



General Flying Services trading as:

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DECATHLON

8KCAB

BELLANCA AIRCRAFT CORPORATION

HANDLING NOTES

NB:

1. From when CASA required their own template for the AFM and the flight school was required to provide Handling Notes to pilots.
2. So, no-one in Australia got to see the real AFM that was required for original certification, nor the manufacturer's Pilot Operating Manual.
3. This document is marked up for VHT-CUM, a Standard Decathlon with 150 HP fixed pitch prop.
4. Notes by David Pilkington 31/3/2020.

Congratulations on your decision to fly a fully aerobatic aeroplane which is cleared for all manoeuvres excepting LOMCEVACS and TAIL SLIDES.

OPERATING LIMITATIONS - NORMAL AND AEROBATIC

<u>AIRSPPEED DESIGNATION</u>	<u>CAS KTS</u>	<u>AIRSPPEED INDICATOR MARKING</u>
Never Exceed (V_{NE})	156	Red Line
Caution Range	140-156	Yellow Arc
Maximum Structural Cruise (V_{NO})	140	End of Green Arc
Normal Operating Range	47-140	Green Arc
Manuvering (V_A) at Gross Weight:		
Normal Category	105	None
Aerobatic Category	113	None

NOTE

- At 50 kts, IAS is 4 kts lower than CAS
At 156 kts, IAS is nearly 4 kts higher than CAS
- CAS - Calibrated Airspeed: This is indicated airspeed corrected for position and instrument error.
- IAS - Indicated airspeed assumes zero instrument error.
- V_{NE} - Maximum safe airspeed which is not to be exceeded at any time.
- V_{NO} - Not to be exceeded except in smooth air only and then with caution.
- VA - No full or abrupt control movements allowed above this airspeed.

ENGINE LIMITATIONS AND INSTRUMENT MARKINGS

Engine: Lycoming IO-320-E1A or E1B--Modified by B-11anca STC #SE7CE

Propeller: Hartzell

Fuel, Minimum Octane Rating, Aviation Grade--80/87:
Approved for Continuous Use--100/130

Tachometer: Normal Range (Green Arc) 1800-2700 RPM
Maximum (Red Line) 2700 RPM

Cylinder Head Temperature:
Normal Range (Green Arc) 90°-500° F
Maximum (Red Line) 500° F

Oil Temperature:
Normal Range (Green Arc) 100°-245° F
Maximum (Red Line) 245° F

Oil Pressure:

Normal Range (Green Arc)	60-100 psi
Caution Range (Yellow Arc)	25- 60 psi
Maximum (Red Line)	100 psi
Minimum (Red Line)	25 psi

WEIGHT AND BALANCE LIMITS

Maximum Gross Weight--1800 lbs

Centre of Gravity Range

Normal Category

(+13.5) to (+21.0) @ 1800 lbs.
(+11.5) to (+21.0) @ 1550 lbs. or less
Straight line variation between the
points given.

Aerobatic Category

(+13.5) to (+18.5) @ 1800 lbs.
(+11.5) to (+18.5) @ 1550 lbs or less
Straight line variation between the
points given.

DATUM: Wing leading edge.

FLIGHT LOAD FACTORS (1800 LBS. GROSS WEIGHT)

<u>CATEGORY</u>	<u>LOAD FACTOR LIMITS</u>	<u>ACCELEROMETER</u>
		<u>MARKING</u>
Normal	Positive + 5G	Green Arc
	Negative - 3G	Green Arc
Aerobatic	Positive + 6G	Red Line
	Negative - 5G	Red Line

NOTE: Maximum load factors for Normal Category operations are shown by the ends of the green arc on the accelerometer. Load factors within the yellow arc up to the red radial lines are permitted only in the Aerobatic Category.

KINDS OF OPERATION

Only VFR, day or night operations are approved with all required equipment operating in conditions as specified in FAR Part 91.
Flight into known icing conditions is prohibited.
Crosswind landings have been demonstrated at 17 KTS.

UNUSEABLE FUEL

Any fuel remaining in the tanks when fuel gauge reads "0" (empty) cannot safely be used in flight.

Aerobatic Category--The inverted fuel header tank provides fuel for approximately 2.0 minutes of continuous inverted flight. The header tank will automatically refill after approximately three minutes of upright, straight and level flight.

INVERTED FLIGHT

Aerobatic Category--The header tank provides fuel for approximately two minutes of continuous inverted flight. Monitor oil pressure while inverted. Minimum oil pressure is 60psi.

WARNING: Fuel starvation may occur after a series of inverted manoeuvres since the header tank may have had insufficient time to refill.

MANOEUVRES

Aerobatic Category--(See FAA Approved Airplane Flight Manual for basic approved aerobatic manoeuvres. Section 1.2.7)

REQUIRED PLACARDS

(See FAA Approved Airplane Flight Manual for required placards. Section 1.1.7)
BUT CASA required that the FAA Approved AFM be discarded!

EMERGENCY PROCEDURES

GENERAL: This section covers the recommended procedures to follow during emergency and adverse flight conditions. As it is not possible to define every type of emergency that may occur, it is the pilot's responsibility to use sound judgement based on experience and knowledge of the aircraft to determine the best course of action. It is considered mandatory that the pilot familiarize himself with the entire manual, especially, this section prior to flight.

NOTE: All airspeeds in this section are indicated airspeeds (IAS), unless stated otherwise.

ENGINE FIRE DURING START

If the fire is believed to be confined to intake or exhaust system (result of flooding engine):

- 1) Continue cranking engine with starter.
- 2) Mixture Control-- IDLE CUT-OFF.
- 3) Throttle-- FULL OPEN.
- 4) Inspect aircraft thoroughly for damage and cause prior to restart.

If fire persists or is not limited to intake or exhaust system:

- 1) Mixture Control --IDLE CUT-OFF.
- 2) Fuel Shut-Off Valve--OFF.
- 3) Electrical and Magneto Switches--ALL OFF.
- 4) Exit Aircraft.
- 5) Direct fire extinguisher through the bottom of the nose cowl or through the cowl access door.

ENGINE FIRE IN FLIGHT

- 1) Mixture Control--IDLE CUT-OFF.
- 2) Fuel Shut-Off Valve--OFF.
- 3) Electrical and Magneto Switches--ALL OFF.
- 4) Cabin Heat--OFF Front and Rear.
- 5) Use hand fire extinguisher if available.
- 6) Land immediately using "Forced Landing Procedures".

WARNING: Do not attempt to restart engine.

ELECTRICAL FIRE

An electrical fire is usually indicated by an odor of hot or burning insulation and wisps of smoke.

