2008 NASA SOFTWARE OF THE YEAR SUMMARY EVALUATION DOCUMENT

Identification Information	
Software Title:	
NASA Case No.	
Responsible Center(s):	

Software's Developmental Status	
Current Technology Readiness Level (1-9):	Classification (A-H):

Significance to NASA Mission Part A - Impact on NASA's Mission

Significance to Science, Technology, & Industry in General Part B – Impact on Science & Technology

Significance in Impact on the Quality of Human Life Part C

Extent of Current and Potential Use

Usability of the Software

Usability of the Software (Continued)

Quality Factors Considered in Software

Quality Factors Considered in Software (Continued)

Quality Factors Considered in Software (Continued)

Efforts to Transfer/Commercialize Software	
Description of Plan/Strategy to Transfer/Commercialize Software	
NASA Intellectual Property Status/Potential	
Commercialization Potential for the software.	
Dates Software released for commercial or program use	
List all existing licenses and/or partnership agreements for the software	

Innovation (Creative New Features, Solutions, and Achievements)

2005 NASA SOFTWARE OF THE YEAR SUMMARY EVALUATION DOCUMENT FORM

Instructions

The purpose of the Summary Evaluation Document is to provide the Software of the Year (SOY) Panel Members with most of the information necessary to evaluate each nominated software package.

Each Center must submit a Summary Evaluation Document for each software package they nominate. The information provided in the attachment must:

- Fit on six printed pages. A page is a standard 8.5 x 11-inch piece of paper printed in 12 pitch Times Roman font with one-inch margins (top, bottom, and sides). **Note: The SOY Panel Members will only be given the first 6 pages of the Summary Evaluation Document submitted for each software package nominated.**
- Contain all sections of the Summary Evaluation Document form (the evaluation sheet used maps directly to the sections in the Summary Evaluation Document form).
- Be sufficiently focused and accurate to allow the SOY Panel Members to easily understand and score the nominated software. Please use the Glossary for an explanation of terms used in these guidelines and in the evaluation sheet.

There are eight sections on the evaluation sheet and eight corresponding sections in the Summary Evaluation Document form as follows:

Section	Title	Required Information
1. Refer to the glossary in Appendix I for a definition of terms used. 2. For Sections III, IV, V, VI, and VII, use as much space as needed to describe the areas in the Summary Evaluation Document form, however, do not exceed the 6-page limit on the total Summary Evaluation Document form.		
I	Identification Information	Provide: • Software title, same as that used in Form 1329 (Space Act Award Application). • NASA case number assigned during the processing of the NASA Disclosure of Invention and New Technology (Including Software) Form 1679, and • Responsible Center(s) which includes the Center sponsoring the software nomination for SOY award and all other Centers involved in developing the software.
II	Software's Developmental Status	Provide the current Technology Readiness Level (as defined in Appendix II) of the software. If the level is 6 or less the software will be automatically excluded from SOY competition.
III Part A	NASA Mission Significance and Impact	Describe the significance and impact (see definitions of significance and impact in the SOY Glossary) the software has on NASA's mission. Identify: • NASA Headquarters programs, projects and technologies that are being directly supported by this software.

Instructions

Section	Title	Required Information
1. Refer to the glossary in Appendix I for a definition of terms used. 2. For Sections III, IV, V, VI, and VII, use as much space as needed to describe the areas in the Summary Evaluation Document form, however, do not exceed the 6-page limit on the total Summary Evaluation Document form.		
		• Client group. • Why the software is significant in the technology areas? • The software's impact in these areas.
III Part B	Science, Technology, & Industry Significance and Impact	Describe the significance and impact the software has on science, technology, & industry beyond direct support to NASA's missions (e.g., biotechnology, medicine, education, etc.). This refers to the adaptation of NASA mission technologies to secondary technology application areas for clientele different than those originally intended. These technology areas are known as horizontal technologies (see glossary). Identify: • The sciences and/or technologies that are being directly supported by this software. • Client group. • Why the software is significant in the horizontal technology application areas. • The software's impact in these areas.
III Part C	Impact on the Quality of Human Life	Describe the significance and impact the software has on the quality of human life. Consider such things as: • Intellectual impact • Environmental impact • Energy conservation impact • Tool to help improve human understanding of life • Health and safety impact • Improvement in processes such as: administrative, technical, research, educational, etc.
IV	Extent of Current and Potential Use	Describe the extent to which the software is supporting or has potential to support government & private sector efforts. For present use identify: • Federal, state, and/or local governments using the software. • Non-government (private sector) organizations using the software. • Points of contact for each government and non-government organization using the software, including name, address, and phone number.

