AFRL-AFSPC-SMC

- R2O & CCMC –

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Research to Ops (R2O) Outline

- Overview
- Operationalization: Process & Issues
- CCMC OWG
- SWFL Potentials for CCMC

Overview

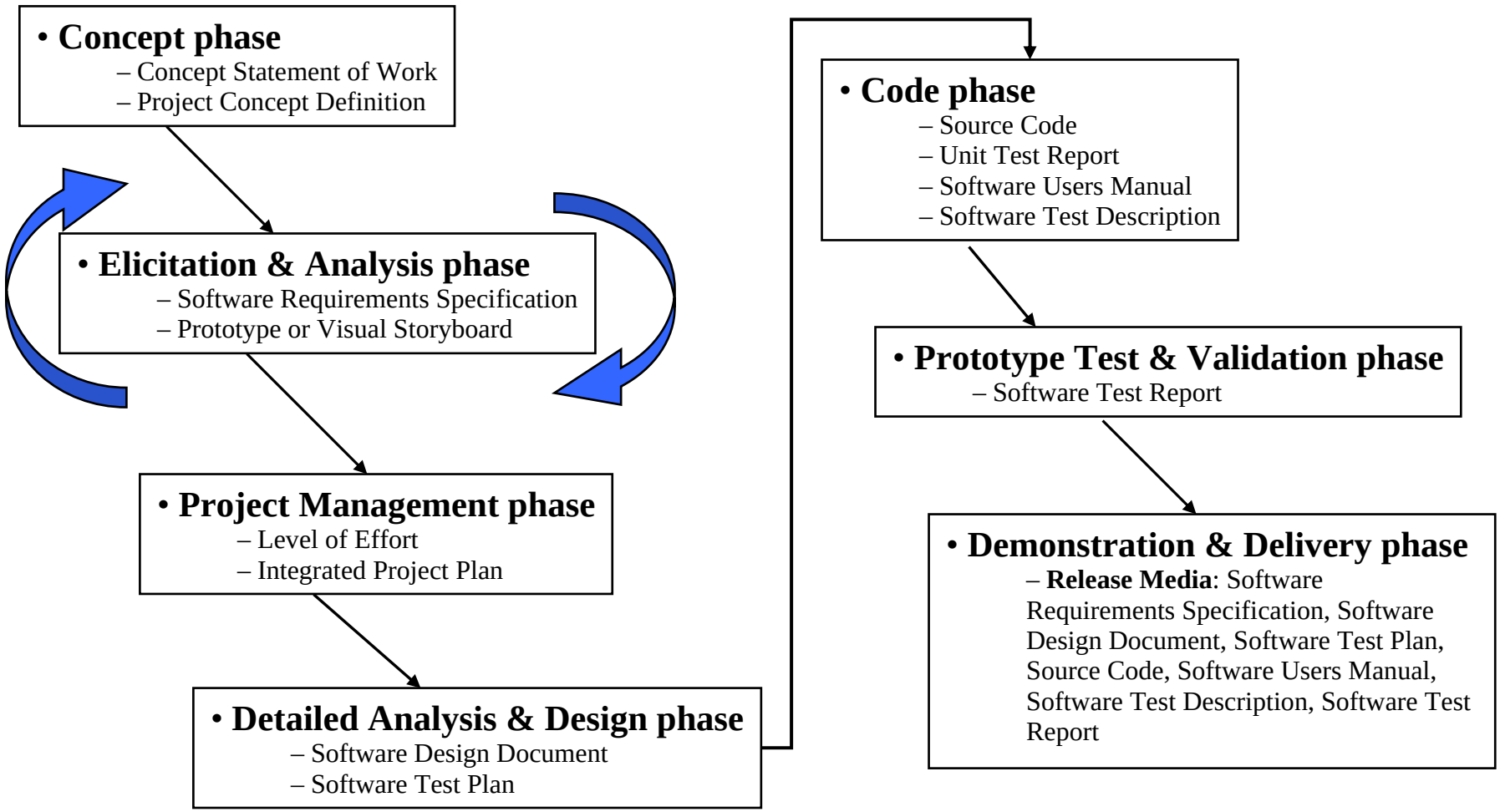
- Operationalization = Research to Ops
- Needs completed ops-relevant research
  - Plenty exists
- Needs ops requirements & funding applied
  - Not so much
- Progressing towards more ops-applied (system-impact) products

Operationalization Process
Simplified

- General Process
  - Have Idea for product (ID model)
  - Apply existing requirements (if any)
  - Promote/Sell
  - Get Advocate(s)/Customer(s)
  - Rewrite Requirements to match product/prototype
  - Start building product/prototype
  - Get funding
  - Rewrite requirements to match product & sponsor
  - Continue building product
- (Continued)
  - Find/Get a host
  - Rewrite requirements to match product & host
  - Finish building the product
  - Final rewrite of requirements
  - Deliver product/prototype & documentation
  - Repeat all for ops version
    - With varied amounts of funding & contractor support loss
  - Integrate the product into ops
  - Maintain/Train product/sw
  - Upgrade (repeat process)?

