
# The United States Approach to Nuclear Launch Accident Mitigation

Presentation to:

## United Nations Committee on Peaceful Uses of Outer Space

## Scientific and Technical Subcommittee

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# Introduction

Section 5.4 of the Safety Framework states "*All practical efforts should be made to mitigate the consequences of potential accidents*".

- The United States National Response Framework / Nuclear/Radiological Incident Annex outlines the response to nuclear/radiological contingencies and specifies the role and responsibility for the Coordinating Agency

- For accidents involving the release (or potential release) of nuclear/radioactive materials from NASA spacecraft, National Response Framework specifies that NASA is the Federal Coordinating Agency
  - NASA provides the leadership, expertise, and authority to implement nuclear/radiological aspects of the response
  - NASA is the primary Federal source for information of a technical nature regarding the onsite and offsite radiological effects
  - Since NASA launches all nuclear spacecraft from Cape Canaveral, Florida, the State of Florida and County of Brevard have primary responsibility for implementing protective measures for the public

- This Process is referred to as Radiological Contingency Planning

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# Radiological Contingency Planning Goals

- Ensure public health and safety
- Protect the environment
- Notify appropriate agencies in the event of an accident involving potential release of radioactive material
- Generate public information messages on any mishap that are accurate, timely, consistent, and easily understood
- Assess whether a release of radioactive material has occurred
- Quantify and predict the dispersion of any radioactive material released
- Formulate and recommend appropriate protective actions to be taken onsite and offsite
- Support smooth transition to a Unified Command if needed
- Address out-of-launch area accidents resulting in sub-orbital or orbital reentry

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# Agencies Involved

- NASA
- State of Florida
- Brevard County
- Department of Energy
- US Air Force / 45th Space Wing
- Environmental Protection Agency
- Federal Emergency Management Agency
- National Oceanic and Atmospheric Administration / National Weather Service
- Department of State

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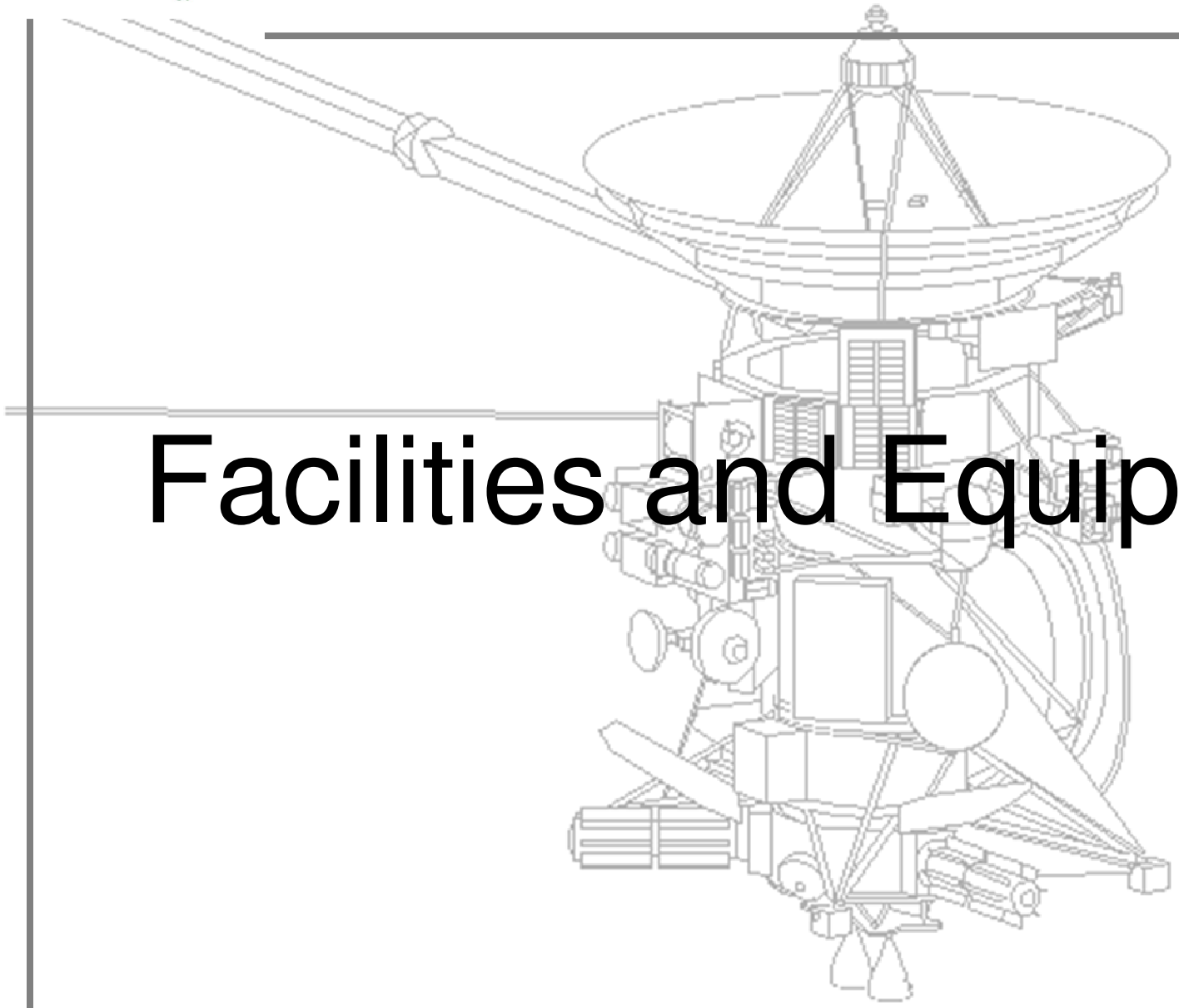
# List of Plans

