**LUFTFARTSTILSYNET**
*CIVIL AVIATION AUTHORITY*

OK

# AUTHORIZATION PAGE - FLIGHT MANUAL

**Issue No.: 1 Supersedes issue No.: Dated:**

This Flight Manual is issued for the sailplane LS3-a

1. **Aircraft Registration**.....**LN-GHC**

2. **Certificate of Airworthiness**
   Place and date of issue: .....Oslo/Norway.....08.05.1979

3. **Manufacturer of Aircraft**
   Name: .....Rolladen-Schneider Flugzeugbau GmbH
   Address:.....Mühlstr. 10, D-63329 Egelsbach
   Germany

4. **Designation of Aircraft**
   Aircraft type and serial no.....LS3-a.....s/n 3339
   Year of construction:.....1900
   Type certificate no.: .....LBA 317

5. **Maximum number of seats**.....1

6. **Minimum Crew** .....1

7. **Maximum take-off mass**
   Landplane:.....472 kg / 1041 Lbs

8. **Special notes**

*None*

LUFTFARTSTILSYNET

Date of approval: 13.06.2001

for Inge Kiedrowski
Head of Maintenance Section
1st Inspection Department

Structural Limits:

The LS3-a sailplane is designed to permit full control surface deflections or strong gusts or severe turbulence at speeds up to 190 km/h (103 kts, 118 mph).

At speeds between 190 km/h and 270 km/h (103-146 kts, 118-168 mph), yellow arc, the following conditions should be avoided not to exceed the design limit of the aircraft: severe turbulence, rapid movement of flaps and control surface deflections of more than one third of possible travel. Maneuvering loads, gust loads and loads due to control surface deflections should not be encountered simultaneously.

When divebrakes are deployed, maneuvering loads exceeding 3 G's and speeds greater than 190 km/h (103 kts, 118 mph), should be avoided because of possible additional loads due to turbulence.

