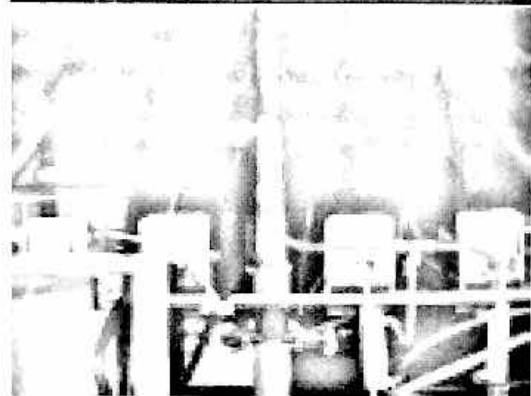


Pilot's Operating Handbook



Airframe S-12XL Airaile Serial No.
Engine Rotax 912UL-2 Serial No.
Propeller Warp Drive 3 Blade Composite Serial No.
Intercom PS-Engineering PM501 Serial No.
ELT Ameri-King AK450 Serial No.
Fire Suppression H3R Inc. Right-Outtm 14oz Halon Serial No.

SPECIFICATIONS		Cockpit Width	41 in	Useful Load	490 lbs	Oil Capacity	3.0 qts	PERFORMANCE 0' MSL		Stall Flaps	37 mph
Wing Span	31.0 ft	Number of Seats	2	Wing Loading	7.2 lbs	Coolant Capacity	4.4 qts	Take Off Roll	285 ft	Roll Rate	70deg./sec
Area	152 sq ft	Landing Gear	Fixed Tricycle	Power Loading	13.75 lbs	Propeller Diameter	72 in	Rate of Climb	900 fpm	Glide Ratio	7:1
Mean Chord	4 ft 10.5 in	Fuel Capacity	18 gal US	Limit Load Factors	+4 -2	Prop Type	Composite 3 blade	Service Ceiling	14,000' ft	Landing Roll	200 ft
Aspect Ratio	6.33:1	WEIGHTS AND LOADINGS		POWER PLANT		Gear Reduction	1:2.27	Cruise	75 mph	Endurance	4.4 hrs
Length	20 ft 6 in	Gross Weight	1100 lbs	Engine	Rotax 912 UL 2	Fuel G.P.H.	4.1 gal @ 80%	VNE	100 mph	Range	374 miles
Height	93 in	Empty Weight	610 lbs	Output	80 hp			Stall Clean	42 mph		

Revision Release Codes

- 001 Preliminary Issue of POH, issued October 27, 1999 after completion of the FAA airworthiness inspection
- 002 Issued after 5 hours test flight time
- 003 Issued on November 16th, 1999 after completion of test pilot's full testing phase. This issue is for the most part complete and contains typographical errors as well as content omissions. The next release of the POH should be a practical final release.
- 004 Issued January 3rd, 2000 after the test pilot had a hard landing resulting from a full flaps high angle climbout with a (simulated) engine failure. This was an effort to expand the operational flight envelop of the airplane and resulted in at least one data point OUTSIDE the airspeed/altitude envelope. New notes added to the procedures section regarding short field and rough field operations.
- 005 Issued February 23rd, 2000 with a checklist reflecting the condition inspection and updated maintenance procedures and intervals. There are also changes to the content grammar, readability and flow. Charts have been included electronically (as opposed to 'cut and paste' after printing out the document). This version will be updated again to reflect content changes to the condition inspection about to be carried out on the plane and to finalize the handbook for grammar, readability and content.
- 006 Issued March 12, 2000 Includes an updated cruise checklist and procedure because of an incident whereby the fuel was not properly feeding from both tanks during cross country flight. Reflects updates as necessary from the 100 hour inspection conducted in March.
- 007 Issued ??,2000 Minor typographical fixes included.

Table of Contents

Chapter 1. Familiarization	Page 3
Learn the basic configuration and behavior of the airplane as well as the most important operating rules regarding operation of a homebuilt experimental aircraft.	
Chapter 2. Aircraft Performance	Page 4
Overview of the performance limitations such as maximum suggested crosswind, short field takeoff distances, best angle and rate of climb configurations, and suggestions as to how and when to use such configurations.	
Chapter 3. Standard Procedures	Page 6
Learn the piloting procedures for almost any situation such as soft field takeoff procedures, how to start the engine, performing chandelles, etc. Includes	
Chapter 4. Weight and Balance	Page 11
Current weight and balance data of the aircraft including techniques and charts to calculate the loading of the aircraft prior to takeoff.	
Chapter 5. Airframe Maintenance	Page 12
Learn the philosophy and procedures for maintaining the airframe, who can perform maintenance on the airframe and how often it should be done. Though not comprehensive, this chapter highlights most of the important inspection points. Full, detailed inspection procedures can only be developed over time and by a qualified mechanic.	
Chapter 6. Powerplant Maintenance	Page 14
Learn the fundamentals of engine maintenance. Reference to the engine manufacturer's (Rotax) documentation is highly recommended. Full, detailed inspection procedures can only be developed over time by a qualified engine mechanic.	
Appendix A. FAA Issued Operating Limitations	Page 15
Appendix B. Manufacturer Index	Page 16
Appendix C. Pre-flight and In-flight Checklists	Page 17
Appendix D. Reference Condition Inspection Checklist	Page 19
Appendix E. Placards	Page 21
Appendix F. Maintenance tools, equipment and supplies	Page 22

Chapter 1 Familiarization

The White/Rans S-12 is a two place, high wing pusher design of low weight and moderate horsepower. Additionally the design has a below average lift to drag ratio due mostly to the large thick wing. The stability of this design configuration is very high. There are no significant divergent tendencies within the operational envelope of flight.

The aircraft kit was manufactured by Rans Aircraft in Hays, Kansas. In its kit form, the airplane came with all welding and sophisticated fabrication completed. The majority of the amateur build requirements are satisfied by drilling holes in components, making the finish cuts on lengths of tubing, running wiring, hoses, etc. and assembling the pre-manufactured sub-assemblies into the completed aircraft. All told, the number of hours spent on the amateur build portion of this aircraft mounted to over 750.

This aircraft does not meet FAR §103.1 and thus does not qualify as an "ultralight" but instead according to FAR §21.175, and an experimental (special) airworthiness certificate must be issued for this amateur-built aircraft. FAR §21.191 A private or recreational pilots license is required to fly this airplane. Because this particular aircraft is not equipped with lights, night flying is prohibited; and because no transponder or communication radio is installed, entry into tower controlled airspace is prohibited. If you need another reason not to fly into weather or other limited visibility conditions, the un-certificated Rotax 912 engine on this aircraft is restricted to daytime VFR use only. For these reasons, flight into instrument meteorological conditions with this aircraft is **STRICTLY PROHIBITED**. There is an emergency locator transmitter on-board the aircraft capable of transmitting voice and also can be easily removed from the aircraft for portable operation should the survivors need to leave the crash site. Also, this aircraft is prohibited from carrying passengers for compensation or hire and that does include buying the pilot lunch and a motel at your destination.

In-flight behavior of the aircraft is very similar to other high wing designs such as the Cessna 172 with the exception that the S-12 has a considerably higher power to weight ratio (for increased climb and acceleration performance) and a higher drag to weight ratio (when you loose power, the aircraft has very little momentum and drag slows it down **IMMEDIATELY**). The pusher prop is located above the centerline of the airframe and compared to other more traditional aircraft such as a 172, creates a significant nose-down moment with the addition of power and conversely a nose-up moment with the reduction of power. This tendency is highest for example at the time of a missed-approach. The unwary pilot, adding full power from an idle power setting at very low altitude and low airspeed will notice a very high stick force required to keep the nose in a climb attitude.

