Enhancing Far Forward Trauma Care with Computed Echo Tomography: A Forward-Looking Analysis Based on Current Experience

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MB, RP, MM and RK have no conflicts of interest

JC is the Chief Medical Officer of MAUI Imaging, Inc. and has equity in the company

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The Problem: Bone Blocks the View

Skull blocks brain imaging
Pathology such as intracranial hemorrhage, cerebral contusions, and midline shift invisible to standard POCUS

Ribs create shadows
Narrow cardiac, pulmonary, and upper abdominal windows; critical eFAST views can be difficult

Sternum & spine opaque
Mediastinal injuries and spinal trauma cannot be assessed

Operator-dependent
Finding acoustic windows requires significant training — limited in austere environments

2

Critical limitations of all conventional POCUS systems

① **Cannot image through bone**

② **Requires skilled operator to find windows**

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What Is Computed Echo Tomography (CET)?

CONVENTIONAL ULTRASOUND	COMPUTED ECHO TOMOGRAPHY
Beamforming on the SEND side	Beamforming on the RECEIVE side (patented)
Narrow focused beam → one scan-line at a time	Unfocused omnidirectional PINGS fill the volume
Must preset depth, zoom, & dynamic range	Echoes received on all elements simultaneously
Bones, gas, and metal create blank shadows	Proprietary CET algorithms accommodate for different speeds-of-sound
Operator hunts for an acoustic window	No window-hunting — system reconstructs the image

KEY: CET uses the same safe sound frequencies as conventional US — only the math changes.

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What CET Can See — That POCUS Cannot

CRANIAL VAULT	TRACHEA & BRONCHI	HEART (parasternal)
Subdural / Epidural hematoma · Contusion · Midline shift · Falx & Ventricles · Foreign bodies	Trachea · Carina · Left & Right mainstem bronchi — through the sternum	Pericardium + All 4 chambers & valves — through ribs without subxiphoid probe
Score: 4.25 / 5	**Score: 4.25 / 5**	**Score: 4.60 / 5**

LONG BONES	ABDOMEN	SPINE
Bony cortex · Medullary cavity · Displaced and Nondisplaced fractures	Liver, spleen, kidneys, pancreas, aorta, vena cava, major vessels — NO rib shadow artifacts	Lateral and posterior longitudinal, and PA cross-sectional views visualize all boney structures as well as the spinal cord within the spinal canal
Score: 4.33–4.67 / 5	**Score: 4.60–4.80 / 5**	**Score: 2.6–3.0 / 5 (improving)**

All images were reviewed in real-time by 5 independent experts in sonography, emergency medicine, and/or trauma/general surgery and scored using the American College of Emergency Physicians diagnostic imaging quality scoring system. All scores ≥ 3.0 are considered adequate for clinical diagnosis and management.

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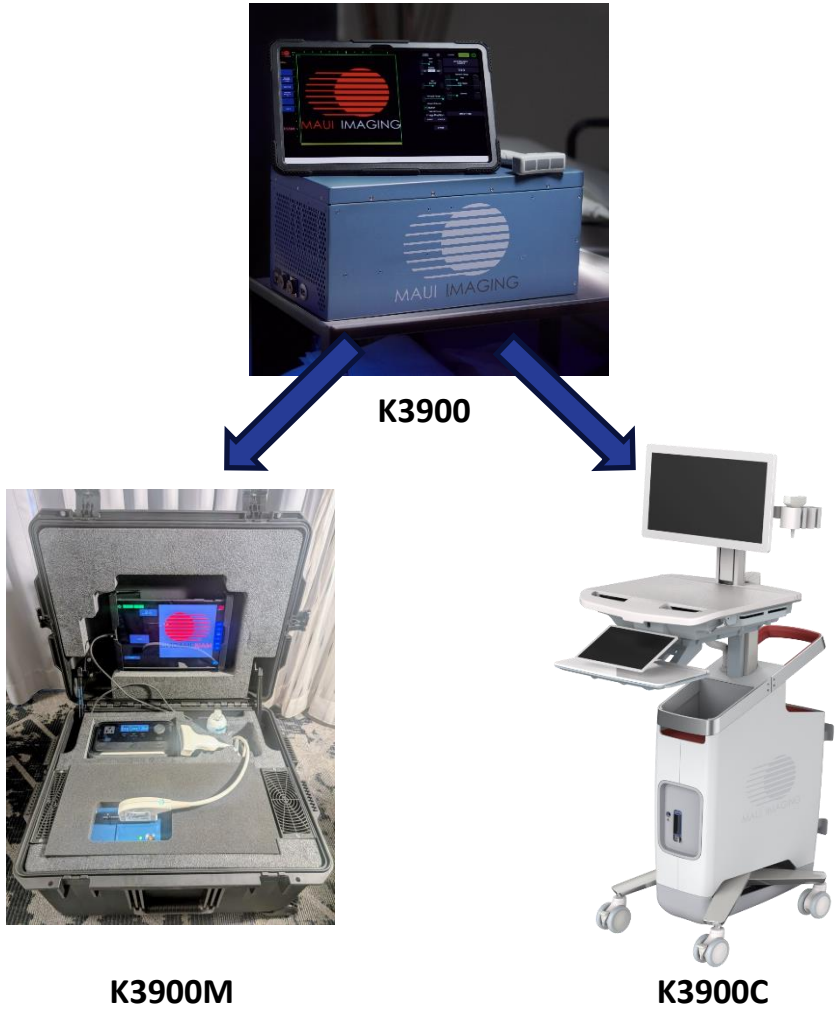
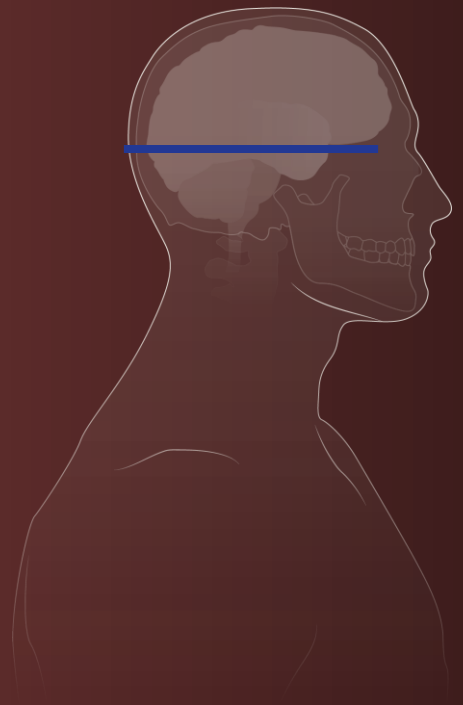
MAUI K3900: FDA-Cleared Diagnostic Ultrasound System

