NASA NDE WORKING GROUP
NEWSLETTER

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NASA HQ MESSAGE

R. Burdine 202-358-0569 or Dr. T. Lynch, Vitro Corp. 202-646-6372

In October, 1992, the idea of an empowerment working group was proposed by Code QR as a means of addressing Agency NDE issues. It was portrayed as a vehicle to provide consensus direction for NDE efforts and to coordinate and develop a recognizable NDE program that would address NASA's needs. On April 14, 1993, JSC hosted the organizational meeting which formally began the NASA NDE Working Group (NNWG).

The Working Group is charged with the responsibility of promoting a NASA NDE program addressing NASA's interests and needs. This includes promoting communication and cooperation among field installations, involving customers in the decision process and developing program objectives and goals. The Working Group formed its first standing committee to debate issues and recommend prioritized NDE program objectives for Code Q funding.

Activities are now underway to conclude both a Charter and SOP for the Working Group. Other activities include inter-center and inter-agency cooperative efforts, the development of an NDE directory identifying resources and skills throughout NASA and the development of this Newsletter.

NNWG HIGHLIGHTS

R. Neuschaefer, 205-544-7382 or M. Prebilsky, 713-483-7134

Great progress in communication among the NASA NDE community was made over the past several months. The NASA NDE Working Group held its first organizational meeting on April 14-16 at JSC.

A full-house representation from 10 field installations as well as HQ Code QR attended the meeting. This activity, initiated by Robert Burdine of Code QR, resulted in much-improved awareness within the NASA NDE community. The NNWG was briefed on each other's current activities and developed more points of contact across the Agency. Robert Neuschaefer, MSFC, was elected Chairperson and Marie Prebilsky, JSC, as Vice-Chairperson. Hector Delgado, KSC, chairs the new Code Q Standing Committee which operates under the NDE Working Group. We hope that this is only the first of many Standing Committees focusing on different interests within the community.

Since this meeting, NNWG has held regularly followup tele-conferences, and now we have a Charter ready for Code Q approval. An Operating Procedure for our Working Group has been finalized under the leadership of Richard Russell, KSC. John Larson, KSC, is compiling a NASA NDE Directory, which will be a wonderful resource for all of us. Dr. Yoseph Bar-Cohen, JPL, is Editor and Publisher of our new Quarterly Newsletter. So-far, NNWG has made significant progress, and this is just the beginning.

CURRENT EVENTS AND ACTION ITEMS

A NASA NDE Directory is currently being prepared by the NNWG. The directory will briefly describe the individual NDE centers, their capabilities, responsible personnel and contractors. Mr. John Larson, KSC, is responsible for this action item.

The review of two specifications for NDE of composites, that were developed by JPL, is underway by each of the NASA Centers. This effort is expected to lead to NASA-wide documents. We recommend this review process to all NDE specs of NASA wide interest.

The Code Q Subcommittee, chaired by Hector Delgado from KSC, is collecting FY95 RTOP topics. The process of prioritizing these RTOPs will be discussed on a Telecon in August.

NASA CENTERS NEWS AND ANNOUNCEMENTS

GSFC

Dr. E. J. Chern, 301-286-5836

In Aug. 93, the Materials Branch of GSFC is scheduled to be relocated to a recently completed 58,800 sq. ft. QA and Detector Development Laboratory (QUADDL), Bldg 30. The dedication of the QUADDL Building by the Center Director, Dr. John M. Klineberg, will be held on July 23, 1993. The Materials Branch which consists of Materials Assurance Office, Metals Section, Polymer Section, Ceramics Section and Composite Section, provides a broad spectrum of analytical and support services to all GSFC flight projects. The functions of the Branch include materials assurance and review, development, identification, certification, failure analysis and NDE of space flight hardware. Although NDE responsibility resides in the Composites Section, NDE tasks are carried out across all the Sections of the Branch using various analytical and test methods for effective project support.

JPL

Dr. Y. Bar-Cohen, 818-354-2610

JPL is hosting a monthly Technical Seminar that is opened to the industry and academia as a forum of collaboration and technical interaction. In June, Dr. Rick Claus from VPI presented his center activity

in the area of fiber-optic sensors for smart structures. In this month, Dr. Greg Carman from UCLA presented a model for analysis of smart materials on micro and macro-levels.

The 1st NASA Materials, Processes and NDE (MP&NDE) Standards Meeting was held at JPL from March 23 to 24, 1993 with over 40 participants from all NASA centers. The meeting was sponsored by NASA Code QE and its advocate is Mr. Richard Weinstein. This effort was established to help coordinate NASA wide standards covering space related issues. The 2nd MP&NDE Standards meeting will be held in March 1994 at JSC.