This airplane is quite capable of short field operations. Take-off distances of less than 300 feet with full flaps, 1 pilot, and a 10kt headwind are possible. Likewise short landing distances are equally possible but difficult due to minimal braking power provided by the aircraft's inefficient hydraulic braking system. Rough and soft field operations are possible but should be avoided where possible due to the fragile nature of the aircraft. The nosegear of this airplane is particularly susceptible to damage when mis-treated.

Intentional spins are prohibited in this aircraft. However, even a low time pilot will be able to recover easily from stalls and avoid departures. Stalls are marked with a gentle drop of the nose or in the case of power-on climbing banked stalls, the high wing will in fact drop (provided no pilot rudder input is used). A power on stall with only the pilot on board may be hard to recognize and in fact may never occur. The aircraft is not intended for aerobatics of any nature which would intentionally exceed 2G's positive loading (4G design limit) and while the structure is designed to ultimately sustain 2G's negative loading, it is recommended to avoid negative loading of any nature due to fuel starvation problems with the gravity fed fuel system.

In general, maintenance of the aircraft is focused on the powerplant (coolant, oil and other consumables) and the fabric sails. Loosing an engine or a big patch of your wing fabric is just about the most likely and serious threat to your well-being. The sails are coated with a UV resistant clear which extends their life from 350 exposure hours to approximately twice that. In any case, the sails should be treated with care; frequent detailed inspections will avoid any catastrophic failures. Other obvious failures are equally as important such as cracking of structural members, fatigued aluminum, missing rivets, loose bolts and elongated holes. Maintenance of the aircraft should only be performed by the designated repairman Jim White, but by regulation can be performed by virtually anyone. A 12 month condition inspection is a requirement of the airworthiness certificate and can be performed only by the designated repairman or a licensed A&P mechanic. If at any time, a major change is made, a re-inspection by the FAA is necessitated (FAR §21.93). When ownership of the aircraft is transferred, a new repairman certificate will need to be issued through the FAA.

A specific outline of the aircraft's operating limitations, as issued by the FAA at time of inspection, is given in Appendix A and as a requirement must be on-board the aircraft at all times. All pilots should be aware of the FAA issued operating limitations for this amateur built aircraft.

Chapter 2 Aircraft Performance

Overview

Comprehensive performance charts (takeoff distances, rate of climb, etc.) are difficult to develop in 40 hours of flight testing. It is generally not possible within the scope of basic flight testing to experience the meteorological conditions that would allow a test pilot to generate data for all density altitudes. This factor and the general performance of this aircraft lend themselves to one important performance characteristic: log time in the airplane and learn for yourself the maximum performance characteristics if you need to push the envelope. Suggestions of climb performance and take-off and landing distances charted at the end of this chapter are logical estimations given by the test pilot.

Operational Milestones

This aircraft has been flown to 14,000 feet MSL with a single pilot, it has been operated on very short (300 feet), very rough fields (furrowed field), it has flown in 20 to 25 mph winds, it has flown in formation with other aircraft, and it has been flown at gross weight of 1100lbs. Maximum demonstrated crosswind by the test pilot during the certification phase was about 10 knots.

Typical Engine Performance

As for engine performance, it is best to review the Rotax operating manual. This manual does a very good job of informing the pilot with respect to engine performance and engine operating parameters. As a fundamental means to knowing engine limitations, the following apply and were observed during the first 40 hour test period:

RPM: Maximum 5 minutes at full throttle, Maximum 5500 continuous
Oil Temp: Do not takeoff less than 130 F or operate higher than 270 F
Oil Pressure: Typically comes up to 65psi immediately and stays there
CHT: Should be at least 130 F for engine runup and typically below 200 F
Water Temp: Raises to 130 F for runup and typically below 200 F
Water Pressure: Increases to 12 psi and may drop below that in cruise
Fuel Burn: Calculate flight plans with 4.5gph fuel usage and 65mph cruise

An important consideration for engine performance figures is a result of the very effective cooling system of this aircraft. In cold weather it becomes necessary to block off the air inlet to the radiator to keep the engine temperatures in the green. If you notice unusually cool engine operation in flight, the best thing to do is descend to a lower (and warmer) altitude and land when convenient to cover up the radiator inlet.

Takeoff and Landing Distance

In most any case, the runways typically encountered at modern day airports will be far longer than necessary for the S-12, even on a warm day at gross weight. However, the novice pilot should not attempt to operate on low performance days near gross weight with less than 1000 feet of runway. This is a scenario reserved for the pilot who is familiar with the aircraft. If flying solo and reasonably familiar with the airplane, 500 feet of runway (without obstacles) will usually suffice. With 50 foot obstacles in the same conditions, for takeoff or landing, a good pilot should give himself 750 feet of runway. If all conditions are in the pilots favor (pilot skill, sea level, 15mph headwind, solo pilot, smooth runway, no obstacles) then 200 feet of runway can suffice for takeoff and 300 feet for landing. The main reason for increased

landing distance is the lack of braking power.

Figure 2.1 - Take-off and Landing Distance Chart

This take-off/landing distance chart is to be used as a guide for the new pilot. All of these distances are purely estimation (extrapolated from key data points gathered during the testing phase) by the test pilot and should serve as a general reference only. As a pilot of this aircraft, you should be experienced in the plane before trying to fly yourself and a friend into a remote area at high altitudes for an afternoon of hiking. You may find yourself committed to an impos-

Density Altitude	Take-off Weight (lb)	Obstacle Clearance (ft)	Surface Condition	Runway Length (ft)
0	820	0	Asphalt	500
5000	820	0	Asphalt	700
10,000	820	0	Asphalt	1500
0	1100	0	Asphalt	650
5000	1100	0	Asphalt	1000
10,000	1100	0	Asphalt	1900
0	820	50	Grass/Dirt	700
5000	820	50	Grass/Dirt	1000
10,000	820	50	Grass/Dirt	2200
0	1100	50	Grass/Dirt	900
5000	1100	50	Grass/Dirt	1300
10,000	1100	50	Grass/Dirt	2600

For any given condition, allow 10 percent runway distance increase per 1000' density altitude change, allow 40 percent runway increase from smooth to rough conditions, allow 30 percent runway increase from minimum weight to gross weight, allow 8 feet per foot obstacle clearance, allow 2 percent runway distance decrease per knot headwind.

sible landing with not enough performance to execute a go around.

Best Glide and Rate of Climb

As previously mentioned, this data was collected for one set of conditions only and best estimations must be used to extract the data to meaningful numbers at different weights and altitudes. This rate of climb data was collected at a take-off weight of 880lbs at an elevation of 4000MSL with an ambient air temperature of about 55 to 60 degrees Fahrenheit.

As density altitude increases, two factors change the performance characteristics of the aircraft with regard to climb rate:

Engine power output decreases as altitude increases

Propellor efficiency decreases as altitude increases

It is important to understand that both of these effects are additive and will reduce performance to a sub-par level at high altitudes. While testing the service ceiling at around 820 pounds, 6167U was observed to have a 200fpm maximum climb rate at 14,000 indicated altitude. At gross weight and 10,000 density altitude, you may find yourself unable to attain more than a 200 fpm climb.

