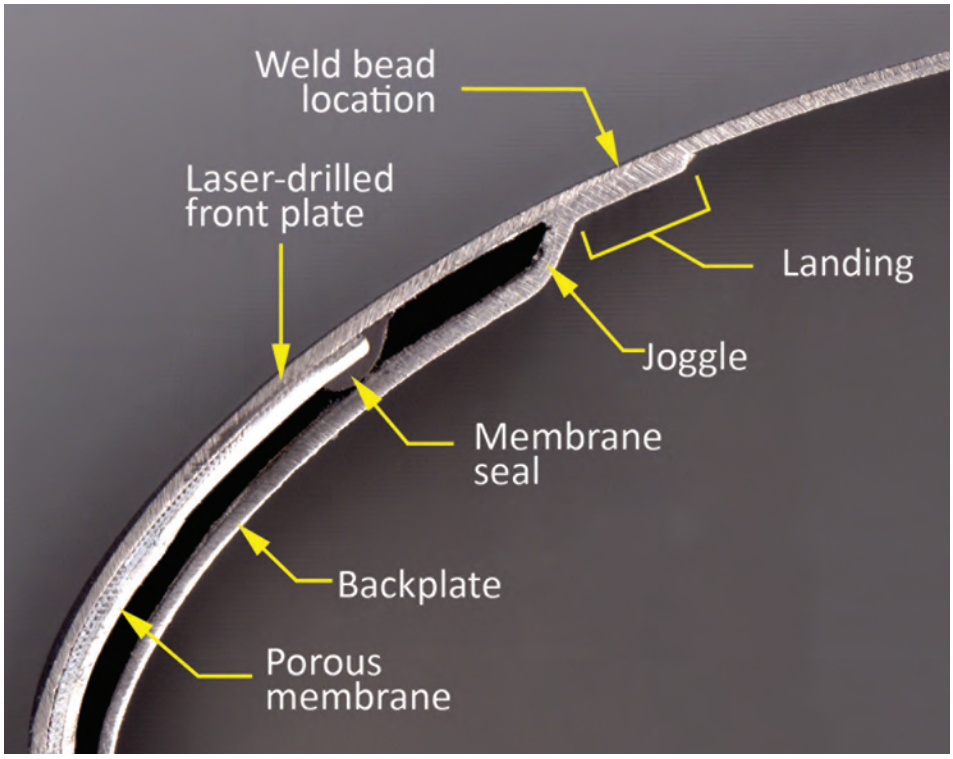
Porous Panel “Leaking”

A common occurrence with all TKS® porous panels is “leaking” when not in use. Specifically, panels will stream very small quantities of TKS ice protection fluid while in flight or drip when parked. This characteristic is normal due to the porous panel design.

CAV Ice Protection is here to give information on your TKS® Ice Protection System and porous panel “leaking”. Our Repair Station Manager, Brian Sader, shares some insight into the topic.

Every panel contains a fluid reservoir and a porous membrane. Both work together to provide an even distribution of fluid over the panel’s entire porous area. The membrane is the key element and only works properly if the fluid is supplied and distributed evenly to the panel. The reservoir provides the fluid supply.

The membrane’s porosity is designed and tuned to create a 3 psi pressure drop at 32°F when ice protection fluid is forced through. For general aviation class aircraft, the 3 psi value is far higher than any aerodynamic pressures encountered on the aircraft leading edges. The 3 psi mark assures a uniform distribution of fluid will pass through the porous panel regardless of airspeed and air flow (angle of attack) angle.



TKS® Ice Protection System
Porous Panel Cross Section

Read next page for more information.

ICE PROTECTION

When properly prepared, the fluid reservoir assures that a relatively instantaneous fluid supply is available at the panels for delivery. The reservoir and membrane are designed to retain the internal fluid volume as long as possible, which keeps startup time to a minimum. In an inactive state, the panel is able to retain fluid when the temperature reaches 32°F or lower due to the fluid's viscosity.

Viscosity drops as fluid temperature rises above 32°F. For example, the fluid viscosity at 70°F has roughly 1/3 the viscosity of fluid at 32°F. Thinner fluid is difficult for the membrane to hold and can cause fluid to pass through.

This characteristic can be seen on the lower edge of the panel's drilled active area, typically near the inboard end of the panel. The wing dihedral creates a small pressure head in the panel, the highest value being at this point. Fluid slowly moves downhill in the panel reservoir, then exudes from the panel's lowest point.

Low volume fluid loss of this type from the panel can be very deceptive. In flight, exuding fluid can look very similar to normal operation on the inboard section of a panel. Remember, fluid loss is only from the panel reservoir during warm conditions, far above temperatures associated with icing conditions. Exact temperature ranges are difficult to quantify; however, above 60°F is typically where this type of fluid "leaking" occurs.

Porous panel "leaking" is not a maintenance issue or concern for normal operation. Though it does point out the need to observe proper preparation of the system prior to flights where icing conditions may occur. If the panels have drained their fluid, filling the entire porous panel system can take between 5 to 10 minutes. Proper observation of TKS pre-flight steps assures that your TKS Ice Protection system will be ready and available when needed.