Nuclear Thermal Propulsion Engine Technology Maturation Plan

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Nuclear and Emerging Technologies for Space 2018 Conference
Las Vegas, NV
26 February – 1 March, 2018
Partners and Participants

• Support and Funding
  – This work is being done under the Nuclear Propulsion Project Office (NPPO) at NASA Marshall Space Flight Center
  – The NPPO is funded through the NASA Game Changing Development (GCD) Program of the Space Transportation Mission Directorate (STMD)

• This Technology Maturation Plan has been created with the hard work of:
  – Nuclear Propulsion Project Office
  – Aerojet Rocketdyne
  – BWX Technologies
Mission Architecture

- Engine requirements derived from a series of potential Mars missions:
  - Lunar Gateway aggregation/assembly
  - LDHEO departure
  - SLS 8.4m fairing
  - Three 25,000 lbf engines, Isp of 900s
Technology Maturation Plan (TMP)

TMP Objectives

• The TMP is a potential development plan for NTP technologies that includes current technology development and potential growth into the ground test of a protoflight NTP engine system.
  - General approach is to minimize early costs while systematically eliminating risks
  - Early focus on reactor fuel development
  - Technology gaps between current liquid engine state of the art and NTP engine needs
  - Ground test facility technologies
Scaled Facility Tests / Demonstrations

15
Rocket Exhaust Capture System (RECS) Subscale & Facilities Design

16
RECS SS Phase II Tests

17
H2 Heater Design & Fab
TMP, Prototype Reactor Development

Pre-Decisional, For Discussion Purposes Only
Full Scale Facilities Design & Preparations

21  Full Scale Test Facility Conceptual Design

22  Full Scale Facility Design & Fabrication

27  Assemble Engine / Reactor #1 on Test Stand
TMP, Prototype Engine Development and Test

Engine / Reactor Full Scale Cold Flow Tests (Non-nuclear)

Powerpack Critical Components Design, Fab & Testing

Prototype Engine Development

Full Scale Full Power Testing (Nuclear Powered)

28. Full Scale Test Series - Zero to Low Power Engine #1 (Nuclear Facility Controlled LH2 Supply initially with transition to TPA LH2 supply using engine control system)

29. Remove Test Engine #1 / Replace with Test Engine #2 Only if required

30. Full Scale Full Thrust Test Series Base Plan: Engine 1 Alternate: Engine 2

Engine Manufacturing

26a. Manufacture Prototype Test Engine #1

26b. Manufacture Prototype Test Engine #2

NTP Prototype Test Engine Final Design
Summary

NTP Technology Maturation Plan Summary

• The TMP is a potential development plan for NTP technologies that includes current technology development and potential growth into the ground test of a protoflight NTP engine system. The integrated approach to technology maturation, prototype engine development and a ground test demonstration offers a pathway to change NTP from an “advanced” propulsion concept forever waiting for its chance, to a demonstrated propulsion technology ready for flight engine development.