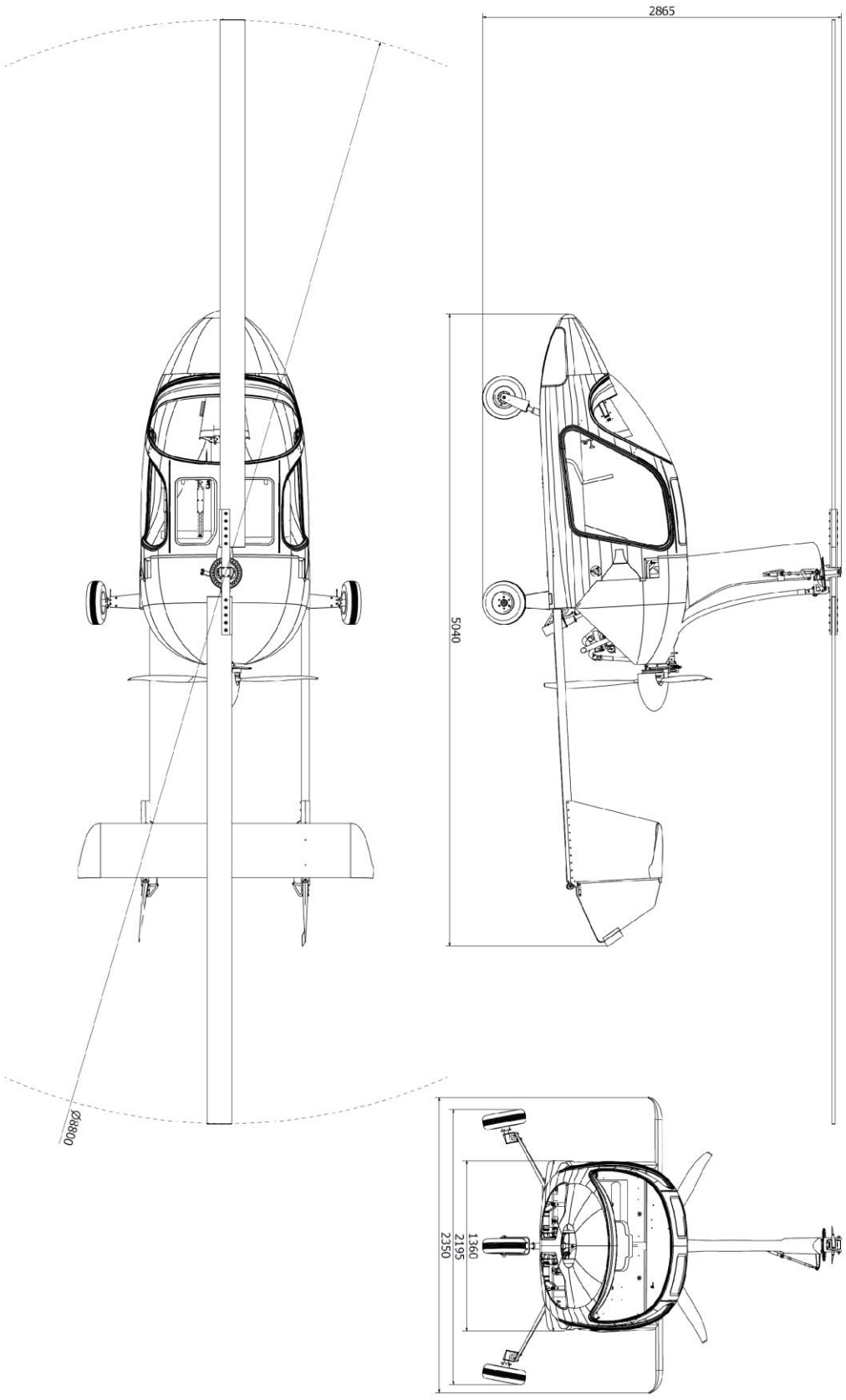


Figure 2.2-2 Tercel three side view

2.3 Control Systems

2.3.1 Schema of the Rotor Control System

Number	Name
1	Mast
2	Control Stick
3	Rotor Head
4	Bowden Cable
5	----------
6	----------
7	Holder
8	Holder

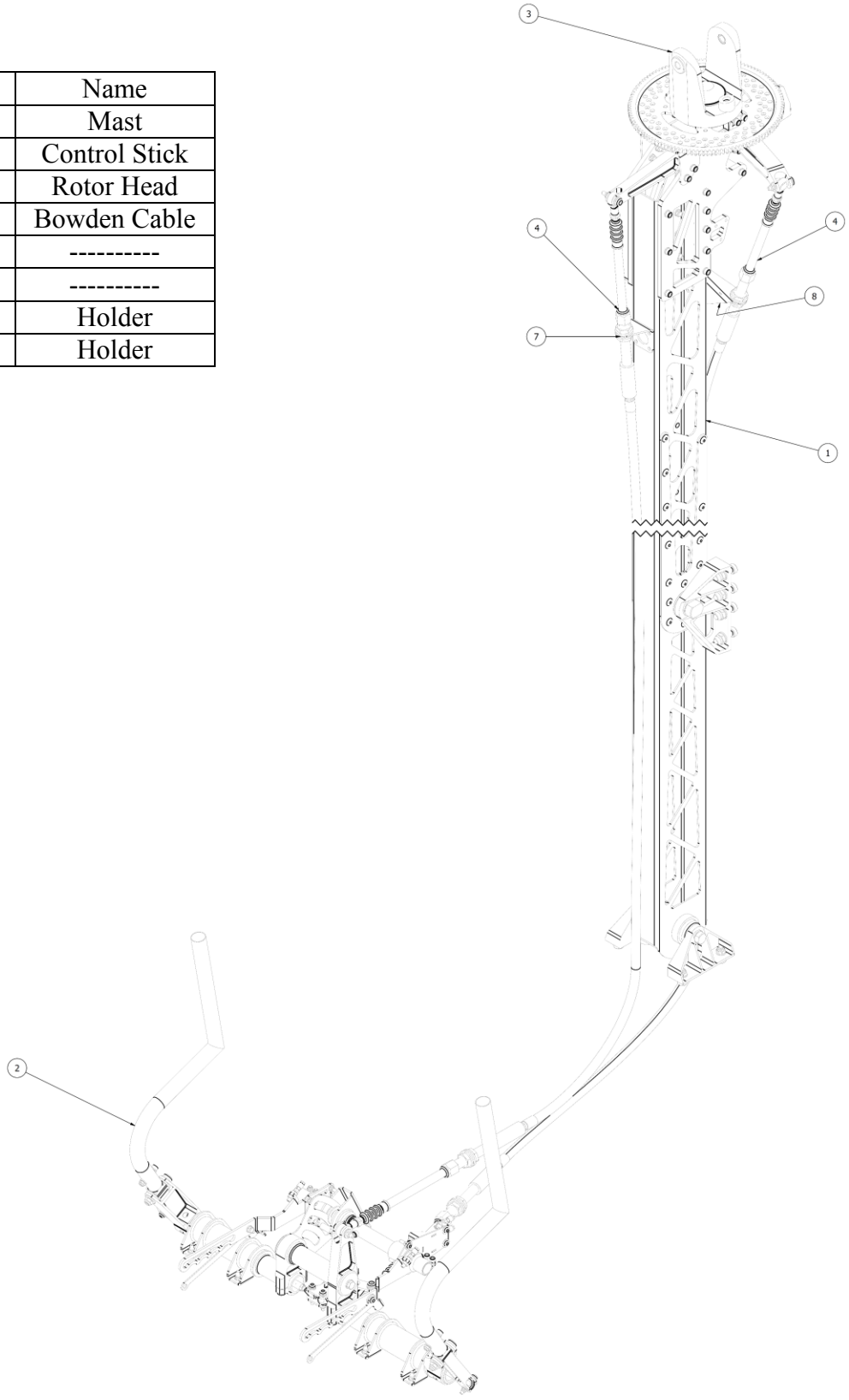


Figure 2.3.1 Rotor Control System

2.3.2 Schema of the Directional Control System

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	ZE1.000.CON.211.00.00.0	Pedals unit
2	2	ZE1.000.CON.210.01.00.0	AL angle section
3	2	ZE1.000.CON.210.02.00.0	Pusher 12x120
4	1	ZE1.000.FLG.400.00.00	Rudder lever
5	2	GAS 6 Fluro	Joint Albeco GAS 6 Fluro
6	2	3900107R Mazuria	Tie handle
7	2	3800213 Mazuria	Rudder tie
8	2	DIN 912 - M6 x 30	Bolt M6x30
9	2	DIN 912 - M6 x 35	Bolt M6x35
10	4	DIN 912 - M8 x 40	Bolt M8x40*
11	2	DIN 934 - M6	Nut M6
12	4	DIN 985 - M6	Nut nylonstop M6
13	2	DIN 6924 - M6	Nut nylonstop M6 LONG
14	6	032 0600 000 01	Nylon washer 6x18x2
15	4	031 0601 000 01	Nylon washer 6x10x3
16	8	003 0800 000 01	Nylon washer 8,4x17x2
17	8	34125048017	Rivet AL/ST 4,8x17
18		Taśma antypoślizgowa	Antislip tape

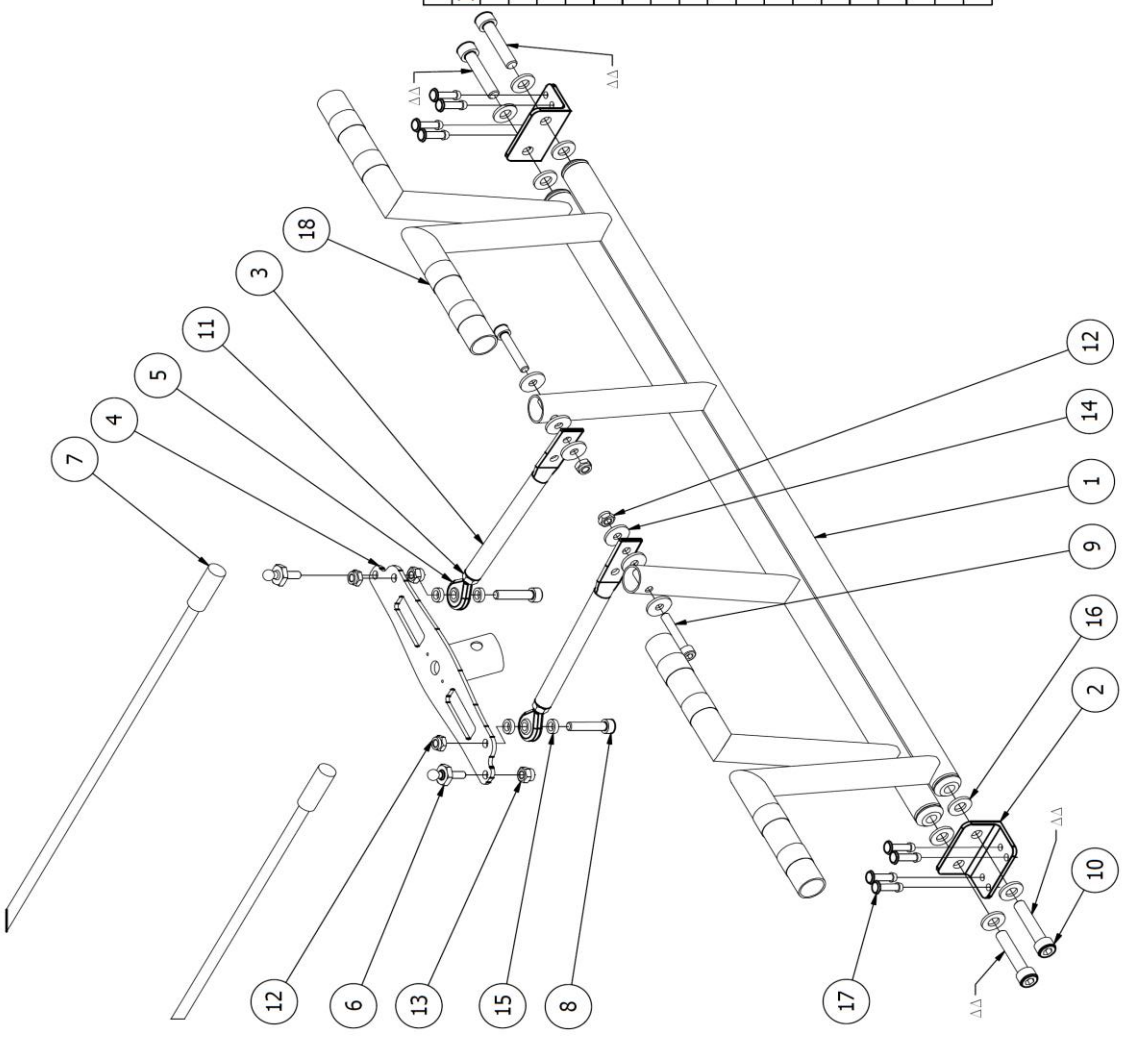
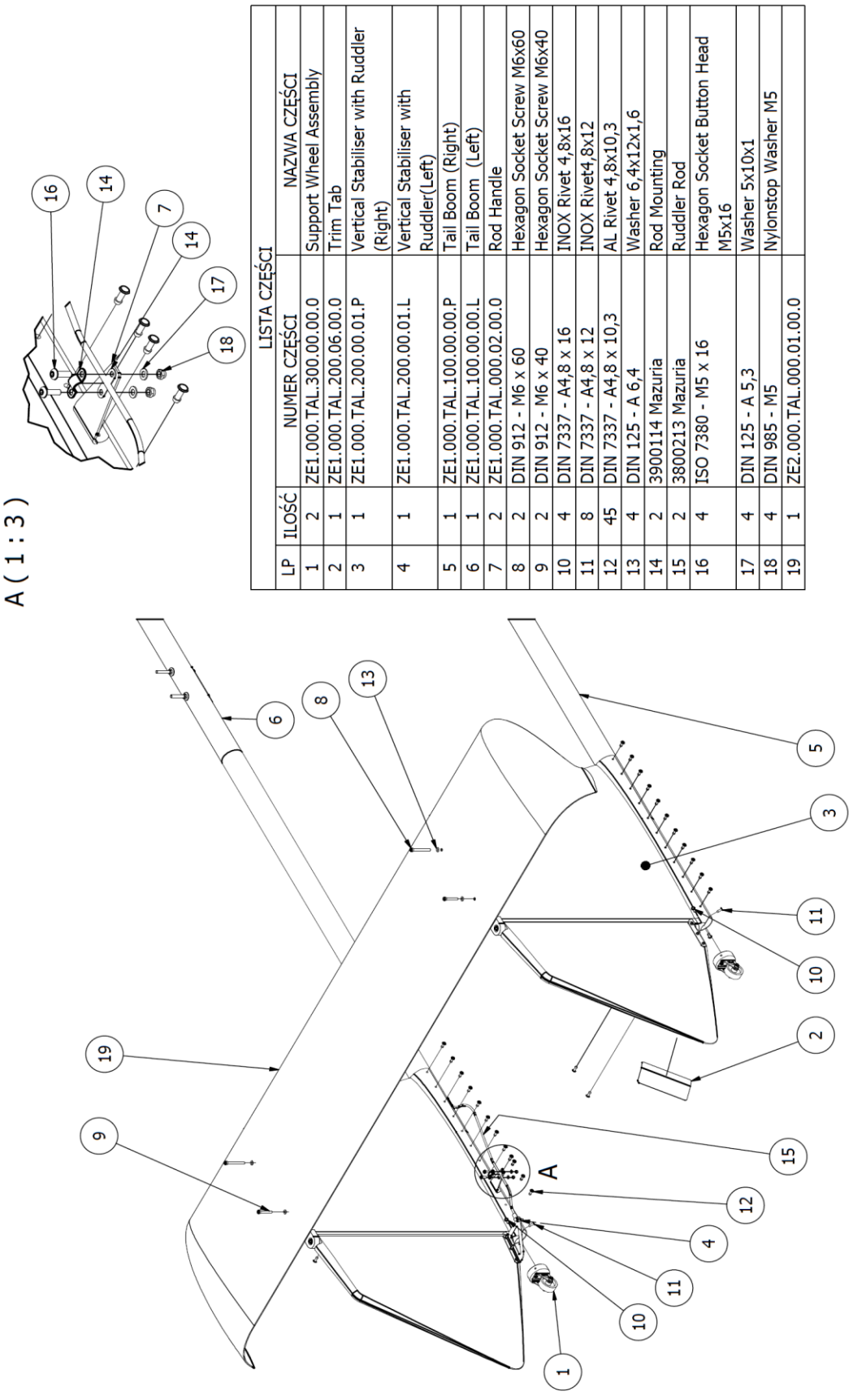


Figure 2.3.2 Directional Control System - Pedals



LISTA CZĘŚCI

LP	ILOŚĆ	NUMER CZĘŚCI	NAZWA CZĘŚCI
1	2	ZE1.000.TAL.300.00.00.0	Support Wheel Assembly
2	1	ZE1.000.TAL.200.06.00.0	Trim Tab
3	1	ZE1.000.TAL.200.00.01.P	Vertical Stabiliser with Ruddler (Right)
4	1	ZE1.000.TAL.200.00.01.L	Vertical Stabiliser with Ruddler(Left)
5	1	ZE1.000.TAL.100.00.00.P	Tail Boom (Right)
6	1	ZE1.000.TAL.100.00.00.L	Tail Boom (Left)
7	2	ZE1.000.TAL.000.02.00.0	Rod Handle
8	2	DIN 912 - M6 x 60	Hexagon Socket Screw M6x60
9	2	DIN 912 - M6 x 40	Hexagon Socket Screw M6x40
10	4	DIN 7337 - A4,8 x 16	INOX Rivet 4,8x16
11	8	DIN 7337 - A4,8 x 12	INOX Rivet4,8x12
12	45	DIN 7337 - A4,8 x 10,3	AL Rivet 4,8x10,3
13	4	DIN 125 - A 6,4	Washer 6,4x12x1,6
14	2	3900114 Mazuria	Rod Mounting
15	2	3800213 Mazuria	Ruddler Rod
16	4	ISO 7380 - M5 x 16	Hexagon Socket Button Head M5x16
17	4	DIN 125 - A 5,3	Washer 5x10x1
18	4	DIN 985 - M5	Nylonstop Washer M5
19	1	ZE2.000.TAL.000.01.00.0	