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

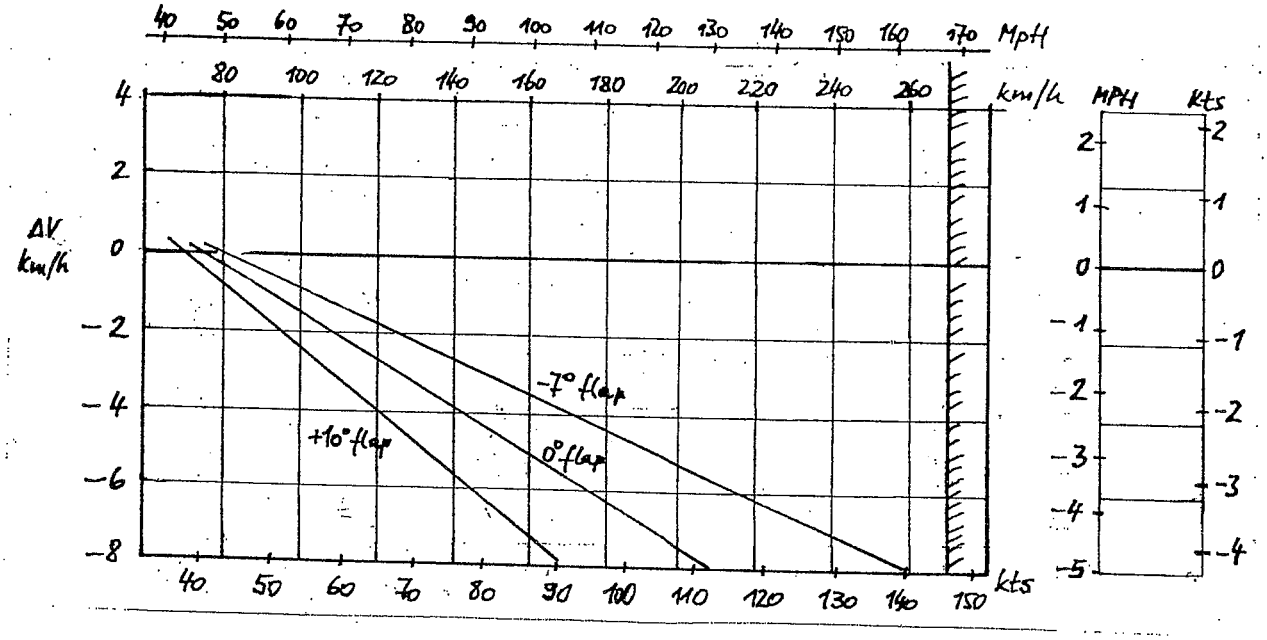
## Airspeed Limits

| | km/h | kts | mph |
|---|---|---|---|
| 1. Never exceed (IAS) from sea level up to 3000 MT (9800 ft) ..... | 270 | 146 | 168 |
| 6000 MT up to 19700 ft ..... | 219 | 118 | 136 |
| 10000 MT up to 32800 ft ..... | 173 | 93 | 107 |
| 2. Maneuvering ..... | 190 | 103 | 118 |
| 3. Limit Speed in rough air ..... | 190 | 103 | 118 |
| winch launch ..... | 130 | 70 | 81 |
| aero tow ..... | 190 | 103 | 118 |
| with flap position from 20° to 10° ..... | 160 | 86 | 99 |
| with flap position from 10° to 0° ..... | 190 | 103 | 118 |
| with flap position from 0° to -7° ..... | 270 | 146 | 168 |

**Note:** When flying at altitude the lower limit IAS is always authoritative.

POSITION ERROR OF AIRSPEED SYSTEM

$V_{Cal} = V_I + \Delta V$ (Nose pitot, forward fuselage side static)



Colour Marking on Airspeed Indicator

Green Range 90 - 190 km/h ( 49-1o3 kts, 56-118 mph): See page 1.1

Yellow Range 190 - 27o km/h ( 103-146 kts, 118-168 mph): See page 1.1

Red Line Speed 270 km/h ( 146 kts, 168 mph): Never exceed up to 98oo ft flying altitude. For higher altitudes see page 1.2 .

White Range 85 - 160 km/h ( 46-86 kts, 53-99 mph): At maximum weight of 472 kg (1o41 lbs) 85 km/h (46 kts, 53 mph) is minimum speed in straight and level flight and flap position +10°. 160 km/h (86 kts, 99 mph) is maximum permissible speed with flap positions from +20° to + 10°.

Yellow Triangle 90 km/h ( 49 kts, 56 mph): Recommended approach to landing speed without water ballast.

Weights: Gross Weight ..... 472 kp (1041 lbs)
Maximum Weight of Non-lift Producing Parts ..... 230 kp (507 lbs)
Empty Weight ..... around 250 kp (551 lbs)
Useful Load = Pilot and Parachute

Position of C.G. in Flight (without water ballast):
Maximum allowable:
Forward C.G. position ..... 250 mm (9.84 in) aft of DP.
Rearward C.G. position ..... 400 mm (15.75 in) aft of DP.
Datum Point (DP): Leading edge of wing at root, when under side of fuselage boom placed horizontal.

Useful Load (Pilot and Parachute)

Should be calculated in accordance with guide in service manual.

| Empty Weight | Maximum *) Permissible Load | Minimum Permissible Load | Date | Inspector |
|---|---|---|---|---|
| 263 kg | 110 kg | 80 kg | 13/6-01 | |
| 260,4 kg | 109 kg | 82 kg | 11.04.08 | |

*) Ref page 1.7 for water ballast limitations.

## Water Ballast Limitations

Maximum Capacity 150 liters (150 kg = 330 lbs)

