Enhanced Corpsman to Hospital Optical System (ECHOS)
EABO
Tyranny of space and time

MV-22 Mission Ranges:
- Amphib Pre-Assault Raid (200 nm)
- Amphib External Lift with 10,000 lbs (50 nm)
- Land Assault External Lift (69 nm)
- Self-Deployment (2113 nm)

Cruise Speed: 240 knots

<table>
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<tr>
<th>Platform</th>
<th>Speed (knots)</th>
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<tr>
<td>MV22</td>
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<tr>
<td>LCAC</td>
<td>40</td>
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<tr>
<td>LCU</td>
<td>11.5</td>
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<td>AAV</td>
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<th>Distance (nm)</th>
<th>MV22</th>
<th>LCAC</th>
<th>LCU</th>
<th>AAV</th>
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<td>40</td>
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<td>60.0</td>
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<td>338.0</td>
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<td>50</td>
<td>12.5</td>
<td>75.0</td>
<td>260.9</td>
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McCain/ALNIC Collision

Distance: Approx. 35 NM
Estimated Transit Time: 10-15 minutes
Fitzgerald/CRYSTAL Collision

Distance: Approx. 50 NM
Estimated Transit Time: 15-20 minutes

Collision Location

U.S. Naval Hospital
Yokosuka
The 'Golden Hour' is often used in trauma to suggest that an injured patient has 60 minutes from TOI to receive definitive care, after which morbidity and mortality significantly increase.

NCTH most common cause of potentially survivable death in both military and civilian trauma.

In study: mortality rate of 16.7% for AMP+NCTI over 60 min.

"Lengthy transport times may still impact patients without NCTI in resource-limited areas of operation, such as the Pacific Ocean.

Evacuation times of patients of patients with NCTI should remain under 30 minutes. In those circumstances where transport of NCTI patients from the POI to a Role 2/3 facility is not possible...advanced en route care capabilities and/or resources for the control of NCTI may decrease mortality.

"Use of ultrasound by prehospital medics and non-clinical service members with minimal training" may reduce mortality rates.

AMP  Amputation
NCTI  Non-compressible torso injury
NCTH  Non-compressible torso hemorrhage
MTF  Medical treatment facility
POI  Point of injury
• The timeline for medical assistance will increase while executing EABO in the Indo-Pacific AOR
• The requirement for inside forces to maintain mobility and minimize their signatures prevents established medical facilities
• We cannot assume persistent air superiority or sea control necessary to move patients to higher echelons of care within the "Golden Hour"
• Decreased CASEVAC aircraft availability due to increased aviation operations
  – Scheduled and unscheduled maintenance/inspection NRBA increase
  – Potential ratio of casualties: CASEVAC availability
• More important than achieving the "Golden Hour" is ensuring casualties are treated correctly and stabilized as soon as possible
Use Case Scenario: Battle of Fallujah

• First Battalion, Eighth Marine Regiment, 2004-2005
• Aerial CASEVAC unavailable due to enemy situation within the city
• Battalion Surgeon created the "Forward Aid Station" after observing the benefits of immediate care
  – Dropping the expected 30-40% casualty rate to approximately 18%
Persona: HM3 Bradley

• **Name:** HM3 Bradley
• **Job:** Platoon corpsman
• **Demographics:** 20 yo, High School Graduate, Gen Z comfortable with technology but not necessarily knowledgeable about how it works
• **Education:** High school, Boot Camp, Hospital Corps School, Field Medical Service School, FMF pin
• **No previous deployments**
• **Only medical personnel at EAB**
Use Case Scenario Situation

- 11th MEU deployed to Indo-Pacific
- HM3 Bradley attached to BLT HIMARS battery
- Strategic Picture: Deter adversary aggression in the region, de-escalate tensions.
- Steady State operations: escalating hostilities, but currently below the threshold of conventional war
- Robust enemy Air Defense threat
- Battery tasked to establish EAB IOT deny adversary access to a key strait and SLOC
- EAB 120 nm from LHD OPBOX with Role 3 capability
- "Inside Force" within range of LRPF missile systems
- Platoon is detected by the adversary. They are targeted and receive incoming missile fire.
Use Case (Present)

Time

0-5
Platoon takes casualty

HM3 Bradley assesses casualty

1-30
 Begins CLS/TCCC

Continues providing limited care

AD Threat/No escorts available

30-45
Reports 9-line information to Platoon HQ

CASEVAC lands at EAB

9-line reported to CoC

45-60
Patient arrives at Role 3 for treatment

9-line reported to CoC

CASEVAC launched

60-90

Escorts available/CASEVAC launched
Use Case (Future)

