

Rolladen Schneider Flugzeugbau GmbH	FLIGHT MANUAL	LS4	Page 0-1 Edition 1.1.81
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FLIGHT MANUAL

For the sailplane type LS4

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

This Flight Manual is issued for the sailplane LS4

Registration Number _____

Serial Number _____

Manufacturer Rolladen Schneider Flugzeugbau GmbH
Mühlstrasse 10, 6073 Egelsbach, Germany

Owner

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.



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Pages 1-1 through 3-13 approved by Luftfahrt-Bundesamt 19. Aug. 1982

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Edition: Octobre 1999

Revision - 1

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Prepared:
02.02.00

Verified: *Wapla*

Complies:

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General

The LS4 sailplane is designed and approved according to LFSM regulations. The safety margin - ratio of fracture loads to permissible maximum loads which may occur some times - is 1.5 only. This means that fracture loads will be achieved when exceeding permissible load factors by 50%. 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.

19. 12. 80 <i>Gunk</i>	20. 12. 80 <i>Schäpke</i>
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AIRSPPEED LIMITS

	km/h	kts	MPH
<u>Never exceed (IAS)</u> from sea level up to 6500 ft	270	146	168
up to 9800 ft	257	139	160
up to 19700 ft	219	118	136
up to 32800 ft	173	93	107
<u>Maneuvering</u>	180	97	112
<u>Limit Speed</u> in "severe turbulence"	180	97	112
winch launch	130	70	81
aero tow	180	97	112

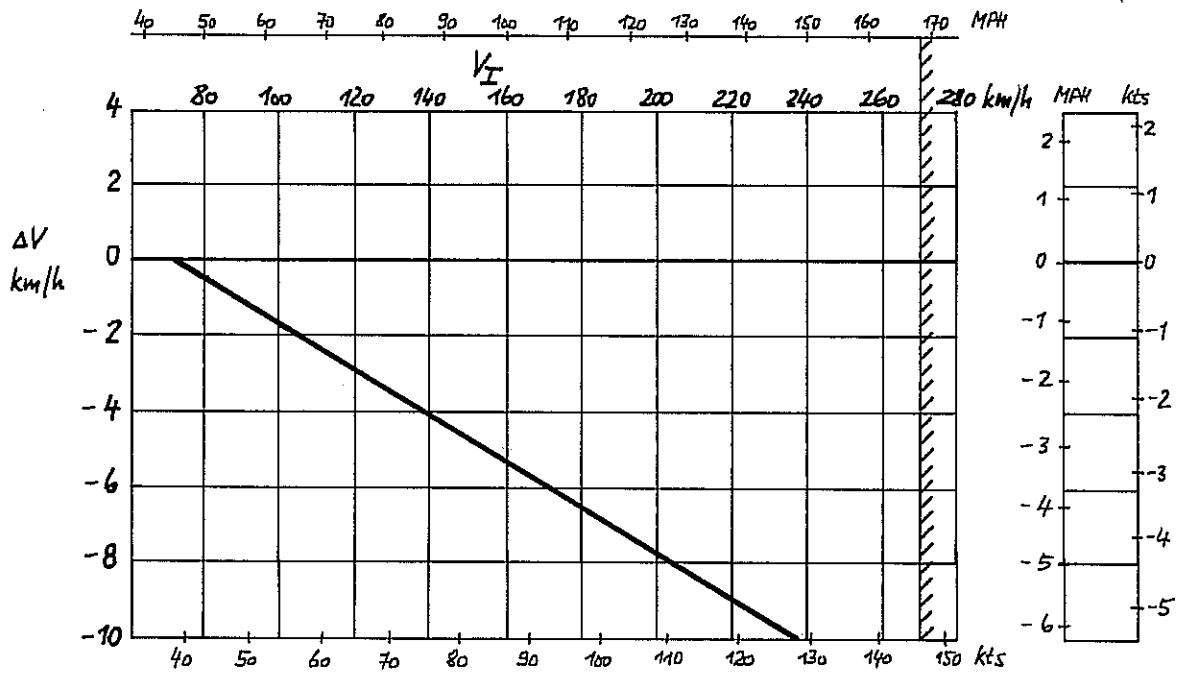
For "severe turbulence" see page 1-1.

