

## Controller-Pilot Data Link Communications (CPDLC) Test Tools

*The goal of the CPDLC project is to provide a means of data communications in ATC operations which will be a supplement to air/ground voice communications.*

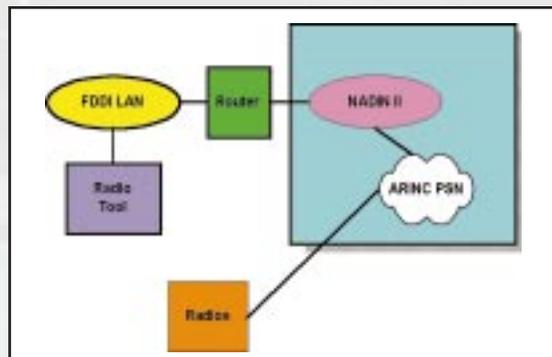
This addition of data communications will support improvements in airspace use and capacity. Data communications will:

- Provide for a more dynamic and efficient air/ground information exchange mechanism
- Provide an additional means of communication between pilots and controllers
- Reduce congestion on voice channels
- Reduce operational errors resulting from misunderstood instructions and readback errors

The William J. Hughes Technical Center is dedicated to the support of the CPDLC program. The Technical Center provides specialized laboratory facilities, highly skilled personnel, human factors support, simulation facilities, test aircraft, and a state-of-the-art communications infrastructure which are key to the successful implementation of CPDLC.

### Aircraft Radio Test Tool

The Aircraft Radio Test Tool (ARTT) allows a tester to send Controller-Pilot Data Link Communication, Build I (CPDLC I) messages to a CPDLC I equipped avionics platform. The test tool will verify the ARINC network connectivity to the FAA Data Link Applications Processor (DLAP) and the implementation of the CPDLC I message set into the avionics. The messages include the Monitor for Communication (MFC),

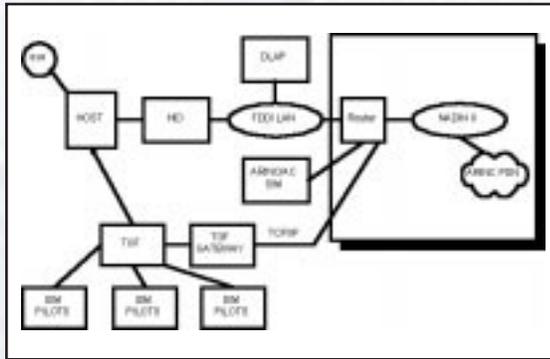


Transfer of Communication (TOC), Confirm Squawk (LCS), and Altimeter Setting (ASM). The tool will also receive CPDLC I messages sent by the avionics platform including Logon (CPL), Logoff (COF), and Pilot Response (CWR). The resulting simulation capability will provide an environment that will have many characteristics of the actual operational environment. The diagram above shows the architecture of the ARTT simulation system.

### ARINC/Aircraft Interface Simulator (AACIS)

The ARINC/Aircraft Interface Simulator (AACIS) provides a complete testing environment for the Controller to Pilot Data Link Communication (CPDLC) I program. By incorporating both the host simulation capabilities along with the Target Generation Facility (TGF), the AACIS acts as a bridge between the existing simulation capabilities and the added simulation needed for CPDLC I. The AACIS will allow for two critical phases of testing to occur, each with their own special needs. For integration testing, the use of the host simulator and AACIS will allow testing to simulate numerous aircraft performing CPDLC I communications with simulation pilot responses. Testing with the TGF will allow testers to observe CPDLC communications when human subjects (SIM

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PILOTS) are responding to the CPDLC messages giving the most realistic test environment possible. The resulting simulation capability will provide an environment that will have many characteristics of an actual operational system. The diagram above shows the architecture of the AACIS Simulation System.

### Avionics Development

The centerpiece of data link for pilots is the cockpit display, which will present the messages generated by the air traffic controllers to the pilots and permit the pilot to respond. In the Technical Center's Reconfigurable Cockpit Simulator (RCS), any potential data link display can be installed in a realistic cockpit environment. Subject pilots fly simulated scenarios in a glass cockpit avionics environment. Real controller audio is provided to simulate any level of national data link implementation. The RCS can be quickly reconfigured to explore display locations and formats.

The data link avionics lab also provides rapid prototyping laptop computers, which can quickly be reconfigured to emulate data link displays and management units. This permits the exploration of new formats for existing or newly prototyped avionics or improvements to the Computer-Human Interface (CHI).



The RCS and avionics labs support the ongoing development of CPDLC through human factors studies, interegration operational testing, and effectiveness operational testing.

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