Dr. Irvin Glassman Honored for Contributions to Air Force Research

With contributions spanning from the Sputnik era into the future with the Joint Strike Fighter and hypersonic flight vehicles, a Princeton researcher has helped provide propulsion to the Air Force's space and aircraft programs. This researcher has received continuous support for his research from AFOSR for more than 45 years.

Dr. Irvin Glassman, the Robert H. Goddard Professor of Mechanical and Aerospace Engineering at Princeton, has used his expertise in combustion to aid the Air Force in developing rockets and jet aircraft. His research efforts will be reflected in the development of the F-22, Joint Strike Fighter and hypersonic flight vehicles.

Glassman's contributions to the Air Force started in the 1950's just as America was entering the Space Age. His research led to the development of the Glassman Criterion for vapor-phase combustion. This criterion established that aluminum would burn efficiently in solid propellants while boron would not despite its higher energy density. This finding led to the use of aluminum as a component in solid propellant rockets.

Dr. Irvin Glassman

His research in the 1960's resolved combustion instability problems in the Agena rocket, which served as an upper stage in the Thor-Agena, Atlas-Agena and Titan 3-Agena space launch systems. The Agena, which was used from 1959 to 1987, was America's most used top stage with 362 launches.

Glassman also used his expertise to resolve complex issues with jet engines. In the 1970's, he contributed to the development of the Emdee-Brezinsky-Glassman model. This model is used to predict fuel oxidation for JP-type fuels in Air Force gas turbine engines and provides the basis for estimating the production of soot and detectable exhaust signature in aircraft. This modeling allows the engine designer to extend engine lifetime, reduce maintenance requirements, minimize detectable combustion signature, and comply with regulations to protect the environment from harmful exhaust particulate emissions.

Following this research, Glassman's efforts in the 1980's clarified the role of temperature as a controlling parameter to establish the relative sooting tendency of different jet fuel components.

In this decade and the next, as the Air Force develops the Joint Strike Fighter, the F-22 and hypersonic flight vehicles, Glassman's research will also be used. His integrated approach for understanding the fouling tendencies of hydrocarbon fuels at high temperature and pressure is key in developing systems, like the Joint Strike Fighter, F-22 and hypersonic flight vehicles, that require fuel to absorb heat from the vehicle skin, propulsion system and other components.

Program Manager: Dr. Julian Tishkoff
Directorate of Aerospace and Materials Sciences
(703) 696-8478, DSN 426-8478

Research Highlights

Air Force Office of Scientific Research
Communications and Technical Information
4040 Fairfax Dr. Suite 500
Arlington, VA 22203-1613

Director: Dr. Joseph F. Janni

Web site: www.afosr.af.mil

DSN 426-7305 or 426-7307
Comm: (703) 696-7305 or (703) 696-7307
Fax: (703) 696-7320
e-mail: afosrinfo@afosr.af.mil

Editor: Jean Schaefer

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Air Force Office of Scientific Research
Communications and Technical Information
4040 Fairfax Drive, Suite 500
Arlington, VA 22203-1613

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Have an idea for a story? Contact Jean Schaefer at:
(703) 696-7305 or by e-mail at:
afosrinfo@afosr.af.mil