With Robert Lindberg

Interview by Frank Sietzen Jr.

Why was the National Institute of Aerospace (NIA) established?

The National Institute of Aerospace was formed by a consortium of universities in response to a competitive solicitation from NASA Langley. So it was conceived by Langley Research Center as an external nonprofit partner to exist nearby and expand Langley's research networks—especially to strengthen its relationships with academia.

What are some of your programs?

We have a wide range of both research and graduate programs under way right now. NASA gave us two primary jobs. One is to contribute to research in aerospace technologies and atmospheric sciences. The second is to provide both full-time and part-time graduate education here locally in the Hampton Roads area.

The projects that we are involved in today, on the research side, fall into three categories: work in aviation and aeronautics research; research in science, particularly atmospheric and planetary sciences; and research and technology development related to [space] exploration—those would be exploration systems, exploration missions. We do some work as well in support of the current NASA human spaceflight program.

What would that be?

We supported aspects of the shuttle's Return to Flight.

What do you see as possible fields for technological breakthroughs?

I think there are opportunities to make several technology breakthroughs. Let me give just a few examples. One is that there is an opportunity to achieve breakthroughs that will revolutionize the way air travel contributes to the overall economy of the United States.

Today, air travel is a key element of our economic engine. It is built around the very mature and somewhat congested hub and spoke system of the major airlines. One example of ways in which new technology is going to revolutionize the future of air transport is an idea involving an entirely new system of small aircraft, starting with air taxis and perhaps moving on to personal air vehicles. This will become not an element of the current air transportation system in the United States, but a nearly independent adjunct to it, utilizing many of the 5,000 small, unimproved airports through new technologies that will allow single-pilot operations. This will enable commercial IFR [instrument flight rules] operations with single-engine aircraft and reduced landing minimums at airports without active control towers, and so on.

The technologies are in front of us to pursue. We will allow that to happen. Anyone who thinks everything that can be invented in aeronautics has been invented is missing the potential for an entirely new dimension of air travel that is not part of our language today.

What is a personal air vehicle?

A personal air vehicle is one designed from the outset to be used by an individual who is a customer of flight but isn't a proficient pilot. The flying proficiency would be built into the aircraft itself. Lest you think this is a long way off, we are working today to put in place the capability for unmanned aerial vehicles to fly in controlled airspace in the United States. The military is working on that right now.

Once we have UAVs flying in controlled airspace, it is a simple step to say perhaps they are safe enough that a passenger can be put on that autonomous vehicle. Then you would have a system where you could go to a local airport, without a pilot's license, and hop on a personal air vehicle that would take you where you need to go. Rather than using hub and spoke, you would fly from point to point.

How far away do you think such a capability would be?

Not within the next decade. But the technology would be developed within the next decade, and it would make this happen in the decade beyond that.

Do you see enhanced roles for V/STOL or tiltrotor aircraft?

Yes. I'm not as familiar with that, but that is a piece of it. Certainly STL [short takeoff and landing] allows you to consider a wider range of nodes within the airspace system than fully improved airports.

Do you think the nation needs a U.S. aeronautics vision?

The call is for a policy. The answer is yes. I agree with the [NASA] administrator and others who agree with Congress that a vision is needed. An aeronautics research policy is needed. If we had a current one articulated, it would serve as the basis for determining what investments and what priorities we place on the federal investments on aeronautics research, especially civil aeronautics research.

Are you concerned about the current state of NASA's funding for aeronautics?

Yes, I am concerned about aeronautics. NIA contributes to a wide range of NASA missions. Both the aeronautics vision and the space vision of the agency are important to our future, and we work to contribute to the benefit of the public good in both regimes.

That said, yes, I am concerned, if the trend continues to reduce the aeronautics budget in the out years, beyond the budget today. We took the responsibility to produce a report earlier this year which calls for a significant increase in aeronautics research. But that wasn't the fundamental purpose of the report. Its fundamental purpose was to articulate the specific research objectives and potential outcomes that were not being pursued today, or that needed to be pursued.

From those answers, gathered during the report, we determined that a significant increase in aeronautics was needed. These also included those areas that industry felt were important and needed pursuing.

Do you see the need for a greater role in aeronautics R&D by agencies other than NASA, such as the FAA or others?

