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Harnessing the Risk-Related Data Supply Chain: An Information Architecture Approach to Enriching Human System Research and Operations Knowledge

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Information Architecture

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- What is it?
  - A representation of the enterprise built using systematic rational methods. The architecture contains a representation of the current state as well as a design of the desired (target) state that operates more effectively and efficiently. The target state is designed to facilitate the movement of data and information to the right people at the right time to get their work done.
- How is it built?
  - Identify the data/information and the people and systems generating or consuming that data/information
  - Identify the business processes
    - are they defined, documented, ad hoc, a combination
  - Determine the target state
- How is it used?
  - Determine a transition strategy (priorities and specific tasks) to move from the current state to the target state

Current Information Architecture

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- Multiple projects generating data
  - Operational
  - Research
- Multiple systems storing data
- Few connections between the systems
- Inefficient access to data/information
- Incomplete knowledge of data/information available

Current & Target State: Human System Risk Business Process

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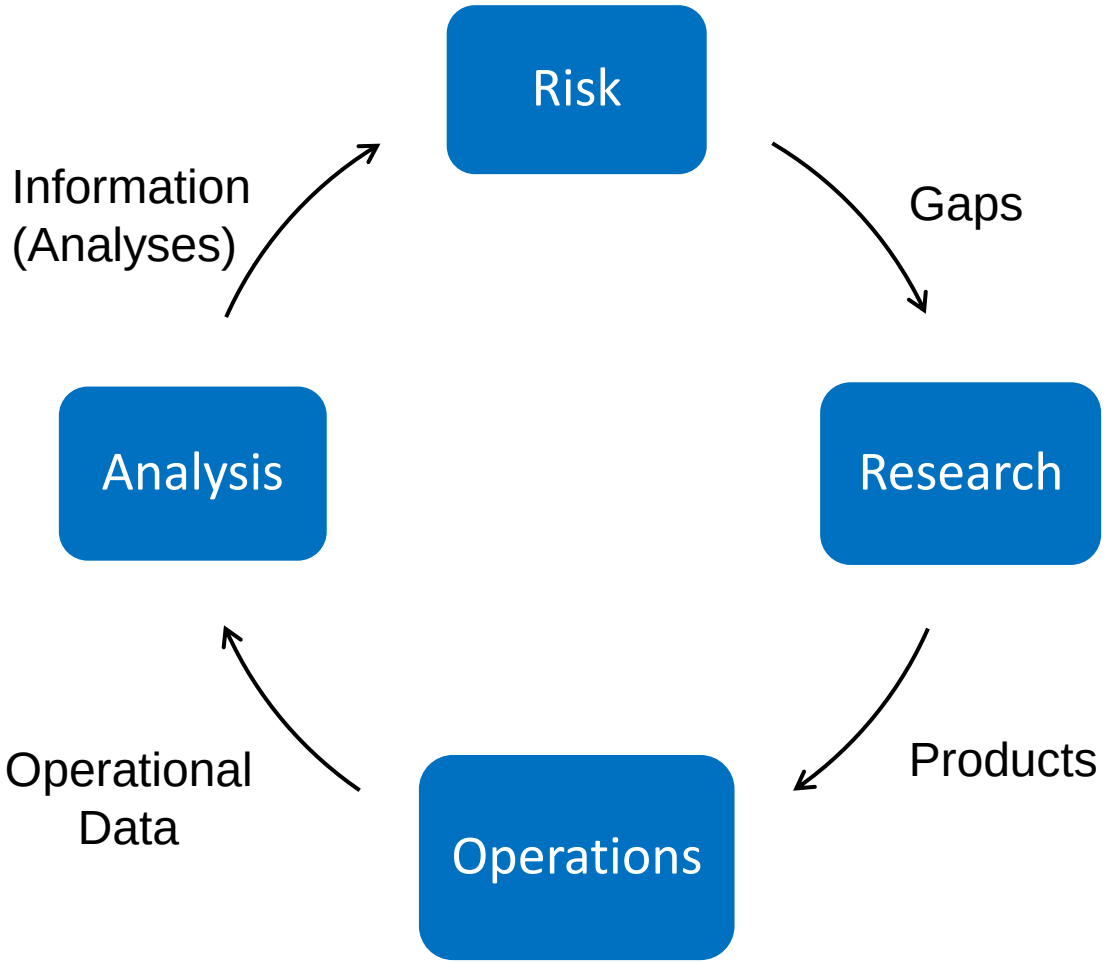
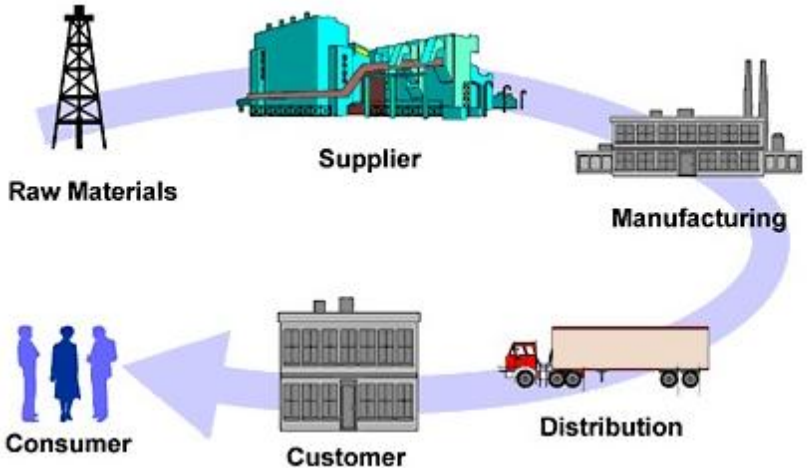


