PILOT OPERATING HANDBOOK

for the aircraft DAR Solo Series

Modell Nr. Solo UL

LTZ-Nr. 944-15 1

Type: DAR Solo UL

Airplane Registration No. _____

Airplane Serial-No. 120 – 230 004

Reference: POH DAR Solo Series Issue-1

4. October 2015 r.

This handbook is to be kept in the aircraft at all times.

The described options of the DAR Solo Series use are certified in Germany .

RECORD OF MANUAL REVISIONS

No.	Issue No.	Description of Changes	Date	Signature
1	1	POH DAR Solo	4 October 2015	T. ILIEFF

Manufacturer Contact Information

Aeroplanes DAR Ltd.
Mladost 103-A-49
Aviation Circus
Sofia 1797
Bulgaria

phone:+359 888 226 445
phone:+359 899 226 445

www.aeroplanesdar.com

info@aeroplanesdar.com

Owner: Sport Aircraft Australia

This Pilot Operating Handbook belongs to the aircraft:

DAR Solo UL / serial number 120-230-004

and is to be kept in the aircraft at all times.

Introduction

DAR Solo aircraft are built in compliance with the airworthiness requirements of various countries and are certified as Microlight, Ultralight, Advanced Ultralight and Light Sport Aircraft.

To operate the aircraft the pilot must hold a license or certificate appropriate to this category of aircraft. The aircraft is not to be flown unless it is registered, carries registration markings in accordance with the requirements of the country in which the aircraft is to be flown, and has a Permit to Fly or certificate of Airworthiness valid in the country of operation.

The aircraft is to be flown under daytime VFR conditions. Flight in conditions other than daytime VFR without the correct aircraft equipment and pilot ratings is extremely dangerous and can result in serious injury or death.

Pilots holding licences for other categories, even higher ones, are required to be checked out by an appropriately qualified instructor prior to flying this aircraft as it possesses characteristics that are unique to light sport type aircraft. These characteristics include low inertia, susceptibility to turbulence and wind gradient and special engine considerations.

The safety of all occupants, the aircraft and persons on the ground are the sole responsibility of the the Pilot in command. Do not operate this aircraft in a manner that would endanger the occupants, the aircraft or persons on the ground.

Bear in mind that the engines used in DAR Solo aircraft are not certified aviation engines and thus may not offer the same safety standards found in other classes of aircraft. Prepare your flight so that you can always reach an emergency landing area should you experience engine failure. On cross country flights, ALWAYS keep an emergency landing field in sight.

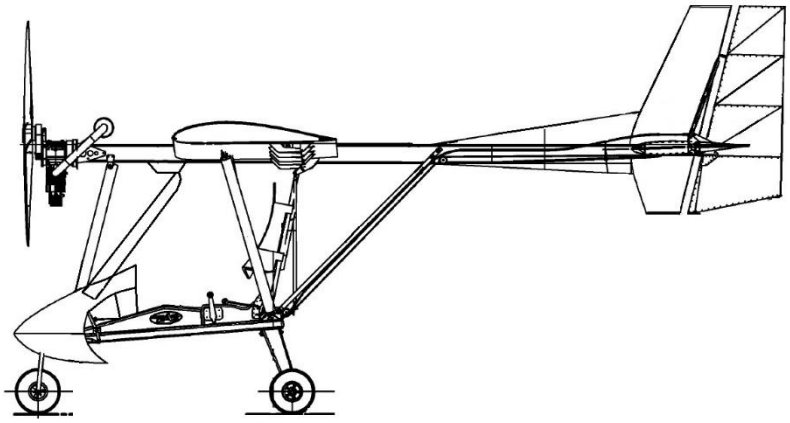
Changes to the control system, structure, wings and engine are prohibited.

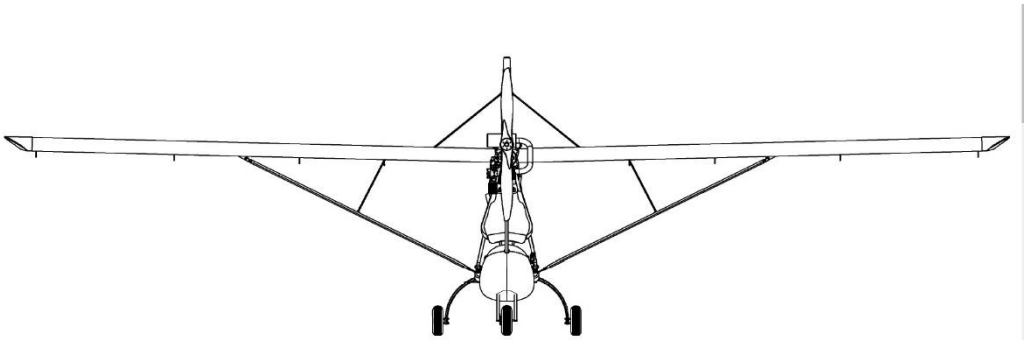
These changes would invalidate any certificate of airworthiness or permit to fly and as such would result in an insurance becoming null and void.