- 1) Electrical Switches--ALL OFF (Leave Magneto Switches ON).
- 2) Air Vents/Windows--OPEN only if absolutely necessary for smoke removal and ventilation.
- 3) Use hand fire extinguisher if available and necessary.
- 4) If fire continues, land immediately.

If fire/smoke stops and electrical power is required for the remainder of the flight, turn the master switch ON, followed by the desired circuit switch. Allow a minute between turning on each switch in order that the faulty circuit may be located and switched OFF.

ALTERNATOR/ELECTRICAL FAILURE

An alternator failure is indicated by a steady discharge on the ammeter.

- 1) Master Switch--CYCLE in attempt to reset the overvoltage relay.
- 2) If excessive battery discharge continues, turn OFF all non-essential electrical equipment to conserve battery power.
- 3) Land as soon as practical.

NOTE: If only one circuit appears to be inoperative, remove and replace the suspected fuse with a spare of the same amperage rating. These spare fuses are located above the regular fuses in use.

ENGINE FAILURE ON TAKE-OFF

If sufficient runway remains:

- 1) Throttle--CLOSED.
- 2) Land using brakes as required.

If airborne and insufficient runway remains for landing, attempt an engine restart if altitude permits:

- 1) Emergency Fuel Pump--ON.
- 2) Alternate Air--FULL HOT.
- 3) Mixture Control--FULL RICH.
- 4) Fuel Shut-Off Valve--CHECK ON.
- 5) Magneto Switches--BOTH ON (UP).
- 6) Propeller Control--FULL FINE. *(if applicable)*

If no restart is possible:

- 1) Select most favourable landing area ahead.

WARNING: Maintain flying speed at all times and do not attempt to turn back towards the runway unless sufficient altitude has been achieved.

ENGINE AIR RESTART

- 1) Maintain Airspeed--80MPH minimum recommended.
- 2) Magneto Switches--BOTH ON (UP).
- 3) Mixture--FULL RICH or LEANED as required at high altitude.
- 4) Fuel Shut-Off Valve--CHECK ON.
- 5) Alternate Air--FULL HOT.
- 6) Emergency Fuel Pump--ON.
- 7) Propeller Control--FULL FINE. *(if applicable)*
- 8) If restart not possible, change throttle, mixture, primer settings in attempt to restart.

ENGINE AIR RESTART continued...

- 9) Follow "Forced Landing Procedure" if unable to restart..

NOTE: The engine starter may be engaged in flight if the engine has stopped windmilling.

PARTIAL POWER LOSS/ROUGH RUNNING

- 1) Follow the engine air restart procedures.
- 2) Land as soon as practical using "Precautionary Landing Approach" procedures.

Obstruction of the engine intake air may be indicated by a gradual power loss. Alternate air should be applied to the hot position and left in that position as long as the obstructed condition exists.

ABNORMAL OIL PRESSURE/TEMPERATURE INDICATORS

Oil pressure and temperature problems are usually related with one affecting the other.

Before any action is taken, cross check the other engine instruments and control settings for possible clues.

High oil temperature is generally a result of loss of oil, engine over-heating (note CHT if available) or a malfunctioning oil cooler by-pass valve. If the situation remains unchecked, oil pressure usually drops resulting in possible engine damage. Power should be reduced while maintaining cruise airspeed. Place mixture in FULL RICH position and land as soon as practical.

Little or no oil pressure is usually caused by failed pressure regulator valve, pump, loss of oil, clogged oil line, high oil temperature or a defective gauge. A landing should be made as soon as practical using minimum RPM changes. Plan a "Precautionary Landing Approach" as engine failure may be imminent.

LOSS OF PROPELLER CONTROL (If applicable)

In the event of loss of oil pressure to the propeller and/or propeller governor, the propeller will automatically go to the LOW RPM position. The throttle may be used with caution as necessary to climb or maintain level flight. A precautionary landing should be made as soon as practical.

PRECAUTIONARY LANDING APPROACH

A precautionary landing approach should be used whenever power is still available, but a complete power failure is considered imminent.

Maintain a higher and closer pattern than normal to remain in gliding distance of the intended touch-down point. Use the normal landing procedures in addition:

- 1) Airspeed--65K recommended (61K minimum).
- 2) Throttle--CLOSED when in gliding distance to runway.
- 3) Propeller Control--FULL FINE.

NOTE: Slipping the aircraft by cross controlling the rudder and ailerons will increase the rate of descent.

FORCED LANDING (COMPLETE POWER FAILURE)

- 1) Airspeed--Maintain 65 K.
- 2) Mixture--IDLE CUT-OFF.
- 3) Fuel Shut-Off Valve--OFF.
- 4) Master Switch--ON.
- 5) Radio-MAYDAY 121.5 MHZ.
- 6) Attempt to position the aircraft 1000ft. above ground level (AGL) over the intended point of landing or 500ft. when downwind and abeam the intended point of landing.
- 7) All Electrical Switches--OFF.
- 8) On Final Approach--Airspeed--65 K, (61 K minimum).
- 9) Touchdown with minimum airspeed (three point full stall).

NOTE: If possible or if necessary after aircraft has come to a complete stop, remove and activate the emergency locator transmitter from the aircraft for increased transmitting range.

DITCHING

Should it become necessary to make a forced landing over water, follow the "Forced Landing Procedures" in addition to the following:

- 1) Cabin Side Door--JETTISON.
- 2) Land into wind if high winds are evident or parallel to swells with calm winds.
- 3) Contact the water with a nose high attitude.
- 4) DO NOT STALL prior to touchdown.

PITOT--STATIC SYSTEM FAILURE

A malfunction in the static system will affect the airspeed, altimeter and vertical speed indicator and is usually a result of an obstructed static opening. Use the alternate static source.

WARNING: With alternate static source ON, subtract 65ft. from indicated altitude and 9 K from indicated airspeed.

SEVERE TURBULENCE

In severe turbulence do not exceed 121 CAS. Maintain a constant nose attitude rather than flying by reference to the altimeter and airspeed indicator.

STALLS

The Decathlon stall characteristics are conventional. The stall warning horn will proceed the stall by 5-9K depending on the amount of power used. There is very little aerodynamic buffeting preceding the stall.

Aileron control in a power on stall is marginal. Large aileron deflections will aggravate a near stalled condition and the use is not recommended to maintain lateral control. The rudder is very effective for maintaining lateral control in a stalled condition with the ailerons placed in the neutral position. To recover from a stall, proceed as follows:

- 1) LOWER NOSE and add FULL POWER simultaneously.
- 2) Use the rudder to maintain lateral control.

