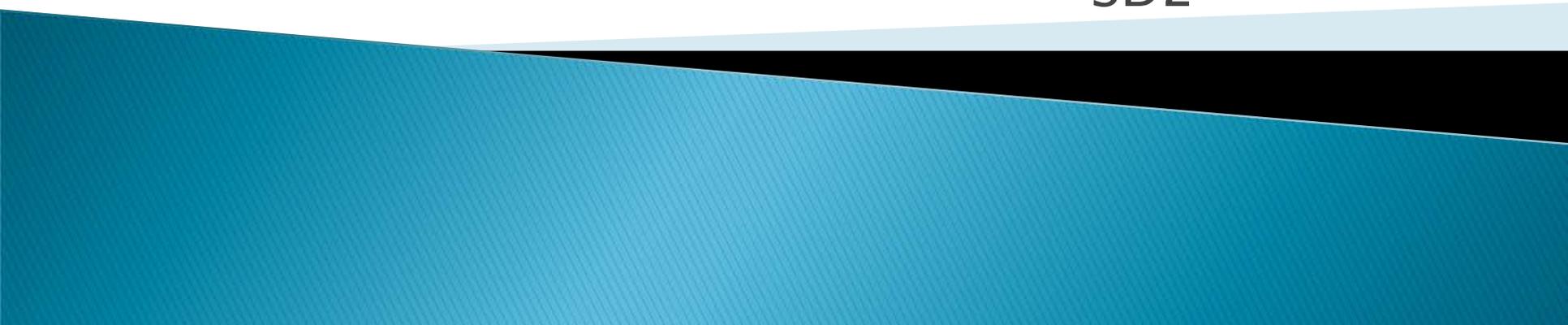


# Medical Operations Support for ISS Operations

## The Role of the BME Operations Team Leads

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# Introduction

- ▶ **Medical Operations Support for ISS Operations**
  - Consists of a team of flight surgeons, biomedical flight controllers (BMEs), and BME Operations Team Leads (OTLs). Together, they possess a unique responsibility to the onboard ISS crew.
  - Our staff provides crew health monitoring and support and addresses specific medical needs for each crew. This includes the development of medical requirements for space flight and the responsibility to enforce those requirements through various means.
  - In addition, our staff provides real-time operational support for the onboard Crew Health Care System (CHeCS) through flight control operations, console references, crew procedures, and training.
  - This presentation will concentrate on role of the BME OTLs, who provide the integration function across all CHeCS disciplines for onboard procedures and operational products

# ISS Operations Team Leads (OTLs)

- ▶ Within Medical Operations there are BME Operations Team Leads (OTLs). OTLs are responsible for a multitude of operational tasks that contribute to the development and continuous support of each CHeCS hardware device. Each of these tasks are vital for successful on-orbit operation of all CHeCS hardware.
- ▶ Need for this position was realized in the late 90's while developing the CHeCS procedures and operational products for the 1<sup>st</sup> ISS crew. Lack of integration across all stake-holders within each CHeCS discipline (Health Maintenance, Environmental Monitoring, and Exercise Countermeasures) was evident and the OTL position was developed within Medical Operations to bring each discipline together, integrate all inputs, and validate the finalized procedures and products with a member of the astronaut office.
- ▶ OTLs assigned by subsystem (EHS/HMS/CMS). For each CHeCS device there is a prime OTL and a back-up OTL assigned.

# CHeCS Hardware/Software

## Health Maintenance System (HMS)

- Automated External Defibrillator (AED)
- Ambulatory Medical Pack (AMP)
- Advanced Life Support Pack (ALSP)
- HMS Ancillary Support Pack (HASP)
- Intubating Laryngeal Mask Airway (ILMA)
- Respiratory Support Pack (RSP)
- Variable Oxygen Supply (VOS)
- Eyewash
- Crew Medical Restraint System (CMRS)
- Crew Contamination Protection Kit (CCPK)
- ISS Medical Accessory Kit (IMAK)
- Ultrasound (SDTO/Payload)
- ISS Medical Checklist (book)
- In Flight Examination Program (IFEP)
- On-Orbit Hearing Assessment (O-OHA)
- Sound Level Meter (SLM)
- Acoustic Dosimeter

