



## **Pilot Operating Handbook and Airplane Flight Manual**

### **GENERAL**

#### **Section I**

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THANK YOU.....





You have obtained what we feel is the latest state-of-the-art in the most user(and family)friendly homebuilt aircraft in the world. Its performance is spectacular and its life almost beyond measure given reasonable care. We encourage you to become familiar with this handbook as well as the FARs that are applicable to your operation. The combination will provide you with safe and sound knowledge for operation of your personally manufactured EXPRESS.

#### **IMPORTANT NOTICE**

This handbook must be read carefully by the owner or operator(s) of the EXPRESS in order to become familiar with its operation and to obtain all it has to offer in terms of both speed and reliability. Herein are suggestions and recommendations to help you obtain safe performance without sacrificing outstanding economy. You are encouraged to operate your machine in accordance with and within the limits identified in this Pilot's Operating Handbook and Approved Flight Manual as well as any placards located in the airplane.

Again, another reminder- the operator should also be familiar with the Federal Aviation Regulations as applicable to the operation and maintenance of experimental airplanes and FAR Part 91 General Operating and Flight Rules. The aircraft **MUST** be operated and maintained in accordance with any FAA Airworthiness Directives which may be issued against it. It is also prudent and mandatory to operate within any established limits or Service Bulletins.

The FARs place the responsibility for the maintenance of this airplane on the owner and the operator who must ensure that all maintenance is accomplished by the owner or qualified mechanics in conformity with all airworthiness requirements wstablished for this airplane.

All limits, procedures, safety practices, time limits, servicing, and maintenance requirements contained in this handbook are considered mandatory for the continued airworthiness of this airplane, in a condition equal to that of its original manufacture.

#### **USE OF THIS HANDBOOK**





The Pilot's Operating Handbook is designed so that necessary documents may be maintained therein for the safe and efficient operation of your 4-place EXPRESS. It's loose leaf form allows easy maintenance of updates and revisions, and is also a convenient size for storage and use within the cockpit.

The handbook is in ten basic sections in accordance with the GAMA Specification No.1, Issued 15 February 1975, Revised 1 September 1984, Revision #1.

#### **NOTE**

Except as noted, all airspeeds quoted in this handbook are Indicated Airspeeds (IAS) in Knots, and assume zero instrument error.

#### **REVISING THIS HANDBOOK**

Immediately following the title page is the "Log Of Revisions" page(s). The Log of Revision pages are used for maintaining a listing of all effective pages in the handbook (except the SUPPLEMENTS section). and as a record of revisions to these pages. In the lower right corner of the outlined portion of the Log is a box containing a capital letter which denotes the issue or reissue of the handbook. This letter may be suffixed by a number which indicates the numerical revision. When a revision to any information in the handbook is made, a new Log of Revisions will be issued. All Logs of Revisions must be retained in the handbook to provide a current record of material status until a reissue is made.

#### **WARNING**

When this handbook is used for airplane operational purposes, it is the pilot's responsibility to maintain it in current status.

#### **AIRPLANE FLIGHT MANUAL SUPPLEMENTS REVISION RECORD**

Section IX contains the Express Design Inc. Approved Airplane Flight Manual Supplements headed by a Log of Supplements page. On the "Log" page is a listing of the EXPRESS Approved Supplemental Equipment available for installation on the airplane. When new supplements are received or existing supplements are revised, a new "Log" page will replace the previous one, since it contains a listing of all





previous approvals, plus the new approval. The supplemental material will be added to the grouping in accordance with the descriptive listing.

NOTE

Upon receipt of a new or revised supplement, compare the "Log of Revisions" page just received with the existing Log page in the manual. Retain only the new page with the latest date on the bottom of the page and discard the old one.

**DESCRIPTIVE DATA**

**ENGINE** Lycoming, IO-360 C1C6

**PROPELLER** Hartzell, 2 Blade 7666A-2, HCE2YR Hub

**FUEL** 100LL (blue) Av gas

Standard System Capacities

Main, Useable	46.0 gallons (U.S.)
Auxiliary wing tanks	34.0 gallons

**OIL CAPACITY**

8 quarts (U.S.)

**WEIGHTS**

Max Take-off Weight	2895 lbs.
Max Landing Weight	2895 lbs.
Max Baggage Comp.(4 per, full fuel)	(per Wt & bal) lbs.

**CABIN AND ENTRY DIMENSIONS**

Height 44.5 inches

Width - Interior, front 45 inches





Width - Interior, rear 42.75 inches

#### BAGGAGE

Compartment Volume 20.6 cu ft

#### SPECIFIC LOADINGS (Max Take-off Wt.)

Wing Loading - 200HP	21.1 lbs/sq ft
Power Loading - 200HP	14.5/lbs/hp
Useful Load - 200 HP	1195 lbs

#### GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

**CAS** Calibrated Airspeed is the indicated speed of an airplane, corrected for "position error" and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

**GS** Ground Speed is the speed of an airplane relative to the ground.

**IAS** Indicated Air Speed is the speed of an airplane as shown on the airspeed indicator when corrected for instrument error. IAS values published in this hand-book assume zero instrument error.

**KCAS** Calibrated Airspeed expressed in "knots."

**KIAS** Indicated Airspeed expressed in "knots."

**TAS** True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature, and compressibility.

**V<sub>A</sub>** Maneuvering Speed is the maximum speed at which application full available aerodynamic control will not overstress the airplane.