SPINS

Normal or inverted spins are approved in this aircraft when flown in the aerobatic category. Spins are prohibited in the normal category. Use the following recover procedure:

- 1) Throttle--CLOSED.
- 2) Ailerons--NEUTRAL POSITION.
- 3) Elevator--NEUTRAL POSITION.
- 4) Rudder--FULL DEFLECTION in the opposite direction to the rotation.

When rotation stops ($\frac{1}{2}$ to 1 turn after recovery initiated).

- 1) Rudder--NEUTRALIZE.
- 2) Nose attitude--RAISE smoothly to level flight attitude.

PRE-FLIGHT INSPECTION

- 1)
 - a. Release control stick from seat belt, check freedom of movement.
 - b. Check ignition switch "OFF".
 - c. Check fuel quantity on fuel gauge.
 - d. Fuel valve "ON".
 - e. Inspect seat belt for condition.
 - f. Secure rear seat belt and shoulder harness if not in use.
 - g. Before aerobatic flights, remove loose articles and equipment.
- 2)
 - a. Check wing root covers and greenhouse for security.
 - b. Check aileron for freedom of movement and security.
 - c. Check condition and security wing, wing tip and lights.
 - d. Check condition and security struts and strut fittings.
- 3)
 - a. Check right main wheel for proper inflation.
 - b. Check brakes and lines for leakage and security.
 - c. Inspect wheel fairing for security.
 - d. Check right fuel quantity and filler cap security.
- 4)
 - a. check oil level and secure dip stick. Inspect engine compartment for general condition, gas leaks, oil leaks, etc.
 - b. On first flight each day, drain gas from gascolator and check for leakage.
 - c. check windshield for cleanness.
 - d. Check prop for nicks and prop spinner for security.
 - e. Check air filter for cleanliness and security.
- 5)
 - a. Check left main wheel for proper inflation.
 - b. check brakes and lines for leakage and security.
 - c. Inspect wheel fairing for security.
 - d. check left fuel quantity and fill cap security.
 - e. Inspect stall warning switch for freedom.
 - f. Check pitot-static tube for stoppage.
- 6)
 - a. Check condition and security wing, wing tip and lights.
 - b. Check condition and security struts and strut fittings.
 - c. Check aileron for freedom of movement and security.
 - d. Check wing root cover for security.
- 7)
 - a. First flight each day, drain gas from aft fuselage drain.
 - b. Inspect bottom of aircraft for general condition.
- 8)
 - a. Check control surfaces for freedom of movement and security.
 - b. check tail wheel security and proper inflation.
 - c. check condition and security of tail and tail brace wires.

NORMAL OPERATING PROCEDURES

PRE-FLIGHT

The airplane should be given a thorough visual inspection prior to each flight. This procedure is recommended as shown previously.

PRE-START CHECK

1. Seat Belts--Adjust and Lock.
2. Fuel Valve Handle--"ON".
3. Brakes--Test and Set.
4. Radio and Electrical Equipment--"OFF".

ENGINE START

1. Mixture--Idle Cut Off.
2. Alternate Air--Cold.
3. Throttle Cracked Open.
4. Master Switch--"ON"
5. Prime--As required.
6. Propeller Control--Full Fine. (if applicable)
7. Propeller Area--Clear.
8. Magnetos--"BOTH ON". LEFT 1st
9. Ignition Button--"START". (Release when engine starts).
10. Mixture--Full rich as engine starts.
11. Oil Pressure--Check for Rise.
12. Warm-up at 1000-1200RPM.

COCKPIT PRE-FLIGHT

1. Cabin Door and Left Window--Latched.
2. Flight Controls--Check for free and correct movement.
3. Trim Tab--"TAKE-OFF" setting
4. Flight Instruments and Radios--Set.
5. Accessories--"ON" as required.

ENGINE RUN-UP

1. Throttle Setting--1800 RPM.
2. Magnetos--Check (50 RPM maximum differential between mags, 175 RPM maximum drop).
3. Propeller--Check Operation (full decrease until RPM drop of 300, cycle three times before flight) (if applicable)
4. Alternate Air--Check operation and return to cold.
5. Engine Instruments--Within green arc.
6. At high density altitude, lean for best power before take-off.

TAKE-OFF

1. Alternate Air--Cold.
2. Propeller Control--Full Fine. (If applicable)
3. Throttle--Full Open
4. Check for satisfactory take-off RPM (2700 \pm 50).

CLIMB

1. Airspeed as required. (At S.L. Best R/C 66 K CAS--Best Angle-of-Climb 56 K CAS.)
2. Throttle--Full Open.
3. Mixture-- Full rich or leaned as required at high altitude.
4. Propeller Control--Full Fine. (Check). (If applicable)

LANDING CHECK-LIST

1. Propeller--After power reduction, full Fine. (If applicable)
2. Mixture--Rich.
3. Alternate Air--Check operation and return to cold.
4. Airspeed--66-70 K.

BALKED LANDING (GO AROUND)

1. Throttle--Full open with smooth application.
2. Alternate Air--Cold.
3. Establish climb.
4. Airspeed as required for best R/C or best angle(see above).
5. Trim--Re-Set.

NOTE: All airspeeds are given in I.A.S. unless otherwise noted.

ENGINE STARTING

Before starting, set the parking brake by depressing the brake pedals and pulling the park brake knob located under the far right side of the instrument panel.

To prime for a cold start, turn the electric fuel pump on and push mixture control to full rich. Hold for two to three seconds and return to idle cut-off. For a hot start, prime should not be necessary.

With brakes set, mixture at idle cut-off, throttle slightly open, master switch on, magneto switches both "ON", engage the starter. Release starter as the engine starts and push mixture control to full rich.

If the engine fails to start on the first attempt, another attempt should be made without additional priming. If this fails, it is possible that the engine is over primed. In this case turn the magnetos off, open the throttle and turn the engine over approximately ten revolutions with the starter. Prime the engine again with half the amount of the original prime and repeat the starting procedure.

Check the oil pressure gauge for an indication as the engine starts. If no pressure is indicated within 30 seconds, stop the engine to determine the trouble, even in cold climates.

COLD WEATHER OPERATION

In extremely cold weather (10° F and lower) the use of an external preheater is recommended to minimize wear to the engine and electrical system and to obtain oil pressure within the required 30 seconds.

- A. In starting, if the engine does not start during the first few attempts, or if the engine firing diminishes in strength, it is probable that the spark plugs have been frosted over. In this case, preheat must be used before another start is attempted.

COLD WEATHER OPERATION

continued...