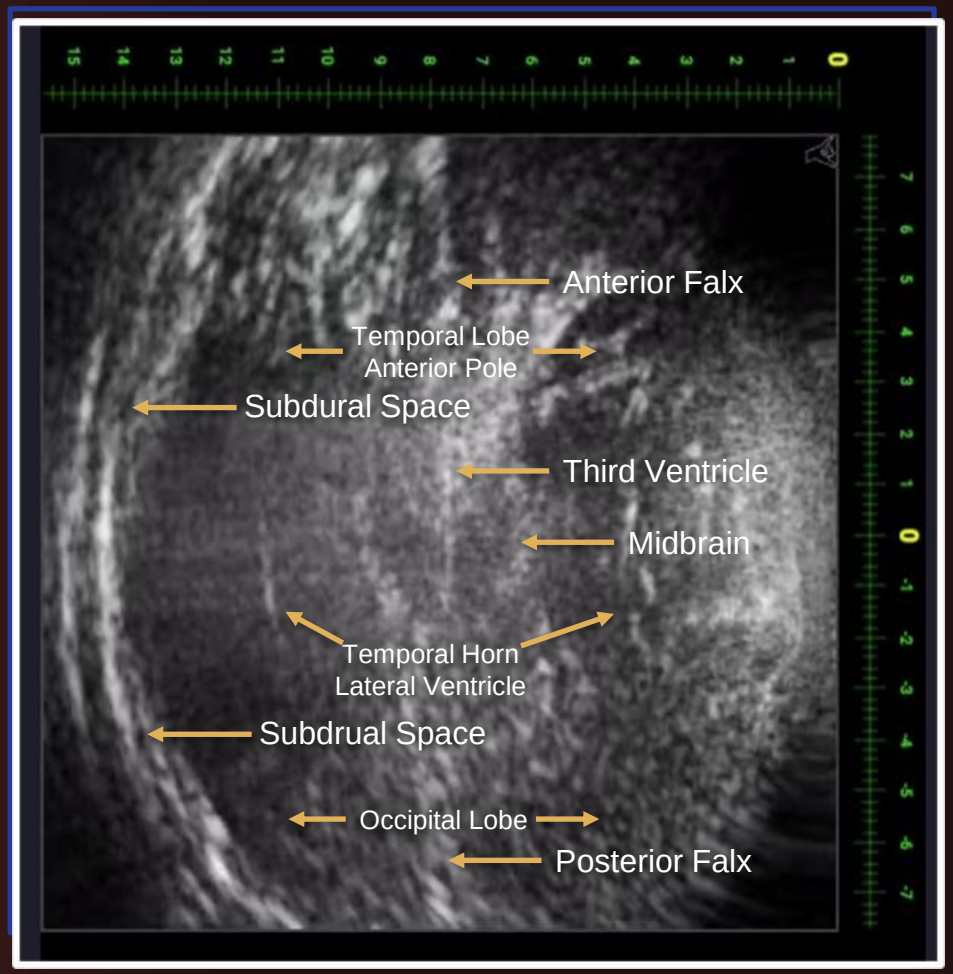


- 4 Component System
  - Processing Unit
  - Android Tablet User Interface
    - Military – Wired Ethernet Cable
    - Civilian Version – WiFi Direct or Ethernet
  - 2-5 MHz Concave Variable Frequency Probe
  - Battery (as shown) – provides power for up to 60 minutes of continuous use when an external power source is not available (military standard alternative in development)
- Power: 110/220V AC / ≤ 400 Watts
- Form Factors:
  - Portable (K3900M)
  - Cart-based (K3900C in development)

