Aerospace Blockset
Release Notes

Contents

Summary by Version

This table provides quick access to what's new in each version. For clarification, see "About Release Notes" on page 2.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Latest Version V3.0 (R2007b)	Yes Details	Yes Summary	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation
V2.3 (R2007a)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V2.2 (R2006b)	Yes Details	No	Bug Reports Includes fixes	No
V2.1 (R2006a)	Yes Details	No	Bug Reports at Web site	No
V2.0.1 (R14SP3)	No	No	Bug Reports at Web site	No
V2.0 (R14SP2+)	Yes Details	Yes Summary	Bug Reports at Web site	No
V1.6.2 (R14SP2)	No	No	Bug Reports at Web site	No
V1.6.1 (R14SP1)	No	No	No	No
V1.6 (R14)	No	No	Fixed bugs at Web site	No
V1.5.1 (R13SP2)	No	No	No	V1.5.1 product documentation
V1.5 (R13SP1)	Yes Details	Yes Summary	No	No

About Release Notes

Use release notes when upgrading to a newer version to learn about new features and changes, and the potential impact on your existing files and practices. Release notes are also beneficial if you use or support multiple versions.

If you are not upgrading from the most recent previous version, review release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the New Features and Changes, Version Compatibility Considerations, and Bug Reports for V1.1 and V1.2.

New Features and Changes

These include

- New functionality

- Changes to existing functionality

- Changes to system requirements (complete system requirements for the current version are at the MathWorks Web site)

- Any version compatibility considerations associated with each new feature or change

Version Compatibility Considerations

When a new feature or change introduces a reported incompatibility between versions, its description includes a **Compatibility Considerations** subsection that details the impact. For a list of all new features and changes that have reported compatibility impact, see the "Compatibility Summary for Aerospace Blockset" on page 25.

Compatibility issues that are reported after the product has been released are added to Bug Reports at the MathWorks Web site. Because bug fixes can sometimes result in incompatibilities, also review fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

MathWorks Bug Reports is a user-searchable database of known problems, workarounds, and fixes. The MathWorks updates the Bug Reports database as new problems and resolutions become known, so check it as needed for the latest information.

Access Bug Reports at the MathWorks Web site using your MathWorks Account. If you are not logged in to your MathWorks Account when you link to Bug Reports, you are prompted to log in or create an account. You then can view bug fixes and known problems for R14SP2 and more recent releases.

The Bug Reports database was introduced for R14SP2 and does not include information for prior releases. You can access a list of bug fixes made in prior versions via the links in the summary table.

Related Documentation at Web Site

Printable Release Notes (PDF). You can print release notes from the PDF version, located at the MathWorks Web site. The PDF version does not support links to other documents or to the Web site, such as to Bug Reports. Use the browser-based version of release notes for access to all information.

Product Documentation. At the MathWorks Web site, you can access complete product documentation for the current version and some previous versions, as noted in the summary table.

Version 3.0 (R2007b) Aerospace Blockset

This table summarizes what's new in Version 3.0 (R2007b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation

New features and changes introduced in this version are

- "Direction Cosine Matrix to Rotation Angles Block Replaces Direction Cosine Matrix to Euler Angle Block" on page 5

- "Rotation Angles to Direction Cosine Matrix Block Replaces Euler Angle to Direction Cosine Block" on page 5

- "New CIRA-86 Atmosphere Model Block" on page 5

- "New NRLMSISE-00 Atmosphere Model Block" on page 5

- "New EGM96 Geoid Block" on page 5

- "Quaternions to Rotation Angles Block Replaces Quaternions to Euler Angles Block" on page 6

- "Rotation Angles to Quaternions Block Replaces Euler Angles to Quaternions Block" on page 6

- "New Aerospace Blockset Demo" on page 6

- "Enhanced HL-20 Demo" on page 6

Direction Cosine Matrix to Rotation Angles Block Replaces Direction Cosine Matrix to Euler Angle Block

The Direction Cosine Matrix to Rotation Angles block converts spatial representation from direction cosine matrix to any of 12 standard sequences of rotation angles.

Compatibility Considerations

The Direction Cosine Matrix to Euler Angle block is deprecated. Models built with the old block continue to be supported from an obsolete library that ships with Aerospace Blockset but is not visible in the Library Browser.

