

**Office Work Instruction**

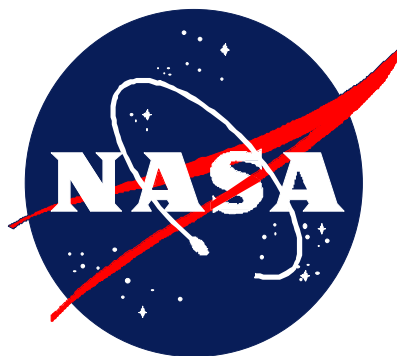
HQOWI 7120-Y011A

Effective Date: November 16, 1999

Responsible Office: YF/Program Planning and Development Division

**Subject: Formulating ESE Technology Development**

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**OFFICE WORK INSTRUCTION**

**FORMULATING ESE TECHNOLOGY  
DEVELOPMENT**

**Original Signed By:**

**Ghassem R. Asrar**

**Associate Administrator**

**Office of Earth Science**

**(Conforming to ISO 9001 Quality System Requirements)**

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**DOCUMENT HISTORY LOG**

<b>Status (Baseline/ Revision/ Canceled)</b>	<b>Document Revision</b>	<b>Effective Date</b>	<b>Description</b>
Baseline		2/8/99	
Revision	A	11/16/99	This is a significant update reflecting maturity of the technology strategy and formulation activities. Interfaces with the OWIs for Formulate and Approve Flight Missions and Solicit and Select Science, Applications, Education, and Technology are better defined, as are those with the Earth Science Technology Office at GSFC. Roles of participants have been clarified and strengthened. The Quality Records are better defined.

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### **PREFACE**

The NASA Office Work Instruction (OWI) for Formulating ESE Technology Development documents the tasks and activities in conformance with the International Organization for Standardization's (ISO) 9001 requirements for quality systems. The OWI supplements the *NASA Strategic Plan*, the *NASA Strategic Management Handbook*, and other higher level NASA directives, which form the basis for how NASA conducts business.

This OWI is not intended to duplicate or contradict any other NASA policy, procedures or guidelines, which currently exist. As such, the OWI will reference prevailing documents where a topic is addressed and existing coverage is deemed adequate. Additional information provided within is intended to supplement existing documentation regarding Headquarters (HQ) implementation of strategic and program/project management, as well as HQ conformance with the ISO 9001 Quality Management System (QMS) requirements.

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## 1.0 PURPOSE

This OWI documents the NASA Earth Science Enterprise (ESE) procedure for formulating ESE Technology Development activities.

## 2.0 SCOPE AND APPLICABILITY

2.1 Scope. The ESE procedure for formulating ESE Technology Development includes developing the ESE technology strategy for formulating new technology development programs, adding new projects to existing programs, developing and maintaining Program Commitment Agreements (PCA), determining technology requirements, developing technology options and partnerships, developing a technology needs assessment report, developing the *ESE Integrated Technology Development / Investment Plan*, and developing the *Technology Infusion Plan*. Investment plans are coordinated with other NASA technology development efforts such as the Cross-Enterprise Technology Development Program managed by the Space Science Enterprise.

The ESE Program Planning and Development Division (Code YF) oversees the Earth Science Technology Program (ESTP) and the Earth Science components of the New Millennium Program (NMP) and the High Performance Computing and Communications Program. Through a comprehensive planning process, ESE integrates a variety of ESE technology development programs/projects into a single comprehensive program.

- The ESTP identifies, evaluates, and invests in technologies early in their development life cycle to reduce the cost and time required to meet science and application program needs for advanced technology that can expeditiously be incorporated into spacecraft and their instrument payloads and into ground-based data, information, and instrumentation systems. Currently, the ESTP includes advanced concepts development, ESE core technology projects, technology studies, the Instrument Incubator Project (IIP), and information systems technology projects. The Earth Science Technology Office (ESTO) at Goddard Space Flight Center (GSFC, Code 720) manages the ESTP execution.
- The NMP provides for space validation of advanced measurement concepts. The objective is to conduct space flight validation of breakthrough technologies that significantly benefit future space science and earth science missions. The Space Science and Earth Science Enterprises jointly manage the NMP.
- The HPCC/Earth and Space Sciences (ESS) develops and demonstrates the potential of high performance computing & distributed networking to further our understanding and ability to predict the dynamic interaction of physical, chemical and biological processes affecting the Earth, the solar-terrestrial environment and the universe. The ESS activity is managed by the ESE with joint oversight by the Office of Space Sciences.

Appendix A depicts the framework within which ESE technology development program formulation activities take place. This Appendix is intended as informational only to illustrate how this OWI relates to others. However, where a potential conflict may be interpreted, the direction specified in each OWI takes precedence over that depicted in Appendix A. As shown in Appendix A, technology requirements developed under this OWI feed procedures documented in other OWIs. HQOWI 7120-Y003, *Formulate and Approve Flight Mission*, documents the procedure for developing and maintaining a program commitment agreement, documenting technology requirements, and developing solicitations for technology demonstration flight missions. Solicitations for focused ESE technology development projects and HPCC projects are done under HQOWI 8310-Y005, *Solicit and Select Science, Applications, Education, and Technology (SAET) Investigations*. The Instrument Incubator Project is an example of a focused technology project. HQOWI 1230-Y004, *Oversee and Evaluate Enterprise Program*, documents technology program oversight procedures.