Figure 2.2 - Power On Rate of Climb Chart

The conclusions reached from the power on rate of climb test data are:

- 1) Best available rate of climb, no flaps, 50mph IAS, 700fpm
- 2) Best available angle of climb, 3 notches, 35mph IAS, 650fpm
- 3) Safest climb (test pilot's recommendation), no flaps, 65mph, 700fpm

Although the true best angle of climb is obtained with full flaps at 35mph indicated, this is not the safest procedure to follow because it is right at the stall speed of the aircraft and engine failure would be difficult to recover from. Only hours of practice and experience will allow

a pilot to make the decision between a climbout over a critical obstacle at 35mph followed

Flaps 0 Notches				Flaps 1 Notch				Flaps 2 Notches				Flaps 3 Notches			
IAS	Climb	Ratio	Angle	IAS	Climb	Ratio	Angle	IAS	Climb	Ratio	Angle	IAS	Climb	Ratio	Angle
35	-	-	-	35	-	-	-	35	800	6.16	9.30	35	625	4.93	11.70
40	600	5.86	9.80	40	700	5.03	11.50	40	680	5.18	11.10	40	600	5.86	9.80
45	680	5.82	9.90	45	700	5.66	10.20	45	750	5.28	10.90	45	620	6.19	9.00
50	760	5.79	9.95	50	700	6.29	9.10	50	620	7.10	8.10	50	700	6.29	9.10
55	750	6.45	8.90	55	650	7.45	7.70	55	620	7.81	7.40	55	-	-	-
60	700	7.54	7.60	60	600	8.80	6.50	60	600	8.80	6.50	60	-	-	-
65	680	8.40	6.80	65	600	9.53	6.00	65	650	8.80	6.50	65	-	-	-
70	620	9.94	5.70	70	-	-	-	70	-	-	-	70	-	-	-
75	600	11.00	5.20	75	-	-	-	75	-	-	-	75	-	-	-
80	425	16.56	3.46	80	-	-	-	80	-	-	-	80	-	-	-

by a safer climb at 50mph. By spending time examining the data from the above chart, an experienced pilot/aerodynamicist can make several very important discoveries regarding the configuration of this airplane, but such a discussion is beyond the scope of a simple POH. It is recommended to simply familiarize yourself with the trends left to right and top to bottom, understand the transitions necessary when retracting or extending the flaps as it relates to climb angle and airspeed (kinetic energy).

In addition to the power-on data, the same chart is given below in the power off configuration to aid the pilot in selecting the best glide speed for engine out emergencies.

Figure 2.3 - Power Off Rate of Climb Chart

The absence of data in this chart reflects the importance of knowing just how fast the airplane can be made to descend. It is highly unlikely that it will glide better with full flaps than in any other configuration so that area of testing was omitted. The most important conclusion from this data is as follows:

1) Best glide no wind conditions, no flaps, 50mph IAS, 5000rpm, 8.1, 6.5 degrees below the horizon

Flaps 0 Notches				Flaps 1 Notch				Flaps 2 Notches				Flaps 3 Notches			
IAS	Climb	Ratio	Angle	IAS	Climb	Ratio	Angle	IAS	Climb	Ratio	Angle	IAS	Climb	Ratio	Angle
35	-	-	-	35	-	-	-	35	-	-	-	35	-	-	-
40	-	-	-	40	-	-	-	40	-	-	-	40	-	-	-
45	-	-	-	45	-	-	-	45	-	-	-	45	-	-	-
50	500	8.80	6.50	50	550	8.00	7.20	50	-	-	-	50	-	-	-
55	700	6.91	8.30	55	620	7.81	7.36	55	-	-	-	55	-	-	-
60	800	6.60	8.70	60	650	8.12	7.10	60	900	6.35	9.80	60	-	-	-
65	800	7.15	8.00	65	900	6.35	9.10	65	900	5.86	9.10	65	-	-	-
70	-	-	-	70	1000	6.16	9.30	70	-	-	-	70	-	-	-
75	1100	6.00	9.60	75	-	-	-	75	-	-	-	75	-	-	-
80	1400	5.02	11.50	80	1500	4.69	12.30	80	-	-	-	80	-	-	-

Chapter 3 Standard Procedures

Overview

This chapter is by far the most detailed of the operating handbook and indeed is the primary reason for having a handbook for the aircraft. The test pilot has spent many hours flying the airplane and has presented here the most refined, safest, and preferred procedures for most all flight situations. All of the procedures herein should be reviewed by a pilot new to the aircraft in order to gain familiarization with the philosophy and methods of flying 6167U. At the same time, realize that everything in the handbook is subject to criticism and the test pilot's operating procedures are no exception.

Starting the Engine

When starting a cold engine, it is of utmost importance to avoid running the motor at very low RPM until it has warmed up. This is because it runs very rough. To start the engine when it is cold, begin with the throttle at idle and the starting carburetor activated. The starting carburetor is the more appropriate name given, by Rotax, to the choke. Engage the starter until the engine starts and immediately begin monitoring the engine instruments. Oil pressure may jump to as much as 100psi for as long as 10 seconds, but as the engine warms up slightly, the oil pressure will return to normal. It is important to never engage the starter for more than 10 seconds continuously and to give it a 1 minute rest period between every 10 seconds, to prevent over-stressing the starter components. After the engine starts, push the throttle open until the engine runs at about 2500 RPM and at this point go ahead and close the starting carburetor (close the choke). This should bring the RPM back to around 2000. In any case it will require a little 'artistry' on behalf of the pilot to get a stubborn engine to idle when cold. The starting carburetor sends a specific fuel air mixture to the engine which lets it run when cold, it is only set for a condition of throttle at idle. After starting the motor, if you close the choke before increasing the throttle, the engine may sputter or die, which is why after a brief period of running the motor with the choke on, you increase throttle to 2500RPM and then turn off the choke. To warm up the engine, set the RPM to 2000 for at least 2 minutes and then increase to 2500RPM until oil temperature reaches at least 120 F. Now it is possible to continue with the run-up procedure to check engine ignition.

If you observe that there is no fuel in the fuel filter, it is best to crank the engine with the ignition OFF until you see the filter fill at least halfway and then continue for a few seconds (do not crank for more than 10 seconds without a break). This condition will occur after you change the fuel filter and also if you inadvertently run the engine with the fuel valve turned off. Cranking the engine with the ignition off will load the supply side of the fuel system with fuel and when you finally start the motor, it will not sputter for lack of fuel, which is something that should be avoided if possible. It is important to note that the engine will run perfectly and the pilot may observe the fuel filter only half full, this is normal.

Engine Run-up

After the engine instruments are in the green and when you are sure the area is clear, set the parking brake and begin the run-up procedure. Increase RPM slowly to 3750 and sequentially turn off and then back on each of the ignition switches. Running the engine on one ignition circuit only will drop the RPM by about 200. There should be a maximum drop of 300 RPM and a difference between the two ignition systems of no more than 115 RPM. It will likely be best to judge the behavior of this check mostly by listening to the motor. After the

check, return the throttle to idle. Each of the 4 cylinders in the engine has 2 spark plugs. One ignition circuit controls one spark plug in each cylinder. Two ignition systems increase the efficiency of the combustion (as evidenced by an RPM drop when you turn off one ignition switch) and secondarily provide a redundancy feature that if one circuit should fail, there is a second system to provide adequate power to land the airplane.