Instructions

Section	Title	Required Information
1. Refer to the glossary in Appendix I for a definition of terms used. 2. For Sections III, IV, V, VI, and VII, use as much space as needed to describe the areas in the Summary Evaluation Document form, however, do not exceed the 6-page limit on the total Summary Evaluation Document form.		
		For potential use identify: • Federal, state, and/or local governments that may make use of the software. • Non-government (private sector) organizations that may make use of the software. • Where and how the software's sponsoring organization intends to try to expand the use of the software. For both current and potential use identify the level of use (modest, average, above average and excellent as defined in the glossary of these instructions).
Creativity		Components used to evaluate software creativity on the software evaluation sheet are: – The usability of the software (approximately 10 % of the creativity score) – The quality of the software package (approximately 40% of the creativity score) – The efforts made to commercialize the software (approximately 10% of the creativity score), and – Innovation produced in the development of the software (approximately 30% of the creativity score).
V	Usability of the Software	Describe key factors, which make the software easy for the end user to use. Specifically address: • Ease of use features that help the end-user understand system displays, input requirements, and outputs. • Technical support provided for problem consultation, trouble-shooting, debugging, fixes, maintenance, and enhancements. • Documentation available including help functions. • Training available. Describe the courses to include media used (e.g., classroom, web, videos, etc.) target audience and schedule for the next 12 months.
VI	Quality Factors Considered in Developing the Software	Provide the justification used for selecting each of the following: • Architecture (e.g., Object oriented, functional

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		decomposition, etc.) • Programming language(s) used • Operating environment (e.g., operating system(s), hardware platform(s), web interactive interface(s), etc.) Furthermore, describe the quality factors that were addressed in developing the software and the tradeoffs made between each factor listed: • Reliability • Function • Performance - to include a description of the performance objectives and technical performance measures that were used. Also indicate if the original performance objectives were achieved. • Reuse • Maintainability See the glossary included in these instructions for definitions of each of the above terms.
VII	Efforts to Transfer / Commercialize Software	Identify efforts made to transfer or commercialize the software including: • Plan/strategy to transfer or commercialize the software. This should include, but is not limited to, establishing licensable IP, marketing the software for commercial use and licensing, and creating NASA/industry partnerships. • IP status and potential of the software, including efforts to establish rights in inventions, copyrights and trademarks that are licensable by NASA. • Commercialization potential assessed, including the identification of key market factors, commercial needs, and the suitability of the software. • Date(s) the software was released for commercial use in accordance with NPD/NPG 2210. • List all existing IP licenses associated with the software in a commercial environment or NASA/industry partnership agreements for the development /commercialization of the software.
VIII	Innovation	Describe the extent of innovation (newness, originality, and/or uniqueness) involved in developing the software.

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		Specifically address: • The extent to which the software is a redevelopment of COTS equivalent software available in the market. If COTS equivalent software exists, state why the COTS was not used and why the equivalent software was developed. • Improvement/non-trivial modification to the state of the art that was made in developing the software. • Any advances in the state-of-the-art achieved by the software. • Any ground-breaking/original software technologies such as new or novel methods, techniques, languages, processes, etc.

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GLOSSARY

Advances the State-of-the-Art: Software that significantly improves or updates currently existing concepts, operating environments, development tools, languages or new processes.

Assessment of Use: An evaluation of the extent of present use of the software and of potential use/marketability of the software. Levels of use or potential use may be defined as follows:

- Modest: less than $1.0 million of useful value.
- Average: between $1.0 million and $10 million of useful value.
- Above Average: between $10 million and $100 million of useful value.
- Excellent: over $100 million of useful value.

Copyright: A government issued grant of exclusive right to an author for an original work that is fixed in a tangible medium of expression, such as software. This right includes the right to exclude others from copying, distributing, and from developing other software derived from the copyright protected software.

