PILOT'S OPERATING HAND BOOK

Rutan Defiant LN-DDD

Norwegian CAA (LT) building permit: 191
Rutan serial no: 0024B
Constructed: 1993-2000
First flight: Sept 16, 2000
Builders: Leif Alstadseter, Cato Arnesen, Klaus Nødland, Rune Rostrup, Alf Inge Hovland, Vidar Sørensen

Approved EAA Chapter 573 Date/sign 16.05.2014 [signature] Name: MIKE BOXILL	POH made by: Cato Arnesen Date/sign: 14/5/2014 Cato A

Revisions (see next page)

Revisions

Rev no	Date	Description of changes
0	2014-05-12	New POH made based on original Rutan POH
1	2014-06-18	Added pilot familiarization program for new pilots (App 8)
2	2014-10-06	Introduction, changed building as Amateur, responsibility of passengers, Revisions responsibility. 1.0 Added Crew and passengers 1.01 Logging of hours 1.4 Fuel, added description to detect alcohol 3.02 Emergency procedures other, added vibration procedure 3.04.02 Changed text, stalls prohibited. 4.02 Normal Procedure Check list, added revision 4.04.03 Added passengers seats. 5.07 Added Service ceiling 7.05 Engine controls, described positions of throttles and mixtures 7.07 Fuel system, added drawing of system 7.08 Electrical system, added drawing of system 7.09 Instrument panel, added drawing and names of equipment 7.10 Dynon EFIS and AUTOPILOT, changed heading and added drawing 7.13 Pitot/Static system, added drawing Appendix 8. Changed the heading, Syllabus, 3,4,6,7,8 and TH1; Flight Instruments

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SECTION 1

GENERAL

INTRODUCTION

This Pilot's Operating Handbook contains nine sections with information required to operate the aircraft. Sources: Rutan Builder Manual, Earlier edition of LN-DDD Owner's manual, EAA Norway "Byggehåndboken", CAA training program.

Section 1 provides basic data and information of general interest. It contains definitions or explanations of abbreviations and terminology commonly used.

This aircraft is build according the National Amateur-Built category. The regulations governing the Amateur-Built category contain only very limited performance requirements, and no flight characteristics requirements. By virtue of its amateur built status, all persons entering this aircraft will be informed by the pilot in command that this is not a certified aircraft.

Revisions of the POH shall be done by the owner(s) of LN – DDD

Attatchments to this POH:
Dynon manual for SkyView

DESCRIPTIVE DATA

1.0 CREW

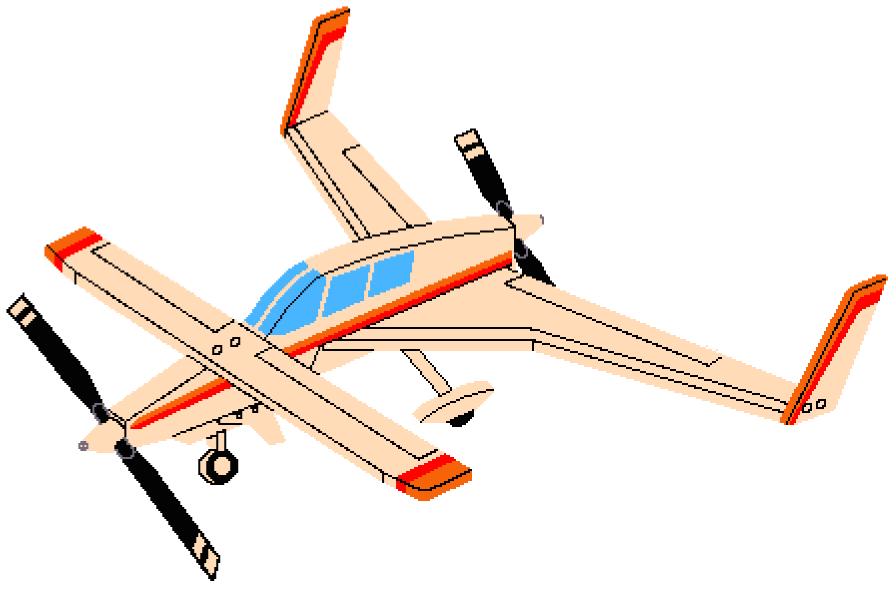
This aircraft has a maximum seating of 4. The minimum crew is one, and the pilot is in the left front seat.

1.0.1 Logging of HOURS

Hours shall be logged as MEP with remarks of Center Line Thrust.

1.1 GENERAL DIMENSIONS

Wing Span/Area 30.75ft / 90.5 sq.ft (9.32m / 8.4 sq.m)
Canard Span/Area .24.16 ft/ 48.9 sq.ft (7.32m / 4,5 sq.m)
Total Wing Area . 139.4 sq. ft (13.0 sq.m)
Length .22.8 ft (6.91 m)
Height .9.33 ft (2.82 m)
Cabin Width.
Front .43in. (1.09 m)
Rear 41.5 in (1.05 m)
Cockpit Height
Front .66in (1.67 m)
Rear 56 in. (1.42 m)
Baggage area seat up 16.5 ft3
seat down 41 ft3



1.2 ENGINES

Front Engine

Engine Manufacturer	Lycoming
Model Number	HIO-360-C1B
Rated Horsepower	200
Rated Speed (rpm)	2900
Displacement (Cubic ins)	360
Type	Four cylinder, Direct Drive Horizontally Opposed, Air Cooled

Rear Engine

Engine Manufacturer	Lycoming
Model Number	HIO-360-D1A
Rated Horsepower	200
Rated Speed (rpm)	2900
Displacement (Cubic ins)	360
Type	Four cylinder, Direct Drive Horizontally Opposed, Air Cooled

1.3 PROPELLERS

Front propeller

Manufacturer	Hendrickson
Type	Wood, fixed pitch
Number of blades	2
Diameter (inches)	65

Front propeller

Manufacturer	Hendrickson
Type	Wood, fixed pitch
Number of blades	2
Diameter (inches)	65

1.4 FUEL

Capacity	(408 litres) 108 US GLS
Usable fuel (level flight)	(398 litres) 105 US GLS
Fuel Grade	100LL leaded avgas or Minimum 91 Octane unleaded auto fuel

Warning:

Do **NOT** use auto fuels containing Alcohol.
A test can be done with a mix of 1 part of water and 9 parts of auto fuel, shake and if water increases after 1 - 2 minutes, there is alcohol in the fuel.

Caution:

Auto fuel is more susceptible to the formation of carb ice than avgas. Auto fuel is also more susceptible to vapor lock. When conditions (ie. High temperatures and altitudes) favoring vapor lock are expected, refrain from using auto fuel.

1.5 OIL

Oil Capacity	7 US qts
Minimum Safe Oil Level	3 US qts
Specification	Lycoming IOH-360 OPS manual
All Temperatures	SAE 15W50 or 20W50

1.6 WEIGHTS

Maximum take off and landing weight	3000 lbs (1365 kg)
Max Baggage Weight	400 lbs (182 kg)
Empty weight	1970 lbs (895 kg) Weighed 29/11 2010 (Incl.2 x 6 qts oil)
Maximum Useful load	1035 lbs (470 kg)

SPECIFIC LOADINGS

Wing Loading: 21.5 lb/sq.ft
Power Loading: 7.5 lb/hp

NOTES, CAUTIONS AND WARNINGS

Specific items requiring emphasis are expanded upon and ranked in increasing order of importance in the form of a NOTE, CAUTION or WARNING.

NOTE

Expands on information which is considered essential to emphasize. Information contained in notes may also be safety related.

CAUTION

Provides information that may result in damage to equipment if not followed.

WARNING

Emphasizes information that may result in personal injury or loss of life if not followed

1.7 ABBREVIATIONS AND TERMINOLOGY

1.7.1 GENERAL AIRSPEED TERMINOLOGY

KIAS	**Knots Indicated Airspeed** is the speed shown on the airspeed indicator assuming no instrument error, expressed in knots.
KCAS	**Knots Calibrated Airspeed** is indicated airspeed corrected for position and instrument error, expressed in knots. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
KTAS	**Knots True Airspeed** is the airspeed relative to undisturbed air, expressed in knots, which is KCAS corrected for altitude, temperature and compressibility.
GS	**Ground Speed** is the speed of the aircraft relative to the ground.
V_A	**Manoeuvring Speed** is the maximum speed at which abrupt full control deflection (in the vertical plane only) will not overstress the aircraft.
V_{FE}	**Maximum Flap Extension Speed** is the highest speed permissible with wing flaps in a prescribed extended position.
V_{NO}	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air, and then only with caution.
V_{NE}	**Never Exceed Speed** is the speed limit that may not be exceeded at any time.
V_S	**Stalling Speed** is the minimum steady flight speed at which the aircraft is controllable in a specified configuration.
V_{S0}	**Stalling Speed in the landing configuration** at the most forward centre of gravity.
V_X	**Best Angle of Climb Speed** is the speed which results in the greatest altitude gain in a given horizontal distance.
V_Y	**Best Rate of Climb Speed** is the speed which results in the greatest altitude gain in a given time.

1.7.2 METEOROLOGICAL TERMINOLOGY

ISA	**International Standard Atmosphere** is a nominal atmosphere where air is a dry perfect gas with a temperature of 15°C (59°F) at sea level. The pressure at sea level is 29.92 in. Hg. The temperature gradient from sea level to 36,089 ft is -1.98°C per 1000 ft.
OAT	**Outside Air Temperature** is the free static air temperature. It is obtained from meteorological sources or in-flight instruments adjusted for instrument error and compressibility effects.
Pressure Altitude	**Pressure Altitude** is the altitude read from an altimeter when the altimeter's barometric scale has been set to 29.92 in. Hg, assuming zero position and instrument error (instrument error is assumed to be zero in this POH except where indicated).

1.7.3 POWER TERMINOLOGY

BHP	**Brake Horsepower** is the power developed by the engine.
RPM	**Revolutions Per Minute** is engine speed.
MP	**Manifold Pressure** is the absolute pressure measured in the engine's induction system, expressed in inches of mercury (in. Hg).

1.7.4 AIRCRAFT PERFORMANCE TERMINOLOGY

Climb Gradient	**Climb Gradient** is the ratio of the change in height during a climb, to the horizontal distance covered in the same time interval.
Demonstrated Crosswind Velocity	**Demonstrated crosswind velocity** is the velocity of the crosswind component for which adequate control of the aircraft during takeoff and landing has been demonstrated during flight tests. The value shown is not considered to be limiting.

Usable Fuel	**Usable Fuel** is the fuel that can be safely used in flight.
Unusable Fuel	**Unusable Fuel** is the fuel that cannot be safely used in flight.
GPH	**Gallons Per Hour** is the amount of fuel (in US gallons) consumed per hour.
LPH	**Liters Per Hour** is the amount of fuel (in liters) consumed per hour.
G	**g** is acceleration due to gravity.
FF	Fuel Flow

1.7.5 WEIGHT AND BALANCE TERMINOLOGY

Reference Datum	**Reference Datum** is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	**Station** is a location along fuselage given in terms of distance from the reference datum.
Arm	**Arm** is the horizontal distance from the reference datum to the centre of gravity of an item.
Moment	**Moment** is the product of weight of an item multiplied by its arm. (Moment divided by the constant 1000 is used in this handbook to simplify balance calculations by reducing the number of digits.)
Centre of Gravity (CG)	**Centre of Gravity** is the point at which an aircraft, or item, would balance if suspended.
CG Arm	**Centre of Gravity Arm** is the am obtained by adding the aircraft individual moments and dividing the sum by the total weight.
CG Limits	**Centre of Gravity Limits** are the extreme centre of gravity locations within which the aircraft must be operated at a given weight.
Empty Weight	**Empty Weight** is the weight of aircraft including unusable fuel and full engine oil.
Useful Load	**Useful Load** is the difference between takeoff weight and empty weight.
Payload	**Payload** is the weight of occupants, cargo, and baggage.
Gross Weight	**Gross Weight** is the loaded weight of the aircraft.
Maximum Takeoff Weight	**Maximum Takeoff Weight** is the maximum weight approved for start of the takeoff run.
Maximum Landing Weight	**Maximum Landing Weight** is the maximum weight approved for the landing touchdown.
Tare	**Tare** is the weight of chocks, blocks, stands, etc. used when weighing an aircraft, and is included in the scale readings. Tare is deducted from the scale readings to obtain the actual (net) aircraft weight.

1.7.6 USEFUL CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
US Gal	3.7854	Litres
Litres	.264172	US Gal
Litres (Avgas)	.719	Kg
Kg	1.39	Litres (Avgas)
Knots (Kts)	1.1516	Statute miles
Knots (Kts)	1,852	Kilometres
Statute miles	0, 86898	Knots
Pounds (lb)	.45359	Kg
Kg	2.2046	Pounds (lb)
Celsius:	(Fahrenheit - 32) / 1.8	
Fahrenheit	(Celsius.1.8)+32	

SECTION 2

LIMITATIONS

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

2.01 AIRSPEED LIMITATIONS

	SPEED	KIAS	REMARKS
V_{NE}	Never Exceed Speed	195	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	175	Do not exceed this speed except in smooth air, and then only with caution
V_A	Maneuvering Speed	130	Do not make full or abrupt control movements above this speed. Do not extend or retract landing gear above this speed
V_{FE}	Maximum Speed with flaps or landing gear extended	150	No flaps installed, the limitation is with gear extended.