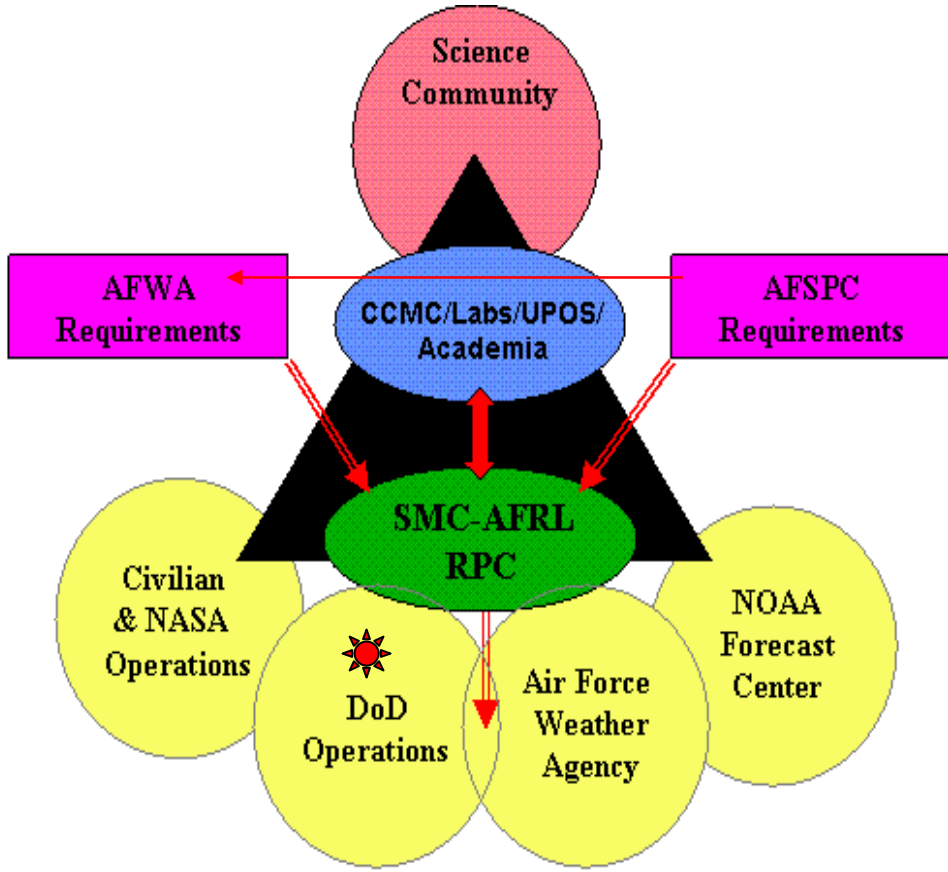
Complexities: contracting, design, test, validation, classification, accreditation

SMC/SYAG's Organizational Standard Prototype Process (OSPP)



Operationalization Process
Players in the Space Wx Ops Arena

- Organizations in the research-to-ops process include:
  - Researchers
    - Gov/DoD Labs, Universities
    - (Commercial Research Entities)
  - Research-to-Ops Units
    - Requirements-generating units
    - RPCs
    - Contract Organizations
    - CCMC
  - Ops Product Hosts & Users
    - Data/Warning/Forecast Centers
    - Anomaly Analysis Groups
    - Radar, SATCOM & Satellite Ops
    - Mission Commanders
    - Soldiers in the Field
      - (technology end users)



Issues with Operationalization

(** = Contribute to “Valley of Death”)

- Multi-Organization Coordination
- **Funding ****
- Lack of Customers
- Too many customers (“Multiple Targets)
- **Changes During Process (“Moving Targets”)****
- **Personnel & Mission Changes****
- Ambiguous Requirements
- **Facilities issues**
- Env Input Data Requirements
  - Quality
  - Availability
- Asset Data Requirements
  - Specs & Thresholds
  - Lack of validation obs
- Mission Data Acquisition
  - Business rules
- Security classification**
- Politics**

