CAVOK

AVIATION TRAINING

Pilot's Operating Handbook

Aero AT3 R100
HA-VOA

„„AERO" Sp. z o. o.
03-942 WARSAW, POLAND
UL. WAŁ MIEDZESZYŃSKI 844

AEROPLANE FLIGHT MANUAL

for the AT-3R100

VERY LIGHT AEROPLANE

Aeroplane registration (Call sign): .....

Aeroplane Serial No.: .....

Registered under No: .....

Approved:

CIVIL AVIATION OFFICE

President of the CAO

(Originally signed for President of the CAO by Mr. Z. Mazan)

Date: 2004-09-23

This aeroplane must be operated in accordance with information and limitations contained in this Manual.

This Manual must be carried in the aeroplane at all times

Doc. No. ATL3.04

WARSAW **SEPTEMBER, 2004**

Editor:

"AERO" Sp. z o.o.

O3-942 WARSAW, POLAND

UL. WAŁ MIEDZESZYŃSKI 844

Approval of translation has been done to the best knowledge and judgment.
In any case, the original Polish language version is authoritive.

English language version of the Polish Document No. ATL3.03 AFM, translated under delegation of authority CAIB No. 54C.

Jan A.Jasiński, B.S.(Eng.)

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RECORDING OF REVISIONS

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Section 1

GENERAL

Page

1.1 Introduction

This Aeroplane Flight Manual is intended to provide pilots and instructors with information for safe and effective operation of this aeroplane which belongs to the Very Light Aeroplane category. This manual contains informative material, which is to be supplied to the pilot according to the requirements of JAR-VLA. Some supplementary information is also introduced into the content by the aeroplane manufacturer. It is the pilot's responsibility to acquaint him/herself with the contents of this manual, as well as with any revisions to it.

CAUTION

THIS AEROPLANE FLIGHT MANUAL IS NOT A FLIGHT TRAINING MANUAL. SEPARATE FLIGHT TRAINING MANUALS EXIST FOR THAT PURPOSE

Should this manual be lost, the General Inspectorate of Civil Aviation – Civil Aircraft Inspection Board is to be notified immediately, and if outside Poland, the local civil aviation authority. Anybody who finds this manual is requested to deliver it promptly to the manufacturer: Aero Sp. Z o. o. 03-942 Warszawa, Wal Miedzeszyński 844, Poland, email : aero@post.pl, tel 0048 22 616 20 87 , fax 00 48 22 617 85 28

and if outside Poland, to the local civil aviation authority.

1.2 Basis of certification

This aircraft type has been approved by European Aviation Safety Agency in accordance with JAR-VLA regulations, amended through to amendment VLA/92/1 and holds a Type Certificate No. A.021. ⑥

1.3 Warnings, cautions and remarks

The definitions below concern the following expressions:
warning, caution, note.

WARNING means that if the warnings concerned are not followed, this will lead to an immediate or significant reduction in flight safety

CAUTION means that if the precautions concerned are not followed this will lead to an immediate or significant reduction in flight safety

NOTE indicates all special issues, which do not directly affect flight safety, but are essential or unusual.

1.4 Descriptive data

This AT-3 R100 Very Light Aeroplane is a two-seat, single engine, low wing, all metal aeroplane, with a three-wheel fixed landing gear with a nose wheel.

1.4.1. Airframe:

1. Dimensions:

- Span	7.550 m / 24' 9¼"
- Length	6.150 m / 20' 6"
- Height	2.230 m / 7' 3¾"
- Dihedral	3 °
- Lifting area	9.30 m^2 / 100.1 ft^2
- Mean aerodynamic chord	1.27 m / 4' 2"
- Wing loading	62.6 kg/m^2 / 12.8 lb/ft^2
- Wing profile	NACA 4415

2. Control surface displacements:

- Slab tail (angles related to the fuselage base – red mark on the fuselage)

Trailing edge down	10° ±1°
Trailing edge up	12° ±1°

- Trim & balancing tab (angles related to the fuselage base – red mark at the fuselage)

When the slab tail trailing edge is down,	
the tab is displaced downward, i.e. by maximum	26° ±3°
When the slab tail trailing edge is up,	
the tab is displaced upwards, i.e. by maximum	44° ±3°

- Ailerons (angles related to the wing chord)
  - Up 20° ±2°
  - Down 15° ±2°
- Rudder (angles related to the chord of the fin)
  - Each side 25° ±2°
- Wing flaps (angles related to the wing chord)
  - Retracted 0° ±2°
  - For takeoff 15° ±2°
  - For landing 40° +5/-2°

3. Landing gear

- Wheel track 2.26 m / 7' 5"
- Main wheel tyre- Type 380 x 150
  - Pressure 2.5 bar / 36 psi
- Nose wheel tyre- Type 5.00-4
  - Pressure 2.5 bar / 36 psi
- Disc brakes
- Type of shock absorber elastic strut

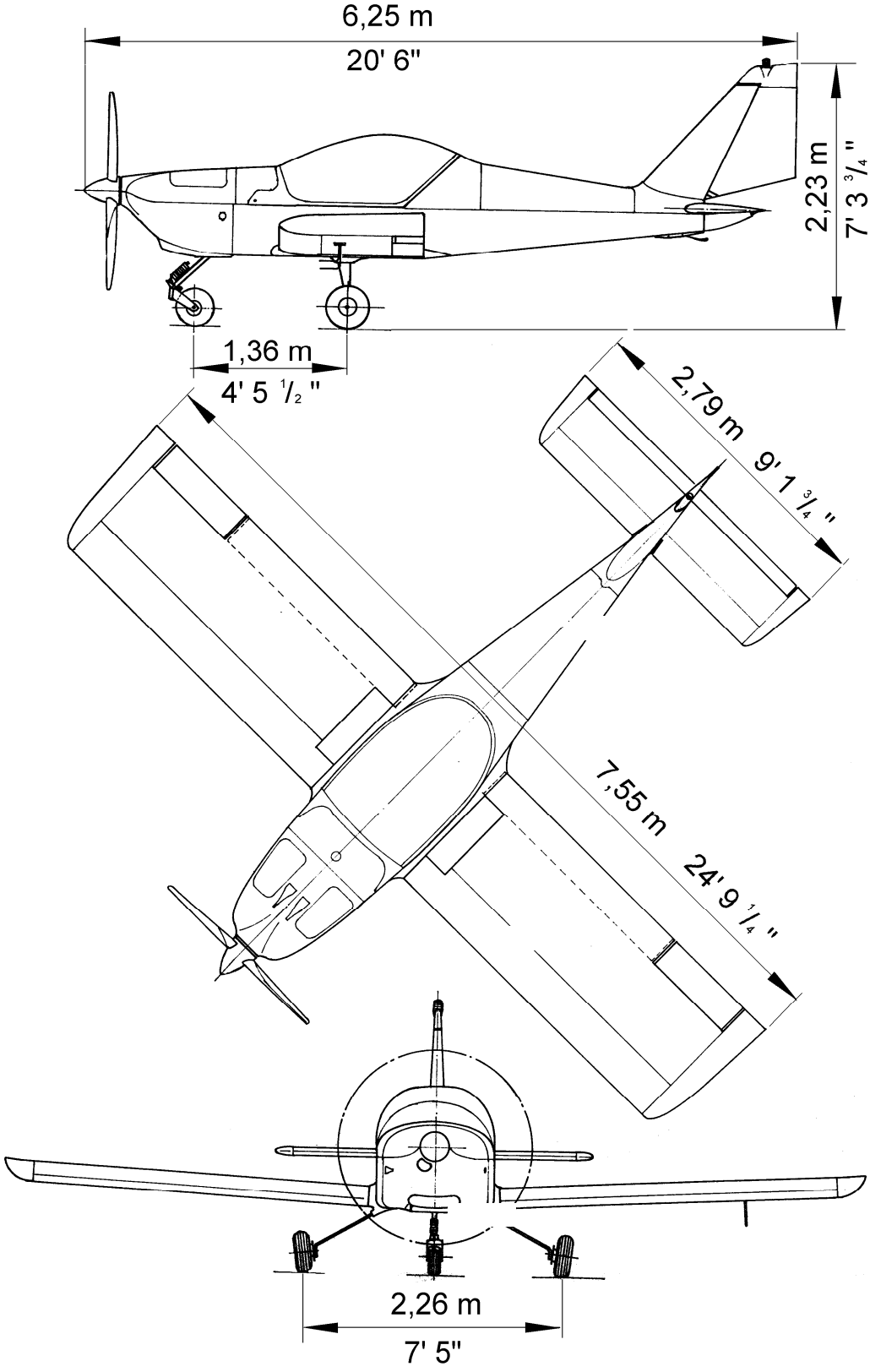
1.4.2. Engine

Four cylinder, horizontally opposed BOMBARDIER ROTAX, model 912S2 or 912S4 engine. The cylinders are air-cooled, the cylinder heads, by liquid coolant. Dual ignition. 73.5 kW / 98.5 HP take-off power, 69 kW / 92.5 HP continuous power.

1.4.3. Propeller

Wooden, fixed pitch, two-blade GT-2/173/VRR-FW101SRTC propeller with 1.73 m (5' 8") diameter and clockwise direction of rotation

1.5 View of the aeroplane (three projections)



1.6 List of definitions and abbreviations

The following words or expressions have been used or may be helpful in particular Sections of this manual.

Basic speeds and their denotations:

IAS – "INDICATED AIRSPEED" means the speed of an air vessel indicated by its airspeed indicator co-operating with a Pitot tube, which is calibrated for the compressibility of an adiabatic airflow in the conditions of the standard atmosphere at sea level, without corrected errors of the airspeed measuring system. All IAS values in this manual presume the airspeed measuring system error to be zero.

CAS – "CALIBRATED AIRSPEED" means the speed of an air vessel after aerodynamic and instrument correction. The calibrated airspeed is equal to the true airspeed in the conditions of the standard atmosphere at sea level.

TAS – "TRUE AIRSPEED" means the airspeed of an air vessel, relative to the undisturbed airflow. It is CAS corrected by the change of air density depending on altitude and temperature.

$$TAS = CAS \sqrt{\rho_o / \rho}$$

ρ - air density at the particular altitude

V_{NE} – Maximum never exceed airspeed. This is a limit speed, which cannot be exceeded in any conditions.

V_{NO} – Maximum structural cruising speed. This is a limit speed which cannot be exceeded except in non-turbulent conditions, and then, only with care.

V_A – Manoeuvring speed. Above this speed, rapid or full displacement of the control surfaces may in certain circumstances result in exceeding the maximum permissible loads of the structure.

V_{FE} – Maximum airspeed with wing flaps extended. This is the maximum permitted airspeed of the aeroplane with wing flaps extended.

V_{S1} – Stalling speed, or minimum airspeed of steady flight, at which the aeroplane is steerable in any other configuration than the landing configuration.

V_{S0} – Stalling speed, or minimum airspeed of steady flight, at which the aeroplane is steerable in the landing configuration.

V_X – Airspeed for the maximum angle of climb. This is the airspeed, at which the maximum increase of altitude over the shortest distance may be achieved.

V_Y – Airspeed for the maximum rate of climb. This is the airspeed at which the maximum increase of altitude in the shortest time may be achieved.

Meteorological denotations

ISA – International Standard Atmosphere.

ISA assumptions:

- The air is a dry perfect gas
- The temperature at sea level is 15 °C / 59℉,
- The pressure at sea level is 1013.25 hPa,
- The drop in the temperature is 3.25 °C per each 500 m of altitude (3.564℉ for each 1000 ft) in the range from sea l evel up to the altitude, at which the temperature is –56.5 °C / -70℉ .

OAT – Outside Air Temperature. This is the temperature of the static air, read from the thermometer, or received from the ground meteorological service, with instrument error and air compressibility effect corrected.

Pressure altitude – This is the altitude read from the altimeter, preset to the standard pressure at the average sea level (1013 hPa).

Denotation of power and rating

Take-off power – Maximum power.

Maximum continuous power – Maximum power permitted for the whole flight.

Engine failure – any engine malfunction, engine stop included.

Terminology used for weights and definition of the centre of gravity of the aeroplane.

Maximum takeoff weight – it is the maximum aeroplane weight at the moment of beginning the takeoff

Maximum landing weight – it is the maximum aeroplane weight in the moment of touch down.

Empty aeroplane weight – It is the weight of the equipped aeroplane, with unusable fuel and full amount of operational agents (oil, cooling agent and hydraulic fluid).

Centre of Gravity – imaginary point on the aeroplane. The aeroplane suspended at this point is in equilibrium.

Limits of the CG – range of C.G positions, which must not be exceeded, when loading the aeroplane to a given total weight.

MAC – the Mean Aerodynamic Chord.

Consumable fuel – This is the amount of fuel which may be consumed, without symptoms of a rough engine running.

Unusable fuel – The amount of fuel, not less than that which gives the first symptoms of rough engine running, under the least favourable conditions for fuel feeding the fuel tank, which may occur during normal operation of the aeroplane.

Operational denotations

Take-off run – the distance from the location where the aeroplane begins to move, to the location where the aeroplane lifts-off from the takeoff surface.

Take-off distance – the distance from the location where the aeroplane begins to move, to the location where the aeroplane reaches the altitude of 15 m / 50 ft. This distance is to be measured parallel to the takeoff surface.

Landing distance – the distance from the location where the aeroplane has the altitude of 15 m / 50 ft, to the location where the aeroplane stops. This distance is to be measured parallel to the takeoff surface.

Landing run – the distance from the location where the aeroplane touches down on the landing surface, to the location where the aeroplane stops.

Demonstrated crosswind capabilities – value of crosswind velocity for which it has been demonstrated that for take-off and landing no extensive pilot force, skill or concentration is required.

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Section 2

LIMITATIONS

2.1. Introduction

This Section contains the limitations on the operation of this aeroplane, the marking of the instruments and the basic informative placards required for safe operation of the aeroplane, engine, the standard systems and the standard equipment.

⑥ The limitations contained in this Section as well as those contained in Section 9 have been approved by the European Aviation Safety Agency.

2.2. Airspeed Limitations

Designation		IAS			
Airspeed		**km/h**	**mph**	**kts**	REMARKS
Maximum never exceed airspeed	V_{NE}	236	146	127	This airspeed must not be exceeded in any condition of operation.
Maximum structural cruising speed	V_{NO}	208	129	112	This airspeed cannot be exceeded, except in non-turbulent conditions, and then, only with care.
Manoeuvring speed	V_A	208	129	112	Above this airspeed, no full or rapid displacement of the control surfaces is to be applied, because in certain operational conditions, at full control displacement, the loading limit of the aeroplane may be exceeded.
Maximum airspeed with flaps extended	V_{FE}	158	98	85	This airspeed is not to be exceeding when the wing flaps are extended to 15° or to 40°.

2.3. Marking of the airspeed indicator

The table below shows the markings of the airspeed indicator and the meaning of the colour coding.

White sector	Range for safe deployment of wing flaps.
Green sector	Range of normal operation.
Yellow sector	Range of limited operation (manoeuvres to be performed with care and in non-turbulent air only).
Red line	Maximum airspeed for any kind of operation.

Airspeed ranges IAS				
		km/h	mph	kts
White sector	from	81	50	44
	to	158	98	85
Green sector	from	96	60	52
	to	208	129	112
Yellow sector	from	208	129	112
	to	236	146	127
Red line		236	146	127

2.4. Power plant

ENGINE	
Manufacturer	BOMBARDIER-ROTAX
Engine model	912S2 OR 912S4
Maximum takeoff power	73.5 kW / 98.5 HP
Maximum continuous power	69 kW / 92.5 HP
Engine maximum RPM	
- take-off (5 MIN.)	5 800 rpm
- continuous	5 500 rpm
- idle	~1 400 rpm
Maximum cylinder head temperature (CHT)	135°C / 275°F
Oil temperature	
-maximum	130°C / 266°F
-minimum	50°C / 122°F
-normal operational	90 to 110 °C 194 to 230°F
Oil pressure:	
-minimum	0.8 bar / 11.6 psi
-maximum	7 bar / 101.5 psi
-normal	2 - 5 bar / 29 -72.5 psi
Fuel pressure:	
-maximum	0.40 bar / 5.8 psi
-minimum	0.15 bar / 2.2 psi
Engine Starting Temperatures	
-maximum	50 °C / 122°F
-minimum	-25 °C / -13°F

Fuel:

Automotive gasoline, unleaded, minimum RON 95

EN228 Premium, EN228 Premium Plus, AVGAS 100LL.

Refer to the Rotax 912S Series Engine Operating Manual for limitations and recommendations relating to fuel grades used

Oils:
The oils, to be marked "SF" or "SG" according to API classification

from –5 °C to +40°C / 23°F to 104°F	SAE 20W-50; SAE 20W-40
from –15 °C to +40°C / 5°F to 104°F	SAE 15W-40, 15W-50,
from –25 °C to +40°C / -13°F to 104°F	SAE 10W-40
from –30 °C to +40°C / -22°F to 104°F	SAE 5W-50; SAE 5W-40

- maximum amount of oil	3.5 litres / 3.6 US qts
- minimum amount of oil	2.5 litres / 2.6 US qts

Cooling agent

Water-free, anti-freeze liquid suitable for aluminium radiators,

Capacity of the system – 2 litres (2.1 US qts)

For recommended by engine manufacturer types of coolant, see Rotax 912S Series Engine Operating Manual. ⑥

Propeller:

Manufacturer	GT ELICHE
Propeller model	GT-2/173/VRR-FW101SRTC
	Two blade, wooden, fixed pitch
Diameter of the propeller	1.73 m / 5' 8"
Direction of rotation	Clockwise

2.5. Marking of the engine monitoring instruments

Stated below, are the ways in which the engine monitoring instruments are marked, as well as the meanings of the coloured markings.

Coloured marking	**Red line or sector**	**Green sector**	**Yellow sector**	**Red line or sector**
The instrument, or the measured parameter	**Minimum limit**	**Range of normal operation**	**Range of limited operation**	**Maximum limit**
Tachometer	-	1,400 to 5,500 rpm	0 - 1400 rpm, 5500 - 5800 rpm	5800 - 7000 rpm
Oil temperature	50℃ (120℉)	90÷110℃ (194÷230℉)	50÷90ºC (120÷194℉) 110÷130ºC (230÷266℉)	130℃ (266℉)
CHT	-	75÷135℃ 167÷275℉	-	135℃ 275℉
Exhaust gas temperature	-	600÷850℃ 1112÷1560℉	850÷880℃ 1560÷1616℉	880÷900℃ 1616÷1652℉
Oil pressure	0,8 bar (11.6 psi)	2÷5 bar (30÷72.5 psi)	0,8÷2 bar (11.6÷30 psi) 5÷7 bar (72.5÷101.5 psi)	7 bar (101.5 psi)
Fuel pressure	0,15 bar (2.2 psi)	0,15÷0,4 bar (2.2÷5.8 psi)	-	0,4 bar (5.8 psi)

⑥

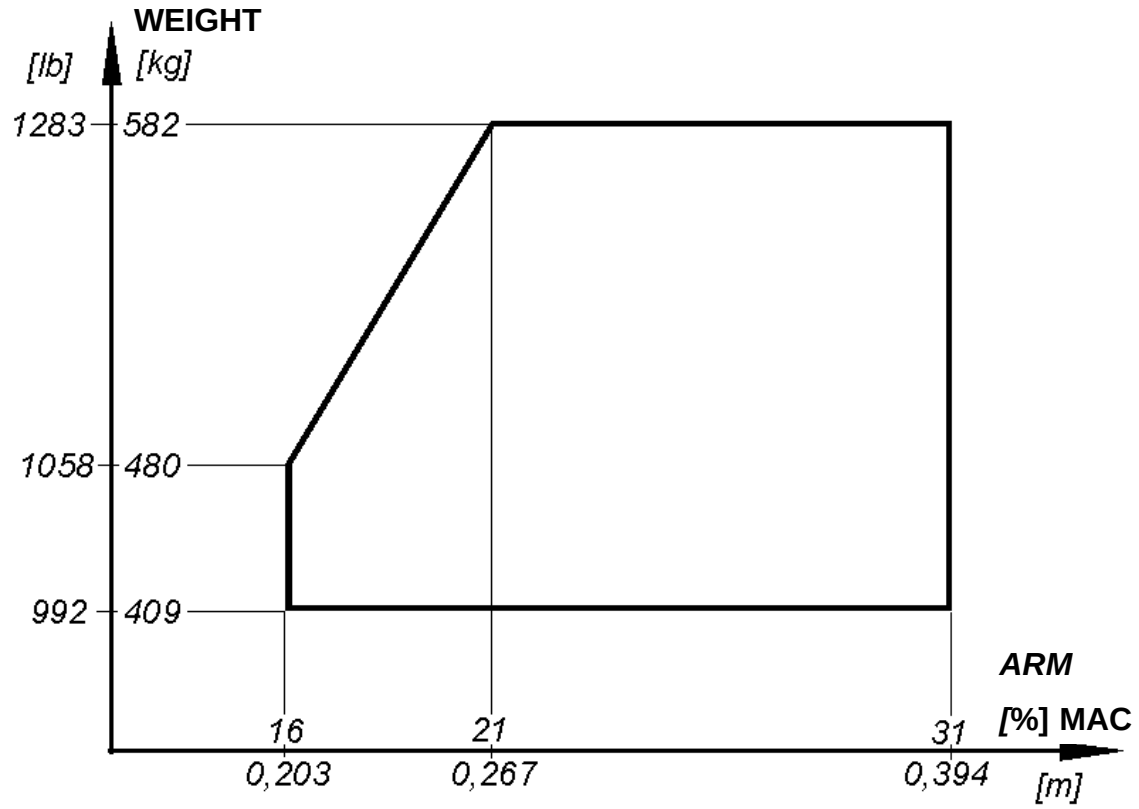
2.6. Weight

Maximum take-off weight	582 kg / 1283 lb
Maximum landing weight	582 kg / 1283 lb
Empty, equipped aeroplane weight	350 kg / 772 lb
Maximum load in the luggage compartment:	30 kg / 66 lb
- port luggage compartment (large)	20 kg / 44 lb
- starboard luggage compartment (small)	10 kg / 22 lb

2.7. Limitation of C.G position

Distance of the extreme C.G. positions from the leading edge of the Mean Aerodynamic Chord (MAC).

