Preparation for an Earth Independent Medical Operations Demonstration using the Tempus ALS™ Medical Device

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Evolution of Tech Demo Plans:

Preparation for an Earth Independent Medical Operations (EIMO) Demonstration using the ~~Tempus ALS™ Medical Device~~

Multi-functional Integrated Medical (MIM) Devices

The Tech Demo Collaboration

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Tech Demo Specific Aims:

1. Determine the efficiency of using a multi-functional integrated medical device instead of a suite of individual devices

2. Determine the feasibility of including a multi-functional integrated medical device within an exploration medical system

3. Simulate Earth Independent Medical Operations (EIMO) on ISS while using a multi-functional integrated medical device and communication delays of different lengths

Aim 1: Multi-functional Medical Device Efficiency

- Currently on ISS, the Crew Health Care System (CHeCS) consists of individual medical devices for vital sign monitoring, ultrasound imaging, inner ear exams, etc.
- A multi-functional integrated medical device may improve medical care efficiency over the current suite of individual devices
- The multi-functional integrated medical devices under investigation include:
  - Tempus ALS™ (Remote Diagnostic Technologies, Ltd., Philips Corp, Farnborough, UK)
  - LifeBot® (LifeBot Health, Chicago, IL)

About the Tempus ALS™* Device

- Multi-parameter vital signs monitor (ECG, blood pressure, SpO2, etCO2, temperature, etc.)
- Ultrasound imaging and video laryngoscopy
- Tempus LS defibrillator module
- Procedural guidance (iAssist)
- Data capture and transmission
- Communication capabilities

*Remote Diagnostic Technologies, Ltd., Philips Corp, Farnborough, UK

About LifeBot®* Devices

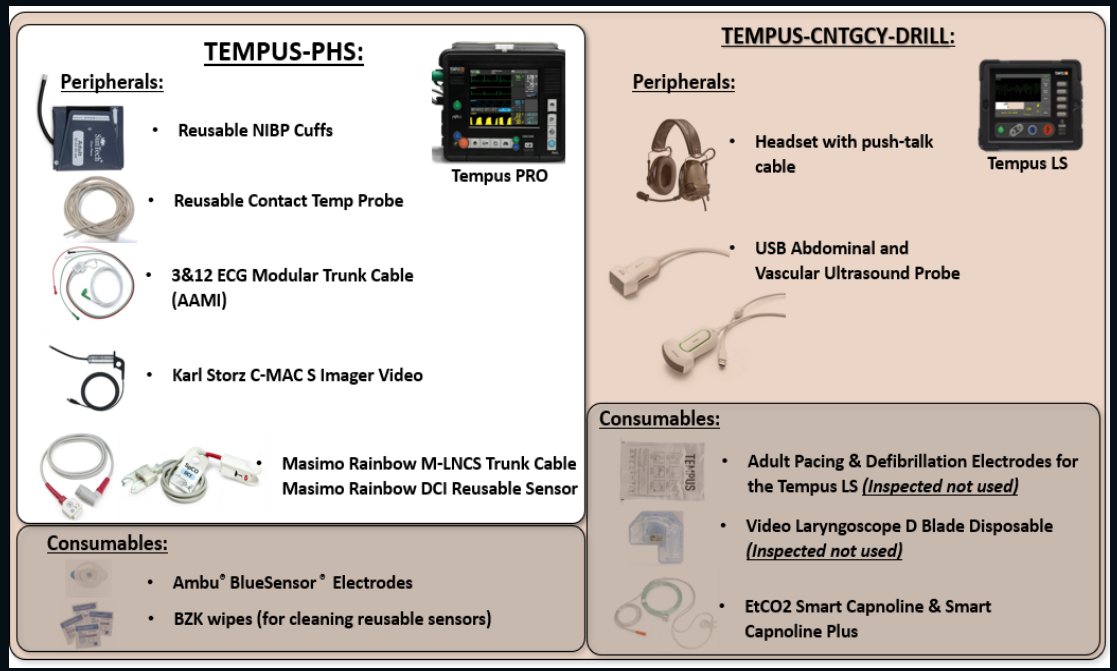
- Multi-parameter vital signs monitor (ECG, blood pressure, SpO2, etCO2, temperature, etc.)
- Defibrillation, ultrasound, digital stethoscope, otoscope, eye exam camera, dermotoscope, and video laryngoscopy
- Data management of patient call reports and electronic health records
- On-board audio, video and data communications capabilities