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2.2 Applicability. This work instruction for Formulate the ESE Technology Development Program applies to the NASA Office of Earth Science (OES, Code Y) offices and divisions. The Associate Administrator for Earth Science is responsible for maintaining this document. The controlled version of this OWI is available on the World Wide Web (WWW) via the HQ ISO 9000 Document Library at <http://hqiso9000.hq.nasa.gov>. Any printed version of this OWI is uncontrolled (reference: HCP 1400.1, *Document and Data Control*). Proposed revisions will be accomplished by following HQOWI 1410-Y015, *Approve Quality Documents*.

### 3.0 DEFINITIONS (TBD)

3.1 Program Level (Level 1) Requirements. Program level (Level 1) technology requirements include and amplify those stated in the PCA and identify the science, applications, and supported operational measurement requirements which drive technology planning and development investments. They also include agency-level policy requirements affecting investment decisions. The program level requirements also identify key technology infusion need dates established as part of overall enterprise planning efforts.

Appendix B of the *Earth Science Enterprise Management Handbook* provides additional ESE-specific terms and definitions.

### 4.0 REFERENCES

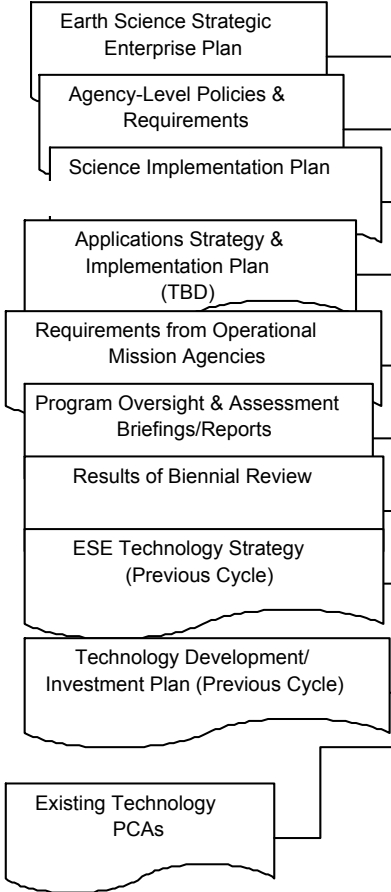
The following documents contain provisions that, through reference in this OWI or in policy or procedure documents, constitute the basis for the documented procedure:

NPG 7120.5	NASA Program and Project Management Processes and Requirements
HQOWI 7120-Y003	Formulate and Approve Flight Mission
HQOWI 8310-Y005	Solicit and Select Science, Applications, Education, and Technology (SAET) Investigations
HQOWI 1230-Y004	Oversee and Evaluate Enterprise Programs