- $V_{FE}$  Maximum Flap Extend Speed is the highest speed permissible with wing flaps in a prescribed extended position.
- $V_{NE}$  Never Exceed Speed is the speed limit that may not be exceeded at any time.
- $V_{NO}$  Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air and then only with caution.
- $V_{SO}$  Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration.
- $V_{S1}$  Stalling Speed or the minimum steady flight speed at which the airplane is controllable
- $V_X$  Best Angle-of -Climb Speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance. Also, speed for rotation on takeoff.
- $V_Y$  Best Rate-of -Climb Speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

#### **METEOROLOGICAL TERMINOLOGY**

- ISA** International Standard Atmosphere in which
- 1) The air is a dry perfect gas;
  - 2) The temperature at sea level is 15° Celsius (59° F);
  - 3) The pressure at sea level is 29.92 in. Hg. (1013.2 mB);
  - 4) The temperature gradient from sea level to the altitude at which the outside air temperature is -56.5°C (-69.7°F) is - 0.00198°C (-0.003566°F) per foot and zero above that altitude.
- OAT** (Outside Air Temperature) The free air static temperature, obtained either from in-flight temperature indicators adjusted for instrument error and compressibility effects, or ground meteorological sources.





**Indicated Pressure Altitude** The number actually read from an altimeter when the barometric subscale has been set to 29.92 in Hg or 1013.2 millibars.

**Pressure Altitude** Altitude measured from standard sea-level pressure (29.92 in Hg) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero. Position errors may be obtained from the Altimeter Correction Graph.

**Station Pressure** Actual atmospheric pressure at field elevation.

**Wind** The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

## **POWER TERMINOLOGY**

**Take-off and Maximum Continuous** The highest power rating not limited by time.

**Cruise Climb** The power recommended for cruise climb.

## **ENGINE CONTROLS/INSTRUMENTS**

**Throttle Control** Used to control power by introducing fuel-air mixture into the intake passages of the engine. Settings are reflected by readings on the manifold pressure gauge.

**Propeller Control** This control requests the propeller to maintain engine/propeller rpm at a selected value by controlling blade angle.

**Mixture Control** This control is used to set fuel flow in all modes of operation and cuts off fuel completely for engine shutdown.





**EGT (Exhaust Gas Temperature)** This indicator is used to identify the lean and best power fuel flow for various power settings.

**CHT (Cylinder Head Temperature)** This indicator is used to identify the operating temperature of the engine's cylinders.

**Tachometer** Indicates the RPM of the engine/propeller.

**Propeller Governor** Regulates the RPM of the engine/propeller by increasing or decreasing the propeller pitch change mechanism in the propeller hub.

## **AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY**

**Climb Gradient** The ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.

**Demonstrated Crosswind Velocity** The velocity of the crosswind component for which adequate control of the airplane during take-off and landing was actually demonstrated. The value shown is considered to be limiting.

**MEA** Minimum enroute IFR altitude.

**Route Segment** A part of a route. Each end of that part is identified by:  
1) a geographic location  
2) a point at which a definite radio fix can be established.

**GPH** Gallons per hour fuel flow.

**PPH** Pounds per hour fuel flow

## **WEIGHT AND BALANCE TERMINOLOGY**





**Reference Datum** An imaginary vertical plane from which all horizontal distances are measured for balance purposes.

**Station** A location along the airplane fuselage usually given in terms of distance from the reference datum

**Arm** The horizontal distance from the reference datum to the center of gravity (CG) of an item.

**Moment** The product of the weight of an item multiplied by its arm. (Moment divided by a constant may be used to simplify balance calculations by reducing the number of digits.

**Airplane Center of Gravity (CG)** The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.

**CG Arm** The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.

**CG Limits** The extreme center of gravity locations within which the airplane must be operated at a given weight.

**Useable Fuel** The fuel available for flight planning purposes.

**Unuseable Fuel** Fuel remaining after a runout test has been completed in accordance with government regulations.

**Standard Empty Weight** Weight of a standard airplane including unuseable fuel, full operating fluids and oil.

**Basic Empty Weight** Standard empty weight plus any optional equipment.

**Payload** Weight of occupants, cargo, and baggage.

**Usefull Load** Difference between take-off weight, or ramp weight if applicable, and basic empty weight





**Maximum Ramp Weight** Maximum weight approved for ground maneuvering. (It includes the weight of start, run-up, and taxi fuel)

**Maximum Take-off Weight** Maximum weight approved for the start of the take-off run.

**Maximum Landing weight** Maximum weight approved for the landing touchdown.

**Zero Fuel Weight** Weight exclusive of useable fuel.

**Tare** The weights of chocks, blocks, stands, etc. used on the scales when weighing an airplane.

**Jack Points** Points on the airplane identified by the manufacturer as suitable for supporting the airplane for weighing or other purposes.

## Limitations

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## **GENERAL**

The data approved by Express Design Inc. (EDI) and the Limitations presented herein are those established by EDI as applicable to the Express aircraft.

This section follows the format approved by the GAMA Specification #1, and is intended to provide operating guidelines and limitations specific to the Express aircraft only. All airspeeds quoted are given conventional nomenclature, are shown in knots, calibrated airspeed, and assume zero instrument error.

