ExMC Technology Watch

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2013 NASA Human Research Program Investigators’ Workshop
• Objectives:
  – To identify emerging, high-impact technologies that augment current ExMC development efforts
  – To work with academia, industry, and other government agencies in order to accelerate the development of medical care and research capabilities for the mitigation of potential health issues that could occur during space exploration missions

• Establishment of partnerships with external organizations is beneficial to technology development and furthers NASA’s goal to provide a safe and healthy environment for human exploration
Overview

• Background
• FY12 Highlights
  i. Gap reports
  ii. Gap report review process
  iii. Student/Capstone projects
Background - Overview

Technology Watch

- Space Medicine Exploration
- Medical Condition List (SMEMCL)
- Capabilities Needed for Diagnosis, Treatment, and Monitoring
- Gap Analysis
- Technology Gaps
- Deliverables: Requirements Prototype System
- Knowledge Gaps
- Deliverables: Evidence
- Tech Watch
Exploration Medical Capability (ExMC) Element

TECH WATCH

Element Manager – Tammie McGrath
Deputy Element Manager – Bara Reyna
Element Scientist – Sharmi Watkins, MD
Deputy Element Scientist – Anil Menon, MD
Wiki Lead – Jack Rasbury
Technical Lead – Michael Krihak

Tech Watch Agent
GRC
Laurie Stauber

Gap Owners
Gap 4.02 – B. Thompson
Gap 4.04 – S. Olson
Gap 4.06 – A. Weaver
Gap 4.09 – J. McQuillen
Gap 4.12 – J. McQuillen
Gap 4.14/4.15 – J. Zoldak
Gap 4.27 - TBD

Tech Watch Agent
LaRC
Lisa Scott Carnell

Gap Owners
Gap 4.26 – L. Scott Carnell

Tech Watch Agent
JSC
Victor Hurst

Gap Owners
Gap 1.01/1.03 – R. Shah
Gap 2.01 – D. Butler
Gap 2.02, 4.24 – A. Menon
Gap 3.01, 4.01 – V. Hurst
Gap 4.03/4.08 – E. Kerstman
Gap 4.11 –M. Urbina
Gap 4.13, 4.22 – R. Shah
Gap 4.17 – D. Chin
Gap 5.01 – L. Best

Tech Watch Agent
ARC
Michael Krihak

Gap Owners
Gap 4.05 – M. Krihak
Gap 4.19 – A. Katterhagen
Gap 4.21 – A. Katterhagen
Gap 4.23 – M. Krihak
Regional Distribution

ARC
JSC
GRC
LaRC
Gap Report Content (Public Domain)

• Each Gap Report contains:
  – Relevant medical conditions
  – Summary of evidence
    • Typically refers to prevention, diagnosis and treatment
  – References

• Gap reports reviewed annually
  – Structured, peer-reviewed process

• Gap reports are publicly available:
  http://humanresearchwiki.jsc.nasa.gov
  http://humanresearchwiki.jsc.nasa.gov/exmc (collaboration side)
Annual Revision Focus Areas:

- Gap title
- Update medical evidence
- Interim stages for gap closure and metrics (internal)
- Approach for gap closure (internal)
- Update present state of technology
- Target schedule for closure (internal)
- Update related Tech Watch summary
- Update related student work summary
- Schedule (internal)
Gap Report Review Process

Gap Owner – Report Update

Clinical & Technical Lead Review

Task Lead Review

SME Review

Element Manager Review

Element Scientist Review

ExMC Advisory Group Review (if necessary)

Gap Review Presentation to ExMC Team

Wiki Review, Post on Wiki

SME – Subject Matter Expert
Student Projects
FY12 Goal: Improve the efficiency of site visits

- Evaluate synergies through telecommunications first
  - Provide the point-of-contact with ExMC Gaps
- Determine whether or not a site visit is in the best interests
  - Obtain approval through Element management
- Identify appropriate personnel and laboratories to visit
- Provide a trip report to ExMC Tech Watch project
- Develop targeted student project(s) that address specific gap needs
Student Projects

Site visit
Student project
General Highlights from FY12

• Joint-effort with HHC on an in-flight lab analysis capability
  – Findings through our Tech Watch process fed into the HHC development activity.
  – Several joint visits or telecons: DNA Medicine Institute, Nanomix, Rice University, OPKO, Philips, Biocartis

• Strategic collaborations/leveraging opportunities
  – Federal: DTRA, DARPA, Federal Laboratory Consortium
  – Private sector: IBM, GE
  – Research institutions:
    • Cleveland Clinic
    • Houston Technology Center (HTC) and Regional Centers of Innovation & Commercialization
    • Texas Medical Center’s National Center for Human Performance
General Highlights from FY12 (continued)

- Published Exploration Medical Capabilities *agency tech need* article in NASA Tech Briefs Magazine February 2012 issue
- Revisions of gap report and review process
- ExMC Gap brochure revision
- 15+ gap reports completed and available on the public wiki link:
  
  http://humanresearchwiki.jsc.nasa.gov
ExMC Gap Brochure

Exploration Medical Capability Gaps

During long-duration exploration missions beyond low Earth orbit, the crew will need medical capabilities to diagnose and treat diseases as well as for maintaining their health. The Exploration Medical Capability Gap document is designed to help medical professionals and clinical facilities understand the different levels of care required for space missions.

Ensuring the health, safety, and effective performance of astronauts is critical to the human exploration of space. NASA Glenn Research Center's Human Research Program (HRP) plays a vital role in providing solutions to critical problems that pose significant risks to human exploration missions and their crews at risk. These efforts are accomplished in support of the Johnson Space Center, which leads NASA's HRP.

HRP is looking to Federal laboratories, academia, or industry partners to collaborate with them on the Exploration Medical Capability Gaps document.

Any technology addressing these needs must be compatible with general space flight restrictions on mass, volume, electromagnetic interference, and radiation, and any intervention must be effective and acceptable from the crew's viewpoint.

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www.nasa.gov
Tech Watch Accomplishments

Student Project Highlights from FY12

• 20+ student projects
  – Topic area examples: chemical eye wash, assisted medical procedures, auscultation, laboratory analysis
  – Contributions to element: provided assistance in gap closure, ground analog testing protocols, collation of information/data for gaps, engineering design
  – Significant academic contributions:
    • Texas A&M, U. Michigan, UCLA, Johns Hopkins University

• Participated in 2012 RASC-AL (Revolutionary Aerospace Systems Concepts – Academic Linkage)
  – Concepts for nanoprobe developed by Washington University
• Exploration Medical Capability (ExMC) is charged with reducing the “Risk of Unacceptable Health and Mission Outcomes Due to Limitations of In-Flight Medical Capabilities”
  – The ExMC charter is to utilize technologies and informatics that address evidence-based medical conditions.

• Tech Watch was active in developing strategic collaborations with academia, federal laboratories and the private sector.

• Multiple senior projects were developed to address many of the ExMC technology and knowledge gaps.

• Tech Watch is continually improving internal capability to maintain database and track technologies.