Aeroprakt A-22L

# Operator & Maintenance Manual

Published to provide pilots and owners with the information necessary for the safe and efficient operation of this aeroplane.

*This Manual is under no circumstances to be used as a substitute for flight training by a qualified flying instructor.*

| | |
|---|---|
| Model designation | Aeroprakt A22L Foxbat |
| Manufacturers serial number | 2007 - |
| Registration | **24-** |
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**Record of revisions**

Any changes to the manual must be recorded in the following table according to information from the manufacturer and Australian agent

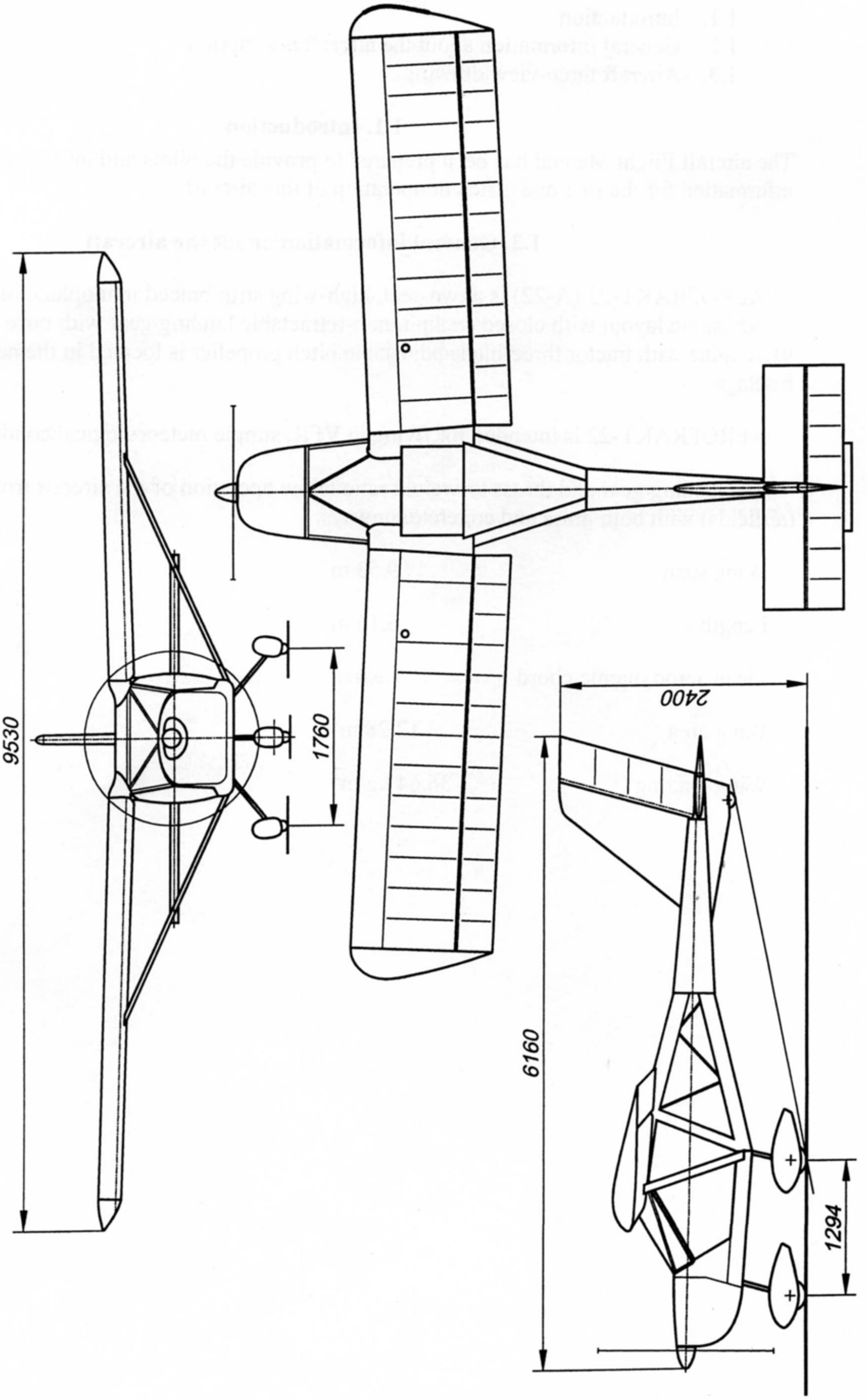
| Rev. No. | Affected Section | Affected Pages | Date | Approval | Date | Date Inserted | Signature |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

## Contents Page

***See also Operator's Manuals for***

- ***Rotax 912 engine***
- ***other (eg Radio, transponder etc) equipment***

***Fig 1: AEROPRAKT A22 FOXBAT – 3-VIEW SCHEMATIC***



## 1.0 INTRODUCTION TO THE A22

The A-22 is a non-aerobatic two seat ultralight aircraft designed for recreational flying and primary training in daytime VFR flight from grass or hard runways. It is a metal air-framed high-wing strut-braced monoplane with side-by-side seating and extensive cockpit glazing. The fixed tricycle landing gear has hydraulic brakes and a steerable nose wheel linked to the rudder pedals. The standard power unit is a 100 bhp Rotax 912ULS driving a ground adjustable 3-blade composite propeller. Two wing-tanks give a total fuel capacity of 92 litres. Standard A22 aircraft are fitted with a Rotax FLYdat digital engine instrument pack. *Ensure you are fully familiar with the FLYdat operation before you fly this aircraft – see section 10 of this manual.*

### 1.1 Airworthiness standards

**Australia** – RAA Type Accepted both as factory built and 51% kit
**Germany** – BFU-95 Type Certificate numbers 61176 (DAeC) & 600/05-121 (DULV)
**Germany** – DULV Type Certificate 600/05-121
**UK** – BCAR Section S - CAA Airworthiness Approval Note (AAN) PFA-317-432

### 1.2 Controls

Single centre stick (option: centre 'Y' 2-handle) - elevator & flaperons
Dual rudder pedals
Central flap lever in cockpit roof – 2 positions, 10˚and 20˚
Dual side throttles
Central cold start choke control
Electric pitch trim
Brake lever on control stick – hydraulic discs on main-wheels, central parking brake lock
Right and left fuel taps for wing tanks

### 1.3 Dimensions

| | |
|---|---|
| Wing span | 9.53 m |
| Length | 6.16 m |
| Height | 2.4 m |
| Wing chord | 1.4 m |
| Wing area | 12.28 m |
| Wing loading at max t/o | 36.64 kg/m |
| Main undercarriage track | 1.76 m |

### 1.4 Weights

| | |
|---|---|
| Empty weight | 263 kg. +/-2% |
| MTOW | 525 kg (450 kg for factory built aircraft registered in Australia). |
| MTOW ballistic rescue system | 472.5 kg |
| Maximum cockpit load | 172 kg |
| Minimum cockpit load | 55 kg |
| Maximum luggage bin | 20 kg |

### 1.5 CofG datum and range

Datum – Front face of propeller mounting-flange
AOD – 1.500 metres to 1.700 metres aft of datum – equivalent to 17-39% of mean aerodynamic chord -aircraft level with reference to the lower door valances.

## 2.0 PERFORMANCE

### 2.1 Take-off distance

**Normal** – Maximum 250 metres at MTOW on bitumen/short dry grass to height of 50 feet. *No flap and holding nose-wheel just "off" during the t/o run.*

**Short field** – Maximum 100 metres at MTOW on bitumen/short dry grass to height of 50 feet. *First stage flap and holding nose-wheel slightly higher during the t/o run.*

### 2.2 Rate of Climb

600-1,200 feet per minute on full power at 57kts flaps up depending on weight.

### 2.3 Cruise Speeds and Fuel Consumption

90kts / 5,200 rpm at 14 litres per hour.
70kts / 4,400 rpm at 11 litres per hour.
60kts / 4,000 rpm at 10 litres per hour.
55kts / 3,800 rpm at 8 litres per hour.

### 2.4 Rates of Descent

400 feet per minute at 52kts and "clean" (flaps up). This equates to a glide ratio around 10-11:1
750 feet per minute at 48kts and "full flap" (20˚).

### 2.5 Landing

**Normal** – Maximum 350 metres at MTOW on bitumen/short dry grass from a height of 50 feet, throttle at idle, no flap.

**Short field** – Maximum 150 metres at MTOW on bitumen/short dry grass from a height of 50 feet, use of engine and full (20˚) flap.

### 2.6 Flight Limitations

- ***Aerobatics, banked turns over 60˚, intentional spinning & accelerated stalls are prohibited.***
- ***Keep the doors, if fitted, closed in flight (doors may be removed single or together before flight).***
- ***No loose luggage.***
- ***No smoking during flight.***

[see next page for limitations]

**Load factors at MTOW**

+4 maximum positive G-load, -2 maximum negative G-load

**Side-slipping**

Permissible at maximum 15˚ bank angle and maximum 70 knots

**Speeds**

- **Vne** – (Never exceed speed) 115 kts
  *Do not exceed this speed in any operation.*
- **Vno –** (Maximum structural speed) 80 kts
  *Only exceed this speed in smooth air*
- **Va** – (Manoeuvring speed) 80 kts
  *Do not make full or abrupt control movements above this speed.*
- **Vy** – (Best rate of climb, no flap) 57 kts
- **Vf –** (Flaps extended speed) 62 kts

  Do not exceed **Vf** with the flaps extended
- **Best L/D -** (best glide speed, flaps up) 52 kts
- **Vs1 –** (Stall, no flaps & wing level) 36 kts
- **Vso** – (Stall, with full flap & wing level) 32 kts

***Note – stall speeds in turns are much higher! For example, at 60 degrees of bank angle, stall speed is 51 kts with no flap!!.***

2.7 Bank angle - Maximum 60˚ left or 60˚ right.

2.6.1 Nose up/down - Maximum 30˚up or 30˚ down.

2.8 Headwind/crosswind Take-off/Landing

The A22 has been shown to be capable of safe take-offs and landings in crosswinds of up to 15kts.

Maximum headwind component is 25 knots

***Do not exceed your own personal safe limit.***

2.9 Engine Limitations

***See your Rotax Operators Manual for full engine information.***

| | |
|---|---|
| Manufacturer | Bombardier Rotax GmbH |
| Type | Rotax 912ULS |
| Max rpm | 5800 (max 5 mins) |
| Max continuous rpm | 5500 |
| Dual ignition check | 4000 |
| Normal idle | 1800-2100 |
| Minimum idle | 1400-1800 |

Max exhaust gas temperature 880˚C (norm 760–800˚C).
Max cylinder head temperature 135˚C (norm 95–100˚C).

Min oil temperature for take off 50˚C (norm 85–110˚C)
Max oil temperature 130˚.

Min oil pressure 0.8 bar/*12 psi*
Max oil pressure 7.0 bar/*95 psi*
Normal oil pressure 2-5 bar/*30-75 psi*

## 3.0 Fuel grade

**Premium Unleaded octane rating 95** (or better) - normal use

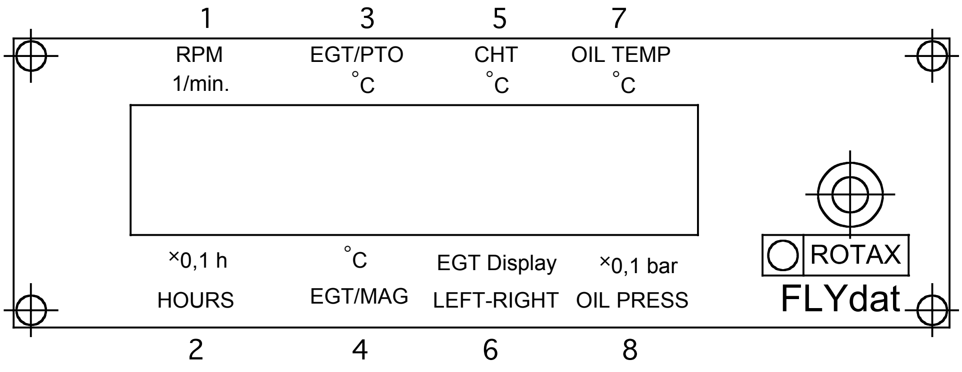
**Avgas** - acceptable providing mineral engine oil is used and changed more frequently (see Rotax Operator's Manual for details)

***See your Rotax Operator's Manual for recommended fuel and oil grades.***

## 3.0 FLYDAT ENGINE INSTRUMENTS

On the FLYdat display (see Fig 2 below) the following engine data are indicated:

***Fig 2: FLYdat display***




| | | |
|---|---|
| 1 - RPM | - engine speed, revolutions per minute |
| 2 - HOURS | - hours of operation, x 0.1 hour |
| 3 - EGT/PTO | - exhaust gas temp, propeller side, °C |
| 4 - EGT/MAG | - exhaust gas temp, magneto side, °C |
| 5 - CHT | - cylinder head temperature, °C |
| 6 - EGT disp | - l or r line of cylinders for EGT |
| 7 - OIL TEMP | - oil temperature, °C |
| 8 - OIL PRESS | - oil pressure × 0.1 bar |

The FLYdat instrument is programmed for the following:

**- standard range, safe lower and upper limits (green range);**
**- take-off mode and warn limits (yellow range);**
**- each minimum and maximum value of alarm limit (red range).**

If the engine is running at speed less then 1,400 rpm then the red lamp “Battery discharge” ignites.

