

OFFICE OF
SAFETY AND MISSION ASSURANCE (OSMA)

**NONDESTRUCTIVE EVALUATION (NDE)
STRATEGIC PLAN**

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Prepared by

NASA NDE Working Group (NNWG)

National Aeronautics and Space Administration

PREFACE

This is the first issue of the NASA NDE Strategic Plan. In this plan you will find the vision, strategic goals and objectives for the evolution of the Agency-Wide NDE Program. This document represents a guide by which the Office of Safety & Mission Assurance (OSMA) and the NASA NDE Working Group (NNWG) can jointly plan and implement the activities of the NDE Program.

This Strategic Plan is a living document, and will be revised as necessary to stay current with the dynamic requirements of NASA programs and missions, current technology and consistent with budget allocations. Meanwhile, it stands as a guide for the programmatic decisions to be made in the years ahead, and as a framework for prioritizing OSMA RTOP's in an organized manner.

This Plan was prepared by the NASA NDE Working Group as part of the group's responsibility for developing an Agency-Wide program to both identify and meet NDE requirements that will positively impact safety and reliability levels within NASA. The Working Group is composed of representatives from all the field installations and Code QW. Members and their organizations are as follows:

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List of Acronyms and Definitions

NDE - Nondestructive evaluation
 NNWG - NASA NDE Working Group
 OSMA - Office of Safety and Mission Assurance
 RTOP - Research and Technology Objectives and Plans
 ViTS - Video Tele-Conference System
 VoTS - Voice Tele-Conference System

1. INTRODUCTION

1.1. *Purpose and Scope*

This document is intended as a resource for joint planning by the NASA Office of Safety and Mission Assurance (OSMA) and the NASA NDE Working Group (NNWG). The document describes the Agency-wide NDE program strategic goals, defines high level technical infrastructure, and presents development objectives and key activities in response to the goals. The underlining purpose is to make clear the relationship between NDE and improvements in safety and reliability and the enhancement of the probabilities for mission success. This provides a justification for a high profile for a focused NDE development and application

The NDE Strategic Plan goals are responsive to OSMA's vision, mission, and strategic goals and to NASA's evolving role in this era of changing national priorities. Based on OSMA's strategic goals and reflecting Agency needs, the NNWG has developed a comprehensive program, as summarized in the following sections. It identifies what is need to meet imposed requirements, and the research and development activities necessary to evolve the needed technologies and capabilities.

1.2. *OSMA Strategic Plan*

OSMA's Strategic Plan states organizational goals and direction for Code Q. This Strategic Plan provides a top-level view of OSMA functions and program initiatives for FY 1996 through 1998. The Plan provides vision and mission statements (shown below), OSMA strategic goals and objectives, key program elements, and identifies budget thrusts. The NDE Strategic Plan is responsive to and in alignment with the OSMA Strategic Plan.

OSMA Vision:

We are leaders, innovators, and experts in safety, reliability, maintainability and quality, supporting NASA's quest to expand frontiers in air and space.

OSMA Mission:

We assure the safety and success of NASA's strategic enterprises and functions by developing, advocating, and applying safety, reliability, maintainability, and quality policies, processes, standards and technologies, and by providing support and oversight.

1.3. *NDE Vision*

As part of the overall NASA and OSMA vision, the NDE Program vision is to:

Ensure NDE is effectively used across the Agency, by providing an advisory and education forum and by promoting Agency-wide cooperative action on issues of management and operation of NDE programs.

1.4. NDE Mission

As part of the overall NASA and OSMA mission, the NDE Program mission is to ensure the integrity of NDE processes utilized by NASA Programs for achieving safety and mission success and educating the NASA community regarding the capability and applicability of NDE technologies.

We are fully committed to continue and strengthen ongoing and approved activities that support this mission. In addition, we have identified key strategic objectives and goals that are essential to maintain our leadership in this changing environment.

2. STRATEGIC GOALS

2.1. Strategic Goals

OSMA intends to play a long-term leadership role in NASA NDE activities. The following set of NDE strategic goals have been adopted by OSMA.

1. Strengthen the visibility and influence of the NNWG in the conduct of the NASA flight and research programs (present and future).
2. Develop and maintain an NDE infrastructure to meet NASA program requirements.
3. Develop and maintain Standards and Specifications, as required, for aerospace applications whenever technical societies/industry standards or specifications are not available. Broaden the use of industry standards within NASA.
4. Develop programmatic-relevant, cost effective NDE methodology/instruments, and transfer them to NASA implementers and industry.
 - * Strengthen cooperative NDE efforts among the NASA Centers and NASA Programs.
 - * Establish a certification process for space hardware NDE to ensure the implementation of cost-effective technology.
 - * Identify long-range potential safety/reliability areas of concern for follow-on NDE Planning.
 - * Establish a mechanism for communication of NASA Field Installations and Contractors concerns and alert of potential problems related to inspection of flight hardware.

