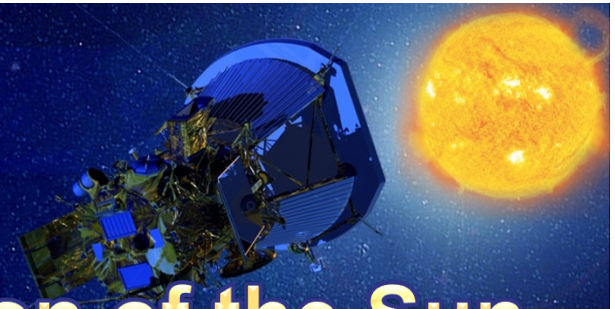
Solar Probe Plus

A NASA Mission to Touch the Sun



Integrated Science Investigation of the Sun
Energetic Particles

Preliminary Design Review
05 – 06 NOV 2013

NASA · GSFC · SwRI · APL · Caltech · U-Az · U-Del · UNH

ISIS

Solar Probe Plus

Energetic Particles

Performance Assurance

Joerg Gerhardus

Outline

- Safety, quality and reliability program being used in the development of the instrument
- Description of software quality system, and software IV&V plans
- EEE parts selection and screening plans as well as materials selection and screening plans
- Any special processes required to build the instrument
- Contamination control and ESD
- Plans for selection and qualification of special items such as detectors and mechanisms
- Any exceptions being taken to the SPP PAIP
- Preliminary FMEA, or plans for FMEA, Fault Tree Analysis
- Describe the manner in which the reliability engineer works with the design team to ensure that reliability is maximized

Outline

- Requirements
- SMA Oversight & PAIPs
- Organization
- Design Assurance
- Hardware Quality
- Software Quality
- Safety
- Path Forward

SPP PA Requirements and PAIPs

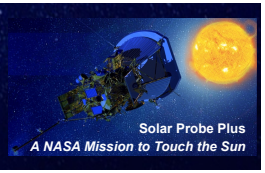
APL Requirements:

- Solar Probe Plus (SPP) Instrument Mission Assurance Requirements Compliance Matrix
- APL document # 7434-9096 Rev. -

ISIS Implementation through plans (PAIP) and operating procedures:

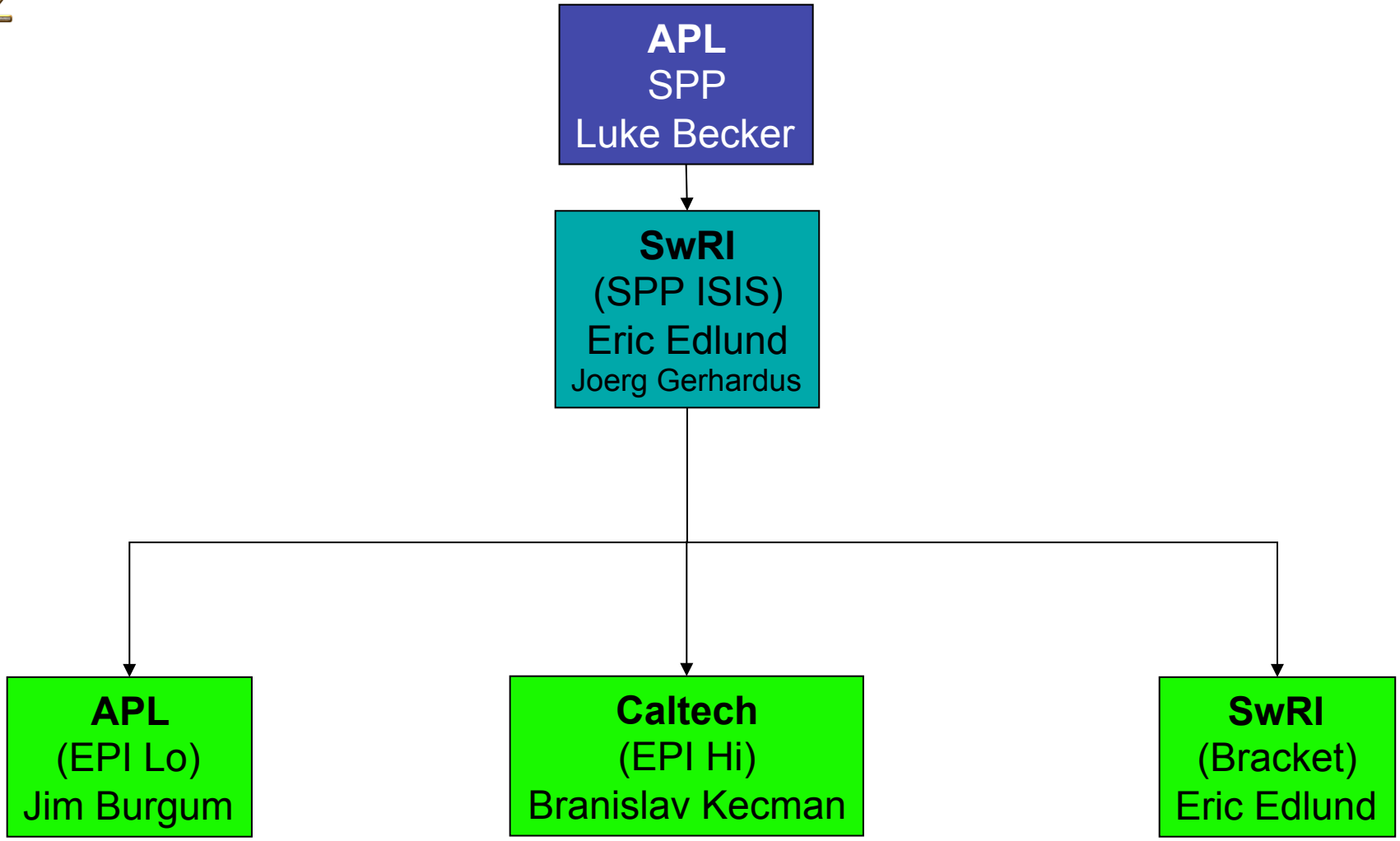
- SwRI: 16105-PAIP-01 Rev. 0, released TBD
- APL: Solar Probe Plus (SPP) Performance Assurance Implementation Plan; APL document # 7434-9003 Rev. -, released TBD
- Caltech: CIT-SPP-004 Rev. A, released 10/07/2013

