An Overview Of How Jet Propulsion Laboratory Develops Mission Systems.

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Jet Propulsion Laboratory
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- ESD Material adopted from : JPL Public Website
- WBS Material adopted from NASA Procedural Requirements NPR 7120.5E

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NASA Centers and Facilities

There are 10 **NASA centers**, which provide leadership for and execution of **NASA's** work

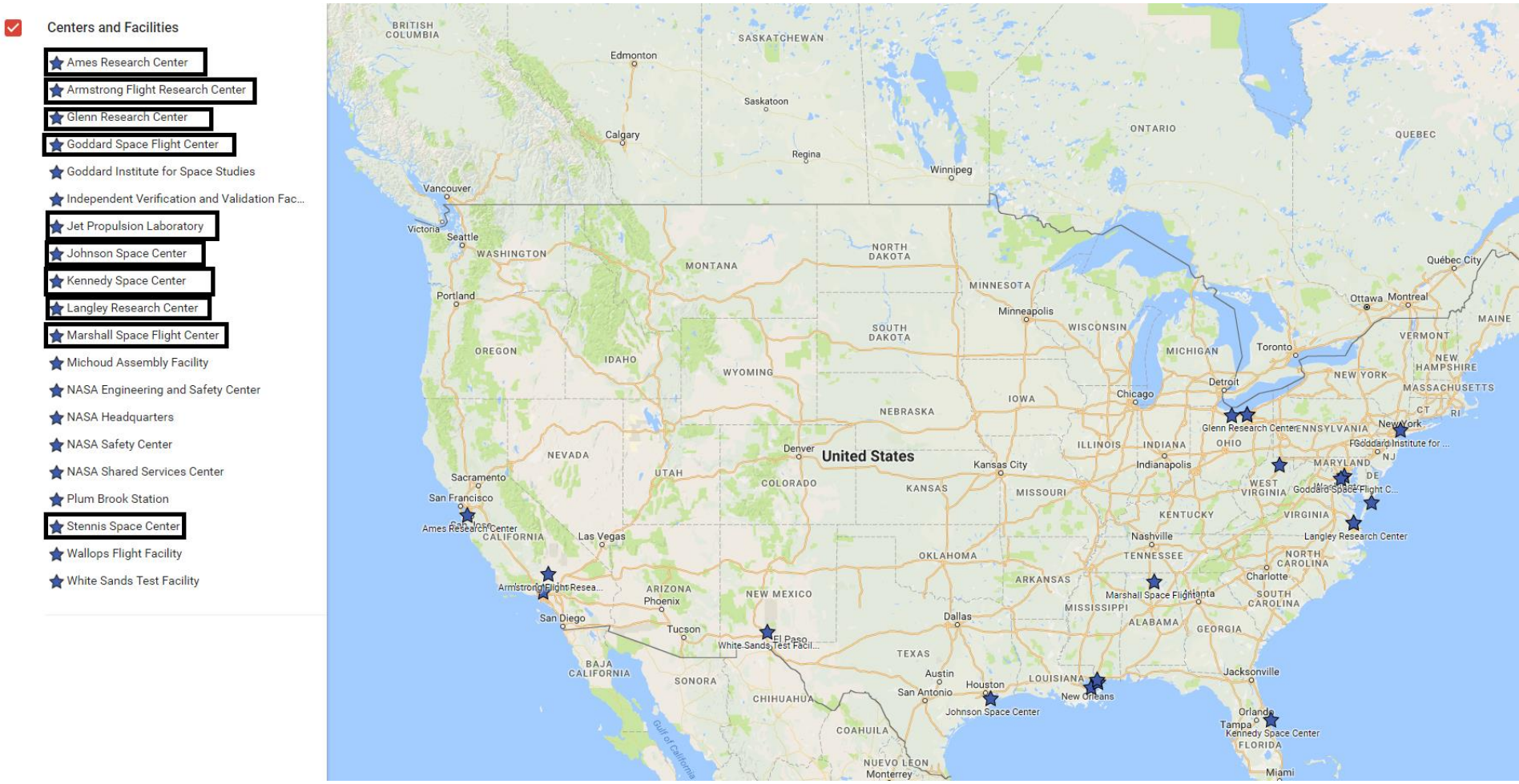

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Image from Google (search NASA Centers)

Jet Propulsion Laboratory

JPL is a federally funded research and development center

- The Jet Propulsion Laboratory is a national research facility that carries out robotic space and Earth science missions.
- In addition to its missions, JPL developed and manages NASA's Deep Space Network, a worldwide system of antennas that communicates with interplanetary spacecraft.
- **JPL is a federally funded research and development center managed for NASA by Caltech.**
- JPL is very different from most NASA Centers in that it:
  - Develops entire flight system including hardware, software and integration
  - Integration of contractor flight systems
    - Can all be outsources or mixed with in house
  - Management / Oversight
    - Entire mission <-> to single instruments
  - Operations
    - Entire flight system <-> single instruments
- ~5000 employees
  - Engineering & Science, Solar system Exploration, Safety & Mission Success, Mars Exploration, Astronomy & Physics, Earth Science and Technology, Interplanetary Network.

