Foreword

This Pilot's Operating Handbook (POH or Handbook) has been prepared to familiarize operators with the Velocity XL-RG airplane. Read this Handbook carefully. It provides operational procedures that will assure the operator obtains the performance published in the manual, data designed to allow the most efficient use of the airplane, and basic information for maintaining the airplane in a "like new" condition.

• Note •

All limitations, procedures, maintenance & servicing requirements, and performance data contained in this Handbook are mandatory for compliance with FAA operating rules and for continued airworthiness of the airplane.

This Handbook includes the material required to be furnished to the pilot by the Federal Aviation Regulations (FARs) and additional information.

The Handbook

This Pilot's Operating Handbook has been prepared using GAMA Specification #1 for Pilot's Operating Handbook, Revision 2, dated 18 October 1996 as the content model and format guide. However, some deviations from this specification were made for clarity. The Handbook is presented in loose-leaf form for ease in inserting revisions and is sized for convenient storage. Tabbed dividers throughout the Handbook allow quick reference to each section. Logical and convenient Tables of Contents are located at the beginning of each section to aid in locating specific data within that section. The Handbook is divided into ten sections as follows:

The data presented in this Handbook is the result of extensive flight tests.

• Note •

It is the responsibility of the owner to ensure that the Pilot's Operating Handbook is current at all times. Therefore, it is very important that all revisions be properly incorporated into this Handbook as soon as they are received.

Warnings, Cautions, and Notes

Warnings, Cautions, and Notes are used throughout this Handbook to focus attention on special conditions or procedures as follows:

• WARNING •

Warnings are used to call attention to operating procedures which, if not strictly observed, may result in personal injury or loss of life.

• Caution •

Cautions are used to call attention to operating procedures which, if not strictly observed, may result in damage to equipment.

• Note •

Notes are used to highlight specific operating conditions or steps of a procedure.

Section 1 - General

Table of Contents

Introduction

This section contains information of general interest to pilots and owners. You will find the information useful in acquainting yourself with the airplane, as well as in loading, fueling, sheltering, and handling the airplane during ground operations. Additionally, this section contains definitions or explanations of symbols, abbreviations, and terminology used throughout this handbook.

• NOTE •

For specific information regarding the organization of this Handbook, revisions, supplements, and procedures to be used to obtain revision service for this handbook, refer to the “Foreword” immediately following the title page

The Airplane

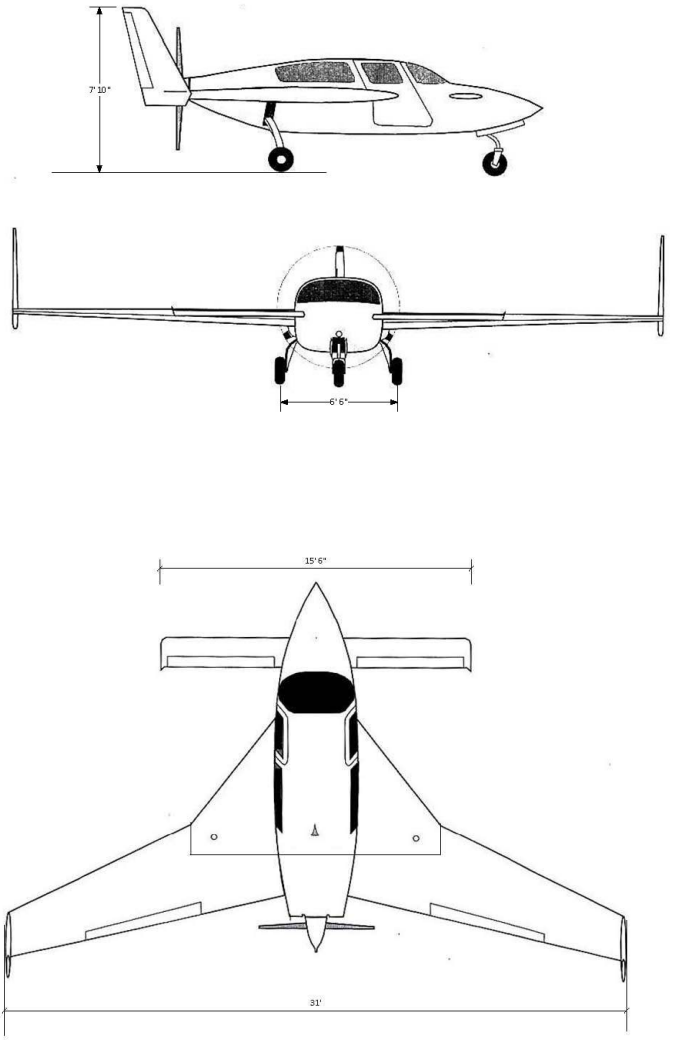


Figure 1-1
Airplane Three View

Engine

Number of Engines 1

Number of Cylinders 6

Engine Manufacturer ..... Teledyne Continental

Engine Model IO-550-N

Fuel Metering ..... Fuel Injected

Engine Cooling ..... Air Cooled

Engine Type ..... Horizontally Opposed, Direct Drive

Horsepower Rating ..... 310 hp @ 2700 rpm

Propeller

Manufacture ..... MT

Propeller Type ..... Constant Speed, Three Blade

Hub Model Number ..... MTV-9-D (S/N 080830)

Diameter ..... 70"

Blade Model Number LD178-102a (S/N TG-16665, 66, 67)

Fuel

Total Capacity ..... 85.0 U.S. Gallons

Total Usable ..... 81.0 U.S. Gallons

Approved Fuel Grades:

100 LL Aviation Fuel (Blue)

100 (Formerly 100/130) Grade Aviation Fuel (Green)

Oil

Oil Capacity (Sump) ..... 8 U.S. Quarts

Oil Grades:

All Temperatures ..... SAE 15W-50, 20W-50, or 20W-60

Below 40 ºF ..... SAE 30

Above 40 ºF ..... SAE 50

Maximum Certificated Weights

Maximum Gross for Takeoff ..... 3400 lb
Maximum Baggage Compartment Loading ..... 130 lb
Standard Empty Weight ..... 1874 lb
Maximum Useful Load ..... 1526 lb
Full Fuel Payload ..... 1016 lb

Cabin and Entry Dimensions

Maximum Cabin Width ..... 49 inches
Maximum Cabin Length ..... 109 inches
Maximum Cabin Height ..... 49 inches
Maximum Entry Width ..... 26 inches
Maximum Entry Height ..... 34 inches

Baggage Spaces and Entry Dimensions

Baggage area is located aft of the rear seats.

Maximum Baggage Width ..... 44 inches
Maximum Baggage Length ..... 24 inches
Maximum Baggage Height ..... 30 inches

Specific Loadings

Wing Loading .....23.4 lb per square foot
Power Loading .....10.96 lb per hp

Section 2 - Limitations

Table of Contents

Introduction

• NOTE •

Limitations associated with optional equipment are not described in this section. For optional equipment limitations, refer to Section 9, Supplements

The limitations included in this Section of the Pilot's Operating Handbook (POH) were defined and tested by the builder.

This section provides operating limitations, instrument markings and basic placards required by regulation and necessary for the safe operation of the Velocity XL-RG and its systems and equipment. Refer to Section 9 of this handbook for amended operating limitations for optional equipment. Compliance with the operating limitations in this section and in Section 9 is required.

