

NASA NDE WORKING GROUP NEWSLETTER

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Quarterly Newsletter

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MESSAGE FROM THE NEW NASA HQ, CODE QW DIRECTOR, Former Astronaut Guy S. Gardner (202-358-2006)

As the new Director, Quality Assurance Division, I look forward to meeting and working with all of the members of the NASA NDE Working Group. Recently, I had the opportunity to participate in the Working Group's Program Review for the Deputy Administrator of Code Q, Dr. Michael Greenfield. I was impressed with the wide range of NDE activities in which you are involved, and the expertise of the Chair, Marie Havican, the Vice-Chair, Dr. Yoseph Bar-Cohen, and the "Chair Emeritus," Bob Neuschaefer, who represented the Working Group.

In this era of downsizing/re-inventing Government, inter-agency cooperation to maximize our resources is essential, and the Working Group is ideally suited to play a major role in influencing the future direction of the NASA NDE programs. The development of an NDE Strategic Plan is an important element in determining the focus and



Guy S. Gardner, NASA HQ
Director, Code QW

future directions of the Agency in this field. I understand from Joe Siedlecki that this effort is well underway, and encourage your completion of the Plan.

Finally, during the NDE Program Review, the need for an annual NDE Working Group workshop hosted by one of the NASA centers was identified as a means of improving communications between centers. I would encourage and support holding such a workshop.

ABOUT THE NEW NASA HQ CODE Q DIRECTOR

Guy S. Gardner was born on January 6, 1948, in Alta Vista, Virginia, and grew up in Alexandria, Virginia. He received a B.Sc. degree with majors in astronautics, mathematics and engineering sciences from the United States Air Force Academy in 1969 and a M.Sc. degree in aeronautics and astronautics from Purdue University in 1970. From 1971 to 1980, he had a distinguished Air Force career, for which he received many special honors, including: Air Force Legion of Merit, 2 Defense Superior Service Medals, Defense Distinguished Service Medal, 3 Air Force Distinguished Flying Crosses, 14 Air Medals, National Intelligence Medal of Achievement, Distinguished Graduate of the USAF Academy, Top Graduate in pilot training, Top Graduate from the USAF Test Pilot School, Test Pilot School Outstanding Academic Instructor, Test Pilot School Outstanding Flying Instructor, and Distinguished Astronaut Engineering Alumnus of Purdue University.

In May 1980, Gardner was selected by NASA as a pilot astronaut and during his 11 years as an astronaut, he worked in many areas of Space Shuttle and Space Station development and support. In 1984, he was assigned as pilot on the first Space Shuttle mission to be launched from Vandenberg AFB, California, which was later canceled. On December 2-6, 1988, Gardner first flew in space aboard the Orbiter Atlantis as pilot of the STS-27 crew. This mission carried a Department of Defense payload. Later, on December 2-10, 1990, he flew aboard the Orbiter Columbia, as pilot of the STS-35 crew. The mission carried the ASTRO-1 astronomy laboratory that consisted of three ultraviolet telescopes and one X-ray telescope.

Gardner left NASA in June 1991 to command the USAF Test Pilot School at Edwards Air Force Base, California. In August 1992, he returned to NASA as program director of the joint U.S. and Russian Shuttle-Mir Program. At the end of 1994, he became the Director of Quality Assurance, Code QW, at NASA Headquarters.

Gardner is married to the former Linda A. McCabe of Guilderiand, New York. They have three wonderful children: Jennifer, Sarah, and Jason. His recreation interests include enjoying his family.

NASA HQ CODE QW MESSAGE (J. Siedlecki, 202-358-0205)

I would like to thank each of you for your prompt inputs to Marie Havican's presentation of the NASA NDE Program Overview to the Deputy Associate Administrator/Q, Dr. Michael A. Greenfield, and to the new Code QW Division Director, Guy S. Gardner, whose biographical sketch was given above. Marie was ably assisted in portions of the Program Overview by Robert Neuschaefer and Dr. Yoseph Bar-Cohen. The NDE presentation went very well and elicited the following guidance, which should be considered during the upcoming review of the FY 96 RTOP proposals. In Dr. Greenfield's words, the NDE RTOP emphasis should be to "reduce to practice

existing NDE devices/techniques to meet NASA requirements." He is interested in specific deliverables that meet clearly identified Agency needs. He defines "reduction to practice" in rigorous terms as meaning daily operational use.

