Australian Government
Civil Aviation Safety Authority

AIRWORTHINESS BULLETIN

Aircraft Washing

AWB 02-019 **Issue** : 2
Date : 17 December 2014

1. Applicability

All aircraft that undergo washing, cleaning and polishing.

2. Purpose

This Airworthiness Bulletin sets out to provide general guidance and warnings on the subject of aircraft washing and cleaning and also serves as a reminder that any work carried out on an aircraft, including washing and cleaning, is required to be in compliance with the aircraft's applicable manuals and other relevant product user instructions.

Regardless of whether aircraft washing/cleaning is listed in the maintenance schedule as a task requiring certification, or if the owner is cleaning his/her aircraft on the weekend, the basic principles for correct washing procedures remain the same: knowledge, training, experience with the aircraft type and compliance with the manufacturer's instructions are critical to the continued airworthiness and safe operation of the aircraft.

3. Background

Defect reports submitted to CASA over many years have identified damage occurring to undercarriage bearings and control surface hinge points where investigation into the defect revealed these bearings were not re-lubricated after washing. Through a combination of the resulting corrosion and excessive wear, this has led to failures of undercarriage torque links and various other movable pivot points.

As well as the lack of re-lubrication, in some instances, rod end bearings were found to have failed prematurely due to continual washing of the aircraft with heavy duty, solvent cleaning agents.

Additionally, there has been reports of the use of unapproved cleaning agents, such as truck wash, which have a high salt (sodium chloride) content and are intended for cleaning automotive vehicles (made from steel) as opposed to the typical aluminium aircraft structure.

Although it is desirable that aircraft be kept thoroughly clean of deposits containing contaminating substances such as oil, grease, dirt and other organic or foreign materials, it is even more important that the cleaning agents used should not add to the corrosion problem on aircraft.

4. Discussion

Aircraft cleaning should be a regular part of aircraft preventative maintenance and can be considered as an important part of an aircraft's **corrosion prevention & control program (CPCP)**.

Additionally, washing and detail cleaning of an aircraft will facilitate a more detailed visual inspection of the aircraft for owners, pilots and engineers. This is achieved by the removal of soils, grit and residue that can often hide potential problems on the aircraft such as degradation of seals and plastic components, 'working' rivets, loose fittings and fasteners, damage and wear on landing gear and flight control surfaces.

Cleaning agents work by removing soluble and insoluble soils from the surface being cleaned by dissolving, emulsifying or suspending soils in a solution. They can either be classified as light (such as synthetic detergents and soap), or heavy (such as solvents and emulsion type cleaning agents).

Solvent emulsion type cleaners (heavy cleaners) should be avoided for the washing of aircraft. However, on occasions, and in certain heavily soiled areas there may be a need for the use of these solvent type cleaners where the area is difficult to clean.

These heavy cleaners may carry health and environmental risks together with the possible risk of damaging parts of the aircraft such as composites, acrylics, fabrics, rubber and synthetic seal materials and even some two-pack paints if not washed-off thoroughly.

Heavy cleaners also contain solvents and corrosive ingredients that may cause damage to electrical wiring and terminations. They easily remove grease from inside of bushes, bearings and can damage rod end bearings and similar moveable fittings, potentially impacting the airworthiness of the aircraft.

Extra care should be taken to remove any traces of the heavy cleaners from the airframe after its use. Similarly, lubrication should be re-applied to all necessary areas that may have been exposed to the cleaning agent.

Covers and protective blanks

Many aircraft maintenance manuals or other manufacturers' instructions give details for the requirement to cover critical components, such as pitot-tubes, static vents, AOA sensors and other ports that need to be protected during the washing process. Often the aircraft will have its own fabric covers as well as intake and exhaust blanks to protect such areas. In some aircraft it will be necessary to seal off grills/vents and other apertures and/or the taping up of doors and emergency exits.

Caution: Always remove these covers and tape after washing. There has been many accidents/ incidents that have resulted from pitot/ static vents or other critical sensors being left covered when the aircraft has been released to service.

The Washing Process

The use of stiff bristled brushes is not recommended for use in aircraft washing. Aggressive rubbing, used in conjunction with abrasive brushes, will result in scratches on the aircraft surfaces. It will also force contaminants into difficult to remove areas and bearing surfaces.

Use of a hose with a low pressure or a fine spray nozzle is recommended during washing, rather than using a stream of high pressure water which can force the water, contaminants and detergents into joints and cavities that could lead to corrosion and other damage in unwanted areas.

It is recommended that washing takes place in an area protected from the sun so as to prevent the cleaning agent drying onto the surface. This can lead to streaking as well as residue and increase the further potential risk of corrosion.