*LifeBot Health, Chicago, IL

Aim 1: Multi-functional Medical Device Efficiency

Tempus ALS™ ISS Tech Demo: Phase I – ESA led

1. The Health Maintenance System (HMS) Periodic Health Status (PHS) Exam is performed nominally and then with the Tempus ALS™
   - Time to complete the PHS exams is collected
2. A nominal Medical Contingency Drill is performed. Operators determine the Tempus ALS™ capabilities that could enhance medical contingency management
   - User experience feedback is collected

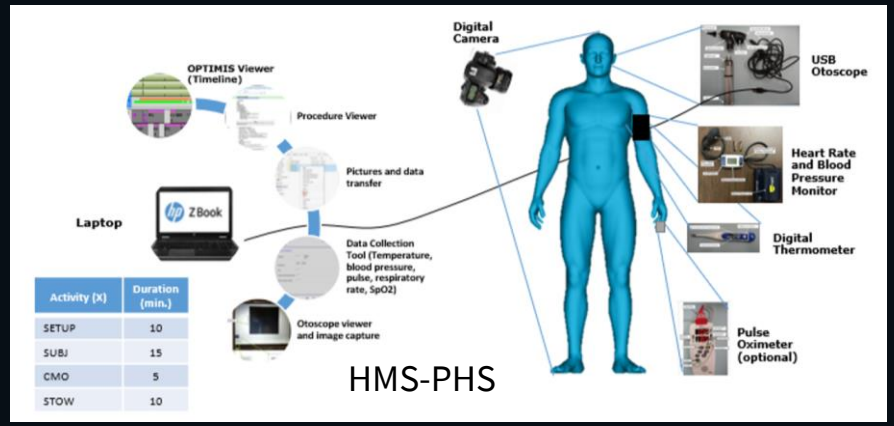


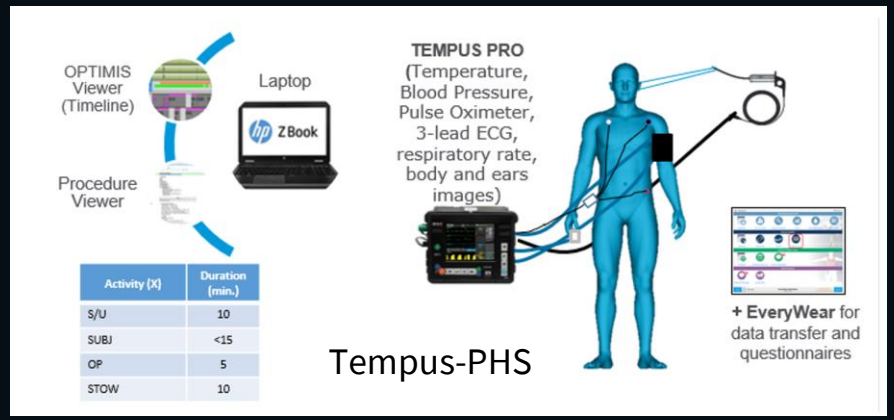
Aim 1: Multi-functional Medical Device Efficiency

Tempus ALS™ ISS Tech Demo: Phase I – ESA Led

- Use the time to complete comparison to determine increases in efficiency
- Use the user experience feedback to determine user preferences

