National Aeronautics and Space Administration

NASA
SOFTWARE

2017–2018
CATALOG

TECHNOLOGY
TRANSFER
P R O G R A M

To meet the challenges of space exploration, NASA has a storied history of operating at the forefront of technology development.

Our goals have always been lofty, and that tradition continues today as we prepare to take humanity farther from home than ever before.
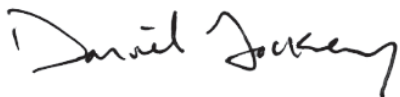
Advancing the state of the art in software — in the fields of aeronautics, materials, data processing, propulsion, electronics, and everything in between — has been, is, and will continue to be an essential component of every NASA success and achievement.

With this thought in mind, we are pleased to present the third edition of the NASA Software Catalog.

We've added dozens of titles, broadened the scope of some sections, and made a few tweaks to others to ensure that we are providing you with the best of the best. Some entries are being offered to the public for the first time. Each code is available free of charge.

In the two years since the publication of our last catalog, we've been working behind the scenes to streamline and expedite the software release process. NASA has been charged with making its technology as broadly available to the public as possible, and it's a responsibility we take very seriously.

As you browse through these pages, we hope you find a solution that precisely addresses a design challenge that you've been facing. Our dedicated software release team is on-hand to answer any questions that you might have.

Daniel Lockney
Technology Transfer Program Executive
Space Technology Mission Directorate
NASA Headquarters

TABLE OF CONTENTS

USING THE CATALOG

Offering an extensive portfolio of software products for a wide variety of technical applications, the NASA Software Catalog is organized into fifteen broad subject matter categories.

The codes within each category are listed alphabetically. All catalog entries include the software title, the product ID number (known internally as the NASA case number), a short description, and the software's specified release type. Some software descriptions contain links to additional information or downloading options.

Each code listed in the catalog is available at no cost and has been evaluated for access requirements and restrictions:

- **General Public Release** — For codes with a broad release and no nondisclosure or export control restrictions

- **Open Source Release** — For collaborative efforts in which programmers improve upon codes originally developed by NASA and share the changes

- **U.S. Release Only** — For codes available to U.S. persons only, with no further transfer of the software allowed without the prior written approval of NASA

- **U.S. and Foreign Release** — For codes that are available to U.S. persons and (under special circumstances) persons outside of the U.S.

- **U.S. Government Purpose Release** — For codes that are to be used on behalf of the U.S. government
    - **Project Release** — For use under a contract, grant, or agreement
    - **Interagency Release** — For use by U.S. government agencies
    - **NASA Release** — For use only by NASA personnel and contractors

The software catalog is continually updated. Please visit the NASA Technology Transfer Portal for the latest updates and revisions:
technology.nasa.gov

REQUESTING SOFTWARE

NASA software may be requested through the NASA Software Catalog website:

software.nasa.gov

1. Select the Request Software button below the item description for the catalog entry. Many open source software codes and mobile apps provide a URL link so that the requester can download the software directly; it is not necessary to use the Request Software button for these codes.

2. Complete the request form. All required fields must be filled in before you can submit your request. Requests will automatically be routed to the appropriate center's Software Release Authority (SRA) for processing.

POINTS OF CONTACT

Each NASA center has a Software Release Authority (SRA) representative ready to assist you with your software requests. Contact information is provided below:

Case Number	NASA Center	Contact Information
ARC-XXXXX	Ames Research Center	arc-sra-team@mail.nasa.gov
DRC-XXX-XXX	Armstrong Flight Research Center	afrc-ipo-softwarecatalogue@mail.nasa.gov
GSC-XXXXX	Goddard Space Flight Center	gsfc-softwarerelease@mail.nasa.gov
HQN-XXXXX	NASA Headquarters	hq-sra-team@mail.nasa.gov
NPO-XXXXX	Jet Propulsion Laboratory	jpl_ott@jpl.nasa.gov
KSC-XXXXX	Kennedy Space Center	ksc-dl-software-request@mail.nasa.gov
LAR-XXXXX	Langley Research Center	larc-sra@mail.nasa.gov
LEW-XXXXX	Glenn Research Center	grc-sra-team@mail.nasa.gov
MFS-XXXXX	Marshall Space Flight Center	msfc-sra-team@mail.nasa.gov
MSC-XXXXX	Johnson Space Center	jsc-ttco-software-request@mail.nasa.gov
SSC-XXXXX	Stennis Space Center	ssc-technology@nasa.gov

How's the weather on Neptune?

Computer models of the atmospheres of Earth, Mars, Venus, Titan, and Neptune are available through NASA's Space Environments and Effects (SEE) Program, a partnership with industry, academia, and other government agencies that seeks to develop more reliable, more effective spacecraft. These codes can be used for diverse mission applications, and they offer values for atmospheric parameters including density, temperature, and winds.

Earth Global Reference Atmospheric Model (Earth-GRAM) 2016
MFS-MFS-32780-2   Pages 72, 75

Venus Global Reference Atmospheric Model (Venus-GRAM) 2005, Version 1.0
MFS-32314-1   Page 73, 82
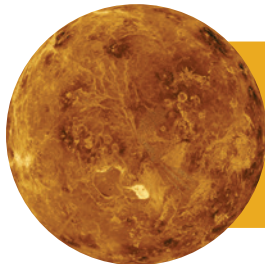
Neptune Global Reference Atmospheric Model (Neptune-GRAM), Version 1.0
MFS-32296-1   Page 79
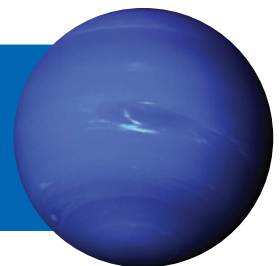
Mars Global Reference Atmospheric Model (Mars-GRAM) 2010
MFS-33158-1   Pages 73, 78
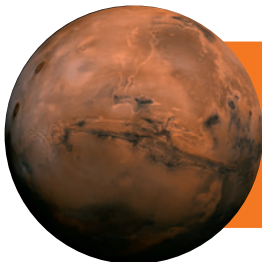
Titan Global Reference Atmospheric Model (Titan-GRAM), Version 1.0
MFS-32297-1   Pages 73, 81

2016 NASA
SOFTWARE OF THE YEAR
AWARDS

The software design teams behind a multipurpose computational fluid dynamics tool and an innovation that enables pilots to take a more proactive role in managing a plane's trajectory tie for the 2016 NASA Software of the Year honor.

Engineer David Wing led the research effort that delivered TAP.

TAP

The Traffic Aware Planner (TAP) is a cockpit-based software tool that helps pilots determine the most efficient flight paths to destinations while en route and flying among other aircraft in the same airspace. Developed by NASA's Langley Research Center and Engility Corporation, the code will help air carriers save time as well as reduce fuel consumption and carbon emissions.

The Federal Aviation Administration and two airlines have already expressed interest in the technology. Captain Scott Sander, Director of Fleet Technology at Alaska Airlines is calling TAP "a game-changing capability." Also, several aerospace companies have acquired evaluation licenses to explore the innovation's commercialization potential.

The TAP development team includes David Wing, Mark Ballin, Kelly Burke, Robert Vivona, David Roscoe, David Karr, Stephen DePascale, Sharon Woods, Brendan LeFebvre, and Andres Danziger.

Pegasus 5

Pegasus 5 is a revolutionary computational fluid dynamics (CFD) tool that provides the automated integration of CFD grids. It enables higher-fidelity aerodynamic analysis and delivers impressive speed, flexibility, and usability.

One of the most widely used CFD solvers at NASA, Pegasus 5 is also utilized extensively in industry for modeling and simulation. In the education realm, the software has been released to more than 100 students and professors at many major colleges and universities, including Stanford, MIT, and the California Institute of Technology.

Stuart Rogers is one of the inventors of Pegasus 5.

Inventors include Stuart Rogers, Norman Suhs, and William Dietz. The team has won an Outstanding Technology Development Award by the Far West Region of the Federal Laboratory Consortium (FLC).

Software of the Year Runner-up

Generic Command and Telemetry Application (CI-TO), Johnson Space Center

Honorable Mentions

James Webb Space Telescope Integrated Simulation Test (JIST), Goddard Space Flight Center

Analytics Cloud, Jet Propulsion Laboratory

Distributed Observer Network (DON 3.1), Kennedy Space Center

Magnetogram Forecast (Mag4), Marshall Space Flight Center

The Software of the Year competition recognizes development teams who have set high standards for significant software that is creative, usable, and transferable. An advisory panel with representatives from across the agency reviews entries and recommends winners to the Inventions and Contributions Board.

TOP 20
SOFTWARE CODES

Are these in your toolbox?

Push Forward with NASA Turbine Propulsion Codes

Business Systems and Project Management

Acquisitions, Business Processes, Property Management, Risk Management, Scheduling

Featured Software

Closed-Loop Accounting Management System (CLAMS) KSC-12289

The Closed-Loop Accounting Management System (CLAMS) is a web-based application used to disseminate critical processing information to the workforce and provide feedback to management that the information was received. The tool allows management at any level to accurately track any critical information, and it also serves as a historical database of what information was sent out, to whom, and when it was received. CLAMS has potential application as shareware to companies using Cold Fusion Server software.
U.S. Release Only

Electronic Timecard System KSC-12051

The Electronic Timecard System can be utilized by any business or organization wishing to streamline its payroll department procedures. The automated system minimizes the consumption of paper and eliminates the need for weekly pick-up and delivery of time sheets. The tool also simplifies the daily recording of time worked by employees, and it allows employees to "sign" their "timecards" electronically at the end of each week. Supervisors can review employee electronic timecards daily and sign them electronically.
U.S. Release Only

Goal Performance Evaluation System KSC-12036

The Goal Performance Evaluation System (GPES) is an innovative interactive software application that implements, validates, and evaluates an organization's performance by the achievements of its employees. The tool has been used for strategic planning, employee performance management, and center-wide communication. The system is web-based and uses a relational database to host information.
U.S. Release Only

Project Cost-Estimating Capability, Version 2 MFS-33187-2

Used to develop cost estimates/models for space systems, this technology combines an Excel® add-in with a simple, robust, and transparent collection of NASA cost-estimating relationships (CERs), statistics, work breakdown structures, and cost-estimating algorithms. The approach's use of native Excel® functionality to provide basic calculations limits the overhead required to maintain a model and affords more visibility to the user with regard to the calculations and equations involved in generating an estimate.
General Public Release

Schedule Test and Assessment Tool (STAT), Version 5.0 MFS-33362-1

STAT is a schedule management software add-in developed to work specifically within the Microsoft® Project® scheduling application. The software provides the automated capability to quickly identify, quantify, and report numerous types of critical schedule assessment data for management use. Clear and objective reporting of key schedule assessment information includes: logic network integrity indicators, performance and trend metrics, schedule driver identification, data comparisons, margin and milestone tracking, and various other analysis data that can be used by project teams to assist in decision-making.
General Public Release

Action Item System, Version 2.0 — GSC-16768-1

This web application allows users to assign and track action items. Helpful emails are distributed when an action is created, updated, or closed, and reminder emails are sent to assignees when an action item deadline is approaching or has passed.
U.S. Government Purpose Release

Application Information Logging Services (AILS) — KSC-13992

AILS offers the ability to log application events using a centralized set of services.
U.S. Government Purpose Release

Audit Tracking Information System (ATIS) — MFS-33070-1

The Audit Tracking Information System (ATIS) provides the audit manager and team with the tools/information needed to perform, manage, and close an audit. All affected personnel have centralized, timely access to system tools and data. The process is automated to the maximum extent practical, improving efficiency and providing information on all aspects of any particular audit.
U.S. Government Purpose Release

Authorization Services (Authos) — KSC-13984

Authos provides a suite of tools to authorize access to client applications.
U.S. Government Purpose Release

Automated Animation Creation Tool (ANIMATOR) — MFS-31690-1

The Automated Animation Creation Tool (ANIMATOR) is a software program developed as a two- and three-dimensional tool for creating Motion Picture Experts Group (MPEG) animation files.
U.S. Government Purpose Release

Automated Release Processing (ARP) — MSC-25494-1

The Automated Release Processing (ARP) application supports the release of engineering documentation. It is a Documentum-based client/server application that uses an Oracle® database and a database management system (DBMS) for data storage.
U.S. Government Purpose Release

Brahms: A Multi-Agent Simulation/Execution Environment for the Brahms Language — ARC-15654-1

Brahms is a multi-agent programming language for modeling people and systems in a conceptual world. The tool gives users the ability to model the behavior of human organization, communication, and teamwork, as well as human-machine interaction.
U.S. Government Purpose Release

Client/Server Automated Work Control System (CEV-AWCS) — MSC-25549-1

CEV-AWCS tracks the workflow of thermal protection, from work authorization through manufacture and repair.
U.S. Government Purpose Release

Closed-Loop Accounting Management System (CLAMS) — KSC-12289

The Closed-Loop Accounting Management System (CLAMS) is a web-based application used to disseminate critical processing information to the workforce and provide feedback to management that the information was received. The tool allows management at any level to accurately track any critical information, and it also serves as a historical database of what information was sent out, to whom, and when it was received. CLAMS has potential application as shareware to companies using Cold Fusion Server software.
U.S. Release Only

Customer Survey   MFS-33069-1

Customer Survey is a generic survey tool that affords the ability to construct, email, and manage surveys. Because it exists on a virtual server, overhead costs are extremely low.
U.S. Government Purpose Release

Data Service Provider Cost-Estimation Tool and Comparables Database   GSC-14905-1

The Data Service Provider Cost-Estimation Tool (CET) and Comparables Database (CDB) package provides NASA's Earth Science Enterprise (ESE) with the ability to make lifecycle cost estimates. The package employs a cost-estimation-by-analogy approach. For more information, please visit: http://opensource.gsfc. nasa.gov/projects/CET/index.php
Open Source Release

eInfo Services (EIS)   KSC-13991

eInfo is a web service used to provide employee information to web applications
U.S. Government Purpose Release

Electronic Guest Operations (EGO)   MSC-25083-1

Electronic Guest Operations (EGO) has been used as an all-encompassing electronic guest management system for tracking guest invitations/RSVPs to shuttle launches, landings, and receptions. The tool serves as a single application that will maintain guest and mission information, run standard reports, email guests, produce mailing labels, and export data. Via the Internet, invited guests can access EGO web pages from all over the world to register their attendance intentions, access relevant mission data, and update their contact information. After guest registration, administrative support personnel have used EGO to maintain guest-seating assignments, send email communications, maintain attendance to special receptions, and gather security information for foreign guests. EGO replaces a very paper-intensive process, saves a significant amount in postage costs, and reduces error-prone data entry. The tool has been built with flexibility and customization in mind. Its initial scope was broadened to also serve as the login for people invited to view an International Space Station friends and family website created by Wyle Life Sciences. The Constellation program also used EGO to invite guests to attend the Pad Abort (PA-1) test flight in 2010.
U.S. Government Purpose Release

Electronic Position Description System (ePDS)   MSC-24585-1

The Electronic Position Description System (ePDS) is a NASA-developed, web-based application for creating, classifying, editing, approving, publishing, reporting, viewing, and archiving federal civil service employee position descriptions. ePDS, a desktop application, contains no protected PII or SBUC data. Recipient federal agencies will have no inter-connectivity with NASA systems or networks.
U.S. Government Purpose Release

Electronic Timecard System   KSC-12051

The Electronic Timecard System can be utilized by any business or organization wishing to streamline its payroll department procedures. The automated system minimizes the consumption of paper and eliminates the need for weekly pick-up and delivery of time sheets. The tool also simplifies the daily recording of time worked by employees, and it allows employees to "sign" their "timecards" electronically at the end of each week. Supervisors can review employee electronic timecards daily and sign them electronically.
U.S. Release Only

Fingerprint Cards   MSC-25574-1

Security personnel have used this application in order to print employee information onto fingerprint cards.
U.S. Government Purpose Release

Florida Refrigerant Online Service Tracking   MSC-25498-1

This system allows users to meet state and federal regulatory requirements for tracking Freon.
U.S. Government Purpose Release

Goal Performance Evaluation System   KSC-12036

The Goal Performance Evaluation System (GPES) is an innovative interactive software application that implements, validates, and evaluates an organization's performance by the achievements of its employees. The tool has been used for strategic planning, employee performance management, and center-wide communication. The system is web-based and uses a relational database to host information.
U.S. Release Only

Google Sift   MSC-25403-1

This NASA Online Directives Information System (NODIS) application interfaces with the Johnson Space Center (JSC) search appliance to display a listing of all documents derived from NASA Policy Directives (NPDs), NASA Procedural Requirements (NPRs), and NASA memos that contain the term "center director." The tool allows the user to click on a document link and view a listing of all directives contained in the selected document and also view detailed information for each directive. The application provides an Excel® report of "accepted" directives.
U.S. Government Purpose Release

ID Digit Widget Plug-in   LEW-19442-1

With this software plug-in for MagicDraw, users can perform single or mass prefix ID changes and see the results before the modifications are executed. The tool also performs requirement number validation and informs users if a requirement ID is missing or duplicated.
U.S. Government Purpose Release

Johnson Space Center (JSC) Action-Tracking System (JATS)   MSC-25659-1

JATS is an action-tracking tool that allows for attachments, multiple assignees, dependent and cloned actions, the export control filtering of attachments, and the delegation of responsibilities to another user. Utilizing "grouping" and "roles," the system can be tailored to fit an organization's specific needs. Additional modules have been added to allow correspondence management/tracking and Space Station Review Board action tracking. The legal office action-tracking module can isolate legal documents from the general document repository. JATS also has a full ad hoc search and reporting capability. Reporting features allow hierarchical organizational managers to track and report on the actions of subordinates. The system uses NASA-approved authentication methods and is 508-compliant.
U.S. Government Purpose Release

Kennedy Action-Tracking System (KATS)   KSC-13968

In the KATS application, abstraction liberates developers from the concern of having to manually generate entity framework calls to interact with the data layer This system drastically reduces project "spin-up" time and standardizes interactions to ensure consistently high-performing transactional solutions.
U.S. Government Purpose Release

Move Director Site (MDS)   MSC-25587-1

MDS primarily tracks flight hardware moves, providing a place for training coordinators and move directors to share information.
U.S. Government Purpose Release

NASA Aircraft Management Information System (NAMIS)   MSC-24723-1

The NASA Aircraft Management Information System (NAMIS) is an enterprise resource planning/mission support software suite designed from the ground up to meet the requirements of Johnson Space Center's (JSC's) Aircraft Operations Division (AOD). The system features tools and processes that: 1) eliminate the risk of conducting flight operations in aircraft with overdue inspections, in aircraft with grounding discrepancies, and in aircraft not properly configured for the mission; 2) provide continuous and positive control of all assets including materials, parts, and equipment that exceed a customer-defined value; and 3) reduce material costs and labor hours. NAMIS includes the data, information, and metrics required to support flight operations management and business decisions, as well as the data required by other systems and external components to support consistent and accurate financial reporting and asset accounting.
U.S. Government Purpose Release

NASA Hazard Management System (HMS)   MSC-25694-1

The web-based, access-controlled NASA Hazard Management System (HMS) provides a centralized repository for hazards regardless of origin and offers the ability to report and manage real-time hazards and controls. The primary mechanism for identifying and documenting hazardous conditions within HMS lies in the creation and management of two types of analysis documents: Hazard Analyses (HAs) and Job Hazard Analyses (JHAs). While these two document types offer different approaches for hazard identification and classification, they both offer controls for mitigating hazards. HMS provides a framework within which HA and JHA documents are created, reviewed, and approved. Once approved, the hazardous conditions identified within a document are considered active. More important, the controls associated with the hazards are then also considered active.
General Public Release

NASA Performance Evaluation Profile (PEP)   MSC-25681-1

NASA's Performance Evaluation Profile (PEP) program provides a PC-based method for conducting standardized self-assessments of operational and system safety program processes. PEP features software applications and a modified Management Oversight and Risk Tree (MORT) logic diagram to analyze both the strengths and weaknesses of occupational and system safety programs.
General Public Release

NASA Root Cause Analysis Tool (RCAT)   HQN-11316-1

RCAT has been designed to facilitate the analysis of anomalies, close calls, and accidents and also identify the appropriate corrective actions to prevent recurrence. The software provides an analyst with a quick, easy-to-use, accurate, and repeatable method to perform and document root cause analysis, identify corrective actions, perform trending analysis, and generate usable data for probabilistic risk assessment. All possible causes of accidents (including hardware, software, the environment, weather, natural phenomena, external events, and human error) can be incorporated into the timeline and fault/causal factor trees. The software features an intuitive logic diagramming capability and uses standard terminology, definitions, and symbols.
General Public Release

Performance Improvement Notice (PIN) Tool   MSC-25541-1

The Performance Improvement Notice (PIN) Tool enables improvements (suggestions) to be entered and dispositioned via a programmed workflow. Each PIN is accepted or rejected with rationale. If a PIN is accepted, stakeholders are assigned by organization and then roles and responsibilities are defined so that an action plan can be approved and completed.
U.S. Government Purpose Release

Project Cost-Estimating Capability, Version 2 — MFS-33187-2

Used to develop cost estimates/models for space systems, this technology combines an Excel® add-in with a simple, robust, and transparent collection of NASA cost-estimating relationships (CERs), statistics, work breakdown structures, and cost-estimating algorithms. The approach's use of native Excel® functionality to provide basic calculations limits the overhead required to maintain a model and affords more visibility to the user with regard to the calculations and equations involved in generating an estimate.
General Public Release

Project Risk Information Management Exchange (PRIMX) — GSC-14980-1

The Project Risk Information Management Exchange (PRIMX) provides a centralized source for continuous risk management (CRM) information by combining risk identification, analysis, planning, tracking, control, and communication into a single comprehensive environment that meets the requirements of NASA Procedures and Guidelines (NPG) 7120.5B and 8000.4. The software permits project personnel access to current CRM documentation, gives the status of risk activities, and identifies emerging risks that may influence the formulation development of a given project/program. PRIMX is free-standing network software (not an add-on program) that runs on any Windows® platform.
U.S. Government Purpose Release

Schedule Test and Assessment Tool (STAT), Version 5.0 — MFS-33362-1

STAT is a schedule management software add-in developed to work specifically within the Microsoft® Project® scheduling application. The software provides the automated capability to quickly identify, quantify, and report numerous types of critical schedule assessment data for management use. Clear and objective reporting of key schedule assessment information includes: logic network integrity indicators, performance and trend metrics, schedule driver identification, data comparisons, margin and milestone tracking, and various other analysis data that can be used by project teams to assist in decision-making.
General Public Release

Spinoff 2015 iPad® App — GSC-17366-1

This tool is an iPad® version of the Spinoff 2015 publication, featuring multimedia and shortened versions of the magazine's articles.
General Public Release

Stennis Space Center (SSC) Site Status Mobile Application — SSC-00424

This application provides SSC civil servants, contractors, and tenants the ability to view the center's weather radar and current site status bulletin from a mobile device. Available at the Apple App Store, the application also alerts users via push notification when a new site status is posted.
General Public Release

Task Order Management System (TOMS) — GSC-14702-1

A cost-effective e-Business solution, the Task Order Management System (TOMS) allows for the paperless processing and tracking of virtually any type of government task order contract. The tool provides a standardized user interface into a centralized task order database. TOMS will track a task order from its initiation, through the approval cycle, and out to the vendor and back. The approval cycle function works through email notifications and can be tailored easily to meet the needs of any organization. Completely web-based, TOMS allows for real-time access and will provide an up-to-the-minute status of each task order.
U.S. Government Purpose Release

Taxonomy Services for Google Search Appliance   MSC-25406-1

The Taxonomy Services for Google were written for the purposes of injecting taxonomy metadata into the Google Search Appliance and utilizing it.

U.S. Government Purpose Release

Tools for Security Planning and Assessment of Risk (TSPAR)   MSC-25492-1

The TSPAR software tool provides computer security officials the functionality to create, review, and analyze IT security risk assessment matrices and risk configuration documents.

U.S. Government Purpose Release

What's Up at Wallops (Android® App)   GSC-16683-1

What's Up at Wallops enables individuals to experience launches and flight projects as spectators. This mobile application provides simple, intuitive, dynamic tools that help to answer such questions as: When is the next launch? What is its purpose? What can I expect to see? Where should I look? How can I follow along with the countdown?

General Public Release

What's Up at Wallops (iTunes® App for iPhone®/iPad®)   GSC-16682-1

What's Up at Wallops enables individuals to experience launches and flight projects as spectators. This mobile application provides simple, intuitive, dynamic tools that help to answer such questions as: When is the next launch? What is its purpose? What can I expect to see? Where should I look? How can I follow along with the countdown?

General Public Release

Data Servers Processing and Handling

Algorithms, Data Management, Routers, Servers, Storage

2
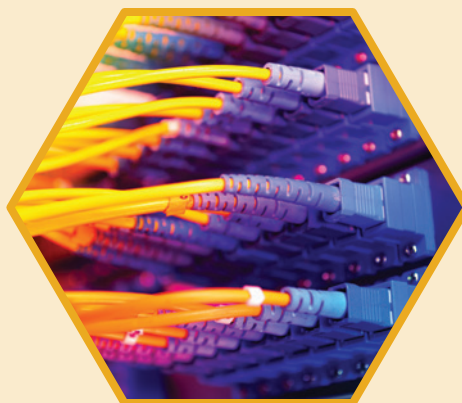
Featured Software

Application Research Toolbox (ART)   SSC-00181

Developed in MATLAB, the Application Research Toolbox (ART) is a collection of computer programs that implement algorithms and parametric mathematical models for simulating remote sensing systems. ART is especially useful for performing design-tradeoff studies and statistical analyses to support the rational development of design requirements for multispectral imaging systems. The toolbox affords the capability to synthesize coarser-spatial-resolution image data sets from finer-spatial-resolution data sets and multispectral image data products from hyperspectral image data products. ART is designed to run on a standard Windows® NT/2000 workstation and MATLAB version 6.5. A programmer's reference guide is included to provide additional detail on setting up the operational environment.

General Public Release

Engineering DOUG Graphics for Exploration (EDGE)   MSC-24663-1

EDGE is a real-time 3D graphics rendering package based on the Dynamic On-board Ubiquitous Graphics (DOUG) engine. It combines key elements from software tools developed for the Space Shuttle Program and International Space Station (ISS) and adapts them for integration with other engineering simulations and facilities. The tool allows drop-in integration with the NASA Trick Simulation Environment and provides a fusion of 3D graphics and simulation outputs.

General Public Release

NASA UNIX Tool Kit
KSC-12269

The NASA UNIX Tool Kit contains three components that all work together to form a single technology for UNIX administration: (1) secure, web-based UNIX System administration tools (KSC-12269) ease the administration of a large, distributed UNIX system, providing a secure mechanism for creating, modifying, locking, and deleting users; (2) the client/server creates, modifies, and queries VERITAS file system quotas on an NFS-mounted file system with a secure web-based interface (KSC-12268); and (3) the web-based IP address tool (KSC-12271) provides an easy-to-use system for maintaining IP address information for a network of computers.
U.S. Release Only

Performance Logging Services (PLS)
KSC-12343

Working in real time and using very little memory and CPU, Performance Logging Services (PLS) is an innovative software-performance monitoring tool that tracks statistics on timing and buffer usage. To assist in troubleshooting, PLS will start or stop other software tools when performance requirements are out of specification. The technology has been used in the Checkout and Launch Control System on NASA's Space Shuttle Program.
U.S. Release Only

Remote Memory Access Protocol Target Node
GSC-16467-1

This NASA technology provides SpaceWire design users with support for executing remote memory access protocol (RMAP) read and write commands. The target IP core is a VHDL description suitable for implementation in a field-programmable gate array (FPGA) or an application-specific integrated circuit (ASIC).
U.S. Release Only

Analog Input Data Acquisition Software   KSC-13203

With the easy-to-use Analog Input Data Acquisition Software, a user can set up a system for monitoring up to five analog input channels. The software requires LabVIEW runtime engine 8.0 (a free download from ni.com) to run the executable.

General Public Release

Application Program Interface (API) for the Orion
Aerodynamics Database (Cap Aero)   MSC-24819-1

Programmed in C, CAP Aero was developed to provide software developers an easily implemented, fully self-contained method for accessing the Crew Exploration Vehicle's aerodynamic database. No special functions (file read/write, table lookup, etc.) are required on the host system other than those included with a standard ANSI C installation. CAP Aero reads files of aero-data tables formatted as specified in the document, "Aerotab Data File Format." The aerodynamic coefficients and forces calculated by the program follow the equations cited in the document, "Formulation of the Orion Aerodynamic Database."

U.S. Government Purpose Release

Application Research Toolbox (ART)   SSC-00181

Developed in MATLAB, the Application Research Toolbox (ART) is a collection of computer programs that implement algorithms and parametric mathematical models for simulating remote sensing systems. ART is especially useful for performing design-tradeoff studies and statistical analyses to support the rational development of design requirements for multispectral imaging systems. The toolbox affords the capability to synthesize coarser-spatial-resolution image data sets from finer-spatial-resolution data sets and multispectral image data products from hyperspectral image data products. ART is designed to run on a standard Windows® NT/2000 workstation and MATLAB version 6.5. A programmer's reference guide is included to provide additional detail on setting up the operational environment.

General Public Release

Athena Software Platform   MFS-33036-1

The Athena platform is designed to be a single-point source for acquiring, assessing, archiving, and disseminating scientific and technical information. The platform ensures successful performance, increases safety, and saves resources.

U.S. Government Purpose Release

Ballast: Balancing Load Across Systems   ARC-16443-1

Ballast is a tool for balancing user load across secure shell handler (SSH) servers. The system includes a load-balancing client, a lightweight data server, scripts for collecting system load, and scripts for analyzing user behavior. Because Ballast is invoked as part of the SSH login process, it has access to user names. This capability, which is not available in traditional approaches, enables Ballast to perform user-specific load balancing. In addition, Ballast is easy to install, induces near-zero overhead, and has fault-tolerant features in its architectures that will eliminate single points of failure.

Open Source

CAPTools-based Automatic Parallelizer Using OpenMP (CAPO)   ARC-14487-1

CAPO analyzes a Fortran program and inserts OpenMP directives into the code to improve its performance on a parallel machine. The tool relies on accurate inter-procedural data-dependence information currently provided by CAPTools, which was developed at the University of Greenwich.

