William P. Murphy
Midshipman First Class
United States Navy

Engine Mapping and Water Ingestion in the SR-30 Turbojet

This project involves an investigation of the effects of water ingestion through a small turbojet engine. Engine performance of the SR-30 turbojet running dry will be compared to the engine's performance with various amounts of water being atomized and injected into the inlet. A metal mesh will be placed at the exit plane of the engine and the thermal plume will be observed using an infrared camera. Observations of this plume will be used to analyze the performance of the engine.

The SR-30 turbojet engine is a small jet engine used in a classroom laboratory environment. It is located in the United States Naval Academy Propulsion Laboratory, and has not been evaluated in detail or performance mapped. Data indicates that the exit temperature probe of the engine is currently misaligned, thus generating erroneous data during laboratory exercises. As a result, prior to mapping the efficiency of the SR-30 or conducting any experimentation with atomized water, the temperature probe at the exit of the turbine will be repositioned. The position of this probe, which is used to measure the exit temperature of the SR-30 engine, must be corrected experimentally. This will involve a hands-on approach to determine how the probe is misaligned or is otherwise inaccurate. Once the probe has been repositioned, the engine temperature and pressure data will be recorded, the component efficiencies will be calculated, and the water ingestion experimentation will be conducted.

Thermodynamic analysis of SR-30 will be conducted to estimate what the optimum temperature should be, and to provide preliminary component and cycle efficiency estimates. Thermodynamic analysis will provide a calibration against the probes' repositioned temperature readings.

Initially, data will be taken from the SR-30 without any water injection system or mesh grid. This data and the method in which it is taken will be used for familiarization with the components of the system and performance of the engine. The first portion of this project will be devoted to the physical development of the engine, and the completion of the initial calculations needed in order to begin experimentation. The physical construction of the system includes building a water injection system, testing nozzles for atomization, and adding the metal mesh. After the system is constructed, testing will begin and the analysis of the system to explore the effects of atomized water on a turbojet will be investigated.

Faculty Advisers

CDR David D. Myre, USN
Aerospace Engineering Department
Professor Martin R. Cerza
Mechanical Engineering Department