

Marshall Enriched Storable Oxidizer

R. Dalton Hicks - UAH Propulsion Research Center

Overview

Based on previous work for DARPA with NASA MSFC, it was discovered Nitrous Oxide (N_2O) can be dissolved into Nitrogen Tetroxide (N_2O_4), resulting in a non-cryogenic, storable oxidizer with favorable performance characteristics and with minimized toxicity and minimized detonation attributes over nitrous oxide alone.

Current Research

Current Research is into the use of MESO as an alternative to Mixed Oxides of Nitrogen (MON) and pure Nitrogen Tetroxide (NTO) in upper stage propulsion systems. Nitrous Oxide acts to both depress the freezing point of NTO, reduce its volumetric toxicity, and increase its vapor pressure.

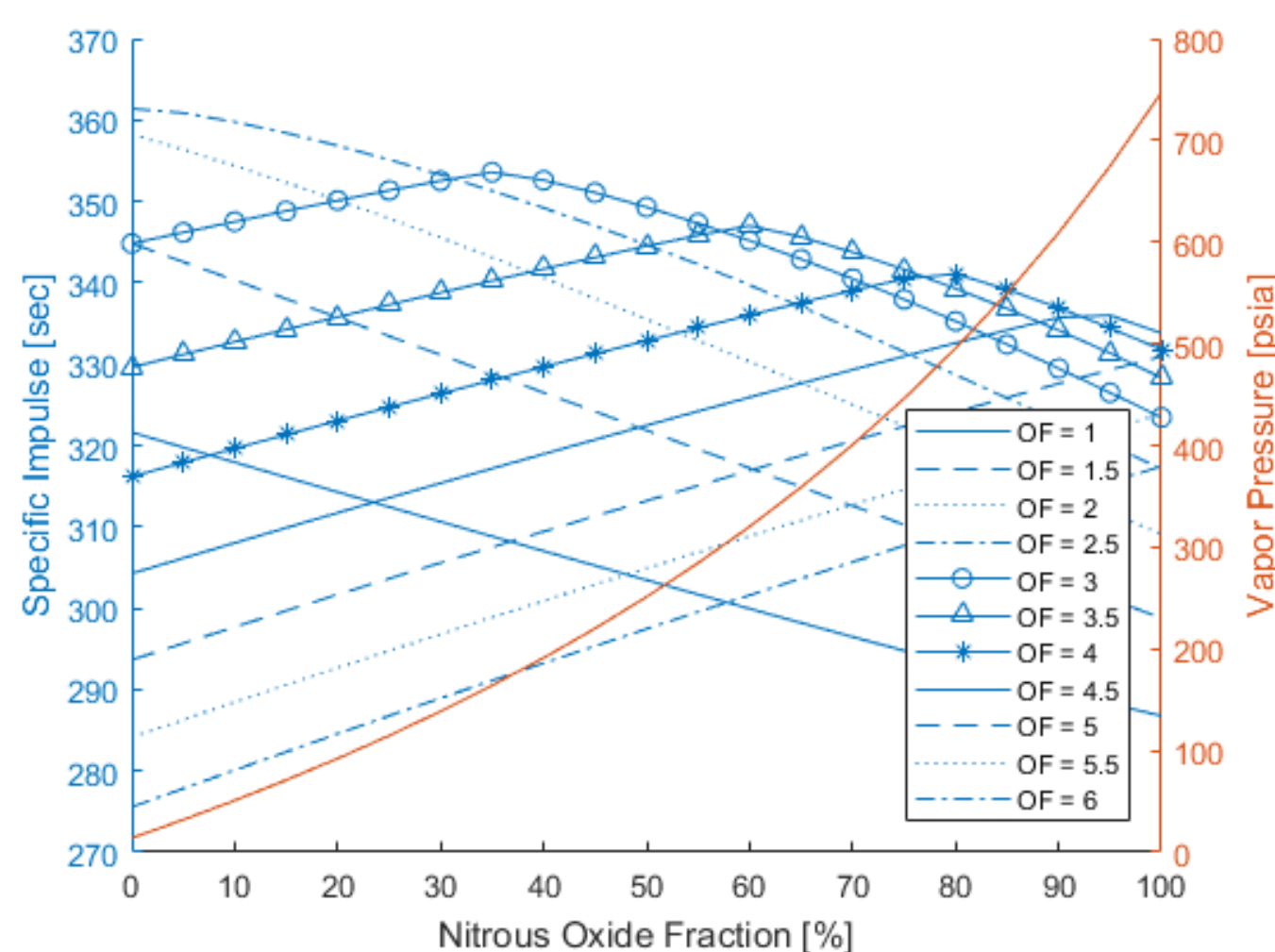


Figure 1: N_2O Fraction Effects

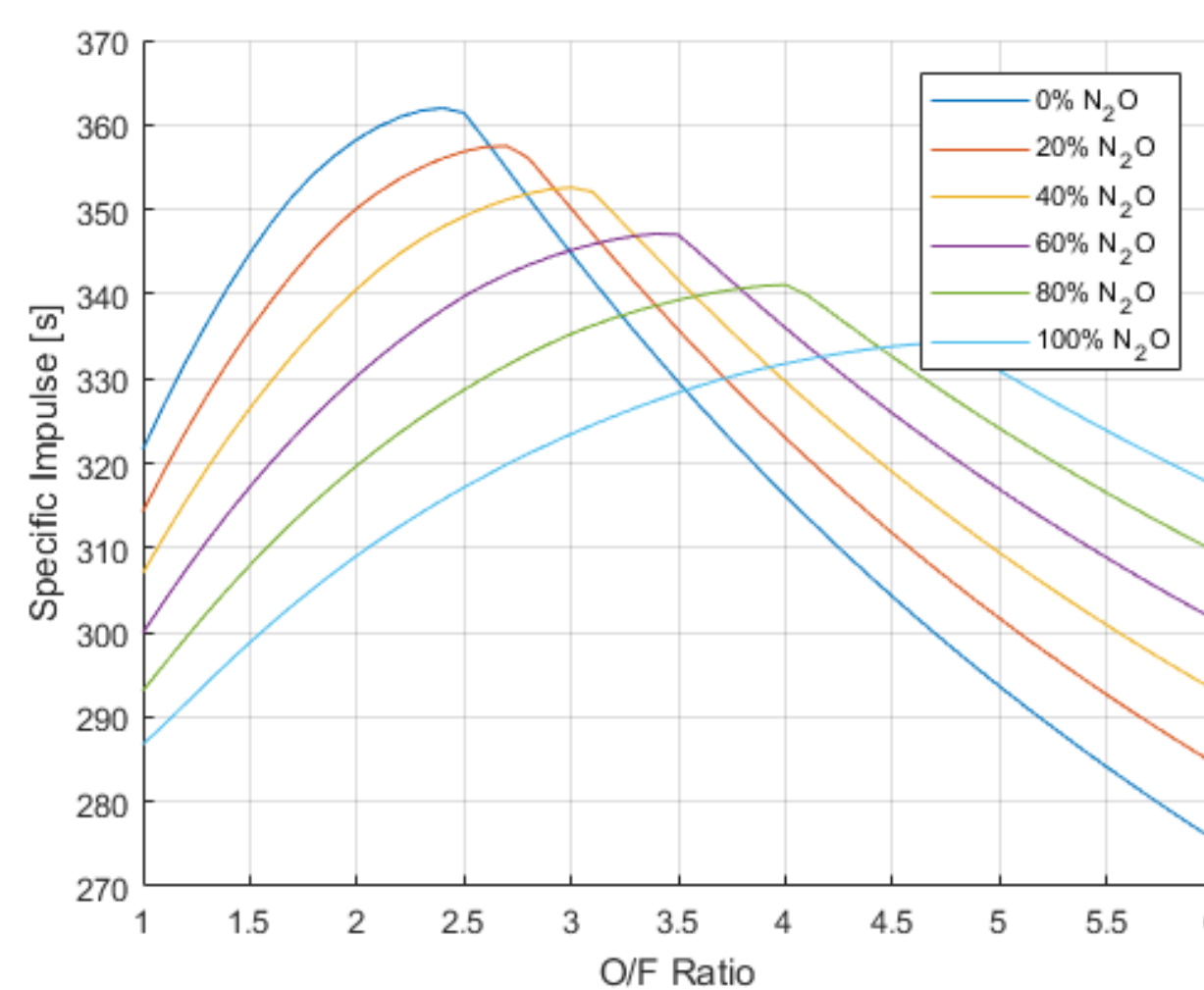