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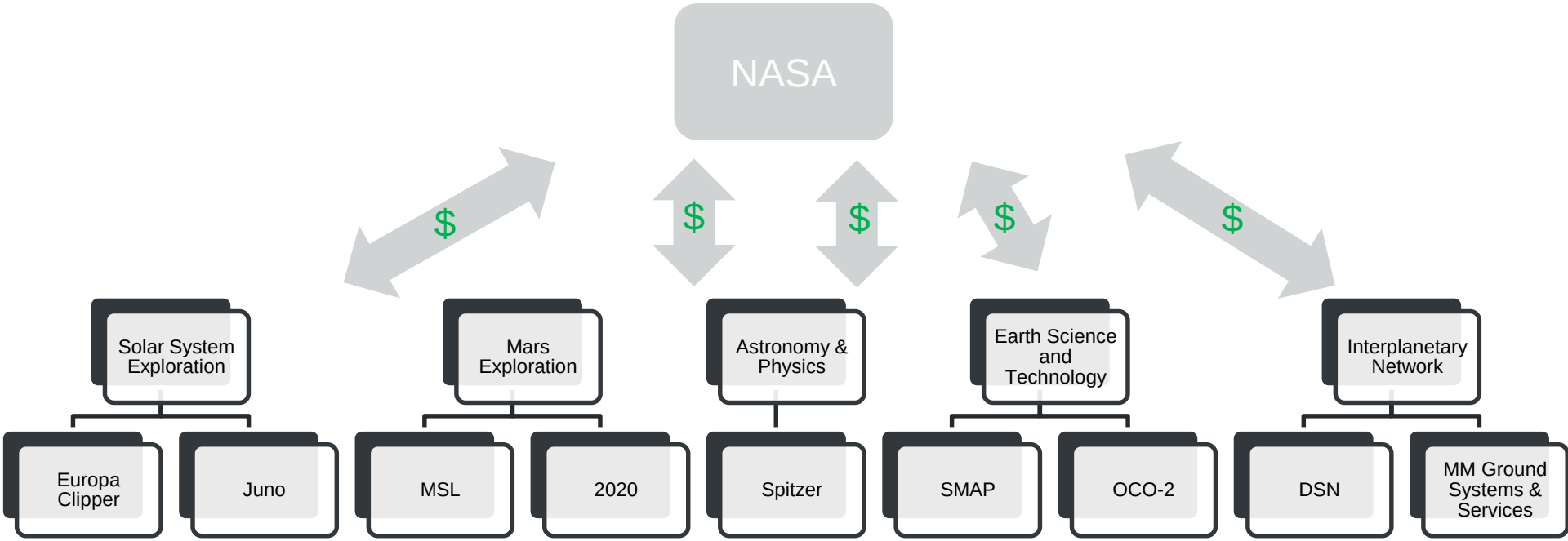
JPL The Organization

Responsibilities at JPL (Projects/Program)



- These directorates are responsible for oversight, development, integration and operations

Note: Projects shown are illustrative of a subset of the JPL mission work

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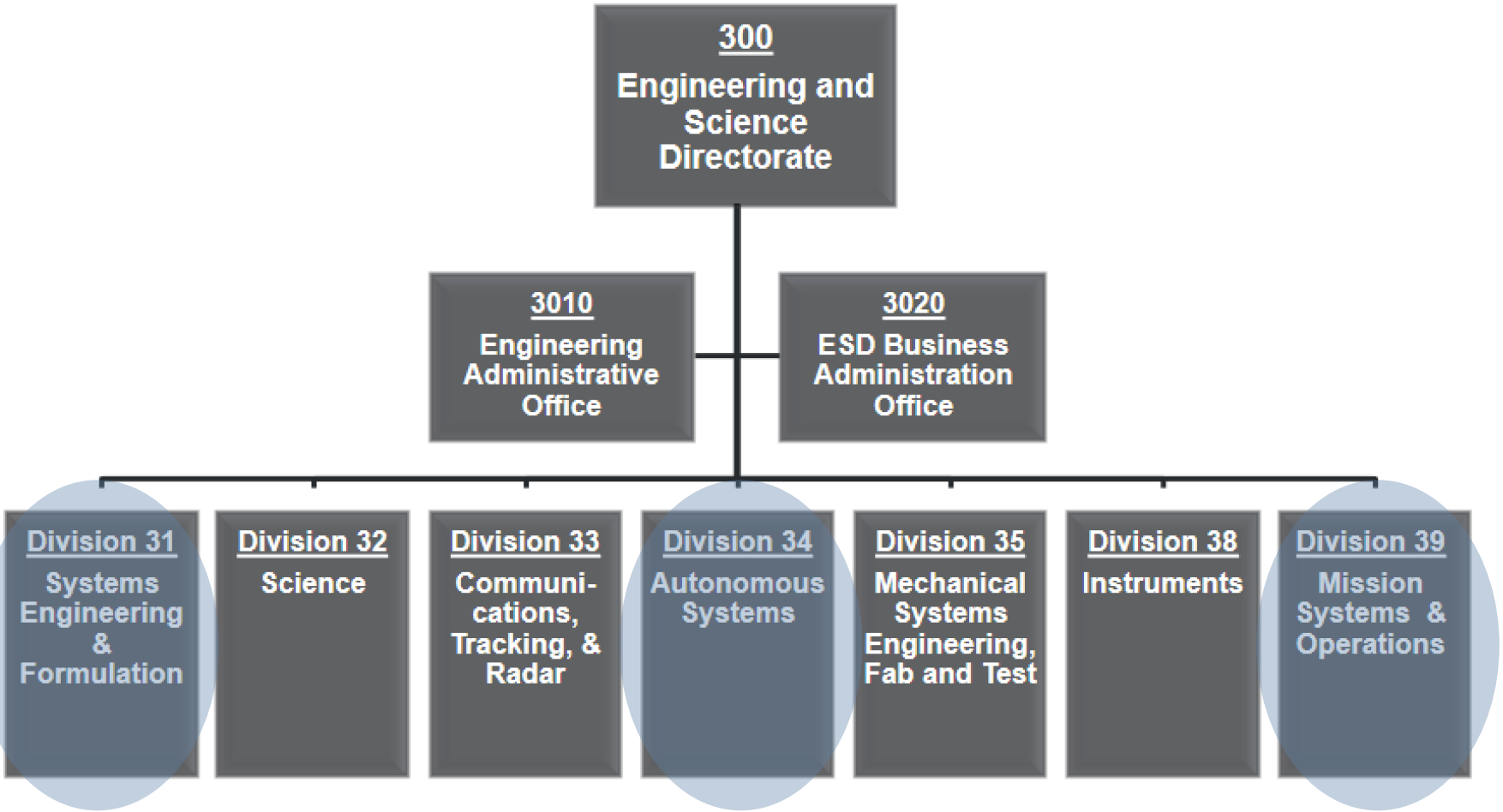
JPL The Organization

