INTERNATIONAL FORMULA ONE TECHNICAL RULES

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Revised: 1 February 2011 Numerous Engine related

PREPARED BY INTERNATIONAL FORMULA ONE PYLON AIR RACING INC.

In Accordance With The Sporting Code Of The Federation Aeronautique Internationale (FAI)

Index:

Changes and corrections should be communicated to the Technical Rules Committee Chairperson for consideration. Additional copies can be obtained for $20 including postage from the Secretary.

International Formula One Pylon Air Racing Inc.
if1airracing.com

The International Formula One racing class is designed and built to the following specifications:

1. ENGINES

1.1 Only Teledyne Continental "C" series or 0-200 engines (or their licensed versions) may be used for Formula One racing. The use of Teledyne Continental factory or other officially approved parts available to all contestants is mandatory. The "C" series engines mavy be modified with the above parts to provide the same horsepower as the 0-200 engine.

1.2 Each individual engine builder or worker must bear in mind that in substituting parts or modifying parts, as allowed by these rules, he is voiding the basic type approval of the part or engine. The owner, pilot and mechanic will assume all risks of modification.

1.3 Deleted

1.4 **Induction**

1.4.1 The engine induction system from and including the carburetor shall remain in the engine manufacturer's design locations. The spider will be mounted on the original manufacturer's studs. The spider height may be shorter but no longer than the original height (3.00 in., 76.0 mm) from the carburetor mount flange to the top of the case stud flange. Intake and exhaust elbows shall be mounted on the original factory position studs. Intake primer pads may be removed, welded and smoothed over. Smoothing of all intake and exhaust parts will be allowed and not subject to any checks except for the dimensional checks as detailed.

1.4.1.1 All primer and manifold pressure lines and their ports will be plugged for racing.

1.4.1.2 These ports may be welded up and smoothed over.

1.5 Engines must remain normally aspirated and no pump or blower to increase the induction air pressure will be allowed. Rev. 2011

1.6 **Carburetor**

1.6.1 A Marvel MA-3 SPA carburetor of any model series must be used. Modifications to the carburetor in the following areas only will be allowed:

1.6.1.1 Alteration of the float level.

1.6.1.2 Smoothing of casting for air and fuel subject to 1.6.1.7.

1.6.1.3 Alteration of the main fuel discharge nozzle including drilling to a maximum of 0.098 in. (2.49 mm) diameter.

1.6.1.4 Changing of needle and seat with the manufacturers approved parts only. The dimensions may be modified as specified in 1.6.1.7.

1.6.1.5 The accelerator pump must be operating in the normal manner. The accelerator pump discharge tube may be cut down to a minimum of 3/4 in. (19.05 mm).

1.6.1.6 Electric fuel pumps may be installed. Rev. 2011

1.6.1.7 The following carburetor dimensions must be met:

1.6.1.7.1 Throttle plate thickness .060" (1.52 mm), no radius on edge permitted.

1.6.1.7.2 Throttle shaft minimum O.D. .300" (7.62 mm) measured at plate. Marvel part #13-1520 or its equivalent.

1.6.1.7.3 Float valve needle seat maximum I.D. .140" (3.55 mm).

1.6.1.7.4 On a two piece carburetor venturi the primary maximum I.D. is .700" (17.78 mm) and the secondary maximum I.D. 1.505" (38.23 mm).

1.6.1.7.5 On a one piece carburetor secondary venturi maximum I.D. 1.530" (38.86 mm). Polishing is permitted, but metal removal is not.

1.6.1.7.6 Carburetor top flange bore maximum I.D. 1.815" (46.10 mm).

1.6.1.7.7 Float minimum depth 1.00" (25.4 mm) over entire length.

1.6.1.7.8 Float minimum length is 1.75" (44.45 mm).

1.6.1.7.9 Intake pipe 1.5" O.D. x .035" wall tubing (with manufacturer's tolerance).

1.6.1.7.10 No holes are permitted from the lower float bowl section of the carburetor into the carburetor intake section except for the main jet, accelerator pump nozzle, and idle discharge passage.

1.7 **Crankcase**

1.7.1 The crankcase width may vary due to wear or for other reasons. Shims may be used to rectify this or to adjust clearance volumes, subject to Rule 1.8.3.

1.7.1.1 The earlier "C" series engine crankcase must be strengthened with through bolts. One method is by drilling the crankcase through the center main bearing flange and using through bolts, 627275, with "0" rings for sealing (see Appendix A).

1.7.1.2 The crankcase breather must be open and aspirated to the outside of the crankcase.

1.8 **Cylinders**

1.8.1 Only Teledyne Continental "C" series or 0-200 cylinders (or their licensed versions) may be used in Formula One racing. Rev. 2011

1.8.2 The minimum cylinder volume with the piston at top dead center is 135 cc.

1.8.3 The maximum swept volume per cylinder is 837 cc.

1.8.4 Maximum inside diameter of the valve seat inserts is 1.580 in. (40.13 mm) for intake, 1.450 in. (36.83 mm) for exhaust.

1.9 **Pistons**

1.9.1 Continental "C" series or FAA PMA 0-200 pistons are allowed. There will be four ring grooves, no more and no less, and each groove must contain at least one piston ring. These pistons are free of restrictions except for minimum weights.

Custom forged pistons are allowed. There will be three ring grooves, no more and no less, and each groove must contain at least one piston ring. These pistons are free of restrictions except for minimum weights.

1.9. 2 Piston rings may be replaced by automotive types including gapless, Teflon, etc. must remain free in their grooves. (A hand test will be applied here.)

1.9.3 The piston rings must remain free in their grooves. (A hand test will be applied here.)

1.10 **Smoothing**

1.10. Smoothing of all internal and external cast and forged parts will be allowed.

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1.11 **Fit**

1.11.1 Any fit, clearance, or oil lubrication hole in the engine to compensate for increased heat and RPM will be allowed, including grooving.

1.12 **Valve Gear**

1.12.1 Camshaft. Any TMC stock or FAA PMA camshaft may be used as long as the valve lift falls within the following specifications: The lift may be measured at the intake or exhaust valve. The intake measurement will start at 40 deg. BTC and remain within the published profile. The exhaust measurement will start at 95 deg. after top dead center (ATC) and remain within the published profile.

Intake Valve Lift		Exhaust Valve Lift	
40 Deg. BTC	CLOSED	95 Deg. ATC	CLOSED
20 Deg. BTC	.030 in. (0.76 mm)	115 Deg. ATC	.030 in. (0.76 mm)
TDC	.090 in. (2.29 mm)	135 Deg. ATC	.090 in. (2.29 mm)
20 Deg. ATC	.195 in. (4.95 mm)	155 Deg. ATC	.195 in. (4.95 mm)
40 Deg. ATC	.295 in. (7.49 mm)	175 Deg. ATC	.295 in. (7.49 mm)
60 Deg. ATC	.375 in. (9.53 mm)	195 Deg. ATC	.375 in. (9.53 mm)
80 Deg. ATC	.430 in. (10.92 mm)	215 Deg. ATC	.430 in. (10.92 mm)
100 Deg. ATC	.455 in. (11.56 mm)	235 Deg. ATC	.455 in. (11.56 mm)
120 Deg. ATC	.455 in. (11.56 mm)	255 Deg. ATC	.455 in. (11.56 mm)
140 Deg. ATC	.430 in. (10.92 mm)	275 Deg. ATC	.430 in. (10.92 mm)
160 Deg. ATC	.375 in. (9.53 mm)	295 Deg. ATC	.375 in. (9.53 mm)
180 Deg. ATC	.295 in. (7.49 mm)	315 Deg. ATC	.295 in. (7.49 mm)
200 Deg. ATC	.195 in. (4.95 mm)	335 Deg. ATC	.195 in. (4.95 mm)
220 Deg. ATC	.090 in. (2.29 mm)	355 Deg. ATC	.090 in. (2.29 mm)
240 Deg. ATC	.030 in. (0.76 mm)	15 Deg. ATC	.030 in. (0.76 mm)
260 Deg. ATC	.015 in. (0.38 mm)	25 Deg. ATC	.015 in. (0.38 mm)
285 Deg. ATC	CLOSED	45 Deg. ATC	CLOSED

1.12.2 Valve Springs.

1.12.2.1. Valve springs, shims, spacers, and retainer washers are free of restrictions. Continental springs and matching hardware are recommended. Valve spring shimming is approved. Rev. 2011

1.13 **Ignition Systems**

1.13.1 Any type of magneto or electronic ignition (or combination thereof) is allowed. Rev. 2011

1.13.2 Fixed magneto timing beyond the manufacturer's specifications will be allowed. 1.13.3 Any type of ignition harness and routing is allowed.

1.13.4 Any type of spark plug is allowed. Rev. 2011

1.14 **Weights**

1.14.1 The following minimum operating weights shall apply and it is permissible to lighten parts to these limits, though not necessarily advisable or possible.

1.14.1.1 Continental cast pistons "C" series or FAA PMA pistons - 675 grams or pistons with rings and wrist pin with end plugs - 967 grams or for a total of four pistons assemblies - 3868 grams.
Custom forged pistons – 610 grams or forged pistons with wrist pins with end plugs – 877 grams or for a total of four assemblies – 3508 grams

Addendum: Use caution when ordering over sized pistons to save worn cylinders, swept volume specifications must be maintained.
Suggested sources for forged pistons:
LYCON: (559) 651-1070
PERFORMANCE ENGINES: (909) 593-5008

1.14.1.2 Wrist pins with end plugs - 200 grams (except that the matched set of piston + pin may be individually less but the two weighed together must be a minimum total of 875 grams).

1.14.1.3 Connecting rods with nuts, bolts, & locking devices and without rod bearings - 745 gm.

1.14.1.4 Crankshaft with end plug and six prop bushings - 24.5 lb. (11.113 kg).

1.14.1.5 Push rods - 90 grams each or 720 grams total for all eight.

1.14.1.6 Rocker arm - 125 grams or 1000 grams for all eight.

1.14.1.6.1 Rocker arms certified under PMA# SE8669-SW have minimum weight of 185 grams each.

1.14.1.7 Intake valve - 75 grams.

1.14.1.8 Exhaust valve - 102 grams.

1.15 **Fuel**

1.15.1 Only standard unmixed aircraft fuel available from an on-site common source will be allowed. Nothing may be added to the fuel, air or fuel/air mixture used in the engine. At any time a fuel sample may be taken from any or all airplanes from some logical and practical point in the fuel system. This sample may be analyzed or tested by the Technical Committee. If testing reveals a discrepancy, the sample may be sealed and sent to an accredited facility for analysis. If there are inaccessible or auxiliary tanks in the fuel system, they shall be blocked off.

