

Turbine Engine Ground Based Icing

A Summary of the SAE G12, Methods, Engine Ground Icing Subcommittee Activities

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Agenda

- **Issue – Ground based Turbine Engine Icing**
- **SAE Committee Status**
 - Work Statement
 - Current Activities
 - Aerospace Information Report (AIR)
- **Database of Events**
- **Concerns**
- **Development Needs**

Engine Ground Operation *Issue*

- Each winter several engine damage events occur, causing air-turn backs, high vibrations, and some thrust loss and engine instability.
- There is a need for a more robust system to remove accumulating ice from engines when operating on the ground for extended periods of time.

SAE G12 Methods Engine Sub-Committee was formed to address engine ground-based icing issues.

Committee Status

SAE G12 Methods, Engine Ground Icing



Engine Ground Operation

SAE G-12

SAE G-12 Methods engine committee is working this issue and will develop an industry recommended practice both for operators and for integration into the engine and aircraft development process.



Work Statement



Engine Ground Operation Work Statement

- **Develop Database of turbine engine events.**
- **Analyze Events.**
- **Look at Airport and Airline Operations.**
- **Consider weather differences on Ops.**
- **Look at development needs.**

Document all observations and issues

AIR Outline

(Aerospace Information Report)



Engine Ground Operation

AIR Elements

- **Database formation and analysis**
- **Airport Operations review**
 - engine inspection and de-icing locations
 - engine run-up locations
 - runway & taxiway treatments and their effect on power run-ups.
- **Engine Ice removal options**
 - power run-ups
 - mechanical ice removal
 - thermal ice removal
- **Engine development/certification review**
- **Weather Forecasting possibilities**

Database of Events



Engine Ground Operation Database

- **101 ground based turbine engine events.**
- **Oslo and Denver have greatest number of events.**
- **Freezing Rain causes most fan damage and vibration events.**
- **Snow causes most stall events & most damage events.**
- **Spinner Ice – fan damage**

Concerns Raised during Ground Operations



Engine Ground Operation *Concerns*

- Currently power run-ups on the ground are not always practicable nor safe for large engines in close quarters.
- Larger engines require higher power settings and longer duration run-up to shed ice from the core inlet
- Some engines have AFM requirement to perform frequent power run-up to shed ice.
- An integrated engine/aircraft certification, airport operations, and flight standards approach needs to be developed to balance a practical solution with an effective shedding procedure.

Engine Ground Operation

Other concerns

- Ice/snow picked up from runway during taxi
- Total taxi time in ice and snow is unlimited
- Taxi time inbound and outbound both contribute to ice on internal engine surfaces
- Engine inspection after departure from the gate has practical problems – engine running, tail mounted installations
- Procedures for removing ice from engine are time consuming / disruptive

Challenges



Engine Ground Operation *Challenge*

The biggest challenge is to get the involvement and assistance of a diverse group (airports, airlines, manufacturers, and regulators) to address engine icing in a safe, efficient, and economically feasible way.



Engine Ground Operation *Development Needs*

Need to provide operators choices to effectively deal with engine ice accretion during ground operation, such as:

- Power run-ups
- Anti/De-Icing fluids (effects on engines?)
- Cleaner taxi-ways
- Hot-air or mechanical deicing procedures
- etc.

Open Invitation



Questions?

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