Cranial Imaging

Imaging the brain is currently not possible with conventional ultrasound





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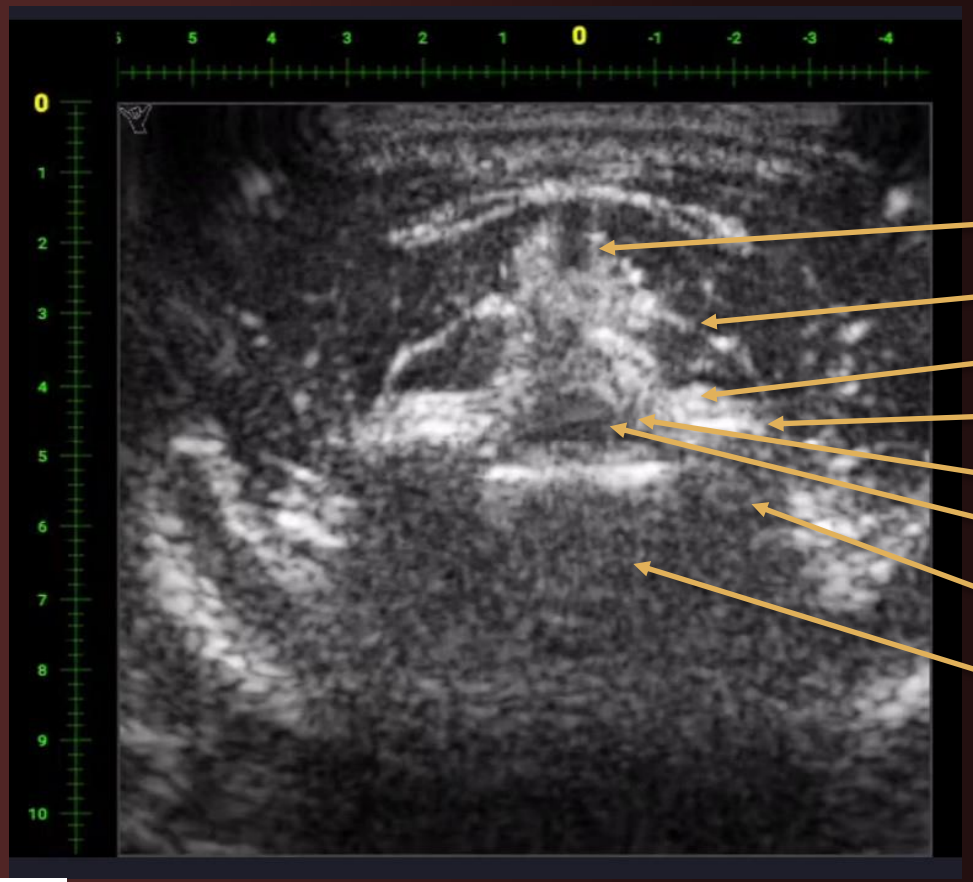
Cervical Spine Imaging

CET Imaging can visualize the spinal cord within the spinal canal, which may allow for assessments of impingement or cervical dislocations



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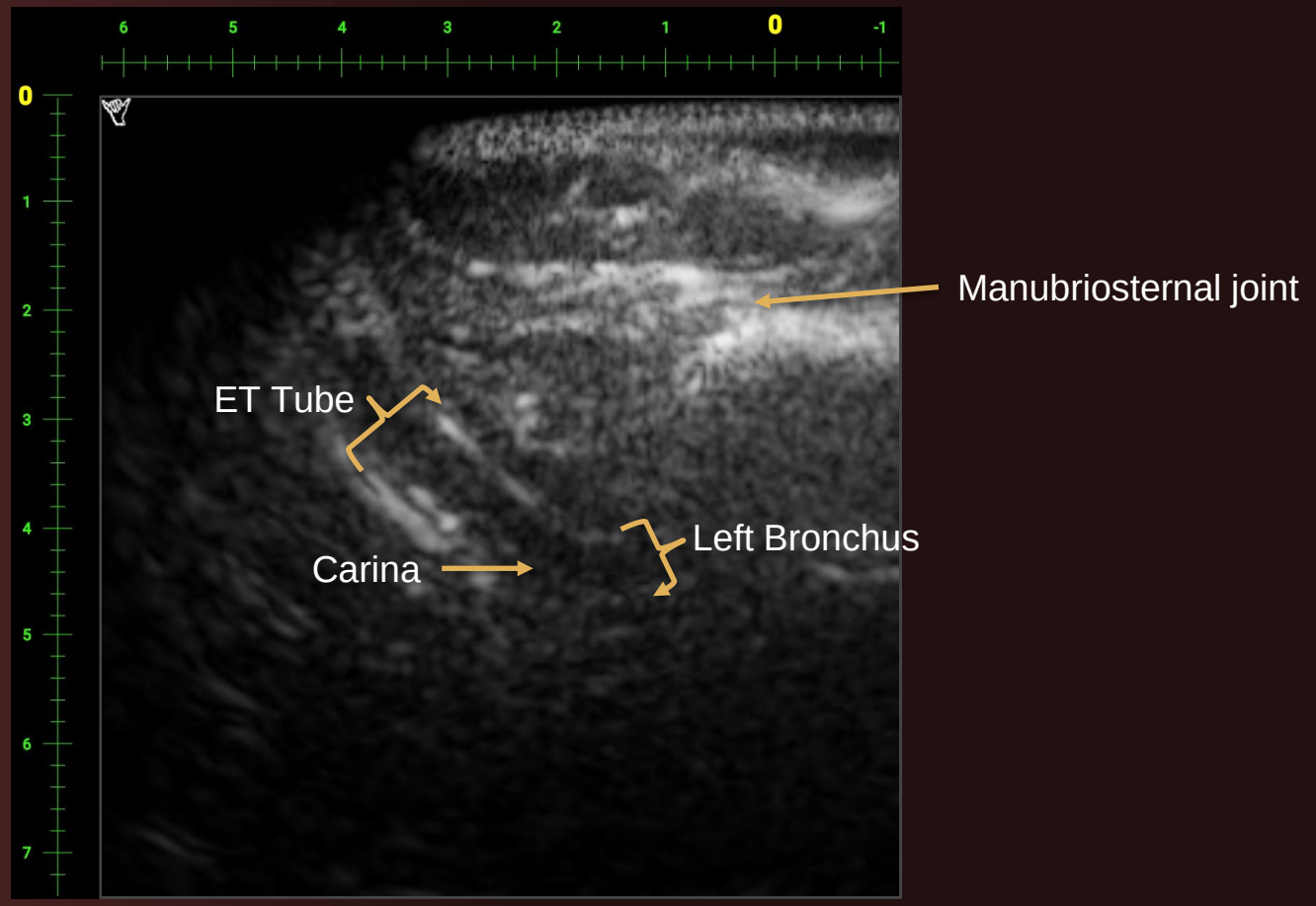
Mediastinal Imaging: ET Tube