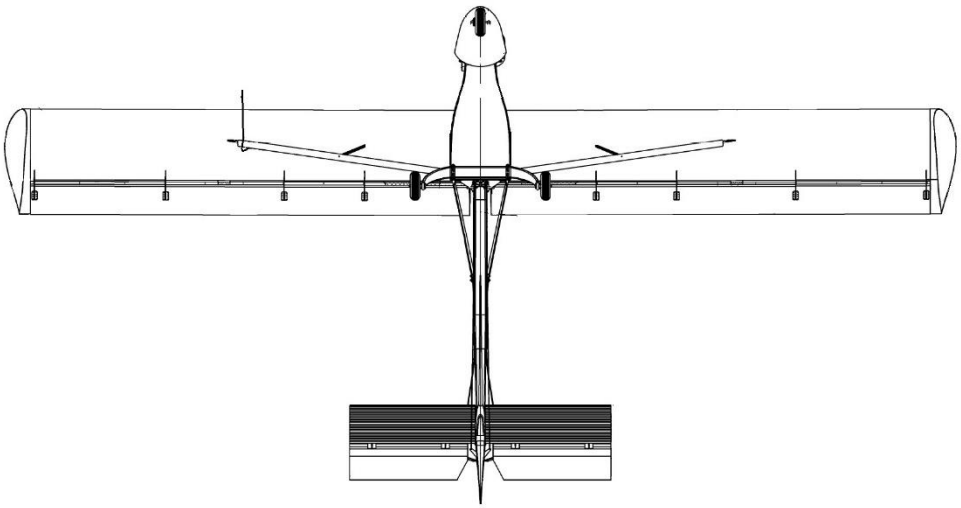
All operating difficulties and equipment failures should be reported to your dealer or the manufacturer.

For fire safety reasons, smoking is prohibited on board of the aircraft.

Three side view: DAR Solo Series







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1. Operating limitations

1.1. Airspeeds: DAR Solo

Never-exceed speed:	V_{NE} = 150 km/h
Speed in turbulent air :	V_B = 121 km/h
Maximum manoeuver speed:	V_A = 109 km/h
Stall speed: flap position 1:	V_{S1} = 50 km/h

If V_A speed is exceeded, only little rudder movement areallowed.

1.2. Weights

Empty weight:	140 kg
Maximum take-off weight:	260 kg
Maximum payload:	110 kg

1.3. Structural limitations:

Positive limit load factor: +4 g

Negative limit load factor: -2 g

1.4. Center of gravity limits:

Reference datum: Wing leading edge

Forward center of gravity: 280 mm

Rearward center of gravity: 400 mm

1.5. Airspeed markings:

White arc: 40 - 90 km/h

Green arc: 43 – 150 km/h

Yellow arc: 50 - 85 km/h

Red arc: VNE= 150 km/h +

1.6. Engine rpm limitations

Polini THOR 250 DS
Max engine rpm: n = 7500 rpm, 5 min. max Max continuous rpm: n = 7000 rpm

1.7. Flap settings

Position 1: cruising

Position 2: take-off / landing

1.8. Propellers

Polini THOR 250 DS
propeller LL Prop 2-blade 1.50 m Ø, pitch 24 inches, full throttle rpm on the ground max. 7500 1/min Propeller rpm approx. n = 2600 1/min

1.9. Engine limitations

Polini THOR 250 DS	
Take-off (5 min)	36.5 hp / 7500 rpm
Continuous	33 hp / 6500 rpm
75%	28 hp / 5600 rpm

Type of oil: 2T synthetic

Fuel mixture: Euro-Super ROZ 95 unleaded (DIN 51603) + 2% oil 2T synthetic

Super Plus ROZ 98 unleaded (DIN 51607) + 2% oil 2T synthetic

Engine temperatures:

Polini THOR 250 DS
Water temp. max. 92°C optimum 80°C

Magneto check at 3000 rpm

rpm drop max. 200 rpm

2. Kinds of operation limitations

- Aerobatics and manoeuvres with more than 60° bankare prohibited
- Daylight, VFR conditions only.
- No flight in icing conditions
- Do not attempt flight in turbulent conditions or in winds exceeding 5 m/s, and less when itis gusty.
- Always follow the appropriate regulations for this category of aircraft.