A facility for characterization of electro-active materials was recently established in the JPL MP&NDE lab. Dr. Greg Carman from UCLA, who is also a summer JPL faculty fellow, is assisting these efforts.

KSC

H. Delgado 407-867-3163 or D. Collins 407-867-4438

KSC is currently developing a device to map defects in glass windows and to measure their dimensions. The device will allow KSC to dramatically reduce the time it presently takes to inspect the Orbiter windows. The test system consists of a CCD detector and a scanning device that inspects the window surface where the data is acquired and stored by the computer. The system was developed by Dr. Stuart Gleaman and Steve W. Thayer from INET. After the completion of scanning a window the detector is positioned over the detected defects and their dimensions are compared to the OMRSD requirements. The estimated saving in labor/inspection time is 520 MHrs/Yr.

J. Larson 407-867-3423 or D. Krauss (EG&G NDE Eng.) 407-861-5158

The KSC NDE laboratory, in conjunction with Rockwell, is conducting tests of RCC utilizing computed tomography. The purpose is to determine if CT can be used to track density changes with progressive flight/heat cycles and thereby provide an indication of the remaining strength/useful service life. Successful application of CT, in conjunction with more portable techniques, to reliably predict the remaining useful life can lead to a significant cost savings. Initial scans of test coupons has demonstrated promise. Present efforts are centered on utilizing actual flight configuration components to assess the effects of the size and complex geometry.

LaRC

Dr. J. Heyman or Dr. E. Madaras, 804-864-4914

The NDE Sciences Branch (NESB) is very active on the national front of NDE. The following are brief statements of NESB recent progress:

- Scanning Electron Acoustic Micrographs (SEAMS) proved feasibility of improving tests of Si_3N_4 ceramic ball bearing (see also MSFC).
- A model was developed to evaluate the density and elastic modulus of SCS-6 fibers.
- An agreement was reached on a draft MOU between LaRC and MSFC for cooperative NDE and technology transfer.
- A Fourier Transform Spectrometer was used to study the absorption spectrum of sapphire fibers.
- An improved surface contamination measurement technology was developed jointly with MSFC.
- A joint LaRC/LeRC study of fiber/matrix interface of ceramic composites was reported at an American Ceramic Society meeting. The Scanning Acoustic Microscope was used for this purpose.

- The recently developed self-nulling (Simpson) eddy-current probe was used to image EDM notches around rivets in a thin aluminum sample as well as fatigue cracks.
- The Simpson probe and ultrasonic contact scanning systems were used to examine corrosion/material loss in simulated lapjoints.
- The influence of the shear angle on the detection resolution of electronic shearography was studied. Tests were made to detect disbonds in aluminum structures of aircraft as well as defects in a composite helicopter rotor blade. A diode laser is being investigated for potential development of a portable shearography system.
- NESB has transferred its thermal NDE technology to Boeing as part of the Aging Aircraft Structural Integrity program.
- A cooperative effort on thermocouple measurements was initiated with the Air Force.
- Acoustic Emission signals were detected from hypervelocity impacts.
- The Quest X-Ray computedtomography system has recently undergone major modification.
- The second harmonics of thermoelastic response of a 0.020" thick piece of spring steel was used to generate amplitude image.
- An NESB developed fiber optics vibration sensor were tested in the NASA 737 aircraft during scheduled engine trim runs.
- NESB demonstrated bolt tension monitor to Rocketdyne and applied quantitative thermal measurements for Lockheed.
- NESB hosted NDE personnel from Lockheed Corporation, McDonnell Douglas, Grumman and Northrop under the Advanced Composites Technology Program.
- On June 3, Dr. William P. Winfree appeared in a CNN Science and Technology Segment discussing a recently delivered Digital X-ray system.
- An FAA/NASA sponsored workshop on neural networks, signal and image processing to aging aircraft was successfully held at LaRC on June 22.

LeRC

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

As part of LeRC's continuing development of NDE methods for high temperature composites, a workshop sponsored by the HITEMP project office was held at LeRC on May 6, 1993. The Workshop was organized and hosted by Dr. George Baaklini from LeRC. The workshop made significant contribution to ensuring domestic technology edge and economic competitiveness in world markets.

The Second International Conference on Acousto-Ultrasonics was held in Atlanta from June 24 to 25, 1993. At this conference, the acousto-ultrasonic method was highlighted for in-situ monitoring of damage accumulation in ceramic matrix composites under various load conditions. Acousto-ultrasonics was also suggested for application to bonded interfaces and composite structures. The proceedings book will be published by the meeting sponsor ASNT (American Society for Nondestructive Testing).

Alex Vary will give the keynote address for the inspection and QA portion of the 2nd Canadian International Conference on Composites that will be held in Ottawa Canada from Sept. 27 to 29, 1993. Vary's address is entitled "New Developments and Future trends in NDE of Composites."

