Soldiers of the 529th Regimental Support Company, 3rd Infantry Regiment, participate in a joint tactical aerial resupply vehicle exercise at Fort A.P. Hill, Va., with the Army Research Laboratory, on Sept. 22, 2017. (Photo by Pfc. Gabriel Silva)

Autonomous Aerial Resupply in the Forward Support Company

Forward support companies are ideally positioned to use autonomous aerial resupply capabilities to support maneuver elements in Multi-Domain Battle.

■ By Lt. Col. Jeremy C. Gottshall and Capt. Richard A. Lozano

The concept of using unmanned aerial systems (UASs) to transport equipment and supplies continues to gain momentum and widespread acceptance by Army leaders. The Army Operating Concept, the Robotic and Autonomous Systems Strategy, and the Army Functional Concept for Movement and Maneuver all call for developing this capability.

Accordingly, the Army and its joint and industry partners have been working to introduce and refine autonomous aerial resupply capabilities to expedite sustainment operations and to minimize Soldiers' exposure to risk. However, the focus has shifted from large, unmanned helicopters carrying thousands of pounds of supplies between static forward operating bases to a smaller, decentralized, organic capability supporting small, dispersed maneuver formations.

To be sufficiently responsive in the dynamic, rapidly changing conditions of close combat, an autonomous aerial resupply capability must reside in the organization that

sustains the lowest echelons of maneuver forces: the forward support company (FSC).

Speeding Resupply

Driven by a renewed emphasis on readiness, capability developers have been examining how unmanned logistics systems could improve distribution from within the brigade combat team (BCT) to the BCT's forward maneuver formations. This effort is even more imperative for the future operational environment.

In the future fight, Army forces will face highly capable adversaries who will challenge U.S. dominance in every domain—air, land, sea, space, and cyberspace. The enemy will challenge U.S. air superiority and deny the Army's use of static safe havens, including forward operating bases and logistics hubs. To win in this scenario, Army forces will task organize at the lowest practical level and operate semi-independently to exploit temporary windows of advantage.

Dispersed and semi-independent maneuver elements require their own decentralized sustainment capabilities to maintain a high operating tempo, endurance, and operational reach. Because windows of advantage are fleeting, the ability to move quickly against an enemy's weak points is crucial. In this environment, the virtue of autonomous aerial resupply is its ability to move mission-critical equipment and supplies when other modes of transportation are not available and before a window of opportunity closes.

Responsive logistics, including aerial resupply, is paramount in this operational environment. Unfortunately, access to manned aviation support for resupply is typically a 72- to 96-hour process. Maneuver and logistics commanders can expect similar delays from unmanned cargo aircraft assigned to aviation units because they use the same multiechelon air movement request and approval procedures. For a commander executing maneuver in Multi-Domain Battle, waiting this long for resupply or transportation of mission-essential equipment could mean the loss of an initiative when a temporary window of local superiority closes.

The Army should decentralize unmanned aerial resupply capabilities by assigning them to FSCs for local control and immediate response just as unmanned intelligence, surveillance, and reconnaissance capabilities are assigned to BCT maneuver formations. Resupply metrics should be in minutes, not days.

Why the FSC?

In the future operational environment, fleeting periods of local dominance will require rapid, timely action; this action will require responsive sustainment. Robust organic sustainment is even more critical in an access-denied environment, where lines of communication—including air, ground, and mission command networks—could be regularly interdicted by enemy action.

Maneuver units at all levels must become less dependent on higher echelons. Therefore, autonomous aerial resupply should be integrated at the lowest level possible.

According to Field Manual 3-96, Brigade Combat Team, FSCs provide the greatest flexibility for logistics support within the BCT. Although organic to the brigade support battalion, FSCs are frequently attached by the BCT commander to their supported maneuver battalions, and they provide the link from the brigade support battalion to the supported battalions.

