AMD-35A
(04/10)

Interagency Aviation

Lessons Learned

No. IA LL 11-02 **Date: February 28, 2011**

Subject: Winter Off-Airport Operations

Area of Concern: Frozen Lake Operations

Distribution: All Aviation Activities

Discussion: Landing on a frozen lake can be challenging, even for the best aviators.

On December 2, 2010 a Super Cub, configured with 31 inch bush wheels (tundra tires), fell through the ice after landing on a frozen lake in Alaska.

According to experienced Alaska mentor pilots, determining the thickness of ice can be very difficult. However, indicators such as “starfish”, pressure ridges, frozen bubbles, cracks, overflow, or dark spots can be used to assess the condition of the ice and indicate that it may not be strong enough to support an aircraft.

Aircraft configuration plays an important role when landing on a frozen surface. Wheel-skis distribute weight over a larger surface area than tundra tires and reduces the pounds per square inch (ppsi) forced on a given area of ice.

For example: Calculating the pounds per square inch (ppsi) of a SuperCub aircraft configured with Airglas LW2500 penetration wheel-skis:

(1345 sq. in x 2 wheel-skis) / 2200 unloaded weight = .81 pounds per square inch (ppsi).

Using the same aircraft configured with 31” tundra tires:

(80 sq. in x 2 tundra tires) / 2200 unloaded weight = 13.75 ppsi.

The example illustrates that the tundra tires increase the ppsi **1600% !**

Due to many variations in the structure, thickness, temperature and strength of ice it’s essential to make some fairly simple field observations:

For both rivers and lakes, warm inflows from springs may create areas of thinner ice. Also, the ice thickness near shore may be thinner (due to warm groundwater inflow or the insulating effect of drifted snow) or thicker (due to the candle-dipping effect of variable water levels).

FINANCIALS

Recovery operations:	$18,500
Unusable asset:	$Unknown
Damage to aircraft:	$70,000
Investigation	$1,200
Shipping to ANC	$1,450
Total	**$91,150**

Note: Two mishaps involving aircraft configuration (i.e. operating with tundra tires on snow) in 2005 and 2006 resulted in over $60,000 in damage.

Observe any snow cover as well as variations in thickness. Obtain the record of air temperature for the past several days, and continue observing air temperatures during the period the ice will be used to support loads.

Contrary to what many think, a rapid and large air temperature drop causes an ice sheet to become brittle, and the ice may not be safe to use for 24 hours.

A simple formula to estimate the minimum ice thickness required to support a load is: $h = 4\sqrt{P}$ where **h** is the ice thickness in inches and **P** is the load, or gross weight, in tons. Remember that the load is the *total* load in tons (not a load capacity). Industry standards used by Alaska operators for a cub-size ski equipped aircraft on fresh water ice is 4-6 inches. Remember to add at least 30% for wheel-equipped aircraft due to the increase in pounds per square inch on the ice.

Fortunately, this aircrew was prepared for winter operations and also possessed two satellite telephones. Just as important, the aircraft was equipped with AFF and there was a human on the other end monitoring the AFF. During their egress from the aircraft, one of the aircrew fell into the water and was soaked up to his chest significantly increasing his potential for hypothermia. Although this aircrew had a full complement of AMD survival gear and personal winter survival gear (heavy parkas, bibs, mittens, and hats), they were stowed in the baggage area behind the rear seat which soon became inaccessible. Shortly after arriving on shore, the aircrew started a fire, contacted their base, and awaited rescue. Because they were only 16 miles from a nearby airport, they were back home within 2 hours of the mishap. They were in luck as a massive storm was approaching the area which would have prevented their rescue for approximately two days which would have made their survival questionable.

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