Based on his own considerable experience with NDE R&D, Dr. Greenfield emphasized that we should stay with one application until finished, before branching out to some other application of a new/improved method, and failing to achieve specific milestones and deliverables in a reasonable length of time. Most of his questions centered on milestones and deliverables, with specific dates for hard product deliverables.

He was most impressed with the silicon nitride work because the developed methods are meeting a very important agency need in the qualification of silicon nitride balls for the SSME Alternate Turbopump Development. The Government-Industry-Intercenter involvement, and the actual reduction to practice were viewed as a model for the NDE program.

Both the Deputy Administrator and the new Division Director, Guy Gardner, were supportive of an NDE Workshop in 1995. Given this positive response, and the fact that there has been no meeting since the initial organizational meeting at JSC in April 1993, I strongly feel that plans should be made to hold such a workshop at a NASA center early in the spring.

Dr. Mulville has been officially re-assigned to the Chief Engineer's Office. As part of this change several engineering functions were also transferred to the Chief Engineer's Office, and Code QW's name has been changed to the Quality Assurance Division, with our new Director, Guy Gardner.

As the plans for the streamlining of NASA go forward, it becomes imperative that the strategic plan be given the highest priority and finished as soon as possible. This plan will be used as the focus and framework for the NASA NDE communities' activities for now and the future. Please give Marie your support in expediting this document.

NNWG HIGHLIGHTS (M. Havican, 713-483-7134 and Dr. Y. Bar-Cohen, 818-354-2610)

CODE Q STANDING COMMITTEE - The Code Q Standing Committee recently elected Dr. James Chern of GSFC to be its new Chair, and Mr. Robert Neuschaefer agreed to be its first Vice-Chair. We know they will do a great job, and we're lucky to have them take the lead. If anyone has questions about the activities of this committee, call Jim or Bob.

CODE Q STANDING COMMITTEE HIGHLIGHTS (Dr. E. J. Chern, 301-286-5836 and R. Neuschaefer 205-544-7382)

A call for RTOP proposals is now issued and it is due to Dr. Chern by Feb. 3, 1995. The requirements and criteria for reviewing these proposals were concluded in a telecon on January 13, 1995. The format for the proposals was faxed to all the Center representatives.

1. Each NASA center is limited to 4 proposals with \$500K/per year ceiling (including joint-center programs).

2. Technical merit of the proposals will be judged in conjunction with Benefit to NASA/OSMA and Program Needs.

3. Cost/Risk Assessment Criterion is an estimate of return on investment for a specific RTOP proposal.

4. Since each center operates differently, endorsement letters from program offices are a plus but not a requirement.

In 2/6/95 Dr. Chern will forward the submitted RTOP pre-proposals to all the Committee members for review and the scores are due back by 2/13/95. The next telecon to discuss the RTOP rating will be on Thursday, February 16, 1995 at 3:00 pm EST.

NNWG PERSONNEL NEWS AND ACHIEVEMENTS

In December, we elected Dr. E. Jim Chern as the Chairperson for the Code Q Committee. Also, we named Bob Neuschaefter to the Vice-Chair. They already organized a NASA wide Telecon on Jan. 13, 1995 in which we finalized the details for the FY'96 RTOP call for proposals. Congratulations, Jim and Bob!

The NDE Branch at NASA LaRC has a new manager. During 1994, Dr. Eric Madaras served as an Acting Branch Manager replacing Dr. Joe Heyman temporarily. In Dec. 1994, Dr. Ed Generazio was appointed to the Branch Manager. Congratulations, Ed!

Mr. Joe Halupnik of JSC recently earned his seventh ASNT Level III certification. He is now certified in VT, RT, PT, MT, ET, UT and NRT. Congratulations, Joe!

Hector Delgado, former Chair of the Code Q Standing Committee has been assigned for a period of six months to the Office of Chief Engineer at NASA HQ. Good Luck, Hector!



