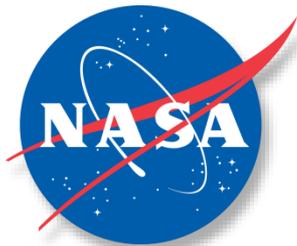




THE NASA COMMERCIAL CREW PROGRAM'S (CCP)  
MISSION ASSURANCE PROCESS



**IAASS 2016**  
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# Overview



- ❖ NASA established the Commercial Crew Program (CCP) in order to provide human access to the International Space Station (ISS) and low Earth orbit via the commercial (non-governmental) sector.
- ❖ A particular challenge to NASA is how to determine the Commercial Provider's transportation system complies with Programmatic mission assurance requirements while at the same time allowing the Provider the flexibility to demonstrate compliance.
- ❖ This will be accomplished through the use of Risk Based Analysis (RBA) and Shared Assurance by NASA thus shifting more responsibility to the Provider. The RBA model will be the focus of this presentation.

## ❖ History

- The CCP started in 2010
  - Funding was initially through research grant-like Space Act Agreements (SAA)
- In 2013 two different procurement activities occurred to further develop an integrated Commercial Transportation System (CTS)
  - CCiCap: SAA with the goal of developing a fully integrated CTS architecture and design that would meet NASA's Low Earth Orbit / ISS mission needs
  - Certification Products Contract (CPC): Firm Fixed Price Contract for certain certification products to help NASA and Commercial Providers identify certification risks early in parallel with CCiCap

## ❖ Commercial Crew Transportation Capabilities (CCtCAP) Contract

- Selection announced in September 2014
  - Two Providers:
    - Boeing
    - SpaceX
- What it funds
  - Two test flights and two to six missions per Provider
- Public-Private Partnership
  - NASA to be prime customer
  - Provider may use vehicle for other purposes

# Mission Assurance Requirements



- ❖ Regulatory Requirements to ensure final product or service
  - Federal Acquisition Regulation (FAR) Part 46, “Quality Assurance”
  - NASA FAR Supplement Part 1846, “Quality Assurance”
  
- ❖ S&MA Agency requirements owned by the Technical Authority
  - Flow-down and implementation owned by CCP
  - Primary S&MA document is NPR 8735.2, “Management of Government Quality Assurance (GQA) Functions for NASA Contracts”
    - Criticality and Complexity defines the extent of GQA
    - Requires verification of 100% safety-critical attributes
      - Exemption to the 100% safety-critical verifications based on statistical process controls or documented risk analysis
  
- ❖ Commercial Environment required NASA to evolve
  - Risk Based Analysis
    - Documented risk analysis based on many factors to determine and assign Government mandatory product assurance actions
      - Does not relieve the Provider from the responsibility of performing quality inspections
  - Government Insight
    - Assure compliance through insight
    - Access to data used in the performance of the contract