| Pilot and Parachute kg | Empty Weight (kg) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 240 | 245 | 250 | 255 | 260 | 265 | 270 | 275 | 280 | 285 | 290 |
| 60 | 150 | 150 | 150 | 150 | 150 | 147 | 142 | 137 | 132 | 127 | 122 |
| 65 | 150 | 150 | 150 | 150 | 147 | 142 | 137 | 132 | 127 | 122 | 117 |
| 70 | 150 | 150 | 150 | 147 | 142 | 137 | 132 | 127 | 122 | 117 | 112 |
| 75 | 150 | 150 | 147 | 142 | 137 | 132 | 127 | 122 | 117 | 112 | 107 |
| 80 | 150 | 147 | 142 | 137 | 132 | 127 | 122 | 117 | 112 | 107 | 102 |
| 85 | 147 | 142 | 137 | 132 | 127 | 122 | 117 | 112 | 107 | 102 | 97 |
| 90 | 142 | 137 | 132 | 127 | 122 | 117 | 112 | 107 | 102 | 97 | 92 |
| 95 | 137 | 132 | 127 | 122 | 117 | 112 | 107 | 102 | 97 | 92 | 87 |
| 100 | 132 | 127 | 122 | 117 | 112 | 107 | 102 | 97 | 92 | 87 | 82 |
| 105 | 127 | 122 | 117 | 112 | 107 | 102 | 97 | 92 | 87 | 82 | 77 |
| 110 | 122 | 117 | 112 | 107 | 102 | 97 | 92 | 87 | 82 | 77 | 72 |

Example: At an empty weight of 250 kg and a pilot and parachute weight of 95 kg, maximum permissible water ballast is 127 kg.

See page 1.6a for limitations in lbs.

## Water Ballast Limitations

Maximum Capacity 150 liters (33o lbs)

| Pilot and Parachute (lbs) | Empty Weight (lbs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 529 | 54o | 551 | 562 | 573 | 584 | 595 | 6o6 | 617 | 628 | 639 |
| 132 | 33o | 33o | 33o | 33o | 33o | 324 | 313 | 3o2 | 291 | 28o | 269 |
| 143 | 33o | 33o | 33o | 33o | 324 | 313 | 3o2 | 291 | 28o | 269 | 258 |
| 154 | 33o | 33o | 33o | 324 | 313 | 3o2 | 291 | 28o | 269 | 258 | 247 |
| 165 | 33o | 33o | 324 | 313 | 3o2 | 291 | 28o | 269 | 258 | 247 | 236 |
| 176 | 33o | 324 | 313 | 3o2 | 291 | 28o | 269 | 258 | 247 | 236 | 225 |
| 187 | 324 | 313 | 3o2 | 291 | 28o | 269 | 258 | 247 | 236 | 225 | 214 |
| 198 | 313 | 3o2 | 291 | 28o | 269 | 258 | 247 | 236 | 225 | 214 | 2o3 |
| 2o9 | 3o2 | 291 | 28o | 269 | 258 | 247 | 236 | 225 | 214 | 2o3 | 192 |
| 22o | 291 | 28o | 269 | 258 | 247 | 236 | 225 | 214 | 2o3 | 192 | 181 |
| 231 | 28o | 269 | 258 | 247 | 236 | 225 | 214 | 2o3 | 192 | 181 | 17o |
| 243 | 269 | 258 | 247 | 236 | 225 | 214 | 2o3 | 192 | 181 | 17o | 159 |

Example: At an empty weight of 551 lbs and a useful load of 2o9 lbs, maximum permissible water ballast is 28o lbs.

Baggage Limitations

Baggage compartment should be used for soft and light materials which would not obstruct the pilot after negative accelerations or injure the pilot in crash landings. Maximum weight of soft items 5 kg (11 lbs).
Installation of batteries, radios and barographs should be done in accordance with instructions in maintenance manual.

Weight Compensation for Pilots not Meeting Minimum Weight Requirements:
Compensating weights can be fastened with a wing nut to a threaded rod ahead of the rudder pedals. A compensating weight of 2.45 kg (5.4 lbs) replaces insufficiency of pilot weight of 5 kg (11 lbs).

Tire Pressure: 3 - 3.5 bar (43 - 5o psi)

Aerobatic Flight: Not permitted.

Structural Limitations in Flight:

At 190 km/h (103 kts, 118 mph) 5.3 G positive and 2.65 G negative.
At 270 km/h (146 kts, 168 mph) 4.0 G positive and 1.5 G negative.

VFR Flight: permitted

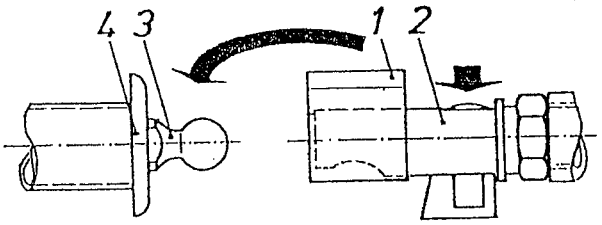
Cloud Flying: permitted, if aircraft is appropriately equipped and certified by inspector.