If all the engine parameters are within safe (green range) limits then all their readings will be indicated by steady (non-blinking) figures. If one or more parameters are out of safe limits then their readings will blink (yellow range). At the same time alarm indicator will blink with period of 0.25 sec.

If one or more parameters are out of programmed alarm limits then their readings will be indicated by blinking figures and alarm indicator will give a steady light (red line).

### 3.1 FLYdat technical data

Design: plastic housing with Plexiglas front plate.

Weight: approx. 0.5 kg.

Display: LCD with background illumination, 2×16 8-mm digits.

Power supply: 12 V DC (min 11.8 V, max. 15 V)

Power consumption: 0.5 A max.

Excess-voltage protection: Short-circuiting of supply above 20V (fuse blows).

Fuse: 3 A.

Operating temperature: 0°C to 60°C.

Storage temperature: -20°C to +60°C.

Vibration limits: amplitude: max. 0.36mm; accelerations: max. 5 g freq: 10 to 500 Hz.

Shock limits: acceleration: max. 10 g; duration of shock: 11 ms.

## 3.2 FLYdat programmed limits

| Parameter | Red line minimum limit | Green range normal operation | Yellow range Warn limit | Red line maximum limit |
|---|---|---|---|---|
| RPM | 1400 | 1400 - 5500 | 5500 - 5800 | 5800 |
| CHT °C | - | - | - | 150 |
| EGT/PTO EGT/MAG °C | - | below 900 | 900 | 930 |
| OIL TEMP °C | 50 | 50 - 140 | - | 140 |
| OIL PRESS × 0.1 bar | 1.5 | 1,5 - 5 | 5 - 7 | 7 |

Ideal operating temperature of oil is from 90 to 110° C.

## 4.0 GENERAL HANDLING

### 4.1 Pre-flight Inspection

Using the EXTERNAL checklist provided (see appendix), start at the pilot's (left side) door and carry out a thorough walk round of the aircraft before each day's flying and if the aircraft has been left unattended for any period of time (eg. at a fly-in). The checklist should be kept in the cockpit when not in use. A copy of the external inspection checklist is provided in the appendix to these notes.

Dead bugs and raindrops do not significantly affect flying characteristics. HOWEVER:

***Never fly the aircraft if there is any frost, snow or ice present on any part of the airframe!***

### 4.2 Engine Start

***Always give proper regard to normal safety procedures.***

Using the INTERNAL checklist provided, carry out the cockpit/internal checks prior to starting. A copy of the checklist is provided in the appendix to these notes.

When the engine fires release the starter key and adjust throttle for 2100 rpm. Prevent forward movement with the brake. Check engine instrument readings – *if oil pressure is not registering and rising within 10 seconds, shut down immediately and ascertain the problem before attempting another start.* Close the choke as soon as possible. Allow at least two minutes warm-up, checking temps and pressures.

Taxi only when the oil temp shows at least 30˚C. Do not use full power until the oil temp shows a minimum 50˚C.

### 4.3 Taxi and Parking

*The A22 is easy to taxi but note that the main wheels are close to the static balance point and the elevator is effective in even a moderate slipstream. Also be aware that the throttle is very responsive in the early part of the lever travel.*

Taxi at a fast walking speed and use the standard "stick aft and into-wind" technique. If practical, park into wind when leaving the aeroplane unattended and lock the controls in a central position with the seat harnesses. Also use chocks and/or tie-downs if there is any likelihood of the aircraft moving in the wind.

### 4.4 Pre Take-off Checks

Use the PRE-TAKE-OFF checklist provided (see appendix) to carry out a power check and ensure that everything is as it should be for take off. Do not run up the engine until the oil temperature has reached at least 50˚C

### 4.5 Take-off and climb technique

The A22 has excellent STOL performance and normally flaps are not used for take off. However at maximum t/o weight on short runways (or in low-density air conditions) you may prefer to use one stage/10˚ of flap.

*Avoid using flap in a headwind greater than 15kts.*

*Flap must not be used for cross-wind take-offs!*

Set the trim for take off using the marked indicator. Line up and smoothly and progressively increase to full power (approx 5200-5300rpm when stationary). Maintain direction with the rudder pedals.

Within a few metres the nose-wheel can be raised slightly clear of the runway but don't raise it *too* high (you should still be able to see the end of the runway over the cowling). If you maintain this nose attitude the A22 will leave the ground of its own accord at about 35-40kts indicated.

Don't allow the A22 to take off below that speed. Now lower the nose slightly to an attitude equal to 55-60kts and adjust the trim as required. Check temps – pressures – rpm – balance - airspeed. Your rate of climb should be 800–1400 fpm depending on weight. If you have used flaps raise them no lower than 200 feet – *do not exceed the 62 kts flap limiting speed.* After no more than 2 minutes, if needed throttle back to 5500 rpm or less.

## 4.6 Stall Speeds and Stall Recovery

Stall speeds have been confirmed by GPS and were recorded in the UK 'first of type' aircraft after reducing airspeed at the rate of 1 knot per second. Prior to stall there is an increasing stick force and a very high nose attitude but only very slight airframe buffet.

Recover by using the SSR (Standard Stall Recovery) technique as described in the current training syllabus.

## 4.7 Spin Information

***Note: intentional spins are prohibited!***

During the A22's test programme it demonstrated a marked reluctance to spin, especially to the right. However, a spin might occur from an "out of balance" situation following a lack of pilot attention to the airspeed and attitude.

The aircraft readily responds to Standard Spin Recovery (SSR) as described in the training syllabus. If you have no SSR experience but find yourself in a spin situation your safest action is to close the throttle and *centralise* all the controls immediately.

The A22 will recover unassisted to a wings-level dive from which it can be gently recovered. *Do not apply out-of-centre forces to the control stick or the rudder pedals during recovery.*

When the spinning stops ease out of the dive without exceeding Vne, Vf or over-stressing the airframe.

*Warning. The A22 has excellent downward vision so beware of mistaking groundspeed for airspeed at low level.*

## 4.8 Cruise

You can set the A22 to cruise comfortably at any speed of your choice between 60-95kts although with the standard propeller fitted your best cruise is about 87-90kts.

Use the following method to set cruise: after climbing to your cruising altitude lower the nose slightly, allow speed to pick up and then begin to reduce power. Adjust the attitude and power whilst using the ASI and VSI to achieve your chosen level speed. Adjust trim for stick "neutral". The A22 can be trimmed to fly "hands off" throughout its cruise speed range.

## 4.9 Turning

Balanced turns are easy in the A22. It exhibits a slight adverse yaw from the roll input but this can be corrected with a touch of rudder.

At higher power settings there is a slight slipstream effect favouring entry to left turns and exits from right turns. This effect is also noticed as a few degrees of gentle pitch-up when entering a left turn and similar pitch-down when entering a right turn.

The effects are not intrusive and can easily be countered with light control inputs as appropriate.

## 4.10 Descent

First lower the nose and smoothly reduce the power to idle - typically 2500-3000rpm due to 'windmilling' of the propeller. Trim for the descent speed chosen – best glide speed is 52kts. In normal descents from a higher to a lower level keep at least 2500rpm. Increase the power briefly every 500 feet to ensure good throttle response. At the lower level increase to the required cruise power, adjust the nose attitude, and then re-trim for stick "neutral".

## 4.11 Approach and Landing

*4.11.1 Method One.* When the runway is long or the wind is strong you should choose to approach "clean" (flaps up) at a trim speed of 55kts using power as required. Begin your "round out" gently but firmly at about 25 feet and "hold off" until the stick is well back. Touchdown on the main wheels and continue to hold the stick back. As the landing speed reduces allow the stick slowly forward to lower the nose wheel *gently* onto the runway.

*4.11.12 Method Two.* When the runway is short or the wind is light your approach should be made with full flap (20˚) at a trim speed of 50kts. Use power as required but *be aware that power-induced trim changes are greater with the flaps fully extended.* Full flap reduces the stall speed, increases drag, and lowers the nose to improve your forward view.

Begin the "round out" at about 25 feet and cross the threshold at 40-45kts. "Hold off" until the stick is well back. Touchdown on the main wheels and continue to hold the stick back. As the landing speed reduces allow the stick slowly forward to lower the nose wheel *gently* onto the runway.

Do not retract the flaps until the landing roll speed is below 25 kts.

## 4.12 Side-slipping

Side-slipping in the A22 is permitted with or without flap. On approach, the best side to slip is with right rudder, giving you a better view of the runway. ***Do not side-slip at speeds under 48 kts or over 70 kts (62 kts with flap).***

## 4.13 Missed Approach and Go-round

*4.13.1 Method One.* From a "clean" flaps up approach increase power smoothly to full power whilst gradually raising the nose. The A22 will accelerate quite rapidly in this situation so be careful with ground and obstacle clearance. Establish a **60kts** climb attitude and trim for stick "neutral".

*4.13.2 Method Two.* From a short-field full flap approach increase power smoothly and sufficiently to establish a climb whilst keeping the stick in the same pitch position. *Do not exceed Vf – flap limiting speed!* Establish a **60kts** climb attitude and trim for stick "neutral".

NB: You will have to apply a forward pressure to maintain the same pitch position when increasing power for a go-round. Adjust the trim accordingly. *Do not raise the flaps* until you have climbed to at least 200 feet and are showing a positive rate of climb then select the "half flap" position and increase to full power. You could fly a small circuit in this configuration.

***Warning.* Do not raise the flaps suddenly at low level either on the approach or climb-out because, as with all aircraft, the A22 will sink noticeably as the flaps retract.**

## 5.0 EMERGENCIES

Deal with engine failure and other forced landings and emergencies according to standard procedures as outlined in the current training syllabus as taught by your flying instructor.

This section contains recommendations to the pilot for the emergency situations during flight. These situations, caused by airframe or engine malfunction can be substantially minimised by ensuring that pre-flight inspections and checks are made regularly.

### 5.1 Engine failure

1. In case of engine failure during the take-off roll, switch OFF the engine ignition system and discontinue the take-off, using braking if needed.

2. If the aircraft is at an altitude up to 150 feet switch the engine off and land straight ahead. **DO NOT ATTEMPT TO TURN MORE THAN 30˚ LEFT OR RIGHT.**

3. If the engine fails during climb over 150 feet, set the aircraft into a steady descent at a speed of 52kts and land in the best place you can see.

   **DO NOT BANK MORE THAN 30˚ WHEN TURNING.** Switch the ignition off, and land.
4. If the engine fails during climb over 400 feet, set the aircraft into a steady descent at a speed of 52kts and turn the plane toward the airfield.

   **DO NOT BANK MORE THAN 30˚ WHEN TURNING.** Switch the ignition off, and land.
5. In case of engine failure during level flight set the aircraft into steady descent at a speed of 52kts, switch the ignition off, estimate wind direction and strength, choose a place for landing and land (preferably into the wind).

5. Under favourable flight conditions try to restart the engine in flight (see paragraph ‘Restarting the engine’ below).

If landing in **WATER**, use full flap to reduce impact speed, undo seat belts and OPEN BOTH DOORS BEFORE TOUCHDOWN. Open the doors as late as possible before touching down as they cannot be re-closed, should the engine be re-started!

If landing in **DENSE VEGETATION**, sugar cane, crops etc, use full flap to reduce impact speed, and treat the top of the crop as ground level for flaring.

If landing in **FOREST**, select the densest part of the tree tops, use full flap to reduce impact speed, and use tree top height as ground level for flaring.

Note – the ballistic recovery system (if fitted) is not effective below 400 feet. Use below this height may significantly worsen the chances of a successful landing.

### 5.2 Restarting engine in flight

To restart the engine in flight:
- set the throttle to engine idle position;
- set the ignition switches into ON position;
- turn the key to the ‘Start’ position.

Alternatively, if you have enough height – at least 4,000 feet AGL – it is possible to re-start the engine by diving to ‘windmill’ the propeller.

## 5.3 Fire

In case of fire on board the pilot should act as follows:

- close the fuel taps
- set the throttle full OPEN
- when engine runs down/stops, switch the ignition OFF;
- set the aircraft into a steady descent;
- make emergency landing.

*See the current training syllabus for advice concerning rapid descents with fire on board.*

## 5.4 Landing with engine stopped

The A22 Foxbat has no peculiar handling features during a landing with stopped engine and flaps up or down. Recommended speed at descent is 52kts, entry into the flare at 15 feet, flare out at 2-3 feet, landing speed 30-35kts.

Maximum lift-to-drag ratio for the aeroplane is approximately 11.5, with flaps fully down it is about 8. So the maximum horizontal distance which the aeroplane may travel while gliding with engine stopped in still air may be calculated by multiplying the altitude by the lift-to-drag ratio.

## 5.5 Spin recovery

***WARNING: Intentional spins on the aeroplane are prohibited!***

**NOTE:** In level flight and during turns, stall approach warning is provided by the aerodynamic characteristics of the aeroplane - shaking of aeroplane structure and controls. As an option, a stall warning device may be fitted to your A22.

To recover the aircraft from an unintentional spin, push the rudder pedal opposite to the direction of spin and then push the control stick smoothly forward. When the rotation ceases put the rudder in neutral position and after reaching speed of 50kts, smoothly level off the aeroplane without exceeding +4 'G' limit.

## 5.6 Pitot system failure

### *5.6.1 **Pitot** tube blockage*

Signs of such failure:

- in level flight readings of the airspeed indicator do not change with changing speed;
- during descent airspeed readings decrease and during climb they increase.