CET imaging allows for verification of ET tube placement without CXR



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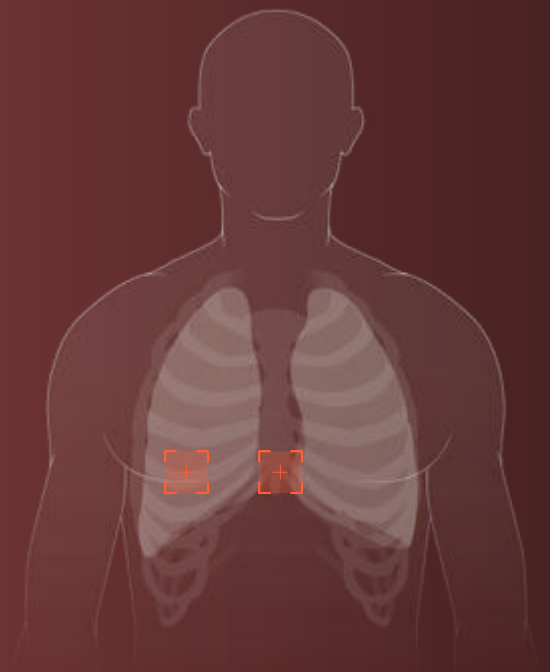
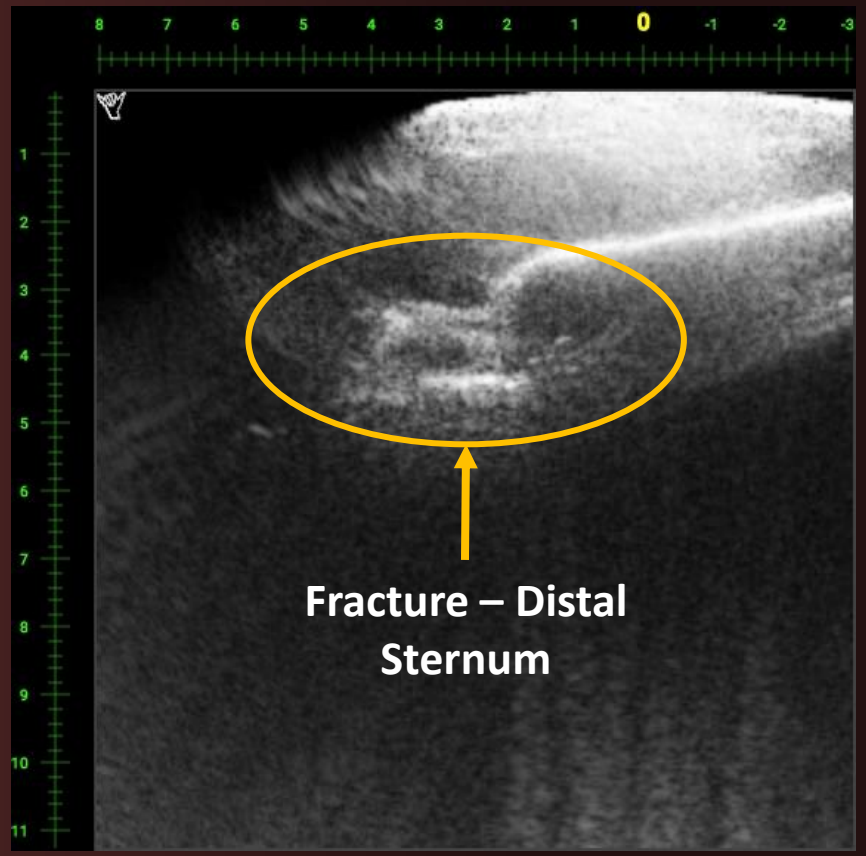
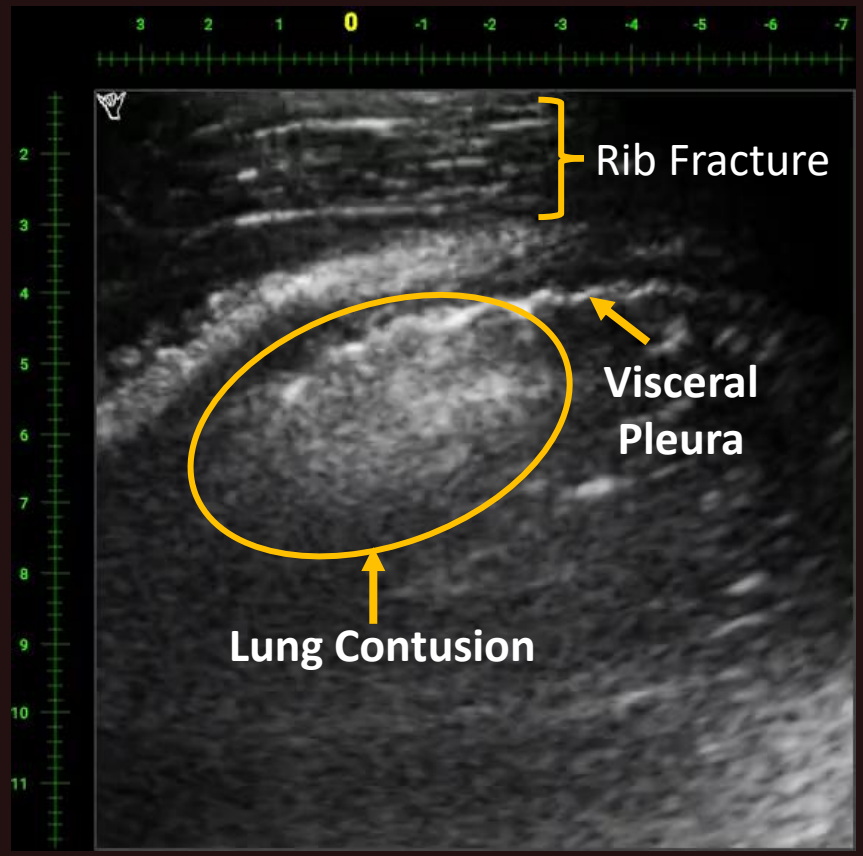
Thoracic Imaging: Lung