Dr. E. Jim Chern, GSFC
Chair, Code Q Committee



Bob Neuschaefter, MSFC
Vice-Chair, Code Q Committee

NASA CENTERS NEWS AND ANNOUNCEMENTS

GSFC (Dr. E. J. Chern, 301-286-5836)

REORGANIZATION OF ASSURANCE TECHNOLOGIES DIVISION - Ms. M. Ann Garrison, Head of the Electronic Packaging & Processes Branch, has been appointed Chief of the Assurance Technologies Division, Office of Flight Assurance (Code 300). Assurance Technologies Division (Code 310) is currently composed of four branches: EEE Parts Branch (Code 311), Electronic Packaging & Processes Branch (Code 312), Materials Branch (Code 313) and NASA Parts Project Office (NPPO) (Code 310.A). The Division is proposing the elimination of the Code 310.A (NPPO) Branch and the elimination of the two sections (Code 311.1 and Code 311.2) under the EEE Parts Branch. Mr. Jack J. Shaw, Head of the NPPO Branch, will become Head of the Electronic Packaging & Processes Branch. The reorganization will take effect in February 1995 pending the approval of NASA HQ and Center management.

JPL (Dr. Y. Bar-Cohen, 818-354-2610)

HEALTH MONITORING OF SPACECRAFT - Under an SBIR Phase II contract, Innovative Dynamics, Inc. is currently developing a health monitoring system that is using a combination of acoustic actuators and sensors. Data is acquired and evaluated using neural network technology. Dr. Bar-Cohen is the JPL Technical Monitor of this program.

NNWG NEWSLETTER ON INTERNET - As of this issue of the NNWG Newsletter, all issues will be loaded onto a new NDE Homepage system that was dedicated on the JPL Engineering Design Management System (EDMS) server. This NDE Homepage system is available on Internet via the World Wide Web using the Mosaic public domain software. The URL address is:

<http://nasa-nde.jpl.nasa.gov/jpl-nde/homepage.htm> This Homepage system is accessible also to non-NASA users and should become active in the first part of February, 1995.

JSC (M. Havican, 713-483-7134)

SEVENTH ASNT LEVEL III CERTIFICATION - The SR&QA Office's NDE Engineer, Mr. Joe Halupnik, recently earned his seventh ASNT Level III certification. This certification is for the Visual Testing Method. It is in addition to those he already holds in RT, PT, MT, ET, UT and NRT.

LeRC (A. Vary, 216-433-6019 or Dr. G. Baaklini, 216-433-6016)

X-RAY COMPUTED TOMOGRAPHY AT LERC MONITORS CERAMIC AND METALLIC MATRIX COMPOSITES COMPRESSOR/TURBINE MATERIALS -This CT system demonstrated excellent resolution at 20 lp/mm (25 μ m) with 20 to 40 percent modulation in the small-field-of-view mode (19x19 mm cross section), and 10 lp/mm (50 μ m) with 50 to 70 percent modulation in the large-field-of-view mode (45x45 mm cross section). CT capabilities included detecting fibers, fiber-matrix debonding and fiber pullout in ceramic matrix composites (CMC) as well as fiber-matrix debonding and the carbon core of oxidized SiC fibers in CMC engine tested vanes. CT evaluation of thermally cycled C/SiC revealed pre-existing porosity, internal architecture, cracking, degradation in coatings and loss of SiC materials.

The LeRC CT facility is capable of characterizing critical manufacturing problems and comparing as-designed with as-built metal matrix composite engine sub-components (rotors and rings). This facility was developed to provide rapid re-engineering and reduction in new product development cycle times. LeRC is cooperating with industry to transform the CT technology from an NDE tool to a manufacturing and structural quality improvement tool for in-process modeling, structural modeling and product safety assurance.

NDE OF FAN/COMPRESSOR MATERIALS-POLYMER MATRIX COMPOSITES - In the process of tailoring ultrasonic methods to characterize pore and fiber volume fraction gradients in polymer matrix composites, LeRC researchers devised an ultrasonic imaging methodology to separate pore fraction from thickness variation effects. This methodology provides a solution to a practical problem where fan and compressor materials are not flat and parallel and thickness variations can mask microstructural effects in ultrasonic images.

MSFC (R. Neuschaefer 205-544-7382, and Dr. S. Russell, 205-544-4411)

SPACELAB TRANSFER TUNNEL EXTENSION (S. Russell, C. Bryson & J. Leak) - The Spacelab Transfer Tunnel Extension (STTE) is used in conjunction with an air lock to allow the STS Orbiter to dock with the Russian MIR. Prior to assembly McDonnell Douglas arranged for NDE of the STTE components by a third party. Dept. EH13 has been using Acoustic Emission (AE), Eddy Current (ET), and Dye Penetrant (DP) to evaluate the STTE during and after evaluation by pressure, axial and bending tests.

