(Photo by Dick Stouffer)

SELECTED DETAILS from the DURAND MK V
Part II

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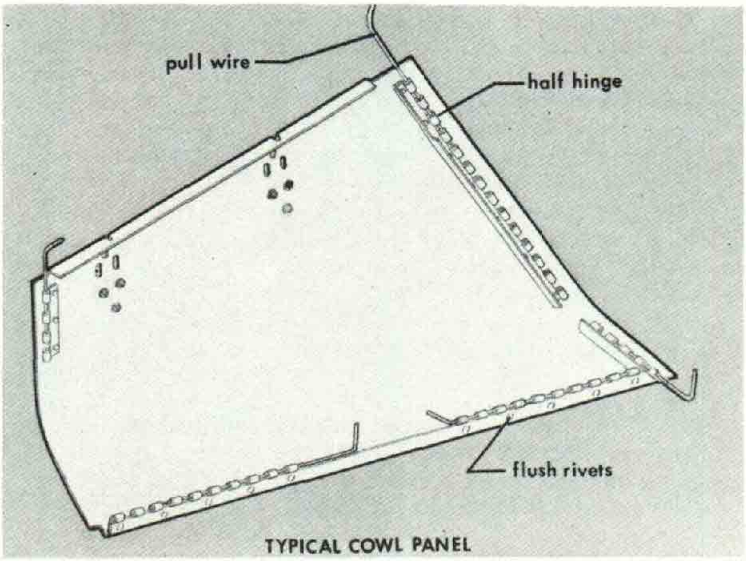
ADDITIONAL INTERESTING DETAILS of the Durand Mk V construction are illustrated in this article. In the design of this project the aim was to make possible an attractively finished professionally engineered product that could be built by a novice. The building processes themselves are limited to simple tasks that can be accomplished with ordinary tools. While the prototype is a really complete airplane with electrical system, lights, full gyro panel, cabin heat, deluxe interior, radio, muffler, and plumbing for auxiliary fuel, any or all of these features could be omitted for a more basic, economical version.

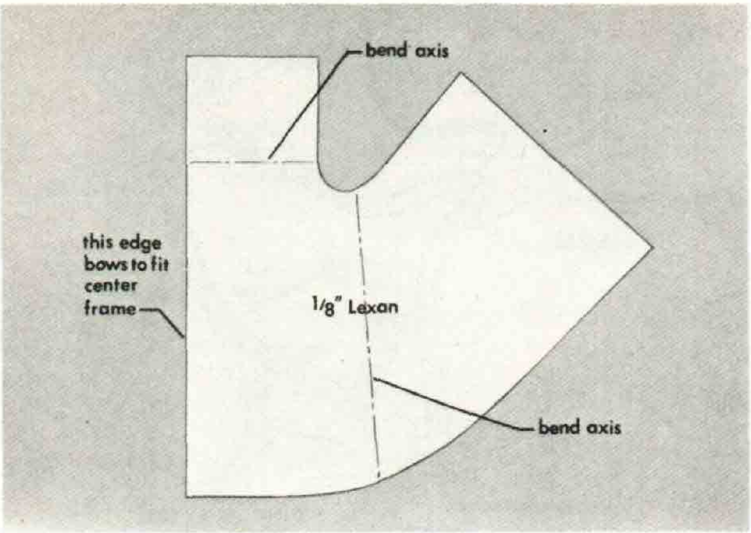
The prototype, several times mistaken for a factory job, is entirely amateur built. I did most of the actual building myself, but I'm a professional engineer, not a craftsman and must admit to possessing less than average native dexterity with tools. Several EAA Chapter 80 members provided willing assistance during construction, but none had previous sheet metal experience. Don Houchin is a medical lab technician, Paul Kanka is a railroad accountant and Larry Quigley is in the insurance business. My wife, Maurine, and I did all of the seat upholstering and the interior. This required dreaming up some new techniques with sufficient fudge factors to compensate for our amateur ability and the limitations of a standard domestic sewing machine. Barry Daniels contributed his automotive painting expertise to give the airplane a really finished appearance even though it was his first experience in painting airplanes.