Using the Parking Brake Valve

The parking brake valve, if closed while the brakes are held on, will maintain better stopping power than using the brakes alone. This is because most of the hydraulic energy lost in this particular brake system is due to the flexure of the plastic brake line. While holding the brakes on hard, switch the valve to the closed position and release the brakes with your feet. Now the length of brake line holding hydraulic pressure is cut approximately in half, increasing stopping power. This technique should be employed for short field takeoffs and landings where stopping power is critical. It is also recommended for run-up procedure when checking magneto operation (the engine generates an enormous amount of thrust at mag-check RPM of 3750). Although when the valve is closed, it does allow you to apply brakes, it is recommended to hold the brakes on, then close the valve. Due to the ease with which the parking brake valve can be closed and open, it must remain an item on all checklists. It is not wise to takeoff or land when the valve is closed. When taxiing, use the brakes as little as possible and avoid using them lightly for extended periods, it is better to brake hard for a short period than to ride them lightly. If the situation ever becomes critical, cut the engine power and as soon as the aircraft is slow enough, put the airplane off the runway on the grass, there the rolling resistance is greatly increased.

High Wind Taxi Methods

Taxiing in high winds and operating on the runway with high crosswinds is no laughing matter. This is a very light aircraft and can be quite easily tipped over or thrown about by wind. Taxi with the utmost care in control orientation and always fly with authority and decisiveness when in high crosswinds. Once the airplane starts to tip over there is little you can do to stop it. If necessary, treat low wind or no wind days like high wind days. If you create the habit of continuously correcting for wind on the ground, you will likely be much safer when the winds do come. Take the time to create a chart for yourself showing control orientation for each type of cross wind (quartering from the front, quartering from the rear, head on, tail wind, direct crosswind). Remember that wind blowing backwards across the control surfaces (quartering tailwind) causes them to work in reverse of what they normally do.

Take-Off Overview

For take-off it is important for you to remember a few things. First of all, if you lose power in a high angle climb with full flaps or even 2 notches of flaps, you will have to IMMEDIATELY put in a large amount of nose down control inputs to maintain airspeed. It is easy to hesitate for a second or two and in this time your airplane can go from 70mph to 30mph. Second of all, you should treat the nose gear gently. Use a generous amount of elevator control to get the weight off the nosewheel as soon as possible, this also keeps the wheel from spinning any faster than necessary and minimizes vibration. The nose will come off the ground at 35mph with full throttle; with the throttle at idle, it is possible to hold the nose up at 25 to 30mph. This also keeps the rotational speed down for the large front wheel which is not in perfect balance. In high crosswind operations, you may have to compromise a bit and keep some weight on the nose for steering until you attain enough airspeed to keep the plane aligned with the runway.

Take-Off Procedure

Be sure your take-off checklist is complete, add power smoothly and hold a large amount of back stick until you feel the nosewheel come off the ground. Keep reducing back pressure as the airspeed increases so that the nosewheel remains 4-5 inches off the ground. If you keep the nosewheel off the ground you will be able to easily feel when the plane is ready to fly. Be careful not to pull up too hard and scrape the tail skid on the ground. Climb the first 50 or 100 feet at 65mph unless you need to clear an obstacle, in which case use the best angle of climb speed. After reaching 150 feet, ease out the flaps (if used) and continue the climb to your cruise altitude. Always observe the maximum flap extension speed on takeoff and landing. If the flap lever is difficult to pull, it is because there is too much wind pressure on the flaps. Push the nose over and reduce the throttle to cruise. When adjusting the power setting, do so in a slow and even manner. If you treat the engine with respect, it will respond when you ask it to. However if you rev the motor recklessly with rapid and erratic power settings, it will likely develop abnormal wear qualities.

Just As You Leave the Ground

As soon as you are off the ground, tap the brakes and stop the mains from spinning, you may notice a considerable amount of shaking if they are spinning fast. Liftoff speed at gross weight and two notches of flaps is approximately 40mph indicated airspeed. Continue your climb at V_x or V_y as required.

Engine/Throttle Usage

The airplane can be held in a climb attitude at full power setting for as long as 5 minutes. After this period of time you should allow for a short rest period or reduce the power of your climb. The engine is not meant to run at full power indefinitely. Also, if you are in a prolonged decent it is wise to periodically add power for a few seconds to clear the motor of excessive fuel build-up and provide a chance for increased circulation of fluids. Be particularly careful after idling the engine for a minute or so on final approach and then adding power for a go-around, give the engine a moment to respond to the first 1/4" of throttle input. Another important aspect of the aircraft is its excess power. With the exception of steep climbs, no matter what attitude the airplane is in, it is possible to quickly exceed 75mph. The throttle in this aircraft becomes just as important as any of the other controls when maneuvering and typically the airplane responds very rapidly to throttle inputs.

Cowl Flaps

This airplane does not have cowl flaps but there is something to be said on this subject. After the initial flight test period and when the weather turned cold, the typical in flight engine parameters started running too low. This is because of the highly effective radiator and the exposed mounting configuration of the engine. If the aircraft is operated in cold weather, the radiator inlet should be blocked either partially or completely. A completely blocked radiator inlet in operational weather of 30 degrees F will yield engine temperatures that are on the verge of too cool. If you discover the engine running too cool (out of the green) in flight, descend to a lower altitude and continue to the nearest point where you can land to cover up the inlet to the radiator. Running the engine at low temperatures is not healthy.

Rudder Usage

The rudder is trimmed for most normal flight conditions, however in a low airspeed high power setting configuration, the aircraft will require a little more right rudder pressure. In

power-off descents, the aircraft will require a slight amount of left rudder. These tendencies are a result of the required aerodynamic right rudder trim which is set for a condition of level un-accelerated flight. The pusher prop, rotating counter-clockwise with respect to the longitudinal axis of the aircraft, is generally located above the vertical tail surfaces and as such the prop wash hits the left side of the vertical tail causing a nose-left tendency. Corrected in normal flight with right rudder trim, when the power is cut to idle there is an excess of right rudder moment and the pilot must use left rudder to fly straight.

Landing Overview

To land this aircraft it is important to remember that it has very little momentum (low gross weight) and a relatively large amount of drag (big wing). If you are doing an approach with full flaps and no power, the decent angle will probably exceed 25 degrees and the flare should occur at no more than one and a half feet above the surface. Why? Because if you flare early, the airplane will slow down drastically and settle rather abruptly on to the runway. If you don't like steep approaches and practically non-existent flares, then don't use flaps, keep in just a little power, and if you want a nice gentle and long flare, round out at about 5 feet and add power at the same time to around 3000 RPM. This is enough power to keep you from slowing down too much and gives you some time to allow the airplane to settle gently onto the runway by ever so slightly reducing the power setting and lowering the nose.

Powered Flare Approach

If you are doing the powered flare landing, you should touch down on the main gear with some power (2500 RPM) and once you do, reduce the power to idle and immediately reduce a little back pressure. Remember, the more power you have the more tendency for the airplane to pitch nose down. Even though you are cooking along at 40mph with 2500RPM and you can't hardly keep the nose wheel off the ground, when you cut the power the nose will come up immediately but the airplane will not likely lift off. Let the nose settle to the ground slowly and keep a little reserve elevator movement for the last few inches so that you can really touch down softly. If you hold the nose up with full elevator, the airspeed will drop suddenly and so will the nose, with no more up elevator to stop the motion.

