Aircraft icing essay

Environment, Air

Abstract In aviation, icing is one of the major weather hazards that cause a number of aircraft accidents. It is a hazard that can snowball out of control and cause problems such as reduce aircraft efficiency by increasing weight, reduce lift, decrease thrust and increase drag. These effects can cause the aircraft to increase stalling speed or cause the aircraft to force downward in flight. Over the years, aircraft engines and airframes have changed dramatically.

Modern day aircraft are aerodynamically less accepting of airfoil contamination than planes preceding them thus, giving the ewer era aircraft somewhat of a handicap, creating more avenues for icing problems to arise. Because of this, investigators need to understand the scope of how icing and how it affects aircraft. This paper will discuss the environments that are conducive to icing, ground and in-flight icing, structural and induction icing, how icing affects an aircraft's system/performance and De-icing. Airplanes fly all year round. When they fly, they usually go distances that are long and short.

They are flown in weather that is warm, cold, rainy and snowy. Airplanes battle al different kinds of elements when on the ground and in the air. For this, there are many precautions taking to make sure these aircraft are safe for flight. But with all the precautions taken there is still one element that hinders aircraft safety. This element is called icing. What is icing? Icing is described to be conditions conducive to icing whenever near or below freezing temperatures and moisture exist together in a given area (www. Ants. Gob). It has been one of the most trying problems aviation has faced over the years.

Studies have shown, from 1982-2000, eighty-one percent of all airframe icing accidents took place between the beginning of October and the end of March while month of January had the highest accidents occurring (www. Ants. Gob). Since 1994, the FAA has issued more than 200 airworthiness directives to address icing safety issues on more than 50 specific aircraft types (www. FAA. Gob). Directives addressed range from activation of airframe pneumatic De-icing boots at first sight of ice accumulation in flight to stricter rules on pre-flight inspections prior to take-off in known icy conditions.

But it has been an on-going tattle to prevent aircraft from being plagued by icing. Even with all the directives and training, the aviation world still has mishaps that transpire because of icing. With accidents happening, investigators need to be well rehearsed on what to look for when icing turns out to be the cause for an aircraft to crash. They need to understand how icing affects an aircraft in flight. Not only that, they need to realize how icing develops and the environment that is conducive to icing. Putting all that information together is the key to having an effective investigation involving the ice phenomenon.

For investigators to understand how icing affects an aircraft's system and performance, they first need to know the conditions which are conducive to icing. That information begins in the clouds. All clouds at subfreezing temperatures nave ten conduciveness Tort Icing to Tort. Lower level stratus clouds produce the most common type of icing, which will be discussed later, called rime ice. Thick, stratified clouds that produce continuous rain such as altruists and investigators usually have an abundance of liquid water because of the relatively larger drop size and number (www. FAA. Gob).

During the winter, these types of cloud systems stretch for thousands of miles and make way for dangerous icing situations for prolonged flights. Thick stratified clouds have a great concentration of liquid water with warmer temperatures and the heaviest icing usually will be found at or slightly above the freezing level where the temperature is never more than a few degrees below freezing (www. FAA. Gob). Cuneiform clouds contain heavy concentrations of large water droplets. When an aircraft fly through these conditions, the large water droplets splatter on the leading edge of the airfoil and rates a buildup of water.

In freezing temperatures, this can lead to clear ice to form on the wings, thus, pilots try to avoid these types of clouds at all costs. Even though icing starts in the clouds, weather fronts also contribute to icing factors too. A condition that favors rapid accumulation of clear icing is freezing rain above a frontal surface (www. FAA. Gob). When it rains above a frontal surface that is warmer than freezing and falls through air at temperatures that are below freezing, the rain droplets become super-cooled and they will freeze upon impact of an aircraft.

Knowing these conditions conducive to icing are important to an investigator so they can better understand the type of environment an aircraft was flying through. This can be a starting point to an icing incident. But there is more to know for an investigator than Just types of clouds. They need to recognize how these clouds can affect an aircraft both on the ground and in the sky because accidents can arise in both places. One area where the environment is conducive to icing which can affect an aircraft is when it is on the ground, prior to flight.

During ground operations, it is essential for an aircraft to be aerodynamically clean prior to takeoff (www. Etc. FAA. Gob). The Federal Aviation Regulations (FARES), Title 14 of the Code of Federal Regulations (14 CUFF), prohibits aircraft from taking off when snow, ice, or frost is adhering to the airplane's wings, control surfaces, propellers, engine inlets and other critical surfaces (Wood and Swinging, pig. 293). It is important for investigators to comprehend the conditions of ground icing and be able to identify them in an accident. Conditions conducive to ground icing come in three different forms.

These include frost, ground water, slush and snow. Frost usually accumulates on an airplanes surface when the temperature is below freezing and there is moisture in the air. Frost is primarily an event that happens as the result of rotational cooling, it frequently ensues with a thermometer level temperature in the mid ass's (forecast. Weather. Gob). When frost accumulates on an aircraft, it may not cover all the aircraft but randomly cover the surface of an aircraft. Frost does not change the basic aerodynamic shape of the wing, but the roughness of its surface spoils the smooth airflow of air thus causing a slowing of airflow (www. FAA. Ova). Fine particles of frost or CE, the size of a grain of table salt and distributed as sparsely as one per square centimeter over an airplane's wings upper surface can destroy enough lift to prevent a plane from taking off (www. Ants. Gob). Small patches of ice or frost can result in localize, asymmetrical stalls on ten wall, wanly can result In roll control problems during take-off (www. Ants. Gob). Frost can even increase stall speed by five to ten percent if it was heavily coated on an aircraft. Ground water is water that is accumulated on the ground from rain that can be splashed onto an aircraft or even ingested into an engine.

When temperatures drop, ground water splashed onto an aircraft can ice over and cause multiple aviation hazards. One hazard from ground water is it can be blown onto aircraft from other aircraft engines. It can be sprayed into 10th the aircraft (Wood and Swinging, pig. 296). The biggest threat from water, slush and snow is the accumulation, melting and then refreezing in icy conditions. S ere aircraft engine inlets and engine blades. It can also be sprayed onto the wings causing ice to form. Another hazard is water freezing in gaps and recesses of primary and secondary flight controls which can restrict movement making it dangerous to control