JS1 REVELATION

Flight Manual

JONKER SAILPLANES

JS1 REVELATION FLIGHT MANUAL

Model:	JS1-A / B, C-18 / C-21
Serial number:	
Registration Number:	
Document number:	1A-5.04.10
Title:	JS1 Revelation Flight Manual
Date of issue:	26 May 2016

Prepared by:	Name: J.S.U. Jonker	Signature:
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Approval: Pages marked **'Approved'** are approved by:	Signature:	
	Agency:	SACAA
	Stamp:	FOR DIRECTOR OF CIVIL AVIATION
Date of approval:	2016 -05- 23	

0. GENERAL

0.1 Record of Revision

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 Agency.

The new or amended text in the revised page will be indicated by a black vertical line in the left hand margin, and the revision number and the date will be shown on the bottom left hand of the page.

Rev. No	Affected Section	Affected Pages	Date of Issue	Description	Approved by	Date of Approval	Date of Insertion	Signature

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1. General

1.1 Introduction

This Flight Manual has been prepared to provide pilots and instructors with all the information required for safe and efficient operation of the JS1 Revelation. All the data that is required by the Airworthiness Requirement CS-22 to furnish the pilot is contained in this manual. It also contains supplementary data supplied by the sailplane manufacturer.

The JS1 Revelation is a high-performance sailplane and not a trainer. Even though it possesses excellent performance and handling qualities, it can only be flown by a skilled pilot who complies with the limitations and recommendations set out in this manual.

If a Jet Sustainer System if fitted, use this manual in combination with the latest approved JS1 Jet Sustainer Flight Manual Supplement.

1.2 Certification basis

This aircraft, with production designation “JS-1A Revelation” or “JS-1B Revelation” has been approved by the South African Civil Aviation Authority (SACAA) in accordance with CS-22 including Amendment AMC 22.1555 (a), AMC 22.1585 (f).

The type certificate no. **J15/12/550** was issued on 23 February 2010 and amended on 30 June 2012.

The type certificate was amended on 1 June 2016 with the optional Jet Sustainer System.

The category of airworthiness is U (Utility).

1.3 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes used in this Flight Manual.

WARNING: means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.

CAUTION: means that the non-observation of the corresponding procedure leads to a minor or to a longer term degradation of the flight safety.

NOTE: draws the attention on any special item not directly related to safety but which is important or unusual.

1.4 Descriptive data

The JS1 Revelation is a high-performance single-seat sailplane of conventional layout with a T-tail. Two wingspan configurations (18 m and 21 m) can be selected, both of which feature full-span flaperons

The cockpit is designed to protect the pilot in the event of a crash. Safety features include a crumple zone in the forward structure. The wing structure consists of spar caps made of carbon fibre rovings and skins of carbon fibre fabric. The wings are connected with a tongue and fork arrangement, secured with two main pins. The airbrakes are a triple blade design on the upper surface of the wing.

Boundary layer control is achieved on the main wing bottom surfaces, the horizontal stabilizer and vertical fin. All control surface hinge gaps are sealed with Mylar strips and Teflon-coated tape.

The water ballast system consists of two main tanks, each integral to a wing and holding approximately 90 litres of water, and two trim tanks in the vertical fin. The tail ballast tanks consist of an expendable tank of approximately 7.5 litres and a non-expendable tank of approximately 5 litres. The 21 m wing tips also feature integral tanks, with a capacity of approximately 17 litres each. The landing gear consists of a 5 inch retractable sprung main landing gear with a fixed tail wheel.

All controls are automatically connected during rigging.

Optionally a retractable jet engine approved for sustained flight can be fitted.

1.5 Technical data

Geometry	JS1-A/B	JS1-C 18m	JS1-C 21m
Wing Span	18 m 59.06 ft		21 m 68.88 ft
Wing Area	11.25 m² 121.09 ft^2	11.19 m² 120.45 ft^2	12.25 m² 131.86 ft^2
Aspect Ratio	28.8		35.9
Fuselage Length (JS1-A) Fuselage Length (JS1-B,C)	7.044 m / 23.11 ft 7.052 m / 23.14 ft		
Fuselage Height (JS1-A) Fuselage Height (JS1-B,C)	1.49 m / 4.89 ft 1.32 m / 4.33 ft		
Weight	**JS1-A/B**	**JS1-C 18m**	**JS1-C 21m**
Empty Weight without Engine	310 kg 683 lbs		330 kg 728 lbs
Maximum Weight	600kg 1323 lbs		720kg 1587 lbs
Wing Loading (min) (70kg pilot)	33.9 kg/m² 6.94 lb/ft^2	34.1 kg/m² 6.98 lb/ft^2	32.6 kg/m² 6.68 lb/ft^2
Wing Loading (max)	53.3 kg/m² 10.92 lb/ft^2	53.6 kg/m² 10.98 lb/ft^2	58.7 kg/m² 12.02 lb/ft^2
Glide performance	**JS1-A/B**	**JS1-C 18m**	**JS1-C 21m**
Best Glide Ratio	53		60
Best Glide Speed at MAUW Flap Setting 4 (9°- 13.5°)	120 km/h 65 kts		
Best Glide Speed at 450 kg Flap Setting 4 (9 ° - 13.5°)	100 km/h 54 kts		
Minimum Sink Rate at empty weight	0.5 m/s 100 ft/min		0.48 m/s 95 ft/min

Table 1.5.0-1

1.6 Three-view drawings

1.6.1 JS1-B

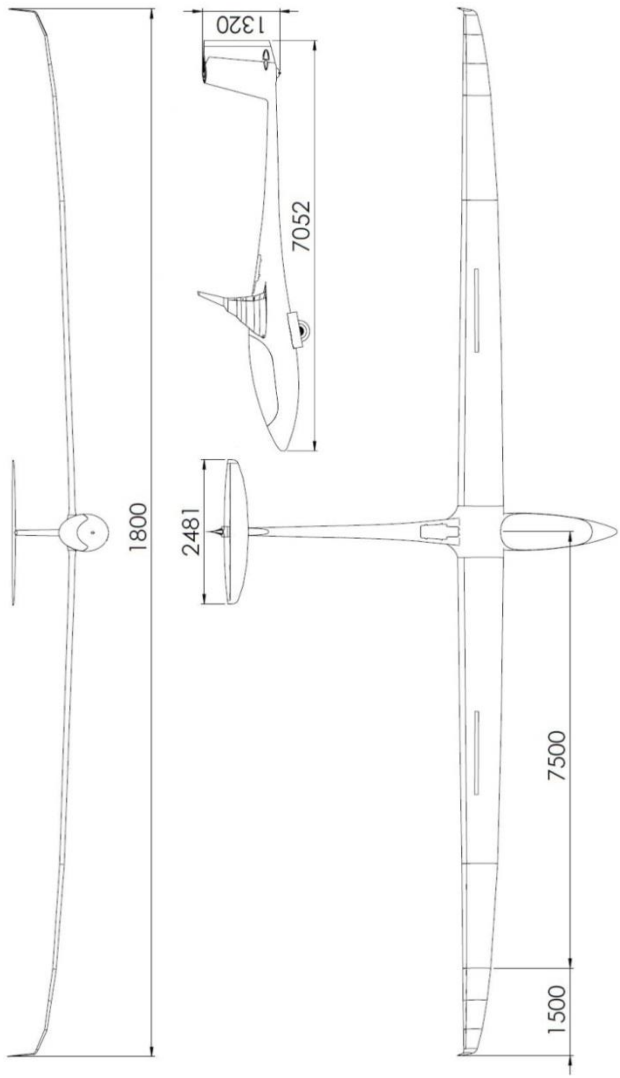

Figure 1.6.1-1

1.6.2 JS1-C 18 m

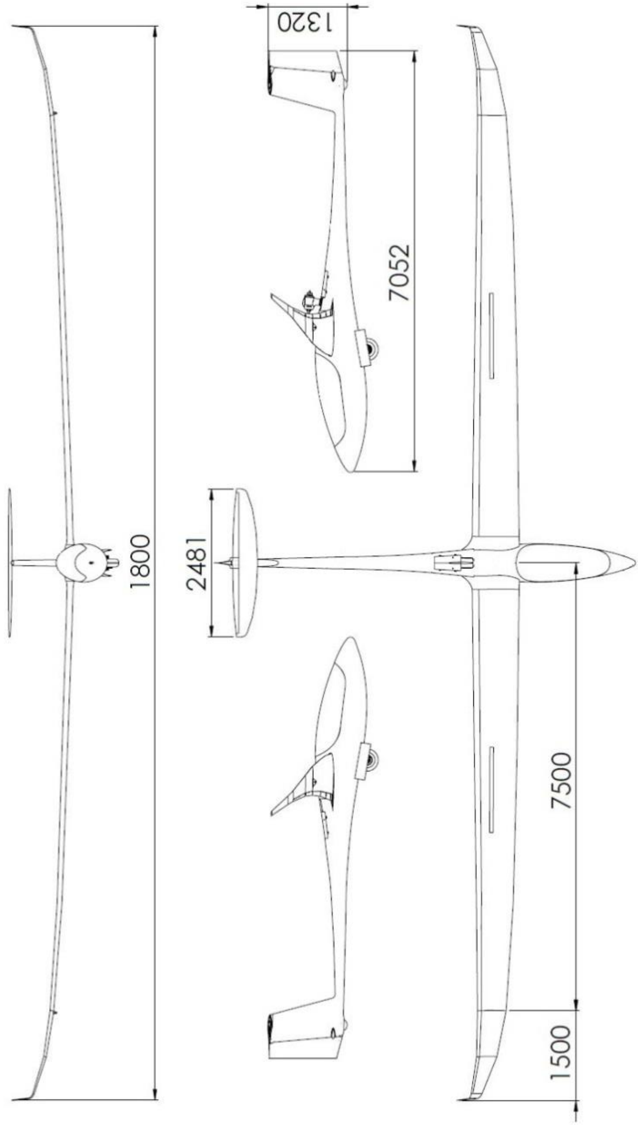

Figure 1.6.2-1

1.6.3 JS1-C 21 m

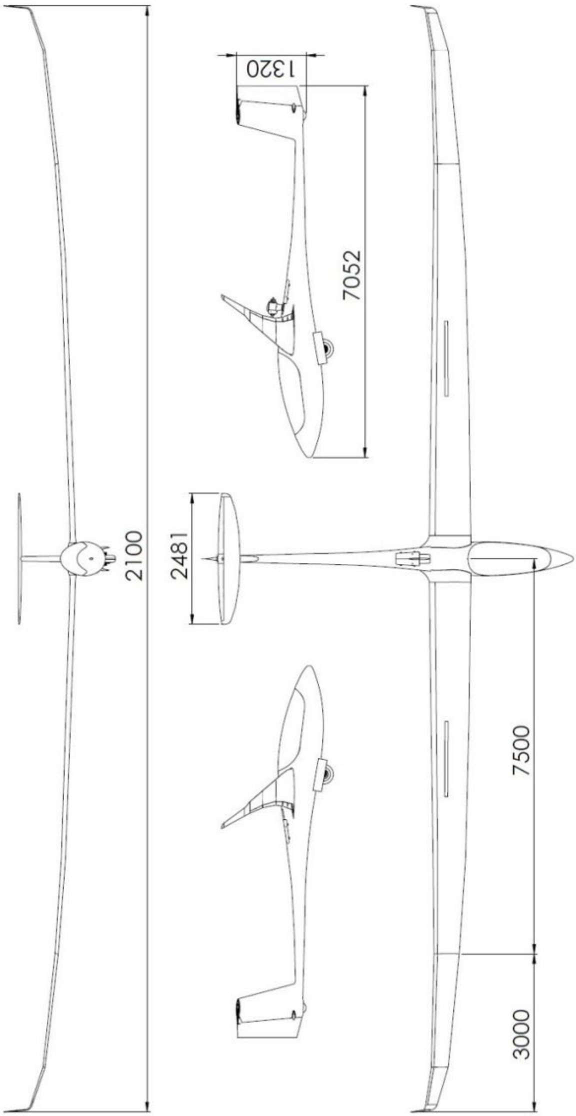

Figure 1.6.3-1

2. Limitations

2.1 Introduction

Section 2 includes operating limitations, instrument markings, and basic placards necessary for safe operation of the aircraft, its engine, standard systems and standard equipment.

The limitations included in this section and in Section 9 have been approved by the SACAA.

2.2 Airspeed limits

Speed limitations and their operational significance are shown below:

Speed		IAS 18 m	IAS 21 m	Remarks
V_{NE}	Never exceed speed	290 km/h 157 kts	270 km/h 146 kts	Do not exceed this speed in any operation and do not use more than 1/3 of control deflection
V_{RA}	Rough air speed	203km/h 110kts		Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-wave rotor, thunderclouds etc.
V_A	Manoeuvring speed	203km/h 110kts		Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane may be overstressed by full control movement.
V_{FE}	Maximum flap extended speed	See Table 2.2.0-2		Do not exceed these speeds with the given flap setting.
V_W	Maximum winch launching speed	150km/h 81kts	140km/h 76kts	Do not exceed this speed during winch or auto tow launching
V_T	Maximum aerotow speed	180km/h 97kts		Do not exceed this speed during aerotow.
V_{lo}	Maximum wheel extension speed	200km/h 108kts		Do not extend or retract the landing gear above this speed.
V_{PO} max	Maximum power plant extension & retraction speed	Refer to JS1 Jet Sustainer Flight Manual Supplement Section 2.2.		
V_{PE}	Power plant extended maximum permitted speed			

Table 2.2.0-1

The following table shows the maximum allowable airspeed for each flap setting:

<table>
<tr><th rowspan="2">Flap setting</th><th rowspan="2">Deflection (°)</th><th colspan="2">V_{FE}</th></tr>
<tr><th>18 m</th><th>21 m</th></tr>
<tr><td>1</td><td>-3°</td><td rowspan="2">290km/h
157kts</td><td rowspan="2">270 km/h
146 kts</td></tr>
<tr><td>2</td><td>+0°</td></tr>
<tr><td>3</td><td>+5°</td><td colspan="2">230km/h / 124kts</td></tr>
<tr><td>4</td><td>+13.5°</td><td colspan="2">170km/h / 92kts</td></tr>
<tr><td>5</td><td>+16.6°</td><td colspan="2">170km/h / 92kts</td></tr>
<tr><td>L</td><td>+20°</td><td colspan="2">160km/h / 86kts</td></tr>
</table>

Table 2.2.0-2

Note: V_{FE} for flap setting 3 is 240km/h (130kts) for the JS1-A and JS1-B models.

The maximum allowable airspeeds for each flap setting are indicated on the airspeed indicator (ASI) with white triangles next to the flap position number, as indicated in Figure 2.2.0-1 (ASI in km/h) and Figure 2.2.0- 2 (ASI in knots).

Figure 2.2.0-1

Figure 2.2.0-2

2.3 Airspeed indicator marking

The airspeed indicator markings and their colour code significance are given in Table 2.3.0-1:

Marking		IAS 18 m	IAS 21 m	Significance
White Arc		98 to 160km/h 53 to 86kts		Positive Flap Operating Range. (Lower limit is 1.1 V_{S0}[1] in landing configuration at maximum weight. Upper limit is maximum speed permissible with flaps extended positive)
Green Arc		103 to 203km/h 56 to 110kts		Normal Operating Range. (Lower limit is 1.1V_{S1}[2] at maximum weight and most forward c. g. with flaps neutral. Upper limit is rough air speed.)
Yellow Arc		203 to 290km/h 110 to 157 kts	203 to 270km/h 110 to 146 kts	Manoeuvres must be conducted with caution and only in smooth air.
Red Line		290km/h 157 kts	270km/h 146 kts	Maximum speed limit for all operations.
Blue line		Refer to Jet Sustainer Supplement Section 2.3		Best rate-of-climb speed V_Y (if engine is fitted)
Yellow Triangle		101km/h 55 kts		Approach speed at maximum weight without water ballast.

Table 2.3.0-1

[1] V_{SO} is defined as the stall speed at maximum weight, in the landing configuration, with the CG in the most unfavourable position, See CS22.49.

[2] V_{S1} is defined as the stall speed at maximum weight, in a specific selected configuration, with the CG in the most unfavourable position, See CS22.49.

2.4 Power plant fuel and oil

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 2.4

2.5 Power plant instrument markings

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 2.5

2.6 Mass

The mass limitations for the JS1 are given in Table 2.6.0-1:

Mass definition	Mass limits	
	18 m	21 m
Maximum All-Up Mass	600 kg 1323 lbs	720 kg 1587 lbs
Maximum Take-Off Mass for winch launching	600 kg 1323 lbs	600 kg (1) 1323 lbs
Maximum Take-Off Mass for cloud flying	437 kg 963 lbs	(2)
Minimum Take Off Weight when flying with water ballast	No limitation	500 kg 1102 lbs
Maximum Mass of non-lifting parts	350 kg 772 lbs	325 kg 717 lbs
Maximum Mass in luggage compartment	15 kg 33 lbs	

Table 2.6.0-1

WARNING: Only soft items such as canopy covers and jackets may be stored in the baggage compartment. This is necessary to prevent injury to the pilot during an emergency landing.

CAUTION: Ensure that items stored in the baggage compartment will not interfere with the operation of the water dump system. Interference may prevent the pilot from dumping water ballast during the flight.

NOTE(1): 21 m configuration only demonstrated to 600 kg

NOTE(2): Cloud flying requirements only demonstrated for 18 m configuration

2.7 Centre of gravity

The following table shows the allowable CG range for the JS1 in the 18 m and 21 m configurations:

Centre of Gravity range (in flight)	Distance from datum	
	18 m	21 m
Most forward CG location	244 mm 9.61 in.	269 mm 10.59 in.
Most aft CG location	375 mm 14.76 in.	375 mm 14.76 in.

Table 2.7.0-1

The datum is defined as the wing leading edge at the wing root rib, i.e. on the wing immediately outboard of the wing-fuselage fairing.

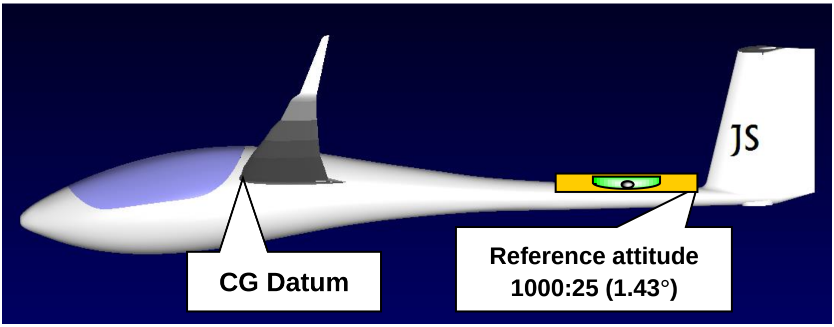

Figure 2.7.0-1

The correct aircraft attitude for weighing is defined as with the aft fuselage boom forward of the fin positioned at gradient of 1000:25, as illustrated in Figure 2.7.0-1.