Open Source

CODE: A Software Framework for Control and Observation In Distributed Environments ARC-14672-1

CODE is a framework for the control and observation of resources, services, and applications. The technology supports the secure and scalable transmission of observed information to other programs, and it enables the secure execution of actions on remote computer systems.
Open Source

Code for Testing User-Written Commands in Stata Statistical Software MSC-25670-1

This NASA-developed tool helps users of Stata statistical software test their own Stata code. Two different programs make testing Stata commands easier, faster, and more reliable.
U.S. Government Purpose Release

Code for Working with .dta Format Files in the Python Programming Language MSC-25658-1

This NASA code helps users work with and manipulate .dta format files in the Python programming language.
U.S. Government Purpose Release

Computational Fluid Dynamics (CFD) Extraction Tool for TecPlot from Data Parallel Line Relaxations (DPLR) Solutions MSC-24982-1

This innovation is a TecPlot macro computer program that processes data from Data Parallel Line Relaxations (DPLR) solutions in TecPlot format. The tool converts SI units into British units. The macro can also process surface solutions.
U.S. Government Purpose Release

Coordinated Data Analysis Workshop Web (CDAWeb) GSC-14292-1

Dealing with the connections between the Sun and the Earth, the CDAWeb software and the CDAWeb service built on this software have been developed and continue to be enhanced and maintained by the Space Physics Data Facility. Please visit: http://cdaweb.gsfc.nasa.gov/cdaweb/istp_public/
Open Source

CriticalThreads: A Low-Level Parallelization Architecture for Critical Applications MSC-25719-1

Critical Threads is a lightweight "pthreading" application interface that allows software developers to parallelize C++ segments without suffering the normally unavoidable operating system level context switching overhead.
U.S. Government Purpose Release

Data Access Toolkit (DAT), Release 1.0 GSC-17291-1

DAT is a software application that performs trending, archive, and data management functions to (1) analyze the performance of an observatory through state of health monitoring using all collected housekeeping data and (2) manage the storage and distribution of all mission data files.
U.S. Government Purpose Release

Domain Name System (DNS) Graphical User Interface (GUI) Software MSC-25624-1

Combining a client graphical user interface with a server process, this NASA software provides the capability for updating a system's DNS settings from an operator's console.
U.S. Government Purpose Release

Dyper: Dynamic Perimeter Enforcement　　　　　　　　　　　　　ARC-16444-1

Dyper protects a site from unauthorized network flows. The tool offers dynamic perimeter enforcement by providing a general-purpose mechanism for maintaining least-privilege network security policies while still supporting the full utilization of multiport protocols. Dyper requires no changes to software or practices outside of the perimeter and only minimal changes inside.
Open Source

Earth-Observing System (EOS) Clearing House (ECHO)　　　　　　GSC-14726-1

The Earth-Observing System Clearing House (ECHO) affords the Earth science community more flexibility in accessing and sharing data and services. As a metadata clearinghouse, ECHO supports iterative query data access. As a service broker, ECHO decentralizes data-manipulation tools and supports the interoperability of distributed functions. For more information, please visit: http://ti.arc.nasa.gov/opensource/projects/echo/
Open Source

Earth-Observing System (EOS) Data Gateway (EDG)　　　　　　　GSC-14938-1

The Earth-Observing System Data Gateway (EDG) provides the Earth science community with a single interface that will search for data granules from distributed data archives. The innovation enables users to explore, discover, and order available data from geographically distributed providers. For more information, please visit: http://opensource.gsfc.nasa.gov/projects/edg/index.php#software
Open Source

EEPROM File System　　　　　　　　　　　　　　　　　　　　GSC-16852-1

The EEPROM File System (EEFS) is a simple, reliable file system for embedded systems. The primary purpose of the EEFS is to provide a file system abstraction for EEPROM or PROM memories that is simple, efficient, and can be proven to be reliable.
Open Source

Engineering DOUG Graphics for Exploration (EDGE)　　　　　　　MSC-24663-1

EDGE is a real-time 3D graphics rendering package based on the Dynamic On-board Ubiquitous Graphics (DOUG) engine. It combines key elements from software tools developed for the Space Shuttle Program and International Space Station (ISS) and adapts them for integration with other engineering simulations and facilities. The tool allows drop-in integration with the NASA Trick Simulation Environment and provides a fusion of 3D graphics and simulation outputs.
General Public Release

Engineering Units Generator (EUGEN)　　　　　　　　　　　　　SSC-00151-1

EUGEN converts digitized sensor output voltage data to engineering units. The tool creates individual processed data files (one file per transducer per test run), converting raw voltage to meaningful measurements such as pressure or temperature. A developer's guide provides specifics on the hardware and software requirements needed to execute the tool.
General Public Release

File Exchange Interface (FEI 5)　　　　　　　　　　　　　　　　NPO-40075-1

The File Exchange Interface (FEI) service offers secure file transaction, storage, transportation, and management services. The tool is implemented with the latest Java technologies for maximum portability and supports a 64-bit file system for very large file transfers over secure socket connections. While database-driven for file transactions and user access management, FEI offers an interactive client software suite for managing administration and general use.
U.S. Government Purpose Release (Project)

Fortran Unit Testing Framework (fUnit v1.0) LAR-17081-1

The fUnit software provides a framework for unit-testing Fortran 90, 95, and 2003 code.
Open Source

HDF-EOS2 and HDF-EOS5 Compatibility Library GSC-15008-1

This software library provides uniform access to HDF-EOS2 and HDF-EOS5 files through one set of application program interface (API) calls. Without the library, programs would have to be written twice to cover both HDF-EOS2 and HDF-EOS5 files. For more information, please visit: http://opensource.gsfc.nasa.gov/projects/HDF-EOS2/index.php
Open Source

HDF-EOS5 Validator GSC-15015-1

This software allows generators of HDF-EOS data products to encode product requirement specifications in XML. The tool will then mechanically check product files against those requirements. For more information, please visit: http://opensource.gsfc.nasa.gov/projects/Validator/index.php
Open Source

Hierarchical Data Format Earth-Observing System (HDF-EOS) Data Extractor (HEEX) GSC-15009-1

HEEX is a tool that enables users to extract HDF-EOS data to binary or ASCII data formats in HTML or XML index. The software can be used for both HDF-EOS2 and HDF-EOS5, and it automatically recognizes the two formats.
Open Source

Hierarchical Data Format Earth-Observing System (HDF-EOS) Metadata Updater (HEMU) GSC-15010-1

HDF-EOS Metadata Updater (HEMU) enables users to modify metadata inside an HDF-EOS file (either HDF-EOS2 and HDF-EOS5). The tool can be used to extract metadata from a dataset to a text file that can then be modified with any text editor; replace metadata with text from an external file; or update metadata with text from an external file. For more information, please visit: http://opensource.gsfc.nasa.gov/projects/hemu/index.php
Open Source

Hierarchical Data Format Earth-Observing System (HDF-EOS) Web Server GSC-15011-1

This shell script chains together existing data usability group tools to: extract ODL metadata from an HDF-EOS file; convert the metadata to XML; reformat the XML into HTML; publish the HTML and the original HDF-EOS file to a web server and an OPeNDAP server; and reformat the XML and submit it to the Earth-Observing System Clearing House (ECHO). For more information, please visit: http://opensource.gsfc.nasa.gov/projects/heserve/index.php
Open Source

Hierarchical Data Format Earth-Observing System (HDF-EOS) XML Document-Type Definitions and Schemas GSC-15016-1

An XML standard has been developed for the HDF-EOS5 file format using document-type definitions and schemas. Users can transform HDF5 files into XML format and vice versa. For more information, please visit: http://opensource.gsfc.nasa.gov/projects/XML_DTD_Schemas/index.php
Open Source

IND 2.1: Creation and Manipulation of Decision Trees from Data — ARC-14529-1

Decision trees are commonly used in artificial intelligence and statistical pattern recognition. A tree is "grown" from data using a recursive-partitioning algorithm. IND re-implements parts of existing standard prediction algorithms, offers experimental control suites, and also introduces new, more sophisticated methods for growing decision trees.
Open Source

Information Sharing Protocol Logger (ISPLOGR) — MSC-25610-1

Written in C, this software program provides the capability of recording Information Sharing Protocol (ISP) data into a Source Independent Telemetry Format (SITF) file. ISPLOGR uses command-line arguments to specify output file names and other required parameters. Once the SITF file is defined, it can be used as input to other available ISP software for data playback.
U.S. Government Purpose Release

Information Sharing Protocol VCR (ISPVCR) — MSC-25608-1

Written in Tcl/tk, the ISPVCR software program provides the capability to record and play back Information Sharing Protocol (ISP) data via Source Independent Telemetry Format (SITF) files. A graphical user interface starts and stops recording and playback and also specifies output file names.
U.S. Government Purpose Release

Interface Software for Nivis ISA100.11a Gateway — MSC-25409-1

This software implements an interface with the Nivis ISA100.11a gateway using the ISA100.11a Gateway Service Access Point (GSAP).
U.S. Government Purpose Release

JavaGenes Genetic Graphs — ARC-14293-1

JavaGenes is a genetic algorithm code written in Java. It evolves graphs using genetic software techniques and has applications in designing drugs, circuits, or any other system that is easily represented by graphs.
Open Source

JavaGenes-Scheduler: Evolutionary Software for Earth-Observing Satellite Scheduling — ARC-15103-1

JavaGenes-Scheduler is a general-purpose evolutionary system designed to compare techniques for scheduling observations. The tool uses a simple, earliest-first scheduler to insert observations into the timeline in permutation order.
Open Source

Jitter Controller Software — MSC-24814-1

Developed for the Constellation program, Jitter Controller Software helps manage the relationships between phase jitter crest factor, frequency jitter crest factor, and cycle-to-cycle crest factor. Written in LabVIEW, the code calls Agilent drivers to write to generator hardware. Although not well documented and originally intended to be disposable, the software has been reused.
U.S. Government Purpose Release

libSPRITE   MFS-33231-1

A set of libraries used in the development of software applications, libSPRITE was specifically designed for real-time systems that operate on a single computational node (but may be multi-core) to systematically address common coding errors, provide for multi-threaded programming to produce the exact same results regardless of the number of cores on the host compute node, and offer support for in-operation reconfigurability (parameter and control flow modifications). Components include engineering unit encoders, math functions, a task scheduler built on top of pthreads, a publish/subscribe data distribution system, and a Lua scripting language interface.
Open Source

Metadata Check   GSC-15012-1

Metadata Check is a command-line tool to check Earth-Observing System (EOS) metadata with a metadata descriptor. For more information, please visit: http://opensource.gsfc.nasa.gov/projects/metacheck/index.php
Open Source

Method and Program Code for Improving Machine Efficiency
in the Computation of Nearly Singular Integrals   MSC-25640-1

This innovation provides a method for improving machine efficiency in the computation of nearly singular integrals. The code has been applied to computational electromagnetics (CEM) problems and could have application to a variety of computational modeling disciplines.
U.S. Government Purpose Release

Multi-threaded Copy Program (MCP)   ARC-16494-1

MCP is a high-performance file copy utility that achieves performance gains through parallelization. Multiple files and parts of single files are processed in parallel using multiple threads on multiple processors. The program employs the OpenMP and MPI programming models.
Open Source

NASA Technology Transfer System (NTTS) Search
and Reporting Application Programming Interface   ARC-16697-1

The NASA Technology Transfer System (NTTS) Search and Reporting application programming interface (API) uses various logical operators to query well-structured Extensible Markup Language (XML) data. The algorithm is capable of providing search results maintaining one-to-many relationships, and it will perform set operations that include union, intersection, and difference. Output can be retrieved in XML or comma-separated value (CSV) format. The interface will provide content search criteria within a context or scope, dynamically interpret operations based on data type, and perform set operations in combination with logical operations.
U.S. Government Purpose Release

NASA UNIX Tool Kit   KSC-12269

The NASA UNIX Tool Kit contains three components that all work together to form a single technology for UNIX administration: (1) secure, web-based UNIX System administration tools (KSC-12269) ease the administration of a large, distributed UNIX system, providing a secure mechanism for creating, modifying, locking, and deleting users; (2) the client/server creates, modifies, and queries VERITAS file system quotas on an NFS-mounted file system with a secure web-based interface (KSC-12268); and (3) the web-based IP address tool (KSC-12271) provides an easy-to-use system for maintaining IP address information for a network of computers.
U.S. Release Only

Nivis ISA100.11a Radio Driver Software for TI Microcontroller — MSC-25408-1

Through a serial peripheral interface (SPI) port, this software allows a microcontroller to interact with a Nivis VN210 radio running an ISA100.11a stack.
U.S. Government Purpose Release

Open GeoSocial Consumer Application — GSC-17162-1

This software interface provides a social and collaborative environment to allow end-users (such as GEOSS users) to (1) discover, visualize, and access Earth science information on demand from simple browsers and (2) share the resulting products with their friends and/or community of interest through social networks.
Open Source

Performance Logging Services (PLS) — KSC-12343

Working in real time and using very little memory and CPU, Performance Logging Services (PLS) is an innovative software-performance monitoring tool that tracks statistics on timing and buffer usage. To assist in troubleshooting, PLS will start or stop other software tools when performance requirements are out of specification. The technology has been used in the Checkout and Launch Control System on NASA's Space Shuttle Program.
U.S. Release Only

Netmark eXtensible Database, Data Access, and Retrieval Composition (XDB3-DARC) — ARC-16119-1B

This innovation will query using a suite of operators in the Netmark/XDB query language to retrieve elements based on the absolute value of tags in the XML source. In an earlier version of the software, element retrieval was based solely on "full-text" term searches of the tags and their values.
Open Source

Remote Memory Access Protocol Target Node — GSC-16467-1

This NASA technology provides SpaceWire design users with support for executing remote memory access protocol (RMAP) read and write commands. The target IP core is a VHDL description suitable for implementation in a field-programmable gate array (FPGA) or an application-specific integrated circuit (ASIC).
U.S. Release Only

Semantic Text Mining and Annotation for Information Extraction and Trend Analysis Tool (STAT) — MSC-24614-1

The Semantic Trend Analysis Tool uses linguistic analysis software and an ontology to extract new dimensions in data records that contain natural language text fields. Text fields in problem report data records (e.g., discrepancy reports, problem reports, corrective-action reports, and software change reports) might contain information that is critical to finding trends and groupings of recurring problems. STAT overcomes problems with scoping by linking up meaningful phrases that could be separated by text (e.g., "not aligned" versus "not completely aligned"). STAT's use of hierarchical ontologies avoids the limitations of data codes, which are flat, closed, and have small sets of values that are often difficult to interpret. The ontology organizes aerospace terminology in hierarchies of types of problems, properties, objects, and functions. The tool identifies and tags problems and equipment mentioned in text fields, thereby providing new data files for record keeping. These new data files support text mining and clustering, report generation, browsing, and search at various levels of abstraction.
U.S. Release Only

Shared Memory Framework for Distributed Processing of Models and Simulation on a Linux Host with Virtual Machines — MFS-32970-1

This NASA innovation implements distributed model processes with shared memory data exchange across virtually hosted operating systems.
U.S. Release Only

Simple, Scalable, Script-based Science Processing Archive (S4PA) — GSC-15877-1

Simple, Scalable, Script-based Science Processing Archive (S4PA) is a disk-based archiving system for remote sensing data. The tool can be used for new data transfer, data preprocessing, metadata generation, and data archival. Services provided include data access control, data subscription, metadata publication, and data recovery. All data are archived on readily available disk drives, with FTP and HTTP being the primary modes of data access. S4PA includes a graphical user interface for monitoring and re-configuring system operation. Please visit: http://disc.sci.gsfc.nasa.gov/additional/techlab/s4pa
Open Source

Simple Subset Wizard — GSC-16375-1

The Simple Subset Wizard (SSW) makes searching for granules easier. The tool unites the search function with various subsetters to deliver a single, simple, seamless process. SSW uses OpenSearch to query the Earth-Observing System Clearing House (ECHO) for granules and then employs individual subset agents to submit requests. The SSW currently has 11 agents to interface with different subsetters and supports the subsetting of 217 EOSDIS data sets. The SSW provides the capability to subset by either temporal range or spatial region, although not all subsetters have both of these capabilities.
General Public Release

Software Suite to Support In-Flight Characterization of Remote Sensing Systems — SSC-00393

A software suite, developed to support NASA's in-flight characterization of commercial remote sensing systems, efficiently automates reproducible processing of ground truth data. Written and developed in the MATLAB programming environment, the characterization suite consists of radiometric, geometric, and spatial scripts that require knowledge of MODTRAN and expertise to run. The technology has been used on the IKONOS, QuickBird, OrbView-3, and AWiFS satellite sensors.
General Public Release

STAMiNA — NPO-45213-1

Utilizing STAMiNA, a simulation tool for the Advanced Sensors Collaborative Technology Alliance Microsensor Network Architecture, users can define: (1) mission environment, including terrain features; (2) a sensed object set, including multiple threat objects; (3) sensor placements, their modalities, and their abilities to sense different object types; (4) threat object trajectories; (5) sensing and sensed data dissemination for information fusion; and (6) various network configurations and formations between sensors to examine the coupling of sensing and communication. With these features, STAMiNA provides an overall system-level performance of different sensor network architectures under different parametric conditions.
U.S. Government Purpose Release

State Chart Autocoder — NPO-47810-1

This NASA technology automatically generates code from UML/SysML state-machine models specified in the MagicDraw modeling tool. Input is saved as XML data files, and output is provided by the state-machine implementation code in C, C++, Python, or Promela. A test suite validates output products, and a test harness allows a developer to execute and animate a model with a graphical state-machine monitor. This monitor can run as either a standalone tool or as an Eclipse plug-in to MagicDraw.
U.S. Government Purpose Release

Synchronization, Archival, Validation, and IP Exchange (Save)　　　　　ARC-16445-1

Save is a high-availability framework that manages IP addresses shared between multiple servers. It also monitors the health of those servers to determine which one should be actively servicing requests at any given time. Synchronization mechanisms allow configuration files to be kept consistent between systems and also allow commands to be executed across all servers of a particular type. Archival mechanisms provide automatic version control of configuration files to aid in recovery in case of errant configuration.
Open Source

User-Friendly Metadata　　　　　GSC-15014-1

The User-friendly Metadata (UFM) tool functions as a filter. The tool accepts an ODL file as input and generates a simple HTML representation of the ODL as output. Command-line options provide a user with the ability to modify the program's functionality. For more information, please visit: http://opensource.gsfc.nasa.gov/projects/UFM/index.php
Open Source

Materials and Processing

Parts, Manufacturing, Production Processes, Composites

3
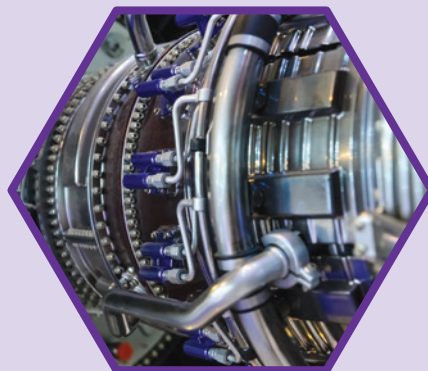
Featured Software

Acoustic Emission Analysis Applet (AEAA) Software　　　　　　　　　　　　LEW-19032-1

This post-processing software tool has been tailored for the novel analysis of composite pressure vessels acoustic emission (AE) data. The software can be used with data acquired from Digital Wave, Inc., and Mistras Group (Physical Acoustics, Inc.) hardware.
U.S. Release Only

Composite Damage (CompDam) Progressive Damage Analysis Software　　　　　　LAR-18832-1

CompDam predicts damage onset, damage progression, and collapse of structures manufactured of fiber-reinforced plastic laminates. The modeling of damage progression is undertaken at the meso-scale, where each ply of a laminate is represented as a homogenous orthotropic continuum. All of the composite damage mechanisms (matrix cracking, fiber breaking and kinking, and delamination) and their interactions are represented. The CompDam software is implemented as user-written subroutines for use with the Abaqus commercial finite element code.
Open Source

Parallel Grand Canonical Monte Carlo Simulation Code (ParaGrandMC)　　　　LAR-18773-1

ParaGrandMC is a highly parallelized code in FORTRAN for (1) simulating the thermodynamic evolution of metal alloy systems at the atomic level and (2) predicting their thermodynamic state, phase diagram, chemical composition and mechanical properties. The approach is based on evolving an initially given atomic system (defined through a list of atomic coordinates of all participating atoms) using a Monte Carlo algorithm. The algorithm is based on repeated random sampling of configuration space using the classical Boltzmann probability distribution.
U.S. Release Only

Ray-Tracing Math Model　　　　　　　　　　　　　　　　　　　　　　　　KSC-12835

The Ray-Tracing Math Model will predict the intensity of infrared heat energy that can be projected from a halogen lamp or a cluster of lamps. While NASA utilized the tool in the Space Shuttle Program, the application can be extended to accommodate other optical and acoustic ray-tracing applications. The current version of the technology assumes ideal parabolic surfaces and reflectors.
General Public Release

Scalable Implementation of Finite Elements by NASA (ScIFEN)　　　　　　　LAR-18720-1

The ScIFEN package, a parallel finite element analysis code written in C++, enables scalable solutions to computational mechanics problems by leveraging several open-source high-performance computing librar-ies for numerical linear algebra routines and parallel input/output. ScIFEN supports several different finite element types, nonlinear material models, and boundary conditions and contains both implicit (ScIFEi) and explicit (SeIFEx) time integration procedures.
U.S. Release Only

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U.S. Release Only

Blackbody VBA Excel® Functions — DRC-015-017

In the analysis of radiation, it is helpful to be able to predict the heat transfer rate and spectral distribution of emitted energy. Presented here is a set of routines written in Microsoft® Visual Basic for Applications (VBA) and incorporating functions specific to Microsoft® Excel® that are useful for predicting the radiative behavior of heated surfaces. These routines include functions for calculating quantities of primary importance to engineers and scientists (e.g., radiative flux and spectral distributions). In addition, the routines also provide the capability to use such information to determine surface temperatures from spectral intensities and calculate the sensitivity of temperature measurements to unknowns in the input parameters.
Open Source

Composite Damage (CompDam) Progressive Damage Analysis Software — LAR-18832-1

CompDam predicts damage onset, damage progression, and collapse of structures manufactured of fiber-reinforced plastic laminates. The modeling of damage progression is undertaken at the meso-scale, where each ply of a laminate is represented as a homogenous orthotropic continuum. All of the composite damage mechanisms (matrix cracking, fiber breaking and kinking, and delamination) and their interactions are represented. The CompDam software is implemented as user-written subroutines for use with the Abaqus commercial finite element code.
Open Source

Materials and Processes Technical Information System (MAPTIS-II) — MFS-32206-1

The Materials and Processes Technical Information System (MAPTIS-II) is an information technology that offers a number of services for acquiring, processing, and disseminating information about materials, materials properties, materials processes, and manufacturing. Content includes materials test results from legacy systems, design allowables, and other online products. The technology provides ready access to accurate data using standard computers, software, and the Internet.
U.S. Government Purpose Release

Parallel Grand Canonical Monte Carlo Simulation Code (ParaGrandMC) — LAR-18773-1

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U.S. Release Only

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General Public Release

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U.S. Release Only

Surface Crack Potential Difference (SCPD) Software   MFS-32848-1

SCPD monitoring software provides the precise relationship between a crack measurement signal and the size of an arbitrary semi-elliptical crack.
U.S. Government Purpose Release

Tool for Analysis of Surface Cracks (TASC)   MFS-33082-1

Created using the commercial math analysis software MATLAB, TASC enables the easy computation of nonlinear J-integral solutions for surface-cracked plates in tension by accessing and interpolating between the 600 nonlinear surface crack solutions documented in NASA/TP-2011-217480. The only required inputs to the program are the surface crack dimensions, plate cross-section dimensions, and material properties. TASC provides a convenient and easy-to-use interface for the solution set that allows a novice user to obtain a fast and reliable fracture toughness solution.
Open Source

System Testing

Acoustics, Shock, Vibration, Thermal Vacuum, Leak and Pressure Testing, Test Criteria, Test Management and Planning, Aerodynamic Testing

4
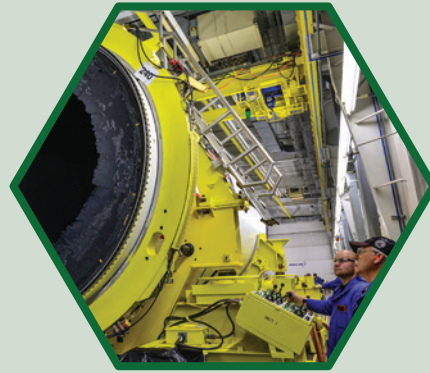
Featured Software

LEWICE 3.2.2 Ice Accretion Software
LEW-18573-1

LEWICE contains an analytical ice accretion model that evaluates the freezing process thermodynamics that occur when super-cooled droplets impinge on a body. Both atmospheric parameters (i.e., temperature, pressure, and velocity) and meteorological parameters (i.e., liquid water content, droplet diameter, and relative humidity) are used to determine the shape of the ice accretion.
U.S. Release Only

OTIS 4: A Trajectory Optimization Computer Code
LEW-18319-1

OTIS 4 is a Fortran program designed to simulate and optimize trajectories of launch vehicles, aircraft, satellites, and interplanetary vehicles. The software is restricted by export control, specifically ITAR.
U.S. Government Purpose Release

RTD Radial-Inflow Turbine Conceptual Design Code
LEW-17453-1

The RTD code executes a conceptual design for a single-stage radial-inflow turbine. A mean-line analysis is performed for the locations having constant radius over the blade span. Constant span-fraction sectors are used at the rotor exit. The analysis can account for stator end-wall clearance flow and swept rotor blades. The loss model includes stator and rotor passage losses, trailing-edge losses, vaneless space loss, disk-friction loss, and rotor-exit clearance loss.
U.S. Release Only

System Identification Programs for AirCraft (SIDPAC)
LAR-16100-1

Written in MATLAB, SIDPAC is a collection of over 300 programs that perform a wide variety of tasks related to system identification applied to aircraft. SIDPAC includes tools for experiment design, data analysis, kinematic consistency checking, static and dynamic modeling, simulation, numerical integration and differentiation, smoothing, filtering, finite Fourier transformation, statistical modeling and evaluation, optimization, parameter estimation, model accuracy quantification, model validation, and more.
General Public Release

TCGRID
LEW-17635-1

TCGRID is a three-dimensional grid-generation code for turbomachinery blades. The software can generate single- or multi-block grids that are compatible with several computational fluid dynamics (CFD) analysis codes, including SWIFT and ADPAC.
U.S. Release Only

Acoustic Propagation and Emulation Toolset (APET)　　　LAR-17761-1

APET is a framework code uniting several acoustic methodologies for the propagation and measurement of source noise audibility at farfield observers, accounting for the effects of the atmosphere, weather, terrain, and spherical spreading. Currently, the toolset consists of a modified version of the Rotorcraft Noise Model (RNM, Version 7) coupled with the newly developed Spectral Attenuation Method (SAM) that contains the Ray-Tracing Program (RTP) and two versions of a Greens function parabolic equation (GFPE) code. APET also includes an audibility prediction scheme based on the work of Abrahamson, initially called ICHIN (I Can Hear It Now) and further developed by Wyle Labs as AUDIB.
U.S. Release Only

Advanced Subsonic and Supersonic Propeller-Induced Noise (ASSPIN) Prediction Program　　　LAR-17590-1

ASSPIN is a computer program that predicts the noise generated by propellers operating at subsonic, transonic, or supersonic helical tip speeds in either single-rotation or counter-rotation mode.
U.S. Release Only

AirShow, Version 1.1.1　　　LEW-17228-1

The AirShow software package enables 3D visualization of computational meshes and computed flow-field data associated with computational fluid dynamics (CFD). The program displays structured grid blocks and computational grid planes.
U.S. Release Only

Arbitrary Accuracy Nonlinear Euler Solver　　　LEW-17465-1

This NASA-developed code is the first in the world to solve nonlinear Euler equations to at least 15th-order accuracy in space and time in two dimensions. It is capable of even higher order accuracy if sufficient computer precision is available.
U.S. Release Only

ASSPIN Input/Output Data Manipulation Tools (ASP_Tools)　　　LAR-17591-1

The format of blade-surface pressure data obtained from aerodynamic codes for ASSPIN input is generally not compatible with that required by ASSPIN, so the ASP_Tools suite provides the capability to manipulate blade geometry and surface pressure data to produce proper ASSPIN input. In addition, the ability to parse ASSPIN output files and obtain specific output variables is provided.
U.S. Release Only

Automated Camera Calibration Software (ACCS)　　　NPO-41312-1

Using collected metrology data, the ACCS system significantly increases the efficiency of the entire camera calibration process, resulting in reduced costs and turnaround time. Even in extreme conditions, the tool performs calibrations with minimal user input.
U.S. Government Purpose Release

Booster Launch Operations Center (BLOC) Custom Software　　　MSC-25367-1

The Booster Launch Operations Center provided NASA with real-time monitoring of shuttle's integrated testing while it was in the Vehicle Assembly Building (VAB) or on the launch pad. USA Design Engineering manned the facility and used this software to monitor the solid rocket booster subsystems (i.e., range safety, electrical and instrumentation, and thrust vector control) using a data feed from the main firing room.
U.S. Government Purpose Release

4. System Testing

CARES/LIFE   LEW-16018-1

This NASA software was developed to predict the reliability and life of structures made from advanced ceramics and other brittle materials (e.g., glass, graphite, and intermetallics).
U.S. Release Only

Channel Emulator   LEW-19351-1

The Channel Emulator (CE) is a software-based network testing tool. Its primary functions are providing data framing services, acting as a flexible protocol gateway, and providing network emulation capabilities. The software can easily accept one protocol, optionally extract the payload, send it out as a different protocol, or encapsulate one in another. The software can also introduce delays up to deep space levels and introduce bit errors and other link degradations.
Open Source

Coupled Structural, Thermal, Acoustic, Electromagnetic (CSTEM) Analysis   LEW-17052-1

CSTEM is a UNIX executable for coupled structural, thermal, acoustic, and electromagnetic analysis and optimization.
U.S. Release Only

DEBRIS Code for Tracking Particles with Mass and Drag Through CFD Solutions on Overset Grids   MSC-23945-1

The DEBRIS software performs particle tracking within an overset grid system from a computational fluid dynamics (CFD) solution. The tracking is based on the particle's mass properties and local aerodynamic characteristics within the flowfield. The software allows the user to specify the particle's location and initial conditions for release and then traces the particle's ballistic trajectory (any lift force is ignored) through the grid system. The resulting trajectory is output to a file that can be viewed/processed as needed by the user.
U.S. Government Purpose Release

Defect Detection and Prevention (DDP)   NPO-20741-1

DDP evaluates criticality by generating a tree of failure modes and a tree of requirements and then evaluating the impact of each failure mode on each requirement.
U.S. Government Purpose Release

Development of Automated Structural Health Monitoring and Qualification Methods and Software for Composite Overwrapped Pressure Vessels   MSC-25421-1

NASA has integrated industry-standard and new, novel analysis methods for assessing the structural health of composite overwrapped pressure vessels (COPV). By significantly increasing throughput, the software has the ability to provide real-time assessments. Adaptive analysis methods have been incorporated into the technology to provide modal analyses at specified points of a structure's life (e.g., loading, unloading, and dwells), thereby increasing the tool's utility and ease of use for acoustic emission testing.
U.S. Government Purpose Release

Fan Broadband Noise Prediction Code   LEW-17279-1

This NASA-developed technology predicts the dipole and quadruple noise that results from the interaction of anisotropic homogeneous turbulence with a rotor or stator.
U.S. Release Only

Fast Scattering Code (FSC), Versions 3.1 and 3.2   LAR-17828-1

The Fast Scattering Code (FSC) is a computer program designed to predict the scattered acoustic field that results from the interaction between a known incident sound and arbitrary three-dimensional surfaces immersed in a potential background flow. The technology is based on the equations of time-harmonic, linearized acoustics and employs equivalent sources for solving an exterior Helmholtz equation boundary value problem (BVP). The incident sound can be generated by FSC using a collection of simple point multi-poles (monopoles and dipoles), or it can be provided by the user from other prediction codes. Predictions for high-frequency/large-scale combinations yield linear systems with millions of unknowns and memory require-ments beyond the capabilities of most advanced computer systems to date. FSC's computational engine has been totally redesigned to alleviate the frequency limitations of the code by employing numerical algorithms that drastically reduce computer resource utilization and take advantage of multiprocessor platforms.
U.S. Release Only

GRAPE.107   LEW-16851-1

GRAPE is a two-dimensional elliptic grid generation code to be used with isolated airfoils. This modified version of the software can generate grids for the RVCQ3D turbomachinery analysis code.
U.S. Release Only

High-Speed Data Viewer   MFS-31700-1

The High-Speed Data Viewer computer software was developed for viewing high-frequency data recorded in the East and West Test Areas at Marshall Space Flight Center (MSFC).
U.S. Release Only

IceVal DatAssistant   LEW-18343-1

This NASA-developed technology provides an improved mechanism for managing the large volume of data generated and utilized in performing icing research.
U.S. Release Only

International Space Station (ISS) Systems Integration Laboratory (ISIL)   MSC-24341-1

This NASA-developed software provides an open-source framework that consolidates ISS laboratory test functions. The technology automates the start-up process of the large ISIL test rig (including configuration validation) and provides test engineers with web access to recorded test data for post-test analysis.
U.S. Government Purpose Release

Jet Noise Prediction Code (JeNo)   LEW-18199-1

JeNo is a Fortran 90 computer code that calculates the far-field sound spectral density produced by axisymmetric jets at user-specified observer locations and frequency ranges. The user must provide a structured computational grid and also input a mean flow solution from a Reynolds-averaged Navier Stokes (RANS) equation.
U.S. Release Only

Jet Noise Prediction Code (JeNo), Version 2.5D   LEW-18199-2

JeNo is a Fortran 90 computer code that evaluates the far-field turbulence-generated noise in non-axisym-metric jets. The propagation Green's function is calculated along a user-specified azimuthal angle (line of sight), but source volume integration is carried out in 3D. The user must provide a structured computational grid in a polar coordinate system and also input a mean flow solution from a Reynolds-averaged Navier Stokes (RANS) equation.
U.S. Release Only

JPF-NAS Java Pathfinder Extension ARC-17301-1

JPF-NAS provides support for model-checking distributed applications. It uses a form of partial-order reduction to explore all possible executions of a distributed Java application.
Open Source

Lag Model: A Turbulence Model for Attached and Separated Flows ARC-14645-1

This NASA-developed technology includes a set of partial differential equations that augment the Reynolds-averaged Navier-Stokes equation. By providing a mechanism that allows flow history to affect turbulence stresses, Lag Model mimics underlying physical processes to provide an improved turbulence model for flows with separation.
U.S. Government Purpose Release

LEWICE 3.2.2 Ice Accretion Software LEW-18573-1

LEWICE contains an analytical ice accretion model that evaluates the freezing process thermodynamics that occur when super-cooled droplets impinge on a body. Both atmospheric parameters (i.e., temperature, pressure, and velocity) and meteorological parameters (i.e., liquid water content, droplet diameter, and relative humidity) are used to determine the shape of the ice accretion.
U.S. Release Only

LINFLUX: 3D Linearized Unsteady Aerodynamic Analysis LEW-17346-1

LINFLUX is a three-dimensional, linearized, unsteady aerodynamic code that can be used to predict the aero-acoustic/aero-elastic responses of axial-flow turbomachinery blade rows to aerodynamic/structural excitations.
U.S. Release Only

MERIDLN LEW-16369-1

MERIDLN is a Fortran program for calculating velocities/streamlines of axial-, radial-, or mixed-flow turbomachinery or annular ducts on the hub-shroud mid-channel stream surface.
U.S. Release Only

MGBK Jet Noise Prediction Code LEW-17062-1

The physics-based MGBK code predicts subsonic and low-supersonic jet mixing noise and shock noise. Predictions are in the form of far-field sound pressure level (SPL) and frequency spectra on an arc or a sideline.
U.S. Release Only

Morpheus Lander Vehicle Simulation MSC-25256-1

The Morpheus simulation is a suite of software models that simulate the performance of a lander vehicle, specifically a terrestrial lander used as a "vertical test bed" platform for developing technology and proving hardware and software systems for use in space exploration. The Morpheus software consists of three main components: flight software, ground software, and simulation software.
U.S. Government Purpose Release

Multiple Kernel Anomaly Detection (MKAD) Algorithm ARC-16462-1

In offline mode, MKAD performs automated anomaly detection on large heterogeneous data sets that contain both discrete symbols and continuous data streams.
Open Source

Multiple Pure Tone (MPT) Noise Code
LEW-17386-1

The MPT noise prediction procedure is based on uniform-rotor computational fluid dynamics (CFD) analysis of BPF tonal content in conjunction with engineering (statistical) correlation information of blade-to-blade non-uniformity effects.
U.S. Release Only

NASA Auralization Framework (NAF)
LAR-18541-1

The NASA Auralization Framework (NAF) is an open architecture for auralization components. It is structured as a set of common building blocks in the form of dynamically linked libraries and will serve as the basis for future auralization capabilities. Several libraries are provided: a core library, a pathfinder library, a scene generator library, a synthesis library, a signal processing library, and a scheduler library. Each library contains a usable but very simple set of capabilities.
General Public Release

NDE Wave & Image Processor (NDEWIP) , Version 3
LEW-18640-1

The NDE Wave & Image Processor software application has been created to provide a state-of-the-art, comprehensive, integrated science-based tool for the advanced visualization, processing, and analysis of NDE and health-monitoring waveform- and image-based data. With NDEWIP, the user has access to a complete post-processing capability in a single tool. Although the software has been developed for the NDE professional, the technology could be used for any other RF signal or image processing and analysis application.
U.S. Release Only

NESSUS 6.2C
LEW-18229-1

The NESSUS 6.2c computer program is a set of separate but related modules for solving a wide range of component and system probabilistic and reliability problems, including finite element analysis, heat transfer analysis, geometry generation, and ceramic material property generation.
U.S. Release Only

OTIS 4: A Trajectory Optimization Computer Code
LEW-18319-1

OTIS 4 is a Fortran program designed to simulate and optimize trajectories of launch vehicles, aircraft, satellites, and interplanetary vehicles. The software is restricted by export control, specifically ITAR.
U.S. Government Purpose Release

OXIMAP: A Model for the Oxidation of C/SiC Composite Structures
LEW-18212-1

The OXIMAP software has been used to analyze the oxidation behavior of carbon-fiber-reinforced composite structures.
U.S. Release Only

PathDroid
ARC-17293-1

PathDroid is an extension of the open-source Java Pathfinder (JPF) verification framework that supports checking binary Android® applications for the absence of software defects including unhandled exceptions and deadlocks.
Open Source

Payloads and Components Real-Time Automated Test System (PACRATS)
MFS-31383-1

The PACRATS data acquisition program allows test engineers to acquire, display, store, and retrieve test data.
U.S. Release Only

PCSTAGE
LEW-16325-1

PCSTAGE is a simple computational simulation of multi-stage turbomachinery blade-to-blade flows on a surface of revolution.
U.S. Release Only

PMESH
LEW-18402-1

The PMESH grid-generation program produces three-dimensional blade-passage meshes for the computational fluid dynamics (CFD) modeling of advanced single- or counter-rotation turboprops and propfans.
U.S. Release Only

Propulsion Diagnostic Method Evaluation Strategy (ProDiMES), Version 1.0
LEW-18371-1

The Propulsion Diagnostic Method Evaluation Strategy (ProDiMES) provides a standard benchmarking problem and a set of evaluation metrics to enable comparison of candidate aircraft engine gas-path diagnostic methods. The MATLAB-based tool enables users to develop and evaluate diagnostic methods independently.
U.S. Release Only

Quick Charge-Coupled Device (CCD) Design Code for Centrifugal Compressor
LEW-17452-1

This NASA-developed technology provides a rapid preliminary assessment of the design geometry and the design-point performance of centrifugal compressors. The analysis is based on a one-dimensional flow model with correlations for the following losses: inlet guide vane, rotor inlet shock, incidence, clearance, blade loading, skin friction, disk friction, recirculation, vaneless diffuser skin friction, and vaned diffuser. With input performance, the code can operate in design mode; with input geometry, the code can operate in analysis mode.
U.S. Release Only

Radial Turbine Off-Design (RTOD) Performance Code
LEW-14060-1

The RTOD code predicts the performance of a single-stage radial-inflow turbine (with either radial or swept rotor blades) as a function of pressure ratio, speed, and stator setting.
U.S. Release Only

