LA-UR-13-21558
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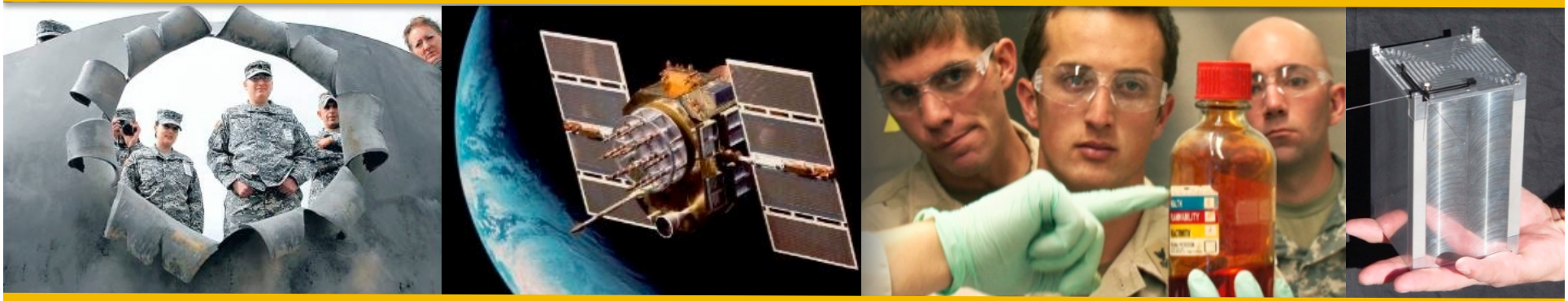
Title:	Los Alamos: A National Security Laboratory Science & Engineering Solutions
Author(s):	Wallace, Terry
Intended for:	2013 Pacific Operational Science & Technology Conference, 2013-03-05/2013-03-08 (Honolulu, Hawaii, United States)



Los Alamos: A National Security Laboratory
Science & Engineering Solutions

Terry Wallace
Principal Associate Director for Global Security
Senior Intelligence Executive

March 7, 2013

Los Alamos is essential to national security, global security, and energy security

Three missions

- Stockpile Stewardship
- Global Security
- Energy Security

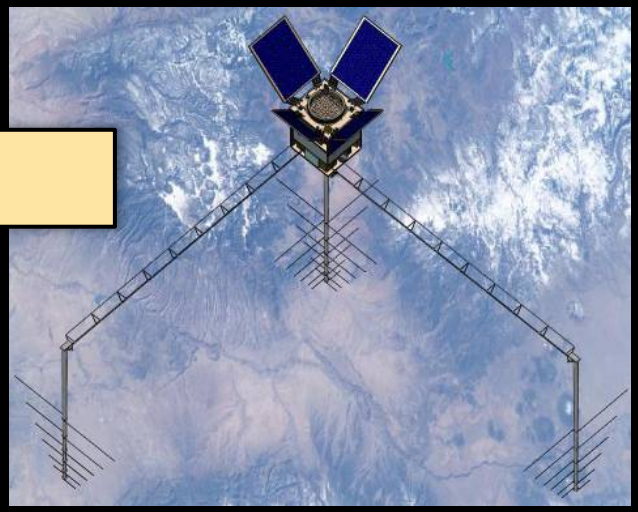
We anticipate, innovate, and deliver solutions

We span the spectrum from **Discovery** through **Applied Science** to **Prototypes**

We use the outstanding science, engineering, and technology from our core stockpile stewardship mission for other national needs