*5.4. (a) Developing and implementing contingency plans to interrupt accident sequences that could lead to a radiation hazard*

- Conduct of Operations
- Field Monitoring
- Data Management
- Data Assessment
- Logistics Support
- Out-of-Launch Area Contingency
- Source Recovery
- Public Communications
- Long Term Transitioning



# Facilities and Equipment

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# Emergency Response Support to Launch

- Radiological Control Center (RADCC)
  - Technical Monitoring and Assessment Team
  - Coordinating Agency Representative Management Group (CMG)
  - Joint Information Center (JIC)

- Pre-deployed Field Monitoring Capabilities on and off-site
  - Environmental Continuous Air Monitoring System – ECAMS
  - Field Radiation Monitoring Teams

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# On-Site Radiological Contingency Control Organizations

Radiological Control Center (RADCC)

- Staffed by technical and radiological assessment personnel from NASA, Department of Energy, US Air Force 45th Space Wing, national Oceanic and Atmospheric Administration, and State of Florida
- Performs the data collection and assessment function supporting deployment for launch site and field data collection activities
- Evaluates field measurements and data from automated monitoring systems to determine if a radioactive material release has occurred
- Evaluates data collected and develops recommended actions for review and approval by the Coordinating Agency Representative

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# On-Site Radiological Contingency Control Organizations

## Coordinating Agency Management Group (CMG)

- Staffed by management authority from NASA, Department of Energy, Federal Emergency Management Agency, Environmental Protection Agency, Advisory Team for the Environment, Food and Health, State of Florida and Brevard County
- Performs the management decision making activities governing the overall radiological response
- Coordinates NASA response to out-of-launch area accidents through NASA Office of Protective Services Representative in CMG

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# On-Site Radiological Contingency Control Organizations

Joint Information Center (JIC)

- Staffed by public information specialists, scientists and engineers from various agencies
- Provides informational releases to the media, public and other governments on the status of the radiological monitoring and assessment actions and conditions post-accident

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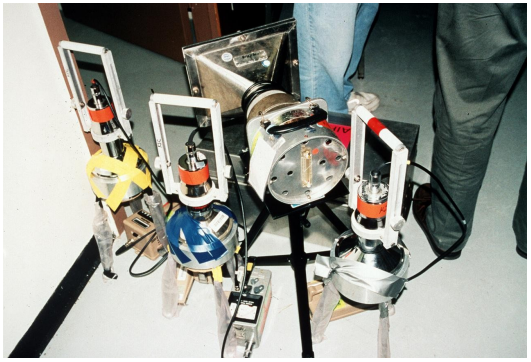
# Representative Launch Monitoring Locations

30 Environmental Continuous Air Monitor (ECAMS)
(>105 km span)
- 9 on-site
- 17 off site
- 4 mobile (12 personnel)

12 RADMON Teams
- 9 on site (21 personnel)
- 3 off site (6 personnel)
- Equipped with FIDLER detectors,
- Alpha survey meters, and high volume air samplers