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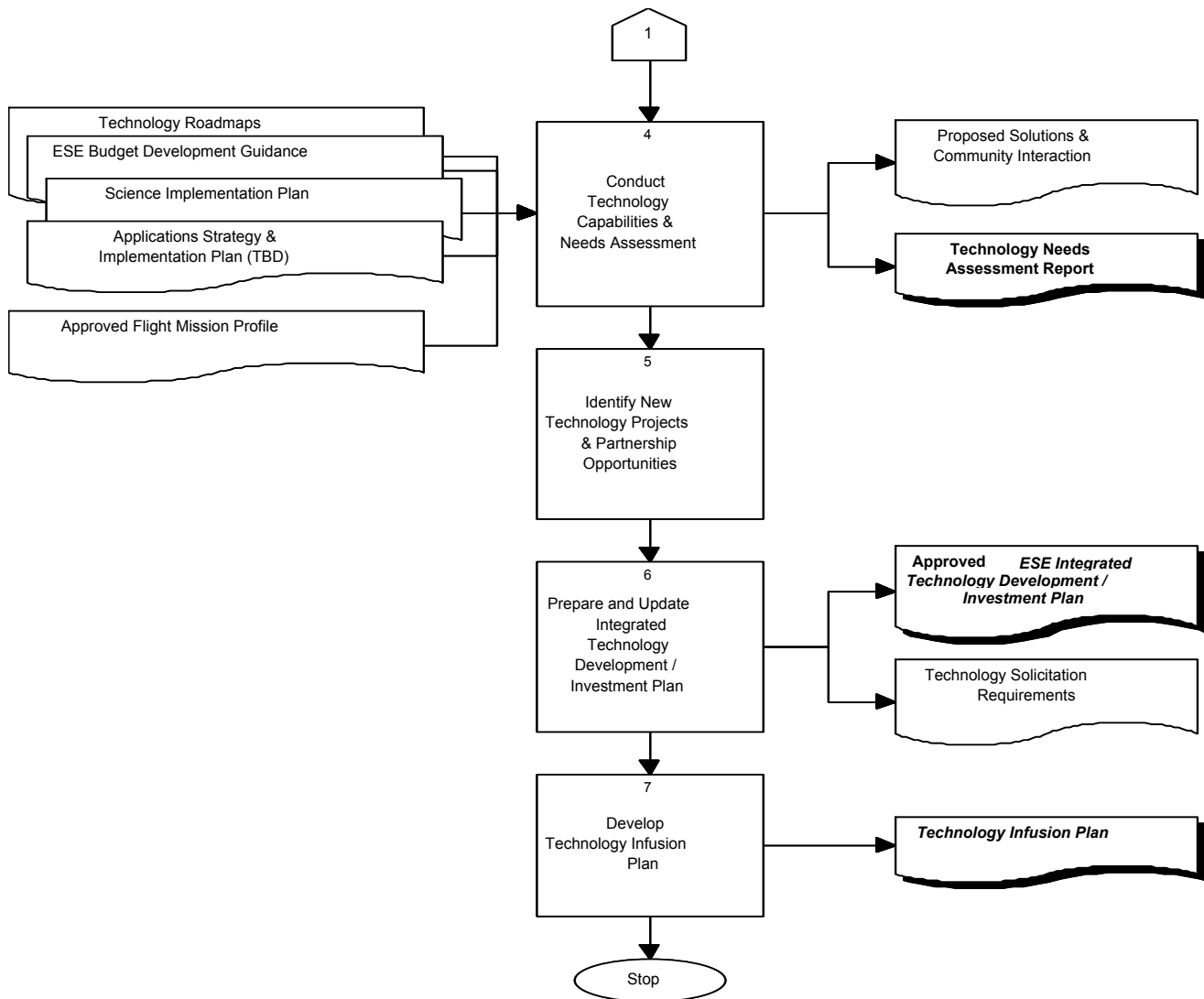
**5.0 FLOWCHART**

The following flowchart depicts the procedure described in Section 6. Outputs in boldface type represent the quality records listed in Section 7. The different border on Activity 1 indicates that this activity may move in future iterations to a different work instruction.



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## 5.0 FLOWCHART (CONTINUED)



## 6.0 PROCEDURE

The following table describes the flowchart of Section 5.



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- |   |          |   |
|---|----------|---|
| <p>Lead Technologist<sup>1</sup><br/>Technology Strategy Team<sup>2</sup><br/>ESE Associate Administrator</p>   | <p>1</p> | <p><u>Develop / Maintain Technology Strategy.</u> The <i>ESE Technology Strategy</i> complements the overall <i>Earth Science Strategic Enterprise Plan</i> and provides an expanded vision, more focused policy guidance, and essential planning and investment concepts for those implementing technology development activities. Developed and maintained by the lead technologist and approved by the ESE Associate Administrator (AA), it will be updated on a periodic cycle consistent with the Enterprise strategic plan. This activity includes the following major tasks:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <i>Review Current Documentation and Inputs.</i> With the support of the Earth Science Technology Office (ESTO), the lead technologist reviews Agency- and Enterprise-level strategies, policies, and implementation plans to identify and assess impacts on the current ESE technology strategy and investment plans.</li> <li><input type="checkbox"/> <i>Update the Technology Strategy Documentation.</i> With the support of the ESTO, the lead technologist updates the <i>ESE Technology Strategy</i> to reflect new policies, directions, requirements, and opportunities.</li> <li><input type="checkbox"/> <i>Review and Approve the ESE Technology Strategy.</i> The lead technologist submits the strategy document to the technology strategy team and to the Agency's Chief Technologist for review and comment. The lead technologist incorporates constructive comments, and submits the <i>ESE Technology Strategy</i> to the ESE AA for approval.</li> </ul> |
| <p>Lead Technologist,<br/>ESE Program Coordinator for Technology<br/>Technology Strategy Team<br/>ESE Associate Administrator<br/>ESE Business Division</p> | <p>2</p> | <p><u>Develop, Maintain, and Approve PCAs.</u> The PCA is a contract between the AA and the NASA Administrator to deliver specific technical, cost, and schedule commitments for a given program such as the ESTP or NMP. The PCA also establishes key policies and programmatic interfaces (such as complementary programs) which must be accommodated during program implementation.</p> <p>The PCA is written for the life-cycle of a program and is reviewed and updated annually. The PCA also is updated as new projects are initiated. Typically, an update involves the addition of an annex to an existing PCA covering new projects or budget revisions.</p> <p>The PCA outlines Enterprise-level technology requirements, near-to-mid (out to five years) and long-term (6 years and beyond) goals, and metrics to measure program performance and ensure compliance with the Government Performance and Results Act (GPRA). Both the AA and the</p>   |

<sup>1</sup> The Program Planning and Development Division (Code YF) provides the lead technologist. The lead technologist supported by the Program Coordinators for Technology Development conducts formulation activities on an annual basis in conjunction with the annual Program Operating Plan (POP) development activities.

