

# Lessons from Improving Multiagency Coordination of Launch Approval for Nuclear Material

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*Unrestricted distribution*

*Note: A full acronym list appears at the end*

Version control:

Rev. A - 12/1/25

Rev. A is the original version

*INSRB evaluates quality, identifies significant gaps, recommends areas for additional analysis, and advises the head of the sponsoring agency (US Government launches) and the Secretary of Transportation (commercial launches, upon request), all per NSPM-20*

# Preamble

## Disclaimer:

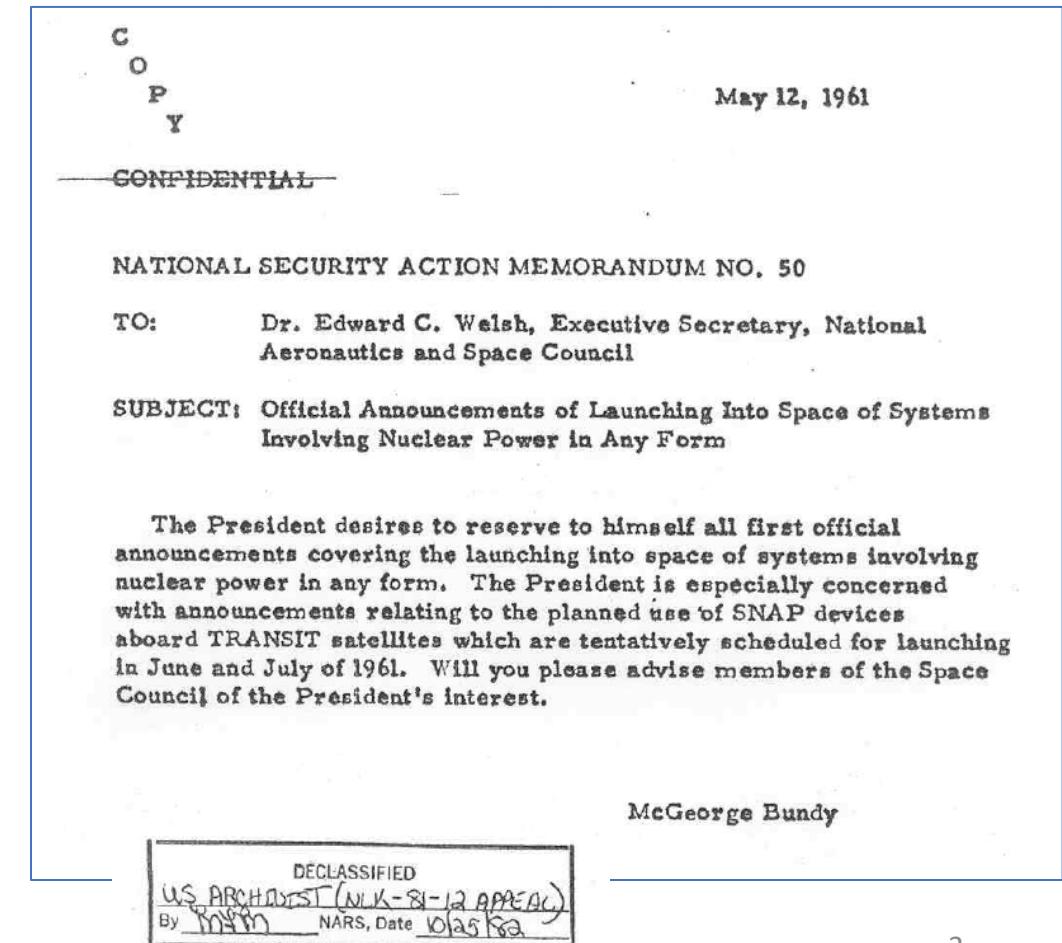
- Presentation material represents established interagency and INSRB positions
- All remarks not citing established positions are solely the view of the presenter

## INSRB Participating agencies:



# The Origins of Interagency Nuclear Safety Review

- 1961 – NSAM 50 – *The President should know first*
- 1963 – NSAM 235 – *ok, not about everything*
- 1963 – *DoD and AEC work out more formalized interagency review approach...*
- 1965 – NSAM 50 (revised)
- 1965 - *A Recommended Approach to “Interagency Nuclear Safety Review of Aerospace Nuclear Systems,” Report to the Administrator of NASA*
- 1970 – *Updated review approvals procedures for “minor” sources*