3. Operation of the Engine

3.1. Polini Thor 250 DS - is a 1-cylinder, two stroke, Water-cooled engine.

To start the engine:

Manual fuel pump	PUMP
Throttle	IDLE
Choke	OPEN
Ignition (both magnetos)	ON
Propeller blade area	CLEAR
Brakes	ON
After engine starts, choke	CLOSED (Automatic)

If the engine does not start, repeat the starting procedure.

NB! Never move the prop with the ignition (MAG) switches on!

Fuel mixture for Polini THOR 250 DS engine:

Super leaded ROZ 98 or unleaded ROZ 95 + 2% Oil (synthetic or semi-synthetic grade oil)

If the engine has been flooded, close the throttle, open choke and start the engine. When the engine starts, quickly reduce the throttle to idle.

An water cooled engine requires a fairly long warm upperiod. Run the engine at 3000 rpm for at least 2 minutes then engine is hot. Perform the MAG check at 3000 RPM. RPM drop should not exceed 200 RPM.

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4. Flight Operations

4.1. Taxiing:

The nose wheel steering is conventional and is directly connected to the rudder pedals. Push the right pedal to turn right. Push the left pedal to turn left.

Taxiing is simple. The turning radius of the DAR Solo is small, and the plane handles cross wind during taxing very well.

When taxiing with a strong tail wind, hold the control stick firmly in the neutral or nose-down position.

When taking off or landing on bumpy grass strips, exercise caution to avoid striking the propeller.

4.2. Take-off and climb:

After completing the "before take-off" checklist, make certain the runway and approach are free before you taxi to the takeoff position

Wing flaps in take-off position (flap position 2).

Gently bring the throttle to full forward position, check tachometer.

At full throttle, the tips of the propeller blades produce hard knocking sounds.

Pull the stick slightly back during the initial roll.

The nose wheel will lift off at approx. 40 km/h.

Further accelerate with the nose wheel up 5-10 cm off the ground.

The aircraft will take-off at 50 km/h. Push the stick slightly forward and increase airspeed to 60 km/h in shallow climb.

Continue to climb at 70 km/h.

Retract flaps at a height of approx. 150 m. This will cause a slight noseheavy moment.

Trim the aircraft to 110 km/h and continueclimbing. Slight right rudder is necessary to compensate both engine and propeller torque during climbing.

Whenever possible, take-off into the wind.

The maximum demonstrated crosswind component for take-off and landing is 5 m/s. No special procedures are required.

During the initial take-off phase, it is essential that the aircraft accelerate sufficiently in order to prevent stalling, should a sudden loss of power be experienced.

By a loss of engine power at altitudes below 80 m do not attempt course corrections of more than 90°. Quickly trim the aircraft to a gliding speed of 60 km/h (push stick

forward). Avoid obstructions. Using the flaps touch down at a low speed. The approach phase can be shortened by slipping. Before undertaking an emergency landing in rough terrain, turn off the fuel valve and the ignition.

4.3. Cruising flight

In order to fly the aircraft comfortably, it should be trimmed to the desired airspeed with the throttle set for the appropriate rpm for horizontal flight.

Typical speeds:

Polini THOR 250 DS	
cruising flight	
Engine speed Airspeed:	6000 rpm 110 km/h
economical flight	
Engine speed Airspeed:	6000 rpm 100 km/h
Fuel flow:	4 - 6 l/h

The maximum speed must never be exceeded.

DAR Solo: 150 km/h

In a turbulent weather the maximum airspeed is: 121 km/h

At the first indication of carburettor icing (rpm drop, stuttering engine running, increase in fuel consumption as indicated by the flow meter, if installed) apply carburettor heat if installed and, if possible, fly the aircraft into nonicing conditions.

4.4. Turning flight

Turns are coordinated using the aileron and rudders. With the increase of airspeed, significantly less amount of rudder deflection is needed.

Banks of 45° degrees or more are not recommended, abanking angle of more than 60 degrees is prohibited. In steep banks keep the nose and airspeed under control by means of the rudders and elevator.

4.5. Stalls

In cruising flight configuration, the stalling speed is 50 km/h.

At approximately 45 km/h there will be a slight buffeting of the airframe. When flown in this condition the aircraft is fully controllable.

However, lateral altitude corrections must be done mainly with the rudder.

Example: right wing low => rudder deflection to the left.

If the aircraft is stalled slowly with the elevatorin detent, it will enter into a stable stalled descent. Altitude loss can be up to 30 m.

During a whip stall, the aircraft clearly pitches down (up to 40°). By slightly releasing the elevator, airspeed will increase and the aircraft will return to horizontal flight. Maximum altitude loss is 80 m.

The aircraft reacts similarly in flap positions.