### *5.6.2 Pilot actions:*

Do not use airspeed indicator readings. In level flight set the engine speed to 4000-4100 rpm, the airspeed in this case will be 55-60kts. While descending reduce the engine speed to idle and set a sink rate of 700 fpm - in this case the airspeed will be approximately 60kts.

### *5.6.3 **Static** tube blockage*

Signs of such failure:

- readings of airspeed indicator increase during take-off but decrease during climb down to values below minimum speed;
- airspeed indicator readings are notably unlikely;
- during descent airspeed readings increase and during climb decrease.

### *5.6.4 Pilot actions:*

Do not use the airspeed indicator. Check the airspeed by tachometer readings only.

## 5.7 Radio failure

If there is no radio transmission/reception make sure that:

- the radio is switched on;
- the frequency is set correctly;
- headset cable(s) is plugged into the radio set.

Set VOLUME to maximum, SQUELCH to OFF.

Check the radio connection on other frequencies. If the radio connection is lost the pilot should discontinue the flight, pay more attention to look-out and in any situation continue to make relevant reports about the aircraft position, pilot actions and flight conditions.

## 5.8 Flying in dangerous meteorological conditions

Flying in dangerous meteorological conditions means flying in conditions when icing is possible, during thunderstorm activity, in strong turbulence or other adverse conditions.

Pay attention continuously to weather changes. If weather conditions begin to deteriorate make your decision in time to change the route or discontinue the flight.

### *5.8.1 DO NOT FLY IN ICING CONDITIONS*

Having got into such conditions you should try to leave the hazardous area immediately, for example by descending (if safe to do so), abandon the flight and land at the nearest airfield or suitable place.

### *5.8.2 DO NOT FLY NEAR THUNDERSTORMS*

Having noticed a thunderstorm area, estimate the available time, the direction of thunderstorm movement and land at the nearest airfield or a suitable place. Tie the aeroplane down. The control surfaces must be secured with clamps or stops, the doors must be firmly closed. If possible, cover the top surface of the wing to prevent hailstone damage

Strong turbulence can be very dangerous. Avoid it in flight taking time to change the route or discontinue the flight.

If you get into strong turbulence at low altitude try climbing immediately to a higher altitude, if possible, flying away from the source of turbulence.

During intensive turbulence the airspeed must be at least 55kts and no more than 70kts, with an altitude at least 350 feet. Turns must be performed with bank angle no more than 30°. If you cannot avoid the turbulence, carry out a precautionary search and landing, trying not to exceed the limit values of speed and bank angle.

### *5.8.3 DO NOT FLY IN CLOUD*

If you inadvertently fly into cloud, fly out of it IMMEDIATELY by descending and checking your airspeed and bank angle. When the horizon line is obscured by cloud, the bank angle may be checked by the vertical orientation of the compass reel. NB: TESTS HAVE SHOWN THAT AN UNTRAINED VFR PILOT WILL LOSE AIRCRAFT CONTROL WITHIN 2 MINUTES OF ENTERING CLOUD – WITH POTENTIALLY CATASTROPHIC RESULTS. AVOID CLOUD!

### *5.8.4 AVOID WIND SHEAR*

Wind shear is the difference in wind direction and velocity at low altitudes in which the aircraft may be suddenly deflected from your intended flight path. Wind shear is most dangerous when the aircraft is at the final stage of flight, ie. during final approach.

Due to the increase of tailwind component or decrease of headwind component near the ground, your airspeed decreases, the lift drops, the sinking rate increases. Such situations may occur suddenly and you should know when and where this phenomenon may be expected and should be ready to act accordingly to ensure safe flight and landing.

Most often the wind shear is connected with:
- descending below higher ground, large buildings or trees when on final approach;
- passing weather fronts;
- forming of thunderstorm clouds;
- significant inversion at 150-700 feet altitude.

When expecting wind shear, approach at 55kts minimum. You should be ready to increase engine speed to full power and go-around.

### *5.8.5 AVOID WAKE TURBULENCE*

Getting into wake turbulence of another (especially large) aircraft is very dangerous. Wake turbulence is created by propeller slipstream, wing and fuselage generated vortices. Getting into wake turbulence may cause a complete loss of aircraft control. The most dangerous wake turbulence is during the take-off, initial climb, final approach and landing, although it can be experienced at any time when flying behind other aircraft.

## 6.0 MISCELLANEOUS

The A22 should be operated only under the conditions of its Type Acceptance. The conditions of the certificate are detailed in the Annex of the Type document and as the pilot it is entirely your responsibility to be conversant with them. Amongst other things they prohibit aerial work (other than training), flight over settlements and built-up areas, night flying, and flying in bad weather. You should also be aware that the A22 has not been cleared for parachute dropping, or banner or glider towing.

### 6.1 Some useful "Do's & Don'ts"

Do's….

- Do ensure that you always carry out all pre-flight external and internal checks before flying
- Do ensure you are fit to fly and not taking medication or anything else which could affect your fitness to fly
- Do observe the flight and other limitations included in the Flight Manual
- Do keep your aircraft clean – in particular, regularly check inside the wheel fairings (if fitted) for accumulated debris – as weight can build up over time
- Do fly within your capabilities – in particular, always be ready to 'go around' if the landing isn't right
- Do become completely familiar with the flying speeds – maximum, cruise, climb, glide and, in particular, flap limiting speeds

Don'ts….

- Do not fly the A22 in poor weather conditions.
- Avoid flying over terrain that offers no forced landing options.
- Do not fly over water unless you have survival equipment and proper communications. *Wear a lifejacket and open both doors before ditching.*
- Avoid flying over inhospitable terrain unless you have suitable survival equipment and proper communications. *Take water and food.*
- Do not fly above 10,000' without oxygen.
- Do not chat to your passenger during take-off, circuit departure/rejoin, approach, or landing. *Focus on flying and maintain the right nose attitude.*
- Do not make out-of-balance turns, *especially at low level*.
- Do not make sideslip approaches below 48kts.

***REMEMBER – Aviate – Communicate – Navigate***

# 7.0 A22 FOXBAT - DETAIL DESCRIPTION

## 7.1 Airframe

*7.1.1 Wing:* high placed, strut braced, constant chord, forward swept.

*Washout:* 2.5°.

*Wing section:* Antonov P-IIIa, thickness - 15.5%.

*Wing construction:* leading edge skin and spar creating wing "D" section, ribs and "J"-shape aft web are made of aluminium.

Leading edge skin, ribs and aft web are made of Alclad 2024 sheet aluminium 0.5 mm thick.

Spar: caps of extruded aluminium angles riveted to the aluminium web 0.8 mm thick.

Root wing section has aluminium skin (both upper and lower) 0.8 mm thick between the spar and aft web creating a root box structure withstanding local wing bending and torque.

Wing is hinged to the fuselage through fittings on the spar and aft web. Between ribs No 7 and 8 there is a fitting fastened to the spar with bolts for the wing strut attachment. Ribs No 1, 5, 9, 13 are reinforced (made of 0.8 mm sheet) and are fitted with brackets for flaperon hinging.

The flaperon has similar structure, all its parts are made of 0.5 mm aluminium sheet. Both wing and flaperon have fabric covering.

*7.1.2 Fuselage:* all-metal construction: middle portion is made of aluminium sections bent of 1.5-2.0 mm sheet forming fuselage edges. Rear portion (tail boom) is made of 0.8 mm aluminium sheet and essentially a monocoque structure. Nose portion of the fuselage (engine cowling) is made of composites.

Fuselage has 5 frames. Frames 1, 3, 4 and 5 are made pressed of aluminium sheet, frame 2 is assembled from bent sheet sections. Engine mount attachment fittings are installed on frame 1 and the engine truss is included into fuselage load-carrying structure helping fuselage to withstand the loads from nose landing gear. Frames 3, 4 and 5 together with skin form the monocoque. Middle portion of the fuselage is covered with corrugated 0.8 mm aluminium sheets on bottom and partly on top. Cockpit glazing is made of organic glass.

*7.1.3 Stabiliser:* structure consists of ribs, spar and 0.5 mm aluminium sheet skin. Stabiliser has attachments to the fuselage and 3 hinge brackets for elevator attachment. Fin is structurally similar to stabiliser and is non-detachable from fuselage. Elevator and rudder structure is similar to that of flaperons.

## 7.2 Control system

Aeroplane control system includes controls for ailerons (flaperons), elevator, elevator trim tab, rudder and wheel brakes. The primary controls are dual. Ailerons and elevator are controlled using a single centre stick attached to shafts sliding through bearings in the main bulkhead. The stick is connected with rods and bell-cranks providing synchronisation of their motion (rotation) for lateral control (in roll).

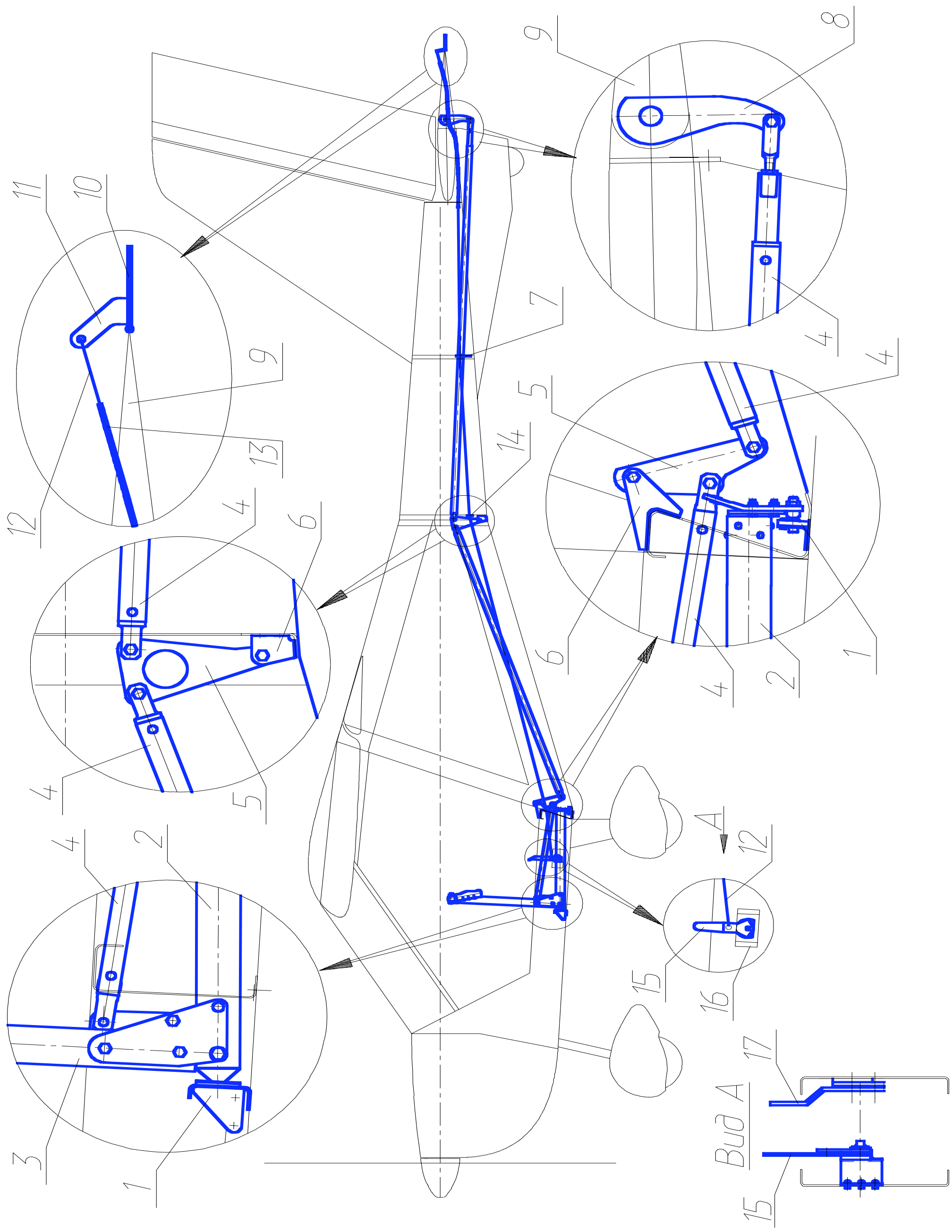
## 7.3 Elevator

Elevator control system (see Figure 3) linkage consists of three rods and two bell-cranks. The bell-cranks are installed at frames No. 2 and 3.

***Fig 3: Control Systems***

1 - control column bracket;
2 - control shaft;
3 - control column;
4 - rod;
5 - bellcrank;
6 - bracket;
7 - rod support;
8 - elevator arm lever;
9 - elevator;
10 - trim tab;
11 - trim tab arm lever
12 - cable;
13 - cable cover;
14 - cable guide;
15 - trim tab control lever;
16 - lever bracket;
17 - choke lever

Elevator deflection angles: upward 25 ± 1° (UK – 22 ± 1°), downward 22



## 7.4 Elevator trim tab control system

Elevator trim tab is used for controlling the force on control stick in pitch. Australian A22s use an electric trim system. The electric trim tab control buttons are accessible on the control stick. Trim tab is connected to the servo with a cable. The trim tab control cable runs through two guides at frames 2 and 3 and through the flexible conduit (Bowden cable cover) - to the trim tab arm lever. The trim tab is hinged to the elevator trailing edge on stiff wire serving also as a torsion spring. The trim tab angles of deflection are: upward 20 ± 1°, downward 30 ± 1°.