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

19. 12. 80 <i>Genuta</i>	20. 12. 80 <i>Wapka</i>
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POSITION ERROR OF AIRSPEED SYSTEM

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



19. 12. 80

Gemeke

20. 12. 80

Wagner

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Colour Marking on Airspeed Indicator

- Green Range: 85 - 180 km/h (46 - 97 kts, 53 - 112 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 Range: 180 - 270 km/h (97 - 146 kts, 112 - 168 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. Maneuvering loads, gust loads and loads due to control surface deflections should not be encountered simultaneously.
- Red Line: 270 km/h (146 kts, 168 MPH)
 Never exceed up to 6500 ft above MSL flying altitude. For higher altitudes see page 1-2.
- Yellow Triangle: 90 km/h (49 kts, 56 MPH)
 Recommended approach to landing speed without water ballast.

19.12.80 <i>Grunke</i>	20.12.80 <i>Wagner</i>
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Weights:

Max. flight weight (with waterballast): 472 kg <1041 lbs.>

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

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

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

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.

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 TN4054 (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 waterballast 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. mass of non lifting parts see entry on page1-7.

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. 140 kg <309 lbs.>

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C.G. position in flight (without waterballast)

Maximum allowable:

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

Rearward C.G. position: 400 mm (1.57 in.) aft of DP.

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

Note: Loading waterballast shifts inflight C.G. forward. From rearward flight C.G. position, 140 liters <308 lbs., 30.8 Imp. Gal.> of ballast shift the C.G. approx. 50 mm <1.97 in.> forward.

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Cockpit Load (Pilot and Parachute)

New entry with each annual inspection and when changing equipment. Should be calculated in accordance with guide in Maintenance Manual.

Empty Weight	Maximum Per- missible Load	Minimum Per- missible Load	Fixed Ballast forward	aft	Date	Inspector

19. 12. 80 <i>Heurke</i>	20. 12. 80 <i>hkapka</i>
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Water Ballast Limitations

Maximum Capacity 60-70 kg (132-154 lbs) each bag = 120-140 kg (264-308 lbs)

Pilot and Parachute (kg)	Empty Weight (kg)									
	230	235	240	245	250	255	260	265	270	275
70	140	140	140	140	140	140	140	137	132	127
75	140	140	140	140	140	140	137	132	127	122
80	140	140	140	140	140	137	132	127	122	117
85	140	140	140	140	137	132	127	122	117	112
90	140	140	140	137	132	127	122	117	112	107
95	140	140	137	132	127	122	117	112	107	102
100	140	137	132	127	122	117	112	107	102	97
105	137	132	127	122	117	112	107	102	97	92
110	132	127	122	117	112	107	102	97	92	87

Example: When empty weight is 240 kg (529 lbs) and pilot and parachute weight is 95 kg (209 lbs), maximum permissible water ballast is 137 kg (302 lbs).

See page 1-9 for limitations in lbs.

Water Ballast Limitations

Maximum capacity 120-140 kg (264-308 lbs)

Pilot and Parachute (lbs)	Empty Weight (lbs)										Pilot and Parachute (kg)
	507	518	529	540	551	562	573	584	595	606	
154	309	309	309	309	309	309	309	302	291	280	70
165	309	309	309	309	309	309	302	291	280	269	75
176	309	309	309	309	309	302	291	280	269	258	80
187	309	309	309	309	302	291	280	269	258	247	85
198	309	309	309	302	291	280	269	258	247	236	90
209	309	309	302	291	280	269	258	247	236	225	95
220	309	302	291	280	269	258	247	236	225	214	100
231	302	291	280	269	258	247	236	225	214	203	105
243	291	280	269	258	247	236	225	214	203	192	110
	230	235	240	245	250	255	260	265	270	275	

Empty Weight (kg)

Example: When empty weight is 529 lbs and pilot and parachute weight is 209 lbs, maximum permissible water ballast is 302 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. 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 trim weights can be fastened with a knurled nut to a threaded rod ahead of the rudder pedals. One 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) in mainwheel
 2.5 bar (36 psi) in tailwheel

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Aerobatics: Aerobatic Manoeuvres not approved.

Structural Limitations in Flight:

At 180 km/h (97 kts, 112 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).

Sideslip

Sideslip speed range: up to 180 km/h (97 kts, 112 MPH)

During sideslip rudder control force decreases to almost zero force.

For a straight and steady sideslip 100% rudder and between 50 to 75% aileron deflection are necessary.

Degradation in airspeed system goes down to zero airspeed indication. Depending on airspeed indicator, negative values may be indicated. (Fuselage nose pitot and forward side statics used).