- B. In temperatures below 40°F some extra priming may be necessary. During extremely cold temperatures, starting will be aided by pulling the propeller through four or five revolutions by hand to "break loose" or "limber" the oil thus conserving battery energy.

WARNING: When pulling the propeller through by hand, treat it as if the ignition switch is turned on. A loose or broken ground wire on either magneto could cause the engine to fire. Be sure the master and magnetos are in the OFF position and the throttle closed. If possible, have a pilot at the controls and chock/tiedown the aircraft.

WARM UP AND GROUND CHECK

Engine warm-up should be conducted at 1000 to 1200 RPM. The magneto check is run at 1800 RPM using the BOTH-LEFT-BOTH-RIGHT-BOTH sequence. Maximum RPM drop on each magneto is not to exceed 175 RPM and the differential between mags should not exceed 50 RPM. The alternate air and propeller control should be checked for operation at this time. To check prop control, pull vernier control from full increase RPM to full decrease until a 300 to 500 RPM drop is noted, then return to full increase--cycle the prop through this procedure three times to assure positive control. The engine is ready for take-off when the oil pressure is steady and in the green and when the engine will accept full throttle without hesitating or faltering. Avoid using alternate air on the ground. With the alternate air selected, induction air is not filtered and abrasive dirt particles can enter the engine.

TAKE-OFF POWER CHECK

It is important to check full-throttle engine operation early in the take-off run. The take-off should be discontinued if there are any signs of rough engine operation or sluggish engine acceleration.

NORMAL TAKE-OFF

Align the airplane with runway centerline. Assure that the tail wheel is tracking straight. Keeping the stick aft of neutral, smoothly open the throttle all the way with the prop control full forward. As the speed increases, use sufficient forward stick pressure to raise the tail to approximately level flight position using the rudder to maintain directional control.

CLIMB

If best rate of climb (or best angle of climb) is not required, a climb speed between 70 - 78 K will provide good forward visibility (and engine cooling in a warm climate). The mixture should be full rich when the power is greater than 75%. At 75% power or below, the mixture may be leaned.

CRUISE

The maximum recommended cruise power setting for the Decathlon is 75%. Fuel consumption can be reduced significantly at high altitudes by leaning the mixture. For optimum fuel consumption in cruise at 75% power or less, lean the mixture to peak EGT (if an exhaust monitor is installed).

Continuous use of alternate air during cruising flight decreases engine efficiency. Unless conditions are severe, do not cruise with alternate air on. When selecting alternate air, do so slowly to the full-on position and only for a few seconds at intervals to determine if ice may have developed on the air intake filter. The Decathlon is not approved for flight into known icing conditions.

STALLS

The stall characteristics of the Decathlon are conventional in all configurations. For stall speeds at various angles of bank, refer to stall speed table.

THAT TABLE IS NOT IN THIS DOCUMENT NOR THE CASA AFM!

APPROACH AND LANDING

The airplane should be trimmed to an approach speed of approximately 65 K.

- DAY VFR TOLERANCE: "NOT BELOW THRESHOLD SPEED + 10 KTS"*
- A. As a general rule, it is good practice to contact the ground at a minimum safe speed consistent with existing conditions. In calm or light wind conditions and in short and/or soft field conditions, a full stall landing is recommended. In a full stall landing, the flair or round-out should be made with power off. A three point landing attitude should be held just above the ground while increasing the back pressure on the stick as air speed drops until the stick is in the full aft position at the time of touch-down. Brake as necessary.
- B. In high gusty wind or when a cross wind exist, a wheel landing is recommended preceded by an approach of about 65 - 70 K. The flair if made with slight power (900 - 1200 RPM) to a level flight attitude just above the ground. Contact with the ground is made on the main landing gear. At the time of contact, the stick is brought slightly forward of neutral to hold the airplane firmly on the ground in a near level attitude. As speed decreases, lower the tail slowly to the ground and then hold full aft stick. Brake as necessary. Maintain cross-control corrections for cross wind conditions throughout the landing flair and roll out as necessary to maintain directional control.

ENGINE SHUTDOWN

Before engine shutdown turn off all radio equipment and other electrical equipment. The engine is shutdown by closing the throttle and pulling the mixture control full aft to the idle cut off. After the engine quits, turn off the master switch and both magnetos.

GROUND HANDLING

The Decathlon is easily handled on the ground by using the handle on the lower right side of the fuselage just forward of the tail section. The tail can be lifted and the airplane can be pushed, pulled and turned from this position. Tie down rings are provided under each wing on the main wing strut. The tail is secured by tying the rope or chain through the tail wheel unit. The aileron and elevators can be locked by securing the seat belt around the front control stick in a full aft position. Ground handlers should specifically avoid pushing or pulling on propeller spinner, propeller tips, wing struts, fuselage stringers or tail surfaces.

AEROBATICS IN YOUR DECATHLON

Although your Decathlon is certificated as an aerobatic airplane, this in itself does not mean that the airplane can "take anything you can give it". The limits must be observed and the following suggestions will make aerobatics in your Decathlon (or any other airplane) safer and more enjoyable.

1. Never attempt any aerobatic manoeuvre without first receiving dual instruction from a qualified flight instructor. Although aerobatics are very safe when correctly done, a pilot without training or experience can get into trouble doing aerobatics.
2. Remember, altitude is your best insurance when doing aerobatics. According to Federal Air Regulations, the minimum legal altitude for aerobatics is 3000 feet AGL. Keep in mind that 3000 feet is therefore the minimum recovery altitude from any inadvertent manoeuvre and that 1000 feet of altitude can often be lost in a three-turn spin.
3. Always inspect your airplane before flying aerobatics. This should include a thorough pre-flight inspection and inspection of the cabin to insure that no loose articles are present. The rear seat belt should be fastened around the seat when doing solo aerobatics to prevent its catching on the rear stick.
4. Watch for other traffic while doing aerobatics. Perform a 90 degree clearing turn in each direction before beginning, checking for traffic all around the airplane. See Part 91 of the Federal Air Regulations for airspace in which aerobatics are prohibited.
5. Check your airplane weight and balance. The rear c.g. limit for aerobatics must be respected. To exceed any limits is to invite trouble.
6. Do not do aerobatics unless you are in good physical condition--not when you have a hangover, a cold or any other illness. If you are not in good condition, your reaction time is increased and your tolerance to G-loading is decreased.
7. Know and respect your airplane's structural limitations.

LOAD FACTOR

In straight and level unaccelerated flight the airplane is said to be at 1 g. In this flight condition, the sum of the wing and horizontal tail loads equals the weight of the airplane in pounds.