## 7.5 Rudder and nose landing gear control system

Rudder and nose landing gear are controlled using pedals. Rudder is connected to the pedals in the cockpit with two cables (diameter 2.5 mm). The pedals are attached to two shafts (one shaft for left pedals and one for right pedals) hinged to the lower fuselage beams. Each shaft has two arms. One of the arms is connected with a cable to the rudder, the other - with a rod - to the nose landing gear. Rudder control cables run from the pedals to the rudder arm levers via pulleys on frames 2 and 3 and guides on pilot seat beam and frame 4. Tension of the cables is adjusted using turnbuckles attached to the pedal shaft arm levers. The rudder angle of deflection (to each side) is 21 ± 1°. (See Fig. 4 for details of the rudder and nose gear control system)

## 7.6 Control system of flaperons (drooping ailerons)

The aeroplane has full-span slotted ailerons, which also can be simultaneously deflected downward and so used as flaps. Independent deflection of the flaperons both for roll control and for increasing the lift is provided by the aileron droop mechanism attached to frame 2 (behind the pilot seats) inside the rear section of the fuselage. Flaperon control linkage consists of rods, and its main elements are shown in fig.5.

For lateral control (in roll) there are rods attached at one end to control stick bell-crank and at the other to aileron control shafts. The shafts are attached at one end with a universal joint to the ailerons and at the other end to the pins on droop lever.

Deflection angles of the flaperons (as ailerons): upward 20 ± 1°, downward 13 ± 1°.

Flaperons can be deflected as flaps by manually raising and lowering the handle of the aileron droop lever. The lever is held in position by means of a comb plate with 3 grooves/notches accepting the droop lever pin. Release of the droop lever is achieved by moving the flap deflection handle to the right. The handle lever pulling a Bowden cable in cover rotates the comb plate (clockwise on the figure) and disengages the pin-slot fixator. Fixation of the lever is provided by a spring on the comb plate axle returning the comb plate to initial position. Rear end of the droop lever lowers the flaperon control shafts and at that the aileron control levers are rotated about the hinges in the roll control rod ends thus causing aileron droop.

Deflection angles of the flaperons (as flaps): $1^{st}$ position - 10 ± 1°,
$2^{nd}$ position - 20 ± 1°.

***Fig 4: Rudder and nose landing gear control system***

1 - nose landing gear
2 – rods
3 – pedals
4 - pedal support
5 – turnbuckle
6 – cable
7 – guide
8 – pulley
9 - rudder.

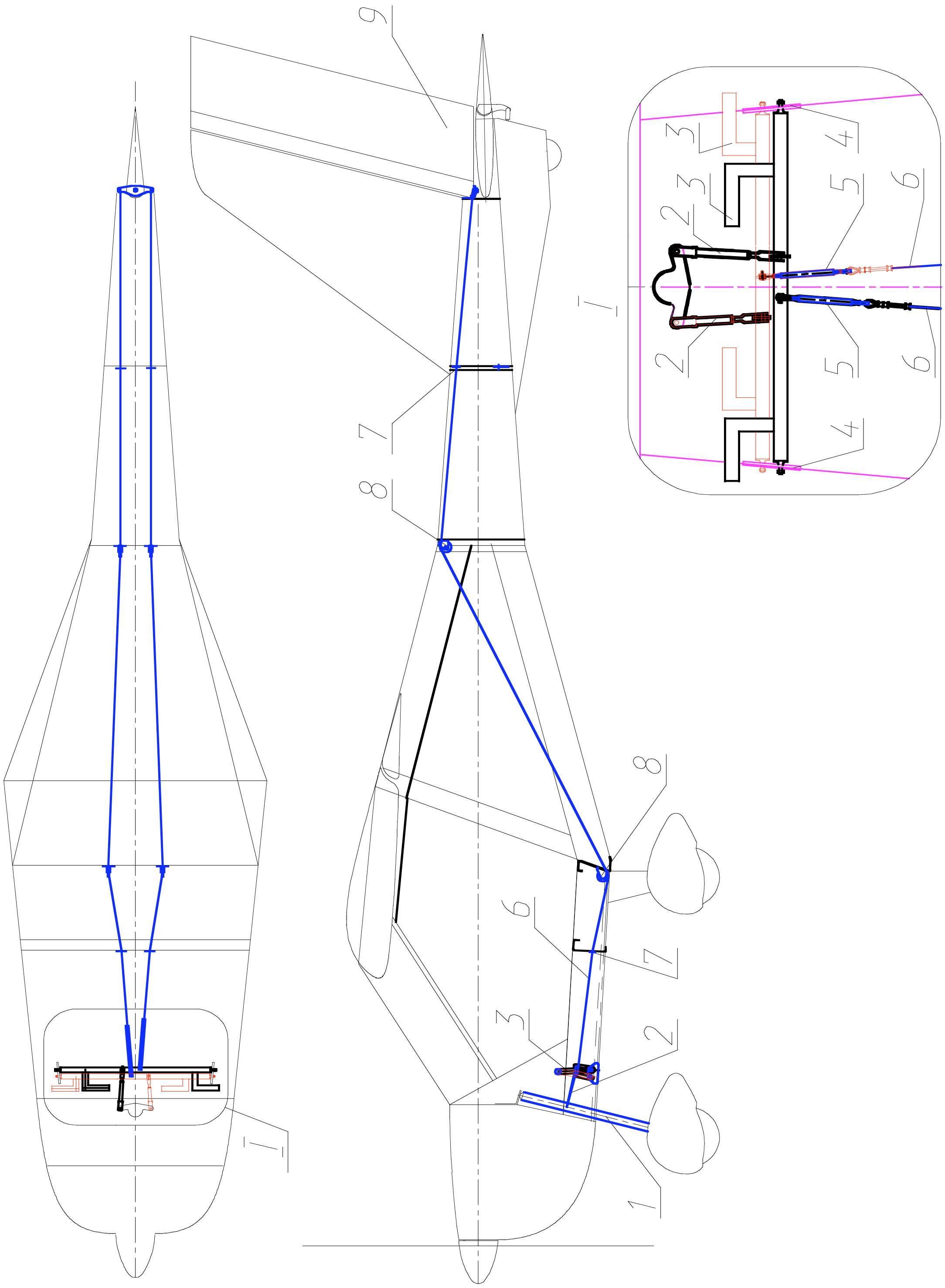
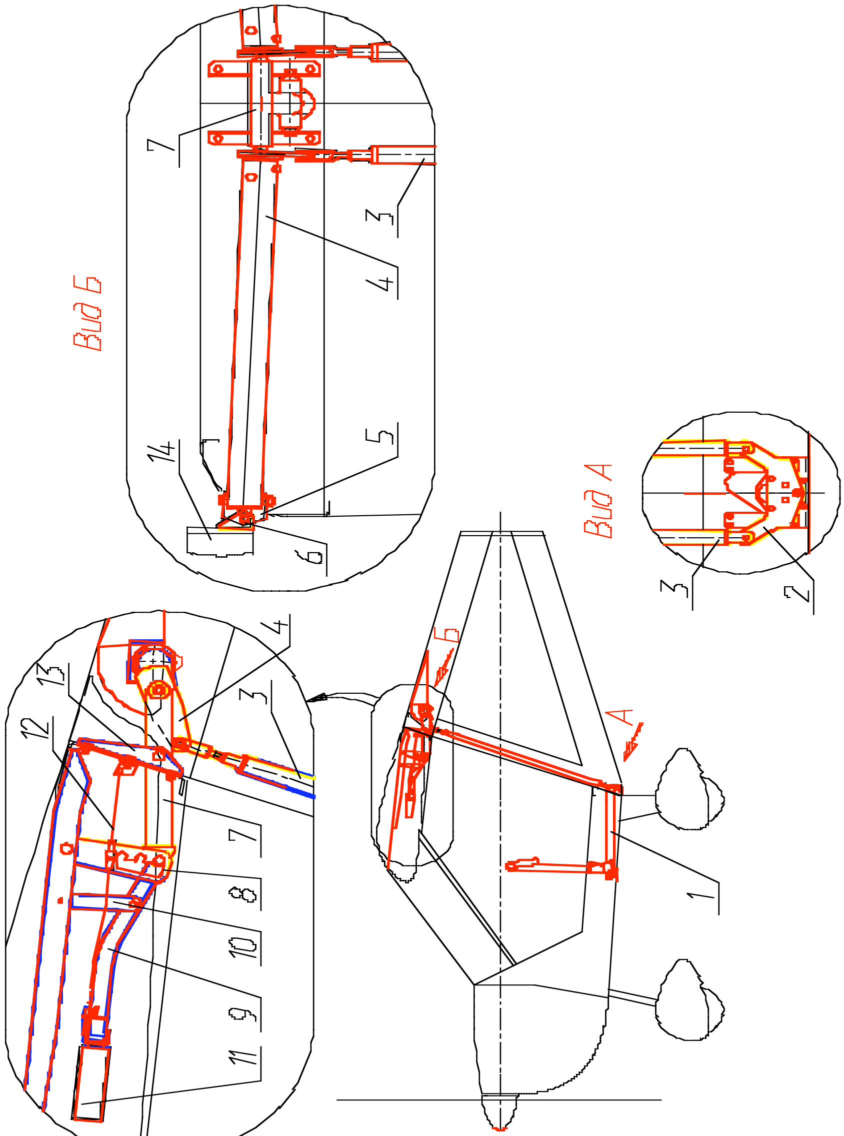


***Fig 5: Aileron droop mechanism ('flaperons')***

Main components:

1 - control column
2 - control column bellcrank
3 – rods
4 - lever with shaft
5 - universal joint;
6 - flaperon bracket
7 - droop lever
8 – combplate
9 - control lever
10 – shackle
11 – handle
12 - cable with cover
13 – bracket
14 - flaperon.

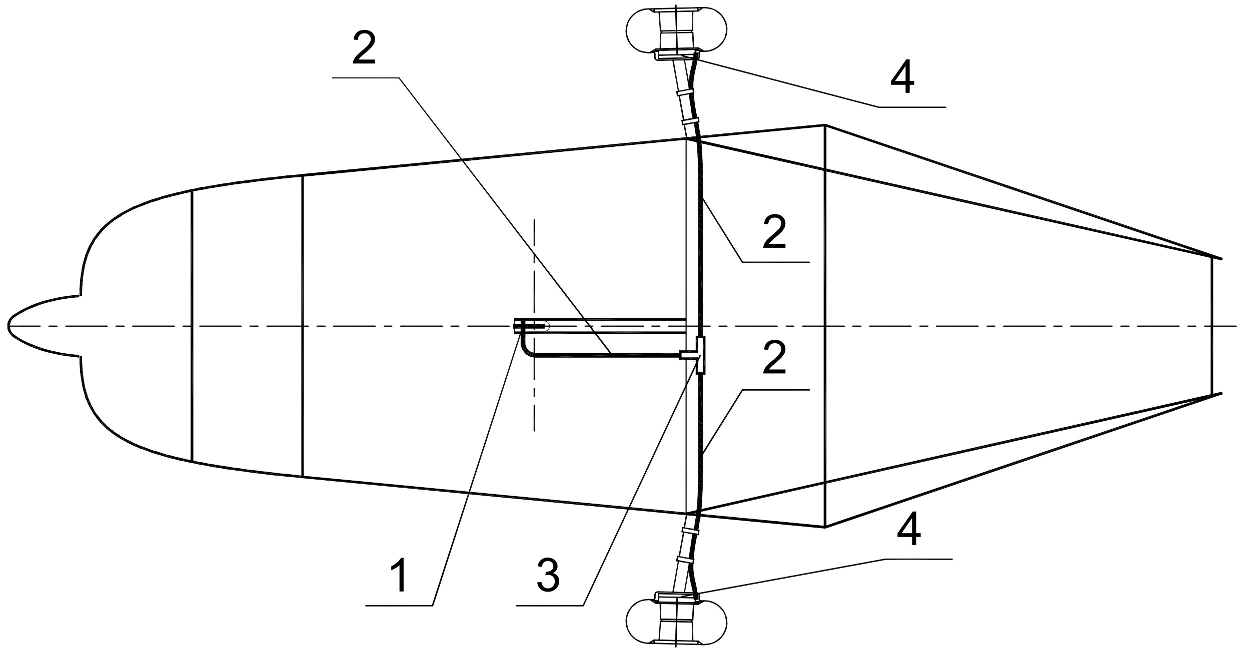


## 7.7 Brake control system

The main wheel brakes are actuated by a lever mounted on the control column. Each brake consists of braking pads and disk fixed to the wheel hub. The pads are actuated by a slave cylinder connected to the master cylinder with hydraulic lines. (See fig.6) When the pilot pulls the brake lever the pads are pressed to the disk thus providing the braking moment depending on the force applied to the control lever.

***Figure 6: Brake control system***

1 - control lever
2 - hydraulic lines
3 - T-connector
4 - brake disks.