Based on these goals, the NNWG has developed detailed program plans that contain strategic objectives and activities. These objectives and plans are described in the following sections.

3. STRATEGIC OBJECTIVES

3.1. *Mission Drivers*

In response to the expected flat budget, NASA's approach is to reduce the large amount of resources being spent on infrastructure operations in order to divert additional funds to aeronautics, space technology, and environmental observations, and to have resources for some new starts. NASA's strategy is:

- significantly extend the life of the shuttle and other important infrastructures, which will drive action to inspect the operational readiness of these systems.
- increase industrial involvement (to aid advanced technology transfer)
- shorten the life cycle of developing new technology to lower the risk of using new technology.

Stringent Flight assurance requirements are increasingly being imposed on current and planned NASA Programs as a result of the extension of their period of use and the growing demands on missions objectives. Further, life-cycle cost considerations of systems development is driving NDE considerations into flight systems requirements. Such Programs include the Space Station and the polar platforms of the Earth Observing System (EOS) of Mission to Planet Earth.

3.2. *The Needs Assessment Process*

Over the last two years, the NASA NDE Working Group assessed the NDE needs of the Agency and initiated a NASA-wide NDE program to address the changing NASA requirements. During the Annual Workshops, progress reports of NASA Centers activities, various on-going relevant tasks, and papers describing proposed new tasks are presented. Review and discussion of new tasks is done and a total program is developed at the final session of the Workshop. The Working Group prioritizes the program elements and scope the proposed new tasks and continuing tasks in this final Workshop session. Progress discussions are held in video and audio teleconferences throughout the year.

The Working Group formed a Standing Committee that consists of representatives from all NASA Centers with one vote per Center. The Standing Committee defines the goals and criteria for evaluation of new RTOPs. Further, the Standing Committee reviews these goals and criteria annually to ensure their relevance to NASA changing requirements and to implement lessons learned. Starting in 1996, the Annual workshops will be held in the second half of January to review the RTOPs that are submitted in response to the pre-POP-Call proposals.

3.3. *Strategic Objectives*

A basic strategic plan with strategic goals has emerged from this process. Supporting the strategic goals are strategic objectives and activities as shown below. A discussion of the

individual objectives and achievement strategies of these goals can be found in Section 5.0.

A. Strengthen the visibility and influence of the NNWG in the conduct of the NASA flight and research programs (present and future):

- * Create an NDE Oversight Committee composed of representatives of the appropriate Headquarters programmatic divisions to provide guidance for the work of the NNWG and coordination with the Agency's policies and programs.
- * Provide for high level communication between NASA field installations and with other government organizations, private industry, academic, and professional organizations.
- * Develop closer working relationship between HQ, Code Q, and the NDE programs.
- * Develop and maintain a multi-year Program Plan as a resource for the joint planning by Code Q and the NNWG.
- * Establish a quick response mechanism to provide the necessary resources within an FY to meet previously undisclosed program needs requiring rapid action.
- * Assure integration of NDE activities as a full participant in the concurrent engineering protocol for future NASA programs.
- * Provide input to the Chief Engineer and the Engineering Management Council.

B. Develop and maintain an NDE infrastructure to meet NASA program requirements:

- * Expand the Agency-wide NDE capabilities.
- * Upgrade the capability and reliability of the NDE methods used NASA-wide.
- * Improve NDE techniques and data analysis through automation.
- * Pursue increased productivity initiatives for NDE.
- * Develop and maintain an infrastructure to support the NNWG.
- * Promote NDE staff excellence and continuity.
- * Promote interagency training initiatives.
- * Establish an interagency point of contact for information gathering and dissemination of information through electronic networking, taking advantage of the information superhighway.
 - Enhance the NNWG Newsletter and the NNWG Homepage System.
 - Establish an electronic NNWG Bulletin Board.
- * Support a cost-effective R&D program to assure NASA's world class advancement in NDE.
- * Increase cooperative cross-utilization of resources between Centers and Programs.

C. Develop and maintain Standards and Specifications for space applications whenever technical societies/industry standards or specifications are not available:

- * Select, develop and utilize advanced NDE technology needed to meet future mission requirements. Generate standard procedures for this advanced technology.
- * Whenever possible, work with industry to develop and utilize nationally recognized NDE specifications and standards.
- * Promote and coordinate transferring of specifications/standards to reduce duplication and

increase harmonization of NDE activity NASA-wide.