Certification Status

The Velocity XL-RG is certificated in the EXPERIMENTAL category under a special airworthiness certificate pursuant to CFR 21.191g.

Operating Limitations

Operating Limitations are part of the Airworthiness Certificate. A copy of the Operating Limitations are provided here for reference only.

U.S. Department of Transportation
Federal Aviation Administration
Operating limitations for N621CM
Johnston, Donald E Velocity XL-RG SN 3RX166

1) This aircraft does not meet the airworthiness requirements specified in Annex 8 to the Convention on International Civil Aviation. Operations in civil airspace outside of the United States will require the written permission of the applicable Civil Aviation Authorities (CAA). That written permission must be carried aboard the aircraft together with the U.S. airworthiness

Airspeed Limitations

The indicated airspeeds in the following table are based upon Section 5 Airspeed Calibrations using the normal static source. When using the alternate static source, allow for the airspeed calibration variations between the normal and alternate static sources.

	SPEED	KIAS	REMARKS
VO	Max. Maneuvering Speed	140	Do not apply full or abrupt control movements above this speed.
VNO	Max. Structural Speed *Decrease 4 knots for each 1000-ft above 12,000 feet (Press. Alt.)	180*	Do not exceed this speed except in smooth air and then only with caution.
VNE	Never Exceed Speed *Decrease 5 knots for each 1000-ft above 12,000 feet (Press. Alt.)	215*	Do not exceed this speed in any operation.
VLE	Landing Gear Extension	125	

Figure 2-1
Airspeed Limits

Airspeed Indicator Markings

The airspeed indicator markings are based upon Section 5 Airspeed Calibrations using the normal static source. When using the alternate static source, allow for the airspeed calibration variations between the normal and alternate static sources.

MARKING	KIAS	SIGNIFICANCE
White Band	65 –125	Gear Extension Operating Range - Lower limit is stalling speed in the landing configuration. Upper limit is maximum speed permissible with gear extended.
Green Band	65 –180	Normal Operating Range - Lower limit is stalling speed with gear retracted. Upper limit is maximum structural cruising speed.
Yellow Band	180 – 215	Operations must be conducted with caution and only in smooth air.
Red Band	215	Maximum speed for all operations

Figure 2-2
Airspeed Indicator Markings

Power Plant Limitations

Engine

Teledyne Continental IO-550-N

Power Rating.....310 hp @ 2700 RPM

Maximum RPM.....2700 RPM

Oil:

Oil Temperature .....240° F (115° C) maximum

Oil Pressure:

Minimum..... 10 psi

Maximum..... 100 psi

Approved Oils:

Engine Break-In: For first 25 hours of operation or until oil consumption stabilizes use straight mineral oil conforming to MILL- 6082. If engine oil must be added to the factory installed oil, add only MIL-L-6082 straight mineral oil.

After Engine Break-In: Use only oils conforming to Teledyne Continental Specification MHS-24 (Ashless Dispersant Lubrication Oil) or MHS-25 (Synthetic Lubrication Oil). Refer to Section 8 - Oil Servicing. Oil viscosity range as follows:

All Temperatures .... 15W-50, 20W-50 or 20W-60

Below 40 °F (4° C)..... SAE 30

Above 40 °F (4° C) ..... SAE 50

Fuel Grade..Aviation Grade 100 LL (Blue) or 100 (green)

• NOTE •

Refer to General Limitations – Fuel Limits in this section for operational limitations regarding fuel and fuel storage.

Propeller

MT

Propeller Type .....Constant Speed, Three Blade

Hub Model Number.....MTV-9-D

Diameter ..... 70"

Blade Model Number..... LD178-102a

Weight Limits

Maximum Takeoff Weight.....3400 lb

Maximum Weight in Baggage Compartment.....130 lb

Instrument Markings

GAUGE	RED LINE Minimum	GREEN Normal	YELLOW Caution	RED LINE Limit
Tachometer	600 RPM	600 – 2500 RPM	2500 – 2700 RPM	2700RPM
Manifold Pressure		10 – 30" Hg		
Oil Temperature		170ºF–220ºF	220ºF – 240ºF	240ºF–250ºF
Oil Pressure	10 psi (idle)	30 - 60 psi	60 – 100 psi	100 psi (Cold)
Fuel Quantity	0		0 – 15	
Fuel Flow		10 – 22 GPH		28 GPH
Cylinder Head Temperature		240ºF–420ºF	420ºF – 460ºF	460ºF

Figure 2-3
Instrumentation Markings

Center of Gravity Limits

Reference Datum..... Nose of Aircraft

Forward..... 127”

Aft..... 134”

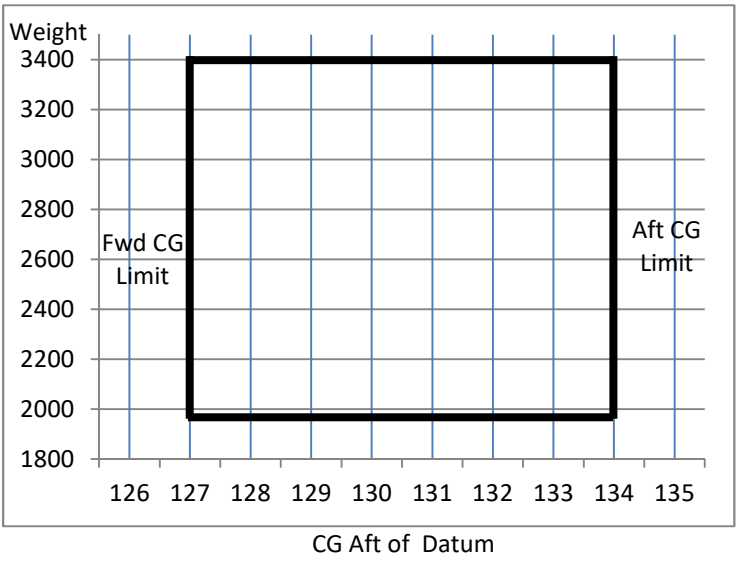


Figure 2-4
C.G. Envelope

Maneuver Limits

• WARNING •

Aerobatic maneuvers are prohibited.

The Velocity XL-RG is licensed as EXPERIMENTAL and is not designed for aerobatic operations. Only those operations incidental to normal flight are approved. These operations include normal stalls, chandelles, lazy eights, and turns in which the angle of bank is limited to 60°

MANEUVER	ENTRY SPEED
Chandelles	130 KIAS
Lazy Eights	130 KIAS
Steep Turns	130 KIAS
Stalls (not whip stalls)	Slow deceleration
Accelerated Stalls	110 KIAS

Flight Load Factor Limits

3400 lb.....+9.0g,and -7.0g

Minimum Flight Crew

The minimum flight crew is one pilot.

Kinds of Operation

The Velocity XL-RG is equipped and approved for the following type operations:

• VFR day and night.
• IFR day and night.

Icing Conditions

Flight into known icing conditions is prohibited:

Runway Surface

This airplane may be operated on any smooth runway surface.

• CAUTION •

Operation on unimproved runway surfaces will cause additional wear and may require additional maintenance or inspection.

