ATTACHMENT A

Statement of Work

GODDARD INSTITUTE FOR SPACE STUDIES (GISS)
STATEMENT OF WORK

1.0 Introduction

The Goddard Institute for Space Studies (GISS) is a laboratory in the Earth Sciences Division of the Science and Exploration Directorate of the Goddard Space Flight Center (GSFC) and its primary mission is research that emphasizes a broad study of global change, an interdisciplinary research initiative addressing natural and man-made changes in our environment which occur on various time scales from decades to millennia and which affect the habitability of our planet. The research combines analyses of comprehensive global datasets with global models of atmospheric, land surface, and oceanic processes and includes study of past events on Earth such as paleoclimate change and the study of other planets as an aid to prediction of future evolution of Earth on a planetary scale.

Established in 1961, GISS is located in New York City near the campus of Columbia University in order to facilitate cooperative research programs with NY area universities and research organizations. A joint GISS-Columbia University graduate program in Atmospheric and Planetary Science provides the opportunity for students to perform their thesis research on GISS programs and many of the full-time, on-site personnel at the GISS facility are university research scientists and post-doctoral fellows. Another important educational outreach mission of GISS has been the New York City Research Initiative (NYCRI), a program dedicated to increasing the pool of interested and academically qualified underrepresented minorities who are successfully completing science programs in the NY area high schools and colleges. The NYCRI program attempts to create an environment where students and their faculty mentors acquire a vested interest in scientific discovery and progress by having them become fully contributing participants in real research projects.

While the participation in GISS research programs by the university personnel as described above is key, GISS requires a support services contractor to perform specific functions that are not inherently governmental. This Contractor will provide support services to GISS in the following functional areas: scientific programming and analysis, computer facility operations, library and publications services, logistical support, and project management support.

The GISS research programs to be supported can be conveniently grouped into three broad areas: Global Climate Modeling, Earth Observations, and Planetary Atmospheres. The following brief descriptions of these areas illustrates in a general way, the nature of the research efforts.

Global Climate Modeling: The climate modeling program at GISS is primarily aimed at the development of three-dimensional general circulation models (GCMs) for simulating the Earth's climate system, although research efforts include the development and use of two-dimensional energy balance models and one-dimensional radiative-convective models. Primary emphasis in the use of the GCMs is placed on investigation of climate sensitivity, deduced in part on the basis of paleoclimate studies, and on projections of climate change for the next 10-100 years. GCM developmental research focuses on sensitivity to parameterizations of clouds and moist convection, boundary-layer turbulence, ground hydrology, and ocean-atmosphere-ice interactions, as well as investigations of more accurate numerical methods. A major focus of GISS GCM simulations is to study the potential for humans to impact the

climate as well as the effects of a changing climate on society and the environment including natural ecosystems.

Earth Observations: Accurate data are necessary for characterizing the Earth's climate and for monitoring trends in the average state of the atmosphere. Satellites provide the obvious potential of observing changes of the Earth system on a global scale. One important component of GISS research is the effort to help define which satellite observations are most needed in the near term and intermediate future and the study of how satellite data relates to and supports data acquired using more conventional techniques. Satellite observations are analyzed to obtain information on the Earth's surface, atmosphere, aerosols, and global cloud systems. Clouds are potentially the most powerful feedback mechanism in the climate system, but that feedback is still only moderately well characterized. GISS serves as the Global Processing Center for the International Satellite Cloud Climatology Project (ISCCP), a program established in 1982 to collect and analyze satellite radiance measurements to infer the global distribution of clouds, their properties, and their diurnal, seasonal, and interannual variations. The resulting archived datasets and analysis products are used to improve understanding and modeling of the role of clouds in climate. The Global Aerosol Climatology Project (GACP) was established in 1998 as part of the NASA Radiation Sciences Program and the Global Energy and Water Cycle Experiment (GEWEX) to: (1) analyze satellite radiance measurements and field observations in order to characterize global distribution of aerosols and (2) perform advanced global and regional modeling studies of the aerosol formation, processing, and transport. GISS serves as the GACP processing center for developing and maintaining a global aerosol climatology compiled from analyses of channel-1 and -2 AVHRR data. The Glory Mission, with launch slated for late 2010, includes the Aerosol Polarimetry Sensor (APS), which will make measurements of the radiance and polarization of scattered sunlight that can be analyzed to deduce microphysical and optical properties of aerosols and their spatial and temporal distributions. Most of the science team for the Glory APS instrument is located at GISS and will take the lead in the science data processing for those measurements.