There are opinions on that both pro and con. Certainly NASA works closely with the FAA, in that the FAA is the agency responsible for articulating research needs and has a research portfolio of its own. That said, NASA has had for many years the responsibility to be the lead agency for aeronautics research. That dates back to the predecessor organization NACA. I think it is appropriate that NASA continue to be that cornerstone agency for civil aeronautics research in the U.S. One reason [is that] NASA has the experts and NASA has the facilities. And the Title X responsibility. So you would have to change all of that if you were to shift that responsibility to others.

What is your assessment of the state of the U.S. aerospace industry today?

The change we've seen in the past 20 years is that we have gone from an industry that was competitive on a national basis to an industry that must be competitive on the world stage. It is a paradigm shift to recognize that the aerospace industry in the U.S. is now a world player, and must interact with the world economy. Perhaps my biggest concern regarding the aerospace industry today—and it extends as well to the other high-technology industries in the United States—is that the country is not producing new engineering and technical graduates at a rate to allow our high-technology industries to grow and expand—or even to thrive.

How do you see the NIA working to get more young people to study math and science?

We can do two things. First of all, we are working to become one source of evergreen engineering talent, for NASA Langley as well as nationwide and in the industry. We will do our small part in that by developing our focused research programs for students here, to prepare them in unique ways to make contributions. That's an intensive effort that is ongoing today, but the numbers are small. Today we have about 41 graduate students at NIA on full fellowships, full assistantships, pursuing their master's and doctoral work through our member universities.

That's just one piece of it. The other piece is outreach. In addition to giving us the research and education missions, NASA gave us a mission to contribute to outreach activities. We now have programs that span all age groups, and we

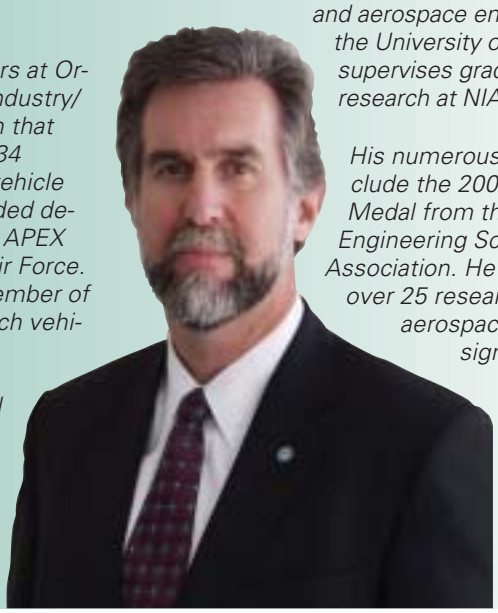
Robert Lindberg was named the first president and executive director of the National Institute of Aerospace in October 2003. He had joined NIA at its inception in October 2002 and served initially as its vice president for research and program development.

Lindberg had previously been with Orbital Sciences, where he held numerous executive and management positions, including senior vice president for defense programs, deputy general manager of the Advanced Programs Group, vice president and program manager for X-34, and vice president for program development.

During his 16 years at Orbital, he led the industry/government team that developed the X-34 reusable launch vehicle test bed and headed development of the APEX satellite for the Air Force. He also was a member of the Pegasus launch vehicle design team, which received the 1991 National Medal of Technology. Prior to joining Orbital, he was a research scientist and branch head in the Navy Space Program at the Naval Research Laboratory in Washington, D.C.

Lindberg holds a B.S. in physics from Worcester Polytechnic Institute, an M.S. in engineering physics from the University of Virginia, and a doctorate in mechanical engineering from Columbia University.

He is a fellow of the American Astronautical Society (AAS), an associate fellow of AIAA, a member of Sigma Xi and Sigma Pi Sigma, and the immediate past president of AAS. He serves as research professor in mechanical and aerospace engineering at the University of Virginia and supervises graduate student research at NIA.



His numerous honors include the 2003 Egleston Medal from the Columbia Engineering School Alumni Association. He has published over 25 research papers in aerospace systems design, controls, and robotics, and has taught mechanical engineering at George Washington University.

work in a variety of complementary ways to positively impact the future workforce.

We are partners with NASA Langley and Virginia Tech in producing six award-winning distance learning programs. These are educational television programming activities. They include the Kids Science News Network for children in kindergarten to second grade, the NASA SciFiles for children in grades three to five, and NASA Connect for children in grades six to eight. Space exploration, aeronautics, and NASA projects are used as a stimulus to explore standards-of-learning-based curriculum materials for teachers.