# The Prior “Modern Era”

- 1977 – PD/NSC-25 – *stabilizing and codifying the process*
- 1995 – Revision to PD/NSC-25 – *adoption of using A2 values*
- 1996 – Revision to PD/NSC-25 – *adjusted text regarding OSTP role*

A summary of this information can be found in Section 2.1 of the document at <https://ntrs.nasa.gov/citations/20230002528>



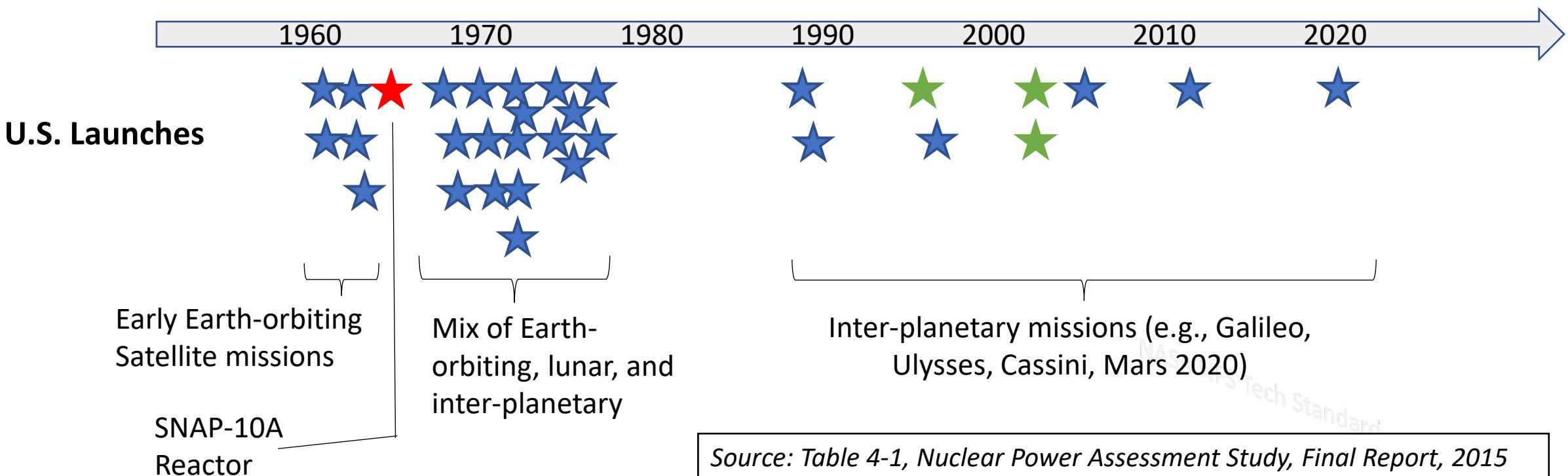
## As a snapshot – INSRP in 1995:

- 2 ongoing reviews for NASA: Cassini and Mars Pathfinder
  - E.g., Submitted 280 significant comments for the Cassini Preliminary Safety Analysis Report (SAR)
  - E.g., Submitted 53 significant comments for the Mars Pathfinder Updated SAR
- Empaneled for a DoD TOPAZ II review, but no activity
- Five standing sub-panels – 50 INSRP reviewers on file
- 17 meetings recorded for ongoing reviews

Ref: FY 1995 Annual Report of the Interagency Nuclear Safety Review Panel

# Nuclear Flight History for RTGs, Reactors, and RHU-only Launches

- Some launches include more than 1 RPS
- Some RTG launches included RHUs
- DoD launches are included, but have not occurred since the late 70s

