

# **Aerospace Blockset™ Release Notes**

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*Aerospace Blockset™ Release Notes*

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## Summary by Version

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

<b>Version (Release)</b>	<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>
V3.8 (R2011b)	Yes Details	Yes Summary	Bug Reports
V3.7 (R2011a)	Yes Details	Yes Summary	Bug Reports
V3.6 (R2010b)	Yes Details	Yes Summary	Bug Reports
V3.5 (R2010a)	Yes Details	No	Bug Reports Includes fixes
V3.4 (R2009b)	Yes Details	No	Bug Reports Includes fixes
V3.3 (R2009a)	Yes Details	No	Bug Reports Includes fixes
V3.2 (R2008b)	Yes Details	No	Bug Reports Includes fixes
V3.1 (R2008a)	Yes Details	No	Bug Reports Includes fixes
V3.0 (R2007b)	Yes Details	Yes Summary	Bug Reports Includes fixes
V2.3 (R2007a)	Yes Details	Yes Summary	Bug Reports Includes fixes
V2.2 (R2006b)	Yes Details	No	Bug Reports Includes fixes
V2.1 (R2006a)	Yes Details	No	Bug Reports at Web site
V2.0.1 (R14SP3)	No	No	Bug Reports at Web site

<b>Version (Release)</b>	<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>
V2.0 (R14SP2+)	Yes Details	Yes Summary	Bug Reports at Web site
V1.6.2 (R14SP2)	No	No	Bug Reports at Web site
V1.6.1 (R14SP1)	No	No	No
V1.6 (R14)	No	No	Fixed Bugs
V1.5.1 (R13SP2)	No	No	No
V1.5 (R13SP1)	Yes Details	Yes Summary	No

## Using Release Notes

Use release notes when upgrading to a newer version to learn about:

- New features
- Changes
- Potential impact on your existing files and practices

Review the release notes for other MathWorks® products required for this product (for example, MATLAB® or Simulink®). Determine if enhancements, bugs, or compatibility considerations in other products impact you.

If you are upgrading from a software version other than the most recent one, review the current release notes and all interim versions. For example, when you upgrade from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

## What Is in the Release Notes

### New Features and Changes

- New functionality

- Changes to existing functionality

### **Version Compatibility Considerations**

When a new feature or change introduces a reported incompatibility between versions, the **Compatibility Considerations** subsection explains the impact.

Compatibility issues reported after the product release appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so review the fixed bugs in Bug Reports for any compatibility impact.

### **Fixed Bugs and Known Problems**

MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. Bug Reports include provisions for any known workarounds or file replacements. Information is available for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

### **Documentation on the MathWorks Web Site**

Related documentation is available on [mathworks.com](http://mathworks.com) for the latest release and for previous releases:

- Latest product documentation
- Archived documentation

## Version 3.8 (R2011b) Aerospace Blockset

This table summarizes what's new in Version 3.8 (R2011b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Summary	Bug Reports

New features and changes introduced in this version are organized by these topics:

- “Conversion of Error and Warning Message Identifiers” on page 4
- “Efficient C Code Generation” on page 5
- “Blocks and Block Elements Being Removed” on page 5

### Conversion of Error and Warning Message Identifiers

For R2011b, error and warning message identifiers have changed in Aerospace Blockset™.

#### Compatibility Considerations

If you have scripts or functions that use message identifiers that changed, you must update the code to use the new identifiers. Typically, message identifiers are used to turn off specific warning messages.

For example, the `aeroblk:s1translate` identifier has changed to `aeroblks:s1translate:invalidVersion`. If your code checks for `aeroblk:s1translate`, you must update it to check for `aeroblks:s1translate:invalidVersion` instead.

To determine the identifier for a warning, run the following command just after you see the warning:

```
[MSG,MSGID] = lastwarn;
```

This command saves the message identifier to the variable *MSGID*.



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**Note** Warning messages indicate a potential issue with your code. While you can turn off a warning, a suggested alternative is to change your code so it runs warning-free.

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## Efficient C Code Generation

With the code reuse functionality from Simulink® Coder™, the Aerospace Blockset software now has efficient C code generation for all blocks. In previous releases, you could not reuse generated code.

