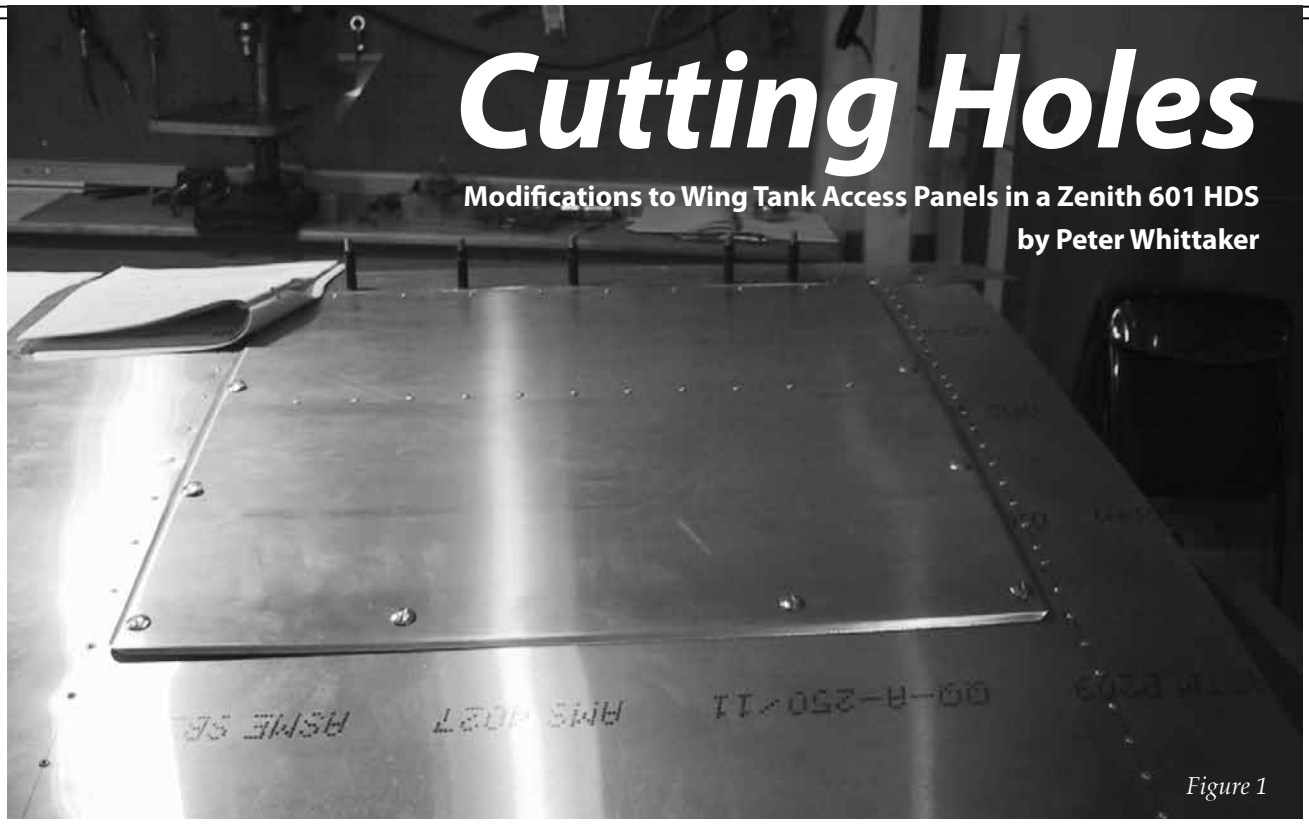


Cutting Holes

Modifications to Wing Tank Access Panels in a Zenith 601 HDS

by Peter Whittaker

Figure 1

I COMPLETED my plans built Zenith 601 HDS (C-GKWI) in 2013 and began test flights in April of that year. I built in the option for wing lockers and installed a fuel tank in each wing locker. These are used in conjunction with a header tank mounted on the cockpit side of the firewall and together the three tanks give a capacity of 23 US gallons. Each wing tank holds 7.5 US gallons and all tanks are welded aluminum with a twist lock type fuel cap. Electric fuel pumps (Facet) transfer fuel from the wing tanks to top up the header tank in flight. The Jabiru 3300 engine in the 601 receives sufficient fuel by gravity from the header tank, although an additional Facet fuel pump is plumbed in line for added boost as a backup. After the first few flights and associated refuelling, it became readily apparent that the novelty of opening the entire wing locker cover to get to the tanks would rapidly wear off.