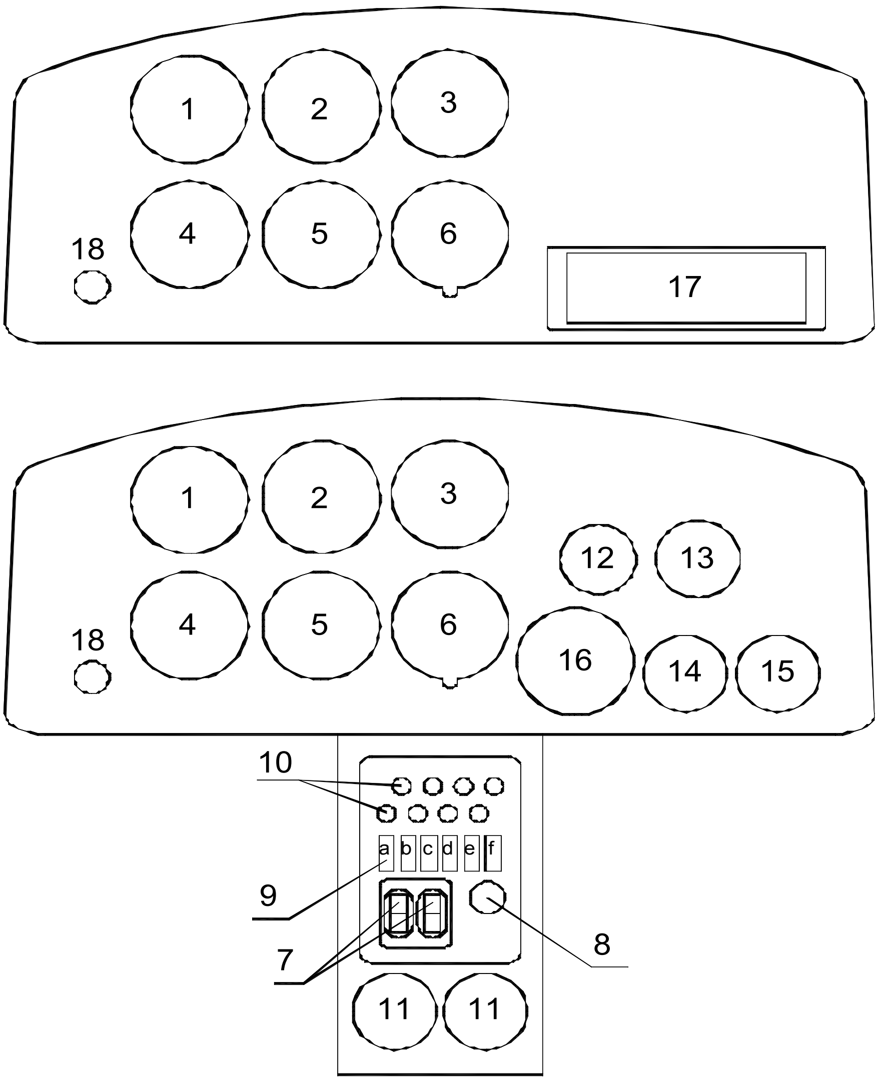
## 7.8 Instrument panel

The standard placement of instruments and switches on the instrument panel and electric board is shown in the alternatives in fig.7. Other layouts may be requested by customers.

***Figure 7. Instrument panel arrangement***

1 - air-speed indicator
2 - artificial horizon (optional)
3 - altimeter
4 - reserve
5 - directional gyro (optional)
6 - vertical speed indicator
7 - ignition switches
8 - start key
9 - switches: a - fuel level indicators; b - radio; c - strobes; d - navigation lights; e - landing light; f - reserved

10 - fuses
11 - fuel level indicators
12 - water temperature
13 - tachometer
14 - oil temperature
15 - oil pressure
16 - radio
17 - FLYdat
18 - cockpit heating controls



## 7.9 Landing gear

The aeroplane has tricycle landing gear with steerable nose wheel. Main landing gear has two steel spring legs each attached with two welded steel brackets to the lower boom of frame No.2. The main wheels have hydraulic disc brakes. Nose landing gear is of telescopic design. It is connected with rods to the rudder pedals for steering. The nose leg consists of an oleo and a rod with wheel fork. The cylinder is connected to the rod with a steel spring (glass fibre composite spring on early models) serving simultaneously as torque link and shock absorber (80 mm travel). The nose leg is attached to frame No. 1 at two points - lower and upper brackets. The brackets have bronze bearings. Each wheel is enclosed in a wheel spat.

### 7.9.1 Landing gear data:

- wheel base - 1700 mm,
- wheel track - 1300 mm,
- turn radius - 3.3 metres.

### 7.9.2 Main landing gear:

- wheel camber at MTOW - 7 degrees,
- wheel convergence at MTOW - 1.5 degrees
- size – 6x6.00 Matco MH series
- inflation - 14psi max

### 7.9.3 Nose landing gear:

- size – 6x6.00 Matco MH series
- steering angle ±30 degrees
- inflation - 14psi max

## 7.10 Seats and harness system

As standard fitment, there are two height adjustable soft seats with adjustable safety belts with buckles. Optional non-adjustable fibre-glass frame seats with cushions may be fitted. The seats are mounted on top of two lateral beams. Prior to seating in the cockpit the pilot should adjust the seats according to height and the belts to their longest length. After entering the seat, the pilot should fasten the belt and adjust it according to stature. The seat design, with properly adjusted and fastened belts, does not hamper pilot actions for full control and also protects from injuries if pilot and passenger are subjected to inertia loads.

## 7.11 Entrance doors

The entrance doors are made of organic glass and a metal tubular frame. The doors open upward. In opened or closed position the doors are retained by gas struts. When closed the doors are secured with catches. When open the doors allow unrestricted and quick access into and out of the cockpit in any normal or emergency situation. There are rotating window scoops on both left and right doors for air ventilation, preventing glass misting and for providing visibility in rain or snow during landing.

One or both doors may be removed before flight without any serious deterioration of flight characteristics. The doors MUST NOT BE OPENED IN FLIGHT as this could cause serious adverse flying effects, even the detachment of the door, with potential damage to the tail.

## 7.12 Power plant

The aeroplane is equipped with a four-stroke four cylinder Rotax-912ULS engine manufactured by BOMBARDIER-ROTAX GmbH company (Austria). The engine has 4 opposed cylinders, a dry crankcase lubrication system, separate 3 litre oil tank, automatic adjustment of valve clearance, two carburettors, mechanical fuel pump, double electronic ignition system, integrated water pump, electric starter, integrated reduction gearbox. All engine systems (fuel, electric, cooling system) are mounted according to the Operator’s Manual for the Rotax-912 engine. Propeller: three-blade, on ground adjustable pitch. Propeller diameter 1.71 m.

## 7.13 Engine control system

The engine has dual throttles which can be used from each seat. The throttles are on the outer side of each seat. The throttles are interconnected with a shaft and a rod. The throttles have cable linkages. Fuel mixture control (choke) is performed via a lever on the central console between the seats.

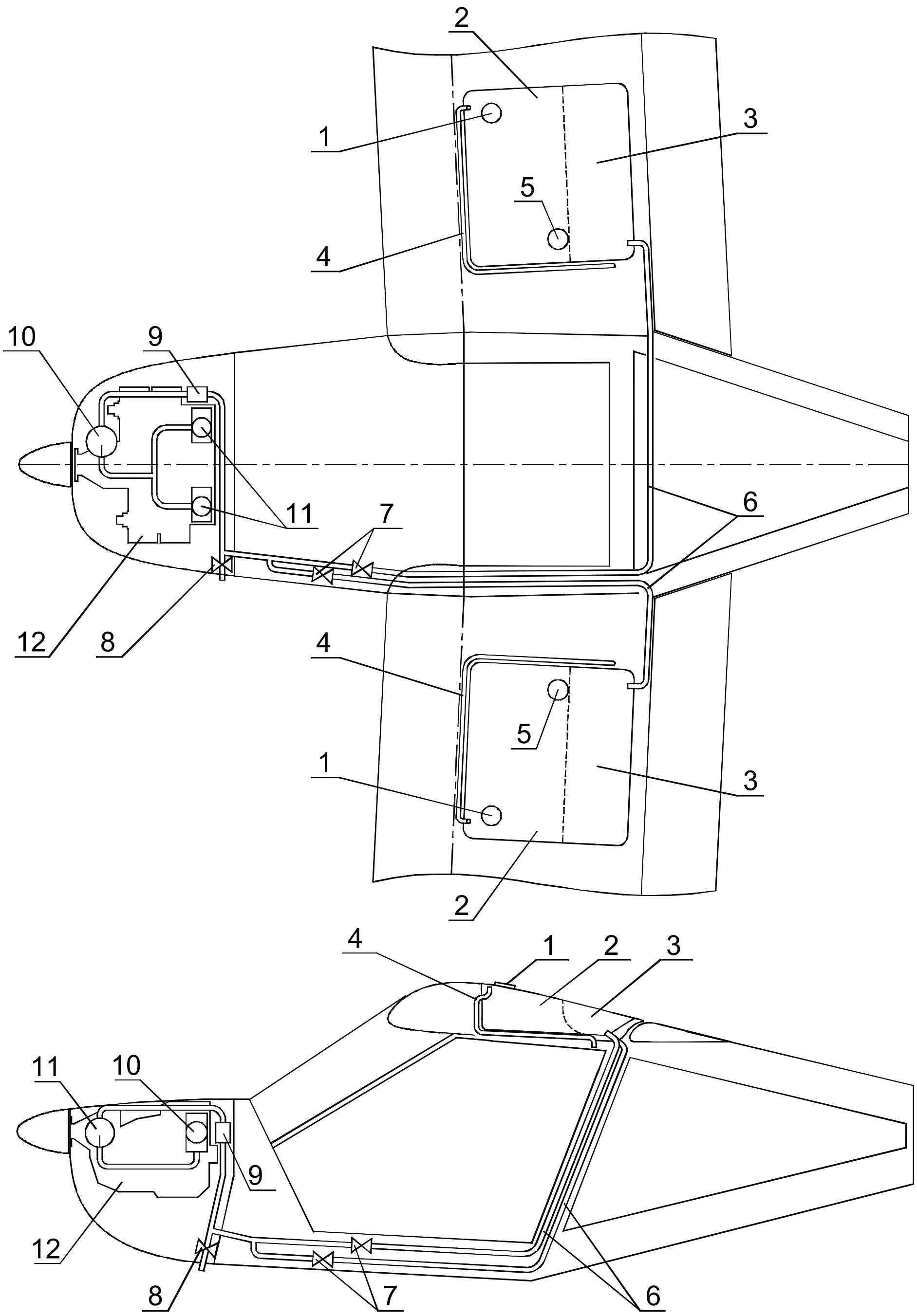
## 7.14 Fuel system

The fuel system is arranged according to recommendations of the Operator’s Manual for the Rotax-912 engine (see fig. 8)

***Figure 8. Fuel system schematic***

Current aircraft are fitted with a fuel vapour return line to the right/starboard fuel tank. Please see Service bulletins for guidance on fuel management.

1 - filler cap
2 - fuel tank
3 - fuel tank feed section
4 - fuel tank vent lines
5 - fuel probes
6 - feed fuel lines
7 - shut-off valve
8 - drain valve
9 - fuel filter
10 - fuel pump
11 – carburettors



## 7.15 Electrical system

The electrical system is wired according to Rotax-912 engine Operator's Manual (see fig.9).

***WARNING: On all matters concerning the engine, its systems and accessories refer to the Rotax engine operator's manual.***

### *7.15.1 A-22 electrical system description*

The electrical system is designed to provide safe engine operation. It comprises of the following main components:

- ignition unit;
- engine instruments;
- electric cables and wiring;
- electric power supply system;
- control panel

### *7.15.2 Ignition system*

The engine is equipped with a dual ignition unit of a breakerless, capacitor discharge design, with an integrated generator (see ignition system diagram in the engine Operator's Manual for details). The ignition unit is completely free of maintenance and needs no external power supply.

Two independent charging coils located on the generator stator supply one ignition circuit each. The energy is stored in capacitors of the electronic modules. At ignition the two external trigger coils actuate the discharge of the capacitor via the primary circuit of the dual ignition coils. The firing order of fuel mixture in the cylinders is 1-4-2-3.

### *7.15.3 Installation of ignition box*

There are two electronic units and 4 double ignition coils in the interference damping box (see the diagram). The electronic units are installed on the engine on rubber shock absorbers.

### *7.15.4 Electric power supply system*

Electric power supply system consists of an integrated generator, rectifier-regulator, capacitor, battery, safety fuse block and power supply switch. The integrated generator is a permanent magnet 10-pole single phase 250w AC generator.

For the DC supply an electronic voltage regulator with full-wave rectification is used (brand: Ducati, Rotax No. 965 345 with connector housing 965 335). The DC-output over engine speed is shown in a table in the engine installation instructions.

The capacitor ensures that if the battery fails, the control function of the regulator will continue and therefore voltage peaks will be avoided.