RAT-EDA
LEW-18321-1

This NASA-developed technology is a MATLAB-language computer program for exploratory data analysis. Through the fast post-processing of measured time-series Raman spectral data, RAT-EDA reveals thermo-chemical properties and turbulent-chemistry interactions in combustion. The computer program deduces probability density functions of combustion temperatures using user-selected super-pixel regions for each major species (e.g., O_2, N_2, CH_4, CO_2, or H_2O).
U.S. Release Only

Rotor-Stator Interaction (RSI) Broadband Noise Prediction Code
LEW-18131-1

RSI is a Fortran computer code for calculating the spectrum of broadband noise produced by the interaction of fan-rotor wake turbulence with fan-exit guide vanes (i.e., the stator). Provided with incident-turbulence characteristics, the code computes the spectra of acoustic power upstream and downstream of the stator on a mode-by-mode basis at each frequency of interest. Target frequencies are arbitrary and need not be harmonics of a fan's blade-passing frequency.
U.S. Release Only

Rotorcraft Noise Model (RNM), Version 7 — LAR-17753-1

The RNM simulation model calculates community noise, computing time histories for arbitrary vehicle flight operations. The technology accommodates multiple noise sources (e.g., rotors and engines), each represented by a sphere of spectral data at a reference distance. Propagation to the ground accounts for spherical spreading, atmospheric absorption, ground impedance effects, and limited weather effects.
General Public

RTD Radial-Inflow Turbine Conceptual Design Code — LEW-17453-1

The RTD code executes a conceptual design for a single-stage radial-inflow turbine. A mean-line analysis is performed for the locations having constant radius over the blade span. Constant span-fraction sectors are used at the rotor exit. The analysis can account for stator end-wall clearance flow and swept rotor blades. The loss model includes stator and rotor passage losses, trailing-edge losses, vaneless space loss, disk-friction loss, and rotor-exit clearance loss.
U.S. Release Only

RVCQ3D.406 — LEW-16851-2

RVCQ3D is a two-dimensional computational fluid dynamics (CFD) analysis code for turbomachinery (e.g., compressors, turbines, and mixed-flow machines). The technology solves Navier-Stokes equations on a blade-to-blade surface of revolution using explicit finite-difference techniques. Three differencing schemes are available: central differences, AUSM+, and H-CUSP. Three turbulence models are also available: Baldwin-Lomax, Cebeci-Smith, and Wilcox 2006 K-Omega.
U.S. Release Only

SCISEAL — LEW-16330-1

This computer program has been used to study the fluid dynamic forces in SEALS.
U.S. Release Only

SmaggIce UNIX, Version 2.0 — LEW-17399-2

The SmaggIce software toolkit can be used to create structured grids for single- or multi-element 2D iced airfoils in preparation for computational fluid dynamics (CFD) analysis. Software tools will measure ice shape characteristics, add artificial ice shapes, prepare an ice surface for gridding, perform domain decomposition, create and modify grids, analyze grid quality, and output grids for subsequent input into flow solvers.
U.S. Release Only

SmaggIce Windows®, Version 2.0 — LEW-17399-1

The SmaggIce software toolkit can be used to create structured grids for single- or multi-element 2D iced airfoils in preparation for computational fluid dynamics (CFD) analysis. Software tools will measure ice shape characteristics, add artificial ice shapes, prepare an ice surface for gridding, perform domain decomposition, create and modify grids, analyze grid quality, and output grids for subsequent input into flow solvers.
U.S. Release Only

Solar Array Verification and Analysis Tool (SAVANT) — LEW-17681-1

The powerful, yet easy-to-use SAVANT quick-engineering code calculates the expected radiation damage to solar cells in Earth orbit. The tool contains ten types of solar cells and four types of cover glass. Radiation damage calculations are based on the Displacement Damage Dose method developed at the Naval Research Laboratories.
U.S. Release Only

4. System Testing

Sound Lab (SLAB), Version 5 — ARC-14991-1

SLAB is a software-based, real-time, virtual acoustic-environment rendering system designed to study spatial hearing in environments such as concert halls, listening rooms, virtual reality, aviation spatial information displays, and video game sound effects.
Open Source

System Identification Programs for AirCraft (SIDPAC) — LAR-16100-1

Written in MATLAB, SIDPAC is a collection of over 300 programs that perform a wide variety of tasks related to system identification applied to aircraft. SIDPAC includes tools for experiment design, data analysis, kinematic consistency checking, static and dynamic modeling, simulation, numerical integration and differentiation, smoothing, filtering, finite Fourier transformation, statistical modeling and evaluation, optimization, parameter estimation, model accuracy quantification, model validation, and more.
General Public Release

Systematic Sensor Selection Strategy (S4) Software — LEW-18815-1

The Systematic Sensor Selection Strategy (S4) optimally selects a sensor suite from a larger pool of candidate sensors based on their performance in a diagnostic system. S4's user-defined fault-diagnostic approach considers conflicting objectives including cost, weight, and reliability.
U.S. Release Only

SWIFT, v.400 — LEW-17635-2

SWIFT is a multi-block computational fluid dynamics (CFD) analysis code for turbomachinery. The software, which solves Navier-Stokes equations using explicit finite-difference techniques, can be used for linear cascades, isolated blade rows, or multistage machines. Three differencing schemes are available: central differences, AUSM+, and H-CUSP. Three turbulence models are also available: Baldwin-Lomax, Cebeci-Smith, and Wilcox 2006 K-Omega.
U.S. Release Only

TCGRID — LEW-17635-1

TCGRID is a three-dimensional grid-generation code for turbomachinery blades. The software can generate single- or multi-block grids that are compatible with several computational fluid dynamics (CFD) analysis codes, including SWIFT and ADPAC.
U.S. Release Only

TD2 Axial Turbine Design and Performance Code — LEW-11029-1

TD2 performs a streamline analysis that can use meridional velocity gradients to control the radial distribution of work and flow for multistage, multishaft, cooled/uncooled axial-flow turbines. The effects of streamline slope and curvature are included in the radial equilibrium. Hub and tip radii are specified at inlet, at exit, and between each blade row, and velocity diagrams for each stage can be individually controlled. An internal loss correction determines blade-row total-pressure-loss coefficients along the streamlines.
U.S. Release Only

Tempest — LEW-17294-1

Tempest was created to provide Internet/Intranet connectivity to real-time embedded applications.
U.S. Release Only

Time-Accurate, Sectored, One-Dimensional Reactive Code for Simulation, Prediction, and Control of Combustion Instabilities   LEW-17677-1

This sectored one-dimensional model utilizes a simplified computational fluid dynamics (CFD) algorithm to simulate combustion and acoustic processes (including instabilities) in combustors with complex shapes. Utilizing modest computational resources, the code produces realistic results and is well suited for controls development.
U.S. Release Only

Tone Fan Noise Design/Prediction System (TFaNS), Version 1.4   LEW-17063-1

TFaNS predicts tone noise emanating from a fan stage, including the effects of reflection and transmission by the rotor and stator and by the duct inlet and nozzle.
U.S. Release Only

Tone Fan Noise Design/Prediction System (TFaNS), Version 1.5   LEW-17063-2

TFaNS predicts tone noise emanating from a fan stage, including the effects of reflection and transmission by the rotor and stator and by the duct inlet and nozzle. Version 1.5 upgrades include: the SOURCE3D subprogram's ability to perform transmission-loss calculation for modes scattering into themselves; the inlet and aft radiation codes' use of infinite envelope elements in the far-field; and the AWAKEN subprogram's use of a new Acoustic Wake/Turbulence File format.
U.S. Release Only

TSONIC   LEW-16851-3

The TSONIC Fortran program calculates the transonic velocity on the blade-to-blade stream surface of a turbomachine.
U.S. Release Only

Vehicle Acoustic Environment Prediction Program   MFS-31904-1

The Vehicle Acoustic Environment Prediction Program was developed in 1988 and used in Phase A acoustic environments for engine testing in flight vehicles at liftoff.
U.S. Government Purpose Release

WOPWOP   LAR-16680-GS

WOPWOP is used for helicopter main-rotor noise prediction. The user must input measured air loads.
U.S. Release Only

Propulsion

Propellants, Cryogenics, Engine and Motor Performance Analysis

5

Featured Software

ACD Aerodynamic Design of Multistage Axial-Flow Compressors　　　　　**LEW-17448-1**

ACD is an analysis code used for the aerodynamic design of multistage axial-flow compressors. The technology provides velocity diagrams on the streamlines at the blade-row edges. Blade elements are defined by centerline curve and thickness distribution, and blade-element inlet and outlet angles are established through empirical incidence and deviation-angle adjustments to the velocity diagrams. Blade elements can be stacked to provide the full blade design.

U.S. Release Only

Aerospike Design and Performance Tool (ADAPT)　　　　　**MFS-33098-1**

The ADAPT computer code designs and analyzes the performance of linear, annular, or plug-cluster aerospike engines. ADAPT can automatically evaluate aerospike nozzle performance over a wide variation of independent design variables, and it can be used in concert with other built-in analysis techniques to optimize aerospike nozzles over an entire flight envelope. Any propellant system can be modeled. Outputs of the code include files that contain the thruster/spike contour and a summary output file for each thruster/spike design point, as well as vacuum and delivered performance data for the thruster and the entire thruster/spike module. One-dimensional performance data are also included for both the thruster and aerospike so that efficiencies and comparisons may be made.

U.S. Release Only

Aerotherm Chemical Equilibrium (ACE) — MFS-32300-1

The Aerotherm Chemical Equilibrium (ACE) code was developed for predictive thermal/ablative analysis of rocket nozzle liner materials. The tool offers versatility in calculating quantities of importance to a broad variety of thermochemical processes.

U.S. Release Only

Chemical Equilibrium Applications (CEA) — LEW-17687-1

The CEA program calculates chemical equilibrium product concentrations from any set of reactants and determines thermodynamic and transport properties for the product mixture. Built-in applications account for theoretical rocket performance, Chapman-Jouguet detonation parameters, shock-tube parameters, and combustion properties.

U.S. Release Only

Generalized Fluid System Simulation Program (GFSSP), Version 6.0 — MFS-33019-1

The Generalized Fluid System Simulation Program (GFSSP) is a general software tool that can perform complex fluid flow analysis in a wide variety of applications, including those related to chemical processing, gas processing, power plants, hydraulic control circuits, and various kinds of fluid distribution systems. The tool models liquid fuel phase changes that include compressibility and mixture thermodynamics and allows the user to apply and vary "what-if" effects of external influences.

U.S. Government Purpose Release

Rocket Engine Transient Simulation Software (ROCETS) — MFS-31858-1

The Rocket Engine Transient Simulation (ROCETS) software consists of a library of rocket engine component software modules for combustion chambers, nozzles, turbines, pumps, valves, lines, etc. The tool can be used to analyze both steady-state and transient performance under various operating conditions in a variety of environments.

U.S. Release Only

ACD Aerodynamic Design of Multistage Axial-Flow Compressors LEW-17448-1

ACD is an analysis code used for the aerodynamic design of multistage axial-flow compressors. The technology provides velocity diagrams on the streamlines at the blade-row edges. Blade elements are defined by centerline curve and thickness distribution, and blade-element inlet and outlet angles are established through empirical incidence and deviation-angle adjustments to the velocity diagrams. Blade elements can be stacked to provide the full blade design.
U.S. Release Only

ACOD Multistage Axial-Flow Compressor Off-design LEW-17449-1

A companion tool to Glenn Research Center's ACD software (LEW-17448), ACOD is streamline analysis code for predicting the off-design performance of multistage axial-flow compressors. Flow, blading, and loss are modeled similarly to ACD.
U.S. Release Only

Advanced Ducted Propfan Analysis Code (ADPAC) LEW-16768-1

Developed by the Allison Engine Company under contracts with Glenn Research Center, ADPAC solves tightly coupled internal/external flows through future-concept short-duct turbofan engines.
U.S. Release Only

Aerospike Design and Performance Tool (ADAPT) MFS-33098-1

The ADAPT computer code designs and analyzes the performance of linear, annular, or plug-cluster aerospike engines. ADAPT can automatically evaluate aerospike nozzle performance over a wide variation of independent design variables, and it can be used in concert with other built-in analysis techniques to optimize aerospike nozzles over an entire flight envelope. Any propellant system can be modeled. Outputs of the code include files that contain the thruster/spike contour and a summary output file for each thruster/spike design point, as well as vacuum and delivered performance data for the thruster and the entire thruster/spike module. One-dimensional performance data are also included for both the thruster and aerospike so that efficiencies and comparisons may be made.
U.S. Release Only

Aerotherm Chemical Equilibrium (ACE) MFS-32300-1

The Aerotherm Chemical Equilibrium (ACE) code was developed for predictive thermal/ablative analysis of rocket nozzle liner materials. The tool offers versatility in calculating quantities of importance to a broad variety of thermochemical processes.
U.S. Release Only

Axial-Flow Turbine Off-Design (AXOD) Performance LEW-16323-1

AXOD computes the flow and efficiency of multistage axial-flow turbines as functions of speed and pressure ratio. The technology uses a span-line analysis with simple radial equilibrium. The loss model includes blade-row inlet losses, blade-row losses, and stage-test losses. Coefficients are selected to match the known design-point performance, and the internal model provides the off-design performance.
U.S. Release Only

BLAYER LEW-16851-4

BLAYER is a Fortran program used for calculating compressible laminar and turbulent boundary layers in arbitrary pressure gradients.
U.S. Release Only

Boundary-Layer Integral-Matrix Procedure (BLIMP)　　　　　　MFS-23348-1

The Boundary-Layer Integral-Matrix Procedure (BLIMP) software provides fast, highly accurate solutions to gas-phase boundary-layer flow problems encompassing a broad range of boundary conditions. The tool is capable of obtaining accurate and economical solutions to governing differential equations of momentum, energy, and species.

U.S. Government Purpose Release

Broadband Fan Noise Prediction System (BFaNS)　　　　　　LEW-17307-1

BFaNS computes the broadband noise generated by a turbofan engine's fan stage. Noise sources can include turbulence impingement and boundary-layer turbulence convection.

U.S. Release Only

Centrifugal Off-Design Performance (CCODP) Compressor　　　　　　LEW-17450-1

CCODP is a one-dimensional off-design performance prediction code used for centrifugal compressors. Correlations account for the following types of loss: inlet guide vane, impeller incidence, shock, skin friction, blade loading, trailing edge, clearance, vaneless and vaned diffuser friction, recirculation, and disk friction.

U.S. Release Only

Charring Material Ablator (CMA87) Code　　　　　　MFS-32299-1

The Charring Material Ablator (CMA87) code is a predictive software program that performs thermal and ablative analysis of rocket nozzle liner materials. The software is written in ANSI-standard Fortran 77 and uses standard mathematical functions found in common linkable object libraries on most high-end workstations and/or PC platforms.

U.S. Release Only

Chemical Equilibrium Applications (CEA)　　　　　　LEW-17687-1

The CEA program calculates chemical equilibrium product concentrations from any set of reactants and determines thermodynamic and transport properties for the product mixture. Built-in applications account for theoretical rocket performance, Chapman-Jouguet detonation parameters, shock-tube parameters, and combustion properties.

U.S. Release Only

CMA92FLO Aerotherm Charring Material Thermal Response Ablating Program　　MFS-31355-1

The CMA92FLO Aerotherm Charring Material Thermal Response Ablating Program is an implicit finite-difference computational procedure.

U.S. Release Only

CMPSTK Multi-Stage Axial-Flow Compressor Off-Design　　　　　　LEW-17451-1

Developed for studying variable geometry effects at the conceptual design level, CMPSTK is a combination of the STGSTK and CMPGEN computer codes. STGSTK predicts multistage axial-flow compressor off-design performance using mean-line stage stacking, and CMPGEN estimates design-speed flow range and efficiency ratios.

U.S. Release Only

Compressible Flow Toolbox　　　　　　LEW-17898-1

The Compressible Flow Toolbox is a set of algorithms that solve classical compressible equations for isentropic flow, fanno flow, Rayleigh flow, normal shock, oblique shock, and expansion. Implemented in the MATLAB programming language, the technology can be used in the analysis of one-dimensional steady flow with constant entropy, with friction, with heat transfer, or with supersonic Mach numbers.

U.S. Release Only

Computational Fluid Dynamics (CFD) Seal Analysis Code   LEW-16582-1

This technology is a computer program designed for the study of fluid dynamic forces.
U.S. Release Only

Computed Tomography Cylinder Unwrapper/Re-slicer Software (CT-CURS), Version 2   LEW-19031-1

CT-CURS is a dedicated unwrapping/re-slicing software tool for computing tomography data from cylindrical and partially cylindrical structures. The technology can be used as a complement to vendor software or can be utilized as a completely standalone visualization program.
U.S. Release Only

CORBASec   LEW-17214-1

This technology has been used for distributed aerospace propulsion simulations.
U.S. Release Only

CORSAIR Three-Dimensional Unsteady Viscous Flow Analysis/WILDCAT Two-Dimensional Unsteady Viscous Flow Analysis, Version 35.05.01.01   MFS-31622-1

CORSAIR is a three-dimensional unsteady Navier-Stokes analysis used for solving flows in rotating turbomachinery components. CORGRD is the grid generator written to accompany the CORSAIR analysis. The grid generator produces overlaid O-H grids for rotating turbomachinery components, including those with tip clearance and varying endwall radii. WILDCAT is the two-dimensional counterpart of CORSAIR.
U.S. Government Purpose Release

Cryogen Storage Integrated Model (CryoSIM)   MFS-33071-1

CryoSIM provides input power and dry mass estimates for insulation and hardware used in in-space applications to maintain cryogens in storage. System heat load estimations and associated propellant loss masses can also be generated.
U.S. Government Purpose Release

CSPAN Axial-Flow Compressor Conceptual Design Code   LEW-16074-1

This span-line analysis technology uses isentropic simple radial equilibrium to determine a flow path.
U.S. Government Purpose Release

Delta-V Along Line-of-Sight (DVALOS) Software   GSC-17484-1

DVALOS provides the capability to calculate an expected radial delta-V as seen from a supporting Deep Space Network (DSN) tracking station based on a planned maneuver for a DSN-tracked spacecraft. DVALOS may be used post-maneuver to compare observed versus expected delta-V in order to discern maneuver burn performance.
U.S. Government Purpose Release

EADIN Communication Protocol   LEW-19264-1

This communication protocol allows microcontrollers to talk with each other in a structured fashion. It is embodied in C++ code that runs on the microcontrollers. The software is not mission-certified and is being used for demonstration and testing purposes only.
Open Source

Five-Axis, Three-Magnetic-Bearing Control Code (FATMaCC), Version 1.0 — LEW-17293-1

FATMaCC is a comprehensive C++ controller for a magnetically supported verticle rotor, versatile control code. It possesses many desirable features not available in previous in-house controllers. Using a 1-GHz processor, the software will control a five-axis system in either a decentralized or a more elegant centralized (model control) mode at a loop time of 56 seconds. It levitates and controls (with only minor modification to the input-output wiring) a two-axis and/or a four-axis system. Stable rotor levitation and control is accomplished through appropriate key presses to modify parameters (e.g., stiffness, damping, and bias).
U.S. Release Only

Gaseous Nitrogen (GN2) Orifice Mass-Flow Calculator — MSC-24873-1

This calculator has been used to determine GN2 high-pressure tank-source depletion rates for the Space Shuttle Orbiter Water Spray Boiler (WSB), and it has also been used to gauge the ability of GN2 consumables to support APU lubrication cooling during entry.
U.S. Government Purpose Release

GASRAD: A Computer Program for Thermal Radiation from Gaseous Rocket Exhaust Plumes — MFS-31685-1

GASRAD is a computer code for predicting incident thermal radiation from defined plume gas properties in either axisymmetric or cylindrical coordinate systems. It predicts plume-induced radiation using band models. Radiation is integrated over a hemisphere above the receiver.
U.S. Release Only

Generalized Fluid System Simulation Program (GFSSP), Version 6.0 — MFS-33019-1

The Generalized Fluid System Simulation Program (GFSSP) is a general software tool that can perform complex fluid flow analysis in a wide variety of applications, including those related to chemical processing, gas processing, power plants, hydraulic control circuits, and various kinds of fluid distribution systems. The tool models liquid fuel phase changes that include compressibility and mixture thermodynamics and allows the user to apply and vary "what-if" effects of external influences.
U.S. Government Purpose Release

Generalized Fluid System Simulation Program (GFSSP), Version 5.0 (Educational Version) — MFS-32929-1

The Generalized Fluid System Simulation Program (GFSSP) is a general software tool that can perform complex fluid flow analysis in a wide variety of applications, including those related to chemical processing, gas processing, power plants, hydraulic control circuits, and various kinds of fluid distribution systems. Example problems can be used effectively as a teaching aid to students as part of their senior undergraduate or graduate coursework.
U.S. Release Only

ML_POGO Stability Analysis Software — MFS-33024-1

This technology models the coupled structural/propulsion (pogo) stability of a liquid-propellant rocket.
U.S. Release Only

Model Development for Exhaust Plume Impingement Effects on Launch Stand Design (PLIMP/LSD) — MFS-26283-1

A two-phase Navier Stokes code has been developed to improve plume and plume impingement methodology. An easy-to-use thermal response model enables designers to evaluate the plume impingement load on a structure more rapidly and to evaluate the necessary modifications more rapidly.
U.S. and Foreign Release

Model5 Reusable Solid Rocket Motor (RSRM) Ignition Model   MSC-25205-1

This program has been used to: (1) generate realistic random pairs of RSRM ignition transients and (2) provide thrust-differential and pressure-rise rate envelopes.
U.S. Government Purpose Release

Modular Aero-Propulsion System Simulation (MAPSS)   LEW-17674-1

MAPSS is a flexible turbofan engine simulation environment that provides easy access to health, control, and engine parameters through a graphical user interface. The technology can be used as a simulation environment for developing and testing advanced control algorithms, or it can run transient simulations or generate state-space linear models for creating a piecewise linear controller.
U.S. Release Only

Morpheus Engine Geometry Calibration Using Image Processing and Parameter Estimation   MSC-25500-1

This novel video-image processing application calibrates the geometry of a thrust-vector-controlled engine. For offline calibration, Morpheus will read a video taken from an iPhone® camera; for offline calibration, the software will read a video from a webcam.
U.S. Government Purpose Release

Multidimensional, Multiphysics Computational Heat Transfer Analysis Software (UNIC)   MFS-32554-1

The Multidemensional, Multiphysics Computational Heat Transfer Analysis Software (UNIC) solves transient, coupled, and simultaneous conjugate heat transfer solutions commonly encountered in rocket engine and launch vehicle component design and analysis.
U.S. Release Only

NASA Flywheel for iPad®   LEW-19133-1

This augmented reality application highlights NASA Glenn's research efforts in the area of flywheel energy storage systems. Presenting users with 3D views of flywheel hardware and space applications, the app utilizes a printed optical target, available on the GRC Flywheel Program brochure and through the NASA Glenn web portal. Additional video and imagery are also included in the application package. The software has been compiled and bundled as an iOS app for the iPad® and intended for release through the Apple App Store.
Open Source

PHANTOM: A Unified Flow Analysis for Turbomachinery Flows   MFS-32321-1

PHANTOM is a unified, three-dimensional, unsteady Navier-Stokes analysis used for solving flows in rotating turbomachinery components operating in liquids or gases. Working fluids could be air, liquid or gaseous hydrogen, liquid or gaseous oxygen, kerosene, or others. The flow may be incompressible (e.g., a fuel pump in a liquid-fueled rocket engine) or compressible (e.g., the turbine that drives that fuel pump).
U.S. Release Only

Plume Impingement Effect (PLIMP)   MFS-26292-1

Plume Impingement Effect (PLIMP) can be used to simulate the impingement of rocket engine exhaust on nearby spacecraft surfaces.
General Public Release

Propellant Feed System Analytical Tool (PFSAT)   MSC-25181-1

The PFSAT parametric analytical tool predicts heat leaks into cryogenic propellant distribution lines. The technology can also be used to determine the optimum orifice diameter for an optional thermodynamic vent system.

U.S. Government Purpose Release

Reactive and Multi-Phase (RAMP2) Computer Program   MFS-31602-1

The RAMP2 computer program predicts nozzle flowfields of supersonic and rocket nozzle performance. The tool is capable of multi-phase flowfield analysis including high-altitude plumes. Code enhancements account more accurately for variable oxidizer/fuel ratios.

U.S. Release Only

RMC Code   MFS-32290-1

The RMC code computes radiation from solid rocket motor flow fields. Each receiver specified in the surface input is selected in sequence. Radiation is computed for each spectral interval requested, and radiation results are summed for output. The computation for each spectral band begins with conversion of plume properties to optical properties for that band; rays from the receiver surface are generated in random directions to intersect the plume.

U.S. Release Only

Rocket Engine Transient Simulation Software (ROCETS)   MFS-31858-1

The Rocket Engine Transient Simulation (ROCETS) software consists of a library of rocket engine component software modules for combustion chambers, nozzles, turbines, pumps, valves, lines, etc. The tool can be used to analyze both steady-state and transient performance under various operating conditions in a variety of environments.

U.S. Release Only

SNAP, Version 2.3   LEW-17816-1

SNAP is an N-body high-fidelity propagation program that can model the trajectories of the planets, the Sun, and virtually any natural satellite in the solar system.

U.S. Release Only

STAN5   LEW-13009-1

This computer program computes general two-dimensional turbulent boundary-layer flow using finite difference techniques. Without requiring any modifications to the program code, STAN 5 can handle a wide range of boundary-layer problems. The technology has been used extensively at Stanford University.

U.S. Release Only

TURBAN Turbomachine Design Code   LEW-17454-1

TURBAN analysis is performed at the arithmetic mean diameter. The stage velocity diagrams are either all similar (therefore have the same work factor) or are determined from an input stage work split. All stages have the same stator exit angle. Stage-by-stage tailoring of the velocity diagrams is not allowed.

U.S. Release Only

Variable O/F Ratio Method of Characteristics Program for Nozzle and Plume Analysis (MOC Program)   MFS-31901-1

This software was developed for solving 2D and asymmetric inviscid supersonic flow fields. The newer modifications provide better runtime error handling, enhanced mesh control accuracy near the nozzle exit plane, and offer additional start line control options.

U.S. Release Only

V072 Rotor Wake/Stator Interaction Noise Prediction   LEW-17065-1

The V072 computer code predicts noise from rotor wake/stator interactions. The technology can perform compressor rotor wake prediction only, rotor/stator or fan/FEGV interaction only, fan/core stator interaction only, and both fan/FEGV and fan/core stator interactions.
U.S. Release Only

WOBBLE   LEW-17325-1

This technology computes the tone noise associated with propellers and predicts axial and circumferential directivity. The acoustic model is exact and accounts for all unsteady sources.
U.S. Release Only

Electronics and Electrical Power

Solar Arrays, Batteries, Cabling, Grounding, Converters, Electrical Analysis

6
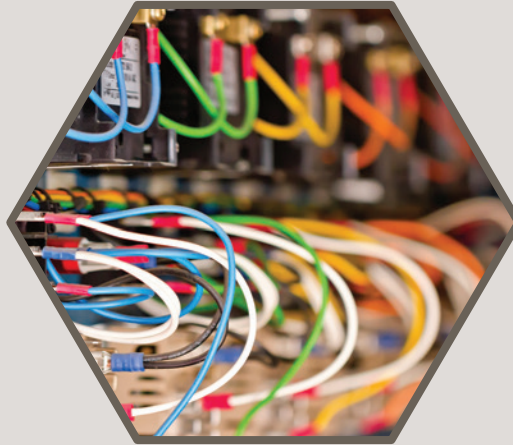
Featured Software

Capture Test Waveform for the SCaN Testbed Harris SDR   LEW-19286-1

The Capture Test Waveform is a software application designed for space-based reconfigurable radios. The innovation allows snapshots of a radio's receiver environment for any number of objectives, including interference mitigation or radio frequency mapping. Digital samples are acquired and stored in the radio's memory for processing. Depending on a radio's resources and architecture, the application could be run in parallel with a standard communications link waveform application. (The software is labeled "test wave-form" because it does not perform any standard communication link functions, e.g. , carrier recovery or demodulation.)

U.S. Release Only

Power Quality Impedance Tester Software   MSC-25353-1

The Power Quality Impedance Tester Software and the Frequency-Response Analyzer (FRA) combined deliver a complete frequency-response measurement system. The software runs on any personal computer using Microsoft® Windows® XP/2007. Data, displayed on a graphical user interface, can be saved to a text file.

U.S. Government Purpose Release

Solenoid Inductance Calculator   KSC-12253

The Solenoid Inductance Calculator can be used to compute the inductance approximation of a cylin-drical solenoid of arbitrary dimensions. The technology's calculation method (1) uses magnetic vector potential to provide a more precise estimate of inductance and (2) is not limited to a specific range of coil geometry values.

U.S. Release Only

6. Electronics and Electrical Power

Capture Test Waveform for the SCaN Testbed Harris SDR   LEW-19286-1

The Capture Test Waveform is a software application designed for space-based reconfigurable radios. The innovation allows snapshots of a radio's receiver environment for any number of objectives, including interference mitigation or radio frequency mapping. Digital samples are acquired and stored in the radio's memory for processing. Depending on a radio's resources and architecture, the application could be run in parallel with a standard communications link waveform application. (The software is labeled "test waveform" because it does not perform any standard communication link functions, e.g. , carrier recovery or demodulation.)

U.S. Release Only

Physics-Model-Based Wiring Fault Detection Toolbox for MATLAB   ARC-17046-1

Providing a toolbox of functionality for MATLAB, this NASA-developed software detects precursor wiring faults (e.g., chafing) in shielded impedance-controlled cabling using measurements from off-the-shelf, time-domain reflectometry or vector-network analyzer hardware. The technology combines high-fidelity analytical physics models for signal propagation with fast Bayesian inference algorithms for intrinsic cable and fault-parameter retrieval.

Open Source

Power Quality Impedance Tester Software   MSC-25353-1

The Power Quality Impedance Tester Software and the Frequency-Response Analyzer (FRA) combined deliver a complete frequency-response measurement system. The software runs on any personal computer using Microsoft® Windows® XP/2007. Data, displayed on a graphical user interface, can be saved to a text file.

U.S. Government Purpose Release

SOLAR: A Rapid International Space Station (ISS) Power-Availability Simulator   MSC-24623-1

SOLAR is a Java-based tool that leverages commercial off-the-shelf software (Satellite Toolkit) and an existing ISS electrical power system model (SPEED) to rapidly perform thousands of power availability simulations.

U.S. Government Purpose Release

Solenoid Inductance Calculator   KSC-12253

The Solenoid Inductance Calculator can be used to compute the inductance approximation of a cylindrical solenoid of arbitrary dimensions. The technology's calculation method (1) uses magnetic vector potential to provide a more precise estimate of inductance and (2) is not limited to a specific range of coil geometry values.

U.S. Release Only

Operations

Ground Software, Telemetry, Command
and Control, Global Positioning Systems,
Extra-Vehicular Activity, Radio, Communications

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Featured Software

Consultative Committee for Space Data Systems (CCSDS) File Delivery Protocol (CFDP) Software Library, Version 3.1   GSC-14993-1

This library provides for the reliable transfer of large data blocks to and from spacecraft. It implements the international standard CFDP protocol, can be used from mission to mission, and supports both ground and flight software.

U.S. Government Purpose Release

Copernicus Trajectory Design and Optimization System, Version 4.3   MSC-25863-1

Copernicus 4.3 includes updates to the plugin interface, a new differential corrector solution method, updated SPICE SPK files, updates to the Python interface, some new training videos, and numerous other refinements and bug fixes.

U.S. Government Purpose Release

GNSS-Inferred Positioning System and Orbit Analysis Simulation Software (GIPSY-OASIS)   NPO-19636-1

GIPSY-OASIS is widely used for geophysical and global positioning system research.

U.S. Government Purpose Release

Integrated Test and Operations System (ITOS), Release 8   GSC-16025-1

This ITOS modification features a new-events system that includes tools to allow the user to create old-style log files and manage the log database.

U.S. Government Purpose Release

SCaN Optical Link Assessment Tool, Version 2   LEW-19313-1

A calculation procedure has been designed and implemented in software that enables the specification and design of a space-based optical communications system. The resulting optical link budget essentially accounts for the communication power flow through the entire optical communications channel from the transmitter to the receiver and yields design specifications for the optical system necessary to assure reliable data transmission with desired operational metrics such as data rate, link margin, etc. The link assessment tool takes into account all the sources of deleterious noise that enters into the communications process such as electronically generated noise in the optical detector and stray optical irradiance from external sources. The link budget has the capability of being interfaced with the orbital element calculations of the Satellite Tool Kit (STK) to allow the dynamic description and evolution of optical link operation from any space-borne satellite within the solar system to and from the Earth. The current version implements PPM and DPSK modulation types that can use PIN, APD, or nanowire optical detectors in the presence of atmospheric turbulence. Coded and un-coded link power margins are provided.