Planetary Atmospheres: Although limited in number, the atmospheres of the other planets of the solar system provide a nonetheless broad range of conditions and regimes for which we can test our basic understanding of atmospheric processes, including the greenhouse effect, aerosol and cloud physics, and atmospheric chemistry and dynamics. GISS research programs involve the observation and/or modeling of the atmospheres of Venus, Mars, Jupiter, Saturn, and Titan. Prior mission activity included the GISS Photopolarimeter/Radiometer instrument on the Galileo Orbiter spacecraft that provided visible and near-infrared photometry-polarimetry and thermal infrared radiometry observations used to infer vertical temperature profiles and the vertical and horizontal distribution and particle microstructure of the clouds and haze in the Jovian atmosphere and to map the photometric, polarimetric, and thermal properties of the surfaces of the Galilean satellites. Current mission involvement includes GISS participation on the Cassini Mission Imaging Science Subsystem team.

2.0 Scope of Work

The basic objectives of this mission contract are to provide scientific programming and analysis in support of specific GISS research programs and to perform computer facility operations, technical library operations, and overall logistical support for the GISS research facility. The scientific programming and analysis functions are integral parts of the respective research programs, whereas the other support functions are required to maintain and operate the facilities used in performing said research.

To fulfill the mission support requirements, the Contractor shall furnish comprehensive support services that include management, operations, and coordination. The Contractor shall have full authority and responsibility to manage the support services in accordance with the specified performance requirements and to run the entire operation in a coordinated and responsible fashion. As a consequence, the Contractor is given responsibility for ordering and maintaining an inventory of supplies used in these various operations, and authority to perform travel necessary to render support at off-site locations and to obtain necessary professional information by attendance at professional meetings and conferences.

3.0 Performance Requirements

The performance requirements for this support services contract are characterized by functional service areas: scientific programming and analysis, computer facility operations, library and publications services, logistical and utility support, and program management. The scientific programming and analysis function directly supports efforts grouped into three research areas: Global Climate Modeling, Earth Observations, and Planetary Atmospheres.

3.1 Functional Service Areas

3.1.1 Scientific Programming and Analysis

The Contractor shall perform scientific programming and analysis in support of the specified research programs at GISS. The work involved in the specified research areas requires substantial use of computers and appropriate numerical techniques and processing methods. Some of the research areas entail mathematical representations of linear and nonlinear physical systems expressed in terms of partial differential or integral-differential equations that are solved by numerical computations. Other areas involve data processing and visualization development, numerical simulation of remote sensing observations using radiative transfer modeling, and interpretation of measurements to analyze spacecraft instrument performance. The work of the Contractor shall include the consideration of the numerical stability and accuracy of the solutions and model simulations. Development of appropriate numerical methods for the various applications shall emphasize the most efficient use of the computational facilities available to GISS personnel.

Scientific programming and analysis extends into programming techniques and detailed understanding of computer usage. When a mathematical formulation of the physical problem is completed, the analyst works with the programmer in carrying the solution through to the final numerical or visual display, including all details of programming and coding. The function includes the design, coding, detailed flow charting, debugging, and documentation of scientific programs, as well as the construction of final program systems for production running. Programs shall encompass such areas as pattern recognition, numerical modeling and simulation of physical systems, image data analysis, dynamic interaction with graphic displays, processing and maintenance of large information libraries on various storage media, and data reduction and archiving. Coding is done primarily in the FORTRAN language, with use of C and C++ for some applications.