Table 2.7.0-2 gives the forward and rear centre of gravity limits (no payload) for different empty masses that will allow a cockpit range of 70kg to 115kg.

Empty mass		**Empty Centre of Gravity range**		
		Forward limit to allow a maximum cockpit load of 115kg (253 lbs)		**Rear limit** to allow a minimum cockpit load of 70kg (154 lbs)
kg	**lbs**	**18 m**	**21 m**	**18 m & 21 m**
320	705	558 mm 22.0 in.	593 mm 23.4 in.	597 mm 23.5 in.
330	727	553 mm 21.8 in.	587 mm 23.1 in.	593 mm 23.4 in.
340	749	548 mm 21.6 in.	582 mm 22.9 in.	590 mm 23.2 in.
350	771	543 mm 21.4 in.	577 mm 22.7 in.	586 mm 23.1 in.
360	793	538 mm 21.2 in.	572 mm 22.5 in.	583 mm 23.0 in.
370	815	534 mm 21.0 in.	568 mm 22.4 in.	580 mm 22.8 in.
380	838	529 mm 20.8 in.	563 mm 22.2 in.	577 mm 22.7 in.

Table 2.7.0-2

If the calculated empty centre of gravity falls outside of this envelope, the minimum and maximum cockpit loads must be determined using the formula given in the Maintenance Manual Section 9.

2.8 Approved manoeuvres

This aircraft is certified in the Utility category (U). The following aerobatic manoeuvres are permitted in the 18 m configuration only:

- Lazy Eight
- Chandelle
- Steep turns
- Positive loops
- Stall turns
- Spins

Refer to Section 4.5.10 for the recommended entry speeds for each manoeuvre.

Note: No aerobatic manoeuvres were demonstrated in the 21 m configuration.

2.9 Flight load factor limits

The minimum and maximum approved manoeuvring loads are given in the Table 2.9.0-1 below:

Condition	IAS		Load factor
	18 m	21 m	
Maximum positive manoeuvre	203km/h 110kts		**+ 5.3**
Maximum negative manoeuvre	203km/h 110kts		**- 2.65**
Maximum positive manoeuvre	290km/h 157kts	270km/h 146kts	**+ 4.0**
Maximum negative manoeuvre	290km/h 157kts	270km/h 146kts	**- 1.5**
Maximum positive manoeuvre with airbrakes open	290km/h 157kts	270km/h 146kts	**+ 3.5**
Maximum positive manoeuvre with flaperons in landing configuration	155km/h 84kts		**+ 4.0**

Table 2.9.0-1

2.10 Flight crew

The minimum and maximum pilot mass is indicated on the cockpit placard.

Minimum cockpit load:	**70 kg (154.3 lbs)**
Maximum cockpit load:	**115 kg (253.5 lbs)**

CAUTION: If the measured empty CG is not within the normal empty mass CG range, the minimum and maximum cockpit loads must be calculated and the cockpit placard values corrected accordingly.

Pilots below the minimum weight must add nose ballast according to the centre of gravity calculations as explained in Section 6.

NOTE: The term “cockpit load” includes pilot, parachute, baggage and any other temporary equipment.

Contact the manufacturer or approved service station if assistance is required.

2.11 Types of operation

The JS-1 Revelation is approved for:

- VFR day
- Cloud flying only in 18 m configuration without water ballast where national regulations permit

NOTE: For Cloud flying the take-off mass must not exceed the Maximum Take-Off Mass without Water ballast as given in Section 2.6, and engine must be retracted (if fitted).

Refer to Section 2.12 for the minimum equipment required for cloud flying.

2.12 Minimum equipment list

Instruments and other equipment on the minimum equipment list must be approved. Refer to the accessory approval section in the JS1 REVELATION Maintenance Manual for details.

The minimum equipment:

- Pitot-static type airspeed indicator, scale 50 to 350km/h (27 to 189kts), colour markings in accordance with Section 2.3
- Altimeter.
- Aircraft compass or suitable GPS navigational system with redundant battery supply.
- 4-point symmetrical seat harness.
- Operating placards.
- Control surface gap seals (Mylar seals) on all control surfaces.

Additional instrumentation required when flying with water ballast:

- Instrumentation indicating outside air temperature with the probe installed in the fuselage nose.

Additional instrumentation required for cloud flying:

- Turn and bank indicator or artificial horizon.
- Variometer to indicate vertical speed.

Additional instrumentation required if engine is fitted:

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 2.9

2.13 Aerotow and winch launching

Maximum approved towing speeds and recommended weak link ratings for the JS-1 are listed in Table 2.13.0-1.

Launch Method	Maximum Speed (18 m)	Maximum Speed (21 m)	Recommended Weak link
Winch or ground launch	150km/h / 81kts	140km/h / 76kts	750 daN (E.g. Tost weak link #3, Red)
Aerotow	180km/h / 97 kts		600 daN (Tost weak link #4, Blue)

Table 2.13.0-1

For Aerotow launching:

Tow rope length	18 m	21 m
Approved	30 to 70m (100 to 230 ft)	50 to 70m (164 to 230 ft)
Recommended	45 to 55m (148 to 180ft)	55 to 65m (180 to 213ft)

Table 2.13.0-2

NOTE: Only textile ropes may be used for aerotow launching.

2.14 Other limitations

2.14.1 Limitations when flying with water ballast

Intentional manoeuvres not permitted when flying with water ballast:

- Loops
- Chandelles
- Lazy Eights
- All aerobatic manoeuvres listed in the Aerobatic category
- Intentional spins

Cloud flying is not permitted when flying with water ballast.

2.14.2 Temperature restrictions without water ballast

Flights in conditions below -30°C are prohibited. When the outside air temperature is less than -30°C, a descent to lower altitudes (higher temperatures) must be conducted.

WARNING: Icing of even small amounts of water ballast may cause structural damage to the wing tanks and fin structures.

WARNING: Sub-zero temperatures may result in the controls freezing up. Move controls, including airbrakes, regularly to reduce the risk of control freezing.

2.14.3 Temperature restrictions when carrying water

Flights with water ballast are prohibited in conditions where there is a risk of icing. When the outside air temperature is below 0°C (32°F), water ballast must be dumped or a descent to lower altitudes (higher temperatures) must be conducted. Flying in temperatures below freezing with water in the non-expendable tank is not allowed.

WARNING: Icing water ballast may cause structural damage to the wing and fin structures. Avoid flying in icing conditions, or storage of the aircraft with water tanks filled.

WARNING: Dumped water may freeze at the valve outlets at outside temperature well above the freezing point.

CAUTION: Currently no additives (e.g. anti-freeze) are approved to lower the water freezing point.

2.14.4 Limitations while dumping water ballast

Dumping water ballast takes approximately five minutes. While dumping, the fuselage static ports may get temporarily blocked by water entering the static ports. This may cause the airspeed indicator to give incorrect readings during the descents. These erroneous readings may continue until the main tanks are empty.

CAUTION: Avoid high speed flying (within 30km/h or 16kts of limit speeds) when water is dumped. Monitor approach speeds and approach angles as the actual approach speed may be indicated incorrectly. It is recommended to change to the alternate static port (if fitted) while dumping water.

2.14.5 Limitations of high speed flight

If there are any indications that an airspeed limit may be exceeded (e.g. when flying in wave rotor, near thunderstorms or other turbulent conditions), extend the airbrakes carefully before exceeding 200 km/h (108 kts). In emergencies the airbrakes may be extended up $V_{NE,}$ as defined in Section 2.2. Above 250 km/h (135 kts) the airbrakes are sucked open abruptly after unlocking, resulting in a sharp deceleration which may result in pilot induced oscillations (P.I.O.). This effect is least in the negative flap position. When the airbrakes are extended in possible turbulent conditions the Rough Airspeed (V_{RA}) should not be exceeded. Decelerate to 180km/h or 97kts before closing airbrakes. Airbrake forces above 200km/h are very high.

WARNING: The deceleration associated with the opening of the brakes at high speeds may result in the pilot's head shattering the canopy if the seat harness straps are not tight. Ensure that the seat harness straps are tight before operating the airbrakes at high speeds.

2.14.6 Altitude limitations

The aircraft is limited to an altitude of 9000m or 30000ft AMSL.

See Section 4.5.7 for more details.

NOTE: For further placards, refer to the Maintenance Manual.

2.15 Limitations placards

The placards given in Figure 2.15.0-1 and Figure 2.15.0-2 are fixed to the left side wall of the cockpit and contain the most important mass and speed limitations.

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Limit Airspeeds:	18m km/h	21m km/h
Winch Launch V_W	150	140
Aero-Tow V_T	180	180
Manoeuvring V_A	203	203
Rough Air V_{RA}	203	203
Maximum Speed V_{NE}	290	270
Powerplant Extended V_{PE}	250	250
Powerplant Extension-Retraction V_{PO}	140	140
	kg	kg
Maximum Mass:	600	720
	bar	bar
Tyre Pressure Main Wheel	4.0	4.0
Tyre Pressure Tail Wheel	2.5	2.5

Approved Aerobatic Manoeuvres (18m only):
(Restrictions in Flight Manual) Positive Loops; Chandelles; Lazy Eights; Stall Turns; Spins

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Limit Airspeeds:	18m kts	21m kts
Winch Launch V_W	81	76
Aero-Tow V_T	97	97
Manoeuvring V_A	110	110
Rough Air V_{RA}	110	110
Maximum Speed V_{NE}	156	146
Powerplant Extended V_{PE}	135	135
Powerplant Extension-Retraction V_{PO}	76	76
	lbs	lbs
Maximum Mass:	1322	1587
	psi	psi
Tyre Pressure Main Wheel	58.0	58.0
Tyre Pressure Tail Wheel	36.2	36.2

Approved Aerobatic Manoeuvres (18m only):
(Restrictions in Flight Manual) Positive Loops; Chandelles; Lazy Eights; Stall Turns; Spins

Figure 2.15.0-1 **Figure 2.15.0-2**

The placard given in Figures 2.15.0-1 and 2.15.0-2 must list the same units as the airspeed indicator. Refer to the Maintenance manual for the placards with other units.

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 2.10 for the additional placards required when operating the Jet System.

The calculated minimum and maximum cockpit loads must be entered with a permanent marker on the cockpit placard (as illustrated in Fig 2.15.0-4) and must correlate with the values in the mass and balance report.

Cockpit loads (Parachute included)

	Tail battery included	Fuselage tank full	18m	21m
Maximum	☐	☐	kg	kg
Minimum(i)	☐	☐	kg	kg
Minimum(ii)	☑	☐	kg	kg
Minimum(iii)	☐	☑	kg	kg

Figure 2.15.0-4

The nose ballast placard, Figure 2.15.0-5, is located underneath the Control panel.

NOSE BALLAST

	kg		Reduction in MIN cockpit weight (kg)
=	2	→	4.5
=	4	→	9
=	7	→	16
=	9	→	20.5
=	11	→	25

NOSE BALLAST

	lbs		Reduction in MIN cockpit weight (lbs)
=	4.4	→	9.9
=	8.8	→	19.8
=	15.4	→	35.3
=	19.8	→	45.2
=	24.3	→	55.1

Figure 2.15.0-5

Figure 2.15.0-6 gives the placard to be displayed in the baggage compartment:

BAGGAGE COMPARTMENT
MAX LOAD: 15kg (33lbs)

Figure 2.15.0-6

NOTE: For further placards, refer to the Maintenance Manual.

3. Emergency procedures

3.1 Introduction

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur.

3.2 Canopy jettison

To jettison the canopy pull both left and right canopy jettison latches (labelled or engraved as in the picture below) as far as possible and push the canopy upward with the latches. Do not push the canopy at the rear as that might prevent the rear lip back-up engaging. (The canopy rear lip acts as a Roeger hook).

Figure 3.2.0-1 shows an engraved canopy release and jettison handle.

Figure 3.2.0-1

Figure 3.2.0-2 shows the placard for canopy jettison.

Figure 3.2.0-2

Figure 3.2.0-3 shows the position of right-hand jettison handle in the cockpit.

Figure 3.2.0-3

3.3 Bailing out

The bailing out procedure is as follows:

1. Jettison the canopy as described in Section 3.2.
2. Push the instrument console upwards.
3. Release the safety harness.
4. To exit, lift out of the cockpit seat pan using the cockpit rim and push away from the aircraft to avoid striking the tail surfaces (and if possible try to dive underneath the wing).
5. Deploy the parachute in accordance the manufacturer's instructions.

CAUTION: Due to the JS1 REVELATION's high maximum airspeed and because extremely high airspeeds can built up very quickly following a mid-air collision, it is recommended to use a parachute approved for speeds up to 400km/h.

3.4 Stall recovery

The JS1 has a very mild stall with ample warning. Stalls can easily be recognised by the following:

- The nose is in a higher than normal attitude relative to the horizon
- A slight shudder approximately 2km/h before the stall
- Airspeed indicator starts fluctuating near the stall
- A slight increase in the sink rate
- Aileron effectiveness decreases considerably

The stall recovery procedure is to release the back pressure on the control stick and move it towards the neutral position.

CAUTION: During stalled flight if the angle of attack is increased by further pulling back on the stick, a wing drop may occur. This asymmetric stall may result in a spin if incorrect stall recovery procedures are used.

NOTE: When a stall is initiated by pulling with the nose to a high pitch angle (in excess of 30° above the horizon), the nose may pitch down well below the horizon during the recovery and the altitude loss during recovery may exceed 60 m or 200 ft.

NOTE: When a stall is initiated with 45° bank, and the resulting roll is not prevented with the use of opposite rudder, a loss of altitude exceeding 100 m or 330 ft may ensue.

3.5 Spin recovery

Spin recovery is performed using the standard recovery procedures:

1. Apply rudder opposite direction to the spin rotation
2. Simultaneously release the elevator back pressure by moving the stick forward to the neutral position
3. Centralize the rudder when the rotation stops
4. Gently pull out of the resulting dive

NOTE: Ailerons should be kept neutral during the recovery process. (However, full aileron deflection in either direction does not have a significant influence on the recovery behaviour.

CAUTION: Move flaps to Position 3 during the pull-out if the spin was commenced in flap Position 4, 5 or L to avoid exceeding V_{FE} (Maximum Flap Extended Speed).

WARNING: Intentional spins with water ballast are prohibited.

WARNING: Intentional spins in 21 m configuration are prohibited.

Altitude loss during recovery is between 100m and 150m (330 ft to 500ft) without water ballast and up to 220m (720 ft) at maximum weight. The spin rotation speed is relatively low, typically five to six seconds per rotation.

If the spin is entered with a high incident angle, the nose will oscillate in pitch during the first two rotations. After approximately one rotation, the nose will (with very aft CG positions) rise above the horizon before stabilizing in a nose down spin attitude. Pitch oscillation may continue during the spin, especially with aft CG positions.

3.6 Spiral dive recovery

A spiral dive may occur when:

1. The aircraft terminates spinning automatically should the pilot continue applying into-spin control inputs.
2. During excessive slip angles with full rudder deflection.

Indications of a spiral dive are high bank angle, increasing airspeed and a high G-loading.

Spiral dive recovery is performed by:

1. Apply aileron, co-ordinated with rudder, gently against the direction of the turn until the wings are level with the horizon
2. When the wings are level, neutralize both aileron and rudder
3. Gently pulling out of the resulting dive

CAUTION: During the resulting dive take care not to exceed V_{NE}.

3.7 Excessive sideslip recovery

An excessive sideslip may occur when the pilot applies full cross control input.

At a slip angle exceeding 20° (approximately 40° on the yaw string) rudder control forces reverse as the rudder is sucked into the wake of the stalled fin.

To recover from an excessive slip:

1. Apply opposite rudder against the direction of the yaw.
2. When balanced flight is restored, neutralize both aileron and rudder.

WARNING: If an excessive slip angle is not corrected with opposite rudder input, the secondary effect of yaw may cause the sailplane to roll and enter a spiral dive. It is not possible to prevent roll by applying full opposite aileron during excessive sideslip.

CAUTION: The rudder control input force to recover from a side slip exceeding 20° is high (approximately 20daN) and increases if the speed is allowed to build up during the resulting spiral dive. Apply sufficient rudder input to recover from the sideslip to prevent spiral dive.

3.8 Engine failure – Jet turbine

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 3.2.

3.9 Fire

3.9.1 Engine fire on the ground

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 3.3

3.9.2 Engine fire in flight

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 3.3

3.9.3 Electrical fire

An electrical fire is very unlikely due to the protection with circuit breakers for all systems. Each battery has a fuse at the terminals and each battery supply has a circuit breaker switch on the instrument panel.

In case smoke or fumes comes from the instrument panel, take the following action:

1. Switch off the master switch supplying the circuits.
2. If a circuit breaker “pops”, reset once only. This is most probably the faulty circuit.
3. Land as soon as possible.

3.9.4 Cockpit fire on the ground

The most likely cause of a cockpit fire on the ground is when beams of sunlight reflected off an open canopy are concentrated onto a surface inside the cockpit.

This is easily prevented by keeping the canopy covered when the aircraft is left unattended, or by positioning the aircraft with the nose pointing towards the sun.

In case of a fire, use an aircraft type fire-extinguisher to extinguish the fire.

NOTE: After any electrical emergency or fire maintenance action is required.

3.10 Other emergencies

3.10.1 Cable failure during winch launch

In case of a cable failure during a winch launch, take the following actions:

1. Immediately push the stick sufficiently forward to establish a nose-down attitude in order to regain flying speed.
2. Release cable
3. Only once adequate flying speed has been regained:
   - Extend airbrakes and land straight ahead (provided sufficient runway is available), OR
   - Use an abbreviated circuit and carry out a landing on the airfield.

NOTE: If the cable failed during the steepest part of the launch, it is normally necessary to lower the nose well below the horizon to regain flying speed.

If the cable fails while close to the ground, gently lower the nose and land normally.

WARNING: Do not open airbrakes until the airspeed exceeds the normal approach speed.

3.10.2 Flight with asymmetric water ballast load

Asymmetric water ballast load may develop during flight if:

1. A main tank dump valve leaks
2. One main tank dumps water faster than that the other, due to a partial opening valve, or dumping during prolonged unbalanced flight
3. Only one main tank valve opens during water dumping

A developing asymmetry is easily recognizable due to the increased roll tendency towards the heavy wing. At low airspeed a considerable amount of aileron deflection is necessary to keep the wings level.