COTS (Commercial Off The Shelf) Equivalent SW Available on Market: Are there any software products on the market that are equivalent in functionality and capability to the nominated software product

Creativity: See innovation. Components used to evaluate software creativity on the software evaluation sheet are:

- The usability of the software (approximately 10 % of the creativity score)
- The quality of the software package (approximately 40% of the creativity score)
- The efforts made to commercialize the software (approximately 10% of the creativity score), and
- Innovation produced in the development of the software (approximately 30% of the creativity score).

Development Status: The current Technology Readiness Level (TRL) of the software package. If the software is rated between 1 and 6, it is automatically disqualified from further SOY competition. The definitions of the TRL levels are found in Appendix II.

Documentation Quality: The degree to which published operating procedures, system functional descriptions, and technical specifications are understandable and useful.

Ease of Use: The end user's perspective of how effortless the system is to interact with and understand. This includes several user related issues such as:

- User system interface (e.g., a graphical user interface (GUI)) and the mechanisms (menus, icons and buttons) by which the user exercises the system functions,
- User support provided, and
- Flexibility in changing the content and format of system outputs (reports, displays, and other output).

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Efforts to Commercialize Software: Patent council determination that the software may be licensable, patents, copyrighted material, trade secrets, inventions, trademarks and other knowledge that is the basis for commercializing the software.

Function: How closely the system processes match the end user's requirements. Also, refers to verification of the software program with regard to its correctness in meeting the requirements/specifications.

Ground Breaking/Original: Software applications whose functionality never existed before. This item refers to the development of new software technologies such as new languages, methods, techniques and processes.

Government Potential Use: The likelihood that the currently operational NASA software may be utilized in support of other government agencies (federal, state, or local).

Government Present Use: The extent of current federal, state, and/or local government utilization of the currently operational NASA software.

Horizontal Technology: A Technology in one technology area of application that is adapted to a different area of application.

Impact: The effect of the software on the program, and/or project. Examples of impact include: cost and timesavings, increased productivity, reduced risk, and increased security and safety,

Improvement/Non-Trivial Modification: New software or any pre-existing software modified by more than a trivial variation or improvement. A trivial variation or improvement includes minor code improvements that do not materially alter the software's operation.

Innovation: Producing meaningful new ideas, forms, methods, techniques, processes, systems, and interpretations or analogies. Also, using new knowledge, ideas, and/or inventions to create new products or services. Components used to evaluate software creativity on the software evaluation sheet are:
- Whether or not there is equivalent COTS software available,
- Improvement/non-trivial modification of previously existing software,
- Advances in the state-of-the-art, and
- Groundbreaking/original effort.

Invention: Any new idea, concept, technique, device, or process that has not yet been commercialized.

Justification for selecting technology and/or approach chosen: This justification is concerned with use of effective architecture(s), languages and tools. What efforts were made to select an architecture that would assure the optimal technological approach? For example:
- What was the architecture (Object-oriented, Function-based, etc) chosen and why?

– What language(s) (such as 4GLs or specialized languages) was chosen and why?

Maintainability: The ease and cost-effectiveness of system trouble-shooting, fixes, upgrades, and enhancements to meet changing system requirements.

NASA Case No: The number used in Form 1329 and is assigned by the Center Patent Attorney during processing of the New Technology Disclosure Form 1679.

Non-Government Potential Use: The likelihood that the currently operational NASA software may be utilized in the support of industry and non-profit sectors.

Non-Government Present Use: The extent of current utilization by industry and/or non-profit sectors of the currently operational NASA software.

Other Science and Technologies: Horizontal or crosscutting technology areas (e.g., Biotechnology, Communications, Construction, Education, Environment, Information Technology, Manufacturing, Materials, Medicine, etc) and secondary uses of the technology:
– Where the user(s) is not necessarily part of the clientele group for whom the application was originally developed.
– Whose application extends outside of NASA's mission support.

Patent: A government grant issued to an inventor or applicant for an invention that gives the inventor or applicant the right to exclude others from making, using, selling, or importing the patented invention.

Performance: The efficiency and effectiveness of the software system operation, in terms of responsiveness, throughput, cost and other technical performance measures. Response is a measure of how quickly and effectively the system reacts to a user's interaction with the system. Throughput is a measure of the computational work (based on workload characterization) accomplished by the system (software and hardware) within a specified time. The technical performance measures vary from system to system.

