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# Systems Engineering

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# Instrument Requirements and Performance Modeling

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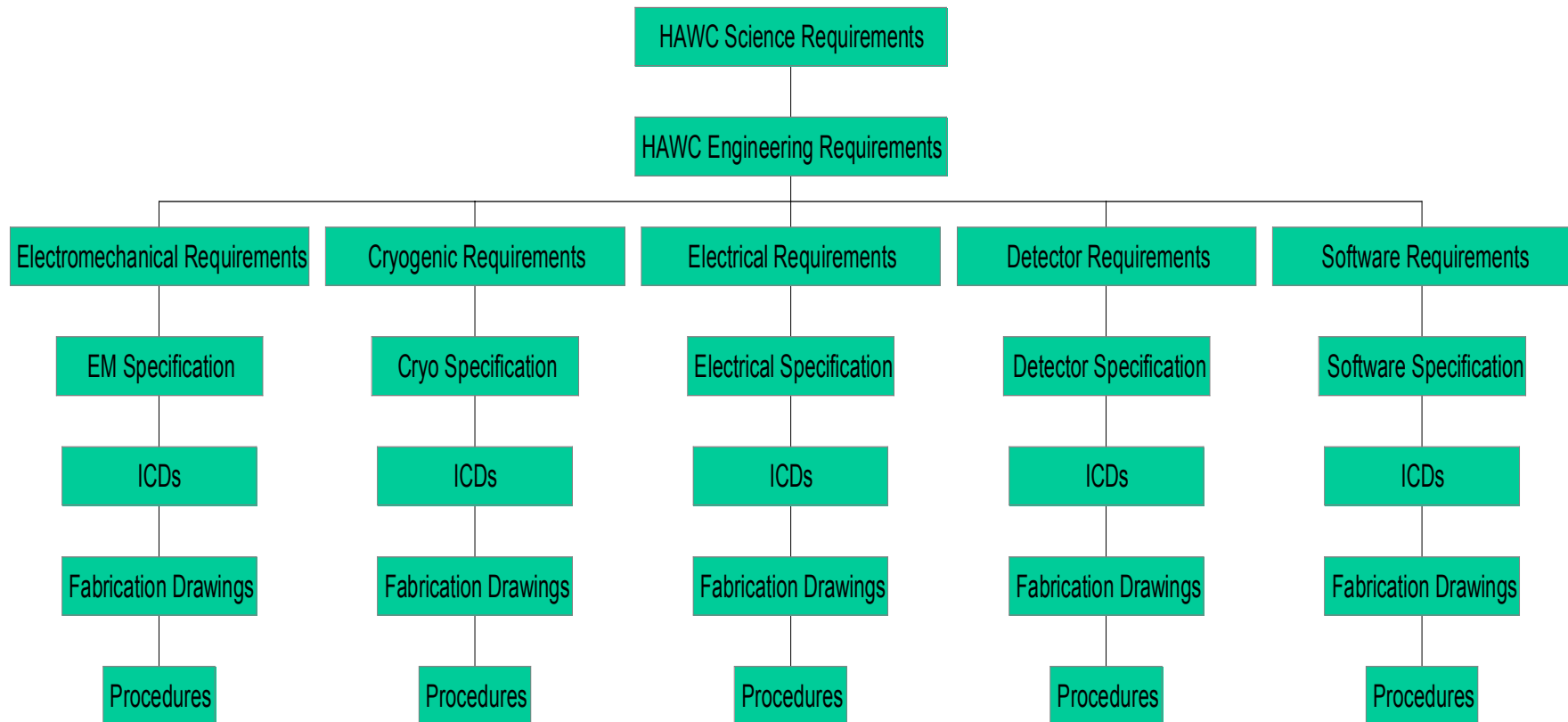
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# Systems Engineering Management

F. Kirchman



# HAWC Requirements Flowdown





# Interface Control

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- HAWC Does not take a traditional Systems Engineering approach to interface control
- IPT Leads are responsible for managing interfaces concerning their expertise
  - Opto-Mechanical IPT lead manages Mechanical ICDs
  - Electrical IPT lead manages Electrical ICDs
  - Cryogenics IPT lead manages Thermal ICDs
  - Software IPT lead manages software ICDs
  - Instrument Manager and PI manage SOFIA Interface
- ICDs are to be in place by CDR



# Configuration Management



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**Configuration Management (CM) has been defined as a “tool used to ensure that the configuration of project hardware and software is known at any point in time during the project life cycle.”**

- Recognizing the importance of this discipline is imperative in regards to the production of hardware and software necessary to support mission requirements. It should not be thought of as a hindrance to progress, but as the means for achieving it in the most effective and thorough manner.
- Keeping this in mind, a CM Plan will be written and released in order to provide the HAWC team with the necessary guidelines for the release and control of documentation and the processing of all changes that may arise during the design and development of the HAWC.

Highlights of the CM system include (but are not limited to):

- Assignment of control numbers for both documents and drawings
- Electronic Submittal, Review, and Sign-Off for both drawings and documents from individual workstations in an effort to offer a “paperless system”
- Official release of documentation and distribution to team members
- The CM Office will serve as the central repository for all HAWC master documentation and the repository from which controlled data is disseminated to the project team
- All changes to baselined documentation will be tracked online, and a complete status accounting for change activity, documentation, drawings, and action items will be available, as needed.



# HAWC Verification



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- Component Verification will be accomplished by the responsible IPT
  - Overall HAWC systems verification will be accomplished in a three step process
    - at GSFC during development testing
    - At Ames Research Center using SOFIA simulators
    - Aboard SOFIA during flight testing and commissioning phase
  - There is a possibility of using CSO observatory to verify HAWC sensitivity
  - Safety related functions of HAWC will be verified in concurrence with SOFIA/USRA through the established FAA certification process



# HAWC Risk Plan



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- Major risks to individual IPTs are evaluated by the IPT lead and presented in their section
  - Major risks to HAWC Instrument performance and programmatics are presented here
  - Risk Mitigation Plans are developed coordinated with SSMOC Science Interface IPT
  - Risk Items are tracked closely, so that mitigation plans can be instituted promptly if required



# HAWC Risks



Risk	Effect	Mitigation
Detector Design is state of the art in array technology and cryogenic packaging	Schedule and budget risk, due to use of cutting edge technology	Track progress closely, provide adequate resources up front for development, Early prototype test
SOFIA interfaces are not fully defined	If SOFIA interface is not fully defined soon HAWC functionality, extensibility and maintainability may be compromised	Coordinate interface issues closely with SOFIA
Distributed systems engineering approach is not traditional	Possibility of conflicting interfaces	Instrument Manager assumes systems engineering role
Geographically distributed project with diverse Institutions	Potential confusion during development activities	Define Roles and Responsibilities ASAP