## **AIRCRAFT OPERATING SPEEDS**

### **Express Aircraft, General**

<b>SPEED</b>	<b>MARKINGS</b>	<b>KCAS</b>	<b>(mph)</b>
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Never Exceed Speed	Vne	Red Line	204	(235)
Caution, smooth air only		Yellow Arc	123-151	(142-174)
Maneuvering Speed	Va		123	(142)
Normal Op Range	Vno	Green Arc	104-151	(120-174)
Full Flap Op Range	Vfe	White Arc	50-87	(58-100)
Clean Stall Speed	Vs		55	(63)
Stall Speed Ldg Config	Vso		50	(58)

POWERPLANT LIMITATIONS  
OPERATING LIMITATIONS

200 HP, IO360C1C6 (LYCOMING SPECIFICATION)

T.O. & Max Continuous RPM	
Full Throttle, red line	2700 RPM
Normal Operation	600 (idle) 2350 - 2450 rpm (cruise)

Cylinder Head Temperatures	
Maximum	475°F (246°C)
Normal Operating Range	325 - 380°F (163 - 193°C)
Recommended	150 - 435°F (65-223°C)

Oil Temperatures	
Maximum	240°F (115°C)
Desired Operating	160 - 180°F (71 - 82°C)

Oil Pressure	
Minimum Operating (idle)	10 psig
Normal Operation	30 - 60 psi
Maximum (starting & warm up)	100 psi

Fuel Flow	
Cruise	65% = 61#/hr, 75% = 79#/hr

Fuel Pump Inlet Pressure	
Maximum	+8.0 psig (0.54 atm)
Recommended	-1.0 psig (-0.07 atm)
Minimum	-2.0 psig (-0.14 atm)





Vacuum Pressure	
Normal Operating Range	4.3 - 5.9 In. Hg

Fuel Grade	100 LL
Maximum Lead content	2 cc/gal

#### OIL SPECIFICATION

Following initial break-in of the engine it should be operated with an ashless dispesant oil (MIL-L-22851) conforming to the applicable Lycoming engine handbook. Break-in (the first 50 hours or until oil consumption has been stabilized) should be accomplished using a corosion preventative oil or straight mineral oil. Low power settings (less than 65-75%) should be avoided during the break-in period and the oil level checked frequently.

#### POWERPLANT INSTRUMENT MARKINGS

It is recommended that the following markings be made on the engine instrument gauges to conform to convention.

#### OIL TEMPERATURE

Caution (Yellow Radial)	200 - 240°F
Normal Oper. Range (Green Arc)	160 (170) to 180 (220) °F
Maximum (Red radial)	240°F

#### OIL PRESSURE

Minimum (Idle, Red radial)	10 psi
Caution Range (Yellow arc)	10 - 30 psi
Operating Range (Green arc)	30 - 60 psi
Maximum - Cold oil (Red radial)	100 psi

#### TACHOMETER

Operating Range (Green arc)	600 to 2750 (2450) rpm
Maximum (Red radial)	2800 (2500) rpm

#### CYLINDER HEAD TEMPERATURE





Operating Range (Green arc)	240 to 380°F
Maximum (Red radial)	460°F
Recommended T.O.	240°F

#### MANIFOLD PRESSURE

Operating range (Green arc)	15 to 29.6 in. Hg.
Maximum (red radial)	29.6 in. Hg.

#### FUEL FLOW - Lbs/Hr.

Operating Range (Green arc)	45% (85%)
	41 to 77 (53 to 113)
Maximum Flow (Red radial)	110 (130)

#### VACUUM PRESSURE

Operating Range (Green arc)	4.3 to 5.9 in.
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Hg.

#### WEIGHT LIMITS, Express FG - 200 HP:

Maximum Ramp, T.O. & Landing Weight	2895 lbs.
Maximum Baggage Weight	250 lbs.

#### CENTER OF GRAVITY LIMITS

##### FORWARD LIMITS

The allowable Center of Gravity (CG) range is from Fuselage Station (FS) 74 to FS 84.95.

##### AFT LIMIT

The aft CG limit is FS 84.95 inches, and must be considered a firm limit. Loadings which place the CG further aft are dangerous and must not be accepted. A "Weight and Balance" sheet must be completed and carried in the aircraft at all times. See section VI.

#### REFERENCE DATUM





A Fuselage Station (FS) datum must be used to establish the aircraft weight and balance. FS 34, the forward face of the firewall, is generally a convenient location regardless of engine configuration.

#### MANEUVERING LIMITS

The Express Model FG is licensed as EXPERIMENTAL. Spins are not approved. Maneuvers which have been flown by Express Design approved test pilots are shown in the chart below. Care must be used and smooth control inputs used at all times when performing maneuvers which involve unusual aircraft attitudes, and instruction in such maneuvers is considered prudent.

#### DEMONSTRATED MANEUVERS

MANEUVER	ENTRY SPEED	MAX G'S
Chandelle	160 Kts.	3.5
Lazy Eight	189 Kts.	1.0 to 1.5
Stalls (not whip stalls)		0.0 to 1.5

#### WARNING

Since the IO 360C1C6 engine does not have an inverted oil system extreme care must be used during low or negative G maneuvers. Lack of oil pressure may cause the propeller to go to flat pitch and engine overspeed will result. Transient oil pressure conditions near zero must be limited to less than two seconds.

#### NOTE

All pilots are again reminded that instruction in unusual attitudes in the Express is highly desirable. Speed buildup during maneuvers can be rapid and proper control useage throughout the maneuver to remain within limits.

Minimum fuel in the tank under use is 20 gallons, auxilliary wing tanks should be empty. Sideslips should be limited to 30 seconds maximum and oil pressure should be monitored in accordance with the note above and fuel should be selected from the high wing during sideslips.

#### FLIGHT LOAD FACTOR LIMITS





Flaps up	+4.5 to -2.3 g's
Flaps down	+2.5 to -2.0 g's
Design Ultimate (Flaps up)	+8.8 to -4.4 g's

#### MINIMUM FLIGHT CREW

Minimum crew is one (1) pilot

#### TYPES OF OPERATIONS AND LIMITS

The Express Model FG approved for the following types of flight when the required equipment is installed and operations are conducted as defined in this LIMITATIONS section.