D. Develop programmatic-relevant, cost effective NDE products and transfer them to NASA implementers and industry:

- * Participate with government-wide working groups and industry associations to promote technology transfer.
- * Develop and present technical papers for all new technology projects.
- * Expand the RTOP program to include Center technology transfer office representatives in the project reporting loop.
- * Promote participation in the RTOP program to ensure all critical NDE areas are addressed and solutions promoted.

E. Strengthen Cooperative NDE efforts among the NASA Centers and NASA Programs.

- * Encourage joint RTOP programs.
- * Increase use of other NASA facilities capability.
- * Participate in the Annual Workshops, and the Video as well as the audio Telecommunications.

4. PROGRAM OVERVIEW

4.1. NDE Function

4.1.1. General

The NNWG is concerned with the systematic application of accepted NDE techniques and tools to total inspection/evaluation processes, to assure that the NDE methods used NASA-wide are reliable, cost effective and are compatible with national or international standards. The NDE provides the technological base for inspection/evaluation tools and techniques.

Implementation of work to satisfy the NDE functional concerns requires that we present the assumptions, issues and drivers used in the planning process:

4.1.2. Assumptions And Issues

1. Assumptions

- a. Military and technical societies provide primary standards and specifications.
- b. Project schedules and requirements dictate dedicated NASA requirements for critical NDE methods.

2. Issues

- a. OSMANDE Program applicability to mission specific inspection/evaluation processes.

- b. NDE involvement in the design stage and concurrent engineering.
- c. Form of NDE function participation in project implementation.
- d. Agency funding direction and magnitude for NDE improvements and applications.

4.2. NDE Services

4.2.1. General

NDE services provide important day-to-day nondestructive inspection and evaluation. The services contribute to the quality, reliability and integrity of spacecraft, support structures and scientific instruments by verifying conformance to program requirements.

4.2.2. Field Installations

Each field installation provides services in its own way, with various organizational structures and cost charge-back schemes. While there are differences in approach, very similar services are needed. The mix of items serviced is very different and therefore hard to compare generally. Each Installation is shaped and optimized by local requirements.

4.2.3. Programmatic

The programmatic component of the program is focused on involving the NDE discipline earlier in the design and hardware development process and to better utilize NDE. The first goal is to develop standards and specifications, using industry standards where possible, to aid system contractors in meeting the NASA's NDE requirements. Quick results are wanted, where possible, to aid in ongoing design review processes. Limits of the current state-of-the-art and knowledge are of great concern; therefore, efforts will be made to define the areas needing long term development.

4.2.4. NASA's NHB 5300.4 document

NASA will attempt to utilize industry standards, where possible, to avoid unnecessary cost. The overall NASA NDE activity is defined in NHB's 5300.4 (1B) "Quality Program Provisions for Aeronautical and Space System Contractors"; 5300.4 (1C) "Inspection System Provisions for Aeronautical and Space System Materials, Parts, Components and Services"; and 5300.4 (1 D-2) "Safety, Reliability, Maintainability and Quality Provisions for the Space Shuttle Program".

4.3. Infrastructure Needs

4.3.1. General

The NDE community must continuously improve its capabilities, services, and cost/benefit ratio. Specifically, the evolution of the NDE community Infrastructure must include improvements in

operability, availability, reliability, related support functions, and inter-installation communications. Higher productivity at lower cost is also a key driver in each of these areas. The NASA NDE Working Group will incorporate life-cycle cost considerations into all new capability development decisions, from design through disposal.

Specific infrastructure implementations and technology development are covered in Section 5. Major improvements are expected through use of new developments in nondestructive evaluation. Further, proper support for maintenance of current capability (vis-à-vis funding) and introduction of new capability must be stressed.

4.3.2. Infrastructure Tasks

The NDE community is encouraged to:

- Participate in:
 - * NDE needs surveys, teleconferences and workshops
- Maintain and improve communications through:
 - * Bulletin boards, newsletters and electronic conferences
- Provide training support for:
 - * Technical needs
 - * Project support and management
- Provide administrative support for:
 - * Document systems
 - * Financial reports/tracking
 - * Policy documents
- Improve cooperation to:
 - * Optimize use of NASA's investment in facilities and equipment
 - * Speed up and widen application of useful technology across the Agency
 - * Identify and prioritize Agency NDE needs.
 - * Educate the NASA Community in NDE
 - * Provide for the advancement of new NDE capabilities to meet these needs through focused R&D programs.
 - * Facilitate implementation of delivered technologies across operating organizations.
 - * Ensure the integrity of NDE processes used by NASA through an updated certification process.