The programming function also includes the running of production programs, the development of scripts and running procedures, the monitoring of the status of the various physical models as they

progress through their computational cycles, and the communication of results of these runs to the scientific staff. If in the course of this work, problems arise due to changing experimental evidence or to changing theoretical scientific emphasis, the Contractor shall respond to the needs of the research project by expanding and modifying programs to meet the new situation and to ensure the timely completion of these efforts by utilizing additional project support where appropriate. Scientific programming includes the maintenance and documentation of completed codes adequate to assure mission continuity. Included in the area of program maintenance are the responsibility for incremental changes in established programs, the creation of minor utility programs needed for larger production jobs, and support in improving and updating, where necessary, the documentation of established programs.

3.1.1.1 Global Climate Modeling

Research at GISS on global climate relies dominantly on a constantly evolving array of general circulation models (GCMs). The complex computer programs that constitute these models numerically solve the fundamental equations describing the conservation of mass, energy, momentum, etc., for each atmospheric gridbox in a three-dimensional array, while taking into account the transfers between gridboxes. They must also address, usually in a highly parameterized form, the physical processes within the gridboxes, including sources and sinks of quantities. The array of GISS climate GCMs is under continual development to improve the overall capability of realistically simulating present climate and potential climate changes. Much of this ongoing development is focused on examining the sensitivities to parameterizations of sub-grid physical processes such as clouds and moist convection, boundary-layer turbulence, ground hydrology, air-surface interactions and then attempting to improve the realism of those parameterizations that appear to be important. This process typically involves control runs with a current-version GCM that are compared to experiment runs with the modified-improved parameterization. Owing to sometimes complex interrelations, this may entail an iterative process involving more than one physical parameterization. In many cases, this model development research is taking advantage of the option of incurring additional complexity given increases in available computational capability.

The ultimate objective of GISS global climate research is to simulate with a reasonable level of confidence, past, present, and potential future climate states. Present and shorter-term past climate simulations are compared with historical records with the objectives of validating the performance of the climate model and of better understanding the causes of the modest climate changes observed thus far. Longer-term past climate simulations are compared with climate inferred from paleoclimate studies based upon ice cores, tree-ring analyses, and pollen in lake sediment cores, for example, thus permitting an examination of larger climate changes than those occurring in the historical climate records. Projections of future climate changes are focused on estimating potential impacts and on discerning those changes associated with anthropogenic forcings such as increasing greenhouse gases and tropospheric aerosols.

Another aspect of climate model development is in the area of adding or modifying the variables that constitute the model diagnostics, namely, the many derived quantities that are used to illustrate and understand the behavior of the instantaneous model atmosphere-ocean system and the climate as represented by appropriate time and spatial averages. Some climate experiments suggest new diagnostic information that may be useful in interpreting results or new ways of presenting existing diagnostic information that may be desirable. New approaches for display of diagnostic quantities often

are prompted by the capability of newly acquired hardware or the desire to place results on-line for easier access.

Specific detailed activities supporting the Global Climate Modeling research are: (1) Continue ongoing progress in the design, programming, implementation, and testing of changes to be included in the next version of the climate GCM. Carry out specific analyses of climate simulations and perform additional simulations. Collaborate with software experts at GSFC to improve the model computing speed with multiple-processor computers. (2) Support the continuing identification, development, and implementation of new diagnostics for the GISS climate models. (3) Continue the development, programming, and testing of an improved parameterization of sub-grid scale turbulence transport in the GISS atmosphere and ocean GCMs. Maintain appropriate documentation of the tests and the evaluation of model performance. (4) Support the effort to complete a systematic general documentation of the core GISS climate model. (5) Refine parameterization of cumulus updraft properties to include more realistic entrainment and detrainment and possible effect of pressure gradient on updraft speed. Revise ice microphysical property assumptions used in the cumulus cloud parameterization. Explore avenues for reducing low-level cloud cover and heating in regions of shallow cumulus and for increasing cloudiness in marine stratocumulus regions.