<sup>2</sup> Code YF identifies representatives from NASA Field Centers and key programs for technology program formulation support and participation on the technology strategy team. The team includes the ESTP, NMP, and HPCC program manager and others from the Earth Science Technology Office (ESTO) at Goddard Space Flight Center.

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Administrator sign the PCA and are responsible for notifying the other in the event that a commitment cannot be met and to initiate the timely renegotiation of the terms.

This activity to develop, maintain, and approve the PCA includes the following major tasks:

- Formulate New Technology Thrusts and Enterprise-Level Requirements.* New technology thrusts, generated from NASA science and applications programs and mission concepts and, potentially, from ideas generated through the NASA Institute for Advanced Concepts, along with NASA and ESE strategic plans, are the fundamental input for developing technology program PCAs. Based on new or changed strategies and thrusts, the Lead Technologist will establish programmatic guidance and direction which the Program Coordinator for Technology will articulate as Enterprise-level (Level 1) requirements to reflect the refined strategic direction and objectives for the technology program.
- Establish Goals, Objectives, and Performance Metrics.* The lead technologist supported by a Program Coordinator for Technology and the ESE technology strategy team formulates technology program goals, objectives, and performance metrics in accordance with established and anticipated technology needs, science and application requirements, and policy guidance.

*Integrate and Write PCA.* Working with the appropriate technology program manager, the Program Coordinator for Technology consolidates and writes the draft PCA for AA review and approval. ESE has full responsibility for developing the ESTP PCA. The ESE is responsible for developing the Earth Science part of the NMP PCA and with the Office of Space Science seeks its approval by the Administrator. Similarly, the ESE is responsible for the Earth and Space Science component of the HPCC PCA and with the Office of Aerospace Technology seeks its approval by the Administrator. Since the majority of activities lead to definition and conduct of a space flight demonstration mission, the NMP PCA is handled through procedures defined in the Formulate and Approve Flight Missions (HQOWI 7120-Y003).

- Request PMC Approval to Proceed with Implementation.* For new programs, the Program Coordinator for Technology prepares program documentation and reports for submission to the NASA Program Management Council (PMC). As required by NPD 7120.5, *Program/Project Management*, the documentation presents the information developed in the formulation activity and includes the PCA.

The PMC assesses the documentation and determines if the program is consistent with Agency strategic goals and risk parameters. If risks are high, an independent readiness assessment may be required. The Independent Assessment Program Office (IAPO) typically prepares a presentation for the PMC that identifies the members of the assessment team, provides an executive summary, describes the Program, and discusses readiness, technical, and resource status

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and issues.

The PMC approves implementation of the program as proposed or provides guidance for reworking the program. The Program Coordinator for Technology revises the program as directed, and the PMC re-evaluates the program's implementation readiness. This cycle repeats until an acceptable program is formulated.

- Forward to AA and Administrator for Revisions/Approval.* The Program Coordinator for Technology presents the final draft PCA to the AA for approval. As part of the AA approval process, the proposed budget of the PCA is reviewed for approval by the Business Division (YB) prior to AA approval. This helps to ensure that the proposed PCA is consistent with the present formally approved budget. If requested, the Program Coordinator for Technology incorporates changes into the draft for final AA approval and signature. After the AA signs the PCA, the Program Coordinator for Technology sends it to the Administrator for signature. If requested, the Program Coordinator for Technology incorporates changes into the draft for final Administrator approval and signature.

Lead Technologist  
 ESE Program Coordinators for Technology  
 Technology Strategy Team  
 ESE Control Board  
 ESE Headquarters Division Directors  
  
 ESE AA

- 3 Establish Program-Level Technology Requirements. Program-level (Level I) technology requirements include and amplify those stated in the PCA and identify the science, applications, and supported operational measurement requirements which drive technology planning and development investments. The program-level requirements also identify key technology infusion need dates established as part of overall Enterprise planning efforts. Specific relationships and guidance with regard to complementary non-ESE technology development programs such as the Cross-enterprise Technology Development Program are established. These requirements are baselined by the ESE Control Board headed by the ESE AA at Headquarters. This activity includes the following major tasks:
  - Identify Scientific and Applications Measurement Objectives.* Scientific measurement objectives are generated through the Earth science community and are subject to periodic management and discipline reviews. The science and applications implementation plans document fundamental research themes. Under the direction of the lead technologist, ESE Program Coordinators for Technology work with scientists and applications specialists to identify the Earth system quantities that support the fundamental research themes. They then define the physical measurements that provide these quantities. At the discretion of the scientists and applications specialists, the process may involve the broader Earth science community in deriving measurement objectives. The technology strategy team, and science and applications program managers as appropriate, review the measurement objectives to ensure the requirements were interpreted correctly. These measurement objectives are included in the technology needs assessment report produced in Activity 4.
  - Coordinate with Complementary Non-ESE Technology Development Programs.* With the support of the ESTO and Program Coordinator

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for Technology, the lead technologist establishes formal interfaces and agreements with regard to how technology development requirements and investment planning will be coordinated and negotiated on a periodic (likely budget) cycle. The lead technologist identifies driving policies and joint requirements that will affect ESE technology investment planning.