5. SECTION 5.0 PROGRAM CONTENT

5.1. General

The intent of the following goals is to provide methods of implementation of the polices and

functions of NNWG charter and NHB 5300.4. Each goal incorporates several different objectives and strategies. These strategies are actions which will need time, knowledge and supervision from participating field installation.

5.2. Goal A: Role of the Working Group

Strengthen the role and influence of the NNWG in the conduct of NASA flight and research programs.

The objective of this goal is to develop and implement the necessary management and administrative interfaces, procedures, and activities for the NNWG to effectively carry out NHB 5300.4 and the NNWG Charter.

Initially the NNWG was formed as an annual NNWG Workshop to foster communication between field installations and seek Agency-wide improvements which could be implemented for greater economy and efficiency. The emphasis was on NDE of NASA space and ground hardware. Recently, the NNWG has taken the form of a chartered working group and has stepped up to the task of ensuring that NDE is embedded in the NASA programs and the requirements are sound and adequate to achieve program goals. It is now necessary to develop appropriate interfaces, procedures and activities. To accomplish this goal, the NNWG must have participation and/or oversight of the programmatic offices of NASA Headquarters. Code QW must provide the enabling actions for this goal.

Objectives & Strategies

5.2.1. HQ Oversight NDE Committee

Create an NDE Oversight Committee composed of representatives of the appropriate Headquarters programmatic offices to provide guidance for the work of the NNWG and coordination with the Code QW division's policies and program.

1. Address NDE programmatic requirements at a Section of NHB 7120.5 "Management of Major Systems and Projects".
2. Develop a NASA NDE policy document to address NDE from design, selection, control, verification, qualification and documentation.
3. Hold Program Workshops for exchange of information on NDE problems and issues. These Annual NASA NDE Workshops should support closer working relationships across program lines to avoid overlaps.
4. Study the integration of NDE requirements associated with the U.S. and international partners' systems and related interfaces in the commercialization of space and generate a policy for the following:

- * Integrating NDE requirements for all systems and assessing commonality needs.
- * Insuring that NDE requirements are incorporated in the design.
- * Adapt ISO-9000 requirements

5.2.2. Communications & Working Relationships

Provide for communications between and working relationships with NASA Field Installations and with other government organizations, private industry, university, and professional organizations by:

1. Establishing an inter-agency point of contact for information gathering and dissemination of information, i.e., directory, equipment sources, inspection procedures, shared sources, etc.
2. Representing the NASA NDE functions at the various professional organizations Annual meetings.
3. Developing closer working relationship between NDE and Met/Cal programs.
4. Increasing involvement in NDE activities by participation in the Annual NNWG workshops, VoTS and ViTS.
5. Representing the NASA NDE functions in NASA committee and coordination activities.
 - A. NDE advocate to Code Q.
 - B. NDE panel.
 - C. Flight program system review.

5.2.3. Plans

Develop and maintain a multi-year NDE Plan and an annual NDE Implementation Plan as a resource for a joint planning and control by Code Q and the NNWG.

5.3. Goal B: NDE Infrastructure to Meet Requirements

Maintain and foster continuous improvement of the NDE infrastructure to meet NASA's program requirements

The NNWG has expanded in size and scope to the point that to continue it must assess and strengthen its infrastructure. It must gain recognition from the installations and Headquarters for

its contributions. Areas of concern are the resources, participation, and communications required to support a viable organization.

Increasing productivity and efficiency of NDE have been the concern of the NASA NNWG and NASA research, development and testing facilities. The potential savings in resources justifies a program for further research into methods of improving productivity and efficiency of NDE. In order for this program to be successful it is essential to develop a comprehensive plan for the development, utilization and application of new technology to increase the productivity and reliability of NDE throughout NASA.

The NNWG framework must be efficiency organized to facilitate the goals enumerated elsewhere. The NNWG must be responsive to on-going development NASA-wide in the areas of methods, instrumentation and procedures. Once the infrastructure is in place it must be supported, reviewed and revised as required.

NASA's agenda of aerospace projects places complex demands upon its NDE community and requires the application of increasingly advanced NDE technologies. In recognition of the contribution of NDE skills make to the successful achievement of NASA's goals, a program to organize continuous re-evaluation of needs, instruction, and certification must be undertaken. A training emphasis helps assure that the agency will continue to attract and keep qualified people by enabling them to continuously update their technical skills. Also, an organized program of cross training reduces the repercussions of technical specialization, a tendency that centralizes important knowledge within key individuals and creates hardship when transfers, resignations, or other such changes occur.