⑨



2.8. Approved manoeuvres

The aeroplane is approved to perform the following manoeuvres:

- All normal flight manoeuvres
- Stall (except tail slide)
- Lazy eight
- Chandelle
- Steep turn not exceeding 60° of bank

Entry airspeed:	IAS		
	km/h	mph	kts
Lazy eight	190	118	102
Chandelle	220	136	118
Steep turn with 60° of bank	170	105	91

WARNING!

AEROBATICS AND INTENTIONAL SPINS ARE PROHIBITED

2.9. Controlled Load Factors

The limits of maximum permissible load factors:

With wing flaps retracted: **-1.5 to +3.8**

With wing flaps extended: **0 to +2**

2.10. Crew of the aircraft

The minimum crew of this aeroplane is 1 pilot

2.11. Types of operation

This aeroplane is approved for flights by day in Visual Meteorological Conditions (VMC-Day)

This aeroplane is approved to operate according to Day VFR, when the equipment specified in the LIST OF MINIMUM EQUIPMENT is installed and working correctly.

WARNING!

FLIGHTS IN KNOWN ICING CONDITIONS ARE PROHIBITED.

LIST OF MINIMUM EQUIPMENT

SYSTEMS OR DEVICES,	VFR DAY*
ELECTRIC POWER SYSTEM AND DEVICES	
1. Battery	1
2. Alternator	1
3. Voltammeter	1
4. Generator warning light	1
FLIGHT AND NAVIGATION INSTRUMENTS	
1. Airspeed indicator	1
2. Altimeter	1
3. Magnetic compass	1
ENGINE MONITORING INSTRUMENTS	
1. Tachometer	1
2. Cylinder head temperature indicator	1
3. Exhaust gas temperature indicator	1
4. Oil temperature indicator	1
5. Oil pressure indicator	1
6. Fuel quantity indicator	1
7. Fuel pressure indicator	1

(11)

* – In the column "VFR DAY" the equipment is marked, which must be installed and correctly operating.

2.12. Fuel

Fuel tank: capacity:

airplane to AT3-054:

- Total capacity 73.5 litres / 19.42 US gal
- Consumable fuel 70.0 litres / 18.5 US gal
- Unusable fuel 3.5 litres / 0.92 US gal

(11) airplane from AT3-055:

- Total capacity 68.5 litres / 18.09 US gal
- Consumable fuel 65.0 litres / 17.7 US gal
- Unusable fuel 3.5 litres / 0.92 US gal

Approved fuel"

- Automotive unleaded gasoline of minimum RON 95. EN228 Premium, EN228 Premium Plus
- Aviation gasoline AVGAS 100LL.

(Refer to the Rotax 912S Series Engine Operating Manual for limitations and recommendations relating to fuel grades used)

2.13. Number of seats

This aeroplane has two seats.

The dual control system enables the aeroplane to be controlled from both the port and starboard seats.

2.14. Limitation placards

Placards on the instrument panel:

AT-3 R100 AIRPLANE, APPROVED IN ACCORDANCE WITH JAR-VLA FOR VFR-DAY OPERATIONS.
FLIGHTS IN KNOWN ICING CONDITIONS PROHIBITED.
AEROBATIC MANOEUVRES INCLUDING SPINS PROHIBITED.
OTHER LIMITATIONS ACC. TO AIRPLANE FLIGHT MANUAL

On the instrument panel below of the airspeed indicator

MAX MANOEUVRING SPEED
V_A = 208 km/h IAS

or

MAX MANOEUVRING SPEED
V_A = 112 KTS IAS

or

MAX MANOEUVRING SPEED
V_A = 129 MPH IAS

On the starboard luggage compartment

LUGGAGE 10 kg or **LUGGAGE 22 lb**

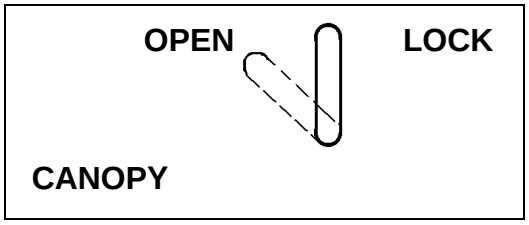
On the port luggage compartment

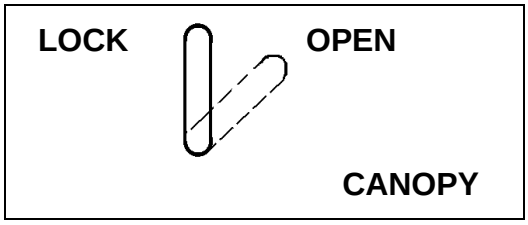
LUGGAGE 20 kg or **LUGGAGE 44 lb**

On the jettisoning handle of the canopy

PULL TO JETTISON CANOPY

On the opening handle of the canopy





⑥

On the fuel tank filler

airplane to AT3-054:

FUEL 70 LITRES
UNLEADED MIN RON 95
EN228 Premium/Premium Plus
AVGAS 100LL

(11) airplane from AT3-055:

FUEL 65 LITRES
UNLEADED MIN RON 95
EN228 Premium/Premium Plus
AVGAS 100LL

On the oil filler, one from below labels:

OIL 3,5 L

OIL 3.6 US QTS

Section 3

EMERGENCY PROCEDURES

Page

3.1. Introduction

Section 3 contains information concerning controlling and procedures, which are to be utilised in emergency situations, and which may occur during aeroplane operation.

To prevent danger in emergency situations, the basic indications contained in this section are to be considered and applied as required.

3.2. Engine failures

3.2.1. Engine failure during takeoff

- Maintain airspeed IAS = 112 km/h / 70 mph / 60 kts
- Fuel pump. OFF
- Fuel valve SHUT
- Throttle IDLE
- Ignition switch OFF
- Battery and generator OFF
- Landing: ahead avoiding obstacles, if any

3.2.2. Engine failures in flight

- Fuel pressure drop, engine power drop
  - Fuel pump ON
  - Fuel valve opening To be CHECKED
  - Fuel quantity on board To be CHECKED
- Excessive engine vibration
  - Carburettor heating Switch ON
  - Fuel pump Switch ON
- Exceeding the cylinder head temperature:

⑧
  - Temperature of the exhaust gases – for comparison To be CHECKED
  - Over-speeding the engine
  - Exceeding the maximum oil temperature
  - The oil pressure drops below the permissible minimum

CAUTION.
IN ALL OF THE ABOVE CASES, REDUCE THE POWER TO THE MINIMUM POSSIBLE, FLY TO THE NEAREST AIRFIELD, AND – BE PREPARED FOR PRECAUTIONARY LANDING

3.3. Engine re-starting in flight

• Maintain airspeed	IAS = 120 km/h / 75 mph / 65 kts
• Fuel quantity in the tank	To be CHECKED
• Fuel valve	OPEN
• Emergency fuel pump	Switch ON
• Throttle to be set	IDLE (or 10 % opening)
• Choke – (when the engine is cool)	ON
• If the propeller does windmill – ignition	ON
• If the propeller has stopped – engine starter	ON

If the engine starts to run:

• Throttle, according to the required power	SET
• Operational parameters of the engine	To be CHECKED
• Emergency fuel pump	OFF

If the engine does not start to work	Perform EMERGENCY LANDING

NOTE

The engine can be re-started in the entire range of operational airspeeds and altitudes. The loss of altitude and airspeed during engine re-starting in flight is not great.
No other special procedures are required for engine re-starting in flight.

3.4. Smoke and fire

3.4.1. Engine fire on ground

In case of engine fire on ground take the following steps below:

- Fuel valve — SHUT
- Throttle — FULL OPEN
- Ignition switch — OFF
- Electrical equipment — OFF
- Battery and generator — OFF
- Fire extinguisher — TO BE USED

3.4.2. Fire in flight

In case of engine fire in flight

- Maintain airspeed — IAS = 120 km/h / 75 mph / 65 kts
- Fuel valve — PULL SHUT
- Throttle — FULL OPEN
- Ignition switch — OFF
- Battery and generator — OFF
- Cabin canopy vents — SHUT
- A side-slip – opposite to the fire, to blow it out — TO BE PERFORMED
- When the engine stops — PERFORM EMERGENCY LANDING

CAUTION.
AFTER AN ENGINE FIRE
DO NOT TRY TO RE-START THE ENGINE

In case of fire in the electrical system

- Maintain airspeed IAS = 120 km/h / 75 mph / 65 kts
- Electrical equipment OFF
- Fire extinguisher (if fire is in the cabin) TO BE USED
- Cabin canopy vents KEEP OPEN
- If the fire persists, decide upon a place for landing.

3.5. Gliding flight

- Recommended aeroplane configuration Wing flaps retracted
- Airspeed IAS = 120 km/h / 75 mph / 65 kts
- Throttle IDLE
- Gliding ratio (No power) 8

3.6. Emergency landing

3.6.1. Precautionary landing

- Landing place IDENTIFY
- Wing flaps to 40º EXTEND
- Maintain approach airspeed IAS = 100 km/h / 62 mph / 54 kts
- Safety belts FASTEN FIRMLY
- Electrical equipment OFF
- Locks of the canopy UNLOCK

Before touch-down:

- Fuel valve PULL SHUT
- Battery and generator OFF
- Ignition switch OFF
- Levelling out directly before touchdown. After touching-down, keep control stick fully pulled.

3.6.2. Landing after engine failure

- Wing flaps to 40º — EXTEND
- Maintain approach airspeed — IAS = 100 km/h / 62 mph / 54 kts
- Safety belts — FASTEN FIRMLY
- Locks of the canopy — UNLOCK
- Electrical equipment — OFF
- Fuel valve — PULL SHUT
- Battery and generator — OFF
- Ignition switch — OFF
- Throttle — IDLE

3.7. Recovering from unintentional spin

In case of an unintentional spin, the following recovering procedure is to be used.

- Throttle — IDLE
- Rudder – opposite to aeroplane rotation — APPLY
- Control stick — NEUTRAL
- Ailerons — NEUTRAL
- Wing flaps — RETRACT

When the aeroplane stops to rotate

- Rudder — NEUTRAL
- Control stick – gentle proceed to level flight
- Throttle – for level flight — TO BE SET

WARNING

INTENTIONAL SPINNING IS PROHIBITED

3.8. Other emergency procedures

3.8.1. Icing

- The aeroplane is not equipped with a de-icing system. Therefore the area, where icing conditions exist is to be left as soon as possible.
- Carburettor heating ON
- Heating of the cabin ON
- To a limited degree, some ice may be removed by hand, through the window of the cabin.

3.8.2. Abandoning the aeroplane with use of parachute

- Maintain airspeed IAS = 120 km/h / 75 mph / 65 kts
- Fuel Valve PULL SHUT
- Ignition switch OFF
- Battery and generator OFF
- Headset cables DISCONNECT
- Safety belts UNFASTEN
- Canopy (Pull both jettisoning levers and push out the canopy both hands TO BE JETISONED
- The aeroplane TO BE ABANDONED
- The parachute, at a safe distance: DEPLOY

3.8.3. Failure of the electric system

- Check the condition of the system (Voltammeter, generator signalling light)
- Check the circuit breakers and fuses. Switch ON again, as required

In case of generator failure act as follows:

- Generator OFF
- Power receivers, not required to continue the flight OFF

3.8.4. Failure of the static and pitot pressure systems

The failure of the flight and navigation instruments might be caused by leakage or constriction of the pipes of the static or pitot pressure systems.

In case of failure of the static or pitot pressure system, the landing approach is to be performed with flight parameters monitored by the tachometer and other correctly working flight and navigational instruments only. On ground, water sediment is to be removed from the systems, and the sensors of static and pitot pressure checked to be clean and not constricted. Have the systems checked for leakage.

3.8.5. Failure of balancing tab control system of slab tail

In case of failure of the balancing tab control system of the slab tail in flight, if the aeroplane becomes "tail heavy" (the nose rises), the airspeed is to be reduced to read about IAS = 112 km/h / 70 mph / 60 kts to reduce the force on the control stick

Section 4

NORMAL PROCEDURES

4.1. Introduction

Section 4 contains the list of inspection tasks and detailed procedures for normal aeroplane operation with standard equipment installed. Normal procedures concerning the optional equipment or systems are contained in Section 9.

4.2. Rigging and de-rigging the aeroplane

If de-rigging the aeroplane and preparation for transportation is necessary, refer to Aeroplane Maintenance Manual of AT-3 R100 Aeroplane, Section 2.6 – Transport of the de-rigged Aeroplane

4.3. Daily pre-flight and post-flight inspection

Recommended daily pre-flight inspection:

- Check amount of fuel, oil and engine coolant
- Check for leaks of oil, fuel and coolant.
- Drain fuel sediment
- Check condition of exhaust pipes.
- Check condition of nose and main landing gear:
  - condition of the tyres,
  - tyre pressure, (visually)
  - condition of rubber shock absorber of the nose landing gear.
- Check condition of engine cowling, its locking and securing.
- Visually check propeller blades are clean and in good condition.
- Visually check the cockpit canopy is clean.
- Check the canopy for correct opening and locking.
- Check the inspection holes in the fuselage and wing are closed and locked.

- Check the sensor of pitot and static pressure is clean
- Check the sediment tanks of the pitot and static pressure systems in the following way:
  - Unscrew the caps.
  - Check the caps are dry (if not, evacuate the sediment)
  - Screw on and tighten the caps onto the sediment tanks.
- Check condition and cleanliness of radio antennas.
- Visually check condition of the stabilisers and control surfaces.
- Visually check condition and secure fixing of the safety belts.
- Check free and smooth movement of the flight control system i.e. the elevator, rudder, ailerons and wing flaps, and check it for significant play or excessive friction.
- Check the levers controlling the engine move smoothly.
- Visually check condition of all board instruments.
- Check condition of battery and of the electric system.
  - BATTERY switch ON
  - Indication of voltammeter CHECK
  - Turn indicator, artificial horizon CHECK
  - Radio equipment CHECK

The battery is serviceable if the voltammeter reads not less than 12 V.

Recommended daily post-flight inspection

- Check the fuel, oil and cooling systems for leaks.
- Check fixing and general condition of the radio antennas
- Check the general condition of the aeroplane and its landing gear.

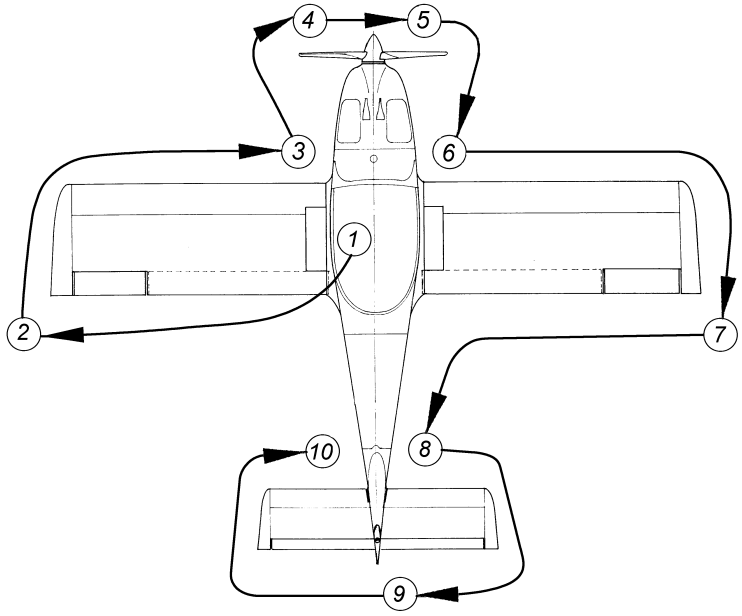
4.4. Preparation for flight

4.4.1. Determining weight and Centre of Gravity

The pilot is responsible for the correct aeroplane loading. It is his duty to ensure that the C.G. position does not move outside the permissible limits defined in item 2.7 Centre of Gravity. The method for calculating total weight and C of G position is given in Section 6 "Weight and Balance"

4.4.2. Pre-flight inspection of the aeroplane

It is the duty of the pilot to perform a pre-flight inspection prior to the flight or after a break in flights, when he has left the cabin. The inspection is to be made, starting with the cabin and walking clockwise around the aeroplane.



(1.) Cabin

- Canopy – Opening, closing and operation of locks	CHECK	
- Inside cabin– All foreign items	REMOVE	
- Collapsible tow bar from flying controls – if installed	REMOVE	⑨
- Condition of the seats	CHECK	
- Luggage, collapsible tow bar – if will carry	SECURE	⑨
- Seat belts	CHECK	
- Flight controls – Free movement, lack of significant play and extensive friction	CHECK	
- Balancing tab		
- Full travel	CHECK	
- Take-off setting	ESTABLISH	
- Wing flap – Extension	CHECK	
- Wing flap setting to 40º	ESTABLISH	
- Carburettor heating – to be set OFF	CHECK	
- Fuel valve – to be set OFF	CHECK	
- Fuel pump – to be switched OFF	CHECK	

- Ignition – to be set OFF	CHECK
- Fuel level – to be checked with the gauge	CHECK
- Battery and generator – to be switched OFF	CHECK
- All electrical equipment– to be switched OFF	CHECK
⑨ - Parking brake – if installed	ON

(2.) Port wing

- Structure – Condition and cleanliness	CHECK
- Wing flap – Condition of structure and play in control system and hinges	CHECK
- Ailerons – Condition of structure and play in control system and hinges	CHECK
- Pitot tube – Fixing and cleanliness	CHECK
- Inspection flap – to be closed and locked	CHECK

(3.) Port landing gear

- Tyre – Check the tyre pressure (visually)	CHECK
- Brake system	CHECK

(3.) (4.) Fuselage front part

- Canopy – Visually check cleanliness	CHECK
- Fuel tank – Fuel quantity and locking the filler-cap	CHECK
- Engine cowling – Locking and leaks	CHECK
- Propeller and spinner – Condition and cleanliness	CHECK
- Exhaust pipes – Condition	CHECK
- Antenna of transponder – Condition and fixing	CHECK
- Fuselage bottom surface –Condition and cleanliness	CHECK
- Air intake covers - installed	CHECK

NOTE
It is recommended that Air Intake Covers are installed when operating the aircraft in ambient temperature below 12^0C/54^0F

(5.) Nose landing gear

Tyre – Check the tyre pressure (visually)	CHECK
Shock absorber – Condition	CHECK
Towing bar – to be removed from the aeroplane	CHECK

(6.). Starboard landing gear and front part of fuselage

Tyre – Check the tyre pressure (visually) CHECK

- Brake system CHECK

- Oil level and presence of the dipstick (turn the propeller several times first) CHECK

CAUTION

When turning the propeller by hand, special care is to be observed and the following is to be checked:
- the ignition is switched off,
- the parking valve is on, or
- the chocks are put under wheels.
The possibility of spontaneous ignition always exists

⑨

(7.) Starboard wing

- Structure – Condition and cleanliness CHECK

- Ailerons – Condition of structure and play in control system and hinges CHECK.

- Wing flap – Condition of structure and play in control system and hinges CHECK.

- Inspection flap – to be closed and locked CHECK

(8.) Fuselage rear part, starboard

- Structure – Condition and cleanliness CHECK

- Antennae – Condition and cleanliness CHECK

(9.) Empennage

- Fin – Condition and cleanliness CHECK

- Rudder – Hinges and their play CHECK

- Slab tail – Hinges and their play CHECK

- Trim & balancing tab – Hinges and their play CHECK

(10.) Fuselage rear part, port

- Structure – Condition and cleanliness CHECK

- Inspection flap – to be locked CHECK

4.5. Normal procedures and list of inspection tasks

4.5.1. Airspeeds for safe operation

Airspeed	Flaps	IAS		
		km/h	mph	kts
Take off: – lift-off	15º	77	48	42
– at altitude 15 m		112	70	60
Maximum angle of climb (VX)	0º	110	68	59
Maximum rate of climb (VY)	0º	120	75	65
Maximum angle of climb (VX)	15º	100	62	54
Maximum rate of climb (VY)	15º	110	68	59
In rough air (recommended)	0º	160	99	86
Landing approach	40º	100	62	54
Maximum cross-wind component	0 to 40º	21.6	13.4	11.7

4.5.2. Before starting engine

⑨

- Seat in the cabin — TO BE OCCUPIED
- Canopy — SHUT AND LOCK
- Luggage – stow & secure — CHECK
- Seat belts — FASTEN
- Reading of the fuel quantity indicator — CHECK
- Ignition – to be switched off — CHECK
- Battery and generator – to be switched off — CHECK
- All electrical equipment – to be switched off — CHECK
- Trim and balancing tab – to be set to "TAKEOFF" — CHECK
- Flight controls – full and free movement of — CHECK
- Wing flaps — RETRACT
- Parking brake (if installed) — OFF

4.5.3. Using an electric ground power source

The aeroplane is equipped to use electric power from external sources. A typical power receptacle (of 11041 – type) is installed at the port side of the fuselage, in front of the wing. The polarity of the delivered connecting cable is marked on it. Special attention is to be given to the correct polarity, when connecting to the external source (Battery). The voltage of the external source must be 12 to 14 Volts.

The engine starting procedure, when using an external power source, is the same as when using the aeroplane's own battery.

After completing engine start, the external source is to be disconnected from the aeroplane.

CAUTION

Incorrect connection of the poles may result in damage of the electrical system of the aeroplane

4.5.4. Engine starting

CAUTION

Engine started is prohibited with the parking brake on

CAUTION

During conducting the engine test, in spite of brakes using the aircraft can be move. To avoid this it is recommended additional securing the aircraft against move by chocks putted under wheel. ⑨

Take special care during the engine starting and testing without apply chocks under the wheel.