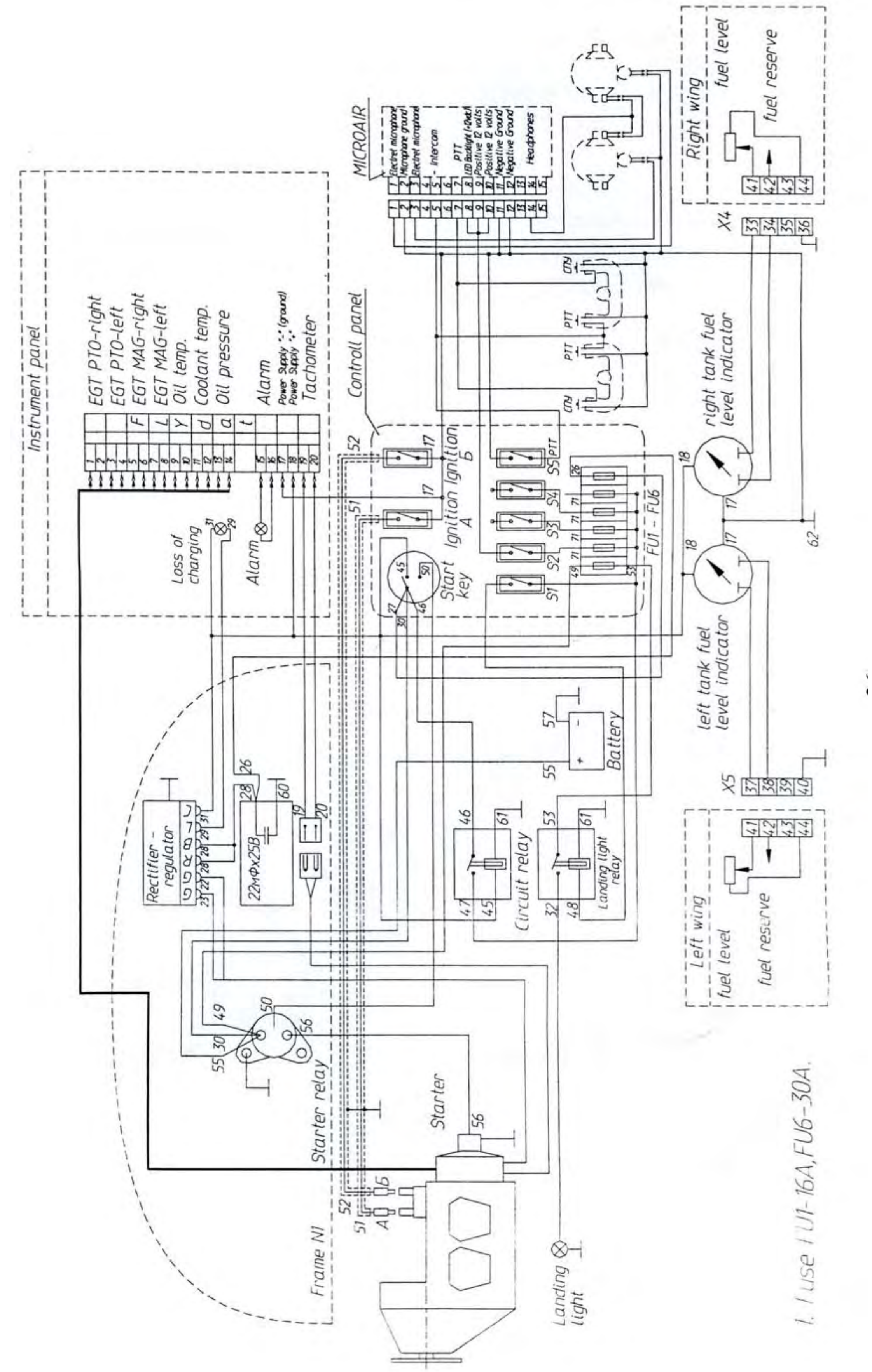
### *7.15.5 Charge control circuit*

The battery charge control circuit consists of rectifier-regulator block and has two terminals: L and C on connector block. C terminal is connected after the master switch and thus controls the system switching off. L terminal is connected via the indicator lamp 12V 0.2A to C terminal output and intended for checking the battery charge level and system operation state. With a faulty charge control circuit the charging indicator lamp is either permanently on or off. However even with faulty charge control circuit (e.g. by overload) the generator and regulator (power and control circuit) might be working correctly.

The control panel is located on the instrument panel. It consists of system switch-off and engine start lock and of two ignition toggle switches.

The electric wiring is made of aircraft grade wire of 0.75, 1, 2.5 and 6 $mm^2$ cross-section area. 0.75 $mm^2$ wire is used for connection of the engine thermocouples and sensors. 1 $mm^2$ wire is used for connection of FLYdat power supply, starter relay and ignition coils. 2.5 $mm^2$ wire is used for battery charge circuit. A 6 $mm^2$ cable connects the starter and battery.

***Figure 9 - Electric system wiring diagram***



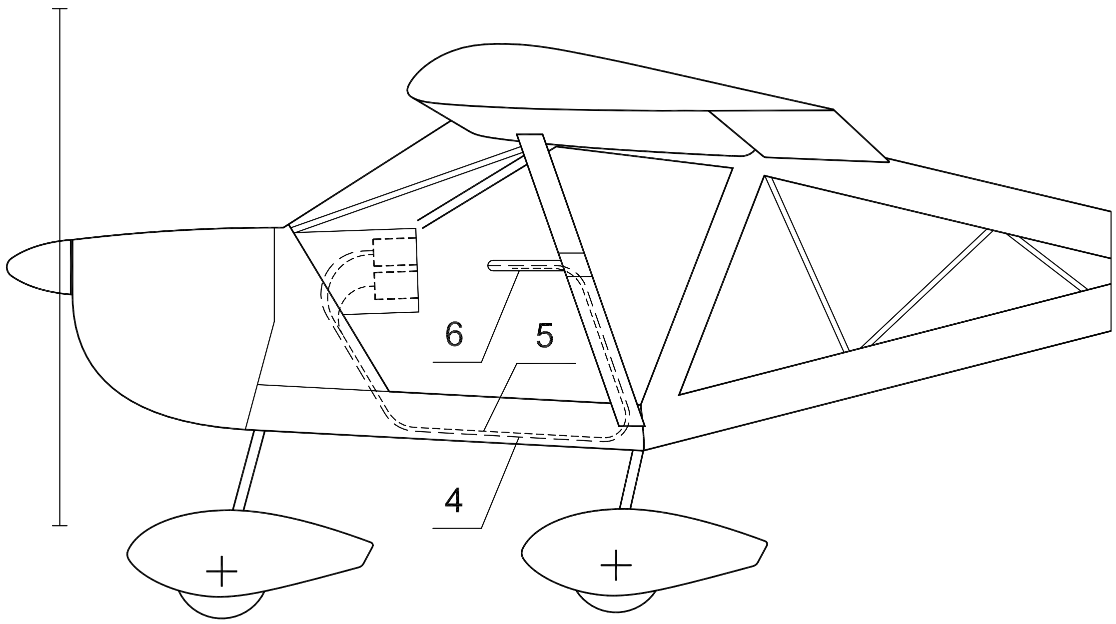
## 7.16 Pitot and static pressure system

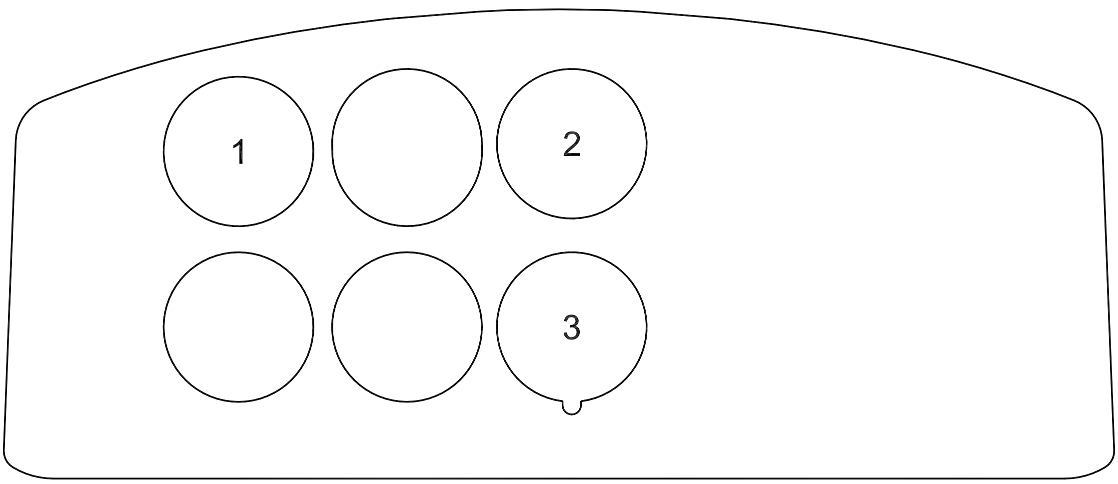
The Pitot tube is attached to the left-hand wing strut and is connected with the full and static pressure lines (transparent tubes) running inside the strut into the cockpit and then - to the airspeed indicator, VSI and altimeter.

***Figure 10. Pitot and static pressure system***

The pitot and static pressure system consists of (see fig.10)

1 – Airspeed indicator
2 – Altimeter
3 – VSI
4 – Pitot pressure line
5 – Static pressure line
6 – Pitot tube



# A22 SERVICING AND MAINTENANCE

## 8.0 A22 SERVICING AND MAINTENANCE

### 8.1 Parking/storage

Extended parking of A-22 aeroplane is possible in a hangar or in the open air. In the latter case the aeroplane should be parked in a place equipped with tie-downs. When parking the aeroplane take into consideration the prevailing wind direction. The aeroplane should be parked with its nose into the wind. The tie-downs must be secure in strong wind conditions. The aeroplane is tied at three points: upper, on the wing strut fittings and on the nose landing gear leg.

***NOTE: Do not pull the tie-downs too tight or they will overload the wing structure and cause deformation.***

*8.1.1 When keeping the aeroplane in the open air do the following:*

1. Secure the wheels with wheel chocks from both sides; put the nose wheel in neutral position.
2. Fix the elevator, rudder and ailerons in neutral position with screw clamps.
3. Cover the engine, canopy and Pitot tube with protective covers.
4. If parking outside in poor weather, try to cover the flying surfaces with suitable covers, with appropriate ventilation.

Particular attention should be given to protection of the aeroplane from corrosion. Mainly this consists of keeping the protective coatings intact. Good care of fabric covering of the wing and tail is important for maintaining the aeroplane's excellent flight performance and reliability.

*8.1.2 For keeping the fabric covering in good condition do the following:*

1. Regularly clean the covering of dust, dirt, moisture, frost and snow.
2. Protect it from scratches.
3. Avoid petroleum derivatives, solvents, alkali and acids coming into contact with the covering.

***WARNING: DO NOT FLY the aeroplane if its fabric covering has a slightest tear, particularly on the top surfaces of the wings. Ensure professional repair is carried out before flying.***

The canopy is made of an organic glass. Wipe it with a clean, soft piece of cotton fabric, flannel or suede soaked in soapy water. Oil stains should be removed with cotton wool soaked in kerosene. A proprietary cleaner such as 'Plexiplus' is excellent. ***Do not use petrol, solvents and acetone as they cause glass clouding and discolouration.***

### 8.2 Airframe maintenance schedule

*8.2.1 During the pre-flight inspection the pilot should always check:*

1. Airframe and fabric covering for absence of damage.
2. Locking of joints.
3. Control surfaces motion and secondary control system condition.
4. Landing gear condition, rotation of wheels, inflation of tires (visually).
5. Harness system.
6. Pitot and static ports.
7. Condition of flight instruments.
8. Engine condition (according to the engine operator's manual).
9. Condition of propeller. (Cracks, nicks and other damage of blades, paint condition).
10. Engine mount condition (fittings and shock absorbers).
11. Exhaust system (for secure attachment of its parts).
12. Fuel system for absence of fuel leaks.

*8.2.2 After the flight the pilot should do the following:*

1. Perform the same checks as before the flight.
2. Make appropriate notes into the aeroplane log book.

## 8.3 General maintenance

***NB: See the Rotax engine manufacturer's operational and maintenance manuals for details of engine maintenance!***

***Please join/subscribe to the Rotax engine manufacturer's Service Bulletin system as soon as possible!***

*The airframe maintenance actions described below should be performed according to the maintenance plan shown in the table below.*

1. Check the condition of the entire aeroplane structure paying particular attention to the elements loaded in flight and during take-off and landing.
2. Inspect the condition of the primary structural members and check any play in the airframe main joints.
3. Check the engine condition according to its operator's manual.
4. Inspect the engine mount system.
5. Check the engine cowling locks condition.
6. Inspect the propeller.
7. Check the locking of aeroplane component joints.
8. Check that the entrance doors open & close properly.
9. Check the control surfaces condition and correct motion.
10. Check the control systems for friction in linkage and excessive forces.
11. Inspect main and nose landing gear and check the brake operation.
12. Check the flight instruments condition and their correct operation.
13. Inspect the outer metal structure elements for absence of damage of the protective coating and corrosion. Check the fabric covering condition.
14. Clean and lubricate the bearings and hinge joints.
15. Check the control surfaces deflection.

### *8.3.1 The airframe maintenance schedule is given below in the table:*

| *Period of time, or condition, for maintenance work* | *Work to do (see the plan above)* |
|---|---|
| Every 12 months | 1 - 14 |
| After every 50 flight hours | Change engine oil and filter |
| After every 100 flight hours | 1 – 13<br>Check/replace spark plugs |
| After a rough landing | 1 - 11 |
| At the end of flight season, before extended storage, or at least every 12 months | 1, 12, 13 |
| After 1000 flight hours/2000 landings | Items 1-15 |
| After 1500 flight hours | Mandatory strip down & inspection of engine |

## 8.4 Aeroplane transportation

The aeroplane can be towed on the ground (within the airfield area) by the crew or by a car. The entrance doors must be closed. Speed of towing by car should not be more than 10 km/h. The towing rope should be tied to the nose landing gear leg near its attachment to the fuselage.