Minimum Equipment required for VFR and Cloud Flying see Maintenance Manual.

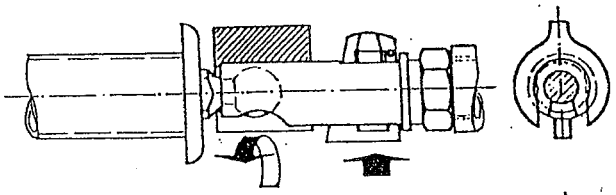
Break Away Link in Tow Rope: for winch and aero tow max. 600 kg (1323 lbs).

## Hotellier Control System Connectors

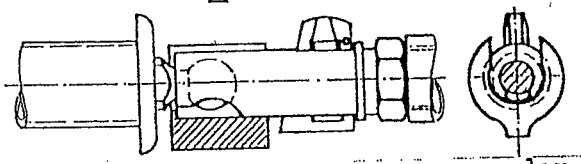
Prior to assembly, everybody should be familiar with the functioning of the Hotellier control system connectors (a.k.a. ball snap joints or clip and ball coupling). With the locking plate fully pressed, each connector <2> must be engaged **fully** on the ball <3>. During securing, the locking plate moves slightly backwards. Using the securing sleeve <1>, installation is possible only with the slot facing down, respectively the rib facing up. After proper connection and turning the sleeve by 180 degrees, the joint is secured, see also sketch below.




Locked



Locked and secured :



**Warning:** With connectors unsecured, the locking plate may open under load temporarily ! The locking plate should never be greased !

6.7.93 Geuck

-6. JULI 1993 Schaplen

## Stalls

Before entering stall, light tail shudder can be noticed. The effectiveness of the ailerons is reduced by about 50%, and the rate of sink increases considerably. The stall should be terminated through downward deflection of the elevator.

## Spins

If a stall is exaggerated through further upward deflection of the elevator, depending on C.G. position, the aircraft may spin.

Termination of spin by pronounced deflection of rudder opposite to spin direction and careful pull out.

Altitude loss due to termination of spin is about 50 m (150 ft).

## Limitation of High Speed Flight

If there are indications while flying under large cloudbank, or while flying in clouds, that the maximum permissible rough air speed will be exceeded, divebrakes should be deployed carefully before 190 km/h (103 kts, 118 mph) is reached. Divebrakes can also be deployed in emergencies up to a speed of 270 km/h (146 kts, 168 mph). However, one should insure that the flaps are in the $-7^{\circ}$ position. Once deployed divebrakes can be retracted only at speeds below 220 km/h (119 kts, 137 mph). When divebrakes are deployed, for example, 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.

## Emergency Canopy Release

Pull red handle on right side of instrument panel to release forward canopy hinge, then open canopy locks on both sides of cockpit and push canopy off.

Rain:

Raindrops will change the airfoil and will effect performance significantly. Therefore, the approach speed to a landing should be increased by at least 10 km/h (5 kts, 6 mph). To improve visibility canopy window should be opened when flying in rain.

Icing:

Water ballast should be drained when there is danger of freezing to avoid ice formation at the tail or one-sided freezing of the water ballast. When there is danger of icing, control surfaces should be moved continuously. To improve visibility, canopy window should be opened.

Landing on Water:

Canopy should be jettisoned and parachute straps should be released on downwind leg. Touch down at lowest possible speed with landing gear retracted. During touchdown protect face with left arm. After touchdown release seatbelts and leave cockpit.

(monitor)
Assembly:

1. Clean and grease all pins and matching holes.
2. Divebrake handle in unlocked position, about 10 cm (4 in.) aft of locked position. Flap handle in zero degree position. Main pins should be within reach.
3. Check if divebrakes are in locked position on wings. If they are, they should be unlocked with main pin handle.
4. Insert right spar end into fuselage until wing root pins are inserted.
5. Flap actuators should be meshed into drive gear. Occasionally drive gear will have to be adjusted by hand.
6. Divebrake actuators should be meshed with pins on fuselage, where fuselage pins may have to be adjusted through moving divebrake handle in the cockpit.
7. Right wing should now be pushed until flush with fuselage. Now connect left wing following the same procedure as with right wing, carefully observing the dihedral of the wings.