Performance Assurance Implementation Plan



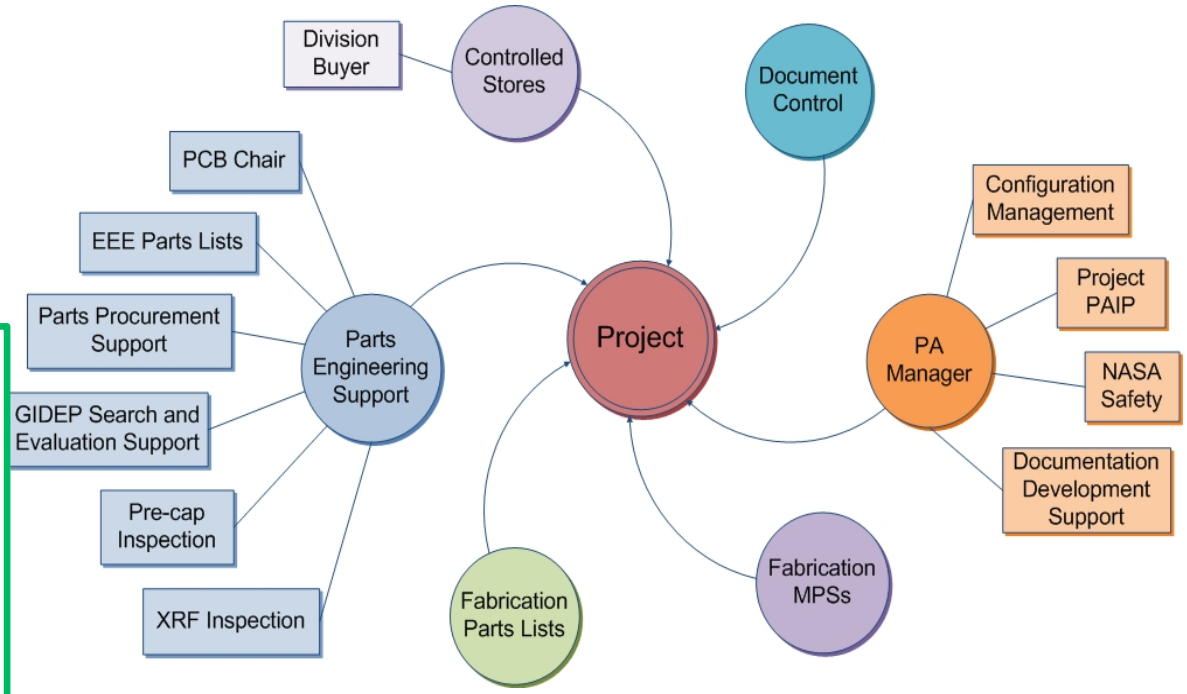
- Deliverables
- General Quality Requirements
  - Procurement
  - QA Surveillance
  - Training and Certification
  - Design and Development Review Process
  - Configuration Management
  - Non Conformance Process and Reporting
- Hardware Quality Requirements
  - Manufacturing, Inspection, Assembly, Test, and Inspection Planning
  - Controlled Stores
  - Fabrication processes
  - Inspection
  - Acceptance Test Verification
  - Handling Packaging, Shipping
- Software Quality Requirements
  - Requirements Analysis
  - Reviews
  - Verification and Validation
- Safety
- Reliability Assurance
- EEE Parts Program