U.S. Release Only

Autonomous eXplorer Control System (AXCS)   ARC-16721-1

AXCS enables smartphones and other mobile devices to be utilized as a ground-based test bed for operations in extreme environments. For NASA, the technology is currently being used to evaluate hardware for balloon launches. The software's tool kits provide environmental and situational measurements, command and data handing (CD&H) functions, events timing, data logging, and communications with external devices.
Open Source

Autonomous Precision Landing Navigation (APLNav) System   MSC-24721-1

The APLNav system provides a simple, cost-effective, reliable, and proven optical terrain navigation tool for planetary landing applications. Passive optical digital cameras are used to create surface images that are rendered against a digital elevation model. The system is derived from the digital scene-mapping and area correlation navigation method that has been employed by cruise missiles for decades.
U.S. Government Purpose Release

CalSimHydro   NPO-48235-1

This web-based, Google Earth-enabled interactive interface provides a tool for configuring, running, viewing, and downloading the results of a CalSim 3.0 hydrology preprocessor program. The software allows the user to (1) interact with a map of water budget areas (WBAs) and display data for a selected WBA in tabular form or as a time series plot; (2) edit input and run a CalSim 3.0 hydrology preprocessor; and (3) compare results with base-run output and download the output file. CalSimHydro will be delivered to the California Department of Water Resource (DWR) and released as a part of the CalSim 3.0 system.
U.S. Government Purpose Release

Class A Core Flight Software (SBN653)   MSC-25998-1

This software provides a communication pass-through between NASA's Core Flight Software (CFS) framework's software bus and the ARINC-653 standard sampling port mechanisms. It adapts the CFS framework to run within ARINC-653 partitioned operating environments.
U.S. Government Purpose Release

Command, Control, Communications, and Intelligence (C3I) Delay/Disruption-Tolerant (DTN) Networking Software   LEW-18493-1

This code is a DTN implementation of the Constellation Program's C3I software.
U.S. Government Purpose Release

Command, Control, Communications, and Intelligence (C3I) Networking Software   LEW-18494-1

This implementation of the Constellation Program's C3I software has provided an environment for the prototype testing of a variety of networking protocols.
U.S. Government Purpose Release

Command, Control, Communications, and Intelligence (C3I) Voice Exchange Software   LEW-18495-1

This implementation of the Constellation Program's C3I software has provided an environment for the prototype testing of a variety of voice exchange components.
U.S. Government Purpose Release

Consultative Committee for Space Data Systems (CCSDS) File Delivery Protocol (CFDP) Software Library, Version 3.1   GSC-14993-1

This library provides for the reliable transfer of large data blocks to and from spacecraft. It implements the international standard CFDP protocol, can be used from mission to mission, and supports both ground and flight software.
U.S. Government Purpose Release

Copernicus Trajectory Design and Optimization System, Version 4.3   MSC-25863-1

Copernicus 4.3 includes updates to the plugin interface, a new differential corrector solution method, updated SPICE SPK files, updates to the Python interface, some new training videos, and numerous other refinements and bug fixes.
U.S. Government Purpose Release

Debris Examination Using Ballistic and Radar-Integrated Software (DEBRIS)   MSC-24827-1

DEBRIS provides the rapid and accurate C-band/X-band radar analysis to assess debris-related threats posed to ongoing missions. Jointly developed by Johnson Space Center (JSC) and the United States Air Force (USAF), the system is composed of two applications: the primary DEBRIS tool, which observes the initial 150 seconds of a flight, and the Automated Radar Debris Examination Tool (ARDENT), which observes the flight time segment between 150 and 480 seconds.
U.S. Government Purpose Release

DF Library (DFLIB), Version 1.X   MSC-25683-1

The DF Library (DFLIB) is a collection of software application programming interfaces (APIs) that provide convenience-function capabilities unique to a mission control center (MCC). These APIs allow the conversion of the DDD:HH:MM:SS time format to/from a floating point number; provide an X Windows pop-up message generator and an X Windows file-selection interface; and include ISP computation interface functions and macros.
U.S. Government Purpose Release

Flexible Docking Tool for Real-Time, Planning Missions   MSC-24801-1

This flexible software tool improves rendezvous planning for a vehicle visiting the International Space Station (ISS). Features include a telemetry processing function, a relative motion function, a targeting function, a vector view, and two- and three-dimensional graphics. The technology's modeling capability ensures that a vehicle stays within desired coordinates.
U.S. Government Purpose Release

Flight Dynamics Planning and Analysis (FDPA) Subsystem Software   MSC-24638-1

The FDPA subsystem's data pre-processing, flight simulation and analysis, and data post-processing capabilities have enabled accurate operations assessments for the International Space Station and Space Shuttle Program. Assessments are performed in a sequential manner using graphical user interface menus and name-list statements to define required input and desired output.
U.S. Government Purpose Release

Global Positioning System (GPS) Receiver Analysis Tool (RAT)   MSC-24649-1

RAT reads telemetry information from a GPS receiver and determines the receiver's performance. As a telemetry-input file is read, an analyst can see the plotted satellites and telemetry information change in animated form. The analyst can halt the animation and generate high-quality PostScript images of the plot suitable for importing into post-flight reports.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) Alert Notification System Router (ANSR), Version 4.0   GSC-17233-1

ANSR is an alert notification system providing paging and email services. Using call chains and call trees, ANSR supports call acknowledgment and call escalation allowing for multiple contingencies. As a central point of alarm configuration, notification, and reporting, it also provides a graphical configuration tool, a console-based monitoring tool, and a web-based log viewer.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC)
API Performance Testing Utility, Version 3.0   GSC-16168-1

This tool is used to test and measure the GMSEC middleware systems by recreating test scenarios under various configurations. The benchmarks run simulations at increasing loads, measuring the performance in terms of message transmission delay. The results can be visually inspected Excel® graphs or raw numerical data. The utility features the ability to compare performance of middleware-based systems against raw TCP socket-to-socket communications, offering a better perspective on the relative value of the GMSEC-compliant middleware systems.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) Compliance Test Suite   GSC-16074-1

The Compliance Test Suite includes both message publisher and message validator applications. The publisher feature provides a variety of predefined, displayable, and selectable messages. The validator reads a selected message and validates it against a corresponding XML schema. Detailed warnings and errors can be accessed with a double click on any specific message.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) Criteria Action Table
(CAT), Version 5.5   GSC-17185-1

The Criteria Action Table is a real-time decision-making component. Using predefined criteria, CAT will ingest messages in real time, analyze the content and context, and determine if the predefined criteria has been met. If so, an associated set of predefined actions is automatically triggered. Predefined actions can also be disabled. A decision-making, action-triggering component, such as CAT, can contribute to system-wide situational awareness, provide system-wide process orchestration, and enable system automation.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) Environmental Diagnostic
Analysis Tool (GEDAT), Version 2.0   GSC-16276-1

Version 2.0 of GEDAT features: a new tree-table display with selective filtering to support large-scale environments; added displays for CPU, memory, network resource graphing/plotting, server configuration, and message statistics; filtered search capabilities; improved menu-bar navigation capabilities; automatic elevation of errors or critical events; and user-configurable notification timeout monitoring.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) Parameter Display Tool   GSC-16073-1

This technology is a GMSEC-compliant software component that enables users to create and view a display page consisting of parameter and telemetry mnemonic values. Both text and color are used to delineate status.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) Reusable Events Analysis
Toolkit (GREAT), Version 3.0   GSC-17234-1

GREAT is a toolkit for event/log messages, supporting single and multiple satellite systems. It provides real-time message display and message archive and retrieval. GREAT is useful as a debugging tool for monitoring real-time activity (as reported by all other components) and retrieving and analyzing historical events.
U.S. Government Purpose Release

Goddard Mission Service Evolution Center (GMSEC) System Agent, Version 3.1   GSC-17483-1

The GMSEC System Agent is a GMSEC-compliant software component that provides health information about the computer hosting the agent to other GMSEC components utilizing a middleware-based architecture. It also affords the capability to execute commands received from a GMSEC directive message as well as the capability for monitoring specified log files.
U.S. Government Purpose Release

GNSS-Inferred Positioning System and Orbit Analysis Simulation Software (GIPSY-OASIS)   NPO-19636-1

GIPSY-OASIS is widely used for geophysical and global positioning system research.
U.S. Government Purpose Release

GRC GSFC TDRSS (GGT) Waveform   LEW-18976-1

GGT Waveform is a binary-phase-shift-keying (BPSK) spread-spectrum waveform that uses BPSK and SS-BPSK modulation to enable standard TDRSS functionality. The spread-spectrum BPSK modes operate over the TDRSS single-access and multiple-access services at data rates of 18 kbps forward and 24 kbps return, with options possible for encoding/decoding and scrambling. The BPSK modulation modes operate at 155 kbps and 769 kbps forward, and 192 kbps and 769 kbps return, respectively. Similar options are available for encoding/decoding and scrambling. The waveform supports a SpaceWire data interface to the flight computer and provides a standard 1553 command and telemetry interface.
U.S. Government Purpose Release

Ground Hardware Management Tool (GHMT) Web Application   KSC-13923

The Ground Systems Development and Operations (GSDO) Program requires a web-based application to effectively manage and coordinate the various components of ground support equipment (GSE) used at Kennedy Space Center (KSC) throughout spacecraft/launch vehicle processing and integration flow as well as for launch pad operations. The GHMT application tracks and manages GSE data used in support of KSC\GSDO operations planning and launch campaigns.
U.S. Release Only

Input Device Framework (IDF)   MSC-25810-1

This framework maps physical input devices (joysticks, gaming controllers, custom control panels, etc.) to application-specific virtual controller interfaces. It provides a pattern for writing device-independent code.
Open Source

Inspire Connect Explore (ICE)   KSC-13772

The Inspire Connect Explore (ICE) application is an inspiration tool utilized by education and external relations organizations at NASA to increase STEM awareness and participation.
U.S. Release Only

Integrated Test and Operations System (ITOS), Release 8   GSC-16025-1

This ITOS modification features a new-events system that includes tools to allow the user to create old-style log files and manage the log database.
U.S. Government Purpose Release

Integrated View (IView), Version 1.1.2   MSC-25625-1

The Integrated Viewer (IView) is a web-based electronic tool used to execute Onboard Short-Term Plan Viewer (OSTPV) activities. The software serves as a consolidated user interface, integrating information from OSTPV, the International Procedure Viewer (IPV), and the Automated Stowage Note (ASN) tool.
U.S. Government Purpose Release

Interoperable Remote Component (IRC)   GSC-14308-1

IRC provides robust interactive and distributed control/monitoring of remote instruments. The IRC architecture combines the processing capabilities of Java with the power of XML to express hierarchical data in a human-readable, platform-independent format. For additional information, please visit: http://opensource.gsfc.nasa.gov/projects/IRC/index.php
Open Source

Java Astrodynamics Toolkit (JAT)   GSC-14912-1

The Java Astrodynamics Toolkit (JAT) is a collection of Java components that aid flight dynamics engineers in performing space mission design; trajectory optimization; and spacecraft navigation, attitude-determination, and control systems analysis. Current capabilities include orbit propagation, orbit determination, maneuver planning, spacecraft attitude simulation, and 3D orbit and attitude visualization.
Open Source

Joint-Execution Package Development and Integration (JEDI) Application   MSC-25099-1

JEDI is the primary tool used by all International Space Station control centers to create and approve messages for astronauts and flight control teams. JEDI messaging enables ground and crew personnel to update specific tasks or procedures quickly and efficiently.
U.S. Government Purpose Release

Orbital Communications Adaptor (OCA) Management System (OCAMS)   MSC-24833-1

OCAMS is a simulation-to-implementation, multi-agent system development methodology that combines ethnography, participatory design, multi-agent simulation, and agent-based systems integration. Employing the Brahms programming language, the technology automates tasks, leverages network infrastructure to distribute information, and links arbitrary hardware and software systems to teams of people on Earth and in space.
U.S. Government Purpose Release

Maestro Science Activity Planner for Mars   NPO-45871-1

The Maestro Science Activity Planner (Maestro) provides an intuitive interface to the Mars Exploration Rovers Mission, combining cutting-edge visualization with sophisticated planning and simulation capabilities.
U.S. Government Purpose Release

Method for Automatic Optimization of Yaw Maneuvers for Orbiting Space Vehicles   MSC-25656-1

This software provides a simplified analytical solution for yaw maneuver optimization. The approach is applicable to the International Station (ISS) as well as other orbiting space vehicles.
U.S. Government Purpose Release

Mission Display (MDX) System   NPO-35238-1

The Mission Display (MDX) System can be used to visualize a wide variety of raster scan data, including IFSAR images and DEM. The technology enables the user to view very large data sets (greater than 2 gigabytes per image) and offers several ways to combine information from different data sets into a single display window.
U.S. Government Purpose Release

Modeling-Error-Driven Performance-Seeking Direct Adaptive Control   ARC-16235-1

This software uses a novel, stable, discrete, time-adaptive law that implements flight control to target damages/modeling errors in a direct adaptive-control framework. The baseline controller uses dynamic inversion with proportional integral augmentation. This methodology will investigate conditions for stability as well as performance.
U.S. Government Purpose Release

Multi-Purpose Attitude and Pointing System (MAPS), Version 7.1 — MSC-25522-1

The Multi-Purpose Attitude and Pointing System (MAPS) has been used for attitude development and line-of-sight analysis since 1991. Version 7.1 of the software allows the user to model any motion-control system without post-processing or manually modifying data.
U.S. Government Purpose Release

NASA Caution and Warning Tool for International Space Station (ISS) Partners — MSC-24697-1

Making it easier to communicate and coordinate evaluation and resolution activities, this software enables industry partners to receive the same caution and warning (C&W) data displays that ISS flight control teams receive. The technology allows all parties to consult from the same perspective. Status information is communicated to subscribers via XML message transmissions.
U.S. Government Purpose Release

Open Mission Control Technologies (Open MCT) — ARC-15256-1D

Open MCT is an open source and web-based mission control framework for the visualization of data on desktop and mobile devices. The tool is designed for analysis, visualization, operation, and support of spacecraft missions. It provides an extensible plugin system, allowing it to be integrated with existing ground systems and adapted to support multiple missions as well as non-space applications.
Open Source

Planning Products Change Request (PPCR) Application — MSC-24807-1

For the International Space Station (ISS) mission plan, this comprehensive change-request management tool offers built-in workflow processes to track condition-related information and thousands of tasks and activities. The technology allows planners to view a summary of all of the changes for any one mission day, even though the changes may have been received via multiple PPCRs and from various other flight controllers and disciplines.
U.S. Government Purpose Release

Positional Login (POSLOGIN) — MSC-25483-1

In the Mission Control Center at Johnson Space Center, the operational support of International Space Station missions requires around-the-clock monitoring by flight controllers and support staff. POSLOGIN has been developed to ensure that processes remain in place and continue to be executed during shift changes.
U.S. Government Purpose Release

Propulsion System Controller Checkout (PCOC) Software — MFS-32259-1

The PCOC computer served as the electrical ground support equipment for FASTRAC engine avionics. The PCOC software that executed on the computer provided a window into engine operation, as well as main propulsion system operation and thrust vector control system operation. The software displayed a graphical representation of the FASTRAC engine and associated MPS, offering visual indications of tank levels, valve positions, propellant locations, and engine ignition.
U.S. Government Purpose Release

ROBUS-2 Fault-Tolerant Broadcast Communication System for Modular Avionics — LAR-17264-1

ROBUS-2 is a time-division, multiple-access broadcast communication system that uses a time-indexed communication schedule for medium-access control. The technology provides guaranteed fault-tolerant services that include: message broadcast (Byzantine agreement), dynamic communication schedule update, time reference (clock synchronization), and distributed diagnosis (group membership).
Open Source

Sasquatch Footprint Predictor   MSC-25513-1

Sasquatch is used to predict flight paths and landing regions (i.e., footprints) to ensure that an aircraft's payload will land in a safe, obstacle-free region of a drop zone.

U.S. Government Purpose Release

SCaN Optical Link Assessment Tool, Version 2   LEW-19313-1

A calculation procedure has been designed and implemented in software that enables the specification and design of a space-based optical communications system. The resulting optical link budget essentially accounts for the communication power flow through the entire optical communications channel from the transmitter to the receiver and yields design specifications for the optical system necessary to assure reliable data transmission with desired operational metrics such as data rate, link margin, etc. The link assessment tool takes into account all the sources of deleterious noise that enters into the communications process such as electronically generated noise in the optical detector and stray optical irradiance from external sources. The link budget has the capability of being interfaced with the orbital element calculations of the Satellite Tool Kit (STK) to allow the dynamic description and evolution of optical link operation from any space-borne satellite within the solar system to and from the Earth. The current version implements PPM and DPSK modulation types that can use PIN, APD, or nanowire optical detectors in the presence of atmospheric turbulence. Coded and un-coded link power margins are provided.

U.S. Release Only

Scheduling and Planning Interface for Exploration (SPIFe)   ARC-15795-1A

The SPIFe interface allows plans to be generated under complex constraints and reduces the number of team members necessary to achieve mission goals. The technology, consisting of a set of plugins built using the Java Eclipse Rich Client Platform (RCP), complies with the standards of the Ensemble project. SPIFe software offers several novel controls and visualizations for task planning and a generalized application interface for communicating with planning engines.

U.S. Government Purpose Release

Scheduling, Training Administration and Records (STAR) System   ARC-16336-1

This technology is a next-generation, web-based training management system for crews, instructors, and flight controllers. Replacing the Training Administration Management System (TAMS), the Flight Operations Curriculum Administration System (FOCAS), and approximately 100 other disparate tools, STAR provides integrated curriculum development and documentation, customized training plans, personnel and facilities scheduling, training event feedback, and other training resources.

U.S. Government Purpose Release

Score 3.2 and Subs (3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8)   MSC-26142-1

Score is an application used to build and edit timelines with resource and constraint checking capabilities. It provides the status of activities, allows for the inclusion of hyperlinks to activities, and affords the ability to check and manipulate constraints and resource usage by activities.

U.S. Government Purpose Release

Space Telecommunications Radio System (STRS) Compliance Tools   LEW-18562-1

These tools are used to help verify software compliance to the NASA-developed Space Telecommunications Radio System (STRS) architecture. The goal of STRS is to support waveform application portability, upgradability, and reduce the cost and risk of using software-defined radios for NASA. Compliance Tools is a Bourne shell script that tests an STRS application for the appropriate method signatures. The output is a web page containing the results. The command and compliance application WFCCN is ported, compiled, and linked with an STRS infrastructure to verify static compliance so that all required STRS infrastructure-provided methods are implemented as well as the named constants, typedefs, and structs.

U.S. Release Only

Thermal Insulation System Analysis Tool (TISTool)   KSC-13561

The Thermal Insulation System Analysis Tool has been updated with more test data from the Cryogenics Test Laboratory and has been converted to Fortran 95 to allow for easier distribution.

U.S. Release Only

Visiting Vehicle Ground Trajectory Tool   MSC-24763-1

This targeting tool provided the ability to perform planning and real-time operations for the visiting International Space Station (ISS) vehicle group.

U.S. Government Purpose Release

Structures and Mechanisms

Deployables, Structural Loading Analysis and Design

8

Featured Software

Beyond Low-Earth Orbit (LEO) Architecture Sizing Tool (BLAST)   MSC-25505-1

A user-friendly, configurable spacecraft sizing tool, BLAST provides a shareable, re-creatable and rigorous end-to-end multi-element architecture framework that has been used to generate mass data for in-space, beyond low-Earth orbit (LEO) transportation vehicles and architectures. Offering a novel approach to modeling, BLAST couples extensive MER research with the ability to assess mission changes instantaneously by analyzing sensitivity sweeps of several parameters at once.

U.S. Government Purpose Release

CCGEOM   LEW-17450-1A

CCGEOM is a Fortran computer code developed to facilitate the rapid generation of flow passage and blading for various turbomachinery components.

U.S. Release Only

Data Transfer Between Dissimilar Meshes (DTBDM), Version 2.0   LAR-16371-1

Designed to automate an otherwise labor-intensive process, DTBDM puts the aerodynamic loads output of a computational fluid dynamics (CFD) package into the structural model of an aircraft to allow for deflection calculations.

U.S. Release Only

Launch Vehicle Analysis (LVA) Tool   MFS-31694-1

The Launch Vehicle Analysis (LVA) Tool is a software program that integrates ground and flightload analysis with direct-solution structural and thermal analysis. A typical solution can be obtained, starting from scratch, in thirty to sixty minutes, and subsequent runs can be done in less than two minutes.

U.S. Government Purpose Release

Piping Stress Analysis Software   KSC-11692-1

The Piping Stress Analysis Software calculates the stress, working pressure, or required pipe-wall thickness for a given application in a simple, straightforward manner. The program allows the user to select a specific material from a database of commonly used materials or create a customized database for an unlisted material. Pipes can be analyzed according to several sets of requirements, including the ASME/ANSI B31.1 and B31.3 piping codes and the JIC hydraulics code. Both standard and SI metric versions are available.

U.S. Release Only

Software Platform for Post-Processing Waveform-Based
Non-destructive Evaluation, Version 2   LEW-18460-1

As the name suggests, this tool provides a software platform for post-processing waveform-based non-destructive evaluation (NDE).

General Public Release

AESOP-STAB Ablation Modeling and Optimization Program, Version 3.1   MSC-25566-1

To help maximize payload capability, AESOP-STAB determines the minimum weight of an n-layer thermal protection system (TPS) material subject to temperature constraints. Code modifications include enhanced environment input options, solution routines, and material response capabilities. To use the program, the user must define the thermal model, select the desired optimization procedure(s), define all thermo-physical properties for each material, and provide the desired boundary conditions (i.e., heating rates and back wall conditions). AESOP-STAB was designed to make the preparation of input data as simple as possible.
U.S. Release Only

Beyond Low-Earth Orbit (LEO) Architecture Sizing Tool (BLAST)   MSC-25505-1

A user-friendly, configurable spacecraft sizing tool, BLAST provides a shareable, re-creatable and rigorous end-to-end multi-element architecture framework that has been used to generate mass data for in-space, beyond low-Earth orbit (LEO) transportation vehicles and architectures. Offering a novel approach to modeling, BLAST couples extensive MER research with the ability to assess mission changes instantaneously by analyzing sensitivity sweeps of several parameters at once.
U.S. Government Purpose Release

CCGEOM   LEW-17450-1A

CCGEOM is a Fortran computer code developed to facilitate the rapid generation of flow passage and blading for various turbomachinery components.
U.S. Release Only

Data Transfer Between Dissimilar Meshes (DTBDM), Version 2.0   LAR-16371-1

Designed to automate an otherwise labor-intensive process, DTBDM puts the aerodynamic loads output of a computational fluid dynamics (CFD) package into the structural model of an aircraft to allow for deflection calculations.
U.S. Release Only

Half-Cycle Crack Growth   DRC-010-044

A NASA-developed software program that predicts the operational flight life of critical aero-structural components, this tool offers a reliable method for calculating theoretical fatigue crack growths that could lead to catastrophic failures. The program, which builds upon and integrates Armstrong's proven half-cycle and closed-form aging theories, considers every half-cycle of loading spectra for specific structural components. Because it takes into account mini-amplitude stress loading and half-cycles based on duty cycles, the innovation is an improvement over traditional prediction software.
General Public Release

HCDstruct   LAR-18313-1

This MATLAB routine generates a scalable finite element model suitable for hybrid wing-body (HWB) structural analysis and optimization. HWB geometry structure is based on a vehicle sketch-pad (VSP) surface model of an aircraft and a FLOPS-compatible parameterization of the center body and wing structure. Optimization and weight calculation are based on a NASTRAN finite element analysis of the primary structural components.
U.S. Release Only

Launch Vehicle Analysis (LVA) Tool   MFS-31694-1

The Launch Vehicle Analysis (LVA) Tool is a software program that integrates ground and flightload analysis with direct-solution structural and thermal analysis. A typical solution can be obtained, starting from scratch, in thirty to sixty minutes, and subsequent runs can be done in less than two minutes.
U.S. Government Purpose Release

Launch Vehicle Loads Analysis for Preliminary Design (VLOADS) , Version 1.4   MFS-27332-1

The VLOADS program calculates launch vehicle in-flight structural loads for preliminary design. The program may also be used to calculate structural loads for upper stages and planetary transfer vehicles. Launch vehicle information and input data (e.g. , aerodynamic coefficients, mass properties, propellants, engine thrusts, and performance data) are compiled and analyzed by VLOADS to produce distributed shear loads, bending moments, axial forces, and vehicle line loads as a function of X-station along a vehicle's length. If the launch vehicle has boosters or wings, translational accelerations and interface loads are also computed.
U.S. Release Only

Monocoque Tank Analysis Spreadsheet System (MonTASS), Version 2.0   MFS-31223-1

The Monocoque Tank Analysis Spreadsheet System (MonTASS) computer program enables rapid analysis and preliminary design of structural domes and truncated sections of cones. The software performs both design and analysis functions and can be used to analyze nonpressurized conical structures.
U.S. Release Only

Object-Oriented Optimization Tool, Version 2.0   DRC-014-024

This object-oriented framework integrates the analysis codes for multiple disciplines. Optimization can then take place within each discipline module, in a loop between the central executive module and the discipline modules, or both.
General Public Release

Piping Stress Analysis Software   KSC-11692-1

The Piping Stress Analysis Software calculates the stress, working pressure, or required pipe-wall thickness for a given application in a simple, straightforward manner. The program allows the user to select a specific material from a database of commonly used materials or create a customized database for an unlisted material. Pipes can be analyzed according to several sets of requirements, including the ASME/ANSI B31.1 and B31.3 piping codes and the JIC hydraulics code. Both standard and SI metric versions are available.
U.S. Release Only

Reduced Order Analysis Using a Nonlinear STiffness Evaluation Procedure (RANSTEP)   LAR-17262-1

RANSTEP is used for solving geometrically nonlinear random vibration problems of complex structures. The tool allows computation of otherwise inaccessible modal nonlinear stiffness terms from commercial finite element programs. Some operations are performed outside the commercial codes and utilize in-house-developed FORTRAN codes. Two solutions procedures (i.e., equivalent linearization and time numerical simulation) of different fidelity and computational costs are offered in each implementation.
U.S. Release Only

Software Platform for Post-Processing Waveform-Based Non-destructive Evaluation, Version 2   LEW-18460-1

As the name suggests, this tool provides a software platform for post-processing waveform-based non-destructive evaluation (NDE).
General Public Release

Trajectory Software Application Deorbit Opportunities Processors (TSA/DOPS)   MSC-24639-1

Originally developed for the Space Shuttle Program and the International Space Station, TSA/DOPS allows multiple users to collaborate in the design and development of spacecraft deorbit opportunities. Once key parameters and variables have been entered, software algorithms generate useful information regarding sun-angle violations and ascending nodes.
U.S. Government Purpose Release

Environmental Science
Earth • Air • Space • Exoplanet

Terrestrial Environments, Planetary Atmospheric Modeling, Radiation Shielding

9

Featured Software

Earth Global Reference Atmospheric Model (Earth-Gram) 2016   MFS-32780-2

Earth-Gram 2016 is a computer code that can run on a variety of platforms including PCs and UNIX stations. The model provides values for atmospheric parameters such as density, temperature, winds, and constituents for any month and at any altitude and location within the Earth's atmosphere. Earth-Gram 2010 is also currently supported.

U.S. Release Only

Electric Propulsion Interactions Code (EPIC)   MFS-32165-1

EPIC is an interactive computer toolset that enables the construction of a 3D spacecraft model and the assessment of a variety of interactions between the model's subsystems and the plume from an electric thruster. EPIC unites different computer tools to address the many complexities associated with spacecraft/plume interaction processes.

U.S. Release Only

Interactive Spacecraft Charging Handbook With Integrated, Updated Spacecraft Charging Models (ISCCH), Version 3.1   MFS-31675-1

The ISCCH is an interactive, web-based multimedia product that offers updated and integrated spacecraft charging models. The software guides the non-expert using the power of sophisticated analysis tools.

U.S. Release Only

Mars Global Reference Atmospheric Model (Mars-GRAM) 2010   MFS-33158-1

Mars-GRAM is an engineering-level atmospheric model widely used for diverse mission applications, including systems design, performance analysis, and operations planning for aerobraking, entry descent and landing, and aerocapture.
General Public Release

NASA/Air Force Spacecraft Charging Analyzer Program (NASCAP-2K), Version 4.1   MFS-32056-1

NASCAP-2K is the next-generation spacecraft charging analysis code. The technology is a comprehensive update to the original NASCAP spacecraft charging codes written twenty years ago. Resulting from a collaboration between NASA and the U.S. Air Force Research Lab (AFRL), the software builds upon the Air Force's DynaPAC charging algorithms and will replace 3D spacecraft charging codes for all environments.
U.S. Release Only

Orbital Debris Engineering Model (ORDEM), Version 3   MSC-25457-1

ORDEM offers flux as a function of debris size and year. The technology can be operated in spacecraft mode or telescope mode. An upgraded user interface uses project-oriented organization and provides graphical representations of numerous output data products.
General Public Release

Titan Global Reference Atmospheric Model (Titan-GRAM), Version 1.0   MFS-32297-1

Titan-GRAM is a program that provides engineering estimates of density, temperature, pressure, and winds for Titan's atmosphere. More information on the Space Environments & Effects (SEE) Program can be found at http://see.msfc.nasa.gov/
U.S. Release Only

Venus Global Reference Atmospheric Model (Venus-GRAM) 2005, Version 1.0   MFS-32314-1

Venus-GRAM 2005 is a program that provides engineering estimates of density, temperature, pressure, and winds for the atmosphere of Venus.
General Public Release

3D Visualization Software for Mission Science Operations (Viz)   ARC-14933-1

The Viz package provides situational awareness, science analysis, and data understanding capabilities for planetary exploration mission science operations. Affording a modular and extensible visualization environment, the technology couples network and plug-in interfaces with a 3D scene graph database and an interactive 3D viewer.
U.S. Government Purpose Release

Active-Response Gravity Offload System (ARGOS Horizontal Software)   MSC-25394-1

ARGOS provides a simulated environment to test robotic systems and humans in reduced gravity, including microgravity and lunar and Martian environments. Generation 1 of the technology repurposed a commercial off-the-shelf load management system as a proof of concept. Generation 2 utilizes a fully custom design with expanded system capabilities for speed and load capacity.
U.S. Government Purpose Release

Advanced Land Image Assessment System (ALIAS)   GSC-15185-1

ALIAS supports radiometric and geometric multispectral image processing for the Advanced Land Imager (ALI) instrument onboard NASA's Earth Observing-1 (EO-1) satellite. The radiometric subsystem characterizes and (where possible) corrects: detector operability; gain; bias; coherent, impulse, and random noise; signal-to-noise ratios; saturation levels; striping and banding; and the stability of detector performance. Geometric processing functions support sensor alignment calibrations; sensor chip assembly alignments; modulation transfer function characterizations; image-to-image characterizations; and geodetic accuracy assessments. Please visit the following URL for more information: http://opensource.gsfc.nasa.gov/projects/Alias/index.php
Open Source

BUMPER Micrometeoroid and Orbital Debris Risk Assessment Tool, Version 3.0   MSC-25474-1

BUMPER is the primary risk analysis program used by NASA to provide safe and reliable operation of spacecraft exposed to the impacts of micrometeoroid/orbital debris (MMOD). BUMPER 3.0 is a major update to BUMPER-II released in the early 1990s.
U.S. Government Purpose Release

CEOS Data Cube Platform, Version 2   LAR-18928-1

The Committee on Earth Observation Satellites (CEOS) has long recognized a need for data processing infrastructure to support Earth science objectives in developing countries. Forest preservation initiatives, carbon measurement initiatives, water management, and agricultural monitoring are just a few examples of causes that can benefit greatly from remote sensing data. Currently, however, many developing nations lack the in-country expertise and computational infrastructure to utilize remote sensing data. The CEOS Data Cube Platform offers a flexible model to address these needs. The platform provides a framework that includes support for automated ingestion of a wide variety of remote sensing data products.
U.S. Release Only

Crisis Mapping Toolkit (CMT), Version 1   ARC-17472-1

The Crisis Mapping Toolkit (CMT) is a collection of tools for processing geospatial data (images, satellite data, etc.) into cartographic products that improve the understanding of large-scale crises, such as natural disasters. The cartographic products produced by CMT include flood inundation maps, maps of damaged or destroyed structures, forest fire maps, population density estimates, etc. CMT is designed to rapidly process large-scale data using Google Earth Engine and other geospatial data systems.
Open Source

Desktop Exploration of Remote Terrain (DERT)   ARC-17647-1

Desktop Exploration of Remote Terrain (DERT) is a software tool for exploring large digital terrain models (DTMs) in 3D. It aids in understanding topography and spatial relationships of terrain features, as well as in performing simple analysis tasks relevant to the planetary science community.
Open Source

Earthdata Search Web Application   GSC-17399-1

Earthdata Search enables users to quickly and intuitively discover, search, visualize, and access Earth science data in a highly visual manner. It interfaces with and demonstrates current state-of-the-art services provided by NASA EOSDIS such as the Common Metadata Repository (CMR) for sub-second search results, the Global Imagery Browse Services (GIBS) for fast tiled imagery visualizations of data, and OPeNDAP for data access, transformation, and subsetting.
Open Source

Earth Global Reference Atmospheric Model (Earth-Gram) 2016   MFS-32780-2

Earth-Gram 2016 is a computer code that can run on a variety of platforms including PCs and UNIX stations. The model provides values for atmospheric parameters such as density, temperature, winds, and constituents for any month and at any altitude and location within the Earth's atmosphere. Earth-Gram 2010 is also currently supported.
U.S. Release Only

Electric Propulsion Interactions Code (EPIC)   MFS-32165-1

EPIC is an interactive computer toolset that enables the construction of a 3D spacecraft model and the assessment of a variety of interactions between the model's subsystems and the plume from an electric thruster. EPIC unites different computer tools to address the many complexities associated with spacecraft/plume interaction processes.
U.S. Release Only

ElectroStatic Return of Contaminants Tool (Updated)   MFS-32011-1

The ElectroStatic Return of Contaminants (ESR) tool is a first-generation computational code created for computing the return characteristics of spacecraft-generated contaminants. The code computes the Debye sheath (if necessary), the returned contaminant mass rate, returned mass flux, returned mass ratio, return velocity, and surface sputter (where applicable). To help the user, default values have been supplied for all program inputs.
U.S. Release Only

Emission of Solar Protons (ESP) Model   MFS-31315-1

The Emission of Solar Protons (ESP) Model is a computer model of the solar proton environment. The tool predicts total solar proton fluence levels for interplanetary space in the energy range of 1 to 300 MeV, which is the range required for both solar cell and electronics applications.
U.S. Release Only

GeoCam, Version 2   ARC-16088-1A

GeoCam is a geospatial system for disaster response that consists of (1) low-cost consumer hardware (i.e., a digital camera or cell phone, position/orientation sensors, and an optional embedded controller) and (2) a web-based workflow that enables images and other geo-referenced data to be shared and viewed in a variety of ways. GeoCam includes software that computes image location and provides for geo-rectification, KML-formatted geospatial data generation, image management, and geo-referenced data sharing.
Open Source

Global Precipitation Space and Ground Radar Comparison Software   GSC-15469-1

Designed to support a prototype validation network for the Global Precipitation Measurement (GPM) space-flight mission, this space and ground radar comparison software collects data from the Precipitation Radar instrument flying on the Tropical Rainfall Measuring Mission (TRMM) spacecraft. Please visit the following URL for additional information: http://opensource.gsfc.nasa.gov/projects/GPM/
Open Source

GLOBE Program's Citizen Science Cloud App for iOS   GSC-17391-1

GLOBE members currently enter their scientific data using a data entry tool on GLOBE's site. The GLOBE Cloud Data Entry App allows both non-GLOBE members and GLOBE members to enter cloud observations into their mobile devices and send their observations to the GLOBE database. Users are able to enter data even when a mobile device is not connected to the Internet.
General Public Release

GLOBE Program's Data Entry App for Android®   GSC-17390-1

The Global Learning and Observations to Benefit the Environment (GLOBE) program is a worldwide hands-on primary and secondary school science and education program. The GLOBE Program's Data Entry App for Android® enables members to enter data via their Android® devices and when in the field, where they may not have an Internet connection. Their data will be stored locally on their iOS devices and sent to the GLOBE database once their devices get connected to the Internet. This project also facilitates data entry by leveraging mobile capabilities including GPS, photography, and date/time.
General Public Release

GLOBE Program's Data Entry App for iOS   GSC-17389-1

The Global Learning and Observations to Benefit the Environment (GLOBE) program is a worldwide hands-on primary and secondary school science and education program. The GLOBE Program's Data Entry App for iOS enables members to enter data via their iOS devices and when in the field, where they may not have an Internet connection. Their data will be stored locally on their iOS devices and sent to the GLOBE database once their devices get connected to the Internet. This project also facilitates data entry by leveraging mobile capabilities including GPS, photography, and date/time.
General Public Release

General EQFlux   GSC-14791-1

The Windows EQFlux computer program converts solar-cell damage resulting from hard-particle radiation into the equivalent fluence on MeV electrons. Please visit the following URL for more information: http://opensource.gsfc.nasa.gov/projects/eqflux/index.php
Open Source

Hazards and Population Mapper (HazPop) Mobile Application for iOS Platform   GSC-17605-1

HazPop is a free app developed by the NASA Socioeconomic Data and Applications Center (SEDAC). The App enables users to easily display recent natural hazard data in relationship to population, major infrastructure, and satellite imagery. Hazards data include the location of active fires over the past 48 hours; earthquake alerts over the past seven days; and yesterday's air pollution data measured from space. The app shows the location of major dams and nuclear power plants and provides more detailed information and imagery for these facilities where available. By drawing a circle around a point or area of interest on the map, users can obtain an estimate of the total population and land area enclosed within.
General Public Release

