IS YOUR AIRCRAFT ICE LEGAL?

Understanding Flight Into Known Icing conditions and the FAA regulations governing your ice protection system.

In colder climates and as the winter sets in, the risk of aircraft icing increases. Without the correct ice protection, icing conditions can severely impact your aircraft, increasing drag, and decreasing lift, preventing the aircraft from maintaining controlled flight and risking unrecoverable wing or tail stall.

If you make the investment required to equip your aircraft for ice, it's important to know that it will guard against the eventualities associated with freezing precipitation, icy clouds and unexpected showers. But whilst this may assure the safety of you and your passengers, you may not actually be certified for flight in icing conditions or legally allowed to launch year-round if there is risk of known icing.

Only those aircraft models that have undergone significant testing and are FAA certified for Flight Into Known Icing conditions are legally allowed to take off in icing conditions. Those systems classified as "non-hazard" buy time for a pilot to escape unexpected icing but are not legally allowed to fly in known icing conditions.

What is Flight Into Known Icing?

Flight Into Known Icing (FIKI), refers to an aircraft taking off into or flying through atmospheric conditions in which the formation of ice is present in flight and which has been forecast via pilot reports and other weather measurement tools.

Many aircraft are equipped with dei-cing or anti-icing systems to provide protection in an emergency. However, unless the aircraft has been explicitly FIKI certified, it's not legal for take-off into known icing conditions under FAA rules, and shouldn't be flown through icing conditions for any longer than is necessary to escape the conditions.

Does your aircraft meet FAA FIKI Regulations?

It's essential to be clear on when your aircraft was built and what the regulations were at that time.

The FAA has updated the criteria to meet FIKI regulations numerous times, most notably in 1973 and 1993. Thus depending on when your aircraft was manufactured, your levels of ice protection may differ from or fall short of modern regulation.

Check your aircraft's documentation to confirm whether any built-in ice protection systems certify the aircraft for FIKI.

The general rule is that unless explicitly stated, your ice protection systems must be assumed to not meet the FAA FIKI standards.

Non-Hazard v FIKI Certification

	FAA REQUIREMENTS		INCLUDED WITH TKS®	
	NON - HAZARD	FIKI	NON - HAZARD	FIKI
Components required to perform intended function	✓	✓	✓	✓
Electromagnetic interference testing	✓	✓	✓	✓
Critical area protection		✓	✓	✓
Reliability standards		✓		✓
No appreciable loss of propellor thurst by ice		✓	✓	✓
System Safety Analysis: **a. evaluate loss of system** **b. determine if system failure creates a hazard**	✓	✓ ✓	✓ ✓	✓ ✓
Icing System Function Annunciation		✓	Some models	✓
Testing to show that airplane has adequate performance, stability, controllability, stall warning, and stall characteristics for expected ice accretions.		✓	Some models	✓
Susceptibility to ice shedding damage		✓	Some systems	✓
Air data (pitot, static, AOA, stall warning) and other systems function normally in icing.	Some aspects with IFR	✓		✓
Fluid reservoir capacity requirements (e.g. 150 min.@ normal flow rate) **a. Fluid quantity gauge**		✓	Some models	✓

Obtaining FIKI certification

To be certified for Flight Into Known Icing an aircraft is rigourously tested for its tolerance to ice accumulation on unprotected surfaces (tunnel and dry-air testing, testing behind an icing tanker, and flight in natural icing conditions) and to ensure it can safely operate throughout atmospheric icing conditions (temperature, Liquid Water Content (LWC), altitude, drop size).

In a 45-minute simulation hold of the aircraft in continuous maximum icing conditions (such as that found in stratus clouds) antennas, landing gear, fuselage nose cones (or radomes), fuel tank vents, fuel tip tanks, and leading edges are observed. An aircraft is certified if it can operate safely in significant icing conditions.

