(Photo by Dick Stouffer)

SELECTED DETAILS from the DURAND MK V

Part One

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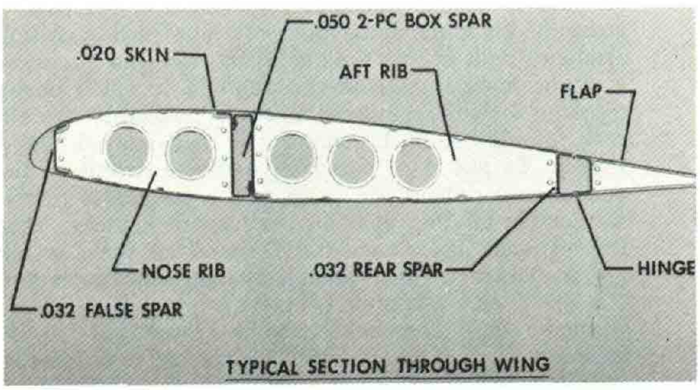
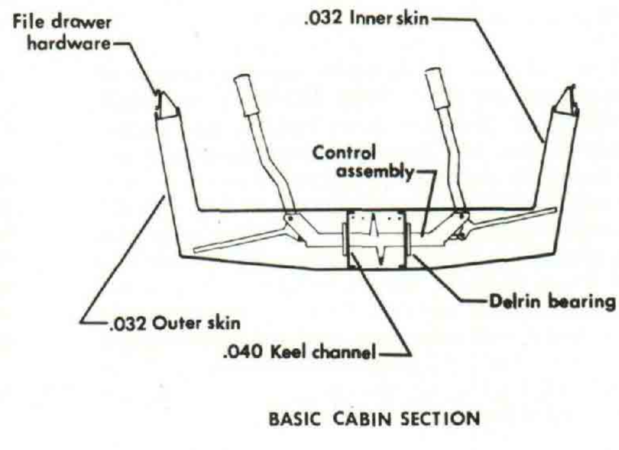
AT AIRPORTS WHERE the Mk V stopped enroute to Oshkosh last summer several people thought that this homebuilt was a new design just off an assembly line. It has been described as "sophisticated". However, appearances can be deceiving. The Durand Mk V was designed from its inception to be a home workshop project economical of shop space, construction time and materials. Scarcely any material or time is spent on jigs or fixtures since the structure is essentially self-aligning. Except for a sheet metal brake and an aircraft welding outfit, its construction requires essentially tin snips, a few files, drill and hack saw. No machining is required. It can be pop riveted or, if one prefers, there are many places where standard solid rivets can be driven. They're cheaper, but a helper would be necessary at times to hold the bucking bar.

Sheet aluminum proves to be a pleasing material to work with. After the parts are cut out and bent to shape the construction evolves mostly into an exercise in hole drilling. The material is clean and the processes neat. The finished product is a durable piece of work, and the material itself projects the factory-built image that seems to instill a bit of extra confidence. The required aircraft welding outfit comes into use for fabricating steel parts such as fittings, control system parts, engine mount, exhaust system, etc. Welding is required to about the same extent as for an "all wood" job.

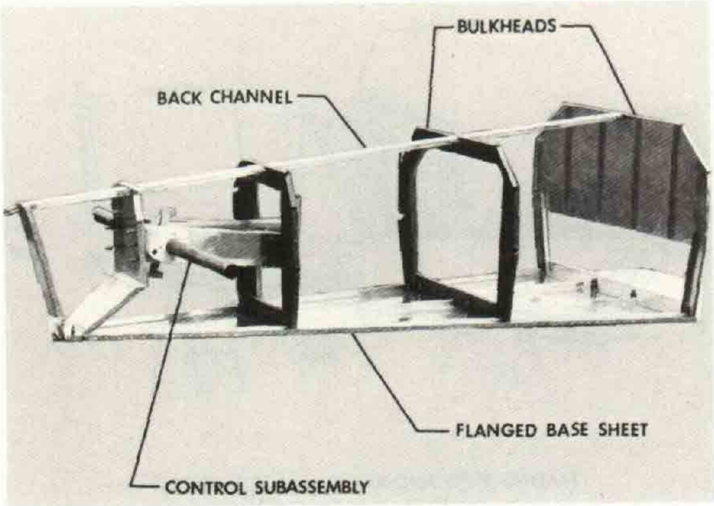
A number of interesting innovating design and construction features have been incorporated into this airplane, some of which may find their way into future homebuilts not yet on the drawing board. Some of these features as well as the general construction of the Mk V are illustrated here.