Aerodynamic and Mechanical Braking

For maximum braking effect when on short fields, retract the flaps at touchdown to put weight on the mains, keep the nose high for aerodynamic braking thru 35mph, all the while using as much brake pressure as possible without slamming the nose to the ground. When you are under 30mph, it is best to let the nose wheel down and use maximum brake pressure.

Shutting Down the Engine (on the ground and in-flight)

After you land the aircraft and taxi off the runway, you have already provided an adequate cool down rest period for the engine. Normally after touch down, the throttle goes to idle and there is a certain amount of taxing involved. Set the throttle to idle, turn off both ignition circuits simultaneously and allow the propeller to stop. If you ever decide to turn off the engine while in flight, it is necessary to do a 30 second 'cool-down' run at 3000RPM prior to ignition shut off. Cutting the engine ignition when the engine has been running at high temperatures will cause it undue stress. Running the motor at 3000RPM for 30 seconds will circulate water and put the engine into a state of readiness for shut down. Be sure to reduce from 3000RPM to idle prior to turning off the ignition circuits. Follow the appropriate start up procedure for hot or cold start when it is time to re-fire the motor. Be sure to allow sufficient pre-heat time for the engine to warm up if you shut it off during flight in cold weather.

Emergency Procedures, Off Field Emergency Landings

In the case of an engine that will not start in flight, first focus on flying the airplane at the best glide speed of 50mph and aiming for a suitable landing field. This is the best still-air glide speed and essentially is the slowest sink rate. This will maximize your options in gliding to nearby fields and give you the most time to handle the emergency. If you have enough altitude, go through the checklist for engine starting by first observing fuel quantity and the fuel valve. Try a warm engine start first and if that fails, use the choke to start the engine. All the while, do not fail to fly the airplane and under no condition should you ever try to stretch the glide beyond what the aircraft is capable. Many pilots are killed because they are too ignorant to recognize that the airplane is coming down whether they approve or not. Save the stall for the last 1 or 2 feet of altitude if the terrain is very rough. Don't try to stretch a glide over top of power lines, it would be better to dive under them. If you stall and/or spin the aircraft at low altitude, the NTSB accident report will paint an ugly picture of your piloting skills. You should have enough time after committing to an off-field landing to do the following important steps: 1) Secure your seatbelts and 2) Un-latch the doors for a speedy egress from the aircraft. In addition, if you are certain of a serious emergency, do not hesitate to activate the ELT on your way down...there is no reason to wait for it to activate during the impact. Also if there is time it would be good to shut off the main fuel valve, but this is not a requirement.

Cruise Flight Fuel Consumption

Although it will not pose an immediate problem, if one of the fuel caps were not vented correctly you will find that during flight, fuel will feed from one tank only. If both fuel caps are improperly vented and are exposed to low pressure, the engine will likely starve for fuel before making it to the cruise flight situation. It is highly recommended to make estimated calculations regarding fuel usage. NEVER ASSUME that the quantity of fuel indicated in one tank is also in the other tank. If there is any indication of something that isn't quite right, make a cautionary landing as soon as practicable.

Cruise, Climbs and Descents

This airplane was meant to move at 65mph. Essentially everything is done at 65mph. Climb at 65mph, cruise at 65mph and descend at 65mph. As with any aircraft, the technique is to adjust your pitch for airspeed (elevator stick pressure) and adjust your power for the climb/descent rate. An intelligent reader quickly notes that flying this aircraft at 65mph ALL the time results in moderate throttle usage. Just as mentioned previously, the throttle in this aircraft is just as important as any other control. Learn to use it just like you use your feet on the rudders or your hand on the stick. Add power to increase your climb rate, decrease power to increase your descent rate. If you are flying too high, don't just push the stick forward but also reduce the throttle. If you are too low, don't just pull the stick back but also add power. The plane will cruise most comfortably at around 65mph indicated airspeed but cruising at 70, 75 or even 80mph is easy because of the excess power. Respect the yellow range marking on the airspeed indicator because it is there for a purpose. Higher speeds are reserved for only the smoothest of air.

Pitch Trim

There are two forces that trim the aircraft in its pitch attitude: power and elevator/horizontal stabilizer position. Understand that adding power will add a nose down trim to the airplane and reducing power will add a nose up trim to the airplane (remember the thrust line of the engine is above the center of the airplane). Also understand that increasing airspeed adds a

nose up trim and decreasing airspeed adds a nose down trim (due to the decalage settings of the horizontal stabilizer, designed to produce negative lift at cruise airspeeds). The point of this discussion is that the aircraft, by design, will fly approximately level (not climbing or descending) regardless of the power setting. If you are holding forward pressure or back pressure on the airplane to maintain level flight, chances are you have displaced the trim tab or you are at the wrong speed for the power setting. Don't fight the aircraft, allow it to establish an equilibrium before you start to second guess the trim setting.

Add power: the power creates a pitch down moment which increases airspeed. The increased airspeed thus creates a pitch up moment and the aircraft balances at a new higher, cruise speed.

Reduce power: the loss of power creates a pitch up moment which decreases airspeed. The decreased airspeed thus creates a pitch down moment and the aircraft balances at a new, lower, cruise speed.

The balance of these forces will change depending on the location of the center of gravity of the aircraft. Be prepared for unusual (more appropriately 'unfamiliar') behavior when you fly the airplane in different loading conditions. Visualize the dynamics of trim and energy balance while in flight to help you understand the interaction between pitch trim, power settings and airspeed.

Steep Turns

Steep turns (60 degree bank) are an approved maneuver in the S-12 and pose no particular threat with the pilots prior understanding of the aircraft's behavior. Remember that one of the most distinguishing characteristics of this plane is that it has very little momentum because of its low weight. Because of this, it does not have the energy necessary to carry it through a turn. To change the direction of the airplane from straight and level requires acceleration, and acceleration requires energy. In a larger airplane, a slight increase in throttle is enough energy for the turn because a certain amount can be robbed in the form of airspeed, without jeopardizing the safety of the maneuver. In the S-12, the energy to turn is far greater with respect to the stored energy of level flight (momentum) and will rapidly decrease airspeed to the point of a stall. The remedy is to dive rather sharply during the turn or to increase power as you begin banking the airplane. Practice will tell you how much power is required, but for all practical purposes, from a cruise of 65mph, you should imagine adding full power throughout the turn to maintain your altitude. Failure to do so will drop airspeed well below 50mph.

Auto-Steepening Tendency

During the flight testing phase the aircraft was put through nearly every conceivable flight attitude likely to be encountered by the average pilot in most conditions. The plane was not tested for aerobatics and other such maneuvers but during testing, one significant flight mechanics tendency was noticed. After banking into a turn more than about 20 degrees, a certain amount of opposite aileron pressure is required to keep the bank from auto-steepening. This characteristic is due in part to the large wing and low airspeed. In a tight turn at 65mph indicated airspeed, the outside wing is traveling significantly faster than the inside wing and as a result has more lift. The remedy is to use a slight amount of opposite aileron. The effect increases as the radius of the turn decreases (low airspeed steep banks will create the most dramatic tendencies). This can be a dangerous characteristic when flying at low altitudes in gusty winds so be sure to understand the aircraft intimately before taking it to low altitudes.