Objectives & Strategies

5.3.1. Assess and Maintain Agency-Wide NDE Capability

Periodically review and assess the adequacy of operational NDE to ensure cost effective and reliable methods and facilities are used.

5.3.2. Upgrade NDE Equipment

Develop investment plan for restoration and upgrade of equipment common to the needs of the Field Installations.

1. Evaluate the Field Installations' requirements versus current capabilities, versus contemporary commercial products and develop a general plan for the Agency.
2. Benchmark the performance of the tractability chains and NDE processes common to a number of Field Installations and identify the best process for adoption by all Field Installations.

3. Develop a redeployment for equipment replaced because of tighter uncertainty requirements.

5.3.3. Increase Productivity and Decrease Operational Costs of NDE

1. Develop a general plan for increasing productivity of NDE - Develop and annually upgrade a plan for increasing productivity of NDE using inputs from all the Field Installations.
 - A. Determine NDE areas where automatic NDE would be feasible and would greatly increase productivity.
 - B. Determine NDE areas where in-process and in-service monitoring would be feasible and would greatly increase the productivity of NDE.
 - C. Determine equipment/software requirements that would allow for automated procedures to be exchanged between NASA Field Installation.
2. Study the following technologies to determine their impact on NDE automation and autonomous operation.
 - A. Hardware communication interfaces (IEEE 488.2, DMA, etc.)
 - B. Commercial hardware and software packages
 - C. New technologies related to automation and in-process/in-service operation.
3. Develop the following to improve the productivity of NDE systems.
 - A. Expand the information exchange among NASA Field Installations regarding increasing the productivity of NDE. The use of the NNWG Newsletter and the Mosaic NNWG Homepage system should be expanded.
 - B. Define measures needed to ensure software procedures perform a thorough and accurate NDE of all critical parameters of structures under test.
 - C. Develop a program to standardize the automation and operate autonomics systems among NASA Field Installations.
4. Review and assess progress.
 - A. Conduct a review at the Annual Workshop of all improvements in the productivity of NDE applications.
 - B. Report at the Annual Workshop the general status of the NDE automation and application of utilized or developed at NASA.

5.3.4. NNWG Infrastructure

1. Develop and maintain an infrastructure to support the NNWG.
 - A. Develop plans, policies, and procedures which will foster a better understanding of, and recognition for, activities of the NNWG.
 - B. Pursue ways and means of increasing participation.
 - C. Explore avenues for increased resources.
2. Areas to develop:
 - A. Organization:
 - 1) Membership.
 - 2) Management.
 - 3) Administrative documents and financial reports.
 - 4) Subcommittees: Standing and ad-hoc.
 - B. Supplied resources:
 - 1) Headquarters.
 - 2) Installations.
 - 3) Individual Laboratories.
 - C. Participation in surveys, workshops, ViTS, and VoTS.
 - D. Communications through electronic communications, bulletin boards, and Mosaic NNWG Homepage system, as well as provide input to the NNWG Newsletter.
3. Review and assess progress through progress reviews on development of the individual areas at the Annual Workshop.

5.3.5. Staff Development

Promote the development of excellence and continuity of the Field Installation's NDE staff.

1. Develop an NDE training program.
 - A. Poll all Field Installations to assess current needs.
 - B. Database of recommended training vendors.
 - C. Establish source(s) and distribution of training funds.
 - D. Delineate planning responsibilities.

- E. Identify training sources.
 - 1) Seminars.
 - 2) Self-paced programs.
 - 3) Formal on-the-job training.
 - 4) Technical papers/workshops.
 - 5) Attend symposiums and conferences.

5.4. Goal C: Process Standards and Specifications

Develop, expand and maintain standards and specifications to meet NASA requirements.

Technical organizations are forming and maintaining standards and specifications in various area of NDE however, space requirements are inadequately covered by these standards. NNWG will develop, expand and maintain standards and specification which are required to meet NASA needs. Only standards and specifications that are not available from technical organizations will be developed. NNWG will make efforts to transfer the developed NASA-wide standards and specifications to the responsibility of selected technical organization for industry-wide standardization.

- 1. Broaden use of industry standards.
- 2. Adapt ISO-9000 requirements in coordination with NASA's overall effort.
- 3. Share existing Field Installation standards and specification to form unified NASA-wide standard requirements.

5.5. Goal D: Develop Programmatic Relevance and Technology Transfer

Develop programmatic-relevant, cost effective NDE methodology/instruments and transfer them to NASA implementers and industry.