MAUI can image vital organs through the ribcage without special training







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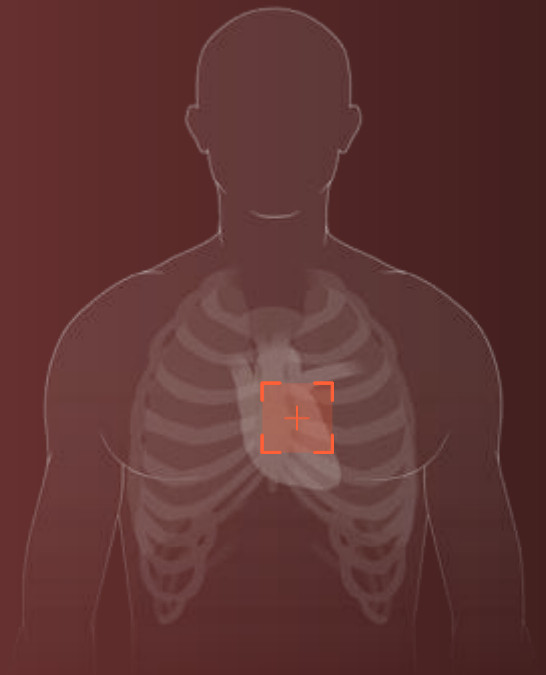
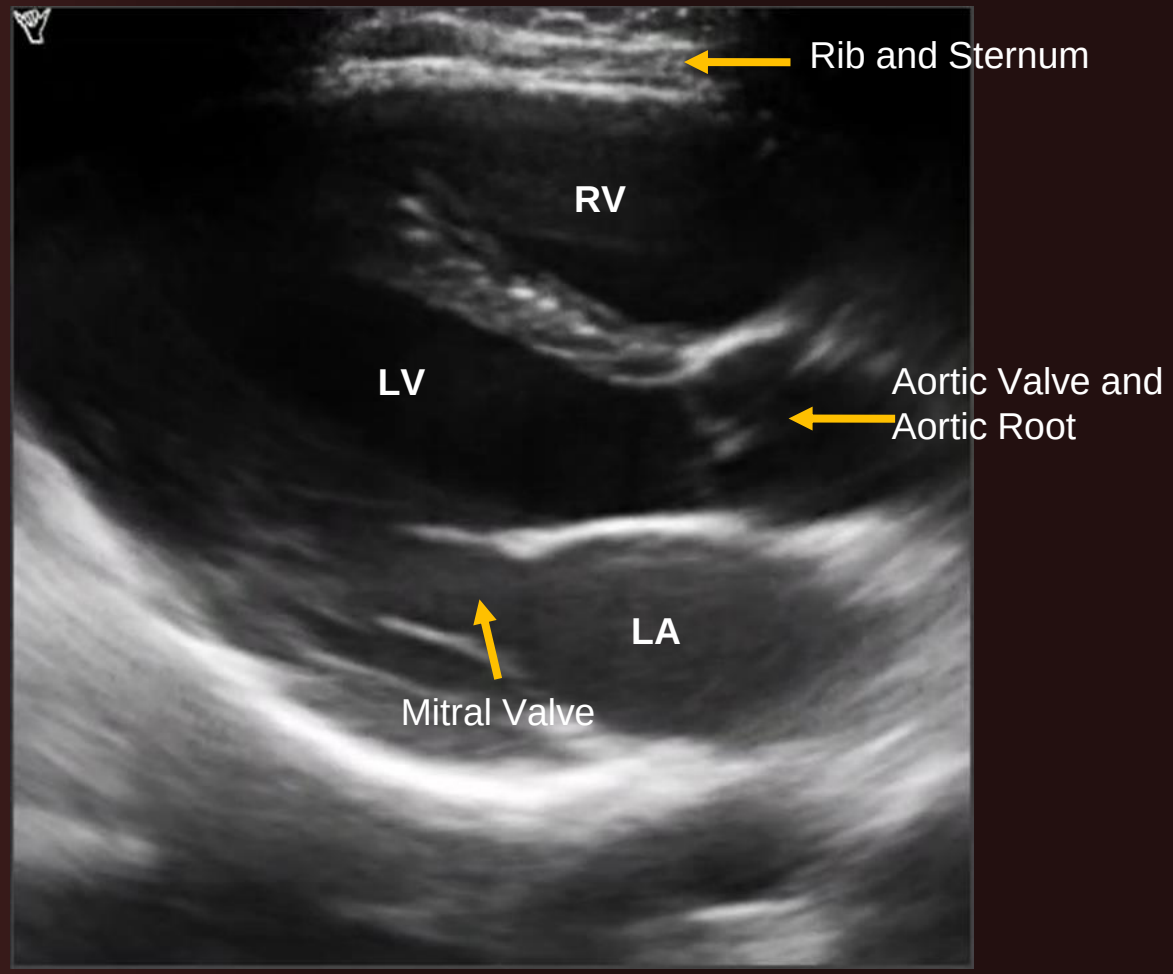
