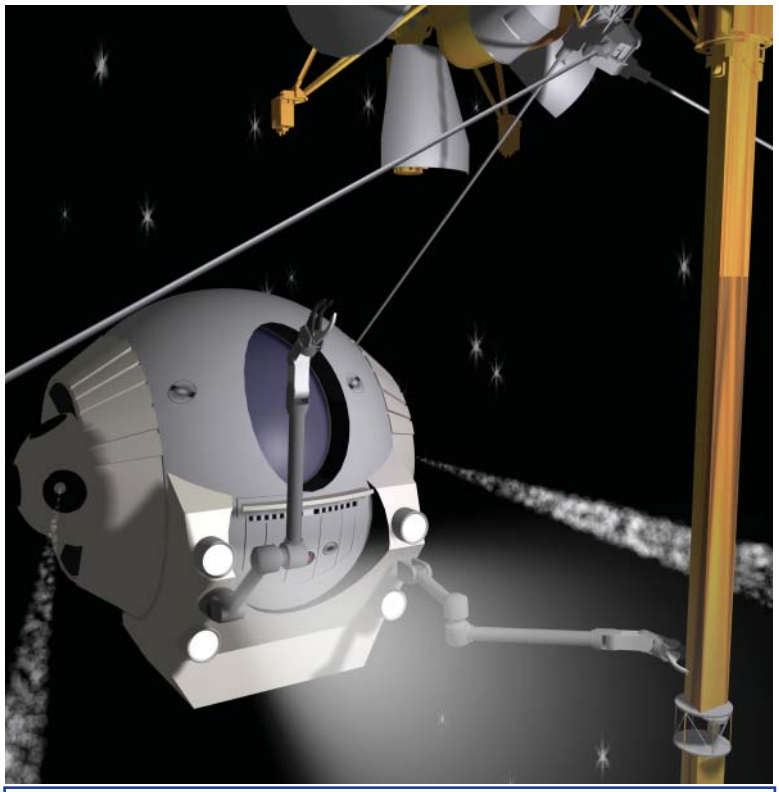
Designing Ionic Liquids for a Greener Space Frontier

Project Purpose: This research project involves using Molecular Dynamics to identify new Ionic Liquids, with chemical and physical properties, for advanced propulsion applications.



Maneuverings during an Extra-Vehicular activity (EVA) in space could be performed more efficiently by the use of new Ionic Liquids.

Understanding the Project:
The goal of the Energetic Ionic Liquids project is to use High Performance Computers, (HPCs) Computational Chemistry Materials Science (CCM) to design Ionic Liquids to replace hydrazine. There are several advantages to using Ionic liquids as fuel over Hydrazine. Hydrazine is a carcinogenic, colorless, fuming, oily liquid or white crystalline (sugar like) solid that smells like ammonia. It has a high vapor pressure, evaporates easily, and is highly toxic if inhaled or internally ingested. Hydrazine is also a lower density fuel and therefore a higher volume capacity is required to contain the fuel.

Benefits to Our Warfighters
Using ionic liquids over current rocket fuels will provide cheaper and more reliable access to space. It may also lead to the ability to travel longer distances than we are currently able to. Ionic liquids will also increase satellite on orbit life time. This means longer life spans for satellite and hopefully less “space junk” caused by satellites that are no longer active. And f nally, they will also reduce environmental toxicological hazards associated with current monopropellants like hydrazine.

IMPACTS:
- ***Replaces hydrazine a bio-hazard***
- ***Increase satellite orbit life time***
- ***Provide cheaper and more reliable access to space***

Dr. Jerry Boatz AFRL Propulsion Directorate, Edwards AFB, CA, is the principle investigator of this challenge project currently utilizing the AFRL DSRC High Performance Computers. With total hours of 2,1000,00 on Eagle and 800,000 on Falcon. Successful numerous runs using HPC codes, GAMMES, Wchem and ACEs .