Assembly continued:

8. Insertion of main pins is possible only when all actuators except aileron connectors have coupled properly.
9. Connect aileron system with ball snap joints. Check connection by trying to pull connectors off balls. You may secure connectors using safety pins after connection and test.
10. Install horizontal tail and secure with safety nut against tapered bolts using a suitable coin until red marking on mounting bracket is invisible.
11. Install Braunschweig tube, battery, barograph and automatic parachute.
12. Tape upper and lower wing fuselage connection, and access hole on upper side of elevator.
13. Fill water ballast tanks and check proper dumping.

Disassembly:

Reverse assembly sequence, except before removing main pins unlock dive brakes and disconnect aileron connectors.

Pre-flight Checks:

1. Check water drain holes and check for leaks in water ballast tanks.
2. Check static ports, pitot and Braunschweig tube for clogging.
3. Check air pressure in wheel.
4. Check wheel brake effectiveness.
5. Check tow release.
6. Check emergency canopy release.
7. Check weight and balance, especially minimum and maximum useful load as well as trim weights.
8. Check instruments including radio.
9. Adjust backrest, headrest and rudder pedals.
10. Check papers.
11. Before take off carry out check in accordance with check list under instrument panel cover.

Post-flight Check:

1. Remove insects and dust.
2. If moisture has accumulated in divebrake boxes, remove with sponge.
3. Insure that water ballast has been dumped.

Adjustment of Rudder Pedals:

Adjustment is possible in flight and on the ground. Release pressure of pedals and unlock pawl pulling release handle. Push pedals forward with feet into desired position and lock. To move pedals rearward, pull pedals with release handle into desired position and lock.

Adjustment of Backrest:

Adjustment is possible only on the ground. The backrest can be adjusted at the bottom of the seat to allow for fitting of various types of parachutes, and in the baggage compartment. This varies the slope of the backrest. The latter can be adjusted by releasing the lock in the baggage compartment.

Adjustment of Headrest:

Adjustment is possible only on the ground. After release of lock the headrest can be moved forward and backwards.

Automatic Parachute Static Line:

Attach to red main bulkhead portion at left rear of pilot.

Landing Gear:

Landing gear can be extended or retracted in the whole permitted speed range.
A brisk movement of the gear handle facilitates gear retraction.
Gear handle forward = gear up.
Gear handle rearward = gear down.

Wheel Brake:

Wheel brake is coupled to rudder pedals support, and should be activated with heels. The wheel brake is an emergency brake, and should be used sparingly.

Water Ballast:

Each tank holds about 75 liters (20 US-gallons). The maximum permissible load should be taken from the table on pages 1.7 or 1.8.

Filling of Water Tanks: Open appropriate dump valve. Using connection hose, suck residual air from water bag. Subsequently, fill desired amount of water. Close valve. Repeat same procedure on other wing.

Dumping of Water: Open both valves simultaneously. Dumping of full tanks requires two to three minutes. Unequal dumping may be indicated when aircraft with free stick rolls around longitudinal axis. This necessitates early counteraction during landing roll.

Note: Flights with water ballast when temperatures are below freezing should be made only if water is not dumped.

1. The dump valve can freeze completely or partially, causing unequal dumpin
2. The escaping water can lead to icing of the flap near the fuselage, and could block flap movements.
3. The escaping water could lead to substantial icing at the end of the fuselage, could block the rudder and could lead to excessive tail weight.

Winch Launch:

oparcie zagłówek
Backrest and headrest should be secured to avoid pilot's sliding backwards during acceleration and steep climb. uniknąć
Flaps at 0° position, set to 10° position after transition arc.
Trim slightly forward. Trim position mark at the trim setting indicator should be just before reference mark.
Ask winch operator to avoid brisk acceleration. The higher the starting acceleration the higher is the pitch up tendency. uniknąć energicznych przyśpieszeń
When the tow rope tightens, use wheel brake to avoid rolling over tow rope.