Current State:
Flow of Risk Data/Information

- By mapping the risk-related data flow from raw data to useable information and knowledge (think of it as a data supply chain), the Human Research Program (HRP) and Space Life Science Directorate (SLSD) are building an information architecture plan to leverage their existing, *and often shared*, IT infrastructure.



Target Information Architecture: Some Key Aspects

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Get the Right Information to the Right Place at the Right Time!

- Single place to go for evidence
  - Can be a distributed system underneath
- Risk representation tool that fully represents the richness of the risks and enables problem solving about the risks
  - Many risks have relationships among them.
    - E.g. inadequate nutrition can be a contributing factor to many other risks
  - Some risks share mitigation strategies
- It is important to understand how people and systems in the enterprise participate in multiple tasks and activities

Activities Derived from Key Aspects

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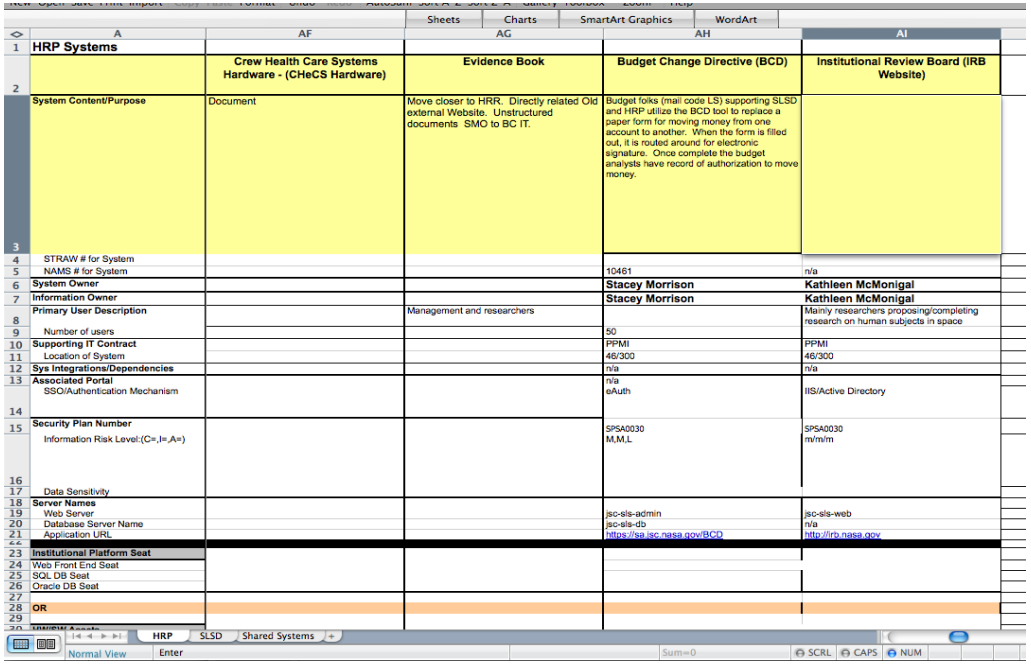
Single place to go for evidence

- Creation of an Evidence Base Working Group and Executive Committee to handle all data requests for data derived from personally identifiable data in our systems (both research and clinical data)
- Data systems inventory – identify all types of data in SLSD and HRP systems