Figure 2.3.3 Directional Control System - Rudders

2.4 Fuel System (Diagram)

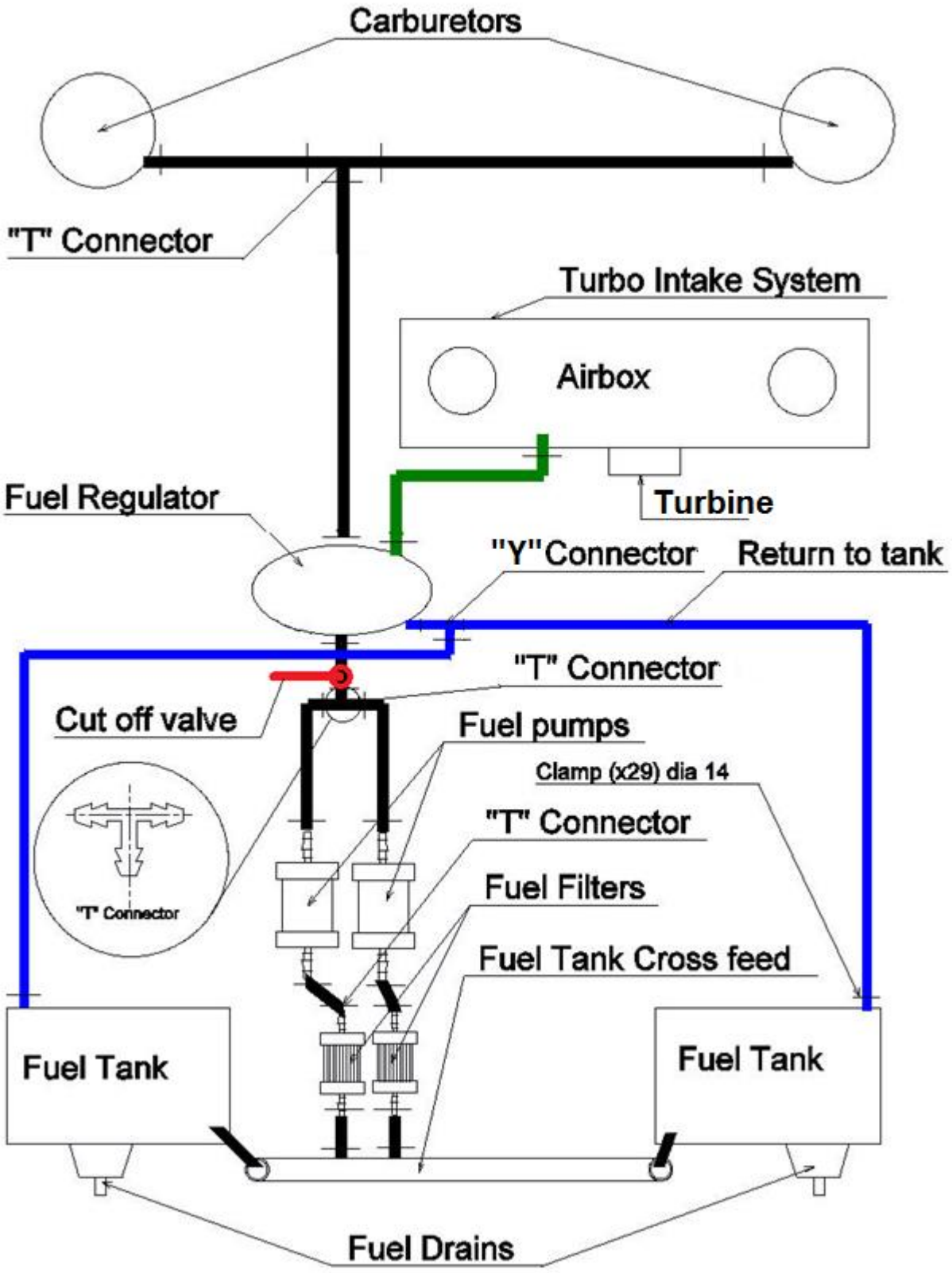


Figure 2.4.1 Fuel System

2.5 Oil System (Diagram)

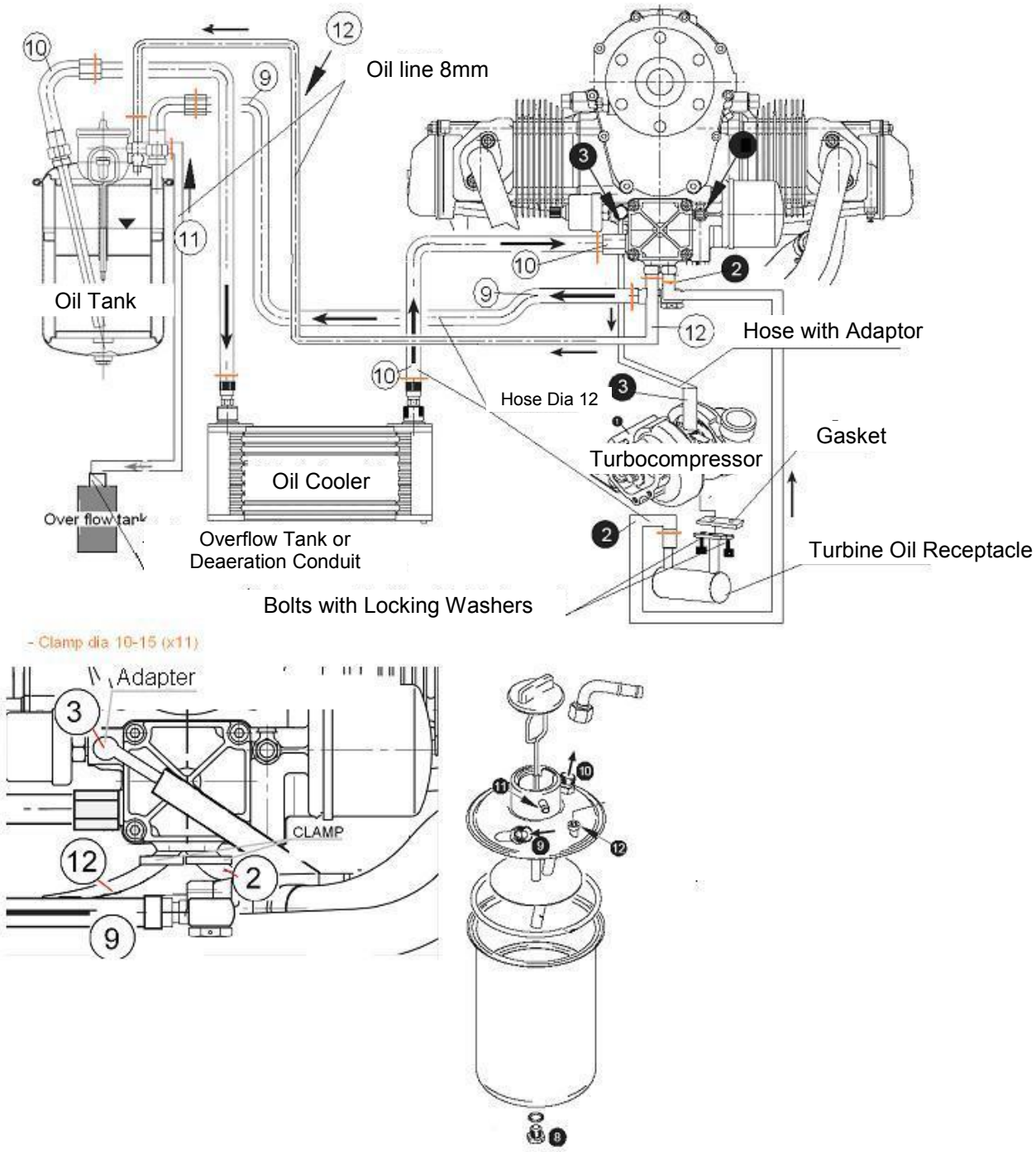


Figure 2.55-1 Fuel System

2.6 Engine Cooling System (Diagram)

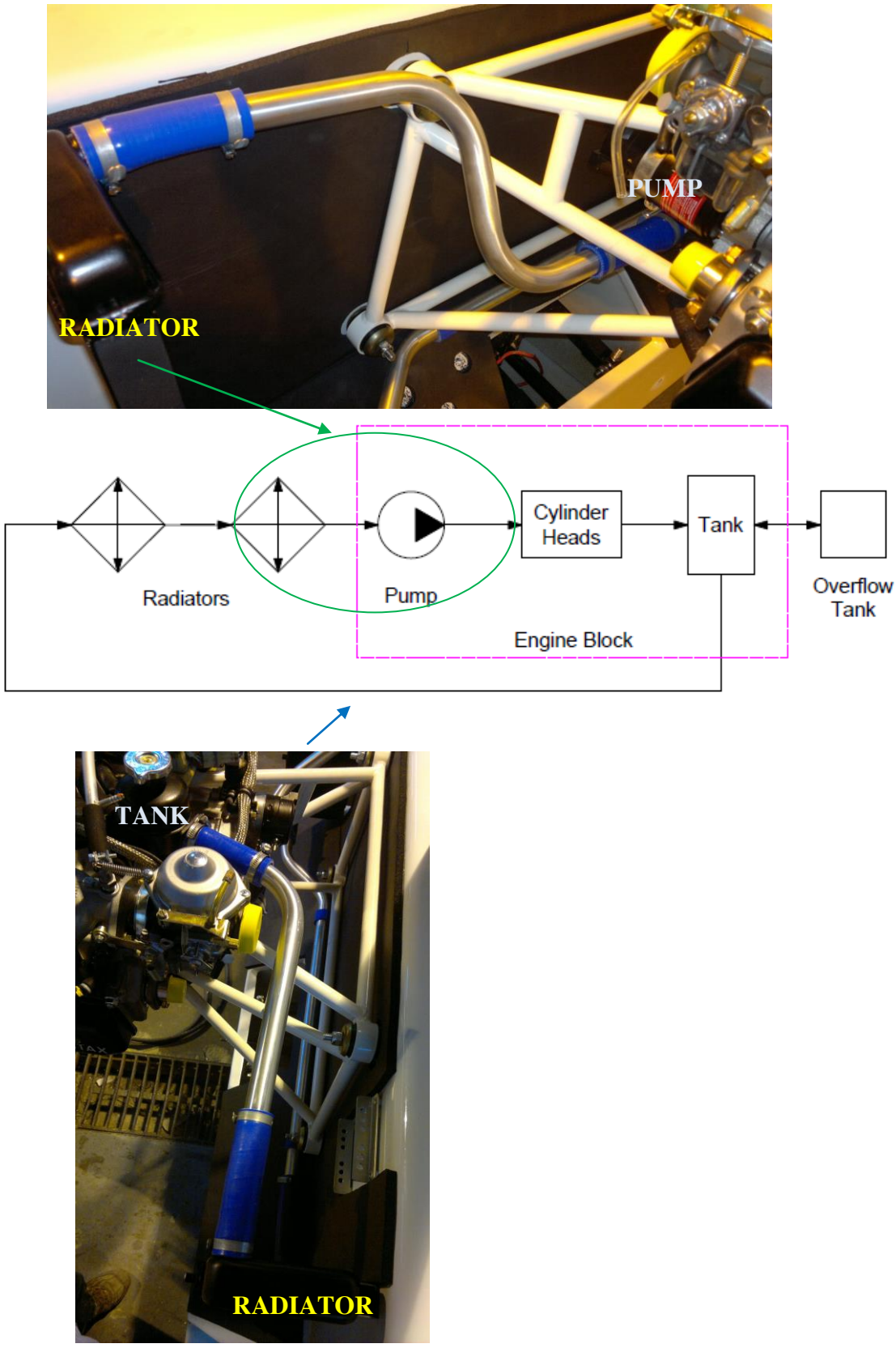


Figure 2.6-1 Engine Cooling System

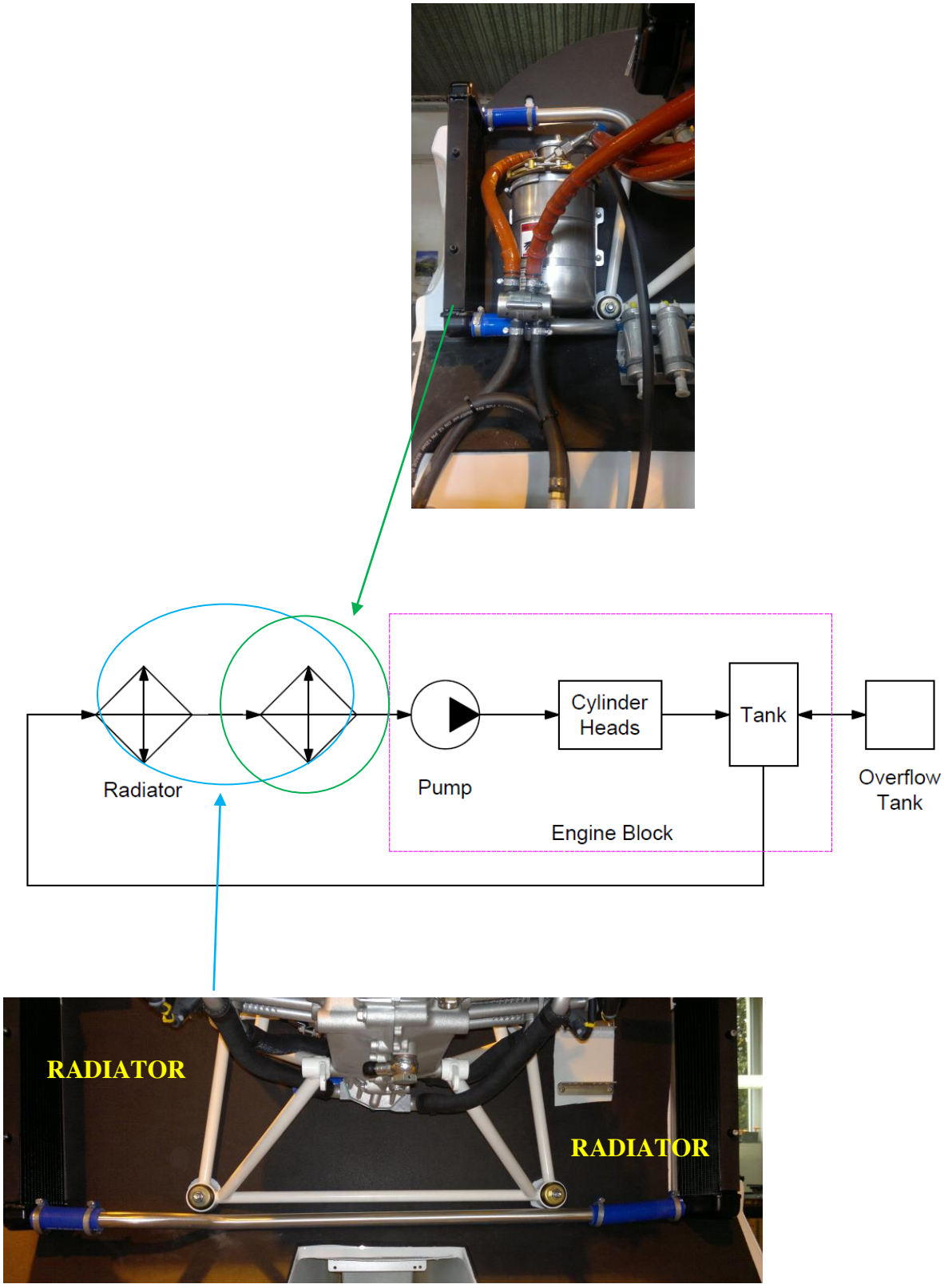


Figure 0.1 Engine Cooling System

2.7 Electrical System (Diagram)

The main source of electrical energy of the gyrocopter is engine mounted DC generator (14V, 250W at 5800 rpm). The electrical system is two-lead system because of the composite structure of the cabin. The master switch is placed on the central console panel and is activated with a removable red key.

The electrical system supply: the ignition system, engine start-up system, fuel pumps, instruments, sensors, radio equipment, electric trim system, cabin heating fan, cabin light, navigation lights, other appliances connected by sockets. On the side of the instrument board, there is a 12V socket (a typical socket for a car lighter) and USB(+5V) receptacle allowing for connecting additional devices.

Individual circuits are enabled with appropriate marked switches and secured with circuit breakers. When the generator is idle (e.g. the engine is off, it is at a low speed or there is a failure), orange indicator light turns on (charging) on the instrument board, and the electric units are supplied from the battery (12V, 10Ah).

Elucidation of denotations on the diagram of the electrical system:

1	BATTERY		21	TRANSPONDER
2	INTEGRATED GENERATOR		22	TRIMM
3	ELECTRIC STARTER		23	FAN
4	EXTERNAL REGULATOR			
5	STARTER RELAY			
6	STARTER SWITCH		**OAT**	Outside Air Temperature
7	CAPACITOR		**CHT**	Cylinder Head Temperature
8	CABIN LIGHT		**EGT**	Exhaust Gas Temperature
9	MASTER SWITCH-RED KEY		**OT**	Oil Temperature
10	OPTIONAL 1		**OP**	Oil Pressure
11	4 WAY CIRCUIT BREAKER		**RRC**	Rotor Revolution Counter
12	MAIN ELECTRIC FUEL PUMP		**ABT**	Air-Box Temperature
13	AUX ELECTRIC FUEL PUMP		**MAP**	Manifold Pressure
14	MAGNETO SWITCH		**FLS**	Fuel Level Sensor
15	MAGNETO SWITCH			
16	ELECTRIC IGNITION MODULE “A”			
17	ELECTRIC IGNITION MODULE “B”			
18	CHARGING LAMP			
19	FUSEBOX			
20	TRANSCEIVER			

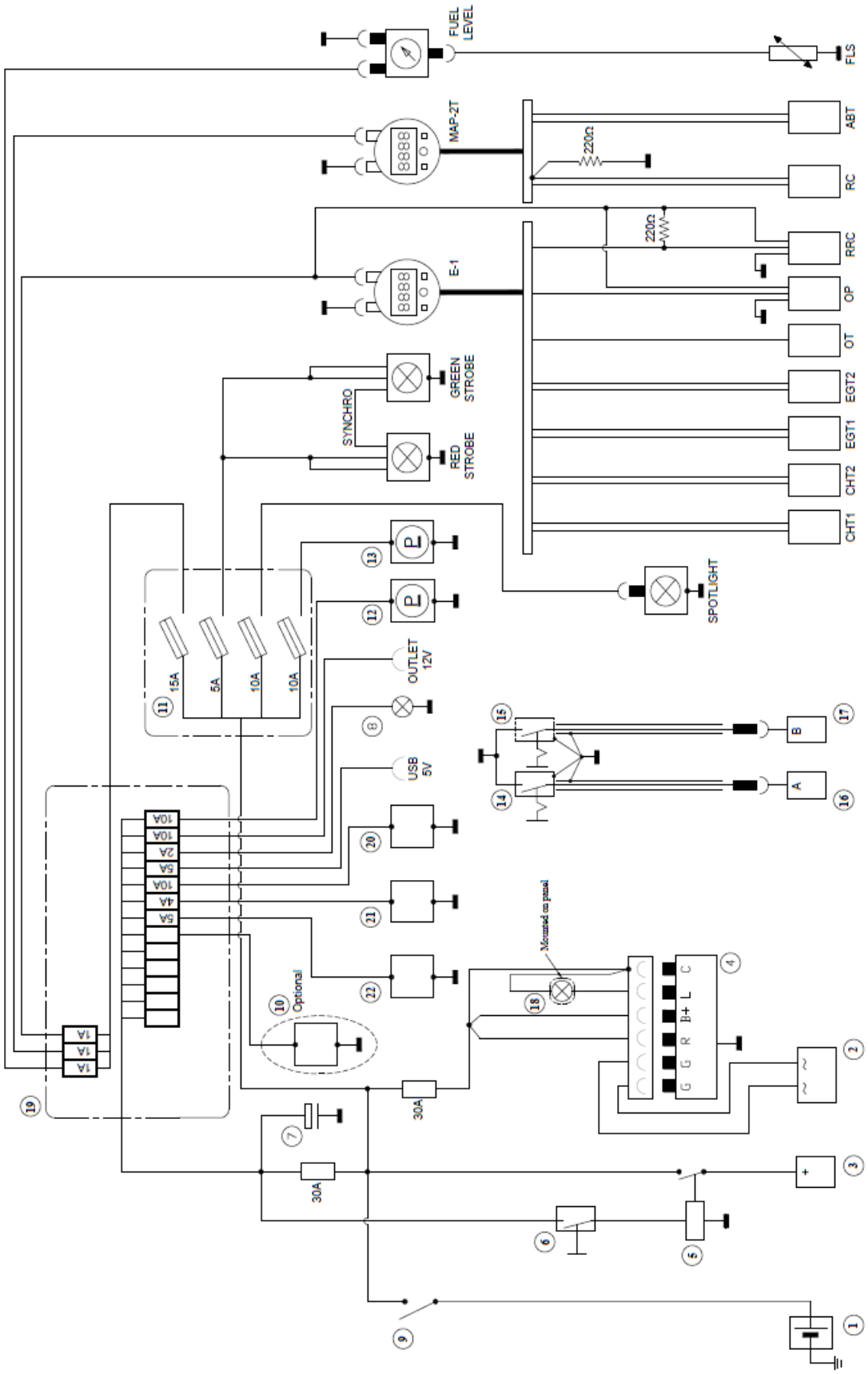


Figure 2.7-1 Electrical System

2.8 Prerotation System

Prerotation consist of Belt Clutch (transmission), Flexible Shaft and Bendix. Prerotation is engaged by the pilot from the cabin. Pulling the prerotation handle stretches belts in Belt Clutch and applies torque via Flexible Shaft to the Bendix. Bendix gear moves automatically and couples with rotor head gear.