## Environmental Health System (EHS)

- Tissue Equivalent Proportional Counter (TEPC)
- Intravehicular Charged Particle Directional Spectrometer (IV-CPDS)
- Extravehicular Charged Particle Directional Spectrometer (EV-CPDS)
- Radiation Area Monitors (RAMs)
- Crew Passive Dosimeters (CPDs)
- Compound Specific Analyzer - Combustion Products (CSA-CP)
- Compound Specific Analyzer - Oxygen (CSA-O2)
- Carbon Dioxide Monitoring Kit (CDMK)
- Portable Gas Delivery System (aka IGDS)
- Volatile Organic Analyzer (VOA)
- Formaldehyde Monitoring Kit (FMK)
- Gas Sampling Canister (GSC)
- Air Quality Monitor (aka GC/DMS)
- Total Organic Carbon Analyzer (TOCA)
- Water Quality Hardware (WSCK, WMK)
- EHS Water Kit
- Microbiology Hardware (SSK, MAS)

## Countermeasures System (CMS)

- Cycle Ergometer w/Vibration Isolation and Stabilization(CEVIS)
- Treadmill w/Vibration Isolation and Stabilization(TVIS)
- T2 -treadmill (17A)
- Advanced Resistive Exercise Device (ARED)
- Interim Resistive Exercise Device (IRED)
- BP-ECG
- Heart Rate Monitor II (HRM)
- Periodic Fitness Evaluation (PFE)
- Medical Equipment Computer (MEC)

# Team Interfaces

- ▶ Engineering
  - ▶ Science disciplines/laboratories
  - ▶ Surgeons
  - ▶ Pharmacy
  - ▶ Crew Training
  - ▶ Crew Office
  - ▶ MOD – ECLSS, OSO, CIO/ISO, Flight, ODF, THOR, P/TV, PHALCON, MER, MER CHeCS, CATO, IMC, CAPCOM, etc.
  - ▶ Human Factors
  - ▶ ASCRs
  - ▶ Space Medicine Advanced Projects
  - ▶ Payloads
  - ▶ Logistics and Maintenance (L&M)
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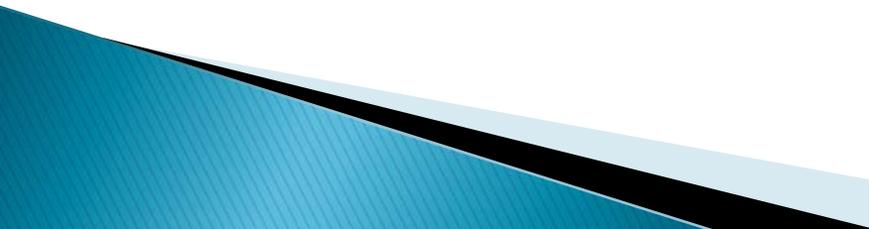
# OTL Personnel

- ▶ Organized by subsystem
  - HMS – L. Nieschwitz, K. Pierpoline
  - CMS – D. Conly, L. Nieschwitz, C. Toder, I. Gipson, A. Perk
  - EHS – K. Ballard, W. Misek, C. Woo
  
- ▶ Additional Projects
  - Operations Nomenclature (Op Nom) – L. Nieschwitz
  - Med Ops Book Manager – V. Sabatier (Interim)
  - Medical Checklist Book Manager – K. Pierpoline
  - Operational Control Agreement Database (OCAD) – V. Sabatier
  - SDTOs (Harness, Colorimetric Water Quality Monitor Kit, Air Quality Monitoring) – D. Conly, K. Ballard
  - EHS Integration Tasks – W. Misek

# New CHeCS Hardware

- ▶ CHeCS Hardware identified to satisfy Medical Operations Requirement
- ▶ ISS program CR Review
- ▶ Hardware Development Kickoff
  - Design Reviews (PDRs, CDRs, etc)
    - OTLs often support reviews to provide operational input.

