The drive to Mach 5

Lewis pushes technology toward hypersonic flight

By Kristin K. Wilson

USHING an aircraft engine beyond its performance limitations is a risky proposition. For a team of researchers at NASA Lewis, going to such extremes is all in a day's work.

The team recently completed a series of tests inside the Center's Propulsion Systems Laboratory (PSL) to evaluate the operability of a General Electric J85-21 turbojet engine run at Mach 3, 1-1/2 times faster than its maximum flight speed of Mach 2.

The tests were part of an overall program, supported by NASA's Hypersonics Office, to develop a turbine-based combined-cycle (TBCC) propulsion concept that may one day propel aircraft and spacecraft from take-off to hypersonic speeds of more than 5 times the speed of sound. To put this in perspective, the SR-71 "Blackbird," considered the fastest operational aircraft, has a recorded top speed of 2,193 miles per hour or approximately three times the speed of sound. The NASA Lewis concept could revolutionize high performance aircraft and ultimately make space exploration more affordable by using air-breathing propulsion.

"Combined cycle systems represent a major breakthrough in propulsion technology," said NASA Lewis task manager James Walker, Engine Systems Technology Branch. "In practice, an air-breathing propulsion system such as TBCC may one day lower the high launch costs associated with rocket-powered space vehicles. It's an ideal candidate for a hypersonic cruise vehicle or the first stage of a two-stage-to-orbit launch vehicle."

Combined cycle systems integrate two or more different engine types into a single propulsion system to enhance operating capability. Practical designs, however, must minimize redundancy and mechanical complexity to reduce the size, weight, and overall cost of the propulsion system. The focus of the NASA Lewis program is to combine a currently available turbine engine with a ramjet flowpath to provide the required performance for hypersonic flight.

An air-breathing system of this type is designed to function in several different modes to propel a vehicle from take-off to hypersonic speeds. First the turbine engine operates without the ramjet at take-off and subsonic speeds. Then the ramjet flowpath is opened at approximately the sonic speed to permit additional air through the propulsion system. The two engines operate simultaneously up to about Mach 3. Such speeds are considered the limit of current state-of-the-art turbine engines.

ISO 9000—Ready or not, it's coming to Lewis

The time has come to get serious about the implementation of ISO 9000 and a first rate business management system at NASA Lewis.

We are T - 436 days and counting from July 12, 1999. That's the day Det Norske Veritas, our registering body, will visit NASA Lewis to test us and our new business management system. Passing this rigorous exam will represent the first step towards improving our business management and our image as a world-class research and technology organization.

Implementing an improved business management system, as opposed to ISO 9000 alone, will not be easy. Based on the Center's analysis of its
Lewis prepares for ISO 9000 implementation

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options, implementing a business management system makes more sense, has more benefits, and is consistent with the direction ISO 9000 is heading.

The success of this initiative is dependent upon the support, commitment, and understanding of all employees, especially managers and supervisors. Remember, the main goal is not to get a banner that says we are ISO 9000 certified. Our overall objective is to formulate a business management system that increases our efficiency and productivity, improves customer relations, and enables us to better understand and control our costs. The successful implementation of an improved business management system is a strategic and business imperative for NASA Lewis.

Towards this end, the Director’s Leadership Team has approved an approach in which the implementation of the business management system is treated like a project. Each organization will have a project manager and an approved project plan. There will be a Center budget, specific milestones, periodic reviews, and a Center Program Management Council review. To oversee the activities and to help integrate the end product, the Center has established an ISO 9000 Project Office and an Advisory Board of senior Center managers. The Center Director is responsible for the overall success of our business management system ISO 9000, but each Director of and Office Chief is responsible for its success in his or her organization.

Over the course of the last 5 months, NASA centers Johnson and Marshall have been ISO 9000 certified. NASA Lewis’ goal is to have our new business management system in place and to be ISO 9000 certified by the summer of 1999. At the end of this process, the objective is to see marked improvement in what we do and how we do it.

As you (“We”) know, ISO 9000 has been a topic of conversation for quite some time at the Center. The time has come, however, to transition from the concept training stage to the implementation stage. The completion of the process will position the Center for the highly competitive environment of the 21st century.

Remember, July 12, 1999, is the day. A business management system is the goal. Good project management tools are the approach. May the force be with you. ●

—By Marty Kress, NASA Lewis deputy director