In October 1993, LeRC Materials and Structures Div. will hold the 6th Annual HITEMP Review at the Westlake Holiday Inn. NDE topics will be covered in relation to structural composites components of turbine engines.

MSFC

R. Neuschaefer, 205-544-7382 or Dr. S. Russell, 205-544-4416

In the Alternate Turbo-pump Development (ATD) for the Space Shuttle Main Engine, the 440C balls are planned for replacement with silicon Nitride balls. This replacement necessitates the development of reference standards, characterizing them nondestructively and NDE of flight balls. This work has been a multi-Center effort supported by Code QR and the ATD Program Office. The Ceramics Branch of LeRC, under Jonathan Salem was most helpful in developing reference standards and Dr. George Baaklini from LeRC in characterizing the reference standards. Dr. Eric Madaras from LaRC is using advanced CT system, Laser Generated Ultrasonic System, Scanning Electron Electron Microscope and a Scanning Acoustic Microscope to characterize a Si_3N_4 ball containing a surface defect.

Under an RTOP entitled "Filament Wound Composite Pressure Vessel Damage Tolerance Program" managed by Dan Mulville, Code QE, work is underway to provide an experimental, inspection and analytical methodology and data base for filament wound composite structures. Significant progress was accomplished including: Carbon/Epoxy ASTM bottles were impacted and are being NDE'd. Additional testing will be made on Carbon/Epoxy and Kevlar/Epoxy bottles.

Improvements to the Optically Stimulated Electron Emission (OSEE) Sensor Head for surface Contamination Measurements - MSFC, LaRC and Thiokol have had a very successful teaming arrangement to improve the OSEE sensor head used to measure the cleanliness level of Solid Rocket Motor cases prior to performing critical liner bonding. Thiokol uses a commercially available unit. Dr. Tom Yost, LaRC, made a ten-fold improvement in sensitivity with a "user friendly" system having excellent reproducibility and insensitivity to the environment.

Two glass/epoxy struts were tested using laser shearography. These struts support a cryogenic pressure vessel of the Space Station Freedom. The fatigue damage areas in these struts were easily detected and mapped To apply this method for field inspection, a portable shearographic system was ordered from Laser Technology.

SSC

Dr. W. W. St. Cyr (SSC), 601-688-1925 or J. Casanova (Sverdrup Technology), 601-688-2477

SSC's NDT laboratory, operated by Sverdrup Technology, was granted accreditation in RT, MT, UT and PT by the National Aerospace and Defence Contractors' Accreditation Program (NADCAP) in April 1992 and reaccredited in April 1993. To SSC knowledge, their NDT laboratory is the only government lab so accredited. SSC can assist anyone who is interested in obtaining NADCAP accreditation and would like more information or help.

J. Washington (SSC), 601-688-1788

SSC is in the preliminary engineering stages of design review on an NDE laboratory. This facility will have the capability of conducting a full range of NDE in large components of the Space Shuttle Main

Engine (SSME) and all other propulsion test activities at SSC. The lab will promote technological advancement from failure analysis to failure prevention, enhance responsiveness to current and anticipated propulsion testing requirements, and will provide timely strategies to manage potential problems.

COMING EVENTS **(All events are based on Eastern standard time)**

July 30 - Due date for FY95 RTOP First-Call. Topics list should be sent to Hector Delgado, KSC.
Aug. 10 - 2:00 pm, Telecon, Code QR Subcommittee, FY95 RTOP
25 - 1:00 pm, NDE Working Group Telecon
31 - 3:30 pm, Code Q NDE, VITS
Oct. 4 - 10:00 am, NDE Working Group, VITS
October 1993 - 6th Annual HITEMP Review, LeRC is hosting this meeting.
Nov. 8 - Fall ASNT Conference in Long Beach, California. ASNT is planing a half day tour of the JPL facility and its NDE lab.

March 94 - The 2nd NASA MP&NDE Standards meeting will be held at JSC.

RTOP FY95 TOPICS OF HIGH PRIORITY

H. Delgado 407-867-3163
The following are issues of high priority to individual NASA Centers.

MSFC
* Advanced main combustion chamber (AMCC) for SSME.
* NDE of diffusion bonded platelet liner to determine quality of jacket/liner bondline.

A call for such topics was issued by the Code Q Standing Subcommittee and all inputs should be sent to Hector Delgado, KSC, by July 30, 1993. In the future issues of this Newsletter, we are hoping to publish the official list of Code Q high priority NDE topics.

NASA NDE Working Group (NNWG) Newsletter

This NNWG Newsletter is published quarterly by the NNWG and NASA HQ Code QR for the NASA NDE Community.

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