Thoracic Imaging: Heart

MAUI can image vital organs through the ribcage without special training





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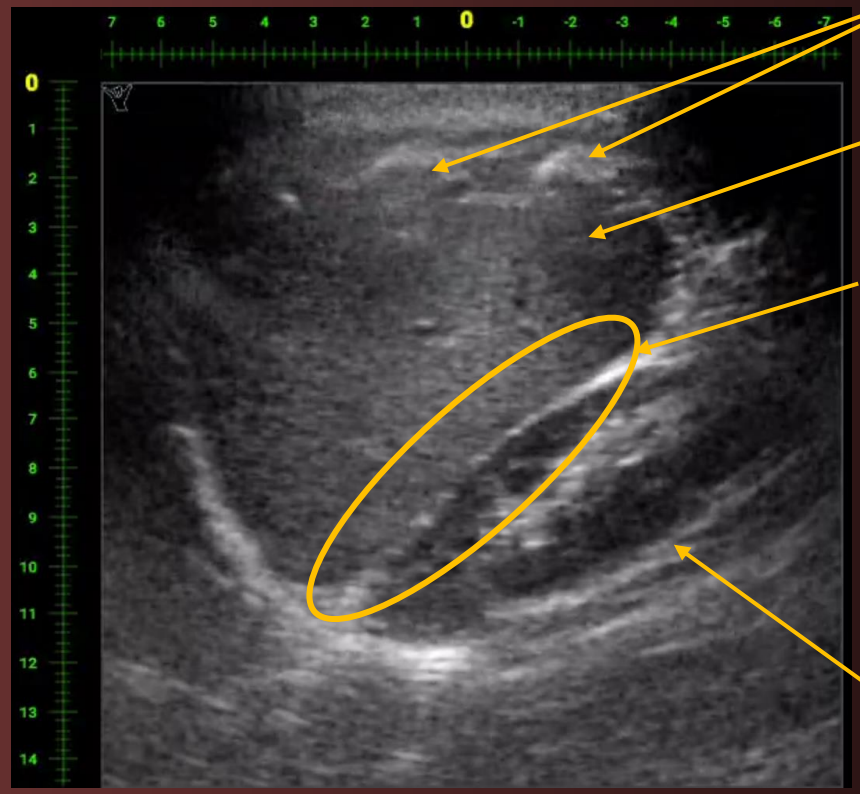
Representative Imaging