## Blocks and Block Elements Being Removed

<b>Blocks or Block Element Names</b>	<b>What Happens When You Use the Block or Element?</b>	<b>Use These Blocks or Block Element Names Instead</b>	<b>Compatibility Considerations</b>
World Magnetic Model 2000	Nothing.	For model years between 2000 and the start of 2010, use International Geomagnetic Reference Field 11. For model years between 2010 and the start of 2015, use World Magnetic Model 2010.	For model years between 2000 and the start of 2010, use International Geomagnetic Reference Field 11. For model years between 2010 and the start of 2015, use World Magnetic Model 2010.
World Magnetic Model 2005	Nothing.	For model years between 2000 and the start of 2010, use International Geomagnetic Reference Field 11. For model	For model years between 2000 and the start of 2010, use International Geomagnetic Reference Field 11. For model

<b>Blocks or Block Element Names</b>	<b>What Happens When You Use the Block or Element?</b>	<b>Use These Blocks or Block Element Names Instead</b>	<b>Compatibility Considerations</b>
		years between 2010 and the start of 2015, use World Magnetic Model 2010.	years between 2010 and the start of 2015, use World Magnetic Model 2010.

## Version 3.7 (R2011a) Aerospace Blockset

This table summarizes what's new in Version 3.7 (R2011a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Summary	Bug Reports

- “New LLA to Flat Earth Block” on page 7
- “New International Geomagnetic Reference Field 11 Block” on page 7
- “Spherical Harmonic Gravity Model Supports New Planet Model” on page 7
- “Simulink® Coder Inlined Code Generation” on page 8
- “Aerospace Blockset Product Now in Simulink Start, Help, and Demos Category” on page 8

### New LLA to Flat Earth Block

The LLA to Flat Earth block estimates the flat Earth position from geodetic latitude, longitude, and altitude.

### New International Geomagnetic Reference Field 11 Block

The International Geomagnetic Reference Field 11 block calculates the Earth's magnetic field and secular variation using the eleventh generation of the International Geomagnetic Reference Field.

### Spherical Harmonic Gravity Model Supports New Planet Model

The Spherical Harmonic Gravity Model block now supports the EIGEN-GL04C gravity field model.

## Simulink Coder Inlined Code Generation

The following blocks now generate inlined code for all targets:

- COESA Atmosphere Model
- Pressure Altitude
- Non-Standard Day 210C
- Non-Standard Day 310
- NRLMSISE-00 Atmosphere Model
- WGS84 Gravity Model
- Spherical Harmonic Gravity Model

In previous releases, if your model contained these blocks, you needed to perform the following to generate code:

- In the Simulink Configurations Parameters pane, select the **Support: non-inlined S-functions** check box on the **Code Generation > Interface** pane.
- Include other source files to generate code.

## Compatibility Considerations

You can now generate code directly from models that contain these blocks. To use existing models:

- In the Simulink Configurations Parameters pane, clear the **Support: non-inlined S-functions** check box on the **Code Generation > Interface** pane.
- Do not include the other source files you previously included to generate code for your model.

## Aerospace Blockset Product Now in Simulink Start, Help, and Demos Category

The Simulink category now contains the Aerospace Blockset software product.

## **Compatibility Considerations**

This change impacts you in the following ways:

- Finding and viewing this product through the MATLAB Desktop **Start** button and in the Help browser **Contents** and **Demos** panes.
- Using the `demo` command to access the product demos.

## Version 3.6 (R2010b) Aerospace Blockset

This table summarizes what's new in Version 3.6 (R2010b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes Summary	Bug Reports

- “New Geoid Height Block” on page 10
- “FlightGear Version 2.0 with Aerospace Blockset Software” on page 10
- “Blocks and Block Elements Being Removed” on page 10

### New Geoid Height Block

The Geoid Height block calculates the height of geoid undulations using one of three geopotential models.

### FlightGear Version 2.0 with Aerospace Blockset Software

The Aerospace Blockset product now supports FlightGear Version 2.0.

For more information on working with FlightGear, see “Introducing the Flight Simulator Interface” in the *Aerospace Blockset User's Guide*.

### Blocks and Block Elements Being Removed

Block or Block Element Name	What Happens When You use the Block or Element?	Use This Instead	Compatibility Considerations
EGM96 Geoid	Still works. Help button redirects to Geoid Height block.	Geoid Height	Replace all existing instances of EGM96 Geoid

<b>Block or Block Element Name</b>	<b>What Happens When You use the Block or Element?</b>	<b>Use This Instead</b>	<b>Compatibility Considerations</b>
			with Geoid Height.
SinCos	Get Simulink Trigonometric Function block behavior. Help button redirects to Trigonometric Function block.	Trigonometric Function	Replace all existing instances of SinCos with Trigonometric Function.