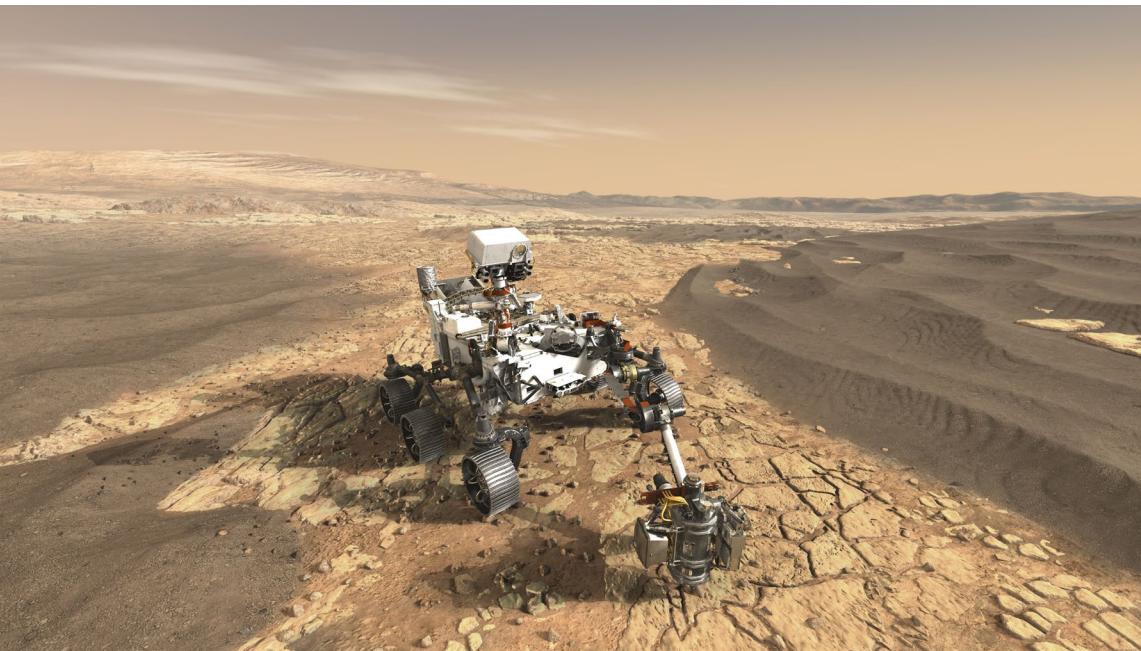


## Federal Launch Approval Framework



# Recent missions: Mars 2020

- Launch Date: July 30, 2020
- Arrival date: Feb. 18, 2021
- Mission: The Mars 2020 "Perseverance" rover is conducting geological assessments of its landing site on Mars; Perseverance is determining the habitability of the environment, searching for signs of ancient Martian life, and assessing natural resources and hazards for future human explorers.



