'A new world'

During a recent demonstration of Network-Enabled Operations capabilities, Paul Comitz, Boeing program manager for NEO, shows how operators from various agencies and air traffic control centers can instantaneously display the same information on their respective screens across a network-enabled air traffic management system.

THOMAS GOERTEL PHOTO

Boeing plays a role in developing the foundation of a next-generation, network-enabled air-traffic-management system

By Daryl Stephenson

Uncertainty. That's not what you want when you have to make quick decisions that affect the lives of millions of people over a large region.

Let's say a major hurricane has just struck the southeast United States. Amid widespread devastation, search and rescue as well as relief operations are under way. But the going is hard, because the storm is still bringing wind and rain, and it's dark.

Among the many problems that air traffic control authorities have to solve is the answer to one pressing question: Where are verified, open runways where military C-130 aircraft can be staged for relief efforts? In today's world, officials from different agencies and command centers likely would have to get on conference calls, exchange faxes and e-mails, and deal with data that might not be accurate or up to date in an hours-long search for the answer.

But what if an individual air traffic controller could plot those open runways and a path to fly to and from them on a display? And what if

that controller could publish this data on a network that would let other agencies' operators, who use different systems, see that same information at the same time on their displays? Uncertainty would give way to certainty. Instead of hours, it likely would take just a few minutes to dispatch the C-130s to those open runways—and people who need relief would get it much more quickly.

This type of rapid response could happen only in a network-enabled air traffic management system. The U.S. Federal Aviation Administration, through its Joint Planning and Development Office (JPDO), wants to implement such a system, called the Next-Generation Air Transportation System, or NextGen, by 2025. But the foundation of such a system—an architecture that enables different systems from different agencies to talk to each other—is ready now. Developed by Boeing and an industry/government partnership over the past two years, the concept of Network-Enabled Operations (NEO) has been validated through proof-of-concept demonstrations and a recent series of eight prototype demonstrations for government, industry and news media visitors at the Boeing Integration Center-East in Crystal City, Va.

The JPDO is sponsoring the Joint NEO Program to leverage government investment in network-enabled technologies while incorporating industry's knowledge and best practices. The government team includes major stakeholders in U.S. aviation—the U.S. departments of Transportation, Defense, Homeland Security, and Commerce—the FAA, and the National Aeronautics and Space Administration. The Joint NEO Industry Team, led by Boeing, includes Computer Sciences Corp., Lockheed Martin and Raytheon.

The above example, involving rapid decision making and response after a hurricane, is drawn from one of two operational scenarios featured in the NEO prototype demonstrations. (The other is a multi-threat security scenario in which a possible coordinated attack on the United States is suspected.)

The message delivered from the NEO demonstrations is that "we are at the point of maturing the technology to begin spreading it out in actual operational implementations at selected sites," said Kevin Brown, Boeing vice president and general manager of Air Traffic Management.

'PRECISION INFORMATION'

"This is a new world that's about to start," said Mike Lewis, Boeing director of ATM Business Development. "Network-centric operations for NextGen is about moving to an operation that exploits shared precision information. We've created an architecture and an information-sharing network, technology tools, and operational concepts that exploit the network capability to immediately share information. Networked operations are fundamental to making NextGen work. You can't get there without a net-centric approach. The information-sharing architecture is ready now for operational implementation. And for the operators who would use this, this is a major step forward."

One of the appealing features of the NEO architecture is that "it embraces existing information systems and adapts them to an environment in which there is a coherent, common exchange of information," said Paul Comitz, Boeing Advanced ATM program manager for Spiral 1 development of NEO. "It's a brokered, standards-based architecture. What this means for the agencies and their operators is that they don't have to buy and learn new systems. They use their own."

Because the NEO architecture is standards-based, it's "relatively easy to add systems to the environment," Comitz said. "The net-enabled services are not pinned to a single system. As we build a portfolio of services, the services can be combined for more complex operations."

One aspect of that combination is a concept called "mash-ups," in which experts take existing data and services and combine them to create new applications in response to new and unexpected situations. "We're very excited about this," said Comitz, because it gives the operators the power to redesign the system to immediately solve real problems that can't be foreseen.

Such a capability would be a very powerful tool in dealing with ATM issues in a natural disaster or in a multi-threat scenario involving a possible coordinated terrorist attack, in which the unexpected is likely to happen. The two NEO prototype demonstration scenarios, in fact, were designed to "flex the system" and produce complex situations that would challenge the operators and stress the NEO architecture, said Gene Hayman, Boeing Advanced ATM manager of Business Development.

"These were live exercises with actual operators in their actual operational settings," Hayman said. "They were designed to be as realistic as possible, so that the operators could demonstrate the capabilities that would be needed to accelerate the implementation of NextGen."

The feedback from the operators and their agency leaders has been that the NEO tools provide a clear advance in shared situational awareness and a significant improvement in the ability to make coordinated decisions rapidly and correctly, Hayman said.

LOOKING AHEAD

Now that the NEO concept has been validated, what's next? The NEO team is advocating four operational implementations of the concept as part of the next phase of the program, said Neil Planzer, Boeing ATM vice president of Strategy. They are:

• Select areas in the Gulf of Mexico or Florida region as shared special use airspace in which airline operations centers, military command centers and FAA traffic flow management would share real-time information.

• Create temporary flight restrictions that allow the rapid deployment of unmanned aerial systems, without encroaching on airspace for civil carriers.

• Use the NEO network to distribute Enhanced Traffic Management System information to reduce ground delays for aircraft.

• As a contingency operation, allow state and local authorities to connect to the NEO air picture on laptops and develop solutions to emergency requirements in real time.

The NEO team estimates it can complete these implementations in 12 to 15 months at a cost of about $20 million.

"These near-term implementations will begin the process of transforming the U.S. air transportation system," said Planzer. "Beginning with these targeted implementations, we'll progress to a full national airspace systemwide deployment." ■

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> – Paul Comitz, Boeing Advanced Air Traffic Management program manager