1. VFR, day and night
2. IFR, day and night

#### WARNINGS

1. Flight operations with passengers for hire and
2. Flight into known icing is prohibited.

#### FUEL QUANTITIES

Standard Wing Tank (23 gal each wing)	46 gallons useable
Extended Wing Tank (17 gal each wing)	34 gallons useable
Total	80 gallons

#### FUEL MANAGEMENT

Do not take off with less than 8 gallons in the wing tanks. Fuel must be used from each wing by the pilot, maintainig left/right wing balance, KNOW YOUR SYSTEM! Many accidents involve fuel, - lack of fuel or mishandling of onboard fuel.

#### SEATING

This aircraft seats four adults, side by side,two front and two rear, and can be flown from either front seat. The aft seats can be be both forward or the left rear facing aft for imroved rear passenger conversations.

#### WINTER OPERATIONS





Winter operations are acceptable with proper oil grades for the operating temperature.

#### PLACARDS

All switches, lights, controls, adjustments and circuit breakers etc. should be marked with labels identifying what the switch, control, etc. is related to and what the position selects.

Safety related items such as door opening instructions, emergency shut-offs, and seat belt/shoulder harness requirements should be placed where obvious and made clearly understandable. An example of this would be the door opening procedure. It should be placed approximately near the door handle as well as being available in the EMERGENCY Section of this handbook (Red Tab).

An example of a switch marking is the strobe light switch. It should be labeled as "Strobe" with "on" and "off" positions identified. Convention is up is "on" and down is "off" for electrical switches. Circuit breakers should be labeled as to their rating, i.e. "5 amp", "3 amp". etc.

#### NOTE

**There are two placards that must be installed.**

- 1. The word "EXPERIMENTAL" must be placed where it can be prominently seen upon entry into the cabin. These letters must be at least three inches high, and contrast sufficiently to be seen on entry.**
- 2. The baggage compartment must have a placard showing the maximum baggage allowed as shown on the weight and balance data sheet for the airplane.**

In addition, the following are some recommended placards:

In front of the pilot:

**Airspeed Limitations  
Max Flap extend speed 98 kts**





**Max Full Flaps 98 kts**

Near the main wing tank gauges:

**Do Not Take Off With Less Than  
12 Gallons in Main Tanks**

Near the extended range tank fuel gauges:

17 Gallons  
useable

17 Gallons  
useable

If strobe equipped:

Turn Strobe OFF when taxiing in vicinity of other aircraft or when flying in fog/clouds. Standard position lights to be used for all night flights

Near canopy latch:

Latch Door Before Takeoff  
DO NOT OPEN IN FLIGHT

Special precautions should be used during flights in/around areas of atmospheric electrical activity as in thunderstorms. This aircraft, being of composite construction, conducts electricity most readily thru such as control cables, wiring, etc., a condition to AVOID.

#### KINDS OF OPERATIONS

#### EQUIPMENT LIST

This airplane may be operated in day or night VFR or day and night IFR in the United States if the appropriate equipment is installed and operable.

You as the owner are responsible for the make-up of the Minimum Equipment List (MEL) for the airplane, and maintenance thereof prior to operation where the equipment is required. For example for a day flight, the position lights need not be operable, however a strobe or anti-collision light must be.

#### **Minimum Equipment List**





System and/or Component	VFR, Day			
		VFR, Night	IFR, Day	IFR, Night
Remarks				
ELECTRICAL POWER				
Alternator	0	1	1	1
Desireable				
Battery	1	1	1	1
Desireable				
Ammeter	1	1	1	1
Voltmeter	0	0	0	0
ENGINE				
Cyl Head Temp	0	0	0	0
Desireable				
Exhaust Gas Temp	0	0	0	0
Desireable				
Manifold Pressure	1	1	1	1
Oil Pressure	1	1	1	1
Oil Temperature	1	1	1	1
FLIGHT CONTROLS				
Elevator Trim System	1	1	1	1
Flap Position Indicator	0	0	0	0
Desireable				
FLIGHT INSTRUMENTS				
Airspeed Indicator	1	1	1	1
Altimeter	1	1	1	1
Magnetic Compass	1	1	1	1
Outside Air Temp.	0	0	0	0
Desireable				
FUEL SYSTEM				
Fuel Quantity Gauges	1	1	1	1
Fuel Boost Pump	1	1	1	1
Desireable				





Fuel Selector Valve	1	1	1	1
<b>System</b>	<b>VFR, Day</b>	<b>VFR, Night</b>	<b>IFR, Day</b>	<b>IFR, Night</b>
<b>and/or</b>				
<b>Component</b>				
<b>Remarks</b>				

#### ICE/RAIN EQUIP.

Pitot Heat	0	0	0	0
Desireable				

#### LIGHTS

Cockpit Lights	0	1	0	1
Desireable				
Landing Lights	0	0	0	0
Desireable				
Nav. (Posn) Lights	0	3	0	3
Rotating Beacon/Strobe	0	1	0	1

#### PNEUMATIC SYSTEM

Instrument Vacuum	0	1	1	1
Pressure Gauge	0	1	1	1

#### PUBLICATIONS

Pilots Oper. Hndbk. &				
Airplane Flight Manual	1	1	1	1
Weight and Balance	1	1	1	1
Pilots License/Medical	1	1	1	1
Radio License	1	1	1	1
Airworthiness Cert.	1	1	1	1
Registration	1	1	1	1
Maps, VFR flight	1	1	1	1
Desireable				
Charts/Appr. Plates	0	0	1	1

#### RESTRAINT SYSTEM

Seat Belt/Occupant	1	1	1	1
Shoulder Harness	0	0	0	0
Desireable				





Baggage Tiedown      0      0      0      0  
Desireable

## **Emergency Procedures**

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**NOTE:**

*All airspeeds quoted in this section are indicated airspeeds (IAS) and assume zero instrument error. The aircraft should be calibrated to determine its specific error for various configurations.*

**EMERGENCY AIRSPEEDS**

ITEM	CONDITION
Emergency Descent	153 kts
Best Glide	90 kts (103 mph)
Landing Approach (w/o power)	80 kts (92 mph)

**NOTE:**

The following check-lists are presented to capture in a compact format those pilot tasks requiring rapid action. These check-lists should be kept handy for ready access by the pilot, and he should familiarize him/herself with them before flying the aircraft. Knowledge of the switch, control, gauge, etc. location quickly, even blindfolded, is highly desirable.