HDFView Plug-in   GSC-14948-1

This Java-language software plug-in to HDFView provides an interface for two versions of hierarchical data formats (HDF 4 and HDF 5). Please visit the following URL for more information: http://opensource.gsfc.nasa.gov/projects/HDF/index.php
Open Source

Interactive Spacecraft Charging Handbook With Integrated, Updated Spacecraft Charging Models (ISCCH), Version 3.1   MFS-31675-1

The ISCCH is an interactive, web-based multimedia product that offers updated and integrated spacecraft charging models. The software guides the non-expert using the power of sophisticated analysis tools.
U.S. Release Only

J-Track 3D Satellite Tracking Application   MFS-32013-1

J-Track 3D is a projection that displays numerous satellites in orbit around the Earth. The technology provides a set of Java components integrated with web pages, back-end processes, and an SQL database and scripts to provide a suite of satellite tracking services. Features include optional ground trace and orbit trace. Please visit the following link for more information: http://science.nasa.gov/realtime/jtrack/3d/JTrack3D.html/
U.S. Release Only

Kepler Community Data Analysis Tools   ARC-16805-1

The Kepler archive contains time-series data calibrated and reduced from detector pixels. The pipelined reduction includes the removal of time-series trends systematic to a spacecraft and its environment.
Open Source

Landslide Hazard Assessment for Situational Awareness (LHASA)   GSC-17452-1

This framework integrates a regional landslide susceptibility map and satellite-based rainfall estimates into a binary decision tree model, considering both daily and antecedent rainfall. Using a regionally distributed, percentile-based threshold approach, the model outputs a pixel-by-pixel nowcast in near real-time at a resolution of 30 arcseconds to identify areas of moderate and high landslide hazard.
Open Source

Lightning Forecasting Algorithm (LFA)   MFS-33225-1

The Lightning Forecasting Algorithm (LFA) is an algorithm that may be implemented within any cloud-allowing or cloud-resolving numerical forecast model that converts gridded forecasts of updraft speeds and graupel hydrometeor mixing ratios in the mixed phase layer into gridded estimates of total lightning flash rate density.
General Public Release

Low-Altitude Trapped Radiation Model, Version 1   MFS-31309-1

Accurate models of the Earth's trapped energetic proton environment are required for both piloted and robotic space missions. As astronomical and remote sensing detectors become more sensitive, proton flux can induce unwanted backgrounds in the instrumentation. The Low-Altitude Trapped Radiation Model, based on nearly 20 years of data from the TIRO/NOAA weather satellites, predicts the integral omindirectional proton flux in three energy ranges: >16, >36, and >80 MeV. The model contains a true solar cycle variation and accounts for the secular variation in the Earth's magnetic field.
U.S. Release Only

Lunar e-Library
MFS-32430-1

The Lunar e-Library database provides an accessible, searchable set of technical references on the lunar environment, lunar studies, and past lunar missions. This DVD knowledge base contains 1,100 (PDF) items with an emphasis on documents produced during the Apollo/Saturn era. Full text is available for 870 documents, and abstracts with source information are included for 230 documents that are copyrighted or are limited distribution materials.
U.S. Release Only

Mars Global Reference Atmospheric Model (Mars-GRAM) 2010
MFS-33158-1

Mars-GRAM is an engineering-level atmospheric model widely used for diverse mission applications, including systems design, performance analysis, and operations planning for aerobraking, entry descent and landing, and aerocapture.
General Public Release

Marshall MRMS Mosaic Python Toolkit (MMM-Py)
MFS-33236-1

MMM-Py reads, analyzes, and displays three-dimensional national mosaicked reflectivity data produced by NOAA's National Severe Storms Laboratory (NSSL). MMM-Py can read MRMS mosaics from either their unique binary format or their converted NetCDF format; it can also read and properly interpret the current mosaic design (4 regional tiles) as well as mosaics produced prior to late July 2013 (8 tiles). The technology can easily stitch multiple tiles together to provide a larger regional or national picture of precipitating weather systems. Composites, horizontal/vertical cross-sections, and combinations thereof are easily displayed using as little as one line of code.
Open Source

MATLAB-Based Solar System Ephemeris Toolbox
KSC-12544

This set of MATLAB functions has been used to generate state data (position and velocity) for the Sun, the Earth's moon, and all of the other planets in the solar system. Provided by the Jet Propulsion Laboratory's Solar System Dynamics Group, the technology uses Chebychev polynomial fits of numerical integration results for solar system motion. Essentially, the toolbox functions as the MATLAB equivalent of JPL Fortran routines used to construct binary ephemeris files, verify correct installation, and generate state data.
General Public Release

Magnetogram Forecast (Mag4)
MFS-32802-1

Forecasting from a magnetogram of a sunspot active region, this algorithm predicts solar eruptions anticipated within the next 24 to 48 hours. The technology essentially transforms available solar scientific data into forecasting tools for severe space weather conditions.
U.S. Release Only

Meteoroid Engineering Model (MEM), Version 1.0
MFS-32205-1

The MEM model can be used to describe the meteoroid environment anywhere in the inner solar system. Incorporating a physics-based approach rather than traditional empirical fits, the model provides important information necessary for spacecraft survivability, including meteoroid directionality and velocity distributions.
U.S. Release Only

NASA/Air Force Spacecraft Charging Analyzer Program (NASCAP-2K), Version 4.1
MFS-32056-1

NASCAP-2K is the next-generation spacecraft charging analysis code. The technology is a comprehensive update to the original NASCAP spacecraft charging codes written twenty years ago. Resulting from a collaboration between NASA and the U.S. Air Force Research Lab (AFRL), the software builds upon the Air Force's DynaPAC charging algorithms and will replace 3D spacecraft charging codes for all environments.
U.S. Release Only

NASA Forecast Model Web (NFMW) Map Service
GSC-15276-1

NFMW reads weather forecast models outputs; subsets the data to the region of interest; interpolates the data to the specified size; generates a visualization of the data using colors, contour lines, or arrows; and sends the visualization to the client. More information can be found at: http://opensource.gsfc.nasa.gov/projects/NFMW/
Open Source

NASA Marshall Engineering Thermosphere (MET) Model 2007
MFS-33038-1

MET-2007 consists of a computer program and subroutines. For altitude ranges up to 2,500 kilometers, the technology provides information on atmospheric properties as a function of latitude, longitude, time, solar flux, and geomagnetic indices. The model outputs the following parameters: exospheric temperature, local temperature, atmosphere constituent number densities, average molecular weight, total mass density, and total pressure.
U.S. Release Only

Neo-Geography Toolkit (NGT), Version 2
ARC-16341-1A

NGT is a collection of automated processing tools that can transform raw geospatial raster data from remote sensing instruments into useful cartographic products, including visible image base maps and topographic models.
Open Source

Neptune Global Reference Atmospheric Model (Neptune-GRAM), Version 1.0
MFS-32296-1

From surface to orbital altitudes, this Fortran-based program provides engineering estimates of density, temperature, pressure, and winds for the Neptune atmosphere.
U.S. Release Only

Obs4MIPS
GSC-16848-1

This technology is a front end to the Climate Model Output Rewriter (CMOR2) software package. The technology converts a variety of standard data formats (e.g., netcdf3, netcdf4, Grads control files, and MATLAB data files) to allow publication on the Earth System Grid Federation (ESGF) data node.
Open Source

Orbital Debris Engineering Model (ORDEM), Version 3
MSC-25457-1

ORDEM offers flux as a function of debris size and year. The technology can be operated in spacecraft mode or telescope mode. An upgraded user interface uses project-oriented organization and provides graphical representations of numerous output data products.
General Public Release

Python Advanced Microwave Precipitation Radiometer Data Toolkit (PyAMPR)
MFS-33219-1

This toolkit will read geolocated brightness temperature data (in ASCII format) from any flight of the AMPR airborne instrument. A python script will pull out timing, brightness temperatures, and other information from each channel/geolocation and store them as attributes using the appropriate type of numpy array. The approach consists of ingesting the entire file as a text string and then parsing and converting as necessary. The file is read and the data are populated when the class is instantiated with the full path and name of an AMPR file. Numerous visualization methods are provided, including track plots, strip charts, and Google Earth KMZs. In addition, polarization deconvolution is available.
Open Source

9. Environmental Science (Earth, Air, Space, Exoplanet)

Python Interface to Dual-Pol Radar Algorithms (DualPol)   MFS-33274-1

This is an object-oriented Python module that facilitates precipitation retrievals (e.g., hydrometeor type, precipitation rate, precipitation mass, particle size distribution information) from polarimetric radar data. It leverages existing open source radar software packages to perform all-in-one retrievals that are then easily visualized or saved using existing software.
Open Source

Python Polarimetric Radar Beam Blockage Calculation (PyBlock)   MFS-33284-1

This Python package will calculate beam blockage in polarimetric weather radar data using the specific differential phase (KDP) and fully self-consistent (FSC) methods of Timothy J. Lang, et al. (2009; J. Atmos. Oceanic Technol.). This information can be used to correct the radar data when the radar beams intersect objects like trees, buildings, and mountains.
Open Source

Python Turbulence Detection Algorithm (PyTDA)   MFS-33237-1

PyTDA, an MSFC-based implementation of the National Center for Atmospheric Research (NCAR) Turbulence Detection Algorithm (NTDA), can be used for convective-scale analysis, situational awareness, and forensic meteorology. The software provides Python functions that will estimate turbulence from Doppler radar data. It is written in the Python programming language.
Open Source

Radiation Environment Array Charge Transport (REACT)   MFS-32001-1

The REACT detector array charge collection model is useful in the design of optical sensor missions.
U.S. Release Only

Satellite Contamination and Materials Outgassing Knowledgebase (SCMOK), Version 3.0   MFS-32183-1

SCMOK is a combination of the ASTM E1559 and Space QCM flight databases. Approximately 200 contamination/space environmental effects papers/reports are available, including LDEF papers for the three post-retrieval conferences and also papers related to POSA, MIR, and the International Space Station. The information can be accessed and searched using Acrobat®.
General Public Release

Simple Thermal Environment Model (STEM) User's Guide   MFS-31728-1

Helpful in the thermal analysis of near-Earth spacecraft, the STEM User's Guide is a Fortran-based program that provides engineering estimates of top-of-atmosphere albedo and outgoing longwave radiation.
U.S. Release Only

Space Physics Data Facility (SPDF) Web Services   GSC-14730-1

These web services provide a distributed programming interface to a portion of the Space Physics Data Facility (SPDF) software. The technology conforms to all applicable service specifications of the World Wide Web Consortium. Please visit the following URL for additional information: http://spdf.gsfc.nasa.gov/
Open Source

Space Weather Android® App   GSC-16321-1

Developed for the Community Coordinated Modeling Center, this application displays space weather information. Users can swipe between space weather data products to see the latest available data; pan and zoom to see a detailed view of any particular product; rearrange and add space weather data products to the application layout; and browse a data catalog by category.
General Public Release

Spacecraft Materials Selector (SMS) Expert System — MFS-31328-1

The SMS knowledge base is a preliminary design tool that provides estimates of environmental exposures and/or materials performance. Inputs may launch date, altitude, inclination, mission duration, and certain characteristics of satellite motion.
U.S. Release Only

Terrestrial Observation and Prediction System (TOPS) Biogeochemical Cycle (BGC) Model — ARC-16197-1A

TOPS integrates data from satellites, weather stations, and climate models with ecosystem models to produce nowcasts and forecasts of ecological conditions. Upon further refinement and testing, the ecological nowcasts and forecasts are useful for making a variety of management decisions, e.g., irrigation scheduling, timing of field operations, crop phenology and production, and preparing for floods/droughts and vector-borne diseases.
U.S. and Foreign Release

The Charge Collector (TCC), Version 2.1 — MFS-32019-1

TCC is a compilation of spacecraft charging tools including design guidelines and a variety of information from government/industry/academic databases and reports.
U.S. Release Only

Thermal Protection System Sizing (TPSSZR) Using Sinda/Fluint — ARC-15016-1

TPSSZR is an automated thermal protection system (TPS) distribution and sizing analysis code for analyzing space vehicles at the conceptual-design level. The technology automatically generates TPS stackups and aerothermal environment files, maintains consistent material properties descriptions, and has the capability to simultaneously evaluate multiple nominal and abort flight trajectories.
U.S. Government Purpose Release

Titan Global Reference Atmospheric Model (Titan-GRAM), Version 1.0 — MFS-32297-1

Titan-GRAM is a program that provides engineering estimates of density, temperature, pressure, and winds for Titan's atmosphere. More information on the Space Environments & Effects (SEE) Program can be found at http://see.msfc.nasa.gov/
U.S. Release Only

Trapped Proton Model (TPM) — MFS-31329-1

TPM determines the differential omnidirectional proton flux from 1 to 100 MeV. At high altitudes, the model is based on CRRESPRO developed by AFRL; at low altitudes, the model is based on data from the TIROS/NOAA (POES) low-altitude polar-orbiting satellites. The model contains a true solar cycle variation and also contains sub-models for quiet and active magnetospheric states.
U.S. Release Only

Trapped Radiation Models: Uncertainties for Spacecraft Design — MFS-31319-1

The focus of Trapped Radiation Models software development effort was to help spacecraft and payload designers to account for uncertainties in predictive models of the Earth's trapped radiation environment. A tool was needed for more accurately determining radiation requirements and risks, which are essential elements for producing less expensive, more reliable spacecraft.
U.S. Release Only

Venus Global Reference Atmospheric Model (Venus-GRAM) 2005, Version 1.0   MFS-32314-1

Venus-GRAM 2005 is a Fortran-based program that provides engineering estimates of density, temperature, pressure, and winds for the atmosphere of Venus.
General Public Release

World Wind Virtual Globe Software Development Kit (SDK)
(Java, Web, iOS, Android®)   ARC-15166-1A

NASA World Wind is an intuitive software application supporting the interactive exploration of a variety of data presented within a geospatial context. The technology offers a 3D graphics user experience with seamless, integrated access to a variety of online data sources via open standards protocols.
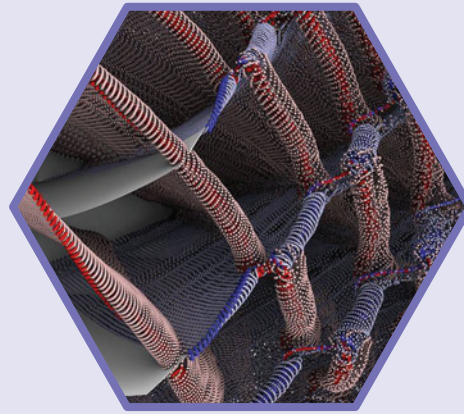**Open Source**

Design and Integration Tools

Vehicle/Payload Modeling and
Analysis, Component and Integrated
System Simulation

10

Featured Software

Automated Triangle Geometry Processing for Surface Modeling and Cartesian Grid Generation (Cart3D)
ARC-14275-1

Cart3D is a high-fidelity inviscid analysis package for conceptual and preliminary aerodynamic design. It allows users to perform automated computational fluid dynamics (CFD) analysis on complex geometry. The package includes utilities for geometry import, surface modeling and intersection, mesh generation, and flow simulation. Cart3D is highly automated so that geometry acquisition and mesh generation can usually be performed within a matter of minutes on most modern UNIX workstations or PCs.
U.S. Government Purpose Release

Fully Implicit Ablation and Thermal Analysis Program, Version 3 (FIAT v3), Unrestricted Version
ARC-15779-1A

FIAT v3 simulates one-dimensional thermal energy transport in a multilayer stack of isotropic materials and structures that can ablate from the front surface and decompose in depth. The implicit solution algorithm and general solution technique make the program very stable and robust for application to both robotic and crewed vehicles entering a planetary atmosphere from space. For input, the code reads material property information from a database file.
U.S. and Foreign Release

Knife, Version 1.0
LAR-17481-1

The Knife library calculates the boolean subtraction of arbitrary watertight triangular polyhedral in order to make near-field sonic boom predictions.
U.S. Release Only

42: A Comprehensive General-Purpose Simulation of Attitude and Trajectory Dynamics and Control of Multiple Spacecraft Composed of Multiple Rigid or Flexible Bodies   GSC-16720-1

42 is a simulator of spacecraft attitude, orbit dynamics, and environmental models. Spacecraft models composed of multiple bodies are supported. Environment models include ephemerides for all planets and major moons in the solar system. 42 supports geometrical visualization through an OpenGL interface, and it is open source and portable across computing platforms, making it customizable and extensible.
Open Source

Advanced Life Support Sizing Analysis Tool (ALSSAT), Version 12.0   MSC-25510-1

The Advanced Life Support Sizing Analysis Tool (ALSSAT) is a computer model for sizing and analyzing designs of environmental-control and life support systems (ECLSS) for spacecraft and surface habitats involved in the exploration of Mars and the Moon. It performs conceptual designs of advanced life support (ALS) subsystems that recycle air and water and process waste in order to reduce the need for resource resupply. ALSSAT is a means of investigating combinations of such subsystems' technologies and thereby assists in determining the most cost-effective technology combination available. Using the Excel® spreadsheet software with Visual Basic programming language, ALSSAT has been developed to perform multiple-case trade studies based on the calculated ECLSS mass, volume, power, and equivalent system mass, as well as parametric studies by varying the input parameters. ALSSAT's modular format is specifically designed for the ease of future maintenance and upgrades.
U.S. Release Only

Architecture Adaptive Computing Environment (ACE)   GSC-14911-1

The Architecture Adaptive Computing Environment (ACE) is a parallel computing language, compiler, and runtime library. The purpose of ACE is to allow a programmer to more easily write parallel programs for a wide variety of parallel computer architectures.
Open Source

Arnold Mirror Modeler Software   MFS-33271-1

This software creates complex finite element models of large-format, lightweight mirrors for complete input decks. Before, building these models could take engineers weeks or even months to complete a single iteration. Now the modeler tool can do the same task in minutes. The software creates many levels of model complexity, from single mirrors (circular or hexagonal shapes) to arrays of mirror segments. Models can have local reinforcement surrounding attachment points, and mesh can be refined (doubled) as many times as necessary.
U.S. Government Purpose Release

Assert-Based Unit Test Tools   GSC-16689-1

The ut-assert unit test tools provide a unit test framework and a collection of utilities that are designed to facilitate unit testing. These tools implement an assertion-based testing philosophy that requires the developer to explicitly write verification statements that assert whether a condition is true or false. This approach is much different than the Flight Software Branch's historical approach to unit testing that creates a log file that requires developer analysis in order to determine whether a test passed or failed. In order to use the tools, developers populate the framework with their unit tests and links with the ut-asssert library to create an executable.
Open Source

Automated Triangle Geometry Processing for Surface Modeling and Cartesian Grid Generation (Cart3D)   ARC-14275-1

Cart3D is a high-fidelity inviscid analysis package for conceptual and preliminary aerodynamic design. It allows users to perform automated computational fluid dynamics (CFD) analysis on complex geometry. The package includes utilities for geometry import, surface modeling and intersection, mesh generation, and flow simulation. Cart3D is highly automated so that geometry acquisition and mesh generation can usually be performed within a matter of minutes on most modern UNIX workstations or PCs.
U.S. Government Purpose Release

Bearing Analysis Tool (BAT)   MFS-31864-1

The Bearing Analysis Tool (BAT) allows detailed design of rolling element bearings rocket engine turbopumps and other applications. It includes a graphical user interface that greatly reduces the effort required to define analytical models for simulation and design.
U.S. Release Only

Charring Ablator Response (CHAR) Code   MSC-25599-1

The CHarring Ablator Response (CHAR) Code is a 1D, 2D, and 3D ablation, thermal analysis, and porous flow solver primarily used to predict the response of ablative thermal protection systems during atmospheric entry. The software can be executed on serial and massively parallel computing platforms.
U.S. Release Only

Computational Fluid Dynamics (CFD) Utility Software Library   ARC-14467-1A

A collection of utility programs and reusable subroutine libraries supports computational fluid dynamics, particularly on multiblock structured grids. The technology is applicable to all flight regimes (subsonic, transonic, supersonic, and hypersonic).
Open Source

Computational Fluids Laboratory 3-Dimensional (CFL3D)   LAR-16003-1

CFL3D is a structured-grid, cell-centered, upwind-biased, Reynolds-averaged Navier-Stokes (RANS) code. It can be run in parallel on multiple grid zones with point-matched, patched, overset, or embedded connectivities. Both multigrid and mesh sequencing are available in time-accurate or steady-state modes.
U.S. Release Only

Configuration-Based Aerodynamics (CBAero)   ARC-15819-1

CBAero is a software tool for the prediction of the conceptual aero-thermodynamic environments of aerospace configurations. The vehicle geometry is defined using unstructured, triangulated surface meshes. For subsonic Mach numbers, a fast, unstructured, multi-pole panel code is coupled with a streamline tracing formulation to define the viscous surface solution. For supersonic and hypersonic Mach numbers, various independent panel methods are coupled with the streamline tracing formulation, attachment line detection methods, and stagnation-attachment line heating models to define the viscous aero-thermal environment.
U.S. Government Purpose Release

Data Parallel Line Relaxation Code (DPLR), Version 4   ARC-16021-1A

The DPLR software package is a suite of CFD tools for the computation of supersonic and hypersonic flows in chemical and thermal nonequilibrium. Included in the package are 2D/axisymmetric and 3D structured grid finite volume Navier-Stokes codes, a pre-processor, and a post-processor. The code supports implicit boundary conditions, generalized multi-block topologies, grid alignment to flow features, and generalized chemical kinetics and thermodynamic property databases.
U.S. Government Purpose Release

Decelerator System Simulation (DSS)   MSC-24014-1

DSS software predicts and analyzes the dynamics of a load of cargo dropped with parachutes from an aircraft, from the first motion in the aircraft until the payload reaches the ground. The system, which comprises a Windows® version paired with Excel®, is easier to use than the UNIX system-based version.
U.S. Release Only

Design Process Integration (DPI)   KSC-12294

Design Process Integration (DPI) is a systems engineering approach using an integrated database. It provides checklist-type data input forms to assure compliance with contractual requirements and also provides a common database repository for the information behind the released design drawings.
U.S. Release Only

DSMC Analysis Code (DAC) Software for Simulating
Rarefied Gas Dynamic Environments   MSC-23445-1

Innovators at NASA's Johnson Space Center have developed software that is an easy-to-use implementation of the Direct Simulation Monte Carlo (DSMC) method that can be applied to a broad base of low-density flow problems. Its built-in flexibility, automation, and intuitiveness, combined with the potential of its parallel processing capabilities, provides an easy-to-use, high-performance solution for analyzing rarefied flows.
U.S. Release Only

EDLFLOW-F: A Next-Generation High-Order High-Fidelity All-Speed
Time-Accurate Flow Solver for Simulating Fluid Flows   ARC-16349-1

EDLFLOW-F solves the unsteady three-dimensional equations for compressible flow using a fourth-order Runge-Kutta integration scheme and a sixth- and/or tenth-order compact differencing scheme for spatial derivatives. Deforming geometry simulations can be carried out using this solver. The technology can also be used in a low-order mode as a Reynolds-averaged Navier-Stokes (RANS) solver. Any flow regime (from incompressible flow to hypersonic flow about arbitrary geometries) can be simulated using EDLFLOW-F.
U.S. Government Purpose Release

eProc Electronic Procedure System for Spacecraft Glass Cockpits (eProc System)   MSC-25186-1

Crew members have the ability to perform all display tasks manually or with electronic procedures. This electronic procedure system, referred to as eProc, is designed as a powerful alternative to reduce crew workload. eProc assists crew members by highlighting vehicle states on a display and cueing up appropriate displays, pop-ups, and commands. eProc is also linked to fault messages, so that crew members can quickly access procedures to any message that appears on the fault summary or log displays.
U.S. Release Only

Extended Testability Analysis (ETA) Tool, Version 8   LEW-19241-1

This technology is a NASA Glenn-developed software application that supports fault management (FM) by performing testability analyses on the fault propagation model of a given system. The tool processes a diagnostic model developed from a commercial software package called TEAMS Designer using a defined set of modeling conventions and practices.
U.S. Release Only

Failure Modes and Effects Analysis (FMEA) Tool   MSC-25379-1

This tool models a system's components and their connective relationships and functions in order to assist in FMEA early in the design lifecycle. The software saves analysis time and provides a standardized and systematic approach in failure analysis, thereby enabling risk mitigation earlier in system design.
General Public Release

FCOD Rapid Prototyping Lab Generic Display Software (FCOD Generic Displays)   MSC-25185-1

This software permits the user to interact with and understand the user interface for a generic "glass" spacecraft cockpit. Based on standards developed by NASA for the Orion spacecraft, it simulates various phases of flight and various malfunction situations to help users understand operating a spacecraft exclusively through computer screens instead of a large number of physical switches, gauges, and other controls.
U.S. Government Purpose Release

Flight Dynamics Simulation of a Generic Transport Model   LAR-17625-1

This software is a flight dynamics simulation of a transport aircraft. It implements general rigid-body equations of motion for vehicle dynamics and draws aerodynamic forces from a standard coefficient expansion implemented as table lookups. Dynamics of actuator servos and bandwidth of sensors are also included. The simulation is coded in Simulink, a model-based environment using a commercial simulation package from Mathworks, Inc. The software is not stand-alone; it must be run from inside this commercial environment, making use of numerical libraries for basic operations as well as the overall time-stepping and numerical integration routines.
Open Source

Fully Implicit Ablation and Thermal Analysis Program, Version 3 (FIAT v3), Unrestricted Version   ARC-15779-1A

FIAT v3 simulates one-dimensional thermal energy transport in a multilayer stack of isotropic materials and structures that can ablate from the front surface and decompose in depth. The implicit solution algorithm and general solution technique make the program very stable and robust for application to both robotic and crewed vehicles entering a planetary atmosphere from space. For input, the code reads material property information from a database file.
U.S. and Foreign Release

functional Availability Simulation Tool Enhanced Release (fASTER)   MSC-24823-1

fASTER is a Monte Carlo simulation tool that has assisted the International Space Station (ISS) Program with determining logistics support resources by simulating a multitude of different operational scenarios of the ISS configuration (during and following assembly). The tool allows for the impacts of complex program resource restrictions and constraints (e.g., crew maintenance time, carrier upmass capability, and sparing postulate) to be assessed and reported.
U.S. Government Purpose Release

General Mission Analysis Tool (GMAT)   GSC-17177-1

General Mission Analysis Tool (GMAT) is a software system for trajectory optimization, mission analysis, trajectory estimation, and prediction. Analysts use GMAT to design spacecraft trajectories, optimize maneuvers, perform orbit determination, visualize and communicate mission parameters, and understand a mission's trade space. GMAT contains models of real world objects (such as spacecraft and thrusters) and analysis "objects" (such as propagators, plots, and reports). These objects are used in a mission sequence in which the user employs commands supported by the system to model mission events and perform estimation. GMAT also contains external utilities to perform specialized analyses, including detection of eclipse and line-of-sight events.
Open Source

General Mission Analysis Tool (GMAT), Version 2011A   GSC-16228-1

GMAT is a software system for trajectory optimization, mission analysis, trajectory estimation, and prediction. Analysts use GMAT to design spacecraft trajectories, optimize maneuvers, perform orbit determination, visualize and communicate mission parameters, and understand a mission's trade space. GMAT contains models of real-world objects such as spacecraft and thrusters, as well as analysis "objects" such as plots and reports. These objects are used in the mission sequence wherein the user employs commands supported by the system to model missions and perform estimation. Please visit the following URL for additional information: http://opensource.gsfc.nasa.gov/projects/GMAT/index.php

Open Source

General-Use Nodal Network Solver (GUNNS)   MSC-25468-1

This C++ toolkit can be used to simulate and solve complex networks of fluids as well as thermal and electrical systems.

U.S. Release Only

Generalized Computer-Based Computation of Venturi and Orifice Pressure Drops   SSC-00161-1

This is a set of computer program routines developed using Intel Visual Fortran Compiler software that calculates fluid system venturi and orifice inlet-to-throat pressure drops and inlet-to-exit pressure drops using highly accurate fluid properties through their interaction with a library workspace created from source code Fortran programs of the REFPROP database, which is produced by NIST. The routines can determine types of flow (e.g. , compressible, cavitating, chocked) through the devices and adjust computations accordingly as the program is running.

General Public Release

Goddard Satellite Data Simulation Unit   GSC-15874-1

The Goddard Satellite Data Simulation Unit (SDSU) is a comprehensive unified system of multi-sensor satellite instrumental simulators. Skill of weather forecasting models can be evaluated in terms of satellite-observed multi-sensor radiance levels. Alternatively, the remote sensing community can more readily utilize atmospheric model simulations to develop and test retrieval algorithms for the application of Earth science.

Open Source

GTM_Polysim: Nonlinear GTM Aircraft Polynomial Simulation in MATLAB, Version 2.0   LAR-17595-1

The GTM_Polysim is a nonlinear simulation of the Generic Transport Model (GTM) aircraft at a 5.5-percent scale. The simulation software is a collection of scripts and programs written and executed in the MATLAB computing environment.

U.S. Release Only

Implicit Finite-Difference Code for a Two-Equation Turbulence Model
for Three-Dimensional Flows (KEM)   ARC-16271-1

This semi-implicit finite-difference code solves the transport equations for the turbulence kinetic energy and its dissipation rate in generalized curvilinear coordinates in three dimensions. The finite-difference equations are solved using the beam-warming approximate factorization algorithm.

U.S. Government Purpose Release

10. Design and Integration Tools

Incompressible Navier-Stokes CFD Solver (INS3D)　　　　　　　　ARC-14020-1

The INS3D code solves the incompressible Naiver-Stokes equations in three-dimensional generalized coordinates for both steady-state and time-varying flow. The equations are formulated using the method of artificial compressibility. The convective terms are differenced using an upwind biased flux-difference splitting. The equations are solved using an implicit line-relaxation scheme. The code is written for single or multiple-zone calculations. It can utilize either pointwise continuous zonal interfaces, or overset zonal interfaces if a PEGASUS interpolation database is supplied. The INS3D code is written in Fortran77 and C. The code, which only runs in a serial execution mode, was developed in the 1990s and is no longer under development at NASA.
U.S. Release Only

Integrated Lunar Information Architecture for Decision Support (ILIADS), Version 3.0　　　GSC-16210-1

ILIADS 3.0 provides the data management capabilities to access CxP-vetted lunar data sets from the LMMP-provided data portal and the LMMP-provided OnMoon lunar data product server. (LMMP stands for Lunar Mapping and Modeling Project.) It also provides specific quantitative analysis functions to meet the stated LMMP level 3 functional and performance requirements specifications that were approved by the CxP.
Open Source

INTegrated ROcket Sizing Model (INTROS) Analytical Tool for Design and Sizing of Launch Vehicles, Version 3.0　　　MFS-32199-1

The INTegrated ROcket Sizing Model (INTROS) is used to perform conceptual and preliminary design sizing and trade and sensitivity studies for launch vehicles. Sizing is done in terms of establishing architectural breakdown structures and related geometry and mass properties.
U.S. Government Purpose Release

Interface Between STAR-CCM+ and 42 for Enhanced Fuel Slosh Analysis　　　GSC-17081-1

STAR-CCM+, a commercially available computational fluid dynamics (CFD) code, is linked with this software tool to 42, a user-friendly NASA in-house flight simulation program, to enable the modeling of fuel slosh as a part of the 42 flight simulation.
U.S. Government Purpose Release

International Space Station (ISS) Onboard Emergency Simulator Software　　　MSC-25520-1

This technology enables onboard crewmembers to receive more effective training during regularly scheduled emergency drills onboard the ISS.
U.S. Government Purpose Release

Johnson Space Center Engineering Orbital Dynamics (JEOD), Version 3.0　　　MSC-25730-1

The JEOD software package is a collection of computational mathematical models used to accurately represent the dynamic state of a spacecraft in a planetary environment. Version 3.0 contains innovations in a number of technical areas.
U.S. Government Purpose Release

Knife, Version 1.0　　　LAR-17481-1

The Knife library calculates the boolean subtraction of arbitrary watertight triangular polyhedral in order to make near-field sonic boom predictions.
U.S. Release Only

KSOPT: An Indirect Method for Numerical Optimization Using the Kreisselmeier-Steinhauser Function, Version 3.1   LAR-18488-1

This is a technique for converting a constrained optimization problem into an unconstrained problem. The technique transforms one or more objective functions into reduced objective functions analogous to goal constraints used in the goal programming method. The reduced objective functions are appended to the set of constraints, and an envelope of the entire function set is computed using the Kreisselmeier-Steinhauser function. This envelope function is then searched for an unconstrained minimum. The technique may be categorized as a SUMT algorithm. Version 3.1 is written in the Fortran 90/95 standard and improves upon the robustness of the code by preventing potential memory allocation errors.
U.S. Release Only

Low-Order Potential Flow Panel Code (PMARC), Version 14   ARC-14407-1

PMARC is a three-dimensional panel code to solve potential flow around wings and bodies. Relative motion between multiple bodies can be simulated
U.S. and Foreign Release

Mac/Linux TetrUSS Computational Fluid Dynamics (CFD) Software   LAR-16882-1

The most awarded software in the history of NASA, TetrUSS is a suite of computer programs used for fluid dynamics and aerodynamics analysis and design. The software is widely used in other government organizations, the aerospace industry, academia, and non-aerospace industries such as automotive, bio-medical, and civil engineering.
U.S. Release Only

Managed Automation Environment for Simulation, Test, and Real-time Operations (MAESTRO) Software Pre-release   MFS-32601-1

MAESTRO is a suite of tools that assists in the setup, configuration control, and operation of a simulation/test laboratory. The software was designed to fit into the NASA Constellation design philosophy by being command, control, communications, and information (C31) compliant.
U.S. Government Purpose Release

Marshall Aerospace Vehicle Representation in C (MAVERIC-II)   MFS-31989-1

Marshall Aerospace Vehicle Representation in C (MAVERIC-II) is a generic low-to-high-fidelity six-degree-of-freedom vehicle flight simulation program.
U.S. Government Purpose Release

Marshall Aerospace Vehicle Representation in C (MAVERIC-X)   MFS-31673-1

Marshall Aerospace Vehicle Representation in C (MAVERIC-X) is a generic low-to-high-fidelity six-degree-of-freedom vehicle flight simulation program that facilitates the rapid development of flight simulations for launch vehicles and spacecraft. It was designed to accommodate multi-staged vehicles, powered serially or in parallel, with multiple engines, tanks, and cargo elements.
U.S. Release Only

MBJEOD: An Integrated Multibody and Orbital Dynamics Simulation Module   MSC-25732-1

MBJEOD is a multibody dynamics (MBDyn) software interface layer that allows the transfer of forces between mutibody articulating objects and the JEOD orbital dynamics package.
U.S. Government Purpose Release

Micrometeoroid and Orbital Debris (MMOD) Shield Ballistic Limit Analysis Program   MSC-24582-1

This technology evaluates proposed shield configurations for probability and depth of penetration if hit by orbital debris. The software enables a user to calculate preliminary dimensions of a shield configuration (thickness, density, and spacing) and then analyze the performance of the user-defined shield configuration over a range of relevant in-orbit impact conditions.
U.S. Release Only

NASA STRuctrual ANalysis (NASTRAN)   LAR-16804-GS

NASTRAN is a finite element analysis program that was originally developed for NASA in the late 1960s under U.S. government funding for the aerospace industry. The software suite provides engineers a comprehensive simulation solution for insight into structural behavior. NASTRAN source code is integrated in a number of different software packages, which are distributed by a range of companies.
Open Source