When a developing asymmetry is observed, take the following action to prevent full asymmetry developing:

1. If a lateral asymmetry is detected but no water was dumped during the flight, there may have been a leak from one tank. The procedure to follow is:
    a. Start to dump water
    b. Monitor the change in roll tendency: If the roll tendency reduces, keep dumping until symmetry is restored. Stop dumping immediately if the roll tendency worsens.
2. If a lateral asymmetry develops while dumping water, one valve might not have opened or opened partially. The procedure to follow is:

a. Visually check if water is dumping from both wings (the water trails can be seen below the wings near the fuselage, and at the tips in the 21 m configuration).

b. If both valves are dumping, keep dumping until both wings empty.

c. If only one valve is dumping water, close dumping valves to prevent full water ballast asymmetry developing.

If the asymmetrical loading cannot be rectified, the pilot is strongly recommended to:

- Land at a suitable airport or field as soon as possible.
- Increase approach speed by 10km/h or 5kts.
- Avoid any operation near stall speeds
- Avoid turns in landing flap with airbrakes extended
- Keep the heavy wing as high as possible during the ground run. Change to the negative flap position after touch down.
- Plan the ground run to accommodate a possible ground loop towards the heavy wing.

NOTE: Check the dump valves before each flight.

Avoid dumping water for prolonged periods of asymmetric flight (for example slipping or skidding while thermalling). This reduces chances of asymmetric water load distribution.

3.10.3 Spin recovery procedure with asymmetric water ballast load

It may be possible to recover the JS1 REVELATION from a spin with a significant asymmetric water ballast loading, provided correct recovery procedures are followed. The high rotation rate of approximately 120° per second may cause extended airbrakes to blank off the elevator. With airbrakes extended the spin attitude stabilizes with the nose approximately 20° below the horizon.

To recover from a spin towards the heavy wing, use the following procedure:

1. Apply full rudder opposite to spin rotation
2. Simultaneously release the elevator back pressure by moving the stick fully forward
3. Close the airbrakes
4. Move flaps to full negative position (Position 1)
5. Apply aileron into the turn
6. Centralize the controls when the rotation stops
7. Gently pull out of the resulting dive

.

A spin entry towards the lighter wing is unlikely and recovery is normal.

WARNING: Intentional spins with water ballast are prohibited and recovery with asymmetric water ballast loading may be impossible if the incorrect recovery procedure is used.

3.10.4 Emergency landing with landing gear retracted

Emergency landings with the landing gear retracted are not recommended because the energy absorption ability of the spring mounted landing gear is much higher than the fuselage shell. However if an emergency landing with the landing gear retracted is inevitable, then land with the flaps in Position L. Try not to stall the aircraft more than 30cm (1ft) above the ground.

3.10.5 Ground loop

If a landing area is too short to stop safely before the end, a ground loop may be initiated:

1. Apply maximum wheel brake to reduce energy as much as possible
2. Initiate ground loop at least 50m or 165ft before the end of the landing area.
3. Lower the into-wind wingtip to the ground
4. Apply rudder towards the ground loop direction and simultaneously decrease the load on the tail wheel load by moving control stick forward

3.10.6 Icing

Controls may freeze up when flying in icing conditions. If ice formation is observed during flight, immediately descend below the freezing altitude level. Control surfaces should be moved continuously and airbrakes operated frequently to avoid flight control freezing.

The direct vision panel can be opened to increase visibility.

3.10.7 Emergency landing on water

During water landing tests with landing gear retracted, it has been shown that aircraft fuselage can submerge completely. The following procedure is recommended for an emergency landing on water:

1. Dump all ballast
2. Make a radio call
3. Extend the landing gear
4. Undo the parachute harness during the downwind leg
5. Ensure safety straps are tight
6. Try to land parallel to the shore and against the wind.
7. Close water dump valves before touch down
8. Touch down with gear extended and speed as low as possible
9. At touch down point use left arm to protect your face against possible canopy fracture
10. After touch down undo belt harnesses

If the sailplane has sustained no damage to the water tanks, it may stay afloat for a long period. Swimming may be the only option when the airframe starts sinking.

4. Normal operating procedures

4.1 Introduction

Section 4 provides checklist and amplified procedures for the conduct of normal operations. Normal operations associated with optional systems can be found in Section 9.

4.2 Rigging and de-rigging

4.2.1 Rigging

The JS1 REVELATION can be rigged by three people without rigging aids or by two people if a fuselage cradle and wing stands are available.

Wing rigging

1. Check that there is adequate ground clearance to extend the landing gear. Once rigged, the assembled aircraft might be too heavy to lift to extend the landing gear.
2. Ensure the rubber water drain plugs are inserted in the wing roots in front of the forward lift pin.
3. Clean and grease all pins and matching bushes including main pins.
4. Unlock both airbrakes using the airbrake locking wrench.
5. Put the flap handle in Flap Position 2 or Position 3 and the control stick to the centre position.
6. If bug wipers are fitted, release both wipers by approximately 1.5 meters and place them in a safe place while rigging the sailplane. This allows the retrieve cable sleeves to be moved temporarily out of the way while inserting the main pins.
7. Close the water valve in the cockpit.
8. Insert the right spar end into the fuselage with the flaperon in the neutral position and the dihedral angle approximately correct.
9. Insert the left spar end into the fuselage, also with the flaperon in the neutral position and the dihedral angle approximately correct.
10. Insert the main pins when the bushes are lined up correctly. Take care not to damage the bug wiper retrieve cable sleeves when inserting the pins.

11. Secure the main pins by rotating the pin upwards into the spring-loaded locks pins.

12. Extend and lock the landing gear, then lower aircraft onto the wheel.

13. For JS1-A and JS1-B, pull wingtip pins fully back and slide wingtip beam into main wing. Slide the pins forward using the JS-rigging tool and make sure locking spring pops up to lock pin in place.

14. For JS1-C, pull wingtip locking lever fully back and slide wingtip beam into main wing. Push the wingtip locking lever forward and ensure it locks positively by pushing the lever over-centre.

15. Check if the 21m tip rubber water drain plugs where inserted during wing rigging (only for 21m wing tips).

CAUTION: The flaperon sandwich can be damaged if excessive force is used and should be handled with care.

WARNING: Never grease the water drain valve, the rubber based seal may be damaged and become detached from the valve-body.

Mount tailplane

1. Clean the tailplane pins and bushes
2. Slide the tailplane onto the fin. Take care that the elevators are sliding into the elevator auto-coupler.
3. Make sure the Mylar edge on the tailplane does not snag on the fin.
4. Screw the tailplane main bolt into position, using the hex socket key tip of the JS rigging tool.

CAUTION: Take care not to over-tighten the tailplane front attachment bolt. (Hand-tight only, max 1 Nm torque.)

Install Auxiliary items

1. Insert the batteries into position in the luggage compartment behind the seat headrest and under the seat pan or in the tail. Secure the batteries in position with the battery retainers.
2. Check the battery fuses / circuit breakers on the battery connector boxes.
3. Install the total energy tube and temporary equipment (logger etc.)
4. Seal the wing-fuselage junctions, wing-wingtip junctions, and the fin-tailplane junctions with tape.
5. Carefully wind the bug wipers (if fitted) back into the wiper-garages, while maintaining slight tension on the retrieve cable.
6. Perform the daily inspection, including positive control check on all controls.

Refuelling – TJ-42 Jet Sustainer

Refer to 1A-5.04.50 JS TJ-42 Jet Sustainer Manual Section 4.10.3.

CAUTION: The convex shape of the canopy can act as a lens and is a fire hazard when the canopy is left open in the sun.

4.2.2 De-rigging

Ensure the non-expendable tail tank is drained of water.

Remove Auxiliary items

1. Remove the main batteries. Lock the battery retainers back in position.

2. Remove the total energy tube and temporary equipment (Logger etc.) Install the “Remove before flight”-cover in the multi probe receptacle.

3. Remove the sealing tape on wing-fuselage junction, wing-wing tips junction and tailplane-fin junction.

Retracting the undercarriage

1. Roll the aircraft into the fuselage dolly. (The gear doors should be approximately 5cm (2 inches) from the ramp end.)

2. Lift the ramp until the main wheel is at approximately 5cm (2 inches) off the ground.

3. Retract the main wheel.

Removing the tailplane (horizontal stabilizer)

1. Unscrew the front attachment bolt using the hex socket key tip of the JS rigging tool.

2. Slide the tailplane forward. Take care to move the tailplane forward evenly so as not to damage the elevators or the elevator auto-coupler.

3. Screw the front attachment bolt back in the fin (not applicable if a captive bolt is fitted).

Removing the wings

1. Unlock the airbrakes from the cockpit
2. Set the flap handle in Position 2 or Position 3 and move the control stick to the centre position.
3. If bug wipers are fitted, release both wipers by approximately 1.5 meters and place them in a safe place while de-rigging the sailplane. This allows the retrieve cable sleeves to be moved temporarily out of the way while removing the main pins.
4. For JS1-A and JS1-B, unlock the wingtip pins, using the JS-rigging tool. Pull the wingtip pin carefully backwards. Slide wing-wingtips out of the inboard section. Secure the wingtips in the trailer.
5. For JS1-C, pull wingtip locking lever fully back and slide wing-wingtips out of the inboard section. Secure the wingtips in the trailer.
6. Insert the tip rigging handle in the tip spar box.
7. Lift the wings at the tips until the main pins can rotate. Rotate the wing pins out of the locked position while pulling back the lock pin.
8. Remove the main pins.

CAUTION: Do not lower the wings after the main pins have been removed. The fuselage shell may be damaged if the correct angle is not maintained.

9. Pull the left wing out of the fuselage spar box – secure the wing in the trailer
10. Pull the right wing out of the fuselage spar area – secure the wing in the trailer
11. Lock both airbrakes, using the JS Airbrake lock tool.

12. Carefully wind the bug wipers (if fitted) back into the wiper-garages, while maintaining slight tension on the retrieve cable.

13. Push the fuselage into the trailer

NOTE: To avoid loading the airbrake caps, do not leave the airbrakes locked on the ground (either rigged or de-rigged). The airbrake locking tool can be used for temporarily locking the airbrakes for maintenance or transportation, and the airbrakes should be unlocked once maintenance or transportation is complete

CAUTION: Take care not to damage the unlocked airbrakes when using a trailer with a hinged top (e.g. Cobra, SWAN, Comet etc). It is likely that damage will result if the airbrakes are partially or fully open when lifting the trailer top.

4.3 Daily inspection

After the aircraft has been rigged <u>and</u> always before the first flight of the day, the aircraft must be inspected carefully to ensure its airworthiness.

The following inspection is essential for flight safety:

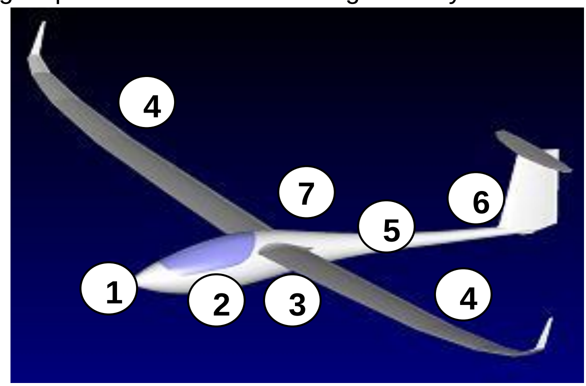


Figure 4.3.0- 1

4.3.1 Forward fuselage

1

1. Check functionality of the nose release hook

4.3.2 Cockpit

2

1. Ensure the canopy is clean
2. Check the canopy emergency release mechanism: pull back both red jettison latches slowly. Care should be taken not the release the canopy completely without having assistance to prevent it from falling.
3. Ensure that the main pins are secured properly.
4. Ensure the proper connection of flaperon and airbrake system:
    - With the control stick in the neutral position and the flap lever in position 3, the flaperon must be flush with the trailing edge at root rib,
    - Airbrakes must lock properly and open evenly
5. Ensure the operation of the rudder pedals, and:
    - Move the rudder pedals fully forwards and backwards to check the rudder cables for signs of fraying, kinks and wear especially near the S-tube exits.
    - Perform a visual check on the rudder pedal retention nuts by checking that they are securely in place.
    - Ensure pedals lock positively in the desired setting under load.
6. Ensure the operation of the water system (main and tail tank valves)
7. Ensure that charged batteries are correctly installed and connected
8. Ensure that the oxygen bottle is properly secured
9. Ensure that the cockpit is clean and all foreign matter is removed

10. Ensure the condition and operation of the safety belts, especially where they pass through the seat back

4.3.3 Landing gear (3)

1. Visually inspect the mechanism and locks
2. Check the condition of the shock absorbing rubbers
3. Check the tyre pressure – The recommend tyre pressure is 3.0 bar (43.5 psi). When using water ballast increase the main wheel pressure to 4.0 bars (58.0 psi).
4. Check the tyre slip mark position and tyre condition
5. Check the condition of the wheel doors hinges and closing springs or bungee cords
6. Check that the CG hook manual and automatic operation works properly. Accumulated dirt or mud may lead to improper functioning of the release hook.
7. Check that the water drain orifice behind the landing gear box is clear.

4.3.4 Wings (4)

1. General condition - check for evidence of damage to the surface finish or structural damage, pressure marks and cracks.
2. Check that the water drain orifices at the wing root and tip are clear.
3. Check the airbrakes for functioning and locking. Check for water or foreign objects in the airbrake boxes.
4. Check that the outer wing panel is properly locked without play.

5. Check that the flaperons move freely with no hinge play. Perform a positive control check on the inboard and outboard flap.

6. Check that wing tip wheels are in good condition – the clearance between the flap trailing edge and the ground in positive flap with maximum aileron deflection must be at least 10mm. Check that wheels are attached positively to the wing.

7. Check that control surface gap seals are installed and properly adhered to the wing recesses.

8. Check that the NACA ducts on the lower surface of the flaperons are clear.

9. If the bug wiper system is installed, perform the checks given in section 7.14.3

10. If flying with water ballast:
    - Check before filling if all the rubber seals on the dump valves are in position, and that all valves are operating correctly.
    - Check the dump rate of the main tanks with the filler caps installed. Ensure that the dump rates of the wings are equal and faster than the dump rate of the tail tank.

4.3.5 Fuselage (5)

1. General condition - check for evidence of damage to the surface finish or structural damage, pressure marks and cracks.

2. Check that the static pressure ports on the fuselage boom are unobstructed.

3. Check that the tail wheel is sufficiently inflated.

4. Check that the water drain orifice in front of tail wheel is not obstructed.

4.3.6 Tail section (6)

1. General condition - check for evidence of damage to the surface finish or structural damage, pressure marks and cracks.

2. Check that the Total energy multi-probe receptacle is clear. Drain all possible water from the receptacle (if the probe was left in position during rain) by removing the multi-probe and then lifting the tail approximately one meter off the ground.

3. Ensure the total energy multi-probe is installed correctly and pushed all the way in. Check instrument functionality by carefully blowing on the multi-probe's Pitot-, Static and TE ports.

4. Check the vertical tail tank valve operation. Check that the dump rate of the tail tank exceeds 1 litre per minute.

5. Check that the tank vent holes on the left-hand side of the fin are unobstructed.

6. Check that the amount of water in the vertical tail fin water ballast tank is correct in relation to wing water ballast and cockpit load.

7. Check that the horizontal stabilizer is properly installed without free play.

8. Check that the control surface gap seals are installed and properly adhered to the stabilizer and fin recesses.

CAUTION: Blowing into the Pitot, Static, and Total Energy probes may cause permanent damage to instruments if performed incorrectly.

4.3.7 Jet sustainer

7

Inspect the jet system in accordance with JS1 Jet Sustainer Flight Manual Supplement Section 4.

4.4 Pre-flight check

Daily Inspection	-	Performed
Control Systems	-	Functional check, positively connected, free movement and no play
Expendable Tail Tank (bottom)	-	Valve opening positively checked
Non-expendable Tail Tank (top)	-	Ensure empty or correctly loaded for CG range
Water Ballast System	-	Check operation and proper sealing of valves and vents unobstructed
Weight and Balance	-	Trim weight, water ballast (tail and wing tanks), minimum and maximum cockpit load within calculated limits
Total Energy Tube	-	Fitted and connection properly sealed, indication ok
Altimeter	-	Set correctly (QNH / QFE / QNE)
Radio	-	Set to airfield frequency, check operation
Other instrumentation	-	Checked, normally indicating zero
Backrest	-	Adjusted
Rudder pedals	-	Adjusted and locks positively in all settings.
Documentation	-	Complete and valid
Landing gear	-	Locked with no play

4.5 Normal procedures and recommended speeds

4.5.1 Launch procedures

4.5.1.1 Winch launch

Winch launching is performed using the CG hook in front of the main wheel.

With a slow-accelerating winch, good aileron control is achieved using Flap 3. With a gentle to strong headwind Flap 4 may be used from the start.

Set the trim slightly forward.

Allow the aircraft to get airborne in the 2-point position (main wheel and tail wheel just touching). As the speed builds up, gently rotate into the full climbing attitude. Change to flap setting 4 once the aircraft is established in the full climbing attitude.

Winch launch speed table	**Airspeed km/h / (kts)**	
	18 m	**21 m**
Recommended winch launch airspeed ranges	120 to 140km/h (65 to 76kts)	
Minimum safe winch launch speeds without water ballast	90km/h (49kts)	
Minimum safe winch launch speeds with water ballast	115km/h (62kts)	
Maximum winch launch speed (V_W)	150km/h (81kts)	140km/h (76kts)

Table 4.5.1.1- 1

WARNING: Retracting the landing gear during the winch launch is not permitted.

To release, pull the yellow release handle all the way. Releasing under tension is not recommended, as this may cause overruns on the winch drum.

WARNING: Downwind winch launches jeopardise the safety of the launch significantly and should be avoided.

WARNING: Winch launch with water ballast should only be attempted with a powerful winch and into wind. The maximum allowed winch launch take-off weight in both configurations (18 m & 21 m) is limited to 600kg (1323 lbs).

WARNING: Release immediately if the wings cannot be kept level during the ground run.

4.5.1.2 Aerotow

Aerotows are performed using the nose release hook. Refer to Section 2.13 for rope lengths.

Set the trim slightly forward of neutral and initiate the ground run in negative flap (Flap setting 1). This will increase aileron efficiency at low speeds. In a crosswind take-off, keep the stick aft during the initial acceleration. This prevents the aircraft weather-cocking into wind.

As soon as positive aileron control is available, set the flap to the setting indicated in the Table 4.5.1.2-1.

