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FLIGHT MANUAL

LS4-a

This manual should be carried in the sailplane at all times.

Registration Signs: F-CLMF Serial Number: 4721

Owner: AAVA

German edition of Flight Manual approved under § 12(1)2. LuftGerPO.
Published - 5. 1. 84

Because of responsibility of information a change of ownership should be reported to the manufacturer immediately.

Approval of translation has been done by best knowledge and judgement.
In any case the original text in German language is authoritative.

Annexe 1

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

Cet intercalaire doit obligatoirement être inséré devant la page de garde d'un manuel de vol en langue anglaise

AVERTISSEMENT

Le présent document en langue anglaise est le manuel de vol approuvé par l'Agence européenne de la sécurité aérienne.

En application des dispositions de l'arrêté du 24 juillet 1991 relatif aux conditions d'utilisation des aéronefs civils en aviation générale (« Un vol ne peut être entrepris que si, d'une part les membres d'équipage sont familiarisés avec l'aéronef et son équipement de bord, notamment le matériel de sécurité-sauvetage et les systèmes spéciaux, et d'autre part ont une connaissance pratique de son manuel de vol ou des documents acceptés comme équivalents. »),

Nul ne peut utiliser l'aéronef avec ce seul document s'il n'a pas une connaissance suffisante de la langue anglaise.

A défaut, il appartient au propriétaire ou à l'exploitant de l'aéronef de se procurer une traduction de ce document sous sa responsabilité.

Référence : Instruction du 13/11/2009 relative à la langue des manuels de vol

Log of Revisions

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in case of approved sections endorsed by the responsible airworthiness authority.
The new or amended text in the revised page will be indicated by a black vertical line in the right hand margin, and the revision No. and the date will be shown on the bottom of the page.

Rev. No.	Pages affected	Date of issue	Approval	Date of approval	Date of insertion	Signature
1	Cover, 1-1, 1-2, 2-4, 2-5	Jan. 5, 1984				
2	1-1, 1-2, 4-6, 4-10	Oct. 1999	LBA	4.11.99		
3	1-1, 1-2, 3-1, 4-2 TN4032 Rev. 1	Oct. 2010	EASA	3.11.2010		
4	1-1, 1-2, 1-4, 2-3, remove pages 6-3 ÷ 6-5 TN LS-S-01	May 2011	EASA	2.09.2011		
5	1-1, 1-2, 3-1, 4-2 TN4032 Rev. 1	May 2011	EASA	28.09.2011		
6	1-1, 1-2, 1-5, 2-3, 9-0, 9-8 – 9-12 TN4049	Febr. 2019	EASA	8.04.2019		

Page	Issue Date	Current / TN		Page	Original	Current / TN
Title	Jan. 5, 1984					
1-1	Oct. 1999	Febr. 2019/TN4049		**6-1**	Nov.15,1983	
1-2	Oct. 1999	Febr. 2019/TN4049		**6-2**	Nov.15,1983	
1-3	Nov.15,1983			**6-3**	Nov.15,1983	Removed / LS-S-01
1-4	Nov.15,1983	May 2011 / LS-S-01		**6-4**	Nov.15,1983	Removed / LS-S-01
1-5	Nov.15,1983	Febr. 2019/TN4049		**6-5**	Nov.15,1983	Removed / LS-S-01
1-6	Nov.15,1983			**6-6**	Nov.15,1983	
1-7	Nov.15,1983					
				7-1	Nov.15,1983	
2-1	Nov.15,1983			**7-2**	Nov.15,1983	
2-2	Nov.15,1983					
2-3	Nov.15,1983	Febr. 2019/TN4049		**8-1**	Nov.15,1983	
2-4	Jan. 5, 1984			**8-2**	Nov.15,1983	
2-5	Jan. 5, 1984			**8-3**	Nov.15,1983	
2-6	Nov.15,1983			**8-4**	Nov.15,1983	
2-7	Nov.15,1983			**8-5**	Nov.15,1983	
				8-6	Nov.15,1983	
3-1	Nov.15,1983	May 2011/4032 Rev. 2				
3-2	Nov.15,1983			**9-0**	Febr. 2019	4049
				9-1	Nov.15,1983	
4-1	Nov.15,1983			**9-2**	Nov.15,1983	
4-2	Nov.15,1983	May 2011/4032 Rev. 2		**9-3**	Nov.15,1983	
4-3	Nov.15,1983			**9-4**	Nov.15,1983	
4-4	Nov.15,1983			**9-5**	Nov.15,1983	
4-5	Nov.15,1983			**9-6**	Nov.15,1983	
4-6	Nov.15,1983	Oct. 1999 / 4043		**9-7**	Nov.15,1983	
4-7	Nov.15,1983			**9-8**	Febr. 2019	4049
4-8	Nov.15,1983			**9-9**	Febr. 2019	4049
4-9	Nov.15,1983			**9-10**	Febr. 2019	4049
4-10	Nov.15,1983	Oct. 1999 / 4043		**9-11**	Febr. 2019	4049
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DESCRIPTION

The LS4 is a Standard Class single seater sailplane with T-tail, retractable landing gear and upper wing surface air brakes.

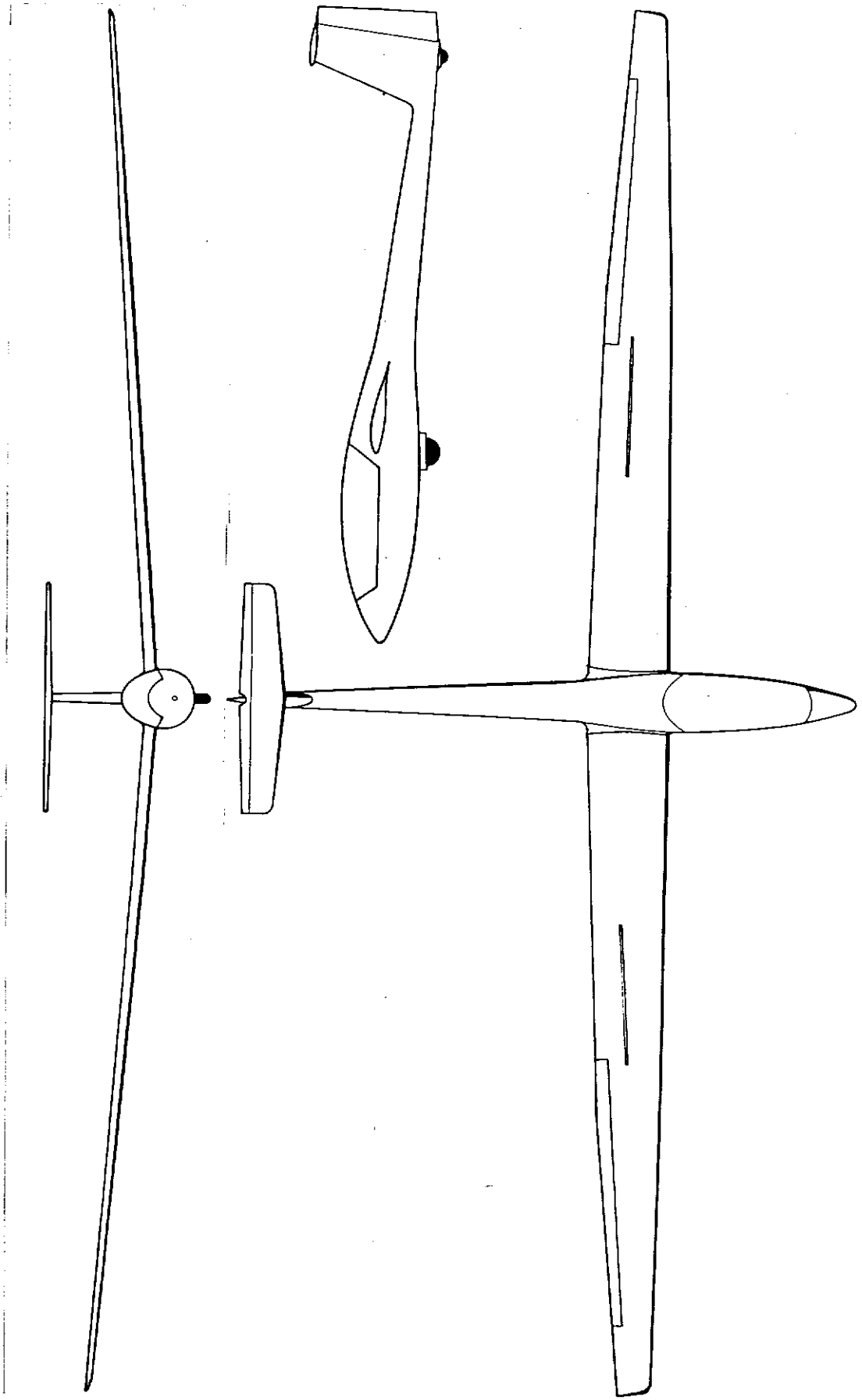
This sailplane has been produced using the latest technology of industrial glass-fibre design.

It is designed for training and competition flights - high performance combined with excellent handling characteristics.

Technical data

Wing span	15 m (49,21 ft)
Length	6.79 m (22.27 ft)
Height	1.32 m (4.31 ft)
Wing area	1o.5 m^2 (113.o sq.ft)
Wing aspect ratio	21.4
Maximum gross weight	525 kg (1157 lbs)
Maximum wing loading	5o kg/m^2 (1o.2 ppsf)
Airfoil	Wortmann modified

THREE DIMENSIONAL DRAWING



GENERAL

The sailplane is designed and originally approved according to LFSM regulations. The safety margin - ratio of ultimate loads to permissible loads, which may occur some times - is only 1.5 . This means that ultimate loads will be achieved when exceeding permissible load factors by 5o %. When exceeding permissible speeds, the safety margin is much lower !

Maximum permissible loads should not be achieved by the pilot's control surface deflections - they result from severe turbulence and the necessary control surface deflections to maintain the desired attitude.

Severe turbulence would include wave rotors, flying in cumulonimbus clouds, dust devils and when crossing mountain ridges in strong winds.

AIRSPEED LIMITS

All airspeed limits are indicated airspeeds (IAS)

	km/h	kts	mph
Never Exceed V_{NE}			
from sea level up to 65oo ft	28o	151	174
up to 98oo ft	266	144	165
up to 197oo ft	227	123	141
up to 328oo ft	179	97	111
Manoeuvering Speed V_A	19o	1o3	118
Limit Speed in "Severe Turbulence".....	19o	1o3	118
Winch Launch V_W	14o	76	87
Aero Tow V_T	19o	1o3	118
Landing Gear V_{Lo} and V_{LE}	28o	151	174
Air Brakes	28o	151	174

For "Severe Turbulence" see above.

NOTE: When flying at altitude, the lower limit IAS is always authoritative.

AIRSPEED INDICATOR MARKINGS

Green Arc: 1oo-19o km/h (54-1o3 kts, 62-118 mph)

Within this speed range it is not possible to overload the sailplane by "Severe Turbulence" and the necessary maximum control surface deflections to maintain the desired attitude.

Yellow Arc: 19o-28o km/h (1o3-151 kts, 118-174 mph)

Within this speed range "Severe Turbulence" or control surface deflections of more than 1/3 of possible travel may exceed the design limit and should be avoided. Manoeuvering loads, gust loads and loads due to control surface deflections should not be encountered simultaneously.

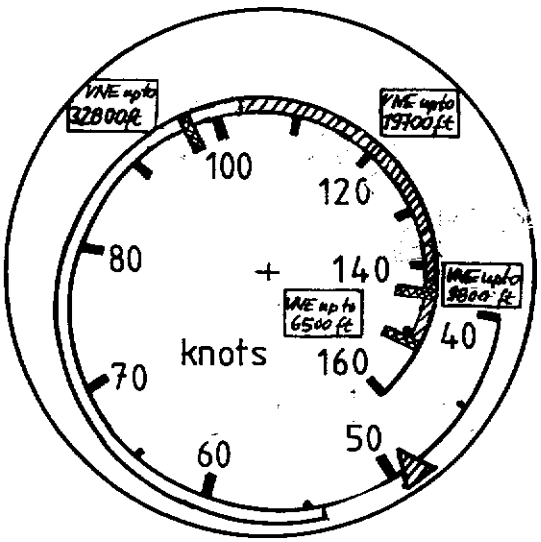
Red Line: 28o km/h (151 kts, 174 mph)

Never exceed up to 65oo ft above MSL flying altitude. For higher altitudes see page 2-1.

Yellow Triangle: 9o km/h (49 kts, 56 mph)

Minimum recommended approach to landing speed without water ballast.