Stall speeds for the flap position,

take-off weight: 260 kg:

Vs1 flap position 1 (cruising flight)	50 km/h
Vs2 flap position 2 (take-off/landing)	40km/h

The stall speeds above will be affected by variations in take-off weights.

4.6. Descent and landing

Begin with your approach early enough in order to set the correct landing configuration without hurrying.

In order to be able to steeply approach short landing strips, use flap position 2. Moreover, the glide path can be effectively shortened by a sideslip. Before proceeding to flap position 2 reduce the speed below max velocity with flaps Vfe 83 km/h, favourably are about 60 – 65 km/h. On final approach with flap position 2 keep the speed at about 50 km/h with the engine at idle.

At the height of approximately 3m begin rounding out to the landing flair. Begin final flair at the height of about 0.5 m. Landing speed is approx. 45 km/h.

4.7. Shutting down the engine:

Under normal conditions, the engine will have cooled down sufficiently during descent and taxiing so that it can be shut down by turning off the ignition. Shut off all electrical accessories and radios before shutting down the engine.

4.8. Sudden loss of engine power:

a) Loss of engine power during take off

Depending upon speed and altitude, lower nose and trim to gliding speed 60 km/h. Do not attempt to return to airfield if altitude is below 80 m after gliding speed has been reached. At lower altitudes it is best to land straight ahead without attempting any course corrections.

Before attempting an emergency landing in rough terrain, switch off the ignition. When landing in a high vegetation (grain or similar) reduce speed directly above the vegetation by extending the flaps to position 2, pull stick fully aft and allowthe aircraft to sink into the vegetation.

b) Loss of engine power during cruising flight

Cross-country flights should be planned to ensure that a suitable landing field could be reached in the case of a loss of the engine power.

Once gliding speed has been established (flap position 1 = cruising flight, V_{IAS} = 48 - 54km/h, look for a suitablelanding field taking into consideration wind conditions.

With sufficient altitude you may attempt to restartthe engine, check:

1 Magneto switches	ON
2. Fuel	SUFFICIENT

c) Starting the engine in flight

When you must to restart the engine, check:

- both magneto switches	ON
- throttle	¼ OPEN
- start engine using starter	

Maintaining airspeed to windmill the prop can help.

4.9. Emergency procedures

I Tipping due to lower speeds

Reduce back pressure on the stick and lower the nose.

Recover

II Sideslip

Set rudder in the opposite direction to a sideslip

Reduce back pressure on stick

III Spin

Throttle to idle.

Apply rudder opposite to the direction of rotation until the rotation will stop

Reduce back pressure on stick

Slowly pull aircraft up

IV Spiral dive

Set aileron and rudder opposite to the direction of rotation and pull back the stick slightly until a horizontal position will be taken.

V Loss of elevator control

With the elevator trim flap, the aircraft can be trimmed to speeds between 70 and 90 km/h.

In calm weather conditions it can also be used to try to land the aircraft. If in doubt, deploy the parachute rescue system.

VI Loss of aileron control

Use the rudder to control the aircraft via skidding rollingmoments. If in doubt, deploy parachute rescue system.

VII Loss of rudder control

Controlling flatter curves is possible with the ailerons only. If possible, perform a field landing in a straight flight. If in doubt, deploy parachute rescue system.

VIII Carburettor fire

Main fuel valve OFF

Full throttle

Sideslip

Follow emergency landing procedures.

5. Ground Handling

5.1. Towing

Manual moving of the aircraft is accomplished by using the tail struts upper connections as push points. Since there is no tow bar applicable at the nose gear, you have to press down the tail to raisethe nose wheel off the ground. With the nose wheel clear of ground, the aircraft can be simply steered by pivoting it on the main wheels.

5.2. Parking

When parking consider a number of factors:

- as a general precaution, set parking brake
- block the wheels with wheel blocks or brake blocks
- flap to zero = position 1

In severe weather and strong wind conditions, tie down the aircraft as outlined in paragraph 5.3. if a hangar is not available.

Caution:

Do not set parking brakes during cold weather (when accumulated moisture may freeze the brakes) or when brakes are overheated.

5.3. Tie-Down

When parking the aircraft outdoors, nose into the wind if possible. Set parking brakes or block wheels with brake pads.

Use ropes or belts (no chains, wire or steel cables) and fasten them to the tie down points (upper end of the wing struts). Then secure them to the ground anchors.

