



Novec™

Brand

Helping Protect Critical Military Assets with Sustainable Fire Protection

U.S. Air Force (USAF) facilities are one of the most rigorous, demanding applications for any fire suppression solution. At all times, the priority is mission capability to support ongoing USAF operations around the world – any fire suppression solution must meet stringent testing and approval standards.

Currently, the USAF maintains 86 Jet Engine Noise Suppressor Test Facilities (“hush houses”) that help ensure that military aircraft maintain peak operational efficiency. Hush houses are very large Quonset-style buildings designed to enable aircraft, their engines and other equipment to be tested to their limits on the ground, while mitigating the resulting extreme noise levels. Fire suppression is critical in these facilities: engine testing inherently involves highly flammable substances like jet fuel, and all the equipment involved is complex, expensive and mission critical to sustaining ongoing aircraft operations. In addition, hush houses are mobile, so all their systems must be designed for efficient take down, transport, and set up.

For decades, Halon 1301 had been the fire suppression agent of choice for this highly demanding aviation application. Its quick and effective fire suppression performance, and compact system size made it highly effective in this application. However, in 1994 halon production was globally banned because it caused extreme environmental damage, particularly to the ozone layer. Some exceptions were created for its ongoing use in critical military and aviation applications like hush houses, but only until a suitable alternative agent could be found.



Searching for a halon replacement

To find an equally effective but more environmentally friendly alternative, the USAF secured the services of Vital Link, Inc. (VLI) of Sealy, TX and its subcontractor Hiller Systems, Inc. VLI is an OEM specialty designer and supplier of aircraft engine test facilities, including hush houses and test cells, and has supported the USAF hush house program since its inception in the early 1980s.

Beginning in the 1990s, VLI considered a range of alternative agents. However, each had drawbacks making it unsuitable for the application.

When 3M™ Novec™ 1230 Fire Protection Fluid entered the market in 2002, VLI and Hiller determined that this new clean agent had an ideal combination of attributes:

- ▶ **Performance:** A fast acting agent that could be effectively and uniformly deployed at all hush house locations - an operational equivalent to halon in all critical areas. Because Novec 1230 fluid is a waterless fire suppression solution, it leaves no residue and is electrically non-conductive, enabling it to help protect mission critical and expensive equipment.
- ▶ **Margin of safety:** One of the highest margins of safety for personnel of any NFPA 2001 clean agent.
- ▶ **Sustainability:** Zero ozone depletion potential (ODP) and less than 1 global warming potential (GWP), supporting USAF sustainability goals.
- ▶ **Transportation:** Stored and shipped as a liquid in non-regulated, non-pressurized containers, making it possible for expedited transport by air to remote bases and facilities for refill.
- ▶ **Cost:** The system was determined by the USAF to be cost-effective considering the value of the equipment, aircraft and engines.

In addition to recognizing these important attributes, stringent “live” discharge testing was required by the USAF to ensure that a system using 3M™ Novec™ 1230 fluid would operate as expected. It was also critical that the total wall-to-wall area inside each hush house would be protected by the system and clean agent of choice.

Testing and validation

The Support Equipment & Vehicles Division of the Agile Combat Support Directory at Robins AFB, Georgia, oversaw witnessed approval testing at a 3M fire test facility and the Air National Guard's Dannelly Field in Montgomery, AL. Testing included:

1. Fire performance testing to evaluate the agent performance
2. Concentration tests to evaluate the system within the hush house

Rigorous fire performance testing assessed the agent's performance in two fire scenarios: a fixed size jet fuel pool fire located under a simulated aircraft wing (pan test), and a dynamic flowing fuel configuration incorporating the geometry and elevation of a jet engine nacelle mock-up with a fuel spray and cascading fuel feeding a pool fire below (engine test).

In both scenarios, all fires were completely extinguished within 30 seconds of the end of each discharge, fully meeting requirements, and no re-flash occurred during 10 minutes of temperature monitoring. Replications of the tests demonstrated consistent performance.

Next, the design concentration test used 3M™ Novec™ 1230 Fire Protection Fluid, in a system manufactured by Siemens, within a full-scale hush house and evaluated the system's ability to reach design concentration within 10 seconds. These tests also met expectations with a system discharge time of 9.9 seconds and the ability to hold the minimum design concentration for over 10 minutes.



A growing call for change

While systems using 3M™ Novec™ 1230 fluid were being tested and qualified for use in hush houses, the pre-existing halon fire suppression system configurations were determined to be obsolete and increasingly problematic. It was clearly time for the USAF to begin converting its hush house operations to a sustainable alternative agent.