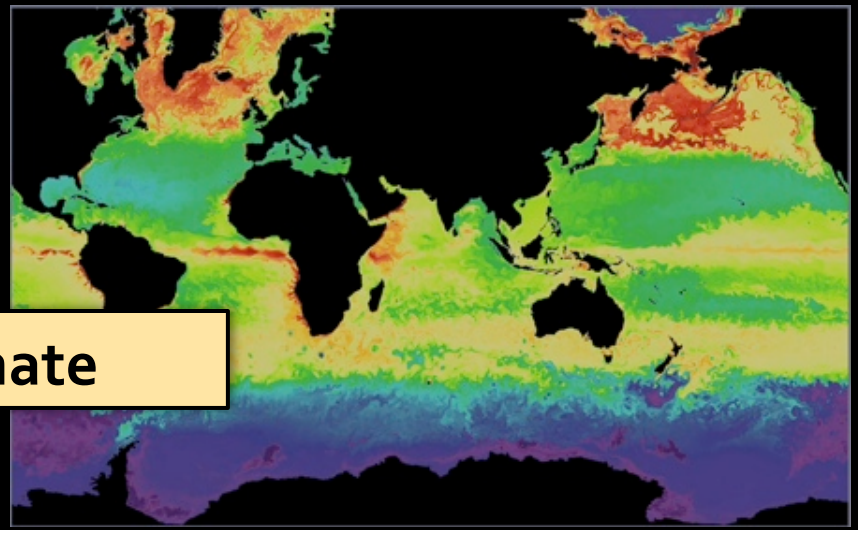
National Security

Warfighter



Space

Explosives

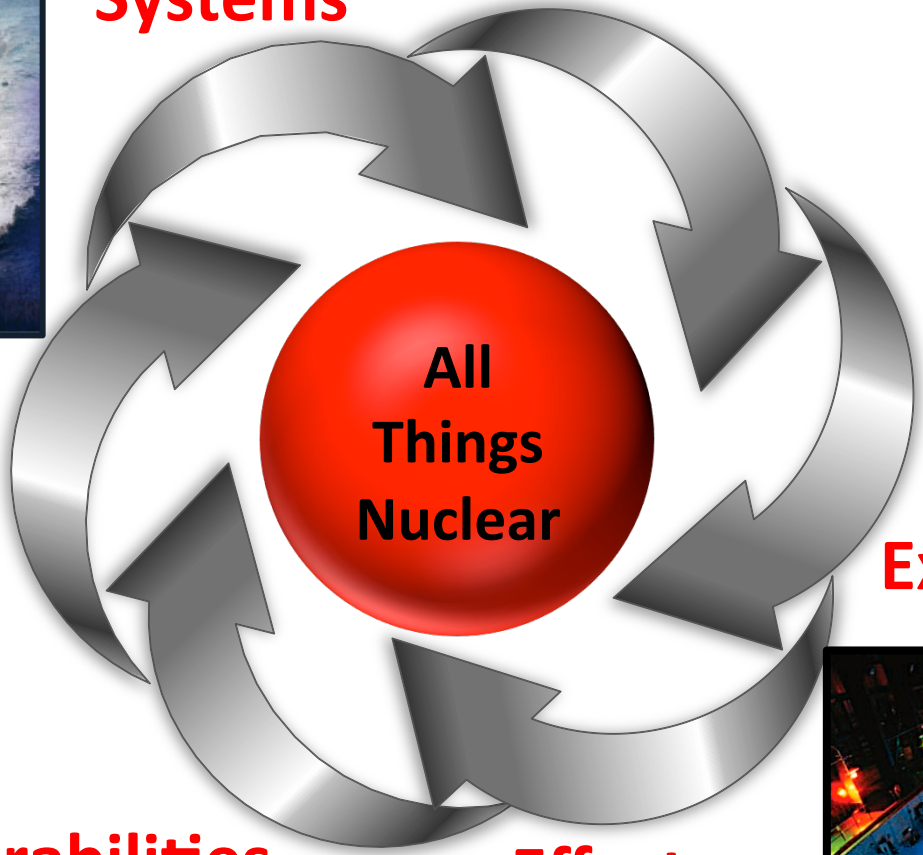


Climate

Los Alamos Mission: All Things Nuclear

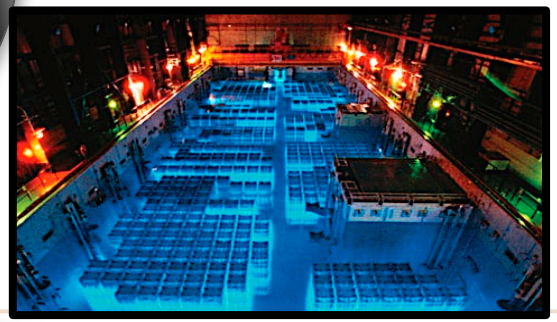
Systems

Materials



Radiological

Explosives