1.16 **Starting Products**

1.16.1 Products to improve starting may be used if applied externally to the carburetor inlet scoop by the ground crew prior to starting.

1.17 **Oil System**

1.17.1 The oil system shall operate in the normal manner. No auxiliary oil system will be allowed to supplement the engine driven oil pump system.

1.17.1.1 Oil tanks may be any shape or size.

1.17.1.2 Modified oil pick-up lines and hoses will be allowed.

1.17.1.3 Any type oil cooler may be used. Oil coolers may be mounted anywhere but must utilize air for cooling.

1.17.1.4 The Continental "C" series (-8) rear cover may be modified in order to accept 0-200 oil pump gears and to allow the use of an oil cooler.

1.17.1.5 There shall be no access from the cockpit to the oil system other than the oil pressure line, which shall be sealed from the firewall to the instrument panel.

1.17.1.6 Oil is free of restriction except as noted below.

1.17.1.7 Oil additives that do not increase combustion may be used.

1.17.1.8 Oil samples may be taken from the aircraft before and after a race or qualifying at the discretion of the Technical Committee.

1.18 **Miscellaneous**

1.18.1 The starter drive gear starter pinion, vacuum pump drive gear and starter mount casting in -12, -14, -16, and 0-200 crankcases may be removed.

1.18.2 Cover plates made from any non-combustible material may be used on the starter, generator, vacuum and fuel pump bosses.

1.18.3 The induction system may be insulated. It must be cooled by air only.

1.18.4 The use of different hose clamps, cylinder base nuts, crankcase bolts and nuts and other miscellaneous nuts and bolts will be allowed.

1.18.5 An engine safety cable at least 3/16 in. diameter (4.76 mm) must be fitted. Specifications for the engine retention cables may be obtained from the Design Guide.

2. WEIGHT

2.1 Minimum empty weight of the airplane is 500 bs. (227 kg) with no fuel or oil.

2.2 Minimum pilot weight is 160 lbs. (72.6 kg) ready for flight. Ballast must be added to meet minimum weight. Any such ballast, which may be inclusive of a parachute, must be adequately secured and removable for weighing. All ballast must be located within 12 in. (305 mm) of the pilot's seat position.

3. PROPELLERS

3.1 Propellers must be fixed pitch in operation.

3.2 Propellers constructed of a single piece of aluminum alloy are not permitted for any flights at a race site.

4. WINGS

4.1 Minimum of 66 square feet (6.132 square meters) of wing area must be used including the area displaced by the fuselage, but not including fillets or stall strips. A fillet is any deviation from the basic platform that starts inboard of 25 percent semispan. Flaps are permitted, but wing area is to be figured with the flaps retracted.

4.2 Ailerons must be 100 percent dynamically balanced. In lieu of this, 100 percent static balance with counterweight outboard of spanwise center of gravity of the aileron will be acceptable. Any other method of balance is subject to approval or rejection by the Technical Committee.

4.3 When demonstrating compliance with Rule 4.1, aircraft of canard configuration will only be allowed the area of one wing, which may be nominated by the owner. This wing will then be measured as indicated in Appendix B.

5. LANDING GEAR

5.1 The main landing gear must be non-retractable and fixed. The nose wheel, tail wheel or tail skid may be retracted.

5.2 Wheel brakes are required.

5.3 Aircraft must have two metal wheels: tires no smaller than standard 11.4 x 5 type will be used and both will touch the ground.

5.4 Wheel pant or fairings if used, must measure in width at least 6.5 in.(165 mm) at the inner and outer axle point line to nominal fairing lines on each side. Pants or fairings must provide unlimited access for wheel and brake inspection.

6. VISION

6.1 When seated in the cockpit with crash helmet, seat belt and shoulder harness on, the pilot must be able to scan a field of vision measured from a datum plane parallel to the aircraft longitudinal axis of at least:

6.1.1 5 degrees down over the nose.

6.1.2 25 degrees true down over the leading edge of the wing for conventional, non-canard aircraft. Canard aircraft must be designed to achieve maximum forward and down visibility for turns and racing formation maneuvers.

6.1.3 45 degrees vertically upwards.

6.1.4 270 degrees horizontally.

6.2. In the absence of a more rational analysis, the longitudinal axis of the aircraft will be considered parallel to the wing chord at 3/8 wing semi-span.

7. NOSE OVER STRUCTURE

7.1 Substantial protection for the pilot other than the fin must be provided either fore or aft of the pilot cockpit. The structure must not obstruct forward visibility.

8. FUEL TANKS

8.1 The fuel tank must have a minimum useable fuel capacity of 5 U.S. gallons (18.92 liters).

9. PARACHUTE AND SAFETY EQUIPMENT

9.1 The cockpit must be large enough to accommodate a pilot wearing a parachute and a crash helmet approved by his/her National Air Racing Association.

9.2 The cockpit must be equipped with a seat belt and shoulder harness.

10. MATERIALS AND WORKMANSHIP

10.1 Must conform to aircraft standards or equivalent. The Technical Inspection Committee is empowered to refuse permission to fly, attempt to pass flight test requirements or to qualify an aircraft, which in their opinion, is not up to reasonably safe standards in either materials, workmanship, detail design, or condition. This applies to new, modified, repaired or damaged aircraft.

11. GENERAL DESIGN

11.1 Aircraft with pilots in prone position will not be permitted. The minimum vertical outside dimension at the cockpit shall be thirty inches (76.2 cm) (see 6.2). Any protrusions, fairings or additions to the fuselage or canopy mold lines will be discounted.

11.2 Center of gravity location at racing gross weight must fall between 8% and 25% of MAC of wing unless deviations are permitted by the Technical Committee. Aircraft operating at c.g.'s aft of 25% may be required to comply with Rule 12.2.5 at the discretion of the Technical Committee.

11.3 The cockpit shall have a means of opening from both the outside and the inside of the aircraft in case of an emergency. A yellow Emergency Release marking at least 2 in. x 4 in. (5 cm by 10 cm) describing release procedures shall be provided on both sides of the aircraft exterior.

11.4 Contest Numbers: Each aircraft shall carry its number in accordance with the IF1 Register of Air Racing Numbers, on both sides of the fuselage or tail. Each digit must be at least 16 inches (407mm) high vertically, with a minimum, single color, stroke of 2 inches (51mm). This number shall have a single color, highly contrasting background. Double digit numbers shall have a minimum 2 inches (51mm) of this background color between them.

12. FLIGHT REQUIREMENTS

12.1 Flight requirements apply to new and modified aircraft and at the discretion of the Technical Committee. All aircraft will fly in racing configuration.

12.2 The following items must be demonstrated:

- 12.2.1 6 "G" pull-up.
- 12.2.2 Dive at 1.1 x maximum speed in level flight (1.1 Vh).
- 12.2.3 Three tight 180 degree turns at full speed without loss of height or stalls.
- 12.2.4 An aileron roll in each direction.
- 12.2.5 Four laps on race course at full speed demonstrating good flight characteristics.

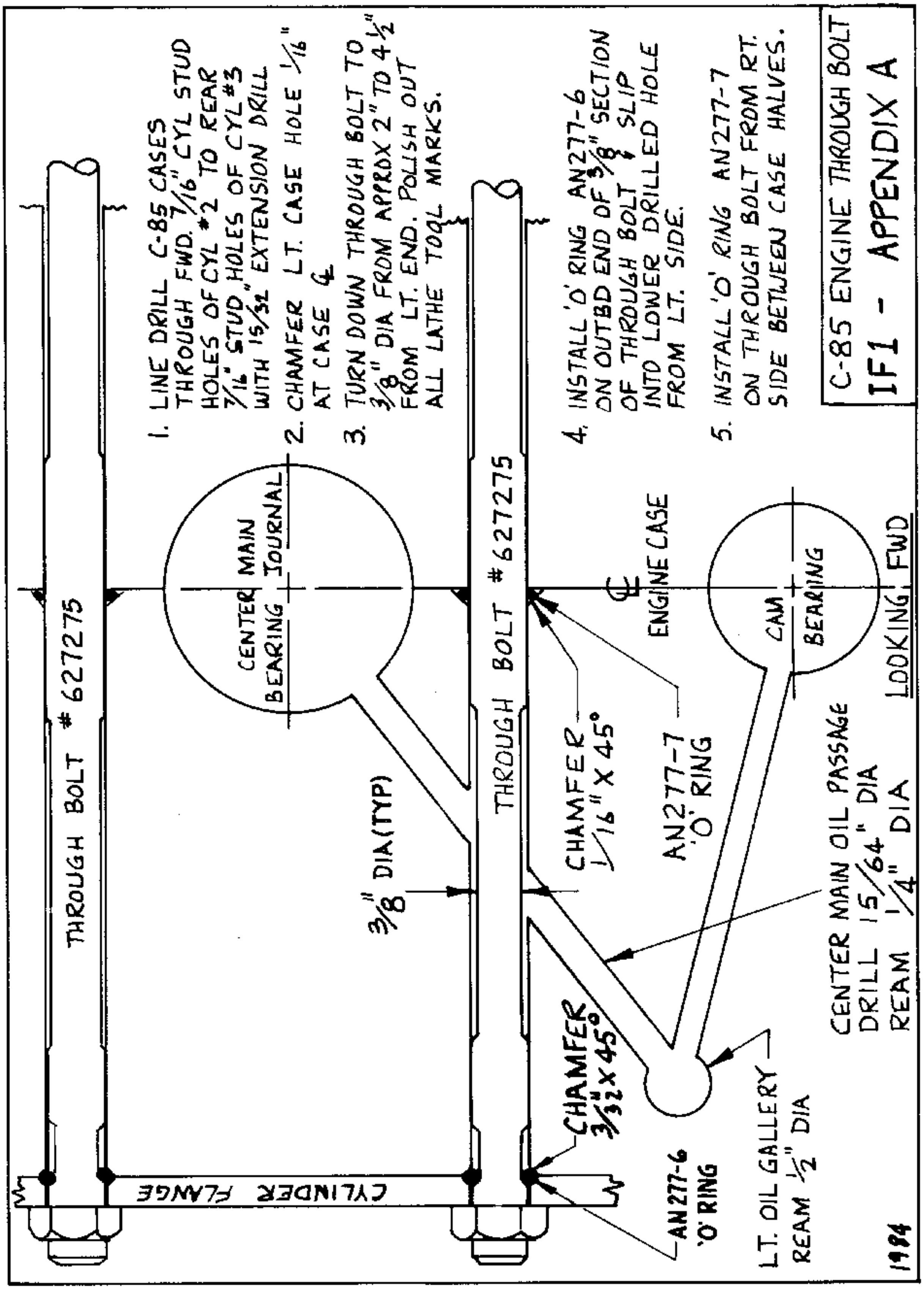
12.3 The flight requirements may be demonstrated concurrently with Pilot Certification (see Procedure Rules).