Aerotow speed table	Flap setting	Airspeed km/h / (kts)	
		18 m	21 m
Recommended aerotow speed ranges	3-4	115 to 140km/h (62 to 76kts)	
Minimum safe aerotow speed (No water ballast, calm conditions)	3-4	105km/h (57kts)	
Minimum safe aerotow speed (MAUW, calm conditions)	4-5	120km/h (65kts)	125km/h (69kts)
Minimum safe aerotow speed (MAUW, turbulent conditions)	4	130km/h (70kts)	135km/h (74kts)
Maximum Aerotow speed (V_T)	3	180km/h (97kts)	

Table 4.5.1.2- 1

Retracting the landing gear on aerotow is not recommended.

To release, pull the yellow release handle all the way. If the low tow position is used, it is recommended to release only after moving into the slipstream of the tow plane - the swirling rope end may cause damage to the aircraft when releasing in the low tow position.

4.5.2 Self-launch procedures

4.5.2.1 Engine start, run-up, taxi procedures

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 2.8

4.5.2.2 Self-launch

Refer to JS1 Jet Sustainer Flight Manual Supplement Section 2.8

4.5.3 Flight

The JS1 REVELATION offers exceptionally good flying characteristics, handling and manoeuvrability.

4.5.3.1 Thermalling

The optimum flap setting for thermalling is Position 4 or 5.

Flap setting 4 is the normal thermalling flap setting. The optimum thermal speed at maximum loading is 105 to 115km/h (57 to 62kts).

When the thermals are very rough it is recommended to fly slightly faster (120km/h / 65kts).

Flap setting 5 gives best results in smooth thermals where minimal centring is required. At maximum weight with this flap setting, the best speed to fly is 105 to 110km/h (57 to 60kts).

4.5.3.2 Inter thermal cruise

To optimise the glide performance, it is important to select the proper flap according to weight and cruise speed. The flaps modify the airfoil's camber, maintaining laminar flow over a wide range of lift coefficients. For every speed and weight combination, there is an optimum flap setting for maximising the glide angle.

The following table gives the optimum flap setting as a function of speed and weight.

Flap settings & deflection		**4** +13.5°	**3** +5°	**2** 0°	**1** -3°
Configuration	With no water ballast	90 - 110 km/h 49 - 59 kts	110 - 120 km/h 59 - 65 kts	120 - 180 km/h 65 - 97 kts	180 - V_{NE} km/h 97 - V_{NE} kts
	With max water ballast	105-125 km/h 57 - 67 kts	125-140 km/h 67 - 76 kts	140-200 km/h 76 - 108 kts	200 - V_{NE} km/h 108 - V_{NE} kts

Table 4.5.3.2- 1

CAUTION: Observe airspeed limits versus altitude to avoid exceeding V_{NE} and V_{FE}.

4.5.3.3 Inflight Engine Start Procedures

Refer to 1A-5.04.50 JS TJ-42 Jet Sustainer Manual Section 4.9.

4.5.3.4 Engine operation in flight

Refer to 1A-5.04.50 JS TJ-42 Jet Sustainer Manual Section 4.9.

4.5.3.5 Inflight engine stop procedure

Refer to 1A-5.04.50 JS TJ-42 Jet Sustainer Manual Section 4.9.

4.5.3.6 Lightning

The JS1 REVELATION is not approved for flight where lightning strikes may occur.

WARNING: Flights in conditions conducive to lightning strikes must be avoided.

4.5.4 Approach

The circuit can be flown with flap set to Setting 3 to 5 (+5° to +16.7°). On final approach for landing the flaps can be changed to Position L (+20°) for a shorter landing with lower touch down speed. Due to high aerodynamic forces, flaps may not be extended to setting L above 160km/h (or 86kts).

Water ballast should be dumped prior to landing. Refer to Section 3.10.2 for asymmetric loading.

Ensure the landing gear is down and locked and verified as such before commencing final approach. The landing gear is lowered when the cockpit handle is moved to the forward position.

Table 4.5.4-1 gives the recommended airspeeds for the approach:

Minimum Recommended Approach Speeds: (Various Approach Types)	Loading configuration		
	Minimum Weight	50 % loaded	Max All Up Weight
Calm conditions, No airbrakes	90km/h 49kts	100km/h 54kts	110km/h 59kts
Calm conditions, airbrakes fully extended	95km/h 51kts	105km/h 57kts	115km/h 62kts
Approach in rain, No airbrakes	100km/h 54kts	110km/h 59kts	120km/h 65kts
Approach in rain, Full airbrakes	105km/h 57kts	115km/h 62kts	125km/h 67kts
Strong crosswind, Flap setting 3, full airbrakes	110km/h 59kts	120km/h 65kts	130km/h 70kts

Table 4.5.4- 1

At maximum weight with the airbrakes fully extended and at 117km/h (63 kts), the approach angle is approximately 1:7 (in calm conditions). Any increase in airspeed increases the approach angle significantly and at V_{NE} without water ballast the glide angle is steeper than 1:1.)

CAUTION: When on final approach, do not change to more negative flap settings (for example, from Setting L to Setting 4) without sufficient airspeed as the resulting loss of lift will cause a significant loss of height.

NOTE: Always lower the landing gear, especially in the case of an emergency landing.

NOTE: Side-slipping the JS1 Revelation on final approach is not recommended as this is an inefficient method to increase the sink rate. However, the aircraft can be side-slipped up to a speed of 203 km/h (110 kts). Partial water ballast has no noticeable effect on the flying characteristics during a sideslip. Airspeed indication may under-read at yaw angles exceeding 20°.

WARNING: When executing a sideslip exceeding an angle of 20°, the control force gradient becomes negative i.e. that the rudder will be aerodynamically pushed against the rudder stop. This can be corrected by applying opposite rudder. **Refer to Emergency section for the recovery procedures of an excessive sideslip.**

NOTE: Landing in Flap Setting 2 or Setting 1 is strongly discouraged due to the increased stall speeds.

NOTE: In the landing configuration with aft CG the maximum trim speed is 0.84 V_{FE}.

4.5.5 Landing

The correct attitude for landing is the two-point attitude with the main wheel and tail wheel making contact with the ground simultaneously.

The hydraulic wheel brake is activated in the aft 20% of airbrake lever range. Ensure that the wheel brake is not applied before touch down, by moving the airbrake lever forward of the wheel brake activation position.

After touchdown the wheel brake can be activated by pulling the airbrake lever further aft. It is recommended to select negative flaps (Setting 1) after touch down. This reduces the risk of nose-over when braking hard, reduces the chances of damaging the flaperon trailing edges on uneven surfaces and improves aileron control at slow speeds.

Whilst slowing down and it is no longer possible to keep the wings level, then centralise the ailerons and brake positively to stop completely. This minimises wear on the tip skid/wheel and reduces the risk of damaging the flaperons.

Safe landing in cross-winds up to 30km/h (16kts) is possible due to polyhedral wing shape allowing high bank angles during touch down:

1. Use Flap setting 4 for moderate crosswinds and Setting 3 for strong crosswinds (exceeding 25km/h or 14kts).
2. Align the aircraft nose with the runway centreline using the rudder.
3. Lower the into-wind wing sufficiently to overcome drift.
4. Keep the into-wind wing lowered until coming to a complete stop.
5. Change to Flap setting 1 after touch down.

4.5.6 Flying with water ballast

The water ballast system allows the weight of the aircraft to be increased to achieve higher wing loadings. The water tanks are integral in the wings.

In the 18 m configuration water is only carried in the inboard section. Each inboard wing tank holds approximately of 90 litres of water.

In the 21 m configuration water is also carried in the wingtips. Each wing tip additionally carries 17 litres of water.

There are two water ballast trim tanks in the fin of the JS1 REVELATION. The water ballast in the bottom tail tank can be dumped and is connected to the main tank valves and will dump simultaneously with the inboard main tanks. This tank can be used to offset the centre of gravity change due to the water ballast in the main inboard wing tanks.

To offset the forward centre of gravity change due to water in the main wing tanks (inboard), the expendable ballast tail tank must be filled according to the graph given in Figure 4.5.6-1.

The top tank ballast is not expendable and can be used to trim the centre of gravity position for pilot weight. Table 4.5.6-1 gives the tail tank capacity for the JS1.

Water ballast capacity (liters)	**18 m**	**21 m**
Main inboard wings	90x2 liters	90x2 liters
Wing tips	0	17x2 liters
Bottom tank capacity (expendable tank)	7.5 liters	7.5 liters
Top tank capacity (non-expendable tank)	4.5 liters	4.5 liters
Fuselage tanks (if fitted), (no fuselage water-tanks when jet sustainer is fitted)	0	42 liters
Total water capacity	192 liters	268 liters

Table 4.5.6- 1

Figure 4.5.6-1 indicates the expandable water quantity required to balance the water in the main inboard wing tanks.

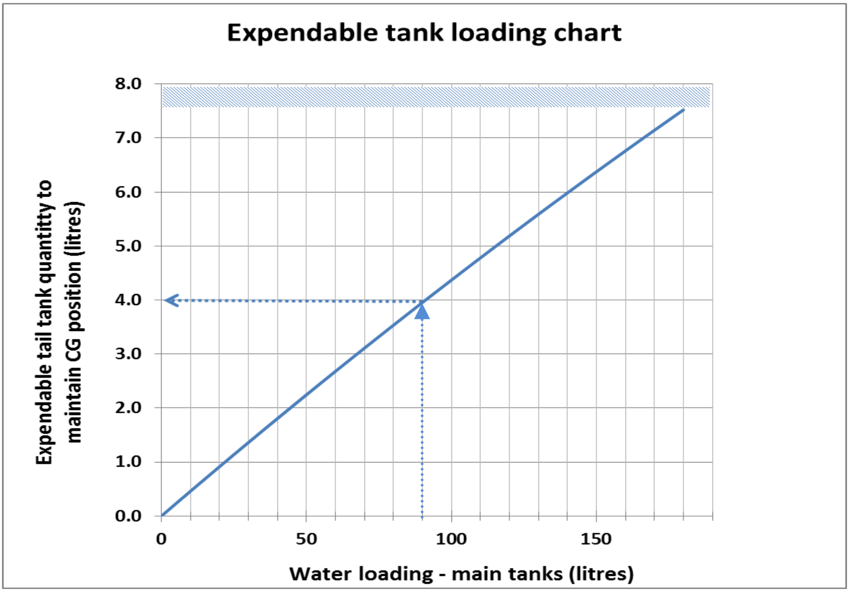


Figure 4.5.6- 1

NOTE: As a conservative approximation, add 1 litre of water in the bottom tail tank for every 25 litres of water in the main inboard wing tanks.

WARNING: The tail tank should always be filled based on the CG calculation as described in section 6.4. Under no circumstances is it permitted to fly with the CG aft of the rear limit.

CAUTION: The filler caps must always be finger tight. Only screw in water when filler caps are finger tight.

Filling procedure

1. Determine the quantity of water ballast to be carried. The quantity of water ballast in the tail is calculated using the graph in Fig 4.5.6-1.

2. Determine the quantity of water to be loaded in each tank. In the 21 m configuration the tips **must** be filled if water is carried in the main tanks. If tanks will be partially loaded water must be loaded in the following sequence:

   i. 21 m tips (if fitted)
   ii. Main wing tanks
   iii. Fuselage tank (if fitted)

3. Close the dump valve in the cockpit.

4. Fill the 21 m tips (if fitted). Filling can be done through the dump valve, using filling equipment allowing a maximum of 0.1bar pressure.

5. Fill the main tanks via the filler caps on the top surface

6. The expendable tail tank can be filled using the bottom filling port on the right hand side of the fin. Ensure that the quantity water in the expendable tank is in relation to the quantity of water in the main tanks.

7. Fill the non-expendable tail tank as follows:

   - Calculate the quantity of ballast for the non-expendable tank using the calculations explained in Sec 6.4.

   - Seal the dump holes (3mm holes on right hand side of fin) with a sealing tape to up to the required level.

   - Add water ballast using the top filling port (top one) on the right hand side of the fin.

Dumping procedure

1. Open the valves by shifting the dump valve lever forward and down. Approximately 40 litres will be dumped in sixty seconds from the main tanks.
2. To dump the ballast only partially, the inboard wings must be dumped first. This is achieved by moving the damp valve lever to the centre position.
3. If progressively increased aileron deflection is required to maintain bank angle while dumping water, the water is probably dumping unevenly. Refer to Section 3.10.2 for details on asymmetrical flight procedures.
4. If more nose-down trim is required after dumping water ballast, the likelihood exists that the expendable tail water ballast has not been dumped. In this case avoid flying at speeds near the stall.
5. Allow sufficient time to completely dump all water before landing. (Approximately five minutes is required.)

NOTE: Increase tyre pressure up to 4.0 bar (or 58.0 psi) when flying fully loaded.

CAUTION: Use clean water without any additives to avoid damage to the structure and rubber seals.

WARNING: Residual air may create undue pressure during high altitude flights above 3000m AMSL (10000ft AMSL); therefore check that breather holes of the wing- and fin tanks are always open.

WARNING: Never apply more than 0.1 bar of water pressure (filling funnel height no more than one metre above the wing) because of possible damage to the structure.

WARNING: Make sure both wing tanks are filled with equal amounts of water to prevent a wing dropping on take-off.

WARNING: Check for the correct dumping sequence. The tail tank must finish dumping before the main wing tanks to ensure safe shifting of CG.

WARNING: The wing tips must be filled with water ballast if the main tanks or fuselage tanks are filled (even partially filled)

WARNING: No tail ballast compensation is required for water loaded in the 21 m tips.

WARNING: Use of water ballast is limited to non-freezing flight conditions. Do not use water ballast for prolonged flights below 0°C (32° F).

WARNING: Do not use any lubricant (grease or petroleum jelly) or wax to seal any water valves not sealing properly. Most lubricants affect the rubber seal and may result in the seal detaching from the valve unit.

4.5.7 High altitude flight

At higher altitudes the Air Speed Indicator will indicate values lower than the true airspeed due to the lower air density. This does not influence loads on the structure but does mean that the colour markings on the Air Speed Indicator are not correct at high density altitude. As flutter depends upon true airspeed, the maximum allowable airspeed must be reduced at high altitudes. Figure 4.5.7-1 gives the V_{NE} as function of altitude for both the 18 m and 21 m configurations.

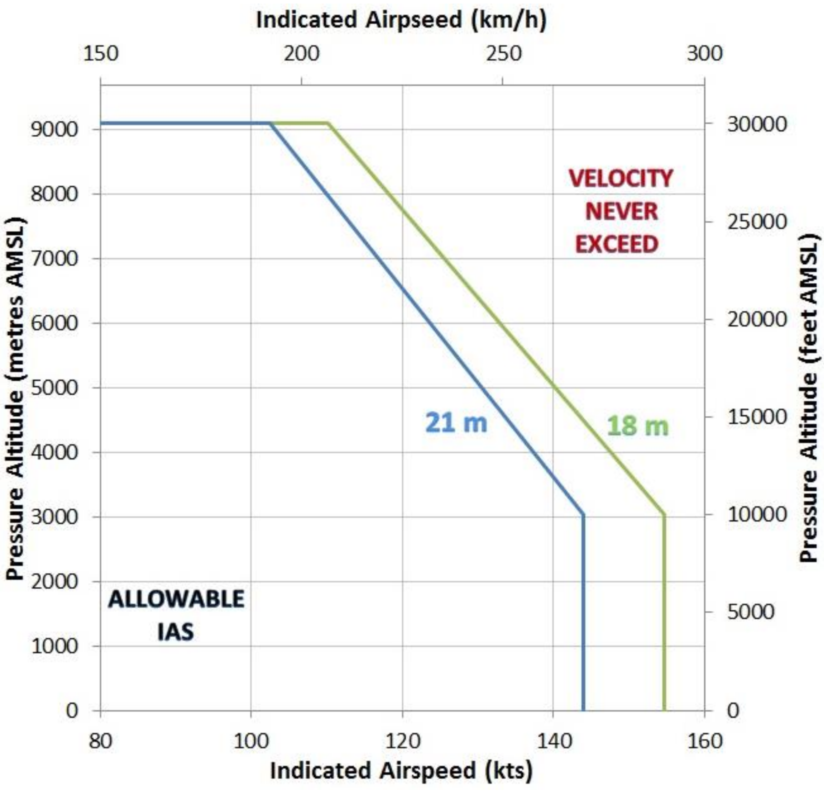


Figure 4.5.7- 1

The placard given in Figure **4.5.7-2** must list the same units as the airspeed indicator. Refer to the Maintenance manual for the placards with other units.

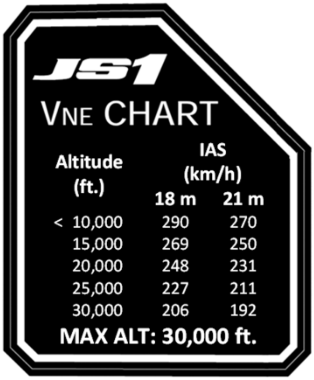


Figure 4.5.7- 2

WARNING: The aircraft is not approved for flights above 9000m (30000ft) above mean sea level.

Flight tests for Type Certification were only conducted to 24 000 ft AMSL.

CAUTION: At higher altitudes the true airspeed (TAS) is higher than the Indicated Airspeed (IAS). Reduce the indicated airspeed to compensate for the effect of high altitude.

4.5.8 Flight in rain

When flying in rain, it can be expect that there will be a decrease in glide performance. The airfoil is specially designed not to have any loss in lift when contaminated and the stall speed is relatively unaffected by rain and bugs. However, it is recommended to increase the landing speed by at least 10km/h (or 5kts) to compensate for turbulence and descending air often associated with rain. The direct vision panel can be opened to increase visibility.

See Section 4.5.4-1 for the recommended approach speeds associated with flight in rain.

4.5.9 Using bug wipers in flight

The operation of the bug wipers in flight depends on the winder system installed. Refer to the instructions of the winder manufacturer for details on the operation. The following basic rules apply.

Ensure sufficient battery capacity is available to perform the cleaning operation and select the correct battery source for the winders.

Cleaning can be performed in level flight or during climbing, as long as airspeed between 90km/h and 120km/h (49kts and 65kts) is maintained. The aircraft should be flown without excessive slipping or skidding.

If the wings are allowed to get too contaminated, the wiper might get stuck at an area. The application of Teflon-based polish before flight will assist in preventing this problem. It may be attempted to run the wiper over the sticky part (if possible) until the surface is smooth.

CAUTION: Do not operate the bug wipers in very turbulent conditions or outside of the tested speed band – the bug wiper may be thrown off the wing.