# OTL – Registers Operations Nomenclature

- ▶ Operations Team Lead (OTL) will work with Ops Team (engineering, crew office, surgeon, Human Factors, etc) to determine Op Nom recommendations
  - ▶ Once approval is received from Ops Team, OTL will provide necessary information to Op Nom Advisory Group representative to submit in a Management Operations Data File (ODF) Change Request
  - ▶ OTL will accompany Op Nom Adv. Group rep to the Op Nom Adv. Group meeting to defend recommendations or take suggestions from mandatory evaluators back to Ops Team (if necessary).
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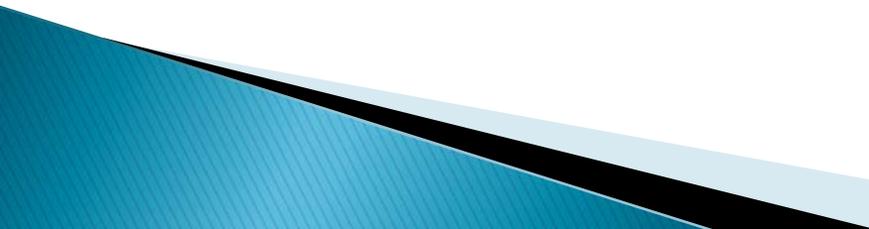
# OTL – Coordinates Stowage and Plug-in-Plan locations

- ▶ **Stowage of New Hardware**
  - Assess stowage implications of hardware and/or associated accessories (kits)
  - Provide SA Integration Deputy with stowage recommendations.
- ▶ Provide dimensions, weight, and any stowage constraints. (This information is obtained from engineering and/or engineering documents.)
- ▶ Work directly with CIO/ISO CHeCS representative if any on-orbit Cargo Transfer Bags (CTBs) are needed.
- ▶ **Plug-in-Plan**
  - Work with CIO/PLUTO to determine any available, required UOP location

# OTL – Addresses Operational Control Agreement Database (OCADs)

- ▶ OCAD OTL sends OCADs to corresponding OTL for coordination.
  - OTL works with Ops Teams to determine an implementation
    - Flight Rules
    - Procedures
    - Training

# OTL – Begins Procedure(s) Development/Publication Process

- ▶ OTL generates new crew/ground procedure from supporting engineering documentation and/or from engineering hardware developers
  - ▶ OTL sends crew procedure to CHeCS crew representative for preview. (Ground procedures are sent to engineering reps)
  - ▶ OTL Conducts Crew Procedure Validation (with hardware if available). (Ground procedures are validated through Operational Readiness Tests (ORTs))
  - ▶ OTL submits CR or R/T SODF CR for SODF procedure publication process (including on CR any MOD disciplines required)
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# OTL – Provides Inputs into Requirements Documentation (IDRD Main, Annexes 2, 3, 4)

- ▶ Increment Definition and Requirements Document:  
Main Book
  - Determine any ‘impact’ activities or activities requiring visibility to be recognized in the Main IDRD (i.e. R&R during docked ops).
  - Respond (electronically) to internally-produced Change Request for the Annex once it is submitted to the Bioastronautics Planning System.
  - Attend Technical Change Meeting or give inputs to the Med Ops facilitator who will be attending the TCM, and ensure changes are incorporated. If required, perform any follow-up tasks/actions assigned at the TCM.

# OTL – Provides Inputs into Requirements Documentation (IDRD Main, Annexes 2, 3, 4) (cont.)

- ▶ IDRD Annex 2: On-Orbit Maintenance Plan – Ops Team Lead Responsibilities
  - Perform thorough review of sections relating to assigned hardware during initial call for input.
  - Provide proposed changes with rationale to both the Medical Operations Annex 2 facilitator and the appropriate Logistics and Maintenance representatives.
  - Respond (electronically) to ISS Program Change Request for the Annex once it is submitted to the Bioastronautics Planning System.
  - Attend Technical Change Meeting (conducted within Logistics and Maintenance) or give inputs to the Med Ops Annex 2 facilitator who will be attending the TCM, and ensure changes are incorporated. If required, perform any follow-up tasks/actions assigned at the TCM.