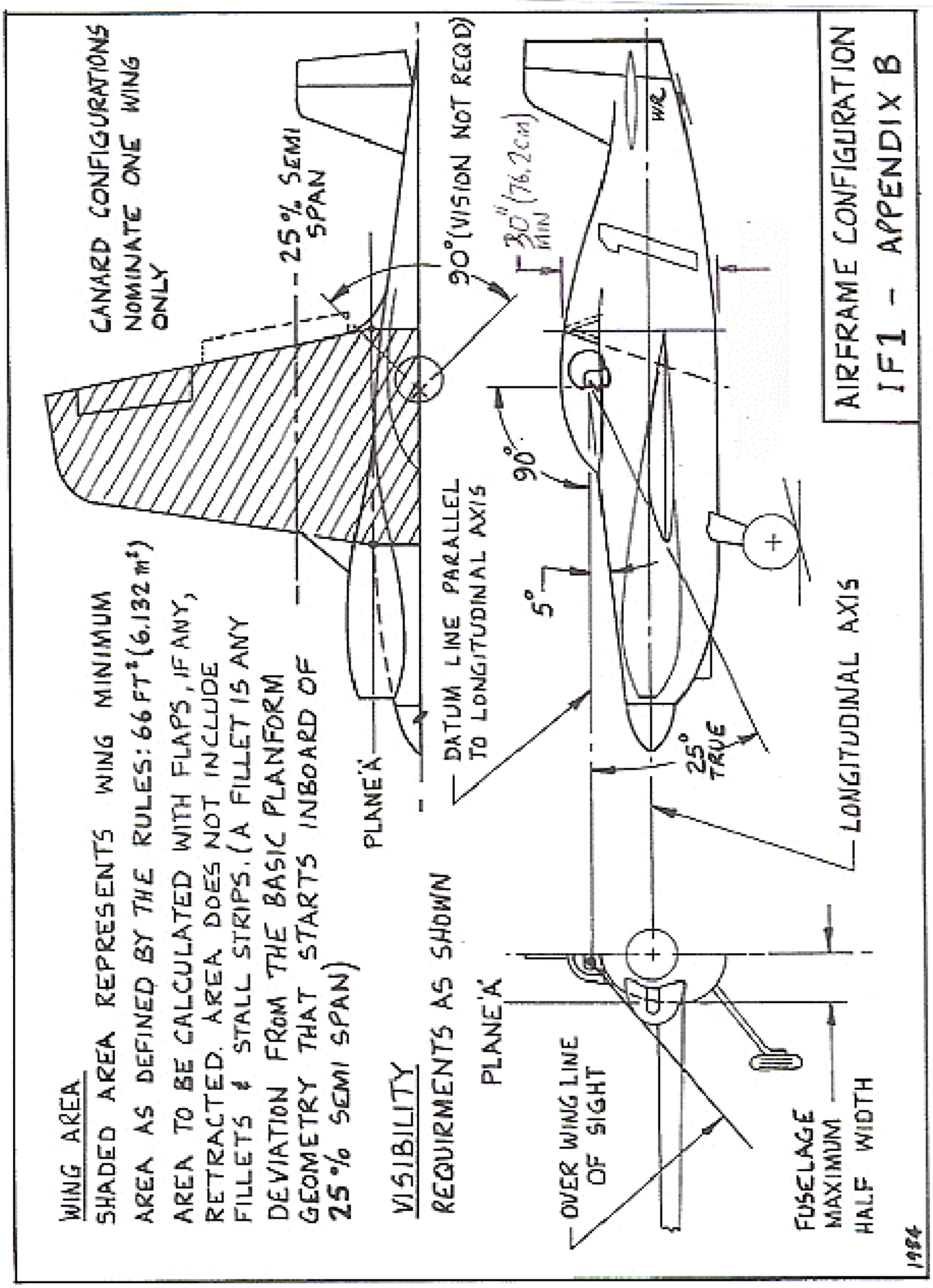
13. SUPPLEMENTARY INFORMATION

13.1 Specifications and installation prints on the Continental engines may be obtained from the Continental Motors Corp., Muskegon, Michigan/Rolls Royce Motors Limited, Light Aircraft Engine Division, Crewe, Cheshire.

Potential changes to these Technical Rules or corrections for errors should be communicated to the IF1 Technical Rules Committee Chairperson.

NOTES:


1. LINE DRILL C-85 CASES THROUGH FWD. 7/16" CYL STUD HOLES OF CYL #2 TO REAR 7/16" STUD HOLES OF CYL #3 WITH 15/32" EXTENSION DRILL
2. CHAMFER LT. CASE HOLE 1/16" AT CASE ℄
3. TURN DOWN THROUGH BOLT TO 3/8" DIA FROM APPROX 2" TO 4 1/2" FROM LT. END. POLISH OUT ALL LATHE TOOL MARKS.
4. INSTALL 'O' RING AN277-6 ON OUTBD END OF 3/8" SECTION OF THROUGH BOLT & SLIP INTO LOWER DRILLED HOLE FROM LT. SIDE.
5. INSTALL 'O' RING AN277-7 ON THROUGH BOLT FROM RT. SIDE BETWEEN CASE HALVES.
C-85 ENGINE THROUGH BOLT
IF1 - APPENDIX A
THROUGH BOLT #627275
CENTER MAIN BEARING JOURNAL
THROUGH BOLT #627275
℄ ENGINE CASE
CAM BEARING
LOOKING FWD
CHAMFER 1/16" X 45°
AN277-7 'O' RING
3/8" DIA (TYP)
CENTER MAIN OIL PASSAGE
DRILL 15/64" DIA
REAM 1/4" DIA
CHAMFER 3/32" X 45°
AN277-6 'O' RING
CYLINDER FLANGE
L.T. OIL GALLERY
REAM 1/2" DIA
1984


WING AREA
SHADED AREA REPRESENTS WING MINIMUM AREA AS DEFINED BY THE RULES: 66 FT² (6.132 m²)
AREA TO BE CALCULATED WITH FLAPS, IF ANY, RETRACTED. AREA DOES NOT INCLUDE FILLETS & STALL STRIPS. (A FILLET IS ANY DEVIATION FROM THE BASIC PLANFORM GEOMETRY THAT STARTS INBOARD OF 25% SEMI SPAN)
VISIBILITY
REQUIREMENTS AS SHOWN
CANARD CONFIGURATIONS NOMINATE ONE WING ONLY
25% SEMI SPAN
90° (VISION NOT REQD)
30" MIN (76.2 CM)
PLANE 'A'
PLANE 'A'
DATUM LINE PARALLEL TO LONGITUDINAL AXIS
90°
5°
25° TRUE
LONGITUDINAL AXIS
OVER WING LINE OF SIGHT
FUSELAGE MAXIMUM HALF WIDTH
AIRFRAME CONFIGURATION
IF1 - APPENDIX B
1984

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APPENDIX C: IF1 RACING PILOT LICENSE DEMONSTRATION

Rev. 2007

A. PAPERWORK REVIEW AND ORAL EXAMINATION

1. Review pilot's logbook to determine total flying time, and total time in the aircraft to be used for the demonstration.
2. Check for valid pilot's certificate, medical certificate, flight review, and aircraft paperwork (current airworthiness, registration, operating limitations, weight and balance, and "annual" condition inspection).
3. Review and discuss weight and balance information, engine and propeller limitations, G-load restrictions, operating limitations, and the technical inspection requirements for the aircraft used in the flight demonstration.
4. Discuss personal motivation, philosophy, and reason for becoming a race pilot.
5. Discuss past history of racing accidents and common causes.
6. Density altitude considerations.
7. Aircraft qualification procedures.
8. Race start procedures.
9. Pylon and scatter pylon procedures.
10. Passing procedures.
11. Methods of communicating emergency-in-progress information to participants and response required.
12. Methods of declaring any emergency and actions for various types of emergencies.
13. Methods of communicating termination of race to participants and response required.
14. Normal race termination procedures.
15. "Deadline" procedures.
16. Race briefing attendance requirements and outline of briefing contents:
    a. FAA regulations and waivers applicable to air racing.
    b. Crowd and race deadlines. ("showlines")
    c. Schedules and relation to staging.
    d. Aircraft ground safety precautions.
    e. Race and scatter pylon locations.
    f. Course obstructions.
    g. Emergency landing facilities.
    h. Coordination with fire/rescue.

Rev. 2007

B. GENERAL PREFLIGHT

1. Sufficient fuel (5 gallons minimum) and oil for proposed flight.
2. Seatbelts and shoulder harness.
3. Loose objects in aircraft. (Encourage the use of a checklist in cockpit)
4. Canopy and access latches.
5. Controls and aircraft structure. Rev. 2007

C. FLIGHT OBSERVATIONS

1. Aborted Start: Simulate an unassisted race start (no tail holder) and accelerate for approximately 300 feet before simulating an engine failure by closing the throttle. Bring the aircraft to a full stop without veering more than 20 feet either side of a straight line.
2. Race Start: Takeoff from a full stop at full throttle without veering more than l0 feet either side of a straight line.
3. Make three 180 degree turns of at least 60 degree bank at an altitude of 500 feet or higher at racing speeds without appreciable loss of altitude.
4. Demonstrate an aileron roll in each direction, followed by a half-roll to the left with a half-roll to the right recovery. All without loss of altitude exceeding 50 feet.
5. Demonstrate three laps on the race course at racing speeds without climbing in turns.
6. Demonstrate formation flying ability and passing techniques on the race course.
7. Demonstrate a normal landing.
8. Demonstrate a simulated power-off landing from racing altitude and speed.

Rev. 2007

Aircraft Race #:

Pilot:

Renewal at:

Date:

Pilot Evaluator:

Signature:

Rev. 2007

INTERNATIONAL FORMULA ONE DESIGN GUIDE

Revised 1985, 1991
Reformatted with revisions 2002

GENERAL

This guide is intended to be used in conjunction with the rules by people designing or building aircraft for IF1 class competition. It is not controlled and may be modified at any time by the Technical Director.