Issue
Funding

- Few space environment research-to-ops programs have ever been an officially “funded program”
  - Not “POMed” (in a program objective memorandum)
- Funding has been “catch-as-catch can”
  - From other organizations/program’s fallout money
- Applicable government organizations (SMC, AFSPC, AFRL, AFOSR, etc) are constrained by the “color” of money they have to spend
  - 6200 = Research
  - 6300 = Applied for Ops Transition
  - Can’t spend one type of $ on a different type of project

Issue
Moving Targets

- Undetermined Hardware / Software Interfaces
  - Mainframe vs PC
  - Stand-alone vs Net Centricity
- Changing Product Requirements
  - From the sponsor/customer
  - Internally, from increasingly more enlightened development personnel
- Change of Customer (Delivery Site) for SEEFS**
  - First to undetermined host site
  - Then to multiple sites (DMO-S, JSPOC, MHPCC, AFWA)
  - Current discussions about host site, user support, env models location
    - Customer Support vs. Host Agency Mandates vs. Config Mngt issue
      - Must have an answer for the war fighter
      - Can't have two different answers for the war fighter
      - Don't prefer differing env model outputs available to customers
      - Strong preference for validated models, especially if replacing existing ones
      - SEEFS has various versions of env models imbedded in it's product generators
      - "Operational prototype" vs. Strip out models vs. Copying of models to the outside

Issue
Personnel & Mission Changes

- Personnel Changes
  - Military moves more often than civilian counterparts
  - Government cutback & military move policies/programs change each yr
    - SMC/SYAG will lose most personnel (from 60+ to 13) in 2007/08 due to realignment, elimination of enlisted programmer career field, and USAF drawdown.
    - AFRL/RVBX will lose several thru 2011 due to HAFB to KAFB relocation
- Mission Changes
  - SMC/SY change from prototyping (OSPP) to producing operational versions & integration [Org. Standard Process (OSP)]
    - Programmers change from prototype coding to documenting new sw requirements & design (SRS & SDD)
    - Criteria change for classification, testing, accreditation, validation
    - Changes to requirements and design
      - Results in some code deletions to focus on customer needs and more acceptable run-times & storage limits for ops support
        - » Example: elimination of several output options for Char/D

Issue
Facilities Considerations

- Lack of real time data feeds at SMC's Research-to-Ops Facility
  - Canned data doesn't cut it for ops testing
- Inability to execute real product runs due to classification considerations
  - This affects capability to perform true validation
- Not ideal venue for required Operational Evaluations (Ops Evals)

Issue

Operational Evaluation - Difficult

SEEFS Spiral 2A Ops Eval - Mar 2006

CCMC OWG
Responsibilities

OWG Responsibilities - Lists to Steering Com.

√ 1) List of OWG Members
- Reps from AFWA, AFRL, NASA, SEC, SMC

√ 2) List of Parameters & Metrics Used/Needed in Operations:
- List of input & output parameters for data and models used at the various space weather operational sites, to include error bars.

√ 3) List of Validations Needed in Operations

√ 4) Operational Hardware System & Software Requirements:

√ 5) Applicable Notes to the CCMC Steering Committee & Science Working Group (SWG)

OWG plans to update all previously delivered lists by Feb ‘08

CCMC OWG
Members

√ 1) List of OWG Members:

Membership - Nov 2007			
AFWA	Matt Sattler/Capt Anderson	402-294-3373	Sattlerm@afwa.af.mil
NOAA/SEC	Kent Doggett (co-chair)	303-497-3317	Kent.A.Doggett@noaa.gov
NASA/SRAG	Steve Johnson	281-483-5323	A.S.Johnson1@jsc.nasa.gov
AFRL/VSBX	Stephen Quigley (chair)	719-556-2889	Stephen.Quigley@cisf.af.mil
SMC/WXT	Christopher Cox (Maj)	719-556-8732	Christopher.Cox@cisf.af.mil

CCMC OWG
Validations Needed

√ 3) List of Validations Needed in Ops: Primary AFSPC & SMC Need of CCMC!

CCMC OWG - List of Validations Needed in Operations

The following list does not consider whether or not a particular model or models reside currently at the CCMC.
This desire for a validition should be considered a recommendation for that model to be acquired and validated by the CCMC.
This list does not provide information on the types of metrics that would be desired for such a validation, but the OWG is willing to provide assistance in developing such metrics and/or validation processes to the CCMC.