2.02 AIRSPEED INDICATOR MARKINGS

Marking	**EFIS (KIAS)**	**SIGNIFICANCE**
White band	65 – 130	Gear operation range
Green band	65-175	Normal Operating Range. Lower limit is maximum weight stall speed. Upper limit is the maximum structural cruising speed
Yellow band	175-195	Operations must be conducted with caution, and only in smooth air
Red line	195	Maximum speed for all operations

2.03 POWER PLANT LIMITATIONS

Front engine
Based on installed engine Lycoming HIO-360-C1B

Maximum horse power	200
Max RPM	2900
Time between overhaul	2000 hours
Oil temperature, max	245 F
Oil temperature, max continuous	225 F
Oil temperature, optimal	180 F
Cylinder head temperature, max recommended continuous	475 F
Oil pressure, normal operating	80 psi
Oil pressure, minimum continuous	45 psi
Oil pressure, idling	30 psi
Oil change interval	50 hours or 12 months
Oil consumption, max	5 hours per quart
Fuel pressure, normal	3-8 psi
Fuel pressure, minimum	0,5 psi
Unleaded auto fuel	91 Octane
Aviation grade fuel	100 LL

Rear engine
Based on installed engine Lycoming HIO-360-D1A

Maximum horse power	200
Max RPM	2900
Time between overhaul	2000 hours
Oil temperature, max	245 F
Oil temperature, max continuous	225 F
Oil temperature, optimal	180 F
Cylinder head temperature, max recommended continuous	475 F
Oil pressure, normal operating	80 psi
Oil pressure, minimum continuous	45 psi
Oil pressure, idling	30 psi
Oil change interval	50 hours or 12 months
Oil consumption, max	5 hours per quart
Fuel pressure, normal	3-8 psi
Fuel pressure, minimum	0,5 psi
Unleaded auto fuel	91 Octane
Aviation grade fuel	100 LL

2.04 Engine instrument markings

Tachometer	Front engine (RPM)	Rear engine (RPM
Normal operating range. Green band	1500-2900	1500-2900
Caution operation range. Yellow band		
Red Line (Max Continuous Power)	2900	2900

2.05 WEIGHT LIMITATIONS

Maximum Takeoff Weight	3000 lbs (1365 kg)
Maximum Landing Weight	3000 lbs (1365 kg)
Maximum weight for operations from non-paved runways	Not allowed
Aerobatic Gross weight	Aerobatic not allowed
Maximum weight in baggage compartment	400 lbs (182 kg)

2.06 SERVICE CEILING

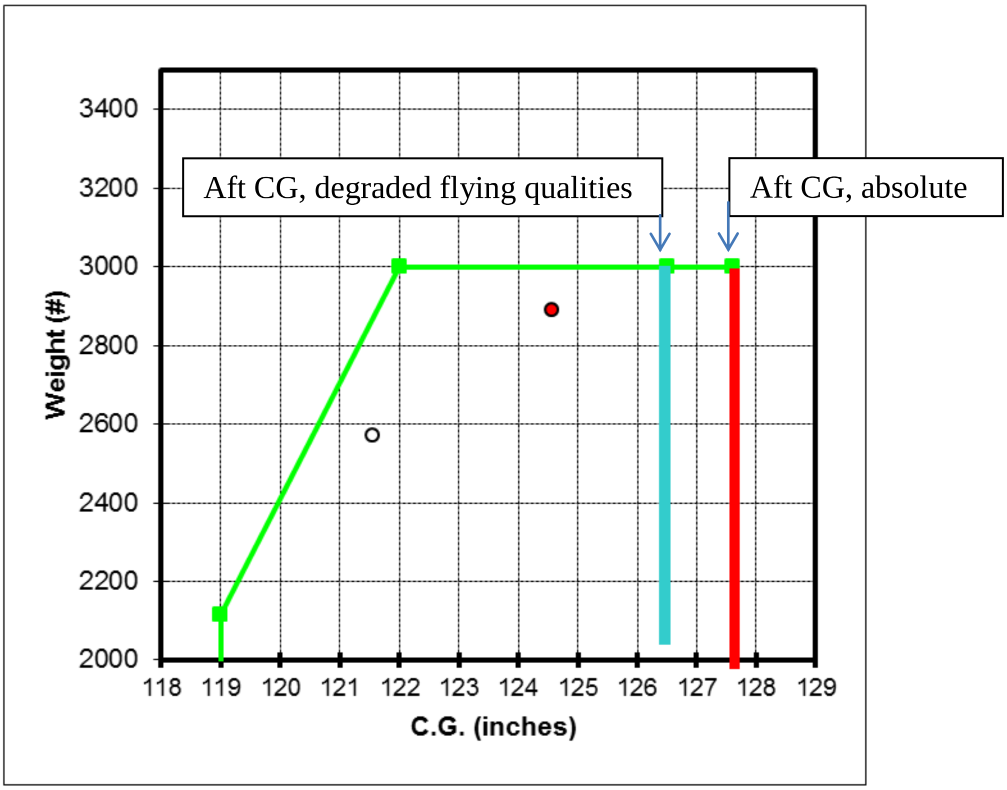
Maximum service ceiling, two engines	18.000 Ft
Service ceiling, one engine	7.000 Ft

2.07 CENTRE OF GRAVITY LIMITS

	Inches aft of datum, at max gross weight
Forward limit	119.0
Aft limit, reduced flying qualities	126.5
Aft limit, absolute	127.5

CAUTION

With only the pilot occupying the aircraft and full tanks, the CG will be in the “degraded flying qualities” region. Therefore it is not advisable to top up the tanks after a flight in case the next flight is with the pilot only.



Centre of Gravity Limits

2.07 MANOEUVRING LIMITS

No aerobatics maneuvers are allowed except those listed below:

	Recommended entry speed
Chandelles	150 KIAS
Lazy Eigths	150 KIAS
Steep turns	140 KIAS
Stalls	

2.08 FLIGHT LOAD FACTORS

The structure has been designed to withstand a load of 3.8 G positive and 1.5 G at max gross weight.
This is the maximum load the airframe structure is designed to withstand indefinitely.

Load Factor Limits
Weight 3000 lbs (1365 kg) and below: . . .. ….+3.8g to – 1.5g

2.09 TYPES OF APPROVED OPERATION

With current instrumentation, the aircraft is approved for day and night VFR operation.
With additional, required instrumentation the aircraft may also be used in IFR operations.

2.10 FUEL LIMITATIONS

Total capacity	408 liters (108 US gal
Usable fuel	398 litres (105 US gal)
Unusable fuel	10 litres (2.6 US gal)
Approved fuels	Aviation fuel. 100 LL Automotive fuel: 91 Octane

2.11 PLACARDS

The following information is displayed by placards:

Location	**Placard**
External	EXPERIMENTAL
Cabin	Passenger warning This aircraft is amateur built and does not comply with the federal safety regulations for "standard aircraft"

SECTION 3

EMERGENCY PROCEDURES

3.01 GENERAL

AIRSPEEDS FOR EMERGENCY OPERATION

Failure of one engine after takeoff	
Best rate of climb	100 KIAS
Best angle of climb	80 KIAS

3.02 EMERGENCY PROCEDURES CHECKLIST

Basic Rules

AVIATE –Fly A/C
NAVIGATE – Select landing area
COMMUNICATE – Contact ATC

ENGINE FAILURES

NOTE: As the Defiant has center line thrust, failure of one engine will not result in any adverse yaw effect, only a reduction in power. This is a very important safety feature that greatly simplifies handling of a failed engine.

FAILURE OF ONE ENGINE DURING TAKEOFF RUN

With sufficient remaining runway to abort:

Throttles	IDLE
Brakes	APPLY

If insufficient runway remains to abort:

Throttles	FULL
Take off	CONTINUE
Airspeed	BEST RATE OF CLIMB: 100 KIAS BEST ANGLE OF CLIMB: 80 KIAS
Return for landing	

FAILURE OF ONE ENGINE IMMEDIATELY AFTER TAKEOFF

Throttles	Full
Take off.	Continue
Airspeed	Best rate of climb: 100 KIAS Best Angle of climb: 80 KIAS
Return for landing	

ENGINE FAILURE DURING FLIGHT

Throttles	Adjust to maintain 120 KIAS
Failed engine	Identify
For failed engine:	
Fuel pressure	Check
Boost pump	On
Mixture	Full rich
Ignition	On
Fuel selector	Switch tanks
Land	At nearest airport

ROUGH RUNNING ENGINE

Mixture	Adjust
Throttle	Adjust
Boost pump	On
Ignition	Both
Fuel selector	Switch tank

HIGH OIL TEMPERATURE

Oil temperature and pressure	MONITOR

LOW FUEL PRESSURE

Boost pump	ON
Fuel selector	CHANGE TANK

LOW OIL PRESSURE

Oil Pressure Indication	CHECK
If confirmed low oil pressure	SHUT DOWN AFFECTED ENGINE
	LAND AT NEAREST AIRPORT

FIRES

FIRE DURING START ON GROUND

Mixture	IDLE CUT-OFF
Fuel Selector	OFF
Bat/Alt	OFF
Fire Extinguisher	PREPARE
Aircraft	EVACUATE
Fire	EXTINGUISH

ENGINE FIRE IN FLIGHT

Affected engine	
Mixture	IDLE CUT-OFF
Boost pump	OFF
Fuel Selector	OFF
Bat/Alt	OFF
Engine Fire Extinguisher	SELECT & RELEASE
Land	ASAP

ELECTRICAL/CABIN FIRE IN FLIGHT

Bat/Alt	OFF
Avionics	OFF
Ignition emergency power	ON
All switches (except Ign)	OFF
Cabin Fire Extinguisher	SELECT & RELEASE
Land	ASAP

FORCED LANDINGS

EMERGENCY LANDING WITHOUT POWER

Airspeed	75-90 KIAS
Gear	DOWN
Throttle	CLOSED
Mixtur	IDLE CUT-OFF
Fuel Selector	OFF
Ignition Switches	OFF
Radio	TRANSMIT MAYDAY
Bat/Alt	OFF

EMERGENCY LANDING WITH POWER (single engine or both engines)

Radio	TRANSMIT MAYDAY
Airspeed	120 KIAS
Selected Field	FLY OVER
Airspeed	75-90 KIAS
Gear	DOWN
Bat/Alt	OFF (after touchdown)
Ignition Switches	OFF (after touch down)

DITCHING

Radio	TRANSMIT MAYDAY
Airspeed	75 KIAS
Gear	UP
Power	300 FT/MIN DESCENT
Approach	HIGH WIND – INTO WIND LIGHT WIND - PARALLEL TO SWELLS

OTHER

SUDDEN VOLTAGE CHANGE

Bat & Alt Switch	CHECK ON
Alternator Circuit Breaker	CHECK

If tripped	
Electrical load	REDUCE
Alternator Circuit Breaker	RESET after 3 min

If not tripped	
Battery selector	SELECT FUNCTIONING SYSTEM

CO MONITOR INDICATION

Power of front engine	REDUCE TO IDLE OR STOP
Cabin Heat	CLOSED
Land	ASAP

STRUCTURAL DAMAGE

On Takeoff	ABORT
In Flight	CONTROL AIRSPEED

Climb to safe stall recovery Altitude, Notify controlling agency,
Make full stop landing with approach speed 5-10 kts higher than normal

RADIO FAILURE

Squawk	7600
Com failure approach procedure	FOLLOW
Green light	CLEARED TO LAND
Red light	CIRCLE
Flashing red light	UNSAFE

VIBRATION DURING FLIGHT

To identify source, Test each engine by shutting down front engine first, if vibration disappear, leave engine shut down and land as soon as possible. If still vibration, engage front engine and shut down rear engine. If no vibration leave engine off and land as soon as possible.
In case of vibration continue, land as soon as possible

3.03 AMPLIFIED EMERGENCY PROCEDURES

ENGINE FAILURES

3.03.01 POWER LOSS OF ONE ENGINE DURING TAKEOFF

If an engine failure occurs during the takeoff run and sufficient runway remains to stop, the most important thing to do is stop the aircraft on the remaining runway. Those extra items on the checklist will provide added safety.
If insufficient runway remains, maintain full power on both throttles, take off on one engine and circle for a safe landing.

If one engine fails after liftoff and sufficient runway remains to make a safe landing, the first response is to promptly lower the nose and adjust power to maintain airspeed and setup for a safe landing.
If insufficient runway remains maintain full power on both throttles and circle for a safe landing. As the aircraft has centre line thrust, there will be no yaw effect.

3.03.02 POWER LOSS OF ONE ENGINE IN FLIGHT

If power is lost on one engine in flight, adjust power on the good engine (or both throttles if it is not obvious which engine has failed) to maintain 120 KIAS. As the aircraft has centre line thrust, there will be no yaw effect. Set course for the nearest airport. Identify the affected engine and attempt restart if applicable.

Complete power loss is usually due to fuel interruption. If this is so; the power will be restored when fuel flow is itself restored.
To attempt to restart the failed engine, and the propeller is wind milling, the procedure is to select Boost Pump ON, switch to the other tank (provided it has fuel) and select mixture to RICH. Check engine gauges for an indication of cause and if no fuel pressure is indicated change tank selection. When power is restored turn Boost Pump OFF.

If engine still fails to start, turn ignition OFF, then ON to isolate a potentially bad ignition system. Try moving the throttle and/or mixture to different settings. This may restore power if mixture is too rich or too lean or if there is a partial fuel blockage. Try the other tank, as water in the fuel may take time to clear the system. Allowing the engine to windmill may restore power. If failure is due to water then fuel pressure will be normal. Empty fuel lines may take ten seconds to refill.

Partial power loss can be due to wrong mixture setting, icing, water/vapour lock or one or more spark plug malfunctioning.

3.03.03 ROUGH RUNNING ENGINE

First, identify which engine is affected by engine roughness. This may be done by setting full power on one engine and the other to idle in turn. Engine roughness will normally be more apparent at full throttle

A slight engine roughness during flight may be caused by carbon or lead deposits fouling one or more spark plugs. This may be verified by selecting one ignition system OFF at a time. A significant power loss in single ignition operation is evidence of either spark plug fouling or an ignition system failure. Assuming that fouled spark plugs is the more likely cause, set cruise power and lean the engine for several minutes. If the problem does not clear up after several minutes, determine if a richer mixture setting will result in smooth running.

A sudden engine roughness or misfiring may be evidence of an ignition problem (either magneto or electronic ignition). Switching one ignition system off in turn will identify which one is malfunctioning. Select different power settings and enrichen the mixture to determine whether continued operation on both ignition systems is possible.

If the problem continues, try different mixture and throttle settings. Select Boost Pump ON and change fuel tanks. Select each ignition system OFF then ON.

CAUTION

The engine may quit completely when one ignition is selected OFF, if the other ignition is faulty. If this occurs, to prevent a severe backfire, select the mixture to idle cut off, wait 10 seconds, then select the ignition back ON. Advance the mixture slowly until engine restarts.

3.03.04 POWER OFF LANDING

Power loss of both engines is very unlikely unless you run out of fuel.
Failure of one engine is a more likely scenario. In case of a failed engine, adjust power to maintain 120 KIAS and plan to land at the nearest air field. Due to the center line thrust, there will be now yaw effect, so approach and landing characteristics will be the same as for a landing with both engines operating.

Should a power off landing never the less be necessary, the initial action is ALWAYS TRIM FOR BEST GLIDE, 90-100 KIAS, depending on weight. If engine power is not restored and time allows check for airports/strips available and notify of problem/intent if possible. Select Mixture to IDLE CUT OFF. Select Fuel Selector to OFF and Ignition Switches to OFF. Transmit a MAYDAY.

Identify a suitable field, planning an into wind landing. Try to be 1000 ft AGL at the end of the downwind leg to make a normal landing. Aim initially for the centre of the field (drag with a wind milling propeller may be higher than expected) Plan for slowest short field landing but above all else do not stall.
When committed to landing lower landing gear, then select BATT/ALT switch to OFF. Seat belts should be tight and touchdown made at the slowest speed possible.

3.03.05 ENGINE FIRE DURING START

These are usually due to over priming. The first attempt to extinguish the fire is to draw the excess fuel back into the induction system. If the engine has started continue to operate to pull the fire into the engine. If the engine is not running move mixture to idle cut off, open the throttle and crank the engine to draw fire into the engine.

If in either case the fire continues for more than 2 seconds it should be extinguished by external means. (eg a handheld fire extinguisher). Fuel selector should be off and mixture at idle cut off.

3.03.06 FIRE IN FLIGHT

Engine fire in flight is extremely rare. The key to dealing with an engine fire is to identify the affected engine, then stop the flow of fuel to the affected engine compartment. Put the mixture to IDLE CUT-OFF, switch Fuel Selector OFF, and select Boost Pump OFF. Close cabin heat and air vents if the front engine is on fire. Select proper fire extinguisher setting (front, rear or cabin) and release the halon fire extinguisher. Close heater and subject to radio requirements turn master of the affected engine off. Select the battery of the unaffected engine on the electrical power source selector. Follow procedure for loss of power of one engine and proceed to land as soon as possible.

Cabin fire is identified through smell and smoke - be sure it is not from outside! It is essential the source is identified through instrument readings, nature of smoke or system failure. If an electrical fire is indicated, , masters should be turned off, (turn emergency ignition power on first), cabin heat turned off and vents open. If required, select CABIN on the fire extinguisher selector and release the halon fire extinguisher. Proceed to land as soon as possible.

3.03.07 OIL PRESSURE LOSS

A partial loss of oil pressure is usually a regulation problem. A landing should be made as soon as possible.