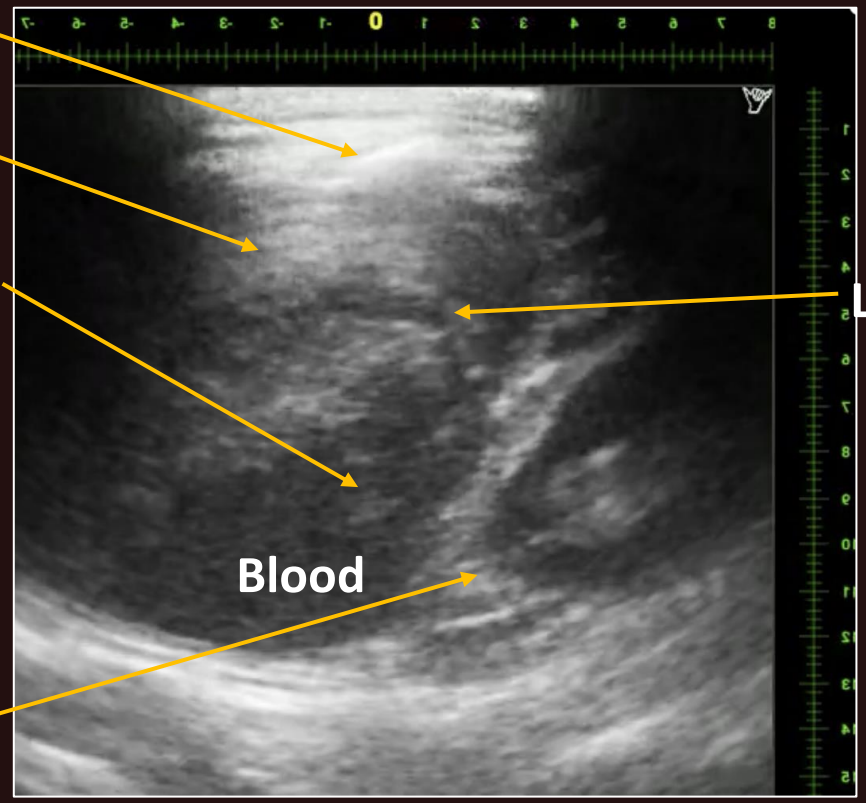
Abdominal Imaging

CET Imaging can expedite eFAST examinations by imaging through the ribs; less experienced medical personnel can obtain diagnostic images

Normal LUQ



Positive eFAST



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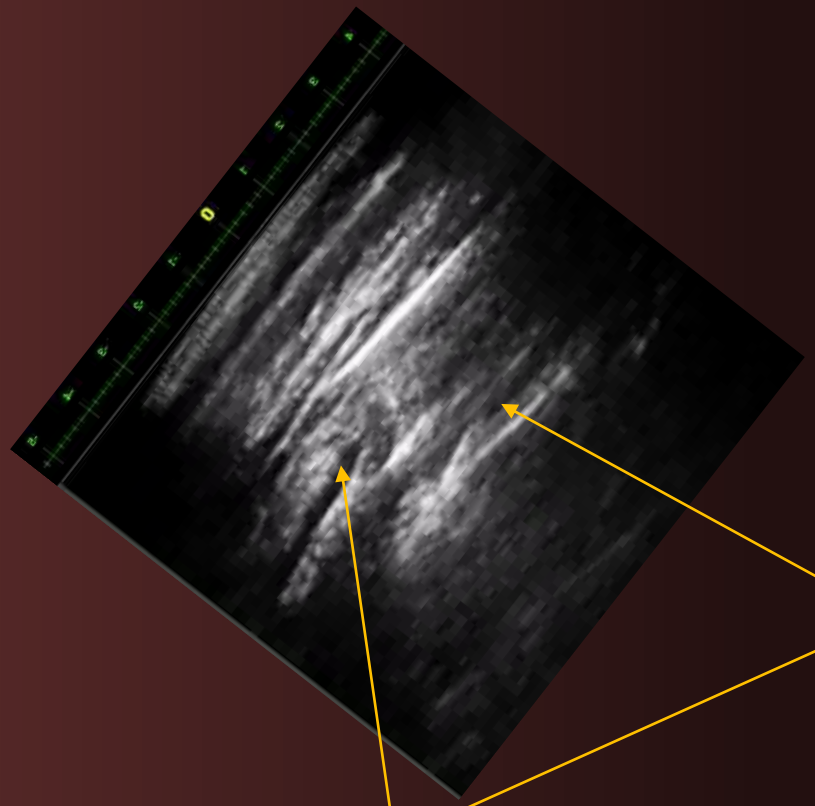
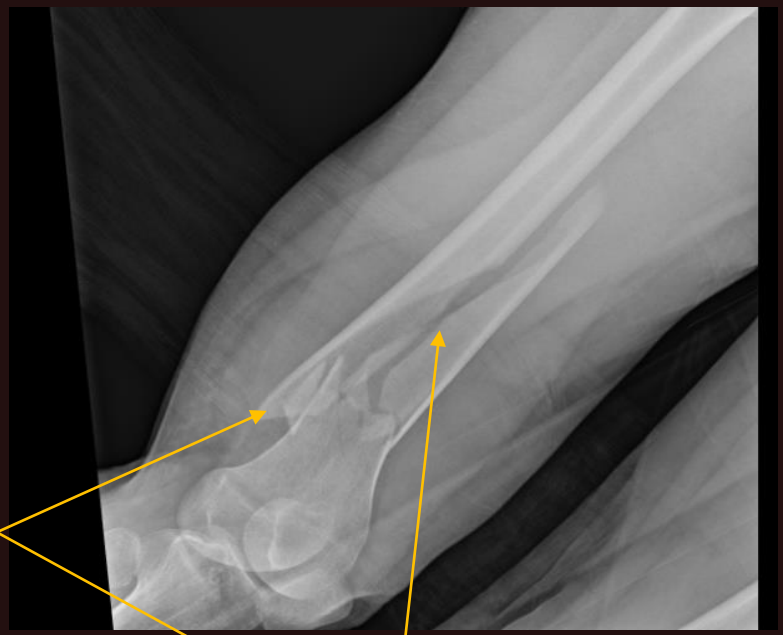
Long Bone Imaging