Engineering And Science (Line)



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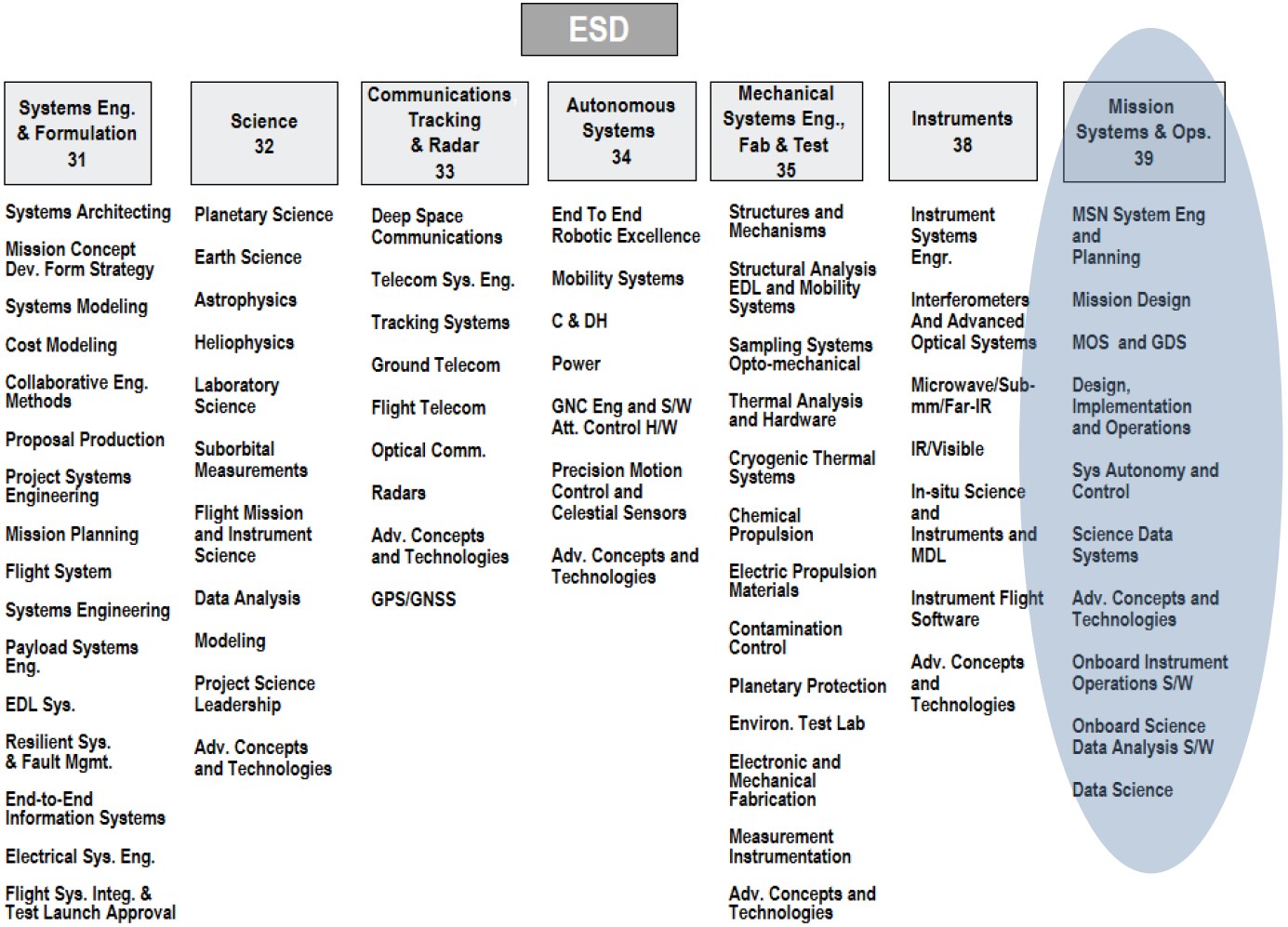
JPL The Organization

Engineering And Science (Core Capabilities)