The wing features a unique two-piece spar with modified J-sections that are formed in a metal brake and assembled with pop rivets. The .050" material can be fabricated either in the spar's full ten-foot length, or it can be spliced at designated staggered low stress points to permit forming in four foot lengths. Rear spar and flap spar are formed from .040" stock. Leading edge channel is .032" thick and is non-structural, its primary function being to align the nose ribs during assembly. Since all four wing panels are of the same size, only a single pair of form blocks is required for making all the ribs for the airplane. Except for the walkways on the lower wing panels, the skin is .020" Alclad.



The forward fuselage is skinned inside and outside for torsional stiffness and occupant protection. Together with the floor and outer skin, the keel channels form a box beam running the length of the passenger cabin providing a substantial mounting for the Delrin control bearing plates, nose gear leg, and lower engine mount. It also serves to enclose all of the control cables. The keel is an assembly alignment fixture that becomes an integral part of the fuselage structure. The upper sill members form closed sections constituting a pair of longerons that carry engine mount fittings at their forward ends. Ordinary full suspension file drawer hardware serves as tracks for the Mk V's forward-sliding canopy.

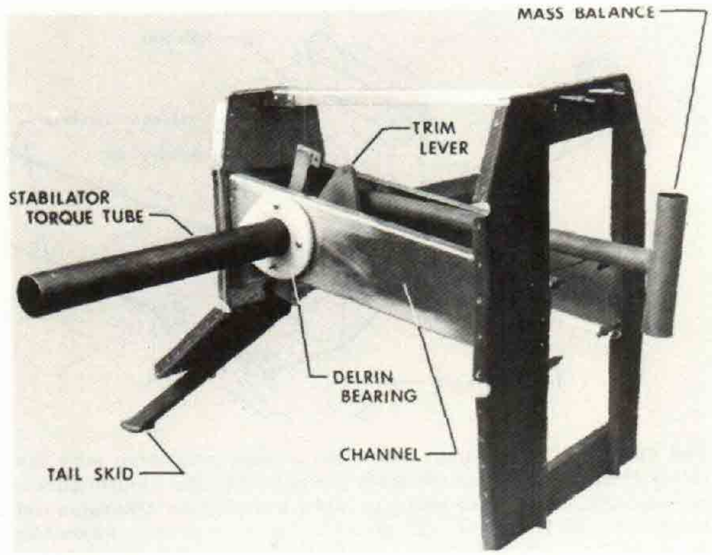


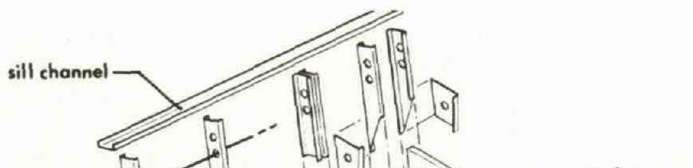
(Photo by Paul Kanka)

The simplicity of the tail cone is seen in this photo. The bottom sheet laid flat on a carpeted work table serves as the base for mounting the four bulkheads, eliminating the need for an assembly fixture. Note that only straight bends are necessary in forming any of the parts. This is truly a stressed skin structure, and except for the back channel which is principally an assembly convenience, there are no longerons or stringers, only skin stiffeners between frame locations. These are riveted to the skins prior to their incorporation into the structure.

