



"TAKE YOUR CESSNA HOME
FOR SERVICE AT THE SIGN
OF THE CESSNA SHIELD"

CUSTOMER CARE NEWS LETTER

MARKETING DIVISION / CESSNA AIRCRAFT COMPANY / WICHITA, KANSAS 67201 / CABLE ADDRESS - CESSCO WICHITA

June 6, 1980

NL80-9

SUBJECT: VOLCANIC ASH HAZARD
(FAA Advisory Circular)

Attached is a copy of FAA's Advisory Circular #43-16 which is a Special Issue on the Volcanic Ash Hazard.

This Circular provides excellent maintenance and inspection recommendations for aircraft exposed to volcanic ash (either in the atmosphere or on the ground) and is applicable to all Cessna models.

Of particular importance is item 5 on Powerplant Considerations because of the abrasive and corrosive affect that volcanic ash can have on engines. The suggested maintenance steps for engines is recommended by the following Powerplant Manufacturers for use on their engines:

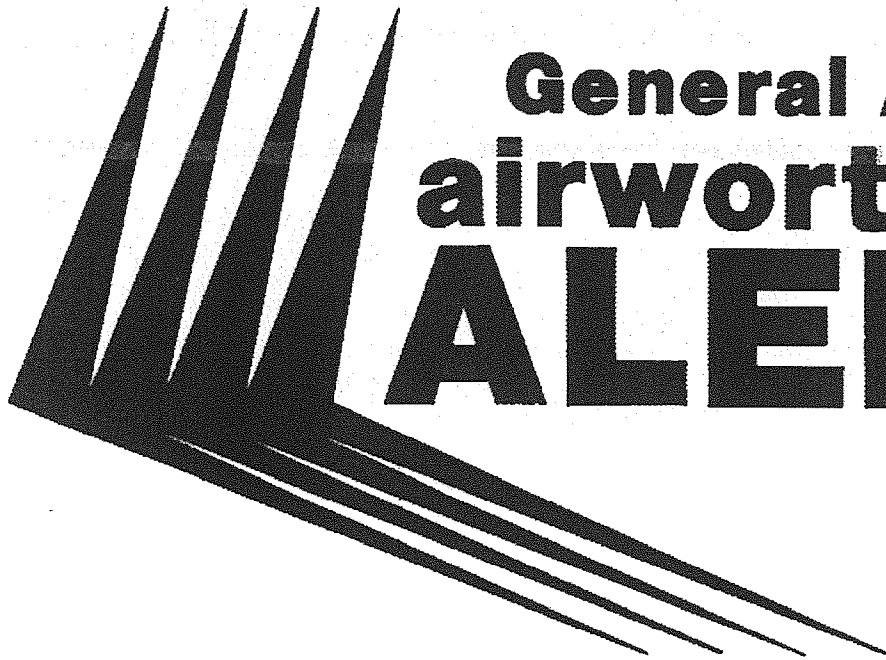
- * Teledyne Continental Motors
- * Avco Lycoming
- * Garrett AiResearch

Also attached is a copy of Garrett Service Information Letter P331-101 which provides some additional information specific to the Garrett turbo-prop engines.

Cessna urges Owners and Operators to review the attached Circular and Garrett Letter carefully and follow the recommended maintenance and inspection procedures when operating Cessna aircraft in a volcanic ash laden environment.

The attached Advisory Circular was mailed, by the FAA, to all registered aircraft owners.

CESSNA AIRCRAFT COMPANY



**General Aviation
airworthiness
ALERTS**

SPECIAL ISSUE

**VOLCANIC ASH
HAZARD!**

**AIR CARRIER
&
GENERAL AVIATION**



**U.S. DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Flight Standards National Field Office**

1. Introduction. The purpose of this special alert is to provide safety information and recommended actions to preclude possible airworthiness problems associated with aircraft exposure to volcanic ash either in the atmosphere or on the ground. The following recommendations are based on the best available information at this time and will be amended as further information and facts are gathered.

