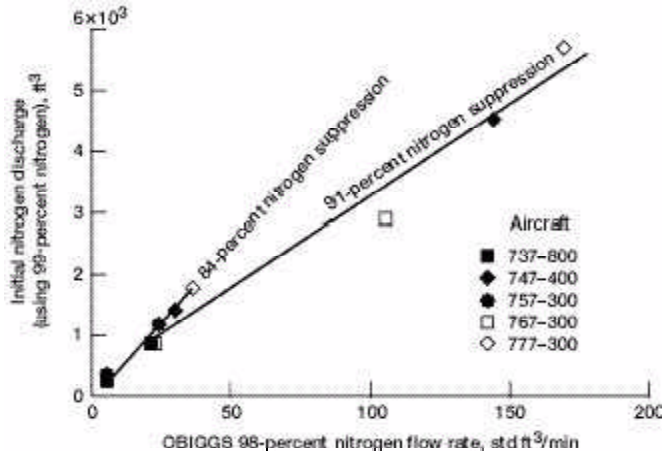
Safer Aircraft Possible With Nitrogen Generation

A system named On-Board Inert Gas Generation System/On-Board Oxygen Generation System (OBIGGS/OBOGS) was studied with Boeing (ref. 1). The study established the requirements for nitrogen purge (for fuel tank inerting and cargo compartment fire suppression) and oxygen (for passengers and crew). The nitrogen would be used for suppressing fires and fuel tank explosions on the aircraft, and the oxygen would be used for breathing gas during high-altitude or emergency operations.

In the vision of the Aviation Safety Program, a nitrogen-generation system might be used in a combined suppression system. Halon gas or a water spray would be used for initial fire suppression; then nitrogen would blanket the burned materials, assuring that a fire would not reignite.

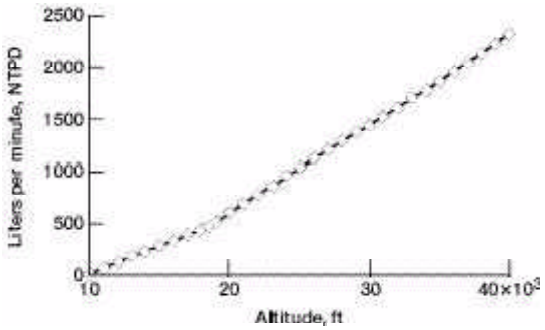
The following graph shows the nitrogen required for fire suppression aboard several commercial aircraft: 737 through 777. The nitrogen volume required grows significantly with the higher requirements for nitrogen percentage in the cargo compartment atmosphere. The final graph depicts the related requirements for oxygen generation aboard the 777 aircraft. Additional data for many aircraft types were created.



Nitrogen-generation requirements for existing transport aircraft.

The study provided the initial information for sizing the fuel tank inerting systems using ground-based and aircraft-based OBIGGS/OBOGS. Other important results in the study were the requirements and timing for aircraft operations, and timing for airport operations to support OBIGGS/OBOGS.

A number of technologies for inerting and oxygen production were suggested. These technologies included hollow fiber membrane and air liquefaction. The study fostered coordination with Boeing designers and technology planners, allowing for easier transition to flight certification and future test flights.



Oxygen-generation requirements for existing transport aircraft. NPTD, normal pressure and temperature dry.

The study was also coordinated with the Federal Aviation Administration Technical Center (Atlantic City, NJ), whose contacts with numerous working groups allow for a diverse multipronged international research program.

NASA Glenn sponsored this work as part of the Accident Mitigation aspects of Fire Prevention under the NASA Aviation Safety Program. A follow-on study to assess the current and future state of the art is being conducted with Boeing/FAA.

Find out more about NASA's aviation safety program (http://www.aero-space.nasa.gov/programs/program_org/as.htm).

Reference

1. Reynolds, Thomas L., et al.: Onboard Inert Gas Generation System/Onboard Oxygen Gas Generation System (OBIGGS/OBOGS) Study (Subtask 1). Aircraft and Spacecraft Guidance and Controls Research Task Order 11, Boeing Commercial Airplane Group, Seattle, WA, June 30, 2000.

Glenn contacts: Bryan A. Palaszewski, 216-977-7493, Bryan.A.Palaszewski@grc.nasa.gov; and Douglas A. Rohn, 216-433-3325, Douglas.A.Rohn@grc.nasa.gov
Author: Bryan A. Palaszewski
Headquarters program office: OAT
Programs/Projects: AvSP (Fire Prevention, Accident Mitigation)