PA Organization Chart

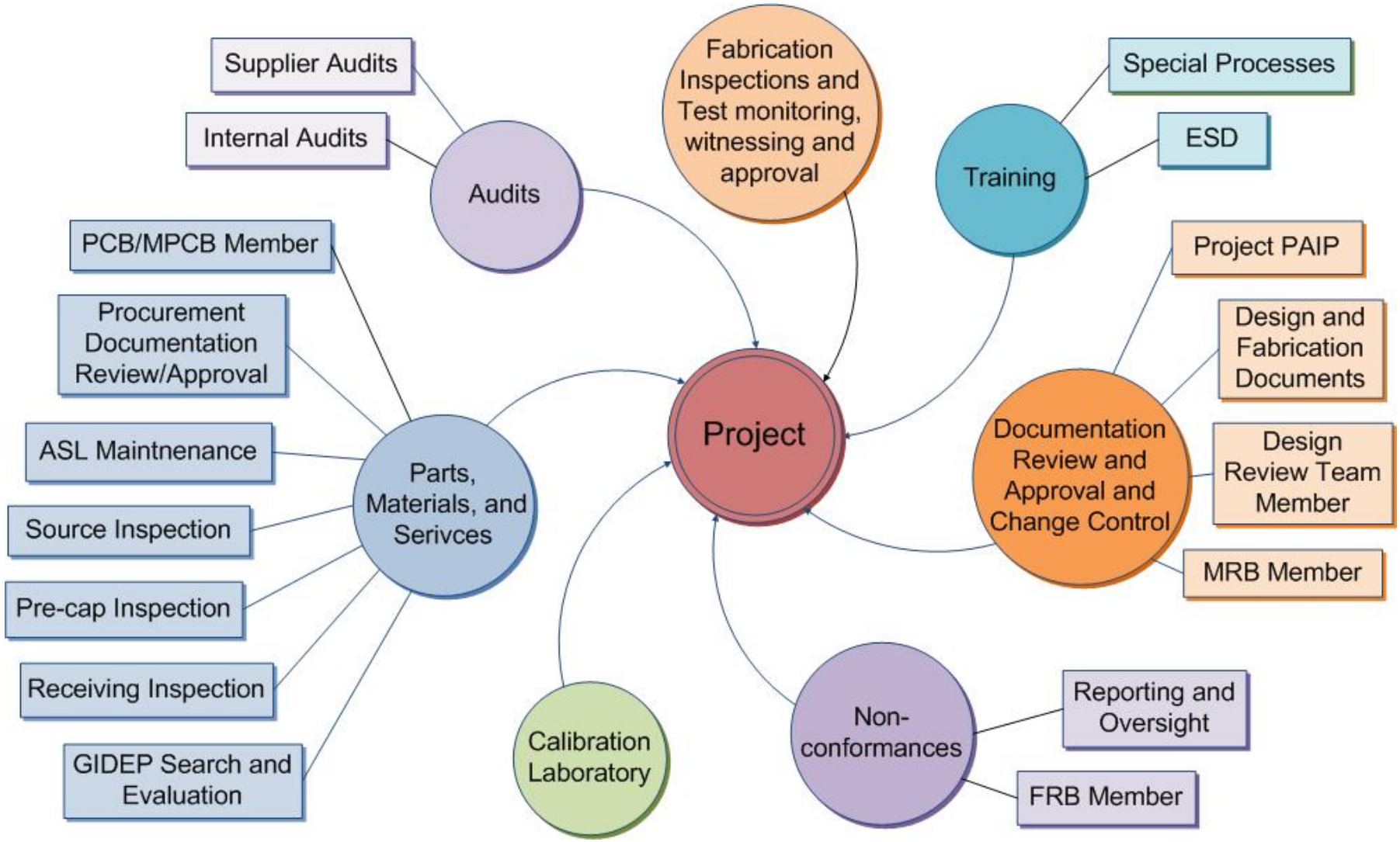


Project Quality Assurance

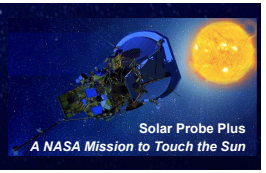
- Project Team PA
  - Reliability engineering
  - Parts acquisition oversight
- Division 15 PA Manager and Staff
  - Coordinate Div 15 Resources
- Independent Project Quality Engineer
  - Oversight & Coordination
  - QA Engineering
  - QA Inspections
- Partner QA
  - Implement local PAIP and support SwRI's SPP ISIS PA Lead