There have been cases in the past where members have built or modified designs, then submitted their aircraft for technical inspection in the field. Upon inspection it was determined the design or modification does not meet the requirements. Subsequent and further analysis proved this field action to be correct, and we wish to prevent this from happening. The Technical Director has the authority to approve or disapprove the modifications and/or new designs of IF1 aircraft. This approval before submittal of aircraft for technical inspection and qualification is not mandatory, but highly recommended. The only cost of this assistance will be the "out-of-pocket" cost and expense of traveling to the project when necessary. The Tech Director is also a source of technical help and assistance for members who wish to design or modify IF1 aircraft. Help can also be obtained from regional technical inspectors appointed in different areas, under the same conditions.

Every member receiving the benefit of advice or assistance from this organization must realize that all recommendations and conclusions are purely advisory. The suitability, integrity and condition of your airplane will be solely the responsibility of the owner, builder and the pilot. No responsibility is assumed by individuals or the IF1 organization.

ITEM 1: ENGINE

Technical Rule 1.18.5 requires engine retention cables. Cables are required to retain the engine on the airframe in the event of a propeller failure. The objective of the requirements set out below is to provide a redundant, fail safe system that will work even if one side breaks.

1.1 **Cables**
Only bare 3/16 in. steel cable will be used - no plastic coated cable. Protective covering (split plastic tubing) may be used, provided it is readily removable for inspection. Use double nicopress, control-cable type end fitting or braided eyelet loop for making end loops.

1.2 **Routing**
The cable must be wrapped around the engine between the cylinders as shown in Figure 1. The cable should be crossed above the engine. The cable may be routed between the lugs on the spider, **looped around and back through the spider** to provide a fail-safe installation (see below). When making the installation consider engine removal.

1.3 **Fail-Safe Installation**
Provide clamps to prevent the engine from sliding off the cable if the airframe attachment fails on one side. Provide a clamp where the cables cross above the engine and/or clamps on the loop at the spider. An alternate approach is to use two separate cables (see Figure 2).

1.4 **Airframe Attachment**

Cables will be attached at two separate locations at the airframe side of the engine mount:

A. Connected to .090 in. thick 4130 steel lugs bolted by the engine mount/airframe attach bolts, (see Figure 3) or

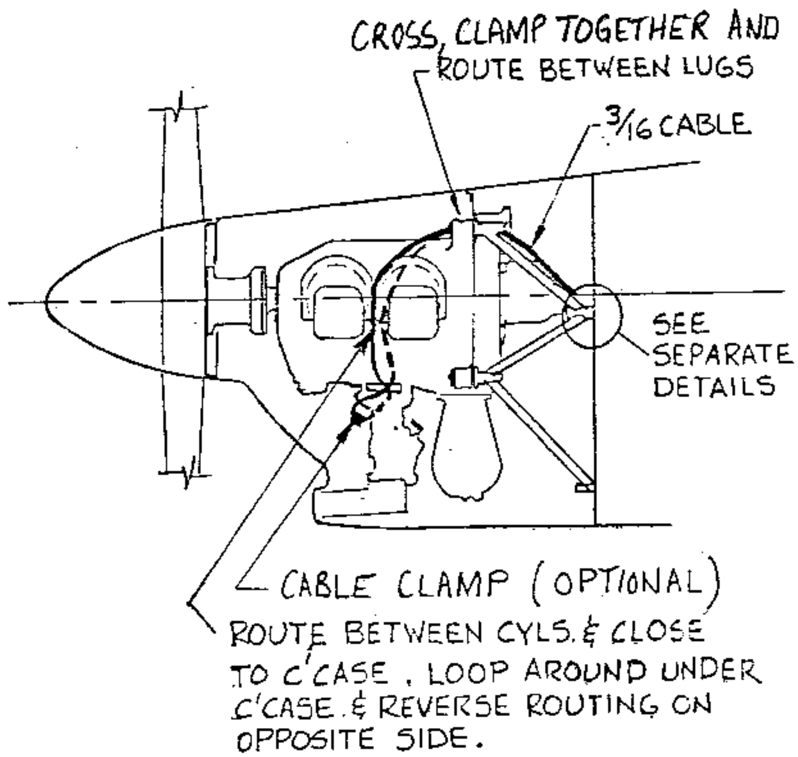
B. Looped around one upper longeron tubing cluster behind the firewall, across the back of the firewall and looped around the other cluster, (see Figure 4) or

C. Wrapped around the tubing cluster at each upper longeron behind the firewall (see Figure 5) or

D. Attached to lugs welded or integrally bonded to the upper longeron or basic airframe structure or

E. Attached to gussets (.090 in. steel) welded between engine mount or frame tubes (minimum of four linear inches of weld per gusset).

SUGGESTED SAFETY CABLE ROUTING



NOTE:

ADDED CABLE LENGTH FOR LOOP UNDER CASE IS BENEFICIAL IN PROVIDING MORE CABLE STRETCH TO REDUCE SHOCK LOADS. ROUTE BETWEEN SPIDER ATTACH LUGS AND LOOP AROUND.

FIGURE 1

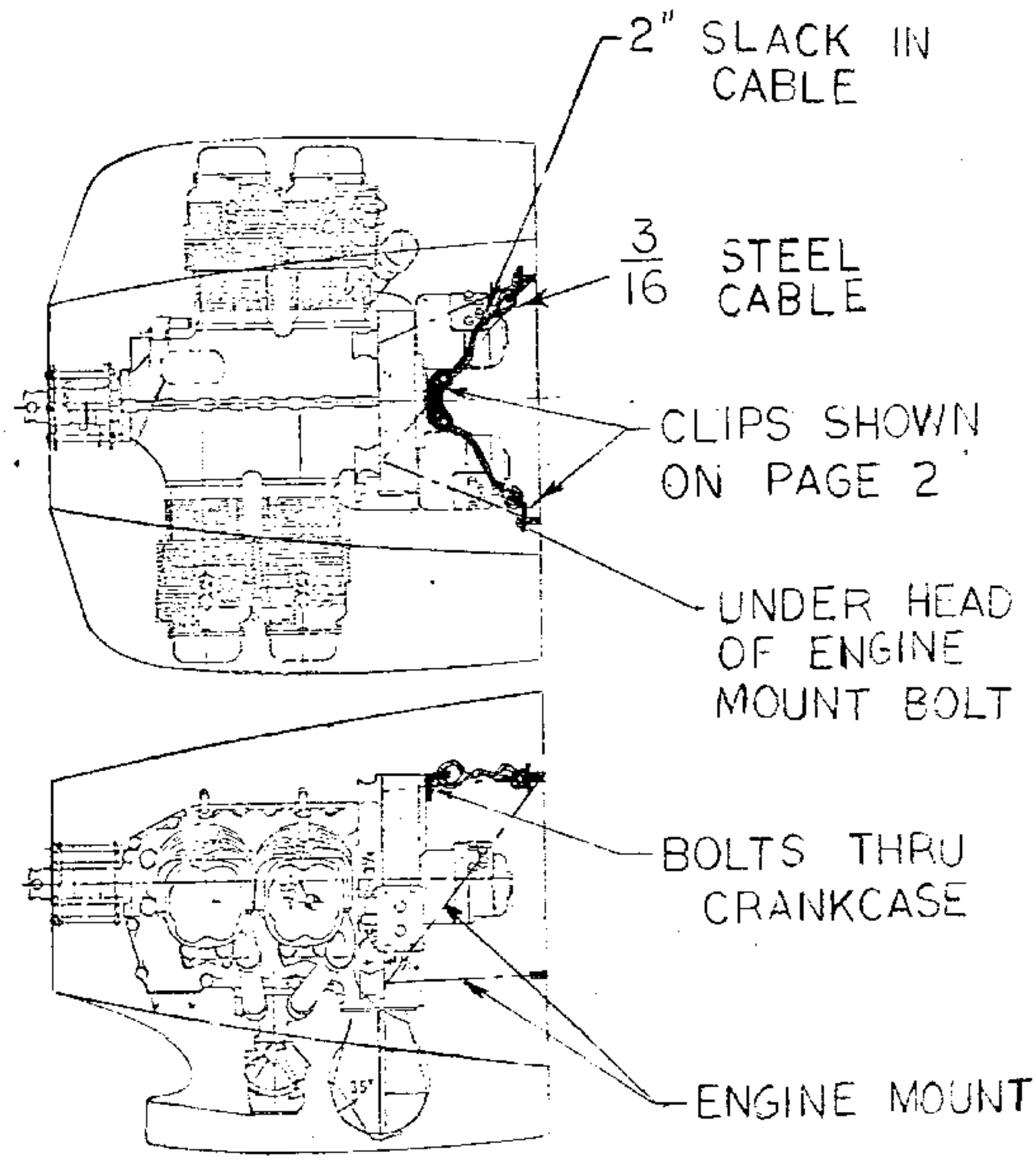

2" SLACK IN CABLE
3/16 STEEL CABLE
CLIPS SHOWN ON PAGE 2
UNDER HEAD OF ENGINE MOUNT BOLT
BOLTS THRU CRANKCASE
ENGINE MOUNT
35°