3.1.1.2 Earth Observations

The primary emphasis of Earth Observations research at GISS is the ongoing development and enhancement of data sets that are necessary for characterizing the Earth's climate and for discerning and monitoring changes in the climate. Obviously, observations from satellites provide the potential for obtaining information on the Earth system on a global scale. Specific GISS research employing such satellite observations are represented by the International Satellite Cloud Climatology Project (ISCCP), the Global Aerosol Climatology Project (GACP), and the future Aerosol Polarimetery Sensor (APS) on the Glory Mission. A significant aspect of the research using these satellite data sets is the study of how such data compares with and supports data acquired using ground-based measurements. Since a fundamental objective of this effort is to develop data sets that characterize the climate state and reveal changes in the climate, substantial emphasis is placed on the specific organization and structure of the data sets so that comparison with climate model outputs and non-satellite data sets is facilitated. This effort therefore includes the development of appropriate techniques for creating climate model diagnostics data sets that are optimized for comparison with observational data sets and in some cases are intended to encourage new measurement strategies and techniques.

Specific detailed activities supporting the Earth Observations research are: (1) Conduct operational production of ISCCP cloud products and associated data and maintain an updated log of processing status and deliveries. (2) Continue support for the ongoing production of the GISS global surface air temperature time series, which is used in assessing realism of climate simulations. (3) Provide support for web page development to update and expand the on-line data sets and information on aerosols, with the intended outcome being improved access to aerosol data. (4) Continue the development of the algorithm package for processing the expected data from the APS of the Glory Mission, with the emphasis being on the creation of the necessary tools to use Glory Mission spacecraft orbit and orientation information along with APS timing information to geolocate individual APS measurements. (5) Generate data sets of diagnostics from climate model simulations for community access in graphical and digital format via the GISS web site and in appropriate digital format for downloads.

3.1.1.3 Planetary Atmospheres

The Planetary Atmospheres research category covers studies at GISS of the atmospheres of other planets in the solar system. These research efforts employ remote sensing observations and theoretical modeling of basic atmospheric process such as aerosol and cloud physics, radiation budget, and atmospheric dynamics and chemistry..Past efforts using remote sensing observations included the Orbiter Cloud Photopolarimeter (OCPP) on the Pioneer Venus Mission and the Photopolarimeter/Radiometer (PPR) on the Galileo Orbiter. Current research in this area is focused on the Imaging Science Subsystem (ISS) on the Cassini Orbiter. Although the emphasis is on planets other than the Earth, this research can result in observation techniques and analyses which may be applied to the Earth's atmosphere. Further, the outcome of research on the atmospheres of other planets can provide important insights regarding basic atmospheric processes for a range of physical conditions. Specific detailed activities supporting Planetary Atmospheres research are: (1) Continue mapping of Saturn Northern and Southern Hemisphere eddy momentum fluxes in dayside images. Continue to test ability of an automated scheme to track features in methane band images and implement that scheme for tracking. Test techniques for applying clustering analysis to multiple-filter Cassini images. (2) Use experience from the past analyses of OCPP polarimetry data to develop appropriate procedures and techniques for the analysis of Research Scanning Polarimeter observations from aircraft, with emphasis on retrieval of cloud properties.