2. Background. Volcanic ash from Mount St. Helens has been analyzed to contain abrasive and corrosive materials such as sulfuric acid and fluoride and chloride salts and acids. Depending on the location of the volcanic ash fallout, the particle sizes range from as small as .5 microns to 100 microns. Most aircraft screens will filter out material down to 15 microns but will pass particles that are smaller.

The ash will probably be encountered as a fine powder, like talcum powder, light grey in color. When dampened it has been reported to set similar to concrete. Due to adhesive action of the sulfuric acid, the acid tends to adhere to the interface between the particles and the aircraft structure causing corrosion. Although volcanic ash may not be visible on the structure, sulfuric acid may still exist causing corrosion and it is recommended that all aircraft that have been exposed to volcanic fallout be given a test to determine the acidity levels. This can be accomplished by the application of nitrazine paper available from many pharmacies. If the Ph factor is 4 or below, it is recommended that the following corrective actions be taken as soon as practicable.

3. Airframe.

(1) Safety precautions including safety glasses, gloves and protective clothing should be adhered to.

(2) Aircraft should be cleaned in the following sequence:

a. The aircraft manufacturer's maintenance manuals should be followed regarding the protection of aircraft systems during the cleaning process. The procedures recommended by the manufacturer for the inspection and cleaning or purging of pitot static systems, instruments systems, etc., should be followed.

b. If there is any volcanic ash coating on the aircraft structure, it should be removed by hand brushing, air or vacuum cleaning prior to performing any washing actions. If the aircraft is washed before removing ash, it will form a corrosive paste.

c. The aircraft should be thoroughly cleaned, inside and out, before washing.

d. The aircraft should be rinsed thoroughly with fresh water without scrubbing to ensure that all parts of the aircraft have been amply rinsed.

e. The aircraft should be given a test at the completion of each wash cycle to ensure a Ph factor of above 4. The Ph factor may be performed by taping nitrazine paper strips on various parts of the structure and wetting with distilled water.

f. It may be necessary to repeat the wash procedures on a continuous basis in areas where fallout continues. To ensure that the sulfuric acid is neutralized, complete the wash cycle using a petroleum base solvent.

g. It is recommended that regardless of the Ph factor, aircraft exposed to volcanic ash be given a water wash as assurance against corrosion.

h. Close inspection for external signs of damaged seals, especially landing gear and landing gear actuators.

4. Systems. For all aircraft exposed to volcanic ash on the ground or air, system checks should include inspection of pitot-static probes, static ports, air conditioning outflow valves and filters, generator cooling tubes and filters, vacuum lines and filters, and externally mounted sensors, such as long wire antenna, and angle-of-attack sensors, to remove any ash contamination. Precautionary inspection should be done on a random basis of electronic equipment subject to cooling air to assure need for equipment removal for removal of ash contamination.

5. Powerplant Considerations.

(1) General. As noted above the nature of the volcanic ash is that it is both abrasive (in the form of fine powder) and corrosive (in the form of acid content). Both turbine engines and reciprocating engines may be affected. Compressor and turbine blades suffer erosion by abrasive particle impact. Lubrication and other fluid systems are subject to contamination by solids and chemicals, while moving parts are subject to abrasive wear.

The abrasive nature of the material causes rapid mechanical damage to moving parts. Experience has shown that engines operated with oil contaminated with the ash has caused them to fail in as few as 20 hours after exposure.

The acids associated with the ash are soluble in oils and as such attack engine parts resulting in rapid deterioration. Engines can also be attacked externally by the corrosive action.