In accelerated manoeuvres, the wing lift can be considerably greater than the gross weight of the airplane. This ratio of lift/weight is called load factor and is indicated in flight by the accelerometer.

For aerobatics, the maximum allowable positive load factor for the Decathlon is 6 g and this is indicated by a red radial on the accelerometer.

MANOEUVRING SPEED

The Decathlon structure is designed so that any control surface may be fully deflected up to manoeuvring speed. Above manoeuvring speed, control surface deflections must be reduced.

NEVER EXCEED SPEED

The never exceed speed (V_{NE}) is the maximum safe airspeed and is indicated by a red radial on the airspeed indicator.

PERFORMANCE SUMMARY

1800# Gross Weight

Stall Speed, MPH CAS
Maximum Speed @ S.L. MPH CAS
Best R/C Speed @ S.L. MPH CAS
Best Angle-Of-Climb Speed @ S.L.
MPH CAS
Never Exceed Speed MPH CAS
Entry speeds for Aerobatic
Manoeuvres

46 K.
120 K.
66 K.

55 K.
157 K.

PILOT WANTS
NUMBERS IN
IAS NOT CAS

See FAA Approved AFM

DESCRIPTION OF THE AIRPLANE

The Decathlon is a tandem two place with a strut braced high wing. The fuselage is a welded steel tube frame Dacron covered. The wing is Dacron covered with formed aluminium ribs and Sitka spruce spars.

ENGINE/PROPELLER

The engine is a Lycoming 10-320-E1A modified by Bellanca STC SE 7CE for inverted flight. It is a four cylinder engine with fuel injection, dual magnetos and has a wet sump.

The Hartzell propeller is a counter weighted constant speed prop. The counter weights provide a fail safe feature causing the prop to go to low RPM if oil pressure is lost. This protects against a possible overspeed condition.

ENGINE CONTROLS

Throttle

The throttle control is a quadrant on the left side of the cabin with front and rear throttles interconnected. An adjustable friction nut is provided at the quadrant to prevent throttle creep.

Alternate Air Control

This control is located directly below the throttle. Alternate hot air is provided by pulling the control knob to the rear. Extended use of alternate air is not recommended as this air is not filtered.

Mixture Control

This control is located on the left side of the instrument panel. To lean the mixture (at 75% power or below), pull the control away from the panel as required. Pulling the mixture control all the way out, provides the fuel cut-off to the engine.

Battery

The Decathlon has a conventional lead-acid storage battery. The battery is located behind the baggage compartment and is equipped with special non spill caps and vent system. The battery and vent manifold is enclosed in a leak proof case with a see-through removable cover.

The battery should be inspected frequently when the aircraft is being used for aerobatics and serviced in accordance with instructions in this manual. Top up to plus 1/16" over plates. Inspect storage area for spillage. If spillage occurs treat as URGENT.

Alternator

The 60 amp alternator provides charging current and has sufficient capacity to operate all electrical equipment without battery drain. During inverted flight, the charging circuit is disconnected by a mercury switch.

Over Voltage Control

The airplane electrical system is protected from surge by an over voltage control which is mounted on the top right side of the firewall.

Voltage Regulator

Alternator output is controlled by the voltage regulator. This regulator also protects the alternator circuit against over load and should be adjusted only by a qualified mechanic.

Electrical Panel

All electrical switches (except the starter), fuses, and fuse spares are on the electrical panel located on the upper left side of the cabin.

Master Switch

The master switch is on the electrical panel and activates the master switch solenoid which connects the battery and alternator to the rest of the electrical system. Electrical equipment will not operate with the master switch off; however, the engine will run with the master switch off since ignition is provided by the magnetos.

Ignition Switches

Ignition switches for the left and right magnetos are to the right of the master switch. Since ignition is provided by the magnetos, the ignition switches must be on to operate the engine.

Equipment Switches

Switches for operation of standard electrical equipment--navigational lights, landing light, emergency fuel pump and optional equipment such as radios, electric turn and bank, etc., are to the left of the master switch.

Fuses

Each electrical accessory is protected by a separate fuse directly above the electrical switch. Spare fuses are also provided on the electrical panel. To check fuse, push in and twist fuse cap counter-clockwise to release cap from electrical panel. If the wire strand inside the fuse is loose or broken, either the fuse is defective or the circuit load has exceeded the fuse rating. To avoid circuit damage, always use a correctly rated fuse for replacement.

Starter Switch

A push button switch in the centre of the instrument panel operates the electric starter. The master switch must be on to operate the starter.

Ammeter

The ammeter measures current to or from the battery. A normal condition is indicated by a zero reading or a plus reading on the ammeter. A negative reading indicates a current draw from the battery which can result from an overloaded system or a faulty charging system.

Seats

Front and rear seats are welded steel tube construction with removable cushions to permit the use of parachutes. Bucket seats are also available to allow for the use of seat packs.

Brakes

Hydraulic brakes are provided for both front and rear seats. A parking brake control is also provided. To operate the parking brake, depress the brake pedals

Cabin Heater

Cabin heat is provided by an exhaust shroud heater. An optional rear seat heater provides additional heat to the rear of the cabin whenever alternate air is not in use.

Push-pull heater controls are on the left side of the instrument panel.

Baggage Compartment

The baggage compartment behind the rear seat accommodates 100lbs of baggage or cargo. The back of the seat folds for access. No baggage or loose articles are to be carried during aerobatic flight.

Engine Oil System

The oil system is a modified conventional wet sump pressure system. Oil is picked up from the integral sump by the engine-driven pump and forced through the engine. Oil returns to the sump due to gravity. Oil quantity is checked with the dipstick which screws into the crankcase on the right side of the engine. The engine is modified by Ballanca to prevent loss of oil when inverted and to provide inverted oil pressure. A baffle, with a trap door which closes when the engine is inverted, is placed between the engine and the sump thus trapping a limited amount of oil in the sump. The oil pickup tube, which is hinged and free to swing then comes to rest on the baffle surface and picks oil up from that position. The oil separator on the firewall prevents oil from escaping through the engine breather when inverted. The engine crankcase is vented from the bottom of the oil sump through the separator during inverted operation. An oil return pump is activated by mercury switches during aerobatic flight so that the oil separator is scavenged and the oil is returned to the pick-up side of the oil sump baffle. Oil pressure must be monitored during inverted flight. Inverted flight must be terminated immediately should oil pressure drop below acceptable limits. An oil pressure warning light is added on the panel which will light when oil pressure goes below 60psi.

Induction Air Filter

An induction air filter is located in the cowling and filters all air entering the engine. Alternate (hot) air is not filtered and continuous use is not recommended.