Taxi Power

Maximum continuous engine speed for taxiing is 1000 RPM on flat, smooth, hard surfaces. Power settings slightly above 1000 RPM are permissible to start motion, for turf, soft surfaces, and on inclines. Use minimum power to maintain taxi speed.

Fuel Limits

Approved Fuel .....Aviation Grade 100 LL (Blue)

Total Fuel Capacity.....84.0 U.S. Gallon

Total Fuel Each Tank.....41.0 U.S. Gallon

Total Usable Fuel.....81.0 U.S. Gallon

Maximum Allowable Fuel Imbalance.....10.0 U.S. Gallon

Altitude Limits

Maximum Takeoff Altitude .....10,000 Feet MSL

Maximum Operating Altitude .....18,000 Feet MSL

The operating rules (FAR Part 91 and FAR Part 135) require the use of supplemental oxygen at specified altitudes below the maximum operating altitude.

Maximum Occupancy

Occupancy of this airplane is limited to four persons (the pilot and three passengers).

Systems and Equipment Limits

Primary Flight Display

1. Flight under Instrument Flight Rules (IFR) is not permitted with the PFD or any standby indicator (attitude indicator or magnetic compass) inoperative. Refer to Kinds of Operation Equipment List.
2. When the PFD is coupled with Autopilot System, the following Limitations apply:

   2.1. Autopilot operation is prohibited above 215 KIAS.

   2.2. The autopilot must be disengaged for go around, and balked landing.

   2.3. The autopilot must be disconnected in moderate or severe turbulence.

   2.4. Minimum engage height for the autopilot is 400 ft AGL.

   • WARNING •

Autopilot may not be able to maintain all selectable vertical speeds. Selecting a vertical speed that exceeds the aircraft's available performance may cause the canard to stall.

   2.5. Minimum speed with the autopilot engaged is 1.3Vs.

   For VOR/GPS and ILS glideslope and localizer intercept, capture, and tracking, the following limitations apply:

   a. The autopilot must be disengaged no later than 100 feet below the Minimum Descent Altitude

   b. The autopilot must be disconnected during approach if course deviation exceeds 50%. The approach should only be continued by "hand-flying" the airplane.

   c. The autopilot must be disengaged at the Decision Height.

d. 12 knot maximum crosswind component between the missed approach point and outer marker.

e. The intercept of the localizer shall occur at least 5 miles outside of the outer marker.

f. If the crosswind component is greater than 12 knots and less than 17 knots, the intercept shall occur at least 10 miles outside of the outer marker.

g. The intercept angle shall be no greater than a 45-degree intercept.

h. The ILS is flown at normal approach speeds.

i. The glideslope is approached in such a manner to allow automatic arming of the glideslope, or if the glideslope is manually armed no more than 15% above the glideslope.

Multi-Function Display

1. The moving map display must not be used as the primary navigation instrument. The moving map display provides visual advisory of the airplane's GPS position against a moving map. The information supplements CDI course deviation and information provided on the GPS navigator.
2. Use of Map page during IFR flight requires an IFR approved GPS receiver installation operated in accordance with applicable limitations.
3. Under no circumstances should the Map page terrain representations be used as a basis for terrain avoidance.
4. The MFD interfaces with separately approved sensor installations. Adherence to limitations in the appropriate sensor installation POH Supplements is mandatory.
5. Traffic information shown on the Map page display is provided to the pilot as an aid to visually acquire traffic. Pilots should maneuver their aircraft based only on ATC guidance or positive visual acquisition of the conflicting

Placards

Federal Aviation Regulations require that a number of different placards be prominently displayed on the interior and exterior of the airplane. The placards contain information about the airplane and its operation that is of significant importance. The placard is placed in a location proximate to the item it describes. For example, the fuel capacity placard is on the tank filler caps. The placards and their locations are shown on the following pages as they appear on the interior and exterior of the airplane.

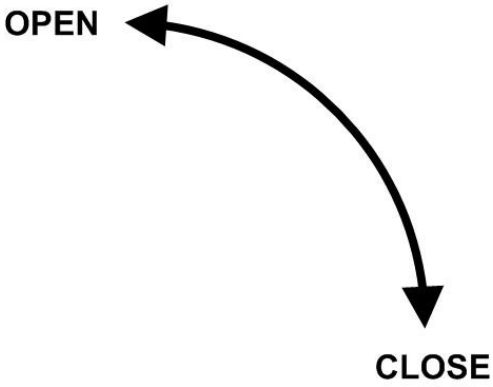
Instrument Panel

PASSENGER WARNING
THIS AIRCRAFT IS AMATEUR-BUILT AND DOES NOT COMPLY WITH FEDERAL SAFETY REGULATIONS FOR STANDARD AIRCRAFT

Fuel Cap

Outside Door Handle

Inside Door Handle



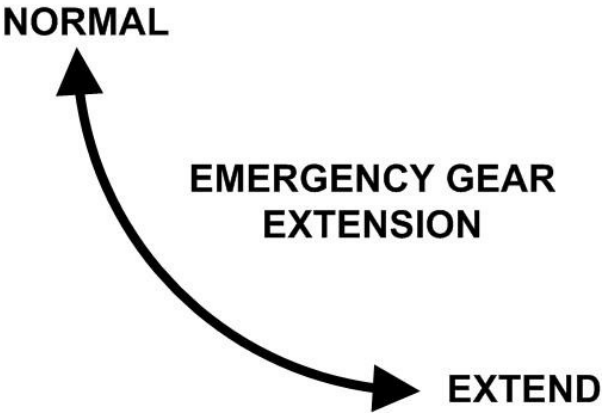
Top/Center Inside Door Panel

Lift While Unlatching

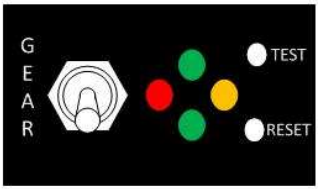
Bottom/Left of Instrument Panel

PARKING BRAKE – PULL TO SET

Left Side of Keel, Forward of Pilot Seat.

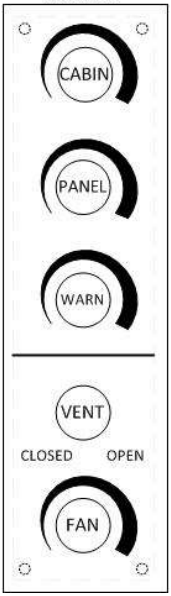


Landing Gear Control Panel



Engine Controls

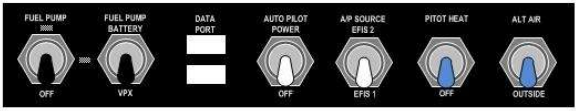
Lighting/Ventilation Controls



ELT Control Panel

Overhead Switch Panel

Lower Left Switch Panel



Lower Right Switch Panel

Section 3 - Emergency Procedures

Table of Contents

Introduction

This section provides the recommended procedures to follow during adverse flight conditions. The information is presented to enable you to form, in advance, a definite plan of action for coping with the most probable emergency situations which could occur in the operation of your airplane.

As it is not possible to have a procedure for all types of emergencies that may occur, it is the pilot's responsibility to use sound judgement based on experience and knowledge of the aircraft to determine the best course of action. Therefore, it is considered mandatory that the pilot read the entire manual, especially this section before flight.