The wing locker covers are held closed by Dzus fasteners of which eight were originally used (Fig.1). After a few initial test flights, I deemed it necessary to add two Dzus fasteners at the front corners of the covers to keep them tight against the wing skin in flight. This gives 10 fasteners that need to be removed to gain access to the fuel filler cap at each wing tank. The Dzus fasteners are relatively quick and easy to remove and re-install after each fill, but the process becomes tedious. Reviews of other 601 builder accounts showed that a common solution was to install a dedicated fuel filler cap access panel set within the main wing locker cover. These were designed to use only two Dzus fasteners which allows for faster and more convenient access to the filler caps. The rest of this article gives the steps that were used to design, fabricate and install the smaller access panels.

Figure 1. Wing locker cover for the left wing; eight Dzus fasteners were initially used to hold it closed. In flight, the cover would lift at the leading edge so additional fasteners were added at the front corners.

The tools used for this project include; a unibit or stepbit for an electric drill, left and right handed aviation snips, a flat file, a rat tail file for rounding out corners, a flexible steel ruler and fine point felt tip marker, an

Figure 2

The entire operation was accomplished with the standard-issue sheet metal tools.

Olfa knife with a hooked draw knife blade for scoring and cutting sheet aluminum, drill bits for drilling out rivets, A4 Avex rivets and hand rivet puller, crimping pliers for putting a bend in reinforcing L-angle and a Dremel tool with an abrasive cutting disc *(Fig.2)*. A small wood block is also handy for backing up underneath the locker cover as rivets are drilled out and new holes are drilled.

Figure 2. The tools used for the project are laid out ready for use. An old towel protects the wing skin and another towel was used to cover each wing locker tank during the procedure.

The design criteria for the size and location of the filler cap inset panels were based on the need for an opening that was big enough to insert a gloved hand (winter operations) and give free access to the filler cap. The access panel also had to have a tight seal and be flush with the main wing cover skin. The dimensions were determined by laying out a plan around my hand in fine point black marker directly onto the wing locker cover skin *(Fig.3)*. The centre position of the filler cap was measured and reference lines were transferred to the cover skin to locate the filler cap centre. The design is such that the existing piano hinge for the wing locker cover could be used as the hinge for the filler cap panel. In addition to the main cut-out lines, lines for inside

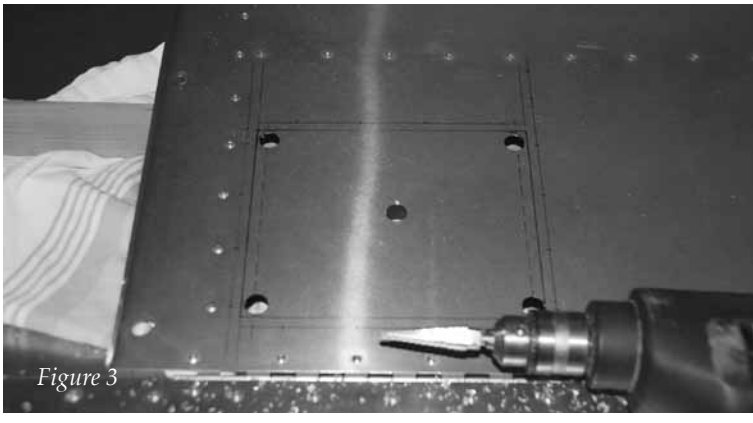
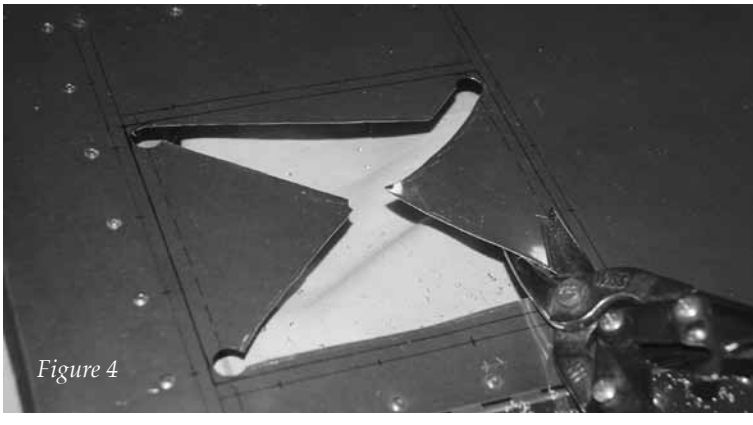