Tires

The Decathlon is fitted with conventional aircraft type 6.00 x 6, 6ply tires.

Fuel System

Welded aluminium fuel tanks are located in the inboard section of the wing. Two (2) 20 gallon tanks are standard. Fuel lines between the tanks and the gascolator are drained from a quick drain on the belly of the aircraft.

The gascolator is drained by a remote actuated quick drain control which can be reached through the oil dipstick access door in the cowl.

Wing tanks proper can be drained by removing a 1/4" pipe plug from the inboard corner of the tank.

The gascolator is mounted on the firewall in the engine compartment. The sediment bowl is removable for cleaning and replacement of the fuel filter.

The fuel shut-off valve is located on the left side of the cabin. The

Decathlon fuel system is an "ON - OFF" system.

Fuel quantity is read from a mechanical float type gauge located in the right

Fuel System continued.....

side fuel tank. This gauge is only accurate in the level flight attitude. Since both tanks are interconnected, only one tank gauge is necessary.

Vent System

Fuel tank air spaces are interconnected and positive venting is provided through a tube which protrudes from the bottom of the left wing just outboard of the tank. A check valve is provided at the vent outlet of each tank to minimize inverted fuel loss.

System Operation

Fuel is gravity fed from the tanks to the engine.

Fuel Pumps

The Decathlon is fuel injected and two fuel pumps are required:

1. An engine-driven, cam-operated pump which operates whenever the engine is running to supply fuel at proper pressure to the fuel injector.
2. An emergency electric pump on the firewall in the engine compartment.

Primer

To prime the engine, turn on the master switch and the electric fuel pump with throttle closed and mixture in idle cut-off. To provide one stroke of prime, move mixture control to full rich and back to idle cut-off. This injects fuel directly into the cylinders. Return electric fuel pump to "OFF" after priming.

Fuel Pressure Gauge

The fuel pressure gauge on the right side of the instrument panel indicates the fuel pressure at the injector inlet.

Header Tank

To provide limited fuel in the inverted position, a shrouded 1.5 gallon header tank is located in the forward cabin under the instrument panel. The outlet from the header tank consists of a standpipe located at the centre of the tank. Thus half of the tank capacity can be used in the inverted position. Even though the inverted fuel supply has not been exhausted. Inverted flight must be terminated immediately if oil pressure should drop below acceptable limits.

NOTE:

The fuel filler cap used on the Decathlon is a non-venting type. A loose cap, or one that is not sealing properly, may cause a fuel unbalance from one tank to another. If an excessive fuel unbalance exists, check the caps for security and the filler cap gasket for condition. Flying the aircraft in an uncoordinated manner may also cause fuel unbalance. Do not assume fuel in left tank is identical to that shown on right tank fuel gauge.

Brakes continued....

and pull out the control located under the far right side of the instrument panel. To release the parking brake, push the control all the way in.

Cabin Door

The Decathlon is equipped with a cabin door which can be jettisoned if necessary. The door is secured by a lock-equipped latch at the rear edge and an aerobatic safety latch on the top and forward edge.

The emergency door release handle is near the forward edge of the door.

To jettison the cabin door:

1. Unlatch the aerobatic safety latch on the top and forward edge of the door.
2. To operate the door release handle, pull firmly to remove the safety locking pin, then pull the red handle aft and up as far as possible. This removed the door hinge pins.
3. Push or kick the door free of the aircraft.

Instruments

All instruments except the fuel gauge are on the instrument panel directly in front of the pilot. Basic instruments are marked with a green arc for the normal operating range, a yellow arc for the caution range and red radial lines for maximum or minimum permissible values. Specific markings for each instrument are given in the FAA Approved Airplane Flight Manual. Electrical instruments are controlled by switches on the electrical panel.

Seat Belts and Harnesses

The Decathlon is equipped with two harness systems for the front seat. A lap belt and single strap shoulder harness make up the primary harness. This shoulder harness has an inertia reel.

The secondary system is an inverted flight harness which consists of a double strap shoulder harness, a lap belt and a crotch strap. A five point rotary buckle connects the strap and will release the shoulder harness and lap belt with one movement.

The double strap shoulder harness has a self adjusting, self locking retractor. The primary harness may be used alone; however, the inverted harness should not be used without the primary shoulder harness. The inverted harness does not restrain the pilot from forward movement.

Pitot-Static System

The pitot and static tubes are clamped to the left front jury strut. These tubes should be checked frequently for alignment and to ensure that holes are not plugged. An alternate static source is provided and should be used if the primary static source becomes inoperative. Both airspeed and altimeter readings must be corrected when the alternate static source is in use.

NOT REALLY - READ THE REM MANUAL

Elevator Trim Tab

The trim tab control is mounted on the left side of the cabin. This type of trim control permits very rapid trim inputs if necessary. Rudder trim is provided by a ground adjustable tab.

FUEL AND OIL REQUIREMENTS

Aviation Grade 80/87 octane fuel is the standard fuel for the Decathlon. Do not use any lower grade as it can cause serious engine damage in a very short time.

Oil sump capacity is eight quarts and aerobatic minimum safe quantity is seven quarts. Recommended time between change is 30 hours, or sooner, as conditions dictate. The following grades should be used for the specific temperatures: (See note below)

<u>AVERAGE TEMPERATURE</u>	<u>SINGLE VISCOSITY GRADES</u>	<u>MULTI-VISCOSITY GRADES</u>
Above 60°F	SAE 50	SAE 40 or SAE 50
30° to 90°F	SAE 40	SAE 40
0° to 70° F	SAE 30	SAE 40 or 20W-30
Below 10° F	SAE 20	SAE 20W-30

All oils used must confirm to Lycoming Spec. No. 301E.

BUT FLIGHT SCHOOLS, TO THIS DAY, USE SAE 50 ALWAYS REGARDLESS
CROSS COUNTRY FLIGHT PLANNING

Useable fuel 140 Litres. *NOPE*
Plan on 45 Litres per hour.

75% power 118 K *READY? 1.*
65% power 115 K *READY?*

NOTE:

Total capacity of oil sump, oil cooler and propeller control system equal ten quarts; however, only the eight quarts in the sump is represented on the dipstick calibration. Maintain your oil level in accordance with this calibration (eight quarts maximum, seven quarts aerobatic minimum). Approximately eight of the ten total quarts is drainable.

AIRPLANE FLIGHT MANUAL
BELLANCA MODEL 8KCAB (150 HP)

BAC ADDENDUM
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REVISED: 2-15-78

LOADING INFORMATION

Weight and balance data is prepared individually for each airplane. Procedures used in this section have been approved by the FAA.