**ENGINE FAILURE**

**Take-off Ground Roll/Low Altitude (Less than 700' AGL)**

Maintain control of the aircraft. If runway permits, land and attempt to stop on runway. If at low altitudes, (less than approximately 700' AGL), pick the most suitable site within +/- 30° off the nose and set up the approach. If time permits, attempt engine start.

ITEM	CONDITION
Establish	90 kts
Declare	Emergency





Check Fuel Boost Pump	ON
Mixture	Rich
Magnetos, cycle & return to	Both
Flaps on final	Full

### In Flight

Establish 90 kt glide. Climb to reduce speed if practical, pick landing site. Attempt AIR START.

ITEM	CONDITION
Check main tank for fuel	Select tank if req'd.
Fuel boost pump	ON emergencies
Mixture	RICH
Cycle mags & return to	BOTH
Engage starter and attempt engine start	
Declare	EMERGENCY
Give posn. on freq or	121.5
Set transponder to	7700

### NOTE

If power is restored and there is any doubt as to the cause of the engine stoppage, land at the nearest airport and determine the cause.

### ROUGH RUNNING ENGINE

ITEM	CONDITION
Adjust Mixture	RICH
If no improvement carefully lean for improvement as follows:	

ITEM	CONDITION
Pwr setting to approx.	2100 rpm (see Eng. Manual)
Mags, Sw to LT, BOTH, RT, then to	BEST
Readjust mixture for	best operation

### NOTE





If power is restored and there is any doubt as to the cause of the engine roughness, land at the nearest airport and determine the cause.

## ENGINE FIRE

### IN FLIGHT

Determine if fire is electrical (Acrid smell)

ITEM	CONDITION
Avionics Master	OFF
Master Switch	OFF
All Radios, lights, etc.	OFF

If fire/smell clears, turn master switch ON then each item of equipment one at a time, waiting long enough to isolate cause.

If no smell, assume an unknown source and:

**Land as soon as possible, find and correct cause.**

If fire continues:

ITEM	CONDITION
Throttle	IDLE
Mixture	CUT-OFF
Fuel Shut-Off Valve	OFF
Fuel Boost Pump	OFF
Transponder	7700
Radio	Emergency & Location (Use active frequency or 121.5)

Land immediately and exit the aircraft.

### On ground (engine start or taxi)

ITEM	CONDITION
Throttle to	IDLE
Mixture	CUT-OFF
Radio (Twr, Unicom, etc.)	EMERGENCY & POSITION
Master Switch	OFF

Continue cranking if during start to pull fire back into the engine. Stop and exit aircraft if taxiing. If unable to stop fire by above means, loose





dirt, sand, may be used thru cooling intakes to quench fire if no extinguisher is available.

#### **EMERGENCY DESCENT**

<b>ITEM</b>	<b>CONDITION</b>
Power to	IDLE
Propeller to	HIGH RPM
Maintain	153 kts (176 mph)
Transponder	7700 or as requested

#### **MAXIMUM GLIDE CONFIGURATION**

<b>ITEM</b>	<b>CONDITION</b>
Establish	90 kts (103 mph)
Flaps	UP
Propeller	LOW RPM

Glide distance is approximately 1.3 nm (1.5 statute miles) per 1000 feet of altitude above terrain, however this may vary significantly.

#### **LANDING EMERGENCIES**

##### **Landing without power**

When landing site is selected and committed to landing the following checklist can be completed. If the terrain is harsh the gear may well absorb energy and although resulting in substantial damage to the aircraft may, in that process, afford some protection to the occupants and thereby a desirable result. When assured of reaching the landing area or committed:

<b>ITEM</b>	<b>CONDITION</b>
Seat Belts/Shoulder Harness	TIGHT
Door	LATCHED
Fuel Boost Pump	OFF
Mixture	CUT-OFF
Mags	OFF
Flaps	AS REQUIRED
Master	OFF
Airspeed	Decrease to Toughdown





Attempt to fly the aircraft and keep the wings level through the approach and landing until the aircraft comes to a complete rest. **EXIT THE AIRCRAFT** and remain clear until assured there is no possibility of fire.

**SYSTEMS EMERGENCIES**

**PROPELLER OVERSPEED**

The controllable pitch propeller with governor used on the Express utilizes oil pressure from the governor to increase pitch (low rpm).

It is however dangerous to run any engine over its rated rpm and thus the method to reduce any overspeed is to immediately reduce the throttle to idle and reduce airspeed to the point where rpm control is regained. Slowly add throttle and hold airspeed well below that at which the overspeed occurred. Mixture may need to be adjusted also for smooth operation. If the overspeed was significant, i.e. over 200rpm over redline, an engine inspection is called for upon landing. Engine operation for the balance of the flight ust be monitored closely.

**PROPELLER DAMAGE**

The propeller needs proper care. Nicks, scratches, and other types of damage require care. While the construction varies, all are highly stressed and nicks can cause stress concentrations that can result in catastrophic failures of the propeller. Refer to the manual for the propeller for proper limits of acceptable damage.