FIGURE 2

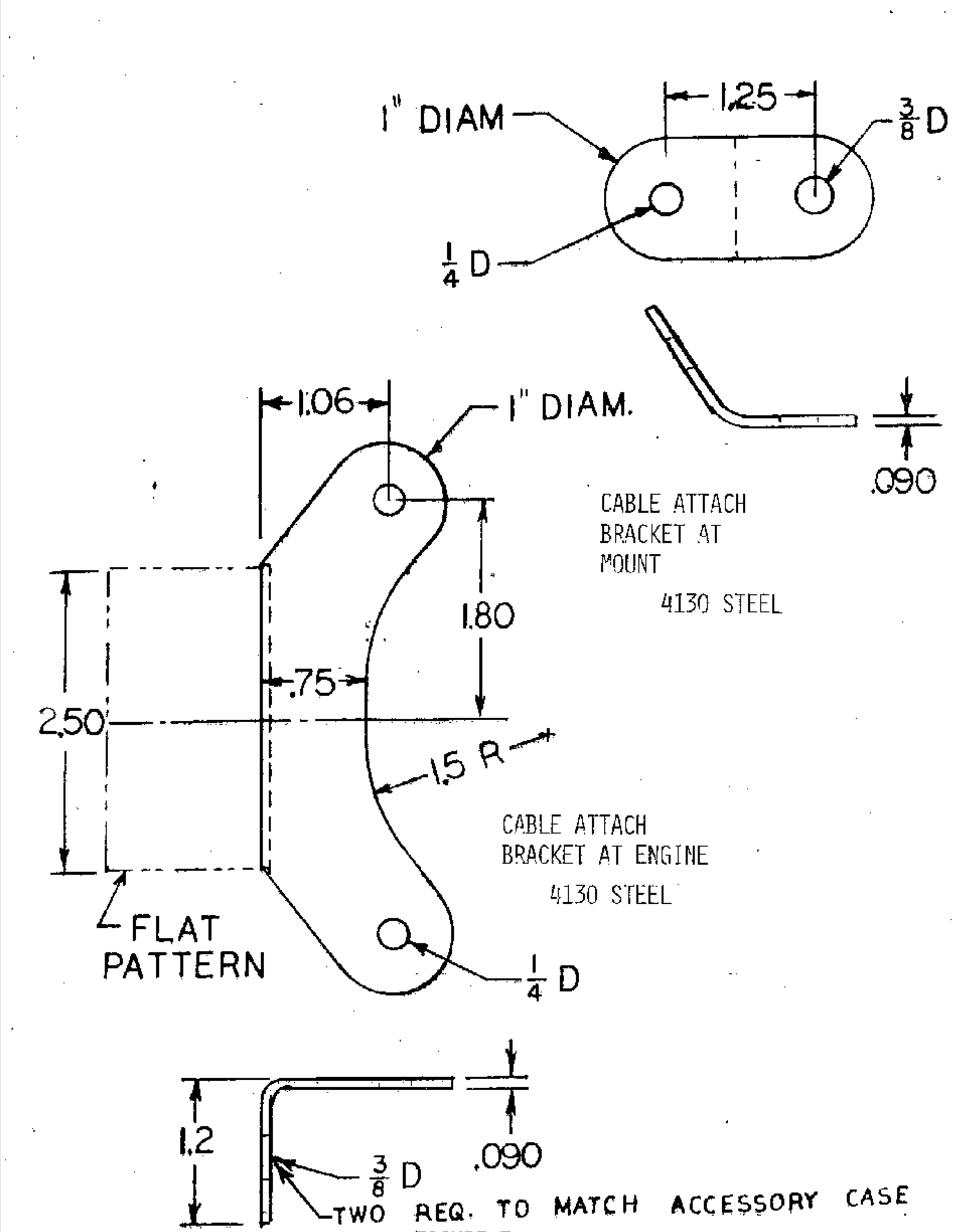
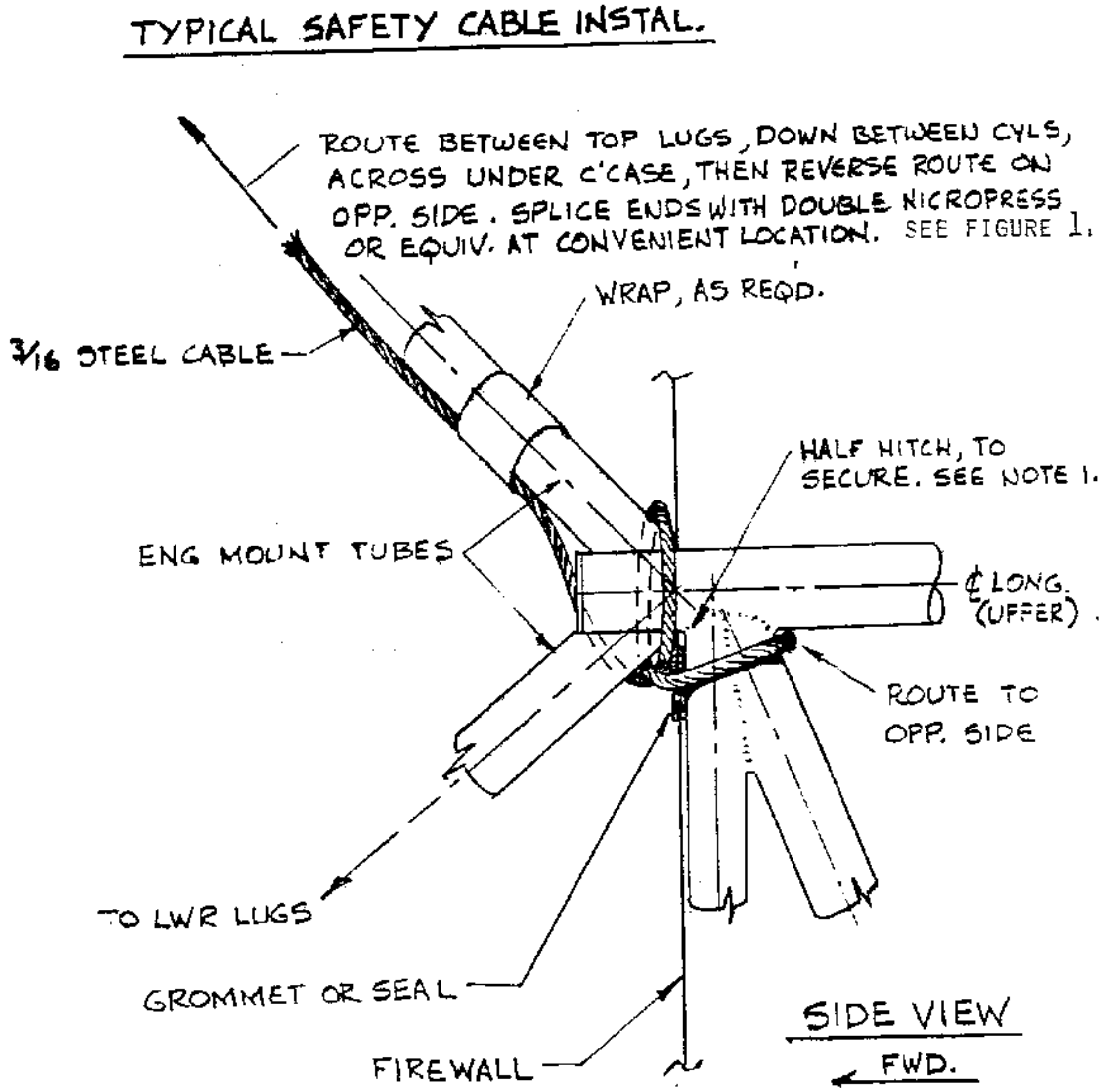

1" DIAM
1.25
3/8 D
1/4 D
.090
1.06
1" DIAM.
CABLE ATTACH
BRACKET AT
MOUNT
4130 STEEL
1.80
2.50
.75
1.5 R
CABLE ATTACH
BRACKET AT ENGINE
4130 STEEL
FLAT
PATTERN
1/4 D
1.2
.090
3/8 D
TWO REQ. TO MATCH ACCESSORY CASE

FIGURE 3



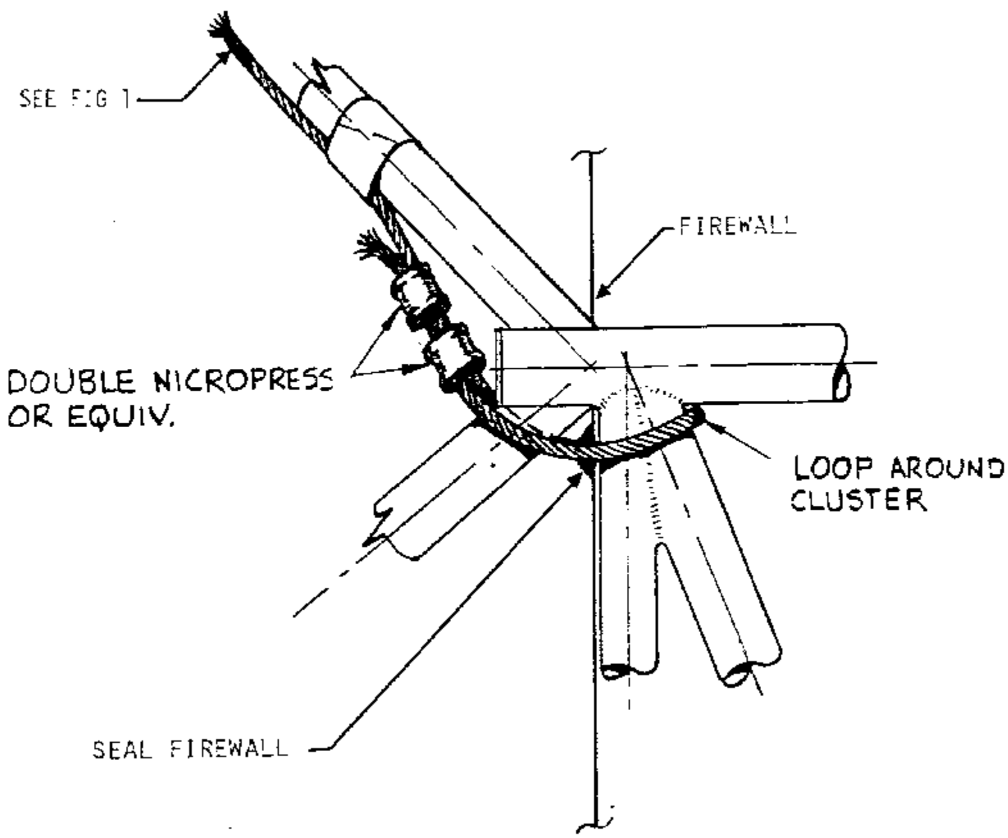
NOTES:

1. SECURE TO CLUSTER AS SHOWN, OR EQUIVALENT, TO PREVENT CABLE FROM SLICING DOWN THRU F'WALL IF ENGINE SEPARATES FROM AIRCRAFT. CROSS-SHIP SECTION OF CABLE BEHIND F'WALL WOULD THEN SLIDE DOWN TUBES AND PIN OR SEVER PILOTS LEGS, IF NOT SECURED. IT CAN BE ASSUMED THAT THE TOP MOUNT WILL NOT FAIL AT THE FIREWALL CLUSTER.

2. LEAVE 1" TO 1-1/2" SLACK EACH SIDE TO ASSURE THAT MOUNT TAKES INITIAL SHOCK.

FIGURE 4

TYPICAL SAFETY CABLE INSTALLATION.



NOTE:

LEAVE 1" TO 1-1/2" SLACK AT EACH SIDE TO ASSURE THAT MOUNT TAKES INITIAL SHOCK.