• NOTE •

Emergency procedures associated with optional systems can be found in Section 9.

Airspeeds for Emergency Operations

Maneuvering Speed:
3400 lb ..... 130 KIAS

Best Glide:
3400 lb ..... 90 KIAS

Emergency Descent:
Smooth Air ..... 200 KIAS

Turbulent Air ..... 90 KIAS

Emergency Landing (Engine-out):
Approach ..... 90 KIAS

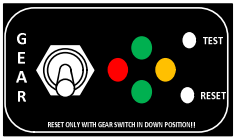
Final ..... 80 KIAS

Annunciator Lights

Master Warning

WARNING LIGHT	SIGNIFICANCE
Fuel Pump ON	AMBER light indicates power to the electric fuel boost pump.
Pitot Heat ON	AMBER light indicates power to the pitot tube heater.
Low Oil Pressure (Flashing)	RED light indicates engine oil pressure is below 10psi.
Low Voltage (Flashing)	RED light indicates main bus voltage is below 25 volts.
Starter Engaged	RED light indicates power to the starter motor.
Pilot Door Unsafe	RED light indicates the pilot door latch is not engaged.
CoPilot Door Unsafe	RED light indicates the copilot door latch is not engaged.
Parking Brake	RED light indicates the parking brake is engaged.

Landing Gear



WARNING LIGHT	SIGNIFICANCE
RED	Indicates the landing gear is not down and locked or fully retracted.
AMBER	Indicates the hydraulic pump is running.
GREEN (Top)	Indicates the nose gear is down and locked.
GREEN (Bottom)	Indicates the main gear is down and locked.

Methodology

Aircraft emergencies are very dynamic events. Because of this, it is impossible to address every action a pilot might take to handle a situation. However, four basic actions can be applied to any emergency. They are:

Maintain Aircraft Control

Many minor aircraft emergencies turn into major ones when the pilot fails to maintain aircraft control. Remember, do not panic and do not fixate on a particular problem. Over-attention to a faulty warning light during an instrument approach can lead to a pilot induced unusual attitude and possibly worse. To avoid this, even in an emergency: aviate, navigate, and communicate, in this order. Never let anything interfere with your control of the airplane. Never stop flying.

Analyze the Situation

Once you are able to maintain control of the aircraft, assess the situation. Look at the engine parameters. Listen to the engine. Determine what the airplane is telling you.

Take Appropriate Action

In most situations, the procedures listed in this section will either correct the aircraft problem or allow safe recovery of the aircraft. Follow them and use good pilot judgment.

Land as soon as Conditions Permit

Once you have handled the emergency, assess your next move. Handle any non-critical “clean-up” items in the checklist and put the aircraft on the ground. Remember, even if the airplane appears to be in sound condition, it may not be.

Section 4 - Normal Procedures

Table of Contents

Introduction

This section provides amplified procedures for normal operation. Normal procedures associated with optional systems can be found in Section 9.

Airspeeds for Normal Operation

Unless otherwise noted, the following speeds are based on a maximum weight of 3400 lb. and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff and landing distance, the speed appropriate to the particular weight must be used.

Takeoff:

- Rotation ..... 70 KIAS
- Initial Climb ..... 90 KIAS

Enroute Climb:

- Normal ..... 120 KIAS
- Best Rate of Climb, SL ..... 90 KIAS
- Best Rate of Climb, 10,000 ..... _
- Best Angle of Climb, SL ..... 90 KIAS
- Best Angle of Climb, 10,000 ..... _

Landing Approach:

- Downwind ..... 100 KIAS
- Base ..... 90 KIAS
- Final ..... 80 KIAS
- Touchdown ..... 70 KIAS

Go-Around:

- Full Power ..... 90 KIAS

Maximum Recommended Turbulent Air Penetration:

- 3400 lb ..... 133 KIAS

- 2900 lb ..... 123 KIAS

Maximum Demonstrated Crosswind Velocity:

- Takeoff or Landing..... 20 Knots

Normal Procedures

Preflight Inspection

Before carrying out preflight inspections, ensure that all required maintenance has been accomplished. Review your flight plan and compute weight and balance.

• NOTE •

Throughout the walk-around: check all hinges, hinge pins, and bolts for security; check skin for damage, condition, and evidence of delamination; check all control surfaces for proper movement and excessive free play; check area around liquid reservoirs and lines for evidence of leaking.

In cold weather, remove all frost, ice, or snow from fuselage, wing, stabilizers and control surfaces. Ensure that control surfaces are free of internal ice or debris. Check that wheel fairings are free of snow and ice accumulation. Check that pitot probe warms within 30 seconds of setting Pitot Heat to ON.

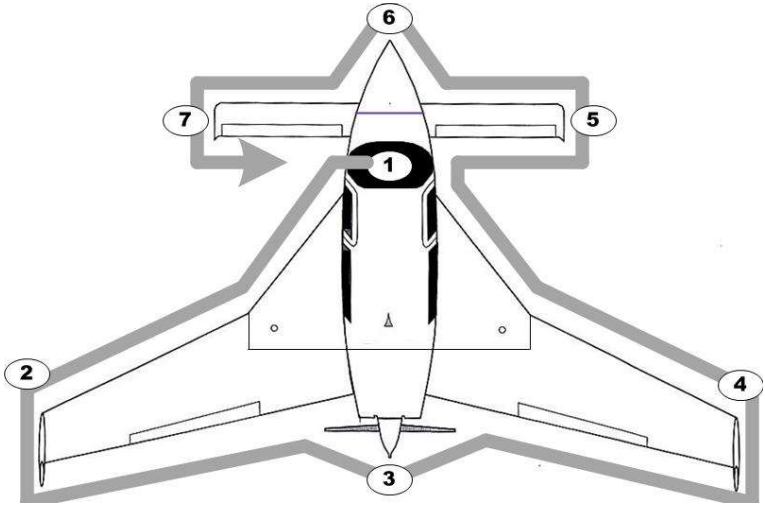


Figure 4-1
Walk-Around

Preflight Walk-Around

1. Cabin
    - 1.1. Required Documents ..... On Board
    - 1.2. All Switches ..... OFF
    - 1.3. Landing Gear Switch ..... DOWN
    - 1.4. EFIS 1 Backup Battery Switch ..... ON
    - 1.5. Master Switch ..... ON
    - 1.6. Lights ..... Check Operation
    - 1.7. Fuel Quantity ..... Check
    - 1.8. Master Switch ..... OFF
    - 1.9. Circuit Breakers ..... IN
    - 1.10. Fire Extinguisher ..... Charged and Available
    - 1.11. Emergency Egress Hammer ..... Available
2. Left Wing
    - 2.1. Door Hinges & Latch ..... Check

2.2. Fuel Sample ..... Check
2.3. Left Main Landing Gear
2.3.1. Tire Pressure 55psi
2.3.2. Brakes ..... Check
2.3.3. Gear Door ..... Attached
2.4. Strake/Wing Surface ..... Check
2.5. Vortilons ..... Check
2.6. Wingtip Lights ..... Check
2.7. Winglet Condition ..... Check
2.8. Rudder Gust Lock ..... Remove
2.9. Rudder ..... Check
2.10. Aileron ..... Check
2.11. Tie Down ..... Remove

3. Engine/Prop
3.1. Prop/Spinner ..... Check
3.2. Cowling ..... Check Attachment
3.3. Exhaust ..... Check Attachment
3.4. Engine Oil ..... Check Level

4. Left Wing
4.1. Tie Down ..... Remove
4.2. Aileron ..... Check
4.3. Rudder Gust Lock ..... Remove
4.4. Rudder ..... Check
4.5. Winglet Condition ..... Check
4.6. Wingtip Lights ..... Check
4.7. Vortilons ..... Check
4.8. Strake/Wing Surface ..... Check

• Caution •

Crew seats must be locked in position and control handles fully down before flight. Ensure seat belt harnesses are not twisted.

