Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Air Force SBIR/STTR

Success Story

TOTAL ATMOSPHERIC LIQUEFACTION FOR OXYGEN AND NITROGEN SYSTEM DESIGN COMPLETED

Air Force heavy airlift aircraft require oxygen for life support systems and nitrogen for inerting the aircraft's fuel tanks. The nitrogen atmosphere above the fuel prevents an explosion if small arms fire ruptures the tanks. Scientists designed total atmospheric liquefaction for oxygen and nitrogen (TALON) to simultaneously produce liquid oxygen and nitrogen onboard an aircraft. The single system has triple benefits of reducing deployment footprints, reducing liquid oxygen supply infrastructure costs, and resolving current deficiencies with fuel tank inerting systems.

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Accomplishment

The Human Effectiveness Directorate at Brooks City-Base, San Antonio, Texas, collaborated with Creare, Inc. of Hanover, New Hampshire, and the Boeing Company in Long Beach, California, to develop a detailed design for a flightworthy, palletized TALON demonstration system. The palletized design will reduce development program costs and minimize aircraft modifications required to install the demonstration system on the C-17.

The effort showed how the TALON system could be fully integrated into the C-17 aircraft. The directorate based the program upon the results of prior Air Force Research Laboratory-funded work aimed at liquifying and storing oxygen for field hospitals and aeromedical evacuation use. Previous Small Business Innovation Research Phase I and II contracts to develop miniaturized distillation and cryogenic refrigeration technologies also contributed significantly to the success of the TALON program.

TALON replenishes the onboard liquid oxygen and nitrogen supplies, reduces the US Air Force deployment footprint, and supports the Air Force critical future capability of agile combat support. TALON would reduce the estimated 20-year, $1.5 billion dependence on the liquid oxygen production and servicing infrastructure. An additional benefit would be a potentially highly reliable and low-maintenance onboard fuel tank inerting system.

Background

Congressional plus-up and Air Force science and technology funding supported the directorate's development to achieve a viable onboard gas generation technology for the C-17 and other airlift aircraft. System design, aircraft integration, and key component demonstrations were several key feasibility issues looked at to lower the technical risk during the effort.

The TALON system is intended primarily to meet the Air Force's need for oxygen and fuel tank inerting systems. However, following the midair explosion of TWA Flight 800, there was increased interest in fuel tank inerting systems for commercial passenger aircraft. TALON technology could be used on mid- to large-sized passenger aircraft as well as to satisfy the requirement for small portable oxygen and nitrogen generating plants.

Human Effectiveness
Support to the Warfighter

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (04-HE-05)