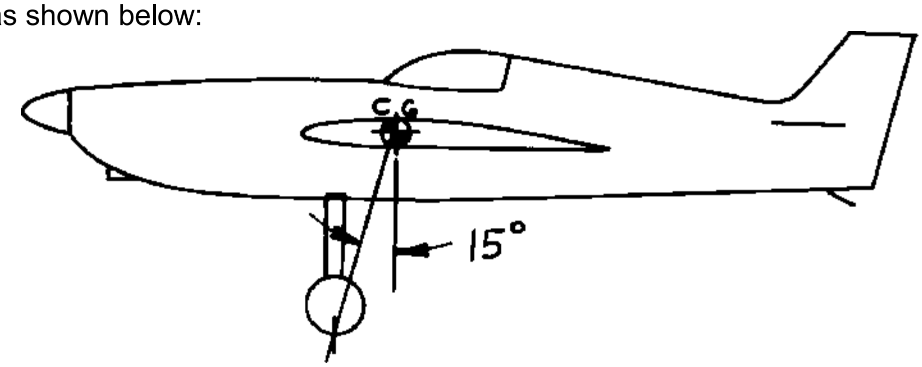
FIGURE 5

ITEM 2: AIRFRAME

2.1 **General** - It is recommended that all builders submit a three-view scale drawing (at least 1/20th scale) to the Technical Director for review and comment before construction of the ship is started. These drawings should include as much design data and detail information as possible. Drawings should show particularly details of wing structure and bracing, if any, giving type of materials, size and construction and spars, ribs, skin, drag bracing, fittings, etc. The location and construction of nose-over structure giving size of members, etc. should be shown and an estimate of weight and balance submitted. All materials submitted will be held strictly confidential.

2.2 **Center of Gravity -** Location of racing gross weight should fall within an 8% to 25% of MAC. CG locations aft of 25% MAC are subject to approval by the Tech Director.

2.3 **Landing Gear** - Past experience indicates that an aircraft with conventional landing gear, the contact point of the main wheels should be on a line 15 deg. forward of the CG location as shown below:



This provides adequate braking and acceptable ground handling if toe in is avoided.

2.4 **Recommended Design Criteria -** These are based on experience including load factors actually measured on aircraft in races.

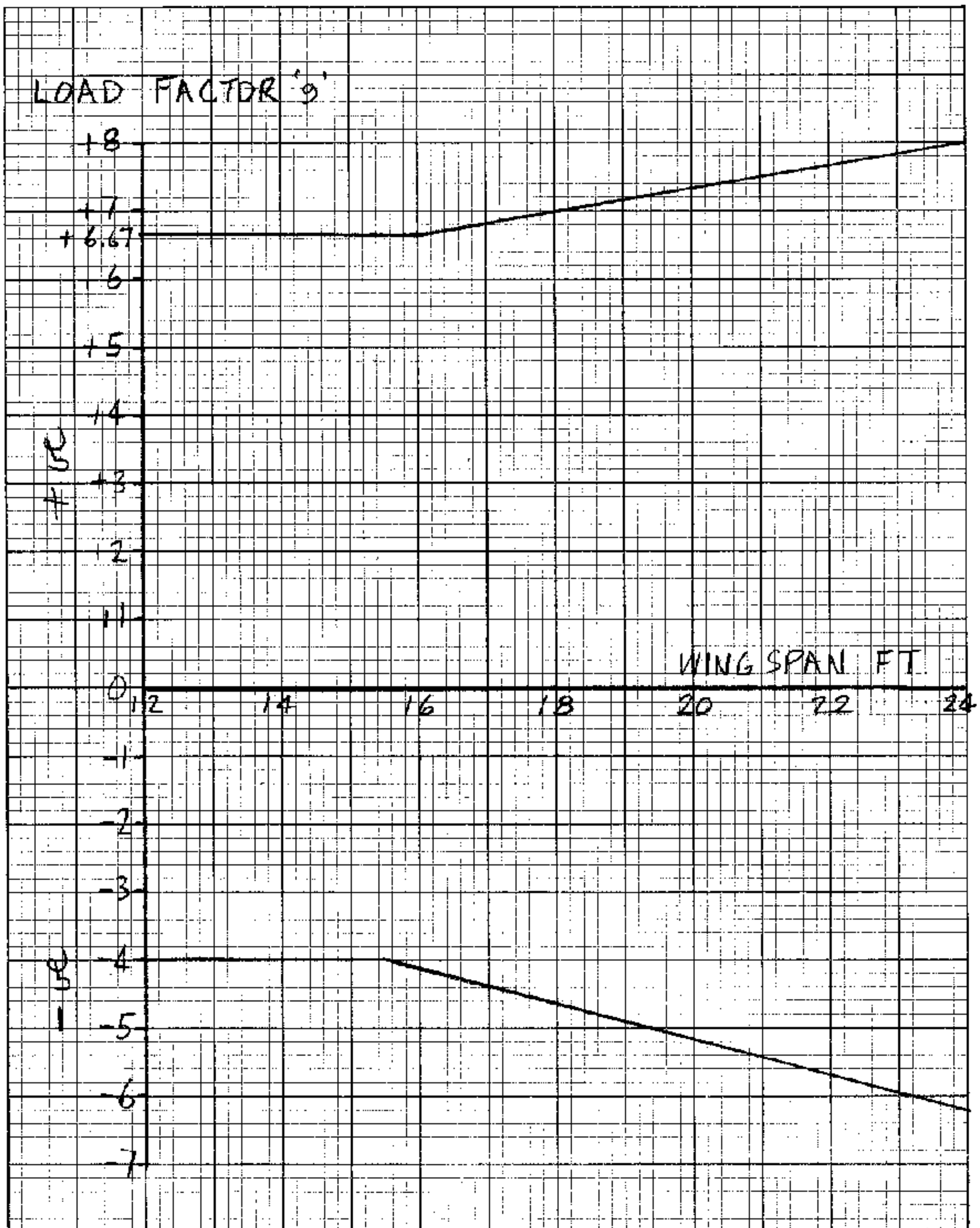
2.4.1 The design limit load factor should be not less than illustrated on Figure 6.

The design ultimate load factor should be not less than 1.5 x limit load factor. There should be no predictable catastrophic failure at the ultimate load factor. The design load factors should be applied to the aircraft racing weight. For wooden structures there is not really any limit load as such; so the compressive ultimate load and the modulus of rupture must be used to determine strength.

2.4.2 The wing structure, control system, fuselage structure and fittings should be designed to withstand, as a limit load, the abrupt application of aileron deflection at 240 mph TIAS. The minimum design deflection should be the least value resulting from the following conditions:

2.4.2.1 Full attainable travel (against the stop).

2.4.2.2 Same as 2.4.2.1 but reduced by the amount of control system deformation, under load, of that portion of the system between the aileron stop and the aileron.



RECCOMENDED MINIMUM DESIGN LIMIT LOAD FACTOR FOR IF1 AIRCRAFT

FIG 6

2.4.2.3 The deflection attainable with a 50 lb. "pilot effort" load applied laterally at the stick grip, including the effects of system deformations.

The torsional loads due to aileron deflection shall be combined with positive or negative wing lift and the torsional loads due to camber such that the most critical combination results.

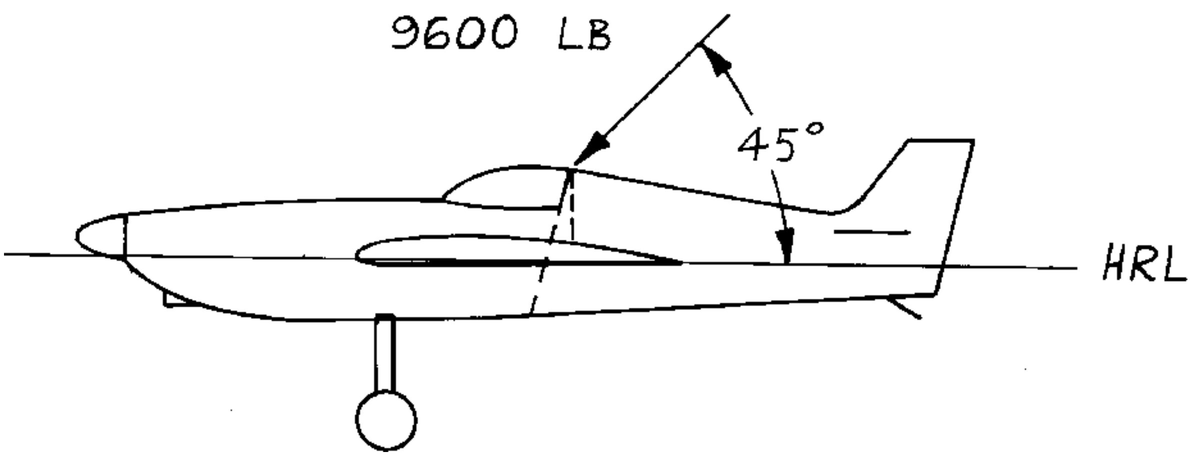
2.4.3 The horizontal and vertical tails and supporting structure should be designed to withstand a limit load resulting from an average normal force coefficient of +1.2 and a dynamic pressure corresponding to the predicted TIAS which will produce an accelerated stall at the aircraft design limit load factor. (Note: this condition approximates a panic recovery (forward stick) from such a stall, wherein zero downwash and sidewash are assumed to exist at the tail).

It will be acceptable to assume that the chordwise load distribution is as follows:
2/3 of the load should have a triangular distribution with the peak at the LE and zero load at the TE and 1/3 of the load should have a triangular distribution with the peak at the control surface hinge and zero load at the LE and TE.

The spanwise load distribution should be determined by a rationale or conservative analysis.

2.4.4 An alternative rule of thumb for the design of a horizontal tail for a 12g airplane is to take the empty weight of the airplane and apply it as a rectangular lift distribution.