Cool engine procedure

- Fuel valve – set to	OPEN
- Starting device (Choke)	ON
- Battery and generator	ON
- "GENERATOR FAILURE" light - illumination	CHECK
- Fuel pump	ON
- Throttle lever – to be set to	IDLE (or open by 10 %)
- The area next to propeller – to be clear	CHECK
⑨ - Parking brake - off	CHECK
- Brakes	APPLY
- Ignition switch	ON

The starter may be switched on continuously for 10 sec., maximum. Subsequently, it needs to be allowed to cool for at least 2 min. When starter is working the "STARTER ENGAGED" light is illuminated.

NOTE

After completing the engine start, check whether the oil pressure starts to rise within 10 sec. The speed of the engine may be increased, only when the oil pressure is stabilised above 2 bar (29 psi).

CAUTION

To avoid damage to battery or starter, never keep the starter switched on for longer than 10 sec. Allow at least 2 min. before switching on again. Never switch the starter on if the propeller has not stopped rotating. Do not start the engine when the battery is weak – this may cause damage to the engine starting system. Proper propeller rotation is evidence of good condition of the battery. Otherwise, switch off the engine, the starter and battery switches and have the fault repaired.

Hot engine procedure

The same as for cool engine start, but without turning the propeller and the starting device (choke) is to be set to OFF.

Procedure for low temperature

The procedure is the same as for cool engine, but the throttle lever may be set to idle only. The carburettor heating is to be switched on. The oil pressure is to be observed carefully. It may be lower because of increased drag of the flow through the oil pump.

If necessary, have the engine warmed up using a hot air blower.

To improve the engine operations in low ambient temperature it is recommended that the air intake covers are used.

> **NOTE**
>
> **At low ambient temperature engine starting may prove difficult, because of a drop in the capacity of the battery. Using external electrical power is recommended**

After starting the engine

- Engine speed of 2500 RPM keep until smooth engine operation is achieved	MAINTAIN	
- "GENERATOR FAILURE" light – go out	CHECK	⑧
- "STARTER ENGAGED" light – go out	CHECK	
- Choke	OFF	
- Fuel pump	OFF	⑧
- Electrical equipment	ON	
- Indications of board instruments	CHECK	
- Engine speed of 2000 to 2500 RPM – until oil temperature of 50 ºC is achieved	MAINTAIN	

Engine test run

- Brakes	APPLY
- Control stick	PULL
- Indications of board instruments – to be within the green sector of the scale	CHECK
- Engine speed to 4000 RPM	SET

Ignition switch in position "1"	SET
Ignition switch in position "2"	SET
Ignition switch in position "1 +2"	SET
Throttle – full open	SET
Maximum engine speed	CHECK

NOTE

Maximum engine speed on ground is 5050 RPM.

RPM drop when one ignition unit only operating is 300 RPM. Maximum difference of engine speed between position "1" and position "2" must not exceed 120 RPM

Carburettor heating	CHECK
Engine idle speed (~1600 RPM)	CHECK
Engine (short time)	COOLING

4.5.5. Before taxiing

⑨

- Artificial horizon	ON
- Turn indicator	ON
- Altimeter	SET
- Radio	SET ON AND CHECK
- Transponder (if required) – code and SBY	SET

4.5.6. Taxiing

- Brakes	RELEASE
- Operation of the brakes	CHECK
- Control stick – to be set according to wind condition	EXECUTE

Taxiing is to be performed using brakes, and at higher speed, with use of the rudder

CAUTION!

TO AVOID ENGINE OVERHEATING AND POLLUTION WITH DUST, OPERATION OF THE ENGINE ON GROUND AT RATINGS HIGHER THAN THE REQUIRED FOR TAXIING IS TO BE LIMITED TO A MINIMUM

4.5.7. Before take-off

- Fastening of the seat belts	CHECK
- Fuel valve – to be opened	CHECK
- Fuel pump	ON ⑧
- Trim and balancing tab – to be set for take-off	CHECK
- Wing flaps – to be set for take-off ($\delta = 15^{o}$)	EXECUTE
- Ignition switch – to be set to "1+2" (BOTH)	CHECK
- Carburettor heating	OFF
- Temperature of the coolant –to be in green sector	CHECK
- Oil temperature–to be in green sector	CHECK
- Oil pressure – to be in green sector	CHECK
- Fuel pressure –to be in green sector	CHECK
- Altimeter – to be set properly	CHECK
- Turn indicator and artificial horizon – to operate correctly	

4.5.8. Take-off

- Brakes	RELEASE
- Throttle – to be opened to full travel, gradually	EXECUTE
- Take-off direction – maintain using rudder pedals	EXECUTE
- Airspeed after lift-off to be maintained at	IAS=112 km/h /70 mph/60 kts
- Landing gear – rotating wheels	BRAKE
- When height 15 m/50' reached – increase to speed to	IAS=120 km/h / 75 mph / 65 kts
- Wing flaps	RETRACT
- Fuel pump (over 100m (300 ft))	OFF ⑧

4.5.9. Climb

- Throttle – to be opened to full travel	EXECUTE
- Airspeed – for climb, to be maintained at (The best climbing speed diminishes for each 1000 m / 3281' by 3 km/h / 1.9 mph / 1.6 kts)	IAS=120 km/h / 75 mph / 65 kts
- Engine operational parameters – to be	MONITORED
- Transponder (if required) – to be set to	ON

4.5.10. Cruise

- Throttle – as required SET
- Trim and balancing tab – as for cruise SET
- Engine operational parameters – to be MONITORED

4.5.11. Descent

- Throttle – as required SET
- Fuel pump ON
- Coolant and oil temperature – to be MONITORED
  (If the engine becomes too cool, the throttle is to be opened and the carburettor heating to be switched ON)

⑧

4.5.12. Before landing

- Fuel pump ON
- Carburettor heating – as required SET
- Throttle – as required SET
- Wing flaps – as for landing (δ = 40 °) SET
- Airspeed for final approach to be maintained: IAS = 100 km/h /62 mph/54 kts

4.5.13. Landing

- Engine rating at altitude below 15 m (50ft), to be DIMINISHED
- Touch-down with the main wheels at airspeed IAS = 80 km/h / 50 mph/ 43 kts
- Throttle IDLE
- Braking AS REQUIRED

4.5.14 Balked landing

- Carburettor heating OFF
- Throttle – gradually FULL OPEN
- Airspeed – to be INCREASED
- Wing flaps – gradually RETRACT
- Airspeed – to be maintained: IAS = 120 km/h / 75 mph / 65 kts
- Proceed to climb EXECUTE

4.5.15. After the landing

- Fuel pump OFF
- Carburettor heating OFF
- Wing flaps RETRACT

- Artificial horizon	OFF and LOCK
-Turn indicator	OFF
- Transponder	OFF

4.5.16. Engine shutdown

- Radio transmitter	SWITCH OFF
- Electrical equipment	SWITCH OFF
- Throttle – to be set to (let the engine cool to normal operational level)	IDLE
- Ignition switch (Allow 2 to 3 min.)	SWITCH OFF
When the engine stops:	
- Battery and generator	SWITCH OFF
- Fuel valve	SHUT OFF

4.5.17. After the flight

- Parking brake ON or put chocks under wheels	EXECUTE	
- Control stick – to be pulled and fastened with the seat belts	EXECUTE	⑨
- Canopy – to be locked with the key	EXECUTE	
- Propeller – to be set horizontally	EXECUTE	

4.6. Additional information

4.6.1. Stall

Stall is to be performed, by slowly pulling the control stick. The engine is to be idle. When the wing flaps are retracted, the aeroplane practically does not stall. Approaching the stalling speed is signalled by aeroplane buffeting, which appears at an airspeed 10 to 20 km/h / 5 to 10 knots / 6 to 12 mph higher than the stalling speed. The aeroplane oscillates longitudinally and laterally. The aeroplane recovers to full steerability, immediately after pushing the control stick forward.

CAUTION!

NEVER TRY TO STALL AT LOW ALTITUDE

For stall speed – refer to Section 5.

NOTE

At engine ratings higher than idle, the stalling speed is lower than that given in the table, by 2 to 15 km/h / 1.2 to 9.3 mph / 1 to 8 kts depending on wing flap position and aeroplane weight.

4.6.2. Flight manoeuvres

The flight manoeuvres are to be performed in accordance with the limits given in item 2.8. Approved manoeuvres.

Steep turns are to be flown with the throttle fully opened.

4.6.3. Flight with a passenger

The pilot is obliged to instruct the passenger on how to behave in an aeroplane cabin.

4.6.4. Crosswind take-off or landing

The correct aeroplane handling characteristics during takeoff and landing have been demonstrated at crosswind velocity up to 6 m/s (21.6 km/h / 13.4 mph / 11.7 kts).

Take-off

The control stick is to be displaced against the crosswind. The take-off direction is to be controlled by use of the rudder. The nose wheel is to be kept down until lift-off speed is achieved. After taking-off, try to avoid touching the ground again.

Landing

The wing flaps are to be extended as required for the conditions of the landing field. Have the aeroplane banked towards the crosswind. In a

strong crosswind, also turn the aeroplane axis from the landing direction towards the crosswind.
Turn back to the landing direction immediately before touchdown.

Lowering the nose wheel earlier after touchdown helps to maintain direction. After touchdown keep the nose wheel down and control the direction with the rudder, and later with the brakes. At the end of the landing run keep the control stick against the crosswind.

4.6.5. Operational speed during takeoff and landing

Stated below in the table are the operational airspeeds for the approved wing flap positions.

Flaps	TAKE-OFF IAS								
	Lifting the nose wheel			Lifting off			After the takeoff		
	km/h	mph	kts	km/h	mph	kts	km/h	mph	kts
0º	65	40	35	85	53	46	120	75	65
15º	65	40	35	77	48	42	112	70	60
40º	-	-	-	-	-	-	-	-	
Flaps	LANDING IAS								
	Approach			Touchdown			Lowering the nose wheel		
	km/h	mph	kts	km/h	mph	kts	km/h	mph	kts
0º	120	75	65	98	61	53	80	50	43
15º	112	70	60	90	56	49	78	48	42
40º	100	62	54	80	50	43	<60	<37	<32

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Section 5

PERFORMANCE

5.1. Introduction

This Section contains approved data concerning the following issues:

- Calibration of the airspeed indicator system.

- Stalling speeds

- Take-off performance.

- Supplementary information from the manufacturer.

The diagrams have been computed on the basis of actual flight test data, for correct engine and aircraft operation and applying average piloting techniques.

5.2. Approved data

5.2.1. Calibration of the airspeed indicator system

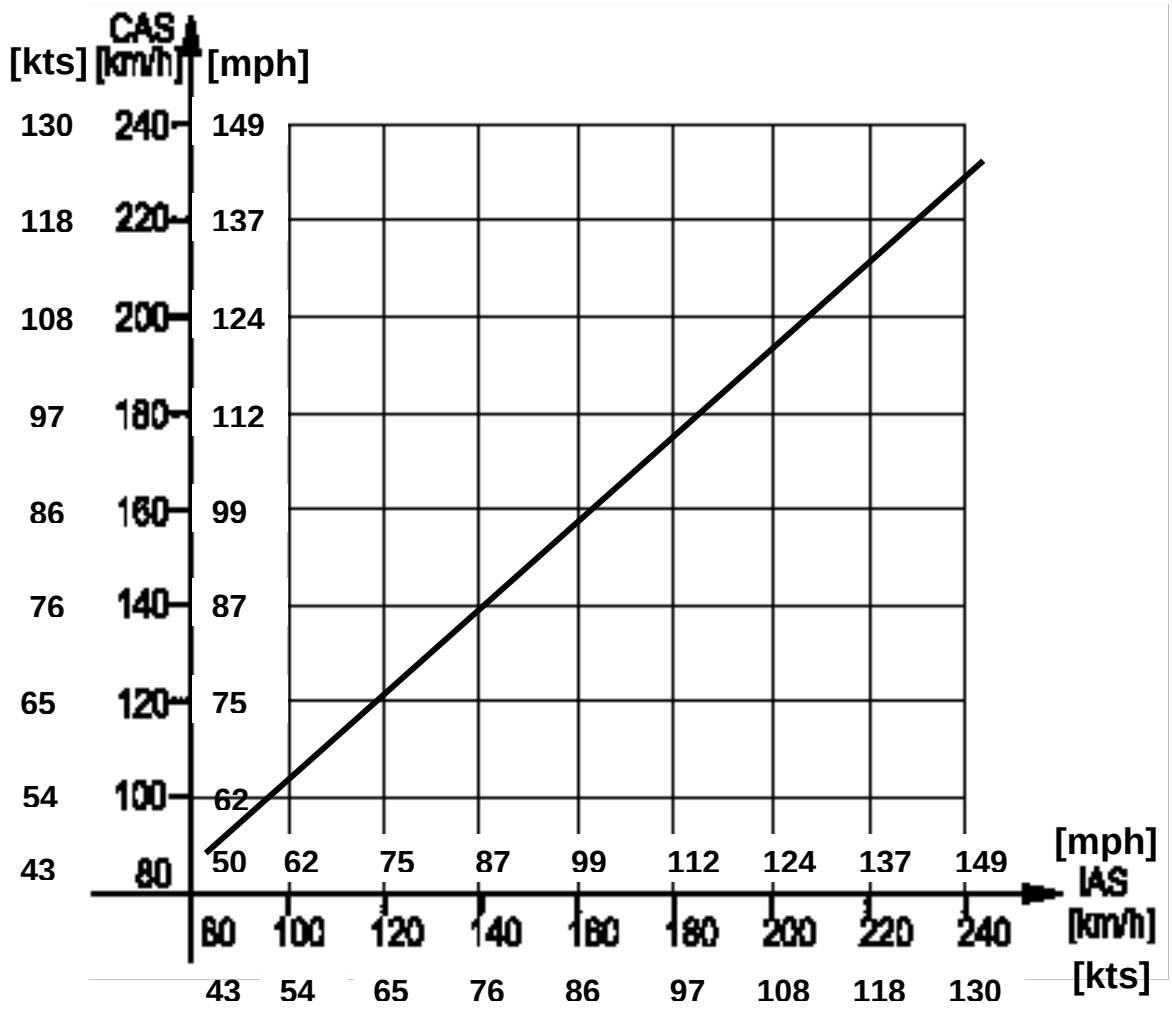
The diagram is based on test flight data.

$$CAS = IAS + \delta V$$

δV – aerodynamic correction

CLIMB, LEVEL FLIGHT, DESCENT

WING FLAPS: retracted, for take-off and for landing



5.2.2. Stalling speed

Aeroplane maximum weight 582 [kg]

Throttle idle

Angle of wing flap displacement	Value of the banking angle		Stalling speed					
			IAS			CAS		
			km/h	mph	kts	km/h	mph	kts
0°	0°	V_{S1}	86	53	46	93	58	50
15°		V_{S1}	81	50	44	90	56	49
40°		V_{SO}	72	45	39	82	51	44
0°	30°	V_{S1}	93	58	50	100	62	54
15°		V_{S1}	90	56	49	97	60	52
40°		V_{SO}	79	49	43	88	55	47
0°	60°	V_{S1}	129	80	70	131	81	71
15°		V_{S1}	124	77	67	127	79	69
40°		V_{SO}	111	69	60	116	69	60

5.2.3. Take-off performance

Conditions:

- Maximum weight 582 kg
- Airstrip surface concrete
- Rating Takeoff power
- Wing flap position (for takeoff) 15 °
- Lift-off speed IAS = 77 km/h / 49 mph / 42 kts
- Airspeed at H = 15 m IAS = 112 km/h / 70 mph / 60 kts

NOTE

For each 10 km/h / 6 mph / 5 kts of head wind velocity the takeoff distance reduces by 8 % and increases by 25% for 10km/h / 6 mph / 5 kts tail wind velocity .

To receive intermediate values of the data given in the table, interpolation is to be made between the increasing values.

TAKE-OFF RUN AND TAKE-OFF DISTANCES

Pressure altitude 0 [m] STD							
Ambient temperature OAT	ºC	-15	-5	+5	+15	+25	+35
	ºF	5	23	41	59	77	99
Take-off run	m	188	195	203	210	225	240
	ft	617	640	666	689	738	787
Take-off distance to H=15m (50 ft)	m	403	419	434	450	482	515
	ft	1322	1374	1424	1476	1581	1690
Pressure altitude 500 [m] (1460 ft) STD							
Ambient temperature OAT	ºC	-18	-8	+2	+12	+22	+32
	ºF	-0.4	17.6	35.6	53.6	71.6	89.6
Take-off run	m	187	202	217	233	250	267
	ft	614	663	712	764	820	876
Take-off distance to H=15m (50 ft)	m	400	432	466	500	536	573
	ft	1312	1417	1529	1640	1759	1880

TAKE-OFF RUN AND TAKE-OFF DISTANCES (continuation)

Pressure altitude 1000 [m] (3281 ft) STD							
Ambient temperature OAT	ºC	-21	-11	-1	+9	+19	+29
	ºF	-5.8	12.2	30.2	48.2	66.2	84.2
Take-off run	m	206	221	241	259	277	297
	ft	676	725	791	850	910	974
Take-off distance to H=15m (50 ft)	m	442	474	526	554	594	636
	ft	1450	1555	1726	1818	1949	2087
Pressure altitude 1500 [m] (4921 ft) STD							
Ambient temperature OAT	ºC	-25	-15	-5	+5	+15	+25
	ºF	-13	5	23	41	59	77
Take-off run	m	229	248	267	288	309	331
	ft	751	814	876	945	1014	1086
Take-off distance to H=15m (50 ft)	m	491	537	573	617	662	708
	ft	1611	1762	1880	2024	2172	2323
Pressure altitude 2000 [m] (6562 ft) STD							
Ambient temperature OAT	ºC	-28	-18	-8	+2	+12	+22
	ºF	-18.4	-0.4	17.6	35.6	53.6	71.6
Take-off run	m	254	276	298	321	344	412
	ft	833	906	978	1053	1129	1352
Take-off distance to H=15m (50 ft)	m	545	591	638	687	738	884
	ft	1788	1939	2093	2254	2421	2900

5.2.4. Landing distance

Conditions:

- Maximum weight 582 kg (1283 lb)
- Airstrip surface concrete
- Rating idle
- Wing flap position (for landing) 40°
- Braking maximum
- Approach speed at H=15 m/50' IAS = 100 km/h / 62 mph / 54 kts

NOTE

For each 10 km/h / 6 mph / 5 kts of head wind velocity the landing distance reduces by 8 % and increases by 24 % for each 10 km/h / 6 mph / 5 kts of the tail wind velocity.

LANDING DISTANCES

Pressure altitude 0 [m] STD							
Ambient temperature. OAT	ºC	-15	-5	+5	+15	+25	+35
	ºF	5	23	41	59	77	99
Landing distance from 15m (50 ft)	m	403	419	434	450	466	481
	ft	1322	1375	1424	1476	1529	1578
Landing run	m	179	186	193	200	207	214
	ft	587	610	633	656	679	702
Pressure altitude 500 m (1460 ft) STD							
Ambient temperature OAT	ºC	-18	-8	+2	+12	+22	+32
	ºF	-0.4	17.6	35.6	53.6	71.6	89.6
Landing distance from 15m (50 ft)	m	423	439	456	472	489	505
	ft	1388	1440	1496	1549	1604	1657
Landing run	m	188	195	203	210	217	224
	ft	617	640	666	689	712	735
Pressure altitude 1000 m (3281 ft) STD							
Ambient temperature OAT	ºC	-21	-11	-1	+9	+19	+29
	ºF	-5.8	12.2	30.2	48.2	66.2	84.2
Landing distance from 15m (50 ft)	m	444	461	479	496	513	530
	ft	1457	1512	1572	1627	1683	1739
Landing run	m	197	205	213	220	228	236
	ft	646	673	699	722	748	774
Pressure altitude 1500 m (4921 ft) STD							
Ambient temperature OAT	ºC	-25	-15	-5	+5	+15	+25
	ºF	-13	5	23	41	59	77
Landing distance from 15m (50 ft)	m	467	485	503	521	539	557
	ft	1532	1591	1650	1709	1768	1827
Landing run	m	207	215	224	232	240	248
	ft	679	705	735	761	787	814
Pressure altitude 2000 m (6562 ft) STD							
Ambient temperature OAT	ºC	-28	-18	-8	+2	+12	+22
	ºF	-18.4	-0.4	17.6	35.6	53.6	71.6
Landing distance from 15m (50 ft)	m	491	510	529	548	567	586
	ft	1611	1673	1736	1798	1860	1923
Landing run	m	218	227	235	243	252	260
	ft	715	745	771	797	827	853

5.2.5. Climb performance

Wing flaps retracted (0º)

Conditions:

- Maximum weight 582 kg (1283 lb)
- Rating (Power setting) (full) nominal power
- Airspeed V_Y =120 km/h / 75 mph / 65 kts IAS

This airspeed is to be reduced by 3 km/h for each 1000 m of altitude (0.57 mph / 0.5 kts for each 1000 ft of altitude).

Wing flaps for takeoff (15º)

Conditions:

- Maximum weight 582 kg (1283 lb)
- Rating nominal power
- Airspeed V_Y =110 km/h / 68 mph / 59 kts IAS

This airspeed is to be reduced by 3 km/h for each 1000 m of the altitude (0.57 mph / 0.5 kts for each 1000 ft of the altitude).