BAC Addendum Page 3 shows the moment diagram and loading envelope applicable to the Model 8KCAB. A weight and balance report containing the airplane empty weight and moment and the approved equipment list is attached to this manual. These items are explained below.

4.1 MOMENT AND LOADING

The loading envelope shows the allowable limits of total airplane moment from minimum weight to maximum gross weight. The moment diagram gives the moment contribution of the pilot, passenger, fuel, oil and baggage. To find the moment contribution of a 100 pound passenger, for instance, move up vertically along the weight scale to 100 lbs., move down vertically to the moment scale where the moment contribution of 4500 in-lbs is read.

To determine if a particular weight configuration is acceptable, find the total weight and the total moment by summing the contribution of each component including the empty airplane (the oil moment is negative and must be subtracted). On the loading diagram, locate the intersection of a horizontal line at the total weight and a vertical line at the total moment. If this intersection lies within the indicated envelope, the configuration is acceptable (see BAC Addendum Page 3).

4.2 WEIGHT AND BALANCE

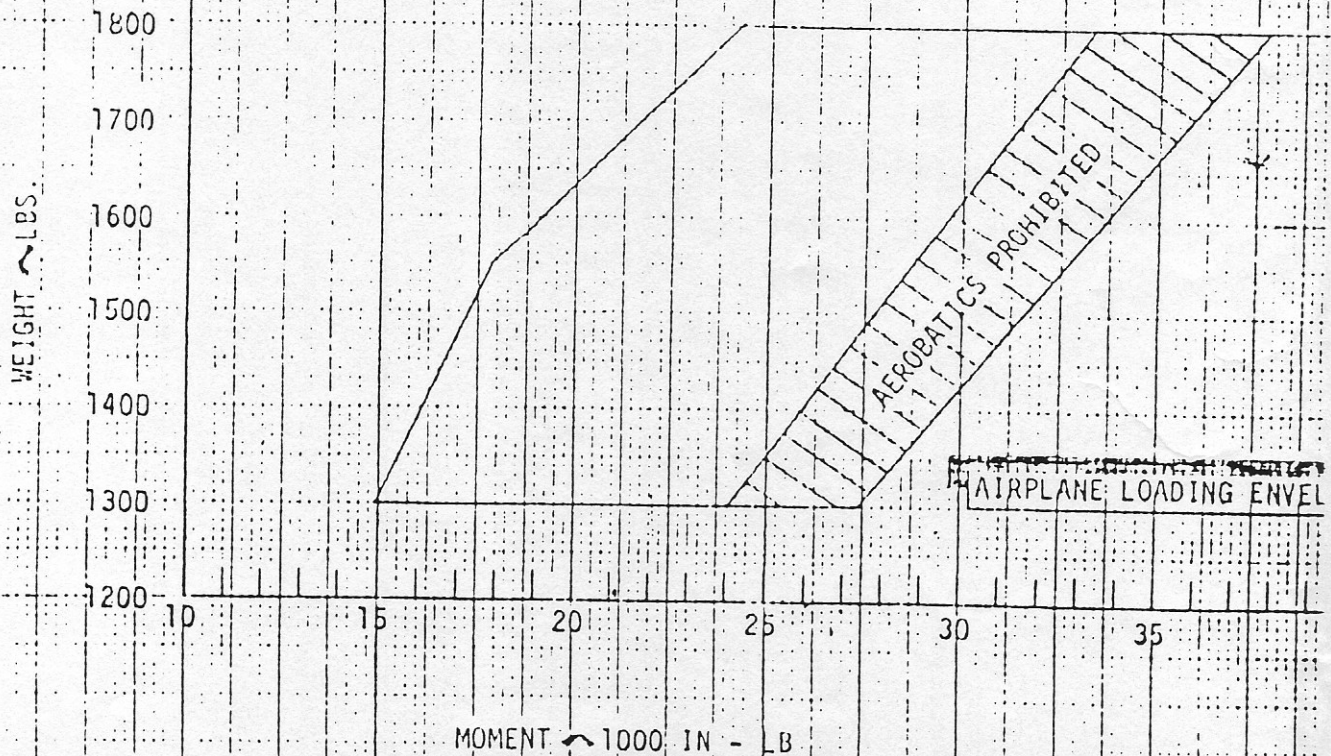
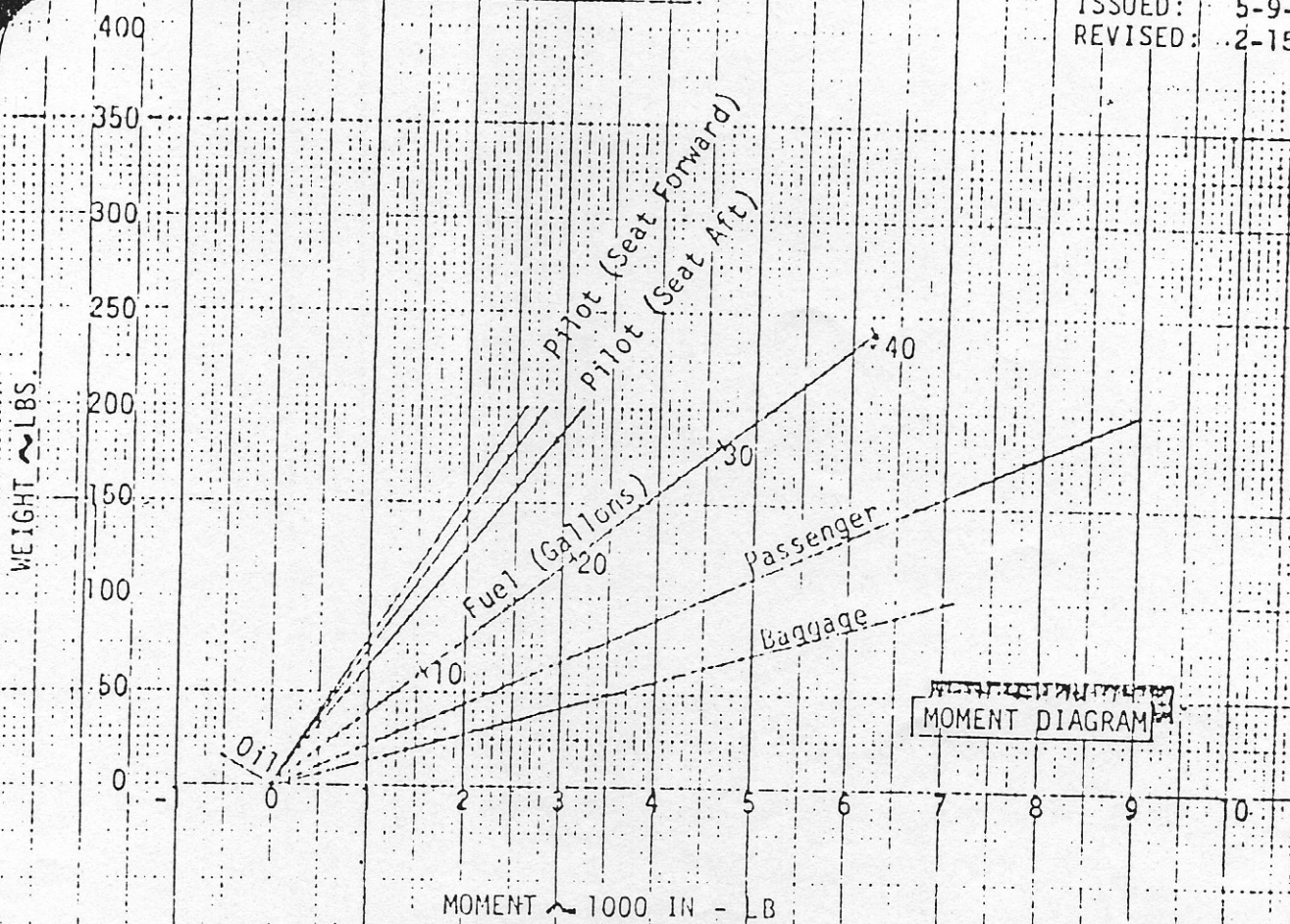
The weight and balance report gives the official aircraft empty weight, empty moment, empty C.G. and useful load. The empty weight includes unuseable fuel and undrainable oil (see BAC Addendum Page 4).