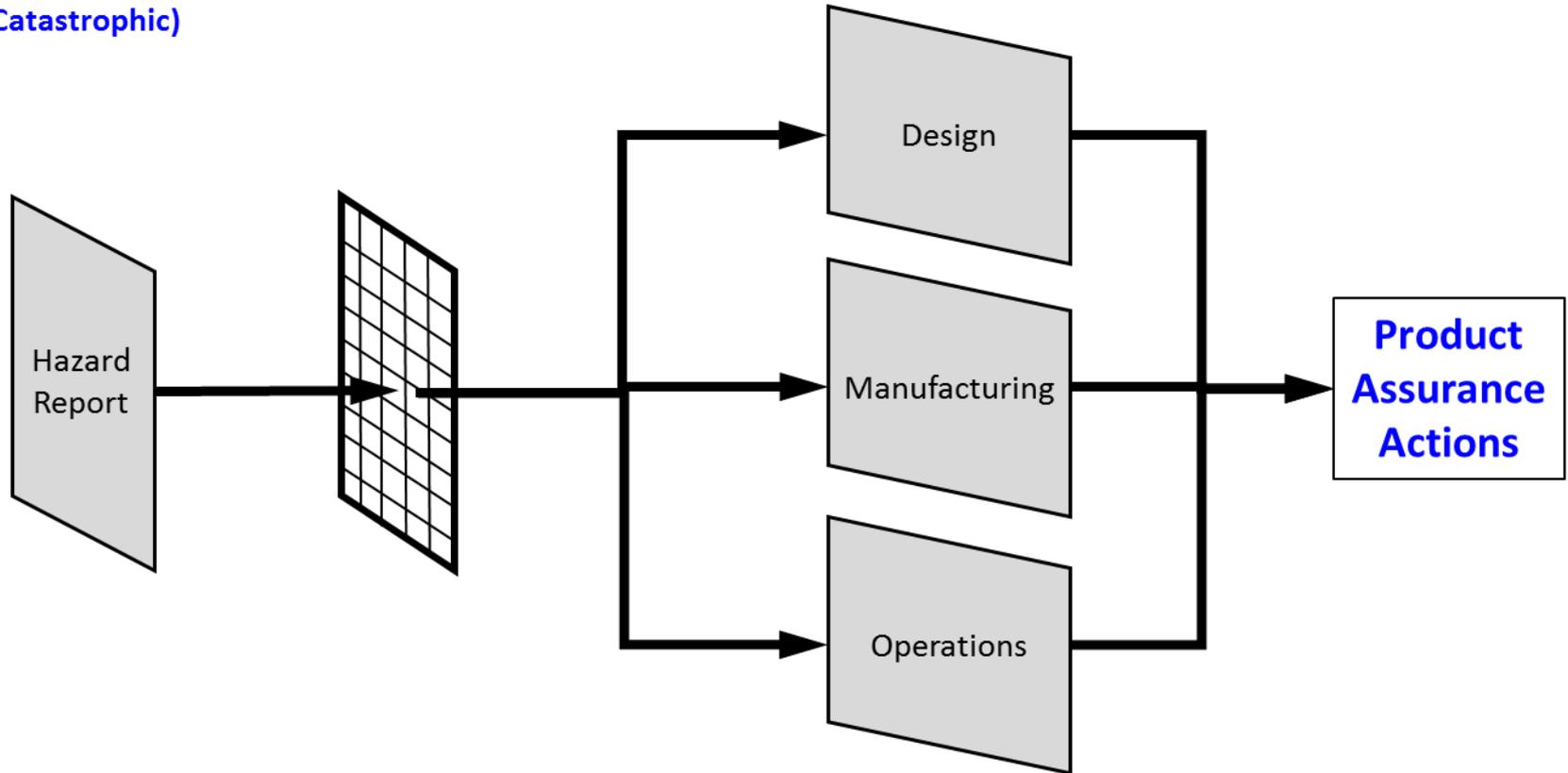
# Risk Based Analysis Process Overview



**Hazard Report  
(Catastrophic)**

**Triage**

**Scorecard(s)**



# Risk Based Analysis Process Details



- ❖ CCP RBA process starts with using catastrophic Hazard Reports
  - Beneficial in identifying safety-critical attributes
  - Iterative process
  
- ❖ Based on risk factors, including:
  - Associated Programmatic Risk
  - Impacts the Probabilistic Safety Assessment
  - Complexity of design and/or process
    - Configuration Management
  - Maturity of design and/or process
  - Past Performance
    - Personnel Competency
    - Degree of difficulty in implementation of verification
  - Likelihood of correct implementation
  - Hazard Cause Likelihood

# Risk Based Analysis Process Details (continued)



## ❖ Triage Phase

- Quickly sorts through the risk of each control/verification set for every hazard cause
  - Associated with the previously stated risk factors

## ❖ Scorecard Phase

- Control/Verification set may go to multiple scorecards
  - Design
  - Manufacturing
  - Operations
- Calculates the total risk score associated with the cause/control/verification set

## ❖ Product Assurance Phase

- Product Assurance Actions (PAAs) will be assigned based on total risk score
  - Record Review
  - Process Audit
  - Witness a Process
  - Examine a Product
- Multiple PAAs may be assigned to a single Cause/Control/Verification set
- These are the mandatory Government surveillance points

# NASA CCP Assurance



- ❖ PAAs implemented by Shared Assurance
  - Does not replace S&MA
    - Allows S&MA to focus resources in higher risk areas
  - Uses other organizations for assurance
    - Eliminates duplication of effort
    - Confidence in other organization's personnel
    - Does not create new work for the other organizations
  
- ❖ Provider is still 100% responsible for both certification and quality of products and services provided
  - Government is verifying Provider is doing what they agreed too

# CCP RBA Results



## ❖ Space Shuttle Program

- Post-Challenger: approximately 44,000 Government Inspection Points at KSC
- End of Program: approximately 10,000 Government Inspection Points at KSC

## ❖ Commercial Crew Program

- Reviewed 70 Hazard Reports
  - Total Number of Causes: 800
  - Total Number of Controls: 3793
  - Total Number of Verifications: 9346
  - Total Number of Product Assurance Actions: 414



# Summary

- ❖ The Risk Based Assurance process uses technical analysis of risk (triage and score card) to determine which hazard cause/control/verification sets require NASA surveillance.
  - Identifies areas of highest risk to focus surveillance
  - Reduces the number of mandatory Government surveillance points without significantly affecting overall system risk
  
- ❖ The RBA process in conjunction with shared assurance is allowing CCP to efficiently use –
  - Available resources to execute the mandatory Government verifications
  - Provide sufficient surveillance to ensure each of the Commercial Providers are delivering their certified Crew Transportation System (CTS) for CCP use

**“The purpose of the CCP is to facilitate the development of a U.S. commercial crew space transportation capability with the goal of achieving safe, reliable, and cost effective access to and from low Earth orbit (LEO) and the International Space Station (ISS).”**

## Questions?