UAS & DRONE OXYGEN (O2) DELIVERY FOR MILITARY & DISASTER RESPONSE

A POWER-FREE, NON PRESSURIZED MEDICAL RESUPPLY CAPABILITY

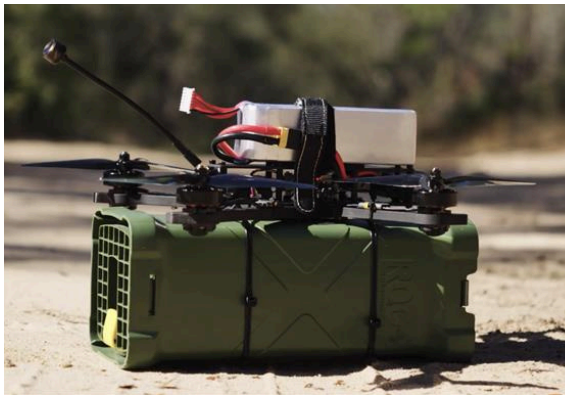
By Andrew Maier

ABSTRACT

Recent conflict confirms long-standing Army assumptions regarding contested logistics, delayed evacuation, and prolonged casualty care. Oxygen remains essential to casualty stabilization yet difficult to position forward when conventional resupply is constrained. This paper documents a fieldable capability demonstrated through a proof flight delivering a non-pressurized, non-explosive oxygen-generation system (ROG) over 1,000 meters using a small, unmanned aircraft. It situates this capability within contemporary conflict observations, Army sustainment doctrine, and existing medical logistics practice, and describes a practical concept of employment for restoring oxygen access forward using systems already in operational use.

INTRODUCTION

A recent proof flight conducted with Tandem Defense delivered a rugged oxygen generator payload over a distance exceeding 1,000 meters using a 7-inch FPV drone. The flight demonstrated that oxygen access can be restored forward using small form unmanned systems comparable to those already fielded and routinely employed today. The oxygen system delivered was non-pressurized and non-explosive, avoiding the handling and transport risks traditionally associated with compressed oxygen cylinders.[1]



Rugged Oxygen Generator carried by 7-inch FPV drone

This demonstration reflects a broader operational reality. Small, unmanned aircraft systems are no longer niche capabilities. Across contemporary conflict, they are employed daily for reconnaissance, fires, electronic warfare, logistics experimentation, and casualty support. Their integration into tactical operations has become routine, particularly in environments characterized by persistent surveillance and interdicted movement.[2]

Within this context, delivering medical capability by unmanned aircraft is not a departure from current practice, but a continuation of it. The question addressed in this paper is not whether unmanned systems belong in medical sustainment, but how they can be applied to close a persistent gap in oxygen access when conventional resupply and evacuation cannot be assumed.[3]

MEDICAL SUSTAINMENT UNDER CONDITIONS OF INTERDICTION

Recent conflict reinforces long-standing Army assumptions regarding medical sustainment in large-scale combat operations. Units operate dispersed. Movement is observed. Evacuation timelines extend when routes are contested. Under these conditions, casualty outcomes are increasingly shaped by what can be sustained forward rather than by what exists at higher echelons of care.[4]

---

[1] Tandem Defense, proof flight after-action documentation, 2025; Department of the Army, FM 4-0, Sustainment Operations (Washington, DC: Headquarters, Department of the Army, 2024).

[2] U.S. Army Training and Doctrine Command, The Operational Environment and the Changing Character of War (Fort Eustis, VA: TRADOC, 2022); Matthew Gault, "Hunted by Drones, Ukrainian Forces Hide Behind Darkness to Evacuate the Wounded," Business Insider, December 2025.

[3] Joint Trauma System, Aerial Delivery of Fresh and StDroored Blood Products (Defense Health Agency, December 2025); Joint Chiefs of Staff, JP 4-02, Joint Health Services (Washington, DC: Department of Defense, 2018).

[4] Department of the Army, FM 4-0; Joint Chiefs of Staff, JP 4-02.

Operations in Ukraine provide a clear illustration of this dynamic. Ukrainian military officers have described evacuation corridors that are intermittently usable and routinely disrupted by unmanned aerial systems, forcing casualty movement to occur only during periods of reduced visibility. As a result, casualties are frequently stabilized and sustained forward longer than doctrinal evacuation timelines would otherwise anticipate.[5]

Assessments of Ukraine's trauma care system, informed by interviews with military and civilian healthcare professionals, describe repeated disruption of medical supply chains caused by interdicted movement and damaged infrastructure. These accounts point less to deficiencies in medical expertise than to friction between need and access under persistent observation and fires. Taken together, these observations closely mirror U.S. Army projections for future conflict.[6]

OXYGEN AS A LIMITING FACTOR IN PROLONGED CARE

In prolonged casualty care, oxygen availability often becomes a limiting factor independent of provider skill or clinical equipment. Oxygen is foundational to airway management, respiratory compromise, and stabilization prior to evacuation. Yet it remains among the most difficult Class VIII commodities to reposition forward under contested conditions.[7]