All cleaners that are appropriate for use on aircraft should be able to be rinsed and neutralised from the surface. Washing aircraft from top to bottom is generally considered good practice.

For fabric covered and antique aircraft, it is generally recommended to use a ‘dry washing’ technique. This is where the cleaning agent can be applied by a spray bottle and swab which is then wiped clean with a dry cloth rather than risking ‘saturating’ the aircraft with water and detergent which could make its way into the internal aircraft structure.

Windows and Transparencies

For the cleaning of plastic surfaces and acrylic windows, it is important that the surface be initially rinsed with water in order to remove any salt deposits or any other water-soluble soil before the cleaning commences to avoid creating unwanted scratches.

Use only soft cleaning cloths with soap or mild detergent that are appropriate for use on windows and perspex. Many dry cloths, not designed for plastic materials, will cause unwanted scratches. Polishing minor scratched surfaces may be accomplished with an approved plastics polish and finally finished with an anti-static polish or cloth.

Particular care and detail should be taken with the task of windscreen/ windshield cleaning to avoid any damage, scratches and contamination that can cause visual distortion or undue sun glare for the pilot.

An FAA report titled, 'Natural Sunlight and its Association to Aviation Accidents: Frequency and Prevention' highlights the facts relating to the many accidents, over a 10 year period, that were associated with glare from natural sunlight. This includes those accidents that resulted from a 'compromised windscreen'. In several of the accidents, the glare effects were exacerbated due to neglected windscreens (dirty, scratched, crazing and pitted), which further scattered the sunlight. This report demonstrates the importance of aircraft windscreens to be cleaned thoroughly and correctly in the interests of safety.

Polishing

For bare, unpainted aluminium aircraft surfaces, some polishing is important to prevent corrosion and microbe build-up on the unpainted metal. After removing oxidation and/or microbe build up, apply the approved surface treatment to protect the metal from further environmental effects as advised by the manufacturer.

However, regardless of the surface finish, it is recommended that heavy polishing is not performed on any aircraft unless specified as a maintenance requirement by the manufacturer.

Incorrect or overuse of polish can have detrimental effects due to the polish, being abrasive, working its way into areas of hinges, bushes, lap joints, etc. and negatively impacting their normal operation. In order to prevent these problems, polishing activities should be limited to the use of only aircraft manufacturer approved products and procedures.

5. Recommendations

1. Use only cleaning products that have been specifically approved for use on aircraft.

2. Always comply with the details contained in the aircraft's Maintenance Manuals, Pilot's Operating Handbook (POH) as well as other applicable manufacturer's instructions or relevant product information.

3. Be aware that automotive and household products can cause damage to the airframe and components and that some household cleaners/detergents contain high levels of salt (sodium chloride) which is corrosive to aluminium.

4. Chlorinated solvents or detergents are NOT to be used to wash aircraft. Chloride can cause stress corrosion cracking in stainless steel and in some aluminium alloys. For these reasons, chloride based detergents, such as trichloroethylene, 111 trichloretan etc. are not to be used in the general purpose cleaning of aircraft.

5. The products and techniques used for cleaning the interior of an aircraft are also important. Due to the confined nature of interiors within the aircraft, only approved (generally non-flammable) cleaners should be used.

6. At the completion of aircraft washing all applicable fittings should be re-lubricated as necessary.

In summary:

Incorrect washing and cleaning procedures and the use of incorrect products not suitable for aluminium aircraft structure can cause damage to the aircraft and further contribute to problems of corrosion rather than being a method of corrosion control.

Washing aircraft to remove contaminants such as dirt, salt, and exhaust gas residue is important and good practice. However, excessive cleaning or the use of unapproved cleaning agents can 'wash out' lubricants and contribute to additional failures, particularly for those components with moving parts that are exposed directly to the washing process.

6. References

- Applicable Aircraft Maintenance/Service Manuals, Pilots Operating Handbooks.
- Applicable Product information, technical data sheets
- Applicable Aircraft Corrosion Control & Prevention Programs (CPCP)
- UK CAA CAP 562 – Book 2, Leaflet 12-10 Cleanliness of Aircraft.
- FAA Human Factors report, "Natural Sunlight and its Association to Aviation Accidents: Frequency and Prevention" May 2003.
- FAA Aviation Maintenance Technician Handbook FAA-H-8030-30, Chapter 6, Aircraft Cleaning and Corrosion Control.

7. Enquiries

Enquiries with regard to the content of this Airworthiness Bulletin should be made via the direct link e-mail address:

AirworthinessBulletin@casa.gov.au

or in writing, to:

Airworthiness and Engineering Standards Branch
Standards Division
Civil Aviation Safety Authority
GPO Box 2005, Canberra, ACT, 2601