Podcast 005 - Winter Ops

Hello everyone and welcome to the Boeing 737 Talk where Mark and I will look to bring you knowledge about this great jet on a regular basis. As well as in depth systems episodes we will also take a look at the latest training thinking, as well as any other subject that we believe will help us, and hopefully you, understand this great workhorse of our skies. Each episode is written by 737 trainers with pilots in mind but may also be of interest to enthusiasts. You can carry on the conversation on our social media pages and if you feel we deserve it leave us a glowing review and why not let your colleagues know about us too. That said, let's start today's episode.

As I was kindly de-icing the wife's car the other morning, it occurred to me that it might be time to dig out those unflattering and unfitted Uniform jumpers, transfer your stripes to said jumper or overcoat (if you're the sort of pilot that has a key fob saying please remove before flight… that is), and start thinking about operating in some harsher environments than what we are used to. So, we are going to talk about Winter Operations.

It goes without saying that operating any aircraft in such environments is much more of a challenge than a nice little afternoon Palma. The threats soon stack up and considering that we will only fly in such environments maybe once or twice a season generally, the unfamiliarity of such procedures and techniques does require careful thought and consideration.

The first thing to say is that winter operations is a huge topic, with references, rules and procedures dotted around in your specific manuals, with each operator having its own way of dealing with them. We shall try and stick to Boeing generics, but also pull from some personal experience we have gleaned from operating in these environments for the last 20 years or so. We shall provide an overview of what you need to consider for various stages of your flight, combining that with some Boeing 737 technical specifics which you will need to be aware of prior to operating in these challenging conditions.

Operating in and out of these environments won't begin a at Checkin, it is a good idea to have a really thorough read of your SOPs and revise this topic a good few days beforehand – that way you won't look like an amateur when the friendly Austrian de-icing chap asks you what type, how much, where and when you want deicing – and it's all very well pointing to the Finnair jet parked across the Apron and asking what did they go for, but it's not a good look…. So lets begin with the walk-around or exterior inspection.

A thorough inspection of all ports, surfaces, cavities, probes, inlets, outlets and vents is required to ensure they are free from contamination. All leading-edge devices, all control surfaces, tab surfaces, upper wing surfaces and control surface balance panel cavities must be free of snow, ice and frost. Light Coatings of frost (up to 3mm) on lower wing surfaces due to cold soak of fuel in the tanks, is allowable. Some operators allow an area on the top surface of the wing to have what's known as CSFF (cold soaked fuel frost). This CSFF can be dispatchable under certain conditions. This area will be detailed within your Flying manual, but if in any doubt, remove all ice/snow/frost from this critical area.

With regard to de-icing and anti icing fluids, it is worth remembering there are 4 types currently in widespread use, and they vary in concentration. The differences of the fluids are in general their viscosity, and what that means. The fluids are designed to shear off the aircraft wing at certain speeds, at varying rates, thus providing a clean wing for takeoff. Fluids will be applied to the critical surfaces, using a one or a two-step procedure. The One-step process is usually used if the aircraft is contaminated by icing/frost, but there is no active precipitation. The two-step process performs the de-icing and then anti-icing as two distinct steps and is used when there is active precipitation. Your company will publish holdover tables every year, detailing a guideline time of how long the anti-icing fluid will be effective under certain conditions.

It is worth remembering that the Holdover time begins with the start of the anti-icing treatment, i.e., for a two-step procedure, the clock starts ticking at the beginning of the second stage. There are no Hold over tables for heavy snow, ice pellets or moderate or heavy freezing rain and hail. It is worth noting that the fluid will drip down off the surfaces and around the aircraft, and many a pilot (and cabin crew) have performed a comedy inelegant fall whilst attempting to take a wintery engine cowl shot selfie. It's all fun and games up until the point you are taking one of your crew to a Finnish hospital to get an ankle looked at, where you had plans to skidoo around the woods in the Santa Claus village with another crew member. Appropriate footwear is needed, when doing the walk-around with care not to ruin that lovely uniform jacket with dripping fluids.

Again, there will a procedure for prepping the aircraft for application of the deicing or anti icing. This will probably be in your supplementary procedures and involves such things as cleaning and sealing the aircraft to stop fluid from penetrating flap cavities, and APU inlets.

Your company will have certain adverse weather extra SOPS when it comes to pre-flight and starting the engines. These will include such items as turning the probe heat on, and limitations on engine starts below -40 deg Celsius, and possibly cycling the flaps 0-40 before taxi. If the ambient temperature is very cold, you may see the OIL FILTER BYPASS light come on after start, as the oil warms up. This will extinguish after a while of engine idle operation. The Engine Start Valve may freeze in the closed position as indicated by no N2 rotation on start. It can be recycled and tried 3 times, after which maintenance action is required.