Because FSCs normally operate in close proximity to their supported battalions or squadrons, they are best positioned to react quickly to changing conditions and logistics requirements. Furthermore, the FSC commander can divide the company and place some elements forward with the supported unit and other elements in the brigade support area. By doing this, the FSC can anticipate and rapidly respond to urgent movement requirements. It can either deliver supplies and mission-essential equipment from the brigade support area or the maneuver battalion's combat trains.

The FSC is ideally situated to use an autonomous aerial distribution capability as an additional means to fulfill routine or urgent resupply requests. This capability would reduce the supported elements' vulnerability to enemy action and increase their ability to exploit an enemy's weakness. Essentially, autonomous aerial resupply gives the FSC a solution to support Multi-Domain Battle maneuver.

Challenges and the Way Ahead

Providing UASs for sustainment support directly to maneuver formations would present some challenges that would need to be addressed before the capability could be effectively implemented. These hard questions must first be answered:

- ☐ How will unmanned logistics systems be operated in a manner that maximizes safety for other aircraft and personnel on the ground?
- ☐ How will these systems be integrated into the tactical airspace control network?
- ☐ Who will operate these systems for the FSC, and what level of training will they require?
- ☐ How will the systems be maintained, and by whom?
- ☐ Will these systems displace other equipment in the FSC?
- ☐ How will cyber and network security concerns be addressed?
- ☐ How much payload should one systems deliver?
- ☐ How fast and how far should the systems be able to go?

To tackle these issues, the Army and Marine Corps established the requirements integrated product team (IPT) for the joint tactical autonomous air resupply system (JTAARS) in October 2016. The IPT is exploring these questions and refining procedures in order to successfully implement autonomous

Soldiers of the 529th Regimental Support Company, 3rd Infantry Regiment, load a joint tactical aerial resupply vehicle with supplies during a tactical unmanned aerial resupply exercise on Sept. 22, 2017, at Fort A.P. Hill, Va. The exercise was held with the Army Research Laboratory. (Photo by Pfc. Gabriel Silva)

aerial resupply at the most forward tactical echelons.

The IPT consists of capability developers and subject matter experts from the Sustainment, Maneuver, Mission Command, and Aviation Centers of Excellence as well as from the Marine Corps headquarters and other stakeholders. The IPT's ultimate objective is to fully document JTAARS requirements and transition JTAARS into a program of record.

In the meantime, Army research organizations and their industry partners are tackling the technical challenges to develop air vehicles with the physical characteristics, automated navigation systems, and associated human-control interfaces that will allow the systems to be integrated into FSCs.

Multiple Department of Defense organizations are actively pursuing technology to deliver capabilities simple enough to maintain and operate within the FSC. The Armament Research, Development and Engineering Center has teamed with an industry partner to develop the joint tactical aerial resupply vehicle, formerly known as the Picatinny Pallet. The U.S. Central Command is also pursuing a cargo UAS.

Together, these representative technology approaches were submitted as a single joint capability technology demonstration proposal. The proposal seeks to develop and demonstrate air vehicles capable of autonomously delivering payloads of 300 to 600 pounds, which aligns closely with the JTAARS IPT's preliminary requirements analysis. While this joint capability technology demonstration was not funded, the work to investigate this solution space continues.

Additionally, the Army Research Laboratory and the Office of Naval Research are working with an industry partner to scale down an existing helicopter autonomy package for integration into smaller unmanned aerial vehicles such as the joint tactical aerial resupply vehicle. This would greatly reduce the requirement for operator control inputs.

In a separate effort, the Army Medical Research and Materiel Command's Telemedicine and Advanced Technology Research Center is seeking to develop capabilities for future combat medics. These capabilities include medical resupply and casualty evacuation with UASs that use vertical takeoff and landing when conventional medevac assets are denied access or unavailable.

Regardless of what form the technical solution ultimately takes, autonomous aerial resupply will provide the FSC commander an additional tool to accomplish the mission of providing adaptable and flexible distribution support for the maneuver battalion. UASs may not immediately replace existing capabilities within the FSC, but they will provide a uniquely responsive distribution option to help maneuver forces seize, maintain, and exploit the initiative in Multi-Domain Battle.

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