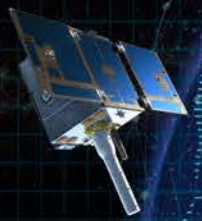
General Atomics Electromagnetic Systems

Presentation to the Space Technology Industry-Government-University Roundtable (STIGUR)

October 4, 2023

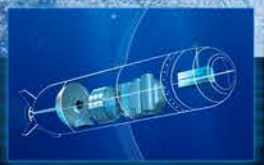










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GENERAL ATOMICS ELECTROMAGNETICS

Business Segments

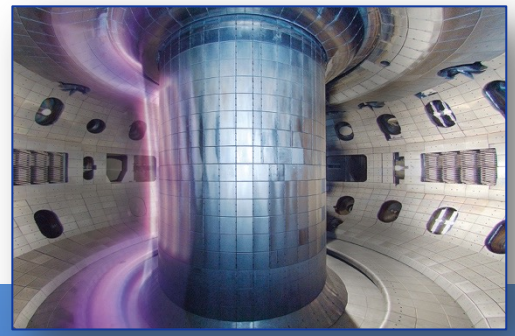
ASI

Leading designer and manufacturer of proven, reliable Remotely Piloted Aircraft (RPA) systems, radars, and electro-optic and related mission systems, including the Predator® RPA series and the Lynx® Multi-mode Radar.

EMS

Develops technologies for the Dept. of Defense, the Dept. of Energy, and commercial customers.

GA is a world leader in the application of electromagnetic technologies to aircraft launch and recovery, projectile launch, pulse power systems, lasers and advanced sensors.

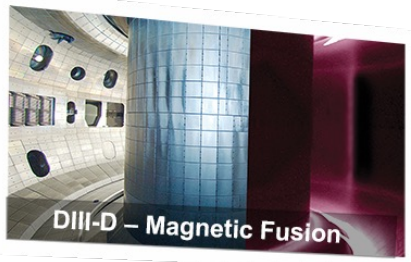


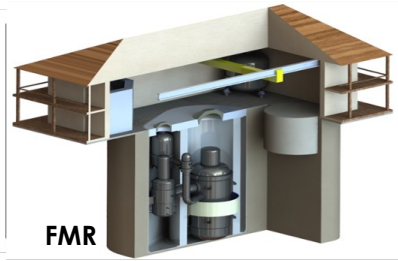
ENERGY

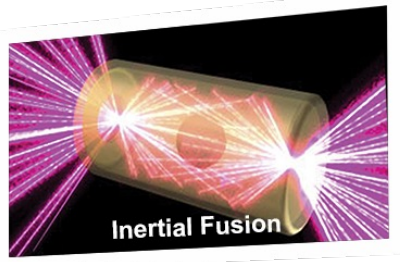
Develops sustainable and alternative energy solutions and materials.

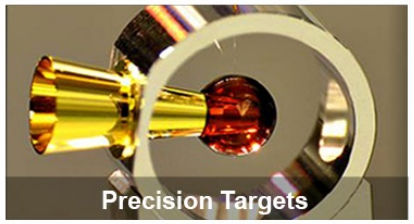
Operates the DIII-D National Fusion Facility.