Source: rps.nasa.gov

# Recent missions: Mars Science Laboratory

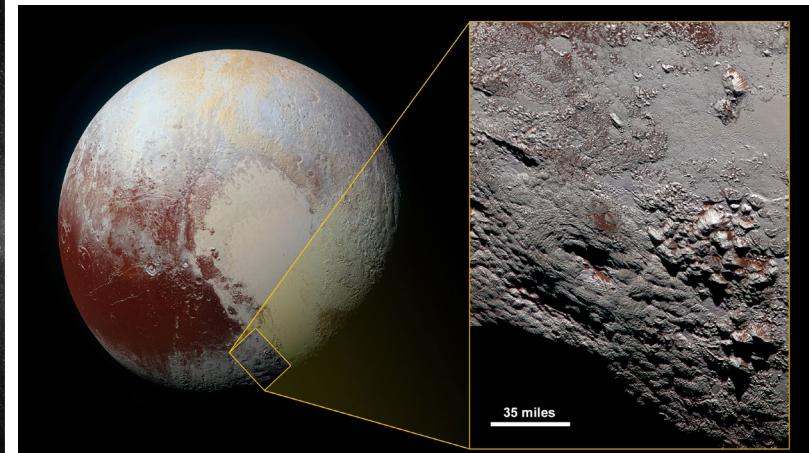
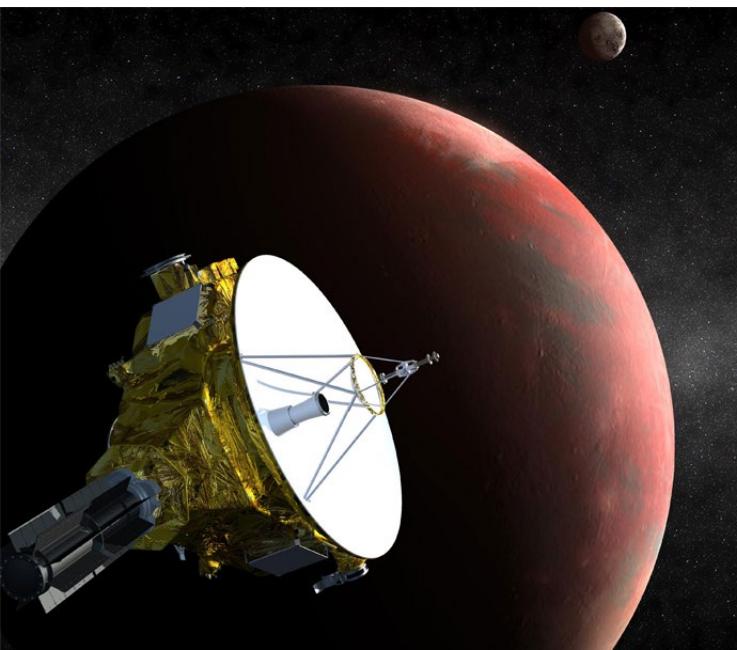
- Launch Date: Nov. 26, 2011
- Arrival date: Aug. 5, 2012
- Mission: NASA's Mars Science Laboratory (MSL) is a large, powerful science rover (Curiosity) designed to study the layered rocks of Gale Crater on the Red Planet. Its main objectives are to try to determine if life ever arose on Mars, to characterize the planet's climate and geology, and to help prepare for human exploration.



Source: rps.nasa.gov

# Recent missions: Pluto New Horizons

- Launch Date: Jan. 19, 2006
- Arrival date: July 2015
- Mission: NASA's New Horizons spacecraft made the first close-up study of Pluto and its moons and other icy worlds in the distant Kuiper Belt. The spacecraft has seven scientific instruments to study the atmospheres, surfaces, interiors and intriguing environments of Pluto and its distant neighbors.



Source: rps.nasa.gov

# And on the horizon?

- INSRB is currently meeting with sponsors of 2 missions:
  - NASA's Dragonfly
  - NASA's Fission Surface Power
- Other government and commercial entities have expressed interest in launching space nuclear systems

➤ *Recall: Per NSPM-20, INSRB only evaluates Tier II/III government missions, and commercial launches upon the request of the Secretary of Transportation*

# The New “Modern Era”

- NSPM-20...
  - Introduced tiering – graded approach to authorization
  - Established quantitative Safety Guidelines for 1<sup>st</sup> time
  - Affirmed the concept of system-specific safety analyses
  - Re-affirmed DOT role as licensing organization for commercial launch of space nuclear systems
  - Created the INSRB (replacing INSRPs)
- Space Policy Directive No. 6 (2020) and Executive Order 13972 (2021) are also germane to space nuclear, but focus largely on programmatic activities

PRESIDENTIAL MEMORANDA

## Presidential Memorandum on Launch of Spacecraft Containing Space Nuclear Systems

INFRASTRUCTURE & TECHNOLOGY | Issued on: August 20, 2019

MEMORANDUM FOR THE SECRETARY OF STATE  
THE SECRETARY OF DEFENSE  
THE SECRETARY OF TRANSPORTATION  
THE SECRETARY OF ENERGY  
THE ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY  
THE ADMINISTRATOR OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
THE CHAIRMAN OF THE NUCLEAR REGULATORY COMMISSION  
THE ASSISTANT TO THE PRESIDENT FOR NATIONAL SECURITY AFFAIRS  
THE ASSISTANT TO THE PRESIDENT FOR SCIENCE AND TECHNOLOGY AND DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: Launch of Spacecraft Containing Space Nuclear Systems

By the authority vested in me as President by the Constitution and the laws of the United States of America, I hereby direct the following:

Section 1. Purpose. This memorandum updates the process for launches of spacecraft containing space nuclear systems. Space nuclear systems include radioisotope power systems (RPSs), such as radioisotope thermoelectric generators (RTGs) and radioisotope heater units (RHUs), and fission reactors used for power and propulsion.