Example: Airspeed Indicator
Winter 6 FMS 4-2



Red
Green
Yellow

Placards see page 2-7

Weight limits:

Max. flight weight (with water ballast): 525 kg <1157 lbs.>

Max. flight weight without water ballast: $W_{max} = W_{nlp} + W_{wings}$

Max. weight of non-lifting parts W_{nlp}: 230 kg <507 lbs.>

W_{nlp} with TN 4046/4047 executed (water bags removed or water bags marked V112) : 250 <551 lbs.>

The term ”non-lifting parts” includes the following: fuselage inclusive permanently fitted equipment, canopy and main pins plus horizontal tail plus max. cockpit load.

Note: If required the max. mass of non-lifting parts may be increased according to maintenance manual LS4 issued May 2011 section 2.2.1 item 2 and tables in section 2.4. This is not valid if TN4049 neo-Winglets has been performed.

Note: TN 4046 (manual revisions) and TN 4047 (increase of mass of non-lifting parts) don’t apply for LS4-b only but also for LS4 and LS4-a (TNLS-S-01).

Caution: With TN4045 (winglets) executed the max. mass and the max. mass of the non-lifting parts are reduced by 10 kg (22 lbs.). The max. amount of water ballast is limited to 100 kg (220 lbs.)

Maximum permissible Cockpit Load (pilot + parachute): 110 kg <242 lbs>

Caution: The maximum permissible Cockpit Load may be reduced by the max. weight of non-lifting parts see entry on page9-1.

Min. Cockpit Load (pilot + parachute):

Without trim weights in fuselage nose: 70 kg <154 lbs.>

With 3 trim weights in fuselage nose: 55 kg <121 lbs,>

Note: (1 trim weight equals 5 kg <11 lbs. pilot mass>)

Note: When being used in a club, Minimum Cockpit Load should be 70 kg (154 lbs). If used otherwise the min. Cockpit Load may be increased according to maintenance manual LS4 issued May 2011 section 2.2.1.

Water ballast in the wings: max. 170 kg <375 lbs.>

Max. baggage weight: 5 kg <11 lbs.>

Max. Instrument weight installed in upper portion of instrument panel: 4 kg <8.8 lbs.>

CENTER OF GRAVITY LIMITS

Position of C.G. in flight (without water ballast)

Maximum allowable:

forward C.G. position . . . . . 225 mm (8.86 in) aft of DP

rearward C.G. position . . . . 400 mm (15.75 in) aft of DP without water ballast

. . . 330 mm (13 in) aft of DP with 170 kg (375 lbs) water ballast

Datum Point (DP): Leading edge of wing at root, when under side of fuselage boom placed horizontal.

NOTE: Loading ballast will move the plane's C.G. forward, unless the C.G. is already at its maximum forward position.

MANOEUVER LIMITS

Acrobatic manoeuvers not approved.

Spins not approved.

FLIGHT LOAD FACTOR LIMITS

At 190 km/h (103 kts,118 mph) 5.3 G positive and 2.65 G negative.

At 280 km/h (151 kts,174 mph) 4.0 G positive and 1.5 G negative.

KINDS OF OPERATION LIMITS

VFR-Flight permitted, minimum equipment see page 2-5.

Cloud Flying permitted, if sailplane is appropriately equipped, certified by inspector and

a) water ballast tanks are empty (LS4-a tanks, volume 80-85 liters per wing <17.6-18.7 Imp.Gal,21.1-22.4 US-Gal>)

b) water ballast tanks are filled after performing TB 4023, Installation of LS4 tanks (volume 65-70 liters per wing <14.3-15.4 Imp.Gal, 17.1-18.5 US-Gal>)

Minimum equipment see page 2-5.

Flight into known icing not approved.

Use of water ballast limited to non-freezing conditions.

CATEGORY OF AIRWORTHINESS

U (Utility) according to JAR 22.

MINIMUM EQUIPMENT LIST

1. Airspeed Indicator, scale 50-300 km/h (27-162 kts, 31-186 mph)
   Colour marking see page 2-2
   Approved types see Master Equipment List page 9-4
   Pressure pick-ups: Fuselage nose pitot (without nose release) or vertical tail fin pitot (with nose release) and forward fuselage side statics.
2. Altimeter
3. Magnetic compass
4. Four piece seat belt harness

   } See Master Equipment List on pages 9-4 to 9-6

5. Back cushion or parachute in compressed form should not be thinner than 80-100 mm (3-4 in)
6. Checklist, type placard, data and loading placard, operating placards. For placards see pages 2-6 and 2-7.
7. LS4-a Flight Manual

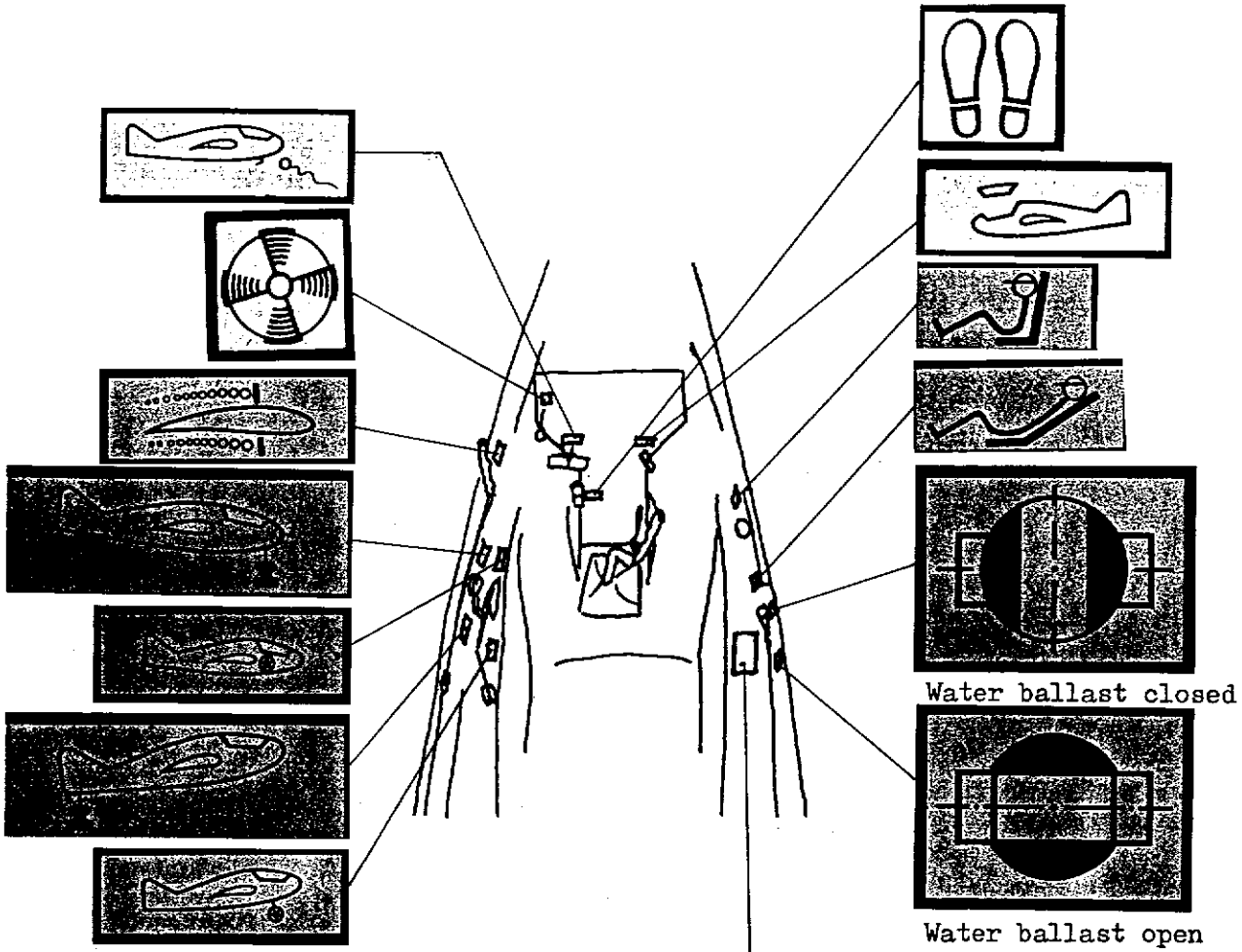
Additionally for cloud flying:

8. Turn and bank indicator
9. Variometer

BREAK AWAY LINK IN TOW CABLE

Break away link in tow cable for winch launch and aero tow maximum 600 kg (1323 lbs).

OPERATING PLACARDS



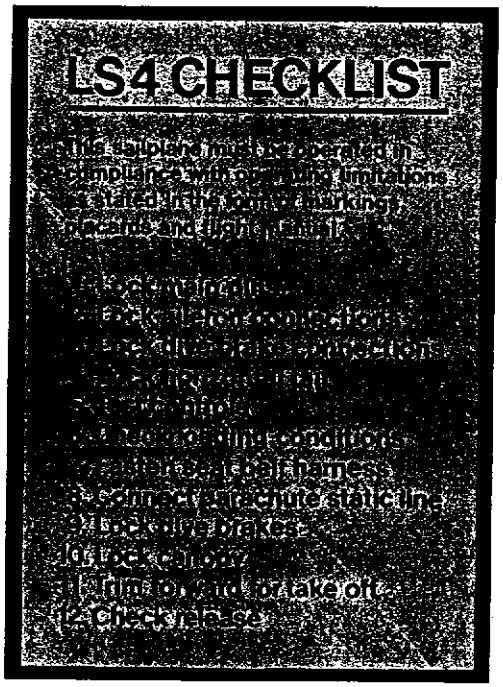
OPERATING PLACARDS

VNE up to 6500 ft	VNE up to 9800 ft
VNE up to 19700 ft	VNE up to 32800 ft

Airspeed Indicator Placards

Refer to page 2-1 for speeds and page 2-2 for positioning diagram

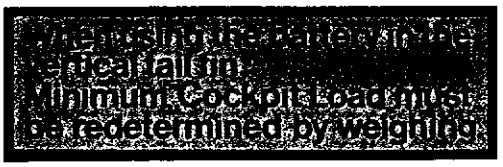
Minimum Cockpit Load kg



Under Instrument Panel Cover

Under Instrument Panel Cover

Canopy Release
on both canopy frames



Under battery box cover of vertical tail fin

Baggage Compartment Placard

Near Altimeter, when range is 20000 ft

Electrical switch positions

Rolladen Schneider Flugzeugbau GmbH		
Type	LS 4-a	
Serial No.	_____	
FAA TC	_____	Made in West-
Reg. No.	_____	Germany

Type Placard at main bulkhead

Tyre Pressure 3-3.5 bar (43-50 psi)	On left main wheel door
Tyre Pressure 2.5-3.5 bar (36-50 psi)	Near tailwheel, if fitted

Edition 15. Nov. 83

Erstellt: 15. April 83 de	Ersetzt:	Geprüft: 15. 4. 83 Schapka

Spin Recovery

Rudder	-	Opposite to spin rotation
Elevator	-	Neutral or slightly forward
Aileron	-	Neutral

Smooth pull-out

Altitude loss - About 50 m (150 ft)

Emergency Canopy Release and Exit

Pull open both canopy locks and pull emergency canopy release handle until the stop. Push the canopy upwards.

With TN 4032 executed:
To bail out open canopy locking handles, then pull the red canopy emergency release handle until the canopy hinge disengages.
A spring at the canopy hinge lifts the canopy at the front end.
Only in case the canopy doesn't separate by itself from the fuselage, you have to push the canopy upwards with both hands on the Plexiglas.
The latch on the rear of the canopy is held back by a spring in the fuselage.
This creates a point of rotation to ensure a safe separation of the canopy.

Other Emergencies

Stalls

Warning	-	Slight tail shudder prior to stall entry
Aileron	-	Effectiveness reduced by about 50%
Sink rate	-	Increases considerably
Termination	-	Stick forward to neutral

Spiral Dive

At high speeds (250 km/h, 135 kts, 157 mph) stable against spiral dive (load factor of 2G).

At low speeds slight tendency.

Elevator	-	Pull
Rudder	-	Hold opposite to dive rotation
Aileron	-	Hold opposite to angle of bank

LIMITATION OF HIGH SPEED FLIGHT

If there are indications while flying under large cloudbanks that the maximum permissible rough air speed (V_A) will be exceeded, air brakes should be extended carefully before 190 km/h (103 kts, 118 mph) is reached. In emergencies, air brakes can also be extended up to a speed of 280 km/h (151 kts, 174 mph).