Rotation Angles to Direction Cosine Matrix Block Replaces Euler Angle to Direction Cosine Block

The Rotation Angles to Direction Cosine Matrix block converts spatial representation from any of 12 standard sequences of rotation angles to direction cosine matrix.

Compatibility Considerations

The Euler Angle to Direction Cosine Matrix block is deprecated. Models built with the old block continue to be supported from an obsolete library that ships with Aerospace Blockset but is not visible in the Library Browser.

New CIRA-86 Atmosphere Model Block

The CIRA-86 Atmosphere Model block implements the COSPAR International Reference Atmosphere (CIRA) 1986 environmental model.

New NRLMSISE-00 Atmosphere Model Block

The NRLMSISE-00 Atmosphere Model block implements the 2001 United States Naval Research Laboratory Mass Spectrometer and Incoherent Scatter Radar Exosphere (NRLMSISE) environmental model.

New EGM96 Geoid Block

The EGM96 Geoid block implements the 1996 Earth Geopotential Model (EGM96).

Quaternions to Rotation Angles Block Replaces Quaternions to Euler Angles Block

The Quaternions to Rotation Angles block converts spatial representation from quaternions to any of 12 standard sequences of rotation angles.

Compatibility Considerations

The Quaternions to Euler Angles block is deprecated. Models built with the old block continue to be supported from an obsolete library that ships with Aerospace Blockset but is not visible in the Library Browser.

Rotation Angles to Quaternions Block Replaces Euler Angles to Quaternions Block

The Rotation Angles to Quaternions block converts spatial representation from any of 12 standard sequences of rotation angles to quaternions.

Compatibility Considerations

The Euler Angles to Quaternions block is deprecated. Models built with the old block continue to be supported from an obsolete library that ships with Aerospace Blockset but is not visible in the Library Browser.

New Aerospace Blockset Demo

Aerospace Blockset has a new demo, Design, Verification, Validation and Test of Satellite Flight Software, which illustrates how to use Aerospace Blockset to perform some to the steps of the design and verification of flight software for a satellite.

Enhanced HL-20 Demo

The HL-20 demo (`aeroblk_HL20`) control system has been enhanced.

Version 2.3 (R2007a) Aerospace Blockset

This table summarizes what's new in Version 2.3 (R2007a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation

New features and changes introduced in this version are

- "New MATLAB Animation Block" on page 7
- "New Pilot Joystick All Block" on page 7
- "WGS84 Gravity Model Block Modified" on page 7
- "New Aerospace Blockset Demo" on page 8

New MATLAB Animation Block

The MATLAB Animation block creates a six-degrees-of-freedom animation of multiple bodies that have custom geometries. It is based on the Aero.Animation object.

New Pilot Joystick All Block

The Pilot Joystick All block provides a joystick interface on Windows platforms. This block is the same as Pilot Joystick, but its Output configuration parameter is set by default to AllOutputs. It outputs six analog channels, buttons, and point of view indicators.

WGS84 Gravity Model Block Modified

The first input of the WGS84 Gravity Model block is now a three-signal vector that contains the position in geodetic latitude, longitude, and altitude. The

second optional input is now a scalar that contains the user-specified Julian centuries. The WGS84 Gravity Model block also has new output coordinates and dimensions to output the gravity vector in NED coordinates.

Compatibility Considerations

The old WGS84 Gravity Model block is deprecated. Models built with the old block continue to be supported from an obsolete library that ships with Aerospace Blockset but is not visible in the Library Browser. To use the new version of the WGS84 Gravity Model block, you must replace the old WGS84 Gravity Model block from the Environment/Gravity library and reconnect the input to take into account the three-signal vector format.

New Aerospace Blockset Demo

Aerospace Blockset has a new demo, Multiple Unmanned Air Vehicles with Collaborative Control, which illustrates the use of the MATLAB Animation block.

Version 2.2 (R2006b) Aerospace Blockset

This table summarizes what's new in Version 2.2 (R2006b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation

New features and changes introduced in this version are described here.