Pronounced forward stick pressure is required in transition arc.

Minimum launch speed without water ballast ..... 90 km/h (49 kts, 56 mph)
with water ballast ..... 100 km/h (54 kts, 62 mph)

1) Sprawdz oparcie i zagłówek
2) Klapy 0 , potem normalnie na 10.
3) Trymer lekko na przód
4) Poprawny start. Im bardziej gwałtowny start, tym większa tendencja do zadzierania nosa
5) Można lekko naciągnąć linę dociskając hamulec na kółku.
6) Startujemy na oddanym drążku.

90 - 130 km/h (bez wody)

Aero Tow:

Trim slightly forward. Trim position mark at the trim setting indicator should be just before reference mark.

Flaps should be kept at 0° until aileron effectiveness. Then flaps should be set at 10° for lower tow speeds or stay at 0°.

Additional aileron effectiveness during initial take off roll may be achieved by deploying divebrakes. Retract divebrakes before leaving ground.

When tow rope tightens, use wheel brake to avoid rolling over tow rope.

Minimum tow speed without water ballast ..... 100 km/h (54 kts, 62 mph)
with water ballast ..... 120 km/h (65 kts, 75 mph)

Permissible Towrope 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.

Free Flight:

Stall Speed is between 65 to 70 km/h (35-38 kts, 4o-44 mph) without water ballast, with full water ballast 75 to 80 km/h (41-43 kts, 47-5o mph) in straight and level flight.

Note: When flying with empty water tanks, leave dump valves in open position to avoid pressure built up inside tanks at altitude.

Thermaling: Flaps +10°, stick pressure should be trimmed to zero.

Best Glide Angle: between 90 and 100 km/h (49-54 kts, 56-62 mph) at flap position 0° or -5°.

High Speed Flight up to 190 km/h (103 kts, 118 mph): Flaps should be between 0° and -7°, depending on desired speed. Once the aircraft is trimmed for thermaling no additional trim adjustment is required for high speed flight. Any stick forces can be removed by adjusting the flap position. This results in correct flap positions for all speeds.

High Speed Flight 190 to 270 km/h (1o3-146 kts, 118-168 mph): Flap position -7°. Stick forces should be reduced to zero through trim adjustment.

Prędkość przeciągnięcia 70 - 75 km/h lotem poziomym

W komunie prędkość 80 - 90 klapy 10°

Prędkość optymalna 95 km/h klapy 0°/-5°

Landing: During approach flaps should always be in +20° position. Water ballast should normally be dumped prior to landing.

Approach speed not below 90 km/h (49 kts, 56 mph) without water ballast and dive brakes deployed.

Divebrakes allow wide control of glide angle. When dive brakes are deployed stall speed increases approximately 10 km/h (5 kts, 6 mph).

Slipping is not necessary to control glide path. Slipping with dive brakes deployed should be avoided because of limited elevator effectiveness.

During pull out before touch down you should deploy divebrakes only one third of travel to avoid stalling and landing in front of desired touch down area.

1) Klapy 10°-20°
2) Prędkość nie mniejsza niż 90 km/h
3) Przy wypuszczonych hamulcach prędkość maksymalna 80 km/h w locie płaskim!
4) Uważać na hamulce!

High Altitude Flights:

Increasing altitude yields higher true airspeed than indicated airspeed. 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 beyond 27o km/h (146 kts, 168 mph).

Using table on page 1.2, maximum permissible airspeeds depending on altitude, the pilot is able to avoid flying faster than true airspeed of 27o km/h (146 kts, 168 mph).

Example: Indicated airspeed of 219 km/h (118 kts, 136 mph) at 6000 m (19700 ft) altitude corresponds to 270 km/h (146 kts, 168 mph) true airspeed.

## Trim System

Trim system uses a spring loaded clamping device for locking and springs for trimming. The trim lever is on the control stick, unwanted changes of trim are not possible.

Trim position can be changed with the control stick, when the trim lever is pulled, forward for nose down, rearward for nose up.

Trim setting indicator on the left cockpit side near the landing gear lever shows trim position relative to neutral reference mark.