At Oshkosh the instrument panel attracted special attention. It is a composite of .040" aluminum, ¼" Masonite, and vinyl fabric. The aluminum cut-outs for the instruments was given a black wrinkle finish. The Masonite overlay with squared and rectangular openings for the instrument areas was covered with contrasting vinyl and adhered to the metal panel with construction adhesive. The covered Masonite mask serves to stiffen the panel against vibration and to give the round instruments a crisp square look and to organize them in functional groupings. The weight penalty involved is very minor, and of course the Mk V is not a midget airplane but is a full-size airplane big enough to accept some compromises in weight without unacceptable penalties in performance or balance.

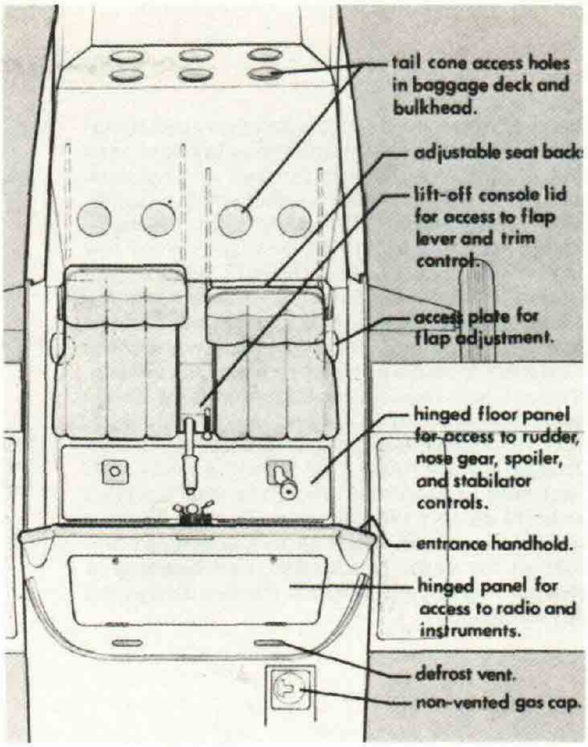
Superimposed on good flying qualities are the little "goodies" that make an airplane an especially desirable possession, regardless of whether it's a factory-built or homebuilt. In this category are the Mk V's swing-out battery, top access to the instrument, maintenance free

Concealed strips of piano hinge are the key to the quick and easy removal or replacement of the engine cowling of the Durand Mk V. The pull wires are accessible when the hinged right and left access panels are open. Removal of all of the cowl panels for a complete inspection of the engine installation is a matter of only three or four minutes. Raising the hinged access panels for routine pre-flight inspection not only provides access to the oil filler neck but also permits inspection of ignition wiring and engine mount. Bird nests would be immediately visible and easily disposed of. These access panels are secured in the closed position with ordinary Stanley chest latches drilled to accept a small cowling safety pin. A small hole in the bottom cowl panel aligned with the oil sump quick drain eliminates the need to remove any cowling sections when changing oil.