FIRST PRIORITY - 3 or more OWG organizations overlap (no particular order)

Comparitive validation of the Hardy Auroral Oval model against the OVATION model
Comparitive validation of OpSEND's UHF SATCOM Scintillation product version of SCINDA model w version used in SEEFS' SatScint product
Input data validation of USU GAIM with/without SSUSI/SSULI/COSMIC
Data validation of the JHU/APL Kp & Dst predictions forced by HAF solar wind output instead of ACE

SECOND PRIORITY - 2 OWG organizations overlap (no particular order)

Validation of Foster's Sub-Auroral Polarization Stream (SAPS) Model (best compared to other SAPS mod, MHD mod trough, or combined auroral/SAPS m
Predicted Kp driven Magnetospheric Specification Model vs Magnetospheric Specification and Forecast Model
Validation of the Detman Hybrid Heliospheric Modeling System against ENLIL/WSA system.

Third Priority - 1 OWG organization chose (no particular order)

Data validation of forecast produced by JHU/APL Radiation Belt Environments model forced by HAF solar wind output
Comparitive validation of the WSA solar wind model against the HAF solar wind model (Ghee Frye may have done some of this)
Comparitive validation of the Smithtro Relativistic Electron Forecast Model against the JHU/APL Rel (reco val of both against ground truth for abs vs relative)
Comparitive validation of USU GAIM against USC GAIM
Comparitive validation of the ENLIL solar wind model against HAF
Comparitive validation of predicted delta B magnitude at ground magnetometers from Weimer Model and same derived from MHD code(s)

Fourth Priority (in no particular order)

Comparitive validation of operational versions of WBMod & WBMGrid with versions used in SEEFS' RadScint & SatScint products
Comparitive validation of the Costello Kp prediction algorithm against the JHU/APL Kp prediction algorithm (done already?)
Comparitive validation of the Proton prediction System (PPS) model against the PROTON model
Li/Temerin Dst prediction against the JHU/APL Dst Prediction
Data validation of the JHU/APL Radiation Belt Environments model forced with observed Dst vs forecasted Dst.
Data validation of the JHU/APL Kp & Dst prediction algorithms with and without observed Kp & Dst

CCMC OWG
Validations Needed

√ 3) List of Validations Needed in Ops: Primary AFSPC & SMC Need of CCMC!

CCMC OWG - List of Validations Needed in Operations
FIRST PRIORITY - 3 or more OWG organizations overlap (no particular order)
Comparitive validation of the Hardy Auroral Oval model against the OVATION model
Comparitive validation of older SATCOM Scintillation version of SCINDA model w newer SEEFS' version
Input data validation of USU GAIM with/without SSUSI/SSULI/COSMIC
Data validation of the JHU/APL Kp & Dst predictions forced by HAF solar wind output instead of ACE
SECOND PRIORITY - 2 OWG organizations overlap (no particular order)
Validation of Foster's SAPS) Model
(best compared to other SAPS mod, MHD mod trough, or combined auroral/SAPS mod)
Predicted Kp driven Magnetospheric Specification Model vs Magnetospheric Specification and Forecast Model
Validation of the Detman Hybrid Heliospheric Modeling System against ENLIL/WSA system.

CCMC OWG
Ops HW & SW Requirements

√ 4) Operational Hardware System & Software Requirements:

- This list will provide requirements and considerations regarding hardware available for use at the various operational sites, model/product generation timeline constraints, and current/anticipated software constraints and standards.

CCMC OWG
Notes to Steering Committee & SWG

√ 5) Notes to the Steering Committee & SWG:

– This list will provide OWG questions, comments, recommendations and other applicable information to the CCMC Steering Committee and SWG, to include:

√ • Other operational considerations and models for the CCMC

√ • Notes on known uses of CCMC products or web resources by the operational organizations

√ • Notes on CCMC educational support with respect to operations

√ • Requests for OWG info to be published on the CCMC web site

√ • OWG Administrative Information (meetings planned, minutes, etc)

• NOTE: Most recent/new input to the Steering Committee relates to CCMC CONOPS and associated organization representatives to CCMC

AFRL SWFL

Potential Near-Term Applications to CCMC

- TBD potential work by AFRL's newly formed Space Weather Forecast Lab (SWFL)
  - SMEI into AFWA Ops
    - Potential for (comparative) validation of SMEI data used in HAF model, etc
  - New Satellite Launch and Deployment (SaLaD) support product development may require validation of auroral oval applications (Hardy vs Ovation, etc)
  - Potential for creation of new products for SWPC
    - GPS effects/error product (solar radio bursts, scintillation, etc)
    - Meteor Effects (METE) product?
    - Note: Well-organized potential new models/products into SWPC review process and committee


The End