

THE LDACS TRANSITION CONCEPT

A low cost and scalable service

SITA is developing a low cost and scalable way to expand today's datalink infrastructure, by including L-band Digital Aeronautical Communications System (LDACS) technology. This supports ANSPs in providing the next generation of ATC services, such as Trajectory Based Operations (TBO) which will be key to improving efficiency and sustainability.

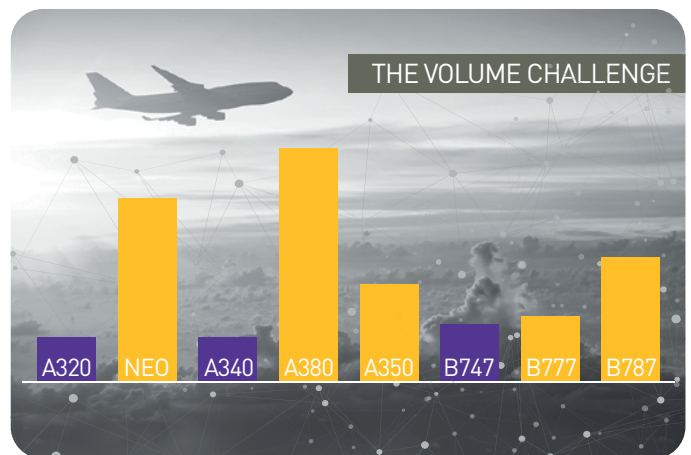
THE GROWING DEMAND FOR DATALINK COMMUNICATIONS

Today, SITA is providing performant and reliable datalink services all over the world using existing technologies, such as VDLm2 and SATCOM. These technologies are likely to be operational in some places for at least the next decade but, elsewhere, demand for alternatives is expected sooner.

When it comes to ATC datalink communications, a significant driver of demand is thought to come from the gradual deployment of Trajectory Based Operations. This concept, which has been operationally demonstrated, involves the synchronization of four-dimensional trajectories between the aircraft and the ANSP. It brings safety benefits, significantly better predictability, reduced fuel burn and better sequencing, while still reducing controller workload. Keeping the pilot and the controller in sync via datalink brings huge benefits but SITA estimates that aircraft making use of this functionality will consume between two and four times the bandwidth of current ATC operations, therefore it places far more demand on the datalink network.

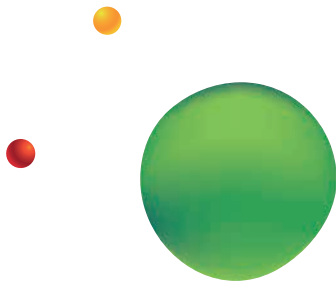
New types of aircraft have been designed to take full advantage of datalink communications and 4D trajectory management. As fleets transition to more modern aircraft with greater diagnostic and performance monitoring capabilities, their usage of AOC (Airline Operational

Communications) will grow dramatically. For example, the volume of AOC in-flight data transmitted typically increases by a factor of four for each new generation of aircraft.



Another reason for increased demand is likely to be traffic growth. While the reduction in traffic caused by the COVID-19 crisis is all too plain to see, Eurocontrol predicts that European 2019 traffic levels will be exceeded by 2024 and continue to grow from there. Growth will return more quickly in some places and more gradually in others, but overall, we will see a pattern of recovery and then expansion.

In the modern world, organizations must be more aware of the security measures in place to protect their digital communications. This is especially true in the ATC environment where safety is always the primary consideration. As ANSPs become more and more dependent on datalink communications, their security concerns are expected to grow. The next generation of communication technologies are likely to be more resilient and robust than what is used today.



LDACS OFFERS HIGH BANDWIDTH, LOW LATENCY, SCALABILITY, AND SECURITY. THESE PROPERTIES MAKE IT A LEADING CONTENDER TO BE THE TERRESTRIAL FOUNDATION OF THE SITA FOR AIRCRAFT MULTILINK CONCEPT; A MECHANISM THAT PROVIDES MULTIPLE COMMUNICATION ROUTES BETWEEN AIRCRAFT AND ANSPs.

AN INTRODUCTION TO LDACS

LDACS is an air to ground communication technology that is being standardized within ICAO and draft SARPS (Standards and Recommended Practices) have been endorsed. LDACS makes use of well-established cellular technology, like that used in 4G mobile infrastructure, and it operates in a different frequency band (L-band) to existing radio infrastructure, so it can be deployed at existing radio sites without the risk of interference. This avoids the significant investments that would be required to find and commission new radio sites.