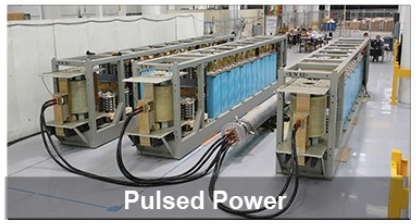
General Atomics Advanced Technologies







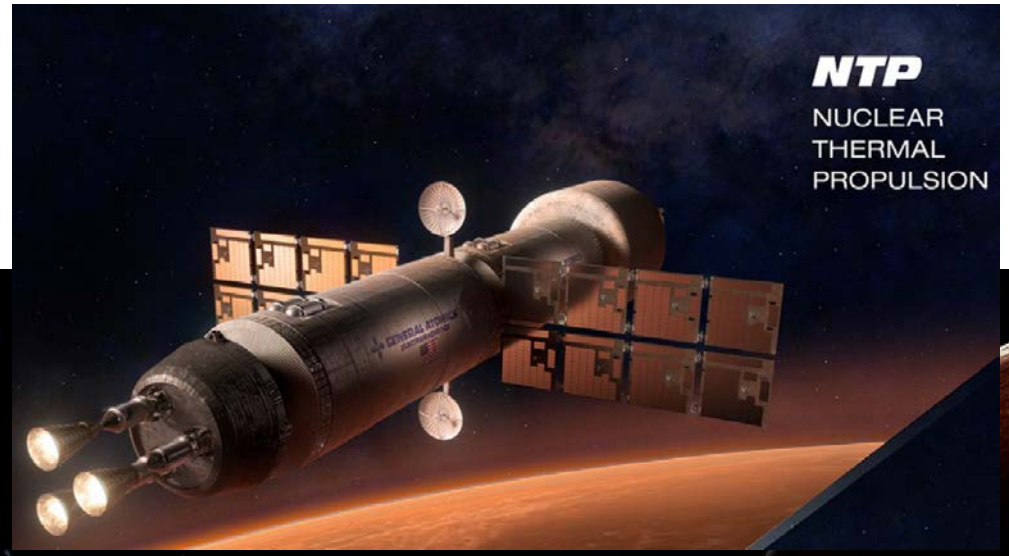




Energy, Space, Airborne UAS, and Marine Systems

GENERAL ATOMICS ELECTROMAGNETICS

General Atomics is Building on Past Experience to Design Safe and Unique Reactors for Today's Space Missions



1955-73 Project Rover

1955-65 SNAP-10A

1958 ONWARD TRIGA®

1970-90 SP-100, TFE In-core Thermionic Reactor

2003-05 Project Prometheus, Nuclear Electric Propulsion

2008 ONWARD Energy Multiplier Module (EM^2)

2019 ONWARD Space Nuclear Propulsion & Power:

Mid 2020s — Nuclear Thermal Propulsion (NTP) for DoD demonstration

Late 2030s — NTP for Mars demonstration

2020 ONWARD Fast Modular Reactor:

Late 2020s — Fission Surface Power demonstration

General Atomics Builds on Past Experience to Develop Safe, Unique, Reactors for Tomorrow's Needs

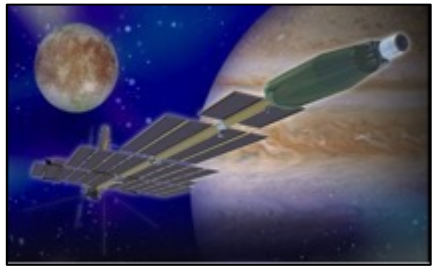
In Space

1955-1965:
SNAP-10A
UZrH fuel

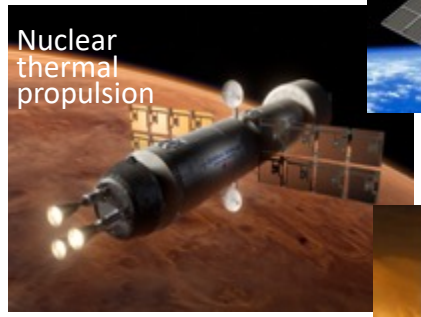
1955-1973:
PROJECT ROVER
6 tons of UC fuel kernels

1970s – 1990s: SP-100, TFE In-Core Thermionic Reactor

2003-2005:
Project Prometheus
Nuclear Electric Propulsion



2019-present
Space Nuclear Propulsion and Power
Missions requiring power and/or high thrust



Nuclear electric propulsion

Fission surface power

On Earth

1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020

1958-present TRIGA®

1967-1974 Peach Bottom

1979-1989 Ft. St. Vrain

1997-2010 GT-Modular Helium Reactor

2008-present Energy Multiplier Module

2020-present
Fast Modular Reactor
Power for a distributed energy grid

GENERAL ATOMICS ELECTROMAGNETICS

STIGUR Meeting Specific Comments

- **GA-EMS designs mission-specific technology solutions. *One size may not necessarily fit all missions.***
- **NASA Nuclear Thermal Propulsion (NTP):**
  - On contract for reactor and fuel design for mission to Mars needs
  - Made and successfully tested fuel to survive hydrogen temperature conditions equivalent to high Isp needs (work also performed during the DRACO Phase 1 program for DARPA)
- **Fission Surface Power (FSP) and Nuclear Electric Propulsion (NEP):**
  - Near-term mission success on lunar surface necessitates high TRL solutions
  - Detailed trade studies show that liquid metal cooled reactor with Stirling power converters would yield lowest reactor mass when high-assay low enriched uranium (HALEU) is used, especially for low power applications of less than ~100 kWe
  - Reactor with Brayton power conversion designs are more suitable for higher power
  - Low mass heat pipe reactor solutions are more suitable for highly enriched nuclear fuels and low power applications