Power-Off Stalls

Stalls in the Rams S-12 are docile and easy to recover from. Immediately after bring the power to idle, the nose must be aggressively raised to get a stall in the normal attitude. If the nose is not brought up immediately and quickly, even full up elevator will not bring the nose up to the horizon and the plane will stall with a nose low attitude. Either way, recovery from the stall is immediate following reduction of back pressure and the addition of power. There is very little buffeting or any other pre-stall warning. If the airplane is in a coordinated turn (climbing or diving) and the stall occurs rapidly enough, the high wing will drop bringing the aircraft to a level bank attitude when the stall occurs. This behavior is the same when flaps are applied.

Power-On Stalls

Power-on stalls are equally as easy to recover from and require a healthy amount of back stick to perform, especially with only one pilot at lower density altitudes. At low takeoff weights and in high density air, the plane may not stall with full power and could simply mush along at a very nose high attitude. There will be a considerable amount of noise and buffeting of the aircraft and it will require an excessive amount of back pressure to keep the airplane in this near-stall condition, which is instantly recovered from by reducing back stick pressure.

Skid and Slip Stalls

While not intended to be everyday maneuvers, stalls in slip or skid configurations possess no violent tendencies to spin but do require special pilot skill and as such are not recommended in most cases. The S-12 for all practical purposes has shown its ability to recover from such a maneuver and that is about the extent of telling you about it in this manual. Stalls should never be performed intentionally with the plane not in coordinated flight, to do so unknowingly is the first indication of a pilots lack of skill and awareness.

Stall Recovery Procedure

The standard stall recovery procedure is as follows: Stick forward, full power, retract flaps and immediately bring the nose up as airspeed hits 55mph. Stalls will result in no more than 500 feet of altitude lost, with proper piloting skills recoveries of less than 200 feet are common.

Forward Slips

The S-12 seems to behave rather erratically in forward slips and exhibits signs of instability and divergence. For example after depressing the right rudder to get into a slip, the rudder pedal practically keeps itself depressed at low airspeeds, a condition called "overbalance." This airplane is capable of slips and they do allow the pilot to quickly loose altitude but again this is an advanced maneuver for skilled pilots only. The flight instruments are not accurate in a forward slip. Practice slips at a higher altitude and use them only when comfortably above the ground. Do not use slips for the last 500 feet of your decent to land.

The Falling Leaf Maneuver

A falling leaf maneuver can be done by an advanced pilot provided there is sufficient altitude to recover from an unwanted departure (spin). Remember this plane is prohibited for intentional spins and if you are uncomfortable with your ability to keep the plane out of a spin, then don't do a falling leaf. It is a mildly violent maneuver and does cause some significant stress on the airframe, thus should not be a regular maneuver or one that an amateur pilot toys with. Bring the nose up and add a slight amount of power (2500 or 3000RPM), keep the stick nearly full back to keep the plane in a stalled attitude. Use the rudder pedals to maintain directional control by "stabbing" them with your feet. DO NOT push a pedal down and hold it down. If the plane banks left, stab the right rudder and immediately release it, then be prepared for stabbing the left rudder. This maneuver can quickly accelerate into a spin with improper use of the rudders by the pilot. If you lose positive control of the falling leaf maneuver, immediately push the stick forward and recover from the stall. It will take a lot of practice to learn the ability to "predict" which rudder pedal to push and how hard to push it. Falling Leaf is more magical than it is aerodynamically balanced.

Spins and Spin Recovery

While the S-12 is prohibited against intentional spins, it is the test pilot's best recommendation to follow this technique to recover from unintentional spins:

- 1) throttle to idle and let go of the stick (or stick to neutral)
- 2) retract flaps (if extended)
- 3) apply rudder full opposite the direction of yaw
- 4) push the stick forward the amount necessary to unstall the wing
- 5) recover from the dive with no more than a 4G pull-up

Though not tested on N6167U, recovery from an unintentional spin using the above procedure should yield prompt and decisive control of the situation.

Lazy Eights and Chandelles

While they were performed in the flight testing phase, these maneuvers are not recommended in the S-12 until the pilot has had some aerobatic training. The S-12 is a fragile aircraft and for the most part, if you are very aware of airspeeds and G-forces, you can execute some rather enjoyable chandelles and lazy eights. However, a low time pilot with no understanding of aerobatics may be quickly overwhelmed with either maneuver and inadvertently overstress the aircraft. Use common sense when approaching these maneuvers.

Rough Field Operations

The Rans S-12 Aircraft is equipped with what the factory calls "tundra tires". While they do allow the airplane to operate from soft and rough fields, they do not indicate that the airplane is well suited for this type of field. The particular concern with rough fields is the nosewheel. For example, after touchdown on a rough field, it is better to taxi the remaining distance required at 30mph with the nose off the ground than it is to taxi at 5mph with the nose on the ground. It will take only one rough field operation to make the pilot aware of this, there is a great deal of noise coming from the nosegear on rough fields. The rough field procedure begins far before touchdown. Use full flaps to get the slowest touchdown speed and attempt to hold the plane 2 inches off the runway until it settles down. Use as much back pressure as necessary to keep the nose off the ground. Similarly on take-offs, the pilot should hold in FULL back stick until the nose comes off the ground, then only use the amount of pressure required to keep the nose off the ground. Use two notches of flaps for rough field take-offs. Three notches may provide a 'lighter' feel but requires some special skills and is for the advanced

pilot. Engine failure near the ground with full flaps in a nose high attitude will result in a very hard landing. Force the airplane off the ground as soon as possible and then fly the airplane in ground effect until it accelerates to an acceptable climb-out speed. Steep climbs at low air-speed with flaps extended should be avoided in all but the absolutely necessary cases.

Short Field Operations

Short field landings are about 30 to 40 percent longer than they need to be because of the inadequate braking system. Even with poor brakes, the S-12 can be comfortably operated in most any condition on a 1000ft runway. Although at the time of print, this aircraft hasn't been tested at gross weight on a hot, humid day, the test pilot can comfortably report that 1000ft is enough distance (even on a grass runway) to takeoff and land over 50 foot obstacles, provided the pilot is of moderate skill. In many cases, with a skilled pilot operating at 3000 feet density altitude and without a passenger on board, 500 feet of runway is comfortably sufficient, provided the 50 foot obstacle does not have to be cleared. For a short field take-off, use two notches of flaps. An alternate technique for short field lift-off is to use three notches of flaps but this is kind of an extreme measure and can lead to an accident if things go wrong. Hold the brakes as hard as you can and run the power up to where the airplane is barely able to stand still. Then quickly release the brakes while at the same time pushing the throttle to full power. Keep the elevator essentially in the cruise setting for the most aerodynamic takeoff roll. If it is a rough AND short field then keep the elevator horizontal until you reach 20mph and then briskly and gently use it as necessary to get the nose off the ground. After the aircraft leaves the ground, climb at the best angle of climb speed of 40mph. When you are clear of your obstacles (if any), continue the climb at a safer speed of 65mph and retract the flaps slowly.

Chapter 4 - Weight and Balance

The reference datum for weight and balance is at the center of the front wheel and with the aircraft level, all arms and weights are measured rearward from there. Changes to standard equipment require calculation of the weight and moment and a new 'current' weight and balance sheet should be printed, the old sheet being marked as "superceded."