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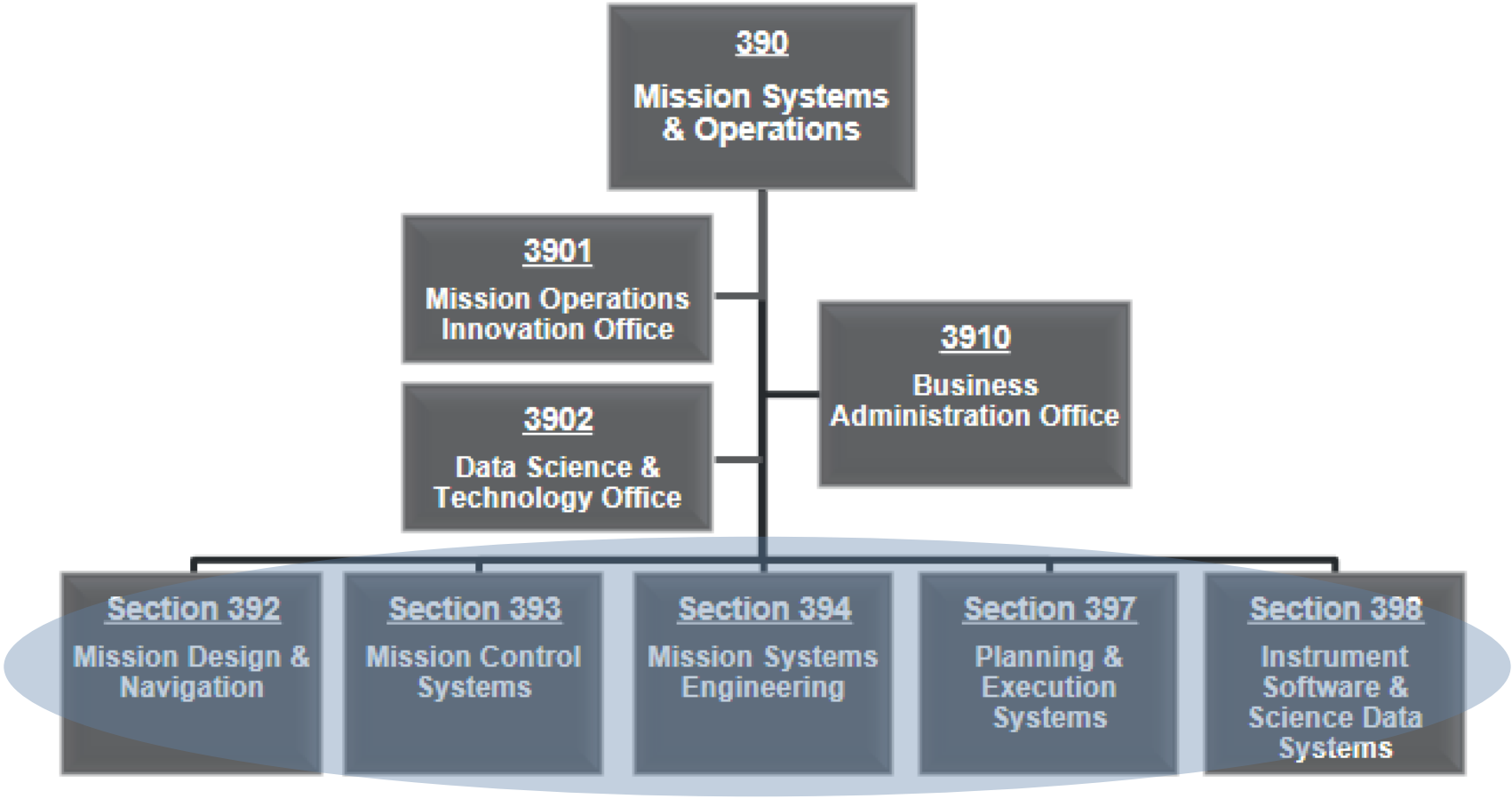
JPL The Organization

Division 39 Structure – Mission Systems & Operations



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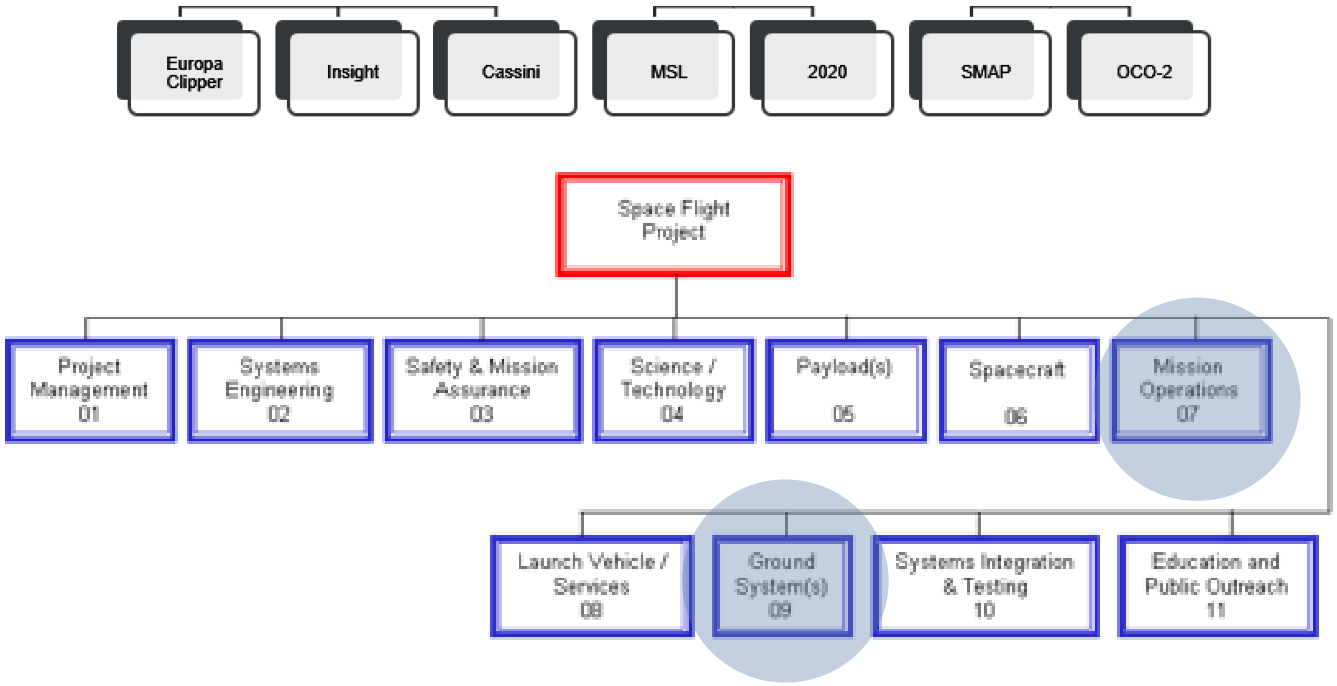
How Work Get Done

Relationship (Project / Line) Project Work Breakdown Structure (WBS)