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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 downward deflection of elevator, 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).

19. 12. 80	<i>Leuck</i>	20. 12. 80	<i>Khalya</i>
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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 air speed will be exceeded, divebrakes should be deployed carefully before 180 km/h (97 kts, 112 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 remember that after unlocking divebrakes will open rapidly and cause uncomfortable negative accelerations.

When divebrakes are deployed during descent after high altitude wave flights a speed of 180 km/h (97 kts, 112 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.

Reverse sequence possible also.

19. 12. 80 <i>Leucke</i>	20. 12. 80 <i>hkapla</i>
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Rain:

Raindrops will change the airfoil and will reduce performance. 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.

19. 12. 80 <i>Heurke</i>	20. 12. 80 <i>Wapke</i>
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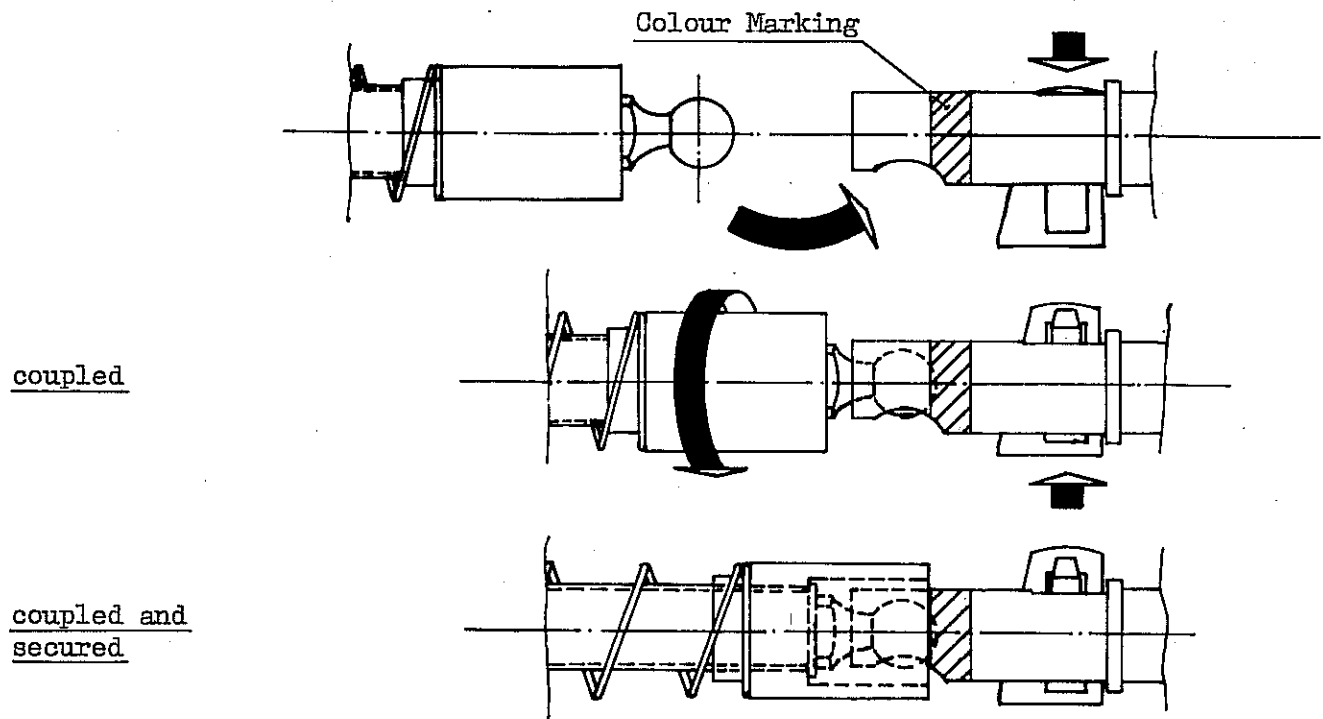
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Assembly

1. Clean and grease all pins and matching holes.
2. Insert left spar end into fuselage and watch for angle of dihedral.
3. Insert right spar end into fuselage and watch for angle of dihedral.
4. Insert main pins when holes are lined up correctly.
5. Secure main pins.
6. Connect dive brake system with ball snap joints.
7. Secure ball snap joints of dive brake system by turning LS-sleeve over joint as far as possible. Check securing by trying to disassemble connectors. See also drawing on page 3-2.
8. Connect aileron system with ball snap joints.
9. 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 3-2.
10. Check steering system connections visually using built in mirrors and colour marking.