3.1.2 Computer Facility Operations

The Contractor shall have full responsibility for the operation of the GISS computer facilities. Key components of the current GISS computer facility are a 96-processor SGI Origin3000 computer and approximately 50 single-processor workstations, all networked using a Fast Ethernet local area network (LAN). Also attached to the LAN are network printers such as HP LaserJet 9050dn and Xerox Phaser 7300 and two STK Timberwolf DLT magnetic tape mini-silos and three Overland LTO Ultrium2 tape loaders used for tape backups. In addition, a 32-processor HP-Compaq AlphaServer ES45, previously managed by the GSFC NASA Center for Computational Sciences (NCCS) is physically located at the GISS facility. Joint use of both Government-owned and University-owned computer hardware making up the GISS computer facility is specified in Cooperative Agreements between GISS and Columbia University, with the responsibility for overall management placed with GISS, which then delegates the responsibility for the facility operation to the Contractor through the mission support contract.

In the course of operating the GISS computer facility, the Contractor will be required to monitor all computing equipment and the LAN to ensure proper functioning. Monitoring of computing equipment shall include identifying any problems with the operating systems that control the computer hardware. In view of the distributed nature of the computing facility, the Contractor shall maintain a reporting system that facilitates rapid and accurate reporting of suspected hardware, software, and network problems by the users of the facility. Whenever computer hardware, software, or network problems or malfunctions are identified, the Contractor shall assess the nature of the problem and determine the appropriate course of action to remedy the problem. For hardware malfunctions that require remedial maintenance or repair, the Contractor shall notify the respective maintenance contractor(s) in a timely fashion and ensure that appropriate access and a complete description of the problem is provided to the hardware maintenance contractor.

The Contractor is responsible for purchasing and maintaining an appropriate inventory of all supplies necessary for the operation of the computer facilities and reporting on these supply costs monthly. These supplies include, but are not limited to: paper for printers, magnetic tapes and other storage media, and printer cartridges. These materials must be organized for rapid access, for accurate inventory, and for secure storage.

A key aspect of the operation of the computer facility is systems programming support. The Contractor shall provide systems programming support capable of installing, maintaining, operating, and monitoring the specific operating systems for the computers in the GISS facility. The current operating systems are IRIX on the SGI Origin3000, AIX/UNIX on the single-processor workstations, and Microsoft Windows XP, Mac OS X, and Linux on desktop machines. In addition to the assurance of proper operating systems functioning on the respective computer platforms, the systems programming function includes ensuring that these computers and their operating systems provide for attachment to the LAN and appropriate functional interaction with other network devices as well as access to the NASA Science Network and Internet through the present DS-3 wide-area network (WAN) link to GSFC. This DS-3 WAN connection is also the link for remote usage of GSFC NCCS computers, with of order 90 percent of the total computing effort supporting GISS research performed on NCCS machines.

As part of the systems programming function, the Contractor is expected to maintain a thorough knowledge of operating systems, compilers, and system utility programs for all of the computers in the GISS facility and to conduct evaluations of the configurations of such software-hardware combinations including new releases in order to provide recommendations regarding changes or new implementations needed to maintain compatibility and optimal performance. The Contractor shall also provide technical support including subcontracted consulting services as necessary relating to definition, technical evaluation, and pricing of hardware, software, and maintenance for the GISS computing facility and support GISS management in developing overall planning for evolution of the computer facility that provides continuing improvements by taking advantage of hardware and software technology developments. After any basic set-up and installation that may be provided by the OEM or hardware vendor for new hardware obtained for the GISS facility, the Contractor shall be responsible for completing the hardware installation including attachment to the LAN if appropriate, and for the installation of any operating system and other requisite software.

The Contractor is responsible for informing users of the features and capabilities of the GISS computing facility through the maintenance of a library of manuals and documentation as well as appropriate on-line information and help functions. Systems programming and technical support staff are expected to support scientific applications programmers in diagnosing program execution problems that appear to be attributable to hardware, operating system, or network problems. The Contractor shall also provide support in evaluating and optimizing the efficiency of applications programs running on current GISS facility computers and is responsible for operational testing and providing support in reprogramming codes for newly acquired computer systems.