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# Environmental Continuous Air Monitor (ECAM)

Typical ECAM Field Installation

- Technology utilized in support of Pluto New Horizons and Mars Science Laboratory launches in 2006 and 2011
- Weather-Resistant
- Continuous telemetry data stream to RADCC via satellite relay
- Direct measurement of breathing zone concentrations
  - Selects for respirable particle sizes
  - Alpha spectrometer
- Generator or AC powered

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# Characterizing the Location and Nature of the Release of Radioactive Material

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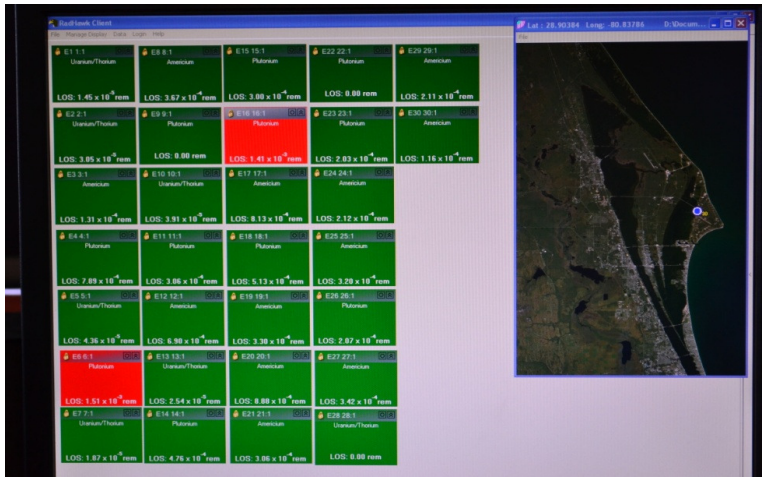
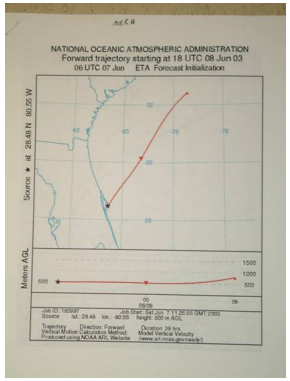
# Release Characterization

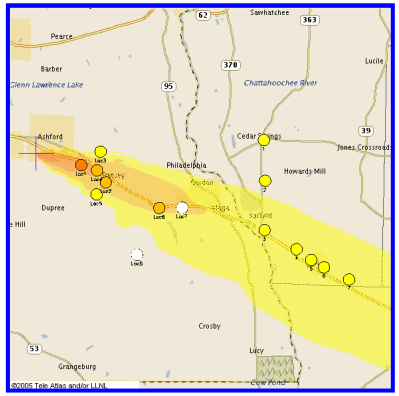
*5.3 (c) Characterizing the location and nature of the release of radioactive material*

*5.4 (d) Characterizing the areas contaminated by radioactive materials*

- ECAMS and Field Teams collect and relay information to scientists and engineers in the Radiological Control Center
- This information is used to determine if a release has occurred
- Real time weather data is used to predict where released material will travel
- Maps overlays generated to show the level of contamination





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# Recommending Protective Actions

*5.4 (e) Recommending protective measures to limit exposure of population groups in affected areas*

- If a release occurs, the Radiological Contingency Control Center will provide protective action recommendations, such as sheltering in place.
- The protective action recommendations are considered by Brevard County and the State of Florida for developing and issuing their Protective Action Guidelines