**ELECTRICAL SYSTEM FAILURE**

The electrical system of this aircraft is key to safe operation in today's environment. It is required for night or IFR operations. The voltmeter is your key indicator of alternator failure which then places the entire electrical load on the battery. The battery will read approximately 12.4 volts on a full battery, and 14+ on the alternator. If you experience alternator failure:

ITEM	CONDITION
If IFR/IMC	Notify ATC Immediately
Master Switch	OFF
Avionics Master	OFF





Lights  
Circuit Breakers

OFF  
Check

A check of the Circuit Breakers may reveal a popped breaker indicating the source of the trouble. If so, turn all individual equipment OFF, reset the breaker and turn the Master Switch ON. If the breaker does not trip again after a few minutes, slowly turn various elements of your system ON one at a time watching for another malfunction attempting to isolate the problem.

If you feel you have isolated the problem and elect to continue the flight, remain particularly alert for another malfunction caused by/related to the first.

#### **UNLATCHED COCKPIT DOOR IN FLIGHT**

The Express door must not be opened in flight. Should a latch become disengaged, cautiously slow the aircraft to approximately 85 kts (100 mph) and attempt to relock without opening any further and/or have a passenger hold the door closed. If this fails, continue the flight at that speed and land as soon as possible.

#### **SPINS**

Intentional spins are not allowed. If a spin is entered inadvertently, reduce the power to idle, neutralize the stick or place forward long enough to break the stall, and place the rudder full against the direction of the spin until rotation is stopped. At this point the aircraft should be recovered to level flight, with smooth positive load factor (pull-out), wings level, of no more than 4 g's (4g's can generally be noticed by a noticeable sagging of your jaw and cheeks) taking particular care not to reenter an accelerated stall (noticeable by sharper, more positive than normal pre-stall buffeting) and another spin. Should this pullout buffeting occur, simply relax somewhat on the back pressure till buffeting ceases and continue the pullout. If the spin has been allowed to develop, a temporary application of power may aid in recovery.

#### **WARNING**

**The Express aircraft is aerodynamically very clean and thus can consume a lot of altitude with such maneuvers.**

#### **EMERGENCY SPEED/ALTITUDE REDUCTION**





Speed reductions should be accomplished by idle power settings and high rpm settings to allow the engine and propeller to assist in the speed reduction. this will cause rapid cooling of the engine but is an acceptable alternative in most cases. This procedure may be appropriate after entry into IMC by a disoriented or non-rated pilot. Even flaps can be extended if necessary, although such a procedure should be followed by an appropriate inspection.

## **Normal Procedures**

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## SAFE OPERATING AIRSPEEDS

### NOTE

**All airspeeds in this section are indicated airspeeds (IAS) and assume zero instrument error. You should make sure your system has been correctly calibrated and account for any errors as necessary.**





Max Demonstrated X-WIND Component- 20 kts

**Express speeds**

- 1) Take-off, flaps up
 

Rotation	65-70kts(75-80mph)
50 feet	65kts(75mph)
  
- 2) Take-off, Flaps APPROACH(1/3)
 

Best angle of climb	65kts(75mph)
Best rate of climb	70kts(80mph)
Cruise Climb	90-100kts(104-115mph)
  
- 3) Landing approach
 

Flaps DOWN(1/3)	65kts(75mph)
Flaps UP (0° deg, faired)	70kts(80mph)
  
- 4) Balked Landing Climb
 

	70kts(80mph)
--	--------------

(on establishment of positive climb)

**PREFLIGHT INSPECTION**

**COCKPIT - (Checklist)**

ITEM	CONDITION
1) Control Lock	REMOVE
2) Avionics master switch	OFF
3) Master Switch	ON
4) Fuel Quantity Gauge	CHECK
5) Lights (If night flight)	CHECK
6) Flaps	DOWN
7) Pitot Heat (If IFR/IMC)	CHECK
8) All Switches	OFF

**WALK AROUND INSPECTION - (Checklist)**  
(Starting at right wing/fuselage)

ITEM	CONDITION
1) Right Flap Attach'mt (Lower side)	Secure



2) Right Aileron	
Hinges	Secure
Motion	Free
Span Edges	No interference
3) Wing Tip	No damage, light secure
4) Wing Upper/Lower Surface	Sight - smooth
Inspection Plates	Secure
Leading Edge	Feel for damage
Fuel Quantities	Check, Caps secure
Fuel Drains	Strain, check for water
5) Right Main Gear	
Tire	Check tread, inflation
Chocks	Removed
Brake pads	Check
Brake Line	Condition
Fairing	Secure
6) Cowling area	
Tire	Check tread, inflation
Chocks	Removed
Screws/retainers	Secure
Cooling Intakes	Clear
Oil	Check quantity, door secure
Spinner	Secure
Blades	No Damage

#### WARNING

Always assume the propeller is "Hot" and the engine ready to start when handling the propeller regardless of mag position.

#### CAUTION

See propeller manufacturer's instructions for nick and damage treatments and limitations. Damaged propellers are dangerous and can result in catastrophic failures.