The ability to use space nuclear systems safely and sustainably is vital to

# INSRB Formation

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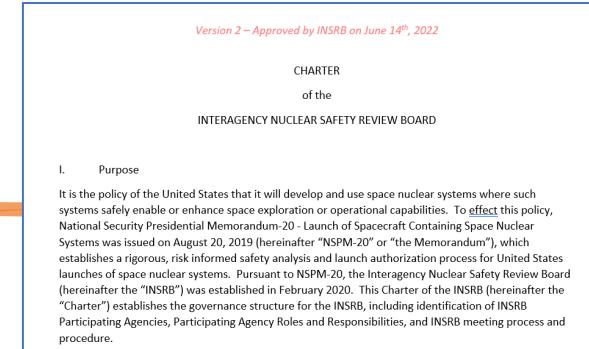
“Within 180 days of the date of this memorandum, the NASA Administrator shall establish an Interagency Nuclear Safety Review Board (INSRB). The INSRB shall consist of representatives from the Departments of State, Defense, Energy, and Transportation, the Environmental Protection Agency, NASA, and, as appropriate, the Nuclear Regulatory Commission. Each of these agencies shall designate technically qualified personnel to the INSRB.”

- NSPM-20

- **Formed in February 2020**
  - No INSRP experience dating back past Mars 2020
- **All participants hail from the policy/safety elements of their respective Departments / Agencies**

# The INSRB Charter

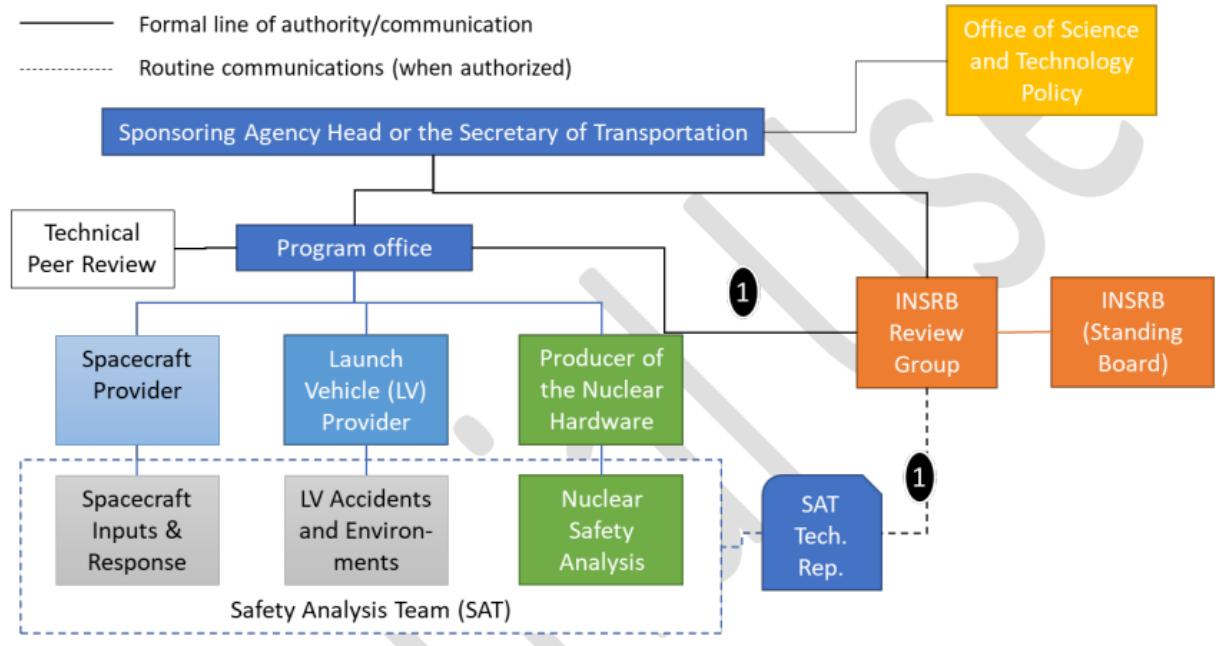
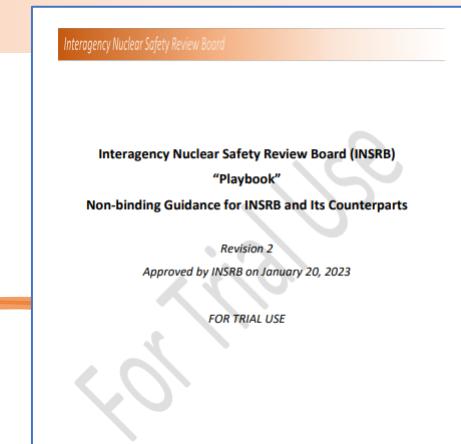
- I. Purpose
- II. Governing Council
- III. Organizational Structure and Functions
- IV. Meetings
- V. Functioning of the INSRB
- VI. Mission-specific Review Plans
- VII. Conflicts of Interest
- VIII. Requirements
- IX. Funding
- X. Revision of This Charter