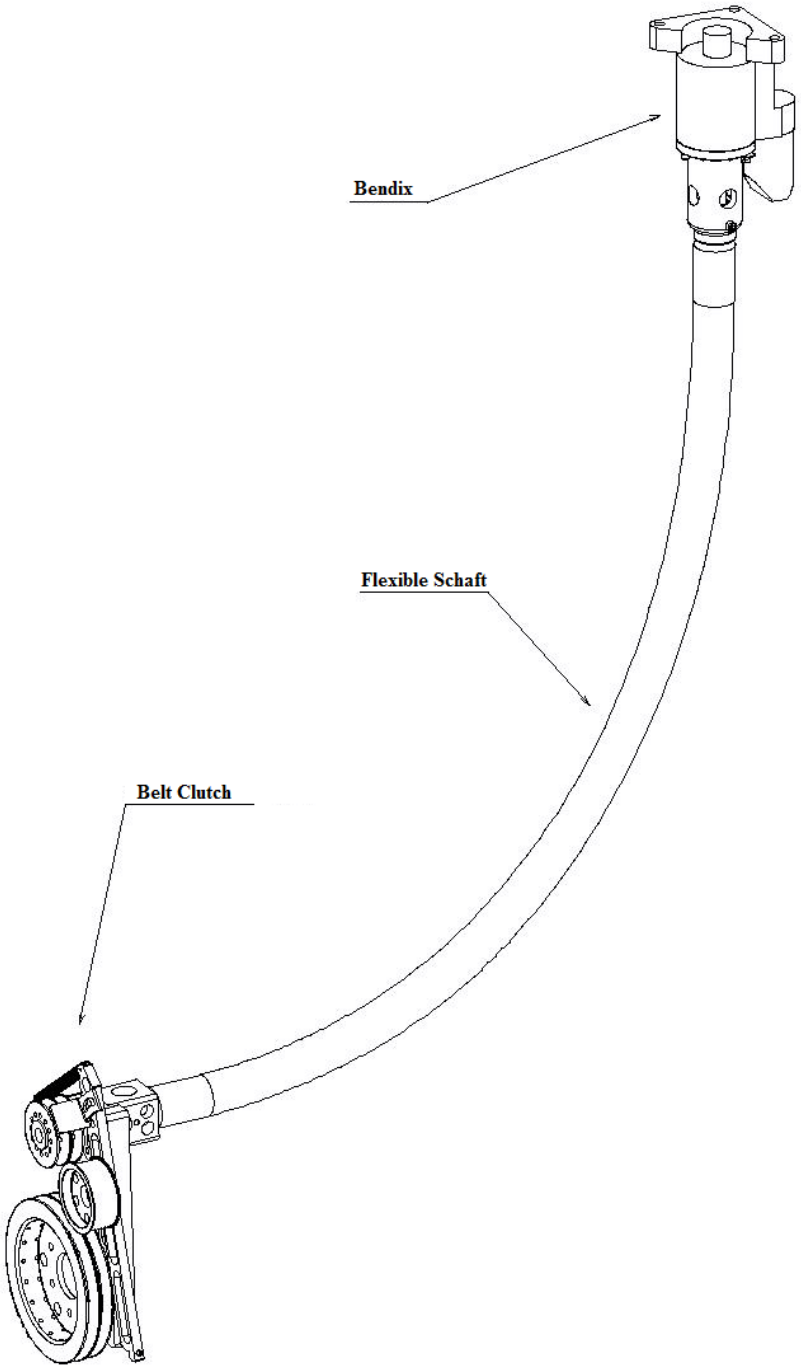


Figure 2.8.1 Prerotation System

Chapter 3 Assembly and Disassembly

3.1. Assembly and Disassembly of the Rotor

3.1.1. Assembly of the Rotor Hub

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	ZE1.000.RHT.300.03.00.0	Top rotor hub cube
2	2	ZE1.000.RHT.300.02.00.0	Small rotor cube
3	2	ZE1.000.RHT.300.01.00.0	Rotor blade mounting plate
4	2	ZE1.000.RHT.300.06.00.0	Rotor blate pocket
5	2	ZE1.000.RHT.301.00.00.0	Rotor blade
6	2	ZE1.000.RHT.300.04.00.0	Bronze sleeve
7	1	ZE1.000.RHT.300.07.00.0	Mounting bolt
8	10	ZE1.000.RHT.300.08.00.0	Shortened bolt M8
9	4	DIN 985 - M6	Nut nylonstop M6
10	11	DIN 985 - M8	Nut nylonstop M8
12	20	DIN 9021 - 8,4	Washer 8,4x24x2
13	4	DIN 125 - A 6,4	Washer 6,4x12x1,6
14	4	DIN 912 - M6 x 60	Bolt M6x60

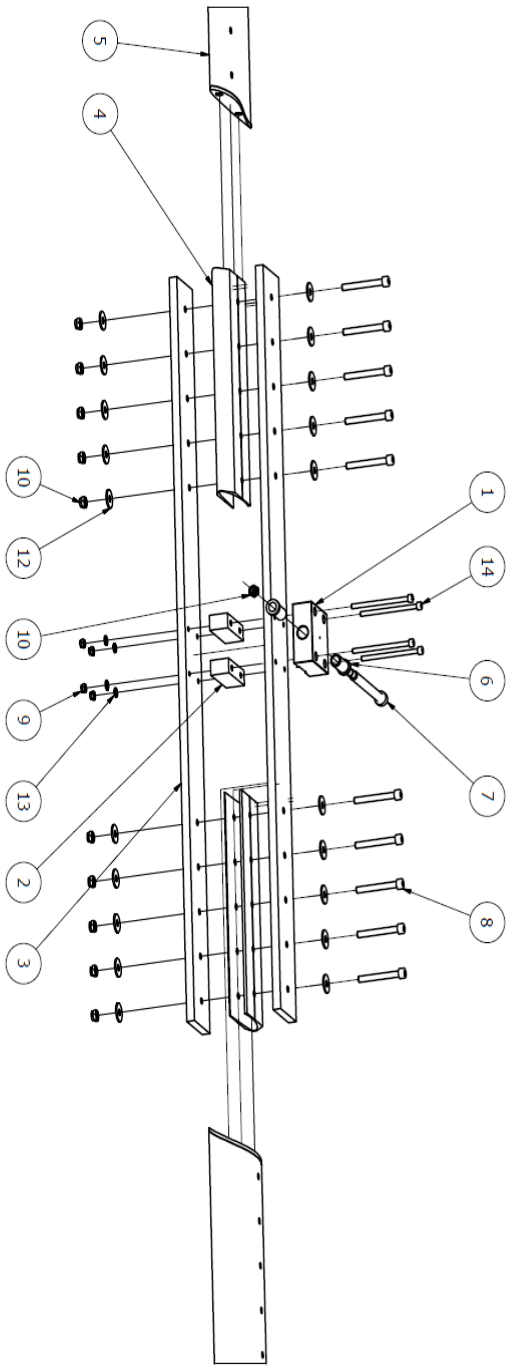


Figure 3.1.1 Assembly of the rotor hub (Note: After assembly, the rotor hub cannot be disassembled)

(Use WHS2000 to lubricate Mounting bolt – Item 7 from figure 3.1-1)

3.1.2 Disassembly of the Rotor

The rotor must be dismounted from the gyrocopter to be carried by road transport.

Dismounting the rotor from gyrocopter:

NOTE: **In order to dismount the rotor from gyrocopter use a ladder and help of another person!**

- Make sure the wheel brakes are activated.
- Fix the control stick in the extreme front position so that the rotor head disc rests on the brake.
- Remove the safety pin (from the nut 10 mounting bolt 7, **Błąd! Nie można odnaleźć źródła odwołania.**1) and unscrew the nut (10, **Błąd! Nie można odnaleźć źródła odwołania.**1).
- With the help of another person holding down the rotor, remove the mounting bolt (7, **Błąd! Nie można odnaleźć źródła odwołania.**1) (making sure the sleeves from rotor and rotor head remain in their places) and carefully remove the rotor from the rotor head.

Detaching the rotor blades from rotor hub:

- Unscrew the nuts (12, **Błąd! Nie można odnaleźć źródła odwołania.**1), remove the M8 bolts (8, **Błąd! Nie można odnaleźć źródła odwołania.**1) and remove the blades (5 and 4, **Błąd! Nie można odnaleźć źródła odwołania.**1) from the hub.
- Gather pieces together and assemble back the hub with M8 bolts, washers and nuts.
- Place the mounting bolt (7, **Błąd! Nie można odnaleźć źródła odwołania.**1) in the hub with sleeves, screw on a nut and pass through the cotter pin.

The removed blades, for storage or transport, must be appropriately fastened and protected against damage.

3.1.3 Assembly and Blades Alignment (Chordwise balance)

The blades and the rotor hub are supplied with the numbers specifying their orientation in the assembly kit. By matching the alphanumerical markings, insert the rotor blades into the sockets in the hub. For each blade fit two screws M10 (into extreme outer holes with washers on both sides). Next, screw nuts to the first contact.

Next, place alignment string as shown on (Fig. 3.1 - 2). The string should pass through the centre of rotation as shown on (Fig. 3.1 - 5). If not, blades attachment must be regulated.

Fit subsequent pair of screws and check alignment. Repeat for the rest of the screws.

If the rotor is not aligned properly, it will result in vibrations. The better the alignment of the rotor is, the greater the comfort of flight and smaller the vibrations and the longer the life of the gyrocopter and its subassemblies. When the string does not overlap the hub axis, two people are needed for help: hold down the blade tips, then push the hub in the right direction. After alignment, tighten the nuts with a torque spanner applying 24 Nm torque.

The correctness of alignment must be checked in the first flight.

Figure 3.1-2 Blades alignment

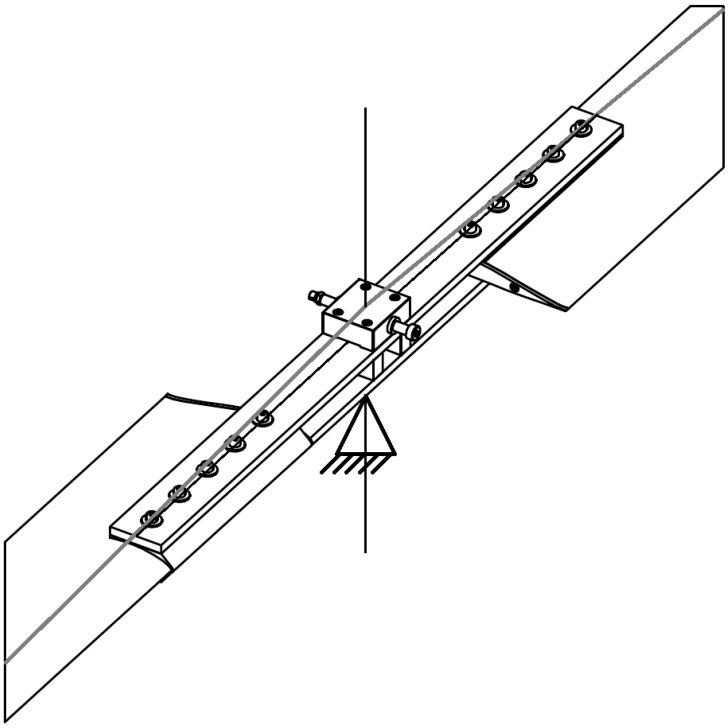


Figure 3.1-3 Blades alignment

3.1.4 Installation of the Rotor on the Gyrocopter

NOTE: **In order to mount the rotor on gyrocopter use a ladder and help of another person!**

- Make sure that rotor blades are attached to rotor hub.
- Make sure the wheel brakes are activated.
- Brake the control stick in the extreme front position so that the rotor head disc rests on the brake.
- Lubricate the mounting bolt (7, Figure 3.1-1) for rotor hub suspension on the rotor head and the slip sleeves with a dedicated lubricant (WHS2000).
- With the help of another person (with a ladder), raise the rotor and place it on the head.
- Insert pin through the head and the hub (making sure the sleeves remain in their places) and press it down to the end.
- Tighten the nut, next unscrew it by 1/4 of a revolution and pass the safety cotter pin through the hole at the end of the pin.
- Check rotor movement range.

s

3.2 Assembly of the Rotor Head

PARTS LIST				
ITEM	PART NUMBER	QTY	MASS	TITLE
1	ZE1.000.RHT.100.01.00.0	1	0,473 kg	Central axle
2	ZE1.000.RHT.100.01.01.0	1	0,919 kg	U Cardan element Bendix Holder
3	ZE1.000.RHT.100.03.01.0	1	0,004 kg	Rotor Revolution Counter Sensor Holder
4	ISO 7380 - M5 x 12	2	0,003 kg	Hexagon Socket Button Head Screw
5	ZE1.000.RHT.100.04.00.0	1	0,047 kg	Steel Ring
6	ZE1.000.RHT.100.05.01.0	1	1,236 kg	Prerotation Rim
7	ZE2.000.RHT.100.06.04.0	1	1,570 kg	Main 'U' Element
8	DIN 628 SKF - SKF 3206 A-2Z	1	0,267 kg	Double Row Ball Bearing
9	ZE1.000.RHT.100.07.00.0	2	0,039 kg	Steel Bushing
10	DIN 472 - 62 x 2	1	0,012 kg	Seger Ring 62x2
11	DIN 981 - KM 6	1	0,047 kg	Bearing Nut
12	DIN 981 - MB6	1	0,008 kg	Safety Washer
13	ZE2.000.RHT.100.12.00.0	1	0,012 kg	Master Bearing Cap
14	DIN 912 - M8 x 25	6	0,017 kg	Hexagon Socket Screw
15	ZE1.000.RHT.100.09.01.0	2	0,011 kg	Nylon Stopper
16	DIN 125 - A 6,4	12	0,001 kg	Washer
17	DIN 933 - M6 x 12	4	0,005 kg	Screw
18	ISO 2339 - A - 6 x 40	1	0,010 kg	Pin 6x40 1:50
19	ZE2.000.RHT.100.11.01.0	1	0,151 kg	Pitch Lever (RHT)
20	ISO 7379 - 8 x 25	1	0,017 kg	Fitted Screw H8
21	DIN 912 - M6 x 25	8	0,009 kg	Hexagon Socket Screw
22	ZE2.000.RHT.100.10.00.0	1	0,183 kg	Roll Lever (RHT)
23	ISO 7379 - 8 x 30	1	0,019 kg	Fitted Scree H8
24	DIN 125 - A 8,4	5	0,002 kg	Washer
25	DIN 985 - M6	6	0,003 kg	Nylonstop Nut
26	GUK 30x1,5	1	0,047 kg	Bearing Self-locking Nut

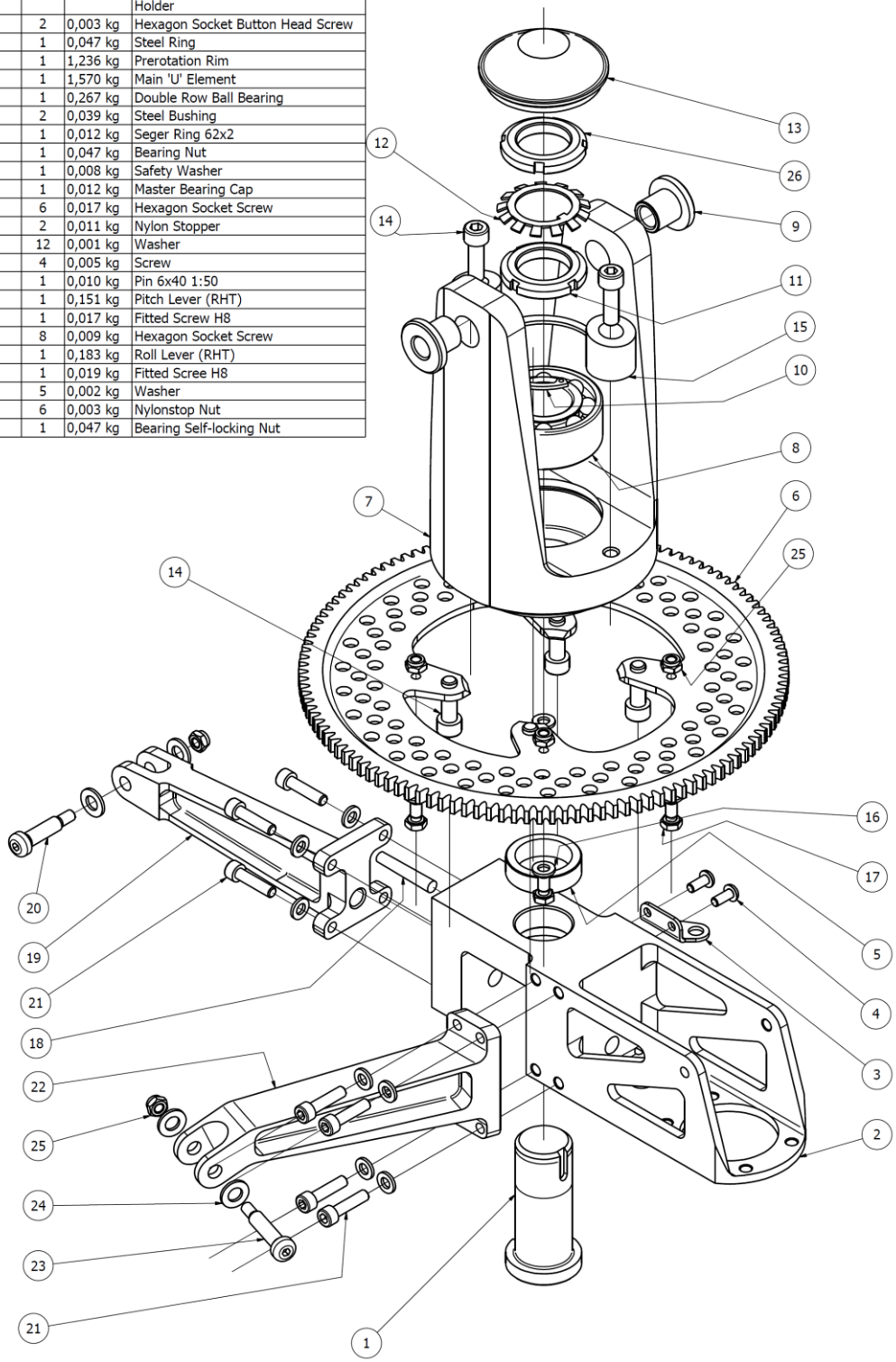


Figure 3.2.1 Rotor Head assembly

PART LIST			
ITEM	QTY	PART NUMBER	TITLE
1	1	ZE2.000.RHT.200.09.00.0	Inner part of Cardan joint
2	2	Podkładka NYLON 10,5x30x3	Washer 10,5x30x3
3	1	ZE2.000.RHT.100.00.01.0	Rotor Head holder
4	1	ZE2.000.RHT.200.10.00.0	Roll control pin
5	1	DIN 125 - A 10,5	Washer

