



Project Accomplishment Summary

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Sandia National Laboratories

Operated for the U.S. Department of Energy by
Sandia Corporation
Albuquerque, New Mexico

PROJECT ACCOMPLISHMENTS SUMMARY

Cooperative Research and Development Agreement (#1787.00)

between **Sandia National Labs** and **Northrop Grumman Systems Corporation**

Note: This Project Accomplishments Summary will serve to meet the requirements for a final abstract and final report as specified in Article XI of the CRADA.

Title: Solar Electric Power Study

Final Abstract:

The Northrop Grumman Aerospace Systems (NGAS) Team, which includes Sandia National Laboratory (SNL) and the University of Michigan (UM), examined NASA's objectives for a flight demonstration of solar electric propulsion technology and developed a solar dynamic mission concept, based on the use of a Brayton-cycle engine that is readily extensible to a full-scale system. In addition, it provides opportunities for beneficial teaming with other organizations, has applications beyond Earth orbit, and offers an effective pathway for NASA to invest in enabling technology. Our concept incorporates advanced space technologies developed for such programs as the James Webb Space Telescope and the Jupiter Icy Moons Orbiter, and extensive development of Brayton systems performed by SNL for the Department of Energy, with low-risk spacecraft technologies from NGAS's Eagle Spacecraft Product Line and COTS equipment, such as BPT-4000 Hall-effect thrusters and Astromesh deployable reflectors. The purpose of this work is to meet NASA's goal of providing technology for medium-range space flight at approximately 300 kWe scale.

Background:

Sandia is developing a supercritical carbon dioxide Brayton cycle. This technology is ideal for increasing power conversion efficiency. This project is the first to consider the use of the Brayton technology in combination with solar energy for use in space applications. The work is needed in order to provide a robust alternative to photovoltaic space (PV) flight power due to the severe technical challenges in scaling PV systems to the high power levels needed for NASA's objectives.

Description:

This CRADA was formed so that a team of Northrop Grumman Aerospace Systems (NGAS), Sandia National Laboratories, and the University of Michigan could respond to a NASA Request that specifically asked for ideas for this type of work. NGAS was the lead on this proposal. The work was funded by NASA under Contract Number #NNC12CA13C. Sandia National Laboratories provided power conversion expertise related to the sCO₂ Brayton cycle, and the University of Michigan provided expertise related to propulsion. If completed, this work would provide a means for satellite placement and mid-range space missions. Although the proposal was completed by the team, NASA funding was reduced and this project was not funded further.

Benefits to the Department of Energy:

If this work is continued in the future, it will aid in development of the sCO₂ Brayton cycle, which will dramatically increase the power conversion efficiency for all types of electricity generation, including space, nuclear, fossil, and solar power.

Economic Impact:

This project funded basic R&D at Sandia National Laboratories for space applications. If funded, future contracts totaling up to ~\$350 for local construction of a 30 kW space tug and a 300 kW mid-range space vehicle were expected.

Project Status:

The work for which this CRADA was created is complete. No foreseeable pathway to sustain the CRADA exists. A preliminary design was completed by the team and reviewed by NASA.

ADDITIONAL INFORMATION

Laboratory/Department of Energy Facility Point of Contact for Information on Project

Bobby Middleton
bmiddle@sandia.gov

Company Size and Points of Contact

Northrop Grumman Aerospace Systems
James Munger 310-813-1448

CRADA Intellectual Property

The system report is NGAS business proprietary.

Technology Commercialization

No technology was developed for commercialization via this CRADA.


Project Examples

A design report is available.

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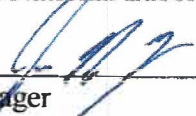
This summary has been approved for public release by Sandia and Northrop Grumman Systems Corporation

Sandia National Laboratories

By 
Bobby Middleton
Principal Investigator

4-22-2015
Date

Sandia National Laboratories

By 
Manager
WFO/CRADA Agreements

4.10.15
Date

Northrop Grumman Systems Corporation

By _____
Title:

Date

In order to expedite the process, if we do not receive your signed reply by 06/29/2015 we will assume your concurrence for the release of this document to the public.