- "Aerospace Toolbox Replaces Control System Toolbox as Requirement for Aerospace Blockset" on page 9
- "Interpolate Matrix Blocks Modified" on page 10
- "Aerodynamic Forces and Moments Block Extended" on page 10
- "New Digital DATCOM Forces and Moments Block" on page 10
- "FlightGear Version 0.9.10 Is Supported by FlightGear Simulator Interface" on page 10
- "Pack net_fdm Packet for FlightGear Now Supports Code Generation" on page 11
- "New SimViewingDevice Block" on page 11

Aerospace Toolbox Replaces Control System Toolbox as Requirement for Aerospace Blockset

The new Aerospace Toolbox is now required to use Aerospace Blockset. See the Aerospace Toolbox User's Guide for more information.

Control System Toolbox is no longer required for Aerospace Blockset. It is recommended for certain applications and still required for certain blocks.

Interpolate Matrix Blocks Modified

The Interpolate Matrix(x), Interpolate Matrix(x,y), and Interpolate Matrix(x,y,z) blocks have been modified to accept the new Simulink Prelookup block output. The Interpolate Matrix blocks inputs have been doubled in number. You must now provide the interpolation index and interpolation fraction as separate input signals.

The old Interpolate Matrix and Prelookup blocks are deprecated. Models built with the old blocks continue to be supported from obsolete libraries shipping with Aerospace Blockset and Simulink but not visible in the Library Browser.

Aerodynamic Forces and Moments Block Extended

The Aerodynamic Forces and Moments block has been extended to allow calculations in the stability and wind axes, in addition to the body axes.

To preserve backward compatibility, the default state of the block assumes a body-body transformation and hides the body velocity input port. If you change this default to stability or wind axes, the body velocity port appears.

New Digital DATCOM Forces and Moments Block

The Digital DATCOM Forces and Moments block calculates aerodynamic forces and moments using the Digital DATCOM static and dynamic stability derivatives and coefficients.

FlightGear Version 0.9.10 Is Supported by FlightGear Simulator Interface

The FlightGear simulator interface now supports the standard binary distributions of FlightGear version 0.9.10 on all platforms.

The FlightGear Preconfigured 6DoF Animation and Pack net_fdm Packet for FlightGear blocks have been updated accordingly, as have the `asbh120` and `asbdhc2` demos.

Pack net_fdm Packet for FlightGear Now Supports Code Generation

With Real-Time Workshop®, the Pack net_fdm Packet for FlightGear block now generates code for all targets, including xPC Target.

The Send net_fdm Packet to FlightGear and FlightGear Preconfigured 6DoF Animation blocks now generate valid but nonfunctional code. For simulating with FlightGear on an xPC target computer, use the Pack net_fdm Packet for FlightGear block with the UDP Send block from the xPC Target block library to route real-time simulation data to a running FlightGear session.

New SimViewingDevice Block

The FlightGear Preconfigured 6DoF Animation block is now a SimViewingDevice. You can use this block when you have connected your model to running target code using the Real-Time Workshop external mode.

Version 2.1 (R2006a) Aerospace Blockset

This table summarizes what's new in V2.1 (R2006a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports at Web site	No

New features and changes introduced in this version are described here.

FlightGear Version 0.9.9 Is Supported by FlightGear Simulator Interface

FlightGear Simulator Interface now supports the standard binary distributions of FlightGear version 0.9.9 on all platforms.

The FlightGear Preconfigured 6DoF Animation and Pack net_fdm Packet for FlightGear blocks have been updated accordingly.

3DoF Animation and 6DoF Animation Blocks Support Code Generation

The 3DoF Animation and 6DoF Animation blocks are now SimViewingDevices. You can view outputs with these blocks when you have connected your model to running target code using the Real-Time Workshop external mode.

Version 2.0.1 (R14SP3) Aerospace Blockset

This table summarizes what's new in V2.0.1 (R14SP3):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	Bug Reports at Web site	No

Version 2.0 (R14SP2+) Aerospace Blockset

This table summarizes what's new in V2.0 (R14SP2+):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports at Web site	No

New features and changes introduced in this version are described here.

Flight Simulator Interface

Aerospace Blockset 2.0 supports an interface to the third-party FlightGear Flight Simulator, an open source flight simulator software package. You can obtain the FlightGear Flight Simulator from www.flightgear.org.

The simulator interface included with Aerospace Blockset is a unidirectional transmission from Simulink to FlightGear using FlightGear's published net_fdm binary data exchange specification transmitted via UDP network packets to a running instance of FlightGear.