When air brakes are extended during descent after high altitude wave flights, a speed of 190 km/h (103 kts, 118 mph) should not be exceeded because of possible severe turbulence.

DAILY INSPECTION

(1) Forward fuselage

- Pitot pressure port, if no nose release is fitted, for clogging
- Nose release, if fitted, working properly

(2) Landing gear

- Recommended tyre pressure 3.5 bar (5o psi)
- Slip mark and tyre condition
- C.G. release including automatic release working properly
- Water drain orifices in front of and behind landing gear box free from clogging (See also page 8-6)

(3) Wings

- Water drain orifices at root and tip free from clogging
- Condition, damage or cracks
- Attachment
- Air brakes working properly
- Ailerons for unobstructed movement and free from play

(4) Fuselage

- Condition, damage or cracks
- Rear static ports at fuselage boom free from clogging
- Recomm.tail wheel tyre pressure, if fitted, 2.5-3.5 bar (36-5o psi)
- Water drain orifice in front of tail wheel, if fitted, free from clogging
- Tail skid for proper adhesion, if fitted

(5) Tail unit

- Condition, damage or cracks
- TE port at upper end of vertical tail fin leading edge free from clogging
- Pitot pressure port half way down vertical tail fin leading edge free from clogging (only if nose release is fitted)
- Charged rear battery connected, if used
- Horizontal tail properly installed
- Horizontal tail for damage or pressure marks
- Tail control surfaces movement unobstructed and free from play

Daily Inspection continued

6. Cockpit

- Canopy cleaned, if necessary
- Proper function of canopy locking and emergency release (not daily, but to be completed at minimum every 3 months):
  a) "Pilot" in seat, both canopy locking handles opened. One person at the front end to lift the canopy from the fuselage.
  b) After puling the emergency canopy release handle the pilot pushes the canopy up at the rear to disengage the LS-Latch (Röger hook) from the spring on the fuselage.
  After pulling the emergency canopy release handle the canopy must be freely moveable at the front.
  With TN4032 executed: The canopy must be lifted at the front by the spring at the hinge by about 60 mm <2.4 in.>.
  c) Then the pilot lifts the canopy at the rear end up as far as possible, the person at the front end holds the canopy.

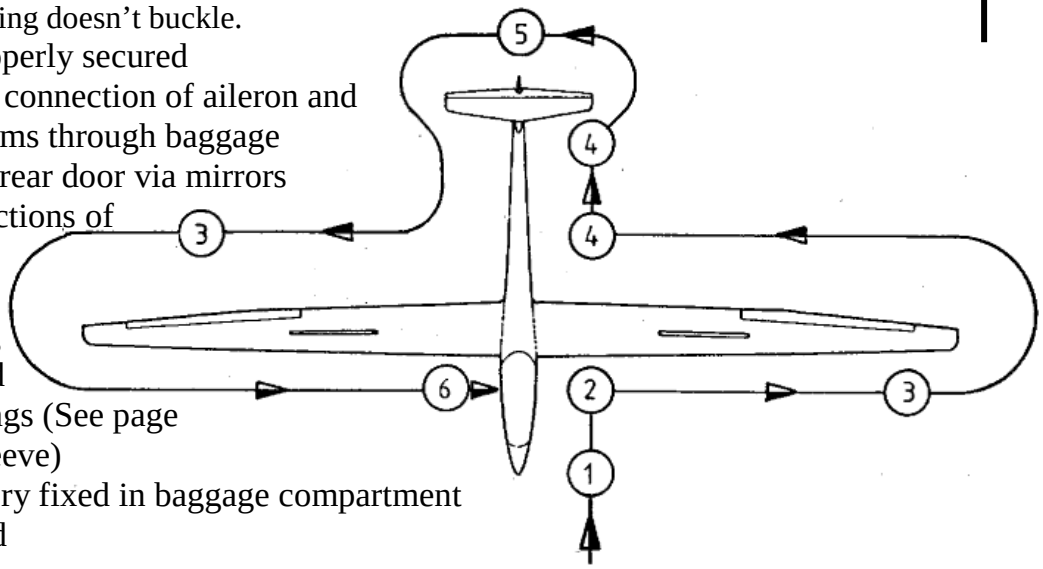
Caution: The person at the front end should not lift the canopy too far up. Otherwise this would unduly deform the spring of the LS-Latch (Röger hook) located at the fuselage.

Note: b) and "Caution*" apply only if TN 4032 LS-Latch (Röger Hook) has been completed

Reinstalling the canopy: 2 persons are needed

a) Pull up the canopy hinge to the open position.
b) One person (at the front end) holds with one hand the emergency release lock in open position (rotate clockwise) and places the canopy with the other hand onto the hinge. The other person holds the canopy at the rear end so far up that it matches the canopy hinge.
c) The front person engages the canopy by turning the emergency release lock anti-clockwise to the stop.
With TN4032 executed: The spring fixed at the canopy must be inserted into the ring at the canopy lifting mechanism. When pressing down the canopy make sure that the spring doesn't buckle.

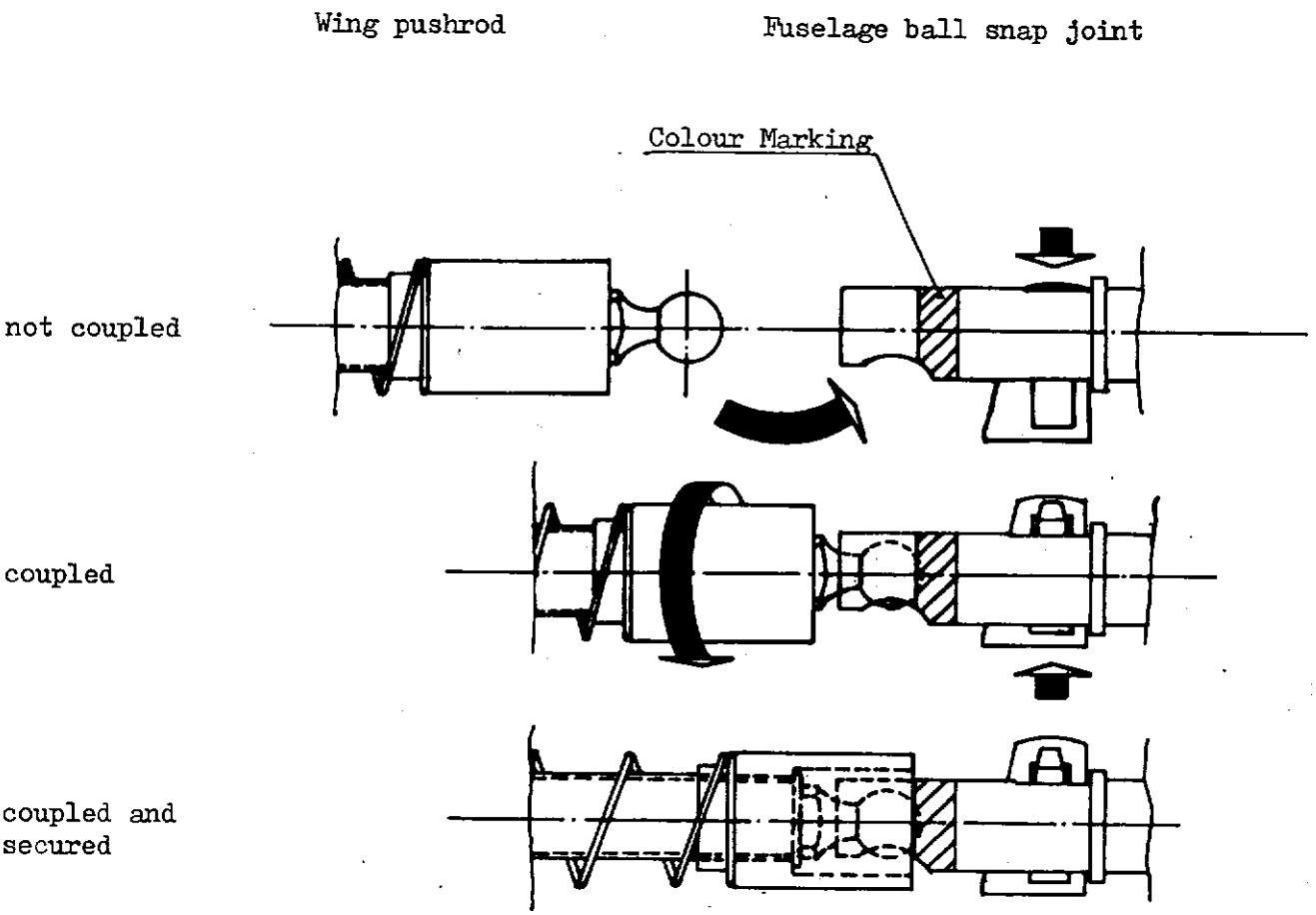
- Main pins properly secured
- Check proper connection of aileron and airbrake systems through baggage compartment rear door via mirrors
- Secure connections of aileron and airbrake systems using LS-sleeve and colour markings (See page 4-3 for LS-sleeve)
- Charged battery fixed in baggage compartment and connected



For assembly and disassembly procedures see Chapter 8.

AILERON AND AIR BRAKE CONNECTION

Connection of aileron and air brake systems using LS-sleeve and colour marking :



PREFLIGHT CHECK

Daily inspection	- performed
Water ballast system	- check for leaks,if filled
Total energy tube	-fitted and connection properly sealed
Weight and balance, especially Minimum and Maximum Cockpit Loads, trim weights and battery position	- checked
Altimeter	- set
Other instrumentation	- checked, normally indicating zero
Radio	- operation check
Backrest	- adjusted
Rudder pedals	- adjusted
Papers (C of A, Logbook, etc.)	- complete and valid
Before take off	- perform cockpit checklist procedure

POSTFLIGHT CHECK

Electrical instruments	- switch off
Battery	- recharge,if necessary
Insects and dust	- remove, using water and sponge and chamois leather
Air brake boxes	- check, if moisture has accumulated and remove with sponge
Water ballast system	- check proper dumping

ADJUSTMENT OF RUDDER PEDALS

- possible in flight or on the ground
- release pressure on pedals
- unlock pawl by pulling black pedal release handle
- forward adjustment : push pedals forward with feet into desired position and lock
- rearward adjustment: pull pedals with release handle into desired position and lock

ADJUSTMENT OF BACKREST

Lower bracket adjustable only on the ground, allows use of various

- types of parachutes
- pull cable through slot for unlocking
- lock in desired position

Slope adjustment possible in flight or on the ground

Forward adjustment:

- slacken shoulder straps
- release pressure of backrest
- push ratchet at right cockpit rim forward and outward into desired position and lock
- check proper locking of ratchet
- retighten shoulder straps

Rearward adjustment:

- release pressure of backrest
- push ratchet at right cockpit rim slightly forward and outward
- push backrest backward into desired position and lock
- check proper locking of ratchet
- tighten shoulder straps

Automatic parachute ripcord

(a) Attach to red main bulkhead portion at left rear of pilot
(b) Use special loop only

Retractable Landing Gear

(a) Extension or retraction permitted over whole approved speed range
(b) Rapid operation eases retraction
(c) Handle locked in forward overcenter position = gear up
(d) Handle locked in rearward overcenter position = gear down

Important Note: **During winch launch, retract gear after releasing tow cable, because C.G. hook is fitted to landing gear fork.**

Warning: **Extend or retract landing gear only, when air brakes are retracted and locked or completely extended.**

Wheel Brake

(a) Press rudder pedals with both feet to activate wheel brake.
(b) Wheel brake is an emergency brake, therefore it should be used sparingly because of high wear rate of linings.

Trim System

(a) Trim lever and trim-locking lever are separate
(b) Trim-locking lever is at control stick
(c) Pull locking lever to free trim knob at left cockpit side
(d) With the trim knob:
    (1) Elevator stick force can be trimmed to zero
    (2) Desired speed can be trimmed
    (3) Release locking lever after trimming to fix trim setting
    (4) Indication of trim setting shown by position of trim knob relative to neutral mark

Warning: ***Elevator trim system must not be used for compensation of minimum cockpit load deficiency.*** *(see below)*

Baggage Compartment

Baggage compartment should be used for soft and light materials which would not obstruct the pilot after deceleration or injure the pilot in crash landings. Maximum baggage 5 kg (11 lbs).
Baggage compartment load counts for useful load and must therefore be included, when checking loading conditions.
For permanent installation of batteries, barographs, ELT etc. see Maintenance Manual chapter 11.

