Aircraft Corrosion: Hidden in Plane Sight.

The Benefits of Washing Aircraft Are Obvious.

SITUATION

The costs associated with unwashed aircraft have become a significant issue in airline fleet maintenance. Studies have documented the financial impact of increased drag caused by oils, dirt, insects, and other contaminants collected on airflow surfaces. With fuel costs representing approximately 24% of total operating costs globally, airline companies have recognized that unwashed aircraft use more fuel with a shorter service life. That are subject to different types of corrosion, and because they are constantly exposed to corrosive environmental conditions. Other factors – including the age of the plane, where it is operated, how often it is cleaned, and whether it is hangared – will also affect how quickly and to what extent corrosion will develop.

DRAG

Aircraft manufacturers invest significant effort during design to reduce the drag profile and to improve efficiency. In some cases, drag is a result of less than ideal laminar flow characteristics, however, the majority of cases point to skin friction as the primary cause of increased drag. According to a report in Aero Quarterly, drag from skin friction increases as a result of surface roughness caused by surface or paint imperfections and the adhesion of dirt or dead insects to aircraft surfaces. Even a minor disruption has the potential to create a significant impact on laminar airflow.

DIRT AND CONTAMINANTS

When dirt, insects, and other contaminants collect on aircraft external surfaces, the laminar flow is disrupted. The natural accumulation of dirt on an aircraft's external surface will introduce a slight roughness that, overall, can induce significant additional drag. Dirt particles and insects adhere to the leading edges and disrupt the surface coating, resulting in a significant reduction in drag and an increase in fuel consumption.

Contamination on the exterior surface may occur at any altitude or when parked at the gate or tarmac. A materials researcher at NASA Langley, Mia Siochi, stated: "bug accumulation occurs at anywhere from the ground to less than 1,000 feet ." In general, insect contamination is most frequently noted during takeoff and landing. The accumulation of insect debris on the leading edge of laminar wings has been recognized as one of the most significant operational concerns associated with laminar flow . Even a slight increase in drag requires the plane to burn more fuel during flight hours. A report from USA Today found that "wing improvements that carry planes more smoothly through the air could save the industry as much as $2.4 billion a year — with bugs counting as a slice of that pie."

CORROSION & REMOVING SALT

Salt is also a major issue. Depending on the locale of the aircraft and its flight path, frequent washing has become mandatory for military squadrons. According to a report published by The Research and Technology Organization (RTO) of NATO , "Removing salt deposits on aircraft is an important component of a successful corrosion maintenance program and this is particularly true for equipment operated in marine environments. Both rinsing and washing aim at preventing corrosion damage by reducing the surface concentration of corrosive agents on aircraft exterior surfaces." Further, the conclusions of an experimental study on the effects of wash intervals on corrosion indicate that the relative benefit of washing increases with increasing severity of the environment .

Data from the Environmental Severity Assessment and Aircraft Wash found that "atmospheric severity increases corrosion damage whereas washing decreases it. The economic parameters are the cost per wash, the cost of aircraft unavailability during a wash and the charge-out rate for aircraft maintenance."

WASHING

Washing aircraft exteriors has been proven to be an effective means of reducing drag and thus improving fuel efficiency. "One of the easiest, most cost-efficient steps an airline can take to save fuel costs is to maintain clean airplanes," findings suggest. Since unwashed aircraft can experience an up to 0.1 percent increase in drag, according to some reports a decrease in fuel efficiency in unwashed planes can be expected. In a report from Boeing, researchers concluded that maintaining aerodynamically clean airplanes is "the most effective means of reducing drag."

"The periodic washing of airplane exteriors also results in minimized metal corrosion and paint damage, aids in locating leaks and local damage and improves the aesthetics of the airplane," according to Boeing . "The question of how frequently to wash aircraft is one of the many management decisions on minimizing the total cost of asset maintenance. Washing an aircraft directly incurs costs while not washing an aircraft indirectly incurs costs from future corrosion damage. Reducing the period between washes may reduce the cost of corrosion damage but increases the cost of washing."

Frequent washing is a practice already in place by major players within the industry. According to a report from the New York Times , "American and Southwest are washing a handful of jet engines each night, a process that used to happen only during thorough maintenance overhauls. Southwest figures it has already saved $1.6 million in fuel costs by reducing the drag caused by dirt and debris. American expects to save roughly $331 million this year, or about 3.5 percent on a total fuel bill that will approach $9.26 billion."

Industry experts now, more than ever, are relying on regular washing and cleaning and in some cases are beginning to require that aircrafts operated in harsh environments be rinsed with clear water immediately after use. Because aircraft washing is necessary for overall savings related to cash airplane-related operating costs, commercial aviation managers are looking to washing experts to ensure their fleet is operating as efficiently as possible.

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REDUCING WASHING COSTS

Without proper equipment, aircraft washing can require an entire shift of eight employees or 64 labor hours, which can be a source of economic irritation for some operations. The proper manual system, however, can reduce that time to 32 hours. With proper training and an hot water system that time can be reduced even further to 16 hours, mitigating any reason not to keep the washed to best practice standards.

RIVEER OFFERS PROVEN SOLUTIONS

The champion of aircraft washing in U.S. and global applications is Riveer. As a leader in clear water rinsing systems and aviation washing, Riveer has the technology and experience to ensure your fleet is getting the necessary care post-flight. Their innovative aircraft rinsing and washing systems are designed to effectively and efficiently wash and rinse the aircraft, removing dust, debris, and other contaminants, helping to reduce drag and thus improve fuel-efficiency. The company's aviation options include Total Aircraft Washing System **(TAWS)**, Birdbath Clear Water Rinse System **(CRWS)**, and Tactical Rinse System **(TRS)**, all of which are designed and built to the squadron's or carrier's specifications.

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