The NASA Vision Statement clearly proclaims that one of NASA's purpose is to develop and transfer technology in partnership with industry and academia to keep America capable and competitive. To do this, NASA must establish program requirements to deliver technological benefits in all current and future efforts, making spin-offs more deliberate and less serendipitous. The NASA NDE activity is perceived as not being proactive in sharing high technology activities with other institutions and industry and not providing routine information on work being done. Therefore, the portion of the NDE program directed at meeting future mission requirements should have planned into it up-front, technology transfer. Alliances and dialogue with other Government agencies, industry and academia need to be established and maintained as an integral part of the NDE Program. Participation by NASA NDE specialists, technologists and scientists in the technology transfer process must be established.

Objectives & Strategies

5.5.1. Center Participation

Promote increased participation in the RTOP program to ensure all critical NDE areas are addressed and solution are promoted.

Development of new technology is the first step in technology transfer process. It is imperative that the Working Group ensure all critical NDE areas are addressed and solutions are promoted. This can only be done by participation from all Centers. Each Center has NDE needs/ requirements which are not being met, and they should be identified to the Working Group. In most cases, other Centers share the same concerns. Solutions to these concerns can be identified and transformed into research proposals for future funding.

5.5.1.1 Flight Hardware Inspection Method Certification Program

To assist in shortening the implementation cycle for new NDE method, NNWG will form a NASA-wide certification program for implementation of new NDE methods or instruments for testing flight hardware.

5.5.1.2 Identify long range potential safety/reliability areas of concern for follow-on NDE Planning.

To assure the relevance and cost effective implementation of new NDE technology, Field Installations will share with the members of NNWG safety and reliability areas of concern. NNWG will form a long range plan that is based on this concerns, which will be used as a guide for future OSMA RTOP proposals.

5.5.2. Government-wide and Industry Participation

Participation with Government-wide Working Groups and industry associations to promote technology transfer.

Involvement with other organization is the second step in technology transfer. It is good practice to contact other organizations who might have an interest in the development of an identified project. Co-funding and shared development work should be investigated to ensure the technology development has transfer applicability.

5.5.3. Center Technology Transfer Office

Expand the RTOP program to include Center Technology Transfer Office representatives in the project reporting loop.

Technology developments having transfer applicability must be identified to the lead Center's Technology Transfer Office. Involvement with this office up-front will enhance the field application of potential interested parties, help with co-funding issues, ensure appropriate documentation is obtained throughout the project, help to identify potential patents, and transfer the technology development through established channels. This resource is currently underutilized, and should be taken advantage of.

5.5.4. Reporting Technology Projects

Development and present technical papers for all new technology projects.

The American Society for Nondestructive Testing (ASNT) Fall and Spring Conferences and the Review of Progress in Quantitative NDE are providing excellent opportunities to transfer new technology. It is encouraged that all NNWG sponsored NDE programs will document the technology development for a paper presentation at these conferences. Also, since it is increasingly disseminated among industry, the NNWG Newsletter is an excellent forum of presenting brief statement about new technology.

Also, the publication of new technology in the NASA Tech Briefs is encouraged. This monthly publication is a digest of new technology that is intended to transfer engineering technology to readers throughout the industry and Government.

5.5.5. Field Installation Technology Transfer Office.

Expand the RTOP program to include Field Installation technology transfer office representatives in the project reporting loop.

5.5.6. Field Installation Participation

Promote increased participation in the RTOP program to ensure all critical NDE areas are addressed and solution promoted.

6. MANAGEMENT ROLE AND RESPONSIBILITIES

The NASA NDE Program will closely coordinate among all interested NASA Headquarters Offices and the NASA Field Installations. The Division of Engineering & Quality Management, Code QW, shall serve as the NASA focal point for Agency-wide NDE policy coordination and cooperative activities with other Government agencies, industry, educational, and nonprofit organizations. This coordination will be accomplished, in part, through the NDE Oversight Committee. The NDE Oversight Committee provides Program review, guidance for the work of the NNWG and coordination with the Headquarters programmatic division's policies and program. The NNWG shall develop and maintain a coordinated and comprehensive Agency-wide NDE program. The projects within the Program will be the responsibility of managers at the designated Field Installations.

All Program plans and activities will be submitted to NASA Headquarters through the NNWG for review and consideration in the planning and budget cycles.

Industrial organizational assignments are delineated below.

6.1. Office of Safety and Mission Assurance, Engineering & Quality Management Division, Code QW, NASA Headquarters

The office will be responsible for the management, funding and execution of the Program. The program shall be implemented in accordance with NHB 5300.4.

6.2. NNWG Oversight Committee

The Committee shall be composed of representatives from other NASA Headquarters Offices. The following offices shall participate by providing guidance, technical coordination and future requirements.