5. Switches (Except EFIS 1 Battery) ..... OFF
6. Circuit Breakers ..... CHECK
7. Throttle ..... CLOSED
8. Propeller ..... Forward (High RPM)
9. Mixture ..... Idle Cut OFF
10. Brakes ..... SET
11. Landing Gear Switch ..... DOWN
12. Internal Lights ..... OFF
13. Passenger Briefing ..... COMPLETED

• NOTE •

Ensure all the passengers have been fully briefed on smoking, the use of the seat belts, doors, emergency exits, egress hammer.

Starting Engine

If the engine is warm, no priming is required. For the first start of the day and in cold conditions, prime will be necessary. Weak intermittent firing followed by puffs of black smoke from the exhaust stack indicates over-priming or flooding. Excess fuel can be cleared from the combustion chambers by the following the Flooded Engine Start procedure.

• WARNING •

If airplane will be started using external power, keep all personnel and power unit cables well clear of the propeller rotation plane.

• Caution •

Alternators should be left OFF during engine start.

1. Before Start Check List ..... COMPLETE
2. Master Switch ..... ON (Check Volts)

3. Mixture ..... FULL RICH
4. Throttle ..... FULL OPEN
5. Fuel Pump ..... HIGH for 5 seconds
6. Throttle ..... OPEN ¼ INCH
7. Propeller Area ..... CLEAR
8. Magneto Switches ..... ON
9. Starter Switch ..... ON TO START

• Caution •

Limit cranking to intervals of 5 seconds with a 20 second cooling period between cranks. This will improve battery and contactor life.

If no oil pressure is noted within 10 seconds, shut down the engine and investigate.

Hot Engine Start

1. Before Start Checklist ..... COMPLETE
2. Master Switch ..... ON (Check Volts)
3. Mixture ..... FULL RICH
4. Throttle ..... OPEN 1”
5. Fuel Pump ..... LOW with Starter Switch
6. Starter Switch ..... ON
7. Fuel Pump ..... OFF after started

Flooded Engine Start

1. Before Start Checklist ..... COMPLETE
2. Master Switch ..... ON (Check Volts)
3. Navigation Lights ..... ON
4. Mixture ..... IDLE CUT OFF
5. Throttle ..... 1/2 OPEN

6. Starter.....Engage
7. Mixture.....Slowly Advance to RICH

After Engine Start

1. Throttle ..... 1000 RPM
2. Oil Pressure.....30psi minimum
3. Alternator.....Primary
4. Avionics .....ON

Before Taxiing

1. Engine Start Checklist..... COMPLETE
2. AHRS ..... ALIGNED
3. Radios/Avionics..... AS REQUIRED
4. Cabin Heat ..... AS REQUIRED
5. Altimeter ..... SET

Taxiing

When taxiing, directional control is accomplished with differential braking. Use only as much power as is necessary to achieve forward movement. Deceleration or taxi speed control using brakes but without a reduction in power will result in increased brake temperature. Taxi over loose gravel at low engine speed to avoid damage to the propeller tips.

• WARNING •

Maximum continuous engine speed for taxiing is 1100 RPM on flat, smooth, hard surfaces. Power settings slightly above 1100 RPM are permissible to start motion, for turf, soft surfaces, and on inclines. Use minimum power to maintain taxi speed.

If the 1100 RPM taxi power limit and proper braking procedures are not observed, the brake system may overheat and result in brake damage or brake fire.

1. Brakes .....CHECK

Section 5 - Performance Data

Table of Contents

Introduction

The performance charts and graphs on the following pages are designed to assist the pilot in determining specific performance characteristics in all phases of flight operations. These phases include takeoff, climb, cruise, descent, and landing. The data in these charts were determined through actual flight tests of the airplane. At the time of the tests, the airplane and engine were in good condition and normal piloting skills were employed.

There may be slight variations between actual results and those specified in the tables and graphs. The condition of the airplane, as well as runway condition, air turbulence, and pilot techniques, will influence actual results. Fuel consumption assumes proper leaning of the mixture and control of the power settings. The combined effect of these variables may produce differences as great as 10%. The pilot must apply an appropriate margin of safety in terms of estimated fuel consumption and other performance aspects, such as takeoff and landing. Fuel endurance data include a 45-minute reserve at the specified cruise power setting. When it is appropriate, the use of a table or graph is explained or an example is shown on the graph.

When using the tables that follow, some interpolation may be required. If circumstances do not permit interpolation, then use tabulations that are more conservative. The climb and descent charts are based on sea level, and some minor subtraction is required for altitudes above sea level. For example, if 4.5 and 8.5 minutes are needed to climb from sea level to 4000 and 8000 feet respectively, then a climb from 4000 feet to 8000 feet will take about four minutes.

Associated Conditions Affecting Performance

Computed performance data in this section are based upon data derived from actual flight testing with the airplane and engine in good condition and using average piloting techniques. Unless specifically noted in the “Conditions” notes presented with each table, ambient conditions are for a standard day (refer to Section 1).

The charts in this section provide data for ambient temperatures from –4° F to 104° F. If ambient temperature is below the chart value, use the lowest temperature shown to compute performance. This will result in more conservative performance calculations. If ambient temperature is above the chart value, use extreme caution as performance degrades rapidly at higher temperatures.

All fuel flow data for cruise is based on the recommended lean mixture setting detailed in Section 4 – Normal Procedures.

Flight Planning

The performance tables in this section present sufficient information to predict airplane performance with reasonable accuracy. However, variations in fuel metering, mixture leaning technique, engine & propeller condition, air turbulence, and other variables encountered during a particular flight may account for variations of 10% or more in range and endurance. Therefore, utilize all available information to estimate the fuel required for a particular flight.

• NOTE •

Whenever possible, select the most conservative values from the following charts to provide an extra margin of safety and to account for events that could occur during a flight.

Cruise Performance Overview

The tables on pages 5-5 through 5-15 contain cruise data to assist in the flight planning process. This information is tabulated for even thousand altitude increments and ranges from Sea Level feet to 16000 feet. Interpolation is required for the odd number altitudes, i.e., 5000 feet, 7000 feet, etc., as well as altitude increments of 500 feet, such as 7500 and 9500.

The tables assume proper leaning at the various operating horsepowers. Between 65% and 75% of brake horsepower, the mixtures should be leaned through use of the exhaust gas temperature (EGT) gauge and adjusted to 50ºF rich of the peak setting. Please refer to page 4-25 in this handbook for proper leaning techniques. At brake horsepowers below 65%, the mixture may be leaned to 50ºF lean of the peak EGT setting.