Installed Equipment, N6167U

Airframe White/Rans S-12XL Airaile Serial No. 04970797

Engine Rotax 912U L-2 Serial No. 4403068

Propeller Warp Drive 3 Blade Composite Serial No. 17760

Intercom PS-Engineering PM501 Serial No. XA-07690

ELT Ameri-King AK450 Serial No. 458 470

Fire Extinguisher H3R Right-Out 14oz Halon Serial No. V-162233

Weight and Balance 11 Oct, 1999

Weight Empty with full oil and anti-freeze and no fuel 610 lbs. Gross Weight 1100 lbs. Useful Load 490 lbs.

	Weight	Arm	Moment
Rear tailwheel	14 lbs	+214 in	2,996 lb*in
Left Main	298 lbs	+78 in	23,244 lb*in
Right Main	298 lbs	+78 in	23,244 lb*in
Empty Aircraft Totals	610 lbs	+81 in	49,484 lb*in

Preflight Take-Off Weight and Balance Worksheet

Use the graphs on the following page to lookup the moments for each item. Mandatory data in [] optional in ()

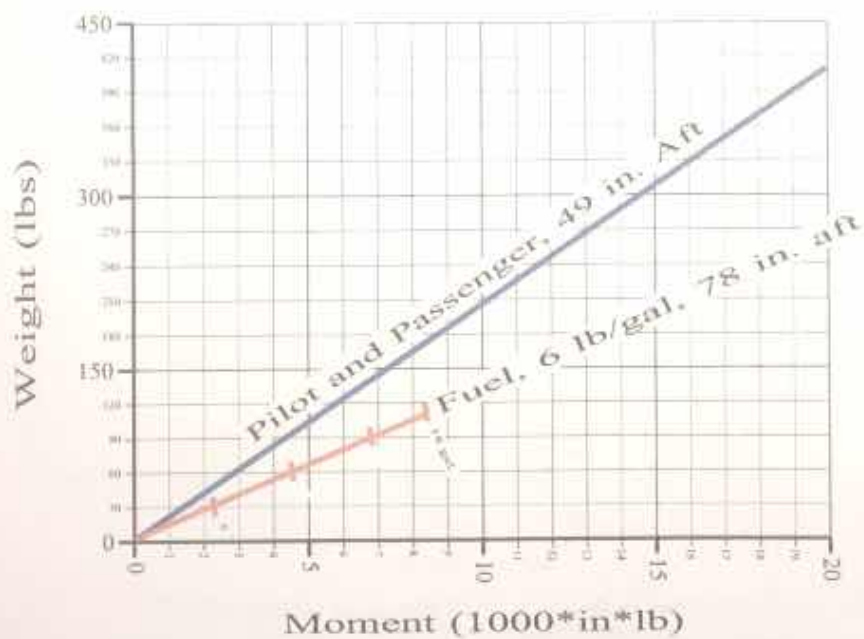
	Weight	Arm	Moment
Empty Aircraft	610 lbs	+81 in	49,484 lb*in
Optional Ballast	75 lbs	+20 in	1,500 lb*in
Pilot	[]	+49 in	[]
Passenger	[]	+49 in	[]
Fuel	[]	+78 in	[]
TAKE-OFF	[]	()	[]

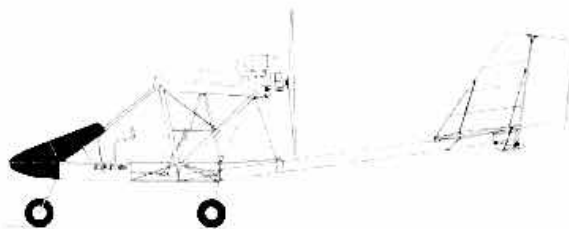
Acceptable CG Arm (Total Moment ÷ Total Weight) is +69.5" to +76.5"

If combined pilot and passenger weight are between 108 and 345 pounds that CG will be acceptable regardless of fuel conditions. However, flying at the aft CG limit requires adjustment of the horizontal stabilizer and hence as suggested by the test pilot, a solo pilot should use 50 or 75 pounds of ballast when operating this aircraft. Failure to do so will impose severe limits on the amount of nose down force available even with full forward stick. In any case, always test the authority of the elevators by doing a short crow hop. The center of gravity of the aircraft is the total moment divided by total weight and must fall within 69.5 and 76.5 inches (aft of the datum). The CG envelope is graphed on the following page, a point inside the hatched region is safe with respect to loading.



Figure 4.1 - Find the moment of pilot and passenger by moving horizontally from total weight to the pilot-passenger line, then read down to moment. Find fuel pounds and moment by trailing along the fuel line to the total fuel on board or gallons; read fuel total weight at left and moment at bottom.





S-12XL

SPECIFICATIONS	52 HP	65 HP	80HP/100HP
Wing Span	31.0 ft	31.0 ft	31.0 ft
Area	152 sq ft	152 sq ft	152 sq ft
Mean Chord	4 ft 10.5 in	4 ft 10.5 in	4 ft 10.5 in
Aspect	6.33:1	6.33:1	6.33:1
Length	21 ft 8 in	21 ft 8 in	21 ft 8 in
Height	88 in	88 in	88 in
Cockpit Width	41 in	41 in	41 in
Headroom	41.5 in	41.5 in	41.5 in
Legroom	44.5 in	44.5 in	44.5 in
Number of Seats	2	2	2
Doors	2	2	2
Landing Gear*	F/TR	F/TR	F/TR
Baggage Volume**	n/a	n/a	n/a
Baggage Capacity	n/a	n/a	n/a
Fuel Capacity	18 gal US	18 gal US	18 gal US

POWER PLANT	503	582	912/912S
Engine	Rotax 503	Rotax 582	Rotax 912UL/912ULS
Output	52 hp	65 hp	80 hp/100 hp
Oil Capacity	n/a	2.5 qts	3.0 qts
Coolant Capacity	n/a	4.4 qts	4.4 qts
Propeller Diameter	68 in	68 in	68 in to 72 in
Propeller Type	Wood	Wood	Wood
Gear Reduction	1:2.58	1:2.58	1:2.27/1:2.43
Fuel G.P.H.	4.0 gal @ 85%	5.75 gal @ 85%	4.5 / 5.0 gal @ 80%

PERFORMANCE

Take Off Roll	285 ft	250 ft	285 ft/220 ft
Rate of Climb	500 fpm	900 fpm	900 fpm/1200 fpm
Service Ceiling	12,500 ft	14,000 ft	14,000 ft/14,500 ft
Cruise	65 mph	75 mph	85 mph/90 mph
VNE	100 mph	100 mph	100 mph
Stall Clean	38 mph	40 mph	42 mph
Stall Flaps	32 mph	33 mph	35 mph
Roll Rate	70° /sec	70° /sec	70° /sec
Glide Ratio	7:1	7:1	7:1
Landing Roll	200 ft	200 ft	200 ft
Endurance	4.5 hrs	3.1 hrs	4.4 hrs/4 hrs
Range	292.5 miles	232.5 miles	374 miles/360 miles