Figure 2: O/F Ratio for different Fractions



Figure 3: Original Test Stand at UAH PRC¹

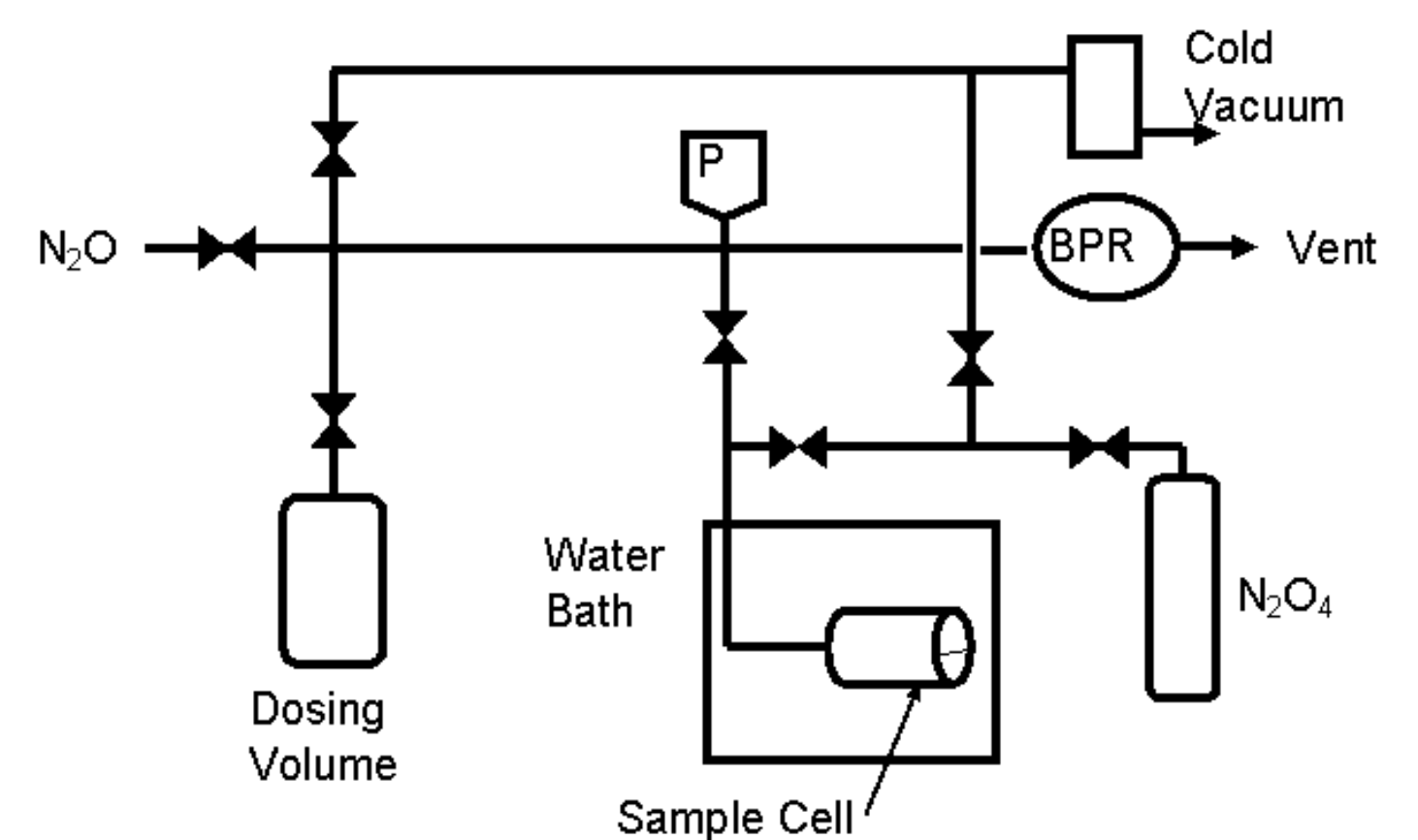


Figure 4: Solution Synthesis Apparatus¹

Impact & Conclusions

The impact of this oxidizer development is advances in upper stage propulsion systems and future low structural mass upper stages with increased performance for longer deep space missions and novel propulsion system design.