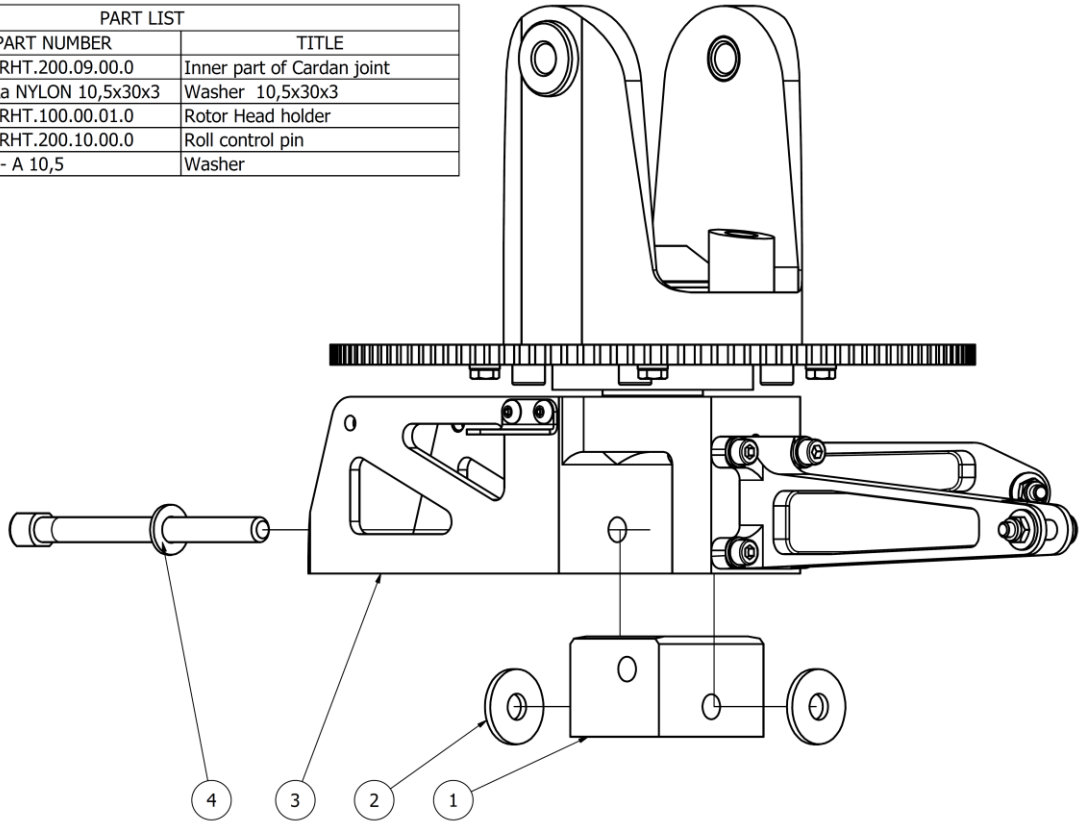
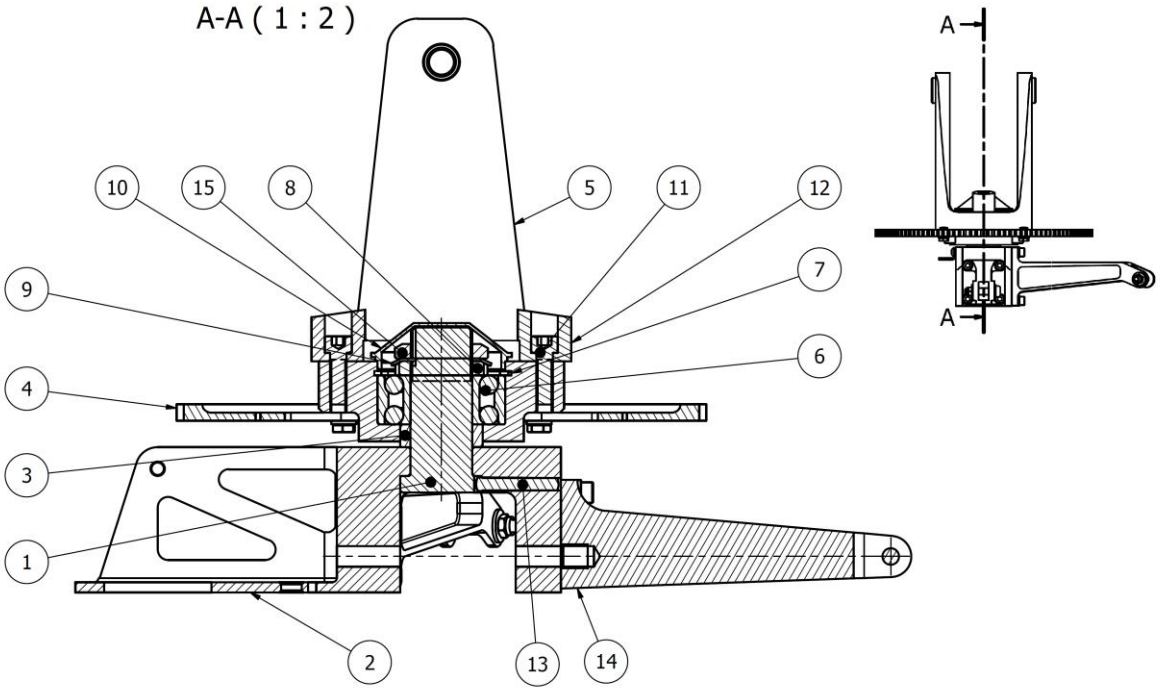


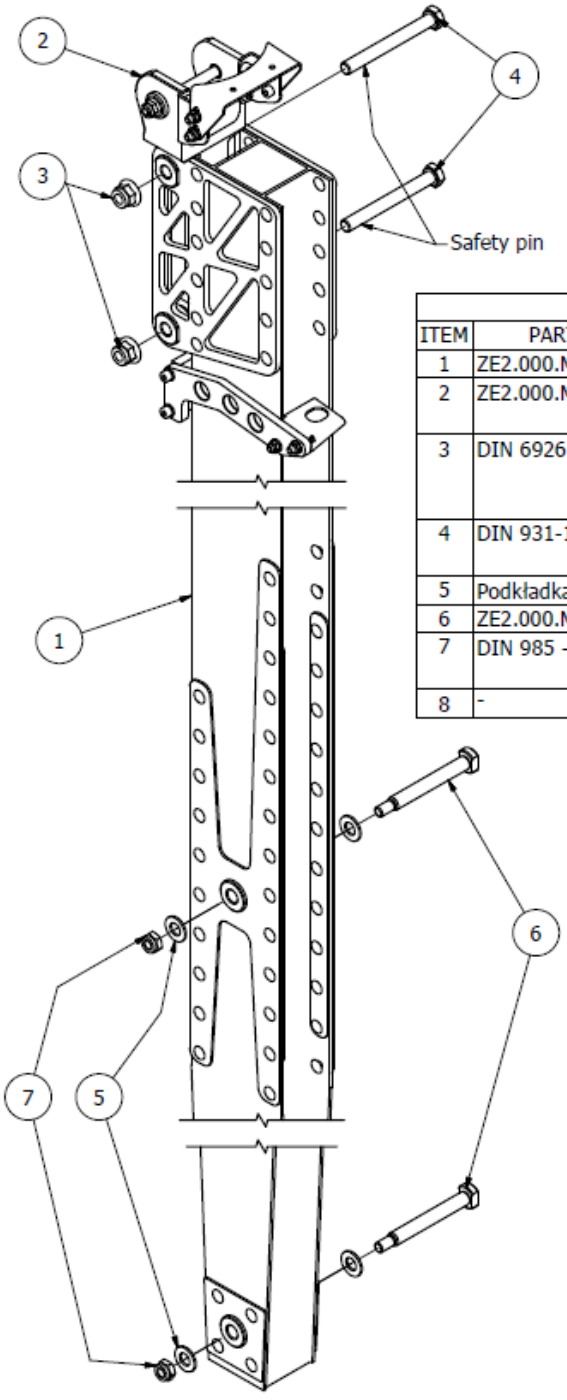
Figure 3.2.2 Rotor head roll pin installation



PARTS LIST			
ITEM	QTY	PART NUMBER	TITLE
1	1	ZE1.000.RHT.100.01.00.0	Main axle
2	1	ZE1.000.RHT.100.01.01.0	U Cardan Element with Bendix Holder
3	1	ZE1.000.RHT.100.04.00.0	Steel Ring
4	1	ZE1.000.RHT.100.05.01.0	Prerotation Rim
5	1	ZE2.000.RHT.100.06.04.0	Main 'U' Element
6	1	DIN 628 SKF - SKF 3206 A-2Z	Dounle Row Ball Bearing
7	1	DIN 472 - 62 x 2	Seger Ring 62x2
8	1	DIN 981 - KM 6	Nut
9	1	DIN 981 - MB6	Safety Washer
10	1	ZE2.000.RHT.100.12.00.0	Master Bearing Cap
11	6	DIN 912 - M8 x 25	Hexagon Socket Screw
12	2	ZE1.000.RHT.100.09.01.0	Nylon Stopper
13	1	ISO 2339 - A - 6 x 40	Pin 6x40 1:50
14	1	ZE2.000.RHT.100.11.01.0	Pitch Lever (RHT)
15	1	GUK 30x1,5	Bearing Self-locking Nut

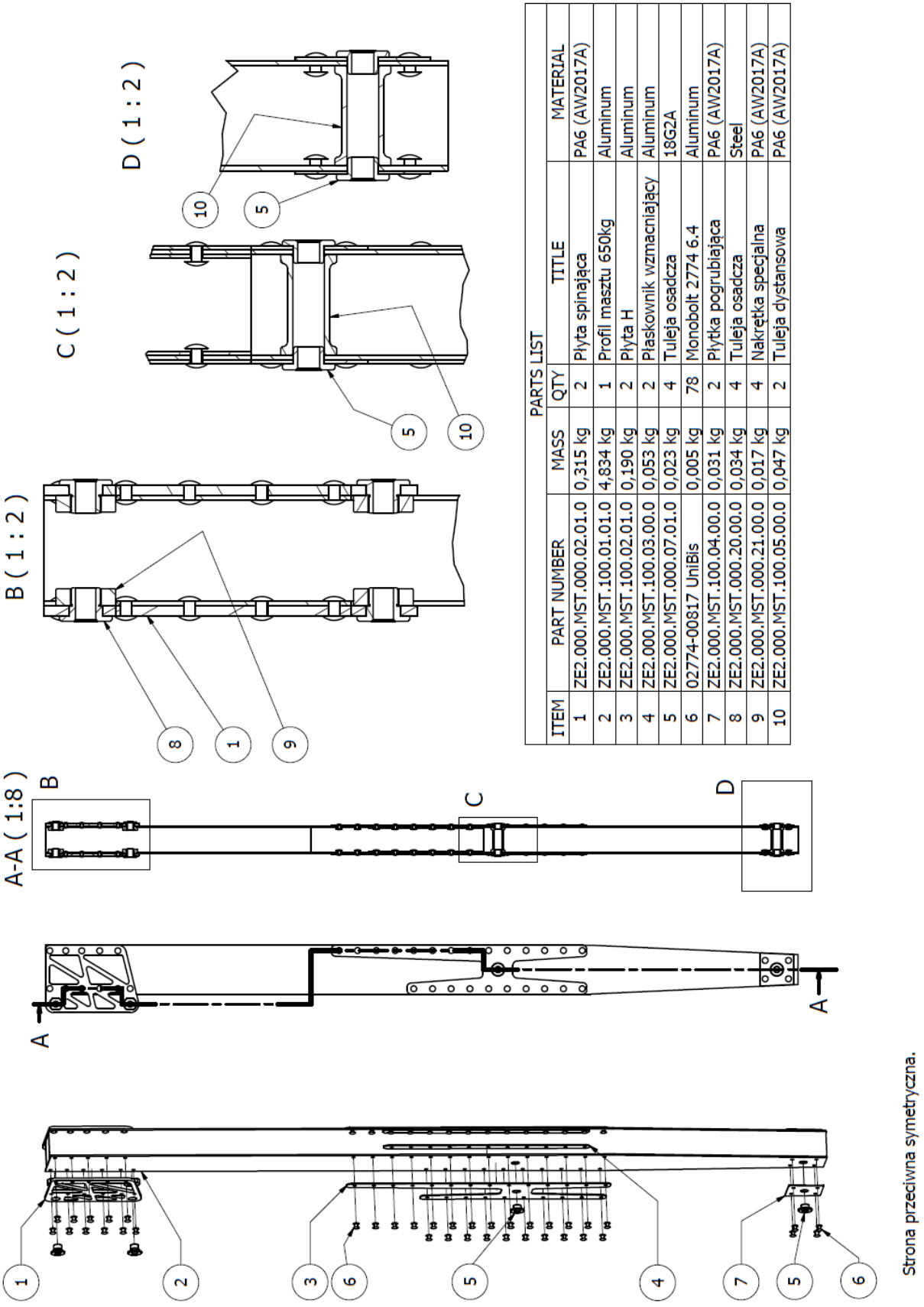
Figure 3.2.3 Rotor Head section

3.3 Assembly of the Mast



PARTS LIST					
ITEM	PART NUMBER	QTY	MASS	TITLE	MATERIAL
1	ZE2.000.MST.100.00.02.0	1	6,809 kg	Maszt dural 650kg	Dural
2	ZE2.000.MST.200.00.00.0	1	1,637 kg	Tłumik drgań wirnika	Dural
3	DIN 6926 - M12	2	0,031 kg	Nakrętka nylonstop z kołnierzem	Stal
4	DIN 931-1 - M12 x 110	2	0,116 kg	Śruba z łbem sześciokątnym	Stal
5	Podkładka stalowa	4	0,001 kg	-	Stal
6	ZE2.000.MST.000.08.02.0	2	0,116 kg	Sworzeń masztu	18G2A
7	DIN 985 - M10	2	0,013 kg	Nakrętka nylonstop	Stal
8	-	2		Zawleczka	Stal

Figure 3.3.1 Mast assembly



PARTS LIST

ITEM	PART NUMBER	MASS	QTY	TITLE	MATERIAL
1	ZE2.000.MST.000.02.01.0	0,315 kg	2	Płyta spinająca	PA6 (AW2017A)
2	ZE2.000.MST.100.01.01.0	4,834 kg	1	Profil masztu 650kg	Aluminum
3	ZE2.000.MST.100.02.01.0	0,190 kg	2	Płyta H	Aluminum
4	ZE2.000.MST.100.03.00.0	0,053 kg	2	Płaskownik wzmacniający	Aluminum
5	ZE2.000.MST.000.07.01.0	0,023 kg	4	Tuleja osadcza	18G2A
6	02774-00817 UniBis	0,005 kg	78	Monobolt 2774 6.4	Aluminum
7	ZE2.000.MST.100.04.00.0	0,031 kg	2	Płytka pogrubiająca	PA6 (AW2017A)
8	ZE2.000.MST.000.20.00.0	0,034 kg	4	Tuleja osadcza	Steel
9	ZE2.000.MST.000.21.00.0	0,017 kg	4	Nakrętka specjalna	PA6 (AW2017A)
10	ZE2.000.MST.100.05.00.0	0,047 kg	2	Tuleja dystansowa	PA6 (AW2017A)

Figure 3.3.2 Mast assembly

3.4 Assembly of the Prerotation Clutch

ITEM	QTY	DESCRIPTION	PART NUMBER
45	1	Coupling lever axle	ZE1.000.PRE.200.15.00.0
44	1	Bracket sleeve	ZE1.000.PRE.200.16.00.0
40	2	Locking spring washer	3638508000 1
39	1	Prerotation cable lock	ZE1.000.PRE.200.14.00.0
38	1	Bearing spacer sleeve	ZE1.000.PRE.200.13.00.0
37	1	V-belts support sleeve	ZE1.000.PRE.200.12.00.0
36	1	V-belt brake	ZE1.000.PRE.200.11.00.0
35	1	Flexible shaft seat	ZE1.000.PRE.200.10.00.0
34	1	Bearing seating	ZE1.000.PRE.200.09.00.0
33	1	Coupling lever	ZE1.000.PRE.200.08.01.0
32	1	Tension pulley	ZE1.000.PRE.200.07.00.0
31	1	Cable hold	ZE1.000.PRE.200.06.00.0
30	1	Stiffening plate	ZE1.000.PRE.200.05.01.0
29	1	Secondary pulley shaft	ZE1.000.PRE.200.04.00.0
28	1	Secondary belt pulley	ZE1.000.PRE.200.03.00.0
27	1	Coupling arm	ZE1.000.PRE.200.01.01.0
26	1	Flexible shaft adapter	ZE1.000.PRE.101.00.00.0
25	1	Hexagon socket screw M5x30	ISO 7380 - M5 x 30
24	1	Hexagon socket screw M6x16	ISO 7045 - M6 x 16 - 4.8 - H
23	1	Rubber	Guma
22	2	Washer M8	DIN 988 - S8 x 14
21	5	Nylonstop nut M8	DIN 985 - M8
20	1	Nylonstop nut M6	DIN 985 - M6
19	1	Nylonstop nut M5	DIN 985 - M5
18	4	Grub screw M6x6	DIN 916 - M6 x 6
17	1	Hexagon socket screwM8x70	DIN 912 - M8 x 70
15	2	Hexagon socket screwM8x40	DIN 912 - M8 x 40
14	1	Hexagon socket screw M8x25	DIN 912 - M8 x 25
13	6	Hexagon socket screw M6x50	DIN 912 - M6 x 50
12	2	Hexagon socket screw M6x16*	DIN 912 - M6 x 16
11	2	Hexagon socket screw M3x5	DIN 912 - M3 x 5
10	1	Hexagon socket screw M8x50	DIN 7991 - M8x50
9	2	Ball bearing 8x22x7	DIN 625 SKF - SKF 6202-RZ
8	2	Ball bearing 15x35x11	DIN 625 SKF - SKF 608-RZ
7	8	Washer M8	DIN 125 - A 8,4
6	6	Washer M6	DIN 125 - A 6,4
5	1	Washer M5	DIN 125 - A 5,3
4	1	Bowden cable mounting	71580-100
3	1	Flexible shaft	51123003
2	1	Return spring	18,2x73 TR 1570
1	3	Nylon washer 8.4x17x2	003 0800 000 01