4.5.10 Aerobatics

The entry speeds and recommended maximum G-loading for approved aerobatic manoeuvres is given in table below.

Aerobatic entry speed	Flap setting	Entry speed km/h / (kts)	G-loading
Lazy Eight	3	180km/h (97kts)	3
Chandelle	3	150km/h (81kts)	2
Steep turn	3	150km/h (81kts)	3
Positive loop	3	200km/h (108kts)	3.5
Stall turns	3	200km/h (108kts)	3

Table 4.5.10- 1

NOTE: No aerobatic manoeuvres are permitted in the 21 m configuration.

4.5.11 Flight over built up areas

Use of the engine system over built up areas below 300m (1000ft) is strongly discouraged due to possible noise limitation.

5. Performance

5.1 Introduction

Section 5 provides approved data for airspeed calibration, stall speeds, take-off performance and non-approved further information.

The data in the charts has been computed from actual flight tests with the sailplane in good condition and using average piloting techniques.

5.2 Approved data

5.2.1 Airspeed indicator calibration

During airspeed calibration tests, the airspeed indicating system was found to be accurate to within 2% over the whole range from V_{S0} to V_{NE}. Figure 5.2.1-1 gives the airspeed correction table.

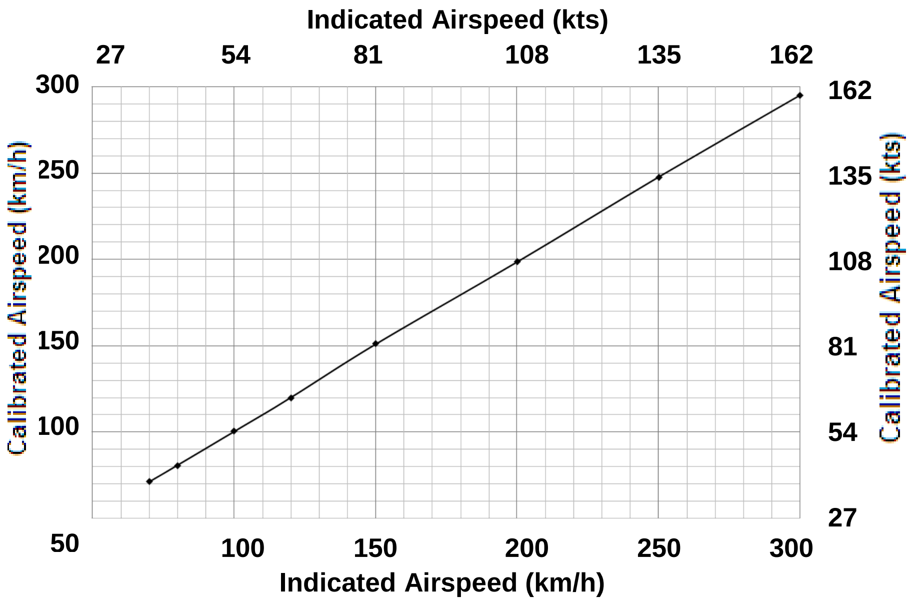


Figure 5.2.1- 1

5.2.2 Stall speeds

The stall speeds (IAS) for the 18 m and 21 m configurations of the JS1 Revelation are given in Tables 5.2.2-1, Tables 5.2.2-2, and Tables 5.2.2-3:

Table 5.2.2.-1 gives the stall speeds for the JS1-B and JS1-C (18 m configuration) with Airbrakes retracted and CG in the mid to rear position**:**

18 m configuration (mid CG)

Gross weight	430 kg / 948 lbs		600 kg / 1323 lbs	
Flap Setting	**Stall Speed (IAS)**		**Stall Speed (IAS)**	
L (20°)	71km/h	38kts	82km/h	44kts
5 (16.6°)	75km/h	40kts	84km/h	45kts
3 (5°)	79km/h	43kts	86km/h	46kts
1 (-3°)	85km/h	46kts	99km/h	53kts

Table 5.2.2-1

Table 5.2.2.-2 gives the stall speeds for the JS1-B and JS1-C (18 m configuration) with Airbrakes retracted and CG in the foremost position**:**

18 m configuration (forward CG)

Gross weight	430 kg / 948 lbs		600 kg / 1323 lbs	
Flap Setting	**Minimum Achievable Speed (IAS), CG fwd**		**Minimum Achievable Speed (IAS), CG fwd**	
L (20°)	78km/h	42kts	89km/h	48kts
5 (16.6°)	79km/h	43kts	92km/h	50kts
3 (5°)	84km/h	45kts	100km/h	54kts
1 (-3°)	89km/h	48kts	105km/h	57kts

Table 5.2.2-2

Table 5.2.2.-3 gives the stall speed with Airbrakes retracted and CG in the foremost position in the 21 m configuration**:**

21 m configuration

Gross weight	**500 kg / 1103 lbs**		**720 kg / 1587 lbs**	
Flap Setting	**Minimum Achievable Speed (IAS), CG fwd**		**Minimum Achievable Speed (IAS), CG fwd**	
L (20°)	70 km/h	38 kts	87 km/h	47 kts
5 (16.6°)	75 km/h	40 kts	88 km/h	48 kts
3 (5°)	82 km/h	44 kts	94 km/h	51 kts
1 (-3°)	86 km/h	46 kts	101 km/h	55 kts

Table 5.2.2-3

With the flying centre of gravity in the forward positions, the elevator is not able to produce a sufficiently high angle of attack to completely stall the wings. In this case, the stall speeds are defined by the minimum achievable speed for the specific flap setting.

The stall speed in all flap settings is increased by approximately 2km/h with the airbrakes extended. The landing gear position has no measurable influence on the stall speeds.

5.2.3 Take-off performance

Not applicable to self-sustaining glider.

5.2.4 Additional information

5.2.4.1 Turbulators

On the lower surface of the flaperons there is a line of blow holes supplying air by NACA ducts. It is necessary to keep these holes and ducts clean for optimum performance. The blow holes force the boundary layer transition from laminar flow to turbulent flow in flap setting 1 and 2. If the boundary layer control is not working properly, a whistling sound can be heard when changing to flap setting 1 and 2.

WARNING: Turbulator tape is fitted to the tailplane and rudder and it is essential for both the performance and control of the aircraft. Flight without tailplane turbulators is not allowed as it might result in a reduction in pitch authority. See the Maintenance Manual for the correct location of the turbulator tape.

5.3 Non-approved information

5.3.1 Demonstrated crosswind performance

The JS1 REVELATION has very good crosswind handling characteristic due to its polyhedral wing shape allowing high bank angles during touch down.

The maximum demonstrated crosswind components are:

During aerotow:	25km/h (14kts)
During winch launch:	25km/h (14kts)
During landing:	30km/h (16kts)

NOTE: See Section 4 on Approach and Landing for more information on landing in crosswinds.

5.3.2 Flight polar

Figure 5.3.2-1 shows the calculated polar for the JS1 in the 18 m for two wing loading cases:

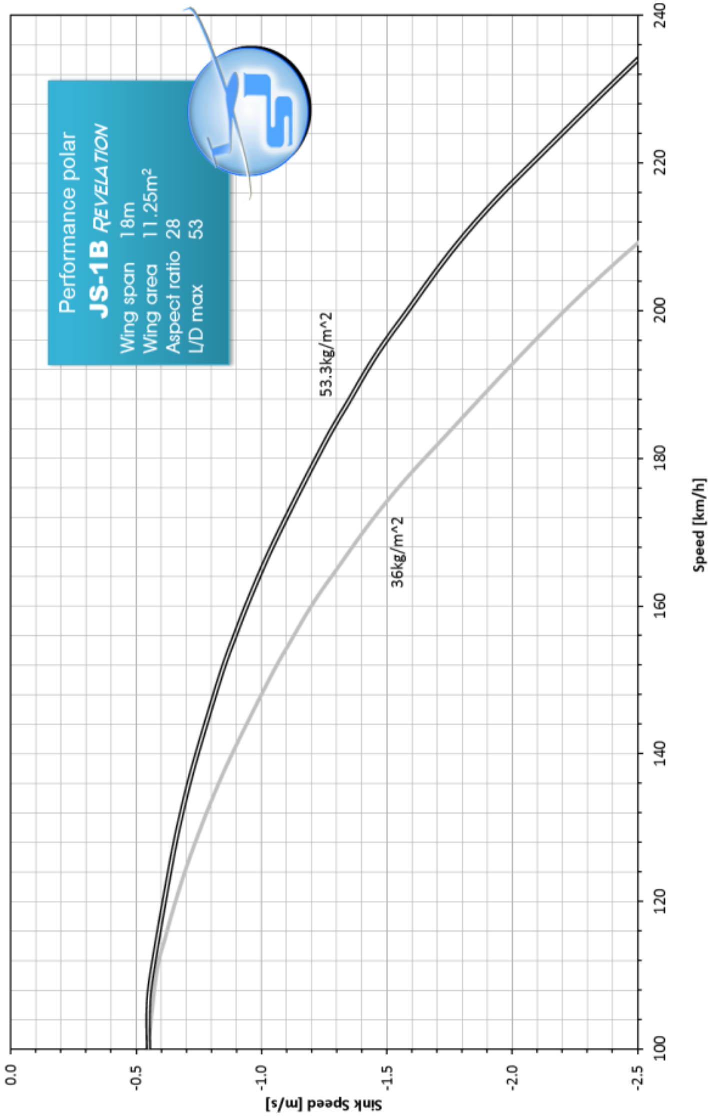


Figure 5.3.2- 1

Figure 5.3.2-2 shows the calculated polar for the JS1 in the 21 m for two wing loading cases:

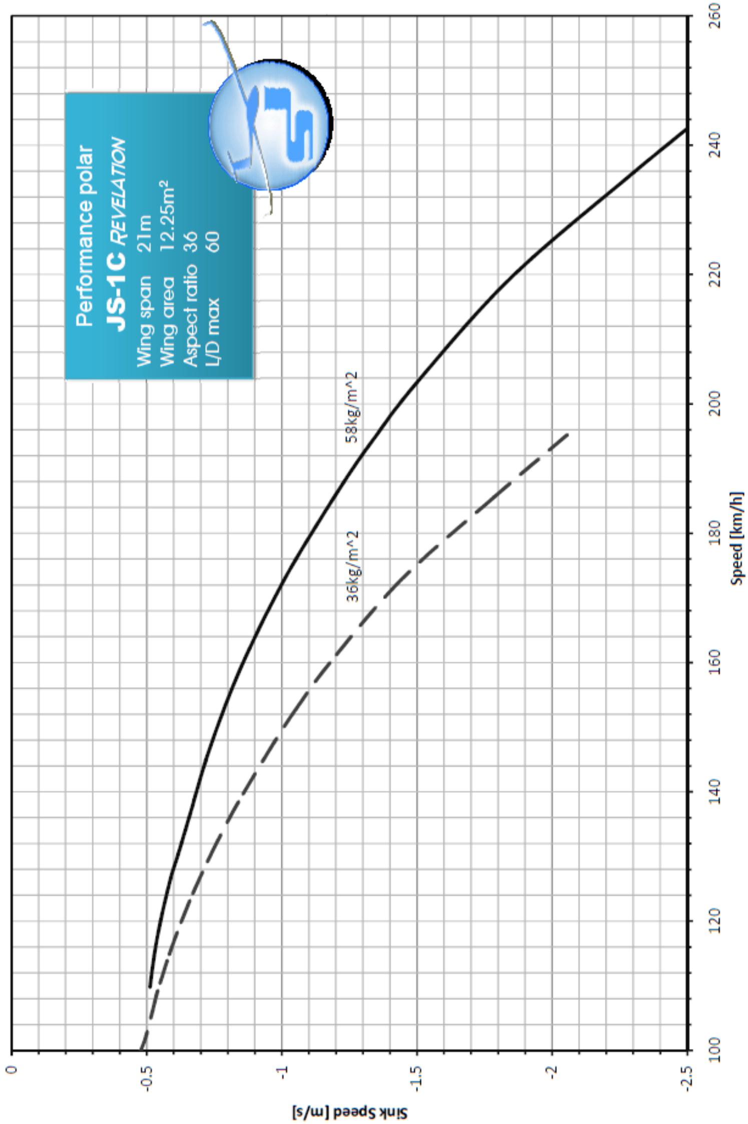


Figure 5.3.2- 2

5.3.3 Noise data

Not applicable to the pure sailplane or self-sustaining aircraft.

6. Weight and balance

6.1 Introduction

This section contains the payload range for the JS1 REVELATION sailplane within which it can be operated safely.

The procedures for weighing and establishing the permitted payload range is given in JS1 REVELATION Maintenance Manual, including:

- Weighing procedures
- CG calculation formulas
- Calculation of minimum and maximum cockpit loads

6.2 Weight and balance record

The Weight and Balance Record summarizes the results of weight and balance calculations and gives the maximum and minimum allowable pilot weights for the aircraft.

The calculated minimum and maximum cockpit loads (as entered on the cockpit placard) must correlate with the values in the mass and balance report and the latest entry in the logbook weight and balance section.

Note: The data presented on the Weight and Balance Record (Table 6.2.0-1) is only valid for the Serial number entered on the form.

Date	Empty weight (M_{EMPTY})	Empty CG position (X_{CG})	Permitted pilot weights				S/N:	
			Without tail battery		With ___ kg Tail Battery		Approved	
			Min	Max	Min	Max	Date	Signed

Table 6.2.0- 1

For the calculation of the permitted maximum and minimum pilot weight refer to formulas given in the Maintenance Manual.

6.3 Permitted payload-range and CG envelope

The JS1 CG envelope is based on the allowable flying mass and CG ranges given in Section 2.7.

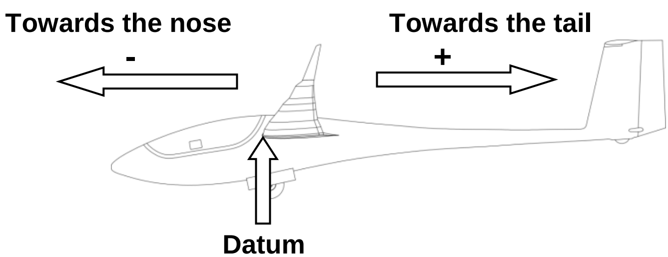
Care must be taken that the CG stays within the allowable limits. The following loads have an effect on the CG position:

- Pilot
- Nose ballast (removable)
- Water ballast - main tank (and tip tanks in 21 m configuration)
- Water ballast – expendable tail tank
- Non-expendable tail tank
- Tail battery
- Baggage
- O_2 bottle
- Fuselage Water ballast (top & bottom tanks)

To allow the pilot to achieve the desired CG position, adjustment possibilities are the nose ballast, the tail battery and water in the non-expendable tail tank (top fin tank).

The expendable water tank in the fin (bottom fin tank) is used to offset the centre of gravity change due to the water ballast in the main wing tanks. No change in the set CG is expected during dumping when this tank is correctly loaded.

Figure 6.3.0-1 and Table 6.3.0-1 give the maximum mass and the moment arms of the various variable loads. The moment arms are measured from the datum, with the sign convention:



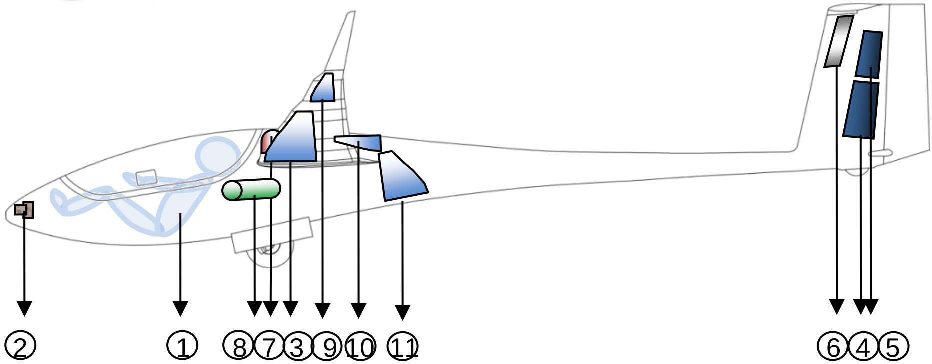


Figure 6.3.0-1

#		Loading point	Max Mass		Moment arm	
			kg	lbs	mm	inch
1	M_{Pilot}	Pilot (with parachute)	115	253.5	-575	-22.6
2	M_{NoseB}	Nose ballast (removable)	11	24.3	-1760	-69.3
3	M_{WingM}	Water ballast - main	180	396.8	200	7.9
4	M_{Tail1}	Expendable tail tank	7.5	16.5	4570	179.9
5	M_{Tail2}	Non-expendable tail tank	4.5	9.9	4630	182.3
6	M_{TailB}	Tail battery	2.7	6.0	4520	178
7	M_{Bag}	Baggage compartment	15	33.1	150	5.9
8	M_{O2}	O2 bottle AL248	2	4.4	0	0
9	M_{WingT}	Water ballast – tip (21 m)	34	75	480	18.9
10	M_{FusT}	Fuel tank - top Fuselage tank - top	8.8 12	19.4 26.5	451	17.8
11	M_{FusB}	Fuel tank - bottom Fuselage tank - bottom	26.4 30	58.2 66.1	925	36.4

Table 6.3.0-1

NOTE: The moment arm of the main water ballast tanks is a conservative approximation - the moment arm changes from 190mm to 200mm as the main tanks are filled.

CAUTION: Various types of tail batteries are used. In Table 6.3.0-1 a tail battery weighing 2.7kg (5.95lbs) is listed. Check the tail battery weight and enter the correct weight for the calculation.

To determine if a selected loading falls within the CG envelope, as illustrated in Fig 6.3.0-2, the following procedure can be used:

1. List all the loads in table format as illustrated in Table 6.3.0-1, (Include the mass and CG arm of the empty aircraft as obtained in the mass and balance report.)
2. Calculate the moments for each load, using the formula:

Moment = Mass x Moment arm

3. Add the mass of the applicable loads
4. Add the moments of the applicable loads
5. Plot the mass against the moment on the JS1 Envelope diagram (Fig 6.3.0-2).
6. The Flying CG can also be calculated using the formulate:

Flying CG position = (Total of Moments) / (Total Mass)

Example:

Determine if the following loading falls within the allowable envelope:

- Empty aircraft: 312kg, CG position 622mm
- Pilot with parachute weighs 90kg
- Both main tank and expendable tail tanks filled to capacity.
- The non-expendable tail tank filled with 2.5 litres of water
- An O_2 bottle of 2kg fitted.

(This example is given in metric units only.)

