Increasing use of CAN in aerospace

The demands on the availability of data in the cabin and cockpit have been increasing in recent years. Since many years, CAN has been used in airborne systems. With the acceptance of CAN technology by Airbus and Boeing, the standardization in the Aircr organization has taken off. Arinc 825 is the standardized higher-layer protocol for this industry.

CANaerospace is one of the roots of the Arinc 825 protocol. Stock Flight Systems (Germany) has developed this protocol a couple of years ago. Several features have been reused in the Arinc 825 approach. The NASA has adopted this CAN-based protocol as a next generation general aviation data-bus within the Advanced General Aviation Experiments (Agate) program in 2001. The NASA Langley Research Center is in the process of installing the CANaerospace/Agate data-bus in two research aircraft for the SATS (Small Aircraft Transportation System) program flight tests. This project’s initial focus is to prove that new operating capabilities will enable safe and affordable access to virtually any runway in the United States in most weather conditions. These new operating capabilities rely on on-board computing, advanced flight controls as well as automated air traffic separation and sequencing technologies. Another project, the CAIS (Common Airborne Instrumentation System) flight data acquisition system will record all relevant flight state data including the CANaerospace network traffic. The CAN interface for the CAIS will be jointly developed by Teletronics Technology (USA) and Stock Flight Systems (Germany). The Bombardier Recreational Products Division has introduced the V220 and V300T aircraft engines. The fuel-injected, water-cooled, 120-degree V-6 engine line has a single overhead camshaft and starts with a normally aspirated 220-hp and a turbocharged 300-hp version. A dual-redundant electronic engine control unit provides true single-lever control of throttle, prop and mixture setting. Aside from the ability to drive classic “steam gauge” type cockpit instruments, the engine control unit uses a redundant CANaerospace/Agate interface for glass-cockpits. At the same time, the 3DED research program funded by the State of Bavaria in Germany will also use the CANaerospace/Agate data-bus. The target of this program is the development and flight testing of a three dimensional situational awareness display for general aviation aircraft. Both SATS and 3DED are using identical CANaerospace/Agate data objects sets.

The Agate data-bus is also based on CAN. The CANaerospace protocol can be mapped to it. The data-bus major advantages are outstanding reliability, simplicity and a self-identifying message format, which supports the interoperability of systems produced by different vendors. CANaerospace is used as a distributed avionics system network and has been certified by the aviation authorities of the Czech Republic. Also, it is present in other NASA programs like Sofia, where it serves as data link between several real-time control systems for the infrared astronomy telescope, which are spread throughout the fuselage of the Boeing 747SP research aircraft. The NASA and the German DLR (Aeronautics Research Organization) manage jointly the Sofia program. The NASA Langley Research Center (USA) is the site, where many of the astronauts of the Mercury and Apollo space programs were trained. The aeronautics division operates a variety of research aircraft including a Boeing 757, a Northrop T38, a Beech 200 King Air, an OV-10 Bronco, and a UH1-D helicopter. The airplanes used for the SATS flight tests are a Cirrus SR-22 and a Lancair LC-40. Due to the experience during system integration, the NASA researchers are evaluating the use of CANaerospace in other research aircraft as well.

The Arinc 825 protocol was influenced by the experiences gained in some previous CAN applications in Airbus aircrafts. The A318 uses a CAN-based system for the smoke detection system. This approach was reused in the A380 aircraft. Also in the A350 several CAN networks have been introduced. “Modern commercial airliners use CAN extensively for numerous systems of all criticality levels,” concluded Ralph Knueppel in his ICC speech. “The combination of CAN and the Arinc 825 standard provides a network for mission- and safety-critical applications in aviation.”

© CAN Newsletter Online - 2020-07-13 - www.can-newsletter.org