# OTL – Provides Inputs into Requirements Documentation (IDRD Main, Annexes 2, 3, 4)(cont.)

- ▶ IDRD Annex 3: Imagery Requirements – Ops Team Lead Responsibilities
  - Perform thorough review of assigned sections during initial call for input by the Medical Operations Annex 3 facilitator.
  - Coordinate any planned changes to the baseline document with the ISS BME Increment Manager and provide any changes with rationale to the Med Ops Annex 3 facilitator.
  - Respond (electronically) to internally-produced Change Request for the Annex once it is submitted to the Bioastronautics Planning System.
  - Attend Technical Change Meeting (conducted by the Imagery Working Group) or give inputs to the Med Ops Annex 3 facilitator who will be attending the TCM, and ensure changes are incorporated. If required, perform any follow-up tasks/actions assigned at the TCM.

# OTL – Provides Inputs into Requirements Documentation (IDRD Main, Annexes 2, 3, 4)(cont.)

- ▶ IDRD Annex 4: Medical Operations and Environmental Monitoring – Ops Team Lead Responsibilities
  - Perform thorough review of assigned sections during initial call for input.
  - Coordinate any planned changes to the baseline document with the ISS BME Increment Manager and submit any changes with rationale to the Medical Operations Book Manager.
  - Attend Technical Change Meeting (conducted within Med Ops) and ensure changes are incorporated. If required, perform any follow-up tasks/actions assigned at the TCM.
  - Respond (electronically) to Space Medicine Configuration Control Board Change Request for the Annex once it is submitted to the Bioastronautics Planning System.
  - Perform final review of approved Annex before it is brought to the Mission Integration and Operations Control Board.

# OTL – Helps provide inputs to Informational Briefings

- ▶ Audiences
  - Requirements Integration Panel (RIP)
  - Increment Management Team (IMT)
  - Generic Joint Operations Panel (GJOP)
  - Joint Operations Panel (JOP)
- ▶ Topics can include
  - Overview of new hardware/Operational Activities
  - Maintenance Requirements/Time Estimates
  - Stowage Constraints
  - Documentation
  - Resupply
- ▶ OTL works with engineering to develop these presentations
- ▶ OTL attendance is optional, unless specifically requested

# OTL – Provides support for Training

- ▶ Assist Space Medicine Training with Lesson Plan Development and certification (if necessary)
  - Support Space Medicine Training in an Operations Team Lead or Subject Matter Expert (SME) Capacity.
- ▶ Assist Space Medicine Training and Engineering with crew and BME training (if necessary)
  - Support Space Medicine Training for new hardware (i.e. TOCA, new EHS Water Kit, Ultrasound)
- ▶ Provide training on hardware and operational usage plan for the Inventory Stowage Officer (ISO) Group
  - Gives them better understanding of pre-pack, transfer, and unpack message instructions
  - Helps ISOs with keeping the Inventory Management System (IMS) more accurately

# OTL – Provides support for Training

- ▶ Provide Familiarization Sessions and What-if sessions for major IFMs/activities
  - Gives hardware engineers, Operations Support Officer (OSO)s, BMEs, Trainers, Astronaut Strength Conditioning Rehabilitation Specialist (ASCRS), and Surgeons an opportunity to become more familiar with a particular upcoming crew activity and prepare for possible real-time scenarios

# OTL – Generates Supporting Documentation for ISS BME Console Operations

## ▶ CHeCS Hardware Catalog

- Provides an overview of the hardware and all its components.
- Outlines the hardware's capabilities and functions
- Describes the physical dimensions and limitations of the hardware
- Explains how the hardware will interface with the vehicle
- References how information will be transferred from the hardware to the ground.
- Gives a timetable for a resupply schedule
- Lists all hazards relating to that piece of hardware
- If the hardware has a display it will show the possible screens the crew may see

# OTL – Generates Supporting Documentation for ISS BME Console Operations (cont'd)

- ▶ BME Console Handbooks
  - A quick reference guide for BME's on console
  - Real Time troubleshooting tips for fast solutions to possible anomalies.