CLIMB PERFORMANCE (FLAPS 0°)

Pressure altitude 0 m STD							
Ambient temperature OAT	ºC	-15	-5	+5	+15	+25	+35
	ºF	5	23	41	59	77	99
Rate of climb	m/s	4.40	4.30	4.20	4.10	3.96	3.83
	ft/m	866	846	828	807	780	754
Pressure altitude 500 m (1460 ft) STD							
Ambient temperature OAT	ºC	-18	-8	+2	+12	+22	+32
	ºF	-0.4	17.6	35.6	53.6	71.6	89.6
Rate of climb	m/s	3.94	3.85	3.76	3.67	3.55	3.43
	ft/m	776	758	740	722	699	375
Pressure altitude 1000 m (3281 ft) STD							
Ambient temperature OAT	ºC	-21	-11	-1	+9	+19	+29
	ºF	-5.8	12.2	30.2	48.2	66.2	84.2
Rate of climb	m/s	3.49	3.41	3.38	3.25	3.14	3.04
	ft/m	687	671	665	640	618	598
Pressure altitude 1500 m (4921 ft) STD							
Ambient temperature OAT	ºC	-25	-15	-5	+5	+15	+25
	ºF	-13	5	23	41	59	77
Rate of climb	m/s	3.03	2.96	2.89	2.82	2.77	2.64
	ft/m	596	583	569	555	545	520
Pressure altitude 2000 m (6562 ft) STD							
Ambient temperature OAT	ºC	-28	-18	-8	+2	+12	+22
	ºF	-18.4	-0.4	17.6	35.6	53.6	71.6
Rate of climb	m/s	2.56	2.51	2.45	2.39	2.31	2.23
	ft/m	504	494	482	470	455	439
Pressure altitude 2500 m (8202 ft) STD							
Ambient temperature OAT	ºC	-31	-21	-11	-1	+9	+19
	ºF	-23.8	-5.8	12.2	30.2	48.2	66.2
Rate of climb	m/s	2.10	2.06	2.01	1.96	1.89	1.83
	ft/m	413	406	396	386	372	360
Pressure altitude 3000 m 9843 ft) STD							
Ambient temperature OAT	ºC	-35	-25	-15	-5	+5	+15
	ºF	-31	-13	5	23	41	59
Rate of climb	m/s	1.05	1.62	1.58	1.54	1.49	1.44
	ft/m	207	319	311	303	293	283
Pressure altitude 3500 m (11483 ft) STD							
Ambient temperature OAT	ºC	-38	-28	-18	-8	+2	+12
	ºF	-36.4	-18.4	-0.4	17.6	35.6	53.6
Rate of climb	m/s	1.19	1.16	1.14	1.11	1.07	1.04
	ft/m	234	228	224	218	211	205

CLIMB PERFORMANCE (FLAPS 15°)

Pressure altitude 0 m STD							
Ambient temperature	ºC	-15	-5	+5	+15	+25	+35
OAT	ºF	5	23	41	59	77	99
Rate of climb	m/s	3,86	3,78	3,69	3,60	3,48	3,37
	ft/m	760	744	726	707	685	663
Pressure altitude 500 m (1460 ft) STD							
Ambient temperature	ºC	-18	-8	+2	+12	+22	+32
OAT	ºF	-0.4	17.6	35.6	53.6	71.6	89.6
Rate of climb	m/s	3,42	3,35	3,27	3,19	3,08	2,98
	ft/m	673	659	644	630	606	587
Pressure altitude 1000 m (3281 ft) STD							
Ambient temperature	ºC	-21	-11	-1	+9	+19	+29
OAT	ºF	-5.8	12.2	30.2	48.2	66.2	84.2
Rate of climb	m/s	2,98	2,92	2,85	2,78	2,69	2,60
	ft/m	587	575	516	547	530	512
Pressure altitude 1500 m (4921 ft) STD							
Ambient temperature	ºC	-25	-15	-5	+5	+15	+25
OAT	ºF	-13	5	23	41	59	77
Rate of climb	m/s	2,54	2,49	2,43	2,37	2,29	2,22
	ft/m	500	490	478	467	451	437
Pressure altitude 2000 m (6562 ft) STD							
Ambient temperature	ºC	-28	-18	-8	+2	+12	+22
OAT	ºF	-18.4	-0.4	17.6	35.6	53.6	71.6
Rate of climb	m/s	2,10	2,06	2,01	1,96	1,89	1,83
	ft/m	413	406	356	386	372	360
Pressure altitude 2500 m (8202 ft) STD							
Ambient temperature	ºC	-31	-21	-11	-1	+9	+19
OAT	ºF	-23.8	-5.8	12.2	30.2	48.2	66.2
Rate of climb	m/s	1,66	1,63	1,59	1,55	1,50	1,45
	ft/m	327	321	313	305	295	285
Pressure altitude 3000 m 9843 ft) STD							
Ambient temperature	ºC	-35	-25	-15	-5	+5	+15
OAT	ºF	-31	-13	5	23	41	59
Rate of climb	m/s	1,23	1,21	1,18	1,15	1,11	1,08
	ft/m	242	238	232	226	219	213

5.3. Supplementary information

5.3.1. Cruise

Airspeed, range and endurance

Conditions:

- Maximum weight 582 kg (1283 lb)
- Wing flaps retracted
- Automotive gasoline, unleaded RON 95
- Consumable fuel:
  - 65 litres / 17.17 US GAL – airplane from AT3-055 or “glass cockpit” equiped. (11)
  - 70 litres / 18.5 US GAL – standard airplane to AT3-054

NOTE

Range and endurance data given in the table relate to using of all of the fuel at the given altitude. Taxiing, take-off and climb are not considered in this calculation.

(11)

Pressure altitude H=300 m (984ft)																		
Engine speed	Airspeed									Fuel consumption		Consumable fuel 65L				Consumable fuel 70L			
	IAS			CAS			TAS					Endurance	Range			Endurance	Range		
RPM	km/h	mph	kts	km/h	mph	kts	km/h	mph	kts	l/h	US gal/h	h	km	miles	NM	h	km	miles	NM
4200	134	83.3	72.5	136	85	73.5	137	85	74	13.9	3.67	4:40	641	398	346	5:00	685	426	370
4400	148	92	80	148	92	80	149	93	80.5	15.0	3.96	4:20	646	401	348	4:39	694	431	375
4600	161	100	87	160	99	86.5	161	100	87	16.3	4.29	3:59	642	399	346	4:18	692	430	374
4800	172	107	93	170	106	92	171	106	92.5	17.5	4.62	3:42	635	395	343	4:00	684	425	369
5000	183	114	99	180	112	97	181	112	97.5	19.0	5.02	3:25	619	385	334	3:41	666	414	360
5200	193	120	104	190	118	103	191	119	103	20.5	5.42	3:10	606	376	327	3:24	649	403	350
5400	203	126	110	198	123	107	199.5	124	107.5	23.0	6.08	2:49	564	350	304	3:02	606	377	328

Pressure altitude H=2000 m (6562 ft) STD																		
Engine speed	Airspeed									Fuel consumption		Consumable fuel 65L				Consumable fuel 70L			
	IAS			CAS			TAS					Endurance	Range			Endurance	Range		
RPM	km/h	mph	kts	km/h	mph	kts	km/h	mph	kts	l/h	US gal/h	h	km	miles	NM	h	km	miles	NM
4200	112	70	60.5	116	72	62.5	130	81	70	11.9	3.14	5:27	710	441	383	5:52	764	475	412
4400	128	80	69	130	81	70	142	88	77	12.7	3.36	5:07	727	452	392	5:30	780	485	421
4600	141	88	76	142	88	76.5	155	96	83.5	13.7	3.62	4:44	735	457	397	5:06	790	491	427
4800	152	94	82	152	94	82	166	103	89.5	14.6	3.86	4:27	739	459	399	4:44	795	494	429
5000	163	101	88	161	100	87	176	109	95	15.8	4.17	4:06	724	450	391	4:24	774	481	418
5200	175	109	94.5	172.5	107	93	188	117	102	17.1	4.52	3:48	715	444	386	4:05	768	477	415
5250	178	111	96	175	109	94.5	191	119	103	17.5	4.62	3:42	709	441	383	4:00	764	475	413

5.3.2. Climb after balked landing

It is possible to retract the flaps by hand in not more than 2 sec., without loss of altitude, or abrupt change in angle of attack, or special piloting skill. After retracting the wing flaps, the performance of the aeroplane is as given under 5.2.5. Climb performance

5.3.3. Take-off and landing on grass airstrips

It is possible to perform take-off or landing from grass strips with grass not longer than 15 cm (a bit less than a half of the wheel diameter). On short cut grass, the takeoff run increases about 10 %.

5.3.4. Affect of rain or insect remains on aeroplane performance and handling

No observable affect of rain or sediment of insects on the aeroplane performance or handling has been noted.

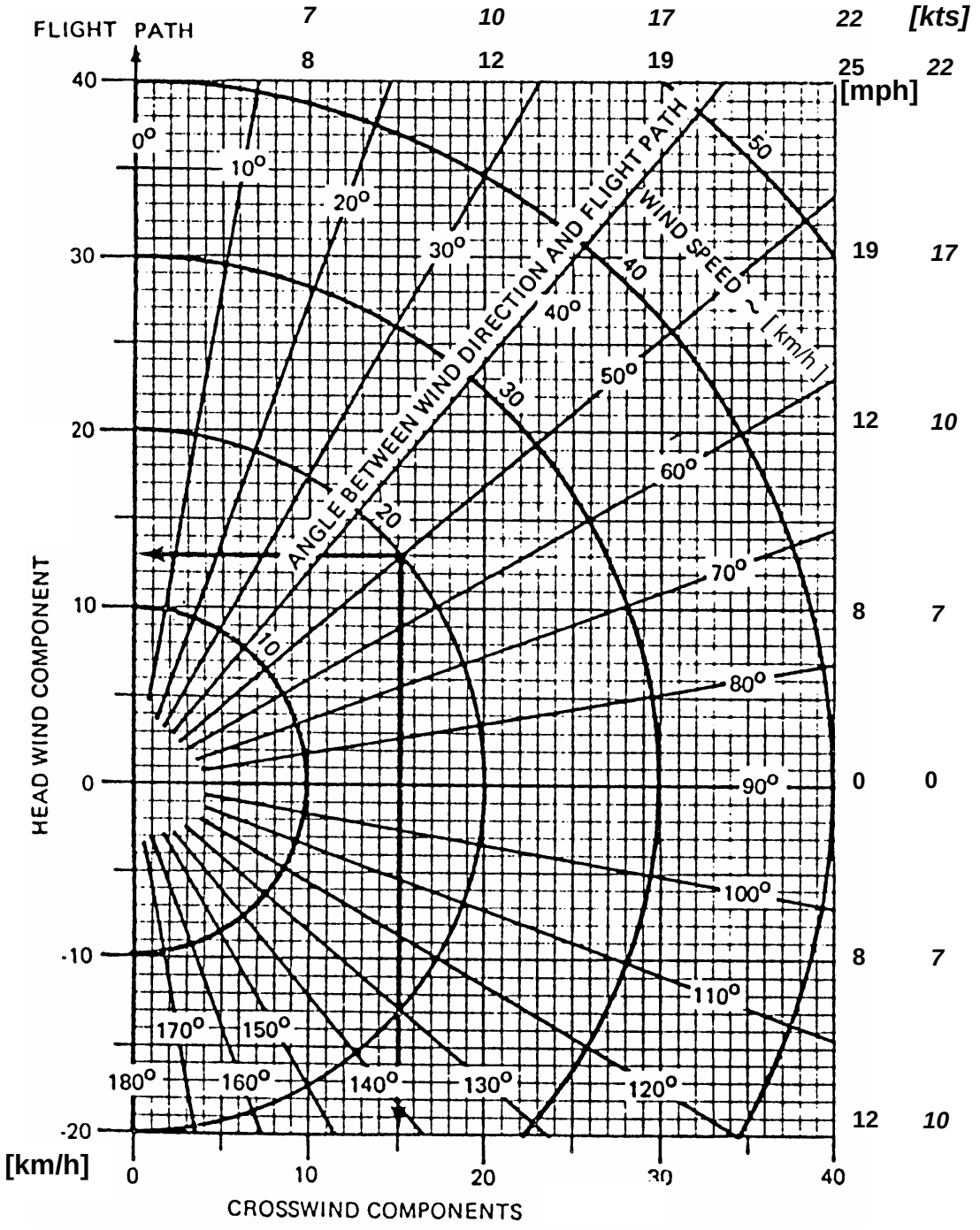
5.3.5. Demonstrated range of operational temperatures

During the test flights, which have been performed in ambient temperatures from –15 °C to +30 °C, it has been proven that all systems operate correctly and the temperature of the components of the power plant, as well as the engine fluids, remain within the limits established by the manufacturer of the engine.

5.3.6. Demonstrated crosswind at take-off and landing

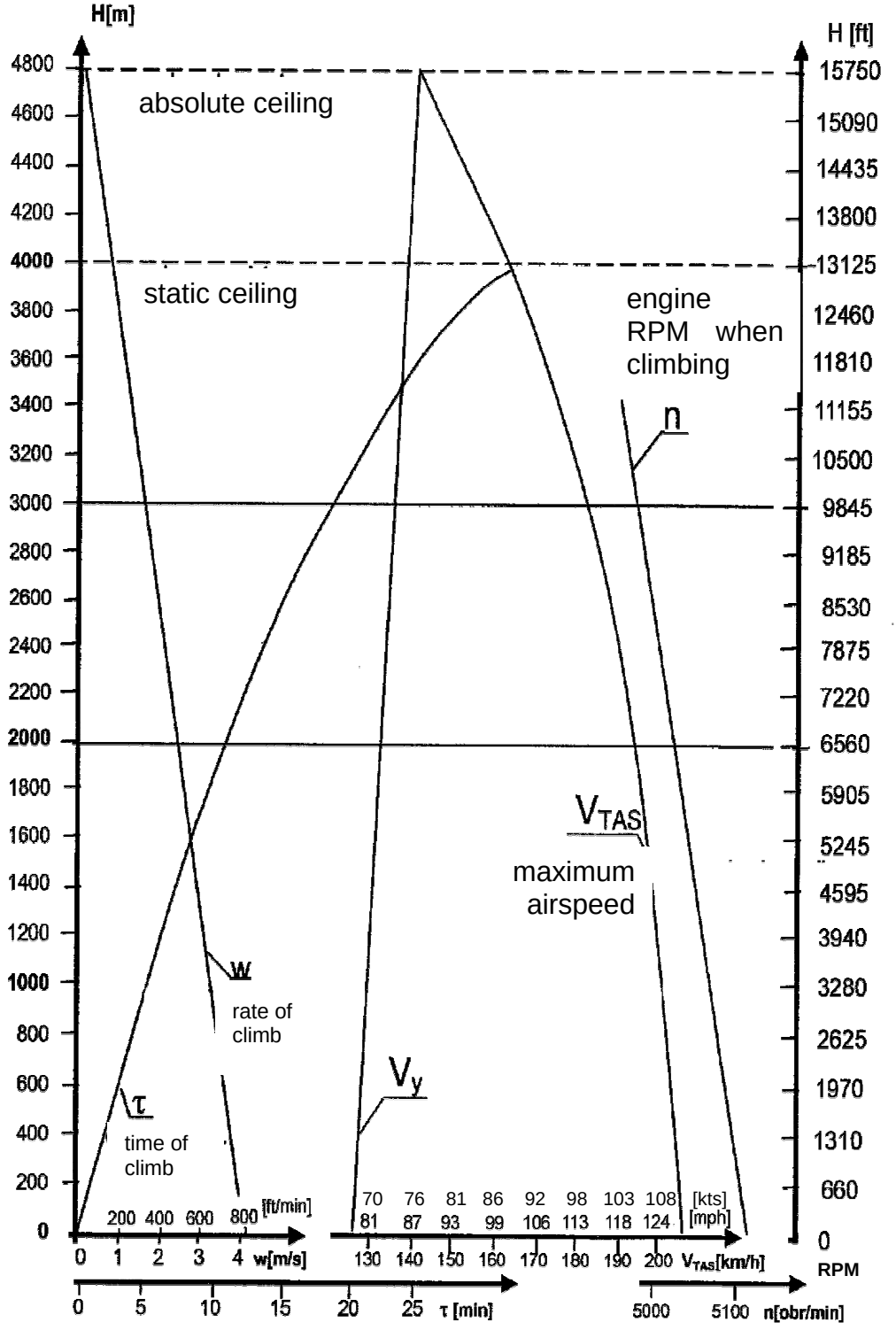
Correct aeroplane handling characteristics have been demonstrated during takeoff and landing with the crosswind velocity up to 6 m/sec. (21.6 km/h / 13.4 mph / 11.7 knots).

Diagram for determination of the crosswind component



5.3.7. Combined diagram of aeroplane characteristics

GT-2/173/VRR-FW101SRTC Propeller
Maximum aeroplane weight 582 kg
Maximum power. wing flaps retracted



5.3.8. Noise

The outside noise level of the AT-3 R100 aeroplane, determined in accordance with the procedure in Chapter 10 Annex 16 ICAO is: 66.6 ±0.35 dB (A), while the permissible level is 70.32 dB (A).

Section 6

WEIGHT AND BALANCE

Page

6.1. Introduction

This Section contains the limitations of the useful load, within which the aeroplane may be operated safely.

The procedure for weighing aeroplane is contained in the Maintenance Manual of the AT-3 R100 aeroplane. Any change in the weight of the empty aeroplane, e.g. after new equipment is fitted, repairs or re-painting, will necessitate re-calculation of the table 6.3 "Weight and Balance Schedule" of this manual. The equipment installed in this aeroplane is shown in the List of Equipment in Section 6-4.

6.2. Weight and Balance Calculation

In order to calculate the weight and centre of gravity of the aeroplane, one of the following procedures should be followed.

WARNING

When calculating the aircraft weight and balance,

the planned fuel consumption should

be taken into consideration.

A decrease in fuel level will result in the Centre of the Gravity moving aft.

Graphical method

From the table 6.3:" Weight and Balance schedule" the actual weight and moment of the empty aeroplane should be read off. If on the rear wall of the cockpit is installed the collapsible tow bar to the weight of empty aeroplane +1,5 kg should be added and moment +2,6 kgm should be increased. ⑨

WARNING

The empty weight of the aeroplane is the weight of the aeroplane with the unusable amount of fuel, engine oil, cooling liquid and with the optional equipment according to 6.4

For known weights of fuel, passenger, pilot and luggage read off the values of the moments from the chart 1 "values of the moments". Weights and moments should be calculated according to the following table:

	Aircraft Loading Example			Your Aircraft loading		
	Weight [kg]	Moment [kGm]		Weight [kg]	Moment [kGm]	
		(+)	(-)		(+)	(-)
Empty aeroplane	358	91.3				
fuel (0.72 kg/l)	43.2		-11,1			
pilot + passenger	142	85.2				
Luggage	14	15.8				
Moment totals		192.3	-11.1			
Total weight and moment	557.2	181.2				

WARNING

The total weight of the aeroplane must not be less than 409 kg or greater than 582 kg

Using Chart: 2 -"Aircraft loading" it can be verified whether the Centre of Gravity is inside the acceptable marked range (envelope) for the specific maximum weight and moment. If not, the aircraft loading should be changed. The Centre of the Gravity should be inside the marked range during the whole flight.