The dissembled aeroplane can be carried by road: on a truck or by a car with a specially equipped trailer. In this case particular attention must be paid to securing of aeroplane parts. The wings and stabiliser with rudder must be transported in special cradles.

## 8.5 Aeroplane dissembling

Aeroplane dissembling includes disconnection of the following main components of the aeroplane:

- left and right wings
- horizontal tail
- propeller
- engine.

### *8.5.1 Wing disconnecting procedure (see fig.11):*

Before dissembling the aeroplane disconnect the push-rods from the flaperons at their top ends inside the cockpit.

1. Empty the wing tanks.
2. Disconnect the aileron control shaft.
3. Remove the wing strut braces by disconnecting them from the wing and fuselage while supporting the wing.
4. Disconnect the wing at its forward and rear hinge fittings.

It is recommended after disconnecting the wing to insert all the fasteners back and lock them with safety wire or pins so you don't lose them! It is also important to lock wire the spherical bearings in the following places:

- forward and rear wing fittings;
- wing fitting for the strut brace;
- flaperon rods.

### *8.5.2 Disconnect the stabiliser (see fig.12)*

1. Disconnect the control cable from the trim tab arm.
2. Disconnect the rudder rod from the elevator arm.
3. Undo the nuts from the attachment bolts and remove the stabiliser.

Insert all fasteners back and secure them. Insert the disconnected wing and stabiliser into their cradles.

### *8.5.3 Propeller removal:*

Before dismantling the engine from the aeroplane remove the propeller as follows:

- remove the locking wire from the studs;
- undo nuts and remove the studs;
- remove the propeller by pulling gently by its hub.

When installing the engine on the aeroplane propeller should be installed in reverse order. Locking of the nuts on the studs should be done in such a way that the lock-wire prevents loosening of the nuts. The disassembled propeller should be carried in a soft package.

### *8.5.4 Engine removal:*

Engine removal should be completed in the following order:

- remove the engine cowling panels;
- drain the cooling liquid and close all drain openings with plugs;
- remove the radiator;
- drain the oil and close all drain openings with plugs;
- disconnect electrical system cables;
- disconnect the throttle and choke control cables;
- disconnect fuel lines;
- drain the fuel from the float chambers of the carburettors;
- remove the exhaust muffler;
- remove the safety pins from engine mount bolts (shock absorbers);
- undo the nuts, take out the bolts and remove the engine together with its mount.

Engine installation should be performed in reversed order. After installation of the engine, re-install the propeller.

### 8.6 Aeroplane assembling

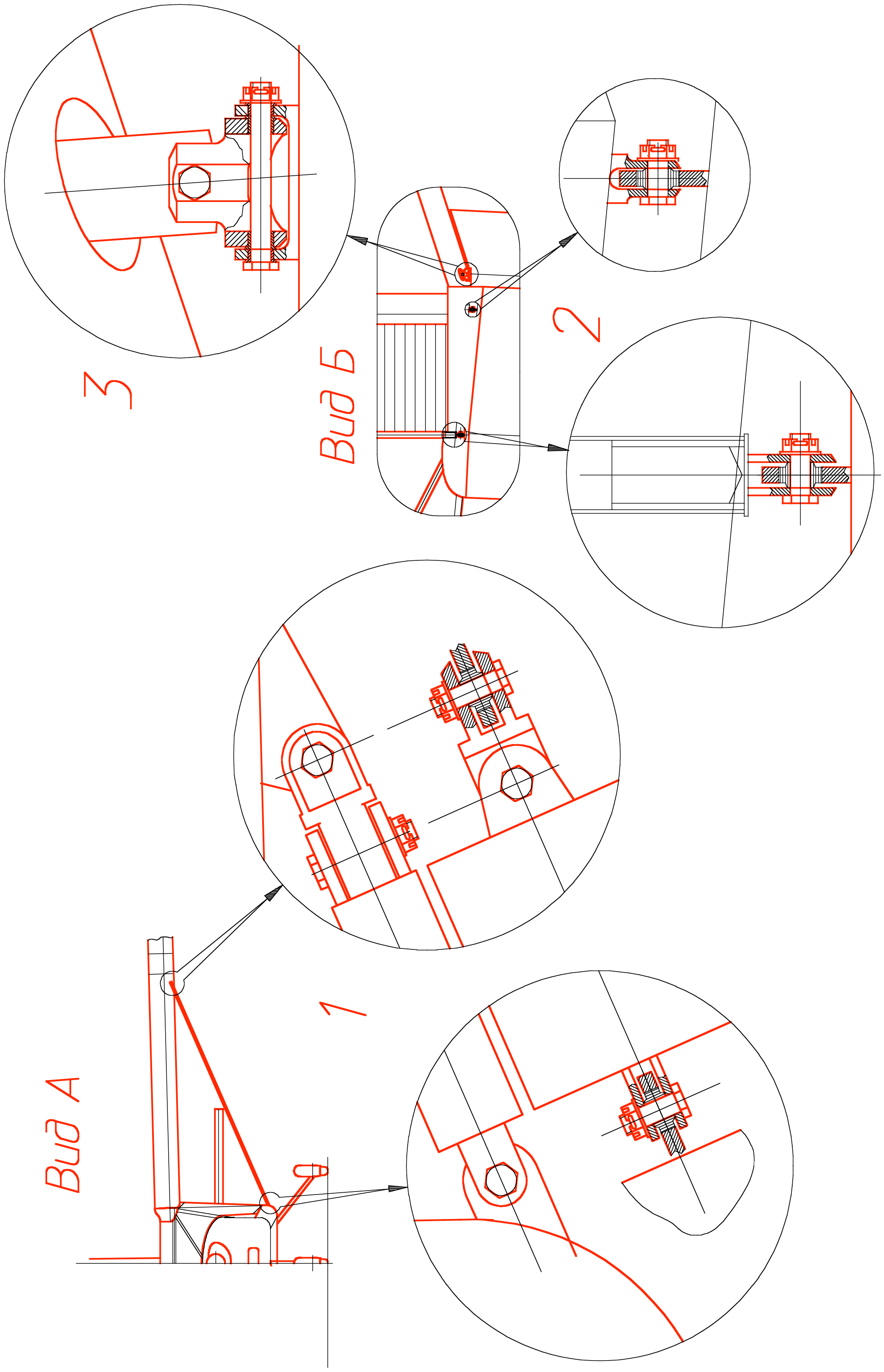
Aeroplane assembling should be done in the reversed order of disassembly. When installing the horizontal tail it is necessary to lead the trim tab control cable first through its conduit in the stabiliser. All hinges and fittings should be cleaned and lubricated before assembling the aeroplane.

### 8.7 Aeroplane washing

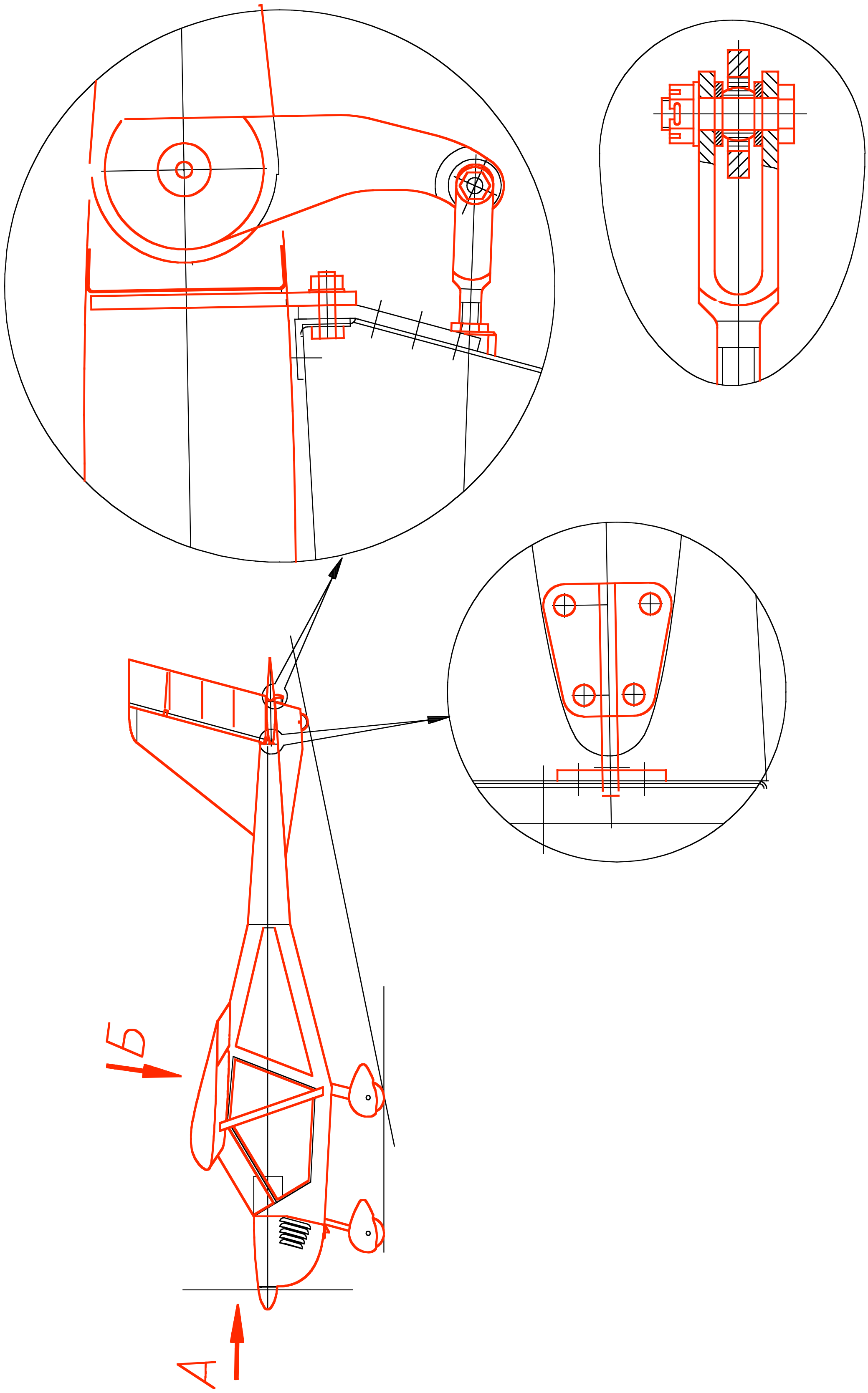
Outer surfaces, engine, propeller, insides of the cockpit, seats may be washed using water, soap and other natural and synthetic detergents.

***WARNING: WASHING THE AEROPLANE USING ANY TYPE OF SOLVENT OR PETROL IS PROHIBITED!***

***Figure 11 – Removing the wings***



## ***Figure 12 – Removing the stabiliser and elevator***



## APPENDIX 1

| **Checklist - External** – *chocks on* | |
|---|---|
| 1. Radio & avionics - off | 34. Stabiliser, Stbd retainer bolts & lock pins |
| 2. Master switch - on | 35. Rudder Stbd control horn bolt & lock pin |
| 3. (Strobes) - on-check-off | 36. Stabiliser Stbd retaining bolt & lock |
| 4. (Landing light) - on-check-off | 37. Starboard fuselage & fin surface |
| 5. Fuel taps - on | 38. Starboard aileron hinge bolts & lock pins |
| 6. Fuel contents - check | 39. Starboard wing fabric, top & bottom |
| 7. Master switch - off | 40. Starboard flaperon covering, hinges & lock pins |
| 8. Brake pressure - check | 41. Starboard wing tip |
| 9. Park brake - on | 42. Starboard fuel tank - dip contents |
| 10. Fuel tap(s) - on | 43. Starboard wing strut fairing |
| 11. Port door latch | 44. Starboard wing leading edge |
| 12. Port wing root fairings | 45. Starboard tyre, wheel fairing |
| 13. Port wing strut fairings | 46. Starboard wing root fairing |
| 14. Pitot/static tube | 47. Starboard door latch |
| 15. Pitot cover - remove | 48. Fuel drain - check for water |
| 16. Port tyre, wheel (& fairing) | 49. Nose wheel & fairing |
| 17. Port wing leading edge | 50. Propeller & spinner |
| 18. Port fuel tank - dip contents | 51. Exhaust outlet |
| 19. Stall warner (if fitted) operative | 52. Remove top cowling - 4 Dzus |
| 20. Port wing tip | 53. Ensure ignition & master - OFF |
| 21. Port aileron covering, hinges & lock pins | 54. Turn propeller by hand - 5-6 revs – ANTI-CLOCKWISE from the front until ‘gurgle’ |
| 22. Port wing fabric, top & bottom | 55. Oil level – check between marks |
| 23. Radio aerial(s) & strobe lamps | 56. Water level |
| 24. Port fuselage & fin surface | 57. Hydraulic fluid level |
| 25. Stabiliser, port retainer bolts & lock pins | 58. Check all 8 plug leads are firmly attached |
| 26. Rudder retainer bolt & lock pin | 59. Check all electrical wiring is secure |
| 27. Rudder port control horn bolt & lock pin | 60. Check all pipes & connections |
| 28. Stabiliser surfaces, rear lock nut & pin | 61. Overall visual inspection of engine |
| 29. Elevator covering and hinges | 62. Replace cowling - 4 Dzus |
| 30. Elevator retaining bolt & lock pin | 63. Windscreen and windows clean |
| 31. Elevator control horn bolt & lock pin | 64. Chocks – remove |
| 32. Trim tab hinge & wire attachment | |
| 33. Tail-wheel bolt & lock pin - secure | |