Prepared:	Verified:	Complies:
02.02.00		

WATER BALLAST

- each wing holds a maximum of 85 liters (22.45 US-gallons, 18.7 Imp-gallons)
- maximum permissible load depends on loading conditions, see page 9-2 for water ballast loading instructions
- filling of water tanks:
  - Dump valve operating levers are marked R and L
  - open appropriate dump valve by shifting its lever backwards
  - lay wingtip on the ground
  - suck residual air from water bag through dump orifice using connection hose
  - connect funnel to dump orifice
  - fill desired amount of water, use clean water only to avoid destroying gasket of valve and consequent leaking
  - during filling disconnect funnel several times to allow residual air to escape
  - never use more than o.1 bar of water pressure (funnel max. 1 m (3.3 ft) above wing)
  - close valve by shifting lever forward
  - repeat procedure for other wing
- dumping of water:
  - open both valves simultaneously by shifting levers backwards
  - 1o liters (2.6 US gal, 2.2 Imp. gal) will be dumped in approximately 1o seconds
  - if aileron stick force is needed to maintain level flight after dumping, this may indicate unequal dumping
  - to avoid ground looping in case of unequal dumping apply aileron in the direction as noticed before shortly after touchdown
- use of water ballast limited to non freezing conditions, see also Flight Manual page 2-4

WINCH LAUNCH

- adjust backrest properly (See page 4-4) } to avoid sliding backwards during acceleration and steep climb
- tighten seat belt harness }
- trim slightly forward, trim lever just before reference mark
- when water tanks are partially filled, keep wings horizontal before take off to avoid unequal water distribution
- break away link in tow cable max. 600 kg (1323 lbs)
- ask winch operator to avoid too high acceleration, the higher the initial acceleration, the higher is the pitch up tendency
- use wheel brake during tightening of tow cable to avoid rolling over tow cable
- pronounced forward stick pressure is required during transition arc
- minimum winch launch speed

  without water ballast .... 90 km/h (49 kts, 56 mph)

  with water ballast .....110 km/h (59 kts, 68 mph)
- retract landing gear after tow, because C.G. release is fitted to landing gear fork

AERO TOW

- adjust backrest properly and tighten seat belt harness
- trim slightly forward, trim lever just before reference mark
- additional aileron effectiveness during initial take off roll may be achieved by extending air brakes, retract air brakes before leaving ground
- when water tanks are partially filled, keep wings horizontal before take off to avoid unequal water distribution
- break away link in tow cable max. 600 kg (1323 lbs)
- use wheel brake during tightening of tow cable to avoid rolling over tow cable
- minimum tow speed without water ballast ... 100 km/h (54 kts, 62 mph)

  with water ballast ... 120 km/h (65 kts, 75 mph)
- recommended tow cable length 30 - 80 m (100 - 260 ft)
- either nose or C.G. release can be used. While using the C.G. release, the landing gear may not be retracted during tow, because release is fitted to landing gear fork

FREE FLIGHT

- Stalling speed for straight and level flight
  without water ballast 65 - 7o km/h (35-38 kts, 4o-44 mph)
  with water ballast 8o - 85 km/h (43-46 kts, 5o-53 mph)
- Stalling speeds for banked flight see table below
- best glide angle between 9o - 1oo km/h (49-54 kts, 56-62 mph)
- high speed flight
  - trim high speeds
  - check speed indication regularly to avoid exceeding limit values
- observe airspeed limits versus altitude
- CAUTION: When flying with empty water tanks, leave dump valve in open position to avoid pressure built up inside tanks at altitude

Banked flight stalling speeds

Angle of bank	Stalling speed without water ballast, wingloading 33 kg/m^2 (6.76 ppsf)			Stalling speed with water ballast, wingloading 5o kg/m^2 (1o.2 ppsf)		
(Deg)	(km/h)	(kts)	(mph)	(km/h)	(kts)	(mph)
0	65-7o	35-38	4o-44	8o-86	43-47	49-54
2o	67-72	36-39	42-45	82-89	44-48	52-55
3o	7o-75	38-41	44-47	86-92	47-5o	54-58
4o	74-8o	4o-43	46-5o	91-98	49-53	56-62
45	77-83	42-45	48-52	95-1o2	52-55	59-64
5o	81-87	44-47	5o-54	1oo-1o7	54-58	61-65
6o	92-99	5o-53	57-62	113-122	61-65	7o-76

Banked flight stalling speeds are calculated from straight flight data

Sideslip

(1) Sideslip can be recommended for landing only with a small amount of air brakes extended.
Low-speed sideslip is not possible because of nose-heavy moment of fully extended air brakes.

(2) Sideslip speed range up to VA = 190 km/h <103 Kt., 118 mph>

(3) For a straight and steady sideslip 100 % rudder and between 50% to 75% aileron deflection are necessary. During sideslip, rudder control force decreases to almost zero force..

(4) Degradation in airspeed system goes down to zero airspeed indication.
Depending on airspeed indicator, negative values may be indicated.
Pressure pick-ups: Vertical tail fin **pitot pressure**
Forward fuselage **lower side static pressure**

(5) Partial water ballast yields unimportant difference in sideslip handling.

Landing

(a) Always extend landing gear in time and lock.

Warning: ***In case of late landing gear extension during final approach, do retract airbrakes and lock beforehand.***

(b) Landing with gear retracted not advisable, because pilot is much better protected by the sprung landing gear compared to the fuselage shell.

(c) Water ballast should normally be dumped prior to landing. Because of possible unequal dumping leave valves open.

Warning: ***Minimum approach speed with air brakes fully extended:***
without water ballast not below 90 km/h <49 Kt., 56 mph>.
with water ballast not below 100 km/h <54 Kt., 62 mph>.

(d) Air brakes allow control of glide angle within wide limits, therefore sideslipping is not necessary.

Warning: ***Minimum speed increases***
With air brakes extended by about 10 km/h <5 Kt., 6 mph>.
In rain and with air brakes extended by about 20 km/h <11 Kt., 12 mph>.

Warning: ***Sideslip with air brakes extended is not recommended for landing, because nose heavy moment of air brakes allows no* slow speed *sideslip.***

HIGH ALTITUDE FLIGHTS

Increasing altitude yields higher true airspeed than indicated airspeed and this difference increases with increasing altitude. This does not influence loads on the structure, which means that colour markings on airspeed indicator are valid unless limited by red lines.

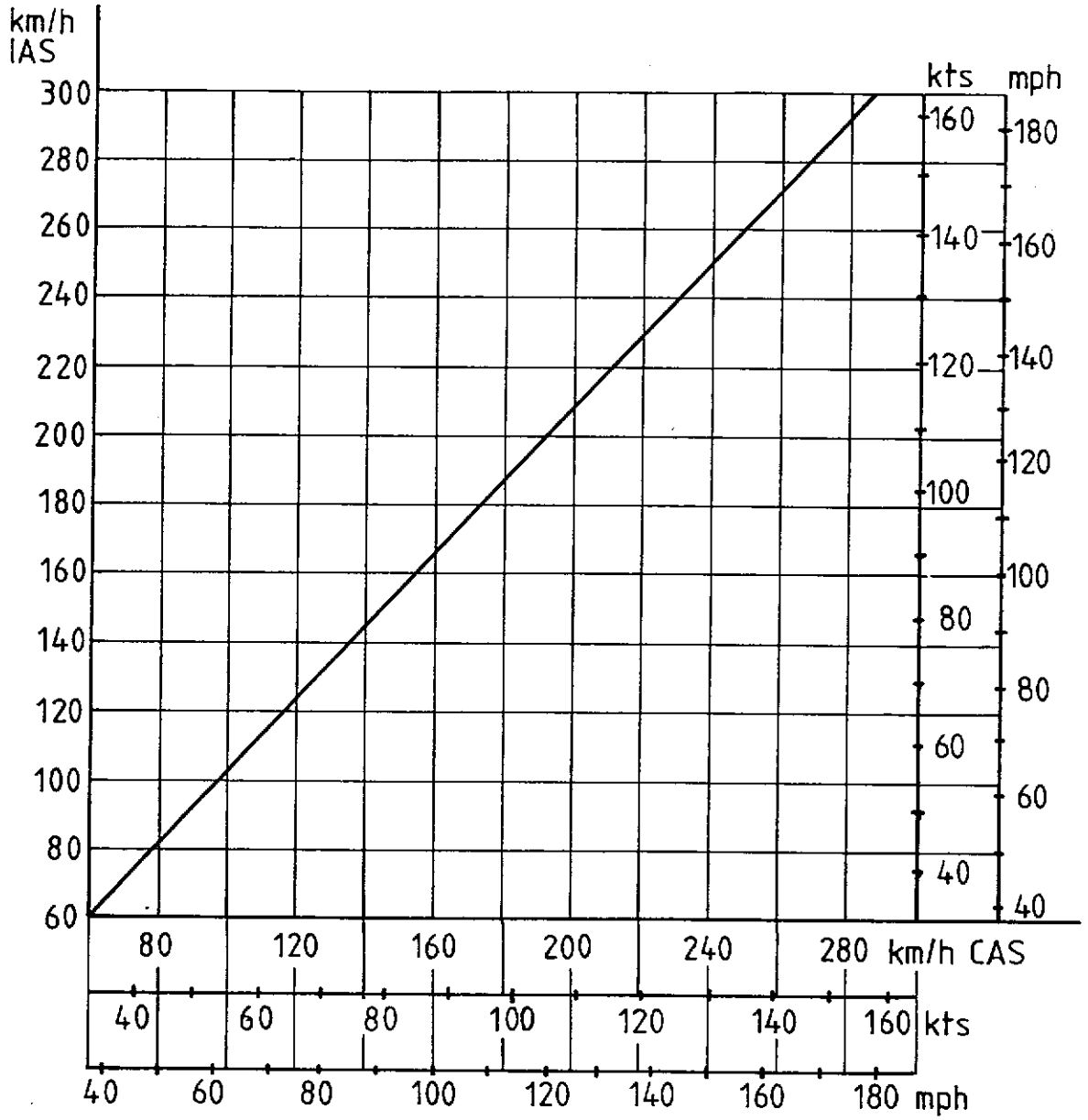
However, as structural limitation depends on true airspeed, this should never be above 28o km/h IAS (151 kts, 174 mph) up to 2ooo m (65oo ft) above MSL.

Using the table on page 2-1, maximum permissible airspeeds depending on altitude, the pilot is able to avoid flying faster than true airspeed of 28o km/h CAS (151 kts, 174 mph).

EXAMPLE: Indicated airspeed of 227 km/h (123 kts, 141 mph) at 6ooo m (197oo ft) altitude corresponds to 28o km/h (151 kts, 174 mph) true airspeed.