NASA.rb (formerly fUnit)   GSC-15137-1

NASA.rb (formerly fUnit) is a collection of Fortran modules that provide a framework for automating the construction, execution, and reporting of unit tests for Fortran software applications. Support is provided for several aspects of unit testing that are peculiar to scientific technical computing including distributing jparal-lel applications and parameterized behavior.
Open Source

NEQAIR Nonequilibrium Radiative Transport and Spectra Program, Version 14   ARC-15262-1B

NEQAIR is a line-by-line radiation code that computes spontaneous emission, absorption, and stimulated emission due to transitions between various energy states of chemical species along a line-of-sight. The complex code enables the calculation of: (1) nonequlibrium or equilibrium populations of excited energy levels for atomic and diatomic molecules, (2) optical radiation emitted and absorbed by atomic and diatomic rotational lines along a line-of-sight or across a shock tube, (3) transport of optical radiation through a non-uniform gas mixture to a solid surface, and (4) detailed spectra at points along a line-of-sight and at a surface.
U.S. and Foreign Release

NetworKing: Space Communications and Navigation (SCaN) App   ARC-16778-1

The NetworKing game is an educational, interactive 3D game in which the player develops a space communication network. As he builds his network infrastructure, client spacecraft are attracted to the network, generating income and allowing the player to build further. As the player expands his robust communication network, fortunate and unfortunate events occur. The game can be downloaded at: http://www.nasa.gov/multimedia/3d_resources/scan.html
General Public

Open Scheduling and Planning Interface for Exploration (OpenSPIFe)   ARC-15795-1B

The Open Scheduling and Planning Interface for Exploration (OpenSPIFe) is an integrated planning and scheduling toolkit based on hundreds of hours of expert observation, use, and refinement of state-of-the-art planning and scheduling technology for several applications within NASA. It was designed from the ground up with the needs of the operational user in mind, and it presents unique solutions to a number of problems common in other commercial and homegrown systems.
Open Source

Parallel Adaptive Mesh Refinement Library (PARAMESH)   GSC-14626-1

PARAMESH offers parallel support with adaptive mesh capability for a large class of models on distributed memory machines. This package of Fortran 90 subroutines provides an application developer with an easy route to extend an existing serial code using a logically Cartesian structured mesh into a parallel code with adaptive mesh refinement.
Open Source

Porous Material Analysis Toolbox (PATO) Based on OpenFoam   ARC-16680-1

PATO is a modular analysis platform for multiphase porous reactive materials. It can be run as a simple Fourier heat transfer code or include more advanced features such as internal decomposition (pyrolysis, vaporization), gas-gas and gas-solid chemical interactions (combustion, cracking, coking), gas species transport (convection, diffusion), and solid morphology evolutions (internal density changes, surface ablation). PATO is implemented as a C++ top-level module of the open source computational fluid dynamics software program OpenFOAM™. This offering is not approved or endorsed by OpenCFD Limited, the producer of the OpenFOAM™. PATO also uses the open-source thermodynamics, transport, and chemistry library Mutation++ produced by the Von Karman Institute for Fluid Dynamics.
U.S. and Foreign Release (Academic)

Savors: A Scalable Aural-Visual Environment for Security Event Monitoring, Analysis, and Response   ARC-16186-1

Savors is a tool for security event monitoring, analysis, and response. The technology scales to real-world environments and uses high-end computing resources on-demand to compile behavior profiles that point to anomalous behavior. Auralization allows both monitoring and analysis to be performed in parallel and draws attention to critical events in one tool when utilizing another. Remote data access and response capabilities across distributed resources are enabled using grid computing that provides a secure, single sign-on environment.
Open Source

SCaN Optical Link Assessment Tool, Version 3   LEW-19463-1

A calculation procedure has been designed and implemented in software that enables the specification and design of a space-based optical communications system. The resulting optical link budget essentially accounts for the communication power flow through the entire optical communications channel from the transmitter to the receiver and yields design specifications for the optical system necessary to assure reliable data transmission with desired operational metrics such as data rate, link margin, etc. The link assessment tool takes into account all the sources of deleterious noise that enters into the communications process such as electronically generated noise in the optical detector and stray optical irradiance from external sources. The link budget has the capability of being interfaced with the orbital element calculations of the Satellite Tool Kit (STK) to allow the dynamic description and evolution of optical link operation from any space-borne satellite within the solar system to and from the Earth. The current version implements PPM and DPSK modulation types that can use PIN, APD, or nanowire optical detectors in the presence of atmospheric turbulence. Coded and un-coded link power margins are provided. This version of the tool also has the ability (1) to solve for prevailing potential data rates given a desired optical power link margin and (2) treat the spatial separations of the optical link transmitter and receiver within the first Fresnel zone.
U.S. Release Only

SCaN Optical Link Budget Tool   LEW-19225-1

A calculational procedure has been designed and implemented in software that enables the specification and design of a space-based optical communications system. The resulting optical link budget essentially accounts for the communication power flow through the entire optical communications channel from the transmitter to the receiver and yields design specifications for the optical system necessary to assure reliable data transmission with desired operational metrics such as data rate, link margin, etc. The link budget takes into account all the sources of deleterious noise that enters into the communications process such as electronically generated noise in the optical detector and stray optical irradiance from external sources. The link budget has the capability of being interfaced with the orbital element calculations of the Satellite Tool Kit (STK) to allow the dynamic description and evolution of optical link operation from any space-borne satellite within the solar system to and from the Earth.
U.S. Release Only

Software for Hybrid Airship Steady Flight Analysis and Preliminary Design ARC-16503-1

This software helps designers of hybrid airships to understand the effects of aerodynamic and thruster performance on steady-state flight mechanics. The software is capable of producing a large number of useful plots and requires only basic geometric, mass, and aerodynamic data to describe the vehicle. The resultant plots and plotting script are compatible with a widely used and freely available plotting package.
U.S. Government Purpose Release

Software for System for Controlling a Magnetically Levitated Rotor LEW-17293-2

Five-Axis, Three-Magnetic-Bearing Control Code (FATMaCC) is a versatile control code that possesses many desirable features that were not available in previous in-house controllers. This software achieves full rotor levitation and control at a loop time of 50 seconds. Using a 1-GHz processor, the code will control a five-axis system in either a decentralized or a more elegant centralized (model control) mode at a loop time of 56 seconds. In addition, it will levitate and control (with only minor modification to the input-output wiring) a two-axis and/or a four-axis system. Stable rotor levitation and control is accomplished through appropriate key presses to modify parameters (e.g. , stiffness, damping, and bias).
General Public Release

Space Shuttle Ascent/Entry Trainer (AET), Version 5 MSC-25252-1

Version 5 of the Space Shuttle Ascent/Entry Trainer (AET) is a simulation software package that models shuttle in both ascent and entry scenarios in order to train astronauts. Functionally, the AET handles operator inputs to the hand controllers and to virtual switches on the computer monitor, and it provides feedback to the operator via the computer monitor in the form of simulated out-the-window graphics and emulated display and control panels.
U.S. Government Purpose Release

Space Station Multi-Rigid Body Simulation (SSMRBS) MSC-25738-1

The SSMRBS innovation uses a commercial off-the-shelf software package to generate the equations of motion (EOM) used in a simulation. The EOM generated and solved in the simulation is based on an order-N algorithm.
U.S. Government Purpose Release

Spacecraft Trajectory Analysis and Mission Planning Simulation (STAMPS) Software MSC-24958-1

STAMPS simulates either three- or six-degrees-of-freedom cases for all shuttle flight phases using translated HAL flight software or generic GN&C models. Single or multiple trajectories can be simulated for use in optimization and dispersion analysis. The technology includes math models for the vehicle and environment and a C version of shuttle onboard flight software.
U.S. Release Only

Station/Orbiter Multibody Berthing/Docking Analysis Tool (SOMBAT) MSC-25528-1

SOMBAT is a multibody dynamics and control system simulation tool. It provides an integrated software environment to perform kinematic and dynamics analysis of space structures and robotic manipulators, including their control elements. The multibody system can consist of an arbitrary number of rigid and flexible bodies in an open-loop topology. The dynamics equations of a given system are generated in a computationally efficient and optimized form in SOMBAT using a symbolic code generator.
U.S. Government Purpose Release

Station Spacewalk Game App ARC-16779-1

This video game features simulations of extravehicular activities (EVAs) conducted by NASA astronauts on missions to the International Space Station.
General Public

System/Observer/Controller Identification Toolbox (SOCIT), Macintosh® Version　　　LAR-15241

SOCIT is a collection of functions, written in MATLAB language and expressed in M-files, that implements a variety of modern system identification techniques. For an open-loop system, it features functions for identification of a system model and corresponding forward and backward observers directly from input and output data. For a closed-loop system, SOCIT identifies an open-loop model, an observer, and corresponding controller gained directly from input and output data.
U.S. Release Only

Systems Capability Organization Reporting Engine board (SCOREboard)　　　LAR-18852-1

The Systems Capability Organization Reporting Engine board (SCOREboard) was developed to integrate 12 sometime disparate data sets into a cohesive human exploration capability story that can be used to communicate NASA's exploration investments within a capability-driven framework. The SCOREboards are actually graphical visualizations of SMT capability data that enable the EMC architecture and notional missions. The SCOREboards present an overview of multiple data points (the performance gaps and their durations, the corresponding gap closing tasks, task testing locations, mission need, and mission criticality) that when viewed together provide a roadmap of system maturation critical for the journey to Mars.
U.S. Government Purpose Release

Systems Improved Numerical Differencing Analyzer and Fluid Integrator (SINDA/FLUINT), UNIX/HP, VERSION 2.6　　　MSC-22524-1

SINDA was originally developed in 1971, with fluid flow added in 1975. SINDA was completely rewritten in 1985, and the fluid flow for that version was added in 1987. (The thermal portions of the old and new versions are very similar, but the fluid flow is entirely different between the two versions. SINDA 2.6 was released in 1994.
U.S. Release Only

Transport Class Model (TCM) Aircraft Simulation Software　　　LAR-18322-1

This six-degree-of-freedom, flat-Earth dynamics, non-linear, and non-proprietary aircraft simulation is a representation of a generic mid-sized twin-jet transport aircraft.
General Public Release

Trick 13 Simulation Environment　　　MSC-25665-1

The Trick Simulation Environment is a generic toolkit used for constructing and running simulations. The Trick 13 Interface Code Generator (ICG), a utility that provides math model class and structure layout data, has been rewritten and is based off of the open source clang/llvm project. The Trick numerical integrators have been replaced with a common set of integrators. Several core components are enhanced from previous Trick versions. Trick 13 is now open-aource software and can be downloaded at: http://code.nasa.gov/#/
Open Source

Trick High-Level Architecture (HLA) Framework for Facilitating IEEE 1516 Simulation Integration　　　MSC-24544-1

This framework removes the complexity of adhering to the Institute of Electrical and Electronics Engineers (IEEE) 1516-2000 High-Level Architecture (HLA) standards for simulation interoperability. The framework is data driven and includes a simple application programming interface (API), making it relatively easy to enhance an existing Trick simulation into a distributed simulation.
U.S. Government Purpose Release

Upwind Parabolized Navier-Stokes Solver (UPS) for Supersonic and Hypersonic Flow Simulation, Version 6.1 — ARC-15250-1

This software provides a means for simulating supersonic and hypersonic flows efficiently and accurately (under certain restrictions). The parabolized Navier-Stokes (PNS) equations are solved using an upwind finite-volume algorithm that is implicit in the marching direction. The solver includes models for turbulent flow and equilibrium- and finite-rate air chemistry.
U.S. Government Purpose Release

Uncertainty Quantification Toolbox (UQTools) — LAR-17855-1

UQTools is a MATLAB-based software package designed to efficiently analyze dynamic systems subject to parametric uncertainty. UQTools accepts uncertainty models based upon both probabilistic and non-probabilistic definitions, and it realizes several complementary methods for performing a variety of uncertainty quantification tasks.
U.S. Release Only

US3D — ARC-17742-1

The US3D software package is a suite of CFD tools developed primarily for computation of supersonic and hypersonic flows in thermochemical non-equilibrium. The main component is a 3D, MPI-parallel, implicit finite-volume code for solving the extended Navier-Stokes equations. In addition to the solver, MPI-parallel pre- and post-processors are included, as well as several utilities to expedite the analysis process and enhance the user experience. The solver is built on an unstructured grid framework accepting arbitrary arrangements of tetrahedra, pyramids, prisms, and hexahedra. Physical modeling is sufficient to solve perfect gas, dissociating, and weakly ionized flows in various states of non-equilibrium. Databases are included containing model parameters to enable simulations of most planetary entry scenarios. The software is designed to replicate common functionality for flight project applications of DPLR. In addition to this baseline, US3D features several numerical and physical model enhancements geared toward analysis of more complex problems that are not readily addressed by tools like DPLR, such as fluid-structure interactions, free-flight simulations, and shape optimization.
U.S. Government Purpose Release

Vehicle Sketch Pad (VSP) — LAR-17491-1

The Vehicle Sketch Pad (VSP) is an aircraft geometry tool for rapid evaluation of advanced design concepts. Fast and accurate geometry modeling allows the designer to use more complex analysis methods earlier in the design process and reduces reliance on empiricism in conceptual design. VSP includes tools to model and export the internal structural layout.
Open Source

WinASSIST: Windows Abstract Semi-Markov Specification Interface to the SURE Tool — LAR-16060-1

The WinASSIST program uses a rule-oriented language to automatically generate input files for the SURE/WinSURE program. The user describes the failure behavior and recovery behavior of a fault-tolerant computer system in an abstract language. The WinASSIST program then automatically generates a corresponding semi-Markov model. The abstract language allows efficient description of large, complex systems. A one-page WinASSIST-language description may result in a semi-Markov model with thousands of states and transitions. The WinASSIST program also provides model-reduction techniques to facilitate efficient modeling of large systems.
Open Source

Windows Semi-Markov Range Evaluator (WinSURE) — LAR-16059-1

This package is used by aerospace flight software developers to predict the reliability of flight-critical computer processes.
Open Source

Crew and Life Support

Biological Sensors, Food, Medical,
Biological Analysis, Crew Support, Basic
Human Model and Cognition

11

Featured Software

HZETRN 2015   LAR-18803-1

This latest update to the HZETRN deterministic space radiation transport code contains new algorithms and options for calculating three-dimensional transport in user-defined combinatorial or ray-trace geometry. More computationally efficient bi-directional algorithms may be used to perform transport through multilayer slabs. Users may also opt to create an interpolation database for various thicknesses within one to three user-defined material layers using a straight-ahead transport algorithm. Calculations may be executed for galactic cosmic ray (GCR), solar particle event (SPE), low-Earth orbit (LEO), and user-defined environment boundary conditions.
General Public Release

Multi-Attribute Task Battery (MATB-II)   LAR-17835-1

MATB-II is a computer-based task battery designed to facilitate research in human multiple task performance with consideration for the effects of automation. The tool includes five component tasks: system monitoring, tracking, communications monitoring, and resource management. A scheduling window provides preview of anticipated workload, and component tasks can be automated or manual. Coded in C++, MATB-II has been tested on the Windows XP® Service Pack 3, Windows® Vista, and Windows® 7 operating systems.
General Public Release

Multi-Attribute Task Battery (MATB-II) Event File Builder (EFBt)   LAR-17840-1

This standalone application allows a researcher to create and edit event files for the NASA MATB II task battery through a graphical interface. A scheduling window provides preview of anticipated workload. Component tasks can be automated or manual. EFBt generates event files in XML code; files can be coded and edited in a standard XML editor.
General Public Release

NASA Task Load Index (TLX)   ARC-15150-1

The NASA Task Load Index (TLX) provides multi-dimensional ratings of overall workload based on a weighted average of six subscales: mental demands, physical demands, temporal demands, performance, effort, and frustration.
General Public Release

Relativistic Ion Tracks (RITRACKS)   MSC-25937-1

RITRACKS has been developed over the last several years at Johnson Space Center to simulate the effects of ionizing radiations at the microscopic scale and to understand the effects of space radiation at the biological level. The fundamental part of this code is the stochastic simulation of the radiation track structure of heavy ions, an important component of space radiations. The code can calculate many relevant quantities (e.g., radial dose and voxel dose) and may also be used to calculate the dose in spherical and cylindrical targets of various sizes. The software can be installed independently on PCs and tablets using the Windows operating system and does not require any coding from the user. It includes a graphic user interface (GUI) and a 3D OpenGL visualization interface. Calculations are executed simultaneously (in parallel) on multiple CPUs.
General Public Release

Atomistic Simulation of Complex DNA Double-Break Strands and the Interactions with the Ku70/80 Heterodimer — MSC-25180-1

This software has assisted in the development of molecular dynamics simulations of a series of DNA duplexes with various complex lesions. The tool has been used to investigate the effects of such lesions on the structural integrity and stability of DNA after it has been insulted by infrared radiation.
U.S. Government Purpose Release

Fine Motor Skills (FMS) Software Application — MSC-26032-1

The Fine Motor Skills (FMS) software is an iPad® application used to collect data on fine motor movements using four different tasks: multidirectional pointing, unidirectional dragging, shape tracing, and pinch-rotate. Data collected include movement time, errors, and x-y coordinates of movements.
U.S. Release Only

GCR Event-Based Risk Model Code (GERMCode) — MSC-24760-1

GERMCode provides scientists data interpretations of experiments; modeling of beam line; shielding of target samples and sample holders; and estimation of basic physical and biological experiment outputs. For mono-energetic ion beams, physical/biological properties are calculated for a selected ion type, e.g., kinetic energy, mass, charge number, absorbed dose, or fluence. Evaluated quantities include linear energy transfer, range, absorption and fragmentation cross-sections, and the probability of nuclear interactions after 1 or 5 centimeters of water-equivalent material.
General Public Release

Human Factors Analysis Support Tool (H-FAST), Version 2.0 — MSC-25653-1

This software increases human factors awareness among design engineers, facilitates communication between human factors engineers and design engineers, and promotes the application of human factors best practices early in the design cycle. H-FAST also offers detailed guidance regarding human factors evaluations and provides the capability to store these evaluations.
U.S. Government Purpose Release

HZETRN 2015 — LAR-18803-1

This latest update to the HZETRN deterministic space radiation transport code contains new algorithms and options for calculating three-dimensional transport in user-defined combinatorial or ray-trace geometry. More computationally efficient bi-directional algorithms may be used to perform transport through multilayer slabs. Users may also opt to create an interpolation database for various thicknesses within one to three user-defined material layers using a straight-ahead transport algorithm. Calculations may be executed for galactic cosmic ray (GCR), solar particle event (SPE), low-Earth orbit (LEO), and user-defined environment boundary conditions.
General Public Release

Integrated Cognitive Assessment Tool: Combining Person, System, and Mission — MSC-24791-1

In short, the Integrated Cognitive Assessment Tool yields quantified measurements of a person's cognitive ability to perform a specific job in space. The software integrates traditional cognitive performance measurements with assessments of the systems/missions in which an individual must operate.
U.S. Government Purpose Release

Kidney Stone Detection Using a Combined Method of B-Mode and Doppler Ultrasound — MSC-25189-1

This NASA algorithm first detects the outlier within a Doppler signal ensemble and then weights the magnitude of the outlier by the magnitude of the B-mode at the same point in space. Thresholding, color scaling, and spatial filtering are applied to output detection, and the information is overlaid onto the B-mode image in real time.
U.S. Government Purpose Release

Man-Machine Integration Design and Analysis System (MIDAS), Version 5   ARC-16050-1A

MIDAS is a 3D rapid-prototyping human-performance modeling environment that facilitates the design, visualization, and computational evaluation of complex man-machine system concepts in simulated operational environments. The tool links a virtual human to a computational cognitive structure that represents human capabilities and limitations. MIDAS operates on a Windows®-based PC platform. An easy-to-use graphical user interface makes the software an accessible tool for designers; no expertise in computer science, programming, or human performance modeling is required.
U.S. and Foreign Release

Multi-Attribute Task Battery (MATB-II)   LAR-17835-1

MATB-II is a computer-based task battery designed to facilitate research in human multiple task performance with consideration for the effects of automation. The tool includes five component tasks: system monitoring, tracking, communications monitoring, and resource management. A scheduling window provides preview of anticipated workload, and component tasks can be automated or manual. Coded in C++, MATB-II has been tested on the Windows XP® Service Pack 3, Windows® Vista, and Windows® 7 operating systems.
General Public Release

Multi-Attribute Task Battery (MATB-II) Event File Builder (EFBt)   LAR-17840-1

This standalone application allows a researcher to create and edit event files for the NASA MATB II task battery through a graphical interface. A scheduling window provides preview of anticipated workload. Component tasks can be automated or manual. EFBt generates event files in XML code; files can be coded and edited in a standard XML editor.
General Public Release

NASA Task Load Index (TLX)   ARC-15150-1

The NASA Task Load Index (TLX) provides multi-dimensional ratings of overall workload based on a weighted average of six subscales: mental demands, physical demands, temporal demands, performance, effort, and frustration.
General Public Release

Network-Form Game Software Library (libnfg)   ARC-16764-1

The libnfg software library describes how humans interact with their environment and with other humans. The tool provides a Monte Carlo analysis of user-specified "network-form games," which are flexible modeling methodologies that combine Bayes nets and game theory to model complex systems.
Open Source

New Regime of Ultrasound Imaging of Strong Scatterers in Tissue Using Envelope-Based Beam Forming   MSC-25190-1

Sacrificing resolution quality, this tool improves the contrast between a kidney stone and other tissue in an ultrasound image.
U.S. Government Purpose Release

New Ultrasound Imaging Regime for Improved Size Measuring of Hard Concretions Present in Soft Tissues   MSC-25187-1

Utilizing ultrasound shadow observations on B-mode images, this NASA-developed technology improves kidney-size determination.
U.S. Government Purpose Release

POSTPROC User-Interactive Software for the Analysis of Human Physiological Data ARC-15287-1

POSTPROC offers researchers and clinicians user-friendly software for processing and analyzing human physiological data. Measurements include electrocardiography, electromyography, respiration, beat-to-beat blood pressure, skin temperature, blood volume pulse, skin conductance levels, and cardiovascular dynamics derived from impedance. The customized application runs under DADiSP/2002, a commercially available engineering spreadsheet from DSP Development Corporation.
U.S. Government Purpose Release

Real-Time Kidney Stone Tracking Algorithm MSC-25192-1

A software component of the Rolling Stones prototype, this algorithm uses focused ultrasound to clear stones from a kidney. The tool processes a series of B-mode images to track a region of interest, offers visual feedback of position location to the user, and targets a stone for automated adaptive pushing. The algorithm uses a colored display scheme to report a confidence estimation of stone location.
U.S. Government Purpose Release

Relativistic Ion Tracks (RITRACKS) MSC-25937-1

RITRACKS has been developed over the last several years at Johnson Space Center to simulate the effects of ionizing radiations at the microscopic scale and to understand the effects of space radiation at the biological level. The fundamental part of this code is the stochastic simulation of the radiation track structure of heavy ions, an important component of space radiations. The code can calculate many relevant quantities (e.g., radial dose and voxel dose) and may also be used to calculate the dose in spherical and cylindrical targets of various sizes. The software can be installed independently on PCs and tablets using the Windows operating system and does not require any coding from the user. It includes a graphic user interface (GUI) and a 3D OpenGL visualization interface. Calculations are executed simultaneously (in parallel) on multiple CPUs.
General Public Release

Spaceflight Dietary Intake MSC-25693-1

This technology allows a crew to record dietary intake quickly and accurately.
U.S. Government Purpose Release

Spinal Ultrasound Just-in-Time Training Tool MSC-25501-1

Augmenting/reducing required Earth-based training and enhancing ultrasound-image reproducibility, this NASA-developed tool provides crewmembers with a review of anatomical landmarks and experimental protocols.
U.S. Government Purpose Release

Spine Elongation Prevention and Exercise Device for Microgravity Environment MSC-25654-1

This technology is being designed to prevent the spinal column lengthening and spinal column bone loss that can occur in a microgravity environment.
U.S. Government Purpose Release

Ultrasound Technique to Separate Hard Objects from Tissue by the Long-Lasting Reverberation in Hard Objects MSC-25188-1

The ultrasound imaging of hard objects creates a reverberant signal, whereas imaging tissue does not. This technology development effort has sought to exploit that difference to improve kidney stone detection.
U.S. Government Purpose Release

Autonomous Systems

Robotics, Automated Systems,
Systems Health Monitoring

Featured Software

Autonomous Real-Time Requirements Tracing (ART)   MFS-33209-1

ART offers the ability to directly trace the real-time execution of software to specific requirements, a unique capability that can only be performed with a Timeliner-TLX system, as no other computer languages directly report this data during execution. The tracing feature does not impose input/output requirements (e.g., print/write statements) on the targeted software because the tracing is performed by an outside program executing separately. The Timeliner-TLX language is currently used for auto-procedures on the International Space Station (ISS) and the Autonomous Mission Operations (AMO) project, and future manned deep-space missions will require the use of extensive auto-procedures to assist in remote intelligent operations.

U.S. Government Purpose Release

ACCoRDs Conflict-Detection (CD3D)/Conflict-Resolution (CR3D) Algorithms LAR-17878-1

Written in Java and C++ and based on the Airborne Coordinated Conflict Detection and Resolution mathematical framework, CD3D and CR3D are prototype implementations of state-based conflict-detection and conflict-resolution algorithms for a 3D airspace.
Open Source

Autonomous Real-Time Requirements Tracing (ART) MFS-33209-1

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U.S. Government Purpose Release

Conflict Prevention Bands LAR-17874-1

Conflict prevention information has been assembled into prevention bands that advise a crew on maneuvers that should not be taken, helping to ensure that an aircraft's path is free of conflicts with other aircraft.
Open Source

Extendable Uniform Remote Operations Planning Architecture (EUROPA), Version 2.1 ARC-15936-1

EUROPA is a general-purpose, reusable, artificial intelligence software system. The tool generates plans for performing complex activities in parallel. Functionality includes the capability of verifying that a plan satisfies all constraints.
Open Source

Integrated Configurable Algorithms for Reliable Operations of Unmanned Systems (ICAROUS) LAR-18850-1

ICAROUS is a software architecture that enables the robust integration of mission-specific software modules with highly assured core software modules for building safety-centric autonomous unmanned aircraft applications. The set of core software modules include formally verified algorithms that (1) detect, monitor, and control conformance to safety criteria; (2) avoid stationary obstacles and maintain a safe distance from other airspace users; and (3) compute resolution and recovery maneuvers (autonomously executed by the autopilot) when safety criteria are violated or about to be violated.
Open Source

Jet Propulsion Laboratory (JPL) Stereo Vision Software Suite (JPLV) NPO-18593-1T

JPLV provides a set of libraries and utilities for basic robotic vision, including stereo ranging and camera calibration. Primarily intended for vision system users rather than vision system developers, the suite hides most implementation details behind a high-level application user interface. No specialized computer-vision knowledge is required.
U.S. Government Purpose Release

Livingstone 2 (System for Automated Diagnosis and Discrete Control of Complex Systems) and Skunkworks (Suite of Supporting Development and Runtime Tools)   ARC-14725-1

Livingstone 2 is a reusable artificial intelligence (AI) software system designed to assist spacecraft, life support systems, chemical plants, or other complex systems in operating robustly with minimal human supervision, even in the face of hardware failures or unexpected events. The technology diagnoses the current state of a spacecraft or other system and recommends commands or repair actions that will allow the system to continue operations. A re-engineered version of the Livingstone diagnosis system that was flight-tested onboard the Deep Space One spacecraft in 1999, Livingstone 2 contains significant enhancements to robustness, performance, and usability. Skunkworks is a suite of software tools that support the rapid deployment of model-based representations of complex systems for Livingstone2 via a visual model builder/tester and two graphical user interface tools that provide status information during testing.
Open Source

Mission Analysis Low-Thrust Optimizer (MALTO)   NPO-43625-1

MALTO is a software tool for preliminary design and optimization of low-thrust interplanetary trajectories. The tool is easy to use, has robust convergence, and can handle many intermediate encounters.
U.S. Government Purpose Release

Mission Simulation Toolkit (MST)   ARC-14932-1

MST offers a simulation framework to support research in autonomy for remote exploration. The system allows developers to test models in a high-fidelity simulation and then evaluate system performance against a set of integrated, standardized simulations.
Open Source

Model-Based Diagnosis Engine For Stochastic Hybrid Systems (HyDE)   ARC-15570-1A

HyDE is a model-based diagnostic engine capable of detecting and isolating discrete (possibly multiple) faults in physical systems. The current version of HyDE has been implemented in C++. Please visit the following URL for more information: http://ti.arc.nasa.gov/tech/dash/diagnostics-and-prognostics/hyde-diagnostics/
U.S. Government Purpose Release

Mystic Low-Thrust Trajectory Design and Visualization Software   NPO-43666-1

Mystic provides very high-fidelity optimization of low-thrust spacecraft trajectories for mission design. The software can be used for general body-centered trajectories, interplanetary trajectories, and trajectories that combine body-centered and interplanetary trajectory legs. Mystic will also provide navigational/operational support for low-thrust spacecraft.
U.S. Government Purpose Release

NASA Tensegrity Robotics Toolkit (NTRT), Version 1   ARC-17093-1

Tensegrity robots offer a biologically inspired approach for building robots based on the tension networks of tensegrity structures, which have no rigid connections between elements. NTRT is a collection of C++ and MATLAB software tools for modeling, simulating, and controlling tensegrity robots. The toolkit was created to enable: the rapid co-exploration of structures/controls in a physics-based simulation environment; the development of tensegrity robotics algorithms (including those for structural analysis, kinematics, and motion planning); and the validation of the algorithms on hardware prototypes.
Open Source

Planetary Observer Planning Software (POPS)   NPO-45418-1

The POPS application suite performs mission design analysis of a spacecraft orbiting a terrestrial planet. POPS is not intended for the study of hyperbolic or interplanetary orbits, although some limited hyperbolic capabilities exist.
U.S. Government Purpose Release

Planning and Control Toolkit for Dual-Arm Manipulation
                                                                    MSC-25463-1

A suite of planning and control algorithms enables NASA robots to perform complex manipulations in a coordinated way, both autonomously and when operating under remote supervision.
U.S. Government Purpose Release

Prognostics Algorithm Library
                                                                    ARC-17735-1

Implemented in MATLAB, the Prognostics Algorithm Library offers a suite of algorithms for model-based prognostics (remaining life computation). It includes algorithms for state estimation and prediction (e.g., uncertainty propagation). The library allows comparative studies and evaluations of different algorithms in order to select the best one for the application at hand.
Open Source

Prognostics Model Library
                                                                    ARC-17736-1

Implemented in MATLAB, the Prognostics Model Library offers a framework for defining and building prognostics models to compute the remaining useful life of engineering systems. The library currently includes models for valves, pumps, and batteries. The implementation consists of a set of utilities for defining a model (specifying variables, parameters, and equations), simulating the model, and embedding it within common model-based prognostics algorithms. A user can use existing models within the library or construct new ones with the provided framework.
Open Source

Robot Application Programming Interface Delegate (RAPID), Version 2
                                                                    ARC-16368-1A

RAPID is a software reference implementation framework for remote operations. The technology promotes interoperability between robot software modules and includes a standard programming interface and data distribution middleware. RAPID facilitates integration of experimental robot software modules created by a distributed development team; improves the compatibility and reusability of robotic functions; and offers speed prototype robot development in a wide range of configurations and environments.
Open Source

Simple, Scalable, Script-Based Science Processor for Missions (S4PM)
                                                                    GSC-14841-1

S4PM is a set of Perl scripts that implement a data-driven processing system to execute science algorithms automatically as new data arrive. The innovation includes a graphical user interface for monitoring algorithms as well as the overall failure system. The Perl scripts can currently process data from the Moderate Resolution Imaging Spectroradiometer and the Atmospheric Infrared Sounder, but the technology can be extended to process data from other missions if desired. Please visit the following URL for more information: http://opensource.gsfc.nasa.gov/projects/s4pm/
Open Source

Small-Body Navigation and Topography (SBN&T)
                                                                    NPO-41647-1

SBN&T provides an integrated program for the spacecraft navigation and determination of small-body dynamics, shape, and high-resolution topography. Multiple-image stereography and photoclinometry are used to construct high-resolution topographic and albedo map centers treated as control points. These landmark maps are re-illuminated and correlated with images to act as body-fixed navigation tie-points.
U.S. Government Purpose Release

Strategic Conflict Resolution (Stratway)
                                                                    LAR-17876-1

Stratway modifies a four-dimensional (latitude, longitude, altitude, and time) flight plan to ensure a conflict-free trajectory. This type of resolution is strategic in that it resolves conflicts over long time horizons, perhaps over several hours.
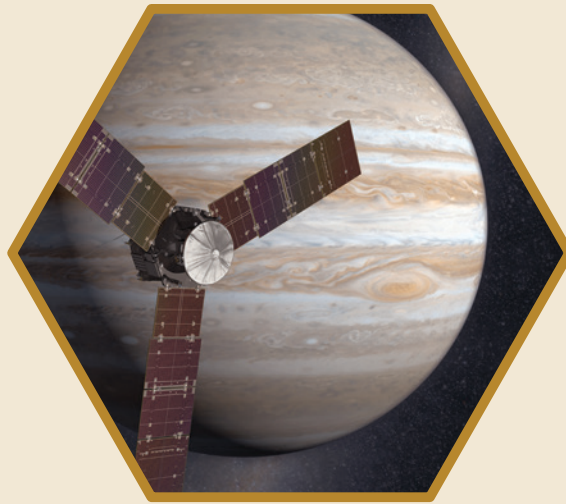**Open Source**

Vehicle Management Space • Air • Ground

Flight Software, Spacecraft Processes,
Command and Data Handling,
Instrument Management

13

Featured Software

Advanced Spacecraft Integration & System Test Software (ASIST) Version 20.0   GSC-16783-1

Since the early 1990s, a government/contractor team has been developing a spacecraft ground system capable of being used for all phases of a spacecraft's life: box-level development and testing, satellite integration and test, and post-launch mission operations. This system uses a single, industry-standard protocol to ease integration with other products and employs COTS, GOTS, and public domain software to form one cohesive unit. It is composed of several parts. ASIST is the user-interface, providing the user with the ability to view and analyze telemetry, send commands, and automate tests. The Front End Data System reads telemetry from spacecraft, distributing requested data packets to subscribing clients; additionally, it controls the forward (command) link to the spacecraft, formatting command packets and verifying that commands are transferred correctly. The Digital History Data Store (DHDS) archives the raw telemetry received from spacecraft and distributes historical telemetry data to clients.

U.S. Government Purpose Release

Formation Flying System for Unmanned Aerial Vehicles (UAVs) and Satellites   MFS-33193-1

Using a distributed mesh network communication architecture, this system facilitates formation flying by providing a framework for the exchange of information among multiple vehicles. By exchanging pertinent data, the vehicles can perform as a single formation deployment shape without direct control from the ground. The technology's generic design affords applicability to an array of vehicle types, including UAVs and satellites.

U.S. Release Only

Onboard Short-Term Plan Viewer (OSTPV), Version 4.0   MSC-24832-1

Innovators at Johnson Space Center have developed a web-based application to support the International Space Station (ISS) Program's real-time operations. OSTPV contains the integrated ISS mission schedule in use at NASA'a Mission Control Center (MCC) and onboard the ISS, and it displays all ISS activities (onboard and on the ground) in an integrated timeline.