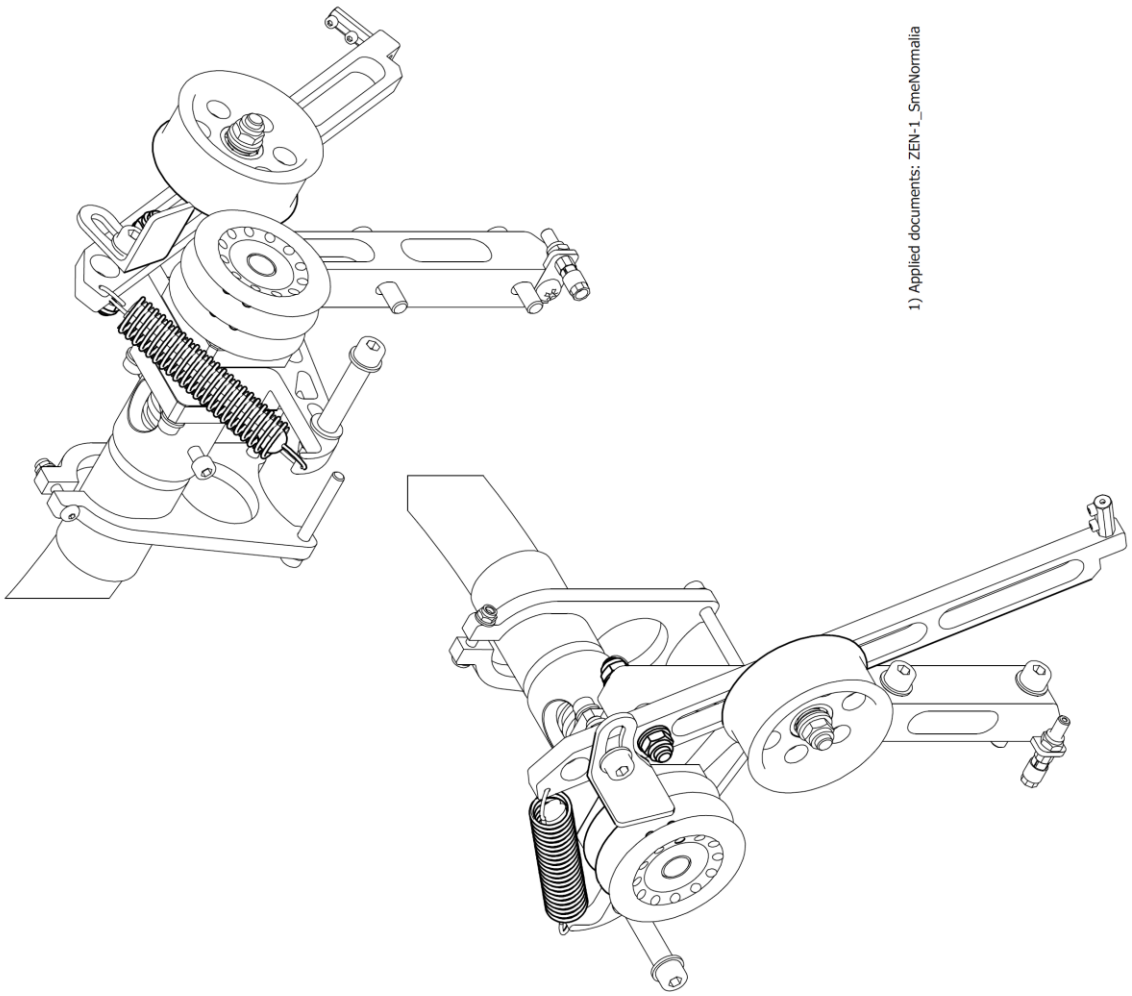


Figure 3.4.3.4.1 Prerotation Clutch assembly

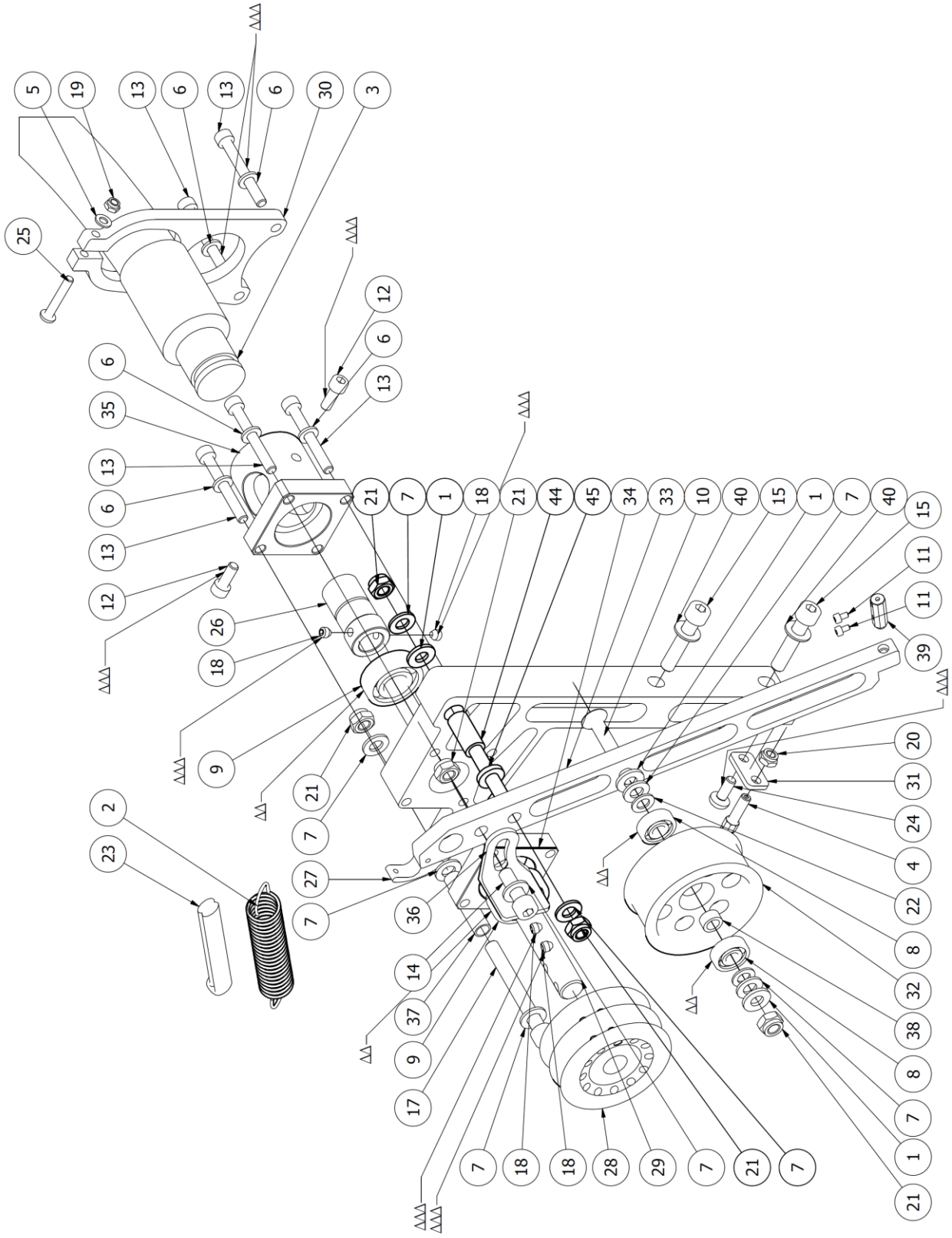


Figure 3.4.3.4.2 Prerotation Clutch assembly

3.5 Control Systems

3.5.1 Assembly of the Rotor Control System

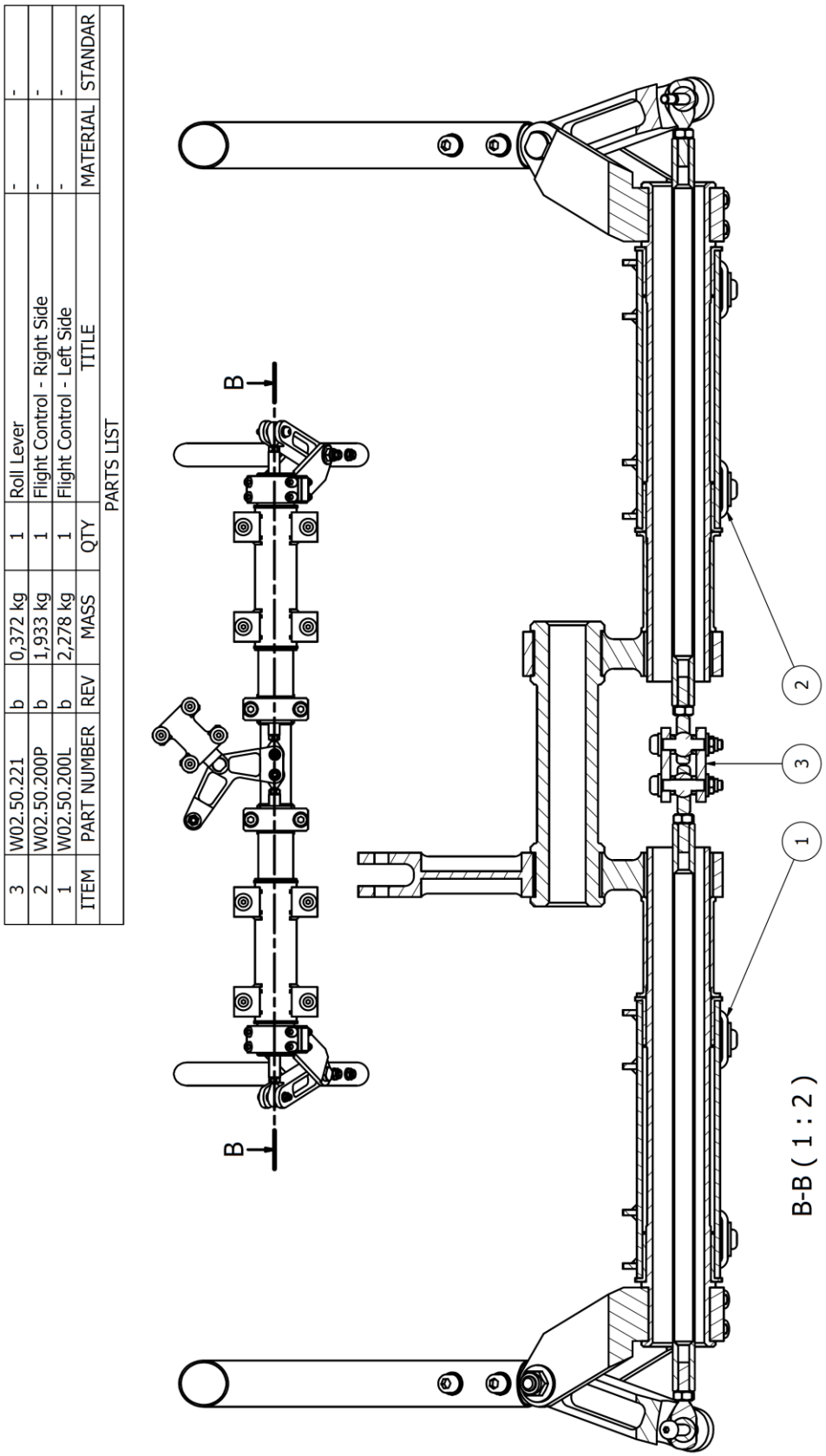
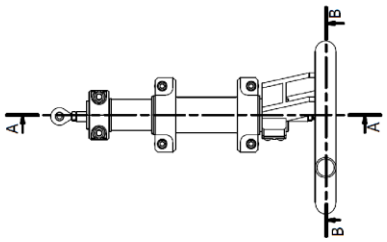
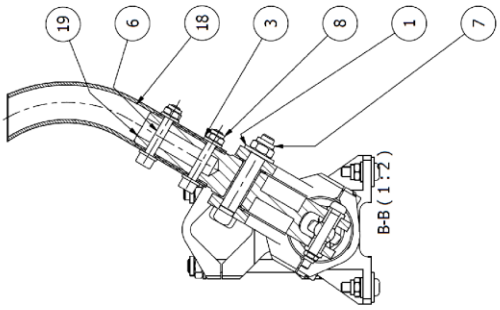


Figure 3.5.1 Flight Control assembly

Poz	Numer części	Wer	Masa	Ilość	Nazwa części	Materiał	Norma
1	DIN 125 - A 10,5		0,004 kg	1	Podkładka		
2	DIN 125 - A 8,4		0,002 kg	2	Podkładka		
3	DIN 125 - A 6,4		0,001 kg	8	Podkładka		
4	DIN 9021 - 6,4		0,003 kg	4	Podkładka		
5	DIN 912 - M8 x 80		0,043 kg	2	Śruba imbusowa		Klasa 8.8
6	DIN 912 - M6 x 35		0,011 kg	2	Śruba imbusowa		Klasa 8.8
7	DIN 985 - M8		0,006 kg	3	Nakrętka samozabezp.		
8	DIN 985 - M6		0,003 kg	6	Nakrętka samozabezp.		
9	DIN 985 - M5		0,001 kg	1	Nakrętka samozabezp.		
10	ISO 7379 - 6 x 30		0,010 kg	1	Śruba pasowana		Klasa 10.9
11	ISO 7380 - M6 x 20		0,006 kg	4	Śruba imbusowa z łbem soczewkowym		Klasa 8.8
12	SBT-F 10_12_18X12		0,005 kg	2	Łożysko ślizgowe		
13	W02.50.223	a	0,036 kg	1	Tuleja dystansowa	EN AW 2017A T4	EN 573-3
14	W02.50.214		0,114 kg	1	Popychacz		
15	W02.50.213P		0,534 kg	1	Prawa oś pochylania	-	-
16	W02.50.210	a	0,263 kg	1	Mocowanie sterownicy	-	-
17	W02.50.205		0,104 kg	1	Kość spinająca	EN AW 2017A T4	EN 573-3
18	W02.50.204	b	0,667 kg	1	Drążek	-	-
19	W02.50.203	c	0,124 kg	1	Dźwignia drążka	EN AW 2017A T4	EN 573-3
20	W02.50.202	b	0,030 kg	2	Zacisk dźwigni UD	EN AW 2017A T4	EN 573-3
21	ISO 7379 - 10 x 40		0,039 kg	1		Steel	ISO 7379
22	W02.50.226		0,004 kg	2	Tuleja	Steel	





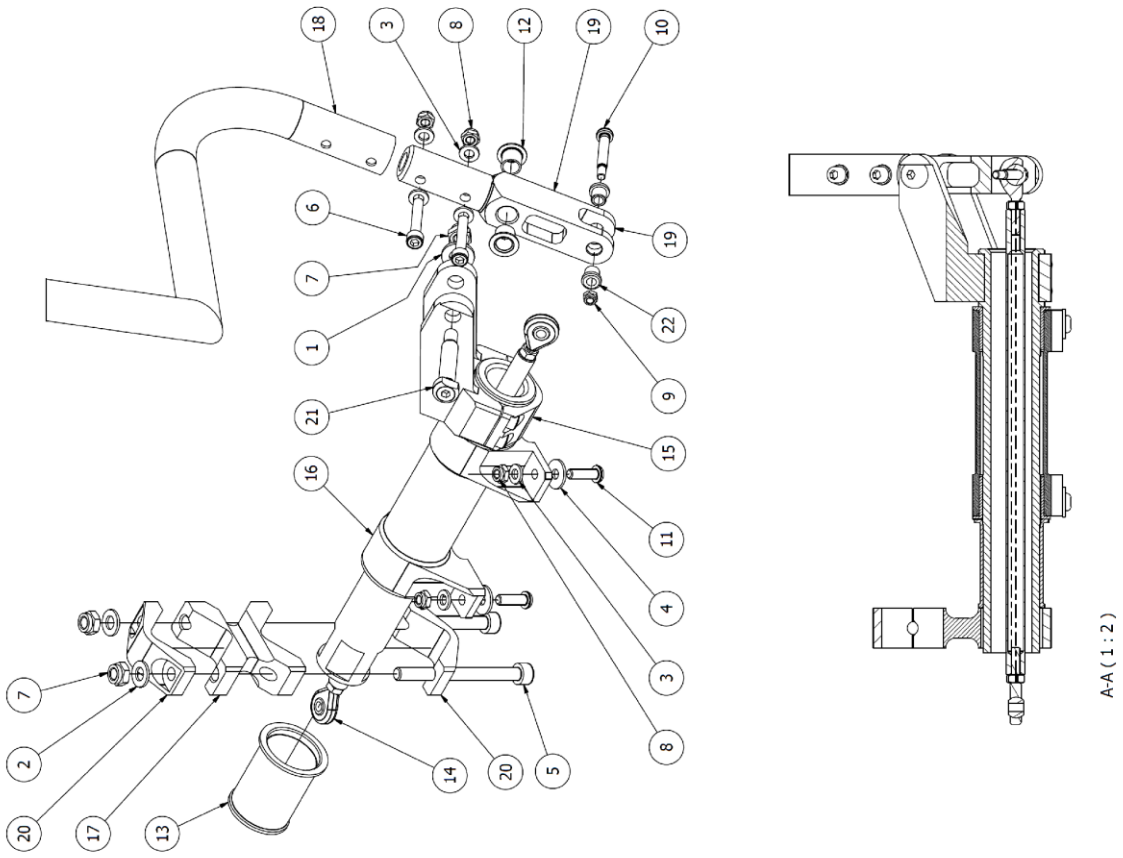


Figure 3.5.2 Flight Control – Right Side

Poz	Numer części	Wer	Masa	Ilość	Nazwa części	Materiał	Norma
24	W02.50.226		0,004 kg	2	Tuleja	Steel	
23	ISO 7379 - 10 x 40		0,039 kg	1		Steel	ISO 7379
22	ISO 7379 - 6 x 30		0,010 kg	1	Śruba pasowana		Klasa 10.9
21	ISO 7380 - M6 x 20		0,006 kg	4	Śruba imbusowa z łbem soczewkowym		Klasa 8.8
20	DIN 912 - M8 x 80		0,047 kg	2	Śruba imbusowa		Klasa 8.8
19	DIN 912 - M6 x 35		0,011 kg	2	Śruba imbusowa		Klasa 8.8
18	DIN 985 - M8		0,006 kg	3	Nakrętka samozabezp.		
17	DIN 985 - M6		0,003 kg	6	Nakrętka samozabezp.		
16	DIN 985 - M5		0,001 kg	1	Nakrętka samozabezp.		
15	DIN 9021 - 6,4		0,003 kg	4	Podkładka		
14	DIN 125 - A 10,5		0,004 kg	1	Podkładka		
13	DIN 125 - A 8,4		0,002 kg	2	Podkładka		
12	DIN 125 - A 6,4		0,001 kg	8	Podkładka		
11	SBT-F 10_12_18X12		0,005 kg	2	Łożysko ślizgowe		
10	W02.50.223	a	0,036 kg	1	Tuleja dystansowa	EN AW 2017A T4	EN 573-3
9	W02.50.215		0,175 kg	1	Rura łącząca sterownice	EN AW 2017A T4	EN 573-3
8	W02.50.214		0,114 kg	1	Popychacz		
7	W02.50.213L	b	0,534 kg	1	Zespół lewej osi sterownicy	-	-
6	W02.50.210	a	0,263 kg	1	Mocowanie sterownicy	-	-
5	W02.50.205		0,104 kg	1	Kość spinająca	EN AW 2017A T4	EN 573-3
4	W02.50.204	b	0,667 kg	1	Drążek	-	-
3	W02.50.203	c	0,124 kg	1	Dźwignia drążka	EN AW 2017A T4	EN 573-3
2	W02.50.202	b	0,030 kg	1	Zacisk dźwigni UD	EN AW 2017A T4	EN 573-3
1	W02.50.201	b	0,092 kg	1	Dźwignia pochylania	EN AW 2017A T4	EN 573-3