The maximum recommended cruise setting is 80% of brake horsepower; however, settings of 75% and below provide better economy with only a modest sacrifice in true airspeed. The mixture must not be leaned above settings that produce more than 80% of brake horsepower unless rough engine operations are encountered. In this instance, lean the mixture slowly until smooth engine operations are reestablished. Be sure to monitor engine instruments to ensure safe ranges.

In some instances, the interpolation process will involve power settings from two different leaning schedules. For example, in Figure 5 - 5, to determine the fuel flow for 2400 RPM and 22 inches of manifold pressure, temperature 78ºF, requires interpolation between values for 2300 RPM and 2500 RPM. The brake horsepower and fuel flow at 2500 RPM are 67% BHP and 14.4 GPH. At 2300 RPM, it is 57% BHP and 10.8 GPH. Interpolating between the two sets of numbers will yield 62% BHP and 12.6 GPH. The interpolated fuel consumption, in this instance, is high because of the different leaning schedules for 57% BHP and 67% BHP. The correct answer, 11.7 GPH, is found by using the interpolated brake horsepower, 62%, and looking up the fuel consumption in Figure 5-1.

Note

By scanning the particular Cruise Performance table in use, the appropriate fuel consumption can usually be found without the need to reference Figure 5-1.

Brake Horsepower (BHP) And Fuel Consumption

%HP	GPH		%HP	GPH		%HP	GPH		%HP	GPH
40	7.6		51	9.6		62	11.7		73	15.7
41	7.8		52	9.8		63	11.9		74	15.9
42	7.9		53	10.0		64	12.1		75	16.2
43	8.1		54	10.2		65	14.0		76	16.4
44	8.3		55	10.4		66	14.2		77	16.6
45	8.5		56	10.6		67	14.4		78	16.8
46	8.4		57	10.8		68	14.6		79	17.0
47	8.9		58	11.0		69	14.9		80	17.2
48	9.1		59	11.2		70	15.1		81	17.4
49	9.3		60	11.3		71	15.3		82	17.7
50	9.5		61	11.5		72	15.5		83	17.9

Figure 5-1

Cruise Performance Tables

• NOTE •

Numbers shown in bold are outside recommended cruise horsepower limits and are included for interpolation purposes only.

Cruise Performance Sea Level

		0ºF		59ºF		99ºF	
RPM	MP	%HP	GPH	%HP	GPH	%HP	GPH
2700	25	89	19.3	85	18.2	82	17.7
	24	85	18.3	80	17.2	77	16.6
2500	26	84	18.1	80	17.2	77	16.6
	25	80	17.2	76	16.4	73	15.7
	24	76	16.4	71	15.3	69	14.9
2300	28	80	17.2	76	16.4	73	15.7
	27	76	16.4	72	15.5	67	14.9
	26	72	15.5	68	14.6	66	14.2
	25	69	14.9	65	14.0	62	11.7
	24	65	14.0	61	11.5	59	11.2

Figure 5-2

Cruise Performance 2,000 Feet

		-7ºF		52ºF		91ºF	
RPM	MP	%HP	GPH	%HP	GPH	%HP	GPH
2700	23	**83**	**17.9**	78	16.8	75	16.2
	22	79	17.0	74	15.9	72	15.5
	21	73	15.7	69	14.9	67	14.4
	20	69	14.9	65	14.0	62	11.7
	19	64	12.1	60	11.3	58	11.0
	18	59	11.2	55	10.4	53	10.0
2500	25	83	17.9	77	16.6	75	16.2
	24	78	16.8	74	15.9	71	15.3
	23	73	15.7	69	14.9	67	14.4
	22	69	14.9	65	14.0	62	11.7
	21	65	14.0	61	11.5	59	11.2
	20	60	11.3	57	10.8	55	10.4
2300	25	71	15.3	66	14.2	64	12.1
	24	67	14.4	63	11.9	60	11.3
	23	63	11.9	59	11.2	57	10.8
	22	59	11.2	56	10.6	53	10.0
	21	56	10.6	53	10.0	51	9.6
	20	52	9.8	49	9.3	47	8.9

Figure 5-3

Section 6 - Weight and Balance

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Note

The empty weight, center of gravity and equipment list for the airplane is contained in this section. The use of this section is valid for use with the airplane identified below.

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Section 7 - Airplane & Systems

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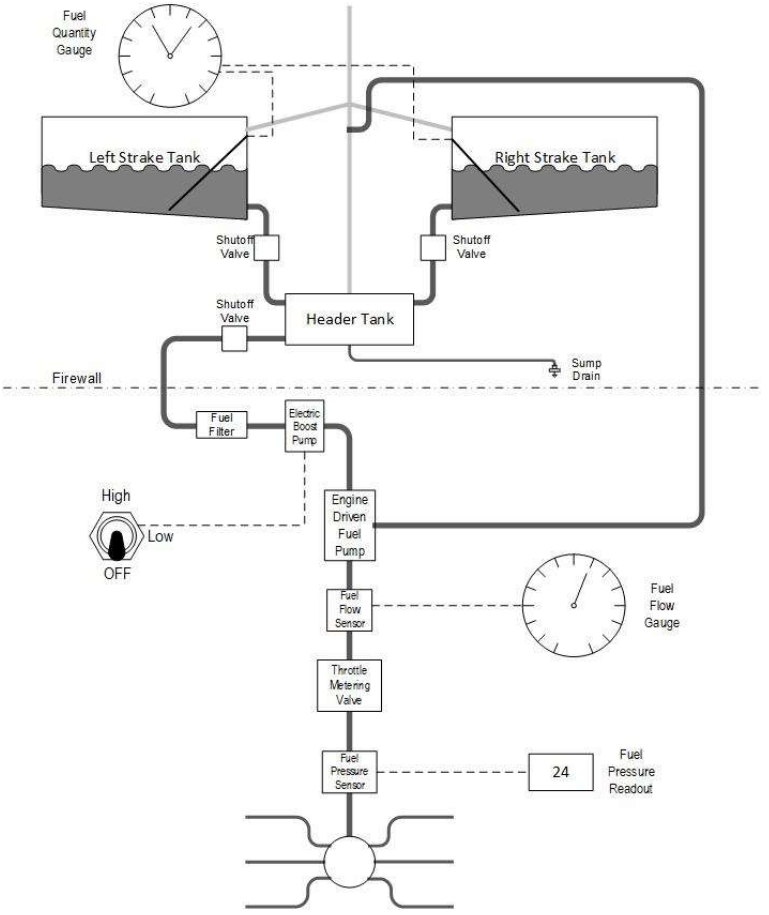
the tank is maintained through a vent line from each wing tank. Fuel, from each wing tank, gravity feeds through strainers to the sump tank.

A dual-reading fuel-quantity indicator is located on the PFD Fuel system venting is Essential to system operation. Blockage of the system will result in decreasing fuel flow and eventual engine fuel starvation and stoppage. Venting is accomplished independently from each tank by a vent line leading to a central vent line mounted just forward of the firewall.