Vulnerabilities

Effects

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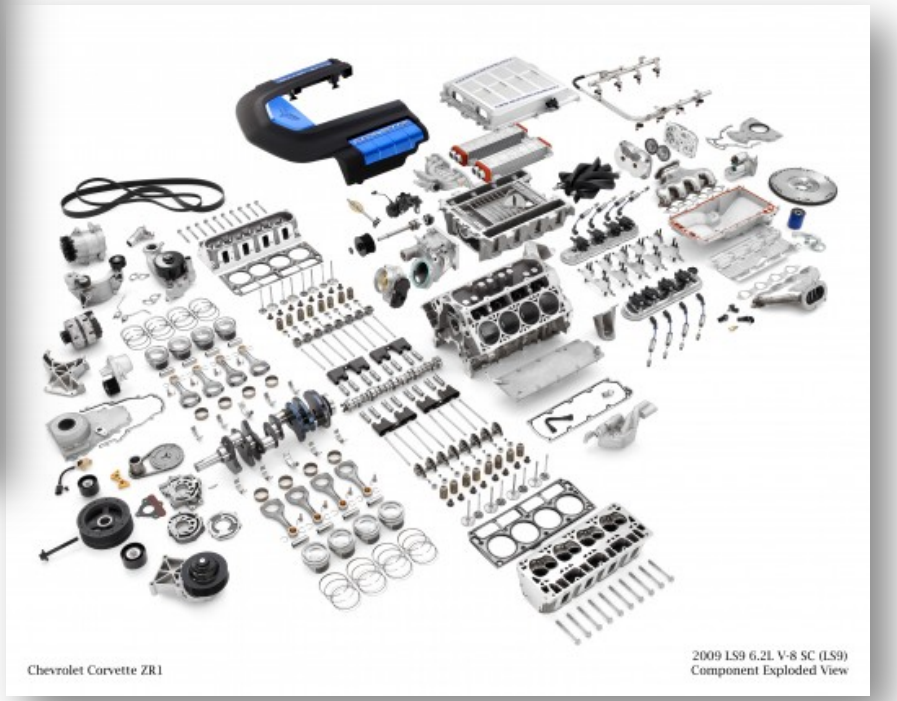
EST. 1943

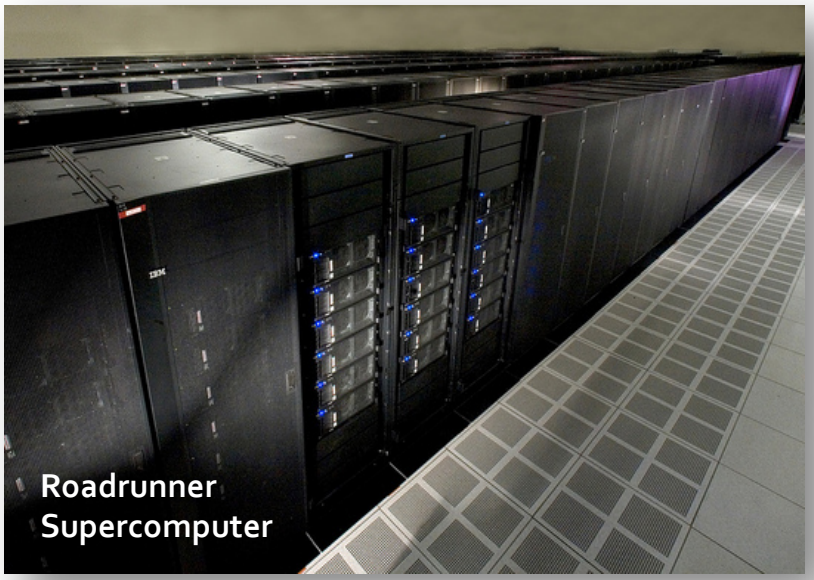
Mission: Stockpile Stewardship

How could you ensure this worked, *without starting the engine*?