HRP Systems	Crew Health Care Systems Hardware - (CHeCS Hardware)	Evidence Book	Budget Change Directive (BCD)	Institutional Review Board (IRB Website)
System Content/Purpose	Document	Move closer to HRR. Directly related Old external Website. Unstructured documents SMO to BC IT.	Budget folks (mail code LS) supporting SLSD and HRP utilize the BCD tool to replace a paper form for moving money from one account to another. When the form is filled out, it is routed around for electronic signature. Once complete the budget analysts have record of authorization to move money.	
STRAW # for System				
NAMS # for System			10461	n/a
System Owner			Stacey Morrison	Kathleen McMonigal
Information Owner			Stacey Morrison	Kathleen McMonigal
Primary User Description		Management and researchers		Mainly researchers proposing/completing research on human subjects in space
Number of users			50	
Supporting IT Contract			PPMI	PPMI
Location of System			46/300	46/300
Sys Integrations/Dependencies			n/a	n/a
Associated Portal			n/a	
SSOI/Authentication Mechanism			eAuth	IIS/Active Directory
Security Plan Number			SPSA0030	SPSA0030
Information Risk Level:(C=,I=,A=)			M,M,L	m/m/m
Data Sensitivity				
Server Names				
Web Server			jsc-sls-admin	jsc-sls-web
Database Server Name			jsc-sls-db	n/a
Application URL			https://sa.isc.nasa.gov/BCD	http://irb.nasa.gov
Institutional Platform Seat				
Web Front End Seat				
SQL DB Seat				
Oracle DB Seat				
OR				

Activities Derived from Key Aspects

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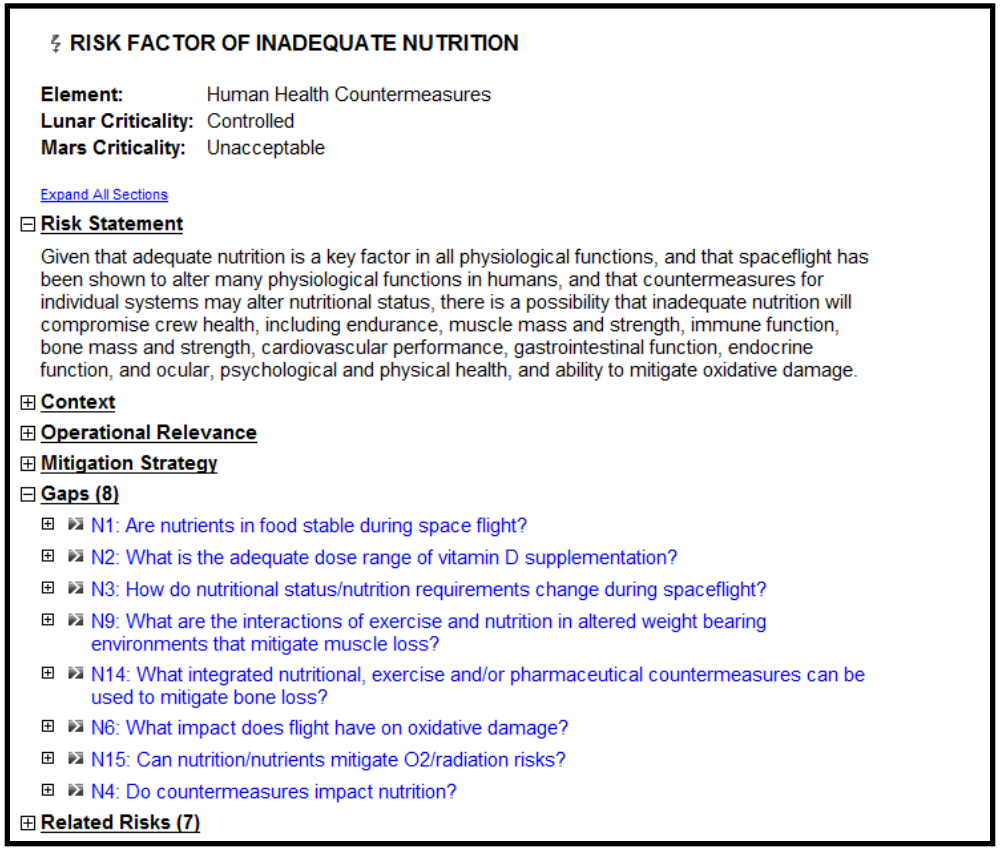
Risk representation tool