Fuel System Schematic



A drain valve at the system low point at the bottom of the sump tank allows draining the system for maintenance and for examination of fuel in the system for contamination and grade. The fuel must be sampled prior to each flight. A sampler cup is provided to drain a small amount of fuel from the sump drain. If takeoff weight limitations for the next flight permit, the fuel tanks should be filled after each flight to prevent condensation.

Fuel Quantity Indicator

A dual reading fuel quantity indicator locator can be found on the PFD. The LEFT pointer indicates left tank fuel quantity and sweeps a scale marked from 0 to 41 U.S. gallons. The RIGHT pointer sweeps an identical scale for the right tank. Each scale is marked with a yellow arc from 8 to 15 U.S. gallons and a red arc from 0 to 8 gallons. The indicators are calibrated to read '0' when no usable fuel remains.
The fuel quantity indications are derived from capacitive type fuel-level sensors installed in each main tank

Boost Pump Switch

Boost pump operation and engine prime is controlled through the Fuel Pump HIGH-LOW switch located on the Left Lower Switch Panel. A two-speed prime allows the fuel pressure to rapidly achieve proper starting pressure. For engine starting, Selecting the HIGH position causes the boost pump to operate at high speed until the fuel pressure reaches 2-4 psi. When the fuel pressure reaches the 2-4 psi range, the switch should be moved to the OFF position.
Selecting LOW energizes the boost pump in low-speed mode to deliver a continuous 4-6 psi boost to the fuel flow for vapor suppression in a hot fuel condition.

Brake System

The main wheels have hydraulically operated, single-disc type brakes, individually activated by floor mounted toe pedals at both pilot stations.

A parking brake mechanism holds induced hydraulic pressure on the disc brakes for parking.

The brake system consists of a master cylinder for each rudder pedal, a hydraulic fluid reservoir, a parking brake valve, a single disc brake assembly on each main landing gear wheel, and associated hydraulic plumbing. Braking pressure is initiated by depressing the top half of a rudder pedal (toe brake). The brakes are plumbed so that depressing either the pilot's or copilot's left or right toe brake will apply the respective (left or right) main wheel brake. The reservoir is serviced with Mil-H-5606 hydraulic fluid. Brake system malfunction or impending

brake failure may be indicated by a gradual decrease in braking action after brake application, noisy or dragging brakes, soft or spongy pedals, excessive travel, and/or weak braking action. Should any of these symptoms occur, immediate maintenance is required. If, during taxi or landing roll, braking action decreases, let up on the toe brakes and then reapply the brakes with heavy pressure. If the brakes are spongy or pedal travel increases, pumping the pedals may build braking pressure.

Parking Brake

• Caution •

Do not pull the PARK BRAKE knob in flight. If a landing is made with the parking brake valve set, the brakes pedals will be prevented from applying any pressure to the brake discs after touchdown.

The main wheel brakes are set for parking by using the PARK BRAKE level on the lower edge of the left instrument panel. Brake lines from the toe brakes to the main wheel brake calipers are plumbed through a parking brake valve. For normal operation, the lever is pushed in. With the lever pushed in, poppets in the valve are mechanically held open allowing normal brake operation. When the handle is pulled out, the parking brake valve holds applied brake pressure, locking the brakes. To apply the parking brake, set the brakes with the rudder-pedal toe brakes, and then pull the PARK BRAKE Lever aft.

Electrical System

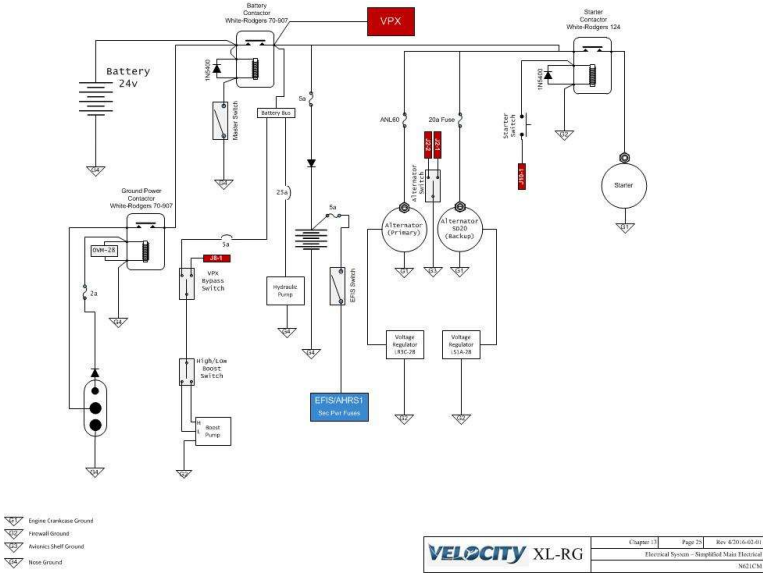


Figure 7-13
Electrical System Schematic

The airplane is equipped with a two-alternator, two-battery, 28-volt direct current (VDC) electrical system designed to reduce the risk of electrical system faults. The system provides uninterrupted power for avionics, flight instrumentation, lighting, and other electrically operated and controlled systems during normal operation.

Power Generation

Primary power for The Velocity XL-RG is supplied by a 28-VDC, negative-ground electrical system. The electrical power generation system consists of two alternators controlled by a Vertical Power VP-X Power Distribution Unit mounted on the right side of the avionics shelf behind the instrument panel. Starting and reserve power is provided by a single Gill 24v

battery and the pilot side EFIS and AHRS have a backup 5ah battery for preflight and emergency power.

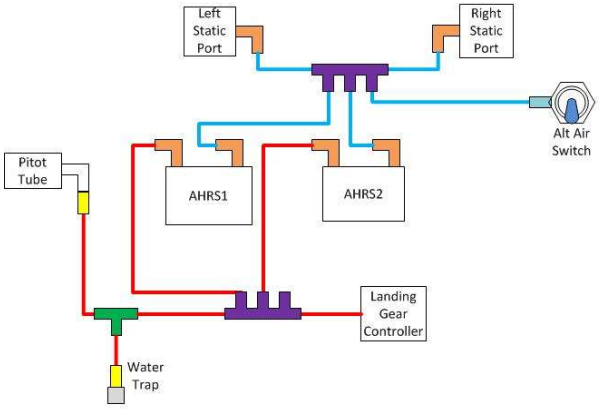
The primary alternator is a gear-driven, internally rectified, 50-amp alternator mounted on the left rear of the engine. The secondary alternator is a gear-driven, internally rectified, 20-amp alternator mounted on the accessory pad at the front of the engine. The primary alternator is regulated to 28 volts and the secondary alternator is regulated to 28.75 volts. The output from both alternators is connected to the Main Bus to the VP-X through a 60-amp and 20-amp fuse respectively. Both alternators are selfexciting (not self-starting) and require battery voltage for field excitation in order to start up - for this reason, the batteries should not be turned off in flight.
The primary battery is an aviation grade 12-cell, lead-acid, 24-volt, 10-amp-hour battery mounted on the right firewall. It is charged from the Main Distribution Bus. The secondary battery is composed of two 12-volt, 5-amp-hour, sealed, lead-acid batteries connected in series to provide 24 volts.
It is charged from the Main Distribution Bus.