The INSRB Charter is publicly available at  
[Nuclear Flight Safety \(nasa.gov\)](https://nuclear.flightsafety.nasa.gov)

# The INSRB Playbook (For Trial Use)

- Roles and Responsibilities
- General Conduct of Business
  - Decision making, information security, etc.
- Review and Evaluation Scope
  - Evaluation vs. analysis, review boundaries, etc.
- Review and Evaluation Process
  - Managing interfaces, exit criteria, etc.
- Review and Evaluation Products
  - Information requests, gaps report, safety evaluation report, etc.
- Appendices
  - Subject matter expertise assessment matrix, etc.

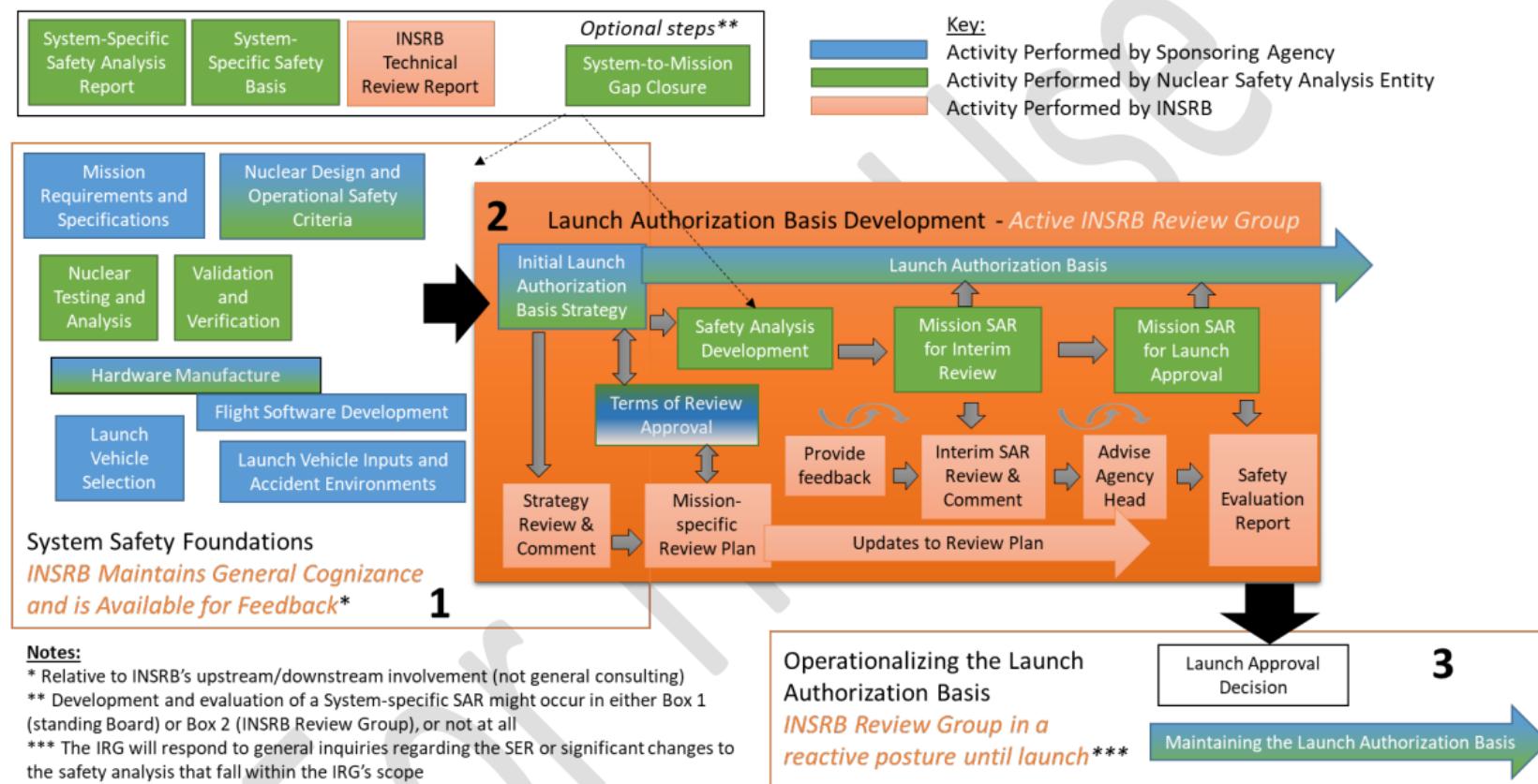


1 Where permitted by the Secretary of Transportation in the case of commercial launches; for all instances where a Mission Review Group is not empaneled, these lines would connect to the Standing Board



The INSRB Playbook is publicly available at  
[Nuclear Flight Safety \(nasa.gov\)](https://nuclear.flightsafety.nasa.gov)

# The INSRB Playbook (2)



- Early engagement (standing Board)
  - Familiarization
  - System safety discussions
- Active review (Review Group)
  - Terms of Review
  - Gap identification
  - Safety Evaluation Report
- Post-authorization engagement
  - Addressing significant system/mission changes

# How to Engage the INSRB

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- If you are a commercial entity:
  - Engage with the FAA Office of Commercial Space Transportation, via Pre-application discussions, a Payload Review submittal, or a Launch Application submittal
- If you are a governmental entity:
  - Engage with the INSRB member from your agency
- Otherwise:
  - Use open house opportunities

# Topics of Potential Interest to CoPP Arising From this History

- Participation:
  - Which agencies are included
  - Ad hoc versus permanent
  - Governmental vs. mixed participation
- Structure:
  - Nature of OSTP's involvement
  - “All agencies as equals” relative to mission sponsors
- Managing throughput:
  - Mission cadence / parallel reviews
  - Government versus commercial activities
- Review Process:
  - Early engagement
  - Focused review during evaluation phase
  - Managing scope: in-scope versus scope-adjacent
- Figures of Merit:
  - “How Safe is Safe Enough” (NSPM-20 Section 3)
  - Reporting metrics (NSPM-20 Section 5(b))
- Decision-making:
  - Executive Office of the President versus Agency Heads
  - Role of the independent review in decision-making process

# Acronyms

AEC	Atomic Energy Commission (now generally Department of Energy, EPA, and NRC)	NRC	US Nuclear Regulatory Commission
DoD	Department of Defense (now Department of War)	NSAM	National Security Action Memorandum
DOT	Department of Transportation	NSPM	National Security Presidential Memorandum
EPA	Environmental Protection Agency	OSTP	Office of Science and Technology Policy
FAA	Federal Agency Administration (part of DOT)	PD/NSC	Presidential Directive/National Security Council
INSRB	Interagency Nuclear Safety Review Board	RHU	Radioisotope Heater Unit
INSRP	Interagency Nuclear Safety Review Panel	RPS	Radioisotope Power Source
IRG	INSRB Review Group	RTG	Radioisotope Thermoelectric Generator
LV	Launch vehicle	SAR	Safety Analysis Report
MSL	Mars Science Laboratory	SER	Safety Evaluation Report
NASA	National Aeronautics and Space Administration	SAT	Safety Analysis Team
NFSO	Nuclear Flight Safety Officer	SNAP	Space Nuclear Auxiliary Power
		U.S.	United States
		USG	United States Government