In this article we focus on LDACS datalink communications, but later the technology is set to enable surveillance, voice, and navigation features.

LDACS offers high bandwidth, low latency, scalability, security. These properties make it a leading contender to be the terrestrial foundation of the SITA FOR AIRCRAFT Multilink concept; a mechanism that provides multiple communication routes between aircraft and ANSPs.

The bandwidth provided by this solution is a minimum of 50 times that of today's VDLm2 connections. This is more than sufficient for the air traffic services expected in the future, the most optimistic traffic growth predictions, and the operational communication needs of future aircraft types. Built-in functionality allows some services (e.g., ATC) to be prioritized over others (e.g., AOC) so that critical information is given precedence.

LDACS provides highly secure connections by employing Public Key encryption to authenticate all participants.

A limitation of current LDACS implementation plans is that they require up-front investments to upgrade the infrastructure of both communication service providers and ANSPs. These models do not correlate well with expected demand that will be both gradual and regional.

THE LDACS TRANSITION CONCEPT (LTC)

SITA considers LDACS to be a very promising technology that is likely to be a key part of the future datalink infrastructure. That said, it is vital that the implementation of the new technology is carried out in a way that keeps costs down for all stakeholders and supports an inevitably gradual transition from existing infrastructure.

SITA and Frequentis have joined forces to develop an LDACS Transition Concept (LTC) designed to support the transition from today's datalink infrastructure to the next generation solution. SITA, as a leading datalink service provider, is ideally placed to manage this transition. Frequentis has been involved in the development of the LDACS technology and standardization process since its inception.

The LTC allows LDACS air to ground communication to be integrated into the existing ground infrastructure and thus it would bring the core benefits of this technology without requiring any change for ANSPs.

The concept supports multiple protocols (ATN/OSI, ATN/IPS and ACARS) so it would cope with a range of avionics standards, as airline fleets are gradually upgraded to the new standards.



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A transition concept like this, that supports legacy protocols and integration into the existing ground infrastructure brings the features associated with the LDACS technology but with some significant benefits, when compared to existing LDACS deployment concepts:

- No changes would be required to ANSP equipment, regardless of the existing implementation method of datalink services (ATN or FANS).
- LDACS connectivity can be targeted to geographic areas that require it and be gradually scaled up from there. This is opposed to existing LDACS concepts that require a significant up-front investment in centralized ground infrastructure.
- Because the LTC concept uses existing ground infrastructure, the lifetime of this infrastructure will be extended, meaning deployment will be quicker, cheaper and involve lower technical risk. This allows SITA to maintain its commitment to provide best value for money communication alternatives.
- Traditionally, LDACS implementations have been dependant on IPS compatible avionics and ground infrastructure. The LTC concept supports legacy standards and therefore allows an LDACS deployment to take place long before IPS has become the norm.

LTC DEVELOPMENT APPROACH

SITA and Frequentis will work closely to develop this concept in three phases. First, a viable prototype will be developed and tested. The next step will be a technical trial to demonstrate the performance, reliability, and functionality of the prototype in a simulated operational environment, which will include interoperability testing with legacy technologies. The last phase will be an operational trial, where LTC equipment will be integrated into the SITA operational datalink infrastructure and demonstrated with LDACS equipped aircraft.

The scope and timing of this work has been coordinated with EUROCONTROL to ensure that a deployable solution will be ready for what they will recommend as the first phase of European LDACS deployment.

For more information on this topic, please contact your SITA FOR AIRCRAFT representative.

SITA AT A GLANCE

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- We work with over 400 air transport industry members and 2,500 customers in over 200 countries and territories. Almost every airline and airport in the world does business with SITA.
- Our customers include airlines, airports, ground handlers, aircraft, air navigation service providers, and governments.
- Created and owned 100% by air transport, SITA is the community's dedicated partner for IT and communications, uniquely able to respond to community needs and issues.
- We innovate and develop collaboratively with our air transport customers, industry bodies and partners. Our portfolio and strategic direction are driven by the community, through the SITA Board and Council, comprising air transport industry members the world over.
- We provide services over the world's most extensive communications network. It's the vital asset that keeps the global air transport industry connected.
- With a customer service team of over 2,000 people around the world, we invest significantly in achieving best-in-class customer service, providing 24/7 integrated local and global support for our services.
- Our annual Air Transport and Passenger IT Insights reports for airlines, airports and passengers are industry-renowned, as is our Baggage IT Insights report.

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