The VP-X controls both alternators, starter, landing light, avionics and lighting. Alternator regulation, overvoltage and overcurrent protection is controlled by independent voltage regulators. Hydraulic power and electric boost pump power is available through traditional circuit breakers on the right lower panel.

During normal operation, the primary alternator provides all power. In the event of a primary alternator failure, the alternator switch in the overhead panel can be used to select the secondary alternator.

Power Distribution

The power distribution system for The Velocity XL-RG consists of a Vertical Power VP-X which provides circuit protection for most of the systems in the aircraft. The hydraulic pump is powered through a traditional bus and circuit breaker. The electric fuel boost pump can be powered through the VPX or through a mechanical circuit breaker by means of a switch on



Pitot-Static System Schematic

Pitot-Static System

The Pitot-Static system consists of a single heated Pitot tube mounted under the canard on the left side of the fuselage and dual static ports mounted on each side of the fuselage under the canard.

The Pitot heat is pilot controlled through a panel-mounted switch. An internally mounted alternate static pressure source provides backup static pressure should that the primary static source becomes blocked. A water trap with drain is located below the Pitot tube to collect any moisture that enters the system. The trap should be drained at the annual inspection and when water in the system is known or suspected.

Pitot Heat Switch

The heated Pitot system consists of a heating element in the pitot tube, a toggle switch labeled PITOT HEAT, and associated wiring. The switch is located on the left lower switch panel.

Section 8 - **Handling, Servicing, Maintenance**

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Introduction

This section provides general guidelines for handling, servicing and maintaining the Velocity XL-RG. In order to ensure continued safe and efficient operation of your airplane, keep in contact with Velocity factory to obtain the latest information pertaining to your aircraft.

Airplane Records and Certificates

The Federal Aviation Administration (FAA) requires that certain data, certificates, and licenses be displayed or carried aboard the airplane at all times. Additionally, other documents must be made available upon request. The mnemonic acronym “ARROW” is often used to help remember the required documents.

Required Documents		Note
A	Airworthiness Certificate	Must be displayed at all times
R	Registration Certificate	Must be in the aircraft for all operations.
R	Radio Station License	Required only for flight operations outside the United States
O	Operating Limitations and Instructions	Operating Limitations must be in aircraft for all flight operations
W	Weight & Balance Data	Current Weight & Balance must be in aircraft for all flight operations

Other Documents	Note
Aircraft Logbook	Must be made available upon request.
Engine Logbook	Must be made available upon request.
Pilot's Checklist	Available in cockpit at all times.

Airworthiness Directives

There are no applicable Airworthiness Directives for this aircraft.

Airplane Inspection Periods

FAR 91.409 requires that all aircraft must undergo an annual condition inspection meeting the requirements of FAR 43. Annual condition inspections are based upon calendar months and are due on the last day of the twelfth month following the last annual inspection. For example: If an annual inspection were performed on 19 November 1998, the next annual inspection will be due 30 November 1999. Annual inspections must be accomplished regardless of the number of hours flown the previous year and can only be performed by a licensed Airframe and Powerplant (A&P) mechanic or the holder of the repairman's certificate for the specific aircraft.

Maintenance

Since the Velocity is classified as an experimental aircraft, the owner can perform any required maintenance. The person who performs the maintenance must also complete the appropriate logbook entries.

• NOTE •

The owner should have the ability and manual procedures for the work to be accomplished.

• Caution •

Do not use unapproved lubricants. Unapproved lubricants may damage control system components, including but not limited to engine and flight controls.

Logbook Entry

After any work is performed, appropriate logbook entries must be made. Logbook entries should contain

- The date the work was accomplished.
- Description of the work.
- Number of hours on the aircraft.
- The certificate number of the individual performing the work.
- Signature of the individual performing the work.

Logbooks should be complete and up to date.

Ground Handling

Application of External Power

A ground service receptacle, located in the forward nose gear well, permits the use of an external power source for cold weather starting and maintenance procedures.

• WARNING •

If external power will be used to start engine, keep yourself, others, and power unit cables well clear of the propeller rotation plane.

To apply external power to the airplane:

• Caution •

Do not use external power to start the airplane with a 'dead' battery or to charge a dead or weak battery in the airplane. The battery must be removed from the airplane and battery maintenance performed in accordance with the appropriate Airplane Maintenance Manual procedures.

1. Ensure that external power source is regulated to 28 VDC.
2. Check MASTER and AVIONICS power switches are 'off.'
3. Plug external power source into the receptacle.
4. Set the MASTER switch to ON. 28 VDC from the external power unit will energize the main distribution bus. The airplane may now be started or electrical equipment operated.
5. If avionics are required, set AVIONICS power switch ON.

• Caution •

If maintenance on avionics systems is to be performed, it is recommended that external power be used. Do not start or crank the engine with the AVIONICS power switch 'on.'

To remove external power from airplane:

1. If battery power is no longer required, set MASTER switch 'off.'
2. Pull external power source plug.

Towing

The airplane may be moved on the ground by the use of the nose wheel steering bar that is stowed in the rear baggage compartment or by power equipment that will not damage or excessively strain the nose gear assembly. The steering bar is engaged by inserting it into lugs just forward of the nose wheel.

• Caution •

If the airplane is to be towed by vehicle, be aware that the Velocity is very light on the nose compared to other aircraft. Insure there is sufficient weight on the nose to prevent prop damage should the nose come off the ground.

Having someone sit in the front seat will place enough weight on the nosewheel during towing.

Section 9 - Supplements

This section of the handbook contains FAA Approved Supplements necessary to safely and to efficiently operate The Velocity XL-RG when equipped with optional systems or equipment not provided with the standard airplane or for special operations or not included in the handbook. Basically, supplements are mini-handbooks and will contain data corresponding to most sections of the handbook. Data in a supplement adds to, supersedes, or replaces similar data in the basic handbook.

A Log of Supplements page immediately follows this page and precedes Supplements produced for this airplane.

The Log of Supplements page can be utilized as a “Table of Contents” for this section. In the event the airplane is modified, it is the owners responsibility to assure that the proper supplement, if applicable, is installed in the handbook and the supplement is properly recorded on the Log of Supplements page.

Log of Supplements

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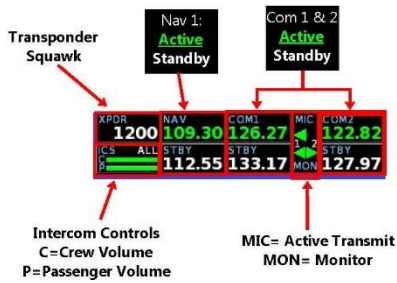
Remote Avionics Control

To save panel space, the HXr can control several models of remotely-mounted radios, transponders and intercoms. The example at right has a single nav radio, dual com radios, a transponder, and four-place intercom. The Avionics Inset window may have more or less information than depicted here; it depends on the remote equipment installed in your aircraft.



To Control A Remote Device:

1. Press the topmost vertical softkey to scroll the green cursor box through the Avionics Inset until the device you want to control is highlighted.

2. The control labels for the highlighted device appear next to the applicable vertical softkeys and the Upper Knob.

• Note •

Press and hold topmost vertical softkey to toggle between COM 1 and Transponder insets.

Section 10 - Safety Information

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