WEIGHTS AND LOADINGS

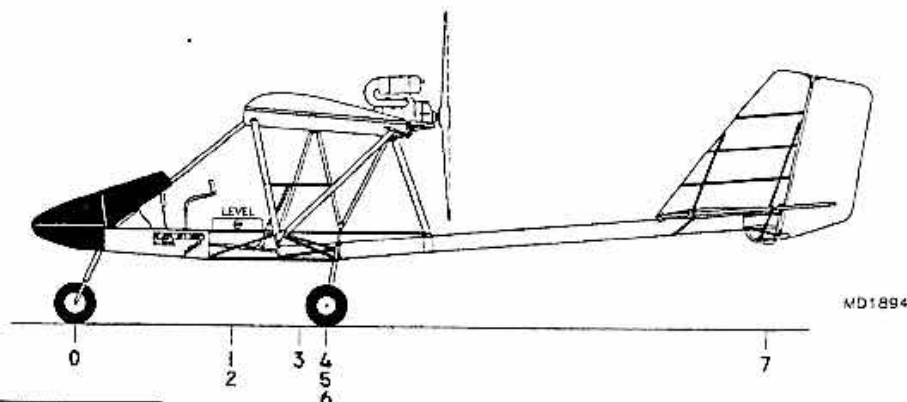
Gross Weight	920 lbs	975 lbs	1100 lbs
Empty Weight	430 lbs	475 lbs	575 lbs
Useful Load	490 lbs	500 lbs	525 lbs
Wing Loading	6.0 lbs	6.4 lbs	7.2 lbs
Power Loading	17.7 lbs	15.0 lbs	13.75/11 lbs
Limit Load Factors	+4-2	+4-2	+4-2

*F/TR=Fixed Trike

**50 lbs of baggage can be carried in the space available behind the seats.
Performance at sea level and maximum gross weight.

WEIGHT AND BALANCE

Use the chart below to figure weight and balance for your particular aircraft.



N.	536RH
DATE WEIGHED	2/17/00
ENGINE TYPE	912W
GROSS WEIGHT	1100
EMPTY WEIGHT	584
USEFUL LOAD	516
C.G. CONDITION	84.1

RANS S-12XL AIRRALE
WEIGHT AND BALANCE

ACCEPTABLE C.G. 69.5" TO 76.5" FROM DATUM 0.
DATUM = 0 @ CENTER OF NOSE WHEEL (AIRCRAFT IN LEVEL ATTITUDE).
LEVEL REFERENCE TO BOTTOM OF DOOR.

BECAUSE THE S-12XL IS A PUSHER THE TAIL WILL REST ON THE GROUND WHEN EMPTY. TO PROPERLY DETERMINE THE CENTER OF GRAVITY THE TAIL MUST BE ELEVATED TO SIMULATE LEVEL FLIGHT. SET THE TAIL ON A SAW HORSE OR STAND HIGH ENOUGH TO BRING THE BUBBLE ON THE LEVEL TO THE CENTER. USE THE ARM MEASUREMENTS FOR THE ITEMS SHOWN ON THE WEIGHT AND BALANCE TABLE. THE CHART INCLUDES A LOCATION FOR BAGGAGE EVEN THOUGH THE S-12XL IS NOT CURRENTLY EQUIPPED WITH A BAGGAGE COMPARTMENT. IF SUCH A CARGO SPACE IS DESIRED PLEASE LOCATE AS RECOMMENDED.

#	ITEM	WEIGHT	ARM	MOMENT
1	PILOT	150	49"	7350
2	PASSENGER	0	49"	0
3	BAGGAGE*	0	70"	0
4	WING TANK 7 GAL.	6	78"	468
5	MAIN GEAR LEFT	198	78"	15464
6	MAIN GEAR RIGHT	205	78"	15990
7	TAIL	24	214"	5136
TOTAL =		583	TOTAL =	44388

$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}} = \text{C.G.}$

$\frac{44388}{583} = 76.15$

#	ITEM	WEIGHT	ARM	MOMENT
1	PILOT	240	49"	11760
2	PASSENGER		49"	
3	BAGGAGE*		70"	
4	WING TANK 14 GAL.	108	78"	8424
5	MAIN GEAR LEFT	277	78"	21606
6	MAIN GEAR RIGHT	281	78"	21918
7	TAIL	26	214"	5564
TOTAL =		932	TOTAL =	69272

$\frac{\text{TOTAL MOMENTS}}{\text{TOTAL WEIGHT}} = \text{C.G.}$

$\frac{69272}{932} = 74.3$

MAX. BAGGAGE 25 LBS.

FLAP OPERATIONS

The flap equipped S-12 Airaille has a wider speed envelope but this is only realized through proper flap usage. Please take the time to become thoroughly familiar with the aircraft and procedures before attempting any maximum performances, take offs or landings. The aircraft functions well without using flaps only take off/landing distances are longer and speeds are higher. Pay close attention to the recommended flight speeds called out in this section.

The first notch of flaps is used to moderately shorten take off rolls. Our tests show (2) notches for T.O. is the best. Further flaps have a tendency to increase T.O. distance. The maximum flap extension speed is 65 mph. Although it is allowable to extend to full flaps at 65 mph, it is actually better technique to extend a notch at a time. **EXAMPLE:** 65 mph-1st notch, 55 mph-2nd notch, 45 mph-3rd notch. You'll find this gives you much smoother approaches with less flap lever pressure. For reference 1st notch/15 degrees, 2nd notch/29 degrees, 3rd notch/44 degrees.

The second flap setting is used more or less as a transition to full flaps on landing. The third notch of flaps is going to yield steeper, slower approaches and the shortest landing roll. Typically a 45 mph approach speed in a 20 degree nose low attitude is desired. **CAUTION:** It is very easy to exceed 65 mph, the maximum flap extension (vfe) speed during such approaches...be aware of this!

POWER OFF STALLS		BANK		
FLAPS		0	30	60
	0	33	39	45
	15	34	38	44
	29	32	36	42
	44	27	35	40

POWER ON STALLS		BANK		
FLAPS				
	0	22	25	27
	15	20	23	26
	29	20	23	24
	44	20	23	24

Performance based on standard day gross weight of 875 lbs.

CAUTION: Inspect flap lever catches for wear every 100 hours. Keep roller lubricated.

PROHIBITED: Spins with flaps extended any degree but 0.

Left Main Gear 277 lbs.

X78

21606

Tail 26 lbs.

x214

5564

Right Main Gear 281

x78

21918

Bare A/C

$$\frac{49088}{584} = 84.1$$

165 lbs. Min. weight of Pilot + Passenger

Zero fuel

584 49088

165 8085

$$\frac{57173}{749} = 76.3$$

9 gal fuel

584 49088

165 8085

54 4212

$$\frac{61385}{803} = 76.4$$

18 gal fuel

584 49088

165 8085

108 8424

$$\frac{65597}{857} = 76.5$$

415 lbs Max. weight of Pilot + Passenger

Zero fuel

584 49088

415 20335

$$\frac{69423}{999} = 69.5$$

9 gal fuel

584 49088

415 20335

54 4212

$$\frac{73635}{1053} = 69.9$$

17 gal fuel Max.

584 49088

414 20286

102 7956

$$\frac{77330}{1100} = 70.3$$

5 lbs Tail Ballast

190 lbs. Min weight of Pilot + Passenger

Zero fuel

584 49088

5 1070

190 9310

$$\frac{59468}{779} = 76.3$$

9 gal fuel

584 49088

5 1070

190 9310

54 4212

$$\frac{63680}{833} = 76.4$$

18 gal fuel

584 49088

5 1070

190 9310

108 8424

$$\frac{67892}{887} = 76.5$$

450 lbs. Max weight of Pilot + Passenger

Zero fuel

584 49088

5 1070

450 22050

$$\frac{72208}{1039} = 69.5$$

10 gal fuel Max

584 49088

5 1070

450 22050

60 4680

$$\frac{76888}{1099} = 70.0$$