Compressed oxygen cylinders impose familiar constraints: weight, transport risk, handling requirements, and reliance on refill infrastructure that may be unavailable forward. These challenges are magnified when resupply routes are interdicted and casualty movement is delayed.[8]

Army and Joint Trauma System publications acknowledge prolonged care environments characterized by constrained medical supplies and limited oxygen availability. Sustaining casualties forward under degraded conditions requires adaptation in how critical supplies are positioned, delivered, and accessed.[9]

ALIGNMENT WITH DOCTRINE AND PRACTICE

Army sustainment doctrine frames the future operating environment as one in which logistics nodes and lines of communication are contested, requiring distributed and adaptive sustainment approaches. Within the medical enterprise, Joint Trauma System guidance on the aerial delivery of blood products has already established precedent for unmanned delivery of time-critical Class VIII materiel when conventional movement is constrained.[10]

Applying unmanned delivery concepts to oxygen generation does not introduce a new requirement. It extends an accepted approach to a commodity that has historically proven difficult to move forward under pressure. The underlying logic which is restoring access to critical medical supplies during periods of interdiction is already embedded in current doctrine and practice.[11]

---

[5] Matthew Gault, "Hunted by Drones, Ukrainian Forces Hide Behind Darkness to Evacuate the Wounded," Business Insider, December 2025.
[6] Lynn Lawry et al., "Health System Organization and Logistics of Trauma Care"; U.S. Army Training and Doctrine Command, Changing Character of War.
[7] Joint Trauma System, Prolonged Casualty Care Clinical Practice Guideline; Joint Chiefs of Staff, JP 4-02.
[8] Department of the Army, FM 4-0; U.S. Army Medical Department, oxygen handling and storage guidance.
[9] Joint Trauma System, Prolonged Casualty Care Clinical Practice Guideline; U.S. Army Training and Doctrine Command, Changing Character of War.
[10] Department of the Army, FM 4-0; Joint Trauma System, Aerial Delivery of Fresh and Stored Blood Products.
[11] Joint Chiefs of Staff, JP 4-02; Department of the Army, FM 4-0.

FIELD CAPABILITY AND CONCEPT OF EMPLOYMENT

The proof flight conducted with Tandem Defense demonstrated that last-mile oxygen access can be restored using small-form unmanned systems comparable to those already in operational use. A rugged oxygen generator payload was delivered over a distance exceeding 1,000 meters using a 7-inch FPV drone, achieving meaningful medical effect without reliance on new airframes, authorities, or sustainment structures.[12]

The significance of this result lies in immediacy. The capability can be executed now, using systems already familiar to units operating in contested environments. While larger unmanned platforms may extend range or payload margin, essential medical resupply effects are achievable at small scale.

CONCEPT OF EMPLOYMENT

When forward medical personnel identify an oxygen requirement, a nearby support node launches a small, unmanned aircraft carrying an oxygen-generation unit to a designated landing point or micro-LZ. Upon receipt, the unit is activated and integrated into existing airway or respiratory interventions. The emphasis is on restoring oxygen access during periods when evacuation or ground resupply is delayed.

In practice, oxygen delivery need not occur in isolation. The same delivery framework can support bundled medical payloads tailored to the situation, including tourniquets, bandages, airway adjuncts, medications, or other time-sensitive Class VIII items. As platform capacity increases, the employment model naturally extends to larger payloads, including blood products, without altering the underlying concept.

This approach supports a flexible, demand-driven method of medical resupply that complements existing sustainment systems rather than replacing them.

CONCLUSION

Contemporary conflict demonstrates that medical sustainment forward will increasingly occur under conditions of constrained movement and delayed evacuation. In such environments, oxygen access becomes a decisive variable in casualty outcomes. Delivering oxygen-generation capability by unmanned aircraft offers a practical means to restore access forward using systems already in use. Employed alongside other critical medical supplies, this approach strengthens medical resilience and improves sustainment performance under conditions the Army already anticipates facing.

Rugged Oxygen Generator delivering medical grade oxygen

Scan to watch proof of flight video

[12] Tandem Defense, proof flight after-action documentation, 2025.

BIBLIOGRAPHY

Department of the Army. FM 4-0: Sustainment Operations. Washington, DC: Headquarters, Department of the Army, 2024.

Gault, Matthew. “Hunted by Drones, Ukrainian Forces Hide Behind Darkness to Evacuate the Wounded.” Business Insider, December 2025.

Joint Chiefs of Staff. JP 4-02: Joint Health Services. Washington, DC: Department of Defense, 2018.

Joint Trauma System. Aerial Delivery of Fresh and Stored Blood Products. Defense Health Agency, December 2025.

Joint Trauma System. Prolonged Casualty Care Clinical Practice Guideline. Defense Health Agency, current edition.

Lawry, Lynn, et al. “Health System Organization and Logistics of Trauma Care Since the Russian Invasion of Ukraine.” Prehospital and Disaster Medicine, 2024.

Tandem Defense. Proof flight after-action documentation, 2025.

U.S. Army Medical Department. Oxygen handling and storage guidance.

U.S. Army Training and Doctrine Command. The Operational Environment and the Changing Character of War. Fort Eustis, VA: TRADOC, 2022.