A complete loss of pressure may signify oil exhaustion (or faulty gauge). Proceed to nearest airport/airfield and be prepared for a single engine landing. The engine may stop suddenly. Maintain altitude and do not change power on the affected engine settings unnecessarily, as this may hasten power loss.
Shutting down the affected engine to limit engine damage may be considered, especially in the presence of additional indicators, such as rise in engine CHT or oil temperature, oil and/or smoke apparent.

3.03.08 FUEL PRESSURE LOSS

If fuel pressure falls, turn on the electric pump and switch fuel selector to the other tank on the affected engine. If the problem remains land as soon as possible and check system.

3.03.09 HIGH OIL TEMPERAURE

High oil temperature may be due to a low oil level, obstruction in oil cooler (internal or external), damaged baffle seals, a defective gauge or other causes. A steady rise is a particular sign of trouble.

Always land as soon as possible at an appropriate airport/airfield and investigate and be prepared for an engine failure. Watch the oil pressure and CHT (Cylinder Head Temperature) gauges to identify an impending failure.
Shutting down the affected engine to limit engine damage may be considered.

3.03.10 ALTERNATOR FAILURE

This is identified from a low voltage on the voltmeter of the affected alternator (front or rear). Normal voltage with a functional alternator is 13.5 – 14.3 Volt. If it drops to 12.5 or lower (battery voltage) a failure may be assumed.

Reduce electrical load as much as possible and check the alternator circuit breaker.
If the circuit breaker is tripped, reset it once and observe voltage. If it trips again, leave it out, pending investigation after landing.
Select the unaffected system (front or rear) on the electrical power selector switch to draw power to both systems from the operative alternator.
Investigate and correct the problem after landing.

Attempt to reset the over voltage regulator. Reset by turning off the alternator switch for one second and then back on again. If the cause was a momentary over voltage (16.5V+) this will return the system to normal.

In the unlikely scenario that there is zero alternator output from both alternators, turn alternator switch off, use only minimum electrical load and land as soon as practicable.
For maximum power conservation, switch on the emergency ignition power selectors, turn off both masters and set the electrical power selector switch to “0” (off).

WARNING

Both rear ignition systems and left front ignition systems are electronic and rely on electrical power to operate. Only the “right” front ignition system is of the magneto type, which will operate independent of electrical power.

3.04 STALL AND SPIN RECOVERY

The following has been taken from information provided after flight testing LN-DDD.

3.04.01 STALLS

The canard configuration gives the Defiant very safe stall characteristics. The canard wing has a slightly higher angle of attack than the main wing. The effect of this is that the canard (front wing) stalls at a higher airspeed than the main wing. As you approach a stall this will lead to a natural drop of the nose and initiate a natural recovery from the stall. As an additional warning of a possible stall situation, at very low airspeeds (80 KIAS and lower), the pressure required to hold the stick aft is doubled. This serves as a useful warning for the inattentive pilot.

One-G and mildly accelerated stalls were found to be benign in all configurations and loadings tested. Stall onset was indicated by a gentle dipping up and down of the nose, caused by the canard starting to stall, while the main wings still fly normally. Maintaining full aft stick causes this gentle oscillation of the nose to continue, while the aircraft starts to sink at about 3-500 ft/min.
Stall behavior was generally quite benign, but low-time pilots should practice stalls at altitude in all configurations to enhance their ability to recognize stall onset. Recovery in all cases occurred almost instantly upon smooth release of aft pressure of the stick, and resulted in the loss of no more than 100-200 feet of altitude. 1-G stall (start of nose escillation) occurred between 50-55 KIAS both clean and with gear down depending upon weight.

Except for accelerated stalls and secondary stalls, approach each slowly while keeping the nose from turning with the rudder. Allow the speed to bleed off until you feel a gentle oscillation up and down of the nose. Note the airspeed and recover with a smooth forward movement of the stick as power is added. Simply relieving back pressure on the stick when the stall occurs may be sufficient with a lightly loaded aircraft. Stalls entered from steep bank or climb will require more aggressive recovery control application.

WARNING

Stall recovery characteristics and spin susceptibility deteriorate progressively with aft CG.
Slow flight, steep turns and stalls must not be performed with CG aft of the “degraded flying quality” limit.

3.04.02 SPINS AND SPIN RECOVERY

Spin is prohibited.

WARNING

Slow flight, steep turns and stalls must not be performed with CG aft of the “degraded flying quality” limit.

SECTION 4

NORMAL PROCEDURES

4.01 GENERAL

AIRSPEEDS FOR SAFE OPERATION (both engines operating)

Vr	Takeoff rotate speed	80 KIAS
Vy	Best rate of climb speed	120 KIAS
Vx	Best angle of climb speed	100 KIAS
Vbg	Best glide angle	90-100 KIAS
Va	Manoeuvring speed	130 KIAS
Vso	Stall gear down	50-55 KIAS
Vs	Stall clean	50-55 KIAS
Va	Maximum gear operation speed	130 KIAS
	Maximum gear down speed	150 KIAS
Vref	Final approach speed	75-90 KIAS
	Demonstrated crosswind velocity	20 kts

4.02 NORMAL PROCEDURES CHECK LIST.

Check list will be revised when necessary and marked with date and revision number.

PREFLIGHT INSPECTION

INTERIOR

Documents/Charts/Licenses/Flight Plan/W&B	ABOARD
Magnetos	OFF
First aid kit	CHECK
Canopy latch	CHECK
Canopy – scratches and cracks	CHECK
Battery Switch	CHECK WORKING
Fuel Quantity	CHECK
Battery Switch	OFF

EXTERIOR

LEFT MAIN WING

Main wheel and fairing	CHECK
Fuel cap	CHECK
Inspection hole covers	CHECK
Aileron fasteners and freedom of movement	CHECK
Nav light	CHECK

REAR FUSELAGE AND ENGINE

Oil quantity	CHECK
Oil door	SECURE
Exhaust pipes	SHAKE ENDS
Propeller and spinner	CHECK FOR NICKS AND CRACKS
Generator belt tension	CHECK
Gascolator	WATER CHECK
Cowling – loose fasteners and cracks	CHECK
Air inlet	CLEAR

RIGHT MAIN WING

Main wheel and fairing	CHECK
Fuel cap	CHECK
Inspection hole covers	CHECK
Aileron fasteners and freedom of movement	CHECK
Nav light	CHECK
Canopy hinges	CHECK

RIGHT CANARD

Elevator – fasteners and freedom of movement	CHECK
Pitot tube cover	REMOVE
Pitot tube	CHECK

FORWARD FUSELAGE AND ENGINE

Oil quantity	CHECK
Oil door	SECURE
Exhaust pipe	SHAKE ENDS
Nose gear and wheel	CHECK
Propeller and spinner	CHECK FOR NICKS AND CRACKS
Gascolator	WATER CHECK
Cowling – loose fasteners and cracks	CHECK
Air inlets	CLEAR
Air filter	CHECK
Rudder	CHECK
Rudder trim tab	CHECK

LEFT CANARD

Elevator – fasteners and freedom of movement	CHECK

BEFORE STARTING ENGINE

Baggage	STOWED & SECURE
Seat belts	Fastened
Passengers	BRIEFED
Pedals position	ADJUST
Parking Brake	SET
Electrical equipment	OFF
Main electrical source selector (front-both-rear)	SELECT
Master switches	ON
Circuit Breakers	CHECK IN
Engine controls – freedom of movement	CHECK
Fuel Selector Valves	RESERVE POSITION
Avionics	ON
ATIS	RECEIVE
Barometer	SET
Autopilot	OFF
Avionics	OFF
EFIS layout	SELECT

NOTE

If passenger pedals are adjusted to far forward, the right wheel brake will be slightly applied. To avoid this, adjust them maximum forward, then crank the adjusting handle back minimum 6 turns.

STARTING REAR ENGINE

Canopy	LEAVE OPEN FOR BETTER VIEW
Mixture	FULL RICH
Electrical fuel pump	RUN BRIEFLY
Throttle	½" OPEN
Propeller Area	CLEAR
Starter Switch	ENGAGE
Engine Fires	RELEASE STARTER
Adjust RPM	1100 RPM
Oil Press	25 PSI within 30 sec
Mixture	LEAN A/R

STARTING FRONT ENGINE

Canopy	CLOSE
Mixture	FULL RICH
Electrical fuel pump	RUN BRIEFLY
Throttle	½" OPEN
Propeller Area	CLEAR
Starter Switch	ENGAGE
Engine Fires	RELEASE STARTER
Adjust RPM	1100 RPM
Oil Press	25 PSI within 30 sec
Mixture	LEAN A/R
Avionics	ON
External lights	AS REQUIRED

BEFORE TAKEOFF – RUN-UP – EACH ENGINE

Brakes	CHECKED & SET
Fuel selectors	TO NORMAL POSITION
Oil temperature	Min 100 F
Mixture	RICH below 3000'
Ignition/magneto	LEFT
Throttle	1800 RPM
Ignition/magneto	CHECK (Max 175 drop/50 diff.)
Engine Instruments	CHECK, green
Voltmeter	CHECK, 14V
Throttle	CHECK IDLE then 1000-1200 RPM
Flight Controls	CHECK
Elevator Trim	SET for T/O
Rudder trim	FULL RIGHT

BEFORE RUNWAY CHECKS

Canopy	LOCKED, PULL HANDLE OUT
Strobes	ON
Transponder	ON
Mixture	RICH below 3000'
Autopilot	OFF

FLIGHT TAKEOFF & CLIMB

Take-off Power	SET – REAR FIRST
Oil and fuel pressure	CHECK
Rotate	80 KIAS
Initial Climb	120 kts
Gear	UP
Elevator and rudder trim	TRIM
Power when obstacles are cleared	REDUCE TO 25 in
Mixture	LEAN for climb
Landing lights	AS REQUIRED

CRUISE

Throttles	SET 19-25 MP
Mixtures	LEAN
Engine Instruments	CHECK

DESCENT

Altimeter	SET
Mixture	ENRICH or FULL RICH
Power	AS REQ. avoid rapid cooling

BEFORE LANDING

Seat Belt/Harness	FASTENED
Landing Lights	AS REQUIRED
Fuel Selectors	NORMAL
Mixture	RICH
Gear	DOWN, CONFIRM LOCKED
Rudder trim	FULL RIGHT

SPEEDS

Approach speed	75-90 KIAS
Vso (stall dirty)	50-55 KIAS
Vs (stall clean)	50-55 KIAS
Vr (rotate)	80 KIAS
Gear extension speed	130 KIAS
Gear extended speed	150 KIAS
Va (maneuvering)	130 KIAS
Vne (redline)	195 KIAS

BALKED LANDING

Throttles	Full FWD
Airspeed	120 KIAS, establish climb
Gear	AS REQUIRED

POSTFLIGHT

AFTER LANDING

Front engine	IDLE CUT OFF TO AID BRAKING
Exterior lights	AS REQUIRED
Transponder	OFF
Mixture	LEAN A/R

ENGINE SHUTDOWN

Throttle	1000 RPM
Avionics	OFF
Engine	IDLE
Ignition/Magnetos	GROUND CHECK
Mixture	IDLE CUT OFF
Ignition switch	OFF, Key OUT
Canopy	OPEN
Hobbs meter	NOTE
Master switches	OFF
All other switches	OFF

SECURING AIRCRAFT

Wheel Chocks	INSTALL
Wing Tie-Down	INSTALL A/R
Pilot Tube Cover	INSTALL
Canopy	CLOSE & LOCK AS REQ

4.04 NOTES AND ADDITIONAL INFORMATION TO NORMAL PROCEDURES

4.04.01 GROUND HANDLING.

Use tow bar or pull / push on prop root to manually position the aircraft. DO NOT push or pull on control surfaces or spinner.

4.04.02 BOARDING.

Open the canopy. Weigh, stow and secure all baggage in the baggage area behind the back seats prior to boarding. Back seat passengers board first, then front passenger, and finally the pilot. Board aircraft on the starboard side by placing the left foot on the fixed step, left hand on the canard and right hand on the cockpit rim. In a springing motion, step up on the step, swing the right foot over the cockpit edge and step onto the cockpit floor.

Passengers may benefit from a stool to aid the boarding. Back seat passenger first step onto the pilot's floor, then step over the front seat back.

Secure harnesses and don headsets. It is advisable to leave the canopy open until the rear engine is started.

4.04.03 PILOT AND PASSENGER POSITION.

Pilots and passengers from 158cm to 193cm tall and up to 136kg can be accommodated. Correct positioning will normally place the head within 5 to 10cm of the canopy. Passengers can use the back seats and right front seat.

4.04.04 COLD ENGINE START.

Preheat engine as necessary in cold climates. Complete the startup checklist. Run the electric fuel pump briefly , hold brakes, clear the prop area and start engines. Oil pressure should come up within 20 seconds. Aggressively lean the mixture and idle above 1000 rpm to reduce the tendency for plug fouling and excessive vibration.

4.04.05 HOT ENGINE START.

If a hot restart on the ramp within a short period of time is anticipated: Complete the startup checklist. Do not run electric fuel pump. Hold brakes. Fully lean mixture, move throttle about 1/3 towards full throttle, clear the prop area and engage the starter. As soon as the engine fires, rapidly move mixture to full rich and reduce throttle to approx. 1100 RPM.

4.04.06 TAXIING.

Harnesses shall be secured prior to ground taxi operations. Taxiing may be performed with canopy open, depending on conditions. Use wheel steering and differential braking to steer the aircraft. Lean the mixture and idle engine above 1000 rpm to reduce the tendency for plug fouling. Hold the stick aft during ground operations over rough surfaces.

When taxiing, it is important that aileron and elevator be used as appropriate to the wind direction.

Taxiing over loose gravel should only be done at low engine speed to avoid abrasion and stone damage to propeller tips.

4.04.07 NORMAL TAKEOFF.

Ensure that elevator and rudder trim are set for take off. The elevators should be approx. flush with the canard, while full right trim should be set for the rudder.

Complete the run-up checklist prior to takeoff, return the mixture to full rich prior to pulling onto the runway. Apply throttle smoothly (rear engine only first to confirm it is running) and ensure engine reaches full takeoff rpm (>2650 rpm) prior to rotation. As the aircraft accelerates, use rudder as necessary to maintain directional control. Maintain neutral stick position. When passing through rotation speed (V_R), rotate smoothly using positive aft stick pressure and then establish an appropriate climb attitude. Retract nose gear when it is no longer possible to land on the remaining runway. After positive climb is established it is advisable to reduce power to 25 in to reduce noise and engine load.

NOTE

With the gear down and full throttle there is a considerable tendency to turn to the left which must be compensated with right rudder. Without full right trim high pedal pressure is required. This tendency disappears when the nose gear is retracted, so after gear retraction the rudder needs to be trimmed left to about neutral position.

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4.04.08 CROSSWIND TAKEOFF.

With a very stiff crosswind, wheel braking for directional control may be required until rudder becomes effective. Preferred technique is to hold aileron into the wind and use downwind rudder. In severe gusty crosswind conditions, apply the downwind brake intermittently and allow the aircraft to accelerate between applications. The takeoff distance can be increased by 50% or more in the presence of a strong crosswind. For a crosswind component above 10 kts, add 5 kts plus ½ the gust factor to normal rotation speed and raise the nose more swiftly to achieve a clean lift-off without sidedrift. After lift-off, allow the nose to weathervane into the wind to correct for centerline drift, and then establish an appropriate climb attitude.