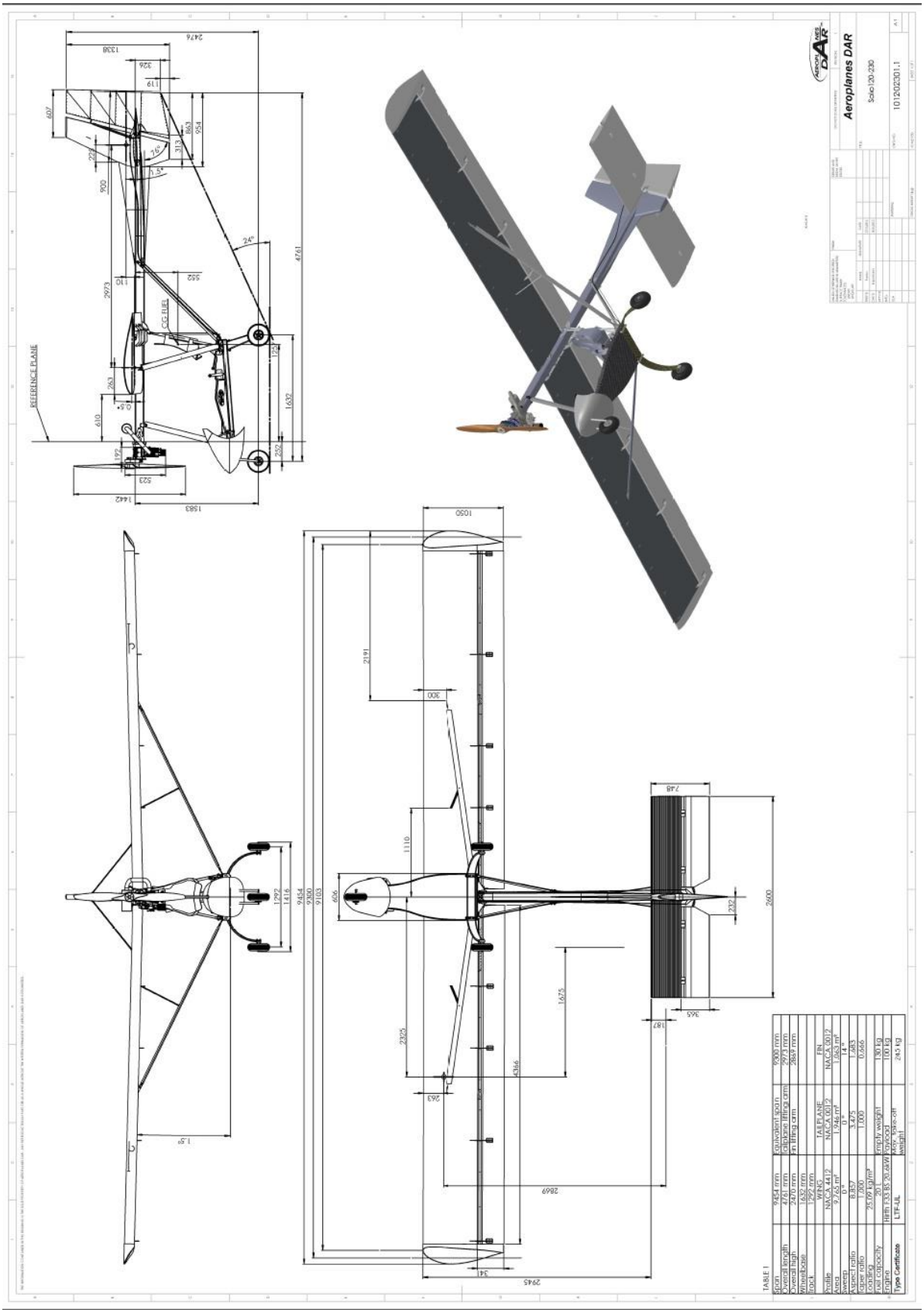
Additionally, mount a rope or strap between the engine cowling and propeller spinner and secure to another ground anchor.

The control stick must be secured with the help of the safety belt in a fully retracted position.

6. Minimum equipment

- three point harness for pilot seat
- Airspeed indicator 0 - 180 km/h.
- Vertical Speed indicator +/- 10 m/s
- Inclinimeter
- Tachometer
- Cooling liquid temperature gauge
- Data placard
- Pilot's operating handbook
- Parachute rescue system
- Checklist

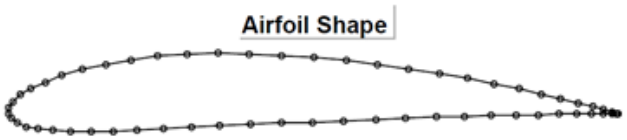
7. Dimensions



8. Weight and balance

Wing profile:

NACA 4412



Cruise speed estimated at about 100km/h = 28 m/s

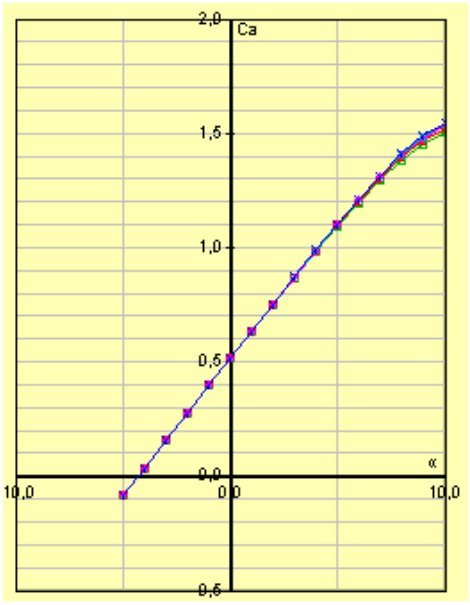
m = MTOW = 245 kg

S = surface area = 9,76 sqm

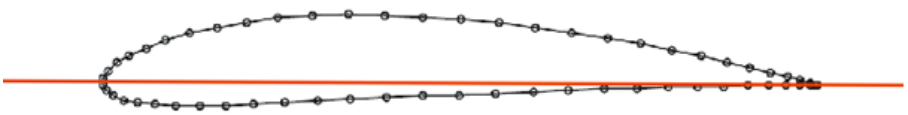
$$Ca = \frac{2 * m * g}{\rho * S * v2}$$

--> Ca = 2 * 245 * 9,81 / 1,22 * 9,76 * 28^2 = 0,51

at 100 km/h cruise speed a Ca of about 0,5 is necessary



Ca of 0,5 is reached at an angle of attack of the wing profile of 0°

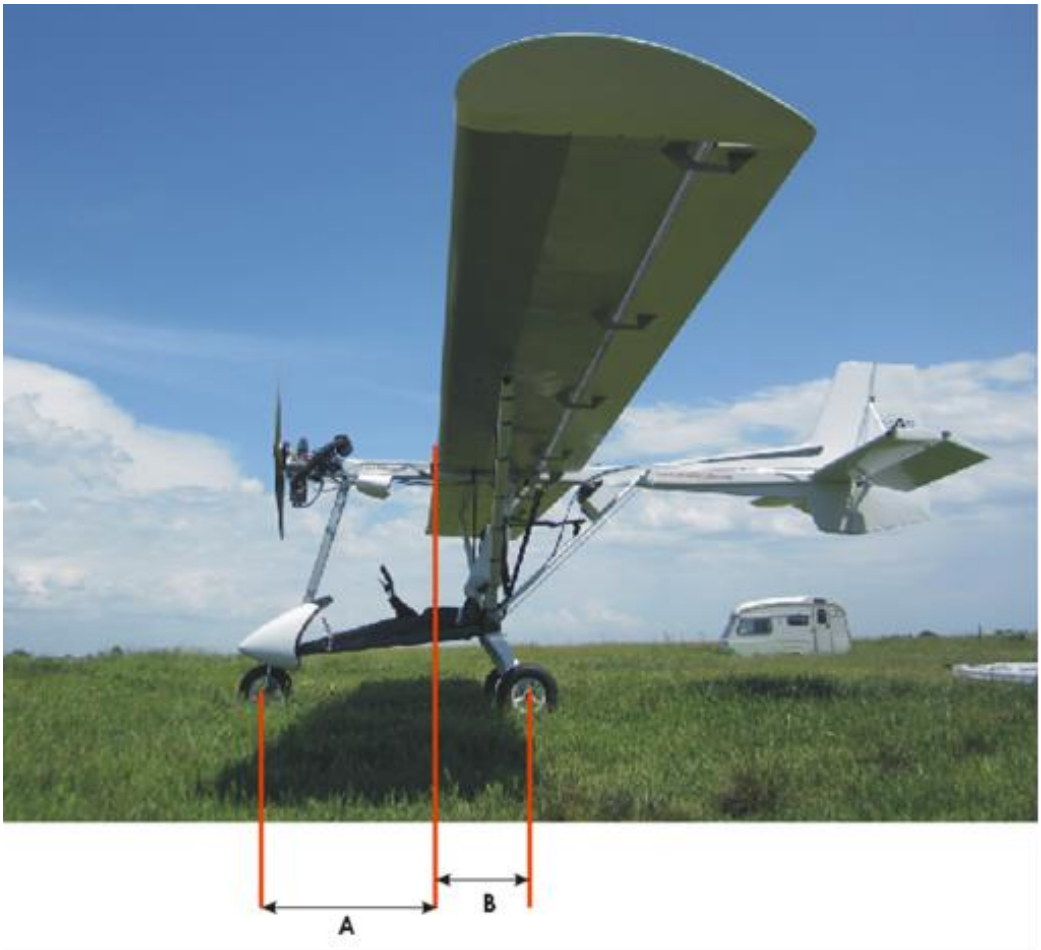


--> The red line (cord line) must be set to zero degree for weight and balance check.