- Office of Space Flight, Code M,
- Office of Space Communications, Code O,
- Office of Aeronautics, Code R,
- Office of Space Sciences, Code S
- Office of Life and Microgravity Sciences and Applications, Code U,
- Office of Space Access and Technology, Code X
- Office of Mission to Planet Earth, Code Y.

6.3. NASA NDE Working Group

The NASA NDE Working Group have the responsibilities and operate in accordance with the procedures given in its Charter. See Appendix D, Working Group.

6.4. NASA Field Installation Assignments

The Field Installation management assignments, in addition to those stated in NHB 5300.4, will be implemented per the Program Implementation Plan.

7. BUDGET

Section 5.0 presents projects recommended by the NNWG. The work accomplished by the Program will be in accordance with the funding level provided by NASA Headquarters and the priorities as established in the Implementation Plan. The funding level by fiscal year is shown in Table 1.

The funding allocated to Goals A and D are for activities necessary to achieve this goals. This may include travel funds in order to prepare position and presentation material, meet with interested parties, or present final papers at various locations, publication costs, etc. Projects associated with Goals B&C will be prioritized by the NNWG during the annual NNWG Workshops. The work that actually will be implemented and accomplished in the newer term will be based on program urgency and personnel and funding availability levels. A cost breakdown by Program Element and project is provided in the Program Implementation Plan.

Goals	FY'95	FY'96	FY'97	FY'98	FY'99	TOTAL
A. Role/Influence of NNWG						
B. NDE Infrastructure						
C. Process Standards and Specs.						
D. Technology Transfer						

RESOURCES

Baseline

Augmentation

TOTAL

8. MILESTONES

A Five year program schedule, showing the overall intent and scope of the planning activity, is provided in Table 2 below. The detailed program schedules will be presented in the program implementation plan.

Table 2: NDE Program Schedule

9. NASA NDE WORKING GROUP CONCURRENCE

Ames Research Center

Kennedy Space Center

Goddard Space Flight Center

Langley Research Center

Jet Propulsion Laboratory

Lewis Research Center

Johnson Space Center

Marshall Space Flight Center

Stennis Space Center

10. APPENDIX A: NNWG History

NASA NDE requirements are growing in complexity as we approach the 21st century. To effectively address the challenges that are associated with these requirements, a group of more than 20 NDE specialists representing each of the NASA Centers met at the Johnson Space Center (JSC) in Houston, Texas and formed the NASA NDE Working Group (NNWG). This meeting was initiated by the former NASA Headquarters manager Robert Burdine, with the assistance of Ted Lunch of Vitro, and was sponsored by NASA Code Q, Mission Safety and Quality. Further, the working group agreed to develop a charter, policy documents, standard operating procedures and a newsletter.

This history and the NNWG activity has been published in the Materials Evaluation, Vol. 52, No. 8, pp: 928-929 (August 1994) and it is attached herein.

Attach the Materials Evaluation article.

11. APPENDIX B: NNWG Current Position

11.1. Current Activity

Field Installation	FY'95 Activity	FY'95 Funding
ARC		
GSFC		
JPL	NNWG Newsletter	\$15K
JSC	NDE of Orbiter Structure	\$150K
KSC	Automated Orbiter Window Inspection/Certification	\$90K
	H2 Fire Camera	(FY'94)\$75K
	Corrosion Under Paint	\$100K
	Orbiter Reinforcement Carbon-Carbon Optical Scanner	(FY'94)\$75K
	Laser Shearography	\$50K
LaRC	NDE Assurance - Advanced NDE Methods	(FY'94)\$170K
LeRC	Radioactive Gas Penetrant NDE Methods	\$50K
MSFC	Laser Shearography	\$100K
	NDE of Silicon Nitride Balls for ATD Bearings	\$200K
	OSEE for Surface Contamination of RSRM	\$125K
SSC		

11.2. Preparing the Strategic Plan

The informal process for assessing needs and formulating and starting proposals for new tasks was discussed in the previous sections. NNWG has formed a Code Q Standing Committee who is responsible for recommendation of RTOP requirements, priorities as well as review RTOP proposals and prioritize the proposals for potential funding by OSMA.

The following are the FY'95 criteria:

1. # and \$ Total:

FY'95 pre-POP 94-1: 33 proposals (\$3.5 M)

FY'96 pre-POP 95-1 14 proposals (\$2.3 M)

2. Number of Submittals:

FY'95: no limit

FY'96: 4/\$500k per center including multi-center programs.