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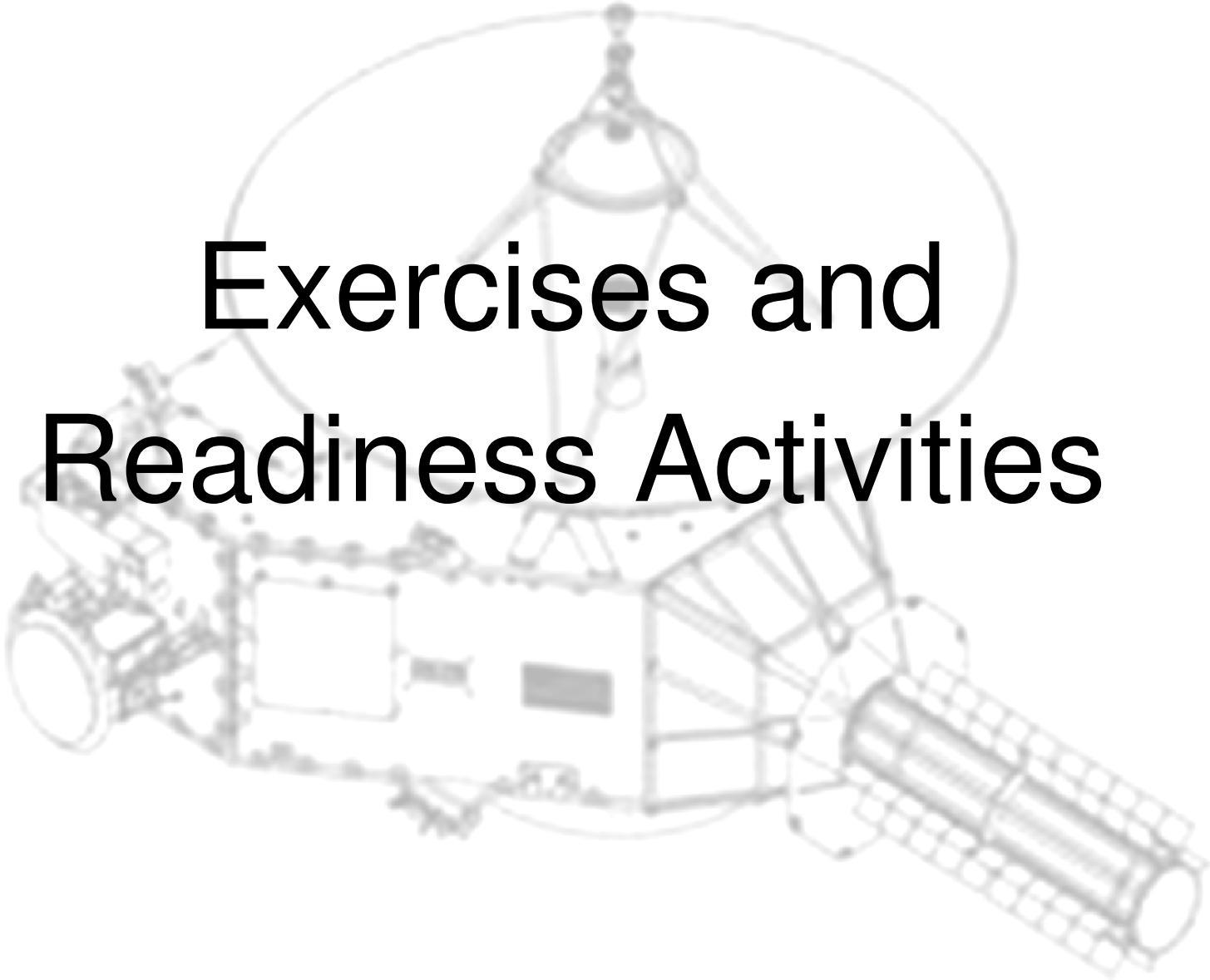
# Exercises and Readiness Activities



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# Contingency Planning  Exercises and Readiness Activities

- Exercises and Verification Tests
  - Command Post Exercises
  - System Verification Test in conjunction with an actual separate launch countdown
  - Joint Information Center Exercises
  - Mock Press Conference
  - On-orbit contingency drills
  - Countdown practices
  - ECAM testing and satellite communications validation
  - Field team/resource deployment drills