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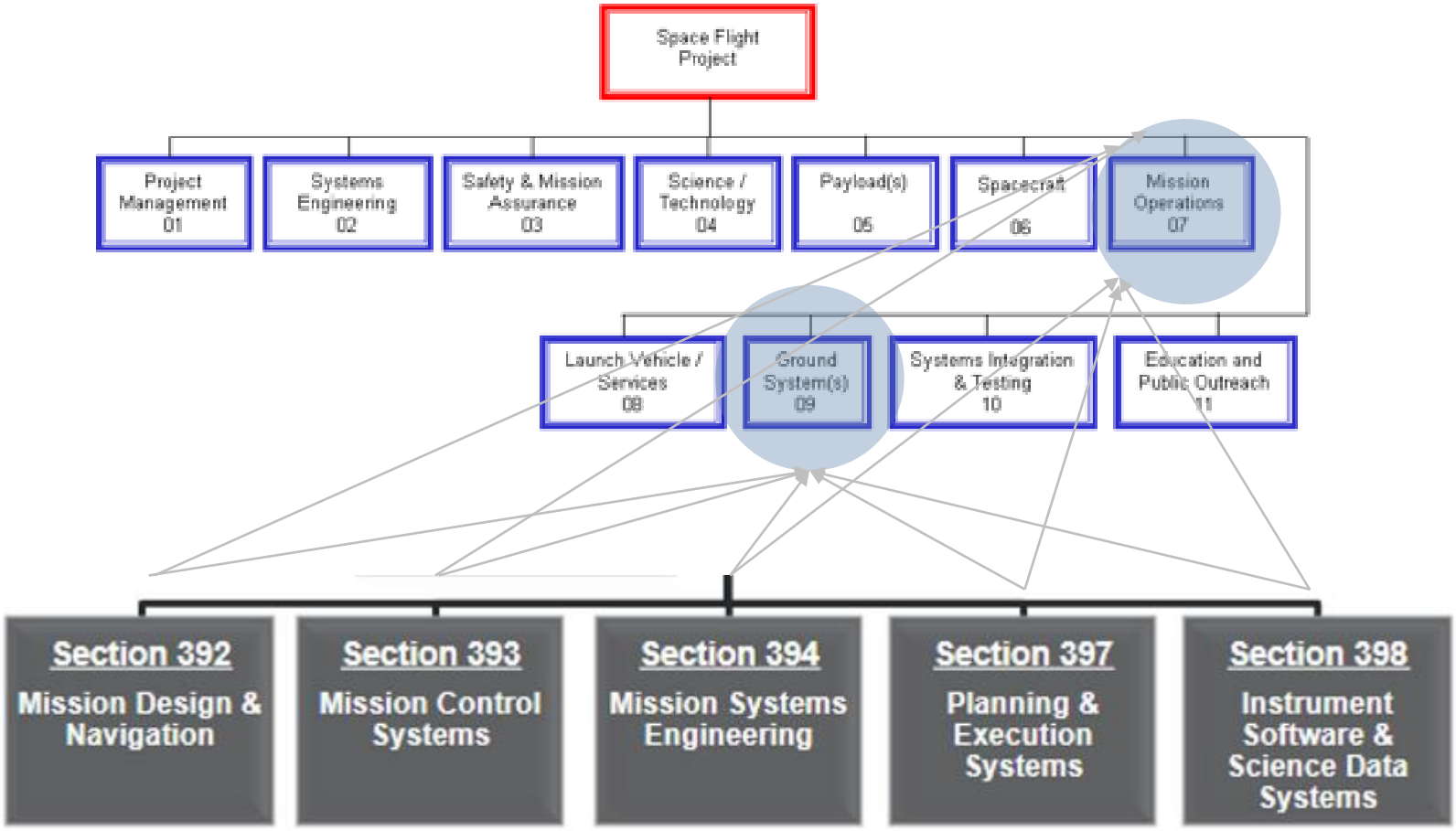
How Work Get Done

Relationship (Project / Line) Project Work Breakdown Structure (WBS)



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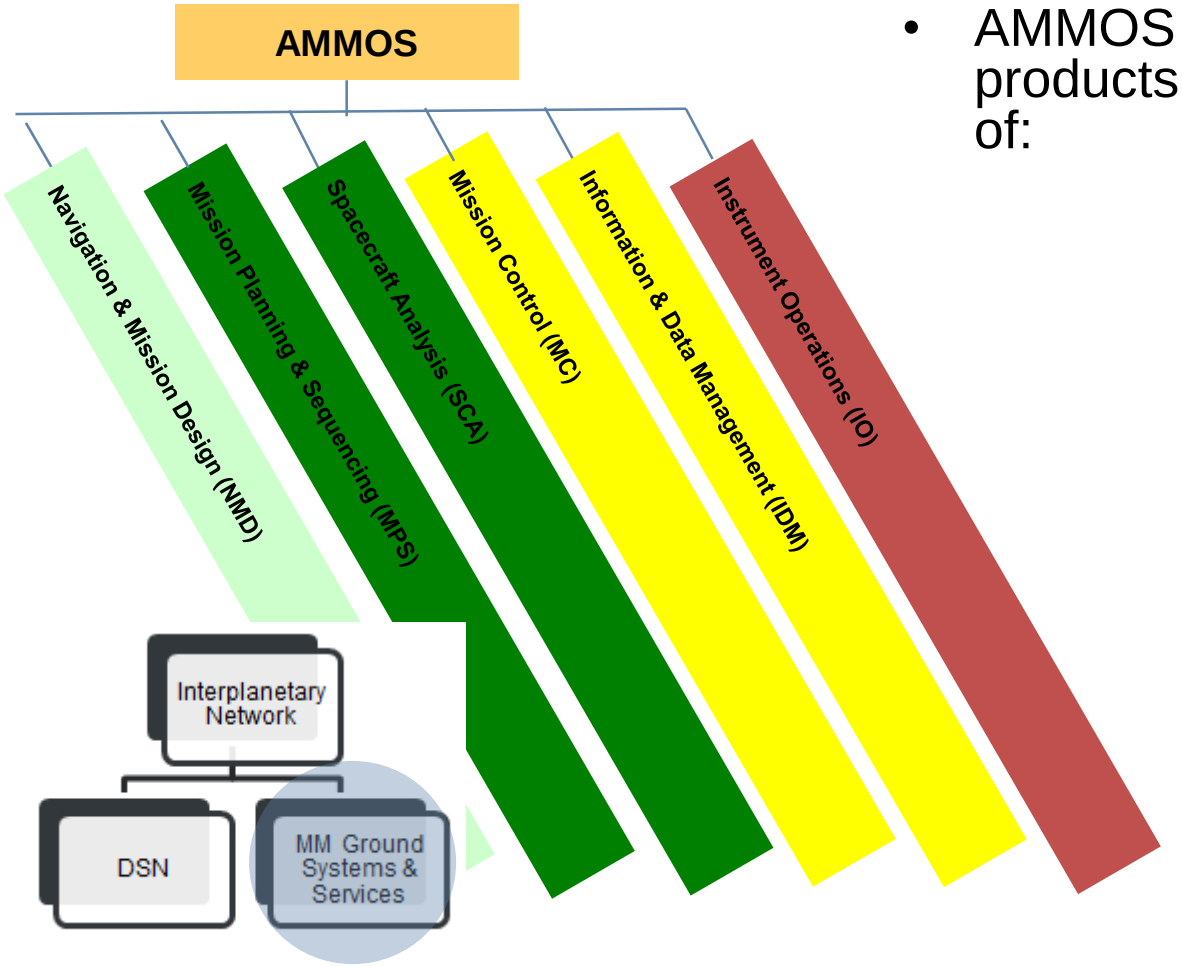
Multi-Mission Ground Systems & Services

