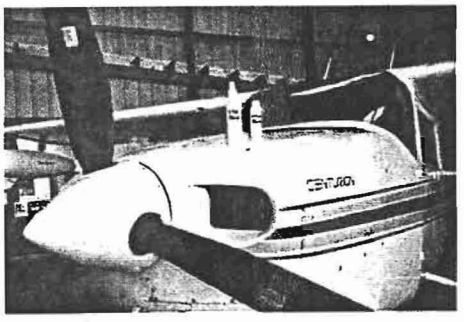
VOLUME 21 NUMBER 6

CESSNA OWNER

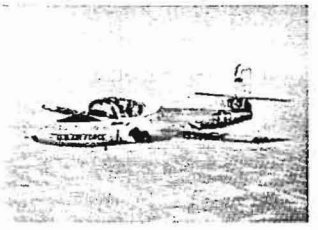
The Official Publication of the Cessna Owner Organization

DEPARTMENTS

MAIN ARTICLES



COVER STORY

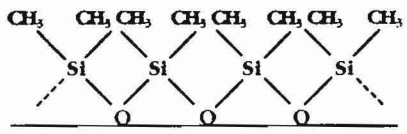


KISS-COTE

By Dr. Keith Kent

New technology that can improve aircraft performance is always hot news in the aviation industry. This article is about a new technology that was originally developed for the dental industry and has since been used in a variety of other places.

Figure 1



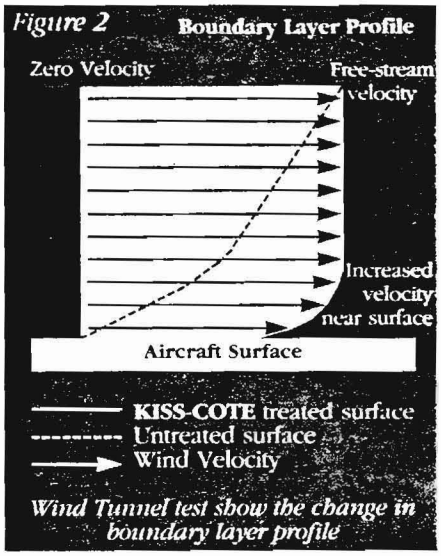
SUBSTRATE

Self-bonding inert polymers present a non-stick face to the environment (CH, methyl groups) with a strong but thin intermediary (Si Silicon) and a reactive side (O Oxygen) which bonds to the mold surface

KISS-COTE Self-Bonding Polymers (KSBP) are the latest technology in low-drag protective surface coatings. According to the manufacturer, these easy-to-apply, non-stick polymers offer reduced maintenance and improved performance by protecting aircraft surfaces, reducing drag, repelling rain and improving ice release.

KISS-COTE is a self-bonding siloxane (see figure 1). When this material is applied to an air foil, the air molecules actually slide on the solid interface, making a dynamic rather than stagnant, boundary layer. Since the boundary layer is moving with the air stream, there is less energy lost at the interface, reducing surface drag (see figure 2).

Figure 2 **Boundary Layer Profile**



Wind Tunnel test show the change in boundary layer profile

This specially modified silicone reduces friction but does not change surface topography — a treated surface

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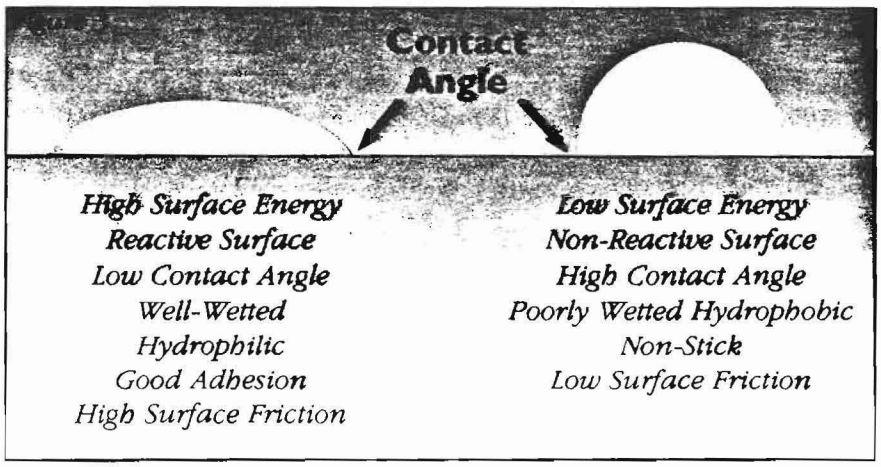
will feel dry, yet slippery and smooth.