Place the aircraft in a level position on three scales with the stabilizer and elevator leveled.

The center of gravity is measured in mm behind the reference line and then calculated as a percentage of the wing chord.

Reference line (leading edge) wing chord L= 1050 mm determine measurements a and b (center of wheel axle).



Distance A = 1025 mm Fuel = 20 l

Distance B = 705 mm Pilot = 96.5 kg

Airplane empty, no gasoline, no pilot Weight on left main wheel = 60.2 kg Weight on right main wheel = 63.0 kg Weight on front wheel = 20.4 kg TOTAL =143.6 kg	Airplane with full fuel tank, no pilot Weight on left main wheel = 70.5 kg Weight on right main wheel = 64.6 kg Weight on front wheel = 21.5 kg TOTAL = 156.6 kg
Airplane with pilot, no gasoline Weight on left main wheel = 92.0 kg Weight on right main wheel = 97.1 kg Weight on front wheel = 50.0 kg TOTAL = 239.1 kg	Airplane with full fuel tank and pilot (MTOW) Weight on left main wheel = 96.0 kg Weight on right main wheel = 105.0 kg Weight on front wheel = 52.1 kg TOTAL = 253.1 kg

8.1. Empty weight center of gravity:

Serial No.120-230-004 Aircraft data sheet No: Typ:944-15 1

Basic empty weight (standard equipment):	136	kg
Operating empty weight (incl. optional equipment):	136	kg
max. useful load:	116	kg
MTOW:	260	kg

It is the pilot's responsibility to ensure that the MTOW of 260 kg is not exceeded.

9. Data placard and checklist:

Polini THOR 250 DS

Power	ON	OFF
V_{so}	40 km/h	43 km/h
V_{s1}	43 km/h	52 km/h
V_x/V_y	52 km/h	-
V best glide	-	52 km/h
V_{max}	125 km/h	-
V_{ne}	150 km/h	150 km/h

Airspeeds

Never-exceed speed: DAR Solo - 150 km/h

Max speed flaps on – 92 km/h

Stall speed: DAR Solo - 43 km/h

Load factor

Positive limit load factor +4 g.

Negative limit load factor -2 g.

Maximum recommended wind speeds for operation

Steady winds 5 m/s

Demonstrated cross-wind component 6 m/s

The pilot operates this aircraft at his own risk.

Manufacturer	Aeroplanes DAR
Model	DAR Solo UL
Serial no.	120-230-004
Registration	
LTZ-Nr	944-15 5
Date of manufacture	01.05.2016
Aircraft basic empty weight	136 kg

10. “Before take-off” checklist

1. The seat belts are fastened?
2. Control system free and correct?
3. Parachute system unlocked?
4. Check fuel level
5. Choke OPEN
6. Electric instruments ON
7. Flaps (take-off/landing) flap position 2
8. Check magnetos
9. Wind direction?
10. Runway and approach CLEAR

11. Approved equipment

Engine and propeller:

Polini 250 THOR DS
Gear Box, 2.8 to 1 reduction ratio
LL Prop – wooden, 2-blade, 1500 mm diameter, 24 inch step

Approved parachute rescue systems:

- GRS 240-260

Be certain to follow the instructions of manufacturer for installation, required maintenance and particularly the avoidanceof moisture in the parachute pack. Should the chute get wet, it must be aired and repacked. There is a time limit on the use of the rocket cartridge in rocket deployed systems.

Before taking off, remove the system safety pin.

After landing secure the system with the safety pin.

Fuel tank capacity - approved versions:

1x 13l

1x 15l

1x 20l

12. Flight performance:

12.1. Take-off distance, Sea-level, +15°C, no wind

Engine:	Polini Thor 250 DS
Take-off roll distance	50 m at 260 kg
Take-off distance over 15 m obstacle	120 m
Take-off speed	45 km/h
Speed at 15 m obstacle	70 km/h

Higher elevations and higher temperatures lengthen the take-off distances.

12.2. Rate of climb, Sea-level, +15°C, no wind

	Polini Thor 250 DS
Engine speed	6500 rpm
Rate of climb	2.5 m/s
Speed for best rate of climb	60 km/h

12.3. Cruising speed

Polini THOR 250 DS	
cruising flight	
Engine speed Airspeed:	5500 rpm 110 km/h
economical flight	
Engine speed Airspeed:	5600 rpm 100 km/h
Fuel flow:	4 - 6 l/h

Maximum range with 13 l tank capacity when windless approx. 200 km

12.4 Engine off performance

MTOW 260 kg

Minimum sink rate 1.8 m/s at 52 km/h, flap position 1 (cruise)

ATTENTION:

Follow the instructions in the Polini Thor 250 DS operator's manual.