#	Loading point	Mass kg	Arm mm	Moment (kg.m) Mass x Arm/1000
	Empty aircraft	312	622	194.1
1	Pilot and parachute	90	-575	-51.8
3	Water ballast - main	180	200	36
4	Expendable tail tank	7.5	4570	34.3
5	Non-expendable tail tank	2.5	4630	11.6
8	O2 bottle AL248	2	0	0.0
	Totals:	**594**		**224**

Table 6.3.0-2

The plotted cross on the diagram illustrated in Fig 6.3.0-2 shows that the CG is slightly behind the aft limit just below the maximum allowable weight.

The flying CG can be calculated as follows:

$$\textit{Flying CG} = \frac{\textit{Total of moments}}{\textit{Total mass}} = \frac{224\,000}{594} = 377mm$$

The flying CG must be within limits given in Sec 2.7.

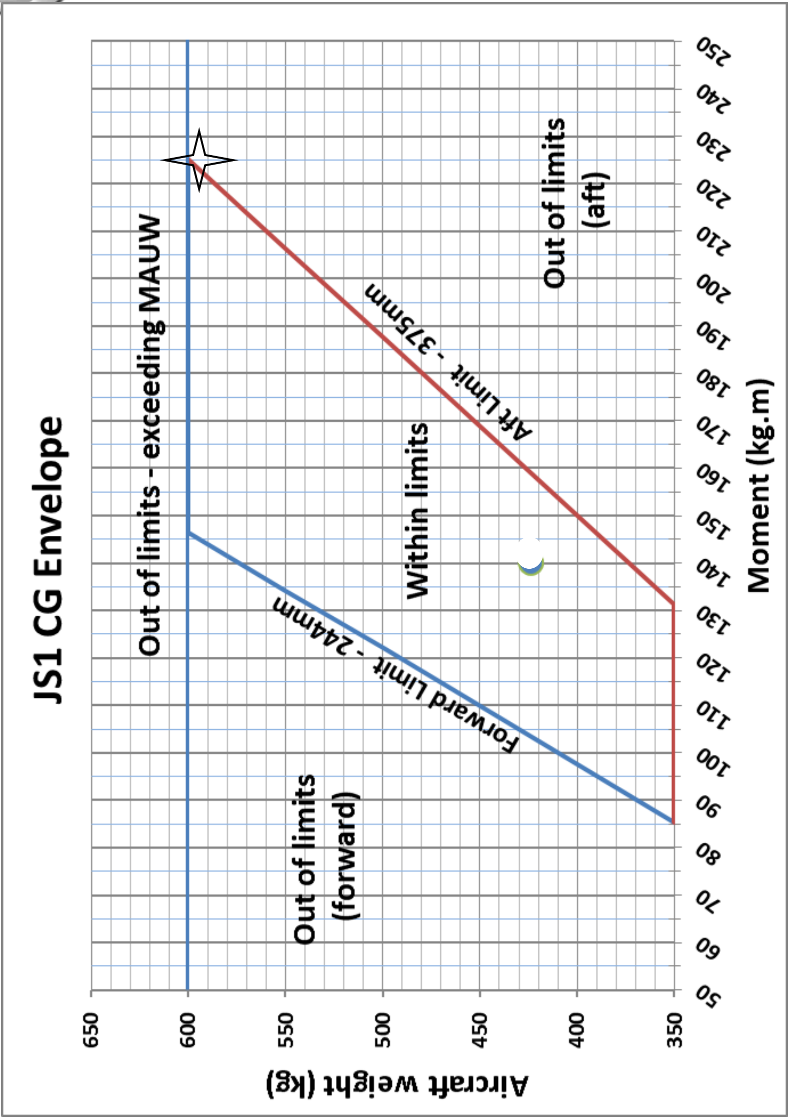

JS1 CG Envelope
Out of limits - exceeding MAUW
Within limits
Aft Limit - 375mm
Forward Limit - 244mm
Out of limits
(aft)
Out of limits
(forward)
Moment (kg.m)
Aircraft weight (kg)
650
600
550
500
450
400
350
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250

Figure 6.3.0-2

Figure 6.3.0-3 gives the envelope for the 21 m configuration.

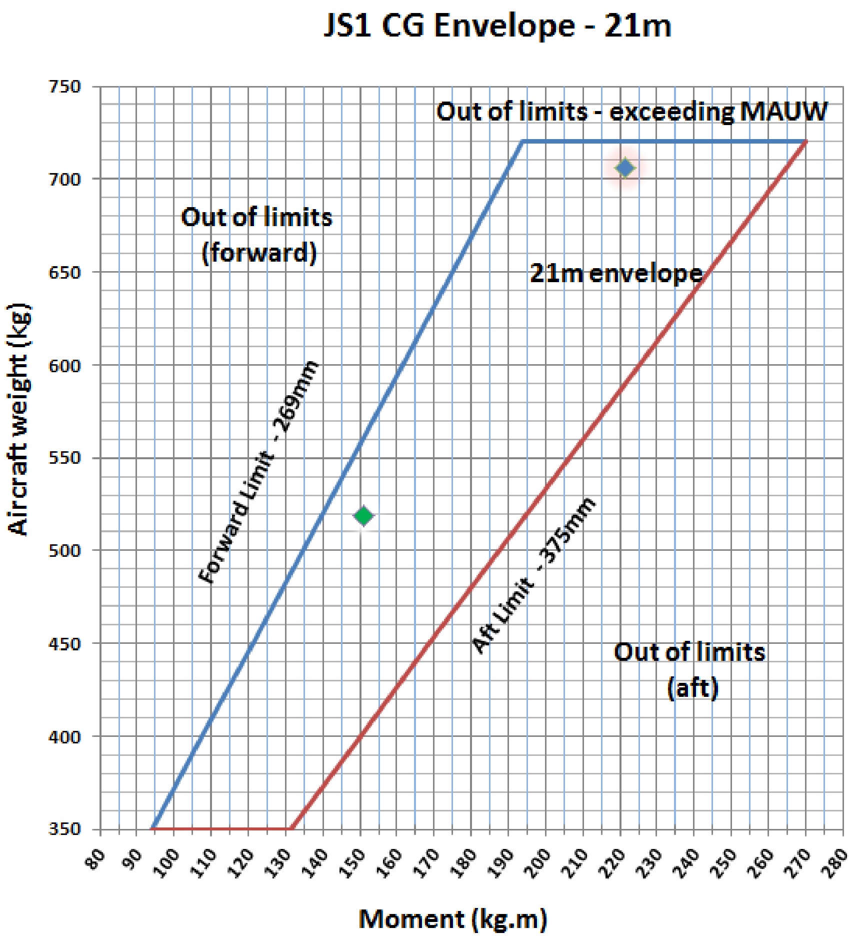


Figure 6.3.0-3

6.4 Optimisation of centre of gravity

The centre of gravity may be shifted toward the aft 25% of the CG to obtain optimum climb performance. The procedure to set up the CG optimally is as follows:

1. Set up the sailplane with pilot in the empty configuration on the desired CG position (aft limit). This can be achieved by:

    - Add/remove permanent ballast and performing the following:
        - Redo the mass and balance.
        - Recalculate the new minimum and maximum cockpit loads as explained in the JS1 Maintenance Manual.
        - Update the Cockpit loads placard (Fig 2.15.0-4).
        - Update the weight and balance record(Table 6.2.0-1)
    - Add/remove removable ballast to change the empty (no water ballast) centre of gravity. Removable ballast include:
        - Tail battery.
        - Water in the non-expendable tail tank (top fin tank).
        - Removable nose weights.

2. When loading the sailplanes with water ballast, the expendable tail tank is used to offset the forward centre of gravity change due to water in the main wing tanks. Calculate the water quantity required in the expendable tail tank, and load accordingly.

When using this procedure, dumping water ballast in flight has no effect on the CG position.

Note: The removable ballast is used to change the centre of gravity (without water ballast) without affecting the approved weight and balance record.

6.4.1 Expendable tail tank

This tank is used only to offset the centre of gravity change due to the water ballast in the main wing tanks.

	Loading point	Mass		Moment arm	
		kg	lbs	mm	inch
M_{TAIL1}	Expendable tail tank	7.5	16.5	4630	182.3

Table 6.4.1-1a

To offset the forward centre of gravity change due to water in the main wing tanks, the expendable tail tank must be filled according to the Table 6.4.1-1b given below.

Water in main tanks		Required water in tail tank	
Litres	US gallons	litres	Quarts
0	**0**	0.0	0.0
20	**5.3**	0.9	1.0
40	**10.6**	1.8	1.9
60	**15.9**	2.7	2.9
80	**21.1**	3.5	3.7
100	**26.4**	4.4	4.7
120	**31.7**	5.2	5.5
140	**37.0**	6.0	6.3
160	**42.3**	6.8	7.2
180	**47.6**	7.5	7.9

Table 6.4.1-1b

6.4.2 Tail battery

Installing the tail battery moves the centre of gravity aft. The required minimum cockpit weight is higher when the tail battery is installed.

The table below indicates the maximum weight and moment arm of the fin battery.

	Loading point	Mass		Moment arm	
		kg	lbs	Mm	inch
M_{TailB}	Tail battery	2.7	6.0	4520	178

Table 6.4.2-1a

Refer to the minimum cockpit weights placard (LH side of cockpit) or Table 6.2.0-1 for the difference in minimum cockpit load with and without tail battery. Fig 2.15.0-4 indicates an example of this placard.

When the tail battery is installed, use the “Minimum (i)” value on the cockpit placard for the tables requiring minimum cockpit weight given in the rest of this section.

6.4.3 Fuselage tanks (optional)

Fuselage tanks may optionally be installed instead of the fuel tanks of the sustainer system. Filling the fuselage tanks moves the centre of gravity aft. The required minimum cockpit weight is higher when water is added to the fuselage tanks.

The table below indicates the maximum weight and moment arm of the fuselage tanks.

	Loading point	Mass		Moment arm	
		kg	lbs	mm	inch
M_{FTTop}	Fuselage tank (top)	12	26.5	435	17.1
M_{FTBot}	Fuselage tank (bottom)	30	66.1	753	29.7

Table 6.4.3-1a

Refer to the minimum cockpit weights placard (LH side of cockpit) or Table 6.2.0-1 for the difference in minimum cockpit load if fuselage tanks are filled. Figure 2.15.0-4 indicates an example of this placard.

6.4.4 Fuel tanks

Fuselage tanks are installed as part of the Jet Sustainer system. Filling the fuselage tanks moves the centre of gravity aft. The required minimum cockpit weight is higher when fuel is added to the fuselage tanks.

The table below indicates the maximum weight and moment arm of the fuselage tanks.

	Loading point	Mass		Moment arm	
		kg	lbs	Mm	inch
M_{FTTop}	Fuel tank (top)	8.8	19.4	435	17.1
M_{FTBot}	Fuel tank (bottom)	26.4	58.2	753	29.7

Table 6.4.4-1

Refer to the minimum cockpit weights placard (LH side of cockpit) or Table 6.2.0-1 for the difference in minimum cockpit load if fuselage tanks are filled. Figure 2.15.0-4 indicates an example of this placard.

6.4.5 Non-expendable tail tank

Adding water to the non-expendable ballast tail tank moves the centre of gravity rearwards. The required minimum cockpit weight increases when water is added to the tail tank.

The table below indicates the maximum weight and moment arm of the non-expendable ballast tank.

	Loading point	Mass		Moment arm	
		kg	lbs	mm	inch
M_{Tail2}	Non-expendable tail tank	4.5	9.9	4630	182.3

Table 6.4.5-1a

Table 6.4.5-1b indicates the required loading (litres of water) in the non-expendable ballast tail tank to achieve the optimum centre of gravity position.

Non expendable tail tank loading requirements to obtain optimum cg (kg)										
Pilot + parachute		**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**
Minimum cockpit weight on placard (kg)	**70**	0	1.1	2.2	3.3	4.5	**Additional fixed ballast may be added and aircraft reweighed**			
	72		0.7	1.8	2.9	4.0				
	74		0.2	1.3	2.5	3.6	4.5			
	76			0.9	2.0	3.1	4.2			
	78			0.4	1.6	2.7	3.8			
	80				1.1	2.2	3.3	4.5		
	82				0.7	1.8	2.9	4.0		
	84	**Out of limits – nose trimming weights required**			0.2	1.3	2.5	3.6	4.5	
	86					0.9	2.0	3.1	4.2	
	88					0.4	1.6	2.7	3.8	
	90						1.1	2.2	3.3	4.5
	92						0.7	1.8	2.9	4.0
	94						0.2	1.3	2.5	3.6

Table 6.4.5- 1b

6.4.6 Removable nose ballast weights

Installing nose ballast weights moves the centre of gravity forward. The required minimum cockpit weight becomes lower when nose weights are installed.

The table below indicates the maximum weight and moment arm of the nose trimming weights.

	Loading point	Mass		Moment arm	
		kg	lbs	mm	inch
M_{NoseB}	Nose ballast	11	24.3	-1800	-70.9

Table 6.4.6-1a

Table 6.4.6-1b indicates the required removable nose trimming weights (in kilogram) to move the CG into a permissible range.

Nose trimming weight requirements to move cg into allowable envelope (kg)										
Pilot + parachute		55	60	65	70	75	80	85	90	95
Minimum cockpit weight on placard (kg)	70	7	7	4	0	CG within limits – Water may be added to non-expendable tail tank to optimize CG				
	72	7	7	4	2					
	74	9	7	4	2					
	76	9	7	7	4	2				
	78	11	9	7	4	2				
	80	11	9	7	7	4				
	82	Outside CG limits	11	7	7	4	2			
	84		11	9	7	4	2			
	86			9	7	7	4	2		
	88			11	9	7	4	2		
	90			11	9	7	7	4	0	
	92				11	9	7	4	2	
	94				11	9	7	4	2	

Table 6.4.6-1b

7. System description

7.1 Introduction

This section gives a description of the aircraft systems together with instruction on the use of it. A detailed technical description of the systems with drawings can be found in the JS1 REVELATION Maintenance manual Section 2. The main aim of this section is to describe the controls, their labels and layout in the aircraft.

7.2 Cockpit controls

7.2.1 Elevator and aileron

The elevator and aileron are controlled conventionally by the control stick. Various stick grip options are available with integrated instrument control buttons or just the radio transmit button (press-to-talk).

A leather boot covers the bottom of the stick. This boot must always be in position to prevent foreign objects from entering the control circuit below the cockpit seat pan.

7.2.2 Trim

The trim knob (green knob) is located on the left side of the cockpit below the airbrake lever.

Two trim installation options are available:

- the trigger trim system, and
- the slider trim system

Trigger trim system:

If the trigger system is installed, the trim is set by pressing and releasing the trigger lever on the stick. The trim position indicator (green knob located on the left side of the cockpit) can be manually shifted to a desired position while the trim trigger is depressed.

Figure 7.2.2-1

Slider trim system:

If the slider trim system is installed, the trim can be adjusted when the trim knob is pressed downwards.

Moving the trim knob has the following effect on the elevator control:

Forward - nose down force

Backwards - nose up force

The trim locks in the set position when the downward pressure is released.

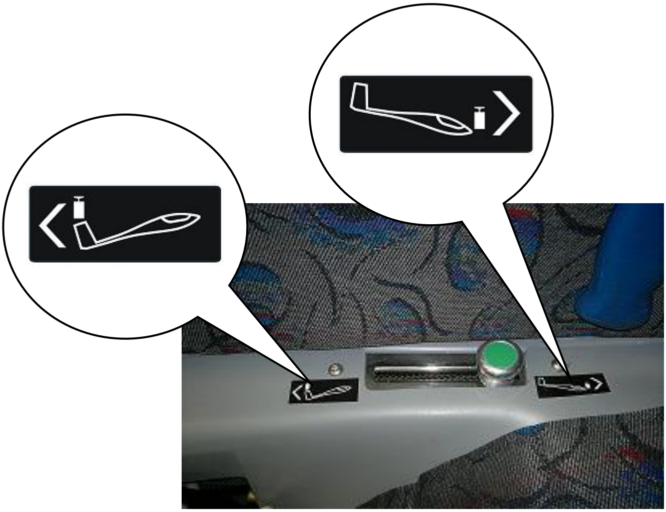


Figure 7.2.2-2

7.2.3 Rudder

The rudder is controlled by the rudder pedals in the front section of the fuselage. The rudder pedal fore and aft position is adjustable in-flight for comfort and to accommodate different size pilots. The rudder pedal adjuster handle is built into the side of the centre console. The adjuster is pulled to disengage the lock.

The pedals can be moved away from the pilot by pressing forward with the feet while the adjuster handle is pulled sufficiently to disengage the lock.

The pedals are adjusted towards the pilot when the adjuster handle is pulled hard while foot pressure is released off the pedals.

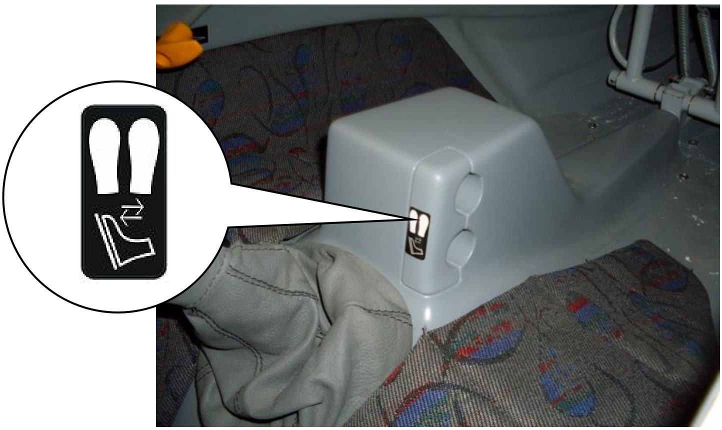


Figure 7.2.3- 1

7.2.4 Flap

The flap control (Figure 7.2.4-1a) is the black handle at the left-hand side of the cockpit. The flap handle can be unlocked by twisting it slightly clockwise as seen from the rear.