- RMAT – Risk Management Analysis Tool
  - Enter all risks into a database tool to capture current risk representation
  - Explore richer representation format that can capture the relationships between components of the risk representation



RISK FACTOR OF INADEQUATE NUTRITION

Element: Human Health Countermeasures
Lunar Criticality: Controlled
Mars Criticality: Unacceptable

Expand All Sections

⊟ **Risk Statement**

Given that adequate nutrition is a key factor in all physiological functions, and that spaceflight has been shown to alter many physiological functions in humans, and that countermeasures for individual systems may alter nutritional status, there is a possibility that inadequate nutrition will compromise crew health, including endurance, muscle mass and strength, immune function, bone mass and strength, cardiovascular performance, gastrointestinal function, endocrine function, and ocular, psychological and physical health, and ability to mitigate oxidative damage.

⊞ **Context**
⊞ **Operational Relevance**
⊞ **Mitigation Strategy**
⊟ **Gaps (8)**
- ⊞ N1: Are nutrients in food stable during space flight?
- ⊞ N2: What is the adequate dose range of vitamin D supplementation?
- ⊞ N3: How do nutritional status/nutrition requirements change during spaceflight?
- ⊞ N9: What are the interactions of exercise and nutrition in altered weight bearing environments that mitigate muscle loss?
- ⊞ N14: What integrated nutritional, exercise and/or pharmaceutical countermeasures can be used to mitigate bone loss?
- ⊞ N6: What impact does flight have on oxidative damage?
- ⊞ N15: Can nutrition/nutrients mitigate O2/radiation risks?
- ⊞ N4: Do countermeasures impact nutrition?

⊞ **Related Risks (7)**

Activities Derived from Key Aspects

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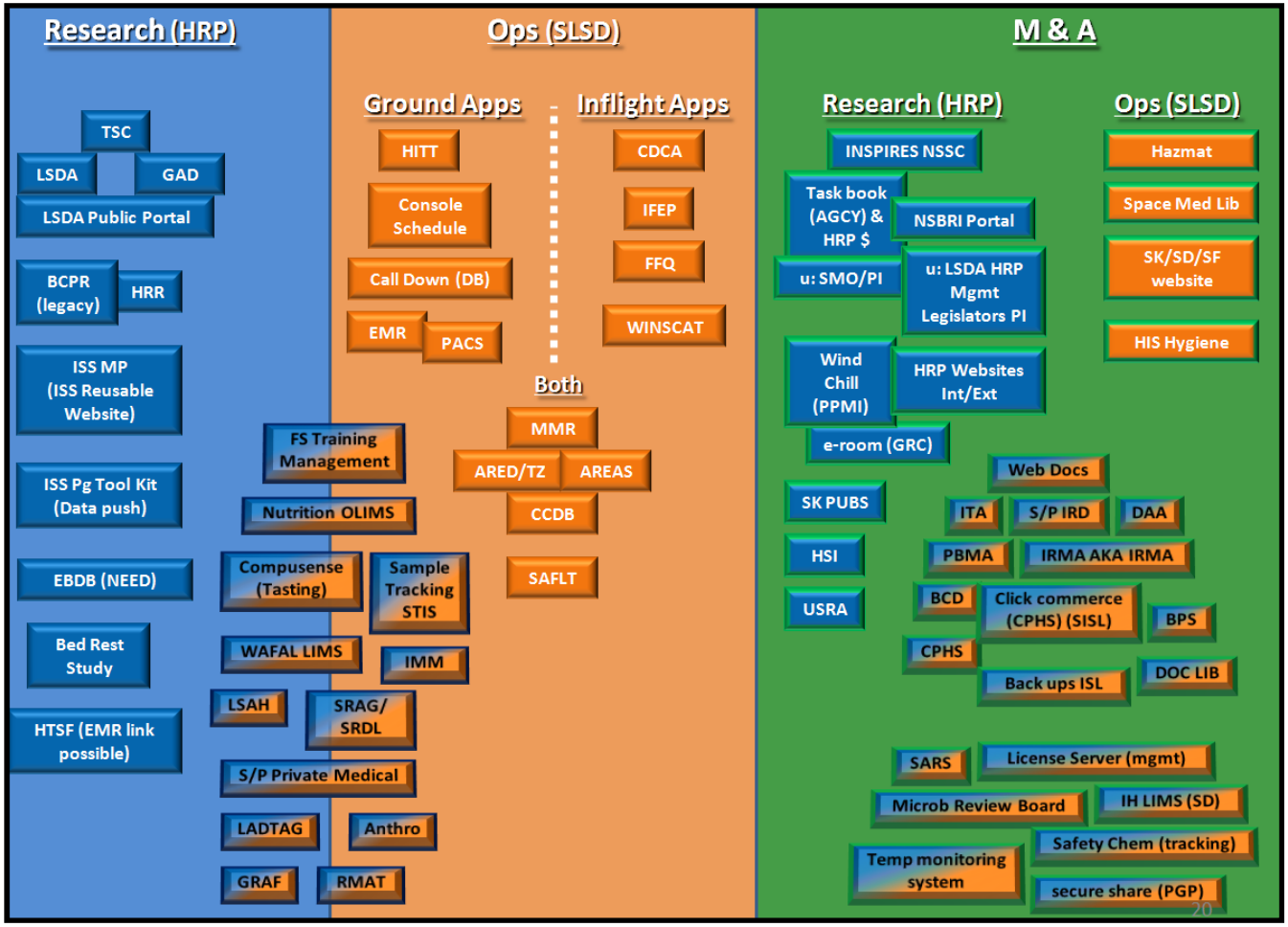
Understand People and Systems Relationships

