Training Course on Data Link (CPDLC/ADS-B/ADS-C) Operations in Aviation

Professional Development Training Course Outline

Category	Aviation and Airport Management	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Modern aviation increasingly relies on sophisticated digital communication systems to enhance **air traffic management (ATM)**, optimize **flight efficiency**, and bolster **aviation safety** Training Course on Data Link (CPDLC/ADS-B/ADS-C) Operations in Aviation offers a comprehensive deep dive into **Data Link Operations**, specifically focusing on **Controller-Pilot Data Link Communications (CPDLC)**, **Automatic Dependent Surveillance-Broadcast (ADS-B)**, and **Automatic Dependent Surveillance-Contract (ADS-C)**. Participants will gain critical knowledge and practical skills essential for navigating the evolving landscape of digital aviation, ensuring seamless integration of these technologies into daily flight and ground operations.

The aviation industry's shift towards **NextGen** and **SESAR** initiatives underscores the paramount importance of data link technologies for **trajectory-based operations** and **reduced separation minima**. This course addresses the critical need for aviation professionals to master these advanced systems, enabling them to leverage **real-time data** for improved **situational awareness**, proactive **decision-making**, and enhanced **operational efficiency**. Through a blend of theoretical instruction and practical application, attendees will be equipped to contribute to safer, more efficient, and sustainable air travel.

Programme Curriculum

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Course Objectives

1. Comprehend the core principles and architecture of modern **aviation data link systems**.
2. Proficiently utilize **CPDLC** for routine and non-routine **air-ground communications**, including clearances and requests.
3. Analyze and leverage **ADS-B OUT** and **ADS-B IN** information for enhanced **situational awareness** and **traffic management**.
4. Understand **ADS-C contract types** (periodic, demand, event, emergency) and their application in **non-radar environments**.
5. Apply data link capabilities to achieve **fuel savings** and **optimized flight paths**.
6. Recognize how data link technologies contribute to **increased airspace capacity** and **reduced air traffic congestion**.
7. Identify and address **human factors** considerations associated with data link operations, including workload and automation.
8. Adhere to **ICAO**, **FAA**, and **EASA** regulations and standards for data link operations.
9. Understand the **cybersecurity implications** of data link systems and implement protective measures.
10. Develop effective strategies for identifying and resolving common **data link system malfunctions**.
11. Apply data link knowledge within the framework of **NextGen** and **SESAR** air traffic modernization programs.
12. Utilize **real-time flight data** for proactive operational adjustments and improved decision-making.
13. Contribute to a **data-driven aviation ecosystem** by effectively managing and utilizing data link information.

Organizational Benefits

- Streamlined communication processes leading to reduced delays, optimized routes, and enhanced fuel efficiency.
- Reduced communication errors, improved situational awareness, and quicker response times to critical situations.
- Better utilization of available airspace and reduced congestion, particularly in high-density or remote areas.
- Lower fuel consumption and optimized maintenance planning through predictive analytics and real-time data.
- Adherence to international and national aviation standards, minimizing regulatory risks and penalties.

- Empowerment of pilots and air traffic controllers with richer, real-time data for more informed and timely decisions.
- Adoption of cutting-edge aviation technology, positioning the organization at the forefront of the industry.
- Automation of routine communications, allowing pilots and controllers to focus on critical tasks.

Target Audience

1. Airline Pilots
2. Air Traffic Controllers (ATC)
3. Flight Dispatchers and Operations Personnel
4. Aviation Regulators and Inspectors
5. Aircraft Maintenance Technicians
6. Avionics Engineers and Technicians
7. Flight Management System (FMS) Specialists
8. Aviation Training Instructors

Course Outline

Module 1: Introduction to Aviation Data Link Systems

- Evolution of air-ground communication: from voice to digital.
- Overview of the global aviation data link infrastructure.
- Key benefits of data link: safety, efficiency, capacity.
- Challenges and limitations of current data link systems.
- Future trends in **digital aviation communication**.
- **Case Study:** The shift from HF voice to FANS 1/A for oceanic operations, highlighting reduced communication errors and improved route flexibility.