(Photo by Paul Kanka)

The small subassembly shown here with the temporary Cleco fasteners still in place is recognizable as a part of the larger subassembly in the preceding photo. Stabilator loads carried by the pair of Delrin bearing plates are distributed into the tail cone skin through the bulkheads to which the deep channel beams are attached. The trim lever is made of the same material as the bearing plates and is free to oscillate forward and backward on the torque tube. On final assembly the stabilator panels are slipped over each end of the torque tube and bolted to it. The balance arm which is also bolted to the stabilator torque tube carries a portion of the mass balance required for flutter prevention. Additional lead ballast is located in the leading edge of the stabilator.

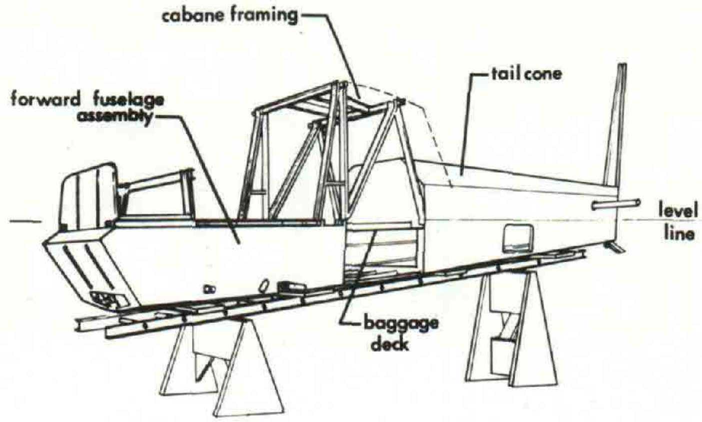




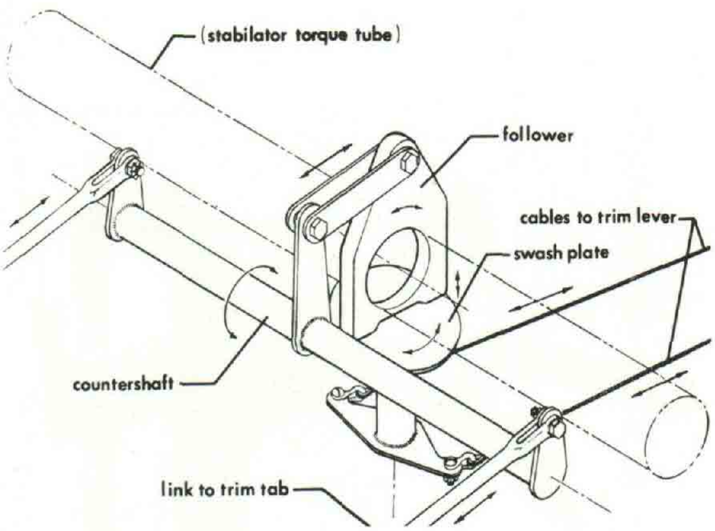
FORWARD FUSELAGE FRAMING

Framing the cabin section subassembly is quite analagous to framing a house — a center girder, floor joists, wall studs (drilled for wiring), and a top plate. The "wall studs" here are 2½ inch channels which, like the 2x4's in a house, are used extensively as a standard framing item. They are found throughout the fuselage in cabane framing, tail cone, seat frames, baggage deck, panel support, and elsewhere. A basic T-shaped structure results from joining the center keel with the main transverse frame carrying the combined lift strut and main gear fittings. At the forward end of the keel are the nose gear and lower engine mount fittings. Wing fittings are integral with solid carry through bars.