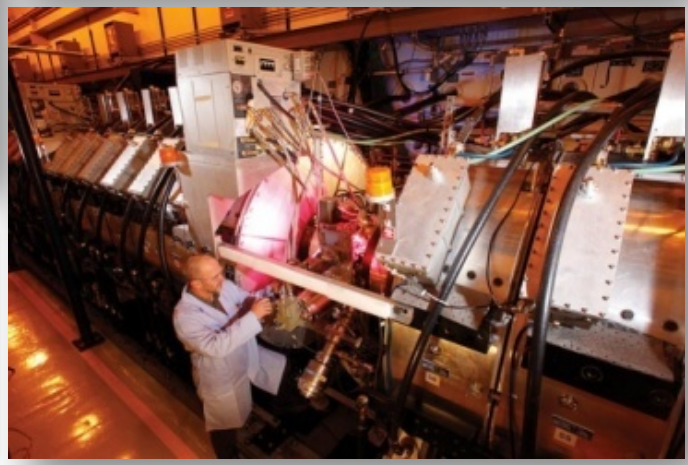


The United States faces a much more complex challenge in caring for its nuclear stockpile.

Modeling, simulation, radiography, and non-nuclear testing help provide assurance


Roadrunner Supercomputer


DARHT – dual axis, 3D X-ray movies



Confidence without nuclear testing requires fundamental understanding of science and engineering

GS Mission: Protect against the Nuclear Threat

"We will provide expert knowledge and operational capability for counterterrorism, counterproliferation, and nuclear threat response, domestically and internationally."

—US Department of Energy/NNSA Strategic Plan, 2011

Los Alamos Global Security responds across the spectrum of Nuclear Threats

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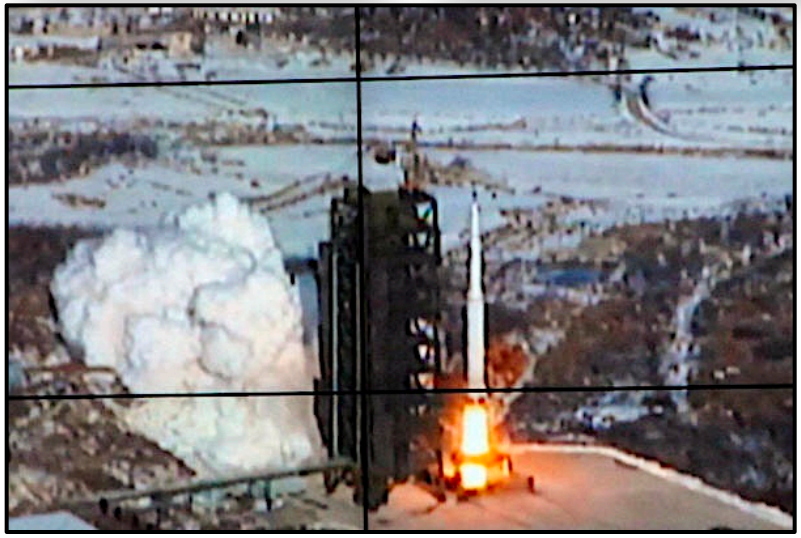
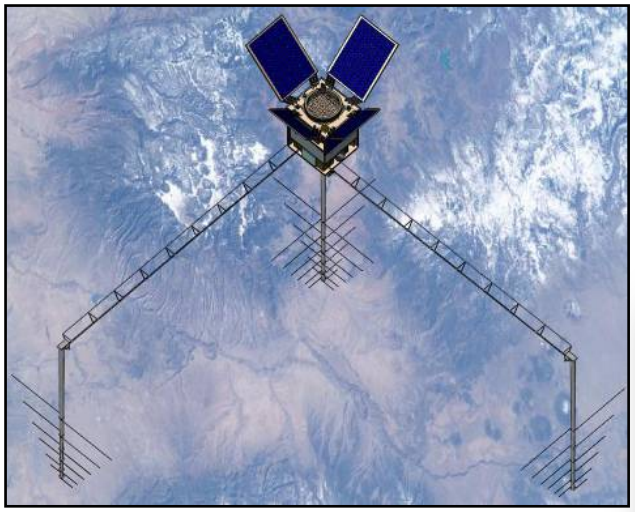
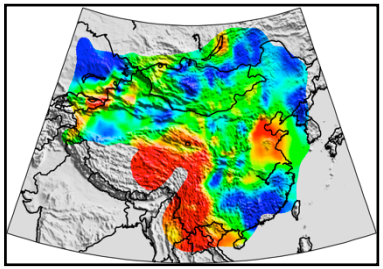
Current Risks: Threats from weapons of mass destruction and terrorism