In addition to that, we have other programs. We work with Langley and Virginia Tech on NASA's Destination Tomorrow program, a high-school-to-adult educational program that highlights new emerging accomplishments in a variety of different realms connected to NASA. We also manage for Langley what is called the Preservice Teachers' Program, which contributes to the preparation of college students who have chosen education as their career. It is aimed at student teachers during their junior and senior years, to contribute to their level of confidence when they emerge as full teachers, enabling them to teach what we call STEM concepts—science, technology, engineering, and math.

In addition to that, we have an in-service teachers' program of workshops that we run in the summer for middle-school and high-school teachers. This is an intensive program where for two weeks they are provided with a wealth of curriculum enhancement materials that are directly focused on standards of learning for mathematics, science, and technology in middle school and high school.

We also have to pay attention to the current NASA workforce and its potential needs. We are working with the NASA engineering and safety center at Langley to develop and conduct what we call the NESC [NASA Engineering and Safety Center] academy. This is a series of 15 two- to three-day short courses, taught by NASA's experts in fields such as fluid systems and life support, propulsion, structure, guidance and control, and so on. It's taught by individuals with the experience of Apollo and the shuttle, and taught for the benefit of the 25-35-year-old cadre of NASA engineers who will be responsible for the development of the CEV [Crew Exploration Vehicle] and CLV [Crew Launch Vehicle] and so on. The idea here is to capture the knowledge and experience of the prior generation, and pass it on to the next generation, who will pick up the torch and run with it.

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Will you be publishing any papers or reports about this work?

It is an educational product, so we are videotaping it. But there are other efforts to capture the lessons learned from specific programs. These complement that, and actually give students in a classroom a live interaction with the expert who has the experience. They also provide a multimedia exchange that can include field trips and hands-on understanding of what was accomplished by the previous generation.

What are some of the space technologies for the exploration vision the NIA is addressing?

NIA is involved mainly in basic research. Some of our work is in new materials, so we have extensive research ongoing in polymer materials and in new ceramics for future exploration systems. We are also doing a fair amount of technology development for future planetary exploration. We are contributing to a NASA Langley research team that is advancing the state of the art in the field of entry, descent, and landing through planetary atmospheres. Of course those capabilities will have applications to future manned systems that return to Earth through our own atmosphere.

Does this include heat shield technology?

We're dealing more with designs at the system level, and looking at the aerodynamics and aerothermodynamics of overall vehicle design, not just heat shield designs. Recently some of our staff shared with some NASA civil servants an achievement award for their contributions to the verification of the Huygens entry trajectory, which the Europeans asked NASA to perform just before it successfully entered the atmosphere of Titan and landed on its surface. We also have Dr. Doug Stanley, a Georgia Tech faculty member who is in residence at NIA. He completed an assignment at NASA Headquarters, leading the Exploration Systems Architecture Study for the agency's administrator, Dr. Griffin.

Do you see future aircraft taking on the characteristics of spacecraft?

What I understand is that if we can solve the sonic boom problem, there is a role for supersonic aircraft in civil aviation—passenger and cargo aircraft. I don't know if there is a role for hypersonic or exoatmospheric aircraft in civil aviation over the next decade or two. We do have programs going in quiet aircraft and in continued investment in sonic boom technology research.

Do you see environmental issues becoming more and more important to the future of commercial aviation?

Yes, I do. I think the community acceptability of aviation is an increasingly important part of our transportation infrastructure. It is dependent upon noise levels around airports being reduced to the point where airports become good neighbors.

Are U.S. universities keeping up with foreign institutions in the teaching of basic aerospace-related subjects?

What I think we need to do is recognize that the industry must expand to be a full global player, and that technological innovation doesn't stop at our borders, either. We need to continue to make the appropriate contribution to these fields. Our universities and educational systems must be connected to the rest of the world. We can't do it in isolation. So collaboration nationally and internationally is a vital part of the future of not only our technological enterprise but that of others.

We run an active visitor program here for foreign nationals. Here at NIA we have exchange visitors from 22 research institutes on four continents, collaborating not just with us and our students, but with NASA Langley as well.