AIRSPEED SYSTEM CALIBRATION

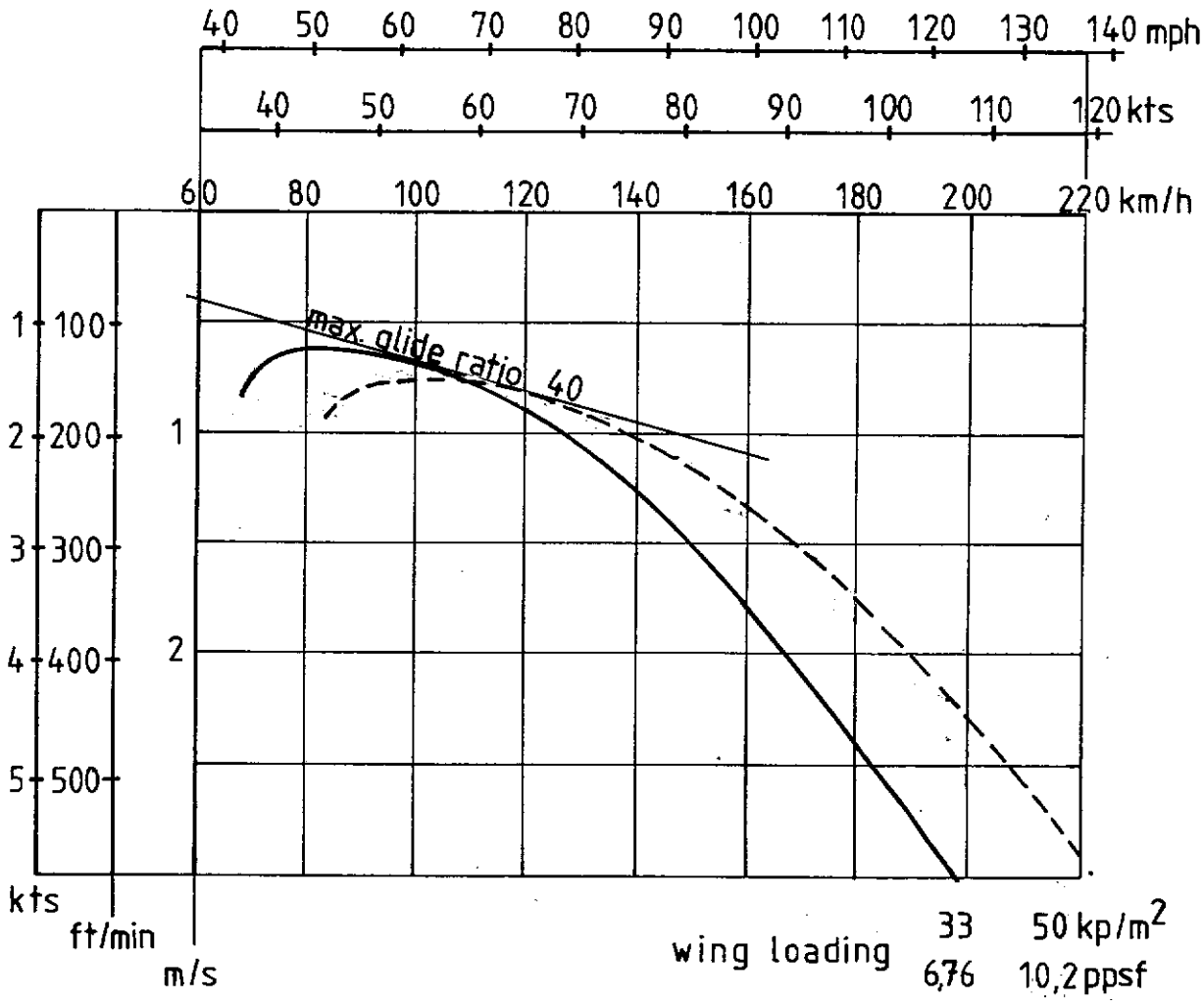
This diagram shows airspeed indicator error due to position of pressure ports.



Pressure ports: Fuselage nose pitot (without nose release)
Vertical tail fin pitot (with nose release)
Forward fuselage side statics

FLIGHT POLAR

The flight polar gives forward speed versus sinking speed related to wing loading.



The flight polar is valid for "clean" wing.
Insects and raindrops on wing decrease performance and handling, see page 4-1o Landing.

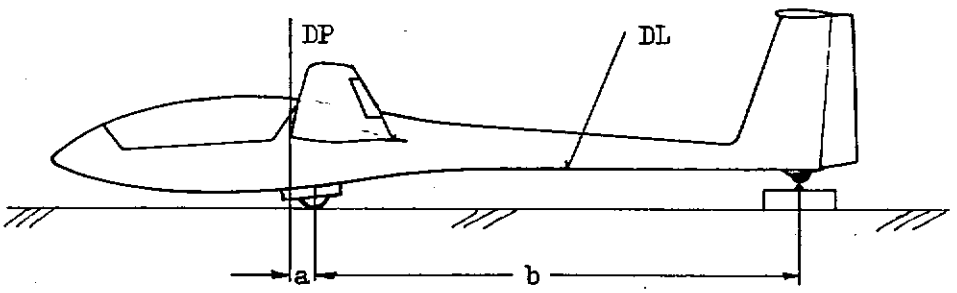
WEIGHING PROCEDURE

To determine in-flight C.G. position, the empty weight C.G. position must be known.

1. Determine weight by weighing all parts and adding together.
2. Assemble sailplane.
3. Raise tail on weighing machine until datum line level using wooden blocks or adjustable jack.
4. Weigh gross tail weight.
5. Measure distance b from tail support to center of landing gear axis.
6. Using plumb lead, determine points on floor perpendicular to left and right datum points, and points on floor perpendicular to center of landing gear axis. Measure distance a from axis to datum point.
7. Determine tare tail weight (Weight of additional material used under 3).
8. Calculate nett tail weight = gross tail weight - tare tail weight
9. Calculate empty weight C.G. position:

$$Xcg = \frac{\text{nett tail weight x b}}{\text{empty weight}} + a$$

10. When battery is fitted in vertical tail fin, weighing must be done in this configuration.



DATUM LINE (DL): under side of fuselage boom placed horizontal.

DATUM POINT (DP): leading edge of wing at root.

CALCULATION OF LOADING LIMITS

1. Determine Minimum Cockpit Load from table "Empty Weight C.G. Limits".

   When being used in a club, Minimum Cockpit Load should be 7o kg (154 lbs). If it is higher, permanent ballast may be fitted under forward seat portion. See page 9-3.

   Minimum Cockpit Load should be entered in the following places:

   1) in weighing report of inspection
   2) in Flight Manual, page 9-1
   3) under instrument panel cover
   4) on Data Placard in cockpit

2. Maximum Cockpit Load normally is 11o kg (242 lbs), as given in empty weight C.G. table.

   It may be lower due to excessive equipment or repairs. Calculate Maximum Cockpit Load by deducting weight of fuselage (including permanently fitted equipment, canopy and main pins) and horizontal tail from maximum weight of nonlifting parts. (23o kg, 242 lbs)

   Maximum Cockpit Load should be entered in the following places:

   1) in weighing report of inspection
   2) in Flight Manual, page 9-1
   3) on Data Placard in cockpit

3. Empty Weight (perhaps increased by weight of permanently fixed ballast) should be entered in the following places:

   1) in weighing report of inspection
   2) in Flight Manual, page 9-1 for calculation of maximum permissible water ballast weight.

4. Battery position during weighing should be entered in the following places:

   1) in equipment list of inspection
   2) on Data Placard in cockpit

EPMTY WEIGHT C.G. LIMITS

Empty Weight (kg)	Cockpit Load Range (kg) / Empty Weight C.G. Limits (mm)						
	6o-11o	65-11o	7o-11o	75-11o	8o-11o	85-11o	9o-11o
23o	625-65o	625-67o	625-69o	625-71o	625-731	625-752	625-773
231	623-649	623-669	623-689	623-7o9	623-73o	623-75o	623-771
232	621-648	621-668	621-688	621-7o8	621-728	621-749	621-77o
233	62o-647	62o-667	62o-687	62o-7o6	62o-727	62o-747	62o-768
234	618-646	618-666	618-685	618-7o5	618-725	618-746	618-767
235	616-645	616-664	616-684	616-7o4	616-724	616-744	616-765
236	615-644	615-663	615-683	615-7o3	615-723	615-743	615-763
237	613-643	613-662	613-682	613-7o1	613-721	613-741	613-762
238	611-642	611-661	611-681	611-7oo	611-72o	611-74o	611-76o
239	61o-641	61o-66o	61o-679	61o-699	61o-719	61o-739	61o-759
24o	6o8-64o	6o8-659	6o8-678	6o8-698	6o8-717	6o8-737	6o8-757
241	6o7-639	6o7-658	6o7-677	6o7-696	6o7-716	6o7-736	6o7-756
242	6o5-638	6o5-657	6o5-676	6o5-695	6o5-715	6o5-734	6o5-754
243	6o3-637	6o3-656	6o3-675	6o3-694	6o3-713	6o3-733	6o3-753
244	6o2-636	6o2-655	6o2-674	6o2-693	6o2-712	6o2-732	6o2-752
245	6oo-635	6oo-654	6oo-673	6oo-691	6oo-711	6oo-73o	6oo-75o
246	599-634	599-653	599-671	599-69o	599-71o	599-729	599-749
247	597-633	597-652	597-67o	597-689	597-7o8	597-728	597-747
248	596-632	596-651	596-669	596-688	596-7o7	596-726	596-746
249	594-631	594-65o	594-668	594-687	594-7o6	594-725	594-744
25o	593-63o	593-649	593-667	593-686	593-7o5	593-724	593-743
251	591-629	591-648	591-666	591-684	591-7o3	591-722	591-742
252	59o-628	59o-647	59o-665	59o-683	59o-7o2	59o-721	59o-74o
253	588-627	588-646	588-664	588-682	588-7o1	588-72o	588-739
254	587-626	587-645	587-663	587-681	587-7oo	587-719	587-738
255	586-625	586-644	586-662	586-68o	586-699	586-717	586-736
256	584-625	584-643	584-661	584-679	584-698	584-716	584-735
257	583-624	583-642	583-66o	583-678	583-696	583-715	583-734
258	581-623	581-641	581-659	581-677	581-695	581-714	581-732
259	58o-622	58o-64o	58o-658	58o-676	58o-694	58o-712	58o-731
26o	579-621	579-639	579-657	579-675	579-693	579-711	579-73o
261	577-62o	577-638	577-656	577-674	577-692	577-71o	577-729
262	576-619	576-637	576-655	576-673	576-691	576-7o9	576-727
263	575-619	575-636	575-654	575-671	575-69o	575-7o8	575-726
264	573-618	573-635	573-653	573-67o	573-688	573-7o7	573-725
265	572-617	572-634	572-652	572-669	572-687	572-7o5	572-724
266	571-616	571-634	571-651	571-668	571-686	571-7o4	571-722
267	569-615	569-633	569-65o	569-667	569-685	569-7o3	569-721
268	568-614	568-632	568-649	568-666	568-684	568-7o2	568-72o
269	567-614	567-631	567-648	567-665	567-683	567-7o1	567-719
27o	566-613	566-63o	566-647	566-664	566-682	566-7oo	566-718

EMPTY WEIGHT C.G. LIMITS (lbs, inches)

Empty Weight (lbs)	Cockpit Load Range (lbs) / Empty Weight C.G. Limits (inches)			Empty Weight (kg)
	176-242	187-242	198-242	
507	24.600-28.785	24.600-29.600	24.600-30.430	230
509	24.531-28.728	24.531-29.540	24.531-30.366	231
511	24.464-28.672	24.464-29.480	24.464-30.303	232
514	24.397-28.617	24.397-29.421	24.397-30.241	233
516	24.330-28.562	24.330-29.363	24.330-30.179	234
518	24.265-28.507	24.265-29.305	24.265-30.117	235
520	24.199-28.453	24.199-29.247	24.199-30.056	236
522	24.135-28.400	24.135-29.190	24.135-29.996	237
525	24.070-28.347	24.070-29.134	24.070-29.936	238
527	24.007-28.294	24.007-29.078	24.007-29.877	239
529	23.944-28.242	23.944-29.022	23.944-29.818	240
531	23.881-28.190	23.881-28.967	23.881-29.760	241
534	23.819-28.138	23.819-28.913	23.819-29.702	242
536	23.757-28.087	23.757-28.858	23.757-29.644	243
538	23.696-28.037	23.696-28.805	23.696-29.587	244
540	23.636-27.987	23.636-28.751	23.636-29.531	245
542	23.576-27.937	23.576-28.699	23.576-29.475	246
545	23.516-27.887	23.516-28.646	23.516-29.419	247
547	23.457-27.839	23.457-28.594	23.457-29.364	248
549	23.398-27.790	23.398-28.543	23.398-29.309	249
551	23.340-27.742	23.340-28.491	23.340-29.255	250
553	23.283-27.694	23.283-28.441	23.283-29.201	251
556	23.225-27.647	23.225-28.390	23.225-29.148	252
558	23.168-27.600	23.168-28.340	23.168-29.095	253
560	23.112-27.553	23.112-28.291	23.112-29.042	254
562	23.056-27.507	23.056-28.242	23.056-28.990	255
564	23.001-27.461	23.001-28.193	23.001-28.939	256
567	22.946-27.415	22.946-28.144	22.946-28.887	257
569	22.891-27.370	22.891-28.096	22.891-28.836	258
571	22.837-27.325	22.837-28.049	22.837-28.786	259
573	22.783-27.280	22.783-28.001	22.783-28.736	260
575	22.730-27.236	22.730-27.954	22.730-28.686	261
578	22.677-27.192	22.677-27.908	22.677-28.637	262
580	22.624-27.149	22.624-27.861	22.624-28.588	263
582	22.572-27.106	22.572-27.816	22.572-28.539	264
584	22.520-27.063	22.520-27.770	22.520-28.491	265
586	22.469-27.020	22.469-27.725	22.469-28.443	266
589	22.418-26.978	22.418-27.680	22.418-28.395	267
591	22.368-26.936	22.368-27.635	22.368-28.348	268
593	22.317-26.895	22.317-27.591	22.317-28.301	269
595	22.267-26.853	22.267-27.547	22.267-28.255	270
	80-110	85-110	90-110	(kg)