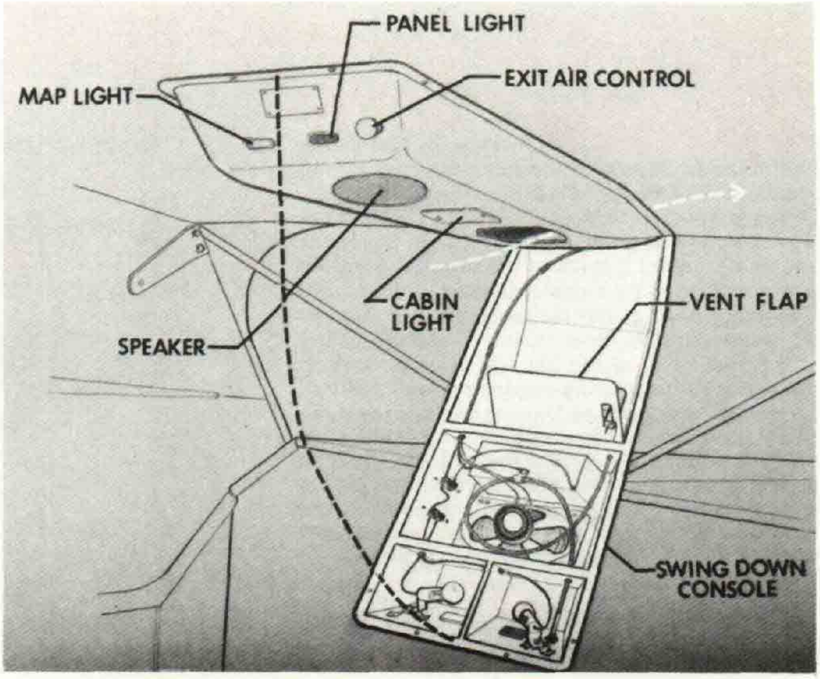


It looks like a heat molded double curved Plexiglas windshield — but it isn't. The apparent double curvature is an optical illusion. The effect is produced by three independent simple curves that result when this pattern is pushed into place and clamped to the canopy frame during assembly. The material is Lexan, a tough but pliable polycarbonate, slightly more expensive than Plexiglas, but it permits cold forming and eliminates the greater expense of an oven and heating. Its curvature produces a rigid surface requiring no corner posts that would interfere with one's vision. The canopy frame is small diameter round or square steel tubing and runs smoothly on full suspension file drawer tracks bought at the local hardware store.



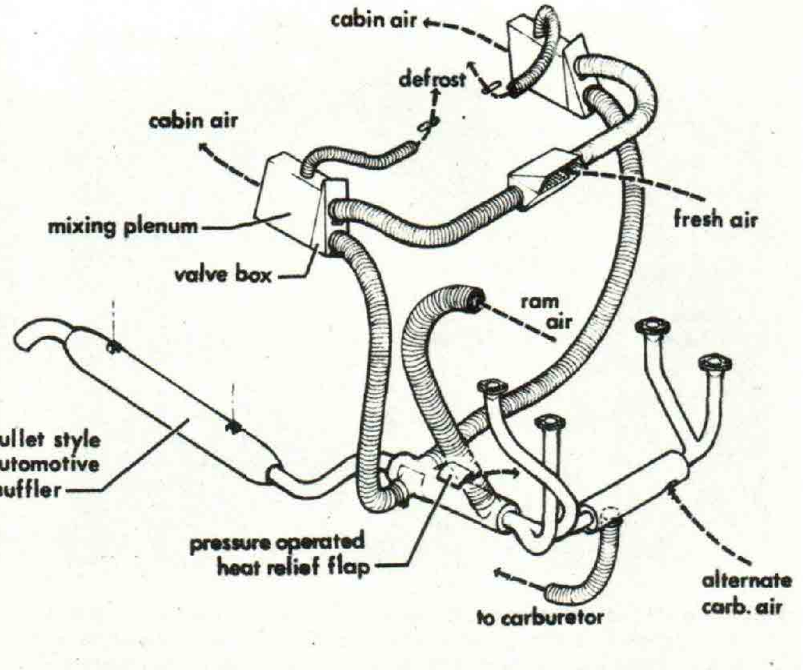
Cabin layout has been planned for comfort, occupant safety, conveniently located controls, and easy mechanical maintenance. It features a flat floor across the entire cabin and a width of 44 inches at elbow height. Seats have independently adjustable backs to accommodate both tall and short pilots. For occupant safety and structural rigidity the cabin area is skinned both inside and outside. Stick control wins over the conventional wheel or yoke on three counts here — mechanical simplicity, safety in a crash landing, and a more naturally coordinated control movement. Trim lever between the seats moves upward for nose up and downward for nose down — no other position indicator necessary. Similarly, the motion of the quadrant mounted throttle is directed naturally up for climb and back down for descent.

landing gear, and zipper type engine cowl. The flat cabin floor with hinged panel that opens to expose all of the primary control system is a feature to be appreciated at inspection time. I believe that builders seriously contemplating a project should base their decision on the kind of airplane they really want to own, maintain and fly once the work is finished. The construction period for any type is a fascinating but temporary situation.