13. Attaching the wings

The wings are attached to the fuselage as follows:

Step 1. preparation of the wing for mounting. placed in a convenient place, bolts, nuts and tools needed for mounting

Step 2. Slowly push the wing against fuselage. so that the wing plates to enter the wing brackets/grips of the fuselage. put the bolts.

Step 3. Mounted strut and smaller auxiliary strut.

NB! Wing did not leave without support,
until installing second wing aircraft is extremely unstable!!!

Step 4. Placed second wing by the same procedure.

Step 5. Carefully check that both have properly locked into place, fasten it (20) and place the cotter pins

Step 6. Once the wing is mounted, must be connected ailerons push rods controls. Check the special ball-joint connectors of ailerons push rods is it work properly. Carefully assure that the slide mechanism of the mixer work properly.

NB! Check ailerons control ball-joint connectors to be correctly installed and ailerons/flaperons move properly.

Step 7. Attach Pitot tube air-line, check the line for damages, crushing and folding.

Step 8. Mount and fasten wing center section fairing

NB! DO NOT FLY WITHOUT INSTALLED WING CENTRAL SECTION FAIRING!

14. Pre-flight inspection

Before each flight the pilot must carry out a visual inspection of the aircraft.

14.1. Engine

- Check propeller for damage and security
- Check for leakage under the engine
- Check cooling liquids for Polini Thor 250 DS
- Check attachment of the engine
- Check that watercooler/radiator is clean for Polini Thor 250 DS

14.2. Landing gear

- Check secure attachment of all components (hub caps, brake mechanism, brake disc)
- Check for a visible deformation
- Check pressure and condition of tires

14.3. Left wing

- Wing connections secured?
- Wing struts properly attached and secured?
- Auxiliary struts secured?
- Pitot tube secured and free from dirt and water?
- Check aileron hinges and push rods controls
- Check condition of cover sheet
- Check wing tips for deformation

14.4. Left side of fuselage

- Check condition of glass-fiber fairing (cracks, holes, etc.)
- Check secure attachment of glass-fiber fairing (check for missing screws at the upper/lower connection)
- Check central beam (connection with platform struts, all components installed over central beam)
- Tank filler cap secured?

14.5. Empennage

- Check attachment of the horizontal stabilizer
- Check control surface hinges?
- Check connections of the elevator push-pull cable
- Check the elevator struts for a secured attachm ent and possible deformation
- Check rudder cables for being connected and secured
- Check cover sheet

14.6. Right side of fuselage

- Check condition of glass-fiber fairing (cracks,holes, etc.)
- Check secure attachment of glass-fiber fairing (missing screws, etc.)

14.7. Right wing

- cf. left wing

14.8. Cabin, inside and outside

- Check condition of windscreen
- Check free movement of the steering (control stick, pedals, tube rod ends, flap mixer)
- Check the brake lever
- Check aileron controls connected and secured
- Visually check aileron controls
- Check fuel lines
- Check the flap lever

14.9. Instruments

- Power supply
- Altimeter setting
- Functioning of the radio and intercom system (if available)

14.10. Drainage

- Drainage of the fuel tank

15. Care and maintenance

1. Care and cleaning. All metal parts are corrosion-resistant and requireno special care. Dirt on the aircraft and the cover sheets can be removed by using clear water.

2. All maintenance work must be carried out by appropriately qualified persons.

3. Especially Repair works and major changesmust be reported and officially inspected.

4. Airworthiness inspections in Germany must be carried out by the manufacturer or by DULV inspectors. In other countries different regulations may apply.

5. Repair works

Repairs by the owner are limited to the exchange of defective parts. Only original spare parts may be used. In no case shall any part be reprocessed, straightened or otherwise processed for repair and re-installation.

6. Periodical inspections

Periodical inspections (50 / 100 hour inspection) should be carried out in accordance with the provisions of the Aeroplanes DAR ltd Maintenance Manual and Engine Maintenance Manual.

If not conducted, the safety of the aircraft is not guaranteed and warranty claims may be omitted. The periodical inspections should be conducted in one of Aeroplanes DAR Technical Centers. If periodical inspections should be conducted by the owner himself, these technical documents (Maintenance Manual) have to be ordered at Aeroplanes DAR ltd.

7. Technical problems

Technical problems or defects should be reported to

- the manufacturer

- the relevant national authority