EMPTY WEIGHT C.G. LIMITS (lbs, inches)

Empty Weight (lbs)	Cockpit Load Range (lbs) / Empty Weight C.G. Limits (inches)				Empty Weight (kg)
	132-242	143-242	154-242	165-242	
507	24.600-25.587	24.600-26.385	24.600-27.179	24.600-27.970	230
509	24.531-25.545	24.531-26.339	24.531-27.130	24.531-27.917	231
511	24.464-25.502	24.464-26.293	24.464-27.081	24.464-27.865	232
514	24.397-25.460	24.397-26.248	24.397-27.032	24.397-27.813	233
516	24.330-25.419	24.330-26.203	24.330-26.984	24.330-27.761	234
518	24.265-25.378	24.265-26.159	24.265-26.936	24.265-27.710	235
520	24.199-25.337	24.199-26.114	24.199-26.888	24.199-27.659	236
522	24.135-25.297	24.135-26.071	24.135-26.841	24.135-27.609	237
525	24.070-25.256	24.070-26.027	24.070-26.795	24.070-27.559	238
527	24.007-25.217	24.007-25.984	24.007-26.749	24.007-27.510	239
529	23.944-25.177	23.944-25.942	23.944-26.703	23.944-27.461	240
531	23.881-25.138	23.881-25.899	23.881-26.657	23.881-27.412	241
534	23.819-25.099	23.819-25.857	23.819-26.612	23.819-27.364	242
536	23.757-25.061	23.757-25.816	23.757-26.568	23.757-27.316	243
538	23.696-25.023	23.696-25.775	23.696-26.523	23.696-27.269	244
540	23.636-24.985	23.636-25.734	23.636-26.479	23.636-27.222	245
542	23.576-24.947	23.576-25.693	23.576-26.436	23.576-27.175	246
545	23.516-24.910	23.516-25.653	23.516-26.392	23.516-27.129	247
547	23.457-24.873	23.457-25.613	23.457-26.349	23.457-27.083	248
549	23.398-24.836	23.398-25.573	23.398-26.307	23.398-27.037	249
551	23.340-24.800	23.340-25.534	23.340-26.265	23.340-26.992	250
553	23.283-24.764	23.283-25.495	23.283-26.223	23.283-26.947	251
556	23.225-24.728	23.225-25.456	23.225-26.181	23.225-26.903	252
558	23.168-24.693	23.168-25.418	23.168-26.140	23.168-26.859	253
560	23.112-24.657	23.112-25.380	23.112-26.099	23.112-26.815	254
562	23.056-24.623	23.056-25.342	23.056-26.058	23.056-26.772	255
564	23.001-24.588	23.001-25.305	23.001-26.018	23.001-26.729	256
567	22.946-24.553	22.946-25.267	22.946-25.978	22.946-26.686	257
569	22.891-24.519	22.891-25.230	22.891-25.939	22.891-26.644	258
571	22.837-24.486	22.837-25.194	22.837-25.899	22.837-26.601	259
573	22.783-24.452	22.783-25.158	22.783-25.860	22.783-26.560	260
575	22.730-24.419	22.730-25.121	22.730-25.821	22.730-26.518	261
578	22.677-24.385	22.677-25.086	22.677-25.783	22.677-26.477	262
580	22.624-24.353	22.624-25.050	22.624-25.745	22.624-26.436	263
582	22.572-24.320	22.572-25.015	22.572-25.707	22.572-26.396	264
584	22.520-24.288	22.520-24.980	22.520-25.669	22.520-26.356	265
586	22.469-24.256	22.469-24.945	22.469-25.632	22.469-26.316	266
589	22.418-24.224	22.418-24.911	22.418-25.595	22.418-26.276	267
591	22.368-24.192	22.368-24.877	22.368-25.558	22.368-26.237	268
593	22.317-24.161	22.317-24.823	22.317-25.522	22.317-26.198	269
595	22.267-24.130	22.267-24.809	22.267-25.486	22.267-26.159	270
	60-110	65-110	70-110	75-110	(kg)

INFLIGHT C.G. POSITION

When loading within limits determined from empty weight C.G. weighing, inflight C.G. position is always within certified range. However, it might be interesting to know the actual inflight C.G. position, which can be obtained by two methods:

1) Weigh as described on page 6-1, but place pilot into seat. Add pilot weight to empty weight. Redetermine values a and b, because of altered suspension level. This method yields exact values.

2) The analytical method yields maximum and minimum inflight C.G. values, because pilot leverage varies according to weight and size of the pilot. Therefore, calculation for inflight C.G. position Xcg_F must be performed twice to find the C.G. range within which the exact inflight C.G. value is.

$$Xcg_F = \frac{(Xcg \times W) - (Xp \times Wp)}{W + Wp}$$

with Xcg = empty weight C.G.position
W = empty weight
Xp = pilot leverage
Wp = pilot weight

Pilot leverage in relation to pilot weight:

Pilot weight		Leverage for foremost C.G.position		Leverage for rearmost C.G.position	
(kg)	(lbs)	(mm)	(in)	(mm)	(in)
6o	132	598	23.543	533	2o.984
65	143	595	23.425	531	2o.9o6
7o	154	592	23.3o7	529	2o.827
75	165	59o	23.228	527	2o.748
8o	176	588	23.15o	527	2o.748
85	187	587	23.11o	527	2o.748
9o	198	586	23.o71	528	2o.787
95	2o9	585	23.o31	53o	2o.866
1oo	22o	585	23.o31	533	2o.984
1o5	231	585	23.o31	537	21.142
11o	242	586	23.o71	543	21.378

For approved inflight C.G. limit values see page 2-4

DESCRIPTION OF SYSTEMS

Airframe

Fuselage structure is a pure fiberglass shell partly reinforced by stiffening frames. The cockpit portion is a double fiberglass shell.

Wing structure is a fiberglass-foam sandwich, a double T section spar carrying bending load

Horizontal tail structure is a fiberglass foam sandwich, carrying all loads without a spar.

Flight Controls

Aileron system activated via pushrods guided in longitudinal motion ball bearings. Connection of system by ball snap joints in fuselage, LS-securing sleeve on wing side pushrod. Aileron partly mass balanced.

Elevator system activated via pushrods guided in longitudinal motion ball bearings. Automatic coupling during assembly of horizontal tail unit. Mass balance in vertical tail fin. Longitudinal trim by adjustable spring system, trim locking lever on control stick, trim lever at left side of cockpit.

Rudder system activated via steel cables, no closed control circuit. 1oo % mass balance at rudder.

Instrument Panel

Panel mounted on floor of cockpit. Depending on version allows for installation of up to 8 instruments plus radio. Weight limitation on instruments installed in upper portion of panel see page 2-3.

Air Brakes Activated via pushrods guided in plain bearings. Connection of system by ball snap joints in fuselage, LS-securing sleeve on wing side pushrod. Upper surface airbrakes of double height, flexible cover blades.

Landing Gear is sprung and retractable, housed in a closed box. Tail skid or tail wheel optional.

Baggage Compartment behind pilot's shoulders is for light and soft materials only. For maximum weight of baggage see page 2-3. For permanent installation of batteries etc. see page 9-3.

Seat Adjustment of backrest see page 4-5.

Water Ballast System **Two tanks per wing, maximum total capacity 85 liters (22.45 US-Gal., 18.7 Imp.Gal.).** Loading and dump valve on under side of wing. Automatic coupling of valve operating mechanism during assembly.

Cockpit

Double fiberglass shell. Controls for landing gear and air brakes located on left cockpit side. Trim lever located on left side of landing gear control, trim release lever on control stick. Controls for tow release, pedal adjustment, canopy emergency release and ventilation are located on instrument panel, water ballast valve control and backrest slope control on right side of cockpit.

Canopy

One piece hinged up front with cover for instrument panel. Canopy frame includes 6 mm metric threads for camera mounts.

Oxygen Installation

Fiberglass receptacle for 3 liter oxygen bottles of 1oo mm (3.94 in) diameter.

HANDLING, SERVICING AND MAINTENANCE

INTRODUCTION

a) For service and information not contained within this manual, it is recommended to contact agent or manufacturer.

b) All correspondence regarding the sailplane should carry its serial number.

c) The serial number can be found on the type placard, on the right side of the main bulkhead.

d) A Maintenance Manual is issued with each sailplane. To keep this up to date, a special product information service may be subscribed. Contact the manufacturer for this information service, which too includes Technical Bulletins and general information.

AIRPLANE INSPECTION PERIODS

a) FAA required annual inspection according to checklist provided in Maintenance Manual after performance of annual maintenance procedure.

b) Manufacturer recommended daily inspection.

c) Manufacturer recommended extraordinary inspection, depending on circumstances (rough landings, ground loops etc.) as provided in Maintenance Manual.

d) Other inspections may be required by the issuance of airworthiness directives applicable to the aircraft or components.

It is the responsibility of the owner/operator to determine that all applicable airworthiness directives are complied with.

When inspections are repetitive, inadvertent noncompliance may be prevented by adding them to the end of the annual inspection checklist or by a special inspection schedule.

e) Life limited parts, such as tow release system components or seat belt harness may require other inspections.

Agency or personnel accomplishing the required inspections and most of the manufacturer recommended inspections must be properly certificated. In case of doubt, consult agent, manufacturer or FAA.

PREVENTIVE MAINTENANCE that may be accomplished by a certificated pilot

a) A certificated pilot who owns or operates an airplane not used as an air carrier is authorized by FAR Part 43 to perform limited preventive maintenance on his airplane. Refer to FAR Part 43 for appropriate list.

b) All other maintenance required is to be accomplished by appropriately licenced personnel.

c) Preventive maintenance should be accomplished in accordance with the appropriate airplane Maintenance Manual, to be sure that proper procedures are followed. A Maintenance Manual is delivered with each sailplane, carrying the serial number.

ALTERATIONS OR REPAIRS

a) Alterations or repairs must be accomplished by licenced personnel.

b) Prior to any alterations the FAA should be contacted to insure that airworthiness of the airplane is not violated.

c) For alterations or repairs a written approval from the manufacturer is required (Special advice, drawings etc.).

GROUND HANDLING

Assembly Procedure

- clean and grease all pins and matching holes
- insert left spar end into fuselage and watch for angle of dihedral
- insert right spar end into fuselage and watch for angle of dihedral
- insert main pins when holes are lined up correctly
- secure main pins by placing handle behind spring loaded peg
- connect air brake system with ball snap joints
- secure ball snap joints of air brake system by turning LS-sleeve over joint as far as possible. Check securing by trying to disassemble connectors. See also drawing on page 4-3.
- connect aileron system with ball snap joints
- secure ball snap joints of aileron system by turning LS-sleeve over joint as far as possible. Check securing by trying to disassemble connectors. See also drawing on page 4-3.
- use built in mirrors and colour markings at aileron and air brake system connections as an additional visual aid to check positioning of LS-sleeve only
- insert battery into vertical tail fin if weighing was performed in this configuration (see Data Placard in cockpit), connect to system and check operation.

Erstellt: 15. April 83	Ersetzt:	Geprüft: 15. 4. 83

GROUND HANDLING

Assembly Procedure continued

- install horizontal tail and secure with slotted nut against tapered pins using a suitable coin until red marking on attachment bracket is invisible.
- install total energy tube, battery (if not already in vertical tail fin) and barograph.
- connect automatic parachute to red marked portion of main bulkhead using special loop only
- seal wing fuselage intersection by taping on upper and lower sides
- seal access hole on upper side of horizontal tail by taping
- perform Daily Inspection

Disassembly Procedure

- reverse assembly sequence, except before removing main pins turn LS-sleeves away from ball snap joints and disconnect aileron and air brake systems

SUPPORTING AREA FOR ROAD TRANSPORT

Fuselage	- tail skid or tail wheel
	- main wheel
	- shell in front of landing gear, minimum width of support 300 mm (11.8 in)
Wing	- right spar at inner or outer main pin hole
	- left, forked spar at inner main pin hole. At outer main pin hole only, if both fork ends are supported
	- shell at root, minimum width of support 150 mm (5.9 in)
	- shell near inner aileron end, minimum width of support 250 mm (10 in)
Horizontal Tail Unit	- at any place, minimum width of support 80 mm (3.2 in)

SUPPORTING AREA TO LIFT WHOLE SAILPLANE

- under wing spar, never under nose section
- under fuselage shell in front of wing
- under fuselage shell behind wing

LONG TERM STORAGE

Preparation for Long Term Storage

- remove instrumentation and store separately
- close external pressure ports (see page 8-6) and inner tube ends
- protect all metal parts using spray oil and vaseline
- close all orifices without preventing air circulation using wire cloth or similar means to prevent entry of small animals

Return to Service

- Inspection according to Annual Inspection (See Maintenance Manual page 2-1 and Chapter 8)
- inspect inside of wings and fuselage for small animals (mice, birds etc.) and/or nests

CLEANING AND CARE

These recommendations are according to paint manufacturer Lesonal's note dated 7.7.81

Suitable

- water with washing-up liquid added in recommended quantities
- car polish with or without silicone
- car hardwax

Suitable with reservations

- tar remover for cars based on petrol and white gasoline
- alcohol like spirit or isopropyl alcohol

Reservations are, that these liquids should only be used for wiping off, not for soaking with rags.