Advanced Multi-Mission Operations System



- AMMOS provides missions with products and services in support of:
  - Navigation and Mission Design
  - Mission Planning and Sequencing
  - Spacecraft Health and Performance Analysis
  - Mission Control and Flight System Monitoring
    - Telemetry and Command
  - Information & Data Management
  - Instrument Operations
    - Instrument Data Processing

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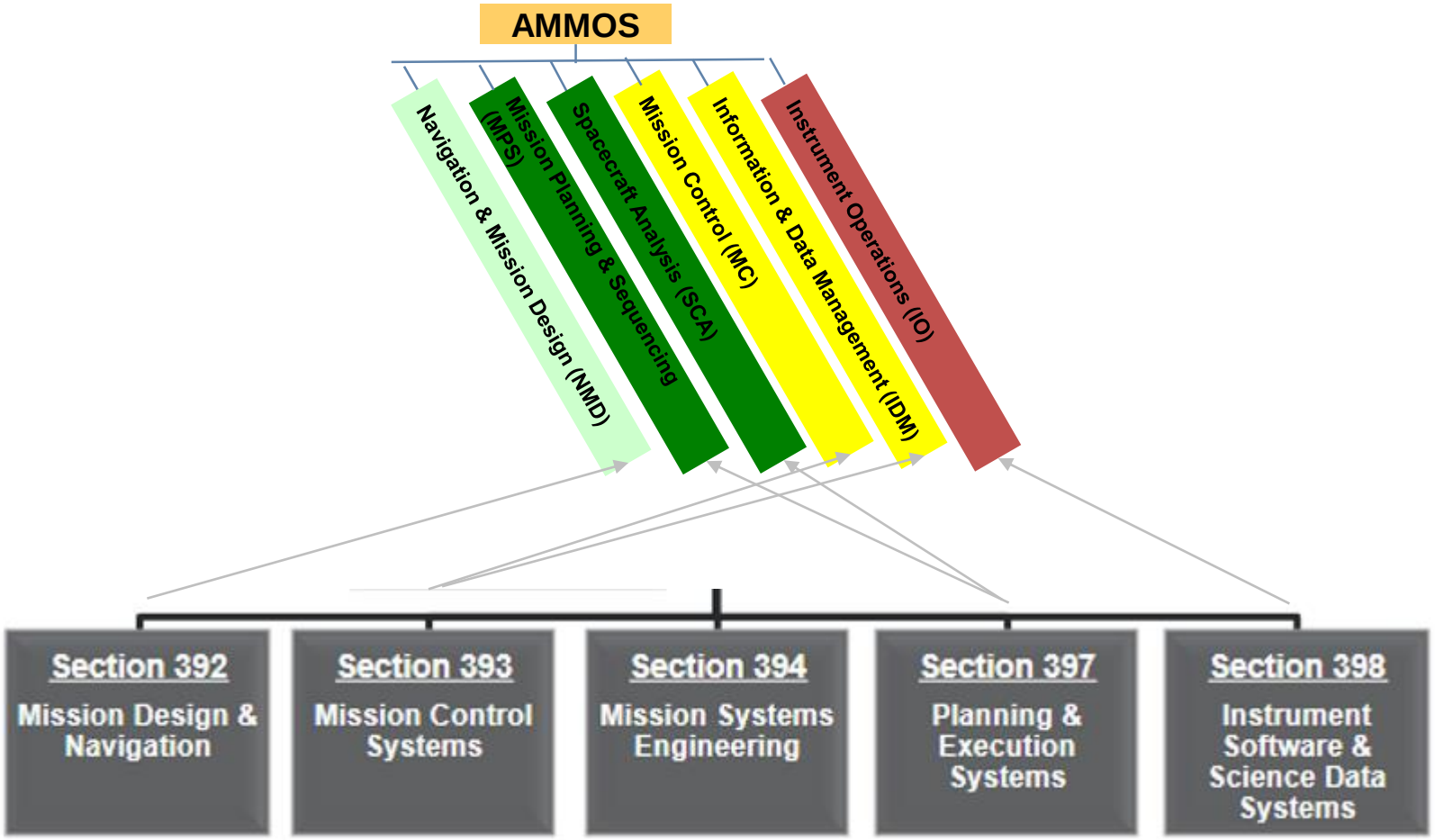
How Work Get Done