- ❑ *Identify Mandated Technology Thrust Areas and Investment-Driving Goals.* ESE Program Coordinators for Technology and ESTO represent ESE in identified cooperating programs and in agency-level forums which establish technology development focus (thrust) areas, investment targets, and success metrics to which the Enterprise must respond. The lead technologist establishes the formal mechanisms and schedules essential for proper coordination and baselining of joint requirements.
- ❑ *Consolidate Scientific and Applications Measurement Objectives with Other Programmatic Drivers.* The lead technologist supported by ESTO consolidates the information developed and compiled in the previous tasks for inclusion in the Level I requirements document. The lead technologist presents the requirements to the ESE Control Board for any modifications and approval. In a subsequent external process, the ESTP, NMP, and HCPP program managers incorporate the requirements into the program plans as appropriate. The Program Plans will be approved by the ESE AA and the appropriate NASA Center Directors.

Lead Technologist  
Technology Strategy Team  
ESE Headquarters  
Division Directors

- 4 Conduct Technology Capabilities and Needs Assessment. This assessment, performed for Headquarters by the ESTO organization, results in the ESE technology needs assessment report. This report traces ESE capability needs and opportunities from the fundamental science and applications research themes identified as Level 1 requirements and as described in the Science and Applications Implementation Plans:
- to the Earth system quantities that need to be established to support the research theme,
  - to the physical measurements that could be used to provide the Earth system quantity,
  - to the detection approaches and implementation options that could be used to achieve the measurement,
  - to the system requirements and challenges for the implementation option.

The assessment activity includes the following tasks:

- ❑ *Formulate Technology and Implementation Options.* With the support of the ESTO and the Program Coordinator for Technology, the lead technologist formulates technology and implementation options that can or might achieve the Earth system quantity measurement objectives identified in the previous activity. Supported by the Technology Strategy Team, the options are evaluated to identify

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technology gaps. The gaps represent the science and applications communities' technology needs.

- ❑ *Identify Advanced Concepts, Thrust Areas and Information System Technologies.* Promising advanced science application and/or technology concepts that are not already identified by the science community are identified and compiled. These concepts are assigned priorities based on periodic technical review by ESE Program Coordinators for Technology supported by the technology strategy team, and are maintained in ESTP databases maintained by ESTO (see Activity 7).
- ❑ *Survey Science, Applications, and Technology Communities for Solutions to Technology Gaps.* ESE science application, and technical management periodically engage their communities to reaffirm priorities, to refine plans, and to address technology gaps. To accomplish this, ESE distributes technology gap information directly to a wide range of scientists; sponsors technology-oriented meetings, seminars, and symposia to distribute information and discuss technology gaps; and engages in in-depth information exchanges with members of the science community identified as having potential solutions to technology gaps. These exchanges serve to identify additional technology solutions, opportunities, and programmatic priorities for use in annual technology investment planning.
- ❑ *Conduct Trade Studies.* Trade studies translate the technology needs assessment implementation and technology gaps into technology performance requirements and compare the relative merits of competing approaches or options. Technologies that enable improved performance for spacecraft components, subsystems, and systems that satisfy measurement capability needs are examined along with feasible implementation options. Examples of trade studies include the following:
  - *Conceptual Mission Studies.* Studies that define conceptual mission, spacecraft, instrument, and information system requirements. These requirements are derived from scientific and application measurement objectives. Also identified are unique spacecraft requirements, including weight constraints, power limitations, and extremely high data rate throughput, and unique information system requirements, including rapid access to higher-level processed data products.
  - *Benefits-Costs Assessments.* Studies to analyze the relative benefits of implementing a specific technology versus the cost of the technology approach.
  - *Technology Readiness Level and Maturity Assessments.* Assessments of the readiness and maturity of specific technologies.
  - *Risk Assessments.* Studies to assess the risk of implementing a specific technology.

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- Assess and Prioritize Technology Options.* The most beneficial technology options are identified based on the results of the various studies conducted. Technology options are ranked in terms of their relevance, for example, to mission, spacecraft, instrument, and information system requirements; cost/benefit ratio; level of readiness and maturity; and risk potential.
- Identify Technologies for Maturity Advancement.* Technologies recognized as critical by potential mission proposers, mission implementers, and flight and ground system providers are identified for maturity advancement. Technologies deemed critical and not currently at an appropriate maturity level to allow for incorporation into missions within a 3-year timeline, are identified and selected for advancement. This task will be worked concurrently with the Develop and Approve Requirements Sets (Candidate Flight Measurement Profiles) activity of HQOWI 7120-Y003 in order to identify “mission-pull” critical needs and “technology-push” opportunities.
- Validate New Technology Capabilities.* Technologies recognized as critical by potential mission proposers and reviewers, mission implementers, and flight and ground system providers are identified for validation. The new capabilities of technologies are validated as required to reduce risks to first-time users to an acceptable level.
- Incorporate Priorities into the Technology Needs Assessment Report.* Information developed and compiled in the previous tasks is incorporated into the technology needs assessment report.
- Obtain Concurrence.* The lead technologist submits the report to the ESE technical division<sup>3</sup> directors for review and comment. The lead technologist incorporates constructive comments, approves and publishes the final report. ESTO establishes a configuration controlled version for future planning and program commitments.