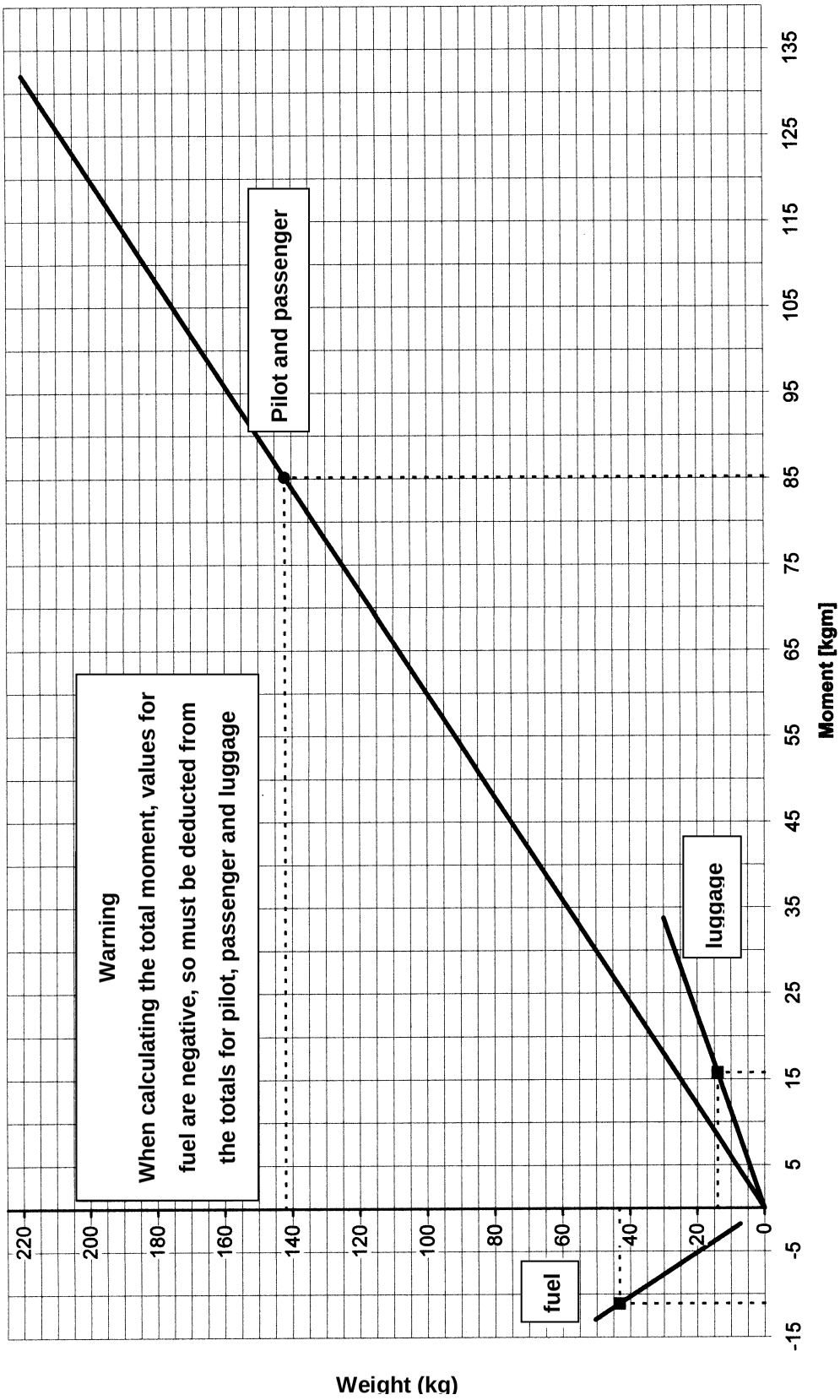


Chart: 1 Values of the moments

⑨

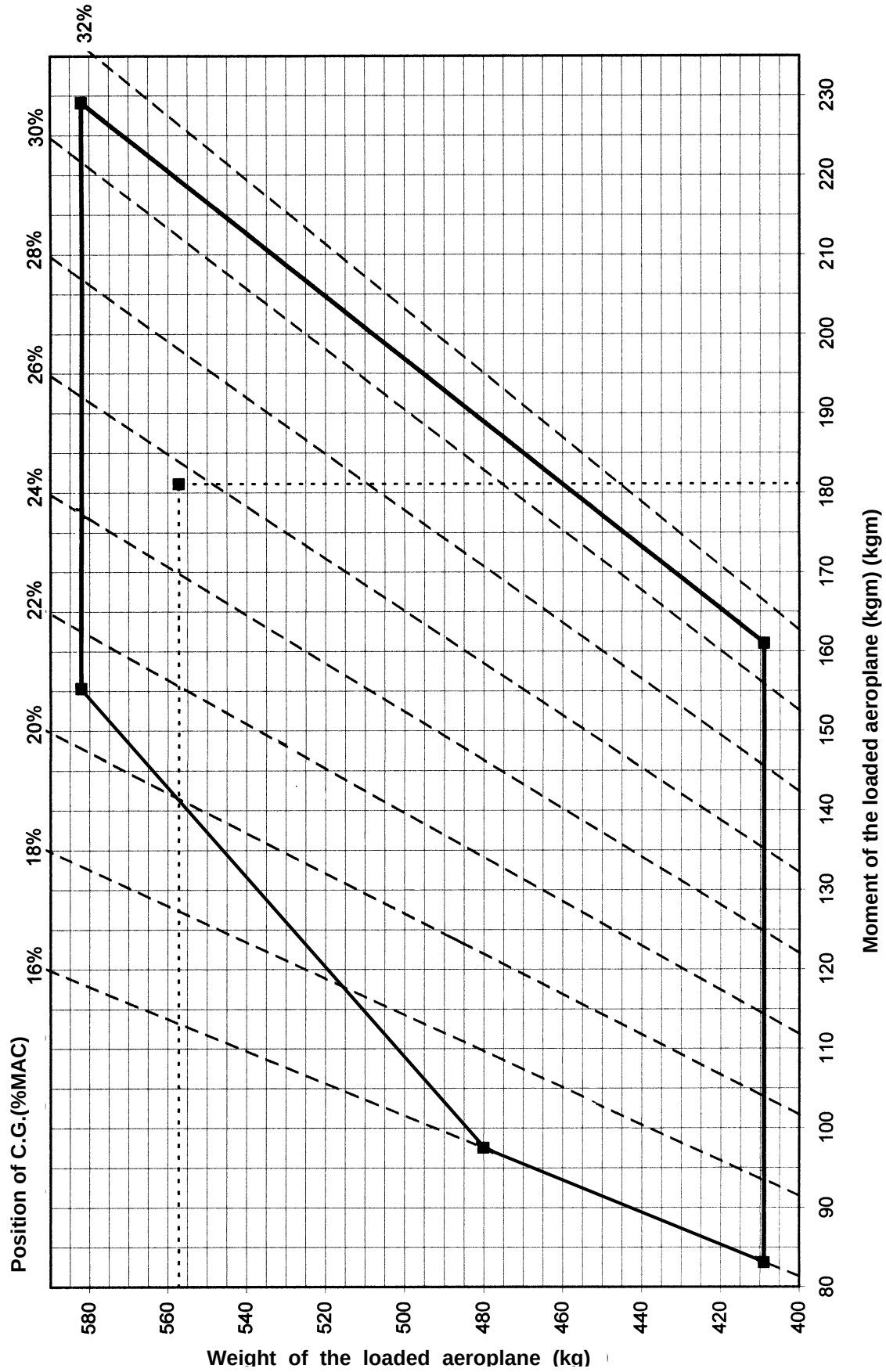


Chart: 2 -"Aircraft loading"

Calculation Method

From the table 6.3: "Weight and Balance Schedule" the actual weight and moment of the empty aeroplane should be read off. If on the rear wall of the cockpit is installed the collapsible tow bar to the weight of empty aeroplane +1,5 kg should be added and moment +2,6 kgm should be increased. ⑨

Values of the moments should be calculated on the basis of the following formula, multiplying the weight by the appropriate arm:

Moment of the pilot and passenger: $M_{crew}[kgm] = 0.60_{(arm)} \times Q_{crew}$

Moment of the luggage: $M_{lugg}[kgm] = 1.125_{(arm)} \times Q_{lugg}$

Moment of the fuel $M_{fuel}[kgm] = -0.257_{(arm)} \times Q_{fuel}$

where: Q = weight [kg]

When calculating the Centre of Gravity, the changes in the weight of oil and cooling liquid can be ignored since the difference of 0.5l (0.45kg) between their max and minimum levels is insignificant.

Weights and moments should be calculated according to the following table:

	Aircraft Loading Example				Your Aircraft Loading			
	Weight [kg]	Arm [m]	Moment [kgm]		Weight [kg]	Arm [m]	Moment [kgm]	
			(+)	(-)			(+)	(-)
Empty aircraft	358		91.3					
Fuel 0.72 kg/l)	43.2	-0.257		-11.1		-0.257		
Pilot +Passenger	142	0.6	85.2			0.6		
Luggage	14	1.125	15.8			1.125		
Subtotals	557.2		192.3	-11.1				
Total weight, arm & moment	557.2	0.325*	181.2					

* total moment divided by total weight = total arm (see below)

Calculate the arm of the Centre of Gravity of the aeroplane (X_{CG}):

$$X_{CG} = \frac{M}{Q} \quad [m]$$

Where:
M – total moment of the aeroplane
Q – total weight of the aeroplane

WARNING

The Arm of the Centre of Gravity (X_{CG}) is measured

rearwards from the leading edge of the wing.

⑨ **The value X_{CG} must not be less than 0.203 m**

or greater than 0.393 m

calculate the centre of the gravity in % mean aerodynamic cord

$$\overline{X}_{CG} = \frac{X_{CG}}{1.27} \times 100\%$$

WARNING

The value $\overline{X}_{CG}$ must not be less than

⑨ **16% MAC or greater than 31% MAC**

6.3 Weight and Balance schedule

SERIAL NUMBER			CALL SIGN							
WEIGHT AND MOMENT OF THE EMPTY AEROPLANE (LAST TWO COLUMNS)										
			CHANGE OF WEIGHT							
DATE	SIGNATURE	DESCRIPTION OF THE MODIFICARTION	ADDED (+)			REMOVED (-)				
			Q [kg]	ARM [m]	MOM. [kgm]	Q [kg]	ARM. [m]	MOM. [kgm]	Qp [kg]	Mp [kgm]
		New factory built aeroplane with the equipment installed according to the equipment list								

Chronology of the construction and equipment modifications effecting changes of weight and moment of the aeroplane

6.4 AT-3 R100 Equipment list

	STANDARD EQUIPMENT	
No.	Name:	
1	Airspeed indicator	
2	Altimeter	
3	Vertical speed indicator	
4	Compass	
5	Fuel level indicator Variant	
6	Engine monitoring instruments	Electronic tachometer Oil temp. indicator Oil pressure indicator Fuel pressure ind. OAT indicator EGT indicator Cylinder head temp. ind.
7	Standard electric system	volt ammeter battery

④

NOTE

ADDITIONAL EQUIPMENT IS TO BE INSTALLED BY THE AEROPLANE MANUFACTURER

WEIGHT OF THE INSTALLED EQUIPMENT IS INCLUDED IN THE EMPTY WEIGHT OF THE AEROPLANE

OPTIONAL EQUIPMENT			
No.	Type of equipment	Model	Installed
1	Turn coordinator	1394T100-7Z	
2	Artificial horizon	GH-112	
3	Artificial horizon R.C. Allen	RCA-26AK-2	
4	Directional Gyro Indicator R.C. Allen	RCA15AK-1	
5	Clock	M877	
6	Clock	ACzS-1	
7	Clock Mitchell	D1-312-5038	
8	Radio-transceiver	KY-97A	
9	Radio-transceiver	KX 125	
10	VOR indicator	KI 208	
11	Intercom	SPA-400	
12	Transponder TRT	.....	
13	Transponder	KT-76A	
14	Transponder	TT31	
15	Encoder	A-30	
16	GPS Bendix-King	Skymap IIIC	
17	Engine run counter	VDO MALAYSIA	
18	Stall warning System	ACI T1	
19	Fuel flow meter	TL-2512	
20	Fuel flow meter	TL-2524	
21	Cabin air intake	AT3.77.400.0	
22	Cabin air outlet	AT3.77.450.0	
23	Extinguisher	AT3.75.000.0	
24	Wheel fairings	AT3.45.000.0	
25	Parking brake	AT3.47.100.0	
26	Parking brake	AT3.47.130.0	⑨
27	Trim an balancing tab	AT3.33.070.0	
28	ELPROP propeller	ELPROP 3-1-1P	
29	Alternator	AT3.61.390.0	
30	Strobe lights	AT3.61.400.0	
31	Landing and taxing lights	AT3.61.410.0	
32	Oil cooler flap control system	AT3.54.400.0	

\+ Equipment installed

o Equipment not installed

33	Anti-collision strobe WHELEN	70509	
34	Position lights	AT3.61.440.0	
35	GPS-VHF Antena	AT3.62.400.0	
36	Rotated propeller axis	AT3.52.500.0	
37	ELT KANNAD	406 AF-COMPACT	
38	Fuel system with additional fuel tank	AT3.53.500.0	
39	„Fuel pump on” light	AT3.61.630.0	
40	„Canopy open” light	AT3.25.250.0	
41	Instruments lighting	AT3.73.200.0	
42	Instruments lighting	AT3.73.300.0	
43	GARMIN System	G500	
44	Engine Monitoring System	MVP-50P	
45	Audio panel	GMA 340	
46	COMM/NAV/GPS	GNS 430W	
47	Radio-transceiver	SL 30	
48	VOR/ILS Indicator	MD200-306	
49	Transponder	GTX 328	
50	FLARM	ECW100	
51	Heated Pitot Tube	AT3.71.200.0	
52	Artificial horizon	4200-10/11	
53	Pitot and static pressure system Variant II	AT3.71.300.0	
54	Landing and taxing LED lights	AT3.61.650.0	
55	GPS GARMIN	AERA 500	
56	Encoder	SSD120	
57	GPS GARMIN	695	
58	ASPEN	EFD1000	
59	DYNON	EFIS-D6	
60	P-CAS Zaon	MRX	
61	Pitot and static pressure system Variant III	AT3.71.250.0	

(12)

\+ Equipment installed
o Equipment not installed

Section 7

DESCRIPTION OF THE AEROPLANE AND ITS EQUIPMENT

Page

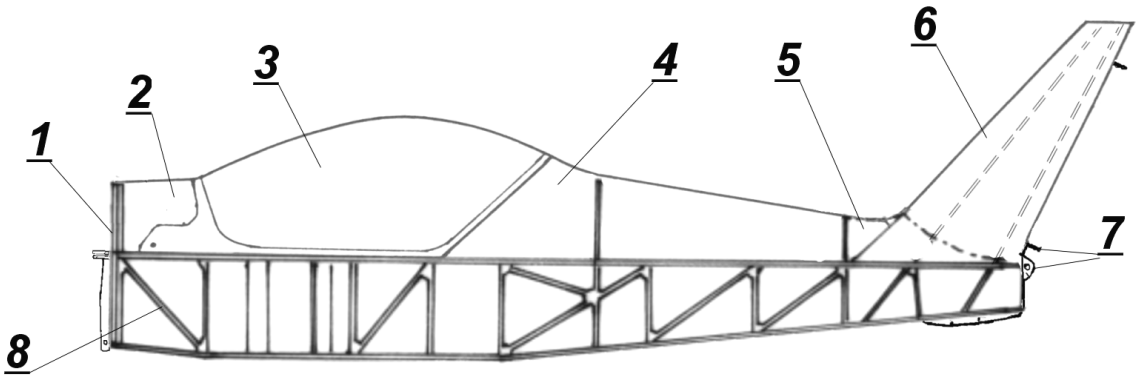
7.1. Introduction

This Section contains a description of the aeroplane and of its equipment.

7.2. Airframe

7.2.1. Fuselage

The fuselage, made of duralumin sheet, has a rectangular section, open in the area of the cabin. In the rear the fuselage passes fluently into the fin, being an integral part. The sections between canopy and fuselage, as well as those between fuselage and fin are made of epoxy-fibreglass composite.

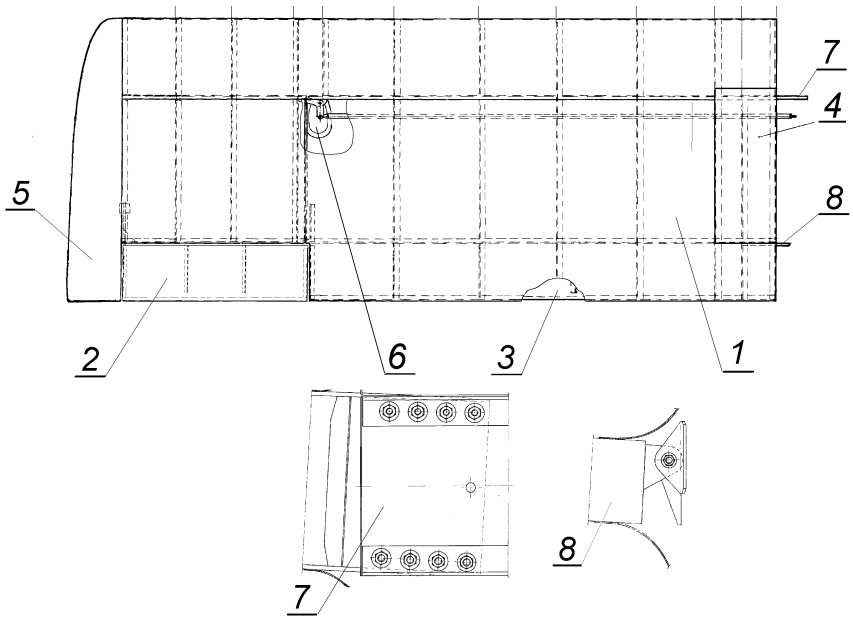


Fuselage

1. Fire wall
2. Upper fuel tank cover
3. Canopy
4. Canopy-fuselage fairing made of epoxy-fibreglass
5. Fuselage-fin fairing made of epoxy-fibreglass
6. Fin
7. Ferules of the rudder and the elevator
8. Fuselage frame

7.2.2. Wings

The wings are made of aluminium and are connected to the fuselage by means of the main and of the rear spars. The ailerons and the wing flaps are of similar design are connected to the wing by means of flat hinges. Wing tips made of of epoxy-fibreglass.

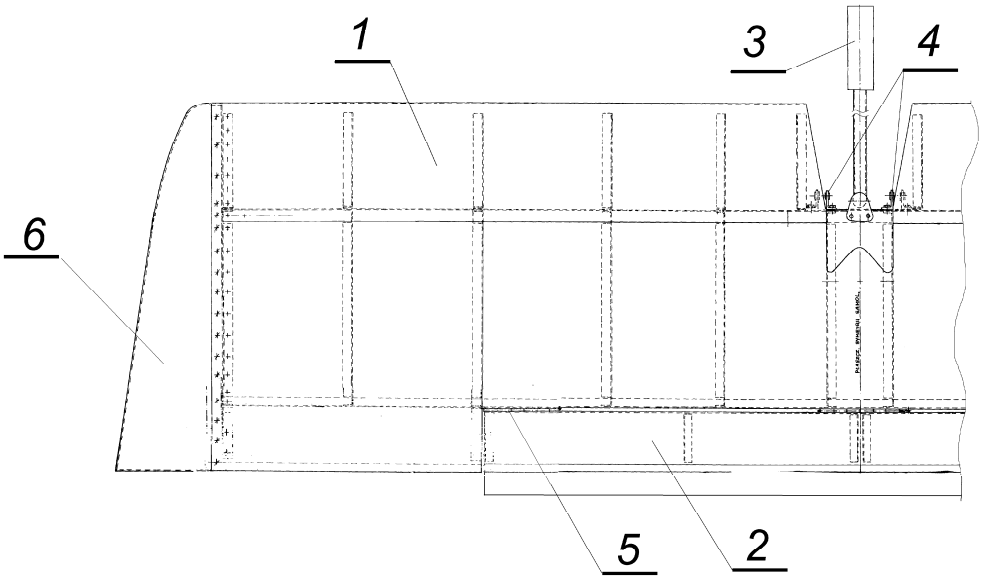


Wing

1. Wing frame
2. Aileron
3. Flap
4. Wing-walk surface
5. Wing tip
6. Inspection hatch
7. Main spar
8. Rear spar

7.2.3. Slab tail

The tail plane is a slab tail design with a structure similar to the wing, mass balanced, hinged at two points. The trim & balancing tab are contained within the contour of the tail plane.

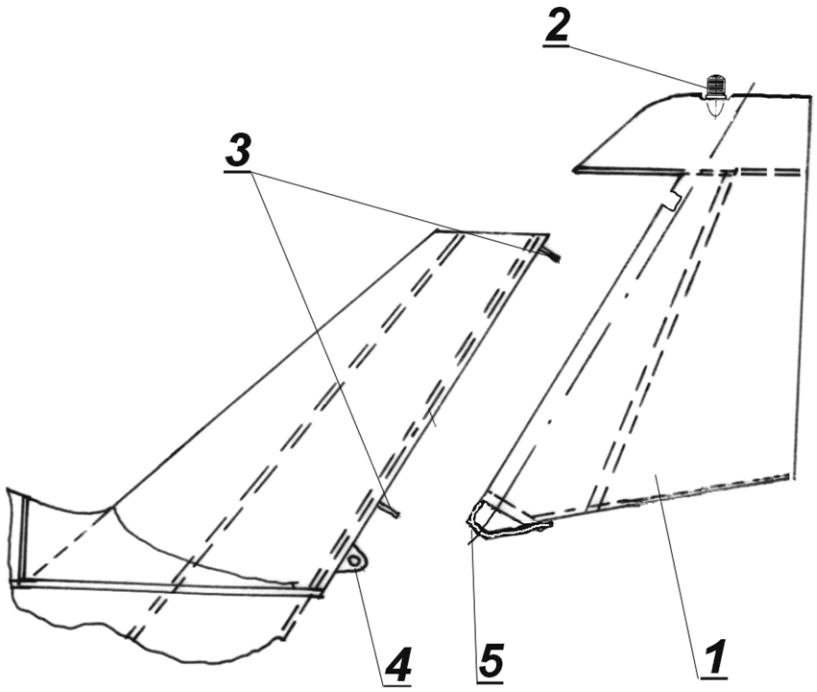


Slab tail

1. Structure of the slab tail
2. Trim and balancing tab
3. Balancing weight
4. Slab tail fittings
5. Trim and balancing tab flat hinges
6. epoxy-fibreglass tips

7. ***7.2.4. Fin and rudder***

The vertical tail unit consists of fin and rudder. The fin is an integral part of fuselage structure.



Fin and rudder

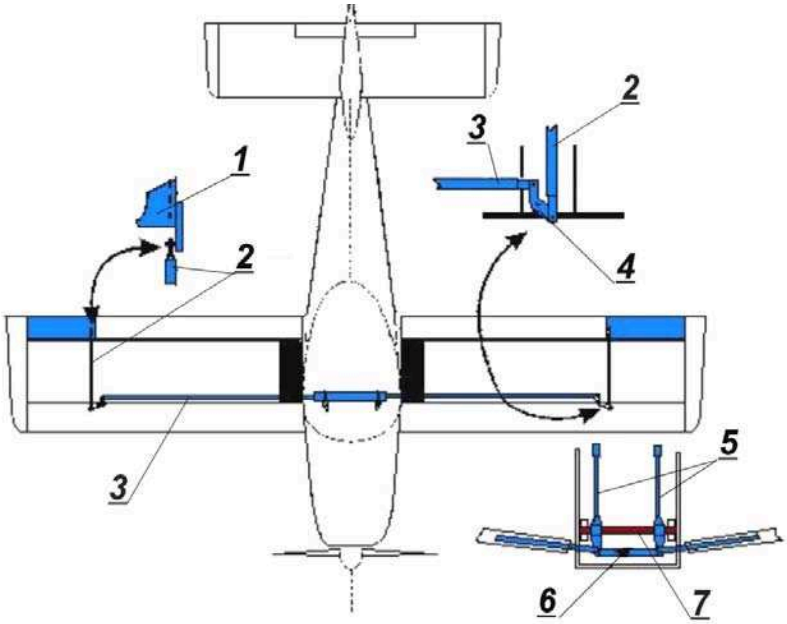
1. Rudder
2. Anti-collision strobe
3. Rudder mountings
4. Slab tail fittings
5. Lower rudder fitting

7.3. Flight control

This section contains a description of the control mechanisms of the wing flaps, the ailerons, the elevator, the trim & balancing tab and of the rudder.

7.3.1. Control of the ailerons

The ailerons are located at the trailing edge of the outboard wing part, between the wing flaps and the wingtips. The scheme of the control mechanism of the ailerons is shown below.