3. Evacuation Criteria
FY'95: Benefit to NASA/OSMA (35 points)
Program Needs (30 points)
Cost/Benefit/Risk Assessment (25 points)
Technology Transfer (10 points)

4. Pre-POP RTOP Ranking Process:

- FY'95: (1) produce a NASA NDE needs document,
(2) prepare proposals that address these needs,
(3) score and rank pre-POP proposals,
(4) submit a prioritized list to Code QW,
(5) response to POP, and
(6) award RTOP by Code Q.

FY'96: Due to the tight schedule this year, we did not go through the full process

A pre-ranking for top ten programs will be conducted by the Standing Committee and these programs will be presented at the Annual Workshop for a detailed review by the committee. The presentation before official ranking will provide opportunity to better understand the proposals and related information. The process will be

- (1) generate a NASA NDE needs document,
- (2) prepare proposals to the needs,
- (3) draft rank proposals to high, medium and low priority first,
- (4) select top ten for presentation at the January workshop,
- (5) score and rank the ten proposals,
- (6) submit a prioritized list to Code QW,
- (7) response to POP, and
- (8) award RTOP by Code Q.

2. In July of each year, the current Vice-Chair will become the Chair of the Code Q Technical Review Committee (formerly, Standing Committee) and the new Vice-Chair will be elected.

12. APPENDIX C: THE PLANNING PHASE

12.1. The need Assessment Process

During the first NNWG Workshop that was held in April 1993, it has been recognized that there is a need for Annual Workshops as well as other mechanisms for discussion of progress of Field Installation activities, various on-going relevant tasks, as well as presentation of proposed new work. The Working Group elected a Chair and a Vice-Chair to lead the Working Group activity while implementing the goals that we defined for the group. The Working Group also elected a Technical Review Committee that defines the need assessment process as a means to prioritize RTOP proposals.

12.2. Prioritizing RTOPs and Recommendations to Code Q

The NNWG Workshops are the principal meetings of the working group. A Workshop session is devoted to a meeting of the program planning committee and another session reports on the general committee activities. The criteria for prioritization process is as follows:

1. Involve as many Field Installation as possible to make it an Agency-wide program.
2. Provide capability to meet new requirements or improve performance.
3. Foster activities with other agencies.
4. Postpone funding activities which can survive on local funding.

12.3. Funding Rational

The cost to be borne by the NASA NDE Program for work done at the participating Field Installations will be only those associated with activities benefiting the Agency as a whole and not an intrinsic part of the installation's work. There are two underlying reasons for direct Headquarters funding of Agency-Wide Institutional Efforts. They are:

Headquarters identifies and assigns, per the NNWG.

Funds for an installations' activities should not be diminished by costs associated with the Agency-wide benefiting activities.

The work tasks found proper for funding by Headquarters are as follows:

1. NDE of flight hardware

- a. Inspection methods to assure the reliability of flight hardware
 - b. Cost efficient test methods
 - c. Support NASA goals of faster, better and cheaper
 - d. Shortening the product life cycle
 - e. Reduce redundancy and simple test procedures
 - f. Allow implementation of enabling technologies
2. NDE Infrastructure Tasks
- A. NNWG participation in Surveys and Workshops
 - B. Communications - Bulletin Board, Electronic Conferences, NNWG Newsletter, Mosaic Homepage System
 - C. Training - Technical, Project Support and Management
 - D. Administration - Document System, Financial Reports/Tracking

12.4. NNWG RTOP PROJECTS

The following table represents the RTOP projects that have been submitted to the Code Q Technical Review Committee for funding consideration. The order and schedule is the result of the Review Committee to accommodate the May 1995 funds availability:

	Centers	FY'96	FY'97	FY'98	FY'99
UT NDE Composites Integrity & Performance	JPL/LaRC	\$212K	\$219K	\$248K	
Reflectometer Development	KSC	\$150K	\$120K		
Valve Health Monitoring and Control	KSC	\$90K	\$100K		
Integrated Eddy Current Imaging Workstation	GSFC	\$80K	\$80K		
Engineering Tomography - Engine Components	LeRC	\$100K	\$100K	\$100K	
Laser Induced Multiple NDE	JPL/LaRC/MSFC	\$270K	\$295K	\$375K	\$210K
NDE Documents, Standards and Guidelines	JPL	\$80K	\$110K	\$85	\$60K
NDE of Fracture Control and Life Assessment	JSC	\$125K	\$125	\$125	
Bonded Joint NDE	LeRC	\$125K	\$125		
Spectral Ultrasonic Homogeneity Characterization	LeRC	\$140K	\$80K	\$80	\$80

13. APPENDIX D: WORKING GROUP CHARTER

Responsible Office: Safety and Mission Assurance Office

NASA NDE WORKING GROUP (NNWG) CHARTER

Attach HQ signed copy.