In 2015, based on the strong testing results, the USAF Support Equipment & Vehicles group qualified an integrated system solution using 3M™ Novec™ 1230 Fire Protection Fluid as its halon successor. According to Michael 'Mick' Randel, SME - Engine Test Stand and Noise Suppressor Team, Air Force Support equipment and Vehicles Program Office, "This [3M™ Novec™ 1230 fluid] was clearly the answer. There is nothing else on the market that has these properties."



“The most notable thing is how smoothly everything has gone”

Thorough behind-the-scenes work then set up the transition, including preparing the fleet of hush houses for conversion and resolving critical requirements that emerged in the meantime. Factors to consider in each installation included climate, weather, geography, mission and operational tempo, condition and configuration, funding, and logistics management. The system installation process also had to take place alongside the normal high operational tempo of routine, urgent and emergency repairs and configuration changes.

In 2019, all testing was complete and the USAF began an aggressive program to convert all 86 hush houses worldwide to use 3M™ Novec™ 1230 fluid within 5 years. The program proceeded smoothly and effectively, and by mid-2021, thanks to excellent support from USAF leadership and contractors, the program was 12 months ahead of schedule. 33 installations were complete and 11 more were works in progress, with no impacts on the USAF's operational tempo. Plus, across all systems installed – including some earlier test systems in place for 3-6 years – operation and maintenance transition from the old halon configurations to the new systems had been seamless and performance had met or exceeded expectations across the board.

“Implementing the fire suppression system configuration using 3M Novec 1230 fluid has had a more positive effect on fleet health than we projected. The most notable thing is how smoothly everything has gone.”

According to Randel, “Implementing the fire suppression system configuration using 3M™ Novec™ 1230 fluid has had a more positive effect on fleet health than we projected. The most notable thing is how smoothly everything has gone. No design changes have been required to the configuration established in testing. The fire suppression systems have also been exposed to a variety of climates and temperatures now, including extreme cold, without any effects on operability.”

A significant positive impact of these updates has been to directly increase operator safety and mission capability. Age, data limitations, performance limitations, and lack of depot maintenance had required the old halon systems to operate under waivers to protect operator safety, and each waiver increased the workload for operators and fire departments with resulting mission and operational impacts. Each conversion to a system using 3M™ Novec™ 1230 fluid permanently resolved all of these burdensome issues.

As a result, according to Col. Michael Holl, former chief, Support Equipment and Vehicles Program Office, “Having this more reliable, stable alternative [to halon] helps make you more effective at producing air power in a location.” The continuing transformation of the USAF’s hush house fire suppression systems to a safe and highly effective solution using 3M™ Novec™ 1230 fluid will help support efficient, sustainable operations around the world.



Smart. Safe. Sustainable.

The 3M™ Novec™ Brand Family

The Novec brand is the hallmark for a variety of proprietary 3M products. Although each has its own unique formula and performance properties, all Novec products are designed in common to address the need for smart, safe and sustainable solutions in industry-specific applications. These include precision and electronics cleaning, heat transfer, fire protection, protective coatings, immersion cooling, advanced insulation media replacement solutions and several specialty chemical applications.

3M™ Novec™ Engineered Fluids • 3M™ Novec™ Aerosol Cleaners • 3M™ Novec™ 1230 Fire Protection Fluid • 3M™ Novec™ Electronic Grade Coatings • 3M™ Novec™ Insulating Gases

Safety Data Sheet: Consult Safety Data Sheet before use.

Regulatory: For regulatory information about this product, contact your 3M representative.

Technical Information: The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use: Many factors beyond 3M’s control and uniquely within user’s control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user’s method of application.

Warranty, Limited Remedy, and Disclaimer: Unless an additional warranty is specifically stated on the applicable 3M product packaging or product literature, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. **3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OR TRADE.** If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M’s option, replacement of the 3M product or refund of the purchase price.

Limitation of Liability: Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.



Electronics Materials Solutions Division

3M Center, Building 224-3N-11
St. Paul, MN 55144-1000 USA

Web 3M.com/Novec
Phone 1-800-810-8513

Please recycle. Printed in USA.
©3M 2021. All rights reserved.
Issued: 8/2021 16833HB
60-5005-0304-4

3M and Novec are trademarks of 3M Company. Used under license by 3M subsidiaries and affiliates. All other trademarks are property of their respective owners.

3M Science. Applied to Life.™