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F L I G H T M A N U A L

For the sailplane type LS3

This Flight Manual should be carried in the sailplane at all times.

This Flight Manual is issued for the sailplane LS3,

Registration Number:

Serial Number:

Manufacturer: Rolladen Schneider
Flugzeugbau GmbH
Mühlstrasse 10
6073 Egelsbach
Germany

Owner:

As a Flight Manual approved by Luftfahrt-Bundesamt.

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Structural Limits:

The LS3 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) 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.

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Airspeed Limits

	km/h	kts	mph
1. Never exceed (IAS) from sea level up to 6600 ft	270	146	168
up to 9800 ft	245	132	152
up to 13000 ft.....	221	119	137
up to 19700 ft.....	177	95	110
up to 26250 ft.....	143	77	89
up to 32800 ft.....	111	60	69
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 +10° to 0°.....	190	103	118
with flap position from 0° to -7°.....	270	146	168

Note: Considering flying altitude the lower limit IAS is always authoritative.

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Colour Marking on Airspeed Indicator

Green Range 85 - 190 km/h (46-103 kts, 53-118 mph): The sailplane can not be stalled at maximum weight of 472 kp (1o41 lbs) and speeds above 85 km/h (46 kts, 53 mph), regardless of flap position and with dive brakes deployed.
The structural limits of the aircraft cannot be exceeded at speeds below 190 km/h (103 kts, 118 mph) through severe turbulence or control surface deflections.

Yellow Range 190 - 270 km/h (103-146 kts, 118-168 mph): The structural limits of the aircraft can be exceeded in this range by severe turbulence, or through rapid deflections of control surfaces.
Severe turbulence would include wave rotors, visible wind funnels, cumulonimbus clouds or when crossing mountain ridges in strong winds. Therefore, in this speed range severe turbulence should be avoided, and control surface movements should be gentle.

Red Line Speed 270 km/h (146 kts, 168 mph): Never exceed.

White Range 85 - 190 km/h (46-103 kts, 53-118 mph): At maximum weight of 472 kp (1o41 lbs) 85 km/h (46 kts, 53 mph) is minimum speed in straight and level flight and flap position +10°. 190 km/h (103 kts, 118 mph) is maximum permissible speed with flap positions from +10° to 0°.

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

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Weights: Gross Weight ..... 472 kp (1041 lbs)
Maximum Weight of Non-lift Producing Parts ..... 240 kp (529 lbs)
Empty Weight ..... around 270 kp (595 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 horizental.

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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

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Water Ballast Limitations Maximum Capacity 150 liters (150kg = 330 lbs)

Pilot and Parachute kg	Empty Weight (kg)										
	250	255	260	265	270	275	280	285	290	295	300
60	150	150	150	147	142	137	132	127	122	117	112
65	150	150	147	142	137	132	127	122	117	112	107
70	150	147	142	137	132	127	122	117	112	107	102
75	147	142	137	132	127	122	117	112	107	102	97
80	142	137	132	127	122	117	112	107	102	97	92
85	137	132	127	122	117	112	107	102	97	92	87
90	132	127	122	117	112	107	102	97	92	87	82
95	127	122	117	112	107	102	97	92	87	82	77
100	122	117	112	107	102	97	92	87	82	77	72
105	117	112	107	102	97	92	87	82	77	72	67
110	112	107	102	97	92	87	82	77	72	67	62
115	107	102	97	92	87	82	77	72	67	62	57
120	102	97	92	87	82	77	72	67	62	57	52

Example: At an empty weight of 280 kg and a pilot and parachute weight of 95 kg, maximum permissible water ballast is 97 kg.

See page 1.6a for limitations in lbs.

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Water Ballast Limitations Maximum Capacity 150 liters (330 lbs)

Pilot and Parachute (lbs)	Empty Weight (lbs)										
	551	562	573	584	595	606	617	628	639	650	661
132	330	330	330	324	313	302	291	280	269	258	247
143	330	330	324	313	302	291	280	269	258	247	236
154	330	324	313	302	291	280	269	258	247	236	225
165	324	313	302	291	280	269	258	247	236	225	214
176	313	302	291	280	269	258	247	236	225	214	203
187	302	291	280	269	258	247	236	225	214	203	192
198	291	280	269	258	247	236	225	214	203	192	181
209	280	269	258	247	236	225	214	203	192	181	170
220	269	258	247	236	225	214	203	192	181	170	159
231	258	247	236	225	214	203	192	181	170	159	148
243	247	236	225	214	203	192	181	170	159	148	137
254	236	225	214	203	192	181	170	159	148	137	126
265	225	214	203	192	181	170	159	148	137	126	115

Example: At an empty weight of 617 lbs and a useful load of 209 lbs, maximum permissible water ballast is 214 lbs.