- Reducing proliferation threats
- Safeguarding and detecting radiological material
- IAEA inspector training
- Counterterrorism
- Critical infrastructure modeling
- Disaster response

Nuclear Nonproliferation:
Los Alamos R&D, deployments, and policy support





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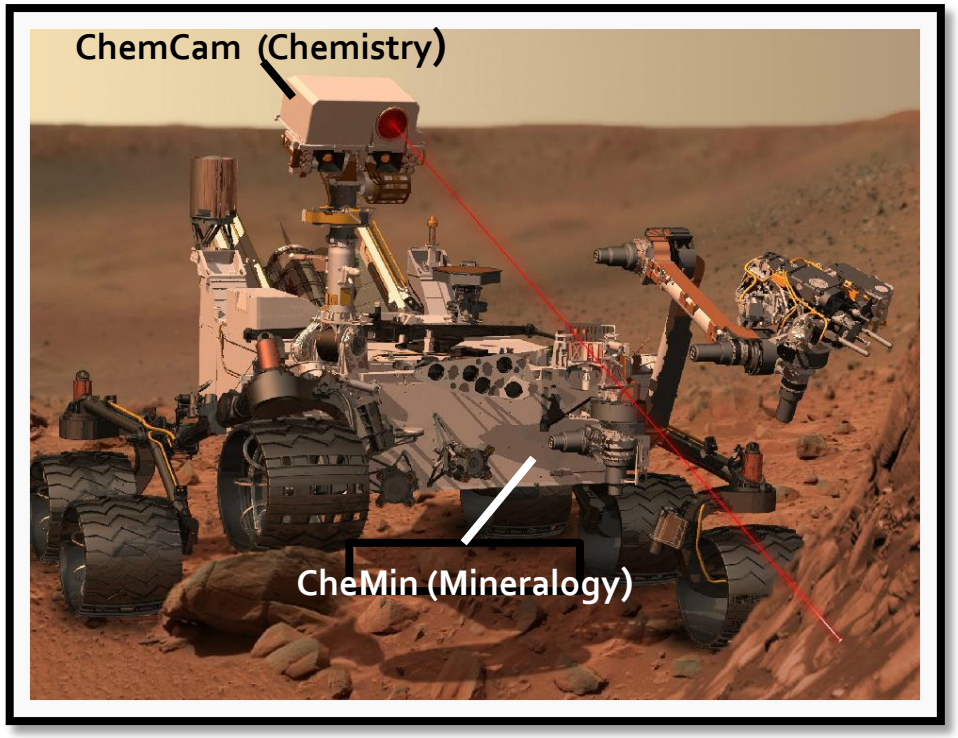
The Science of Sensors: Los Alamos technology used on the Mars Curiosity Rover — and to detect nuclear material



Inspiration for Small Compact Reactors

- As the premier national security laboratory, it is our mission to innovate and mature nuclear and other alternate energy technologies to meet DoD operational energy requirements, including at the forward operating bases.
- We believe that we have a solution to this most urgent national security problem.
- We have invested Laboratory Directed Research and Development funding to mature and demonstrate some of the key technologies and materials that simplify reactor operations and minimize safety and proliferation risk.

"Unleash us from this tether of fuel"
General Mattis, Centcom

Most IED fatalities occur while protecting fuel convoys

Net-Centric Warfare means more energy per soldier; sustainable energy at forward locations is a vital need.