Lead Technologist  
Technology Strategy  
Team, Program  
Coordinator for  
Technology

- 5 Identify New Technology Projects and Partnership Opportunities. Leveraging technology investments with new technology projects and partnerships within the Agency and with other government agencies is a critical activity for reducing costs. To accomplish this, the integrated technology needs assessment must be communicated to, and well understood by, potential partners. This activity includes the following major tasks:
- Distribute Information.* The technology strategy team disseminates and advocates program information on technological needs and initiatives to a wide range of potential partners.
  - Sponsor Events.* The lead technologist supported by the Program Coordinator for Technology, the Technology Program Manager, and ESTO sponsors technology-oriented meetings, seminars, and symposia to distribute information and identify new, external

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<sup>3</sup> The ESE technical divisions include the Research Division; the Applications, Commercialization, and Education Division; and the Program Planning and Development Division.

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technology projects and potential partners.

- Conduct Joint Activities with Potential Partners.* Once potential partners are identified, the technology strategy team conducts joint activities to establish mutually beneficial leveraging programs. A partnership agreement with an external organization or other NASA Enterprise may result.

Lead Technologist  
 Technology Strategy Team  
 ESE Associate Administrator  
 ESE Division Directors

- 6 Prepare and Update Integrated Technology Development / Investment Plan. Based on the results of the trade studies and partnership activities, priorities are established for near-, mid-, and long-term technology development goals. The goals guide ESE and NASA cross-enterprise investments. They also identify leverage opportunities within external technology development programs (Activity 5). The optimized plan for achieving the priority technology development goals within the range of available technology development programs/projects constitutes the *ESE Integrated Technology Development / Investment Plan*. This plan is prepared by the ESTO organization for Headquarters approval. This activity includes the following major tasks with ESTO and NMP support:
- Prioritize Technology Development Goals.* Technology development goals are prioritized based on results from the trade studies and community review. The prioritized goals include performance metrics and readiness need dates projected out 5-years.
  - Identify Leveraging Opportunities.* Outside organizations developing technologies and available for leveraging synergistic investments -- initially identified in Activity 5 -- are down-selected and discussed.
  - Identify Agreements for Mutual Development Opportunities.* Agreements that would facilitate desired technology developments with both NASA and non-NASA organizations are evaluated.
  - Develop Plans to Address Remaining Technology Goals.* Technology development goals that remain unmet after leveraging and agreement opportunities are identified. Plans are developed and/or revised to address these unmet goals.
  - Conduct Periodic Technology Assessments.* On a periodic, but not less than annual, basis the ESTO will conduct an assessment of the state of technology readiness for all the areas of technology of interest reflected in the Technology Needs Assessment document and database. The readiness assessment will be used in making determinations about development progress for the next cycle of investment planning and will be made available to technology panels and other review groups involved with technology acquisitions and mission solicitations.
  - Prepare Plan and Coordinate Review.* Results from the major tasks are consolidated into a draft *ESE Integrated Technology Development / Investment Plan*. The plan will include investments for ESTP, HPCC, and NMP. This draft plan is distributed to the appropriate science, applications, and mission programs for review and comment. The draft also is sent to the technology strategy team and the technology subcommittee of the NASA Advisory Council's

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Earth System Science and Applications Advisory Committee (ESSAAC) for review and comment. Comments are consolidated and incorporated into a final draft as required. This plan will identify solicitations required for technology developments to be implemented through the Instrument Incubator Project, other approved ESTP technology development project areas, for space-based technology demonstration missions to be implemented through the NMP, and for advanced computing and information systems projects to be accomplished through the HPCC. These particular solicitations will be conducted through Headquarters in accordance with processes defined in HQOWI 7120-Y003, *Formulate and Approve Flight Mission*, and HQOWI 8310-Y005, *Solicit and Select Science, Applications, Education, and Technology (SAET) Investigations*. Focused component technology research and advanced concept studies may be awarded directly by ESTO for the ESTP, by JPL for the NMP, and by other NASA Centers as determined appropriate during the planning activities.

- Present Plan to the Associate Administrator for Approval.* The final draft is presented to the AA for approval after ESE Headquarters Division Director review. If requested by the AA, changes are made to the draft prior to final approval. The approved *ESE Integrated Technology Development / Investment Plan* provides the program requirements and priorities required as input to the ESE budget formulation process.
- Update Technology Inventory Databases.* The ESTP Program Manager at ESTO updates appropriate Agency-managed technology databases following direction from the Agency's Chief Technologist. The ESTP Program Manager will establish and periodically verify quality control measures with regard to these database(s).