- Organizational Relationships documentation
- Functional review of Systems



Summary

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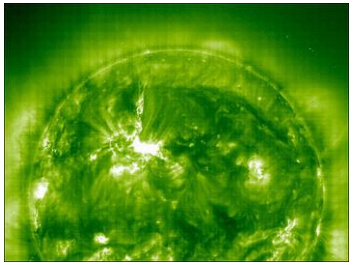

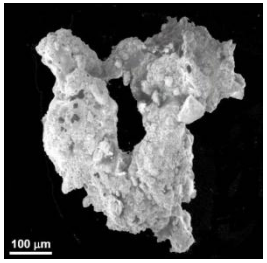

An Information Architecture facilitates the understanding and, hence, harnessing of the human system risk-related data supply chain which enhances the ability to securely collect, integrate, and share data assets that improve human system research and operations.

BACKUP MATERIAL

HRP-SLSD: Organizational View

- HRP and SLSD have a unique organizational construct that adds a layer of complexity to the challenge of building an information architecture plan.
  - Organizational symbiosis at least at the Johnson Space Center
    - HRP program management and support are organizationally embedded in SLSD at the Johnson Space Center
    - Key individuals are both SLSD managers/discipline experts as well as HRP element managers.
    - SLSD employees are funded by and work on HRP-funded efforts, but live within an SLSD organizational reporting structure
    - IT systems and dependency on the kinds of data are entwined
      - This is particularly strong in the area of human system risk-related data/information

Space Life Sciences Directorate

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Deputy Director – J. Craig Stencil
Associate Director – Judith L. Robinson, Ph.D.
Chief Scientist – Neal R. Pellis, Ph.D.
Deputy Chief Medical Officer – James M. Duncan, M.D.
Senior Strategist – Elizabeth E. Richard (Wyle)
Administrative Officer – Carolyn A. Woolverton
Directorate Secretary – Vanessa T. Thomas
Secretary – Barbara C. Buentello (RCJV)
Secretary – Cathy D. Graham (RCJV)

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Deputy Program Manager – Barbara J. Corbin
Program Scientist – John B. Charles, Ph.D.
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** reports directly to Associate Administrator, ESMD*

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Human Health & Performance Integration – Judith L. Robinson, Ph.D.
Innovation – Jennifer A. Fogarty, Ph.D.
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Effective: January 22, 2010