However, even if an aircraft is certified, the FAA stress that this does not mean flight through icing should be treated casually. Conditions may fall outside of the certification envelope, and therefore caution, vigilance and minimised flight through icing conditions is always advised.

Retrofitting your aircraft

Installing ice protection equipment that is certified to meet FAA FIKI regulations can provide you with safety and protection from both known and unexpected icing conditions. There are a few different ice protection systems that can be employed, with different levels of effectiveness:

TKS releases a freezing point depression solution across the frame of an aircraft from dispersion panels fitted to the leading edges, windscreen and propeller. It provides de-icing and anti-icing capabilities.

Pneumatic boots are fitted to the leading edges of an aircraft and only provide de-icing. They consist of a narrow strip of rubber which inflates once ice has formed to break it off.

CHOOSING THE RIGHT ICE PROTECTION

Anti-ice vs de-ice

Boots only provide a de-icing function, which means they can only remove ice that has already formed on the aircraft. TKS provides both de-icing and anti-icing, which helps to prevent ice from forming to begin with, as well as remove anything that may have built up.

Protected areas

Fitted to the leading edges of an aircraft, boots can remove a proportion of the ice. This means that any ice that has formed on other areas of the frame is not addressed, and this can disturb aerodynamics and cause performance losses.

TKS panels are fitted to cover leading edges, the windscreen and propellers, and due to the nature of the system provides protection to the entire frame, thus maintaining flight performance.

Weight

On a typical single engine piston aircraft such as the Bonanza, boots will add approximately 52lbs in hardware weight, while TKS will add around 40lb in hardware, plus another 70lbs in fluid.

Erosion resistance

The more resistant a system is to erosion the longer it will function at its best and the less maintenance or replacement it requires.

As boots are usually made from synthetic rubber, they are susceptible to erosion from the elements and prone to fatigue, so can require replacing every five to ten years. TKS panels are made from titanium and are extremely resistant to erosion, which means they can last the lifetime of the aircraft.

Operational duration

As long as they receive a supply of high-pressure air boots can be used as and when required throughout the flight. TKS can also operate as required so long as there is fluid in the system, with active operation averaging around 2.5 hours.

Longevity

Boots can last 5-10 years before they need to be replaced, while TKS panels can last for the aircraft lifetime.

Each system offers different pros and cons, but TKS not only provides more comprehensive protection against icing conditions, it represents a more cost-effective investment as its longevity and resistance to erosion means it'll stay functional and effective for as long as the aircraft does.

BEYOND FIKI CERTIFICATION

Even if an aircraft is FIKI-certified, it's vital to recognise that this doesn't constitute a cast-iron guarantee against the risks of icing.

FIKI certification should be seen as a minimum standard for flights into icing conditions. FIKI testing measures the performance of ice protection systems within certain parameters, but no test can account for every possible set of circumstances. Thus, pilots should always take every precaution to minimise time spent in icing conditions, as well as ensuring that ice protection systems are maintained according to the manufacturer's instructions and deployed correctly during the flight.

No plane can fly indefinitely with heavy ice build-up without suffering increased drag, reduced lift and impeded handling characteristics, and there will be variations in performance degradation across different aircraft models and different ice protection systems, even if thay are FIKI-certified.

It's also important that pilots take the time to fully understand and weigh the benefits of different ice protection systems when choosing a retrofit option.

While FIKI certification is an important benchmark denoting a system's ability to perform in common icing conditions, this doesn't imply that all FIKI-certified icing systems work the same. Making the right choice regarding your retrofit system means weighing up multiple factors to find the most appropriate ice protection system for your needs.

TKS® For Your Aircraft

Get in touch to find out more about TKS® Ice Protection for your aircraft:

US +1 (913) 738 5390

TKS@cav-systems.com

Registered Offices:

– Number One Industrial Estate, Consett, United Kingdom, DH8 6SR

– 30 Leawood Drive, New Century, Kansas, 66031, USA

TKS® Ice Protection