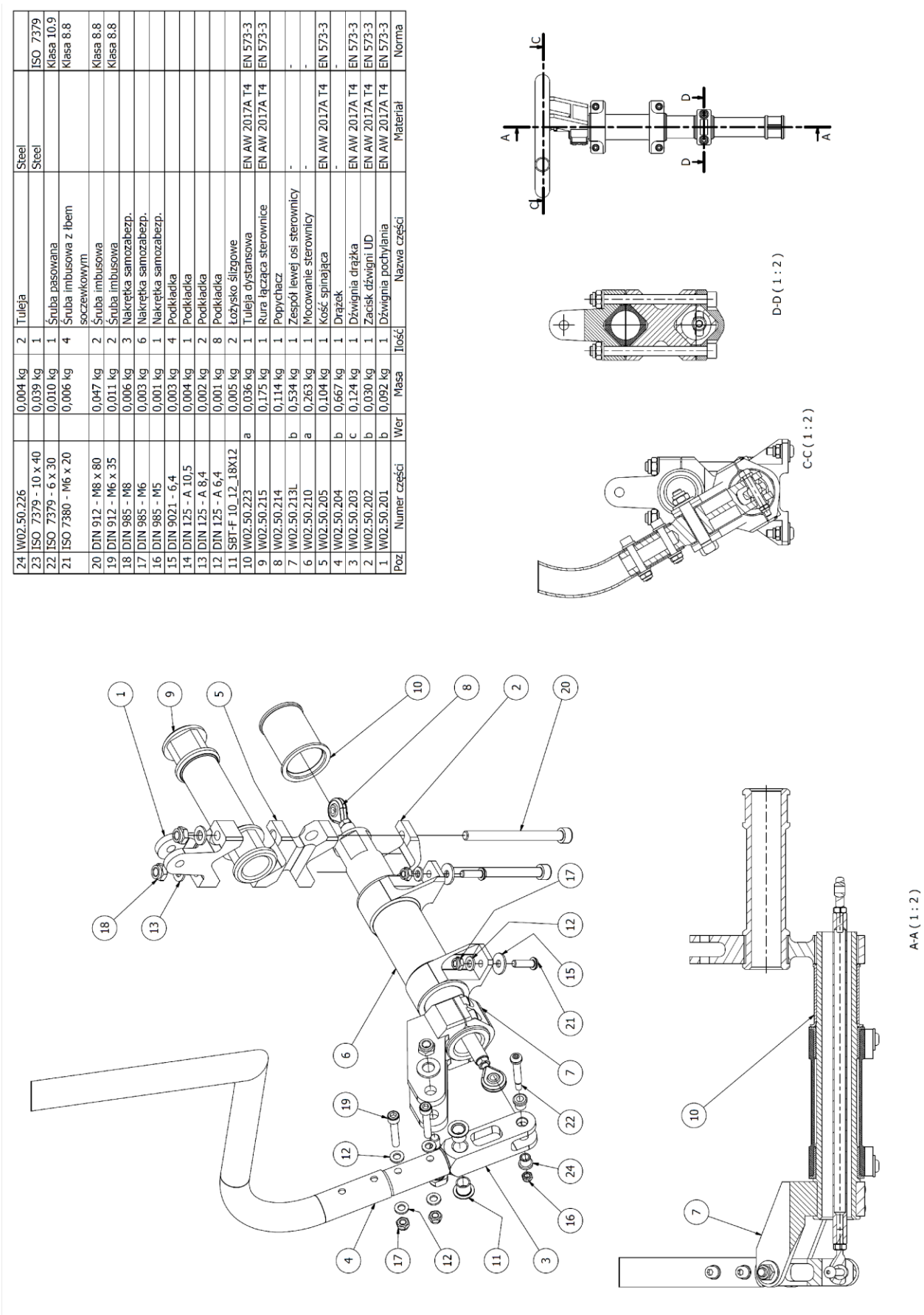


Figure 3.5.3 Flight controls-left side

ITEM	PART NUMBER	REV	MASS	QTY	TITLE	MATERIAL	STANDAR
1	W02.50.207	a	0,000 kg	4	Spacer Ring	EN AW - 6063	EN 573-3
2	W02.50.219	c	0,129 kg	1	Roll Lever	EN AW 2017A T4	EN 573-3
3	W02.50.220	b	0,088 kg	1	Roll Lever Holder	EN AW 2017A T4	EN 573-3
4	W02.50.225		0,034 kg	1	Special Screw	S235SR	PN 10025
5	DIN 125 - A 6,4		0,001 kg	8	Washer		
6	DIN 125 - A 8,4		0,002 kg	2	Washer		
7	DIN 125 - A 10,5		0,004 kg	1	Washer		
8	DIN 9021 - 6,4		0,003 kg	4	Washer		
9	ISO 7379 - 6 x 25		0,009 kg	2	Fitted Screw		
10	ISO 7379 - 8 x 25		0,017 kg	1	Fitted Screw		
11	ISO 7380 - M6 x 25		0,007 kg	4	Hexagon Socket Button Head Screw		
12	DIN 985 - M5		0,001 kg	2	Nylonstop Nut		
13	DIN 985 - M6		0,003 kg	5	Nylonstop Nut		
14	DIN 985 - M8		0,006 kg	1	Bylonstop Nut		
15	SBT-F 10_12_18X09		0,003 kg	2	Slide Bearing		

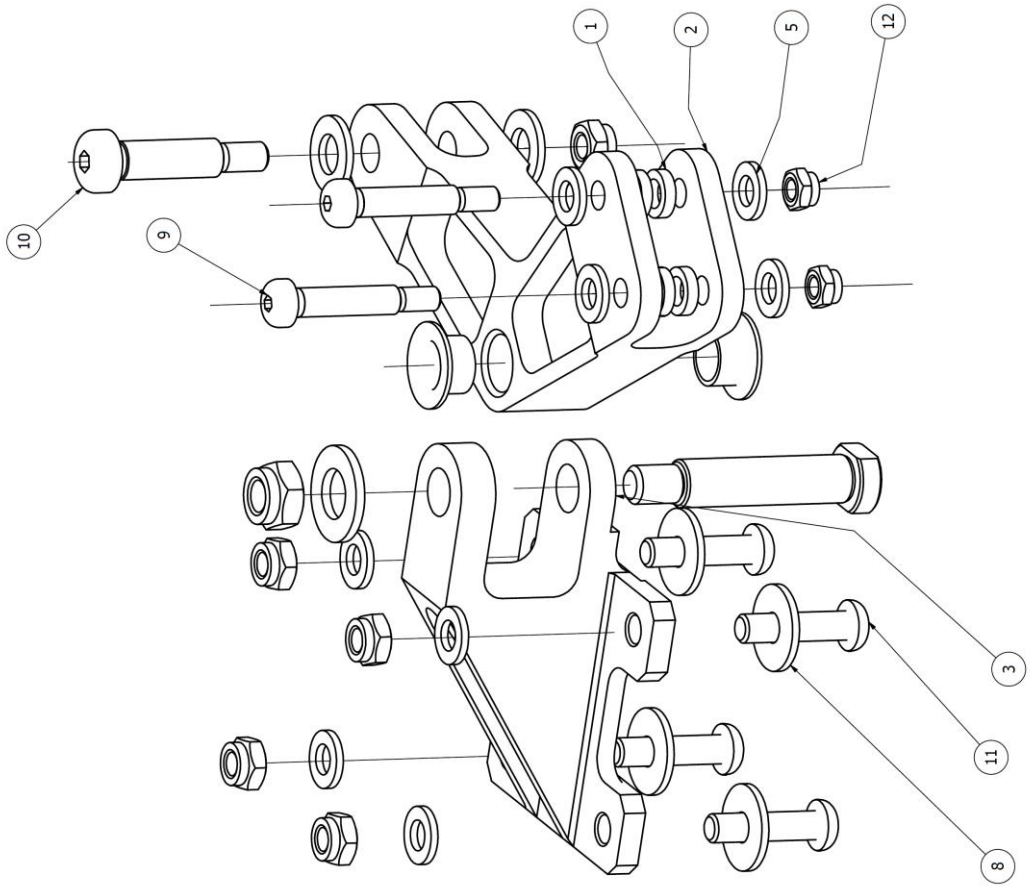
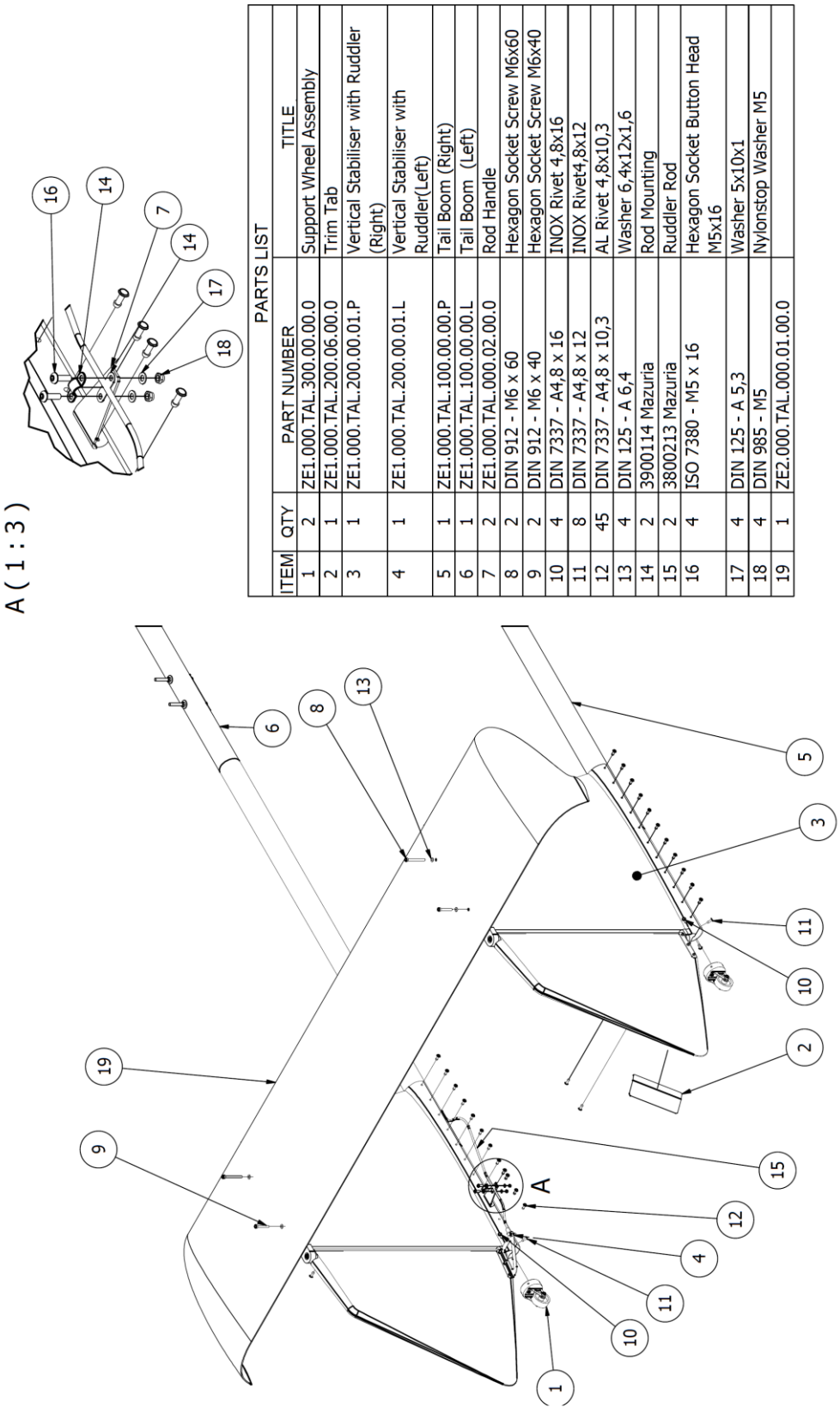


Figure 3.5.4 Roll Lever assembly

3.5.2 Assembly of the Directional Control System



PARTS LIST

ITEM	QTY	PART NUMBER	TITLE
1	2	ZE1.000.TAL.300.00.00.0	Support Wheel Assembly
2	1	ZE1.000.TAL.200.06.00.0	Trim Tab
3	1	ZE1.000.TAL.200.00.01.P	Vertical Stabiliser with Ruddler (Right)
4	1	ZE1.000.TAL.200.00.01.L	Vertical Stabiliser with Ruddler(Left)
5	1	ZE1.000.TAL.100.00.00.P	Tail Boom (Right)
6	1	ZE1.000.TAL.100.00.00.L	Tail Boom (Left)
7	2	ZE1.000.TAL.000.02.00.0	Rod Handle
8	2	DIN 912 - M6 x 60	Hexagon Socket Screw M6x60
9	2	DIN 912 - M6 x 40	Hexagon Socket Screw M6x40
10	4	DIN 7337 - A4,8 x 16	INOX Rivet 4,8x16
11	8	DIN 7337 - A4,8 x 12	INOX Rivet4,8x12
12	45	DIN 7337 - A4,8 x 10,3	AL Rivet 4,8x10,3
13	4	DIN 125 - A 6,4	Washer 6,4x12x1,6
14	2	3900114 Mazuria	Rod Mounting
15	2	3800213 Mazuria	Ruddler Rod
16	4	ISO 7380 - M5 x 16	Hexagon Socket Button Head M5x16
17	4	DIN 125 - A 5,3	Washer 5x10x1
18	4	DIN 985 - M5	Nylonstop Washer M5
19	1	ZE2.000.TAL.000.01.00.0	

Figure 3.5.5 Yaw Controls

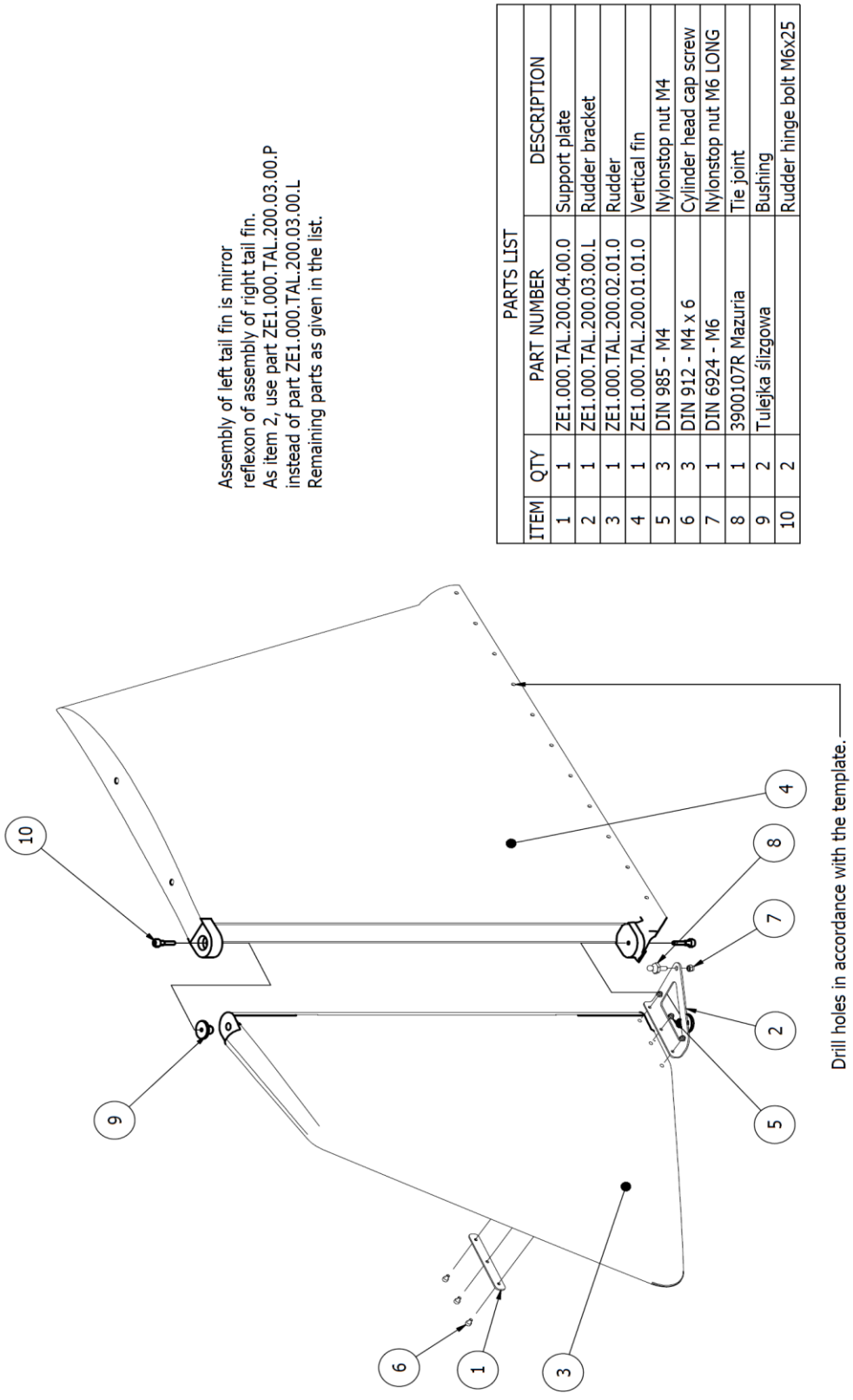


Figure 3.5.6 Rudder assembly

3.6 Replacement of the Master Bearing

See Figure in subsection 3.2 (page 3-8).

Disassembly

1. Remove Main “U” Cap (Fig. 3.2-1, 13).
2. Unscrew Bearing Nuts (Fig. 3.2-1,11) with Safety Washer (Fig. 3.2-1,12).
3. Disassembly Main “U” Element (Fig. 3.2-1,7) with components from Central Axle (Fig. 3.2-1,1) and Prerotation Rim (Fig. 3.2-1,6).
4. Disassembly Seger Ring (Fig. 3.2-1,10).
5. Disassembly Double Row Ball Bearing “Master Bearing” (Fig. 3.2-1,8) from Main “U” Element (Fig. 3.2-1,7).

In order to install “Master Bearing” on Rotor Head follow reverse order.

3.7 Tightening Torques

The table below shows the general recommended values of the tightening torques for bolts and nuts.

thread	Nm	in×lb
M5	6	55
M6	10	90
M8	24	210
M10	38	335
M12	80	708

Chapter 4 Maintenance Work, Operational Materials

4.1 Introduction

The owner/operator is responsible for conducting maintenance at the right time as described in this manual.

4.2 Range of Service Work which can be Performed by the Pilot

Pilot, being the owner or operator of the gyrocopter, can perform the following service work. In this case he should write the maintenance work executed into the gyrocopter book and confirm it with his signature and the licence number held (the qualification certificate).

1. Removing the undercarriage wheels; replacing the wheels; replacing the tyres; cleaning and servicing the wheel bearings. Removing and fitting brakes components in scope required in removing the wheels; replacement of the brake shoes unless special tools are required. Replenishing the fluid in the braking system. Removing and fitting the tail wheels.
2. Replacing the damaged safety wires or cotter pins, except those belonging to the engine, drive transmission system, flight controls system and the rotor.
3. Repairing the upholstery and equipment of the cockpit interior.
   Repairs inside the cockpit do not require dismantling of any structural components or flight controls system, and also they do not collide with these systems or interfere with the gyrocopter structure.
4. Repairs that do not require welding, repairing the fairings and non-structural covers and shields.
5. Replacing the safety belts.
6. Replacing the seats and their parts.
7. Replacing the light bulbs, headlights, reflectors, lenses and lights.
8. Replacing all the shields not requiring removal of the propeller, disconnection of the engine or the flight controls system.
9. Replacing the spark plugs, cleaning, checking the slot.
10. Replacing and servicing the battery.
11. Assembling and disassembling rotor(not rotorhead) and the rotor hub, which design allow to perform this operation without necessity to use special tools.
12. Replacing the VHF equipment unless it is integrated with the navigation equipment.
13. Making and placing the required placards and descriptions in the cockpit.
14. Lubricating the gyrocopter components (along with a prior cleaning of the hinges).
15. Checking air filters (removing, cleaning, fitting, replacing).
16. Checking fuel filters (removing, cleaning, fitting, replacing).
17. Changing the engine oil; removing, cleaning, fitting, replacing the oil filter.

4.3 Oil System

Recommended oil: AeroShell Oil Sport PLUS 4.

Standard quantity of oil in the system: 3,5 dm^3.

All work related with oil system maintenance, including: checking the oil level and its exchange, deaerating the system, rinsing the system, replacing and checking the oil filter are described in the CA 912 ULT engine Service Manual.

Oil exchange must be performed every 100 hours of engine work.

4.4 Engine Head Cooling System

Shortage of the cooling fluid, casued by the usage, must be replenished with distilled water.

To fill in the cooling system it is necessary to apply a mixture of glycol and water with the 50:50 ratio.

The system capacity is 4.5dm^3.

All work related with the engine head cooling system maintenance, including: exchange of the fluid, and rinsing the system is described in the Service Manual of CA 912 ULT engines.

4.5 Brake Fluid

The DOT 4 fluid is recommended for application with the wheel braking hydraulic system. The fluid must be replaced at least every 3 years. 0.5 dm^3 of the fluid must be prepared for exchange.

In order to exchange the brake fluid, unscrew completely deaerator at the brake pump mounted on the control stick. Next replace it with a special deaerator with a transparent tube, provided with the factory kit, then mount the applicator (syringe) in the tube filled with a new fluid. Unscrew the deaerator at the brake cylinder of one of the wheels. By moving the brake lever and forcing in the fluid with the applicator, it must be forced through the system, and the old fluid, flowing out through the deaerator at the wheel, must be gathered into container. Make sure the system is deaerated. Tighten the deaerator at the first wheel, unscrew one at the second and repeat the actions. Unscrew the special deaerator with the tube and change it to the original one. After deaeration, tighten all the deaerators. Check the system for leakage.

NOTE: due to the chemical activity of the fluid, secure places of the deaerator at the brake pump mounted on the stick with paper or a cloth so it does not get onto other gyrocopter components. Look after to your own safety. Finally, clean all the surfaces.

4.6 Air, Oil and Fuel Filters

All the work related with replacing and cleaning air, oil and fuel filters is described in the CA912 ULT engine Service Manual.

4.7 Lubrication Schedule

Before lubrication, the parts must be cleaned of both dirt and the residue of the old lubricant. Lubrication after 50 and 100 hours must be performed during maintenance respectively: 50-hour/half-year or 100-hour/yearly, depending on the mode of performing maintenances (see subsection 5.1).