HRP-SLSD Organizational Relationships

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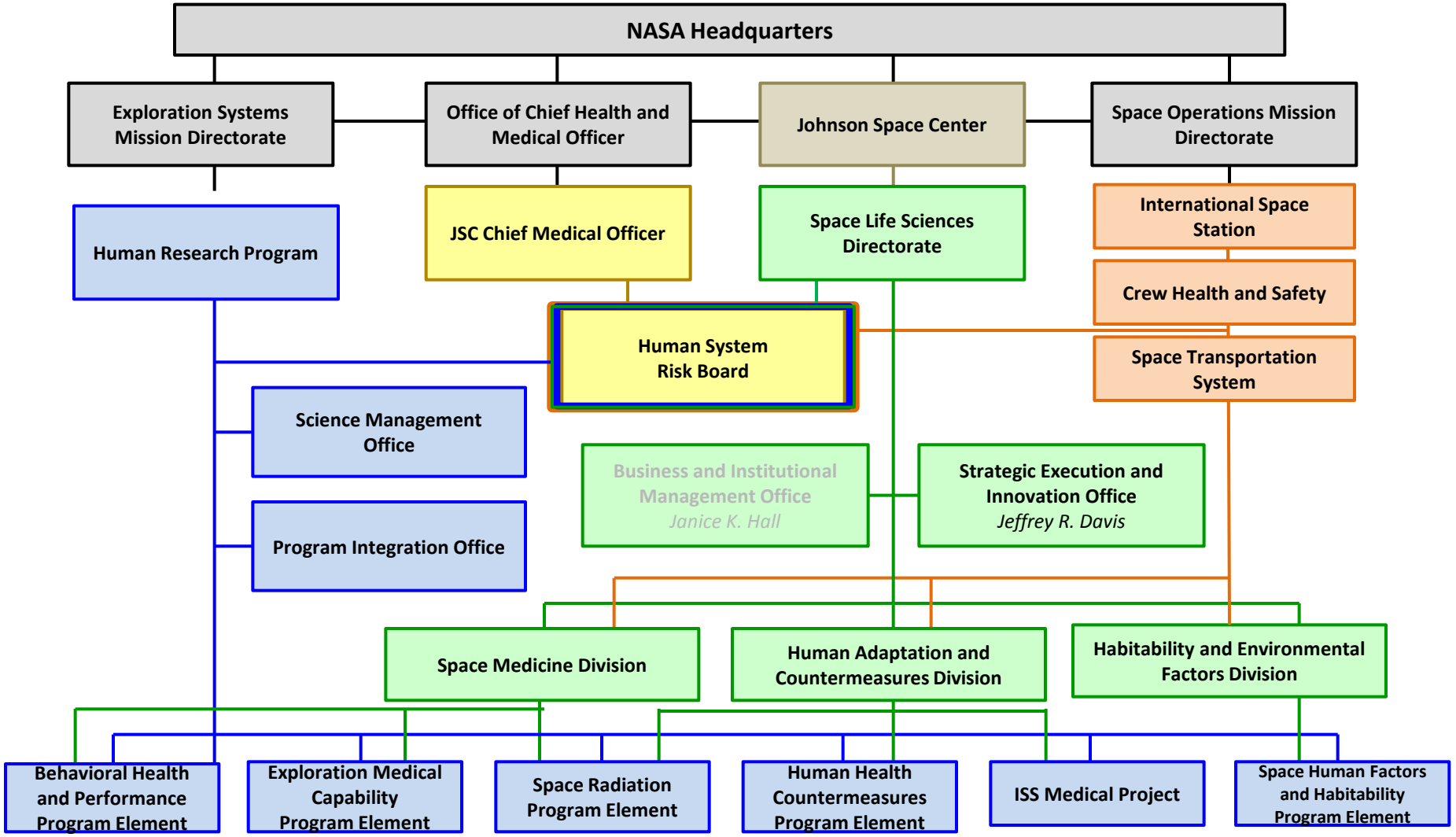
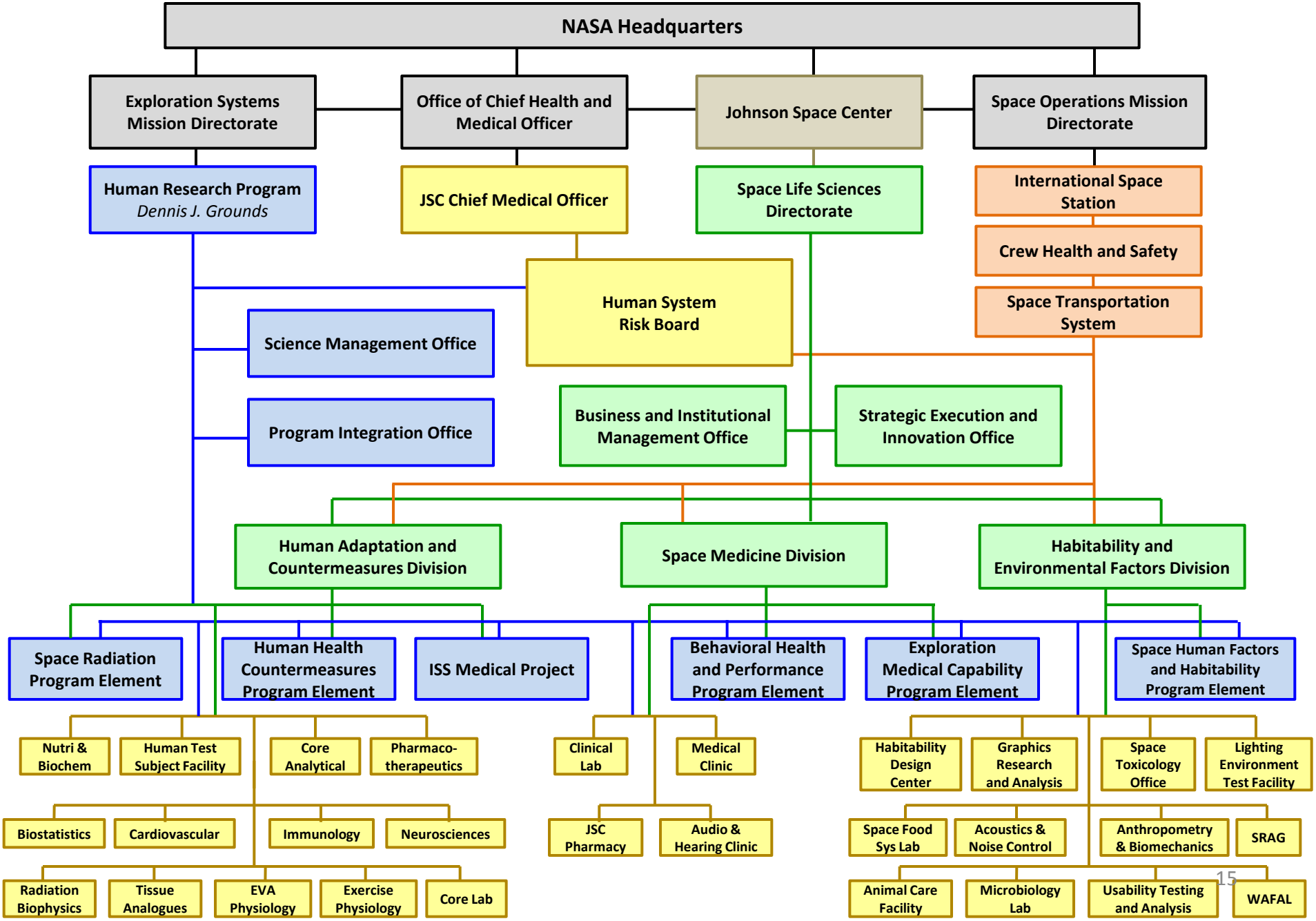
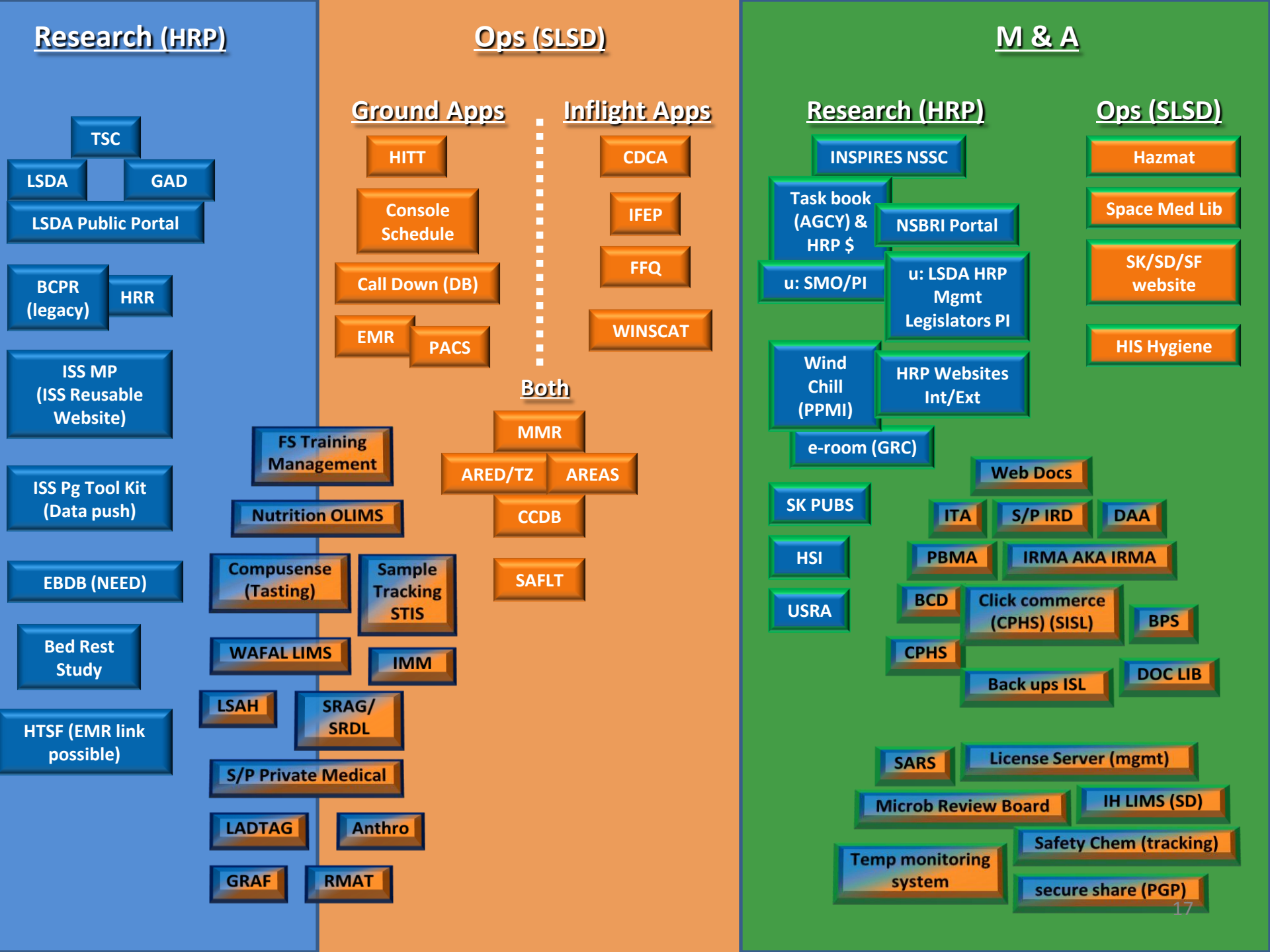