Comparison of the Tempus-PHS to the HMS-PHS

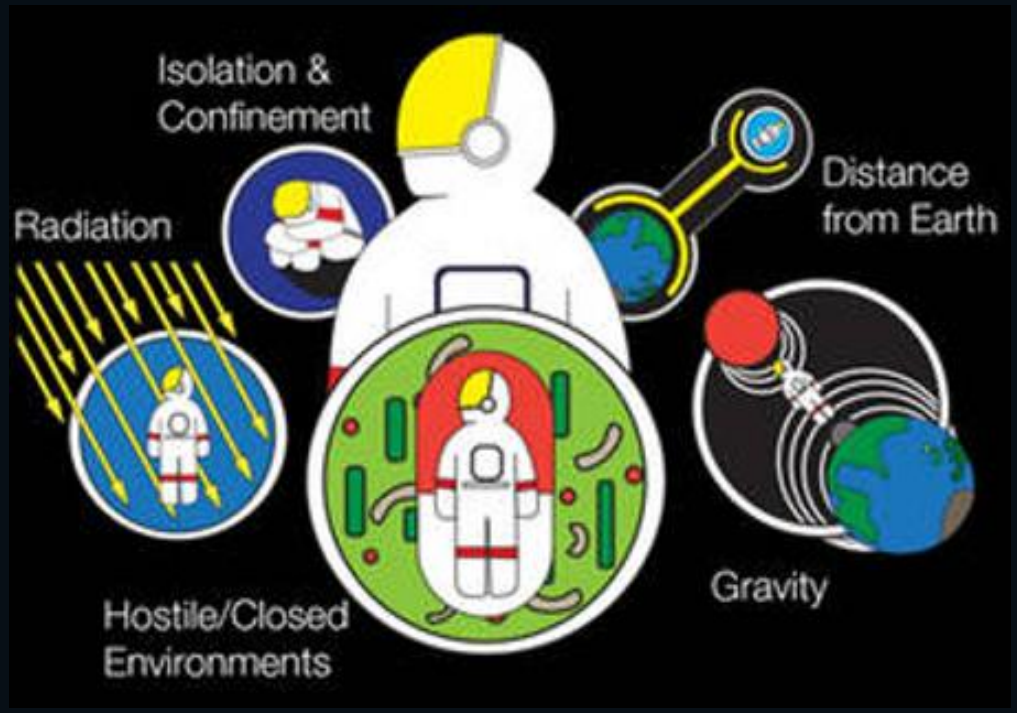




Aim 2: Feasibility of Inclusion in an Exploration Medical System

Exploration Medical Systems will need to:

- Operate within a variety of gravitational fields
- Operate within alternate atmospheric environments (e.g., high O2, low pressure)
- Fit within severely limited mass, volume, and power constraints
- Consider the limited opportunities for resupply
- Consider the limited capability for medical evacuation



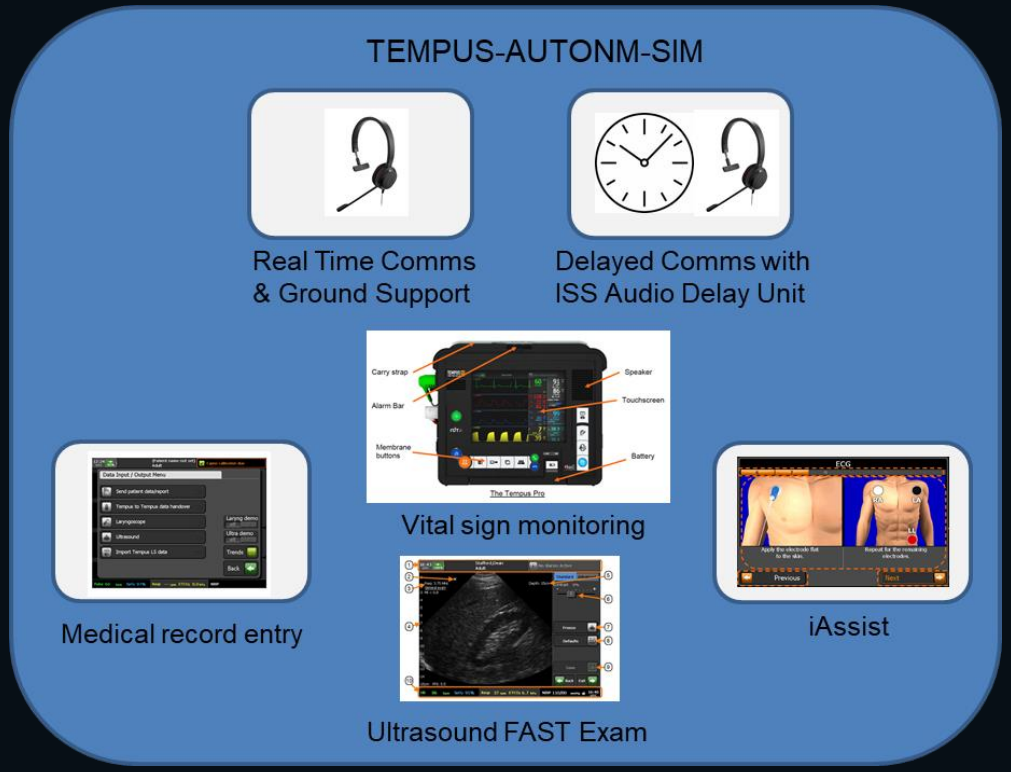
Aim 2: Feasibility of Inclusion in an Exploration Medical System

