

V-22 Osprey Cabin Cooling System Upgrade

Case Study

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Figure 1 - Bell-Boeing's V-22 Osprey aircraft developed for the US Military. Designed for short and vertical take-offs with long-range, cruise performance.



Figure 2 -ASC was contracted to build a physical model of the cabin ducting system and balance flow.

When Boeing decided to upgrade the ECS cooling system on the V-22 aircraft, they were concerned about getting sufficient aircraft time to test out and adjust the design of the system. The upgrade included a significant improvement in the cooling to the cabin – where the cabin air had previously been all added near the front of the aircraft, the new system would include ductwork to provide cooling air to each flight seat. Tests had shown that providing cooling air to each seat in the dark, windowless, and often hot cabin reduced passenger stress considerably. Being able to test and verify the performance of the ductwork was considered key to the success of the upgrade program.

In order to ease aircraft time limitations, Boeing contracted with Airflow Sciences to construct a mock-up of the ducting system in ASC's lab. The mock-up consisted of a structural framework to hang the ducting, a Plexiglas representation of the cockpit, and supply fans to provide the flow through the system. Instrumentation was added to collect pressure and flow data at key points in the system. A flow measurement system was used to determine the flow balance between the cabin outlets.

In addition to balancing the cabin ductwork, tests were performed to assess the effects of different operating conditions on the flows through the system. One unexpected outcome from the test program was the identification of several duct components that were not robust enough to withstand the negative pressures that would occur during certain operating modes. As those ducts would be located within enclosed bulkheads, that problem would not have been identified through a more traditional on-aircraft test program. Boeing is now working with their supplier to update those duct components.

Boeing engineers are very happy with the test program and plan on implementing all of ASC's design recommendations.