Aerospace Blockset currently supports the standard binary distributions of FlightGear versions 0.9.3 and 0.9.8a on all platforms.

Note There is a known problem with FlightGear running on Macintosh, where Weight on Wheels (wow) is 4 bytes, as opposed to other platforms where it is 1 byte. As a result, Aerospace Blockset may experience trouble communicating with FlightGear if you are running FlightGear on Macintosh, and if you are using any of the following parameters:

- wow
- gear_pos
- gear_steer
- gear_compression
- agl
- cur_time
- warp
- visibility

  For more information on the available parameters, see the reference page for the Pack net_fdm Packet for FlightGear block.

New Aerospace Blocks

The new Simulink blocks introduced in Aerospace Blockset 2.0 are listed below:

3DoF (Wind Axes)

6 DoF ECEF (Quaternion)

6DoF Wind (Quaternion)

6DoF Wind (Wind Angles)

Simple Variable Mass 3DoF (Wind Axes)

Simple Variable Mass 6 DoF ECEF (Quaternion)

Simple Variable Mass 6DoF Wind (Quaternion)

Simple Variable Mass 6DoF Wind (Wind Angles)

Custom Variable Mass 3DoF (Wind Axes)

Custom Variable Mass 6 DoF ECEF (Quaternion)

Custom Variable Mass 6DoF Wind (Quaternion)

Custom Variable Mass 6DoF Wind (Wind Angles)

4th Order Point Mass (Longitudinal)

4th Order Point Mass Forces (Longitudinal)

6th Order Point Mass (Coordinated Flight)

6th Order Point Mass Forces (Coordinated Flight)

Direction Cosine Matrix Body to Wind

Direction Cosine Matrix Body to Wind to Alpha and Beta

Direction Cosine Matrix ECEF to NED

Direction Cosine Matrix ECEF to NED to Latitude and Longitude

Direction Cosine Matrix to Wind Angles

ECEF Position to LLA

LLA to ECEF Position

Flat Earth to LLA

Geocentric to Geodetic Latitude

Geodetic to Geocentric Latitude

Radius at Geocentric Latitude

Wind Angles to Direction Cosine Matrix

Besselian Epoch to Julian Epoch

Julian Epoch to Besselian Epoch

FlightGear Preconfigured 6DoF Animation

Generate Run Script

Pack net_fdm Packet for FlightGear

Send net_fdm Packet to FlightGear

Pilot Joystick

Simulation Pace

Three-Axis Accelerometer

Three-Axis Gyroscope

Three-Axis Inertial Measurement Unit

Quaternion Conjugate

Quaternion Division

Quaternion Inverse

Quaternion Modulus

Quaternion Multiplication

Quaternion Norm

Quaternion Normalize

Quaternion Rotation

Wind Angular Rates

World Magnetic Model 2005

Mach Number and Dynamic Pressure Blocks Input

Previously the Mach Number and Dynamic Pressure blocks worked with airspeed as an input. This was not how the blocks were intended to work. Starting with this release, these blocks only accept velocity vectors as input.

Compatibility Considerations

The Mach Number and Dynamic Pressure blocks no longer accept airspeed as an input. Use velocity vectors as input for these blocks.

Version 1.6.2 (R14SP2) Aerospace Blockset

This table summarizes what's new in V1.6.2 (R14SP2):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	Bug Reports at Web site	No

Version 1.6.1 (R14SP1) Aerospace Blockset

This table summarizes what's new in V1.6.1 (R14SP1):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	No	No

Version 1.6 (R14) Aerospace Blockset

This table summarizes what's new in V1.6 (R14):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	Fixed bugs at Web site	No

Version 1.5.1 (R13SP2) Aerospace Blockset

This table summarizes what's new in V1.5.1 (R13SP2):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	No	V1.5.1 product documentation

21

Version 1.5 (R13SP1) Aerospace Blockset

This table summarizes what's new in V1.5 (R13SP1):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	No	No

New features and changes introduced in this version are described here.