Unsuitable

- strong solvents and thinners (acetone)

These items may decompose gelcoat and cause local shrinking.

Completely unsuitable

- trichloroethylene
- carbon tetrachloride or similar hydrocarbon chlorides

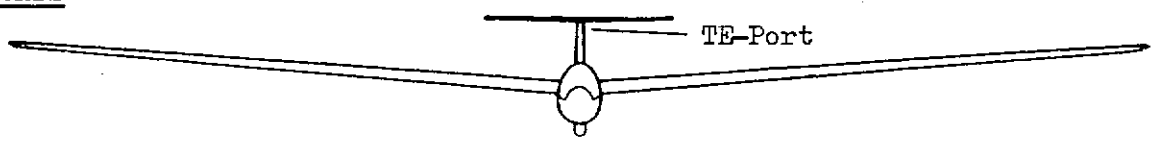
These liquids destroy the gelcoat.

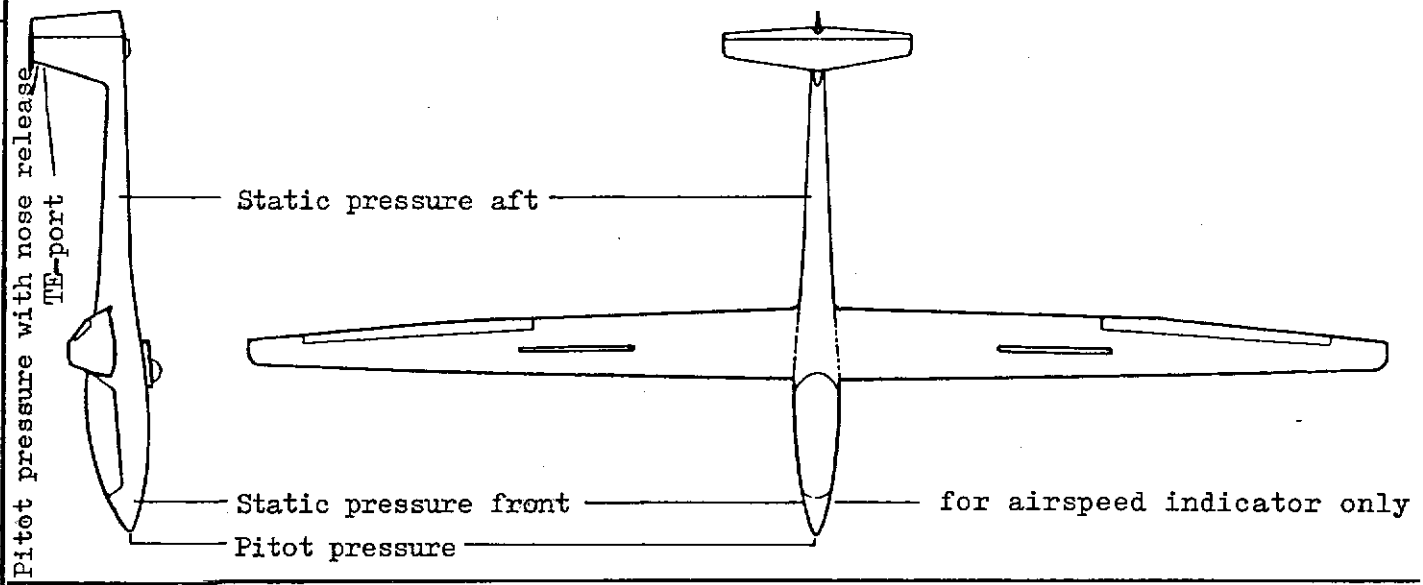
Warning:	Unless regularly polished with hardwax, sanded gelcoat shows distinctive weathering marks due to changes of temperature, ultra violet radiation and humidity.

Longitudinal motion pushrod bearings

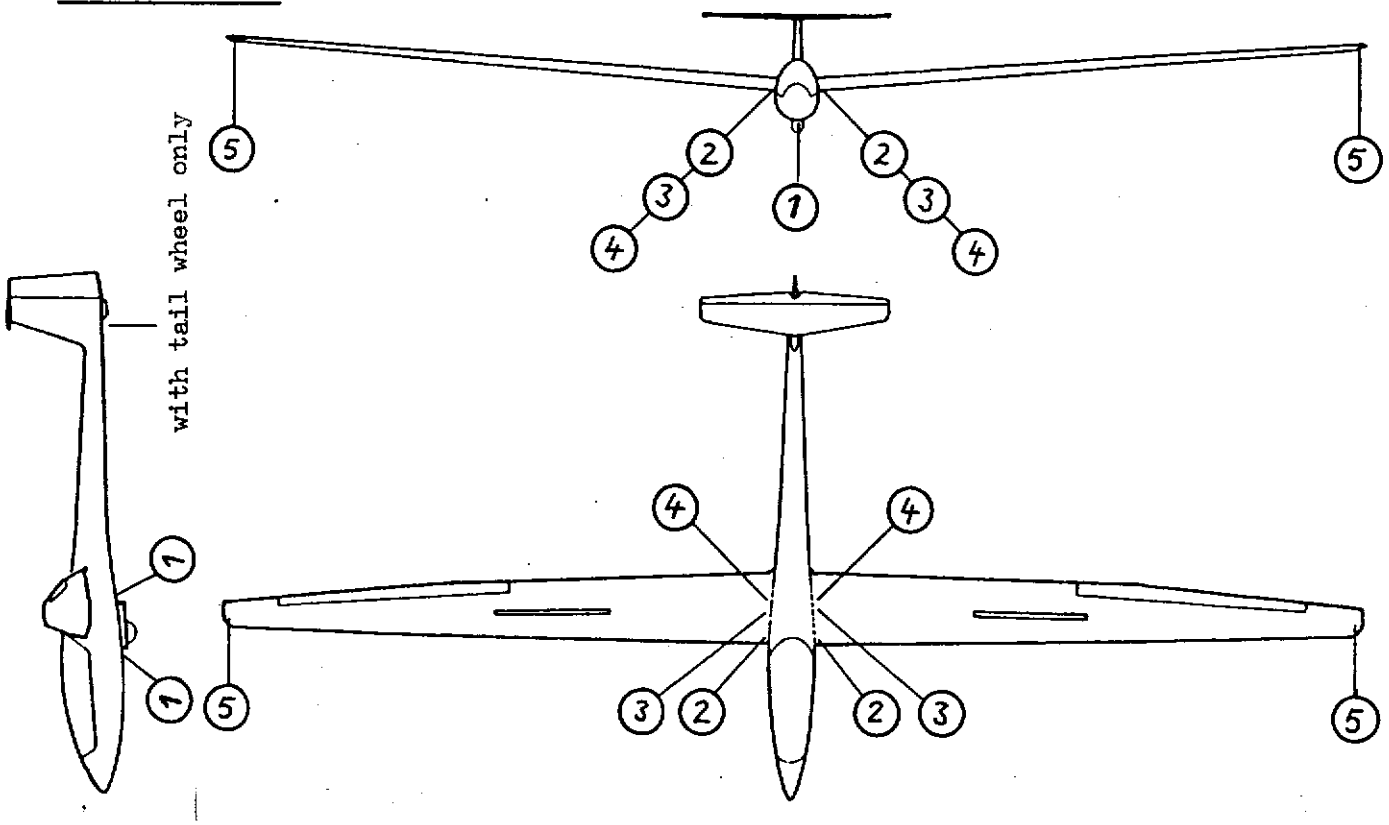
Never grease these bearings, they will be destroyed soon due to collection of small foreign matter. Longitudinal motion bearings are used in elevator and aileron control systems.

PRESSURE PORTS





DRAIN ORIFICES



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9 Supplements

9.1 Introduction

This section contains the appropriate supplements necessary to safely and efficiently operate the sailplane when equipped with various optional systems and equipment not provided with the standard sailplane.

9.2 List of inserted supplements

Date of insertion	Document No.	Title of the inserted supplement
15. Nov. 83	Section 9.3	
February 2019	Section 9.4	Neo-Winglets TN4049

COCKPIT LOADING PLAN

New entry with each annual inspection and when changing equipment. Should be calculated in accordance with chapter 6. Abbreviate battery position as follows: O = None, B = Baggage Compartment, V = Vertical Tail Fin.

Permanently						Date	Inspector
Empty Weight	Maximum Permissible Load	Minimum Permissible Load	Fixed Ballast forward	Fixed Ballast aft	Battery Position		

WATER BALLAST LOADING INSTRUCTIONS

Maximum capacity 85 kg (187 lbs) per wing.

Maximum total capacity 17o kg (375 lbs).

Table provides maximum water ballast weight in relation to empty weight and cockpit load. Baggage and temporary equipment reduce maximum water ballast weight accordingly.

Pilot and Parachute (kg)	Empty weight (kg)										
	230	235	240	245	250	255	260	265	270	275	
70	170	170	170	170	170	170	170	170	170	170	kg
75	170	170	170	170	170	170	170	170	170	170	kg
80	170	170	170	170	170	170	170	170	170	170	kg
85	170	170	170	170	170	170	170	170	170	165	kg
90	170	170	170	170	170	170	170	170	165	160	kg
95	170	170	170	170	170	170	170	165	160	155	kg
100	170	170	170	170	170	170	165	160	155	150	kg
105	170	170	170	170	170	165	160	155	150	145	kg
110	170	170	170	170	165	160	155	150	145	140	kg

Pilot and Parachute (lbs)	Empty Weight (lbs)										
	507	518	529	540	551	562	573	584	595	606	
154	375	375	375	375	375	375	375	375	375	375	lbs
165	375	375	375	375	375	375	375	375	375	375	lbs
176	375	375	375	375	375	375	375	375	375	375	lbs
187	375	375	375	375	375	375	375	375	375	364	lbs
198	375	375	375	375	375	375	375	375	364	353	lbs
209	375	375	375	375	375	375	375	364	353	342	lbs
220	375	375	375	375	375	375	364	353	342	331	lbs
231	375	375	375	375	375	364	353	342	331	320	lbs
242	375	375	375	375	364	353	342	331	320	309	lbs

EXAMPLE: When empty weight is 260 kg (573 lbs) and pilot and parachute weight is 110 kg(242 lbs), maximum permissible water ballast weight is 155 kg (342 lbs).

PERMANENT INSTALLATION OF FIXED BALLAST

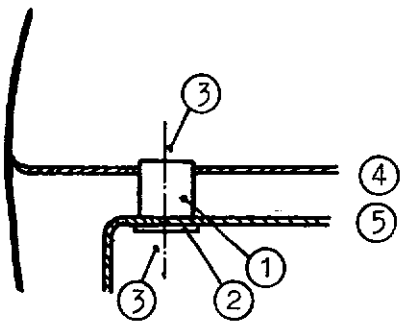
If empty weight C.G. position is too far behind to allow 7o kg (154 lbs) as Minimum Cockpit Load, permanent installation of ballast (trim weights, 2.45 kg (5.4 lbs) each) under instrument panel portion of seat is possible. A trim weight holder can be ordered as optional equipment. Weights should be fixed in flight direction using large washers and selflocking nuts such that vibrations may not cause them to turn round. One weight of 2.45 kg (5.4 lbs) shifts empty weight C.G. position approximately 17 mm (o.669 in) forward.
After permanent installation of fixed ballast empty weight C.G. position should be redetermined by weighing. See chapter 6.

In special cases empty weight C.G. position may be shifted rearward to allow heavy pilots to fly with rearward C.G. positions. Therefore it is possible to fit a battery (Dryfit, measurements 232 x 9o x 5o mm (9.134 x 3.543 x 1.969 in), weight 2.7 kg (5.95 lbs)) into the vertical tail fin battery box. Installation of lead weight is not allowed in battery box.
After installation of battery in vertical tail fin battery box empty weight C.G. position should be redetermined by weighing. See chapter 6.