Reference	kW per Soldier	Company (150) kW	Battalion (600) kW	Brigade (3,500) kW	Fuel (gal/d)
CENTCOM Sandbook	0.7	105	420	2450	4410
USAF Expeditionary Airfield	1.3a6	555	550	3300	5940
Base in a Box	1.8	270	1080	6300	11340
CONUS Base (+ Hospital)	3.7	--	--	12950	23310

"For every gallon of generator fuel used, it took seven gallons to transport it there. We have suffered 80 American fatalities while protecting nearly 2000 convoys required per year…."
Marine Energy Assessment Team
(2009, Afghan Theater Assessment)

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LANL Conceptual Design:
Compact, Safe, Secure, and Mobile

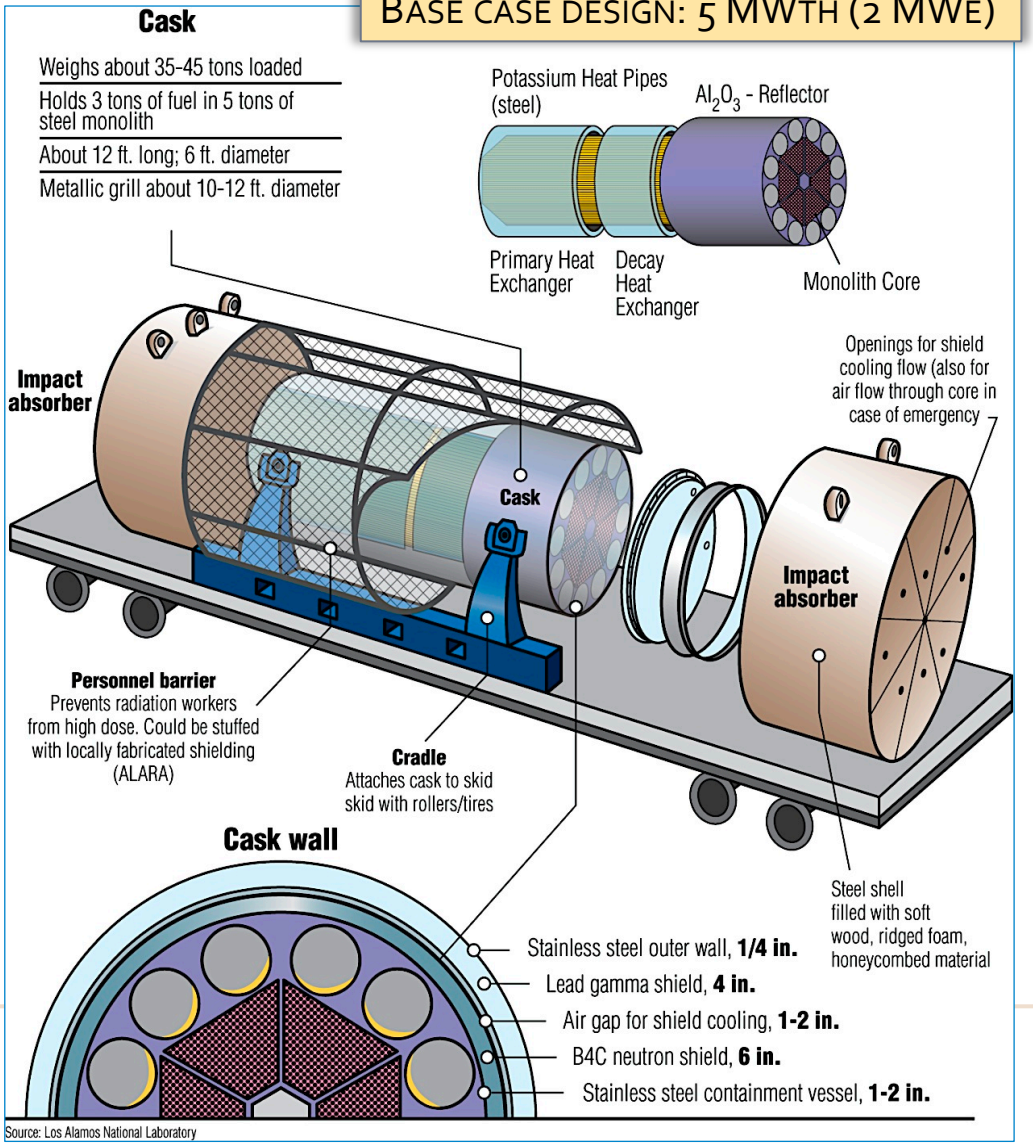
Power: 0.5 to 10 MWe
- Power conversion: coupled to conventional generator
- Heat rejection: Air to air Brayton or could use waste heat for other missions