## APPENDIX 2

## **Checklist - Internal & flying**

### Before start

1. Pre-flight inspection - complete
2. Harness - secure
3. Doors - latched
4. Passenger brief - complete
5. Flaps - check & up
6. Controls - full & free
7. Radios/radio master - off
8. Battery master - on
9. Mags - both on
10. Fuel - right tank only
11. Fuel quantity - check
12. Elevator trim - set to t/o

### Starting

1. **Cold** - throttle closed
2. Choke - full open
3. **Warm** - throttle just open
4. Choke - closed
5. Park brake - on
6. Warning - CLEAR PROP
7. Starter - 10 seconds max
8. Oil pressure - rising 10 secs

### After starting

1. Set throttle - 2000 rpm
2. Oil pressure - 2 bar/30psi +
3. Oil temperature - 30°C min to taxi
4. Radio - on
5. Transponder (if fitted)- on standby

### Taxi checks

1. Compass - turning OK
2. Turn & slip - moving OK
3. Brakes - check

### Engine run-up

1. Oil temperature - minimum 50°C
2. Brakes - on
3. Engine - set to 4000 rpm
4. L&R Mag check drop - max 300 rpm
   - max diff 120 rpm
5. Oil temp - max 150°C

### Pre-take-off

1. Trim - set t/o
2. Battery master - on
3. Strobes - as needed
4. Fuel on - right tank
5. Landing light - as needed
6. Flaps - as needed
7. Controls - full & free
8. Doors - latched
9. Harnesses - secure
10. Avionics - set as needed

### Line up

1. Transponder (if fitted) - on 'Alt'
2. Windsock - check wind
3. Aim point - select

### Take off

1. Throttle - ease full power
2. Engine - min 5200 rpm
3. Nose - nose wheel off
4. Airspeed - lift at 40 kts

### Climb

1. Best speed - 60kts (55kts flap)
2. Engine max - 5800 - 2 min
3. Balance ball - centred
4. Oil T&Ps - monitor

### Pre-landing checks

1. Brakes - check pressure
2. Park brake - OFF
3. Fuel - on & sufficient
4. Instruments - check Ts & Ps
5. Lights/strobes - as needed
6. Harness - secure
7. Transponder - stby on r-way

### Shut down

1. Lights/strobes - off
2. Flaps - up
3. Elevator trim - set t/o
4. Radio - off
5. Transponder (if fitted) - off
6. Throttle - 1800 rpm
7. Mags check - dead cut
8. Mag switches - off
9. Battery master - off
10. Fuel - taps off
11. Chocks - on

## APPENDIX 3

**Care & Maintenance of your KievProp**

### 1. Warranty

Subject to normal use and no abuse or accidental damage, your propeller is guaranteed against defects for 12 months from the date of delivery to you, irrespective of the number of hours used. Should any defect appear – such as a crack in a blade, hub or bolt (or spinner) – STOP using the propeller, take photos of the fault and send them to SilverWing Aviation with a note of the serial number (printed on the blade root ends) and number of hours flown – if possible by e-mail to *info@silverwing.com.au* We will assess the problem, if necessary in consultation with the factory. Replacement items will be supplied as needed.

### 2. Blade life

The propeller blades have a nominal life of 4 years, irrespective of the number of hours flown. There are KievProps with over 1,500 hours on them, and still in excellent condition. After 4 years, you should ideally replace the blades – however, if you have less than 400 hours on the prop, and the blades are free of any significant damage, it is acceptable to use the prop for a further year or up to 500 hours, whichever occurs first.

The factory is continually developing their product and it may be that blade life will be extended in the future.

### 3. Maintenance

(a) Blades.

The propeller blades should be inspected before every flight. Small stone chips on the leading edge (up to about 1.5mm in depth) can be repaired with 2-part epoxy filler or adhesive. However, be aware that blade weight and balance is very important and so take care not to add large amounts of filler.

Over time, in particular if the aircraft is operated from gravel strips and/or the prop has a small ground clearance, the backs of the blades can show light pitting. The blades are painted with automotive 2-part acrylic paint and, provided the weight and balance of the blades is not affected, it is acceptable to lightly sand and re-paint the backs of the blades.

(b) Hub.

Every 50 hours or 6 months (whichever comes first), the spinner should be removed and the hub and all attachment bolts and nuts inspected for corrosion. This is particularly important if the propeller is used on the float version of the Foxbat. Any corrosion should be investigated to ensure it does not threaten the strength of the propeller. If in doubt replace corroded parts!

Every 50 hours or 6 months (whichever comes first), check the **torque** of all the hub bolts – they should be set at **25Nm**. Check tightness in opposite pairs. Note that if you remove the propeller, Nyloc nuts should be replaced after a single use.

When assembling the propeller and during use, do not use grease or lubricant of any kind – this could affect the composite material of the blades and lead to an unsafe condition. However, provided that it does not come into contact with the blades, it is permissible, if absolutely necessary, to use a corrosion inhibition treatment on the hub and bolts.

(c) Pitch.

Every 12 months or 100 hours (whichever comes first) you should check the pitch of the blades (see section 3 of the assembly and pitch setting instructions).

**Assembling, setting the pitch and testing your KievProp:**
***(please read all this information <u>before</u> starting to assemble or dis-assemble your prop)***

**1. General**
As a general guide, coarsening the pitch (giving the blades more 'bite') will give a faster cruise speed, with some decrease in take-off and climb performance for the same engine rpm. Fining the pitch (giving the blades less 'bite') will give a better take-off and climb performance but a lower cruise speed for the same engine rpm.

**2. Assembling the propeller**
(a) The smaller centre hole in the hub faces away from the engine. The larger hole fits over the raised lip (if there is one) on the engine/propeller flange.
*Please note – if a prop-flange spacer is used, the factory inserts a fitting ring in the large hole, enabling correct location of the prop hub/spacer. Do not remove this fitting ring unless you use the prop without the spacer.*

(b) On a flat surface with a covering to protect/cushion the propeller, place the blades in the engine-side half of the hub, ensuring that the raised rings round the roots of the blades fit into their grooves in the hub sockets.

(c) The blades must be in the hub with their convex surface facing the direction of flight. The scimitar sweep of the propeller must be in the correct sense - ie, curving back from the direction of rotation.

(d) Carefully place the front half of the hub over the blades, ensuring the locating reference marks stamped on the hub halves are next to each other and that the blade root ridges match the hub grooves. Loosely tighten the 3 pairs of blade retaining bolts/nuts – the bolts should be inserted from the engine-side, with the nuts showing on the ‘outside’. At this stage ensure that you can gently twist the blades in their sockets without a lot of force. Do not use any kind of lubricant or sealer on the propeller-hub joint.

**3. Setting the pitch** *(before mounting the prop on the aircraft)*
(a) The small 'hooked' end of the pitch adjustment tool fits into the small centre hole in the hub front. Ensure that the two little 'wing' extensions either side of the 'hook' rest flat against the face of the hub. The other end of the pitch tool has a moving scale, which fits over the convex face of the blade with the raised positioning lug snugly positioned over the blade trailing edge.
*We recommend putting some pieces of masking tape on the propeller blades where the end of the pitch adjustment tool fits over them to ensure you don't scratch the blades with the pitch tool.*

(b) A suggested starting point for the pitch angle is around the mid-point (1.0) of the scale on the pitch adjustment tool. However, some customers find this a little too fine and start at a setting of around 1.2 on the scale.

(c) Ensure all blades are aligned to exactly the same pitch degree (you may wish to use a proprietary propeller pitch spirit level or laser tool to ensure an exact match) and tighten the 3 pairs of blade retaining bolts to 20Nm, being careful not to disturb the pitch angle you have set. *Do not over-tighten the prop bolts*; they do not need all your strength! If using castellated nuts, do not insert the split pins at this stage.

**4. Fitting the prop to the aircraft**

(a) Bolt the propeller to the prop flange on the engine using the 6 long bolts. The bolts should inserted towards the engine/prop flange with the nuts on the engine side.  They should be tightened in opposite pairs to 25Nm each. Again, if using castellated nuts, do not insert the split pins yet.

(b) Check the 3 pairs of blade retaining bolts for tightness and re-tighten if necessary to 20Nm - do not over-tighten these bolts.

**5. Static pitch testing**

(a) On a firm surface with no loose gravel, stones or other material, ensure the aircraft is properly chocked/restrained, warm up the engine and conduct a full throttle static run.
DO NOT FLY THE PLANE WITHOUT LOCKING ALL THE PROPELLER BOLTS/NUTS WITH LOCKWIRE, SPLIT PINS OR NYLOCS!!

(b) Depending on your requirements for climb/cruise compromise, a good starting point is for the engine to pull about 90% of redline revs at static full power - for example, a Rotax 912 max revs are 5800, so the static target is around 5250rpm. At this pitch setting, the aircraft will generally hit maximum rpm when flown straight and level. This is the setting at which most GA and ultralight propellers are pitched.

(c) *If the engine revs **faster** than 90% redline at static full power:*
- either coarsen the pitch (that is, turn the blades so they 'bite' more) a degree or so to reduce the rpm, following steps 3&4 above, and re-test. In general terms, with a Rotax 912, one degree is equal to around 250-300 rpm.
- or, provided the redline is not exceeded at static full power, accept the setting. This will give you a good rate of climb but will limit your cruise speed.
Please note:  If you accept a static full power rpm close to or at redline, BEWARE you do not exceed redline when taking off, climbing and cruising!

(d) *If the engine revs **slower** than 90% redline at static full power:*
- either fine up the pitch (that is, turn the blades so they 'bite' less) a degree or so to increase the rpm, following steps 3&4 above, and re-test. In general terms, with a Rotax 912, one degree is equal to around 250-300 rpm.
- or accept the setting. This will give you a good cruise speed but will increase your take off run and reduce your rate of climb.
Please note:  If you accept a static full power at lower rpm, BEWARE you do not exceed Vne in straight and level flight, particularly on full throttle!

**6. Test flying**

(a) When you are happy with the prop pitch angle, note the setting for future reference. Check the prop mounting bolts are correctly tightened to 25Nm and LOCKWIRE, SPLIT PIN or NYLOC all 12 hub and blade bolts. This is particularly important for the propeller hub-flange mounting bolts/nuts. The aircraft can then be test flown.

(b) When test flying, check if Vne can be exceeded in straight and level flight on less than full throttle. Also check if redline rpm can be exceeded in straight and level before reaching Vne. Placard the ASI and/or tachometer with appropriate warnings!

(c) If required, re-pitch and test the propeller after test flying, following steps 3 – 6

**7. Happy flying!**

## APPENDIX 4

### ACI STALL WARNING DEVICE

A22 Foxbats may be optionally fitted with an ACI electric Stall warning device, powered by either a PP9 battery (giving 1-2 years life) or through the aircraft electrical system. The stall warning is operated by a moving vane on the port wing, sounding a loud beeper on the bulkhead wall above and behind the left-hand pilot's seat.

Checking the operation of the stall warner is part of the external daily check of the aircraft.

The warner sounds at approximately 6-7 knots above stall speed.

Avoid flying in rain as, over a prolonged period, water can enter the vane/sensor. In some circumstances this can result in a continuous audible warning tone. The tone will disappear when the vane is dry.

## **Service Bulletins**

1. Fuel cross-feed via vapour control system. 21-04-2004 – ADVISORY

*Please note – all factory built A22 Foxbats delivered in Australia come fitted with a fuel vapour return line to the right/starboard fuel tank!*

1.1. Some A22 owners have reported transfer cross flow of fuel from the left to the right tank via the vapour return system. For this reason you are strongly advised to *draw fuel from the right-hand tank first.*

1.2. The Rotax 912 fuel pump is able to supply considerably more fuel than the maximum demand of the carburettors. The surplus pressure that was previously contained within the pump-to-carbs fuel line can force fuel back to the right hand tank via the vapour return system. The flow rate can be in excess of 3 litres an hour!

1.3. The vapour return system was deemed necessary in order to solve a vapour lock 'problem' that had not been proven to manifest itself in the A22 Foxbat fuel supply - in other words it was a solution in search of a problem. Nevertheless there is a requirement by Rotax that a vapour return system be fitted to all 912-series engines when they are used in an enclosed engine bay.

1.4. Cross flow via the vapour return means that when switched only to the left-hand tank, fuel surplus to demand is pressure-fed back to the right tank. If this tank is already full the excess fuel will exit from the vent pipe below the wing. Pilot unawareness of the situation might lead to a worst-case example of the left tank running dry and the right tank overflowing!

You should always draw fuel from the right-hand tank first, especially if it is full.

After 30 minutes you can switch to the left tank but if after another 30 minutes you suspect from the gauges that significant cross flow has taken place then switch back to the right tank for a while.

1.5. Increasing the frequency of your fuel management checks will solve the problem.

1.6. Return-flow of surplus fuel via the vapour return pipe occurs on all 912-powered aircraft fitted with a vapour return. When only a single tank is used, fuel cross flow is not an issue but with twin tank fuel systems it is essential to use good fuel management.