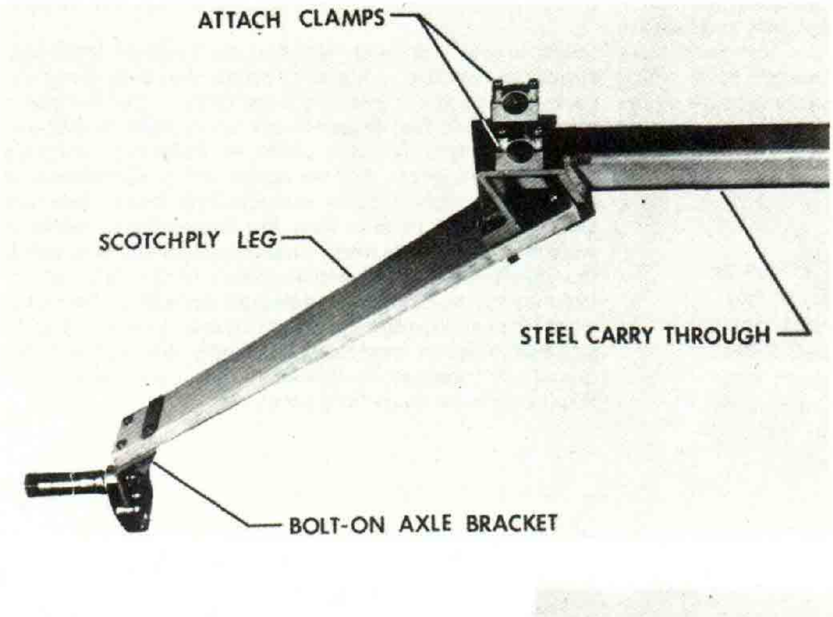


The swing-down console allows easy access for changing lamps or other maintenance. Basically a simple hand formed riveted aluminum pan padded with thin foam and then vinyl covered, the ceiling console serves a number of separate functions and adds a finishing touch to the cabin ceiling above the baggage deck. A flexible push-pull control regulates the quantity of ventilating air flowing out of the cabin. Miniature switches on the right hand side of the console control the map light and cabin ceiling light. A red light illuminating the instrument panel is lighted whenever the airplane's position lights are on. A 4"x6" oval speaker occupies the space between the two light-proof compartments at the front and the light-proof box enclosing the ceiling light ahead of the vent flap. Since the airplane is normally entered from the front, the blank space across the upper part of the console's front face is an ideal place to attach the required passenger warning plate.

Exhaust noise in the cabin is minimized by locating the discharge behind the passenger area and routing the exhaust through a glasspack muffler, an off-the-shelf version of the homemade Swiss muffler. Though heavier, the automotive muffler has the advantage of very low cost and a good low drag contour. The exhaust system is fabricated from standard automotive U-bends, angle bends and straight sections of pipe. The system is routed so as to obtain the maximum possible separation from the fuel supply lines and gascolator. Slip joints and swivel joints are provided in several locations to minimize vibration and expansion problems. Flexible ducting carries heated air from the carburetor heat muff or cabin heat muff and also supplies ambient air to a plenum on each side. There it can be mixed with warm air in any desired proportion for cabin ventilation and heating. A diverter flap is used to direct plenum air against the windshield.



HEATING, VENTILATING, & EXHAUST SCHEMATIC



(Photo by Paul Kanka)
The main landing gear is, in effect, an independent chassis upon which the fuselage rides. Scotchply fiberglass legs are bolted to a rugged carry-through member fabricated from a rectangular structural steel tube. The bending stresses are confined within this structure and are not transmitted into the relatively lighter surrounding sheet metal structure. The fuselage rides on two pairs of aluminum saddles atop the chassis and is secured by bolted down caps. Slight deflections in the massive carry-through tube can be accommodated by rotation within the trunion type mounting. The exceptional energy absorbing properties of the fiberglass legs provide a smooth ride even on an unpaved runway. Since there are no moving parts to this bolted together assembly, practically no maintenance is required.

(Photo by Paul Kanka)
Photo shows details of the fiberglass spring leg attachment and nose wheel steering. The Scotchply leg is secured to the keel of the forward fuselage structure by a tension bolt through the upper end and a pair of U-bolts at the firewall. Steering is accomplished by a cable running directly from a steering horn in the rudder control system to the walking beam, then around the return pulley at the lower end of the leg and straight back to the opposite horn in the rudder system. A short, curved link connects the walking beam to the nose wheel fork. The fork is carried on a welded steel bracket with thrust loads carried by a 3-inch diameter Delrin washer ⅜-inch thick. Not visible in this photo are a tow bar attachment on the front of the fork and a Gerdes shimmy damper on the far side of the bracket.