Figure 3



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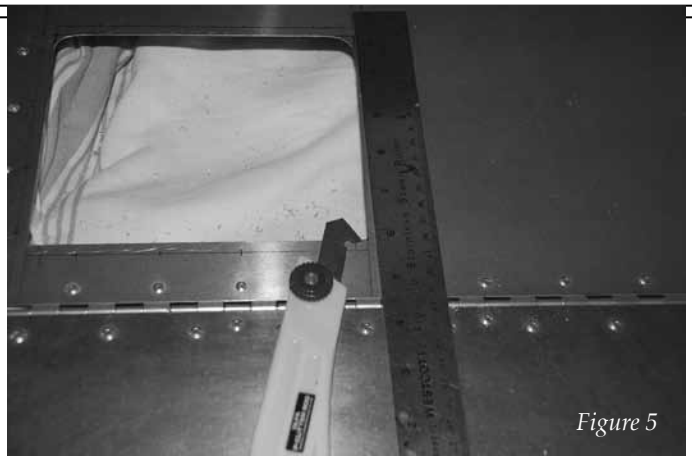


Figure 5

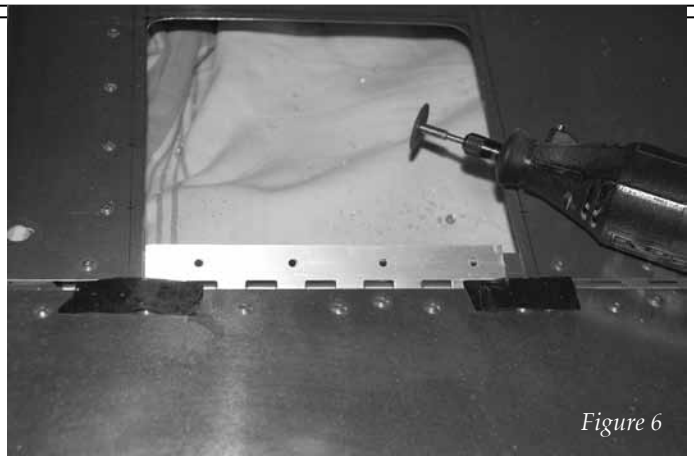


Figure 6

The hardest part in the process was making the first hole in an otherwise perfectly good wing locker cover

flanges and rivet lines were drawn. All of the parts, which include flat flanges (for the panel to sit on), L-angle crimped to the curvature of the wing surface and the panel cover itself, were made from 0.025" 6061-T6 sheet aluminum.

After deciding on dimensions and drawing out the plan on the skin, the first step was to remove sheet metal to create the rough opening. Starter holes were made (Fig.3) using a unibit or stepbit and then tin snips were used to cut back close to the lines (Fig.4). The hardest part in the process was making the first hole in an otherwise perfectly good wing locker cover!

Figure 3. Dimensions of the final opening, overlap for the side and rear flanges, rivet lines and positions for the starter holes were laid out using a fine felt marker. Dashed lines are the inside edges of the flanges, solid lines mark the full opening and the lines with tick marks are the rivet lines for the flanges.

Figure 4. The initial cut with the snips joins starter holes, sheet metal was then trimmed back to square up the opening. Files were used to finish the edges precisely at the lines.

Four starter holes were positioned to give round corners for the finished opening and a fifth hole was made at the centre to facilitate easier cutting. Once all of the trimming was finished with tin snips, a rat tail file was used to even out the round corners and flat files were used to straighten and dress the four sides back to the marked lines of the full opening. The sides of the opening were extended forward to cross the piano hinge and the rivets holding the wing locker skin to the hinge were drilled out between the two side lines.