19. 12. 80	<i>Heucke</i>	20. 12. 80	<i>Khapha</i>
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Assembly of ball snap joints (dive brake and aileron system):



German patent for LS-sleeve applied

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Assembly continued:

11. Insert battery into vertical tail fin.
12. Install horizontal tail and secure with slotted nut against tapered bolts using a suitable coin until red marking on mounting bracket is invisible.
13. Install total energy tube, battery (if not already in vertical tail fin) and barograph. Connect automatic parachute to red marked portion at main bulkhead using special loop only.
14. Tape upper and lower wing fuselage connection and access hole on upper side of horizontal tail.
15. Fill water ballast and check proper dumping.

Disassembly:

Reverse assembly sequence, except before removing main pins turn LS-sleeves free of ball snap joints and disconnect aileron and divebrake systems.

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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 total energy tube for clogging.
3. Check tire pressure in wheel (3 - 3.5 bar, 43 - 50 psi).
in tail wheel (2.5 bar, 36 psi)
4. Check wheel brake effectiveness.
5. Check tow release.
6. Check emergency canopy release.
7. Check weight and balance, especially minimum and maximum cockpit loads,
trim weights and battery position.
8. Check instruments including radio.
9. Adjust backrest and rudder pedals.
10. Check papers.
11. Before take off carry out check in accordance with check list under
instrument panel cover.

19. 12. 80	<i>Leucke</i>	20. 12. 80	<i>hhapha</i>
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Post-flight Checks

1. Remove insects and dust.
2. If moisture has accumulated in divebrake boxes, remove with sponge.
3. Ensure 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 of lower backrest bracket is possible only on the ground and allows for fitting of various types of parachutes. Pull cable through slot in backrest for unlocking.

Adjustment of slope of backrest is possible during flight. Be careful that locking pin catches in slot on right cockpit rim properly.

19. 12. 80	<i>Leuchte</i>	20. 12. 80	<i>Khapha</i>
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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.

Edition: Octobre 1999

LBA-appr. Revision - 1

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Prepared:
02.02.00

Verified:

W. K. Ples

Complies:

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Trim System

Trim locking lever is fitted to control stick. Pulling the locking lever frees trim lever at left cockpit side, which allows trimming stick forces to zero or trimming for desired speeds: forward for nose down, rearward for nose up.

Release locking lever to fix trim setting. Position of trim lever relative to neutral mark indicates trim setting.

19. 12. 80 <i>Gecurke</i>	20. 12. 80 <i>khapka</i>
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Water Ballast

Each tank holds about 70 liters (18.5 US gallons, 15.4 Imp. gallons).

Maximum permissible load should be taken from table on pages 1-8 or 1-9.

Filling of Water Tanks: Open appropriate dump valve and lay wing tip on the ground. Using connection hose, suck residual air from water bag. Subsequently, fill desired amount of water. During filling disconnect funnel several times to allow residual air to get out. Never use more than 0.1 bar water pressure (funnel max. 1 m (3.3 ft) above wing). Close valve and repeat same procedure on other wing.

Dumping of Water: Open both valves simultaneously. 10 liters will be dumped in approximately 10 seconds. 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 dumped after landing. When tanks are partially filled, keep wings horizontal before take off to avoid unequal water distribution.

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Winch Launch

Adjust backrest properly (see page 3-5) and tighten seat belt harness to avoid sliding backwards during acceleration and steep climb.

Trim slightly forward, trim lever just before reference mark.

Ask winch operator to avoid brisk acceleration. The higher the starting acceleration, the higher is the pitch up tendency.

When the tow cable tightens, use wheel brake to avoid rolling over tow cable. Pronounced forward stick pressure is required in transition arc.

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

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Aero Tow

Trim slightly forward, trim lever just before reference mark.

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 Tow Rope 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.

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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.

Best Glide Angle: between 90 and 100 km/h (49-54 kts, 56-62 MPH)

High Speed Flight: Trim high speeds. Check speed indication regularly to avoid exceeding limit values.

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.*

Edition: Octobre 1999

LBA-appr. Revision - 1

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Prepared:
02.02.00

Verified:

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Complies:

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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 beyond 270 km/h (146 kts, 168 MPH) up to 2000 m (6600 ft) above MSL.

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

18.12.80 ^{an} <i>Kerka</i>	20.12.80 <i>Wapka</i>
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