8) Left Main Gear	
Tire	Check tread, inflation
Chocks	Removed
Brake pads	Check





Brake Line	Condition
Fairing	Secure
9) Wing Upper/Lower Surface	Sight - smooth
Inspection Plates	Secure
Leading Edge	Feel for damage
Fuel Quantities	Check, Caps secure
Fuel Drains	Strain, check for water
10) Wing Tip	No damage, light secure
11) Left Aileron	
Hinges	Secure
Motion	Free
Span Edges	No interference
12) Left Flap Attach'mt (Lower side)	Secure
13) Tail Assembly	
Horizontal Stabilizer	No leading edge damage
Vertical Stabilizer	No leading edge damage
Elevator/Rudder	Free motion
Hinges	Secure
Rudder Cables	Secure

#### BEFORE STARTING - (Checklist)

1) Baggage	Stowed, loose items SECURED
2) Seat Belts	Adjusted and SECURED
3) Brakes	SET
4) Circuit Breakers	Checked and IN
5) Master Switch	OFF
6) Avionics Master Switch	OFF
7) Avionics Switches	OFF
8) Door	LATCHED

#### STARTING - (Checklist)

1) Master Switch	ON
2) Fuel Quantity	CHECK
3) Cowl Flaps	OPEN
4) Mixture	FULL RICH
5) Throttle	1/4 OPEN
6) Boost Pump	ON 4 SEC
7) Boost Pump	OFF
8) Clear Propeller	LOOK and call "CLEAR"





- |                     |                           |
|---------------------|---------------------------|
| 9) Starter          | ENGAGE                    |
| 10) On Start        | 1000 RPM                  |
| 11) Oil Pressure    | CHECK                     |
|                     | (Shut down if inadequate) |
| 12) Flaps           | UP                        |
| 13) Alternator      | ON                        |
| 14) Avionics Master | ON                        |
| 15) Avionics        | ON                        |

#### COLD STARTING

Cold starts are similar, except more fuel may be required, implying longer boost pump operation. For temperatures below 20°F, pre-heating is recommended.

#### FLOODED ENGINE - (Starting Checklist)

- |                         |          |
|-------------------------|----------|
| 1) Mixture              | CUT-OFF  |
| 2) Propeller            | HIGH RPM |
| 3) Throttle             | 1/2 OPEN |
| 4) Crank engine         |          |
| 5) Upon start, throttle | IDLE     |
| 6) Mixture              | RICH     |

#### WARNING

Should a backfire occur during any start, continue cranking to draw any fire back into the engine. If backfiring continues or fire starts, exit the airplane and use fire extinguisher to put out fire.

#### PRE-TAXI CHECKS - (Checklist)

- |                                  |                      |
|----------------------------------|----------------------|
| 1) Taxi Clearance                | Obtain and read back |
| 2) Clear aft area prior to power | Clear                |
| 3) Brakes                        | CHECK                |

#### PRE TAKE-OFF RUN-UP - (Checklist)

- |         |        |
|---------|--------|
| 1) Door | LOCKED |
| 2) Area | CLEAR  |





- |                      |                       |
|----------------------|-----------------------|
| 3) Brakes            | SET                   |
| 4) CHT/Oil Temp      | GREEN                 |
| 5) Throttle          | 1700 RPM              |
| 6) Propeller         | CYCLE twice           |
| 7) Mags              | CHECK for 50 RPM drop |
| 8) Instrument Vacuum | CHECK 4.5-5.5 in. Hg. |
| 9) Throttle          | IDLE, 1000 RPM        |

#### BEFORE TAKE-OFF - (Checklist)

- |                                  |              |
|----------------------------------|--------------|
| 1) Door                          | LOCKED       |
| 2) Seat belts                    | SECURE       |
| 3) Instruments                   | CHECK        |
| 4) Fuel Quantity                 | CHECK        |
| 5) Oil Temp./Press               | GREEN/CHECK  |
| 6) Breakers                      | IN           |
| 7) Master switch/Avionics master | ON           |
| 8) Radios                        | SET          |
| 9) Transponder                   | STANDBY      |
| 10) Propeller                    | IN           |
| 11) Mixture                      | FULL RICH    |
| 12) Boost Pump                   | ON           |
| 13) Trim                         | SET TAKE-OFF |
| 14) Flaps                        | SET 15° DOWN |
| 15) Controls                     | Check FREE   |
| 16) Cowl Flaps                   | Check OPEN   |

#### RUNWAY CHECKS (After Cleared) (Checklist)

- |                               |          |
|-------------------------------|----------|
| 1) Strobes                    | ON       |
| 2) Transponder                | ON ALT   |
| 3) Approach and Take-off area | CLEAR    |
| 4) Clearance from Tower       | RECEIVED |
| 5) Runway and approach        | CLEAR    |
| 6) Time                       | NOTE     |

#### TAKE-OFF AND CLIMB - (Checklist)

- |                               |               |
|-------------------------------|---------------|
| 1) Take-off Power             | 2700 RPM      |
| 2) Oil Temp (Green)           | 120°F minimum |
| 3) Cylinder Head Temp (Green) | 140°F minimum |
| 4) Check engine instruments   |               |
| 5) Check Flight Instruments   |               |





- |                                |                   |
|--------------------------------|-------------------|
| 6) Rotate                      | 65 kts (75 mph)   |
| 7) Initial climb               | 90 kts (104 mph)  |
| 8) At $\approx$ 700 feet AGL   | FLAPS UP          |
| 9) Reduce power                | 25 in., 2500 RPM  |
| 10) Mixture                    | LEAN for Climb*   |
| 11) Cylinder Head Temp (Green) | 430°F Maximum     |
| 12) Oil Temp                   | 240°F Maximum     |
| 13) Boost Pump                 | Check Press., OFF |

#### CRUISE - (Checklist)

- |               |                    |
|---------------|--------------------|
| 1) Throttle   | SET                |
| 2) Propeller  | SET (Max 2500 RPM) |
| 3) Mixture    | LEAN*              |
| 4) Cowl Flaps | CLOSE              |
| 5) Fuel tanks | MONITOR            |

#### \* LEANING RULES

- A. Never exceed the maximum cylinder head temperatures
- B. For maximum service life, CHT's should be maintained below 435°F (224°C) during high performance cruise operations and below 400°F (205°C) for economy cruise powers.
- C. Maintain "Full Rich" for Take-off, climb, and cruise power settings of above 75% power. For Take-Off from high altitude airports, if engine roughness is noted, lean only enough to obtain smooth operation. Be alert for temperature rise. This is most likely to occur at altitudes over 5000 feet, and may require opening of cowl flaps.
- D. Always return to full rich before increasing power settings.
- E. Operate the engine at maximum power mixture for performance cruise powers and at best economy mixture for economy cruise power.
- F. During let-down flight operations it may be necessary to manually enrichen fuel/air mixture.
- G. Changes to cruise altitude and/or power settings require the mixture to be reset.