A fine cut in the locker cover skin has to be made at each side line so that the skin can be removed and the hinge exposed *(Fig.5).* The skin was cut using an Olfa knife with repeated light weight scoring slices and using a flexible steel ruler as a cutting guide. With the rivets removed and both side cuts made, the remaining skin can be removed (Fig.5). The last part to be cut is the piano hinge itself, but just the flat hinge plate – not the hinge pin! A Dremel tool with an abrasive cutting disc made easy work of cutting the exposed hinge plate to give a freely moving short section of hinge to which the new cover will be attached *(Fig.6).*

Figure 5. The sides were cut with an Olfa knife to allow removal of the forward piece of locker cover skin and to expose the hinge. The rivets were drilled out and

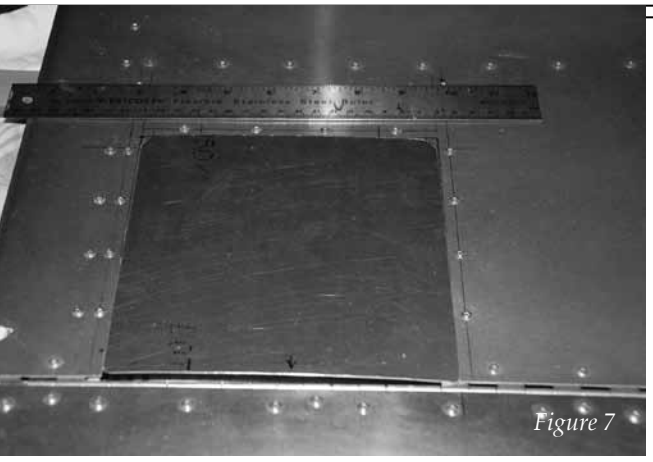


Figure 7


Figure 8

these holes were reused to attach the new access panel.

Figure 6. A Dremel tool was used to make the final cuts and isolate a short section of freely moving hinge plate. Fours layers of electrical tape were used to protect the wing nose skin edge from the cutting disc. Rivet holes from the original rivets are also visible.

Once all of the cutting, trimming and dressing of cut edges was completed, a piece of sheet metal was placed under the opening and a new panel shape was traced using a fine tip marker. The panel was cut, trimmed and filed to produce a final fit *(Fig.7)*. Parts were then cut from 0.025" sheet aluminum for flat flanges which would make seating surfaces for the new panel. An additional L-angle was bent from 0.025" metal and then crimped into a gentle curve to match the curvature of the wing surface (Fig.8). This curved L-angle was used to provide structural reinforcement to the locker cover skin alongside the new opening. The rear flange was made wide enough for two Dzus fasteners, one at each corner (Fig.9).

Figure 7. The new panel was cut and trimmed to get a final fit for the opening. The edges were trimmed to give about a 1mm gap all around to avoid binding.

Figure 8. An L-angle stiffener was bent from 0.025" aluminum and then crimped with pliers to give a gentle curve to match the wing surface curvature.

Figure 9. The rear seating flange for the new panel has a Dzus fastener at each corner. This provides a secure closure and holds the panel flush with the locker cover skin. The rivets were pulled using a flat plate over the rivets to force flattened rivet heads. The flat rivet heads allow the panel to sit flush.

The final step after all of the flanges, L-angle stiffener and Dzus fasteners were installed was to rivet the new panel to the hinge plate. The new panel was taped into place, the wing locker was opened, the hinge plate was held up against the new panel and the rivet hole positions were marked onto the underside of the new panel. After drilling and deburring the rivet holes, the new panel was riveted into place and closed down with the Dzus fasteners to check the final fit. A bit more filing