L.p.	Lubricated parts	Lubrication frequency	Lubricant
1	Bendix rack and prerotation gear rim.	**Before each flying day**	WHS2002
2	Rotor head pitch and roll pin.	**50 hours**	WHS2002
3	Hub suspension bolt on the rotor head (teeter bolt) and slip sleeves.	**50 hours** *)	WHS2002
4	Door hinges.	**100 hours**	WD40
5	Rudder control pedals.	**100 hours**	WHS2002
6	Choke and prerotation levers axles.	**100 hours**	WHS2002

*) The pin for rotor hub suspension on the head (teeter bolt) and the slip sleeves work in a space filled with lubricant inside the rotor hub cube. Exchange of the lubricant should take place during replacement of the pin and the sleeve every 250 hours of flight. Moreover, the pin and the sleeves should be cleaned and covered with a layer of lubricant whenever the rotor is fitted on the head.

Chapter 5 Schedule of Inspections and Maintenance

5.1 Introduction

The owner/user is responsible for conducting inspections and maintenance at the right time as described in this manual. Regular technical maintenance is essential for safe operation.

Inspections and maintenance must be performed basically depending on Flight Hours. However, in case of less intensive usage (below 100 hours of flight during the year), it is necessary to switch to the calendar mode. If the intensity of usage is diverse, the dates of inspections and servicing must be specified by applying a more restrictive criterion at a given moment - as per flying time or the calendar (which occurs first).

Basically, three inspections deadlines have been distinguished:

- every 25 Flight Hours,
- every 50 Flight Hours / half a year,
- every 100 Flight Hours / 1 year.

Above mentioned inspections does not cover all maintenance activities on gyrocopter. Apart from them there have to be conducted special inspections as for example after first 10 hours of flight (in case of brand new machine). Some other must be performed every 250 or 500 hours of flight, or after 3 years of operating time. The detailed schedule for inspections and maintenance is in subsections, 5.4, 5.5, 5.6 and 5.7.

Inspections and maintenance of the gyrocopter should be registered in the form of reports and recorded in the Gyrocopter Book, in which the deadlines for successive inspections should be specified.

Inspecting and servicing the engine and engine related systems should be performed according to the CA 912 ULT Engine Maintenance Manual.

Inspecting and servicing the propeller and related systems should be performed according to the propeller manual.

Inspecting and servicing the avionic instruments and related systems should be performed according to the their manuals.

5.2 Inspection and Maintenance as per Flight Hours

A 25-hour inspection must be performed after 25 Flight Hours (±2.5 hours) since the last 100-hour or 50-hour inspection, or since new.

A 50-hour inspection must be performed after 50 Flight Hours (±5 hours) since the last 100-hour or since new.

A 100-hour Inspection must be performed after 100 Flight Hours (±10 hours) since the last 100-hour or since new.

Admissible time tolerances for performing an inspection do not add up. For example, (performing inspections constantly as per flight time) the fourth 100-hour inspection should be performed after 400±10 hours of flight time rather than after 400±40 hours. Performing an inspection earlier than the admissible tolerance requires the commencement of calculating successive inspections anew, from the current Flight Hours status.

5.3 Inspection and Maintenance as per Calendar

A 25-hour inspection must be performed not later than after 25 Flight Hours after the last annual or half-year inspection, or from the start of utilization.

A half-yearly inspection must be performed after 6 months (±1 month) after the last annual inspection or from the start of utilization.

An annual inspection must be performed after 12 months (±1 month) after the last yearly inspection or from the start of utilization.

Admissible time tolerances for performing an inspection do not add up. For example, (performing inspections constantly as per the calendar) the fourth annual inspection should be performed after 48±1 months rather than after 48±4 months. Performing an inspection earlier than the admissible tolerance requires the commencement of calculating successive inspections anew, from the date of a performed inspection.

5.4 Inspection after the First 10 Flight Hours

No.	Action	Flight Hours	Notes
10.1	Check the tightening torques of the bolts fixing the rotor mast.	**10**	M6 bolts: 10 Nm ± 1 Nm M8 bolts: 24 Nm ± 1 Nm
10.2	Check the tightening of the remaining bolts of the fuselage structure (visually on the basis of the paint marker).	**10**	If at least one bolt/nut loosens, tighten all the cooperating bolts/nuts. The moment values according to subsection 3.7.
10.3	Check that all the pushers are straight and in good condition.	**10**	
10.4	Check clearances (wear) in the control stick system. Checking the condition and attachment of the rear flexible mounting of the torsion tube.	**10**	
10.5	Check the condition of rudder Bowden cables for rubbed spots, corrosion, excessive friction as well as signs of the wear of the tips. Check the connection of the tips to the pedals and to the control surfaces. Lubricating the tips.	**10**	Apply WD40; remove the excess.
10.6	Check condition of the clamping rings fixing the rudder bowdens to the tail pipes.	**10**	Replace even if they are only slightly damaged.
10.7	Check the drive shafts for bent or damage. Check the gear belts for cracks or other damage.	**10**	If drive transmission is not fluent apply talc on the V-belt. If the belts are worn-out or damaged, replace them. Both belts must always be replaced simultaneously.
10.8	Check the fixing of the instruments to the board and the connection of the electrical and pneumatic lines to the instruments.	**10**	
10.9	Check the tail wheels for damage and their clamping rings for bent.	**10**	Clean the axles and ensure the freedom of wheel rotation.
25.1	Check the rotor swing stops, ensure swing freedom ±10º.	**25**	Nylon sleeves (6135) cannot be squeezed too firmly.

5.5 Inspection Every 10 Flight Hours

Activity	Notes
Check pressure in the tyres and look for damage or worn-out.	Pressure in the tyres: standard: 2 bars;
Clean and lubricate the bendix sprockets.	Apply WHS2002. Fixing the bendix on the head control lever, ensure an apical clearance between the bendix toothed wheels and the toothed-wheel rim is about 1 mm.

5.6 25- , 50- and 100-Hour Inspections

Explanation of the meanings of the columns:

25 - 25-hour inspection

50 - 50-hour or half-yearly inspection

100 - 100-hour or yearly inspection

No.	Activity	25	50	100	Notes
	Airframe (Fuselage, Tail Beams, Control Surfaces, Mast)	**25**	**50**	**100**	
01	Check the outside surface of the fuselage for cracks or deformations.		●	●	If detected, the gyrocopter must be grounded and contact the manufacturer to specify the way to restore airworthiness.
02	Check the airframe for damage, twists, buckling or other deformations.			●	If detected, the gyrocopter must be grounded and contact the manufacturer to specify the way to restore airworthiness.
03	Check the tightening torques of the bolts fixing the rotor mast.			●	M6 bolts: 10 Nm ± 1 Nm M8 bolts: 24 Nm ± 1 Nm
04	Check the torque values of the remaining bolts of the fuselage structure (visually on the basis of the paint marker).			●	If at least one bolt/nut loosens, tighten all the cooperating bolts/nuts. The moment values according to subsection 3.7.
05	Check the fixing of the horizontal stabilizer to the vertical stabilizers (4 bolts).	●	●	●	The bolts are fixed by using blue Loctite. The contact surfaces of the stabilizers are sealed with silicone.
06	Check the fixing of the vertical stabilizers to the tail tubes (rivets).	●	●	●	Remove loose or damaged rivets and replace them with new ones.
	Flight Control Systems	**25**	**50**	**100**	
10	Check the condition, clean and lubricate the rotor head control pusher tips.	●	●	●	Apply WHS2002; remove the excess.
11	Check the condition of the rotor head control pusher tips and look for cracks. Check the movement freedom in the full range.		●	●	Check the safety screws (blue Loctite).
12	Check that the rotor head reaches its tilting stops.		●	●	Check the displacement of the control stick (see figures, subsection 8.3).
13	Check all the pushers for bends and examine condition and movement freedom.		●	●	
14	Check clearances (wear) in the control stick system. Check the conditions and security of the rear flexible mounting of the torsional pipe.	●	●	●	

15	Check the freedom of pedals movement. Lubricate if necessary.		●	●	WHS2002 lubricant.
16	Examine condition of rudder bowdens. Check for rubbed spots, corrosion, excessive friction and signs of the wear of the tips. Check the connection of the tips to the pedals and the control surfaces. Check the lubrication.	●	●	●	Apply WHS2002; remove the excess.
17	Check the rudders for operation freedom and clearances. Lubricate the hinges (every 50 hours).	●	●	●	If the control surface is excessively loose, contact the manufacturer. Do not fly with damaged hinges. WHS2002 Lubricant.
18	Check the clamping rings fixing the rudder bowdens to the tail tubes.	●	●	●	Replace even if they are only slightly damaged.
19	Check the operation of the trimmer and the condition of the string, stop, block and spring.	●	●	●	The string must be replaced to a new one even with the smallest traces of wear (rubbed spots).
	Undercarriage, Legs, Wheels, Brake System	**25**	**50**	**100**	
20	Check the wheel bearings for fluent work.			●	Non-service bearings, sealed permanently. Replace if not work correctly.
21	Check front wheel fork for possible bent.			●	Replace if bent. If movement resistance is found, dismantle the fork, lubricate with WHS2002.
22	Check the undercarriage legs and their mounting to the fuselage for damage or signs of material wear (cracks, deformations).			●	The main landing gear track of wheels in the new gyrocopter amounts to 2.2m. The overall maximum admissible difference is 10 cm. Replace in case of an overly large difference.
23	Examine pressure in the tyres and check for damage or worn-out.		●	●	Pressure in the tyres: standard: 2 bars;
24	Checking the wear of the wheel brake lining.		●	●	Replace if necessary. If the brake shoe rub the disc or an uneven wear of the linings occur, unscrew the bolts fixing the brake disc to the wheel hub and check the attachment of the disc.
	Rotor Head, Rotor, Blades, Hub	**25**	**50**	**100**	
30	Check the fixing of the gear rim to the head and fixing bolts.			●	M8 bolts: 24 Nm ± 1 Nm.
31	Check the pins for damage or wear. Remove, clean, lubricate and install. 1. Rotor Hub suspension Pin on the head (teeter bolt); 2. Sideways tilting pin; 3. Fore / aft tilting pin.		●	●	WHS2002 lubricant.
32	Check and lubricate the Teeter Bolt slip sleeves.		●	●	Replace if worn-out. WHS2002 lubricant.
33	Check the head joints and their nylon washers. Detaching, cleaning, lubricating and renewed attaching.			●	Lubricating from the outside with the WD-40 agent is recommended.
34	Check the condition of the brake lining on the rotor head disc and the frictional component of stainless sheet metal.			●	The maximum wear of the cooperating frictional components amounts to 0.5 mm. If need be, replace them with original parts.
35	Check the operation of the rotor brake.	●	●	●	If the contact of the frictional component with the brake lining is not correct (full), adjust its position to ensure the most effective braking.
36	Complete cleaning of the hub and the rotor blades. Check the connection between the hub and the blades. Align the rotor blades.			●	Detach the blades from the hub. After cleaning, the hub must be covered with a layer of WD-40. Attaching and aligning the rotor according to IUL subsection 4.2. Apply new nuts on the bolts fixing the blades to the hub.

37	Check rotor tilt stoppers. Examine swing freedom ±10º.			●	Nylon sleeves cannot be squeezed too firmly.
38	Check blade tracking and rotor balance.	●	●	●	An admissible deviation of tracking amounts to 3 cm. In case of a major deviation or sensible vibrations generated by rotor imbalance, contact the manufacturer.
39	Check the Teeter Bolt rotation freedom and tightening of the nut.	●	●	●	Tighten the nut to the first contact, next unscrew it by 1/4 of a revolution. (Secure with the cotter pin).
40	Check the tightening torques of the bolts and nuts clipping the blades and rotor hub.	●	●	●	22 Nm
41	Check the rotor blades for damage.	●	●	●	Repairs to be done only by the blades manufacturer or an authorized personnel.
	Drive Transmission – Prerotation	**25**	**50**	**100**	
44	Check that the V-belts for cracks, overly stretch or other damage.	●	●	●	If the V-belts are worn-out or damaged, replace them. The V-belts must always be replaced simultaneously. If drive transmission is not fluent, cover the belts with talc.
45	Check the angle section of the prerotation clutch brake.			●	If the angle section is damaged, it must be replaced.
46	Examine the movement freedom of the flexible drive shaft and play in the bearings.			●	Rotate the shaft manually, observing the drive transmission system.
47	Check for the correct engagement of the bendix sprocket with the gear rim .	●	●	●	Lubricate every 10 hours (see subsection 5.5).
	Propeller	**25**	**50**	**100**	
50	Check blade tracking and propeller balance.	●	●	●	In case of a noticeable deviation of blade tracking or sensible vibrations generated by propeller imbalance, contact the propeller manufacturer.
51	Check the tightening torques of the bolts fixing the propeller (hub) to the engine shaft.	●	●	●	25 Nm
52	Check the tightening torques of the bolts and nuts clipping the blades and the propeller hub.	●	●	●	25 Nm
53	Check the propeller blades for damage.	●	●	●	Repairs to be made only after arrangement with the propeller manufacturer.
	Fuel System	**25**	**50**	**100**	
60	Replace or clean the fuel filter.			●	
61	Check the fuel inlet plug for gasket wear and fixing reliability.			●	
62	Check the correct work of the fuel gauge.			●	The indication of the fuel gauge must correspond with the fuel level in the tank.
63	Check fuel tanks ventilation lines for blockage.			●	
64	Check the fuel tanks for pollution.			●	Rinse the tanks if necessary.
65	Check all fuel lines for damage or wear.			●	Replace if necessary.
	Electrical System, Board Instruments	**25**	**50**	**100**	

70	Check the instruments attachment to the board and the connection of the electrical and pneumatic leads to the instruments.		●	●	
71	Check the battery.		●	●	Keep the battery charged and the appropriate level of electrolyte.
72	Calibrate the Airspeed Indicator.			●	
73	Calibrate the compass (if attached).			●	
74	Calibrate the altimeter.			●	
75	Check the instruments.			●	
	Other	**25**	**50**	**100**	
80	Check that the tail wheels damage and their clamping rings for bent.	●	●	●	Clean the axles and ensure the rotation freedom of the wheels.
81	Check the fixing of the central console.	●	●	●	Check that the fixing screws are tight (screws mounted on red Loctite).
82	Clean and lubricate choke, throttle and prerotation lever cables and their passes.			●	WHS2002 lubricant.
83	Clean and lubricate choke and prerotation lever axles.			●	WHS2002 lubricant. Do not lubricate the throttle lever axle or friction washers.
84	Check the placards and information tags for legibility and compliance with the restrictions.		●	●	
85	Check the fixing of the safety belts, that the bolts are tight and secure.		●	●	
86	Checking that the crew belts are not damaged or frayed as well as the condition and certainty of the operation of the clipping clasp.		●	●	

5.7 Other Service Work

No.	Activity	Period	Notes
91	Replacing the pin for rotor hub suspension on the head (teeter bolt) and the slip sleeves.	Every 250 hours	The maximum admissible clearance between the rotor hub and the sleeves amounts to 0.025 mm.
92	Checking that the drive shafts of the prerotation system are not bent or damaged.	Every 250 hours	
93	Replacing the master bearing.	Every 500 hours	The tightening moment of the bearing bolt: 90 Nm ± 2 Nm (plus the crown washer). The distance between the rotor rotation sensor and the prerotation wheel disc = 1 mm.
94	Replacing the brake fluid.	Every 3 years	See subsection 4.5.
95	Replacing the ventilation ducts of the fuel tanks.	Every 3 years	or if cracked or rubbed.
96	Specifying the weight and position of the centre of gravity of the empty gyrocopter.	not less than every 4 years	After every change of the distribution of weights in the gyrocopter (eg after repairs, changes in the fixed equipment)
97	Draining the fuel and rinsing the fuel system with clean fuel.		If fuel is left in the system for a time longer than 3 months.

This page is left blank deliberately

Chapter 6 Weighing and Specifying the Position of the Centre of Gravity

6.1 Introduction

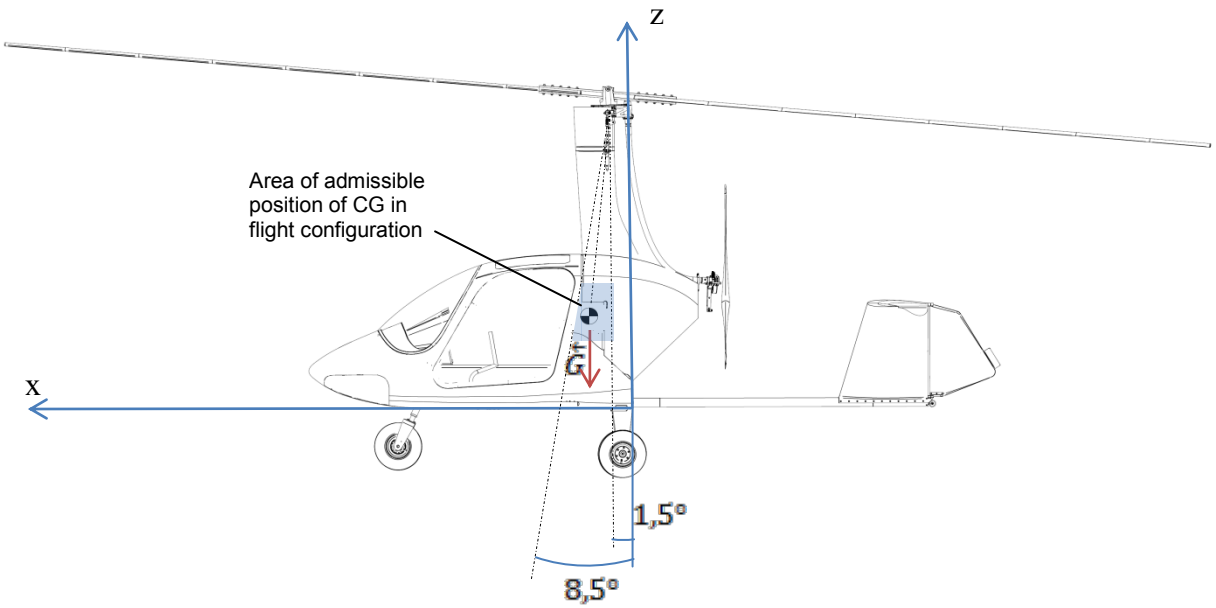
Check weighing and specifying the position of the centre of gravity of the empty gyrocopter must be performed at least every 4 years and also in every case in which a change of weight or weight distribution could occur, e.g. after doing repairs, painting, introducing structural changes, building in new or replacing fixed equipment with other.

6.2 Position of the Centre of Gravity and a Datum Reference

The position of the centre of gravity of the gyrocopter (side view) is determined by the value of the angle which apex is located on the transverse axis of rotor head suspension on the mast, one arm is parallel to the vertical axis of the coordinate system related to the fuselage, and the other arm passes through the centre of gravity of the gyrocopter.

The Cartesian coordinate system, based on the fixed fuselage surfaces, as on the figure below, is helpful in determining the position of the centre of gravity by a method of three-scales placed under the landing gear wheels.

In practice, as a level datum of the gyrocopter, use the upper flat surface of the central tunnel inside the cockpit between the seats.



6.3 Weighing and Specifying the CG Position by a Suspension Method

The suspension method is a basic weighing method and specifying the position of the centre of gravity practised by the manufacturer. It requires suspending the gyrocopter (without the rotor) on the hanging scale by the pin fixing hub to the rotor head.

The gyrocopter weight is a sum of the (net) weight read from the scale on which it was suspended and the weight of the rotor which has to be weighed separately.

The position of the centre of gravity is specified by means of an accurate level (accuracy 0.1º) put on the upper flat surface of the central tunnel inside the cockpit between the seats. It is important that the control stick is not blocked (there is the freedom of tilting the rotor head).