## Version 3.5 (R2010a) Aerospace Blockset

This table summarizes what's new in Version 3.5 (R2010a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

- “New Centrifugal Effect Model Block” on page 12
- “New Spherical Harmonic Gravity Model Block” on page 12
- “New World Magnetic Model 2010 Block” on page 12
- “Demo” on page 12
- “Support for the Simulink For Each Subsystem Block” on page 13

### New Centrifugal Effect Model Block

The Centrifugal Effect Model block implements the gravity centrifugal effect for eight planets and the Moon, plus the capability to customize this effect.

### New Spherical Harmonic Gravity Model Block

The Spherical Harmonic Gravity Model block implements the spherical harmonic gravity models for Earth (EGM2008, EGM96), Moon (LP100K, LP165P), and Mars (GMM2B), plus the capability to customize these models.

### New World Magnetic Model 2010 Block

The World Magnetic Model 2010 block implements the world magnetic model for years 2010-2015 (WMM-2010).

### Demo

The following demo is new:



Gravity Models with Precessing Reference Frame — Illustrates various gravity models with precessing reference frames implemented with the Aerospace Blockset blocks.

### **Support for the Simulink For Each Subsystem Block**

The Aerospace Blockset product now supports the Simulink For Each Subsystem within the limitations of that subsystem.

## Version 3.4 (R2009b) Aerospace Blockset

This table summarizes what's new in Version 3.4 (R2009b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

- “New Zonal Harmonic Gravity Model Block” on page 14
- “FlightGear Version 1.9.1 with Aerospace Blockset Software” on page 14
- “Using the Send net\_fdm Packet to FlightGear Block to Communicate with xPC Target Applications” on page 14

### New Zonal Harmonic Gravity Model Block

The Zonal Harmonic Gravity Model block implements the zonal harmonic gravity model.

### FlightGear Version 1.9.1 with Aerospace Blockset Software

Aerospace Blockset Version 3.4 now supports FlightGear Version 1.9.1.

For more information on working with FlightGear, see “Introducing the Flight Simulator Interface” in the *Aerospace Blockset User's Guide*.

### Using the Send net\_fdm Packet to FlightGear Block to Communicate with xPC Target Applications

The Send net\_fdm Packet to FlightGear block now supports xPC Target™ applications.

In previous releases, you could not use the Send net\_fdm Packet to FlightGear block to communicate with xPC Target applications. Instead, you had to replace the Aerospace Blockset Send net\_fdm Packet to FlightGear with the xPC Target UDP Send block.

## Version 3.3 (R2009a) Aerospace Blockset

This table summarizes what's new in Version 3.3 (R2009a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

- “Enhanced Invert 3x3 Matrix Block Inverse Calculation” on page 15
- “Saving and Restoring the Complete SimState” on page 15
- “Using FlightGear Version 1.9.0 with Aerospace Blockset Software” on page 15

### Enhanced Invert 3x3 Matrix Block Inverse Calculation

The Invert 3x3 Matrix block no longer uses the determinant and adjoint to calculate the inverse. It now uses the Product block.

### Saving and Restoring the Complete SimState

Use the new SimState feature to save the complete simulation state. Unlike the final states stored in earlier versions of Simulink, the SimState contains the complete simulation state of the model (including block states that are logged). You can then restore the state at a later time and continue simulation from the exact instant at which you stopped the simulation. See “Saving and Restoring the Simulation State as the SimState” in the *Simulink User's Guide*.

### Using FlightGear Version 1.9.0 with Aerospace Blockset Software

Version 3.3 of Aerospace Blockset software does not support FlightGear Version 1.9.0. You can use this procedure.

- 1 In the Simulink model, double-click the FlightGear Preconfigured 6DoF Animation block or the Pack net\_fdm Packet for FlightGear block.

The block parameter dialog box is displayed.

- 2** In the **FlightGear version** parameter, select v1.0.
- 3** In the Simulink model, double-click the Generate Run Script block.

The block parameter dialog box is displayed.

- 4** In the **FlightGear base directory** parameter, set the FlightGear base folder to the location of FlightGear Version 1.9.0.
- 5** Click the **Generate Script** button.

The block creates a custom FlightGear run script.

- 6** Open the custom FlightGear run script with a text editor and change the input parameter '--airport-id=' to '--airport='.
- 7** Save and close this file.

For more information on working with FlightGear, see “Introducing the Flight Simulator Interface” in the *Aerospace Blockset User’s Guide*.