The Contractor shall be responsible for developing and maintaining appropriate procedures to insure the security of the GISS computing facility. Standard procedures for authorizing GISS personnel for use of the computing facility will be developed and maintained. Contractor staff is responsible for maintaining the firewall and associated procedures for ensuring minimal risk of the GISS computing facility being compromised through outside network connections. The Contractor shall report to the contract technical monitor and to the GISS staff member designated as the Computer Security Officer

(CSO), any situation, incident, or actual violation that may or does constitute a threat to the GISS computer facility. In addition, the Contractor shall provide support to the CSO in preparing required reports and certification documents regarding the GISS computer facility IT security plans and procedures as well as any security incident or violation reports.

3.1.3 Library and Publication Services

The Contractor shall manage, staff, operate, and provide specialized services for an earth and space science reference and circulation library that services the GISS research staff. The library has approximately 8000 specialized books in science and mathematics, a modest number of current technical reports, and about 6000 bound volumes of back journals. Current journal subscriptions number about 100. The library is staffed from 9:00 a.m. until 5:30 p.m. weekdays. Library functions include purchasing new books, keeping an active file on borrowed books, providing interlibrary loan services, providing support to staff in on-line searches, and preparing current publications lists of GISS reports for use by GISS staff on various aspects of the research programs. The Contractor shall provide a monthly report of library expenses with cumulative totals for the year and projected future expenses for the remainder of the year.

The Contractor shall have the responsibility for operating duplicating and printing equipment provided by the Government and/or Columbia University in the GISS facility and shall support GISS requirements in several related areas of publication services. These include providing support in the preparation and editing of manuscripts, illustration and drafting services, revision of existing material, and the duplication and reproduction of scientific materials. These products must meet the standards as required by the COTR and the GISS publications activities. In addition, the Contractor shall order and provide payment for out-of-house publication services that are beyond the capability of the in-house facilities. The Contractor shall be responsible for monitoring the performance of the duplicating and printing equipment and for notifying the equipment maintenance contractor(s) when remedial maintenance is needed. The Contractor shall also keep complete usage and maintenance records, provide a proper inventory of supplies, and ensure that an appropriate job scheduling system is in place.

3.1.4 Logistical and Utility Support

The Contractor is responsible for providing several logistical and utility functions in support of the operation of the GISS research facility. These include: mail handling and pick-up and delivery within the facility and delivery of outgoing mail to USPS Post Offices; equipment inventory; intra-building movement of equipment and office furniture; logistical arrangements for conferences, meetings, and seminars; and other routine utility activities necessary in the Contractor areas of the GISS facility. The Contractor shall provide support and coordinate GISS facility operational activities with Columbia University and the General Services Administration, including building interior modifications and office reconfigurations. Outgoing mail is collected once a day from one or two deposit receptacles on each floor of the facility, prepared for mailing using a government postage meter, and taken to the USPS Post Office near the GISS building, with an average of fewer than 100 pieces per day. Incoming mail averaging approximately 500 pieces per day is received at the GISS facility lobby, sorted, and distributed once per day to individual employee mailboxes located on each floor of the facility. Contractor Project Manager is designated as the Property Custodian for GISS government-owned property and is thus responsible for ensuring that newly received equipment is tagged and entered into the inventory database; that inventory has at present approximately 300 accountable items. The Contractor is

responsible for ensuring that the property inventory is updated as necessary and providing support to GSFC personnel in the triennial inventory validation. Movement of equipment and office furniture associated with office assignments or re-assignments are performed as needed, typically no more than 10 times per year.