4.04.09 SHORT FIELD TAKEOFF AND/OR OBSTACLE CLEARANCE.

Reduce gross weight as much feasible and ensure that the aircraft CG is nominal. Ensure that the engine oil is fully warmed up and lean mixture as necessary for best power (max rpm) above 5000 ft. Using all available runway, align the aircraft with the centerline and hold full brakes while applying full power. Release brakes using minimum differential braking for directional control. Rotate briskly at 75 KIAS. Accelerate to best angle climb speed (V_X) until any obstacle is cleared, then establish an appropriate climb attitude.

4.04.10 ROUGH OR SOFT FIELD CONDITIONS.

Due to relatively high wheel load and low clearance between rudder and the ground, landing or take off at rough or soft fields is not recommended.

If you must use an unprepared surface, reduce gross weight as much as feasible and adjust the cg as far aft as practical (within limits) to allow an early rotation. Do not use high power with the aircraft stationary, do the mag. check on the

roll if necessary. Hold full aft stick and apply power, gradually to start the aircraft rolling before coming in with full forward engine power. This technique will help minimize prop damage. As the nose raises, the elevator should be leased forward so the nose wheel is held just clear of the ground. Accelerate and lift off at the normal speed and accelerate to the desired climb speed. Do not try to "jerk" the aircraft off prematurely, this only places the aft prop closer to the ground and increases the chance of damage.

4.04.11 HIGH DENSITY ALTITUDE.

Pay attention to runway length limitations and limit gross weight as much as feasible. Always lean for best power at pressure altitudes exceeding 5000 ft.

4.04.12 CLIMB.

Best angle of climb (V_X) is achieved at 100 KIAS with both engines running. For single engine it is 80 KIAS.

Best rate of climb (V_Y) is achieved at 120 KIAS with both engines running. For single engine it is 100 KIAS.. A cruise-climb of 140 KIAS is recommended for best cooling and increased forward visibility. At 500', retard throttle to obtain 25 inches Hg.

4.04.13 CRUISE.

Depending on weather and other factors, higher cruising altitudes may allow for improved ground speeds and less thermally induced turbulence. As the desired altitude is reached, set throttle and prop pitch, then trim for hands-off. The maximum recommended continuous cruise power setting is 75% power and best endurance is achieved around 50% power. At 75% power and below, the mixture may be leaned 25°C rich of peak EGT for best power and 10°C lean of peak EGT for best economy. At max power cruise (above 75%) never lean below 25 rich of peak.

4.04.14 LOW SPEED HANDLING AND STALL BEHAVIOR.

The Defiant has good flight characteristics at minimum speed. It is a docile, controllable airplane at full aft stick at its minimum airspeed of 60 to 65 KIAS . It doesn't exhibit any of the conventional airplane's tendencies to roll or pitch down uncontrollably or other common uncommanded flight path excursions. Any power settings or asymmetric power may be used at full aft stick without changing the way the airplane handles even while holding full aft stick. You can climb descend or maintain level flight by adjusting the throttle setting. The very low speed range (below 80 KIAS is characterized by a doubling of the force required to hold the stick aft, tending to keep the inattentive pilot at a more normal flying speed. Ailerons and rudder are effective at all speeds including full aft stick flight.

Since the flight characteristics of the Defiant are so much better at minimum speed than contemporary conventional aircraft, it hardly seems fitting to use the term " stall " in characterizing the behavior, even though it is technically correct. The Defiant's "stall" consists of any one of the following in the order of prevalence:

1. Stabilized flight (climb, descend, or- level depending on power setting) at full aft stick. Below 70 knots there is a very definite increase in the aft stick force, such that the pilot has to pull noticeably harder on the stick to get below 70 kts. The forward rudder is sufficiently effective for normal operations, including crosswind handling, however it is insufficient to completely counter the yaw due to front engine power when near stall. At full aft stick and high front engine power, the aircraft will yaw to the left. This does not result in a departure since heading can be maintained with right aileron.

2.Occasionally the airplane will oscillate mildly in pitch after full aft stick is reached, This is a mild "bucking" of a very low amplitude, one to two degrees and about one-half to one "bucks " per second. If the full aft stick is relieved slightly, the bucking stops. Bucking increases drag, however a moderate increase in will power will prevent sink. Thus, the stall is not characterized by the word "mush" as is common to aircraft that build up high sink rates at or near stall.

3. Occasionally, particularly at aft cg, the airplane will exhibit an uncommanded Dutch-roll, a rocking back and forth of the wings in roll. The rock, if it exists will be mild and sometimes divergent, reaching a large roll (30 degree bank) by the forth or fifth cycle. The wing rock should be stopped immediately by relaxing off the full aft stick stop . Prolonged divergent wing rock can result in an uncontrolled roll-off and altitude loss. An accurately built Defiant will not experience wing rock when flown within normal cg limits. There is a small nose down trim change due to power advance on the front engine and a small nose-up trim change due to power advance on the rear engine. Symmetrical power changes do not change trim requirements.

Accelerated stalls to 3 G's and steep pull ups to 45 degrees can be done at full aft stick without any departure tendency. Aggravated stalls have been done by holding full aft stick and using full rudder with all combinations of aileron control and at all cg positions. No spin tendency was evident in the flight testing of the two prototypes. You are cleared to do stalls in your Defiant, any power, trim or loading condition within the normal operations envelope. Get completely familiar with the stall handling of your aircraft at all power settings, Intentional spins or attempts to spin are not approved.

CAUTION

Aft of the aft cg limit, the Defiant may be susceptible to aft wing stall which can result in a stall break with a high sink rate. Some canard type aircraft including the Long EZ have experienced "Deep Stall" flight at very aft CG loading. These deep stalls have resulted in vertical descent of the aircraft that could not be recovered from. These have not occurred in a Defiant aircraft, however these experiences underscore the serious nature of an overly aft CG loading in canard aircraft.

Caution

Intentional spins are not allowed with this aircraft.

4.04.15 DESCENT.

Plan the descent well in advance of arrival, considering the cruising altitude and the elevation of the destination. Reduce power slowly to avoid shock cooling the engine such that descent under power will not exceed limiting airframe speed (V_{NE}), or slower if conditions warrant. Start the descent about 6 miles (2 minutes) out for every 1000 ft of altitude loss required, allowing for a nominal 500 fpm sink rate. The Defiant is a clean aircraft with no flaps or airbrakes. To steep descent will easily lead to over speeding and shock cooling of the engines.

4.04.16 APPROACH AND LANDING.

Plan the arrival so that a normal pattern entry to the active runway can be made from the aircraft's present position. Select a runway that (1) will minimize excessive tailwinds/crosswinds, (2) is of an adequate length, (3) has an adequate surface and (4) presents minimal down slope. To prepare for a possible go around, apply full right rudder trim, as full power will require heavy right rudder. Fly 120 KIAS on downwind, 100 KIAS on base and 75-90 KIAS on final. 70 KIAS may be used for final speed if there are no turbulent or gusty conditions. Gear may be lowered below 130 KIAS. Establish a 500 fpm sink rate on final approach.

The Defiant is a very clean airplane and you can double the runway length required if you are 15 kts fast on your approach. Make a complete flare and touch down at 65 kts (light) oar 75 kts (heavy) The normal technique of holding the nose off to minimum speed should not be used. Make a complete flare, then fly it down to touch down. This avoids a common tendency to flare too high

Hold light aft stick during landing roll. Because the Defiant is such a clean aircraft, rollout after landing will be long unless braking is applied. The front engine may be stopped by idle cut off to reduce roll out length. Use wheel steering and differential braking for directional control during the roll out and taxi.

4.04.17 CROSSWIND LANDINGS.

The best method for strong gusty crosswinds is to approach in a wings - level crab and straighten the nose with the rudder immediately before touch down. Be careful to not lock a wheel brake at touch down.

Be careful so as to touchdown with the aircraft centerline aligned along with the runway centerline.

Side-slip should be reduced to a minimum.

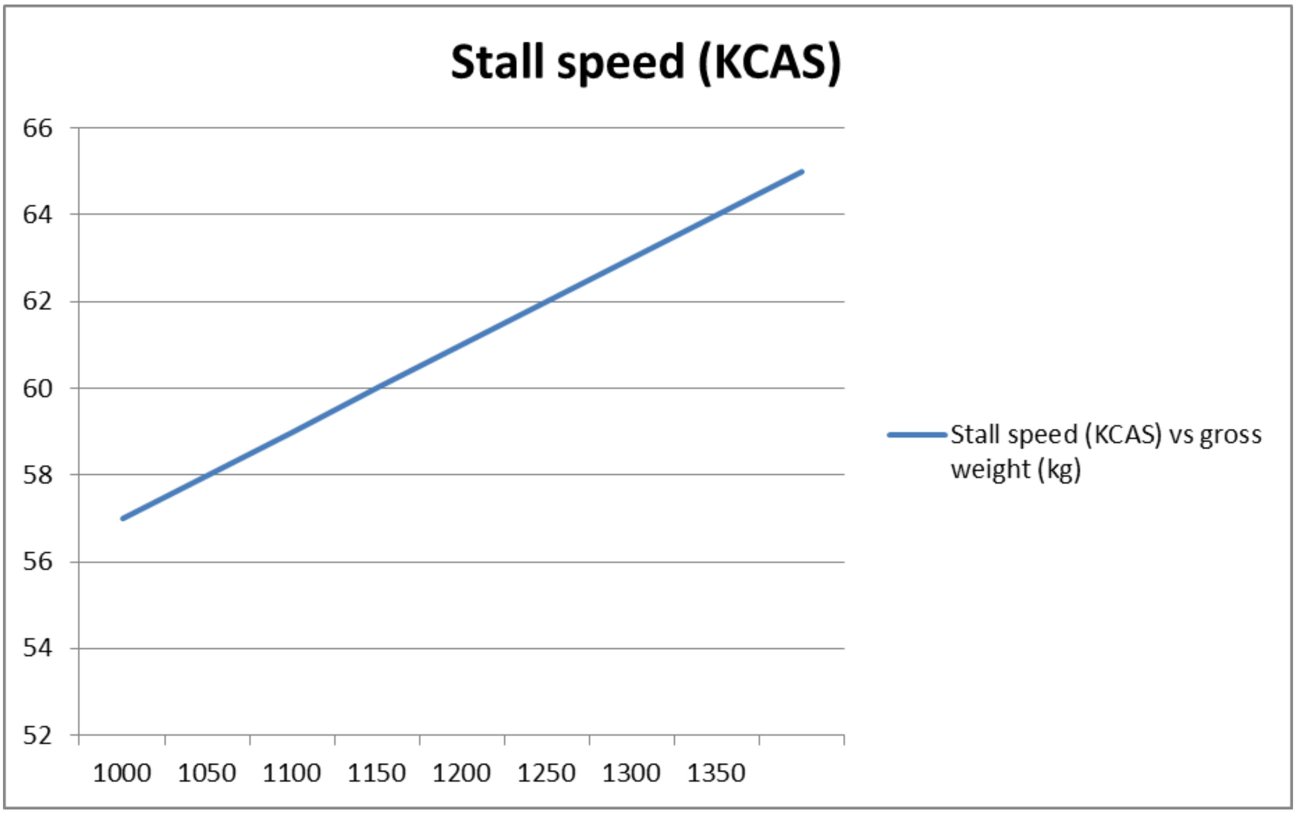
SECTION 5

PERFORMANCE

5.01 GENERAL

Aircraft performance is specific to LN-DDD.

5.03 STALL SPEEDS

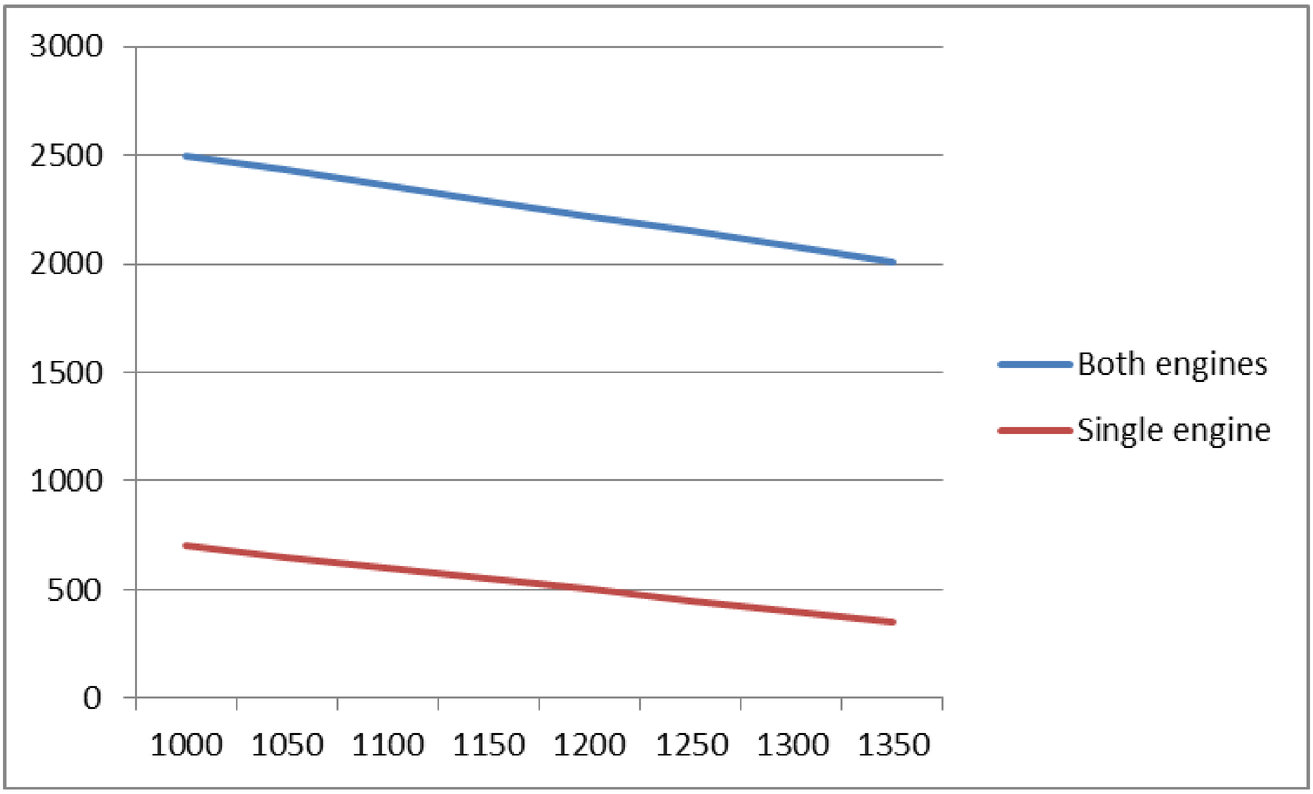


5.04 CLIMB PERFORMANCE

Best climb angle	both engines	100 KIAS
Best climb angle	single engine	80 KIAS

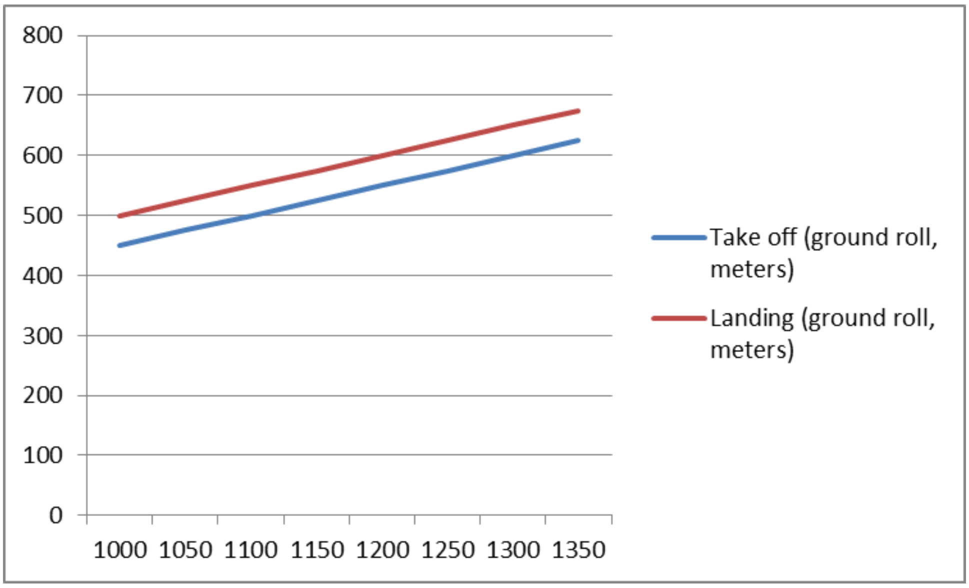
Best rate of climb both engines	120 KIAS
Best rate of climb single engine	100 KIAS

Climb rate at sea level (feet/min) vs gross weight (kg)



5.06 TAKE OFF & LANDING PERFORMANCE

Take off and landing ground roll (m) vs gross weight (kg)



Take off:
Coinditions: Full Throttle, Paved Level, Dry Runway, Zero Wind.
Decrease distance by 10% for each 5 knots headwind.