The admissible range of the centre of gravity of the empty gyrocopter is:

-0,6º ÷ +0,6º

The actual weight and the position of the centre of gravity of the empty gyrocopter for a specific model is recorded in the up-to-date weighing report and is stated in subsection 6.4 of the Flight Manual.

	Admissible range of Centre of Gravity
Empty Gyrocopter	-0,6 ÷ 0,6 [deg]
1 Person on board	4,5 ÷ 6,5 [deg]
2 Persons on board	6,5 ÷ 8,5 [deg]

6.4 Weighing and Specifying the CG Position by a Three-Scales Method

A method of three-scales put under the landing gear wheels is more intelligible for the most of the users. When put on scales, the gyrocopter must be levelled by means of an accurate level held on the upper flat surface of the tunnel inside the cockpit between the seats. The gyrocopter can be weighed both with the rotor fitted and without it. It is essential for the accurate specification of the position of the centre of gravity that the rotor head axis is set up exactly vertical.

The gyrocopter weight is equal to a sum of (net) indications of all the three scales (plus the rotor weight provided it was detached when weighing the gyrocopter).

$$W = W_F + W_{RL} + W_{RR} (+ W_R)$$

The position of the centre of gravity along axis X is calculated from the following formula:

$$x_{cg} = \frac{W_F \times a + (W_{RL} + W_{RR}) \times b}{W_F + W_{RL} + W_{RR}}$$

where:

W – gyrocopter weight
W_F – weight indication under the front wheel
W_{RL} – weight indication under the rear left wheel
W_{RR} – weight indication under the rear right wheel
W_R – rotor weight
a = 1725 [mm] – axis coordinate of the front wheel
b = 75 [mm] – axis coordinate of the rear wheels
x_{cg} [mm]– coordinate of the centre of gravity of the gyrocopter

NOTE:

The theoretical values of dimensions **a** and **b** are stated above.

The values must be measured when weighing and inserted into the formula.

The admissible range of the position of the centre of gravity of the empty gyrocopter is:

180 ÷ 230 mm

Chapter 7 Durability of Structural Components

7.1 Introduction

Observing the admissible operational time of the individual units and parts as well as replacing them or conducting a complete overhaul at the right time is a responsibility of the owner/user. Complete overhauls are executed by or through the agency of the gyrocopter manufacturer – AVIATION Artur Trendak.

Replacement of the individual units or parts of the gyrocopter or complete overhaul should be recorded in the Gyrocopter Book.

Replacing engine subassemblies, components and engine related systems should be performed in accordance with the CA 912 ULT Engine Maintenance Manual.

7.2 Operation Time of the Units

The time is stated in flight hours or years from the date of being built in the gyrocopter, and in case of the engine - working hours or in years from the date of being built in.

Structural Unit or Component	Operation Time	Action
Fuselage as a whole	6000 hours	
Rotor mast	2000 hours	replacement
Rotor (blade, hub)	2000 hours	replacement
Rotor head	500 hours	complete overhaul
	2000 hours	replacement
Pin for rotor hub suspension on the head (teeter bolt) and the slip sleeves	250 hours	replacement
Bolts fixing the rotor hub	500 hours	replacement
Bolts and nuts fixing the rotor blades	1000 hours	replacement
Master bearing	500 hours	replacement
Propeller(check with propeller manual)	600 hours	complete overhaul
Propeller bolts(check with propeller manual)	600 hours	complete overhaul
Landing gear legs	2000 hours	replacement
Rotor head control system	250 hours	complete overhaul
Bowden cables in the rudder system	500 hours	replacement
V-belts in the prerotation clutch	250 hours	replacement
Tensioner pulley master bearing (6209) in the prerotation clutch	500 hours	replacement
Engine	1500 hours or 15 years	complete overhaul
Rubber sleeves (dampers) of the engine frame	1500 hours	replacement
Fuel pump	1000 hours or 5 years	replacement
Fuel lines	500 hours or 2 years	replacement
Oil lines	500 hours or 2 years	replacement
Fuel tank ventilation line	3 years	replacement

Chapter 8 Flight Control System

8.1 Introduction

Chapter 8 includes the design deflection values of the control components along with admissible tolerances.

8.2 Angular Range of Rotor Head Movements

Head Deflection

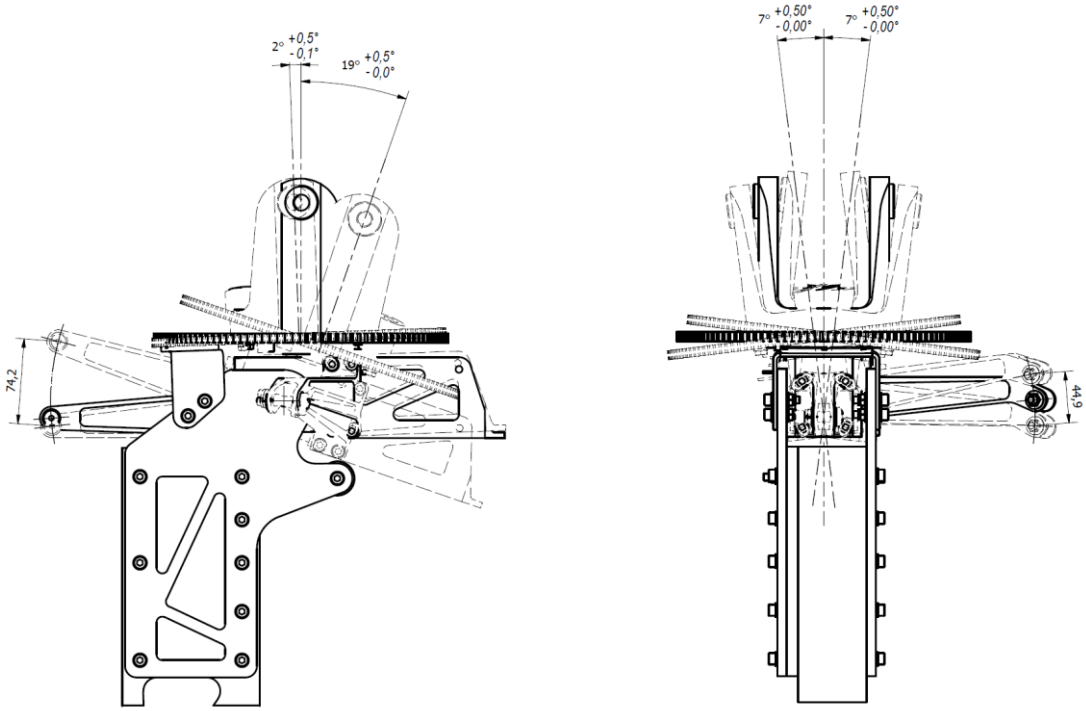


Figure 8.1-1 Rotor Head deflection range

Parking position and braking the rotor:	-2° (+0,5°/-0,1°)	extreme front
Position during horizontal flight:	7°	
Rear position:	19° (+0,5°/-0°)	extreme rear

The maximum angle of head tilt to the left and right is 7° (+0,5°/-0°)

The extreme values of the deflection and tilting angles of the rotor head are determined by the head structure and its suspension, and they are not adjustable.

8.3 Range of the Control Stick Movement

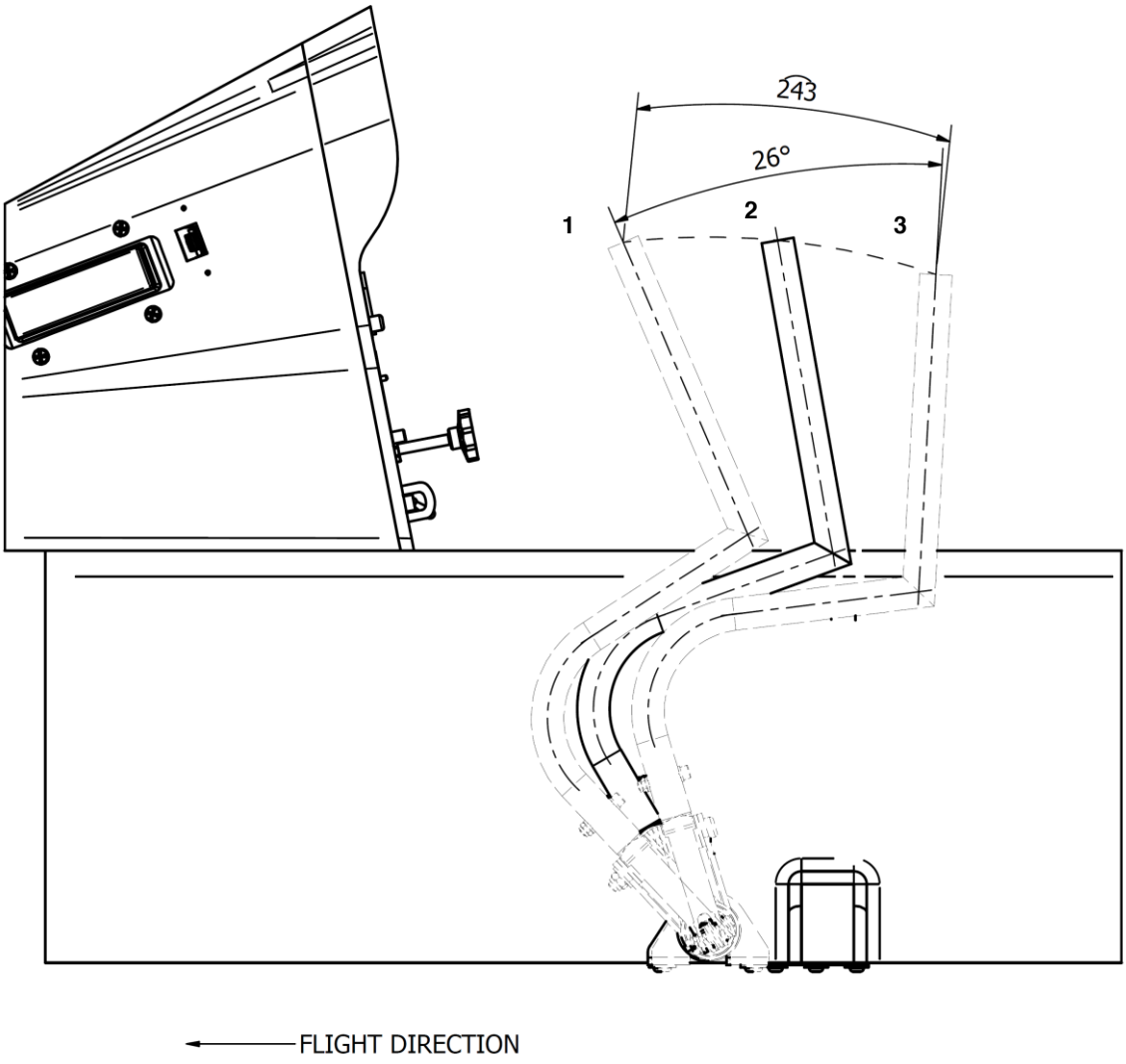


Figure 8.3-1 Control Stick movement range

Position 1 corresponds to the extreme front position of the rotor head (-2°).

Position 2 (vertical) corresponds to the neutral position of the rotor head (7°).

Position 3 corresponds to the extreme rear position of the rotor head (19°).

In order to lock control stick, push it in forward direction and hold in that position by one hand. Then, with the other hand, grab the locking strap, and pull so the stick remains in the extreme front position.

CAUTION!

IT IS FORBIDDEN TO LOCK THE CONTROL STICK DURING THE FLIGHT.

To unlock the control stick, release clamp on the strap and pull the stick.

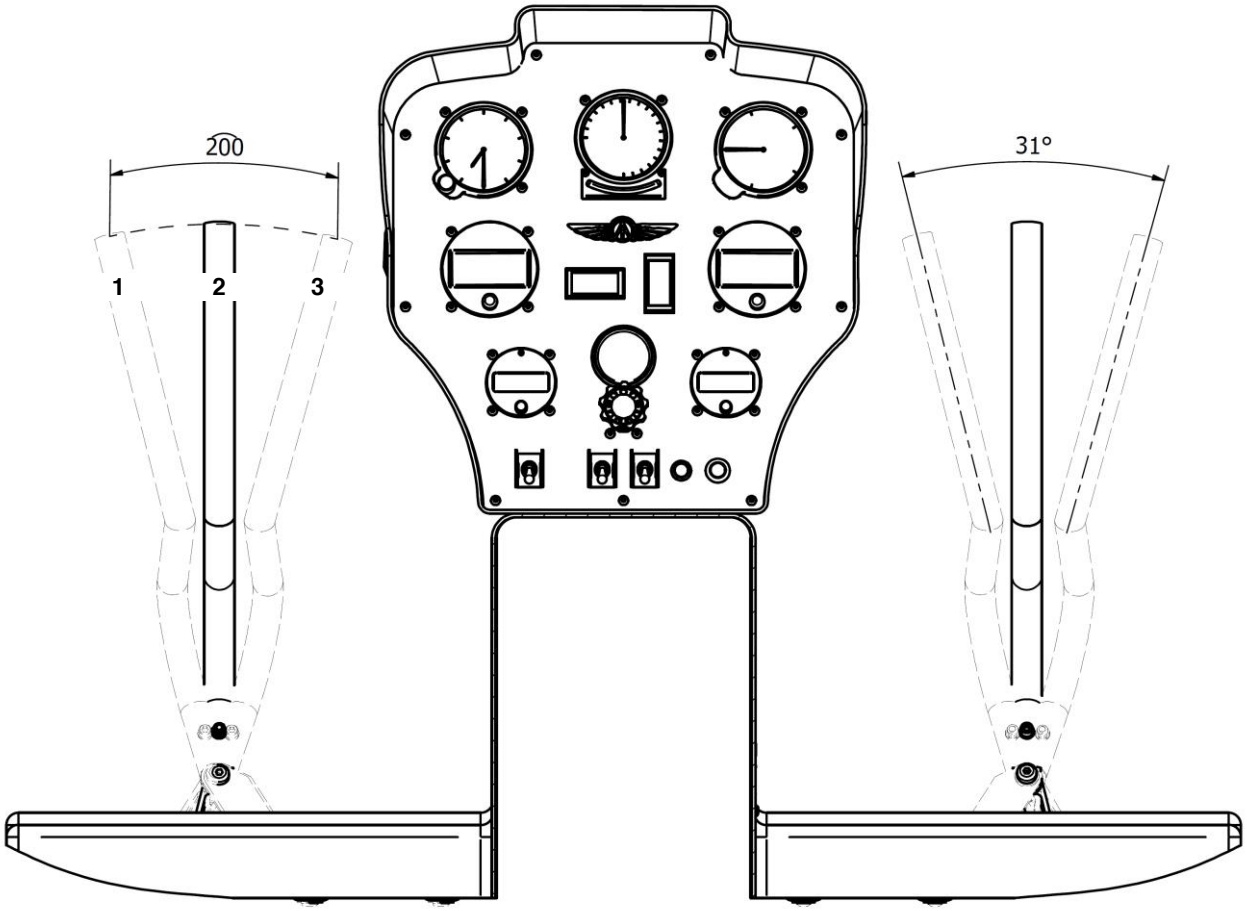


Figure 8.3-2 Control Stick movement range

Position 1 corresponds to a rotor head tilt to the left (7°).

Position 2 (vertical) corresponds to a neutral position of the rotor head (0°).

Position 3 corresponds to a rotor head tilt to the right (7°).

8.4 Pedals, Rudders and Balance Tab

With the neutral positions of the pedals, both rudders should be deflected by 3º to the right (relative to the planes of the vertical stabilizer chords). Adjusting the neutral position of the control surfaces is possible by appropriate fixing of the Bowden cables to the holders on tail beams.

The maximum deflection angle of the control surfaces is 23º ÷ 25º to the right and left relative to the neutral position. These values are much higher than the maximum deflection angles which can occur during the flight. They are not adjustable.

The balance tab is set after the phase of test flights. Its purpose is to facilitate straight flight without the necessity to use pedals by the pilot. If necessary, you can correct the tab position by gently bending it in or out (it is recommended to hold Balance Tab between two blocks of wood and then bend firmly in order to get straight bend line which is the most effective). It is not allowed to strain the control surfaces too firmly as they can become damaged. The tab is affixed with polyurethane glue. Bending the tab to the left deflects the flight direction of the gyrocopter to the right, and vice versa.

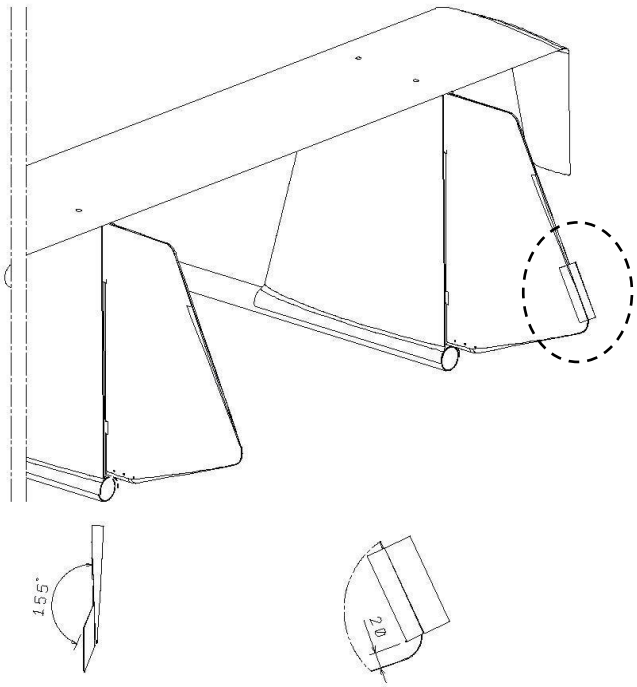


Figure 8.4-1 Balance tab position

Chapter 9 Other Maintenance Information

9.1 Manoeuvring on the Ground, Road Transport

When transporting or moving the gyrocopter, the control stick should always be immobilized with a strap.

For road transport (on a trailer, in a container), detach the rotor (see subsection 3.1.2) and fix the gyrocopter to the base by the landing gear legs.

Moving the gyrocopter on the ground should be performed with great caution by using a forked drawbar, grappled by the front wheel axle or a rope grappled by the front leg.

When parking with the rotor fitted, tie the rotor to the fuselage by means of straps with pockets fitted on the blade tips or by using two tapes.

9.2 Cleaning and Maintenance

The outside surfaces of the fuselage, rotor and propeller must be washed with water with an addition of mild soap. Hard-to-wash stains of lubricant or oil can be removed by means of a lint-free cloth wetted with heavy aliphatic petrol.

For seasoned painted surfaces, you can use any high-grade waxes or an abrasive compound of automotive type. Soft fabrics or suede must be used for polishing.

The glazing is to be rinsed with clean water or a water solution with an addition of mild soap and next wiped up with clean soft fabric, sponge or suede. Exercise great caution with it to avoid scratches.

NOTE:

To clean the glazing do not apply agents containing alcohol!

The cockpit interior, seats, rugs and upholstery should be cleaned with a vacuum cleaner. It is recommended to apply commercially available cleaning agents for car upholstery, however, the guidelines located on the wrapping must by strictly observed.

Clean the engine in accordance with the Engine Maintenance Manual.

9.3 Repairs and Modifications

All repairs and modifications in the structure can be conducted only by authorized personnel and in an agreement with the gyrocopter manufacturer.

CAUTION:

Before performing any **modification** of the gyrocopter,
contact the aviation authority to make sure the planned modification
will not undermine gyrocopter airworthiness.

On performing a repair or modification, weigh the empty gyrocopter and specify the position of its centre of gravity as well as record the data in the table in subsection 6.4 of the Flight Manual.

Chapter 10 Supplements

10.1 Introduction

Chapter 10 includes appropriate supplements essential for the safe and efficient operation of the gyrocopter when it is equipped with various additional systems and equipment not applied in the standard variant.

10.2 List of Introduced Supplements

Document no.	Title of an attached supplement	Notes

In the “Notes” column, confirm manually the existence of additional equipment or systems in the gyrocopter model for which the following manual is intended.