Mobile reactor in standard shipping cask
- Designed to be robust (monolith core)
- Boron carbide shield also acts as 'armor'
- Transportation 'cask' for wheel-in/out

Controlled and monitored locally and remotely
- Self regulation for power output
- Simplified control

Reliable and safe (3 independent means of removing decay heat, 2 independent means of shutdown)
- Heat pipe cooled core (no active components)
- Passive heat removal following shutdown
- Large heat capacity

BASE CASE DESIGN: 5 MWTH (2 MWE)



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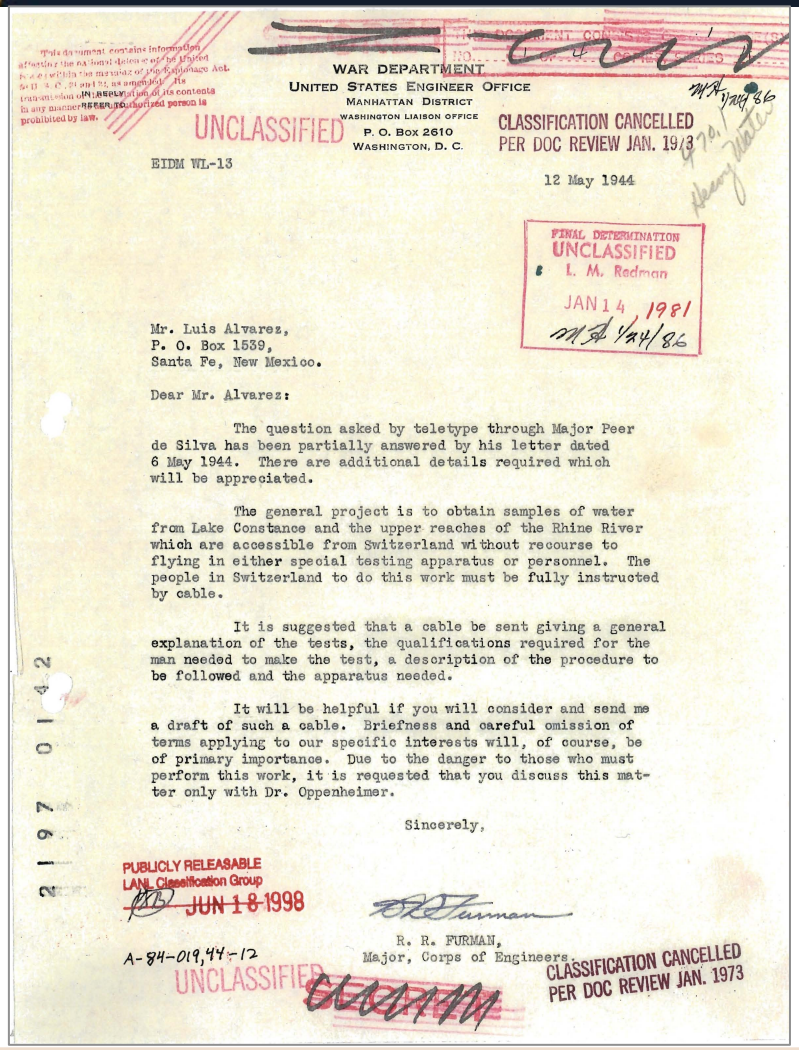
Intelligence Programs



WAR DEPARTMENT
UNITED STATES ENGINEER OFFICE
MANHATTAN DISTRICT
WASHINGTON LIAISON OFFICE
P. O. BOX 2610
WASHINGTON, D. C.

UNCLASSIFIED

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 19/3

EIDM WL-13

12 May 1944

FINAL DETERMINATION
UNCLASSIFIED
L. M. Redman
JAN 14 1981

Mr. Luis Alvarez,
P. O. Box 1539,
Santa Fe, New Mexico.

Dear Mr. Alvarez:

The question asked by teletype through Major Peer de Silva has been partially answered by his letter dated 6 May 1944. There are additional details required which will be appreciated.