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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.
Installation of batteries, radios and baregraphs should be done in accordance with instructions in service 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 - 50 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. In clouds, flaps should be in +10° position.

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).

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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).

Note: During spinning and slipping the airflow may push the rudder to maximum deflection.

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Limitation of High Speed Flight

If there are indications while flying under large cloudbank, or while flying in clouds, that the maximum permissible rough airspeed 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 not in the +10° 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.

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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.

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Assembly:

1. Clean and grease all pins and matching holes.
2. Divebrake handle in unlocked position, about 1o 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 the handl of the main pin.
4. Insert right spar end into fuselage until wing root pins are inserted.
5. Aileron/flap activators should be meshed into drive gear. Occasionally drive gear will have to be adjusted by hand.
6. Divebrake activators 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.

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Assembly continued:

8. Insertion of main pins is possible only when all activators have coupled properly.
9. Install horizontal tail and secure with safety nut against tapered bolt using a suitable coin until red marking on mounting bracket is invisible.
10. Install Braunschweig tube, battery, barograph and automatic parachute.
11. Tape upper and lower wing fuselage connection, and access hole on upper side of elevator.
12. Fill water ballast tanks.

Disassembly:

Reverse assembly sequence, except before removing main pins unlock divebrakes.

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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 weights 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.

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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:

Adjust 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.

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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 emergeny brake, and should be used sparingly.

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Water Ballast:

Each tank holds about 75 liters (20 US-gallons). The maximum permissible load should be taken from the table on page 1.6 .

Filling of Water Tanks: Open appropriate dump valve. Using the connection hose, suck residual air from water bag. Subsequently, fill desired amount of water. Close valve. Repeat same procedure in 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 dumpings.
2. The escaping water can lead to icing of the aileron near the fuselage, and could block aileron 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 or Auto Tow

(a) Trim forward, visible at trim lever in forward position.

(b) Flap position around 0°, set to 10° after transition arc.

(c) Backrest and headrest should be adjusted and secured, safety harness tightened to avoid pilot sliding backwards during acceleration and steep climb.

(d) Ask winch operator to avoid brisk acceleration.
The higher the initial acceleration, the higher is the pitch-up tendency.

(e) When tow cable tightens, use wheel brake , to avoid rolling over tow cable.

(f) Pronounced stick forward pressure is required in transition arc.

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

Retract landing gear **after** tow cable release, because hook is fixed at landing gear.

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Aero Tow

(a) Trim forward, visible at trim lever in forward position.

(b) Flap position around 0°, set to 10° after transition arc.

(c) With a nose hook installed, this must be used for aero tow.
At the C.G. hook pitch-up tendency is higher and requires more practice.
While using the C.G. release, the landing gear may not be retracted during tow, because the release is fixed at the landing gear.

(d) When tow cable tightens, use wheel brake , to avoid rolling over tow cable.

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

(f) Permissible tow rope length: 30 to 80 m (100 to 240 ft)

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Free Flight:

Stall speed is between 65 to 70 km/h (35-38 kts, 40-44 mph) without water ballast, with full water ballast 75 to 80 km/h (41-43 kts, 47-50 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 between 0° and -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 (103-146 kts, 118-168 mph): Flap position -7°. Stick forces should be reduced to zero through trim adjustment.

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Landing: During approach flaps should always be in +10° position. Water ballast should normally be dumped prior to landing.

Approach speed not below 90 km/h (49 kts, 56 mph)

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 angle. Slipping with deployed dive brakes should be avoided because of limited elevator effectiveness.

During pull out before touch down you should deploy dive brakes only half way to avoid landing in front of desired touch down area.

Cloud Flying: Permissible only with flap position +10°, as other flap positions can not be locked.

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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.

However, as safety agains flutter depends on true airspeed, this should never be beyond 270 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 270 km/h (146 kts, 168 mph).

Example: Indicated airspeed of 177 km/h (95 kts, 110 mph) at 6000 m (19700 ft) altitude corresponds to 270 km/h (146 kts, 168 mph) true airspeed.