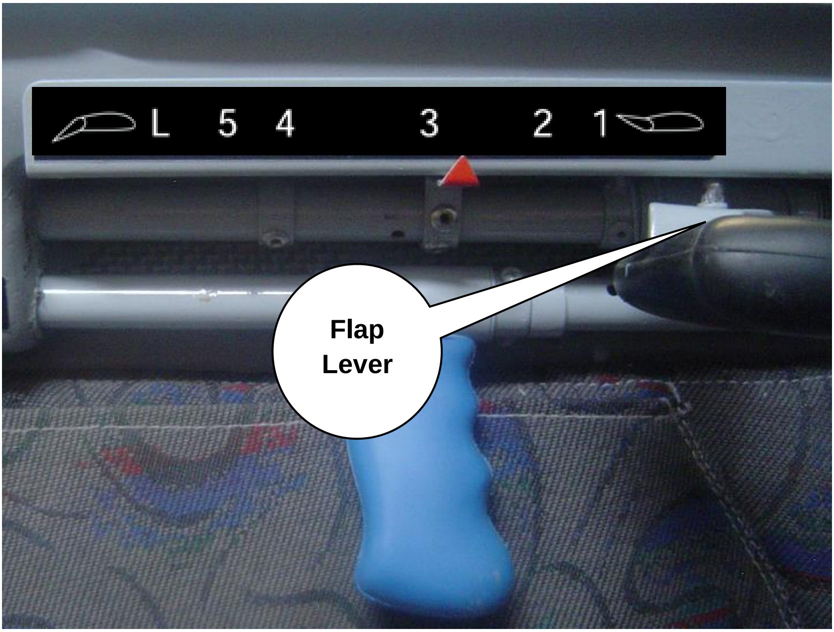


Figure 7.2.4-1a

The flap setting is indicated on the flap indicator plate (Figure 7.2.4-1b), positioned just above the flap handle. It is graded in Flap settings 1, 2, 3, 4, 5 and L. Setting 1 is the most negative setting and setting L is the most positive setting.

Figure 7.2.4- 1b

7.2.5 Release system

The nose and CG hooks are operated simultaneously when the release handle is pulled.

The release handle is the yellow handle positioned on the left-hand cockpit side in front of the flap handle (Figure 7.2.5-1).

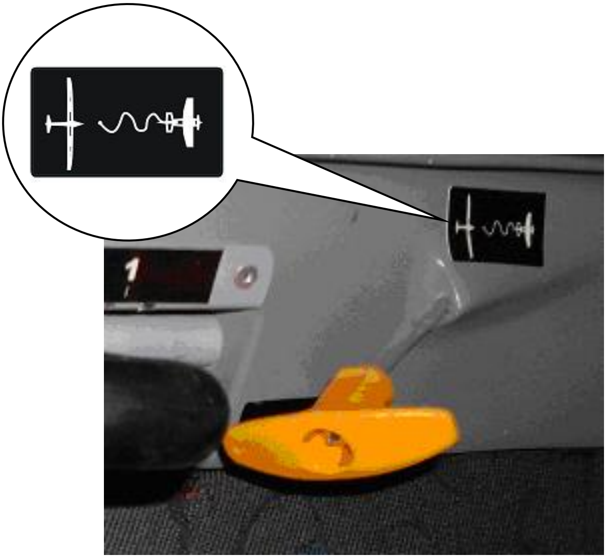


Figure 7.2.5- 1

7.2.6 Ventilation control

The cockpit ventilation is controlled with two air vents:

1. The Adjustable Ball type vent, installed in the right cockpit console (Figure 7.2.6-1)
2. The Scoop window fitted on the sliding window (optional).

The canopy demisting is achieved by vent holes permanently allowing airflow on the front of the canopy.

Figure 7.2.6- 1

7.3 Instrument panel

The instrument panel is integral with the canopy and lifts to facilitate entering and exiting from the aircraft. The canopy can be removed from the instrument console by supporting the canopy and pulling back on both red jettison levers on the sides of the canopy frame.

The instrument layout is built to the owner's requirements, and approved by the manufacturer. There are various options that the customer can choose from. Some of the stickers that are being used on the instrument panel are standard and some of them are custom made. The standard stickers are explained below.

The stickers can appear with the description left, right, bottom or tail or with numbers. The meanings of the symbols are explained below:

- L: Left Battery
- R: Right Battery
- B: Bottom Battery
- T: Tail Battery
- 1: Left Battery
- 2: Right Battery
- 3: Tail or Bottom Battery

Various examples of stickers are listed below:

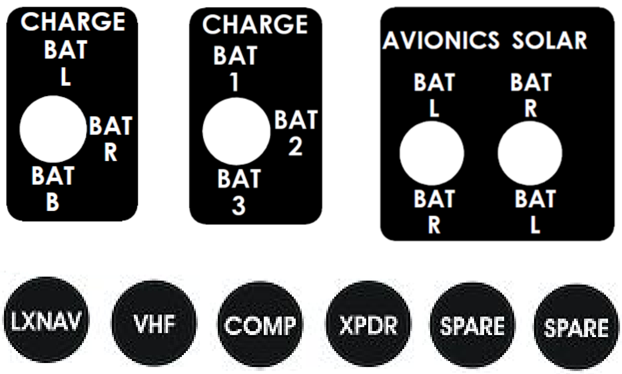


Figure 7.3.0- 1

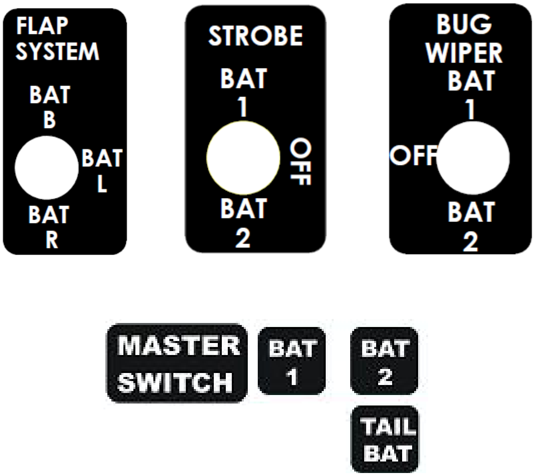


Figure 7.3.0- 2

NOTE: The master switch block and fuse area may vary from the examples shown above, according to the owner's requirements and language.

7.4 Microphone and antenna

The plugs for microphone and antenna from the canopy frame are behind the instrument panel.

CAUTION: The radio microphone is located on the canopy frame. Take care when removing the canopy from the instrument panel that the microphone plug is carefully unplugged to avoid damage to the cables.

7.5 Landing gear system

The landing gear handle is located on the right-hand side of the cockpit and labelled as illustrated in Figure 7.5.0-1. Pulling the handle backwards retracts the wheel and pushing it forward extends the wheel. The handle is rotated firmly towards the cockpit side to lock in the extended and retracted position.

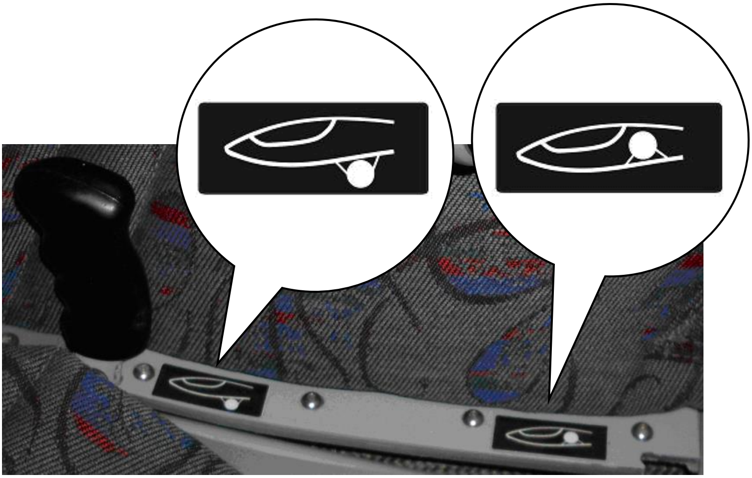


Figure 7.5.0-1

7.6 Seats and safety harness

The seatback is adjustable by two means:

1. The seatback base can be moved forwards and rearwards by removing two thumbscrews on the seatback pivot point and setting the seatback to the desired position (Figure 7.6.0-1).

2. The top of the seatback can be adjusted between an upright or reclined position by moving the seatback adjuster, located behind the seatback, in or out. The seat back adjuster is unlocked by squeezing the seatback locking pins towards each other (Figure 7.6.0-2).

WARNING: Ensure that both thumbscrews and the adjuster locking pins are engaged before flying to prevent the pilot from shifting backwards. This could result in loss of aircraft control.

.

Figure 7.6.0- 1

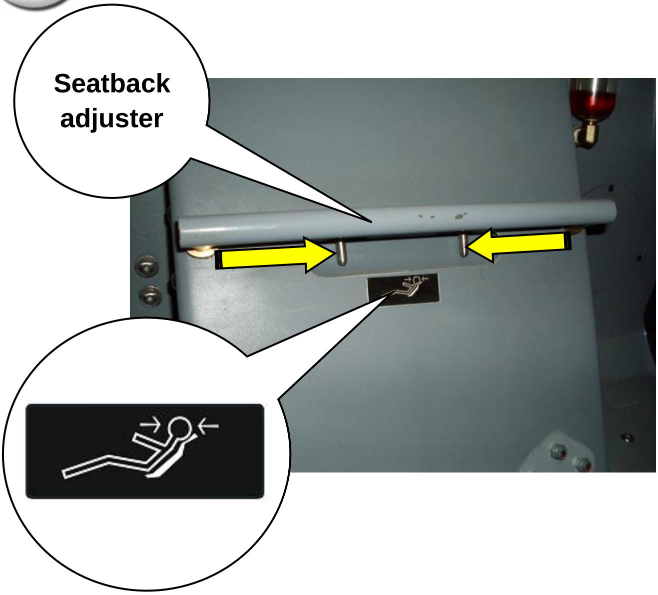


Figure 7.6.0- 2

The safety harness is a four-point system. The lower straps pass through the seat pan and are anchored to the fuselage skin. The shoulder straps pass through the seatback and around the lift tube structure behind the pilot's shoulders.

CAUTION: Shorter pilots should add firm cushions (preferably energy absorbing cushions) on the seat pan to raise the body position in the cockpit. The cushion height should be sufficient to ensure the shoulder straps pull the pilot down positively.

WARNING: No compressible cushions behind the pilot's back are allowed. A forward acceleration (e.g. a winch launch) may prevent the pilot reaching the controls safely if the cushions are of a compressible type.

7.7 Pitot and static system

The aircraft pneumatic system consists of:

- Static (P_{STAT}) piping for ASI and Altimeter
- Dynamic (P_{TOT}) piping for ASI
- Static piping for variometer from fin probe
- Total Energy (TE) piping from fin probe

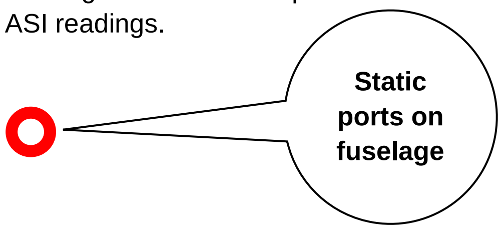
The pneumatic piping is colour coded as follows:

- Static piping for ASI and Altimeter - Blue
- Dynamic piping for ASI - Green
- Static for electronic flight computer from multi-probe - Transparent/White
- Total Energy piping from fin probe - Red
- Mechanical variometer capacity - Yellow

Figure 7.7.0-1 gives a schematic of the instrument layout.

NOTE: The ASI must use the static sources located in the rear of the fuselage tube. The airspeed calibration values are based on these static port readings.

NOTE: Static ports located in the rear of the fuselage tube are marked with a red ring and must be kept unobstructed to ensure correct ASI readings.



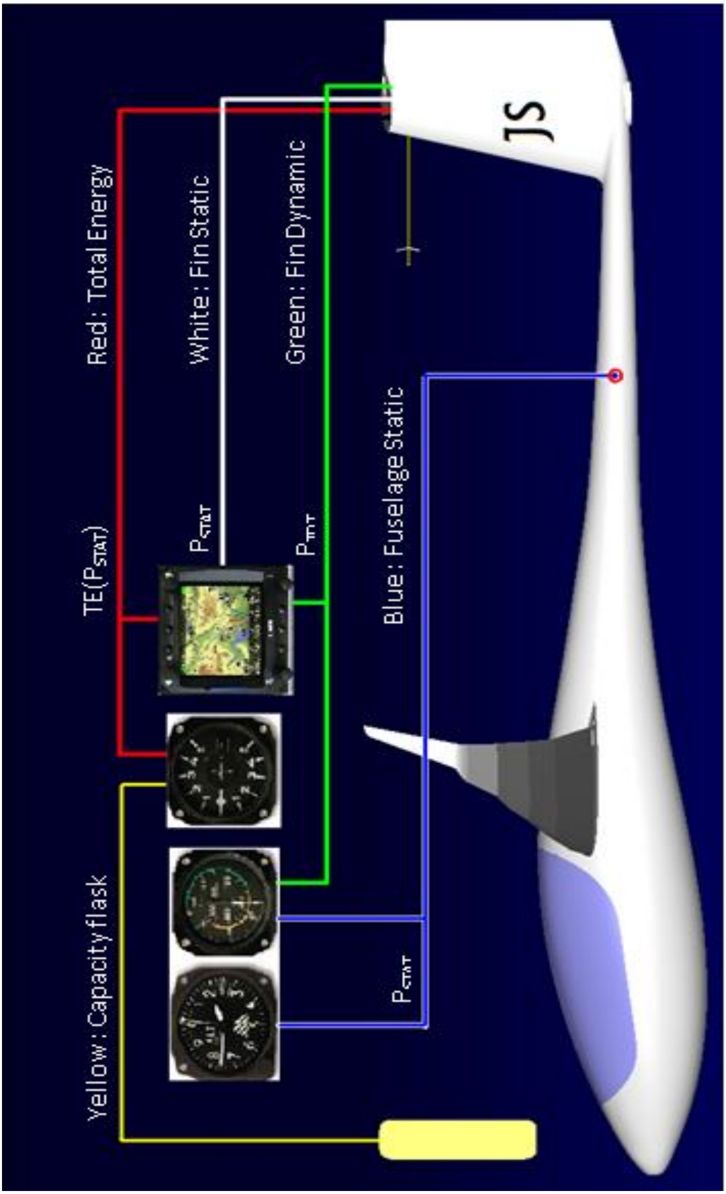

Red : Total Energy
White : Fin Static
Green : Fin Dynamic
Blue : Fuselage Static
Yellow : Capacity flask
TE(P_STAT)
P_STAT
P_TOT
P_STAT
JS

Figure 7.7.0-1

7.8 Airbrake system

The airbrakes are actuated by the blue handle on the left-hand side of the cockpit (Figure 7.8.0-1).

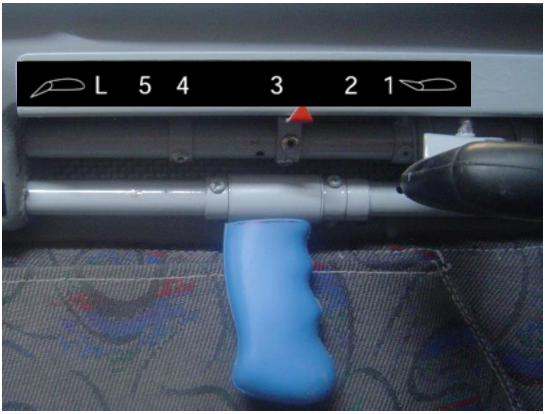


Figure 7.8.0-1

The airbrakes are operated in the conventional manner:

- Pull the handle backwards to open the airbrakes. Figure 7.8.0-2 illustrates the cockpit label for the open airbrake position.
- Push the airbrake lever forward to close the airbrakes. Figure 7.8.0-3 illustrates the cockpit label for closed airbrake position.

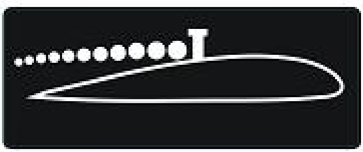


Figure 7.8.0-2

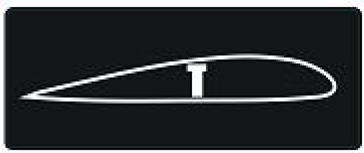


Figure 7.8.0-3

The airbrakes are locked by moving the airbrake handle fully forward, over the over-centre lock. A force of approximately 15 to 20kg is required to lock the airbrakes.

The last 20% of rearward movement actuates the wheel brake. Do not land with the airbrake handle pulled fully open to the rear stop, as this will lock the main wheel. Figure 7.8.0-4 illustrates the cockpit label for the wheel brake position.

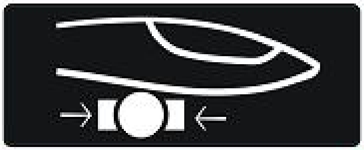


Figure 7.8.0-4

7.9 Baggage compartment

The maximum weight of items in the baggage compartment is 15kg. This should only be used for soft items that will not injure the pilot in the event of a hard or crash landing. Make sure that the batteries that are carried in this area are secured with the battery straps and thumb screws. Make sure that the airflow holes in the rear are not obstructed as this might lead to a reduction in performance of the sailplane.

Figure 7.9.0-1

7.10 Water ballast system

7.10.1 General

The water ballast system allows the weight of the sailplane to be increased to a maximum of 600kg (1323 lbs) in the 18 m configuration and to 720kg (1587 lbs) in the 21 m configuration. The water tanks are integral type to the wings. Each inboard wing tank holds approximately 90 litres of water. Each 21 m wingtip holds approximately 17 litres of water.

There are two tail tanks to enable to pilot set the optimum CG position for a flight:

- The expendable ballast tail tank is positioned in the bottom area of the vertical fin with a capacity of approximately 7.5 litres
- The non-expendable ballast tail tank is positioned above the expendable tail tank in the vertical fin and has a capacity of approximately 4.5 litres. This tank is used to optimize the un-ballasted CG position.

The water in the non-expendable ballast tank can be drained after flight by removing the tape over the holes on the right-hand side of the fin.

A non-expendable ballast fuselage tank is accessible via the engine bay doors. This tank can be installed optionally if an engine is not installed.

The dump valve control is situated on the right-hand side of the cockpit. Pushing the lever forward opens both the wing tank valves and the expendable tail tank valve.

Figure 7.10.1- 1

7.10.2 Main tanks

The main tanks are integral in the main wings.

The dump valves are situated in the lower wing skin, approximately 400mm from the fuselage.

The filling holes are positioned on the top of the inboard wing section near the tip.

Filling is done through the top filling holes as described in Section 4.5.6.

The filling holes are closed by screwing the filler caps into position using the universal rigging tool.

The main tanks are vented through the vent holes in the filler caps. Optionally vent caps fitted with specially designed valves can be fitted. These valves will reduce water spillage through the filler caps when a wing is lowered.

7.10.3 21 m Tip tanks

The tip tanks are integral in the 21 m tips only.

The dump valves are situated in the lower wing skin, approximately 100mm from the tip junction.

The filling is done via the dump valve as described in Section 4.5.6.

The tip tanks are vented through the vent holes positioned near the winglet.