INSTALLATION OF EQUIPMENT IN BAGGAGE COMPARTMENT

Equipment must be attached to landing gear box using threaded spacers, three of which are necessary per unit.
Baggage compartment cover has to be cut to avoid spacers. See sketch.

(1) Spacer, diameter 18-2o mm (o.7-o.8 in), length 15 mm (o.6 in).
(2) Washer B5.3 DIN 9o21-St outer diameter 15 mm (o.6 in)
(3) Screw M5x1o DIN 85-A2
(4) Baggage compartment cover
(5) Landing gear box



MASTER EQUIPMENT LIST

SPECIFICATIONS FOR BASIC EQUIPMENT

1) AIRSPEED INDICATOR

Original certification was carried out using a Winter 6FMS4-2 airspeed indicator with a range of 3o to 3oo km/h and colour marking according to Flight Manual page 2-2.

A similar FAA approved airspeed indicator to meet TSO C2 reading to 3oo km/h (16o kts, 18o mph) may be used. Maximum instrument error ±2%. Colour marking must be according to Flight Manual page 2-2.

Examples: AID 11-1oo2-1 or KI 8ooo

2) ALTIMETER

Original certification was carried out using a Winter 4FGH-1o altimeter with a range of o-1ooo-1oooo meters. (approx. 33ooo ft)

A similar FAA approved altimeter to meet TSO C1o with a range of approximately 33ooo ft and a mercury or millibar subscale may be used.
When an altimeter of up to 2oooo ft only is being used, a placard must be near the altimeter stating: Maximum flying altitude 2oooo ft. (See also Flight Manual page 2-7).

Examples: Kollsman Type 378222 or AID 13-2ooo-1 or AID 13-2ooo-5

3) MAGNETIC COMPASS

Original certification was carried out using no compass.

Any FAA approved magnetic compass (non-stabilized type) to meet TSO C7 may be used.

Examples: Airpath C 23oo or Airpath C 24oo or PZL BS-1 or PZL KJ-13A

4) SEAT BELT HARNESS

The following types are certified:

Gadringer	lap belt	Bagu	IV-E/2	
	shoulder strap	Schugu	II/C	
Gadringer	lap belt	Bagu	V-BB/2	(multiple point buckle)
	shoulder strap	Schugu	II-C/V	
Autoflug	lap belt	Bagu	FAG-7H	(multiple point buckle)
	shoulder strap	Schugu	FAG-7H	

MASTER EQUIPMENT LIST continued

5) OPTIONAL INSTRUMENTS

a) Mechanical Variometer (Vertical Speed Indicator)

Winter	5StV5 or 5StVM5	Bohli	68PVF1
PZL	WRS-5D	Schuemann	SV or CV

b) Electrical Variometer (Vertical Speed Indicator)

Blumenauer	all models
Cambridge	all models
Flexum	all models
Peschges	all models
Westerboer	all models
Zander	all models

c) Turn and Bank Indicator

Gauting	WZ 4o2/31	PZL	EZS-3
RC Allen	12W2D2A or 12W2D2S		

d) Horizon Reference Indicator (Electrical Gyro Horizon)

Gauting	6532/6
AIM	5oo-DCF
RC Allen	RCA 26 AK-4

6) ELECTRICAL INSTALLATION

a) Battery Only life sealed batteries are recommended (Gel cell or Nickel-Cadmium types).
Battery size must be chosen in relation to power requirements to guarantee 8 hours of continuous service. For "German" type radio plus electrical variometer 12V/6.5Ah are adequate.
Power requirement for average "German" type radio is 1.5 A for transmitting, o.4 A for receiving voice and o.o6 A for standby.

Examples: Dittel (Dryfit) 12V 6.5Ah including battery holder

Battery installation see Flight Manual page 9-3

b) Switches Marquardt 2A 25oV or other manufacturers

c) Fuses or Microfuse 2ox5 mm DIN 41571

Circuit Breakers Klixon 7277-2 or 7274-2 or similar

Ratings:	3.15 A	quick acting:	Master
	2 A	quick acting:	Radio Dittel FSG 4oS
	1 A	quick acting:	Electrical variometer Turn and bank indicator

MASTER EQUIPMENT LIST continued

d) Radio — Walter Dittel FSG 4oS, FSG 5o, FSG 6o models
Avionic Dittel ATR 72o models
Becker AR 2ooo and AR 3ooo models

Antenna — Dittel antenna for vertical fin, 118-136 MHz

7) LANDING GEAR

Main wheel	Tost Kobold 1o3/2o,4 inch in diameter
Tyre	Continental 4.oo-4 4PR
Tube	Continental 4.oo-4
Tail wheel	Streifeneder 21o x 65
Tyre	Continental 21o x 65
Tube	Continental 21o x 65

8) RELEASE MECHANISM

C.G. release	Tost G 73
Nose release	Tost E 75

COLOUR CODE OF INSTRUMENT TUBING

The following colour code is used for instrument tubes:

Red	=	pitot pressure
Blue	=	static pressure forward for airspeed indicator only
Yellow	=	static pressure aft
Green	=	total energy tube pressure

In addition three clear tubes are installed from the vacuum bottle stowage compartment to the instrument panel.

9.4 Neo-Winglets

Introduction
In the following text the changes to those sections of the flight manual which are affected by the installation of neo-Winglets will be given. For operation without neo-Winglets the data of the other LS4 (LS4-a) flight manual sections are applicable.

Section 1 General
Subsection amended

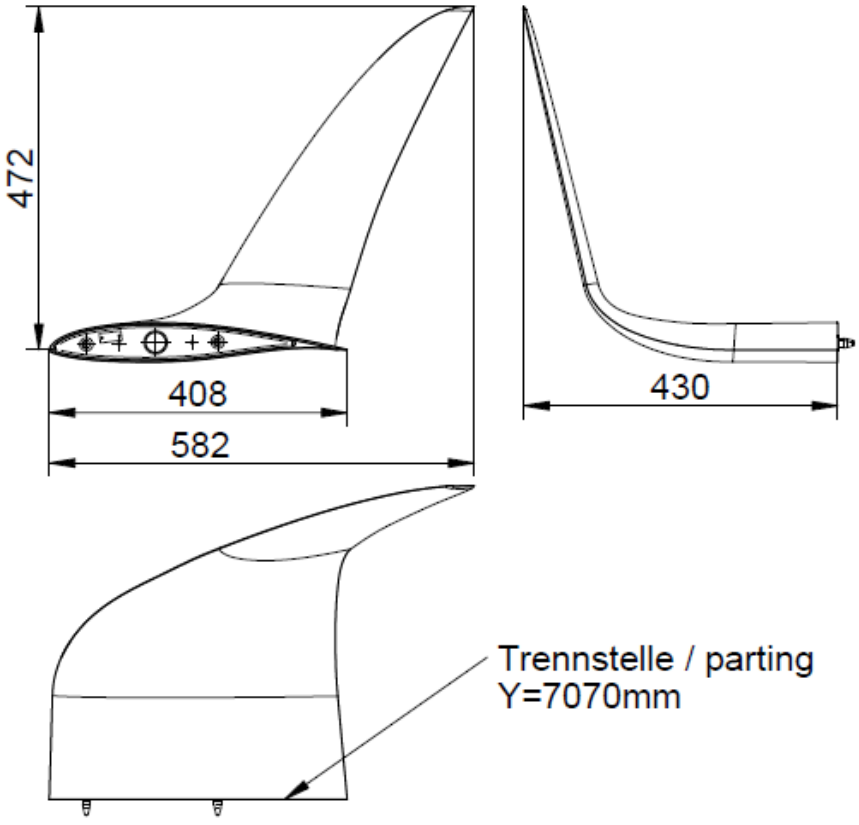
Page 1-6 Descriptive data
Technical details
Option TN4049: Removable wing tips with neo-Winglets

Technical data	units	LS4-a
max. mass with neo-Winglets installed	kg	505
max. wing loading with neo-Winglets installed	kg/m²	48

Note: max. mass of LS4 unchanged
Note: neo-Winglets raise the empty mass about 2 kg.

Caution: If the sailplane will be operated with neo-winglets the max. mass is reduced, see above.

Page 1-7 3-side view of the neo-Winglets



Section 2 Limitations

Page 2-3 Mass (weight)

Subsection amended

Maximum take-off and landing weight with water ballast
LS4: 472 kg
LS4-a: 505 kg with neo-Winglets installed

Maximum weight of the non-lifting parts = 250 kg 517 lbs.

Note: The increase of the max. mass of non-lifting parts according to maintenance manual LS4 issued May 2011 section 2.2.1 item 2 and tables in section 2.4 is not applicable.

Water ballast in the wings: TN4046 and 4047 must be executed for operation with neo-winglets. Thus the max. amount of water in the ballast bags is reduced to 56 kg per bag in case the bag will be made smaller or 50 kg per bag if new bags 4F5-81 will be installed.

Page 3-5 Limitations placards

LS4 no change

LS4-a: Additional placard clearly visible at right cockpit wall to be installed below the data placard:

Max. take-off mass with neo-Winglets installed	505 kg	1113 lbs.

Section 4 Normal procedures
Subsections amended
Page 4-2 Daily Inspection
Wings
Option neo-Winglets: Wingtips correctly mounted? Securing pin flush with wing surface and locked?

Section 8 Handling Servicing and Maintenance
Subsections amended

Page 8-2 Ground Handling Assembly Procedure and 8-3 Disassembly Procedure
Caution: When rigging and derigging the wings the wingtips with neo-Winglets (Option) shouldn't be installed.

Caution: Due to flutter reasons it is not allowed to mount additional masses (e.g. cameras) on the neo-Winglets!

Rigging and derigging the wingtips (Option winglets)

1. Remove the wingtips without winglets (if installed). To accomplish this screw tool W70 into the locking pin and pull out the pin.
2. Slide the wingtip with winglet onto the tubular spar so far that the pins at the root rib engage into the bushes, then push in firmly. Push in the locking pin so far that it matches the wing surface. The pin will be locked by a ball catch. You should notice the catching.
3. Removal of the wing tips with winglets is the same procedure as described under 1.
4. Install the wingtips without winglets (if existent) following the procedure as described under 2. for trailer storage.

Note: If you don't have wingtips without winglets the trailer must be modified to hold down the wings at the tubular spars.

Section 9
LS4 no change

Page 9-2 Water ballast LS4-a

Max. mass 505 kg/1113lbs. with neo-Winglets installed, max. amount of water ballast in the wing tanks 112 kg / 247 lbs,
Max. ballast in the wing tanks, no tail tank filled, with neo-Winglets installed

Cockpit load pilot + parachute + equipment kg/lbs.	Empty mass kg/lbs.									
	240/ 529	254/ 560	250/ 551	255/ 562	260/ 573	265/ 584	270/ 596	275/ 606	280/ 617	285/ 628
70/154	112	112	112	112	112	112	112	112	112	112
75/165	112	112	112	112	112	112	112	112	112	112
80/176	112	112	112	112	112	112	112	112	112	112
85/187	112	112	112	112	112	112	112	112	112	112
90/198	112	112	112	112	112	112	112	112	112	112
95/209	112	112	112	112	112	112	112	112	112	112
100/220	112	112	112	112	112	112	112	112	112	112
105/231	112	112	112	112	112	112	112	112	112	112
110/243	112	112	112	112	112	112	112	112	112	110

112 kg= 247 lbs., 110 kg= 243 lbs.
Max. ballast in the wing tanks, with tail tank filled, with neo-Winglets installed

Cockpit load pilot + parachute + equipment kg/lbs.	Empty mass kg									
	240/ 529	254/ 560	250/ 551	255/ 562	260/ 573	265/ 584	270/ 596	275/ 606	280/ 617	285/ 628
70/154	112	112	112	112	112	112	112	112	112	112
75/165	112	112	112	112	112	112	112	112	112	112
80/176	112	112	112	112	112	112	112	112	112	112
85/187	112	112	112	112	112	112	112	112	112	112
90/198	112	112	112	112	112	112	112	112	112	112
95/209	112	112	112	112	112	112	112	112	112	112
100/220	112	112	112	112	112	112	112	112	112	112
105/231	112	112	112	112	112	112	112	112	112	111
110/243	112	112	112	112	112	112	112	112	111	106

112 kg= 247 lbs., 111 kg= 245 lbs., 106 kg= 234 lbs.

Section 5 Performance
Subsection amended

Page 5-1 Flight polar

Option neo-Winglets: neo-Winglets at the wing tips increase the best L/D by 2 points