Lead Technologist  
Program Coordinator  
for Technology  
Technology Strategy  
Team  
ESE Associate  
Administrator

- 7 *Develop Technology Infusion Plan.* This plan documents the projected outcome of technology investments with regard to availability for infusion into planned future science and applications missions. It is based on the approved Integrated Technology Development/Investment Plan and the established mission need dates (Level I requirements). It reflects key technologies projected to be available by each need date as derived from earlier technology assessments conducted by ESTO and from the approved investment plan. It also reflects key technology readiness dates to enable future measurement concepts and exploratory missions. The *Technology Infusion Plan* will be an input to the development of candidate flight measurement profiles prepared through HQOWI 7120-Y003, *Formulate and Approve Flight Missions*. The plan and the approved flight measurement profile provide a major input to the next technology development planning cycle. This plan is prepared by the ESTO, with input from the NMP, the HPCC, and other technology strategy team members as appropriate, for Lead Technologist approval.

This activity includes the following major tasks:

- Project Technology Readiness Dates.* This information is provided for technologies developed or supported and advocated by ESE and



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is critical to future mission planning.

- ❑ *Disseminate New Technology Information.* Information on the capabilities and maturity of new technologies is broadly disseminated to potential mission proposers and reviewers, mission implementers, and flight and ground system providers. Methods for dissemination are identified in this plan and may vary for each technology development program. Dissemination is the responsibility of the program managers.
- ❑ *Ensure Technology Availability to Industry.* New technology capabilities are identified for transfer to Industry to ensure that resulting products and capabilities are truly available for user incorporation. Where appropriate, commercial standards and architectures are identified for adoption. Transfer methods are identified in this plan.
- ❑ *Prepare and Disseminate Technology Infusion Plan.* Information developed and compiled in the above activity tasks are consolidated into the plan. The lead technologist, supported by the Program Coordinator for Technology, submits the report to the ESE technical division directors for review and comment. The lead technologist incorporates constructive comments, approves, and publishes the final report.
- ❑

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**7.0 QUALITY RECORDS**

RECORD IDENTIFICATION	OWNER	LOCATION	MEDIA Electronic or Hardcopy	SCHEDULE AND ITEM NUMBERS*	RETENTION / DISPOSITION
<i>ESE Technology Strategy</i>	Lead Technologist	Program Planning and Development Division (PPDD) Files	Hardcopy or electronic media as appropriate	Schedule 7, Item 4, "R&D Long Range Planning Files," paragraph A.	Permanent.  Retire to Federal Records Center (FRC) 5 years after supersession or completion. Transfer to National Archives and Records Administration (NARA) when 10 years old.
Approved PCA	Program Coordinator	PPDD Files	Hardcopy or electronic media as appropriate	Schedule 7, Item 6, "R&D Program Manager Control Files."	Permanent.  Retire to FRC 2 years after completion, cancellation, termination, or suspension of the program. Transfer to NARA 10 years after subject event or when 25 years old whichever is sooner.
Technology Program Requirements (Level 1)	Lead Technologist Program Coordinator	PPDD Files	Hardcopy or electronic media as appropriate	Schedule 7, Item 6.	Permanent.  Retire to FRC 2 years after completion, cancellation, termination, or suspension of the program. Transfer to NARA 10 years after subject event or when 25 years old whichever is sooner.
<i>Technology Needs Assessment Report</i>	Lead Technologist	PPDD Files	Hardcopy or electronic media as appropriate	Schedule 7, Item 4, paragraph A.	Permanent.  Retire to FRC 5 years after supersession or completion. Transfer to NARA when 10 years old.
<i>Approved ESE Integrated Technology Development / Investment Plan</i>	Lead Technologist	PPDD Files	Hardcopy or electronic media as appropriate	Schedule 7, Item 4, paragraph A.	Permanent.  Retire to FRC 5 years after supersession or completion. Transfer to NARA when 10 years old.
<i>Technology Infusion Plan</i>	Lead Technologist	PPDD Files	Hardcopy or electronic media as appropriate	Schedule 7, Item 4, paragraph A.	Permanent.  Retire to FRC 5 years after supersession or completion. Transfer to NARA when 10 years old.
<i>Approved Program Plan</i>	Program Coordinator	PPDD Files	Hardcopy or electronic media as appropriate	Schedule 7, Item 6, "R&D Program Manager Control Files."	Permanent.  Retire to FRC 2 years after completion, cancellation, termination, or suspension of the program. Transfer to NARA 10 years after subject event or when 25 years old whichever is sooner.

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\* Quality Records are retained in accordance with the referenced schedule and item numbers from NPG 1441.1, *NASA Records Retention Schedules*.