Approximately 200 ml of water remains in the tank after dumping. This water must be drained by unscrewing the tip drain valve positioned aft of the tip dump valve.

7.11 Power plant

Refer to 1A-5.04.50 JS TJ-42 Jet Sustainer Manual Section 7.

7.12 Fuel system

Refer to 1A-5.04.50 JS TJ-42 Jet Sustainer Manual Section 7.

7.13 Electrical system

7.13.1 System description

The electrical power of the aircraft is supplied by maintenance-free dry-gel type 12 volt batteries. There are two main batteries fitted in the luggage compartment and (as an optional addition) a backup battery in the fin. Electrical wires are built into the sailplane from each battery to the instrument panel via the channel on the right hand side of the cockpit.

Each main battery is equipped with circuit breaker box fitted on top of the battery, preventing incorrect installation.

Switching between batteries is done with a selector switch located near the master switch.

Overload protection is provided for each electrical system by circuit breakers. The rating for each system must comply with the specifications of the equipment manufacturer.

The schematic layout of a possible electrical layout is given in Figure 7.13.3-1.

7.13.2 Power plant Electrical System description

Refer to JS 1 Jet Sustainer Flight Manual Supplement Section 7.2 for more information on the electrical system.

7.13.3 Recommended battery types

The batteries used in the sailplane must be of the dry sealed type as no battery that vents any gas is allowed in the sailplane according the airworthiness requirements of CS-22.

Main batteries:	12V 7Ah/9Ah Sealed Lead Acid battery, Dimensions: 151mm x 65mm x 93mm Fuse required at battery: 15A
Jet battery:	12V 10Ah LiFePo4 battery Dimensions: 151mm x 65mm x 93mm Fuse required at battery: 25A
Aux battery:	12V 10Ah LiFePo4 battery Dimensions: 151mm x 65mm x 93mm Fuse required at battery: 15A
Tail backup battery:	12V Sealed Lead Acid or LiFePo4 battery, Dimensions: 178mm x 34mm x 60mm Fuse required at battery: 10A

WARNING: Only use the batteries supplied with the aircraft or supplied by the JS representative. These batteries have circuit breakers at the terminals for overload protection, and protect the terminals from possible short circuits.

7.13.4 Solar cells

As an option provision is made for solar cells that fit onto the fuselage behind the cockpit.

A selector switch allows each battery to be charged by the solar panel individually.

Refer to Figure 7.13.3-1 for the schematic layout.

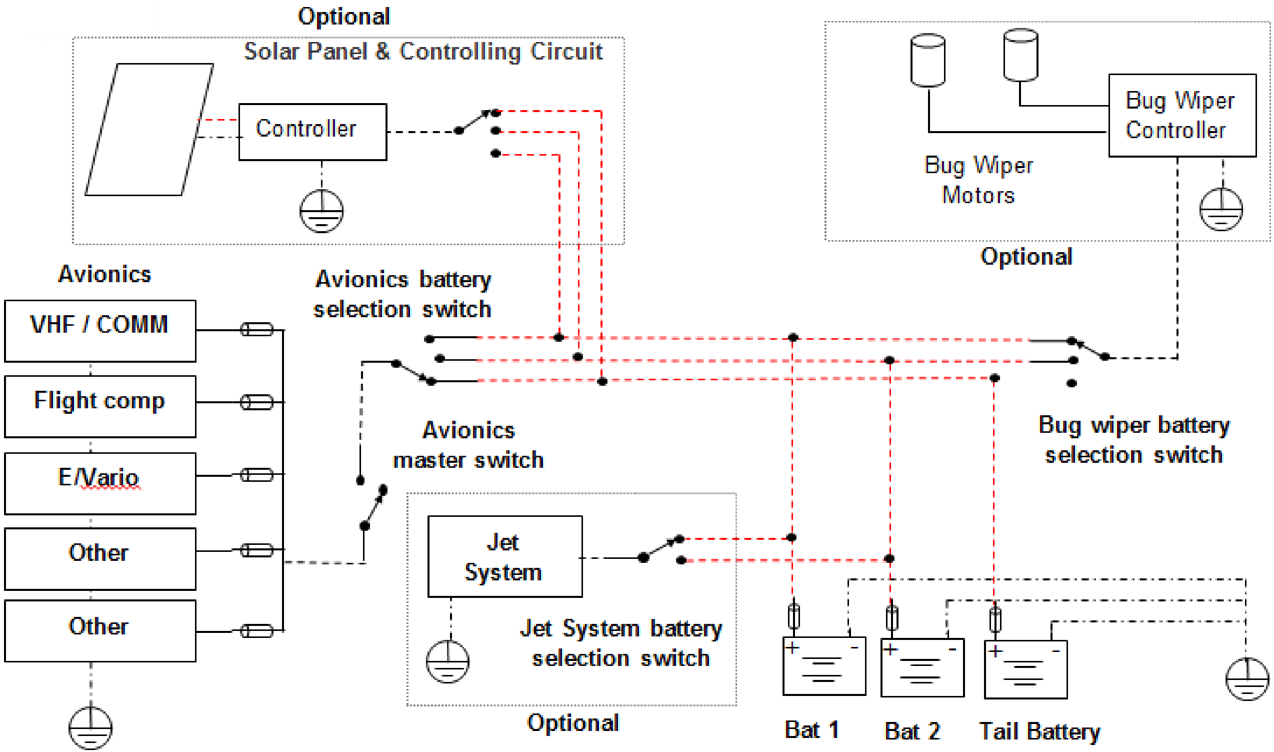


Figure 7.13.3-1

7.14 Miscellaneous equipment

7.14.1 Trim weights

Provision can be made for trim weights to be fitted in the nose of the sailplane adjacent to the nose release hook bulkhead as indicated in Figure 7.14.1-1.

The nose ballast can be made up with combinations of two 2kg weight plates and one 7kg weight plate.

Possible combinations are 2kg, 4kg, 7kg, 9kg and 11kg.

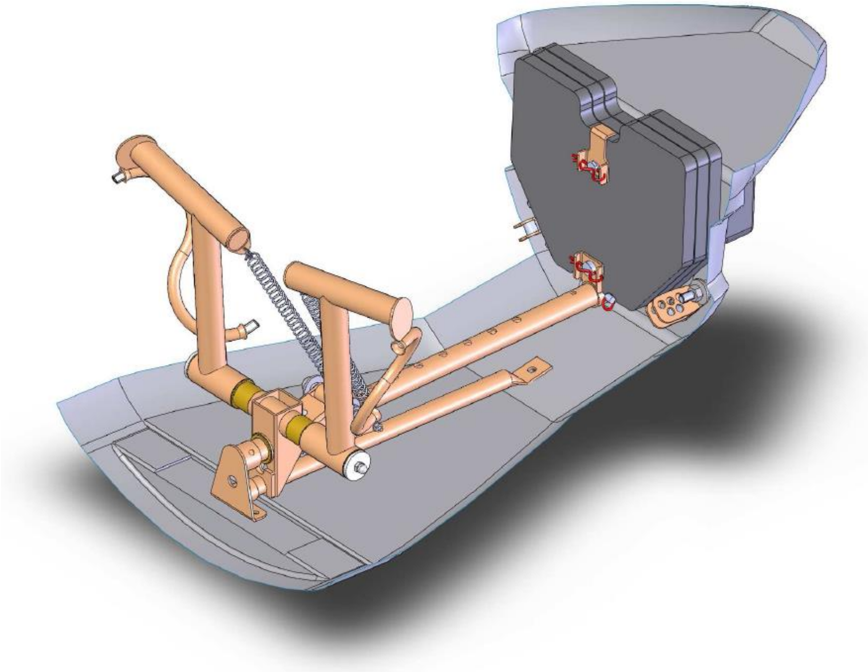


Figure 7.14.1- 1

Refer to Placards (under Limitations) for details on the placard for nose weights.

Installation of the 7 kg weight plate:

1. Remove all locking pins from the assembly
2. Slide the assembly backward
3. Insert the 7kg weight plate in the most forward slot
4. Slide the entire assembly forward until the weight locates in the bulkhead.
5. Install the other weight plates (if required) in the remaining slots
6. Insert the bottom and top locking pins and secure with R-pin
7. Insert the slider locking pin

Removal of the 7 kg weight plate:

1. Remove slider locking pin by removing the R-pin first.
2. Remove the bottom locking pin
3. Remove the top locking bolt and locking plate
4. Remove any other smaller weights on the slider before sliding backward.
5. Slide the remaining weight backward until it is free.

Installation 2kg weight plates:

1. Remove only the top locking bolt and bottom locking pin
2. Install the required amount of weights starting at the most forward position
3. Insert the top locking bolt and R-pin
4. Insert the bottom locking pin.

Removal of the 2kg weight plates:

1. Remove the bottom locking pin
2. Remove the top locking nut
3. Remove the weights by lifting the weights one by one from the slider.

7.14.2 Oxygen

Provision is made for an oxygen bottle at the right-hand side of the cockpit behind the seatback. If an oxygen bottle is used, ensure that it is secured properly.

7.14.3 Bug wiper system

If the bug wiper system is installed, perform the following checks before each flight:

- Check the operation of the bug wiper winding system. Ensure the wipers are set to wipe not closer than 500mm from the winglet.
- Check that both wipers seat correctly in their garages when retrieved.
- Check the condition of the wiping cable and retrieve cable.
- Check that the stabilizing leg of the wiper opens between 70° and 90°.
- Check that the gaps between the fuselage and wings and between wing sections are correctly bridged. While wiping the wiper cleaning filaments may get caught in the gaps if not covered correctly. Figure 7.14.3-1 indicates how Piker-Storka suggests the covering of gaps between panels.

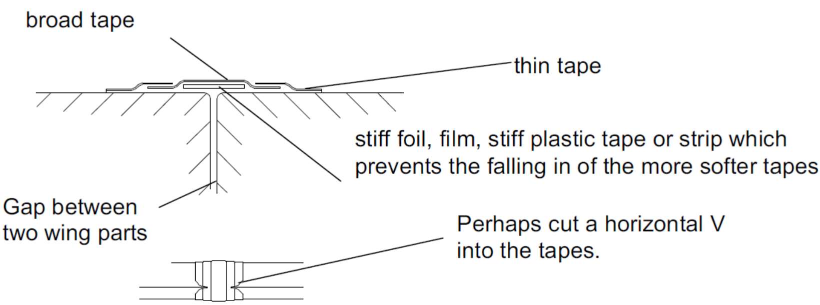


Figure 7.14.3- 1

8. Handling and maintenance

Certain inspections and maintenance procedures to maintain aircraft performance and reliability are included in this Section. It is advisable to follow a regular schedule of lubrication and preventive maintenance, consistent with the usage, climatic and flying conditions encountered.

For service and information not contained within this manual, it is recommended that the agent or manufacturer be contacted. All correspondence regarding the aircraft should carry its serial number.

The serial number can be found in the cockpit behind the back rest on the right-hand side of the fuselage.

8.1 Aircraft inspection periods

The aircraft shall be subjected to an annual airworthiness inspection. A more detailed inspection schedule can be found in the JS1 REVELATION Maintenance Manual.

- Airworthiness inspections must be performed in accordance with the relevant laws of the country in which the aircraft is registered
- The manufacturer recommends performing a daily inspection, pre-flight check and cockpit checks as specified in Section 7
- The manufacturer recommends performing additional inspections in certain circumstances (such as hard landings or ground loops) as explained in the JS1 Revelation Maintenance Manual
- Other inspections, maintenance or modifications to the aircraft, components or systems may be classified as “Mandatory” or “Recommended” according to issued Airworthiness Directives and Service Bulletins
- NOTE: The owner/operator is responsible to ensure compliance with all applicable Mandatory Airworthiness Directives
- Personnel performing inspections and maintenance must be properly qualified in accordance with the relevant laws of the country in which the aircraft is registered

8.2 Ground handling

8.2.1 Ground towing

Either use a rope or other non-metallic cable from the nose hook with someone walking with the wing tip, or

Use a tow bar connected to the tail dolly and a 'wing walker' with a sprung wheel (or someone walking with the wingtip)

CAUTION: Never tow the sailplane faster than walking pace.

WARNING: Do not push or pull on the wingtips.

8.2.2 Supporting area for road transport

- Fuselage:
  - Tail skid or tail wheel (with tail wheel faring removed)
  - Main wheel
  - Shell in front of landing gear, minimum length of support 300mm
- Wing:
  - Main spar at main pin hole closest to the root rib
  - Skin at root rib, minimum width of support 150mm
  - Skin at 7,5m, minimum width of support 250mm
- Tailplane:
  - Anywhere on the skin, minimum width of support 80mm

WARNING: The flaperon sandwich construction can be damaged if excessive force is used and should be handled with care.

WARNING: Removable tail wheel faring can be damaged if not removed for road transport

8.2.3 Tie down

The sailplane can be tied down using the holes in the wingtip skids. It is preferable to position wing stands under the wings inboard of the tip junction adjacent to the tie down ropes. A tie down rope across the rear fuselage boom in front of the fin should also be used to prevent the tail from lifting. It is advisable to restrain the rudder. Always tape the airbrake caps closed if there is a possibility of rain and remember to remove tape during the pre-flight inspection.

NOTE: It is recommended to use a brightly coloured tape to tape the airbrake caps.

8.3 Cleaning and care

8.3.1 General

The JS1 Revelation is manufactured from a composite of glass, carbon and aramid fibres in an epoxy matrix. The gel coat surface layer is finished with a polyurethane acrylic 2K paint topcoat.

There is no composite material available that is impervious to moisture absorption or to UV (ultra-violet) rays. UV rays will break down the epoxy matrix cross links and moisture absorption will damage the bond between the epoxy and the fibres, ultimately degrading the structural integrity of the aircraft. The utmost care must be taken to ensure that the structure of the sailplane is kept dry and not exposed to moist, hot or humid environments for protracted periods.

8.3.2 Paint and gel coat

The purpose of the outer surface finish is to present a good aerodynamic surface to the air when flying, but also to protect the structure from the environment. The main enemy for the structure is UV rays and moisture. UV rays will break down the epoxy cross links and will destroy the structural integrity of the aircraft. Gel coat protects the structure in a self-sacrificing fashion. The gel coat will degrade while protecting the structure. This will shows as cracks and yellowing. The gel coat can be protected by refinishing the aircraft with a Polyurethane Acrylic 2K paint system (factory finish process). Applying hard wax will not prevent UV damage to gel coat, but will slow down the surface deterioration.

Clean the outside of the aircraft with water and a mild detergent. Never use acetone of lacquer thinners to remove tape residue; rather use a silicon-free polish. Immediately after washing the sailplane dry it off with a soft chamois. Use special care not to let water get into the hinge line and airbrakes.

CAUTION: Never use any of the following products on your aircraft:

- Trichloroethylene
- Carbon tetrachloride or similar hydrocarbon chlorides
- Any product containing silicon

8.3.3 Canopy

The canopy must be protected from scratches. Always wash off dust by using liberal amounts of water with a soft chamois, taking care not to let dust get between the chamois and the canopy surface. Dry with a clean chamois. The canopy can be polished with a non-abrasive canopy polish with a rating of 5000 grid or higher.

Never clean the canopy with acetone or lacquer thinners as this will instantly create micro-cracks. Contact a JS representative for recommended canopy polishes.

8.3.4 Cockpit interior

The inside of the cockpit can be cleaned with mild soap and water.

8.3.5 Water tanks

The sailplane should always be stored with the wing tanks open to ventilate. It is also a good idea to put a small electrical fan on top of the wing surface over the water filler hole to force ventilate the tank. This will allow the structure to dry completely and prevent any issues due to moisture absorption.

The O-rings on the water tank filler caps must be replaced if they start to age and crack. If the wing valves leak, the most probable cause is foreign matter below the valve seal and sealing ring. Wiping the area may solve the problem. The valve seal may also be cracked in which case a replacement can be obtained from a JS representative. The seal can be replaced with some difficulty without removing the valve mechanism.

8.3.6 Pins, bushes and control systems

All bare metal surfaces that are not protected with paint must be protected with a thin film of grease.

8.3.7 Seat belt harness

The seat belt harness must be checked regularly for frayed of edges, mildew and wear.

The Fittings and buckles must be checked regularly for corrosion and proper functioning. Also refer to seat belt harness manufacturers maintenance instructions.

8.3.8 Tow release

Clean the nose and CG hooks regularly by means of pressured air and lubricate with spray oil. Also refer to the maintenance manual of the manufacturer.

8.3.9 Longitudinal push rod bearings

Linear bearings are being used throughout the wing control system for the airbrakes and flaperon, and elevator control systems.

These bearings must never be greased or oiled. The oil and grease will pick up dust and foreign matter that will destroy the soft surface of the plastic balls.

8.4 Long-term storage

To store the aircraft for long periods, the following is recommended:

1. Remove instruments and store separately
2. Close external pressure ports and inner tube end
3. Protect all metal parts using acid less spray oil or non-corrosive grease (Vaseline)
4. Close all orifices without preventing air circulation using wire cloth or similar means to prevent small animals from entering.
5. Drain all water tanks and force-ventilate water tanks until insides of the tanks are dry. Remove water filler caps and keep valves open during storage.
6. Leave the airbrakes unlocked on the ground (either rigged or de-rigged) to avoid loading the airbrake caps.
7. Store in an as-dry-as-possible environment

Return to service:

Perform at least the same inspection as for the annual inspection. A typical inspection is included in the Maintenance manual.

Inspect wings and fuselage for small animals or nests and inspect the pneumatic system for blockage due to nests of insects.

9. Supplements

9.1 Introduction

This section includes additional information on the safe operation of the aircraft if fitted with ancillary equipment not included as standard in the aircraft.

9.2 List of ancillary equipment

9.2.1 Oxygen system

Provision is made for an oxygen bottle with a maximum diameter of 86 mm (3.4”). The oxygen bottle tube is installed through the bulkhead on the right hand side of the wheel box. The oxygen bottle must be correctly secured with the bracket provided.

Oxygen equipment installed:

(a) must be approved.

(b) must be free from hazards in itself, in its method of operation, and its effect upon other components.

(c) must have means to allow the pilot to readily determine, during the flight, the quantity of oxygen available

(d) the pilot must be able to safely monitor and operate the system.

9.2.2 Tail wheel fairing (removable)

The removable tail wheel fairing is only suitable for a 200 x 50 tail wheel and does not fit with a 210x65 tail wheel installed. The fairing is not required for normal flight and only improves performance for competition use. It is a delicate part and should only be used on smooth asphalt runways avoiding surface runway lights. The fairing is attached by two stainless pins and then taped with a suitable PVC insulation tape.

JS1 REVELATION

PROUDLY MADE IN SOUTH AFRICA