Quality Tasks

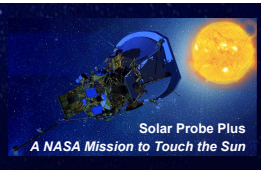


Design Assurance



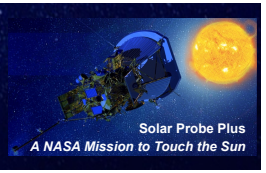
- Hardware designs governed by
  - Design process and controls
    - Requirements Definition
    - System Engineering Process
    - Design Planning
    - Peer Reviews and checklist
    - Verification and Validation
    - Control of Design Changes
  - Software designs governed by
    - Structured software development process
    - Contract Reviews, Software Development Folder, Planning
    - Review of Requirements, and checklist
    - Software Design Specification, Design Peer Reviews, and checklist
    - Coding Standards, Configuration Control, and Code Walkthroughs
    - Test Plans, Test Preparations, Formal Testing, and Reporting
    - Independent QA surveillance and reporting

Quality Assurance



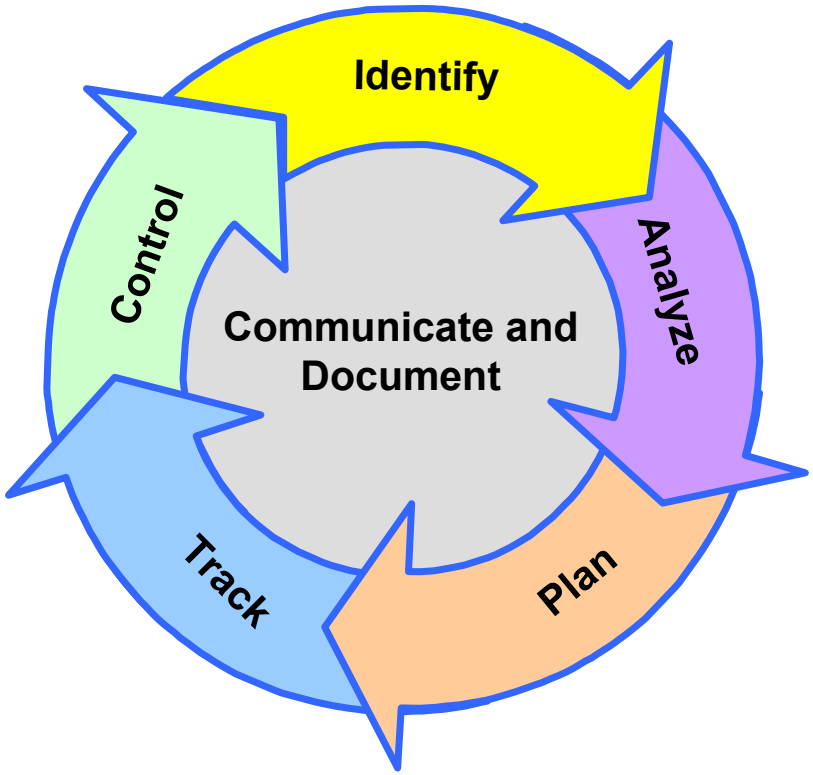
- Procurements per released drawing and indentured parts list
- Periodic GIDEP alert verification performed on EEE parts list
- QA Receiving Inspection of EEE parts for flight hardware
- Flight PWB procurement and coupon testing at GSFC
- SwRI coordinates PCB effort for SPP ISIS with mission-level PCB

Quality Assurance (cont'd.)



- Non-conformance control:
  - Per organization's established procedures
  - MRB and FRB established
  - All non-conformances will be processed as Anomalies or Problem/Failure reports and reported through SwRI to APL as required
- Workmanship
  - Technicians and inspectors are certified to NASA 8739 standards. Vince Ganley & Connie Ovalles are the in-house Level B certified instructors and are available to support other organizations as needed.
- ESD
  - Engineers, operators, and technicians are certified to NASA-STD-8739.7 / ANSI ESD S20.20.

Safety



- SPP ISIS will provide Safety inputs
  - The NPR-8715.3A process circle summarizes the overall safety program risk management approach:
- Safety Hazards Analysis
- Implementation of hazard controls
- Verification

EPI Hi/Lo Hazards and Mitigations

- TBD

- Need input from Scott

Summary

- SPP ISIS Performance Assurance plans and requirements are in place
- PAIPs written in response to the APL MAR Matrix requirements
- SwRI QA independently verifies that we follow plans