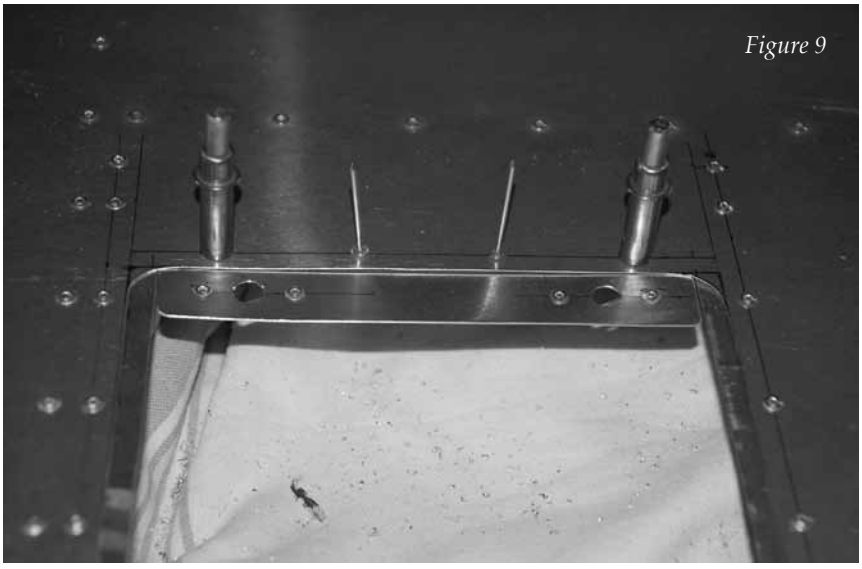
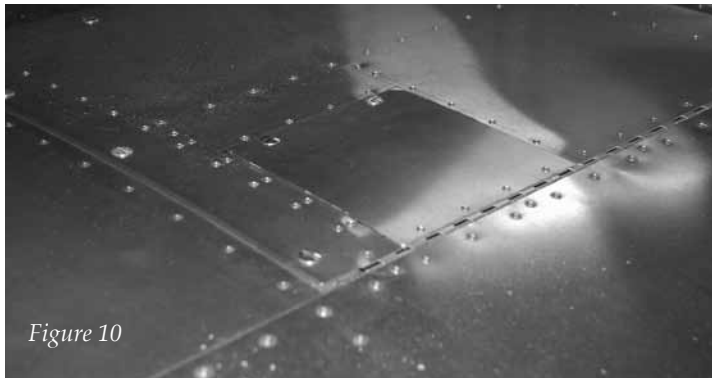


Figure 9

and trimming of the panel was needed to get a good fit after the drilling and riveting, but this was minor tweaking (Fig.10). The completed structure, viewed from underneath shows the flanges, L-angle stiffener and Dzus fasteners in place (Fig.11). The fuel filler cap, although not centred under the opening, is still fully accessible when the panel is opened. The positioning was dictated by the width of the main wing locker opening and the location of the filler cap on the tank.

Figure 10. The completed fuel filler cap access panel is shown within the main wing locker cover of the right wing. Only two fasteners now need to be opened instead of ten for refueling.

Figure 11. The completed structure, viewed from underneath, shows the filler cap relative to the flanges, L-angle stiffener and Dzus fasteners for the new access panel.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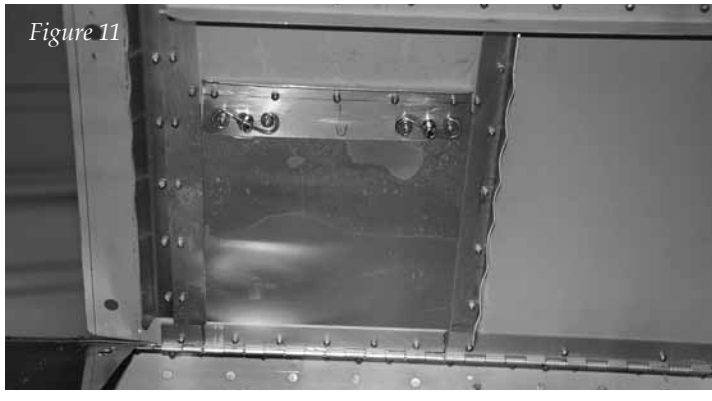
Figure 11

Peter Whittaker *is Vice President of Chapter 85 (Vancouver). He scratch built his Zenith over a 14 year period and continues to improve his aircraft.*

Airtrikes AT 160 gearbox conversion kit

Vassili Tarakanov is a Russian aerospace engineer based in the Montreal area, and for many years he has been supplying gearbox conversion parts for automotive and motorcycle engines. In the past he has used the SPG gearboxes, fitted with a driveshaft, a Mercedes rubber damper, and a bellhousing appropriate to the chosen engine. Vassili has recently begun importing his own gearboxes with improved gearsets to provide a wider range of ratios up to 3.2 : 1. Bolt circles available are Rotax 75mm and Rotax 4". Other circles are available on special order, and gearboxes may be run as tractor or pusher. Weight for the Suzuki/Geo conversion is 25.5 pounds, which is 1.5 pounds lighter than the SPG unit. Bellhousings are available for Suzuki/Geo 3 and 4 cylinder engines, Honda Fit 1500, various Subarus, and BMW motorcycle engines.

AT-160 gearbox alone, suitable for up to 165 hp $1795

AT-160 gearbox with bellhousing, Mercedes coupler, driveshaft $2195

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