Acknowledgements

I would like to thank the following for their continued aid with this research.

- Alabama Space Grant Consortium
- UAH College of Engineering
- UAH Propulsion Research Center
- ¹Roger Herdy of GES Inc.
- Patton Downey of Marshall Spaceflight Center
- Dr. Robert Frederick

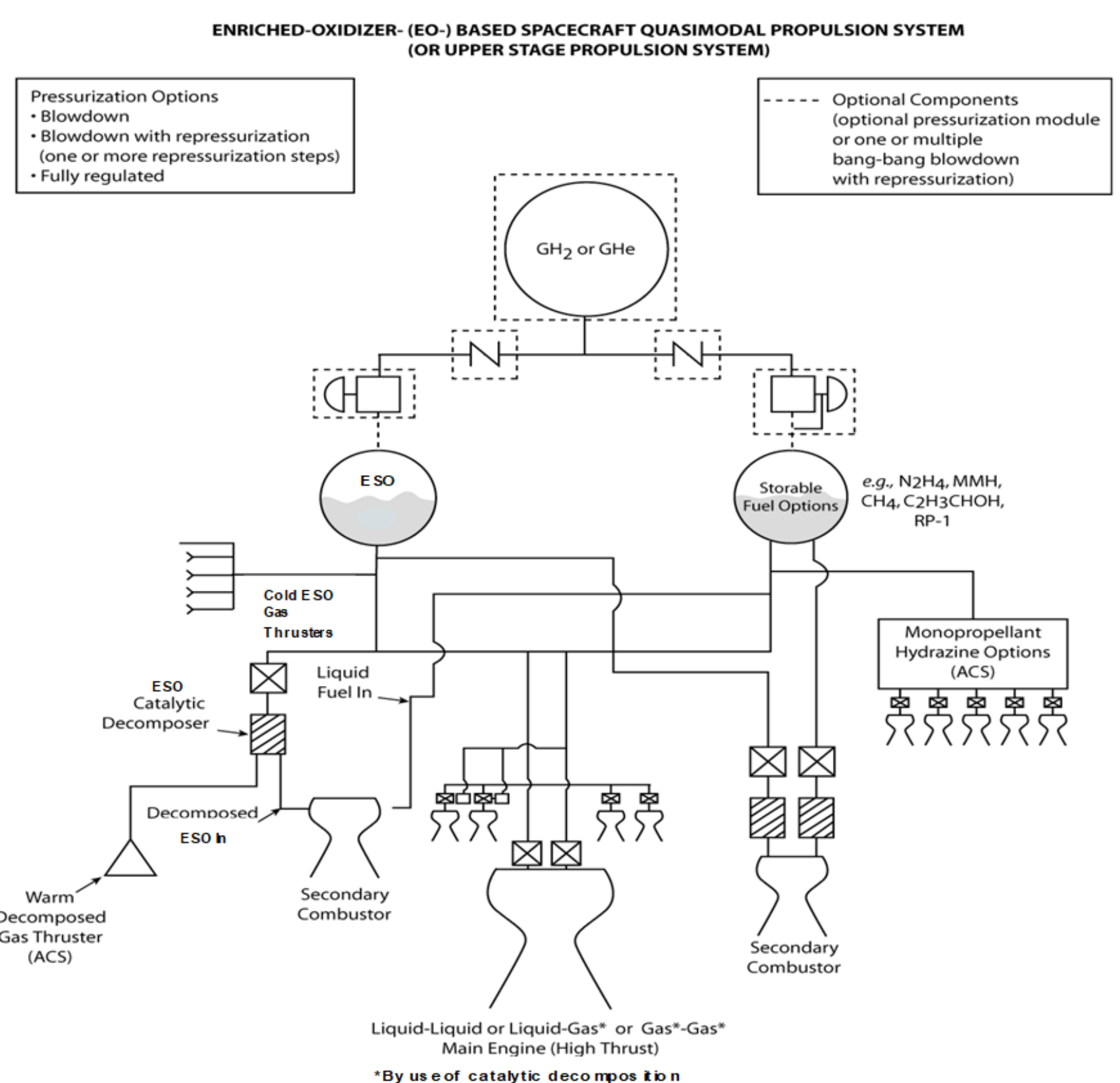


Figure 5: Multi-Modal Propulsion System¹