Relationship (Program / Line) – AMMOS Products & Service



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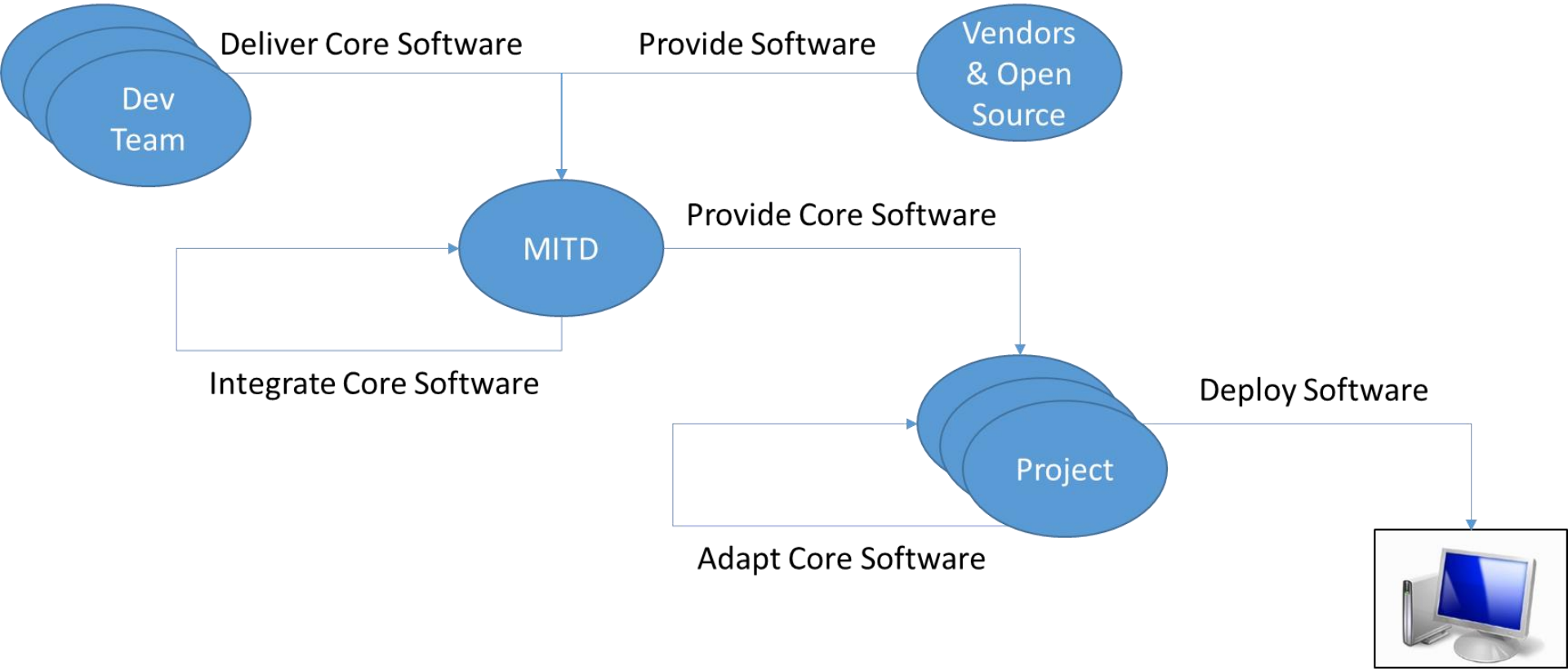
AMMOS / Project Delivery & Deployment Process



MITD - Multi-Mission Integration Test & Deployment

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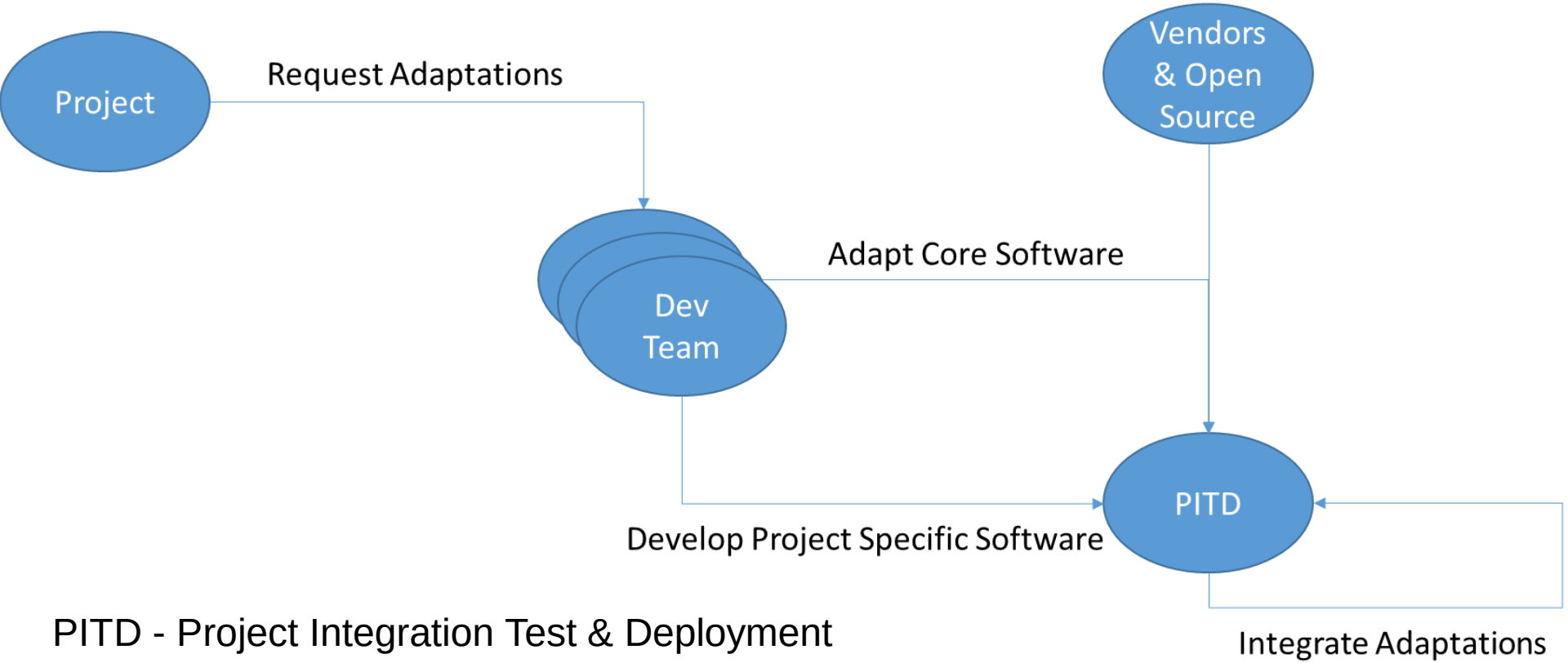
Project Adaptation Process