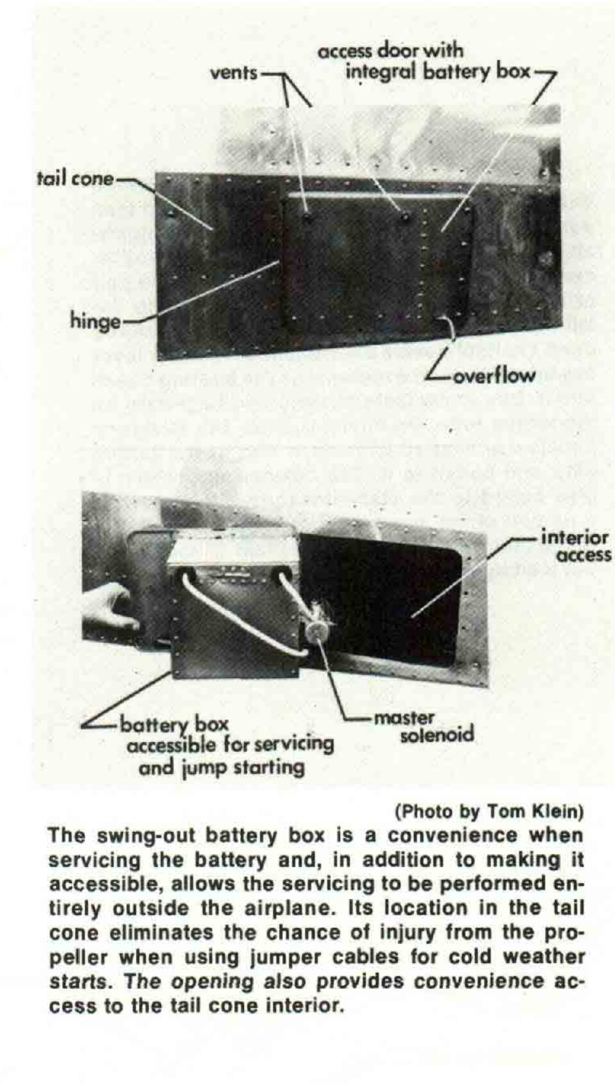
For ease of alignment on assembly the bottom of the fuselage was designed to be a flat plane from tail post to firewall. The forward fuselage section and tail cone of the prototype were aligned on final assembly by supporting them on a common aluminum ladder set on a pair of wood horses adjusted to result in level sills at the canopy track. The baggage deck serves to space the fore and aft fuselage sections the proper distance apart. With these parts in place the cabane framing subassembly is positioned, completing the intermediate section which serves as a transition between the parallel sides of the cabin area and the tapered sides of the tail cone.



MATING FORE AND AFT FUSELAGE SECTIONS



The stabilator is equipped with trailing edge anti-servo tabs that move upward relative to the main surface when the control stick is pulled back, its purpose being to instill a feel to an otherwise balanced control. The same tabs also function as trim tabs, adjustable by the pilot, while simultaneously serving their anti-servo duties. Up or down motion of the trim lever in the cabin is transmitted by cables to the swash plate back at the tail. Rotation of the swash plate causes the follower to rock fore or aft, and this motion is transmitted to the tabs through a countershaft and links. This simple device is made without any machining being involved.



(Photo by Tom Klein)

The swing-out battery box is a convenience when servicing the battery and, in addition to making it accessible, allows the servicing to be performed entirely outside the airplane. Its location in the tail cone eliminates the chance of injury from the propeller when using jumper cables for cold weather starts. The opening also provides convenience access to the tail cone interior.

The Mk V prototype has flown just over forty hours at the time of this writing, and it is no longer restricted to the test area. It's indicated performance to date is approximately as follows:

Take off speed	60 mph
Take off run (grass field)	550 ft.
Best climb speed	80 mph
Initial rate of climb	1200 fpm
Cruising speed, 75% power, 7500 ft.	135 mph TAS
Range with standard fuselage tank	400 mi.
Range with optional wing tanks	520 mi.
Normal approach speed	70 mph
Landing roll (with brakes)	450 ft.

Up to this time the airplane has not been stalled. With the stick back the airplane responds with a series of quick little nibbles involving no appreciable loss of altitude.