Landing
Conditions:
Air speed 80 KIS. Maximum Braking, Paved Level, Dry Runway, Zero Wind
Decrease distances by 10% for each 5 knots headwind .

5.07 SERVICE CEILING

Max with two engines 18.000 Ft
One engine 7.000 Ft

SECTION 6

WEIGHT & BALANCE

6.01 GENERAL

So as to achieve the designed performance and flying characteristics the aircraft must be flown with the weight and centre of gravity (CG) within the approved operating range/envelope. **It is the pilot's responsibility to ensure the aircraft is loaded within its operating envelope before taking off**.

An overloaded aircraft will not take off, climb or cruise as well as one properly loaded. Stall speed may be reduced.

If the CG is aft of the "degraded flying qualities" limit the aircraft may be unstable in pitch, particularly at low speed.
If the CG is aft of the absolute aft CG there is a risk of entering unrecoverable stall and possibly spin due to insufficient longitudinal stability and elevator authority..

With a CG forward of limits it may be difficult to rotate for takeoff or land.

6.02 WEIGHT AND BALANCE DESIGN LIMITS

Datum: Main wing root (wing main beam) is defined as station 181.0 in (lower numbers forward of this datum)

Design CG Range:	Flight Station (FS) 119.0 – 127.5 in (62.0 – 53.5 inches in front of datum)
NOTE	Degraded flying qualities in FS 126.5 – 127.5

SEE APPENDIX 6 FOR DETAILED WEIGHT AND BALANCE SCHEDULE

SECTION 7

SYSTEMS and OPERATION of SYSTEMS

7.01 AIRFRAME

The airframe is a fiber glass construction except for the some steel and aluminium components, notably the engine mounts, main landing gear mounts, control surface links and other miscellaneous items..

The aircraft is a canard configuration, with main wings in the back and a smaller "canard" wing in the front. This configuration adds safety and efficiency as both wings add positive lift (60% lift from main wing, 40% from the canard). Longitudinal stability is ensured by a slightly higher angle of attack of the canard than the main wing. At onset of a stall, the canard will stall before the main wings and cause a natural drop of the nose, which helps break the stall.
The main wings have large winglets for sideways stability, but the all-flying side rudder is mounted below the nose of the aircraft.
Ailerons are mounted on the main wings, while the elevators are mounted on the canard wing.
The Defiant has no flaps.

7.02 LANDING GEAR

The main landing gear legs consist of a single heavy duty fiber glass arc. The main gear is fixed.

The main gear wheels are fitted with Cleveland 15-600 wheels and Cleveland heavy duty disc brakes with dual pucks. The wheels are covered with aerodynamic fairings.

The nose gear is a standard Mooney mechanically retractable gear with a one-piece moulded epoxy shock absorbing unit. The nose gear is steerable via the rudder pedals. The mechanical gear handle has locked-up and locked-down safety hatch. However, the main safety feature against accidental retraction on the ground is that gear has an "over center" position when lowered so that the aircraft's weight will prevent accidental retraction.
An audible alarm sound when the front throttle is pulled to idle with the gear retracted.

7.03 BRAKE SYSTEM DESCRIPTION.

The braking system consists of toe brakes attached to the rudder pedals operating individual Cleveland brake cylinders to each of the main landing wheels, these share a common reservoir installed on the top right back face of the front engine firewall.

Note: Brakes are installed in both front seat positions. The rudder pedal distance is adjustable (the seats are not adjustable) to accommodate different sized pilots

Differential braking should be used to aid the steering nose wheel during tight turns while taxiing. Both brake pedals should have a similar firm feel after approximately ½" of pedal travel. When pulled out, a parking brake knob will lock in brake pressure applied to the brake pedals. To engage, apply both brakes and pull the knob. To release, simply push in the knob.
Do not rely on parking brake use for extended periods of time as fluid expansion/contraction or slow loss is possible.

7.04 FLIGHT CONTROLS

Flight control integrity is essential for safe flight. At installation or after maintenance it should be confirmed that ALL controls are connected and secured so that they **operate within the specified ranges smoothly and in the correct direction.** Full travel should be confirmed prior to each flight. NO play should be permitted in the control hinges; sloppiness may induce flutter. Similarly trim tabs must be free of play.

Dual side stick controls are provided. The control sticks have integrated push-to-talk switches. The elevators are operated through a system of adjustable pushrods. Ailerons are controlled by wires and pushrods. The rudder is operated by pushrods connected directly to the rudder pedals.

Electrical switches are mounted at the base of the instrument panel and on a center console between the front seats.

Cockpit heat control is mounted on the left side of the pilot's instrument panel.
The parking brake control knob is mounted in the same area.

The large, mechanical nose gear retraction handle is mounted below the right side of the pilot's instrument panel.

Elevators and rudder have electrical trim. Rocker type switches with position indicators are located on the centre consol.

The design specified control travel limits are:-

	Surface Design deflection	Tolerance	Actual as measured
Ailerons	21 deg up, 19 down	+/- 2 deg up/down	22 deg up, 19 deg down
Elevators	12 deg up, 20 down	+/- 2 deg up/down	10 deg up, 19 deg down
Rudder	15 in travel (top of trailing edge)	+/- 0.5 in	13 in (accepted)

7.05 ENGINE CONTROLS

The engines are normally aspirated Lycoming IOH-360 on tubular 4130 steel Dynafocal 1 mounts. Ignition for the front engine is one Slick magneto, and one Light Speed Engineering electronic ignition unit. Ignition for the rear engine is two Light Speed Engineering electronic ignition units. Both engines have a filtered air box, a spin-on oil filter, a oil cooler, a low-pressure mechanical fuel pump, an alternator and a lightweight starter. The oil sump is equipped with a quick release oil drain.

The throttles, and mixture controls are in a throttle quadrant mounted in the centre console. Left throttle and left mixture are for the front engine. Right controls are assigned the rear engine. The fuel selectors are on the floor right in front of the pilot seat, close to the center console. No carburetor heat is mounted as the engines are of the injection type.

The electronic ignition units rely on electrical power to operate. Emergency power switches for the electronic ignition units are located on the left side of the pilot's instrument panel. With these switches engaged the ignition units are powered directly from the battery even if the master switches are off. This is a safety feature that can be used in case of an electric fire.

7.06 PROPELLER DESCRIPTION.

The propellers are fixed pitch Hendrickson wooden propellers.

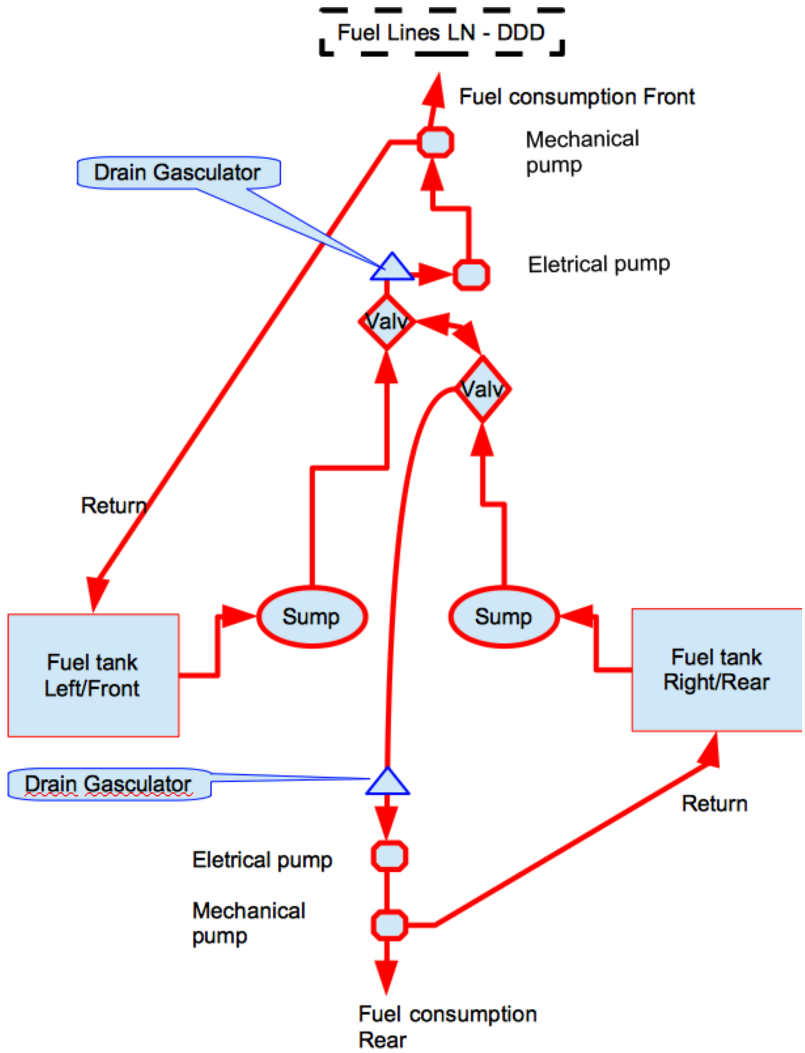
7.07 FUEL SYSTEM

The fuel system consists of two 50-gallon main fuel tanks (wing strakes) with fuselage mounted, 4-gallon sumps. The strake fuel tanks are gauged with visual sight gauges providing reliable data on fuel quantity.
Engine driven mechanical fuel pumps are backed up by the electrical pump commonly found on light low-wing aircraft. Fuel pressure at the injector is instrumented and displayed. The strake tanks are filled through a top-mounted cap on each tank. Gravity transfers fuel from the strake to the sumps. This transfer line is arranged so that the sump fills quickly after its fill line has been unported in maneuvers such as side slips or steep descent when strake fuel is low. The sumps are shaped such that the unusable fuel quantity for all normal attitudes is less than one gallon.

For normal operations, the rear engine uses fuel from the right tank and front engine from the left tank. In general, the fuel valves are always in these "normal" positions and in flight fuel management is not required.

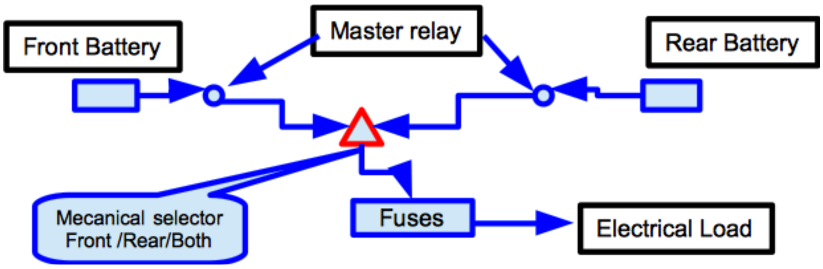
The pilot can use the valves to modify this condition, if required to equalize left/right fuel balance, or to back up a failure of one side. The valves are considered engine valves not tank valves. For example the rear engine can obtain fuel from the right or left or can be shut off (fire emergency or maintenance). It is impossible for an engine to obtain fuel from both sides simultaneously. Drains are provided at both sump tanks and at the gascolators for water removal. The gascolators are mounted on the lower left corner of the engine fire walls.

Full fuel of 108 gallons (410 litres) provides over 16 hours endurance at max endurance speed (approximately 70 knots indicated), over 11 hours endurance at maximum range speed (approximately 110 knot indicated) and 6 hours at normal cruise speed (160+ knots true).This is an unusually large amount of utility.
As is common with multi-engine aircraft the tanks are not filled after a flight. The aircraft's takeoff and performance is significantly reduced at heavy weights, thus it is advised to follow a normal procedure of servicing to approximately 30 gallons (120 litres) per side unless a long-range fight is planned.


Fuel Lines LN - DDD
Fuel consumption Front
Mechanical pump
Drain Gasculator
Eletrical pump
Valv
Valv
Return
Sump
Sump
Fuel tank Left/Front
Fuel tank Right/Rear
Drain Gasculator
Return
Eletrical pump
Mechanical pump
Fuel consumption Rear

7.08 ELECTRICAL SYSTEM

Each engine has a 12V alternator and battery. Via a large mechanical selector electrical power for the aircraft's systems can be drawn from the front, rear, or both. The preferred setting is rear, as this is the larger battery. This feature offers significant redundancy in case there is a problem with one of the alternators or batteries.
Each engine has an emergency power switch for the electronic ignition systems. When activated, the ignition systems draw power directly from the battery, even with the master switches off. This is a safety feature that can be important in case of electrical fires or there is a need to conserve power due to some other electrical problem.