U.S. Government Purpose Release

Range Safety Algorithm Software Module for an Autonomous Flight Safety System   GSC-15594-1

This software library was developed to mitigate the public safety risks of hazards associated with the flight of expendable launch vehicles and other unmanned flight vehicles. The software encapsulates the various constructs and algorithms required to accomplish Time Space Position Information (TSPI) data management from multiple tracking sources. At its core, the technology evaluates various user-configurable rule sets that govern the qualification of TSPI data sources; provides a pre-launch autonomous hold-launch function; performs flight-monitoring/flight-termination functions; and provides end-of-mission safing.

General Public Release

ROAMS Rover Analysis and Modeling Software   NPO-30722-1

ROAMS is a planetary rover simulation software package. The technology consists of mechanical models of a rover, instrument arms, actuators and sensors, power resources, terrain interactions, and onboard software.

U.S. Government Purpose Release

SpaceWire 2014   GSC-17201-1

SpaceWire is a spacecraft communication network based in part on the IEEE 1355 standard of communications. The 2014 version is an update to fix "bugs," improve performance, and change the back-end user interface.

U.S. Release Only

13. Vehicle Management (Space/Air/Ground)

Advanced Spacecraft Integration & System Test Software (ASIST) Version 20.0   GSC-16783-1

Since the early 1990s, a government/contractor team has been developing a spacecraft ground system capable of being used for all phases of a spacecraft's life: box-level development and testing, satellite integration and test, and post-launch mission operations. This system uses a single, industry-standard protocol to ease integration with other products and employs COTS, GOTS, and public domain software to form one cohesive unit. It is composed of several parts. ASIST is the user-interface, providing the user with the ability to view and analyze telemetry, send commands, and automate tests. The Front End Data System reads telemetry from spacecraft, distributing requested data packets to subscribing clients; additionally, it controls the forward (command) link to the spacecraft, formatting command packets and verifying that commands are transferred correctly. The Digital History Data Store (DHDS) archives the raw telemetry received from spacecraft and distributes historical telemetry data to clients.
U.S. Government Purpose Release

Alternative Flight Software Trigger Paradigm: Applying Multivariate Logistic Regression to Sense Trigger Conditions Using Inaccurate or Scarce Information   MSC-25684-1

Helping guidance, navigation, and control (GN&C) engineers to develop robust flight software tools, this innovation allows an autonomous vehicle to trigger certain actions.
U.S. Government Purpose Release

Automated Planning and Scheduling Environment (ASPEN)   NPO-41986-1

ASPEN automates space mission planning and other tasks that involve the reasoning of time, states, resources, and actions.
U.S. Government Purpose Release

Autonomous Landing Hazard-Avoidance Technology (ALHAT) Scanning Lidar-Based Simulation for Mars Landing   NPO-21220-1

The ALHAT simulation tool provides an efficient software model and a set of algorithms in C++ code for performing scanning lidar-based hazard detection and avoidance.
U.S. Government Purpose Release

Core Flight Executive (cFE)   GSC-16232-1

The Core Flight Executive (cFE) provides software bus, time, event, executive, table, and file services, and it defines the application programming interface (API) for each set function. Applications subscribe to cFE services at runtime, making system modifications easy. Facilitating rapid prototyping, new applications can be compiled, linked, loaded, and started without requiring the entire system to be rebuilt.
Open Source

Core Flight Executive/Core Flight System (cFE/CFS) Evolution for Multi-Core Platforms   GSC-16857-1

This development effort modified cFE/CFS flight software components to enable them to run on a multi-core processor or an embedded operating system that supports multi-core processors (e.g., VxWorks 6 and Linux). Modified components included: the Operating System Abstraction Layer (OSAL), the Core Flight Executive (cFE), and parts of the Core Flight System (CFS).
U.S. Government Purpose Release

Core Flight System (CFS) CFDP, Version 2   GSC-16125-1

The CFDP application provides the capability to transmit and receive files to/from the ground. Tables are used to allow flexibility in specifying directory priorities and configurations.
Open Source

Core Flight System (CFS) Checksum Application, Version 2   GSC-15996-1

Checksum (CS) is one of the reusable applications that make up the Core Flight System (CFS). The technology performs memory integrity management by verifying the contents of critical flight memory regions. Unexpected changes in memory (i.e., due to an SEU) are reported to ground operators.
Open Source

Core Flight System (CFS) Data Storage (DS) Application, Version 2   GSC-16126-1

The DS application provides the ability to store data (i.e., messages) into files. Tables are used to provide the flexibility for specifying messages.
Open Source

Core Flight System (CFS) File Manager (FM) Application, Version 2   GSC-16007-1

FM provides the user commands to perform the following operations: copy file, move file, rename file, delete file(s), close file, concatenate file, decompress file, delete directory contents, create directory, remove directory, obtain file information, obtain open file listing, and obtain directory listings.
Open Source

Core Flight System (CFS) Health and Safety Application, Version 2   GSC-16151-1

The plug-and-play CFS Health and Safety application is compatible with the Core Flight Executive (cFE) and uses the Operating System Abstraction Layer (OSAL), both of which were developed by Goddard Space Flight Center in order to provide a reusable, platform-independent, mission-independent, layered architecture for hosting applications. The technology can be used for any government or commercial spacecraft. Please visit the following URL for additional information: http://sourceforge.net/projects/coreflightexec/files/cFE-6.1.1/
Open Source

Core Flight System (CFS) Housekeeping (HK) Application, Version 2   GSC-16127-1

The CFS Housekeeping application provides the ability to organize data from various packets into new packets in order to best utilize the telemetry bandwidth available for a mission.
Open Source

Core Flight System (CFS) Limit Checker (LC) Application, Version 2   GSC-16010-1

The Limit Checker (LC) application is responsible for monitoring telemetry values.
Open Source

Core Flight System (CFS) Memory Dwell Application, Version 2   GSC-16012-1

The Memory Dwell application telemeters the contents of table-defined addresses at a table-defined dwell rate. Addresses can be processed using symbols if the target processor/operating system includes symbols.
Open Source

Core Flight System (CFS) Memory Manager Application, Version 2   GSC-16011-1

The Memory Manager application processes commands, generally from the ground, in order to dump the contents of a memory location, dump the contents of a range of memory locations, load a memory location with specified data, load a range of memory with specified data, or fill an area of memory with the specified fill pattern. Operations can be performed on non-volatile, volatile, and memory mapped I/O.
Open Source

Core Flight System (CFS) Scheduler Application, Version 2   GSC-16123-1

The Scheduler application uses a one-second major timeframe that is divided into a designer-determined collection of equally divided minor timeframes. The technology is configurable and table-driven to provide greater flexibility.
Open Source

Core Flight System (CFS) Software Bus Network (SBN) Application, Version 1.0   GSC-16917-1

The SBN serves as a plug-in to the cFE framework to transfer messages across process/processor inter-faces. The technology has three primary functions: to establish and maintain a connection to each peer over available process/processor interfaces; to distribute and maintain a subscription message database for each peer; and to distribute messages to peers that have subscribed to message identifiers.
Open Source

Core Flight System (CFS) Stored Command (SC) Application, Version 2   GSC-16009-1

The CFS SC application provides the ability to execute onboard absolute-time and relative-time command sequences. The technology offers a generic implementation that can be configured by a user to fit the needs of a specific mission.
Open Source

Formation Flying System for Unmanned Aerial Vehicles (UAVs) and Satellites   MFS-33193-1

Using a distributed mesh network communication architecture, this system facilitates formation flying by providing a framework for the exchange of information among multiple vehicles. By exchanging pertinent data, the vehicles can perform as a single formation deployment shape without direct control from the ground. The technology's generic design affords applicability to an array of vehicle types, including UAVs and satellites.
U.S. Release Only

GFE Lo-Fi Chutes Model   MSC-25004-1

The GFE Lo-Fi Chutes Model provides the basic modeling capability for a sequential series of parachute activities. Actions include deploying the parachute, changing the reefing on the parachute, and cutting away the parachute. Multiple chutes can be deployed at any given time, but in that case all chutes are assumed to behave as individually isolated chutes. Drag characteristics of a deployed chute are based on a coeffi-cient of drag, the face-area of the chute, and the local dynamic pressure only. The orientation of the chute is approximately modeled for obtaining torques on the vehicle, but the dynamic state of the chute as a sepa-rate entity is not integrated (the treatment is simply an approximation).
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) Architecture Application Programming Interface (API), Version 3.7   GSC-17417-1

The GMSEC architecture is a comprehensive flight and ground system architecture that spans the full mission lifecycle. Software components use the GMSEC architecture API to connect to a middleware software messaging bus that in turn is responsible for message routing and delivery. The API isolates the middleware from the components and normalizes middleware behavior. Version 3.7 of the software contains major enhancements to previous releases of the GMSEC API, offering greater reliability and enhanced usability.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) CountdownClock (CC), Version 2.0 — GSC-17186-1

Version 2.0 of CC internally treats countdown records uniformly. It displays in two modes (alternating record like the original as well as multi-record), and it allows dynamic configuration of a number of features, including font size. CC is capable of reading WOTIS files, but can also read TRMM TDX-PLAN files and readily add compatible file formats through the use of Java interface implementations.
U.S. Government Purpose Release

Goddard Mission Services Evolution Center (GMSEC) Remote Application Service Provider (GRASP), Version 2.0 — GSC-16822-1

This entirely new software utility facilitates the secure transmission of GMSEC messages from a secure environment to a less secure environment and makes these messages available to web applications operating in the less secure environment via a generic, language-independent mechanism.
U.S. Government Purpose Release

International Space Station (ISS) Robotics Planning System (RPS) Software Suite — MSC-25639-1

The RPS suite shows graphical representations of ISS robotics arm activities following flights. The technology is also used as an independent graphical simulation for pre-flight robotics activities.
U.S. Government Purpose Release

Loosely Coupled GPS-Aided INS for Range Safety — GSC-15549-1

This Autonomous Flight Safety System replaces the human element of range safety operations and reduces reliance on expensive down-range assets. The software provides a highly reliable platform consisting of multiple navigation sensors and flight computers.
U.S. Release Only

Multiple-Force Vector and Field Detection and Measurement Through a Flexible Medium — MSC-25704-1

This innovation can be used as a tactile human-machine input device or as a tool to improve the grasping quality of robot manipulators. Incipient slip, sample stiffness, and tangential force vector parameters are extracted and used in high-level control algorithms to drive a robotic arm.
U.S. Government Purpose Release

NanoSat Launch Adapter System (NLAS) — ARC-16732-1

NLAS maximizes the efficiency of satellite launch opportunities. The technology acts as a "spacer" between the rocket and the primary spacecraft. NLAS consists of three main subsystems: the adapter, the dispenser, and the deployment sequencer. Each subsystem can be configured to meet the specific needs of a given launch.
U.S. Government Purpose Release

Next-Generation Multidisciplinary Design Analysis and Optimization Open-Source Framework (OpenMDAO), Version 0.1 — LEW-18550-1

OpenMDAO provides the core software infrastructure to integrate multidisciplinary variable-fidelity tools and enables design, analysis, and optimization of complex systems. Version 0.1 functionalities include: component linking, data passing, driver interface, and lazy evaluation. This initial basic capability of the framework is sufficient for users to run and optimize their analyses after they integrate their specific component codes. As OpenMDAO evolves, the following capabilities will be included in the framework: interprocess communications, error handling, user interfaces, geometry application program interfaces (APIs), plug-in interfaces, utilities to wrap tools, versioning, and parallel processing support.
Open Source

Onboard Short-Term Plan Viewer (OSTPV), Version 4.0 — MSC-24832-1

Innovators at Johnson Space Center have developed a web-based application to support the International Space Station (ISS) Program's real-time operations. OSTPV contains the integrated ISS mission schedule in use at NASA'a Mission Control Center (MCC) and onboard the ISS, and it displays all ISS activities (onboard and on the ground) in an integrated timeline.

U.S. Government Purpose Release

Operating System Abstraction Layer (OSAL) — GSC-14921-1

The OSAL library isolates embedded application software from a real-time operating system (RTOS). The technology provides a well-defined, generic interface to RTOS services; a generic interface to hardware services; and an implementation for several current RTO systems. By using the library, an embedded application can remain portable among multiple operating systems on multiple platforms. Please visit the following URL for additional information: http://opensource.gsfc.nasa.gov/projects/osal/

Open Source

Orion Guidance, Navigation, and Control Flight Software — MSC-25615-1

The Orion Crew Exploration Vehicle's onboard GN&C flight software has been developed to a class-A, human-spaceflight-ready standard. The technology uses a MATLAB/Simulink tool suite to embrace a model-based development approach.

U.S. Government Purpose Release

Range Safety Algorithm Software Module for an Autonomous Flight Safety System — GSC-15594-1

This software library was developed to mitigate the public safety risks of hazards associated with the flight of expendable launch vehicles and other unmanned flight vehicles. The software encapsulates the various constructs and algorithms required to accomplish Time Space Position Information (TSPI) data management from multiple tracking sources. At its core, the technology evaluates various user-configurable rule sets that govern the qualification of TSPI data sources; provides a pre-launch autonomous hold-launch function; performs flight-monitoring/flight-termination functions; and provides end-of-mission safing.

General Public Release

ROAMS Rover Analysis and Modeling Software — NPO-30722-1

ROAMS is a planetary rover simulation software package. The technology consists of mechanical models of a rover, instrument arms, actuators and sensors, power resources, terrain interactions, and onboard software.

U.S. Government Purpose Release

Rock Identification Toolkit (RockIT) — NPO-41133-1

RockIT is an interactive tool used by mission scientists to identify and characterize rocks and rock distributions.

U.S. Government Purpose Release

Software Applications for the Control and Management of the Amine Swingbed Experiment — MSC-25526-1

The Amine Swingbed Experiment is investigating the removal of carbon dioxide from the International Space Station breathing environment via a system of vacuum-regenerated amine pressure swing absorption reaction beds. Please visit the following URL for additional information: http://www.nasa.gov/mission_pages/station/research/experiments/Amine_Swingbed.html

U.S. Government Purpose Release

SpaceWire 2014 — GSC-17201-1

SpaceWire is a spacecraft communication network based in part on the IEEE 1355 standard of communications. The 2014 version is an update to fix "bugs," improve performance, and change the back-end user interface.
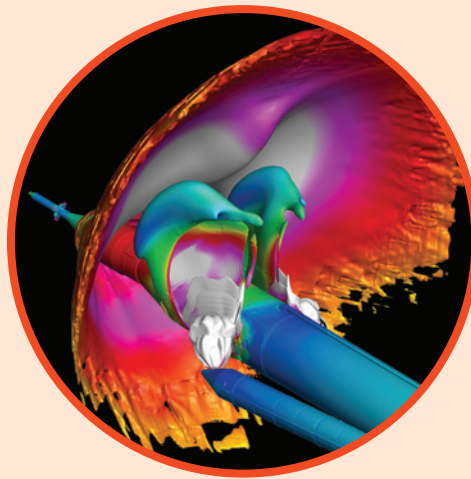
U.S. Release Only

Data and Image Processing

**Algorithms, Data Analysis,
Data Processing**

14

Featured Software

BALFIT: A Multivariate Regression Analysis Tool   ARC-15804-1A

BALFIT is designed for the automated regression analysis of wind tunnel strain-gage balance calibration data. Related strain-gage balance data analysis tasks are also supported. In addition, BALFIT performs an automated regression analysis of more general multivariate data sets at a basic level.
U.S. Release Only

Distributed Observer Network (Don), Version 3.1   KSC-13775

Distributed Observer Network 3 (DON3) is an innovative combination of NASA simulation technologies, NASA information technologies, and commercial video game technology that provide a unique system that leverages the strengths of all three. A key component of the innovation is a standardized data interface for simulation-related information that is coupled with custom software integrated into the game environment.
U.S. and Foreign Release

Quick Plot General-Purpose Plotting Tool   DRC-012-022

Quick Plot is a general-purpose tool used to plot Armstrong Flight Research Center time-history data files and data files in the MATLAB format. The graphical user interface allows commands to be scripted and read from an input script file; input signals can be modified using algebraic expressions.
U.S. and Foreign Release

WinPlot Graphical Display System   MFS-31664-1

WinPlot is a powerful desktop graphical analysis tool that allows the user to generate displays of unrestrictive amounts of data. It was developed to fulfill the need for fast and easily managed graphical displays of NASA test articles and facilities. WinPlot features include seamless displays of realtime and post-test data with time and event-time synchronization of data from multiple sources.
General Public Release

3D Mapping Software for High-Resolution Display of Hail and Rain Data from NWS Radar
KSC-12952

This tool generates a 3D hail/rain map around a large structure, such as the launch pad or a power plant.
U.S. Release Only

3DGRAPE/AL, Version 2
LAR-16415-1

Offering increased fidelity over other packages available in the public domain and sold by private companies, 3DGRAPE/AL (3D Grids about Anything by Poisson Equations with Upgrades from Ames and Langley) provides the latest state-of-the-art software to generate structured volume grids for computational fluid dynamics (CFD) analyses. Aerospace uses include analysis of aircraft and spacecraft in fluid flight regimes.
U.S. Release Only

ARAJ Low-Density Parity Check (LDPC) Codes
NPO-43949-1

This software provides a construction method for protograph-based low-density parity check (LDPC) codes that simultaneously achieve low iterative decoding thresholds and linear minimum distance. The technology can be used for various code rates. Proposed codes may have either fixed input block or fixed output block sizing. Both cases provide rate compatibility. In fact, one encoder and one decoder can support different code rates.
U.S. Government Purpose Release

AutoBayes: Automatic Design of Customized Analysis Algorithms and Programs
ARC-16276-1

AutoBayes uses extended Bayesian networks, a powerful symbolic system, and algorithm schemas to automatically generate efficient and customized programs for data analysis. It generates a standardized design document containing a graphical representation of the Bayesian network and of the details regarding the code's generation.
Open Source

AutoFilter: Automatic Generation of Customized State Estimation Code with Kalman Filters
ARC-16297-1

AutoFilter is a software tool that automatically generates efficient and customized code for navigation and state estimation using Kalman filter algorithms. The input for the tool is a detailed, high-level description of the problem's process, noise, and measurement models as well as software interface descriptions and architectural details. Using its powerful symbolic system and algorithms schemas, AutoFilter symbolically calculates all required matrices and produces code tailored toward the specific problem.
U.S. Government Purpose Release

AutoPost
MFS-32925-1

AutoPost can process any configuration of test data as needed. The tool can combine a series of data parameters into a single parameter.
U.S. Release Only

BALFIT: A Multivariate Regression Analysis Tool
ARC-15804-1A

BALFIT is designed for the automated regression analysis of wind tunnel strain-gage balance calibration data. Related strain-gage balance data analysis tasks are also supported. In addition, BALFIT performs an automated regression analysis of more general multivariate data sets at a basic level.
U.S. Release Only

Block GP: Scalable Gaussian Process Regression — ARC-16864-1

Block GP is a Gaussian process regression framework for multimodal data that can be an order of magnitude more scalable than existing state-of-the-art nonlinear regression algorithms. The framework builds local Gaussian processes on semantically meaningful partitions of data and provides higher prediction accuracy than a single global model with very high confidence. The method relies on approximating the covariance matrix of the entire input space by smaller covariance matrices that can be modeled independently.

Open Source

CertWare Safety Case Workbench Software — LAR-18067-1

This technology contributes several core modules to support safety case models and offers a service-based application programming interface that enables new model-processing capabilities to be plugged into the workbench.

Open Source

Chapter 10 Tools — DRC-014-009

The Dryden Aeronautical Test Range (DATR) staff at the Armstrong Flight Research Center has developed a software package called Chapter 10 Tools in response to challenges posed by the post-flight processing of data files originating from various on-board digital recorders that follow the Inter-Range Instrumentation Group's (IRIG) 106 Chapter 10 digital recording standard but use differing interpretations of the standard. This software toolkit will read the data files regardless of the vendor implementation of the source recorder, display data, identify and correct errors, and produce a data file that can be successfully processed post-flight.

U.S. Release Only

Code for Finding the Argmin and Argmax of a Data Variable in Stata Statistical Software — MSC-25718-1

This technology is used to find the argmin and argmax of a data variable within a Stata data set. The argmin and argmax in this case are the observation numbers at which the data variable achieves its minimum and maximum values (rather than the values themselves). Besides calculating and returning the argmin and argmax (i.e., observation number), the code returns the minimum and maximum values for reference and (upon request) returns the values of other data variables at the same observation numbers.

U.S. Government Purpose Release

Code for Finding the Running Maximum, Minimum, and Range of a Data Variable in Stata Statistical Software — MSC-25722-1

This technology is used to create a data variable that contains the running maximum, minimum, and range (maximum minus minimum) of another variable in a Stata data set. The code can also conceptually divide a data set according to values of other variables and calculate the running maximum, minimum, or range separately within each division.

U.S. Government Purpose Release

Configurable Real-Time Analysis System (CRANS) Software Program, Version 7 — MSC-25673-1

CRANS provides status of an avionics system utilizing an expert system for standard failure and correction options for potential failures. The program provides a means of representing logically interconnected items in a matrix format.

U.S. Government Purpose Release

Constellation PRACA Extension of the Bugzilla Application   ARC-16033-1

The Constellation PRACA I-1 system is a modified version of an open-source, web-based defect tracking tool called Bugzilla. Bugzilla allows software developers to document and track outstanding bugs in their products; in the Constellation PRACA I-1 system, these core capabilities have been extended to provide the necessary functionality and usability defined in the PRACA processing requirements.
Open Source

Core Hierarchical Segmentation (HSEG) Software Package   GSC-15855-1

This version of HSEG is not subject to patent restrictions. Please visit the following URL for additional information: http://opensource.gsfc.nasa.gov/projects/HSEG/
Open Source

Discontinuous Galerkin Spectral-Element Solver (eddy)   ARC-17373-1

Eddy is a fundamental research code for advancing spectral methods for complex geometry. This software is intended to enable researchers to collaborate through a common framework that enables three-dimensional simulations on practical problems. Areas of interest include advanced numerical algorithms, computational optimization, scale-resolving turbulence models, and high-order mesh generation.
General Public Release

Distributed Observer Network (Don), Version 3.1   KSC-13775

Distributed Observer Network 3 (DON3) is an innovative combination of NASA simulation technologies, NASA information technologies, and commercial video game technology that together provide a unique system that leverages the strengths of all three. A key component of the innovation is a standardized data interface for simulation-related information that is coupled with custom software integrated into the game environment.
U.S. and Foreign Release

DthDiff Armstrong Time-History Difference Software Utility   DRC-012-025

A standalone command-line-driven utility program, DthDiff is used to compare two Armstrong time-history format data files generated by the Armstrong Core Simulation Software.
U.S. and Foreign Release

DthData Armstrong Time-History Software Utility   DRC-012-024

A standalone command-line-driven utility program, DthData processes time-history format data files generated by the Armstrong Core Simulation Software.
U.S. and Foreign Release

Dynamic Onboard Ubiquitous Graphics (DOUG) Software Application   MSC-23586-1

The Dynamic Onboard Ubiquitous Graphics (DOUG) application is quickly becoming the primary three-dimensional graphical viewing tool at Johnson Space Center (JSC) as well as onboard the International Space Station (ISS). DOUG is the follow-on product to the Display Software Package (DSP), which is currently installed in all of the major training facilities at JSC. DOUG maintains the same cost-saving scene-load commonality introduced by DSP, allowing all of the facilities to make use of a single standardized scene load. DOUG also extends this commonality both by increasing the number of platforms on which the software will run and introducing a common user interface for scene element manipulation.
U.S. Release Only

Elimination of Parameter Input Requirement for Elliptic Grid Generation Methods in Engineering   ARC-14710-1

This software implements an enhanced method of elliptic grid generation.
U.S. Government Purpose Release

FilePlottingTools   **LAR-18314-1**

This Excel® plugin written in VB.net allows rapid post-processing of thermal analysis data from text files or from SINDA-formatted SAV files. The software can be adapted to other data formats as well.
Open Source

Geometry Manipulation Protocol (GMP) for Computational Fluid Dynamics (CFD) Applications, Version 1.0   **ARC-15193-1**

GMP serializes datatypes between XML and ANSI C data structures to support CFD applications. The library currently provides a description of geometric configurations, general moving-body scenarios (prescribed and/or 6-DOF), and control surface settings.
Open Source

Global Assimilative Ionosphere Model (GAIM)   **NPO-40584-1**

GAIM is used to estimate the three-dimensional electron density distribution of the Earth's ionosphere as a function of time. To achieve high accuracy for users, the software accepts a wide variety of ionospheric measurements as input and produces output either in real time or in post-processing. The software can also generate predictions of the electron density structure for several hours or days into the future.
U.S. and Foreign Release

GPS Occultation Analysis System (GOAS)   **NPO-30596-1**

GOAS processes atmospheric and ionospheric occultation data obtained from low-Earth-orbiting global positioning systems transmission receivers. The technology obtains input from a variety of receiver types and satellites and outputs full atmospheric and ionospheric retrievals.
U.S. and Foreign Release

Ground and Space Radar Volume Matching and Comparison Software   **GSC-15738-1**

This software enables easy comparison of ground- and space-based radar observations for validation purposes. It can be accessed at: http://opensource.gsfc.nasa.gov/projects/GSRadar/
Open Source

Hierarchical Data Format-Earth Observing System (HDF-EOS) to NetCDF Converter   **GSC-15007-1**

This C-language computer program accepts a set of scientific data/metadata from an Earth Observing System (EOS) satellite and converts it from the format in which it was created and delivered into another format for data processing and exchange on Earth. The converter can be downloaded at: http://www.hdfeos.org/software/convert_hdfeos5.php
Open Source

Highly Scalable Matching Pursuit Signal Decomposition Algorithm (MPD)   **ARC-16345-1**

MPD is a powerful and effective iterative algorithm for signal decomposition and feature extraction. The technology decomposes any signal into linear combinations of its dictionary elements, or "atoms."
Open Source

HiMAP: Portable 3-Level Super-Modular Parallel High-Fidelity Multidisciplinary Analysis Process   **ARC-14504-1**

HiMAP solves static and dynamic problems by tightly coupling the Euler/Navier-Stokes flow solutions with modal/finite-element structural solutions using built-in moving grids.
U.S. Government Purpose Release

Hypatheon-Searchable Database Capability for Formalized Mathematics   LAR-18232-1

The Hypatheon suite of software tools provides a searchable database capability for the specialized domain of formalized mathematics. The technology is designed to be a companion to a specific tool called PVS, which supports an emerging type of advanced software verification intended for safety-critical systems. Hypatheon aims to enhance PVS users' productivity by first indexing the mathematical theories rendered in the PVS specification language, then making their contents searchable by an interactive software tool.
Open Source

Image-Adapted Visually Weighted Quantization Matrices for Digital Image Compression (DCTune)   ARC-12015-1

This image compression software eliminates redundant and invisible image components using a discrete cosine transform (DCT). Each DCT coefficient is used to determine the perceived image quality and the bit rate of the image being compressed.
U.S. Government Purpose Release

Inductive Monitoring System (IMS), Version 5: System Health Monitoring Software That Learns System Behavior from Data   ARC-15058-1A

IMS software utilizes techniques from the fields of model-based reasoning, machine learning, and data mining to build system monitoring knowledge bases from archived or simulated sensor data. The technology automatically analyzes the nominal system data to form general classes of expected system sensor values; these classes are used to build a monitoring knowledge base. When monitoring a system, IMS simply checks to see how well the incoming sensor data fit into the classes derived from the training data.
U.S. Government Purpose Release

Inference Kernel for Open Static (IKOS) Analyzers: A High-Performance Static Analysis Engine to Build Automated Code Analysis Tools for the Formal Verification of Critical Software Properties   ARC-16789-1

IKOS is a kernel for the construction of open-static analyzers based on Patrick Cousot and Radhia Cousot's theory of abstract interpretation, which states that computations can be abstracted and reduced to a generalized set of objects and still exhibit the same critical properties of the parent program. By reducing the set of objects through abstraction, IKOS is scalable to large complex computer programs and presents a sound approach to verification of such programs.
Open Source

Information Sharing Protocol Advanced Tool of Math (ISPATOM), Version 02.03.07   MSC-25714-1

ISPATOM is a generic computational software program (comps). Most comps that are run in the NASA Mission Control Center (MCC) must be defined and hard-coded into C or some other programming language. ISPATOM runs on the MCC Linux workstations and can run any computations that can be represented as a mathematical equation without prior configuration. An equation or several equations are simply entered on the command line, the values are calculated, the computed values are saved in output symbols, and the output symbols are published.
U.S. Government Purpose Release

IPv6 Python Extension Module   LEW-19323-1

This extension module allows a user to enable IPv6 features not yet available for any Python versions. Currently, it allows for IPv6 flow labels to be enabled for a given Python socket object.
Open Source

Java-Based Software Tool for Dynamic Aerospace Vehicle Exchange Markup Files   LAR-17460-1

An update to software originally named DAVEtools 0.5, this technology is used for manipulating standard Dynamic Aerospace Vehicle Exchange Markup Language (DAVE-ML) models. The improved tool embeds the necessary initialization data into a data structure to keep the MATLAB workspace uncluttered and creates Simulink models from a generated MATLAB script.
Open Source

Java Pathfinder (JPF), Version 2.0   ARC-15388-1

Java Pathfinder (JPF) is a model checker for Java. The technology takes a Java program and "executes" it in a way that explores all possible executions/interleavings of the threads in the program. This allows JPF to detect certain bugs (e.g., deadlocks and assertion violations) that may be missed during testing.
Open Source

Java Pathfinder Core (JPF-Core) System   ARC-17487-1

JPF-Core is a model checker for Java bytecode. The technology takes a binary Java program and executes it in a user-configurable way to detect defects such as deadlocks and unhandled exceptions, providing significantly higher confidence in correct program behavior than conventional testing.
Open Source

Java Program to Promote an Open-Source "E Standard" for Mass Properties Engineering   LAR-17635-1

This open-source Java software helps develop electronic standards (E-standards) for mass properties engineering. An E-standard is a highly descriptive dataset that includes standardizing functions for data manipulation, interrogation, and formatting. With this tool, any number of users can interface with the proposed E-standard datasets and still seamlessly utilize their own software methods.
Open Source

Kepler Science Data Processing Pipeline   ARC-16332-1A

The Data Processing Pipeline is a central element of the Kepler Ground Data System. The pipeline is used to analyze stellar photometric data from the Kepler spacecraft and report results in order to search for planets within the Kepler photometric dataset. The tool performs pixel-level calibration, photometric analysis, systematic error correction, transiting planet detection, modeling and diagnostic testing of potential transit signatures, attitude determination, stellar target management, and monitoring of instrument health and performance.
Open Source

Kodiak: A Software Library for Verifying Nonlinear Arithmetic Statements   LAR-18268-1

Kodiak is a software implementation of an algorithm for verifying expressions involving nonlinear real arithmetic. It includes an optimizer for nonlinear real functions, a solver for nonlinear inequalities, and an application programming interface (API) for integrating other software verification tools.
Open Source

Libibvpp   ARC-16075-1

Libibvpp is a C++ wrapper around libibverbs, a part of the OpenFabrics software suite.
Open Source

Lossless Hyper-/Multi-Spectral Data Compression Software   GSC-15992-1

This software performs lossless hyper-spectral and multi-spectral data compression. It can be downloaded at: http://opensource.gsfc.nasa.gov/projects/LHD/
Open Source

Mariana: Text Classification System   ARC-16070-1

Mariana is an algorithm that efficiently optimizes hyperparameters for support vector machines for regression and classification. It currently uses simulated annealing for optimization but can be extended to use a variety of stochastic optimization techniques, including Markov Chain Monte Carlo, Sequential Monte Carlo, and genetic algorithms.
Open Source

MATLAB-Code V Toolkit   GSC-15140-1

This toolkit is a set of MATLAB scripts and functions that enable the rapid transfer of optical system and performance data from Code V optical software into the MATLAB environment. Typical applications include: extracting prescription data into MATLAB to confirm consistency of various delivered models; perturbing the models and performing various analyses such as ray tracing or generation of point-spread functions in support of integrated modeling activities; and enabling a MATLAB-driven optical model for integrated system-level modeling of wavefront sensing and control. The toolkit can be downloaded at:
http://opensource.gsfc.nasa.gov/projects/Matlab_Code_V/index.php
Open Source

MATLAB-Oslo Toolkit   GSC-15138-1

This toolkit is a set of MATLAB scripts and functions that enable the rapid transfer of optical system and performance data from Oslo optical software into the MATLAB environment. Typical applications include: extracting prescription data into MATLAB to confirm consistency of various delivered models; perturbing the models and performing various analyses in support of integrated modeling activities; and enabling a MATLAB-driven optical model for integrated system-level modeling of wavefront sensing and control. The toolkit can be downloaded at http://opensource.gsfc.nasa.gov/projects/Matlab/index.php
Open Source

MATLAB-Zemax Toolkit   GSC-15151-1

The MATLAB-Zemax toolkit is a set of MATLAB scripts and functions that enable the rapid transfer of optical system and performance data from Zemax optical software into the MATLAB environment. Typical applications include: extracting prescription data into MATLAB to confirm consistency of various delivered models; perturbing the models and performing various analyses in support of integrated modeling activities; and enabling a MATLAB-driven optical model for integrated system-level modeling of wavefront sensing and control. The toolkit can be downloaded at: http://opensource.gsfc.nasa.gov/projects/Matlab_Zemax/index.php
Open Source

Multivariate Time Series Search Capability to Identify
Complex Patterns in Large Datasets   ARC-16452-1

This software allows the user to specify a time series over multiple variables to search within massive datasets. The tool will return a listing of events (a time series) from the database that spans multiple variables and is within a threshold distance from the query. Experiments on numerous real aviation datasets have demonstrated the algorithm's capability to uncover potential aircraft safety events.
Open Source

MYSTRAN   GSC-17173-1

A finite element analysis (FEA) processor, MYSTRAN takes NASTRAN data decks as input and processes them to generate results files. The input files describe the mechanical nature of a piece of hardware and the loads or driving inputs that cause a reaction.
Open Source

NASA Vision Workbench (VW), Version 3 — ARC-15761-1A

Vision Workbench (VW) is a modular, extensible computer vision framework that supports a range of tasks, including automated science and engineering analysis, large satellite image processing, and 2D/3D environment reconstruction. The framework provides a rapid C++ development environment as well as a flexible, multi-platform system to deploy computer vision applications. The module interface allows new capabilities to be rapidly integrated, and the dataflow architecture allows image-processing pipelines to be quickly developed and reconfigured.

Open Source

nu-Anomica (Previously Sparse One Class Support Vector Machines (SOC-SVMs)) — ARC-16346-1

nu-Anomica is an anomaly detector that can run faster than traditional OC-SVMs. The technology can handle large training sets and works with a well-defined target function.

Open Source

ODL to XML Converter — GSC-15013-1

This command-line Java-based utility converts an ODL Hierarchical Data Format-Earth Observing Satellite (HDFEOS) metadata file to an HDFEOS XML file. The tool utilizes an all-Java ODL library that includes a syntax and grammar parser. The software can be downloaded at: http://opensource.gsfc.nasa.gov/projects/ODL_XML/index.php

Open Source

Outlier Detection Via Estimating Clusters (ODVEC) — ARC-16467-1

ODVEC software provides an efficient method for real-time or offline analysis of multivariate sensor data for use in anomaly detection, fault detection, and system health monitoring. ODVEC uses models automatically derived from archived system data to identify unusual, out-of-family data samples (outliers) that indicate possible system failure or degradation.