PITD - Project Integration Test & Deployment

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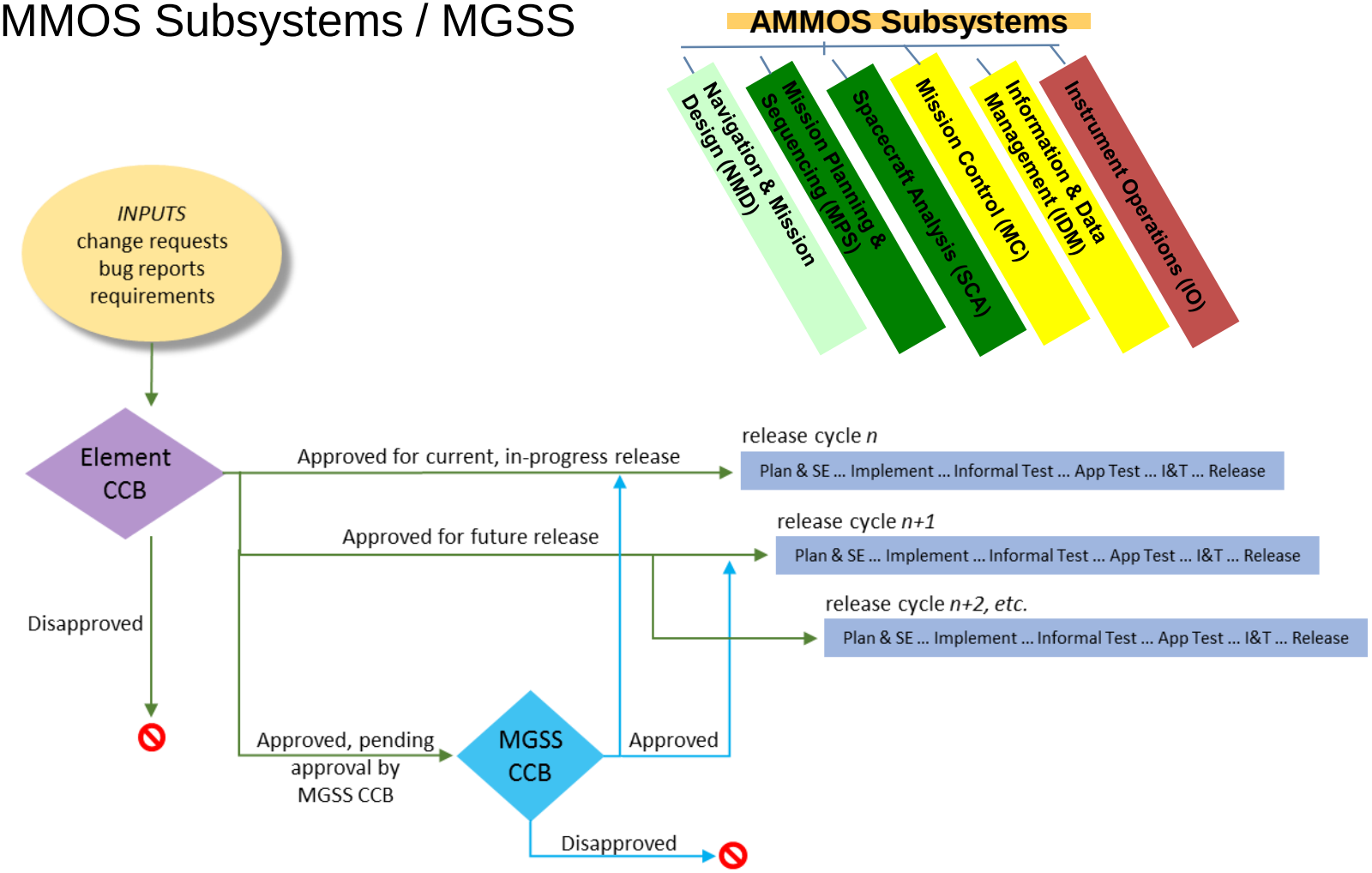
Change Control Board

AMMOS Subsystems / MGSS



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Challenges – Related to Delivery

- MGSS updates AMMOS 3 times a year
  - Update patches (3rd party / Security) 9 times a year
    - Projects take updates based on project schedules
    - Project testing budget limited in operations phases
- Projects have independent schedules
  - Coordinating with multi-mission must be planned on 3 per year basis.
    - Depending on project lifecycle this may be too slow
  - Adaptation teams have to work with Core teams to ensure too many branches do not occur

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Challenges – Related to funding

- MGSS updates AMMOS 3 times a year
  - Funded by NASA
  - New implementation funded on a 6 year plan
    - Seen as too slow for developing projects
  - Maintenance continuous
    - Corrective, Adaptive & Perfective
      - Delivers on 3 per year but must support all projects
- Projects have independent schedules
  - Project Size makes a difference
    - Large projects like to innovate – Hard to capitalize and fold into Multi-mission
    - Large project innovation does not plan for maintenance

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Questions?

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