4.3 EQUIPMENT

Each item installed on the airplane at the time of weighing is marked with an "X" on the equipment list. The weight and moment arm of each item are also shown. The accelerometer is required for acrobatic category operation only (see BAC Addendum Page 6).


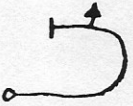
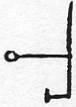

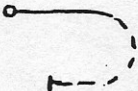


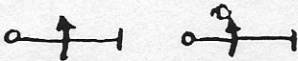

	Kg.	Arm m.m.	Index unit
Basic Empty operating weight VH-CUM (ie. unusable fuel and full oil)	593	752	208855

MOMENT DIAGRAM AND LOADING ENVELOPE



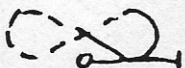
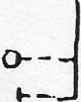
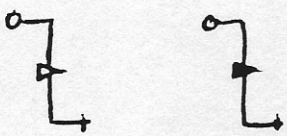
2.7 MANEUVERS

BASIC APPROVED ACROBATIC MANEUVERS AND RECOMMENDED ENTRY SPEEDS

MANEUVER	ARESTI SYMBOL	ENTRY SPEED MPH-IAS	REMARKS-AIRSPEEDS I.A.S. MP
Loop Normal-Inverted		140* 120 KTS	Enter 3.5 to 4 G's--Speed at Top Approximately 50 MPH. Exit 3.5 to 4 G's** Speed 140 MPH 120 KTS.
Immelmann		145* 125 KTS	Enter +4 G's--Speed at Top Approximately 50 MPH. Exit +1 G 45 KTS.
Hammerhead Turn		140* 120	Enter +4.5 G's--Speed at Top Before Turn 50 MPH. Exit +4.5 G's** 140 MPH 120 KTS.
Snap Roll Normal & Inverted		90 80 KTS	Enter With Power-Exit With Power No Full or Abrupt Use of Flight Controls Above V _A
English Bunt		70 60 KTS	Enter With Reduced Power -3 to -4.0 G's** When Pushing Thru From Vertical To Inver Exit Inverted 140-150 MPH* 120-130 KTS.
Vertical 1/2 Slow Roll Up		160* 140 KTS	Enter 160 MPH Level Flight +4.5 G's Pull Up. Exit 60 Push Over To Level Flight 130 KTS. Caution-Flight Above V _C (16 MPH-CAS) In Smooth Air Only
Vertical Slow Roll Down		60 55 KTS	Enter Power-Off 60 MPH Push Over To Vertical Down. Exit 150* MPH Pull Out 4.5 G's to Level Flight 130 KTS.
Slow or Barrel Roll		120 105 KTS	Use Smooth Application of Controls No Full or Abrupt Use of Controls Above V _A 60 KTS.
Outside Loop (Enter From The Top)		70 60 KTS	Enter 70 MPH or Slower With Reduced Power. Push -3.5 to -4 G's** to Inverted-Speed at the Bottom 140 MPH*. Push -3.5 G's** Add Full Power E Straight and Level at the T

2.7 MANEUVERS (Cont.)

BASIC APPROVED ACROBATIC AND RECOMMENDED ENTRY SPEEDS

MANEUVER	ARESTI SYMBOL	ENTRY SPEED IAS-MPH	REMARKS-AIRSPEEDS I.A.S. MPH
Horizontal Eight Inside-Outside		140* 120 KTS	Enter +4 G's Pull Up, Hold 45° Down Inverted, Enter Outside Loop 140 MPH* -3.5 +4 G's**. Exit From 45° Down Normal Flight 140 MPH* 120 KTS.
Hammerhead Turn (Inverted Entry & Exit)		140* 120 KTS	Enter -3.5 to -4 G's--Speed at Top Before Turn 50 MPH. Exit From Vertical Down -3.5 to -4 G's** to Level Flight Inverted.
Spin Normal or Inverted		Stall	Recover with Positive Movement of Stick to Neutral Position & Opposite Rudder Until Rotations Stops--Then Neutral Rudders & Smooth Recovery From Dive to Level Flight. Free Release of Controls is Not Adequate For Recovery. Positive Movement of Controls by the Pilot is Required For Spin Recovery.

NOTE: Refer to Section 2.1.8 for acrobatic operation procedures that apply to all approved maneuvers.

* NOTE: Variations or combinations of the above maneuvers are approved, provided that the speed and load factor limitations are not exceeded.

NOTE: The following maneuvers are not approved: (1) Tail Slide and (2) Lomcevak.

NOTE: Aircraft equipped with fixed pitch propeller requires use of throttle to control RPM during aerobatic maneuvers. Reduce power when operating above normal level flight speed to avoid overspeeding engine RPM.

*No full or abrupt use of flight controls above V_A (Maneuvering Speed).

**Proper use and application of controls and maneuvering load factors are essential to speed control. Improper and/or inadequate application of maneuvering load factors may result in rapid acceleration resulting in unsafe flight situations.