U.S. Government Purpose Release

Perilog, Version 3.0 — ARC-15310-1

Perilog software capabilities include keyword-in-context search, flexible phrase search, search by example, phrase generation, and phrase extraction. The technology's keyword-in-context search feature retrieves documents that contain one or more user-specified keywords in context, ranks documents on their relevance to the keywords in context, and displays the documents with the query words highlighted and, optionally, with strongly associated words also highlighted.

U.S. Government Purpose Release

PixelLearn — NPO-42082-1

PixelLearn is a tool for classifying the pixels in scientific image data sets. Based on one or more images on the same grid, the tool uses cutting-edge clustering algorithms to (1) automatically find structures in an image or (2) label individual classes and use supervised classification methods to extend labels to the rest of the image.

U.S. Government Purpose Release

Portable Environment for Quick Image Processing (QuIP) — ARC-16295-1A

The QuIP interpreter, a software environment for QUick image processing, uses an interactive scripting language designed to facilitate use by non-expert users through features such as context-sensitive automatic response completion and integrated documentation. The package includes a number of script packages that implement high-, medium-, and low-level functions (e.g., analysis of eye images for human gaze tracking, feature tracking, and image filtering). The environment also includes facilities for displaying images on screen, drawing and overlaying graphics, and constructing graphical user interfaces using the scripting language. Currently supported platforms are *NIX and Apple iOS®.

Open Source

Pour: A Framework for Periodic, On-Demand, and User-Specified Information Reconciliation
ARC-15468-1

Pour is a general-purpose information service framework for periodic, on-demand, and user-specified information reconciliation. The technology is designed to accommodate a wide variety of information types with support for high-volume, low-frequency periodic updates, user-specified updates, and automatic updates collected on demand when needed.
Open Source

Quick Plot General-Purpose Plotting Tool
DRC-012-022

Quick Plot is a general-purpose tool used to plot Armstrong Flight Research Center time-history data files and data files in the MATLAB format. The graphical user interface allows commands to be scripted and read from an input script file; input signals can be modified using algebraic expressions.
U.S. and Foreign Release

Requirements Tracing On Target (RETRO)
GSC-14976-1

RETRO offers methods and techniques for information retrieval (IR), including vector retrieval and probabilistic retrieval. The technology can be downloaded at: http://opensource.gsfc.nasa.gov/projects/RETRO/index.php
Open Source

Rocket Plume Spectroscopy Simulation for Hydrocarbon-Fueled Rocket Engines
SSC-00281

Enhancements and modifications to a code developed for plume spectral data analysis in 1994 have made the original computer program applicable to the space shuttle main engine and the Diagnostic Test-bed Facility Thruster (DTFT). The code can now handle the non-uniform wavelength intervals at which spectral computations are made.
U.S. Government Purpose Release

SequenceMiner: Anomaly Detection in Large Sets of High-Dimensional Symbol Sequences
ARC-16053-1

SequenceMiner was developed to address the problem of detecting and describing anomalies in large sets of high-dimensional symbol sequences. The technology performs unsupervised clustering (grouping) of sequences using the normalized longest common subsequence (LCS) as a similarity measure, followed by a detailed analysis of outliers to detect anomalies. SequenceMiner utilizes a new hybrid algorithm for computing the LCS that has been shown to outperform existing algorithms by a factor of five.
Open Source

Space Habitability Observation Reporting Tool (iSHORT)
MSC-25736-1

Designed for use on the iPad® 2 (or newer technology), iSHORT allows users to capture text, audio, video, and photographs within a single interface. The app allows users to indicate the priority of their observation (no change needed, nice to have, or must be addressed); provides a list of memory joggers to assist users in recalling items of interest related to human factors and habitability; and allows for simple report submission within the app.
U.S. Government Purpose Release

Space Packetized Telemetry System (SPoTS)
MSC-25183-1

The Space Packetized Telemetry System (SPoTS) is a real-time telemetry viewer. Display screens are built using a custom display builder with telemetry data fields, plot objects, data widgets, and standard objects. Measurement IDs are loaded from XTCE files.
U.S. Government Purpose Release

Spatial Resolution Verification Tool (SRVT) — SSC-00339

Developed using the MATLAB programming language and environment, this automated software algorithm assesses every image in an acquired data set using edges found within each image. In many cases, it eliminates the need for dedicated edge targets. SRVT automatically identifies high-contrast, uniform edges and calculates the modular transfer function (MTF) and relative edge response (RER) of each image. The tool is capable of quickly verifying spatial resolution, enabling the appropriate use of those images in a number of applications. The SRVT has been validated against traditional techniques using IKONOS and QuickBird satellite imagery.
U.S. Government Purpose Release

Spatial Standard Observer — ARC-14569-1

The Spatial Standard Observer (SSO) is a computer program for (1) measuring and specifying the perceptual intensity of a visual image or (2) the perceptual distance between two visual images. SSO operates on a digital image or a pair of digital images, and it computes a numerical measure of the perceptual strength of the single image or the difference between the images.
U.S. Government Purpose Release

Spectral Analysis Tool (SAT), Version 6.2 — NPO-43129-1

The SAT computer program calculates signal spectra, bandwidths, and interference effects for several families of modulation schemes found commonly in radio, satellites, and space communications. It is primarily used for spectrum management purposes to examine the effects of radio frequency interference on a satellite communication system.
U.S. Government Purpose Release

Stata Code for Finding the "Optimal Alpha" for Several Statistical Tests — MSC-25682-1

Two main types of errors occur in statistical hypothesis testing: type I errors reject a default hypothesis when it is actually correct, and type II errors fail to reject the default hypothesis when it is incorrect. The probability of type I errors is conventionally denoted as alpha, while the probability of type II errors is conventionally denoted as beta. The NASA code developed in this effort calculates the optimal alpha in Stata statistical software for several versions of statistical hypothesis tests.
U.S. Government Purpose Release

Structural Analysis Routines (STARS) — DRC-011-003

Structural Analysis Routines (STARS) is an efficient, cost-effective, and unique computer program that analyzes a variety of practical engineering problems. The software is a fully integrated, multidisciplinary, finite-element-based, graphic-oriented analysis tool that combines individual modules to solve complex engineering problems. STARS can be used for a range of applications, including structural analysis, heat transfer, linear aerodynamics, and computational fluid dynamics (CFD) as well as coupled linear and CFD-based (aeroelastic, aeroacoustic, and aerothermoelastic) acoustics and aeroservoelastic analysis. Because of the tool's highly integrated nature, it has broad application across many engineering disciplines.
U.S. and Foreign Release

Sun Format Database (SunAcc) File Read/Write Library — MFS-32397-1

The Sun Format Database (SunAcc) was developed to fulfill a need for local native storage of space shuttle main engine (SSME) test data. While the file format itself is native to the Sun UNIX platform, the read/write library was developed to be a cross-platform tool and is compatible with a variety of UNIX and Windows® platforms.
U.S. Release Only

Surfer: An Extensible Pull-Based Framework For Resource Selection and Ranking ARC-15295-1

Surfer examines the pool of potential grid resources and extracts the highest-ranking resources that meet user-specified constraints and preferences. The technology has been implemented as a grid service that is compliant with an Open Grid Services Infrastructure (OGSI), and it can also be embedded directly into Java applications through its application programming interface or into non-Java applications through its XML-based command-line interface.
Open Source

Swim: A Software Information Metacatalog for the Grid ARC-15469-1

Swim is a software information service for the grid built on top of the NASA-developed Pour framework. Software information is periodically gathered from native package managers on FreeBSD, Solaris, and IRIX as well as the RPM, Perl, and Python package managers on multiple platforms.
Open Source

Tiled Web Map Service (WMS) Server NPO-44685-1

This technology processes WMS requests that comply with a given request grid from an existing tile data-set. It also generates the KML configuration files required to access WMS tiles.
U.S. Government Purpose Release

Tolerance Domain Specific Language LAR-17546-1

This sensitivity task employs the Monte Carlo method. Thousands of simulations are run with randomly varied input parameters, and then statistical correlations are computed to determine the sensitivity of output parameters to each input parameter.
Open Source

Tool for Interactive Plotting, Sonification, and 3D Orbit Display (TIPSOD) GSC-14732-1

TIPSOD is a software application designed for interactive, animated, 4D (space and time) visualization of satellite orbits. The technology is implemented in Java 3D and is an extension to the existing Satellite Situation Center Web (SSCWeb) 2D static orbit graphics. Please visit the following URL for additional information: http://opensource.gsfc.nasa.gov/projects/tipsod/index.php
Open Source

Vectorization of Global Flood Monitoring System Using TopoJSON GSC-17169-1

This capability allows for the generation of vectors by reading and processing Global Flood Monitoring data and generating aTopoJSON-encoded file for visualization on the web.
Open Source

Video Image Stabilization and Registration (VISAR) MFS-31243-1

Video Image Stabilization and Registration (VISAR) is a software program that will stabilize video images distorted as a result of video camera motion.
U.S. Government Purpose Release

Viewpoints: Software for Visualization of Multivariate Data ARC-16019-1

A software application that allows the interactive visualization of multivariate data using a variety of standard techniques, Viewpoints can be used with extremely large data sets.
Open Source

Visual Environment for Remote Virtual Exploration (VERVE), Version 2 — ARC-16457-1A

VERVE is a 3D visualization system that provides situational awareness, science analysis tools, and data understanding capabilities for robotics researchers and exploration science operations. The technology is highly modular and extensible and includes a 3D scene-graph database, an interactive 3D viewer, and associated graphical user interfaces to OSGI plugin-based applications.
Open Source

Visual System for Browsing, Analysis, and Retrieval of Data (ViSBARD) — GSC-15744-1

ViSBARD provides a way of visualizing multiple vector and scalar quantities as measured by many spacecraft at once. The data are displayed three-dimensionally; may be displayed either as connected lines or as points; and allow the rapid determination of vector configurations, correlations between many measurements at multiple points, and global relationships. Please visit the following URL for additional information: http://opensource.gsfc.nasa.gov/projects/visbard/index.php
Open Source

WinPlot Graphical Display System — MFS-31664-1

WinPlot is a powerful desktop graphical analysis tool that allows the user to generate displays of unrestrictive amounts of data. It was developed to fulfill the need for fast and easily managed graphical displays of NASA test articles and facilities. WinPlot features include seamless displays of realtime and post-test data with time and event-time synchronization of data from multiple sources.
General Public Release

Worldview Satellite Imagery Browsing and Downloading Tool — GSC-17111-1

Worldview is a software tool designed for interactively browsing and downloading imagery from NASA's Earth-observing satellites. Building upon a set of open source mapping and user interface libraries, it provides an environment to visually discover interesting phenomena as observed by NASA satellites, then downloads the data for further analysis. Worldview was designed originally to address the needs of the near-real-time applications community to provide relevant information for time-critical scenarios such as wildfire and flood management. As such, satellite imagery can be be viewed within four hours of observation. Also, the imagery can be viewed in its highest, or native, resolution, and it can be panned and zoomed rapidly through space and time to find the most relevant/cloud-free information available.
Open Source

XML to HDF-EOS Convertor — GSC-15017-1

This software program takes an XML representation of the contents of a Hierarchical Data Format-Earth Observing System (HDF-EOS) file and recreates the file from that description. Please visit the following URL for additional information: http://opensource.gsfc.nasa.gov/projects/xml2he/index.php
Open Source

XML to ODL Convertor — GSC-15006-1

This program translates an XML representation of Hierarchical Data Format-Earth Observing System (HDF-EOS) ODL metadata back to the ODL format. Please visit the following URL for additional information: http://opensource.gsfc.nasa.gov/projects/xml2odl/index.php
Open Source

Aeronautics

Air Traffic Management Tools,
Modeling and Simulation Tools

15

Featured Software

ARC2D (Efficient Two-Dimensional Solution Methods for Navier-Stokes Equations)
ARC-12112-1

ARC2D is a computational fluid dynamics program developed at Ames Research Center specifically for two-dimensional airfoil and simply connected geometries. The program uses implicit finite-difference techniques to solve two-dimensional Euler equations and Navier-Stokes equations. It is based on the beam and warming implicit approximate factorization algorithm in generalized coordinates. Methods are either time-accurate or accelerated non-time-accurate steady-state schemes. The evolution of the solution through time is physically realistic; good solution accuracy is dependent on mesh spacing and boundary conditions.

U.S. Release Only

Chimera Grid Tools, Version 2.1
ARC-16025-1A

The Chimera Grid Tools software package contains a collection of software tools for performing geometry processing, surface and volume grid generation, grid manipulation and diagnostics, flow solver input preparation, multi-body dynamics input preparation and animation, flow solution visualization, debris trajectory analysis input preparation, strand grid and AMR Cartesian grid visualization, flow solution post-processing analysis including forces and moments computation, and convergence history visualization.

U.S. Release Only

Future Air Traffic Management Concepts Evaluation Tool (FACET)
ARC-14653-1

FACET provides a simulation environment for evaluating novel air traffic management concepts, including air traffic control and traffic flow management. Please visit the following URL for more information about the technology: http://www.aviationsystemsdivision.arc.nasa.gov/research/modeling/facet.shtml

U.S. and Foreign Release (Academic)

Langley Stability and Transition Analysis Code (LASTRAC)
LAR-16260-1

LASTRAC is a C++ code that analyzes compressible boundary-layer stability and performs transition prediction using the state-of-the-art Linear Stability Theory (LST) or Parabolized Stability Equations (PSE) methods.

U.S. Release Only

Multi-Aircraft Control System (MACS) Software   ARC-14776-1

MACS increases the overall realism of human-in-the-loop air traffic control (ATC) simulations. The system accommodates multiple onsite or offsite participants (e.g., pilots, controllers, airline dispatchers, or observers) and provides simulations from either a pilot's view or a controller's view.
U.S. Government Purpose Release

OVERFLOW 2: Overset Grid Computational Fluid Dynamics (CFD) Flow Solver
with Moving Body Capability   LAR-17079-1

OVERFLOW 2 is a computer code for simulating viscous, compressible fluid flow about complex aerodynamic configurations. The technology solves the Reynolds-averaged Navier-Stokes equations using structured, overset computational grids. It includes the capability for simulating multiple moving bodies acting under prescribed or aerodynamically forced motion. OVERFLOW 2 is a merge of the previously developed OVERFLOW 1.8 and OVERFLOW-D codes.
U.S. Release Only

Pegasus 5.2: Software for Automated Pre-processing of Overset CFD Grids   ARC-15117-1A

The Pegasus software is used as a pre-processor for overset-grid computational fluid dynamics (CFD) simulations. It provides hole-cutting and connectivity information. Main features include: automated hole-cutting algorithms, a projection scheme for fixing small discretization errors in the overset surface; efficient interpolation search methods; hole-size optimization based on adding additional layers of fringe points; and an automatic restart capability. The code can run in parallel using the Message-Passing Interface (MPI) standard. Capabilities added in this version include: support for cell-centered grids; a triple-fringe option; automated domain decomposition into multiple hole-cutters; improved parallel execution load-balancing algorithm; and additional minor enhancements.
U.S. Release Only

PLOT3D, Version 4.1   ARC-14400-1

PLOT3D is a computer graphics program designed to visualize the grid and solutions of structured computational fluid dynamics (CFD) datasets. Version 4.1 uses the OpenGL/GLUT graphics library. Several new features have been added to the code. These include: automatic computation of grid coordinate minimum/maximum; an orphan point plotting function; the ability to read double-precision unformatted data; negative grid index processing; random specification of colors for different walls; and simultaneous specification of walls and subsets for all zones.
U.S. Release Only

Aeronautical Data Link and Radar Simulator (ADRS)   ARC-15390-1

The ADRS distributed "simulation hub" allows multiple air traffic simulation components (e.g., pilot and controller operator stations and airborne and ground-based decision support tools) to be interconnected in the same simulation. The technology runs on both Windows® and UNIX platforms.
U.S. Government Purpose Release

Airspace Concepts Evaluation System (ACES)   ARC-15068-1

From gate departure to gate arrival, ACES is a dynamic, event-based computer simulation of aircraft operations in the National Airspace System (NAS). The technology's software-agent infrastructure provides flexibility in configuring custom simulations and enables explicit modeling of command and control entities operating within the NAS.
U.S. and Foreign Release (Academic)

Apparatus for Evaluating Software Decision Logic (ADEPT)   ARC-14928-1A

The ADEPT design tool integrates a graphical user interface with an automation decision-logic application. The software generates testable prototypes for traditional usability evaluations. Exportable products can be added to the base architecture.
U.S. and Foreign Release

ARC2D (Efficient Two-Dimensional Solution Methods for Navier-Stokes Equations)   ARC-12112-1

ARC2D is a computational fluid dynamics program developed at Ames Research Center specifically for two-dimensional airfoil and simply connected geometries. The program uses implicit finite-difference techniques to solve two-dimensional Euler equations and Navier-Stokes equations. It is based on the beam and warming implicit approximate factorization algorithm in generalized coordinates. Methods are either time-accurate or accelerated non-time-accurate steady-state schemes. The evolution of the solution through time is physically realistic; good solution accuracy is dependent on mesh spacing and boundary conditions.
U.S. Release Only

Automated Conflict Resolution for Air Traffic Control (AAC), Versions 1 and 2   ARC-15581-1A

The AAC algorithm generates resolution trajectories through a multi-step iterative process: (1) a resolution generator performs the analytical and logical functions; (2) a 4D trajectory synthesizer integrates aircraft equations of motion using detailed models of aircraft performance, operational procedures, and atmospheric conditions; and (3) a conflict detector compares trial resolution trajectories against the 4D trajectories of all other aircraft in an airspace of interest.
U.S. Government Purpose Release

Chimera Grid Tools, Version 2.1   ARC-16025-1A

The Chimera Grid Tools software package contains a collection of software tools for performing geometry processing, surface and volume grid generation, grid manipulation and diagnostics, flow solver input preparation, multi-body dynamics input preparation and animation, flow solution visualization, debris trajectory analysis input preparation, strand grid and AMR Cartesian grid visualization, flow solution post-processing analysis including forces and moments computation, and convergence history visualization.
U.S. Release Only

Center TRACON Automation System (CTAS)   ARC-15309-1

CTAS provides automation tools for planning and controlling arrival air traffic. The technology generates advisories designed to increase fuel efficiency, reduce delays, and provide automation assistance to air traffic controllers. Please visit the following URL for additional information: http://www.aviationsystemsdivision.arc.nasa.gov/research/foundations/index.shtml
U.S. Government Purpose Release

Cockpit Displays of Traffic Information (CDTI) Software Suite ARC-14581-1

CDTI consists of two main components: (1) the Pulse Predictor for Traffic Display Tool, which allows a user to compare a representation of his own expected trajectory with those of other traffic elements; and (2) the Flight-Deck-Based Flight Plan Modification Tool, which allows flight crew members to display and modify their flight plans graphically, check for predicted conflicts, and load changes into the flight management system.

U.S. Government Purpose Release

Control Allocation Technique to Recover from Pilot-Induced Oscillations (CAPIO) ARC-17115-1A

The CAPIO system is designed to operate within an aircraft's flight control system to alleviate pilot-induced oscillation tendencies in an aircraft without adversely impacting aircraft efficiency. The main idea behind the concept is to minimize the phase lag introduced to the system due to control surface rate saturation. CAPIO utilizes: (1) online estimation of phase lag introduced by control surface rate limiting, (2) online adjustment of control allocation weighting terms, and (3) an optimization algorithm (available from MathWorks) that calculates the optimal control solution.

U.S. and Foreign Release

DAIDALUS: Well-Clear Violation Volumes for Concept of Integration of UAS in the NAS LAR-18464-1

DAIDALUS is a reference implementation (in Java and C++) of the RTCA-228 detect and avoid concept for the integration of unmanned aircraft systems into civil airspace. DAIDALUS consists of algorithms for determining the current well-clear status between two aircraft and for predicting a well-clear violation within a lookahead time, assuming non-maneuvering trajectories. In the case of a predicted well-clear violation, DAIDALUS also provides an algorithm that computes the time interval of well-clear violation.

Open Source

Decelerator System Simulation (DSS) MSC-25936-1

DSS is a Fortran software tool used to predict the motion of a vehicle coupled to a parachute. Separate equations of motion for the parachute and vehicle are employed. DSS was modified from an existing NASA software program for the shuttle solid rocket booster (SRB) recovery system simulation.

U.S. Government Purpose Release

Evolutionary Mission Trajectory Generator (EMTG) GSC-16824-1

EMTG is a global trajectory optimization tool intended for interplanetary mission design. The technology automatically searches for the optimal sequence of planetary flybys and propulsive maneuvers for maximizing payload delivery at a destination. Designed for minimal user oversight, EMTG requires only start location, destination, allowable launch-date range, allowable flight time, and minimal spacecraft hardware information.

Open Source

EZ4D LAR-16798-GS

NASA's EZ4D software is a time-accurate three-dimensional Navier-Stokes solver for unstructured meshes. The software framework utilizes generic template programming in C++ to allow users to extend the code for simulations of any general conservation laws. Shared-memory multi-thread as well as distributed-memory MPI paradigms are implemented in EZ4D to facilitate efficient large-scale parallel numerical simulations.

U.S. Release Only

EZASE: Easy Aeroservoelasticity DRC-014-036

This is an easy-to-use MATLAB-based finite element modeling and simulation tool for aeroservoelastic analysis of rectangular wings with trailing-edge control surfaces. It includes a tutorial on structural finite element modeling (FEM_Tutorial.m) using elements such as 12 DOF plates and 6 DOF beams. The code is recommended for graduate and undergraduate students who want to know the basic concepts of medium-fidelity aeroservoelastic modeling. Not all methods are coded to industry standards.

Open Source

Finite-Rate Chemistry, Overset-Grid, Dual-Time Combustion-Reentry Code   ARC-15601-1

This technology modifies the OVERFLOW code for finite rate and equilibrium chemistry by substituting the perfect gas model built into the code with a model that assumes a mixture of thermally perfect gases. Four extra field variables (corresponding to pressure, temperature, the coefficient of thermal conductivity, and the new pressure derivative X) have been added.
U.S. Government Purpose Release

Flight Deck Predictive Weather Display and Decision Support Interface   ARC-16833-1

The Flight Deck Predictive Weather Display and Decision Support Interface is a suite of three methods that support the display of flight deck predictive weather and pilot weather avoidance decisions. Concepts behind the different methods can be combined and applied for manipulating and displaying predictive weather forecast information on different platforms for different end users.
U.S. Government Purpose Release

Future Air Traffic Management Concepts Evaluation Tool (FACET)   ARC-14653-1

FACET provides a simulation environment for evaluating novel air traffic management concepts, including air traffic control and traffic flow management. Please visit the following URL for more information about the technology: http://www.aviationsystemsdivision.arc.nasa.gov/research/modeling/facet.shtml
U.S. and Foreign Release (Academic)

Generic Command and Telemetry Applications for the Core Flight Software Framework (CI-TO)   MSC-26175-1

This set of applications provides general-purpose, configurable, and extensible spacecraft commanding and telemetry functionality supporting a wide variety of communications protocols and transports.
U.S. Government Purpose Release

Langley Stability and Transition Analysis Code (LASTRAC)   LAR-16260-1

LASTRAC is a C++ code that analyzes compressible boundary-layer stability and performs transition prediction using the state-of-the-art Linear Stability Theory (LST) or Parabolized Stability Equations (PSE) methods.
U.S. Release Only

Multi-Aircraft Control System (MACS) Software   ARC-14776-1

MACS increases the overall realism of human-in-the-loop air traffic control (ATC) simulations. The system accommodates multiple onsite or offsite participants (e.g., pilots, controllers, airline dispatchers, or observers) and provides simulations from either a pilot's view or a controller's view.
U.S. Government Purpose Release

Multi-Fidelity Simulation (MFSim)   ARC-17449-1

MFSim is a pluggable framework for creating an air traffic flow simulator at multiple levels of fidelity. The framework is designed to allow low-fidelity simulations of the entire U.S. airspace to be completed very quickly (on the order of seconds). The framework allows higher-fidelity plugins to be added to allow higher-fidelity simulations to occur in certain regions of the airspace concurrently with the low-fidelity simulation of the full airspace.
Open Source

Multiphysics Algorithm with Particles (MAP)   LAR-18801-1

MAP is a multidimensional adaptive Cartesian implementation of the direct simulation Monte Carlo (DSMC) method with paralellization capabilities using MPI. By performing dynamic adaptations of the grid, local time step, and surface temperature, the software has been automated to achieve a quality solution with minimal user input and control. The gas model includes internal degrees of freedom (rotational, vibrational, and electronic), gas phase chemical reactions, and surface reactions. MAP uses an N-level embedded Cartesian grid system and a separate surface geometry (embedded within the grid) that is made up of unstructured triangular elements.
U.S. Release Only

NASA Design and Analysis of Rotorcraft (NDARC)   ARC-16265-1

NDARC software is an aircraft system analysis tool that supports both conceptual design efforts and technology impact assessments of rotorcraft that meet specified requirements. The architecture of the NDARC code accommodates configuration flexibility, a hierarchy of models, and ultimately multidisciplinary design, analysis, and optimization.
U.S. Release Only

"NASA Glenn Research Center: The Early Years" for iPad®   LEW-18993-1

This photographic gallery application contains imagery and descriptions from the GRC image archive. Photos/data cover the period from 1941 to 1979. The software has been compiled and bundled as an iOS app for the iPad® and intended for release through the Apple App Store.
Open Source

Orbit-Determination Toolbox   GSC-15728-1

Based on MATLAB and Java, the flexible Orbit-Determination Toolbox is intended primarily for the advanced mission analysis that might be performed in the concept exploration, proposal, and early design phases. Visit the following URL for more information: http://opensource.gsfc.nasa.gov/projects/ODTBX/
Open Source

OVERFLOW 2: Overset Grid Computational Fluid Dynamics (CFD) Flow Solver with Moving Body Capability   LAR-17079-1

OVERFLOW 2 is a computer code for simulating viscous, compressible fluid flow about complex aerodynamic configurations. The technology solves the Reynolds-averaged Navier-Stokes equations using structured, overset computational grids. It includes the capability for simulating multiple moving bodies acting under prescribed or aerodynamically forced motion. OVERFLOW 2 is a merge of the previously developed OVERFLOW 1.8 and OVERFLOW-D codes.
U.S. Release Only

Parallel Dantzig-Wolfe Decomposition   ARC-16432-1

This implementation of the Dantzig-Wolfe decomposition is built upon the GNU Linear Programming Kit. The technology provides a command-line tool for solving properly decomposed linear programs.
Open Source

Pegasus 5.2: Software for Automated Pre-processing of Overset CFD Grids ARC-15117-1A

The Pegasus software is used as a pre-processor for overset-grid computational fluid dynamics (CFD) simulations. It provides hole-cutting and connectivity information. Main features include: automated hole-cutting algorithms, a projection scheme for fixing small discretization errors in the overset surface; efficient interpolation search methods; hole-size optimization based on adding additional layers of fringe points; and an automatic restart capability. The code can run in parallel using the Message-Passing Interface (MPI) standard. Capabilities added in this version include: support for cell-centered grids; a triple-fringe option; automated domain decomposition into multiple hole-cutters; improved parallel execution load-balancing algorithm; and additional minor enhancements.

U.S. Release Only

PLOT3D, Version 4.1 ARC-14400-1

PLOT3D is a computer graphics program designed to visualize the grid and solutions of structured computational fluid dynamics (CFD) datasets. Version 4.1 uses the OpenGL/GLUT graphics library. Several new features have been added to the code. These include: automatic computation of grid coordinate minimum/maximum; an orphan point plotting function; the ability to read double-precision unformatted data; negative grid index processing; random specification of colors for different walls; and simultaneous specification of walls and subsets for all zones.

U.S. Release Only

Quad-Channel Transport Class Model (Quad TCM) Simulation DRC-014-004

Quad TCM is a non-proprietary, non-sensitive aircraft Simulink model derived from Langley Research Center's Transport Class Model (TCM). A flight control system (FCS) oriented simulation with multi-channel (FCS) components, Quad TCM includes flight control computers (FCCs), sensors, actuators, and interconnects.

General Public Release

RACE: Runtime for Airspace Concept Evaluation ARC-17749-1

RACE is a software architecture and framework for configurable, highly concurrent and distributed message-based systems. RACE can be used to rapidly build simulations that span several machines (including synchronized displays), interface existing hardware simulators and other live data feeds, and incorporate sophisticated visualization components such as NASA's WorldWind viewer. RACE is implemented as a distributed actor system that runs within Java virtual machines.

Open Source

Sector 33 App ARC-16853-1

Offering a single user interface, Sector 33 is an air traffic control simulator game for Apple and Droid mobile devices. The technology includes introductory videos, an interactive air traffic control simulation of up to five airplanes; problem scoring; and integrated solution hints. The game can be downloaded at: http://www.nasa.gov/connect/apps.html

General Public Release

Shape Parameterization Algorithm (MASSOUD) LAR-16882-1

The MASSOUD and/or Bandaids software packages are geometry parameterization tools that may be used to perform design optimization with NASA's FUN3D and other CFD codes.

U.S. Release Only

SolFlyte   LAR-18203-1

SolFlyte enables the analysis of solar-electric HALE aircraft and airship concepts and missions by uniquely modeling the complex interactions of time-dependent astronomical, geographical, and atmospheric factors on key metrics such as energy balance, shadowing, performance, on-site persistence, and design size. Separate functional utilities are linked using the PHX ModelCenter v9.0 integration framework to create the SolFlyte-HTA (airplane) and SolFlyte-LTA (airship) analysis models and the SolFlyte-WND wind data processing model. The flexible inputs and rapid execution of the SolFlyte models broaden the analysis scope and permit parametric design feedback.
General Public Release

Stochastic Terminal Area Scheduling Simulation (STASS)   ARC-17079-1

STASS simulates air traffic in the terminal area and ground traffic on the terminal surface. The technology uses time-based queues at various locations along an aircraft's trajectory to model traffic. For arrivals, queue locations include the freeze horizon, metering fixes, and runways. For departures, queues are positioned at airport gates, runways, and metering fixes. Flight time uncertainty is modeled using probability distributions around queue arrival times.
U.S. Government Purpose Release

StormGen Weather Editor   ARC-16827-1

The StormGen interactive editor facilitates the design and production of dynamic convective weather scenarios. The software exports weather data in formats compatible with widely used air- and ground-tool simulators.
U.S. Release Only

Surface Operations Simulator and Scheduler (SOSS)   ARC-16808-1A

A simulation of air traffic movement on an airport surface, SOSS can be used in developing, analyzing, and testing runway schedulers and resolution algorithms.
U.S. Government Purpose Release

SUPKEM   ARC-16260-1

SUMKEM is a fully implicit, parabolic, partial-differential equation solver that can be used for the integration of unsteady 3D turbulence kinetic energy and dissipation-rate equations. The technology enables any laminar computational fluid dynamics (CFD) solver to compute a given unsteady turbulent flow of interest.
U.S. Release Only

Taxiway Navigation and Situation Awareness (T-NASA) System Simulation Software   ARC-15246-1

The T-NASA suite is composed of a collection of computer programs and libraries that enable the real-time simulation of head-up, out-the-window, and head-down moving map displays. The technology currently runs on a distributed IRIX system using the Performer graphics libraries and the X Windows graphical user interface.
U.S. Government Purpose Release

Tool for Turbine Engine Closed-loop Transient Analysis (TTECTrA)   LEW-19177-1

Developed in the MATLAB/Simulink environment, TTECTrA extends systems analysis by providing transient performance/capability estimates of a conceptual engine design.
Open Source

Toolbox for the Modeling and Analysis of Thermodynamic Systems (T-MATS)   LEW-19165-1

T-MATS is a Simulink toolbox intended for use in the modeling and simulation of thermodynamic systems and their controls. Included generic thermodynamic and controls components may be combined with a variable input iterative solver and optimization algorithm to create complex systems to meet the needs of a developer.
Open Source

15. Aeronautics

Traffic Situation Display (TSD)   ARC-16063-1A

The Traffic Situation Display (TSD) is an integrated display of air traffic, weather, terrain, and special use airspace. The tool was designed to serve as a primary graphical interface for ground operators/dispatchers supporting research simulation of single pilot and/or reduced crew operations. One key feature is the seamless transitional flow between the ego-referenced and position-referenced frames.
U.S. Government Purpose Release

Trajectory-Based Route Analysis and Control (TRAC)   ARC-16433-1

TRAC is an extensible software platform that supports next-generation air traffic concept investigations. The software enables visualization of current-day airspace elements; graphical creation of new elements; and runway-to-runway agent-based simulation and analysis of air traffic concepts.
U.S. and Foreign Release

TRAJEX Binary File Reader   KSC-13564

This MATLAB function opens a binary file generated by TRAJEX, reads and parses it, and outputs a structured data array that can be used in trajectory analysis.
U.S. Government Purpose Release

TURBO-AE: An Aeroelastic and Multi-Stage Aerodynamic Analysis
Code Based on Unsteady 3D Navier-Stokes Equations   LEW-17514-1

Developed for the prediction of flutter, forced response, performance, and rotor-stator interaction effects, TURBO-AE provides high-fidelity modeling of subsonic, transonic, and supersonic flow regimes with attached and separated flow fields. The code calculates performance quantities such as efficiency, mass flow, pressure ratio, temperature ratio, distribution of flowfield properties in the entire domain of calculation, aerodynamic damping to assess flutter stability, and unsteady aerodynamic forces arising from rotor-stator interaction.
U.S. Release Only

Unsteady Flow Analysis Toolkit (UFAT)   ARC-14800-1

UFAT is a software program for analyzing time-dependent flow fields. The technology automatically processes large-scale computer simulations to reveal salient flow features (e.g., vortices and shock waves) with little or no human interventions. UFAT effectively reduces the analysis time of multi-gigabyte datasets from weeks to hours using state-of-the-art particle tracking and feature detection algorithms.
U.S. Release Only

Virtual Airspace Simulation Technology, Real Time (VAST-RT), Capability Two   ARC-15658-1

Designed to assess advanced automation concepts and procedures being considered for the next-generation air traffic management system, VAST-RT offers real-time simulations across all air traffic control domains. Gate-to-gate simulations can involve piloted flight simulators, multiple NASA centers, TRACONS, and towers. The software's architecture links disparate legacy facilities together with simulation components developed in house.
U.S. and Foreign Release

X-Plane Communication (XPC) Toolbox   ARC-17185-1

The XPC Toolbox enables users to: (1) receive real-time information on the state of one or more simulated vehicles from the X-Plane flight simulator and (2) control vehicles running in the X-Plane simulation environment. It can be used to record simulated flight data, visualize flight profiles, create out-the-window visuals, test autopilots, and test control algorithms. The toolbox also enables the display of ghost traffic predefined flight paths in the simulated airspace and the visualization of flight plans in the form of waypoints.
Open Source

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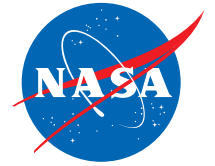4800 Oak Grove Drive
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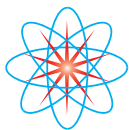
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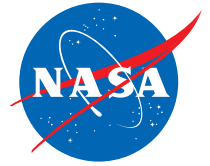### P R O G R A M

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