Control of the ailerons

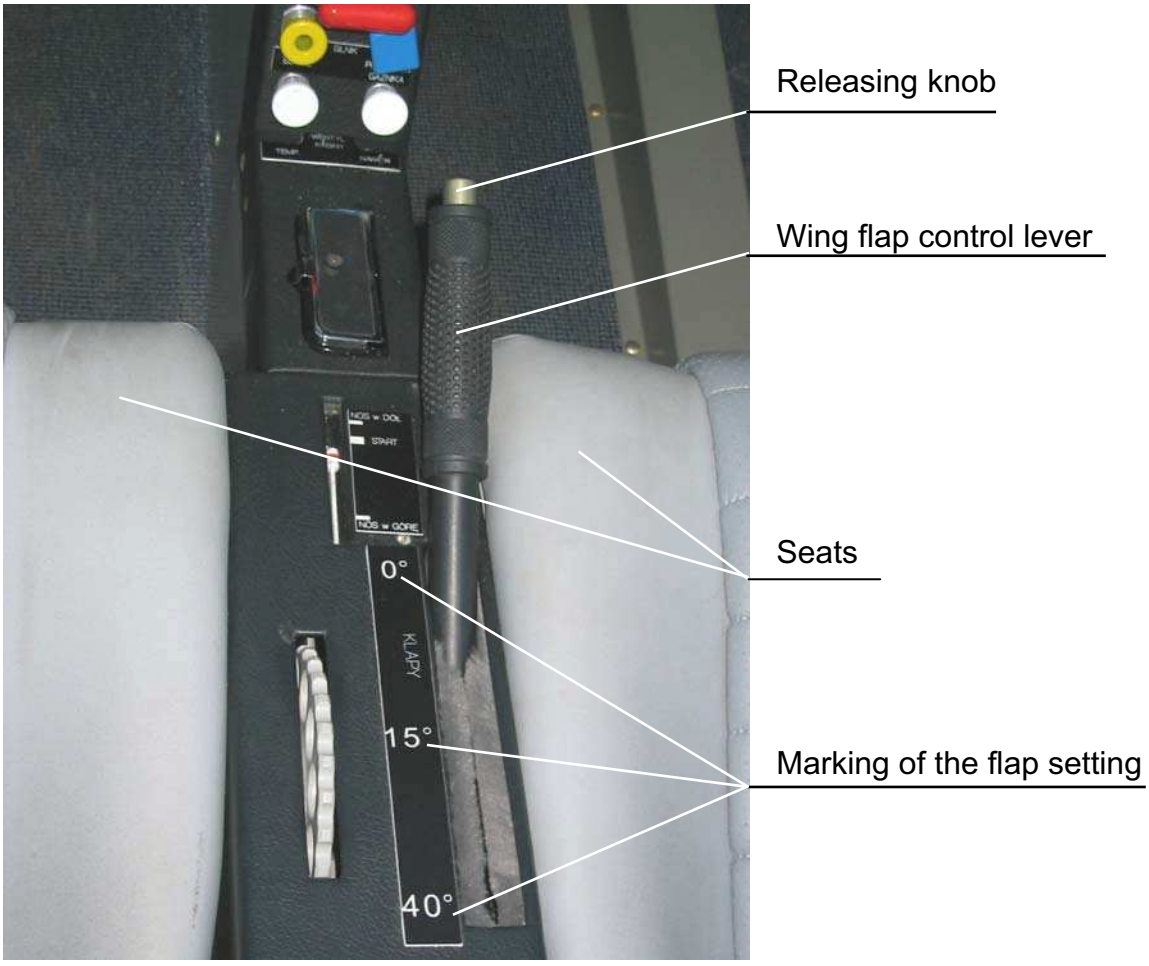
1. Aileron
2. Push rods
3. Push rods
4. Angle lever
5. Control sticks
6. Push rods
7. Torsion tube

1. Control of the wing flaps

The wing flaps which are of crocodile type (split flaps) are located below the trailing edge of the wing, between the fuselage and the ailerons. The wing flap control lever (see the illustration below) is located in the cabin, on the console, between the seats. This lever is fitted with a knob, which is to release the flap-retaining pin and enables the flap to be set in either of its three positions. In the extreme forward position of the lever the flap is set to $\delta_K = 0$ °.

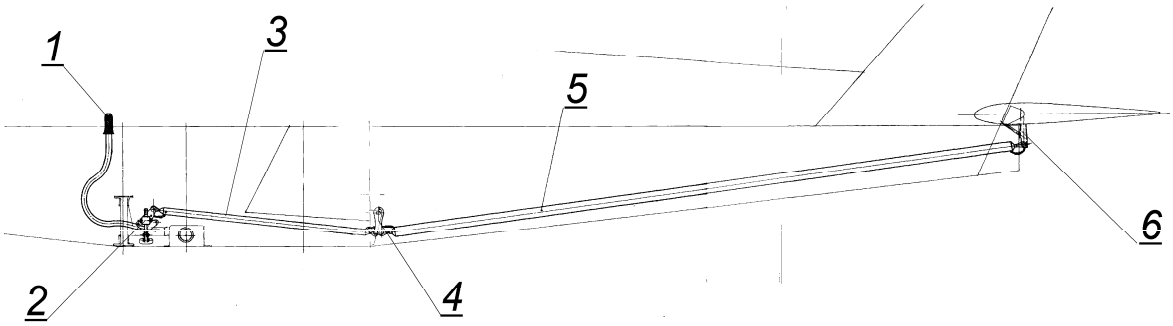
In the middle position of the lever the flap is set to $\delta_K = 15$ ° and in the extreme rear, the setting is $\delta_K = 40$ °.

The wing flap control lever transmits its movement to the flaps via push rod, torsion tube and the two pins.



7.3.3. Control of the elevator

The slab tail elevator is fixed to the spar of the fin. The scheme of the elevator control is shown in the illustration below.



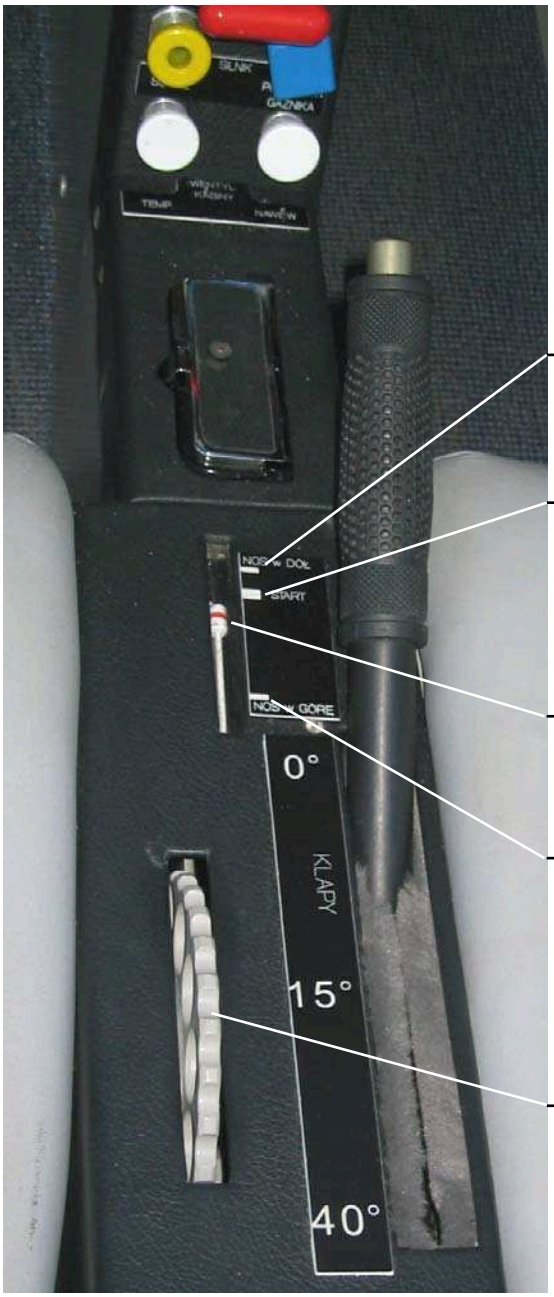
Control of the elevator

1. Control stick
2. Torsion tube
3. Short push rod
4. Connecting lever
5. Long push rod
6. Slab tail arm

7.3.4. Control of the trim/balancing tab

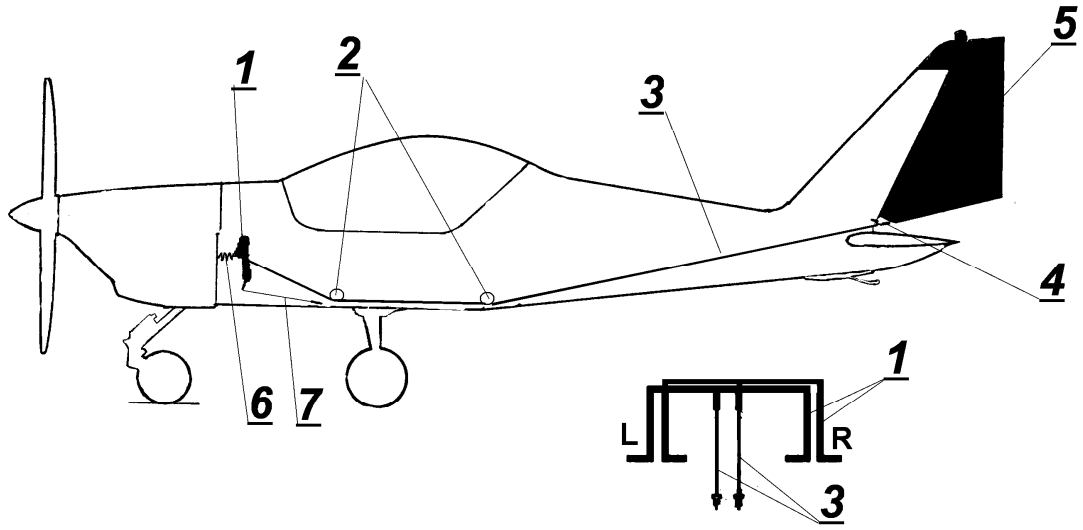
The trim & balancing tab is fixed to the trailing edge of the slab tail elevator is driven by torsion shaft, self locking screw gear and assembly of levers and pushrods .

The illustration below shows the control wheel of the tab and the tab setting indicator.



7.3.5. Rudder Control

The rudder is fixed to the fin. The illustration below shows the schematic of the rudder control.

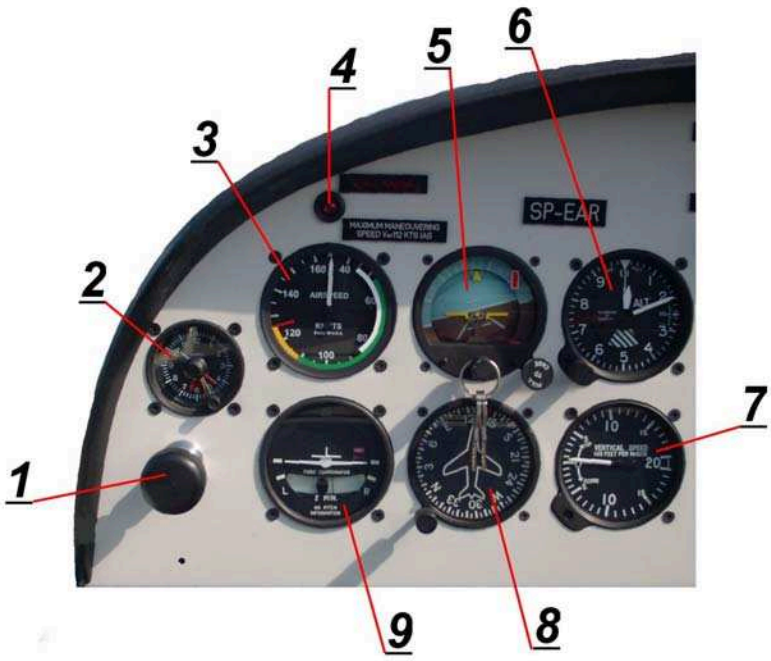


Schematic showing the set-up of the pedals controlling the rudder

1. Rudder pedals
2. Cable pulley
3. Cables
4. Rudder lever
5. Rudder
6. Tension springs
7. Discharge cables

7.4. Instrument panel

The equipment installed in this aeroplane is specified in the List of Equipment on page 6-4.



1- Port throttle lever
2- Clock *
3- Airspeed indicator
4- Stall warning light *
5- Artificial horizon *
6- Altimeter
7- Vertical speed indicator
8- Directional gyro *
9- Turn co-ordinator *
10- Cabin heating control knob
11- Vent control knob
12- Choke
13- Carburettor heating
14- Fuel cut-off valve
15- Battery switch
16- Generator switch
17- Fuel pump switch
18- Ignition switch

19- Fuel quantity indicator
20- Cylinder head temperature indicator (CHT)
21- Oil pressure indicator
22- "Starter engaged" light
23- "Generator failure" light
24- Compass
25- Tachometer
26- "Fuel reserve" light
27- Oil temperature indicator
28- Exhaust Gas temperature indicator (EGT)
29- Throttle lever

30- Volt-Ammeter
31- Hour meter *
32- Carburettor air temperature indicator
33- Fuel pressure indicator
34- Transponder *
35- Radio-transceiver *
36- 12V- DC Supply
37- Intercom *
38- Anti-collision strobe light switch
39- Turn co-ordinator switch
40- Artificial horizon – switch
41- Directional gyro – switch *
42- Starter – circuit breaker
43- Engine instruments - circuit breaker
44- Fuel quantity meter - circuit breaker
45- 12V-DC-supply - circuit breaker
46- "Encoder" - circuit breaker *
47- Transponder - circuit breaker *
48- Intercom - circuit breaker *
49- Radio-transceiver- circuit breaker *

* - optional equipment

7.5. Landing gear system

The aircraft has a three-wheel, fixed landing gear, with nose wheel. The main landing gear is of a flat spring design. The nose wheel is fitted with a rubber shock absorber

7.5.1. Braking system

The aeroplane is fitted with hydraulic disc brakes. The system consists of two hydraulic circuits that activate independent callipers of left and right wheels of the main landing gear. Each of the circuits consists of two brake cylinders [3] located on rudder pedals. In version 1 they are connected via insulating valve [4] and flexible pressure lines with brake callipers [8]. The brake fluid container [1] is located at the highest point of the brake system on the firewall and it supplies each pump independently. Cylinders of the left brake are activated by the left rudder pedals and the right cylinders are activated by the right rudder pedals of both the pilot and the passenger. The insulating valve are located on the firewall in the cabin and prevent the transfer of brake fluid under high pressure from one cylinder to the other instead of the callipers. In version 2 pumps on right rudder pedals activate additional callipers. ⑨

In both variations it is possible to install a parking brake valve.

⑨

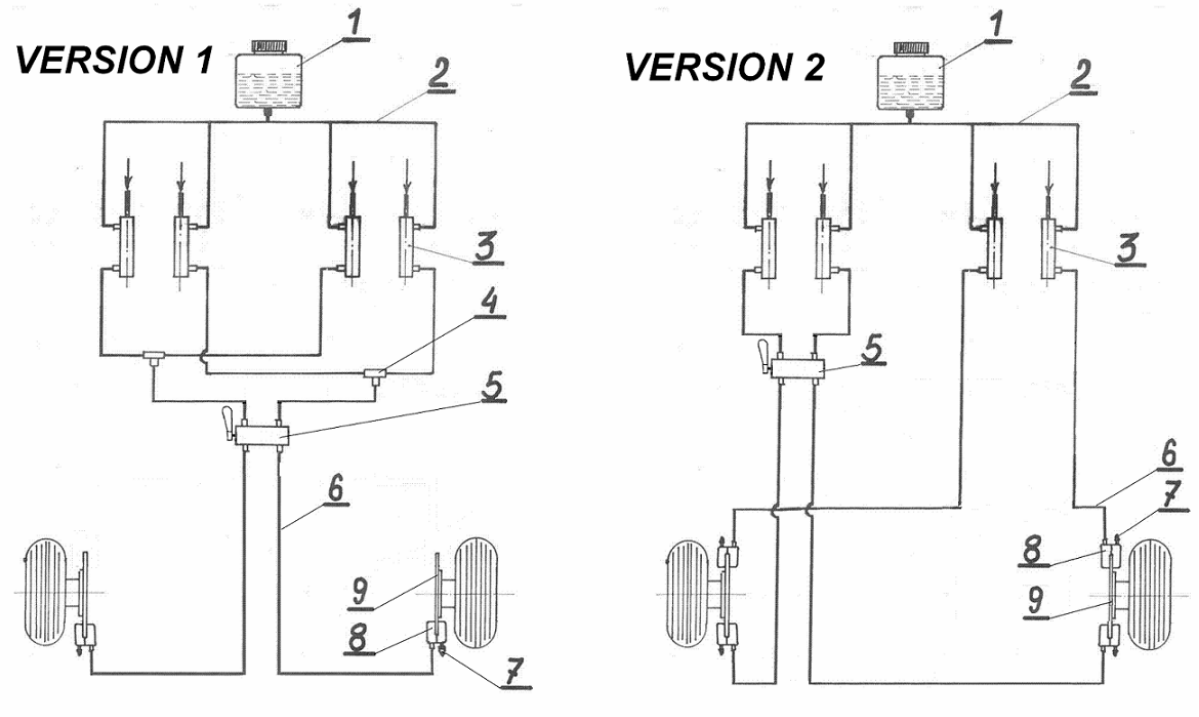


Diagram of the braking system

1 Brake fluid container
2 Feeding line
3 Brake cylinder
4 Insulating valve
5 Parking brake valve (option)
6 Brake pressure line
7 Bleeding valve
8 Brake calliper
9 Brake disk

7.5.2. Parking Brake

The parking brake valve is installed in between the seats tunnel and the parking brake lever is accessible from the left seat.

CAUTION

ENGINE STARTING WITH PARKING BRAKE ON IS PROHIBITED

NOTE

IN ORDER TO APPLY THE PARKING BRAKE IT IS NECESSARY:
- **FROM THE LEFT SEAT PUSH ON TOE BRAKES**
- **ROTATE PARKING VALVE LEVER TO POSITION "ON"**

NOTE

DUE TO POSSIBLE DECREASE IN PRESSURE IN THE BRAKE LINES OVER A LONGER PERIOD OF PARKING TIME IT IS RECOMMENDED TO FURTHER SECURE THE AIRPLANE AS A PREVENTIVE MEASURE FROM ROLLING. ⑨

The parking valve can occur in two types. Type of installed parking brake is specified in Section 6 of this manual, see table "Optional equipment".

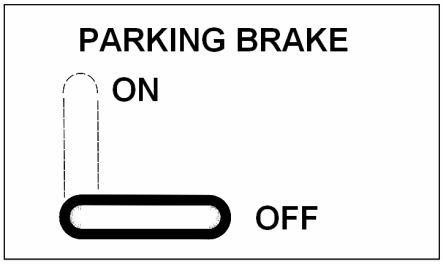
For parking brake variant 2 the valve is installed in break installation of left seat.

For role of the parking brake and the flight controls securing can be used the collapsible tow bar installed on control stick and rudder control pedals. For collapsible tow bar using description see Section 8.4.2 „Parking".

Parking Brake AT3.47.100.0

Valve of parking brake AT3.47.100.0 is non-return valve. After set this valve lever "on" is possible to increase pressure inside the breaking system lines and brake the airplane.

⑨



Parking brake AT3.47.100.0 in „ON" position

1. Valve lever,
2. Parking brake placard,
3. Information placard,

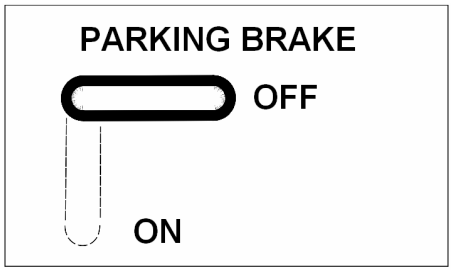
Parking Brake AT3.47.130.0

Valve of parking brake AT3.47.130.0 is cut-off valve. After set this valve lever "on" is not possible to increase pressure inside the breaking system lines, brake cylinders are cut off from callipers. Set the valve lever to position "on" with low level pressure inside the braking lines make impossible to brake the airplane.