## Version 3.2 (R2008b) Aerospace Blockset

This table summarizes what's new in Version 3.2 (R2008b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

New features and changes introduced in this version are

### FlightGear Version 1.0 with Aerospace Blockset Software

Aerospace Blockset Version 3.2 now supports FlightGear Version 1.0. To access this version of FlightGear, you can use this procedure.

- 1 In the Simulink model, double-click the FlightGear Preconfigured 6DoF Animation block or the Pack net\_fdm Packet for FlightGear block.

The block parameter dialog box appears.

- 2 In the **FlightGear version** parameter, select v1.0.

- 3 In the Simulink model, double-click the Generate Run Script block.

The block parameter dialog box appears.

- 4 In the **FlightGear base directory** parameter, set the FlightGear base folder to the location of FlightGear Version 1.0.

For more information on working with FlightGear, see “Introducing the Flight Simulator Interface” in the *Aerospace Blockset User's Guide*.

### Updated Aerospace Blockset Blocks

The following blocks have been updated to support FlightGear Version 1.0:

- FlightGear Preconfigured 6DoF Animation

- Pack net\_fdm Packet for FlightGear
- Send net\_fdm Packet to FlightGear

## Version 3.1 (R2008a) Aerospace Blockset

This table summarizes what's new in Version 3.1 (R2008a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports Includes fixes

New features and changes introduced in this version are

- “Quaternion Support for the Embedded MATLAB Function Block” on page 19
- “New Aerospace Blockset Demos” on page 19
- “Using FlightGear Version 1.0 with Aerospace Blockset Software” on page 20

### Quaternion Support for the Embedded MATLAB Function Block

You can now access the following quaternion functions through the Embedded MATLAB Function block:

- `quatconj`
- `quatinv`
- `quatmod`
- `quatmultiply`
- `quatdivide`
- `quatnorm`
- `quatnormalize`

### New Aerospace Blockset Demos

The Aerospace Blockset product has the following new demos:

- asbSkyHogg, which illustrates the design of a lightweight airplane.
- asbQuatEML, which illustrates a quaternion and models the equations.

## Using FlightGear Version 1.0 with Aerospace Blockset Software

Version 3.1 of Aerospace Blockset software does not support FlightGear Version 1.0. You can use this procedure.

- 1** In the Simulink model, double-click the FlightGear Preconfigured 6DoF Animation block or the Pack net\_fdm Packet for FlightGear block.

The block parameter dialog box is displayed.

- 2** In the **FlightGear version** parameter, select v0.9.10.

- 3** In the Simulink model, double-click the Generate Run Script block.

The block parameter dialog box is displayed.

- 4** In the **FlightGear base directory** parameter, set the FlightGear base folder to the location of FlightGear Version 1.0.

For more information on working with FlightGear, see “Introducing the Flight Simulator Interface” in the *Aerospace Blockset User’s Guide*.



## 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
Yes Details below	Yes—Details labeled as <b>Compatibility Considerations</b> , below. See also Summary.	Bug Reports Includes fixes

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 21
- “Rotation Angles to Direction Cosine Matrix Block Replaces Euler Angle to Direction Cosine Block” on page 22
- “New CIRA-86 Atmosphere Model Block” on page 22
- “New NRLMSISE-00 Atmosphere Model Block” on page 22
- “New EGM96 Geoid Block” on page 22
- “Quaternions to Rotation Angles Block Replaces Quaternions to Euler Angles Block” on page 22
- “Rotation Angles to Quaternions Block Replaces Euler Angles to Quaternions Block” on page 23
- “Enhanced HL-20 Demo” on page 23

### **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 the Aerospace Blockset product 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 the Aerospace Blockset product 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 the Aerospace Blockset software 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 the Aerospace Blockset software but is not visible in the Library Browser.

### **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
Yes Details below	Yes—Details labeled as <b>Compatibility Considerations</b> , below. See also Summary.	Bug Reports Includes fixes

New features and changes introduced in this version are

- “New MATLAB Animation Block” on page 24
- “New Pilot Joystick All Block” on page 24
- “WGS84 Gravity Model Block Modified” on page 24
- “New Aerospace Blockset Demo” on page 25

### 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 manually-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 the Aerospace Blockset product 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**

The Aerospace Blockset product 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
Yes Details below	No	Bug Reports Includes fixes

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

- “Aerospace Toolbox Product Replaces Control System Toolbox Product as Requirement for Aerospace Blockset Product” on page 26
- “Interpolate Matrix Blocks Modified” on page 27
- “Aerodynamic Forces and Moments Block Extended” on page 27
- “New Digital DATCOM Forces and Moments Block” on page 27
- “FlightGear Version 0.9.10 Is Supported by FlightGear Simulator Interface” on page 27
- “Pack net\_fdm Packet for FlightGear Now Supports Code Generation” on page 28
- “New SimViewingDevice Block” on page 28