CET imaging can easily diagnose both displaced and non-displaced fractures of the long bones



Longitudinal View of Distal Femur Fracture.



Longitudinal View of Large Distal Fragment

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Know the Limits — And the Roadmap

CURRENT LIMITATIONS

- Frontal & coronal skull views still suboptimal (scores 1.67–1.75)
- Probe concavity and size limits ease of use in certain regions (cranial vertex, spine, upper chest)
- No Doppler / Flow assessment yet (in development)
- Bone immediately beneath skin (cranial vertex, sternum) still challenging

WHAT'S COMING

- Improvements in SWAP (K3900ML)
- Improved image quality for cranial and spinal imaging
- Vascular flow (Doppler) imaging in development
- 3D volumetric imaging
- AI-assisted image guidance and pathology detection

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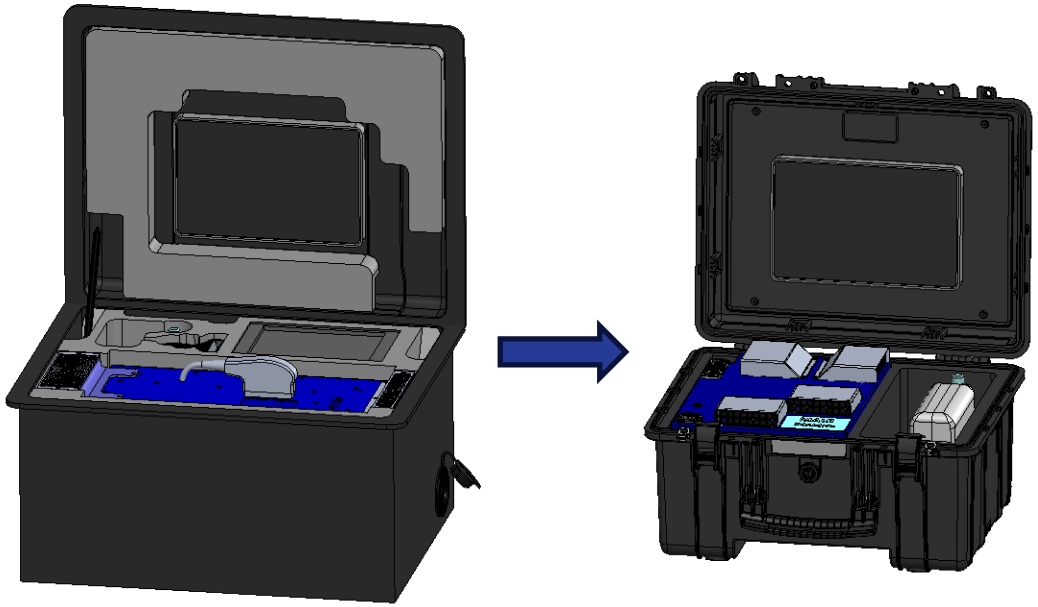
MAUI K3900M v3: Improved Size, Weight, Power Requirements (SWAP) and Performance



K3900M K3900ML

- Size: Small enough to fit in the overhead bin on commercial airlines
- Weight: ~30 kg → < 20 kg (will meet US military “one man lift” limit)
- Improved heat management (increased airflow)
- Interchangeable rechargeable batteries (BT-70791JV Lithium-Ion Batteries commonly used by US military)

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Key Takeaways

01 CET is still ultrasound — same safe frequencies and acoustic energies. Only the software and transducer geometry are new.

02 Our findings are that CET images through bone. You can image the brain at the bedside. Game-changing for TBI assessment in the field.

03 90.8% of 65 views were clinically adequate. The system works — peer-reviewed, published data (JACEP Open 2025).

04 Minimal training needed for image acquisition. Less expert-dependent than conventional POCUS — critical for combat medicine.

05 FDA cleared. DoD sponsored. Being field tested by USMC/USN.
This is real, not a prototype.

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Sources: Cheronis et al. JACEP Open 2025 · Pirahanchi et al. Clinical Neuroimaging 2026 (submitted) · MAUI Imaging patents (160+ issued, David Specht co-inventor)

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