Portability: The extent of compatibility of the software with different operating system environments.

Quality: The extent of the superiority or excellence of the software measured by factors such as: how correctly the software performs the functions for which it was designed; system performance; system reliability; maintainability; and reuse of design, specifications and code.

Reliability: A measure of the probability that a system is operating satisfactorily at a given time. Also, refers to failsafe features built into the application.

Responsible Center: this is the sponsoring Center of the software nominated for the Software of the Year (SOY) Award.

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Reuse: The extent to which the design, specifications, and/or source lines of certified software code of the system being considered for the SOY Award has been structured to facilitate adoption into systems to be developed in the future. Also, the extent to which previous designs, specifications, and/or source lines of certified software code have been incorporated into the system being considered for SOY award.

Science and Technology Significance: The extent of impact the software has on NASA's missions and/or the impact of the software on other science and Technology. See "Other Science and Technology" for further definition in this area.

Significance: Why something stands out or is important. Examples include: unique or greatly improved processes or products; functions, analytical tools and models that enable the development of systems or enable the execution of missions; and new and unique product that has a high probability of commercial success.

Software Class (from NPR 7150.2, NASA Software Engineering Requirements):

Class A Human Rated Software Systems	Applies to all space flight software subsystems (ground and flight) developed and/or operated by or for NASA to support human activity in space and that interact with NASA human space flight systems. Space flight system design and associated risks to humans are evaluated over the program's life cycle, including design, development, fabrication, processing, maintenance, launch, recovery, and final disposal. Examples of Class A software for human rated space flight include but are not limited to: guidance; navigation and control; life support systems; crew escape; automated rendezvous and docking; failure detection, isolation and recovery; and mission operations.
Class B Non-Human Space Rated Software Systems	Flight and ground software that must perform reliably in order to accomplish primary mission objectives. Examples of Class B software for non-human (robotic) spaceflight include, but are not limited to, propulsion systems; power systems; guidance navigation and control; fault protection; thermal systems; command and control ground systems; planetary surface operations; hazard prevention; primary

	instruments; or other subsystems that could cause the loss of science return from multiple instruments.
Class C Mission Support Software	Flight or ground software that is necessary for the science return from a single (non-critical) instrument or is used to analyze or process mission data or other software for which a defect could adversely impact attainment of some secondary mission objectives or cause operational problems for which potential work-arounds exist. Examples of Class C software include, but are not limited to, software that supports prelaunch integration and test, mission data processing and analysis, analysis software used in trend analysis and calibration of flight engineering parameters, primary/major science data collection and distribution systems, major Center facilities, data acquisition and control systems, aeronautic applications, or software employed by network operations and control (which is redundant with systems used at tracking complexes). Class C software must be developed carefully, but validation and verification effort is generally less intensive than for Class B.
Class D Analysis and Distribution Software	Non-space flight software. Software developed to perform science data collection, storage, and distribution; or perform engineering and hardware data analysis. A defect in Class D software may cause rework but has no direct impact on mission objectives or system safety. Examples of Class D software include, but are not limited to, software tools; analysis tools, and science data collection and distribution systems.
Class E Development Support Software	Non-space flight software. Software developed to explore a design concept; or support software or hardware development functions such as requirements management, design, test and integration, configuration management, documentation, or perform science analysis. A defect in Class E software may cause rework but

	has no direct impact on mission objectives or system safety. Examples of Class E software include, but are not limited to, earth science modeling, information only websites (non-business/information technology); science data analysis; and low technical readiness level research software.
Class F General Purpose Computing Software (Multi-Center or Multi-Program/Project)	General purpose computing software used in support of the Agency, multiple Centers, or multiple programs/projects, as described for the General Purpose Infrastructure To-Be Component of the NASA Architecture, Volume 5 (To-Be Architecture), and for the following portfolios: voice, wide area network, local area network, video, data centers, application services, messaging and collaboration, and public web. A defect in Class F software is likely to affect the productivity of multiple users across several geographic locations, and may possibly affect mission objectives or system safety. Mission objectives can be cost, schedule, or technical objectives for any work that the Agency performs. Examples of Class F software include, but are not limited to, software in support of the NASA-wide area network; the NASA Web portal; and applications supporting the Agency's Integrated Financial Management Program, such as the time and attendance system, Travel Manager, Business Warehouse, and E-Payroll.
Class G General Purpose Computing Software (Single Center or Project)	General purpose computing software used in support of a single Center or project, as described for locally deployed portions of the General Purpose Infrastructure To-Be Component of the NASA Architecture, Volume 5 (To-Be Architecture) and for the following portfolios: voice, local area network, video, data centers, application services, messaging and collaboration, and public web. A defect in Class G software is likely to affect the productivity of multiple users in a single geographic location or workgroup, but is unlikely to affect mission