Time

0-5
Platoon takes casualty

10-30
Telementor advanced procedure

30-45
Diagnose NCTI

45-60
Seamless CASEVAC handoff

60-90
HM3 Bradley assesses casualty assisted by ECHOS

Determines enhanced care needed

Telemntor FAST exam using ultrasound/FMV

Patient arrives at Role 3 for treatment

9-line automatically fills

CoC/Casevac updated in real time

Connects with Role 3 facility
Use Case Diagram

ECHOS

- Initiate System
- Activate AR
- Enter Training Mode
- Access Cloud Training Database
- Initiate 9-Line
- Use NLP to report 9-Line
- Program System
- Input CASEVAC CEOI
- Input Enhanced Care CEOI
- Initiate Enhanced Care
- Hands-off Telementor
- Hands-on Telementor
- Cloud Telementor
- Activate Gloves

Corpsman

Chain of Command

Trauma Surgeon

CASEVAC/PET
Proposed Phased Roll Out

• Phase 1: Training
  • ECHOS is implemented both in the corpsmen training pipeline as well as an added training capability while forward deployed or in the field.
  • 5G is limited to local positions allowing virtual training, but limited connectivity to higher echelons of care.

• Phase 2: Digital 9-Line Hand Off
  • ECHOS allows for an enhanced and streamlined 9-line procedure.
  • Voice enable receiver captures 9-line requirements and stores medical data that can be passed off when CASEVAC platform arrives.
  • Limited latency and bandwidth capability, data is passed from 5G nodes from local position to CASEVAC platform.
    • Phase 2a: 9-Line message is integrated with current communication structure sending an updated concurrent message via chat to a higher command post.
    • Phase 2b: 9-Line message is integrated with future 5G enabled COP, concurrently updating the chain of command throughout the CASEVAC process.

• Phase 3: Telementoring
  • ECHOS is used to communicate between corpsmen and physician.
  • Established 5G network allows for quick data transfer and communication between corpsmen and high echelon of care.

• Phase 4: Telesurgery
  • ECHOS can be enabled to allow a physician to conduct aided surgery from a distant location.
## Impacts to DOTMLPF

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<thead>
<tr>
<th>Category</th>
<th>Negligible</th>
<th>Low</th>
<th>Medium</th>
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<tbody>
<tr>
<td>Doctrine</td>
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<td>Organization</td>
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<td>Training</td>
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<tr>
<td>Facilities</td>
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</tbody>
</table>
- No change

- Build on GWOT lessons learned ("Golden Hour")
Organization

-No change

-Augment existing organization

-Emphasis on speed within current structure
Training

- Connectivity is essential to employment
  - deconfliction communication channels
  - service cross-compatibility

- Communications link critical

- Schoolhouse and fleet training

- OGA/civilian cross-training (TTP's)
Materiel

- Existing supply chain
  - allocation (accounting for inspection cycle NRFI timeline)

- Product manufacture location (CPU, transmit/receive)

- Replacements and higher echelon maintenance (minimal user level)
  - Replacement components at multiple sites
  - Test benches/tool allocation at multiple sites
  - Maximize Operational/Intermediate level maintenance capabilities
Leadership

- Early exposure in training pipelines
  - SNCO and Officer
  - IDC requirement
- Effective corpsman/CoC coordination
- Field with existing personnel

- No additional personnel required
- No additional facilities required

- Will require warehouse space for initial fielding and Class IX
Recommended Design

- **Corpsman**
  - Gloves, Goggles, Earpiece (5G compatible)
    - Automatic language recognition protocol (for Nine Line)
    - NVG capability
    - Field battery/power source rechargeability
    - Error code retention for later download/system maintenance
    - Extreme temp/environmental survivability
    - Compatibility with all MOPP levels
    - Sanitation considerations for re-use (in field)

- **Hospital/BAS/Ship ER (5G compatible)**
  - Goggles (surgeon)
  - Gloves (for optional hands on tele-mentoring)
  - Audio connectivity
  - Receipt of Nine Line and medical staff procedure/equipment preparation (file saved for medical record adaptability)
How it works

An ultrasound scan is performed by a paramedic wearing a special glove to guide his hand as he moves the ultrasound probe.

1. Paramedic

2. Scan data is sent over the 5G network from the ambulance to the hospital.

3. Doctors or surgeons viewing in real-time use a joystick to send instructions to the paramedic’s hand to obtain the clearest images.

https://www.thetimes.co.uk/article/robo-glove-lets-clinicians-treat-ambulance-patients-over-internet-27ds9vqtx
How it works: U.S. Army

• Wearable augmented reality (AR) telestration device to guide a non-surgeon through a damage control procedure

• 19 February 2020