CAUTION

DO NOT APPLY PARKING BRAKE BEFORE PUSH ON BRAKE LEVERS
LEFT SEAT BRAKES DO NOT OPERATE WHEN PARKING BRAKE IS ON

In airplane with brake system variant 2 right seat toe brakes operate independently from parking brake lever position. ⑨

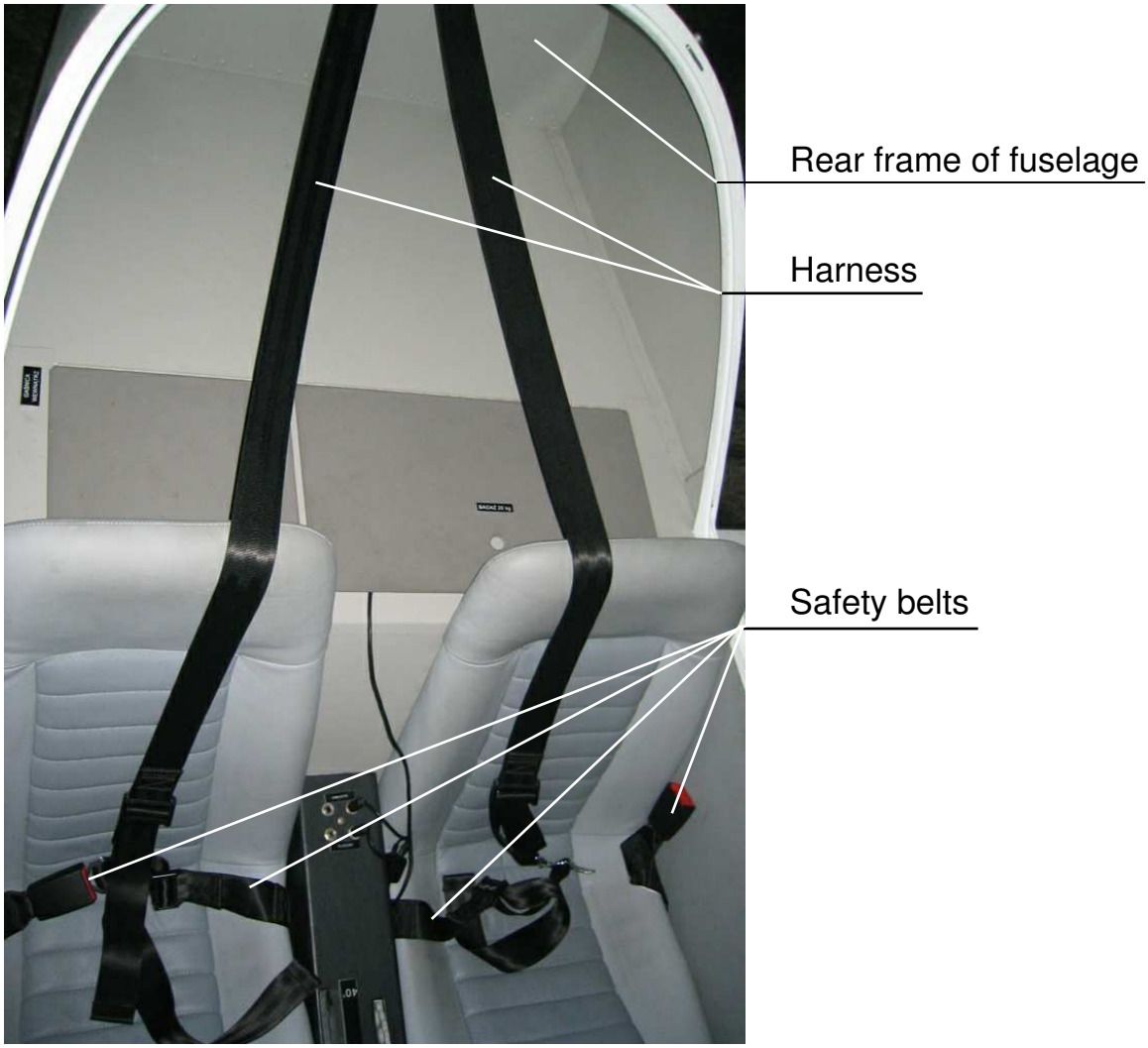


Parking brake AT3.47.130.0 in „ON" position

1. Valve lever,
2. Parking brake placard,
3. Information placard,

7.6. Seats, seat belts and harness

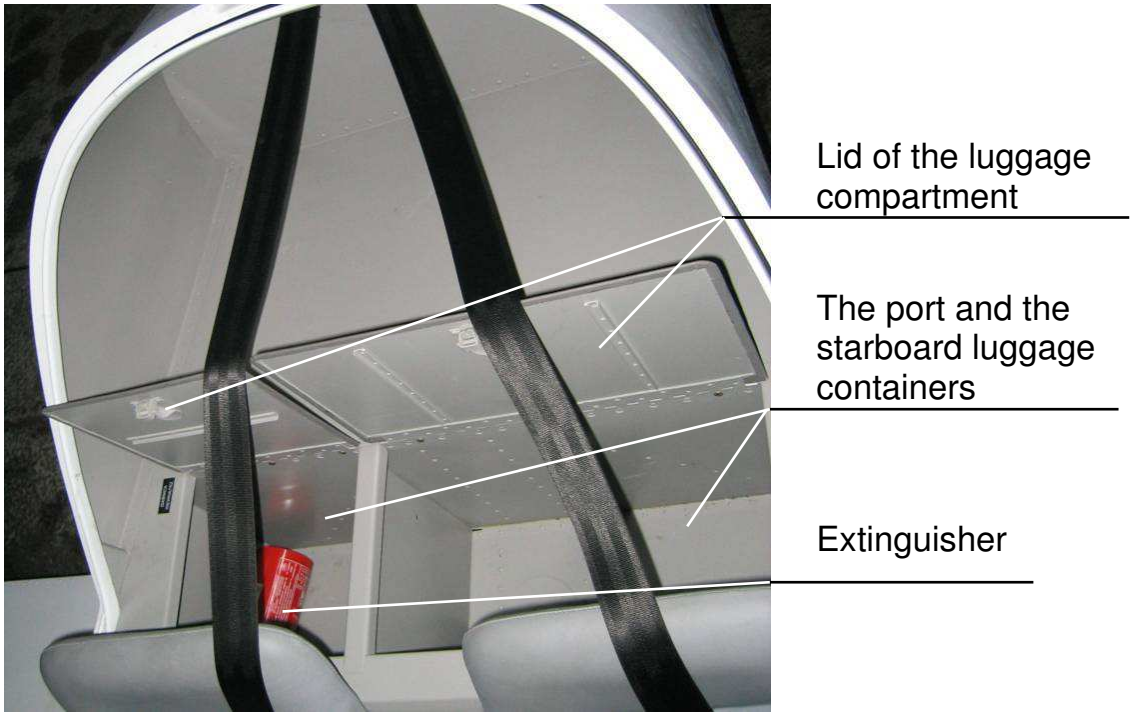
The seat position is permanently fixed (not adjustable). The illustration below shows the installation of the seats. Each seat is fitted with adjustable safety belts.



7.7. Luggage compartment

The luggage compartment is located behind the seats and consists of two containers (see illustration).

The containers are fitted with lids made of metal, locked by latches. Pressing the latch releases it and enables the lid to be opened. The luggage compartment allows for luggage of 30 kg total weight; 20 kg in the port container and 10 kg in the starboard one.

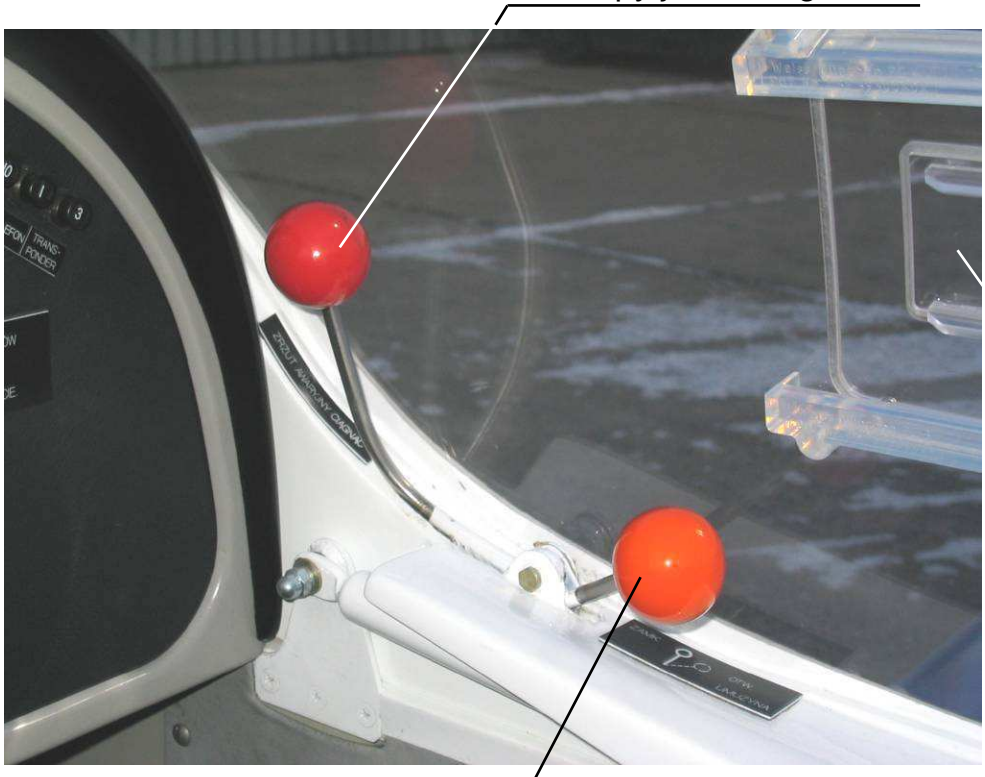


CAUTION

IT IS PROHIBITED TO CARRY INFLAMMABLE, CORROSIVE, EXPLOSIVE, RADIOACTIVE AND OTHER MATERIALS IN THE LUGGAGE COMPARTMENT, WHICH ARE HARMFUL FOR HUMAN HEALTH OR LIFE.

7.8. Canopy

The canopy consists of an epoxy fibreglass composite frame and of profiled acrylic sheet. The canopy can be moved forward, rotating around an axis located in front of the cabin. After entering the cabin the canopy should be pulled on the handle and lowered, until it rests on the fuselage sidewall edges, and then locked with the levers with orange knobs. Sliding venting tabs are installed on both sides of the canopy. Jettisoning of the canopy is achieved by pulling the lever with the red knob and pushing the canopy upwards. The locking and the jettisoning levers are arranged in the front part of the canopy on both sides, one of each, on each side.



7.9. Power unit

7.9.1. Engine

Rotax 912S2 or 912S4 engine

- Four-stroke, opposed, four cylinder engine
- Cylinder heads cooled with fluid, cylinders cooled with air
- Pressure lubrication
- Dual magneto ignition
- Propeller driven via reduction gear
- Electric starter
- Generator

Two interconnected throttle levers, located on the instrument panel, are used to control the engine.

7.9.2. Propeller

Wooden, fixed pitch, two-bladed GT-2/173/VRR-FW101SRTC, propeller, of 1.73 m (5' 8'') diameter.

The propeller rotates in a clockwise direction (when viewed from the cockpit)

7.10. Fuel system

The fuel is contained in the fuel tank, which is located between the instrument panel and the firewall. The fuel tank, made of composite, is contained in a sack, made of fabric resistant to smoke and to fuel.

There are drains installed in the sack, to drain any spilled fuel out of the aeroplane. The fuel tank is fitted with a filler which is drained. A measuring stick is attached to the filler cap. The fuel quantity is measured by the fuel level sensor. The signal from this sensor is transmitted to the fuel quantity indicator and to the reserve fuel sensor. The reserve fuel signal lamp starts to light, when the fuel tank contains 10 litres of consumable fuel.

The fuel is filtered by the coarse filter located on the fuel tank outlet, by the filter in the electric driven emergency fuel pump and by the fine filter, located behind the engine driven pump.

The fuel shut-off valve is located under the fuel tank, behind the firewall, and is operated from the cabin.

The engine driven pump feeds the fuel under pressure via a five-way connector to the carburettors and to the fuel pressure sensor. Surplus fuel is drained back to the fuel tank.

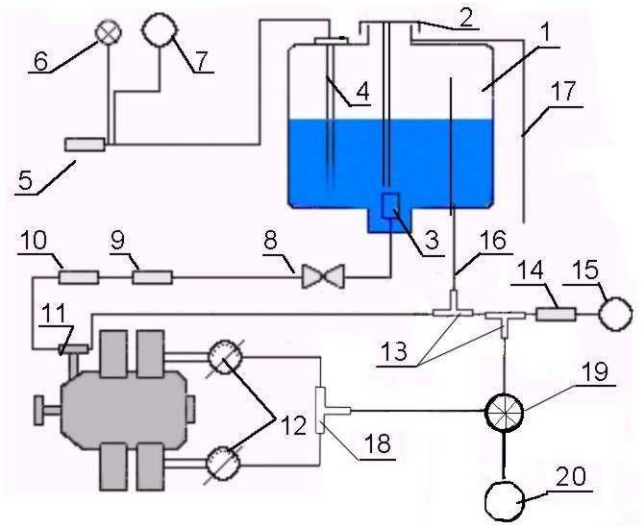
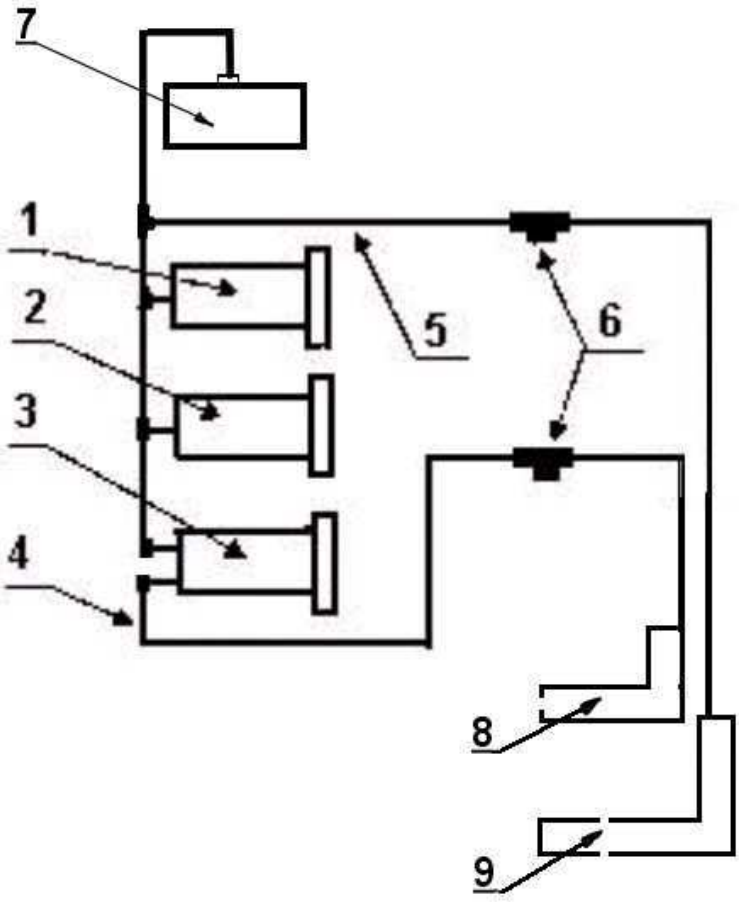


Diagram of the fuel system

1. Fuel tank
2. Filler cap with the measuring stick
3. Coarse fuel filter
4. Fuel level sensor
5. Reserve fuel sensor
6. Reserve fuel signalling lamp
7. Fuel quantity indicator
8. Shut-off valve
9. Electrically driven fuel pump
10. Fine fuel filter
11. Engine driven fuel pump
12. Carburettors
13. Three-way connectors
14. Fuel pressure sensor
15. Fuel pressure indicator
16. Fuel return line
17. Draining line of fuel filler
18. Three-way connectors
19. Fuel flow-meter sensor (optional)
20. Fuel flow-meter indicator (optional)

7.11. Pitot and static pressure systems

The sensors [9] and [8] receive air under pitot and static pressure and transmit it to the airspeed indicator [3], altimeter [2] , vertical speed indicator [1] and altitude encoder[7](option) -see the scheme on the illustration. The sensors of pitot and static pressure are fixed under the port wing. Water sediment containers [6] are installed to both the static pressure line [5] and to the pitot pressure line [4]. The sediment containers are located beneath the pilot's seat and are accessible from outside.



7.12. Electrical system

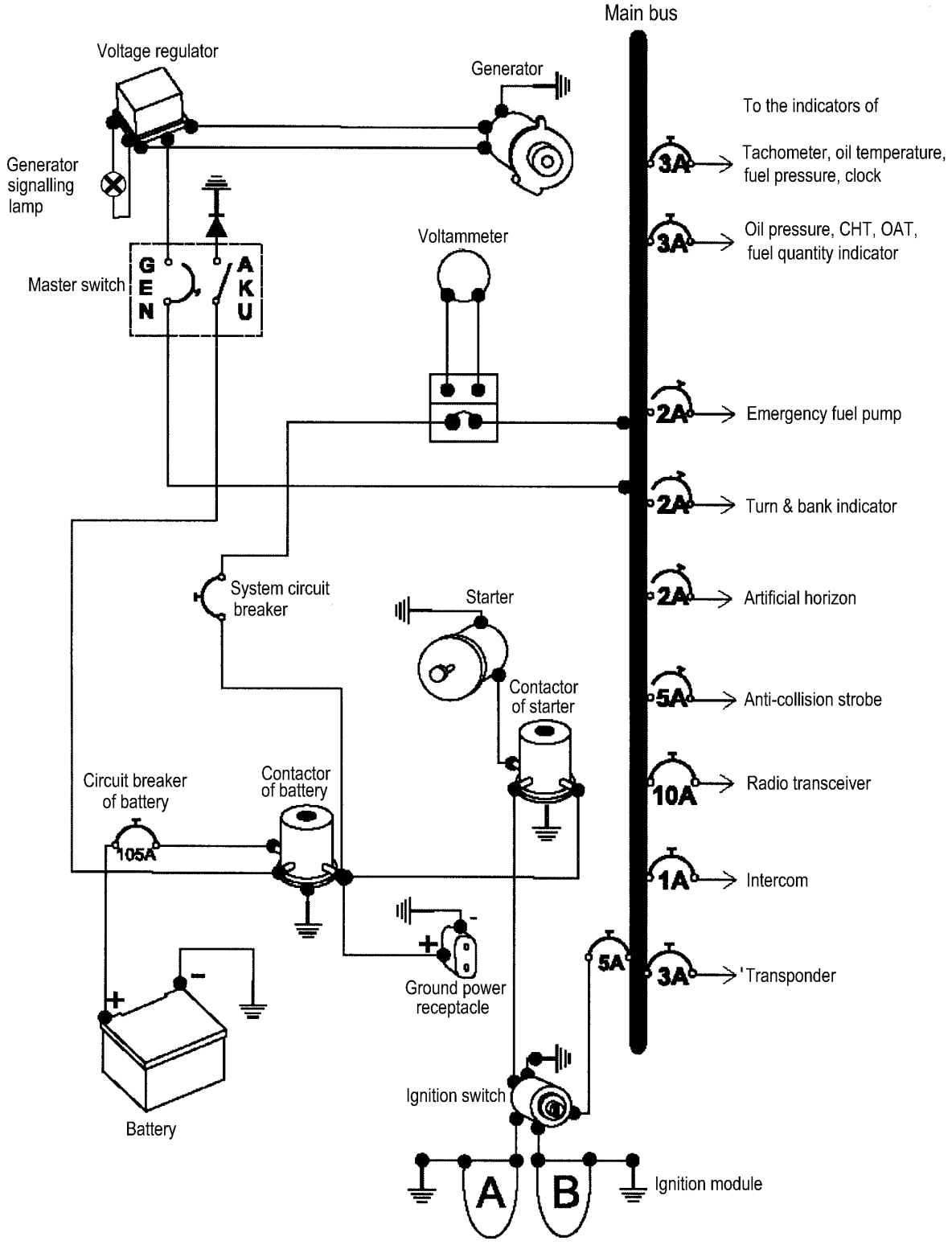
The source of on board electric power is the generator and the battery. It is a 12 Volt system. Automatic circuit breakers located on the instrument panel protect the system. The BATTERY switch switches on the system. The switches BATTERY and GENERATOR perform the task of the system master switch. In case of generator failure, the GENERATOR signalling lamp lights up. In such a case the system is fed from the on board battery.

There is also an electrical ground power receptacle installed into the system, being located in front of the wing, on the port wall of the fuselage, in front of the firewall. An electric board socked is installed in the cabin, on the instrument panel. When using the ground power source, the on board battery is automatically switched off. Switching of the electric power receivers in this case is the same as when using the on board battery.

The following options are available:

- Anti-collision strobe

- Navigation lights and the landing light



Automatic circuit breaker (permanently switched on)

Switch with automatic circuit breaker (switched manually)

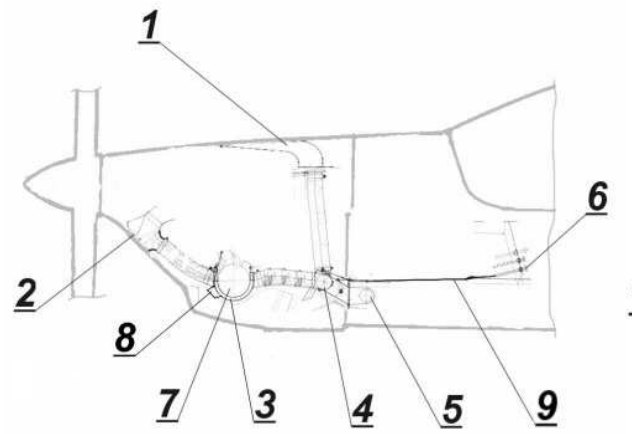
Switch (switched manually)

7.13. Aeroplane equipment

A detailed list of standard aeroplane equipment, as well as of the possible optional equipment is given in the Maintenance Manual of the AT-3 R100 aeroplane. The operational instructions for the optional equipment are given in the section 9 – Supplements.

7.13.1. Cabin ventilation and heating

The cold air ventilation inlet in the lower part of the cabin shares the air intake with the carburettor air inlet connected to the air mixer. The air mixer enables adjustment of the volume and temperature of the cabin ventilating air. The fresh air is ducted from the intake to the heat exchanger located under the muffler and then further to the air mixer. From the mixer the air is ducted to the cabin outlet. The control cables and knobs are located on the middle console.

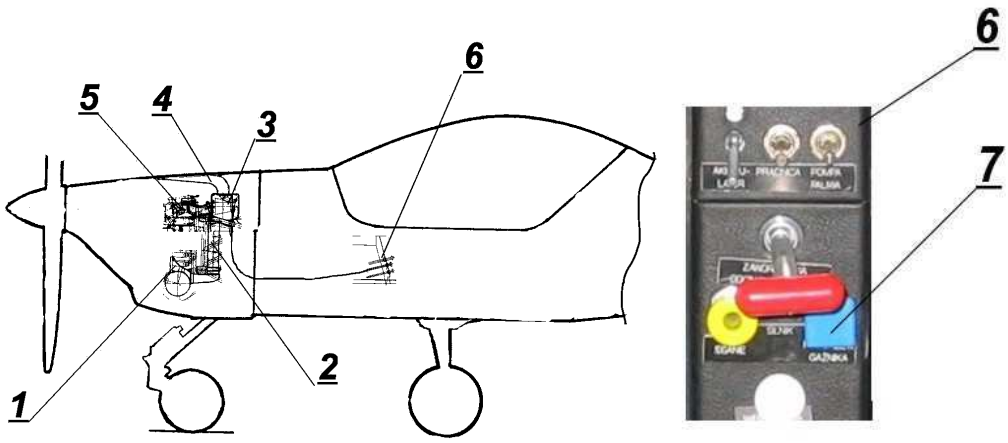


1. Cold air inlet
2. Heat exchanger inlet
3. Heat exchanger
4. Mixer
5. Cabin inlet
6. Middle console
7. Muffler
8. Heat exchanger intake - optional
9. Control cables
10. Temperature control knob
11. Air volume control knob

7.13.2. Carburettor heating installation

Closing of the air flow from the cold air inlet causes suction of the hot air from the engine compartment through the heat exchanger located above the muffler. The heated air is channelled through the air duct to the filter box, where the air streams are mixed. The cold air stream can be adjusted by the flap controlled by the Bowden cable and knob located on the middle console. The temperature of the carburettor intake air can be read from the gauge on the instrument panel.