- Perform demonstrations of multi-functional devices:
  - Tempus ALS™
  - LifeBot®
- Demonstrations will include:
  - Ground testing
  - Testing within the Exploration Atmospheres Chamber
  - Testing on ISS
  - Investigate the ability to integrate with Crew Health and Performance – Integrated Data Architecture (CHP-IDA)
- Determine:
  - Device functionality in a high oxygen/low pressure atmosphere
  - Device functionality and ease of use in a microgravity environment
  - User experience and preferences
- Use lessons learned to aid development of an exploration medical system

Aim 3: Simulate Earth Independent Medical Operations on ISS

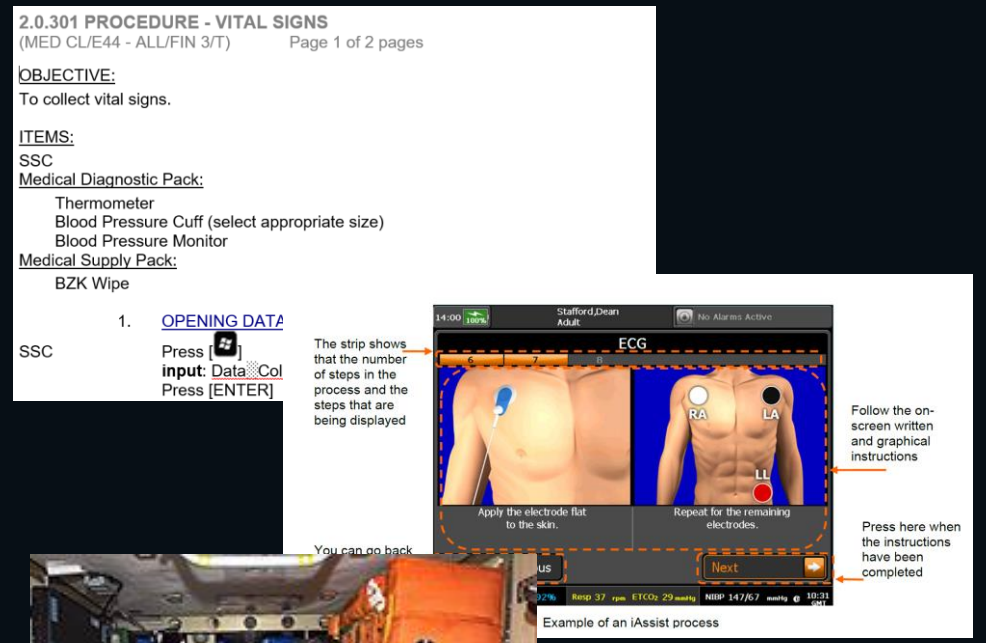
Tempus ALS™ ISS Tech Demo: Phase II – NASA led

- The caregiver is presented with a medical scenario, where the patient complains of flank pain
- The caregiver enters medical information, collects vital signs and performs an ultrasound exam
- Trials are performed with real time communication or delayed communications using various communication platforms
- Procedural guidance is available to the caregiver



Aim 3: Simulate Earth Independent Medical Operations on ISS

- Explore different procedural guidance platforms
- Simulate different communications situations:
  - Use different lengths of audio or video delay
    - Real time
    - On the order of seconds
    - On the order of minutes
    - No communications
  - Trial different types of communication platforms for determination of the most effective method of transmission for medical care advice/instruction
- Use lessons learned to aid development of an exploration medical system



Conclusion

- NASA's exploration missions will require medical systems that provide Earth independent medical care
- The ISS provides a validation platform for candidate exploration medical devices
- Multifunctional medical devices will be demonstrated on the ground, in the exploration atmospheres chamber, and on ISS and evaluated for exploration mission feasibility
- EIMO lessons learned will be incorporated into exploration medical system development

Thank you!

Questions?