	objectives or system safety. Examples of Class G software include, but are not limited to, software for Center custom applications such as Headquarters' Corrective Action Tracking System and Headquarters' ODIN New User Request System.
Class H: General Purpose Desktop Software	General purpose desktop software as described for the General Purpose Infrastructure To-Be Component (Desktop Hardware & Software Portfolio) of the NASA Architecture, Volume 5 (NASA To-Be Architecture). This class includes software for Wintel, Mac, and Unix desktops as well as laptops. A defect in Class H software may affect the productivity of a single user or small group of users but generally will not affect mission objectives or system safety. However, a defect in desktop IT-security related software, e.g., anti-virus software, may lead to loss of functionality and productivity across multiple users and systems. Examples of Class H software include, but are not limited to, desktop applications such as Microsoft Word, Excel, and Power Point, and Adobe Acrobat.

Technical Support: The support available for user assistance, trouble-shooting, fixes, upgrades, enhancements, and documentation.

Technology Commercialization: The process of new technology development through partnerships with government and industry with the objective of creating new products, processes, or services with commercial potential.

Technology Transfer: The process by which technology developed in one organization, in one area, or for one purpose is applied in another organization, in another area, or for another purpose

Technology Readiness Levels (TLR): The level of software system development. There are nine software technology readiness levels, ranging from 1 to 9, associated with the NASA software development life cycle and software having a TRL of 6 or less is automatically disqualified from the Software of the Year competition.

Software Title: the software title should be the same as that used in Form 1329 (Space Act Award Application).

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Understandability: The degree to which the end-user can easily grasp the conceptual operation of the software (i.e., the system architecture). For example, can the end-user easily understand the system displays and outputs?

Usability: How well the user can apply the system functions to his/her needs. The software system usability attributes include understandability, ease-of-use, availability of technical support, quality end-user documentation, and availability of training.

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APPENDIX II
TECHNOLOGY READINESS LEVELS APPLIED TO SOFTWARE

TRL 9: Actual system "flight proven" through successful mission operations

Thoroughly debugged software. Fully integrated with operational hardware/software systems. All documentation has been completed and users have successful operational experience. Sustaining software-engineering support in place. Actual system fully demonstrated.

TRL 8: Actual system completed and "flight qualified" through test and demonstration (Ground or Flight)

Thoroughly debugged software. Fully integrated with operational hardware and software systems. Most user documentation, training documentation, and maintenance documentation completed. All functionality tested in simulated and operational scenarios. V&V completed.

TRL 7: System prototype demonstration in a relevant environment

Most of the software is functionality available for demonstration and test. Well integrated with operational hardware/software systems. Most software bugs removed. Limited documentation available.

TRL 6: System/subsystem model or prototype demonstration in a relevant environment (Ground or Space)

Prototype implementations if the software is on full-scale realistic problems. Partially integrated with existing hardware/software systems. Limited documentation available. Engineering feasibility fully demonstrated.

TRL 5: Component and/or breadboard validation in relevant environment

Prototype implementations. Experiments with realistic problems. Simulated interfaces to existing systems.

TRL 4: Component and/or breadboard validation in laboratory environment

Standalone prototype implementations. Experiments with full-scale problems or data sets.

TRL 3: Analytical and experimental critical function and/or characteristic proof-of-concept

Limited functionality implementations. Experiments with small representative data sets. Scientific feasibility fully demonstrated.

TRL 2: Technology concept and/or application formulated

Basic principles coded. Experiments with synthetic data. Mostly applied research.

TRL 1: Basic principles observed and reported

Basic properties of algorithms, representations & concepts. Mathematical formulations. Mix of basic and applied research.