The drag reduction benefits of KISS-COTE were demonstrated in wind-tunnel tests at the University of Cambridge (England) showing that KISS-COTE provided a two percent drag reduction at Mach .088. In a similar test at the University of Southern California, a low-speed test showed a 0.8 percent reduction in surface drag at an air velocity of 56 mph.

By altering the chemical of a surface, the reactivity and other properties of the surface are also changed. The reactive surface "grabs hold" of molecules passing over it because of its desire to react (see figure 3). A non-reactive surface does not attract other molecules to itself. Consider a reactive surface like a Velcro™ ball rolling on a Velcro™ carpet. A non-reactive surface would be similar to a highly polished ball sliding on smooth ice.

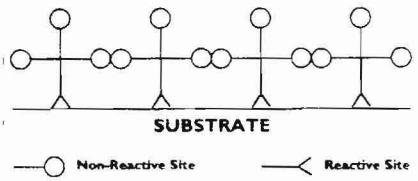


Every attempt at developing a non-stick coating has to address the paradoxical problem that the very qualities and characteristics that makes these materials desirable — their lack of reactivity — also makes them difficult to handle and apply. How is a non-reactive material bonded to a surface? Since it is the reactivity of a material that permits chemical bonding — can an inert material be made to easily react with the surface of a substrate? Most non-stick coatings are poorly bound to the substrate and are susceptible to cracking and de-lamination. They also wear down with exposure.

Adding conventional inert polymers to paint usually turns the material to

a "non-paint." The material will not bond to the substrate and quickly peels away. The inert ingredients are also prone to migration, contaminating any surface they may contact, making repairs or re-painting of a contaminated surface nearly impossible. However, marketing the "benefits" of minute amounts of non-stick polymers incorporated into other materials continues to be popular despite the many inherent problems of these blends. Mixing with other materials such as binders and fillers also diminishes the inert material's beneficial characteristics. Any benefits last only a short time, and usually introduce other problems. Rigid binders tend to crack and de-laminate with fluctuation in temperature.

Figure 4



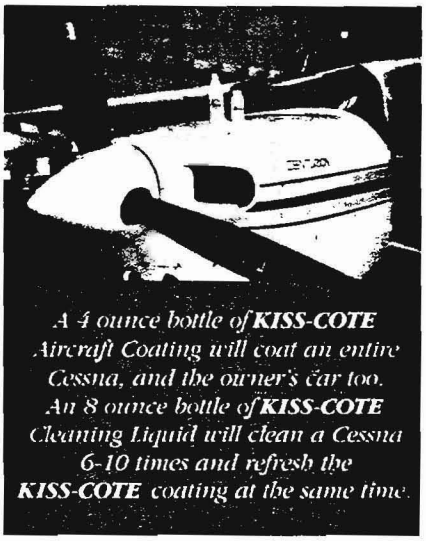
Self-bonding, non-stick polymers have their reactive (sticky) side bound to the subtrate, leaving only non-reactive portions exposed to the outer environment

The KISS-COTE self-bonding non-stick polymers are made using patented technology that makes non-reactive polymer chains so that they have a sticky side and a non-sticky side, like a piece of adhesive tape (see figure 4). This family of materials are a uniquely formulated type of surface treatment that has most of the same properties of the silicone based polymer — temperature, pressure and chemical resistance and water repellent capabilities — yet it adheres to surfaces and will not migrate. Because these polymers are elastic and are unaffected by drastic changes in temperature and pressure, they withstand a variety of extremes in physical environments.

Unlike other materials, these self-bonding siloxanes readily bond to a substrate without any chemical or physical pre-treatments. Therefore,

KISS-COTE Cont.

they do not migrate and transfer to other materials the way PTFE and other silicones quickly move from one place to another. Because of this characteristic coatings can be repaired easily and readily if damaged in use. These polymers are non-toxic, non-volatile and environmentally friendly.



KISS-COTE polymers are applied as thin mono-molecular film layers (approximately 120 Angstroms — 0.012 micron — thick). This thin coating process is lighter in weight than conventional products and does not require any polymerization. You just need to apply it to the surface of the aircraft. Excess can be wiped off with an absorbent cloth. Because these materials organize on a surface without any porosities they offer no matrix for mildew or other microbial in-growth.

KISS-COTE Products are sold to the aircraft industry under the trade names of "MegaGaurd Aircraft Coatings" and "KSBP SpeedCote" For the name of your nearest KISS-COTE product supplier, contact the manufacturer at:

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