(2) Maintenance. Engines which have been operated or subjected to a volcanic ash fallout need:

a. Thorough external cleaning.

b. Cleaning or changing of all oil, fuel, and other systems screens and/or filters and draining all-sumps. Flushing and cleaning of contaminated fluid systems should be accomplished following the engine manufacturer's recommended procedures.

c. Cleaning and scavenging of any open tanks where the ash or chemical action could collect and concentrate.

d. Oil and fluid draining and change.

e. Close inspection for external signs of damaged seals.

f. Cleaning and inspection of accessories and components for contamination such as vacuum filters and regulators.

g. Following cleaning, inspection, and fluid changes the proper operation of the engine should be verified by run-up. Frequent oil and fluid changes should be scheduled. During subsequent operation temperatures and pressures should be monitored closely for changes which may signal problems.

h. Spectrographic oil analysis is an indicator of engine wear and contamination. Comparison of analysis of early samples after cleaning with previous analysis reports can serve as an indicator of an engine's stability.

6. Recurrent Inspections. Aircraft owners and operators are urged to closely monitor aircraft and engines, including systems, on a continuing basis and take action as deemed necessary for aircraft exposed to volcanic ash as assurance against corrosion.

May 21, 1980



SIL

SERVICE INFORMATION LETTER

TPE 331

FOR ALL AIRFRAME MANUFACTURERS
USING TPE331 TURBOPROP, OWNER/
OPERATORS, DISTRIBUTORS, SALES AND
SERVICE ORGANIZATIONS AND FIELD
SERVICE REPRESENTATIVES.

APPLICABLE: MAINTENANCE & ENGINEERING FLIGHT OPERATIONS

S.I.L. P331-101
REV. 0
DATE 5/30/80

SUBJECT:

MAINTENANCE AND INSPECTION RECOMMENDATIONS FOR TPE331 TURBOPROP ENGINES OPERATING IN VOLCANIC ASH-LADEN ENVIRONMENT.

DISCUSSION:

Volcanic ash mainly consists of particulate matter ranging from a powder-like dust to a sandy grit. This material is highly abrasive and may also contain varying amounts of sulfur and other elements which are known to contribute to hot corrosion of turbine section components. These elements when in sufficient concentration can also chemically corrode exposed surfaces, particularly when combined with moisture.

The erosive and corrosive effects of volcanic ash may cause a reduction in engine life and will generally result in the need for increased maintenance and inspection activity.

Detrimental effects on the engine from volcanic ash will be proportional to the concentration of the ash and the period of exposure.

Until such time as sufficient information is gathered to permit a more accurate assessment of the immediate and long-term effects of operating the engine in an ash-laden environment, the following recommendations should be carefully considered, in addition to those outlined in your routine maintenance program.

RECOMMENDATIONS:

- I. Whenever possible, avoid operation in known volcanic ash-laden environment. Exposure to this foreign material in high concentrations, or lesser concentrations for prolonged periods, is considered damaging to the engine and will likely result in increased cost of ownership.
- II. If operation in ash-laden regions cannot be avoided, the following is recommended:
 - A. Engine oil filters should be examined more frequently to ensure that abnormal blockage is not occurring. Should an unusual amount of contaminant be observed in the filter, the filter and engine oil should be changed.

- B. If operation in ash-laden environment is fairly continual the engine oil change interval should be shortened to 100 Hours.
- C. Fuel System Filters should be more frequently examined to ensure that blockage is not occurring.
- D. Air filters in pneumatic circuits associated with the AiResearch and Bendix fuel controls on turboprop engines (P₃ filters) should be examined and cleaned as required after each flight where ash was encountered.
- E. Use of thrust reversing should be avoided where possible on ash-coated runways.
- F. In ash fall-out areas, inlet and exhaust covers should be installed as soon as engine cooling will permit. This is to avoid introduction of ash into the static engine.

NOTE: Detrimental effects on the engine from volcanic ash will be proportional to the concentration of the ash and the period of exposure.

Relaxation of these recommendations in favor of more typical, routine maintenance should be governed by experience. The rate at which erosion is occurring within the engine may be estimated by careful examination of propeller blade and compressor blade leading edges. Thinning, sharpening or roughening of these surfaces is indicative of accelerated erosion.

Sincerely,

AIRESEARCH MANUFACTURING COMPANY
OF ARIZONA



Raymond J. Salvesson, Manager
Customer Service Engineering
Propulsion Engines

RJS/DRM/rb