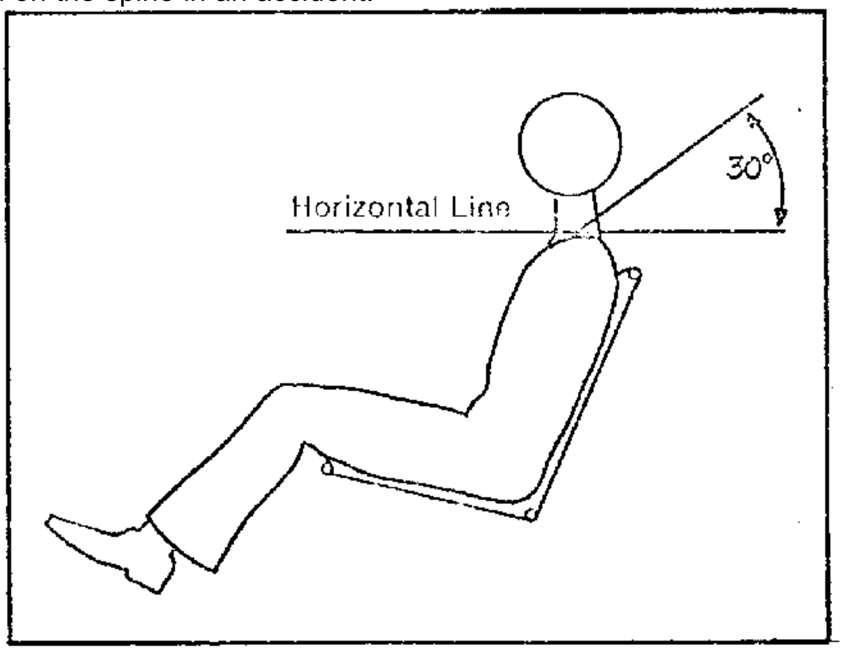
2.5 **Turn Over Structure** - It is recommended that structure behind the pilot's head be designed to support at least a 12g or 9,600 load applied down and forward at 45 Deg.



2.6 **Canopy** - It is required that the canopy be designed to have provision for unlatching from both the inside and outside in case of emergency. See Rule 11.3.

Technical Rule 11.3 requires a marking describing emergency canopy release procedures. One method of making a decal is to obtain some yellow "Scotchcal", use black rub-on letters for the marking and cover with clear self-adhesive material for protection. Rub-on letters can also be applied directly to paint and protected by clear spray material.

2.7 **Safety Harness** - It is recommended that each mounting point be designed to support at least a 12g load or 1300 lb. load in the direction of the belt (180 lb x 12 g x 60%). The rules require a shoulder harness. The shoulder straps should be designed to meet the shoulders at an angle of 0 deg. to 30 deg. **above** the horizontal to prevent download on the spine in an accident.



2.8 **Trailer Loads** - Many instances of damage to aircraft structures have been noted as a result of transporting racing aircraft on trailers. A common form of damage is fatigue cracks in upper longerons just aft of the firewall caused by vibration of the engine. If you anticipate extensive trailering of your aircraft, design in additional strength in affected areas. The most effective solution is probably to remove the engine entirely or support it separately from the airframe in some way during transportation.

2.9 **Breathing Tube** - In the event of catastrophic engine failure or fire, etc., smoke and fumes can enter the cockpit even if the firewall is carefully sealed. Some designers provide the pilot with a breathing tube connected to a fresh air source far enough out on the wing to preclude the intrusion of fumes from the engine compartment.

2.10 **Engine Mount** - The standard Cassutt engine mount is designed for a engine rear accessory case which lacks provision for starter or generator. If a stock 0-200 engine is used with a - 1 rear case, the starter and generator pads will hit the engine mount. Many people bend the tubes to clear the case; this is unacceptable since curved space frame tubes are very inefficient. The solution is either to use a -12 rear case or redesign the engine mount to clear the -12 case.

2.11 **Exhaust Insulation** - There have been instances where people have wrapped their exhaust systems with insulating material such as waterglass and then had their ability to fly the airplane severely hampered by fumes in the cockpit (see 2.9). Some of these materials take a considerable time to cure - some still outgas after more than 30 minutes of ground running the engine.

2.12 **Spinners** - Spinners are troublesome and prone to cracking:

1. Use a backplate and a front plate. Projecting mandrels are hard to align. Attach the spinner to both plates with fasteners.
1. Do not attach composite props to spinners.
2. Make sure the spinner is properly aligned.
3. If you bolt the prop through the front plate, use large area washers or steel inserts to prevent loosening of the prop bolts as the aluminum front plate material is extruded out from under the bolt heads.
4. Check that the bushing holes in the prop are deep enough to accept the crankshaft bushings and allow the prop to sit firmly on the crank flange.
5. Reinforce the prop cutouts with a doubler riveted to the spinner or a welded bead. Leave a 0.1 in. gap between the spinner and prop. Any seal should be flexible.

2.13 **Propellers** - In 1987 all-metal props were no longer allowed in F1 racing. This was due to frequent instances of cracking and dangerous failures. We do not recommend the use of metal props even for testing, but if you still choose to use one be sure to:

Inspect them visually **before each flight** - on the curved outer surface, leading and trailing edge from root to tip. Look for small chordwise dents or two dents with tiny crack between. Remember, one day its not there then after a flight or runup, it is.

On **Sensenich** propellers the most usual location for failures is on the curved front surface 14 to 18 inches from the tip.

On **Macauley** props the critical place is on the back side at the leading edge, again 14 to 18 inches from the tip.

Buy a dye check kit and inspect your propeller with it every three flights.
Always stay 200 rpm away from the vibration modes.
CARE AND MAINTENANCE OF F1 WOOD PROPELLERS (Courtesy of Fred Griffith, Great
American Propeller Company)

1. Use a full size crush plate for best torque and first quality AN/MS propeller bolts, preferably AN76 series.
2. Crush plates of aluminum should be at least 1/4" thick.
3. Use washers under the bolt heads to prevent damage to crush plate.
4. Torque 3/8" propeller bolts to at least 20 ft. lbs. and check the propeller track. Prop should track to 1/32" because of high RPM.
5. Use 25 ft. lbs. to bring in track on one side if necessary.
1. Make sure spinner cut outs clear prop by 1/8" all around to prevent cutting propeller (they move in flight).

7. Make sure spinner screws are lined up properly, especially front spinner plates. If not, use spacers to bring in line.
8. Make sure propeller is clean and smooth. Use wet sanding, polishing compound and paste wax.
9. Do not handle or move propeller by the tips. This could cause un-seen internal fractures and possible in-flight failure.
7. When starting engine, hold propeller halfway between spinner and tip. (A little harder to do but well worth preventing damage to propeller.)
8. Inspect and re-torque your propeller, especially a new prop and always after the first flight.
7. If you go from a dry climate to a high humidity climate, your propeller will take on some moisture and swell slightly. No need to worry. Going from a high moisture climate to a dry climate like Reno, etc., your propeller will shrink and the torque value will decrease. Make certain your torque is holding and re-torque as required.
9. On fairly new propellers the wood may shrink as at Reno and the finish may become bumpy over the glue lines. Wet sanding and polishing compound will take care of this problem.
10. When installing and removing your wood/composite propeller, always hold it in near the hub. Wrenching the propeller out farther on the blade could cause fractures which in turn could cause failures.
11. Use the proper diameter propeller for the temperature and altitude that you will be racing. The high drag of supersonic propeller tips is very costly in performance of the propeller and could even cause damage.
8. Inspect your propeller carefully before and after each flight. If you see something questionable, get an expert to look at the propeller and/or call the manufacture for help and advice.
9. Remember, racing propellers are subjected to many kinds of loads and some are unknown dynamic loads and high G forces. Proper care of your propeller is critical.
12. A high visibility, padded propeller cover is suggested to protect your propeller from damage between flights.
13. Should your propeller become nicked or experience small areas where the paint is gone due to rocks, etc., be sure to fill these areas with epoxy or some finish to keep the wood and composite protected. If the damage is greater, call the manufacture for advice.
14. Your propeller should be perfectly balanced and to make sure it stays that way, always store horizontally on either flat side of the hub face. An alternate method is to hang it horizontally from the hub or bolt holes. NEVER stand it on blade end as the moisture will migrate to the low end and an out of balance condition will occur. After installation of the propeller, always leave propeller in the horizontal position when stopped.

Propeller performance is directly related to tip mach number. The following chart, Fig 7, shows the relationship between tip mach number, RPM, and prop diameter at 240 m/h. It is advisable to keep the tip mach below .92 or so to avoid the dramatic drag rise associated with compressibility effects.

PROP TIP MACH NO. AT 240 mph = 352 FT/SEC

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PROP DIA IN	TEMP °F	3700 STATIC F/S	3700 TOTAL F/S	3700 MACH	3800 STATIC F/S	3800 TOTAL F/S	3800 MACH	3900 STATIC F/S	3900 TOTAL F/S	3900 MACH	4000 STATIC F/S	4000 TOTAL F/S	4000 MACH	4100 STATIC F/S	4100 TOTAL F/S	4100 MACH	4200 STATIC F/S	4200 TOTAL F/S	4200 MACH	4300 STATIC F/S	4300 TOTAL F/S	4300 MACH
58	60	936.4	996.7	.892	961.7	1023	.915	987	1047	.937	1012	1071	.958	1037	1094	.979	1063	1119	1.002	1088	1143	1.023
	70			.883			.907			.928			.949			.970			.992			1.013
	80			.875			.898			.919			.940			.960			.982			1.003
	90			.867			.890			.911			.932			.952			.974			.995
	100			.859			.881			.902			.923			.943			.965			.985
56	60	904.0	969.4	.867	928.5	992.3	.888	952.2	1015	.909	977.3	1038	.929	1002	1061	.950	1026	1084	.970	1051	1108	.992
	70			.859			.880			.900			.920			.941			.961			.982
	80			.851			.871			.891			.911			.931			.952			.972
	90			.844			.863			.883			.903			.923			.943			.964
	100			.836			.855			.875			.895			.915			.934			.955
54	60	871.8	939.4	.841	895.3	961.3	.861	918.9	983.3	.880	942.4	1005	.900	966.0	1027	.919	989.6	1050	.940	1013	1072	.960
	70			.832			.852			.872			.891			.910			.931			.950
	80			.825			.844			.863			.882			.902			.922			.941
	90			.817			.837			.855			.875			.894			.914			.933
	100			.810			.829			.848			.866			.885			.905			.924
52	60	839.7	909.5	.814	862.2	930.5	.833	884.9	951.6	.852	907.6	972.7	.871	930.2	993.9	.890	952.9	1015	.909	975.6	1036	.927 LIMIT
	70			.806			.825			.844			.862			.881			.900			.918
	80			.798			.817			.835			.853			.872			.891			.910
	90			.791			.810			.828			.846			.865			.883			.902
	100			.784			.802			.820			.839			.857			.875			.893

MACH 1 @ 60°F 1117, 70°F 1128, 80°F 1139, 90°F 1149, 100°F 1160 F/S

Fig 7

2.14 **High Aspect Ratio Wings** - As you decide to trade in the old barn door for one of those high tech foam and glass sailplane surfaces, you should consider a couple of items! *A change to a high aspect ratio wing reduces your margin of safety in several areas.*

2.14.1 Center of Gravity Range - For safety, our rules require you to maintain your gross weight CG between 8% and 25% of the Mean Aerodynamic Chord. The MAC is a mathematical approximation of a complex planform to reduce it to an equivalent rectangular wing, like the basic Cassutt. You can obtain 66 sq. ft. with a 5 ft. chord and I3.5 ft. span or a 32 in. chord and 25 ft. span. The allowable CG travel on the slab is About 10 in. but on your High AR it is only 5.4 in., a 46% reduction.