To increase of the temperature turn the knob to the left to unlock and pull to the selected position and turn right to lock.



1. Heat exchanger
2. Duct
3. Air filter box
4. Air intake
5. Carburettors
6. Middle console
7. Carburettor heating control knob

7.13.3 Air intake covers

In case of airplane operation in low ambient temperature it is recommended that intake air covers are used to reduce the intensity of the cooling effect. Inlet covers are installed in the lower cowling by the means of screws.

NOTE

It is recommended that Air Intake Covers are installed when operating the aircraft in ambient temperature below 12^0C/54^0F

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Section 8

SERVICING

8.1. Introduction

This Section contains procedures for the correct control of the aeroplane on the ground and servicing, recommended by the aeroplane manufacturer. It also contains some requirements concerning inspections and basic maintenance, which are to be observed in order to maintain the performance and reliability of a new aeroplane. It is reasonable to proceed according to a prescheduled scheme of lubrication and maintenance, appropriate to the operating conditions and climate.

8.2. Scheduled aeroplane inspections

The scope and the intervals of the inspection schedule are defined in the Aeroplane Maintenance Manual. A separate inspection system may be required for the aeroplane by the appropriate Civil Aviation Authority in order to renew the Certificate of Airworthiness. Tasks to be carried out in relation to scheduled inspections of engine, propeller and equipment, are defined in the respective applicable manuals or operating and maintenance instructions.

The owner and operator are responsible and must insure, that all servicing and maintenance is only carried out by qualified personnel.

8.3 Aeroplane repairs or modifications

Any repair or modification of the aeroplane design may only be performed by authorized personal.

NOTE
Prior to any modification of the aeroplane, ensure with the Civil Aviation Authority, that the intended modification will not negatively affect the airworthiness of the aeroplane

After completing the modification, according to the instructions given in the Aeroplane Maintenance Manual, the aircraft should be re-weighed, and the respective weighing report sheet completed and the Weight and Balance schedule in section 6-3 of this manual must be revised. Also Section 9 of this manual is to be supplemented accordingly.

8.4. Ground servicing

The dimensions of the standard aeroplane are given in the aeroplane drawings (see Section 1). This allows the size of the area required for the aeroplane in a hangar or for parking to be defined.

NOTE.
The size of the required area is to be increased respectively, to provide space for supplementary equipment such as antennas of radio equipment (or other equipment installed according to the operators options).

8.4.1. Relocating the aeroplane on ground

If using the towing bar on a level surface, one person is able to move the aeroplane. The towing bar is to be fixed to the nose wheel ferrules.

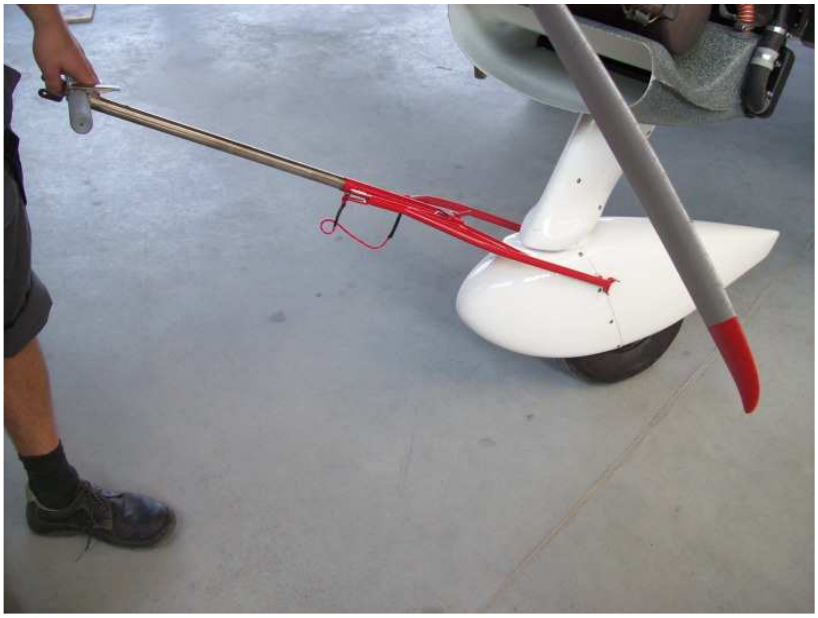
⑨ The tow bar can occurred in two versions (standard and collapsible). Collapsible tow bar for transport purpose can be fixed to the ferrules on the rear wall in the cockpit.

If the ground is not even and there are difficulties in moving the aeroplane, two people may manage the relocation, balancing the plane on the main wheels. One person should guide the wingtip and the other should control the movement with the towing bar.

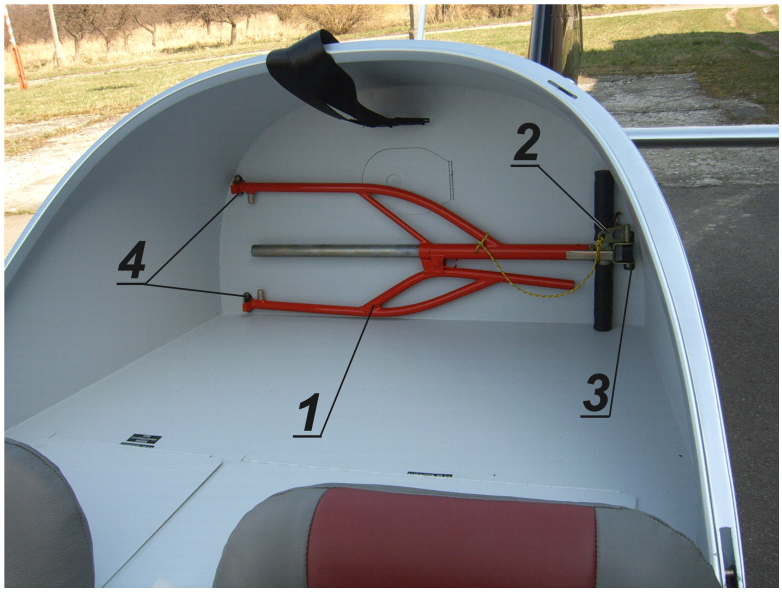
NOTE.

Do not push or pull the aeroplane by holding propeller, control surfaces, wings or fairings.

⑨



Collapsible tow bar



Collapsible tow bar installed on rear wall in the cockpit

1. Taw bar
2. Safety pin
3. Ferrule of tow bar handle
4. Ferrules of tow bar forks

⑨

8.4.2. Parking

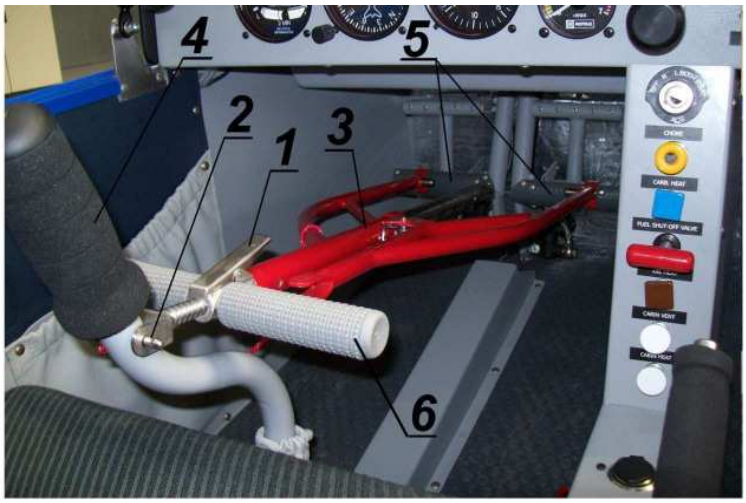
1. Position the aeroplane pointing into wind.
2. Apply chocks to the main wheels.
3. Secure the control sticks with the seat belts.
4. Lock the cockpit canopy and apply a canvas cover, if available.
5. Position the propeller horizontally.

For secure of flight controls can be used collapsible tow bar installed on the control stick and rudder pedals. Collapsible tow bar installed on the toe brakes over rudder pedals working as a parking brake and secure the controls.

For collapsible tow bar install:

- place forks of tow bar on the left seat rudder pedals or toe brakes,
- using safety pin fix the moving arm of tow bar to control stick,
- holding the handle of tow bar and control stick extend the tow bar.

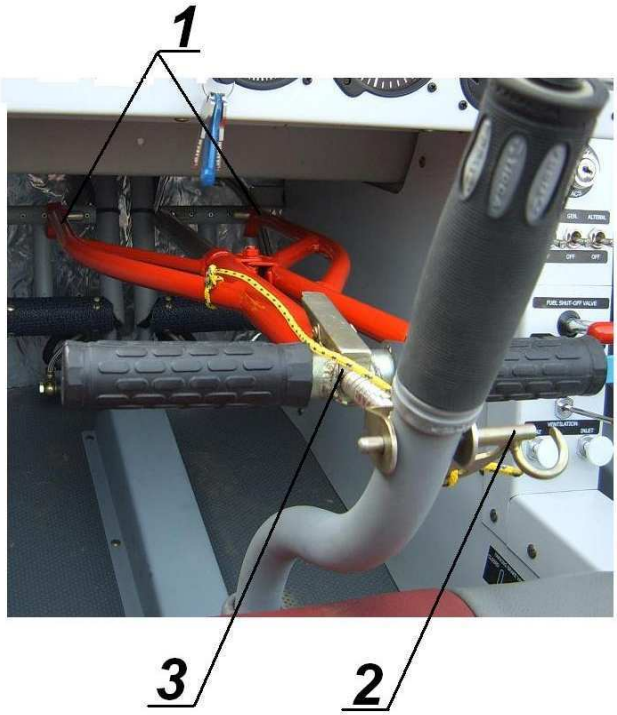
In purpose to remove tow bar from controls unlock the catch pawl and remove safety pin.



Collapsible tow bar installed on the control stick and rudder pedals

1. Catch pawl
2. Safety pin
3. Tow bar
4. Control stick grip
5. Rudders pedals
6. Tow bar handle

⑨



Collapsible tow bar installed on toe brakes over rudder pedals

1. Tow bar forks
2. Safety pin
3. Catch pawl

8.4.3. Tying down

There are lugs for the tie-down ropes on the aeroplane. They are located under the wingtips, at the rear of the aeroplane (tail skid) and at the front (nose landing gear ferrules).

When tying down, the following should be observed:

1. It is recommended to have the aeroplane pointing into wind.
2. Put chocks in front of the main wheels.
3. Apply locks to the ailerons, rudder and elevator, or fasten the control sticks with safety belts.
4. Put the ropes through the specified lugs and drive the mooring anchors in the ground. There should only be slight tension on the tie-downs to prevent sagging.
5. Apply the cover to the pitot and static pressure sensors.
6. Lock the canopy and put on the cover.
7. Position the propeller horizontally.

8.4.4. Lifting

When jacking the aeroplane the following procedure should be followed:

1. Put a stand (under a rib) under each wing to prevent the aeroplane from tilting.

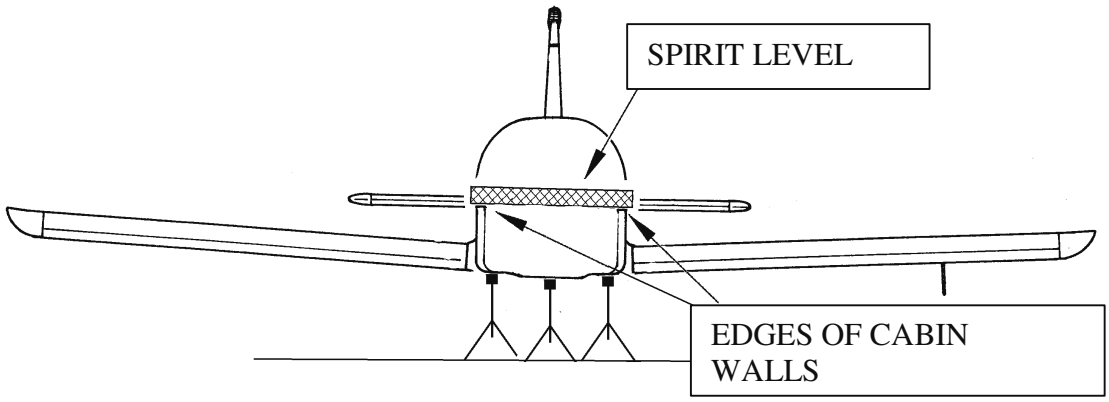
NOTE.

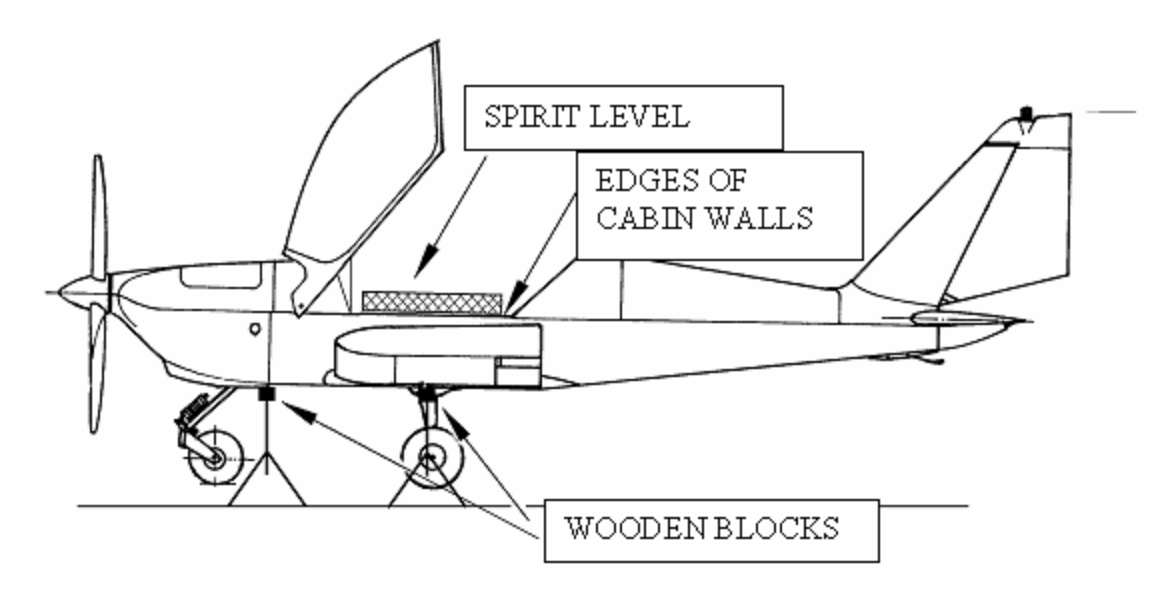
Instead of using jacks, the aeroplane may also be lifted by hand, when holding the lower fuselage edges in the area between the firewall and the wing and in front of the horizontal stabilizer.

2. Locate one of the jacks under the nose landing gear ferrule and the other two, each side next to the cabin walls, under the main landing gear box. Apply wooden blocks
3. Lift the aeroplane gradually to the required height. Lift the aeroplane, raising each jack evenly at the same time and avoid swaying.

8.4.5. Levelling

After lifting, the aeroplane should be levelled, so that the cabin wall edges are horizontal (see the illustration).





8.5. Cleaning and basic maintenance

It is essential for the reliability of the aeroplane components to always keep them clean.

8.5.1. External painted surfaces

Prior to cleaning, take the following steps:
- Protect the wheels, especially the brake discs, covering them.
- Put the cover on the pitot and static pressure sensors.
- Mask off all holes and orifices.

Use clean water to remove all fine particles and then wash the surface with water adding mild soap. Do not use detergents or soaps which are acid, alkaline or abrasive.
To remove spots of grease or oil, use a piece of cloth with naphtha or aliphatic petrol.
After use of naphtha the surface should be re-waxed and polished.

To polish the painted surfaces, a soft cloth or chamois leather should be used. Aged painted surfaces may be treated with automotive waxes or good quality polishing compounds.

8.5.2. Glass panels

The greatest care should be taken to avoid scratches when cleaning glass panels of Plexiglas.

Never wipe the glass panels when dry. Rinse the panel with clean water or solution of mild soap and then wipe with soft clean cloth, sponge or chamois-leather.

To remove films of oil or grease, use tribasic sodium phosphate, well dissolved in water.

Sediments of grease or oil, if difficult to remove, should be cleaned with methanol, hexane, or naphtha. Finally rinse with clean water avoiding excessive rubbing of the glass panel surface.

CAUTION!

DO NOT USE PETROL, BENZENE, ACETONE, ANTI-ICING COMPOUNDS, OR PAINT SOLVENTS, BECAUSE THESE SUBSTANCES SOFTEN THE PLEXIGLASS, OR MAY GIVE RISE TO A NETWORK OF FINE CRACKS

8.5.3. Propeller

The propeller is to be cleaned in the same way as the painted surfaces, but with great care.

8.5.4. Engine

The engine is to be cleaned as indicated in the Engine Maintenance Manual.

8.5.5. Cabin interior

The seats, carpets and upholstery are to be cleaned with a vacuum cleaner.

Do not use water to clean items of cloth or fabric.

Foam-based shampoos for general use on automotive upholstery may be applied, but the indications given on the packing should be strictly observed.

Section 9

SUPPLEMENT No. 44

VFR-NIGHT
(analog instruments)

Section 1. General

The same as for the standard airplane

Section 2. Limitations

2.11. Types of operation

This aeroplane is approved for flights by day and night in Visual Meteorological Conditions (VMC-Day/Night)

This aeroplane is approved to operate according to Night VFR, when the equipment specified in the LIST OF MINIMUM EQUIPMENT is installed and working correctly.

LIST OF MINIMUM EQUIPMENT

SYSTEMS OR DEVICES	VFR Night
ELECTRIC POWER SYSTEM AND DEVICES	
1. Battery	1
2. Generator	1
3. Alternator	1
4. Generator warning light	1
5. Alternator warning light	1
LIGHTING	
1. Position lights	1
2. Anti-collision light	1
3. Landing and taxiing lights	1
4. Instruments and cockpit lighting	1
PRZYRZĄDY PILOTAŻOWO-NAWIGACYJNE	
1. Airspeed indicator	1
2. Altimeter	1
3. Magnetic compass	1
ENGINE MONITORING INSTRUMENTS	
1. Tachometer	1
2. Cylinder head temperature indicator	1
3. Exhaust gas temperature indicator	1
4. Oil temperature indicator	1
5. Oil pressure indicator	1
6. Fuel quantity indicator	1
7. Fuel pressure indicator	1

„1” – in the column “VFR NIGHT” the equipment is marked, which must be installed and correctly operating.

2.14. Limitation placards

**AT-3 R100 AIRPLANE, APPROVED IN ACCORDANCE WITH JAR-VLA FOR VFR-DAY/NIGHT OPERATIONS.
FLIGHTS IN KNOWN ICING CONDITIONS PROHIBITED.
AEROBATIC MANOEUVRES INCLUDING SPINS PROHIBITED.
OTHER LIMITATIONS ACC. TO AIRPLANE FLIGHT MANUAL**

The rest of the section is the same as for the standard aeroplane.

Section 3. Emergency procedures

The same as for the standard airplane

Section 4. Normal procedures

4.4. Preparation for flight

**CAUTION
FLIGHT IN VFR NIGHT CONDITION MUST BE CONDUCT IN ACCORDANCE WITH APPLAING COUNTRY FLIGHT RULES.**

It is recommended to flight in VFR Night condition with efficiency and full charging battery. Must be ensure additional emergency light source such as torch, one for each flight crew member.
For cross country flight it is recommended to take off with maximum fuel quantity.

In purpose to reduce light flesh on the canopy plexi it is recommended to use instrument panel shade assembled per Supplement No 44 „VFR-Night (analog instruments)" to Maintenance Manual.

4.4.2. Pre-flight inspection of the aeroplane

1 *Cabin*

- Position lights – operating CHECK
- Taxiing light – operating CHECK
- Landing light – operating CHECK
- Anti-collision light – operating CHECK
- Instruments and cockpit lighting – operating CHECK
- Instruments and cockpit lighting – switch off CHECK

4.5.4. Engine starting

Cool engine procedure

- Baterry, generator, alternator ON
- Cockpit lighting ON
- Engine instruments lighting ON

4.5.5. Before taxiing

- Instruments lighting ON
- Radio equipment lighting ON
- Position lights ON
- Anti-collision light ON
- Taxiing light (if necessary) ON

4.5.12. Before landing

- Landing light ON

4.5.15. After landing

- Landing light OFF
- Taxiing light (if necessary) ON

The rest of the section is the same as for the standard aeroplane.

Section 5. Performance

The same as for the standard airplane

Section 6. Weight and balance

VFR night equipment weight is included in the empty aircraft weight.

Section 7. Description of the airplane and of its equipment

7.4. Instrument panel

Fig. 1. Instrument panel lighting

1. Dimmer „FLIGHT INSTRUMENTS”
2. Dimmer „ENGINE INSTRUMENTS”
3. Dimmer „COCKPIT LIGHTING”
4. Dimmer „RADIO”
5. Lighting of switches and circuit breakers (light posts)
6. Circuit breaker “INSTRUMENTS LIGHTING”
7. Cockpit lighting bulbs (photo does not show a light on the left side of the instrument panel)

The cabin and instrument lighting consists of four independent circuits:

- flight and navigation instruments
- engine monitoring instruments and lighting of switches and circuit breakers.
- radio equipment
- cockpit lighting

Rotating the knob to the left, to the point detectable switch function causes deactivation of selected circuit of lighting. Rotation to the right knob causes an activation and subsequent increase in lighting intensity.

Two bulb lights are installed over the instrument panel for cabin lighting. The direction of the light bulbs can be changed by rotating an internal spherical part of the light. Those lights can be used to lighting maps or if needed as a additional lighting of the instrumentation panel.

The lighting circuit is protected by a fuse labeled “INSTRUMENTS LIGHTING”.

The rest of the section is the same as for the standard aeroplane.

Section 8. Servicing

The same as for the standard airplane