HRP-SLSD Organizational Relationships to the Lowest Levels



HRP-SLSD: Applications View

- The complexity of the organizational construct is compounded by the complexity of the applications that support both organizations.
- We literally took a physical inventory of the applications used to support HRP, SLSD, and those that were shared.
  - We layed it out by abstracting the business process to the highest level:
    - HRP = Research
    - SLSD = In-flight and ground-based operations
    - M&A = Both organizations have systems that support management and administration


Research (HRP)
TSC
LSDA
GAD
LSDA Public Portal
BCPR (legacy)
HRR
ISS MP (ISS Reusable Website)
ISS Pg Tool Kit (Data push)
EBDB (NEED)
Bed Rest Study
HTSF (EMR link possible)
Ops (SLSD)
Ground Apps
Inflight Apps
HITT
CDCA
Console Schedule
IFEP
FFQ
Call Down (DB)
WINSCAT
EMR
PACS
Both
MMR
ARED/TZ
AREAS
CCDB
SAFLT
FS Training Management
Nutrition OLIMS
Compusense (Tasting)
Sample Tracking STIS
WAFAL LIMS
IMM
LSAH
SRAG/ SRDL
S/P Private Medical
LADTAG
Anthro
GRAF
RMAT
M & A
Research (HRP)
Ops (SLSD)
INSPIRES NSSC
Hazmat
Task book (AGCY) & HRP $
NSBRI Portal
Space Med Lib
u: SMO/PI
u: LSDA HRP Mgmt Legislators PI
SK/SD/SF website
HIS Hygiene
Wind Chill (PPMI)
HRP Websites Int/Ext
e-room (GRC)
Web Docs
SK PUBS
ITA
S/P IRD
DAA
HSI
PBMA
IRMA AKA IRMA
USRA
BCD
Click commerce (CPHS) (SISL)
BPS
CPHS
Back ups ISL
DOC LIB
SARS
License Server (mgmt)
Microb Review Board
IH LIMS (SD)
Safety Chem (tracking)
Temp monitoring system
secure share (PGP)

HRP-SLSD: Business Process View

- We, then talked through the primary lines of business that fall out of the research and operations areas.
- Still keeping it at a high level, we identified 4 primary lines of business
  - Risk Management (both organizations do this)
  - Research Management (primarily HRP, but SLSD does it in support of HRP)
  - Human System Management (primarily SLSD: in-flight medical care, flight medicine clinic, JSC clinic)
  - Innovation. Major SLSD goal this year is to make this more foundational to the organization
- With these 3 elements better understood, we have a notional representation of our IT infrastructure baseline.

Notional Architecture Representation

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