ET and DP inspection of the STTE qualification unit after physical testing did not locate any crack-like indications. During the tests of the qualification unit Acoustic Emissions (AE) were monitored and characterized to provide a basis to assess the flight units. During the pressure and load tests of the first flight unit of STTE conducted in December, the AE activity was less than during the qualification unit pressure and load tests, indicating no crack growth occurred. AE will be monitored during the final yield and ultimate tests of the qualification unit which are scheduled for late January.

INDUSTRY NEWS

Air Transport Association (Steven R. Erickson, 202-626-4134)

The Air Transport Association (ATA) 1995 NDT Forum is scheduled for Sept. 26 to 28, 1995 in Hartford, Connecticut. The forum is the largest aviation-orientated meeting of its type, with 350 participants and representatives from more than 50 airlines worldwide. The 1995 Forum theme is "NDT Technology Today: Enhancing Safety, Reliability, Savings." A call for papers will be issued in the next few weeks, with an emphasis on practical, useful developments that meet the theme of the conference. For further information, contact ATA's Forum Registrar, Marqui Lyons, at 202-626-4081.

General Electric Aircraft Engines (Derek Struges, 513-552-4612)

The Engine Titanium Consortium (ETC) in cooperation with the FAA Technical Center and the FAA New England Engine Propeller Directorate are planning to hold the 1st Open Forum Meeting in Phoenix, AZ, on Feb. 1-2, 1995. This meeting will cover issues related to NDT and Probability of Detection associated with engines that are made of titanium.

Northrop Grumman, Corp. (Collin Bohn, 310-942-5937)

NORTHROP GRUMMAN SUCCESSFUL USE OF SHEAROGRAPHY - Since 1988, Northrop Grumman Corp. has been successfully using shearography on the B-2 program to inspect bonded composites and metallic assemblies. Experience has shown reduction in inspection time by 75% compared to other NDE methods. Further, there are many cases where this method is found to be the only one capable of detecting the specific flaws.

Innovative Dynamics, Inc. (Gail Hickman, 607-257-0533)

DEVELOPMENT OF AN INTEGRATED HEALTH MONITORING SYSTEM FOR SPACECRAFT APPLICATIONS - Innovative Dynamics, Inc. is developing a health monitoring system for composite structures that uses an array of embedded piezoelectric elements. The system uses a broadband excitation source to induce modal structural frequencies. Specific flaws can be detected using pattern recognition techniques. Analytical modeling efforts in progress to reduce the training requirements.

COMING EVENTS (all events are given in EDT format)

NNWG Code Q Standing Committee Meeting, NASA wide RTOP pre-proposals rating, Thursday, February 16, 1995 at 3:00 pm.

FAA's 1st Engine Titanium Consortium (ETC) Open Forum - Phoenix, Arizona, Feb. 1-2, 1995.

ASNT 1994 Spring Conference, Las Vegas, NV, March 23 to 25, 1995

JANNAF Propellant Development & Characterization Subcommittee Meeting - JPL, Pasadena, CA, April 3-7, 1995.

3rd NASA M&P Engineering Meeting - Marshall Space Flight Center, AL, April 11-12, 1995.

Nondestructive Evaluation of Aging Infrastructure - Oakland, California, June 6-8, 1995.

Air Transport Association (ATA) 1995 NDT Forum, "NDT Technology Today: Enhancing Safety, Reliability, Savings," - Hartford, Connecticut, Sept. 26 to 28, 1995.

JANNAF Propellant Meeting, Joint Subcommittees Meeting including NDE - Tampa, FL, Dec. 4-8, 1995.

NASA NDE Working Group (NNWG) Newsletter

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Editor: Dr. Yoseph Bar-Cohen, JPL

All communications should be addressed to:

NNWG Newsletter, JPL, M.S. 82-105, 4800 Oak Grove Dr., Pasadena, CA 91109-8099

Phone: (818)-354-2610, FAX (818)-393-4057 or E-mail: yosi@jpl.nasa.gov