Module 2: Controller-Pilot Data Link Communications (CPDLC) Fundamentals

- CPDLC architecture and components.
- Message types and standardized phraseology.
- Log-on procedures and context management.
- CPDLC applications: clearances, requests, reports.
- Pilot and ATC roles in CPDLC operations.
- **Case Study:** A scenario involving complex route amendments in congested European airspace, demonstrating CPDLC's role in reducing frequency congestion and expediting clearances.

Module 3: Advanced CPDLC Operations and Non-Normal Situations

- CPDLC departure clearances (DCL).
- Transfer of communication and handoff procedures.
- Handling non-normal situations: emergencies, diversions, system failures.
- Interaction between CPDLC and voice communications.
- CPDLC human-machine interface (HMI) considerations.
- **Case Study:** A simulated engine failure scenario requiring urgent diversion and subsequent communication with ATC via CPDLC for revised clearance and emergency services.

Module 4: Automatic Dependent Surveillance-Broadcast (ADS-B) Theory and Application

- Principles of ADS-B: broadcasting aircraft position and velocity.
- ADS-B Out vs. ADS-B In functionality.

- Mandates and equipage requirements (e.g., FAA NextGen, EASA SESAR).
- Benefits for air traffic surveillance and situational awareness.
- Integration with Electronic Flight Bags (EFBs) and cockpit displays.
- **Case Study:** How ADS-B In significantly improved pilot situational awareness during a high-density traffic pattern arrival, preventing potential conflicts.

Module 5: Automatic Dependent Surveillance-Contract (ADS-C) Operations

- Understanding ADS-C contracts: demand, periodic, event, emergency.
- Applications of ADS-C in oceanic and remote airspace.
- Data elements transmitted via ADS-C: position, intent, meteorological.
- Interaction between ADS-C and oceanic air traffic control.
- Troubleshooting ADS-C connectivity issues.
- **Case Study:** An aircraft crossing the North Atlantic without radar coverage, illustrating how ADS-C contracts enabled precise tracking and optimized routing by ATC.

Module 6: Data Link Network Infrastructure

- VHF Data Link (VDL Mode 2) and its role in terrestrial data link.
- Satellite Communications (SATCOM): Inmarsat, Iridium, SwiftBroadband.
- Aeronautical Telecommunication Network (ATN) and ACARS.
- Ground infrastructure for data link services.
- Reliability, latency, and throughput of different data link networks.
- **Case Study:** An analysis of a data link outage in a specific region, tracing the issue back to a ground station component and discussing contingency procedures.

Module 7: Human Factors in Data Link Operations

- Workload management for pilots and controllers using data link.
- Cognitive aspects of text-based communication vs. voice.
- Automation reliance and mode confusion.
- Training strategies to mitigate human error in data link environments.
- Best practices for effective crew resource management (CRM) with data link.
- **Case Study:** An incident where misinterpretation of a CPDLC message led to a minor deviation, analyzed to identify human factors and procedural improvements.

Module 8: Data Link Security and Cybersecurity

- Vulnerabilities of aviation data link systems.
- Threats: spoofing, jamming, data interception.
- Cybersecurity measures and best practices for data link.
- Regulatory requirements for data link security.
- Future challenges in securing connected aircraft.
- **Case Study:** Discussion of potential scenarios involving malicious interference with ADS-B broadcasts and the importance of robust security protocols.

Module 9: Integration with Flight Management Systems (FMS)

- FMS data entry and verification for data link clearances.
- Auto-load functionality and its implications.
- Understanding FMS annunciations and messages related to data link.

- Synchronization between FMS and data link systems.
- Pilot procedures for FMS data link interaction.
- **Case Study:** A flight crew receiving a complex re-route via CPDLC and the correct procedure for verifying and loading it into the FMS, highlighting potential pitfalls of incorrect data entry.