Fuel usage, although it usually moves the CG aft, seldom affects a stock Cassutt. With your new wing you must check the CG both full fuel **and empty** especially if you have a big tank. A heavier pilot (new or post-Christmas) also moves the CG aft. Your airplane is much less tolerant to a couple of pounds added to the aft end - like a paint job. If the CG is not always within the allowable range, you **must change** the airplane or ballast it. A wood prop is 10 lbs. lighter than its metal equivalent - more aft CG movement.

2.14.2 Structure - If your new long wing weighs less than your current wing, worry; find out why. It is probably due to modern, stronger materials, but as the span increases, bending moments and loads increase and you need additional structure to support the extra load. You will be asked to demonstrate a 6g load in flight, and perhaps see 9+g in turbulence during racing later. The analysis is fine for that theoretical paper wing but what about yours? Did all the bonds bond? Are all the voids filled? Did the epoxy mix properly on **your** wing?

Do a proof load test. Turn the wing upside down on a pair of strong saw horses and load sandbags equivalent to 7g x the airplane gross weight (5600 lbs or so) on the wings. If it breaks, you just saved your ***.

2.14.3 Stiffness - This new wing makes you faster right? Loads increase by the speed squared, i.e., a I00 lb load at 200 m/h will increase to 156 lbs at 250 m/h. The wing section is smaller and its stiffness, not only in bending, but in torsion is probably less. That does not mean that it breaks, but it does mean that it bends.

Aileron inputs add torsional load to the wing. Roll left, left aileron up twists wing LE up and increases wing incidence and lift. This rolls you to the right, but we wanted to roll left, remember! The result is reduced aileron effectiveness and possible tip stall.

2.14.4 Aerodynamics - Accelerated stalls: as you pull g, the stall speed increases, so in a turn you must keep the speed up to maintain your safety margin. Tight turns at low speeds are more dangerous since the inside wing slows down more for your high AR design. Consider building in some washout - less (or negative) incidence at the tip than the root. This will perhaps increase drag a little but may make your airplane work better. It is a basic rule of aero design that you do not want the tip to stall.

2.14.5 Ailerons - We have seen a few odd geometrical effects due to bending. Torque tubes will bend at the bearing or support points and try to remain straight in between. They will bend up under load and perhaps move the neutral point of the aileron without moving the stick. People have attempted to counteract this by rigging the system with the ailerons out of line statically so that under load they work better. You should consider, however, that in a low speed situation (dead stick) your ailerons will be unloaded and may alter the airfoil to the extent of **stalling** that portion of the wing. A push rod system is far less susceptible to these problems especially if you use lengths that can remain straight.

2.15 **Fuel Vents** - When the engine stops at 200' on takeoff, you have to hope there is plenty of runway ahead of you. If you survive this, the cause is often a blocked vent; either a design problem, someone forgot to uncover it or the tank was filled to the point that fuel enters the vent system. Keep the vent going straight up or straight down if possible and in a positive pressure area. Avoid sink traps and keep it at the front of the tank so that either tail down or with fuel slosh on takeoff acceleration, the vent should remain clear. Don't bring the vent into the cockpit.

ITEM 3: FLIGHT DEMONSTRATION

3.1 **General -** With a new aircraft, you will be required to demonstrate a 6g pull-up. Be prepared to provide a g meter, preferably panel mounted. If this is impractical, mount it solidly on top of the spar or longeron with racers tape.

Make sure the meter is unlocked. Use a hand induced g force. Attempting to pull 6g on a locked g- meter in the aircraft could be disastrous. Do not attempt the test without a parachute and helmet. Do not use a low speed parachute.

3.2 **Trim**
Sometimes with a new airplane or an old one with a new wing, trim is incorrect. The aircraft will want to climb or dive and has to be held with the stick. With a new wing, this is because you have moved either the center of lift or the center of gravity.

If you have a conventional aircraft without adjustable trim on the tail, you must change the incidence of the horizontal.
o Aircraft flies nose down - move leading edge of horizontal tail down.
o Aircraft trims nose up - move tail up.

A quick fix is to tape a small section of 1/4 in. dowel rod or pencil (3-4 inches long) to the trailing edge of the elevator. This works as a neat and very effective trim tab that can be lengthened or shortened for fine tuning.

Sometimes these adjustments do not work well. This is probably because the tail volume (area x tail moment arm with respect to the wing) is insufficient. Add area to the tail and consider a tail with a similar aspect ratio to your wing and also with a proper section (i.e. not a flat plate!). This problem often occurs when you put a long taper wing on a Cassutt so increase the tail span at the same time.

Do not use sharp leading edges on the tail surfaces. At low incidences they buffet (flutter) due to unstable flow. Similarly sharp wing leading edges will produce a vicious stall.

3.3 **New/Modified Aircraft Flight Test**

Checks required for new aircraft are defined in the Technical Rules (12). Based on these requirements, checks for modified aircraft are at the sole discretion of the on-site Technical Director or his designate.

3.3.1 Check that the aircraft is designed to at least 9g. A proof load test of the wing structure on the ground to at least 7G, under the supervision of a qualified structural engineer is **strongly advised.** Obtain a high speed parachute and G meter. Check CG is within limits at gross weight; if not modify the plane.

3.3.2 Install the G meter per 3.1 of this Design Guide.

3.3.3 Select a test pilot. This is a demanding and potentially dangerous flight if the aircraft is not designed and built correctly. Flight test experience really helps.
Potential problems: Structural failure - control system, tail flutter, aileron flutter, wing. Loss of control - low torsional stiffness, accelerated stall, aft CG, yaw coupling, spin.

3.3.4 Test fit the pilot with a parachute and helmet in the aircraft - can he function well with the canopy closed? If not, find a new pilot - **do not fly without a chute.** Recheck center of gravity. Caution, new pilot and/or chute may move CG behind aft limit.

3.3.5 Conduct the test flight **PRIOR** to arriving at the race site in the privacy of your own airport if possible; this is much less stressful to all of us. In addition to IF1 requirements, static and dynamic stability checks in 3 axes, max level speed, stalls, accelerated stalls, and wind-up turns should be successfully completed. Conduct initial flights at 10,000 ft. AGL. The actual approval flight will then be much easier and safer if you have tried everything beforehand.

3.3.6 At the race site, consult Technical Director and obtain agreement on what must be done and when, make sure inspectors are there ready to watch you.

3.3.7 Have a technical inspector come to your aircraft and observe that a G meter is set to zero and be sure that it is unlocked.

3.4 **Typical Flight Card**

o Check parachute, helmet, gloves, and harness

CAUTION: These tests can be hazardous and are taken at your own risk. In the event of loss of control and recovery is not immediate, jettison canopy, and bail out. If recovery is successful, return for investigation - do not continue flight.

3.4.1 TURNS AND ROLLS

3.4.1.1 Climb to a safe altitude, a minimum of 5000" AGL, position aircraft over field % mile from observers.
3.4.1.2 Accelerate to full speed in level flight, complete three 180 level turns with at least 60 deg. bank.
3.4.1.3 Aileron roll left, followed by aileron roll right.

3.4.2 DIVE FOR FLUTTER

CAUTION: In event of unusual vibration/noise, immediately reduce power gradually, pull up smoothly to reduce speed. Prepare to jettison canopy and bail out. If recovery is successful, return immediately for investigation.

3.4.2.1 Climb to a safe altitude, a minimum of 5500' AGL, position airplane over field, % mile from observers.
3.4.2.2 Shallow dive to 1.1 Vh (110% of max level speed)

3.4.3 6g TEST

CAUTION: Do not exceed dive speed previously cleared. The goal is to pull g while the aircraft is heading upwards not at the bottom of a dive. In the event of structural failure, prepare to bail out just as the aircraft just starts to fall.

3.4.3.1 Climb to a safe altitude, a minimum of 5500' AGL, position airplane over field, % mile from observers.
3.4.3.2 Accelerate the aircraft in a shallow dive to obtain the desired airspeed. Level out and set up a climbing windup turn with a bank angle of 80, 90 deg. or more. Begin applying load with a smooth and steady aft stick deflection to achieve a precise 6g on the meter; pull less than was tested on the ground. Several build up test flights are recommended prior to the IF1 qualification demonstration.
3.4.3.3 If 6g is not achieved, check that G meter is free and repeat with a harder pull. Maintain altitude. If after 3 attempts, 6g is still not indicated, return for consultation.

3.4.4 LAPS

3.4.4.1 Gently move down onto the course, clearing for other aircraft, and complete four racing laps.

ITEM 4: SAFETY EQUIPMENT

4.1 **Clothing** - Fire retardant clothing and gloves are required by IF1 and Reno rules. Formula aircraft have caught fire in the air and a fire resistant flight suit, boots and gloves could give you the seconds you need to get the airplane on the ground. In addition a smart driving suit adds immeasurably to the professional image we need to promote racing.

4.2 **Helmets** - Just because you see other people wearing worthless helmets does not mean that you should! Use a good full face helmet, approved for racing, and make the airplane so that you can wear it comfortably.

ITEM 5: MAINTAINABILITY

Most people worry about this with their second raceplane, because racing is often time constrained. You should design the trailer installation and aircraft assembly process such that it takes no more than two hours with three people working to unload and assemble the plane. Flying to the race is fine until the Tech Crew needs to pull a cylinder. You will need Tech Inspection prior to flying and sometimes flying periods determined by the airshow are not very accommodating. The Tech Inspection Team will require you to drain all the fuel out and will want to look at your carburetor, cylinder and valve gear. The cylinder is chosen at random so it is useful to be able to remove any single cylinder and rocker cover without disturbing the whole baffle system.

You may have to turn the airplane between back-to-back races, so refueling and oil checks need to be accomplished quickly, rather than having to remove the whole engine cowl and half the upper fuselage. The ability to taxi unaided is also useful.

ACKNOWLEDGMENTS

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Any suggestions for changes or improvements to this guide, are more than welcome.

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