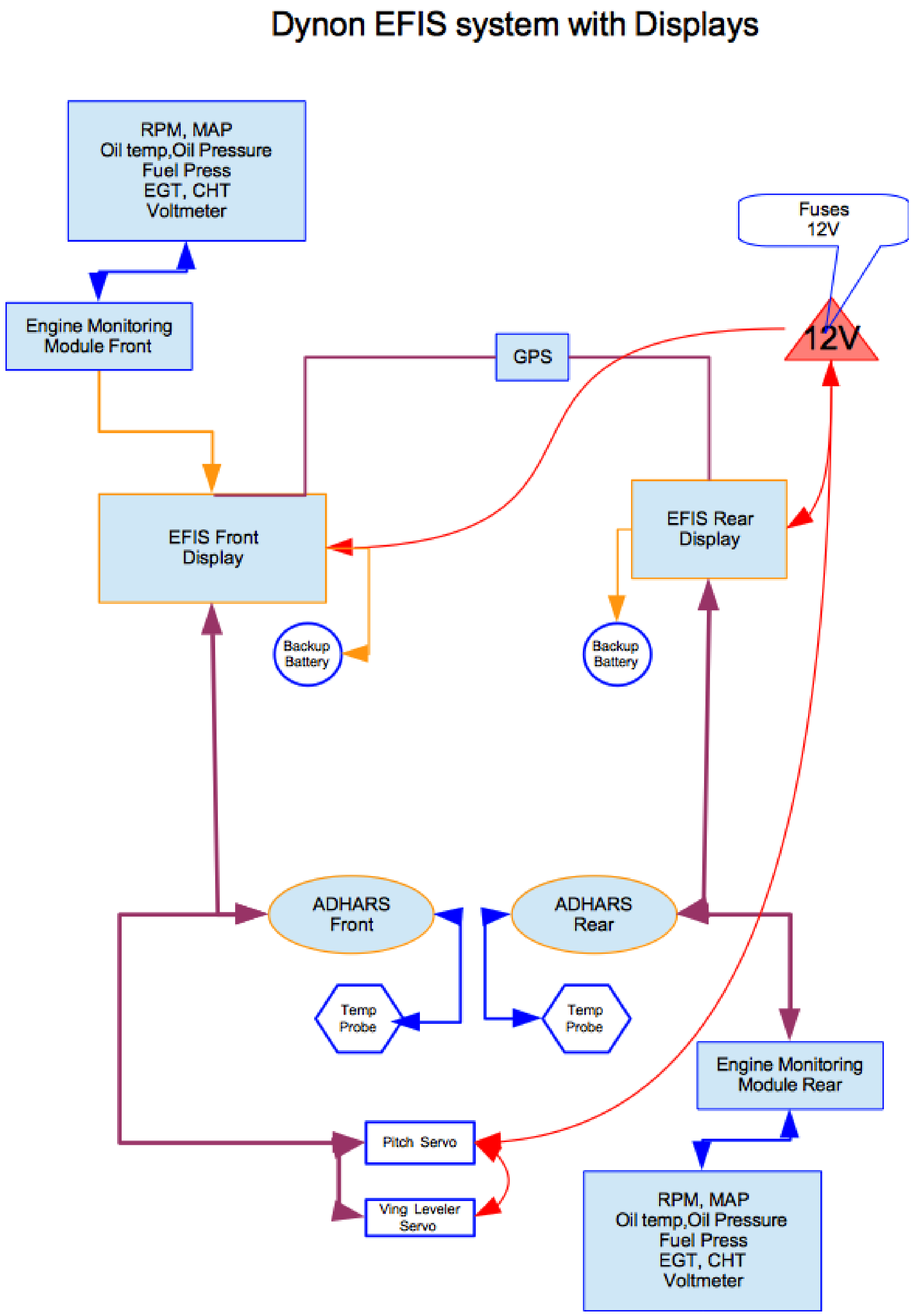
7.09 INSTRUMENT PANEL

The pilot and co-pilot have individual Dynon EFIS for flight instruments, engine instruments and navigation. The pilot's position has a large Dynon D1000 EFIS, while the co-pilot's position has the smaller Dynon D700. Functionally, they are identical. Consult Dynon operations manual for details.
A backup mechanical airspeed indicator is installed.
The instrument panel consist of following in addition to the EFIS and Airspeed instruments.
Left Cocpit, from left to right:
Intercom, ELT Ventilation duct and ventilation regulator, Parking brake handle,
Emergency switches for Electronic Ignition Front and Rear, Efis D1000, Switches for; Strobe, Nav-light, Radios and Pitot. Left and Right magnetos and Starter switches.
Middle cocpit:
Radio, Transponder, Autopilot emergencies switch, USB for EFIS`s. On dashboard, GPS and compass.
Right cocpit:
Dynon Efis D700, Intercom, Airspeed indicator, 12Volt out, Ventilation duct and Battery Selector.
Center console:
Battery and Alternator master switches, Front and Rear, fuel pumps switches, landing light switch, PTT (extra), Mixture controls and Throttles. Fuses.
All controls and instruments are located in the way that Left is Front Engine related, and Right is Rear Engine related.
Example: Left mixture is front Engine, and Right Mixture is Rear Engine.

1	Intercom extra	2	Parking break	3	ELT	4	Ventilation handles
5	Emergencies Ignition switch	6	Switches	7	Left ign/starter switch	8	Right ign/starter swithsh
9	Pedal adjust pilot	10	Gear	11	Autopilot OFF	12	USB for EFIS
13	Pedal adjust right seat	14	Intercom	15	Airspeed analogue	16	EFIS Flight instrument
17	Battery switch	18	Ventilation ducts	19	Power aux	30	EFIS and Flight instruments
31	External GPS	32	Compass	33	Radio	34	Transponder
35	Flight instruments			20	Center console with Throttles and Mixtures	20	Master switches, landing light, fuel pumps and extra PTT. Electric pitch and, rudder switches

7.10 Dynon EFIS and AUTOPILOT

Dynon EFIS and 2-axis autopilot is installed. Consult Dynon operations manual for details.



7.11 HEATING AND VENTILATION

Cabin heat is provided via a heated muff attached to the exhaust system on the right side, and fed with high pressure through Firewall Mounted Warm Air Selector/Bypass Box on the lower side of the firewall. The valve in the selector box is controlled with a push pull knob on the left side of the cockpit. In full forward position, it is closed. In full aft position, it's open, allowing hot air to enter the cockpit.

By pushing or pulling a "cabin/windshield" selector knob next to the heat knob air flow can be directed to the cabin (pedals area) or the wind shield to remove or avoid misting.

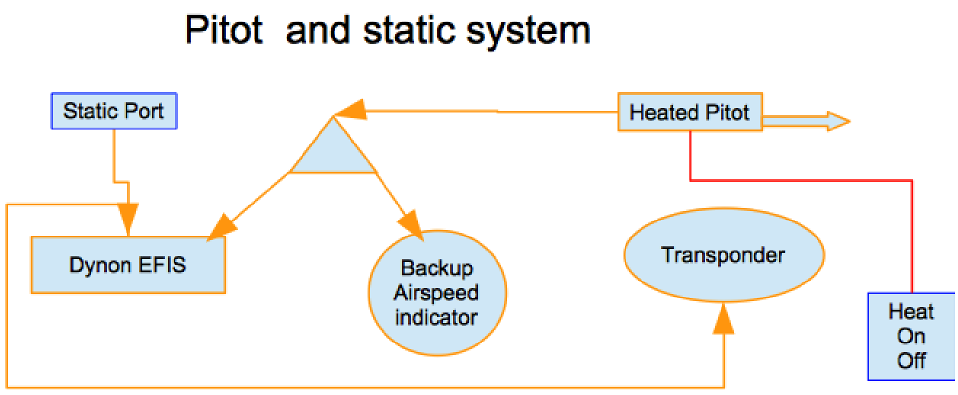
Fresh air from NACA ducts on the sides of the fuselage is fed into adjustable eyeball ducts on the far left and right sides of the instrument panels.

7.12 TRIM SYSTEMS DESCRIPTION

Electric Elevator and rudder trim servos are controlled with two rocker switches in the central consol. The rudder switch has a position indicator.

7.13 PITOT/STATIC SYSTEM DESCRIPTION.

The pitot system provides pitot pressure to the EFIS and the airspeed indicator.
Pitot tube with integrated static port with deicing heating element is installed. The Pitot tube is on the underside of the right canard. The static system supplies static pressure to the EFIS and airspeed indicator and altitude encoder (which provides altitude information to the transponder). The static pressure port are in the cabin..
All shall remain unobstructed during all flight operations.



7.14 Canopy Latch

The canopy is latched by a handle and two safety hooks at the left side of the canopy frame.
The handle is locked closed by pulling it slightly out. To open, push in and rotate the handle clockwise. This will unlock the hatch and slightly raise the canopy. To reduce load on the mechanism, use your other hand to help lift the canopy.

WARNING

Accidental opening of the canopy in flight is a very serious incident. Great care must be taken during the pre-flight check list to ensure the canopy is closed and locked.

SECTION 8

AIRPLANE HANDLING, SERVICE & MAINTENANCE

8.01 GENERAL

This section provides information on handling, service and maintenance of the aircraft.

The owner should also obtain up to date service bulletins (SB), service letters (SL) and Airworthiness Directives (AD) related to installed equipment and particularly the Engine and Propeller and other proprietary items (Wheels, brakes, radio and navigation equipment etc.)

8.02 GROUND HANDLING

Ground towing / non taxi movement is best accomplished by use of the nose wheel steering bar.

When taxiing the aircraft ensure that the taxi path and propeller back blast areas are clear. In the first few feet of taxi apply the brakes to ensure effectiveness. Do not operate the engine at high rpm, taxi with care.

When parking, ensure aircraft is sufficiently protected from adverse weather and that it presents no danger to others (people or aircraft). Park the aircraft into wind if possible and moor securely.

8.03 MAINTENANCE AND SERVICE

All work should be entered in the appropriate log book indicating:

- Date work was done
- Description of work
- Number of hours recorded on the aircraft at that time
- Name and signature of the person doing the work

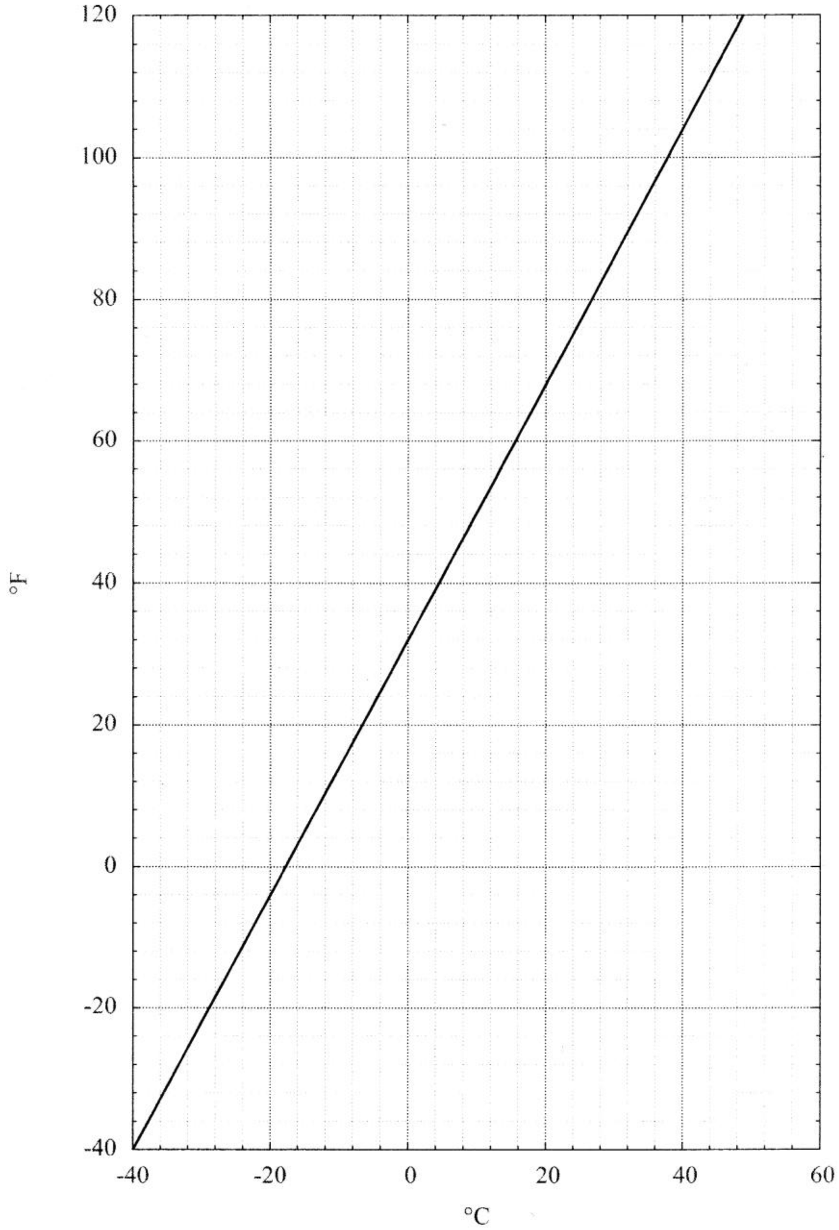
NOTE

A detailed first 50 hour and 100 hour maintenance schedule is given in appendix 5.