## Earth Science Enterprise Office Work Instruction

**Formulating ESE Technology Development**

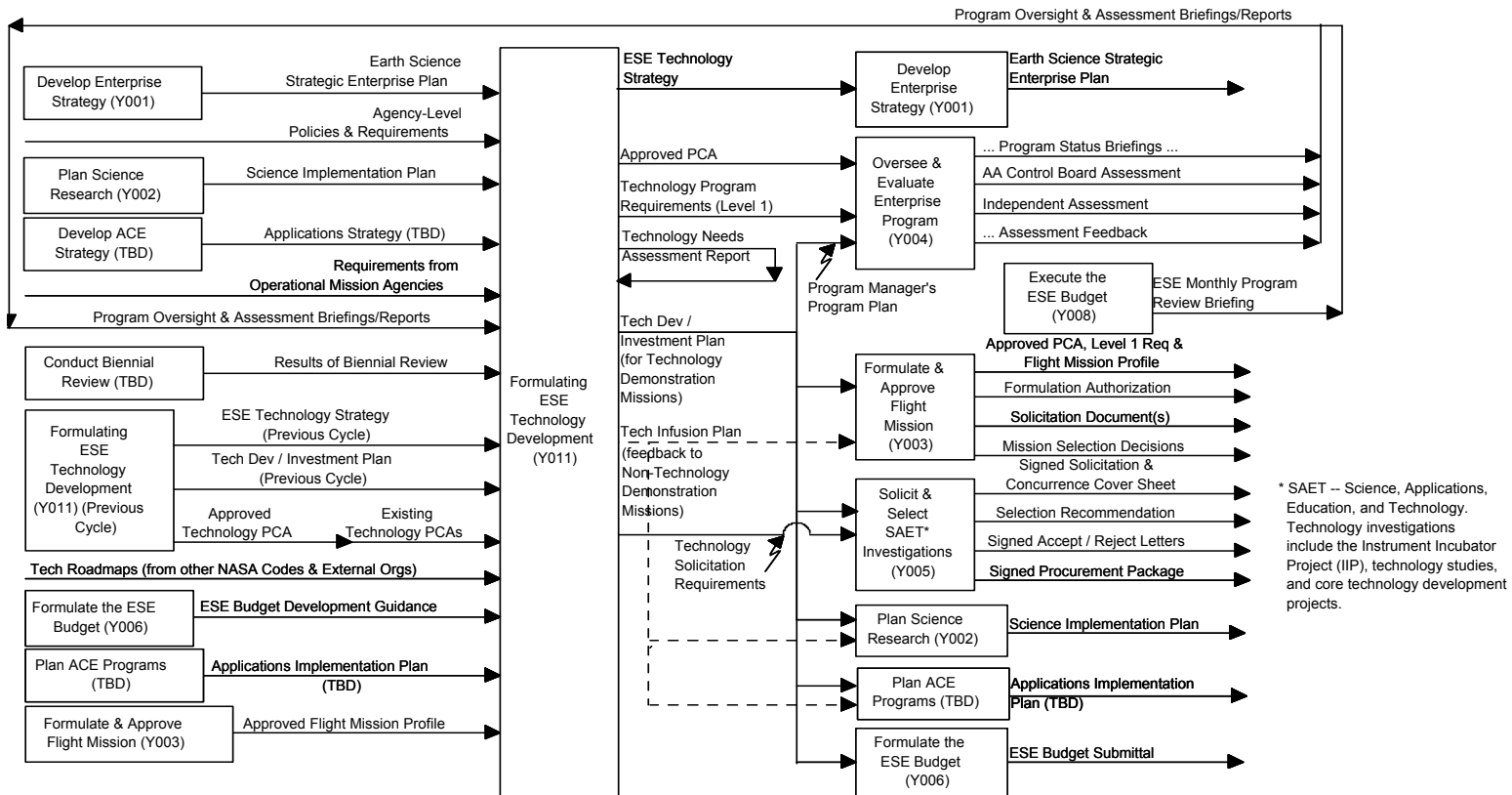
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### APPENDIX A. ESE TECHNOLOGY DEVELOPMENT FRAMEWORK



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**APPENDIX B. EXTERNAL GROUPS**

ESE obtains information, advice, and guidance via conferences, workshops, information exchange meetings, and reports from the following organizations:

- ❑ *NASA Advisory Council's Earth System Science and Applications Advisory Committee (ESSAAC).* Established to work closely with ESE managers to ensure that ESE program planning and direction are consistent with the Enterprise's mission, national priorities, and interests of ESE commercial and international partners. Various ESSAAC subcommittees address ESE-related topics. For example, the ESSAAC Technology Subcommittee provides advice and recommendations to the NASA Advisory Council, through the ESSAAC, on the relationships between ESE science goals and potential solutions. This Subcommittee consists of individuals from universities, other federal agencies and laboratories, and private industry.
- ❑ *Ad Hoc Working Groups.* On an as-needed basis, ad hoc working groups are formed for the purpose of reviewing special aspects of the *ESE Integrated Technology Development / Investment Plan*.
- ❑ *Special Interest DoD Technology Working Groups and Alliances.*
- ❑ *Technology and Commercialization Advisory Committee (TCAC).*