



CASCADe 2027 NON-CONFIDENTIAL SUMMARY »

EasyAir: Self-Navigating Emergency Airway Device

COMOTION REFERENCE »

BDP 8049

Overview

Establishing an emergency airway is one of the most critical interventions available, but today's tools (endotracheal tubes, laryngeal masks, and similar devices) require extensive clinical training, precise technique, and steady hands under extreme pressure. In the hands of an untrained bystander, first responder, or combat medic, improper insertion can cause serious injury or fail outright.

EasyAir is a soft-robotic emergency airway device that eliminates the guesswork from airway placement. Rather than being pushed into place like a conventional tube, EasyAir grows into the airway using a soft-robotic "eversion" mechanism, automatically following the path of least resistance through the mouth and throat. Because it does not require the user to see, aim, or manipulate the device, it can be deployed effectively by minimally trained personnel — a bystander, a soldier in the field, or a first responder — increasing the odds that an airway is established quickly and safely.

INNOVATION MANAGER »

Judy Bridges

SECTOR »

Medical Device

LEAD INVESTIGATOR »

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- **Passive self-navigation:** The device grows and conforms into the trachea or esophagus without requiring visualization, positioning skill, or steering by the user.
- **Dual deployment pathways:** Built-in sealing cuffs and dual air channels allow the device to deliver breathing air regardless if it lands in the trachea or the esophagus, addressing one of the most common failure modes of existing airway devices.
- **Lower insertion forces and reduced tissue trauma:** Bench testing shows substantially lower insertion pressures and forces than commercial laryngoscopes and supraglottic airway devices, reducing the risk of injury during placement.

Description

Modality: Medical Device (Emergency Airway Management). **Indication/Use Case:** Emergency airway management in out-of-hospital cardiac arrest, drug overdose, trauma, and combat casualty care; applicable to both civilian emergency medical services and military first-responder settings. **Target Patient Population:** Adult patients requiring emergency ventilatory support who cannot maintain a patent airway on their own.

EasyAir is built on a "vine robot" or everting-tube soft robotics platform. A thin, flexible tubular membrane is stored inverted on a spool and pressurized with air (or another gas source), causing it to turn itself inside-out and extend forward through the mouth and throat — a growth mechanism called eversion. Because the tube grows from its tip rather than being pushed in as a rigid shaft, it naturally follows the contours of the airway, passively navigating around anatomical

obstacles without sliding or jamming against sensitive tissue, and without requiring a trained operator to steer it.

EasyAir integrates two independent air-delivery channels and two inflatable sealing cuffs directly into the everting tube:

- **Dual air channels:** A central air line runs through the tip of the tube for delivering breaths if the device deploys into the trachea, and a side air line runs along the tube's exterior for delivering breaths if the device instead lodges in the esophagus.
- **Dual sealing cuffs:** A distal sealing cuff forms a seal against the esophagus, larynx, or trachea, while a proximal sealing cuff seals against the pharynx — ensuring an effective airway seal and breath delivery regardless of which passage the device enters, similar in principle to the clinical rationale behind the CombiTube but achieved through soft, self-conforming eversion rather than rigid tube placement.
- **Thermoplastic construction:** Later-generation prototypes are built from thermoplastic polyurethane (TPU) sheets that are lap-sealed or fin-sealed into custom tube and cuff geometries, offering elasticity, abrasion resistance (to withstand contact with teeth), and resistance to degradation from stomach acid exposure. Sheets of differing thickness can be combined to promote curved eversion that conforms naturally to the geometry of the pharynx.
- **Supporting manufacturing innovation:** The team has also developed a novel automated manufacturing method that uses a heated 3D-printer-style toolhead to heat-seal custom tube and cuff geometries from thermoplastic sheet stacks, including a proposed “infinite-length” conveyor-based approach, enabling more consistent, scalable production of custom everting tube robots than traditional hand-sealing methods.

Proof-of-concept results and current development status: The device has progressed through three prototype generations (2021, 2023–2024, and 2024–2025). Across these iterations, bench and phantom testing has demonstrated:

- Insertion (eversion) pressures and forces meaningfully below those measured for commercial laryngoscopes and supraglottic airway devices in published benchmarking studies.
- Airway sealing performance in simplified and anatomically accurate rigid airway phantoms (including a phantom derived from the Advanced Joint Airway Management Simulator, or AJAMS) comparable to sealing pressures used by manual intubation devices, without exceeding pressure thresholds associated with mucosal ischemia.
- Burst-pressure safety factors of approximately 3–5 times the minimum pressure required for eversion, indicating an adequate safety margin for the pressures used during deployment.
- 100% deployment success in the most recent (2024) prototype iteration during phantom-based testing.

Technology Readiness Level (TRL)

TRL 3 - 4 — System or subsystem components tested in a laboratory or relevant environment. Three generations of functional prototypes (2021, 2023–2024, and 2024–2025) have demonstrated critical functions and proof of concept, including successful eversion, sealing, and simulated air delivery in bench-top and anatomically accurate rigid airway phantoms. Testing to date has been conducted in laboratory and simulated (phantom) environments; the device has not yet been evaluated in animal, cadaver, or live clinical settings.

Value Proposition

- EasyAir can be deployed by minimally trained bystanders, first responders, or combat medics, rather than requiring the extensive clinical training needed for conventional intubation.

- The self-navigating eversion mechanism follows the natural contours of the airway, reducing sliding and shear forces that commonly cause tissue injury during manual device insertion.
- Dual air channels and dual sealing cuffs allow the device to establish a functional airway whether it lands in the trachea or the esophagus, addressing a key failure mode of existing single-pathway airway devices.
- Bench testing shows lower insertion pressures and forces than commercial laryngoscopes and supraglottic airway devices, suggesting a reduced risk of airway trauma during placement.
- A scalable, heat-sealed thermoplastic manufacturing process supports consistent, cost-effective production compared to hand-fabricated soft robotic devices.

Intellectual Property Position

- [US12558803B2](#) – Patent issued/granted February 24, 2026.
- [WO2025250781A1](#) - Patent application pending.

Market Opportunity

- The global airway management devices market was valued at approximately \$891.7 million in 2022 and is projected to reach \$1.1–1.2 billion by 2027, growing at a compound annual growth rate of approximately 5.5%, driven by rising incidence of cardiac arrest, expanding prehospital airway management needs, and an aging population (BCC Research, 2023).
- Target customers include emergency medical services (EMS) agencies, hospital emergency departments and ICUs, military medical units, and consumer/bystander emergency-response markets, paralleling the accessibility model of automated external defibrillators (AEDs).
- Existing alternatives present a persistent trade-off: low-cost devices such as standard endotracheal tubes are difficult for non-experts to place effectively, while supraglottic devices marketed as “easy to use” (e.g., laryngeal mask airways, i-gel) still require meaningful training and can fail in the field; other soft-growing airway concepts in development remain dependent on precise sizing and placement.
- Potential adoption pathways include integration into military medic kits and defense medical supply chains, as well as the broader emergency and first-responder equipment market, in addition to traditional hospital and EMS channels.
- The device’s design intent — enabling untrained bystanders to establish an emergency airway — points to a commercial opportunity in public-access emergency equipment analogous to the AED market, alongside its core clinical and military use cases.

References

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