There are two anti-ice systems on the aircraft, Engine anti ice and wing anti ice. The engine anti ice must be selected on immediately after both engines are started and remain on during all ground operations when icing conditions exist or are anticipated. You cannot use engine anti ice when the OAT is above 10 deg. Icing conditions are defined as the when the TAT is below 10 degrees C and visible moisture is present (visibility below 1600m or 1sm)

Taxiing the aircraft around on non-treated aprons, presents more risks and threats. It is worth noting that whilst the runways are generally treated/sanded or cleared, the aprons and taxiways might be contaminated and as such great care is needed whilst manoeuvring. You should therefore taxi at a greatly reduced speed, using smaller nose wheel steering wheel and rudder inputs with smooth thrust applications. Differential thrust may be used to help maintain the aircrafts momentum during turns. There have also been reports of aircraft

taxiing over aprons and taxiways covered in anti icing fluids, ingesting this fluid into the engines, causing stalls and surges as the fluid builds up on the compressor blades.
Certain engines have specific engine run up procedures, check your supplementary procedures, but generally involves running the engine at a high RPM to shift any accumulated snow/ice from the fan blades.

Once in flight the engine and wing anti ice are used as normal. Ice accumulation on the flight deck window frames, windshield centre post, or on the windshield wiper arm is a good indication of structural icing and therefore the need to use the Wing Anti-ice. It is worth remembering that Wing anti ice is not to be used when the TAT is above 10deg, and if using it above FL350, the bleeds may trip off and could cause a loss of cabin pressure. Remember that once the wing anti ice has been selected on, the stick shaker logic is set for icing conditions for the remainder of the flight, irrespective if it is turned off.

When the temperature is colder than ISA, which it probably will be if we are considering cold weather operations, then the true altitude will be lower than the indicated altitude, thus resulting in decreased terrain clearance. Your company or operator will have procedures to apply corrections to altitudes and MDAs and DAs. Various local regulatory authorities will also have procedures of whether you correct your assigned altitude to ensure terrain clearance or if the ATC unit has done it for you. As a rule, if you do intend to fly at a different altitude to that assigned, check with ATC to see if they have corrected it first. As mentioned, companies and operators will have SOPs on what needs to be corrected and what type of approach is allowed with certain temperatures.

Normal procedures and reference speeds will be flown for landing, except to say that if a flaps 15 landing is required or flown, then the concept of VREF ICE is needed. VREF ICE is VREF15+10, and is needed in some situations, for example if engine or wing anti ice is envisaged, or if the landing airfield temperature is below 10degrees Celsius. Always remember to check your Landing distance and be aware of the effects of what could be fast deteriorating conditions. Back yourself up by having done multiple calculations in the cruise.

A good positive landing should be accomplished and note that thrust reverse is most effective on contaminated runways at high speeds. If directional control becomes an issue, the application of thrust reverse exacerbates the skid, due to the cumulative vectors of forces, and thus to regain directional control, reverse should be cancelled, directional control reestablished using rudder and nose wheel steering, and then reverse used again if required.

Once again, the non runway sections of the airport manoeuvring areas might be more slippery than the runway, and these include the Rapid exit taxiways, RETs, and care must be taken when taxying back to the gate.

Remember again to use Engine anti ice if in icing conditions, and there is also the need for engine specific run ups, even when taxing in.

If there is a concern of ice/snow accumulation during the landing roll, it is recommended not to retract the flaps any further than flap 15, to allow an inspection.

The engine shut down procedure is accomplished as normal, with the exception of the stabiliser trim to be set at 5 units, which prevents melting snow and ice from running into the balance bay areas – which may freeze and lock the controls. Also remember to chock the aircraft and release the parking brake to reduce the possibility of the brakes freezing.

If the aircraft is to be left for a period of time in cold weather conditions, then there are procedures, usually performed by the engineers, to ensure the aircraft is prepared for the cold soak.

These include covering ports, draining water tanks, closing doors and removing batteries.

As can be seen above operating into and out of cold weather airfields will present the pilot with many challenges and risks and threats to consider. Careful planning is required, a good knowledge of where your extra SOPS and supplementary techniques are, and an understanding of how the aircraft is to be operated in adverse weather.

Thanks for being involved today and we look forward to welcoming you back on our next episode soon. Until then why not sign up to the newsletter at B737talk.com for extra info, or simply join us on social media and keep those sectors with us going.