# OTL – May Support Hardware Verification Reviews and Bench Reviews

- ▶ OTL may support HVR and BRs and provide the following:
  - Photo documentation of hardware
  - Record any information not already known, such as barcodes and serial numbers
  - Answer Crew Questions regarding hardware operations, procedures, or operations nomenclature
  - If required, provide re-packing and re-labeling suggestions
  - Photograph any packing and labeling changes for procedural impacts or crew instruction
  - If required, support Bench Review at KSC (ARED, T2)

# OTL – Provides Planning Support

## ▶ Pre-Increment Planning

- Draft schedule for upcoming increment (On-Orbit Operations Summary (OOS))
- Based on IDR
- Develop Water Table

## ▶ Stowage Notes

- Provide/Review Stowage Notes for major IFMs
- Verify hardware, serial number, location, etc

# OTL – Provides Planning Support (cont.)

- ▶ Real Time Operations Products
  - Execute and Operations Notes – crew instructions and information
  - Planning Constraints – for console and planners
  - Submit Real Time SODF CR as needed
  - Create approved procedures as needed
  - Prepare/coordinate uplink support products – documents, videos, questionnaires as needed
  - Provide input on and review big picture words/ daily summary words/ daily planning conference inputs

# OTL – Provides Planning Support (cont.)

- ▶ Mission Planning Tool (Database of Med Ops Activities) Review
  - Review and update future weeks on weekly basis
  - Provide input on required activities
- ▶ Console Support
  - Respond to console questions
  - Support on console at the MER CHECS console/MER conference room during major activities or per request

# OTL – Provides Manifesting and Consumables Tracking

- ▶ After completion of on-orbit activity, OTL updates personal consumables tracker and updates are provided to ISOs for updating the IMS.
- ▶ The Tracker also aids in determining which and when more hardware needs to be manifested to allow continued on-orbit operations.

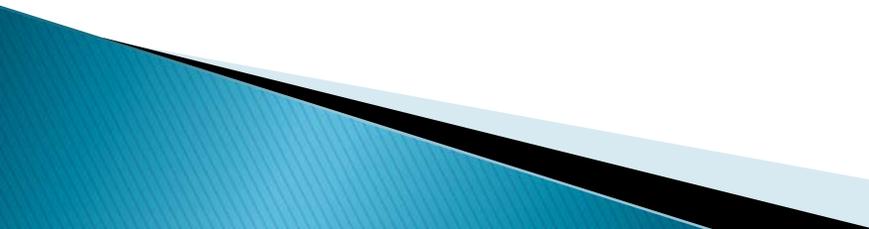
# OTL – Provides Manifesting and Consumables Tracking – (cont'd)

- ▶ Pre-pack (To return items from ISS to the ground) and Transfer (To transfer hardware from shuttle to temporary location on ISS)
  - L-2 months: preliminary pre-pack list is generated from the CHeCS Internal Transfer List spreadsheet, which includes all hardware being delivered and returned on the particular shuttle or Progress.
  - OTL receives notice and inputs all pre-pack, transfer, and unpacking instructions for each piece of hardware. Instructions include GO/NO GO for pre-pack, earliest date for pre-pack, NLT dates for items to be transferred and unpacked based on date of activities, and final stowage location recommendations.

# OTL – Provides Manifesting and Consumables Tracking (cont.)

- ▶ Stowage (To place hardware in a temporary location or its final location during docked ops)
  - L-2 weeks: OTL reviews and/or provides Stowage Notes for all TOCA activities occurring during docked operations.
- ▶ Unpack (To place hardware from its temporary location to its final location)
  - OTL reviews unpack list for specific unpacking instructions and final stowage location.

# OTL – Assist with Anomalies

- ▶ OTL works with the Engineering team to resolve problems and generate responses including but not limited to one time use procedures, follow up questions, troubleshooting steps. OTL also works with engineering with chit development and implementation.
  - ▶ OTL may interact with other MOD disciplines as needed such as OSO and OCA for assistance
  - ▶ If a one time use procedure is needed, OTL will draft it and work on getting real time approvals for uplink
  - ▶ OTL will support Special System Problem Resolution Team (SPRT) and/or Failure Investigation Teams (FITs)
  - ▶ OTL will support console during troubleshooting activities
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# Any Questions?

