

Unmanned Cargo Transport According to SORA – Insights from the DLR Projects ALAADy-CC (2022–2024) and Perspectives for KARGO (2026++)

Summary

ALAADy-CC demonstrated the conversion of a manned gyroplane into a robust, low-cost unmanned cargo drone for low-altitude operations (< 500 ft), using the SORA framework as regulatory basis. Real flight tests validated operational procedures and safety concepts. Key challenges included missing standards for risk mitigation and limited parachute options. The proposed follow-up project KARGO aims for scalable rural cargo operations with one pilot supervising multiple drones, low costs, and continued use of SORA. The presentation includes results from ALAADy-CC and an outlook on KARGO.

Abstract

The development and testing of unmanned aerial systems (UAS) for cargo transport represents a key technology to enable efficient, flexible, and cost-effective logistics—especially in remote areas or for time-critical deliveries. The project ALAADy-CC (Automated Low Altitude Air Delivery – Cross Country) aimed to convert a manned gyroplane-based light aircraft into a robust, low-cost cargo drone, demonstrating the practical potential of unmanned cargo flights in low-altitude airspace (< 500 ft).

A central aspect was the application of the SORA framework (Specific Operations Risk Assessment) as the regulatory basis. In particular, airdrop scenarios—which eliminate the need for precise landing—open up options for economical operations, especially in humanitarian contexts. The demonstrator platform developed in the project was tested in real flight operations, during which operating procedures, testing protocols, and emergency concepts were developed and validated.

From a technical perspective, it was shown that a modular conversion of the gyroplane into an unmanned transport platform equipped with autopilot, power supply, communication, and actuation systems is feasible. The integration of a safety concept, together with comprehensive risk analyses, formed the foundation for applying for a SORA 2.0 operational approval. By aiming for the lowest possible SAIL (Specific Assurance and Integrity Level) classification, operational costs can be significantly reduced while maintaining safety levels.

Workshops with aviation authorities (LBA, EASA) and practical testing revealed key challenges:

- Standardized and officially recognized methods for demonstrating risk mitigations are incomplete or inadequate.
- Conventional parachute systems are unsuitable for low-altitude operations, even though this airspace is ideally suited for drone use.
- Public and regulatory acceptance of airspace integration remains a critical issue.

Against this background, the proposed follow-up project KARGO—the name stands for cost-efficient unmanned cargo transport—is intended to take the next step toward operational deployment and scalability. The project aims to establish an economically viable operating model with the following key features:

- Cargo flights at low altitudes in rural areas.
- One pilot supervising multiple aircraft (supervision instead of direct control).
- Minimization of maintenance and operational costs through robust, simplified technologies.

As in ALAADy-CC, the SORA framework will also play a central role in KARGO—for both operational approval and the further development of standardized verification procedures. At the time of writing, the approval process for KARGO is in its final stages. Therefore, the presentation will not only summarize the findings from ALAADy-CC but also provide a cautious outlook on the goals and planned content of the upcoming KARGO initiative.