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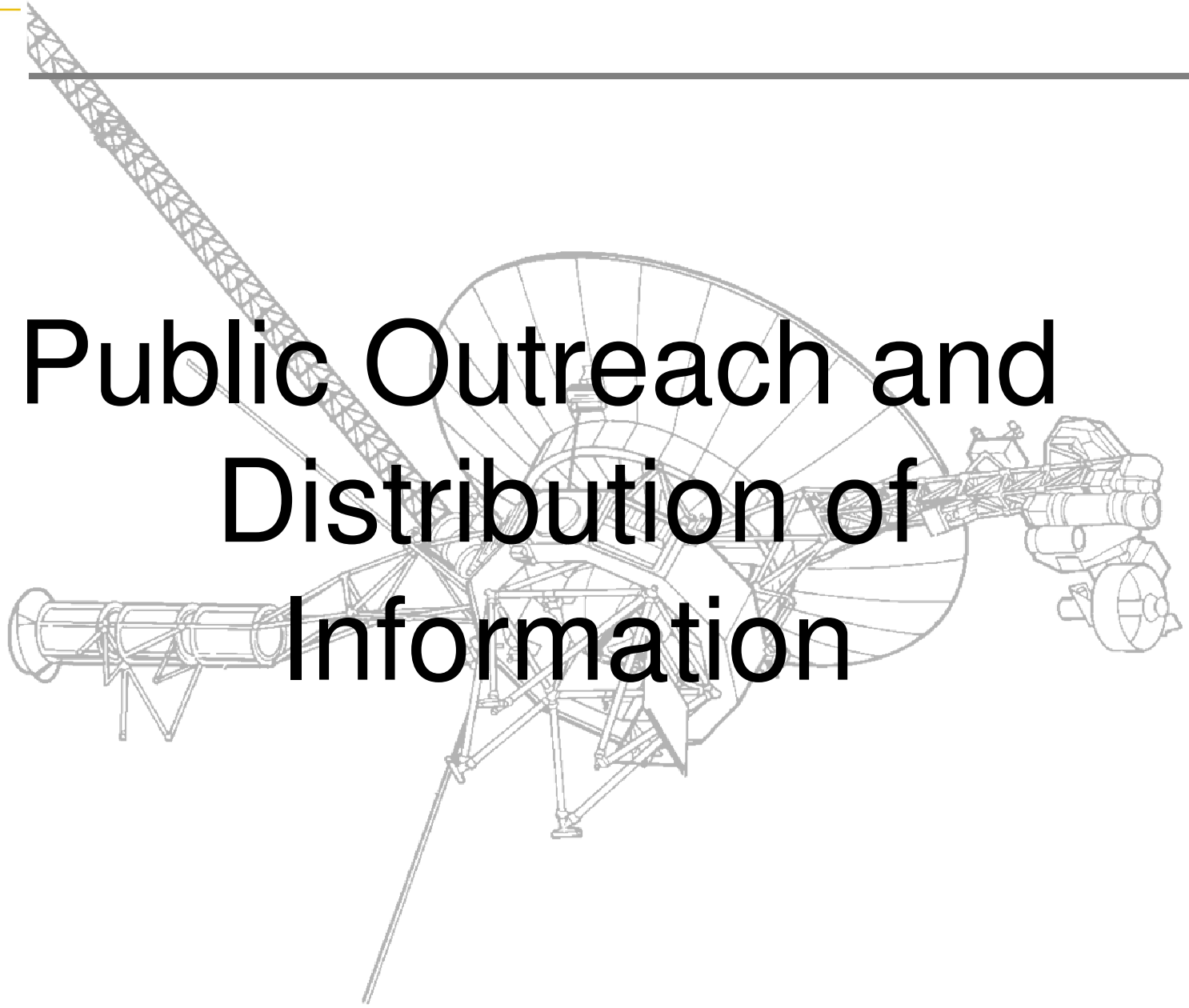

# Public Outreach and Distribution of Information

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# Public Outreach and Distribution of Information

- Readiness Reviews/Presentations to Stakeholders and Decision Makers
  - Brevard County Commission
  - Florida Director of Emergency Management
  - Florida Governor
- Public Outreach
  - Public Outreach Events
    - Town Hall Meetings
    - Brevard County Fair
  - Newspaper Editorial Boards
  - Local Hospital Training
    - Hospitals and Medical Centers coordinated with and selected by local government officials.
    - Training made available to emergency providers regarding proper handling, diagnosing and treatment of radiation contaminated/exposed patients.

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# Dissemination of Information

*5.4 (f) preparing relevant information regarding the accident for dissemination to the appropriate governments, international organizations and non-governmental entities and the general public*

The Joint Information Center provides a single, unified source of accurate, coordinated and approved information to the appropriate governments, the news media and the public about the federal radiological response to a launch accident

- 30+ pages of pre-scripted announcements
- 80+ pages of frequently asked questions and responses to queries
- Social media experts driving the instant message process

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# Conclusions

- The United States has in place a thorough and detailed approach to monitoring and mitigating a launch accident involving the use of an NPS.
- The United States develops a range of plans to deal with potential launch accident scenarios.
- Dedicated personnel, facilities and equipment are in place for every launch involving a NPS to determine if a release occurred.
- Expert scientists and engineers interpret the data to characterize the release and risk, and then make recommendations to policy makers and the public.
- The Joint Information Center is in place to provide accurate and fully coordinated information in a timely manner to the public and other governments