Module 10: Regulatory Frameworks and Compliance

- ICAO SARPs (Standards and Recommended Practices) for data link.
- FAA (Federal Aviation Administration) and EASA (European Union Aviation Safety Agency) regulations.
- Performance Based Communications and Surveillance (PBCS) concepts (RCP/RSP).
- Certification requirements for data link equipment.
- Compliance verification and auditing procedures.
- **Case Study:** An airline preparing for an ADS-B mandate, outlining the process of equipment upgrade, operational testing, and regulatory approval.

Module 11: Future Air Navigation System (FANS) and NextGen/SESAR Initiatives

- FANS-1/A capabilities and global implementation.
- NextGen and SESAR visions for future ATM.
- Trajectory-Based Operations (TBO) and their reliance on data link.
- System Wide Information Management (SWIM) and data exchange.
- Impact of emerging technologies (e.g., AI, machine learning) on data link.
- **Case Study:** A deep dive into a specific SESAR demonstrator project showcasing advanced TBO using enhanced data link functionalities for optimized arrivals.

Module 12: Data Link Performance Monitoring and Analysis

- Metrics for evaluating data link performance (e.g., latency, integrity).
- Tools and techniques for data link message logging and analysis.
- Identifying performance bottlenecks and areas for improvement.
- Reporting data link operational issues.
- The role of data analytics in optimizing data link operations.
- **Case Study:** An airline analyzing its CPDLC message success rates over different regions and identifying recurring issues related to network coverage or ground station performance.

Module 13: Practical Operations and Scenario-Based Training

- Simulated CPDLC/ADS-B/ADS-C operations in a realistic environment.
- Scenario-based exercises covering various flight phases and situations.
- Emphasis on critical decision-making under pressure.
- Interactive group discussions and problem-solving.
- Debriefing sessions to analyze performance and reinforce learning.
- **Case Study:** A full flight simulator session where crews practice a series of data link interactions, including complex oceanic crossings and emergency scenarios, with real-time instructor feedback.

Module 14: Data Link Best Practices and SOP Development

- Developing effective Standard Operating Procedures (SOPs) for data link.
- Integration of data link procedures into existing flight deck workflows.
- Cross-functional coordination between pilots, ATC, and dispatch.
- Continuous training and recurrent qualification for data link operations.

- Sharing lessons learned and best practices across the industry.
- **Case Study:** A workshop on developing a new set of SOPs for CPDLC DCL implementation at a busy international airport, involving input from pilots, controllers, and airport operations.

Module 15: Emerging Data Link Technologies and Future Outlook

- AeroMACS (Aeronautical Mobile Airport Communications System).
- Iris (SATCOM-based data link for ATM).
- Future concepts: integrated air-ground data link, digital tower.
- The role of Artificial Intelligence (AI) in data link automation.
- Anticipated regulatory changes and technological advancements.
- **Case Study:** Exploration of an experimental program testing new high-bandwidth data link technologies for enhanced air-ground communication and real-time weather sharing.

Training Methodology

This course employs a blended learning approach, integrating **interactive lectures**, **practical demonstrations** , and **hands-on exercises** to ensure maximum engagement and knowledge retention.

- **Instructor-Led Sessions:** Expert-led presentations with Q&A, fostering theoretical understanding.
- **Simulations & Role-Playing:** Realistic scenarios using **flight simulators** and **ATC workstations** to practice data link operations.
- **Case Studies & Group Discussions:** In-depth analysis of real-world aviation incidents and operational challenges to develop critical thinking and problem-solving skills.
- **Interactive Workshops:** Hands-on exercises with data link software and systems to build practical proficiency.
- **Multimedia Resources:** Utilization of videos, animations, and interactive diagrams to enhance learning.
- **Pre- and Post-Course Assessments:** To gauge learning outcomes and identify areas for improvement.
- **Peer-to-Peer Learning:** Opportunities for participants to share experiences and learn from each other.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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