The general project is to obtain samples of water from Lake Constance and the upper reaches of the Rhine River which are accessible from Switzerland without recourse to flying in either special testing apparatus or personnel. The people in Switzerland to do this work must be fully instructed by cable.

It is suggested that a cable be sent giving a general explanation of the tests, the qualifications required for the man needed to make the test, a description of the procedure to be followed and the apparatus needed.

It will be helpful if you will consider and send me a draft of such a cable. Briefness and careful omission of terms applying to our specific interests will, of course, be of primary importance. Due to the danger to those who must perform this work, it is requested that you discuss this matter only with Dr. Oppenheimer.

Sincerely,

R. R. FURMAN,
Major, Corps of Engineers.

2197 01 42

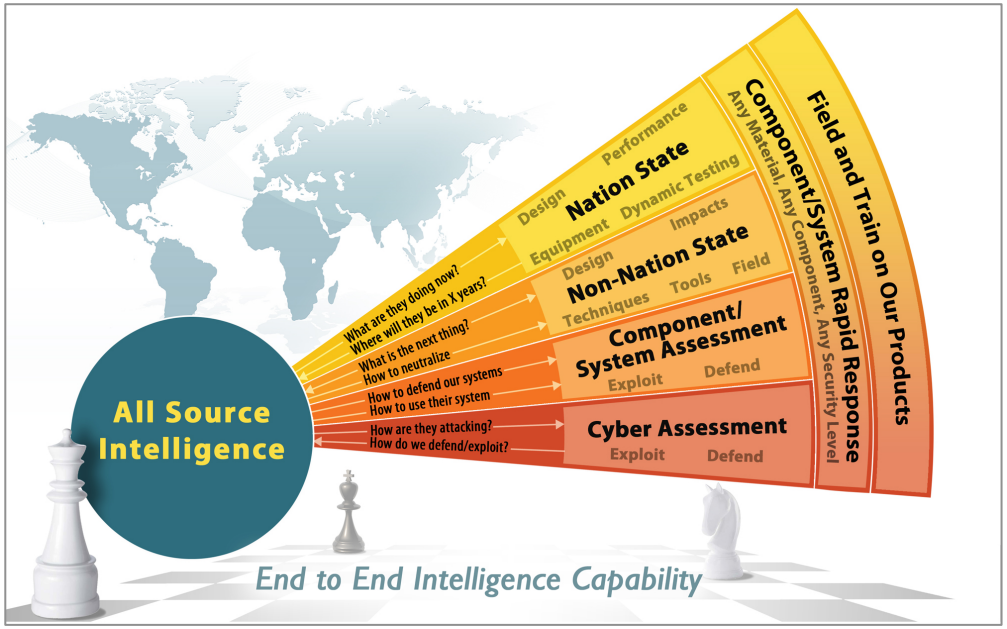
PUBLICLY RELEASABLE
LANL Classification Group
JUN 18 1998

A-84-019,44-12

UNCLASSIFIED

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

Los Alamos has been solving the nation's most crucial and complex challenges since 1943



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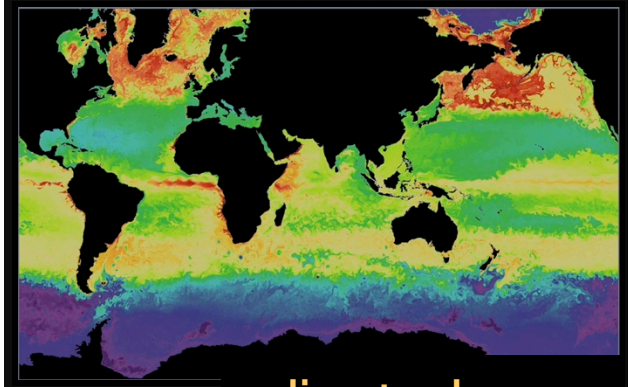
Emerging Threats: A Changing Planet



climate change

environmental insult

price of indium

foreign nuclear aspirations

2030: Concerns

9 Billion People

Dramatic Shift
in Economic Balance

Asymmetric Military Power