New Aerospace Blocks

The new Simulink blocks introduced in Aerospace Blockset 1.5 are listed below:

Simple Variable Mass 3DoF (Body Axes)

Custom Variable Mass 3DoF (Body Axes)

Simple Variable Mass 6DoF (Euler Angles)

Simple Variable Mass 6DoF (Quaternion)

Custom Variable Mass 6DoF (Euler Angles)

Calculate Range

World Magnetic Model 2000

Dryden Wind Turbulence Model (Continuous (+q -r))

Dryden Wind Turbulence Model (Continuous (+q +r))

Dryden Wind Turbulence Model (Continuous (-q +r))

Von Kármán Wind Turbulence Model (Continuous (+q -r))

Von Kármán Wind Turbulence Model (Continuous (+q +r))

Von Kármán Wind Turbulence Model (Continuous (-q +r))

Dryden Wind Turbulence Model (Discrete (+q -r))

Dryden Wind Turbulence Model (Discrete (+q +r))

Dryden Wind Turbulence Model (Discrete (-q +r))

Horizontal Wind Model

Aerodynamic Forces and Moments

Moments about CG due to Forces

Symmetric Inertia Tensor

Estimate Center of Gravity

Estimate Inertia Tensor

Dynamic Pressure

Mach

Create 3x3 Matrix

Invert 3x3 Matrix

Adjoint of 3x3 Matrix

Determinant of 3x3 Matrix

SinCos

Relative Ratio

Pressure Altitude

Ideal Airspeed Correction

Incidence, Sideslip, & Airspeed

Lapse Rate Model

Non-Standard Day 310

Non-Standard Day 210C

Block Implementation Improvements

The following list contains improvements to Aerospace Blockset since the previous release:

- 6DoF blocks now output translational accelerations.

- Out of Range actions (None, Warning, Error) are now available for WGS84 Gravity Model block and the COESA Atmosphere Model block.

- Where applicable, you can now select to output velocity for blocks in knots.

Compatibility Considerations

As a result of conversion from the previous version, the output and behavior of some of the blocks have changed. These differences are listed below.

Dryden Wind Turbulence Block. If DCM equals `eye(3)` (identity matrix) and wind direction equals 0° (from North), the output of the Dryden Wind Turbulence Model (Continuous +q -r) block yields the same results as past versions of the Dryden Wind Turbulence Model (Aerospace Blockset 1.0 and 1.0.1) with approximately 10^{-7} error.

Also, for the Dryden Wind Turbulence Model (Continuous) block, the military specifications result in the same transfer function after evaluating the turbulence scale lengths, and the turbulence transfer functions balance each other out.

Wind Shear Block. When using metric units, values will differ from the previous version of Aerospace Blockset at the second decimal place (0.0x) due to corrections in the metric altitude to measure wind speed. It has been changed from six meters to ~6.096 meters. The specification calls for 20 feet and the new metric altitude is the exact conversion.

COESA Atmosphere Block. When using English units, density units have changed from lbm/ft^3 to $slugs/ft^3$. Blocks will be forwarded, with automatic conversion, to continue to output density in lbm/ft^3. Users may wish to investigate updating their models to use $slugs/ft^3$.

Turbofan Engine System Block. Users might experience minor changes in output values due to unit conversion correction for relative ratios.

Compatibility Summary for Aerospace Blockset

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided with the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version V3.0 (R2007b)	See the **Compatibility Considerations** subheading for this new feature or change: • "Direction Cosine Matrix to Rotation Angles Block Replaces Direction Cosine Matrix to Euler Angle Block" on page 5 • "Rotation Angles to Direction Cosine Matrix Block Replaces Euler Angle to Direction Cosine Block" on page 5 • "Quaternions to Rotation Angles Block Replaces Quaternions to Euler Angles Block" on page 6 • "Rotation Angles to Quaternions Block Replaces Euler Angles to Quaternions Block" on page 6
Version V2.3 (R2007a)	See the **Compatibility Considerations** subheading for this new feature or change: "WGS84 Gravity Model Block Modified" on page 7
Version V2.2 (R2006b)	None
V2.1 (R2006a)	None
V2.0.1 (R14SP3)	None

Version (Release)	New Features and Changes with Version Compatibility Impact
V2.0 (R14SP2+)	See the **Compatibility Considerations** subheading for this new feature or change: "Mach Number and Dynamic Pressure Blocks Input" on page 17
V1.6.2 (R14SP2)	None
V1.6.1 (R14SP1)	None
V1.6 (R14)	None
V1.5 (R13SP1)	See the **Compatibility Considerations** subheading for this new feature or change: "Block Implementation Improvements" on page 24