APPENDIXES

APPENDIX 1

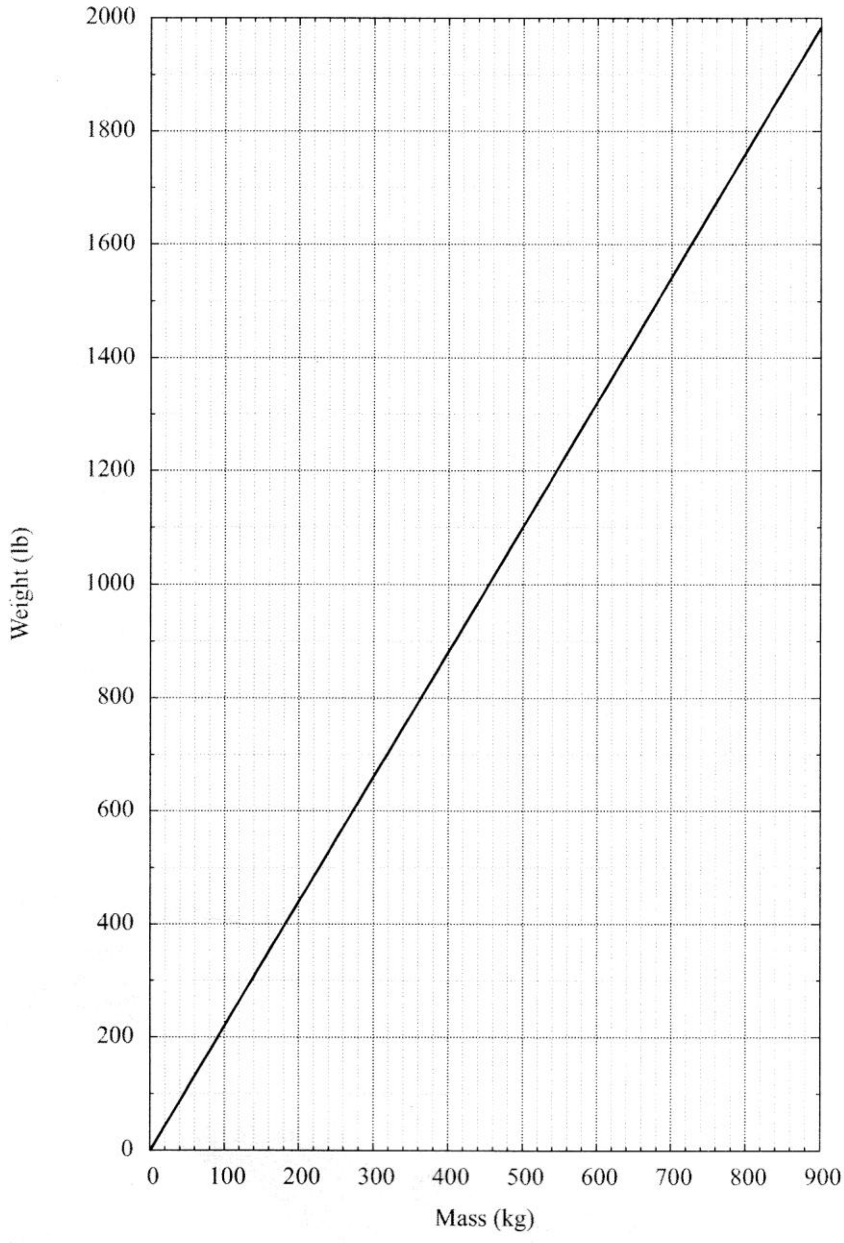
TEMPERATURE CONVERSION CHART



Temperature Conversion Chart

APPENDIX 2

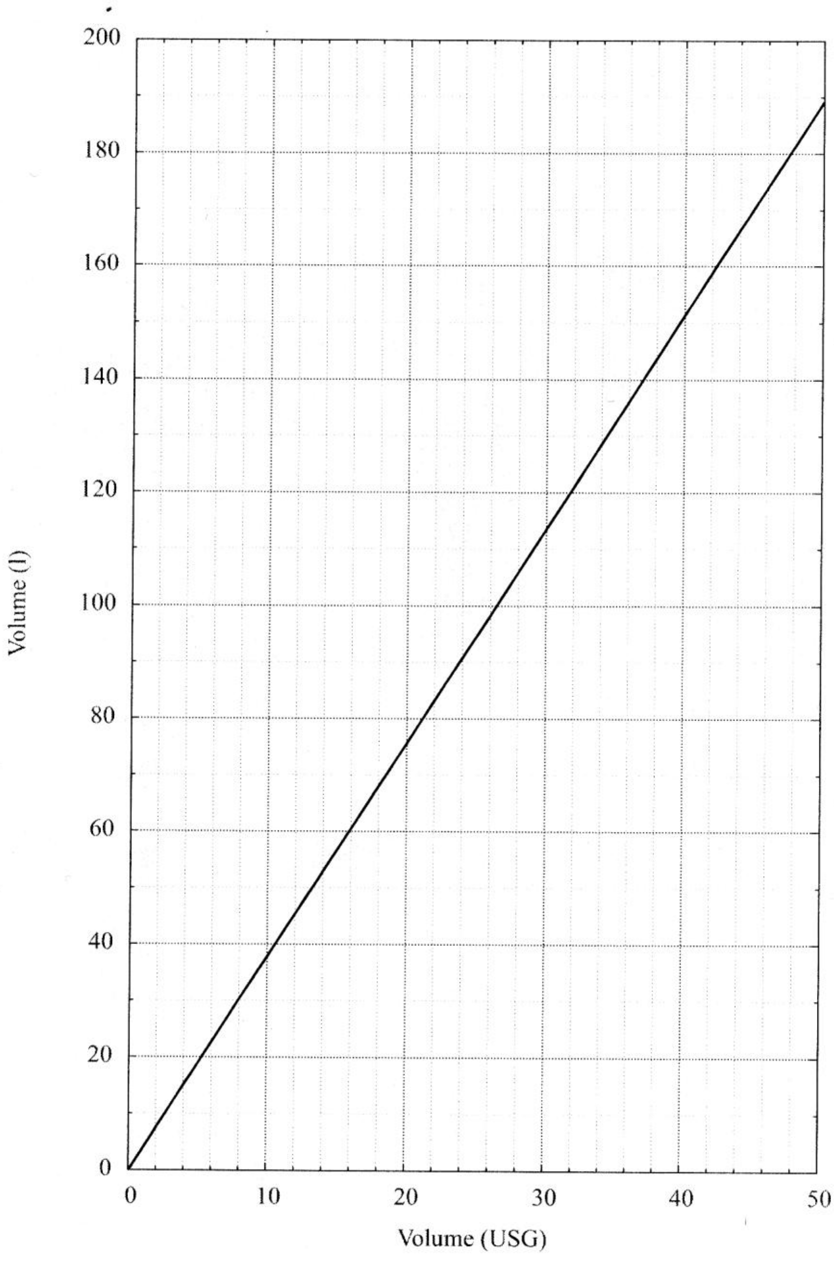
WEIGHT CONVERSION CHART



Weight Conversion Chart

APPENDIX 3

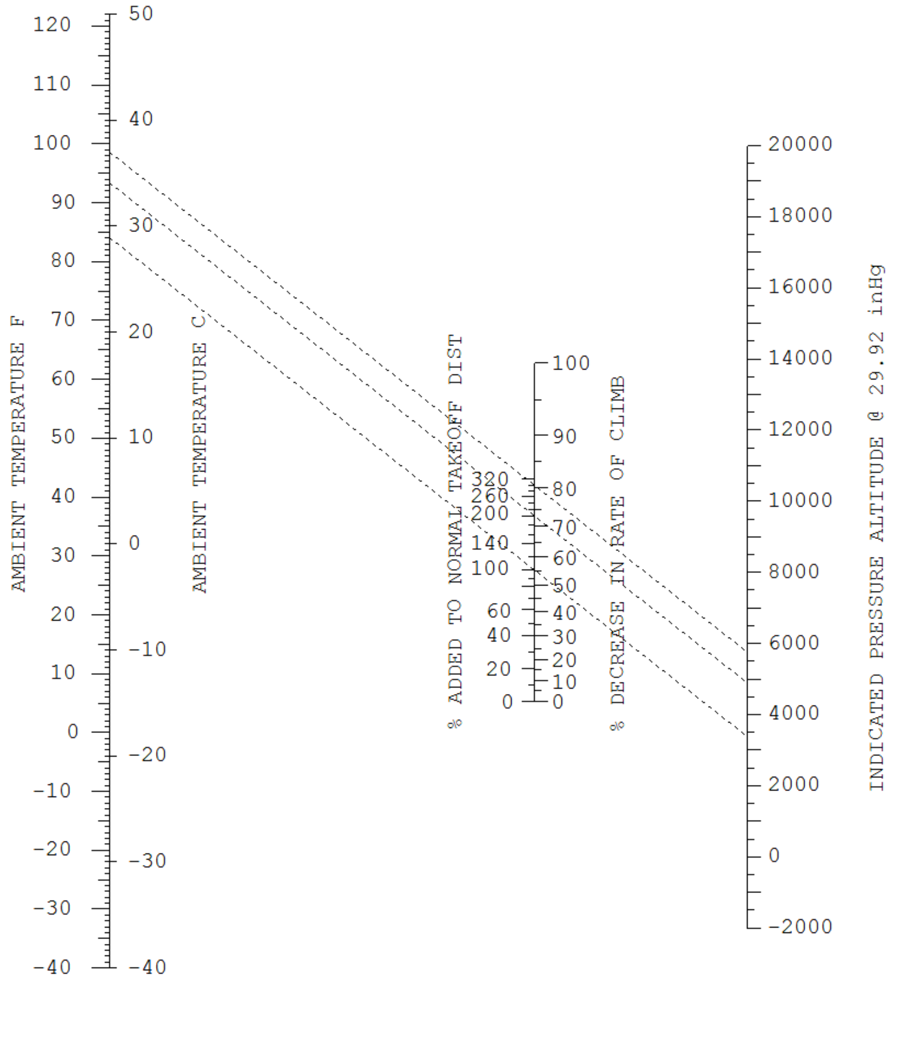
VOLUME CONVERSION CHART



Volume Conversion Chart

APPENDIX 4

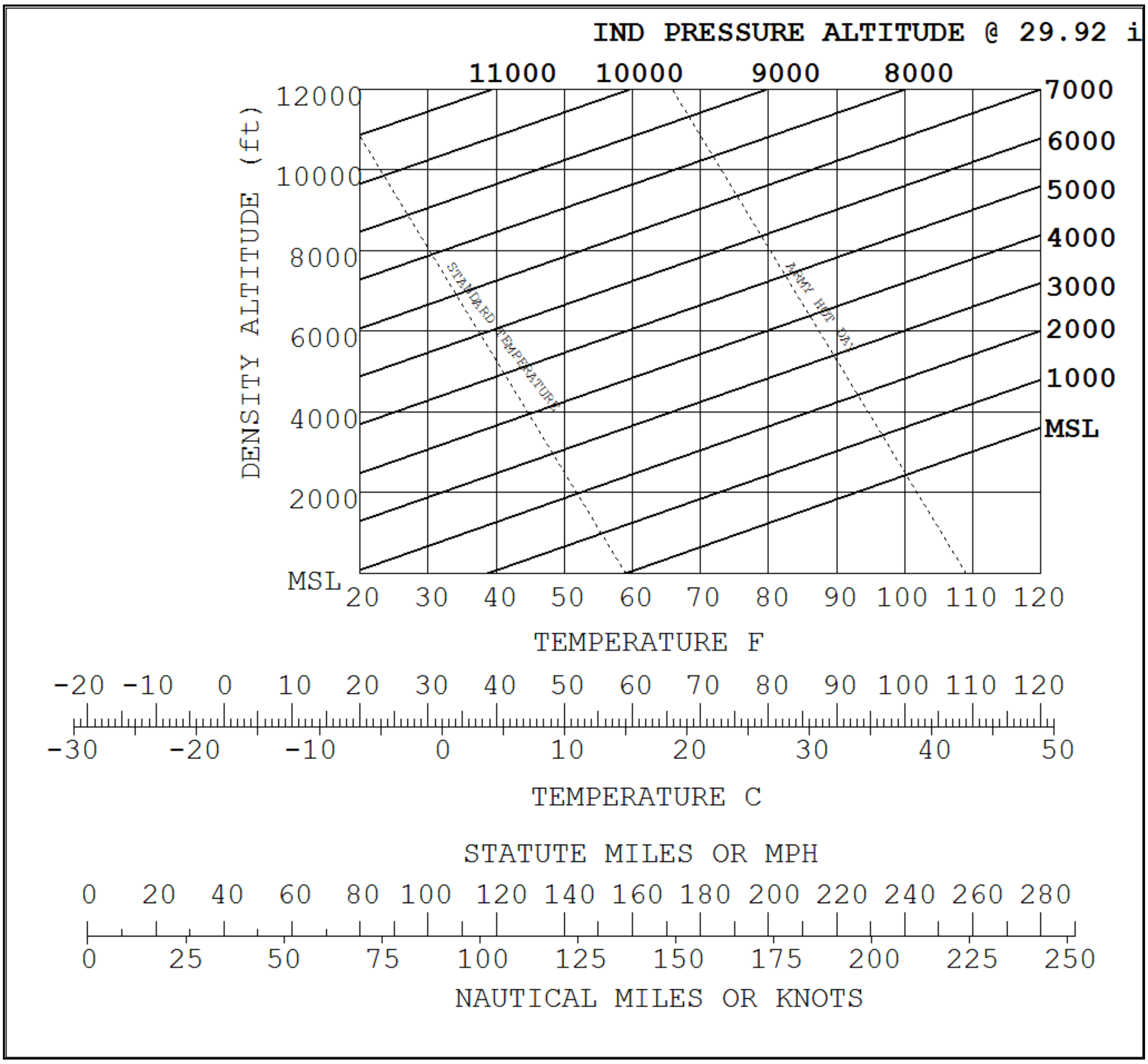
Altitude and temperature effects chart



ALTITUDE AND TEMPERATURE EFFECTS CHART

APPENDIX 5

Pressure altitude conversion table



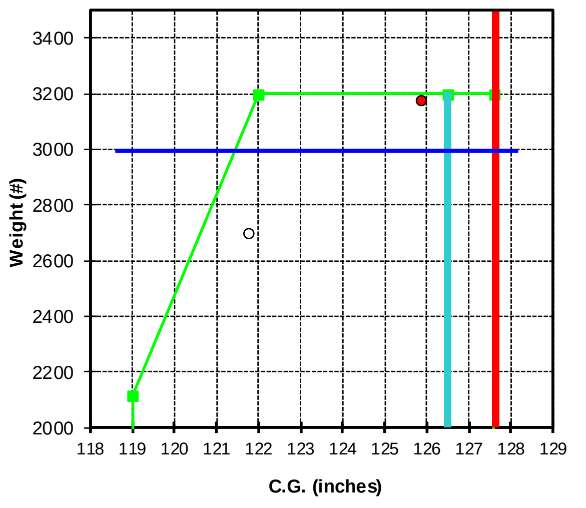
APPENDIX 6

Use the Excel based Weight & Balance calculation spreadsheet

Weight and Balance for DEFIANT - LN-DDD

Station	Weight	Arm	Moment
Basic Empty Weight	1971,0	125,6	247498,5
Front Seats	429,0	95,0	40755
Back Seats	300,0	135,0	40500
Baggage	0,0	165,0	0
Total w/o Fuel	2700,0	121,8	328753
Fuel	476,2	149,0	70952
Total	**3176,2**	**125,8**	**399706**

Max.Gross (Normal) lb's	**3200**	Below Max:	**24**	
Max.fuel to top up tanks	n/a	Max Fuel :	4	Liter
Enter Fuel Loading Here		***Act Fuel:***	**gal 79**	**300**
Approximate Range @ 155Kts		**614** NM		
Approximate Endurance @ 16,0gal/hr		**03:57** (IFR Res)		



DEGRADED FLIGHT QUALITY at CG 126.5 to 127.6
ABSOLUTE AFT CG LIMIT 127.6
CG before take off is red circle
CG at zero fuel is open circle

Aircraft Specific Data -- Not Printed

Type: **DEFIANT** Tail #: **LN-DDD**

Normal Category

min CG	**119**	**1971**	***Min Gross***	**Tomvekt fra veiing 29-11-2010**
max CG	**127,6**	*1971*	*(Min Gross)*	
(max CG)	*127,6*	**3200**	***Wt @ Max CG***	***slope of corner cutout:***
CG2	**126,5**	**3200**	***Max Gross***	**TRUE**
CG1	**122**	*3200*	*(Max Gross)*	*(if no cutout, make Wt2 = Max Gross*
(min CG)	*119*	**2116**	***Wt @ Min CG***	*and CG2<max CG)*
(min CG)	*119*	*1971*	*(Min Gross)*	

Bruk kun venstre del av arket . Høyre del er for utrekninger

Envelope Calculations

is Wt > Max Gross:
FALSE
is CG > Max CG:
FALSE
fuel @ aft CG limit:
122,8 gal

Range and Endurance #'s:

cruise A/S: 155 KTS
fuel burn: 16 gal/hr

Usable Fuel:
115 gal

Usage:

1) the left half of the sheet is the working copy that is printed
2) fill in the information in the RED boxes to calculate the CG
3) the fuel quantity is entered in the box labeled "Act Fuel"
4) the sheet computes the following:
- CG at full fuel (Line 12, red circle)
- CG at zero fuel (Line 9, open circle)
- # below max gross wt (Line 13)
- approx. range for specified A/S (Line 17)
- approx. endurance for specified fuel burn (Line 18)
5) Weight above **blue** line,only for take off on long trips.