### **Aerospace Toolbox Product Replaces Control System Toolbox Product as Requirement for Aerospace Blockset Product**

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

The Control System Toolbox product is no longer required for the Aerospace Blockset product. 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 the Aerospace Blockset and Simulink obsolete libraries, 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
Yes Details below	No	Bug Reports at Web site

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):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>
No	No	Bug Reports at Web site

## Version 2.0 (R14SP2+) Aerospace Blockset

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

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>
Yes Details below	Yes—Details labeled as <b>Compatibility Considerations</b> , below. See also Summary.	Bug Reports at Web site

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

### Flight Simulator Interface

Aerospace Blockset Software Version 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](http://www.flightgear.org).

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

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

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**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, the Aerospace Blockset product might 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.

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## **New Aerospace Blockset Blocks**

The new Simulink blocks introduced in Aerospace Blockset Software Version 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):

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>
No	No	Bug Reports at Web site

## Version 1.6.1 (R14SP1) Aerospace Blockset

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

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>
No	No	No



## Version 1.6 (R14) Aerospace Blockset

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

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>
No	No	Fixed Bugs

## Version 1.5.1 (R13SP2) Aerospace Blockset

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

<b>New Features and Changes</b>	<b>Version Compatibility Considerations</b>	<b>Fixed Bugs and Known Problems</b>
No	No	No

## 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
Yes Details below	Yes—Details labeled as <b>Compatibility Considerations</b> , below. See also Summary.	No

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

### New Aerospace Blockset Blocks

The new Simulink blocks introduced in Aerospace Blockset Software Version 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 the Aerospace Blockset product 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 Software Version 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 the Aerospace Blockset product 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  $\text{lbm/ft}^3$  to  $\text{slugs/ft}^3$ . Blocks will be forwarded, with automatic conversion, to continue to output density in  $\text{lbm/ft}^3$ . Users may wish to investigate updating their models to use  $\text{slugs/ft}^3$ .

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

## Aerospace Blockset Compatibility Summary

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 V3.8 (R2011b)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: <ul style="list-style-type: none"> <li>• “Conversion of Error and Warning Message Identifiers” on page 4</li> <li>• “Blocks and Block Elements Being Removed” on page 5</li> </ul>
V3.7 (R2011a)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: <ul style="list-style-type: none"> <li>• “Simulink® Coder Inlined Code Generation” on page 8</li> <li>• “Aerospace Blockset Product Now in Simulink Start, Help, and Demos Category” on page 8</li> </ul>
V3.6 (R2010b)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: <ul style="list-style-type: none"> <li>• “Blocks and Block Elements Being Removed” on page 10</li> </ul>
V3.5 (R2010a)	None
Version V3.4 (R2009b)	None
Version V3.3 (R2009a)	None
Version V3.2 (R2008b)	None
Version V3.1 (R2008a)	None

<b>Version (Release)</b>	<b>New Features and Changes with Version Compatibility Impact</b>
Version V3.0 (R2007b)	<p>See the <b>Compatibility Considerations</b> subheading for this new feature or change:</p> <ul style="list-style-type: none"><li>• “Direction Cosine Matrix to Rotation Angles Block Replaces Direction Cosine Matrix to Euler Angle Block” on page 21</li><li>• “Rotation Angles to Direction Cosine Matrix Block Replaces Euler Angle to Direction Cosine Block” on page 22</li><li>• “Quaternions to Rotation Angles Block Replaces Quaternions to Euler Angles Block” on page 22</li><li>• “Rotation Angles to Quaternions Block Replaces Euler Angles to Quaternions Block” on page 23</li></ul>

<b>Version (Release)</b>	<b>New Features and Changes with Version Compatibility Impact</b>
Version V2.3 (R2007a)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: “WGS84 Gravity Model Block Modified” on page 24
Version V2.2 (R2006b)	None
V2.1 (R2006a)	None
V2.0.1 (R14SP3)	None
V2.0 (R14SP2+)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: “Mach Number and Dynamic Pressure Blocks Input” on page 34
V1.6.2 (R14SP2)	None
V1.6.1 (R14SP1)	None
V1.6 (R14)	None
V1.5 (R13SP1)	See the <b>Compatibility Considerations</b> subheading for this new feature or change: “Block Implementation Improvements” on page 40