The GISS facility has one conference room that can hold approximately 120 people and a smaller conference room appropriate for smaller groups of order 20-30. GISS typically hosts meetings or conferences of 1-3 days duration that require the larger conference room several times per year. The Contractor is responsible for logistics of audio-visual equipment set up, room layout, registration procedures including badge preparation, and coordination with lobby security personnel for visitor clearances. The smaller conference room is used for various meetings, estimated at 25-40 per year, many of which require similar logistical support, although often at a much reduced level compared to the larger conferences. In addition, the Contractor shall provide logistical support for occasional off-site conferences or workshops co-sponsored by GISS and experimental and observational research activities. Such off-site logistical support is required rather infrequently, probably averaging once every 1-2 years. The Contractor shall provide support in the development, implementation, and evaluation of community outreach and educational programs through the NYCRI and other initiatives.

3.1.5 Program Management

The Contractor shall provide overall program management for the mission contract effort. This support shall entail the appropriate planning and coordination necessary for the Contractor staff to perform the various functional support activities for specific contract work required. The routine administration in support of the contract effort shall include assignment and tracking of actions and preparation of reports as required by the contract. The Contractor shall prepare and submit an appropriate personnel safety and health plan as required by the contract and shall ensure that all elements of the work in this mission contract are performed in accordance with that plan.

3.2 Electronic Information Technology Accessibility Compliance

Since the performance requirements for the Contractor include support for developing and maintaining the GISS web site, the Contractor shall be required to meet the appropriate standards for Electronic Information Technology (EIT) Accessibility (Section 508 of the Rehabilitation Act of 1973 as amended by the Workforce Improvement Act of 1998) Compliance. Section 508 requires that when Federal agencies develop, procure, maintain, or use EIT, Federal employees with disabilities have access to and use of information and data that is comparable to the access and use by Federal employees who are not individuals with disabilities. It also requires that individuals with disabilities, who are members of the public seeking information or services from a Federal agency, have access to and use of information and data that is comparable to that provided to the public who are not individuals with disabilities. The EIT Accessibility standards apply to Software Applications and Operating Systems (1194.21) and Web-based Intranet and Internet Information and Applications (1194.22). In its performance of the support services for GISS, the Contractor shall meet the EIT Accessibility standards for all services associated with Software Applications and Operating Systems and Web-based Intranet and Internet Information and Applications. In order to comply with the Section 508 Electronic and Information Technology Accessibility Standards, the contractor shall perform all work required under this contract in compliance with the following technical standards delineated in Code of Federal Regulations (CFR) Title 36: Part

1194.21 Software Applications and Operating Systems; and Part 1194.22 Web-based Intranet and Internet Information and Applications.

Specific requirements for Section 508 compliance associated with Software Applications and Operating Systems are: (a) When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually; (b) Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer; (c) A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes; (d) Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text; (e) When bitmap images are used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images shall be consistent throughout an application's performance; (f) Textual information shall be provided through operating system functions for displaying text. The minimum information that shall be made available is text content, text input caret location, and text attributes; (g) Applications shall not override user selected contrast and color selections and other individual display attributes; (h) When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user; (i) Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element; (j) When a product permits a user to adjust color and contrast settings, a variety of color selections capable of producing a range of contrast levels shall be provided; (k) Software shall not use flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 Hz and lower than 55 Hz; (l) When electronic forms are used, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.

Specific requirements for Section 508 compliance associated with the Web-based Intranet and Internet Information and Applications are: (a) A text equivalent for every non-text element shall be provided; (b) Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation; (c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup; (d) Documents shall be organized so they are readable without requiring an associated style sheet; (e) Redundant text links shall be provided for each active region of a server-side image map; (f) Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape; (g) Row and column headers shall be identified for data tables; (h) Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers; (i) Frames shall be titled with text that facilitates frame identification and navigation; (j) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55Hz; (k) A text-only page, with equivalent information or functionality, shall be provided to make a web site comply with these provisions, when compliance cannot be accomplished in any other way. The context of the text-only page shall be updated whenever the primary page changes; (l) When pages utilize scripting

languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology; (m) When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with Section 508 technical standards for software applications; (n) When electronic forms are designed to be completed on-line, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues; (o) A method shall be provided that permits users to skip repetitive navigation links; and (p) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.