#### LEANING, EXHAUST GAS TEMPERATURE

A. Maximum power cruise - (Approx 75% power) - 150°F on rich side of peak EGT for best power. Monitor cylinder head temperature.

B. Best economy cruise - (Approx 75% power or below) - Operate at 50°F lean of peak EGT.

#### LEANING, FLOWMETER

Lean to the applicable fuel-flow tables.

#### LEANING, MANUAL MIXTURE CONTROL

- 1) Slowly move mixture control from "Full Rich" towards lean position.
- 2) Continue leaning until slight loss of power or onset of roughness.
- 3) Enrich until roughness or loss of power cease.

#### ADDITIONAL CHECKLISTS

##### DESCENT - (Checklist)

- |                    |                                    |
|--------------------|------------------------------------|
| 1) Master Switch   | ON                                 |
| 2) Mags            | BOTH                               |
| 3) Fuel Tank       | FULLEST TANK                       |
| 4) Fuel Boost Pump | ON within 1000 feet AGL            |
| 5) Altimeter       | SET                                |
| 6) Mixture         | Enrichen thru descent to FULL RICH |
| 7) Power           | As required                        |
| 8) CHT's           | Greater than 180°F                 |

##### PRE-LANDING - (Checklist)

- |               |                 |
|---------------|-----------------|
| 1) Seat Belts | SECURE          |
| 2) Fuel Tank  | Fullest         |
| 3) Mixture    | RICH            |
| 4) Flaps      | FULL            |
| 5) Propeller  | IN              |
| 6) Brakes     | CHECK           |
| 7) Establish  | NORMAL APPROACH |





8) Fuel Boost Pump	ON
BALKED LANDING - (Checklist)	
1) Throttle	FULL
2) Airspeed	85 kts(98 mph)
3) Establish climb	
4) Flaps	RETRACT
(After leaving runway)	
1) Fuel boost pump	OFF
2) Flaps	UP
3) Strobes	OFF
4) Transponder	OFF
5) Lights	As required
6) Trim	Reset to Take-Off
7) Time	Note
SHUTDOWN - (Checklist)	
1) Radios	OFF
2) Avionics Master	OFF
3) Throttle	1200 RPM
4) Mixture	IDLE CUT-OFF
5) Mags	OFF
6) Lights	OFF
7) Master Switch	OFF
8) Control Lock	INSTALLED
9) Chocks/Tiedown	SECURE
10) Brakes	CHECK

#### ABBREVIATED TAKE-OFF CHECKLIST (CIGAR)

<b>C</b> ontrols	FREE
<b>I</b> nstruments	
Breakers	IN





Altimeter	SET
Directional Gyro	SET
Radios	SET
Engine Instruments	GREEN

## Gas

Boost Pump	ON
Fuel Pressure	OK
Fuel Tanks	FULL
Mixture	RICH

## Attitude

Door	SECURE
Seat Belts	SECURE
Flaps	SET
Trim	SET

## Run-up

Brakes	SET
Nose wheel	Straight
Mag check	1700 RPM, 150 max drop
Propeller	TWO CYCLES
Oil Pressure	GREEN

## ABBREVIATED LANDING CHECK-LIST - (GUMP)

## Gas

Tank	FULLEST
Boost Pump	ON
Fuel Pressure	
GOOD	





## Under Carriage

Brakes

CHECK

Flaps

Flaps

SET 1/3 at 100 kts

FULL at 90 kts

## Mixture

Mixture Control

RICH

## Prop

Propeller Control

IN

## Heating and Ventilation

### Cooling Air

To avoid any possibility of ingesting exhaust as part of the cooling air, and to avoid the need for additional surface obstructions, the cooling air intakes are included in the upper cowling, and accept air in the front top area of the engine cooling air intake area. This also provides cooling air flow whenever the engine is running. This air is available to a pair of adjustable jets in the instrument panel, and another pair in the rear of the cabin for the back passengers. By operating the two side controls under the panel, cool air can also be routed into the front foot area.

In case of fire, the cooling air may be turned off by pulling the Fire/Air cutoff knob under the center of the panel.

### Heating

Cabin heat is generated by a heat muff surrounding the front exhaust crossover. From there it passes through the firewall via a rotary control valve, which can shut off the heat flow, route it to the floor vents, and route it to the defrost vents, which are located in the glare shield. A control mounted at the bottom of the instrument panel. In addition, two sidewall mounted controls select warm or cold air for the rear of the





cabin. If warm air is selected for the rear, then the outside cold air intakes must be set to cut-off. As an additional feature, if the heat is shut off with the heat control valve, then cold air may be routed to the floor outlets by setting the rear air selectors to warm air.

### **COLD WEATHER OPERATIONS**

Pre-flight inspection of the Express aircraft is particularly important in cold weather, given the particularly slick design and laminar flow airfoils. Be sure that there are no frost or ice deposits, and that all the control surfaces are free to move properly.

Very cold temperatures require special attention to engine operations. The general recommendation is to pre-heat the engine below 20 Deg. F, and avoid flight engine startups below 10 Deg. F.

Warm up the engine with particular care and attention paid to oil temperature being in the green before take-off. Also, verify the responsiveness of the engine to throttle inputs.

Also, cycle the propeller and ensure it is responding properly.

Flight in icing conditions is prohibited.

## **Performance**

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