Revised:13/07/2001

APPENDIX 7

MAINTENANCE

PREFLIGHT (See also Normal Procedure Checklist)

Check & Service oil
Drain water trap
Service fuel tanks
Check controls
Check panels & cowlings

RUTAN DEFIANT LN-DDD 50/100 HRS MAINTENANCE PLAN

Revidert : 27.10.2012 CA

A= Hver 100 timer

B= Hver 50 timer

1. **Fremre Propeller**

	A(100)	B(50)	Dato	Sign
1.1 Sjekk festeboltenes moment og låsing	x	x		
1.2 Sjekk nav og blader for skader	x	x		
1.3 Sjekk spinnerens fester og tilstand	x	x		

2. **Bakre Propeller**

	A(100)	B(50)	Dato	Sign
1.1 Sjekk festeboltenes moment og låsing	x	x		
1.2 Sjekk nav og blader for skader	x	x		
1.3 Sjekk spinnerens fester og tilstand	x	x		

3. **Diverse**

	A(100)	B(50)	Dato	Sign
6.1 Sjekk brannslukker.	x			
6.2 Sjekk førstehjelpsskrin.	x			
6.3 Sjekk seter, belter og interiør	x	x		
6.4 Sjekk at alle LDPer og MSBer er utført.	x	x		
6.5 Sjekk at alle anmerkninger i reisedagboken er utkvittert.	x	x		
6.6 Før inspeksjonen og resultatet av tetthetsprøven på motoren inn i motorjournalen.	x			

4. Fremre Motor

	A(100)	B(50)	Dato	Sign
2.1 Sjekk cowlingen for sprekker, skadde festhull	x	x		
2.2 Sjekk motorbukk for skader, korrosjon og innfesting i kroppen.	x	x		
2.3 Sjekk motorens fester i motorbukk	x	x		
2.4 Sjekk motor og komponenter for olje eller bensinlekkasje	x	x		
2.5 Sjekk eksossystemet	x	x		
2.6 Sjekk luftinntak og gummislanger	x	x		
2.7 Sjekk kabinvarmeveksler	x	x		
2.8 Sjekk baffling	x	x		
2.9 Sjekk drivstoffsystemet	x	x		
2.10 Sjekk ventilasjonen fra veivhuset.	x	x		
2.11 Sjekk evnt. skift oljefilter og bytt olje.	x	x		
2.12 Sjekk tennpluggene	x	x		
2.13 Sjekk tennplugg kablene	x	x		
2.14 Sjekk magnetenes funksjon og justering	x	x		
2.15 Sjekk jording av magnetene	x	x		
2.16 Sjekk batteri vann-nivå	X	x		
2.17 Sjekk og rengjør bensinfilteret og forgasserens filter	x	x		
2.18 Sjekk throttle	x	x		
2.19 Smør throttle	x	x		
2.20 Sjekk luftfilteret	x	x		
2.21 Sjekk at alle skruer og muttere er faste og låste	x	x		
2.22 Prøvekjør motoren. Utfør tetthetsprøve:	x			
Verdier: Se eget skjema				

5. Bakre Motor

	A(100)	B(50)	Dato	Sign
2.1 Sjekk cowlingen for sprekker, skadde festhull	x	x		
2.2 Sjekk motorbukk for skader, korrosjon og innfesting i kroppen.	x	x		
2.3 Sjekk motorens fester i motorbukk	x	x		
2.4 Sjekk motor og komponenter for olje eller bensinlekkasje	x	x		
2.5 Sjekk eksossystemet	x	x		
2.6Sjekk luftinntak og gummislanger	x	x		
2.7 Sjekk kabinvarmeveksler	x	x		
2.8 Sjekk baffling	x	x		
2.9 Sjekk drivstoffsystemet	x	x		
2.10 Sjekk ventilasjonen fra veivhuset.	x	x		
2.11 Sjekk evnt. skift oljefilter og bytt olje.	x	x		
2.12 Sjekk tennpluggene	x	x		
2.13 Sjekk tennplugg kablene	x	x		
2.14 Sjekk magnetenes funksjon og justering	x	x		
2.15 Sjekk jording av magnetene	x	x		
2.16 Sjekk batteri vann-nivå	X	x		
2.17 Sjekk og rengjør bensinfilteret og forgasserens filter	x	x		
2.18 Sjekk throttle	x	x		
2.19 Smør throttle	x	x		
2.20 Sjekk luftfilteret	x	x		
2.21 Sjekk at alle skruer og muttere er faste og låste	x	x		
2.22 Prøvekjør motoren. Utfør tetthetsprøve:	x			
Verdier: Se eget skjema				

6. Skrog, vinger,hale og ror.

	A(100)	B(50)	Dato	Sign
3.1 Sjekk utvendig etter skader	x	x		
3.2 Sjekk så langt mulig den indre struktur mht. skader, limseparasjon, råte osv	x			
3.3 Sjekk innfesting av vinge,hale og ror.	x	x		
3.4 Sjekk rorwirene.	x			
3.5 Sjekk trinser og wiregjennomføringer	x	x		
3.6 Sjekk kontrollspakene	x	x		
3.7 Sjekk siderorspedalene	x	x		
3.8 Sjekk rorlagrene	x	x		
3.9 Sjekk rorutslag og bevegelse	x	x		
3.10 Sjekk canopy		x		
3.11 Sjekk canopylås		x		
3.12 Sjekk dreneringshull og -rør		x		

7. Understell

	A(100)	B(50)	Dato	Sign
4.1 Sjekk bremsepedalene	x	x		
4.2 Sjekk bremseklosser, kalipere og slanger. Skift bremseklosser ved behov	x			
4.3 Sjekk hjullager, hovedhjullegger og nesehjulsoppheng. Smør ved behov.	x			
4.4 Sjekk hjul og dekk	x	x		
4.5 Heis opp flyet og sjekk at nesehjul går lett inn og ut, eventuelt smør overføringer.	X	X		

8. Instrumenter og systemer

	A(100)	B(50)	Dato	Sign
5.1 Sjekk bensintankene med hensyn til tetthet og innfesting	**x**			
5.2 Sjekk drivstoffledninger og drivstoffkraner	**x**			
5.3 Sjekk drivstoffnivåglass	**x**			
5.4 Sjekk pitotrøret og pitotrørvarme	**x**			
5.5 Sjekk ledningene til pitotrøret	**x**			
5.6 Sjekk at samtlige instrumenter virker	**x**	**x**		
5.7 Sjekk om kompassving er due	**x**			
5.8 Sjekk bevegeligheten i alle kontroller og smør ved behov	**x**	**x**		

APPENDIX 8

Pilot Theoretical and Practical Program (PTPP) for Rutan Defiant LN-DDD with Centerline Thrust

Syllabus

The purpose of this document is to provide a syllabus of theoretical ground and flight training for candidates undertaking the PTPP on Rutan Defiant LN-DDD with Centerline Trust, holding only SEP rating.

1. **Aim**

   To give the candidate a sound theoretical knowledge of multi engine piston aircraft operation in accordance with the visual flight rules (VFR), and to teach the skills necessary for the safe and competent operation of such aircraft.

2. **Course Structure**

   The course shall comprise of a minimum of 4 hours theoretical ground training in the form of lectures, and a minimum of 4 hours flight training. The ground and flight training shall be integrated and coordinated so that the candidate gains the maximum benefit from time spent in the air. On completion of this training, the applicant shall pass a ground examination. All requirements stated in this syllabus are to be regarded as a minimum. Candidates with Night and IMC qualifications may wish to do additional training in instrument and night flying.

3. **Pre-Course Entry Requirements**

   The candidate is required to have 70 hours flight time as pilot in command (PIC) of airplanes before making familiarization application. It is therefore assumed that the applicant for familiarization will be in possession of at least a valid PPL (A) with SEP rating, and have 70 hours experience as PIC before this course. There are no planned solo exercises on the course.

4. **Instruction – Instructor qualifications**

   A Flight Instructor (FI) or a Class Rating Instructor (CRI), approved by the owner(s), shall conduct flight instruction on the course. The ground instruction shall take the form of lessons and briefings given by the same FI, CRI, or an ground instructor approved by the flight instructor.

5. **Training Records**

   A student training record shall be maintained of all ground training conducted and of all flight-training exercises. The record, which must contain limited personal details of the candidate, shall be maintained for a period of 3 years from completion of the training.

6. **Theoretical Examination**

   Candidates shall sit a multiple choice written examination of 40 questions, on completion of the course. The examination pass mark is 75%.

7. **Flight Tests**

   On completion of the course of instruction for the familiarization, including passing the theoretical examination, the candidate will be qualified to fly the Defiant.
   A training with an Instructor has to be performed once a year after the familiarization.

8. **Exemptions from Training**

   Holders of pilot license with MEP or centerline thrust privileges,will be credited with the flying and ground training. Pilots so qualified will be required to minimum 1:15 Hour flight training and a theoretical examination, including mass & balance/performance.

Theoretical Training

The theoretical knowledge syllabus shall be referenced to lessons shown in the table.

Lesson	Subject	Time
TH1	Aeroplane and Engine Systems	1 hr
TH2	Mass and Balance	1 hr
TH3	Effects of Engine Failure on Systems and Performance	1 hr
TH4	Mass and Performance	1 hr
	Total	4 hrs

Flight Training

The Flight Training element of the Multi Engine Piston, centreline thrust course shall consist of a minimum of 4 hours of dual instruction, to include a minimum of 1hour of training in single engine operations. The outline syllabus is as follows:

Exercise	Description	Total Time	Engin Failure
F1	Initial Type Conversion	1 hr	
F2	General Handeling and Circuits	1 hr	
F3	General Handeling – Engine Failures	1 hr	30 min
F4	Single Engine Performance and Circuits	1 hr	30 min
	Total	4 hrs	1 hr

Theoretical Examination

The theoretical examination for a centerline thrust multi-engine piston aeroplane should include questions confined to centerline thrust aeroplanes.

THEORETICAL TRAINING

Lesson: TH1 - Aeroplane and Engine Systems

Duration: 1 hour
Aim: To understand all systems relevant to the operation of the multi engine piston aeroplane used on the course.

Lesson Content:

1 Aeroplane Systems (normal operation):

- Fuel
- Electrical
- Flight Control (primary and secondary)
- Flight Instruments including Dynon Efis
- Avionics
- Braking

2 Engine Systems (normal operation):

- Fuel
- Oil
- Starter
- Ignition
- Mixture

3 Limitations:

- Airframe:
    - Load factors
    - Speeds
- Engine:
    - RPM
    - Temperatures and Pressures

4 Emergency Procedures:

- Refer to the Aircraft Flight Manual

Performance Standard: The candidate shall be able to list and describe the aeroplane and engine systems and their operation, under normal and emergency conditions.

Lesson: TH2 - Mass and Balance

Duration: 1 hour
Aim: To familiarize the candidate with the mass and balance calculations for the airplane type.

Lesson Content:

1. Revision of weight and balance principles
2. Application of principles to airplane type calculation
3. Practice sample calculations using Flight Manual data, and be aware of degraded flight quality with CG between 126.5 and 127.5 at slow speed.

Performance Standard: The candidate shall be able to perform, mass and balance calculations for the airplane type correctly.

Lesson: TH3 - Effects of Engine Failure on Systems and Performance - Centerline Thrust
Duration: 1 hour
Aim: To learn the effects on in flight performance, caused by one inoperative engine

Lesson Content:

1 The multi-engine scene:

- Rationale for 2 or more engines
- Configurations of multi-engine aeroplanes

2 The multi-engine problem:

• Engine failure situation, leading to performance reduction

Factors affecting:

- Power
- Mass/CofG
- Altitude
- Drag (e.g. undercarriage, flaps, etc; feathering)
- Turbulence

3 Take-off Safety Speed (TOSS) (V2) and other V Speeds:

- Definition
- Derivation

4 Effect on Systems:

- Electrics
- Fuel

5 Effect on Power:

- Excess power available
- Optimum speeds

6 Effect on cruise:

- Range
- Endurance

7 Acceleration/Deceleration

8 Zero Thrust:

- Definition
- Purpose
- Determination

Performance Standard: The candidate shall be able to list the systems affected by loss of a single power unit, and explain the subsequent effect on aircraft flight-performance.

Lesson: TH4 - Mass and Performance

Duration: 1 hour
Aim: To revise mass and performance calculations, and practice calculations for the aeroplane type, used on the course.

Lesson Content:

1. Air Navigation (General) Regulations for the time being in force.
2. Revision of principles of mass and performance calculations; use of graphs and tables.
3. Practice in completing calculations for the aeroplane type, using data from the Aircraft Flight Manual to include, as appropriate, the one engine inoperative case:
    - WAT
    - Take off
    - Accelerate/Stop
    - Climb out - flight paths
    - En route ceiling, range, endurance
    - Descent
    - Landing

Performance Standard: The candidate shall be able to perform correctly, all weight and performance calculations relevant to the aeroplane type.

FLIGHT TRAINING

Flight Exercise F1 - Initial Type Conversion
Duration: 1 hour
Aim: To learn the characteristics of a multi-engine aeroplane in normal flight.

Air Exercise:

1. Pre-flight Preparation and Aircraft Inspection
2. Start-up and Taxiing:
   - Cockpit familiarisation
   - Checklist procedures
   - Engine start
   - Engine fire on the ground
   - Taxiing: use of brakes and throttles
3. Take-off and Climb:
   - Check list procedures
   - Normal take-off/cross-wind take-off
   - After take-off checks
   - Normal climb, climbing turns
   - Throttle
4. Cruise:
   - Level off
   - Use of trim
   - Effect of undercarriage
   - Normal turns
   - Cruise checks

5 Engine Handling:
- Engine temperatures and pressures
- Use of: mixture control

6 In Flight Emergencies (other than engine fire/failure):

- Electric
- Airframe and engine icing
- Fire
- Propeller Over-speed
- Others as per Flight Manual

7 Steep turns (45° bank)

8 Descending:

- Descent checks
- Normal descent and descending turns
- Mixture control

9 Demonstration Normal Circuit:

- Checklist procedures
- Approach
- Normal landing

Skill Standard: The candidate shall be able to demonstrate competent handling of the aeroplane both in the air and on the ground, and be able to carry out normal operations in accordance with the aircraft checklist.

Flight Exercise F2 - General Handling and Circuits
Duration: 1 hour
Aim: To learn stall recognition and recovery, multi engine circuit procedures and to revise aeroplane and engine handling.

Air Exercise:

1. Start-up and Taxi
2. Take-off and Climb
3. Stalling:
    - Checks
    - Clean configuration - power off
    - Approach configuration - power off
    - Approach configuration - power on
4. Circuit Procedures - Both Engines Operative:
    - Normal configuration
    - Approach and landing
    - Performance landing
    - Go-around
5. Undercarriage Emergency Procedures including lowering

Skill Standard: The candidate shall be able to demonstrate ability to handle all aspects of normal aeroplane operation including stall recovery with all engines operative.

Flight Exercise F3 - Introduction to Engine Failure
Duration: 1 hour
Aim: To learn to recognize the symptoms of an engine failure; to identify the failed engine; carry out appropriate drills, and learn to operate the aeroplane safely following the total loss of power on one engine.

Air Exercise:

1 Normal Take-Off and Climb

2 Single-Engine Flight: (Consider engine cooling!):

- Demonstrate full feathering drill (engine shut-down) using checklist procedures
- Aeroplane handling with one engine inoperative:
- Power required
- Trim position
- Demonstrate fuel cross-feed
- Demonstrate un-feather drill using checklist procedures
- Demonstrate zero thrust condition determination of 'zero thrust' settings

3 Simulated Engine Failure:

- Effect of engine failure:
- Visual
- Instrument
- Performance
- Identification of failed engine
- Instrument indications

4 Forced Landing Considerations.

Skill Standard: The candidate shall be able to identify a failed engine, demonstrate safe handling of the aeroplane, and state the immediate actions required following an engine failure.

Flight Exercise F4 - Circuits

Duration: 1 hour
Aim: To learn to handle an engine failure shortly after take-off, to carry out the EFATO (engine failure after take-off) drills, go-around and a subsequent landing.

Air Exercise:

1 Take-off Brief

2 Engine Failure After Take-off

3 Circuit:

- Power settings and speeds
- Undercarriage operation:
    - Normal
    - Emergency
    - Visual Committal Height
    - Go-around;
    - Decision
    - Actions
    - Landing

Skill Standard: The candidate shall be able to identify the engine failure after take-off; control the aeroplane; carry out a circuit and a landing.

Appendix B – MEP-Centerline Training Course

TRAINING RECORD

Student name:

Date	Aircraft or Ground	Exercise	Time	Total Hours	Instructor Name	Remarks