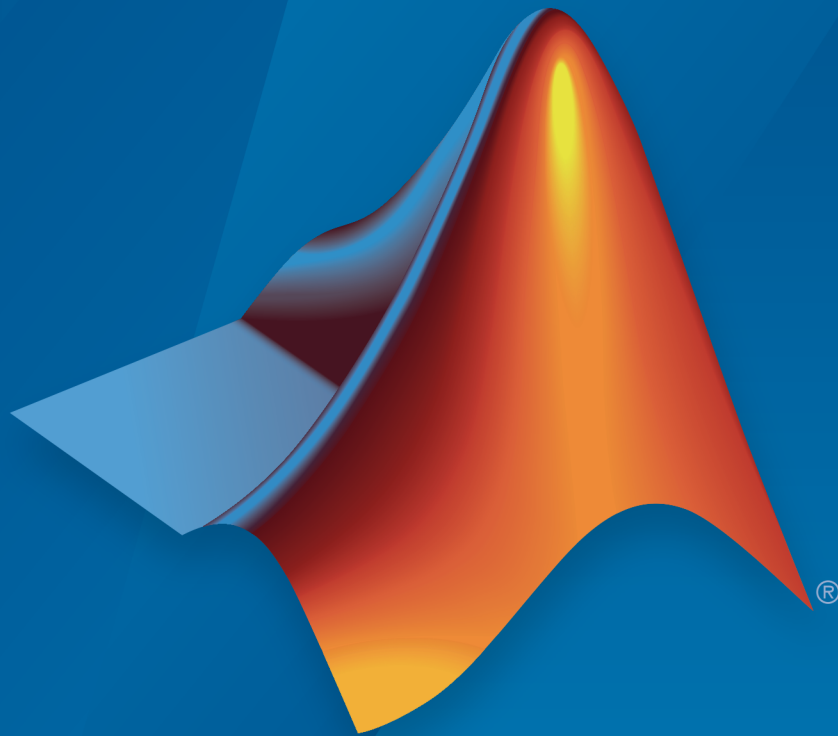


# Aerospace Blockset™ Release Notes



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**No New Features or Changes**

# R2016a

**Version: 3.17**

**New Features**

**Bug Fixes**

**Compatibility Considerations**

## **Flight Instruments: Display measurements through standard cockpit instruments**

Use these blocks, representing standard cockpit instruments, to display measurements:

- Airspeed Indicator
- Altimeter
- Artificial Horizon
- Climb Rate Indicator
- Exhaust Gas Temperature (EGT) Indicator
- Heading Indicator
- Revolutions Per Minute (RPM) Indicator
- Turn Coordinator

For more information, see “Flight Instrument Gauges”.

## **Quaternion Interpolation: Calculate interpolation between two quaternions**

The Quaternion Interpolation block interpolates between two quaternions.

## **Simulink Units**

Units and unit conversion blocks in the Aerospace Blockset™ software are independent of Simulink® units. All blocks from Aerospace Blockset software are treated as computation blocks, and do not propagate units across them.

## **Updated Examples**

These examples have been updated to use the From Spreadsheet block to read data saved in a spreadsheet from a previous simulation:

- NASA HL-20 with Optional FlightGear Interface
- Quadcopter Project

These examples have been updated to use the flight instruments blocks:

- 
- NASA HL-20 Lifting Body and Controller with Flight Instrumentation Blocks
  - NASA HL-20 Lifting Body and Controller with Simulink 3D Animation and Flight Instrumentation Blocks

## **FlightGear versions earlier than 2.0 no longer supported**

The Aerospace Blockset software no longer supports FlightGear versions earlier than 2.0. For a list of FlightGear versions that the Aerospace Blockset software supports, see [Supported FlightGear Versions](#).

## **Compatibility Considerations**

If you are using a FlightGear version older than 2.0, update your FlightGear installation to a supported version. When you open the model, the software receives a warning or error. Obtain updated FlightGear software from [www.flightgear.org](http://www.flightgear.org) in the download area.

## **Unit conversion block precision changes**

These unit conversion blocks may now generate values with better precision:

- Acceleration Conversion
- Angle Conversion
- Angular Acceleration Conversion
- Angular Velocity Conversion
- Density Conversion
- Force Conversion
- Length Conversion
- Mass Conversion
- Pressure Conversion
- Temperature Conversion
- Velocity Conversion





# **R2015aSP1**

**Version: 3.15.1**

**Bug Fixes**



# R2015b

**Version: 3.16**

**New Features**

**Bug Fixes**

## FlightGear Versions 3.2 and 3.4 Support: Interface to these FlightGear versions through flight simulator blocks

These blocks support FlightGear v3.2 and v3.4:

- FlightGear Preconfigured 6DoF Animation
- Generate Run Script
- Pack net\_fdm Packet for FlightGear
- Receive net\_ctrl Packet from FlightGear
- Unpack net\_ctrl Packet from FlightGear

For more information on working with FlightGear, see Flight Simulator Interface.

## International Geomagnetic Reference Field 12 Block: Calculate Earth magnetic field and secular variation

The International Geomagnetic Reference Field 12 block calculates Earth magnetic field and secular variation using 12th generation of International Geomagnetic Reference Field. It replaces the International Geomagnetic Reference Field 11 block.

### Tunable Parameters

These blocks parameters are now tunable

Block	Parameters
3DOF (Body Axes) block	<b>Inertia</b>
	<b>Initial incidence</b>
	<b>Initial velocity</b>
	<b>Empty mass</b>
	<b>Full mass</b>
3DOF (Wind Axes) block	<b>Inertia body axes</b>
	<b>Initial airspeed</b>
	<b>Empty mass</b>
	<b>Full mass</b>

<b>Block</b>	<b>Parameters</b>
4th Order Point Mass (Longitudinal)	<b>Initial airspeed</b>
6DOF (Euler Angles)	<b>Inertia</b>
	<b>Initial velocity in body axes [Xe,Ye,Ze]</b>
	<b>Empty mass</b>
	<b>Full mass</b>
6DOF ECEF blocks	<b>Initial position in geodetic latitude, longitude and altitude</b>
	<b>Inertia</b>
	<b>Initial velocity in body axis</b>
	<b>Empty mass</b>
	<b>Full mass</b>
	<b>Rotational rate</b>
6DOF Wind blocks	<b>Inertia</b>
	<b>Initial airspeed, angle of attack, and sideslip</b>
	<b>Empty mass</b>
	<b>Full mass</b>
6th Order Point Mass (Coordinated Flight)	<b>Initial airspeed</b>
Aerodynamic Forces and Moments block	<b>Reference span</b>
	<b>Reference length</b>
Discrete Wind Gust Model block	<b>Gust length [dx dy dz]</b>
Estimate Center of Gravity block	<b>Empty mass</b>
	<b>Full mass</b>
Self Conditioned [A,B,C,D] block	<b>Poles of A-H*C</b>
Three-Axis Accelerometer block	<b>Lower and upper output limits</b>

Block	Parameters
Three-Axis Gyroscope block	<b>Lower and upper output limits</b>

## Updated examples

- The NASA HL-20 with Optional FlightGear Interface example has been updated to:
  - Help you get started using FlightGear for the example.
  - Provide an example of a fault tolerant controller implemented with Stateflow<sup>®</sup> software. If you do not have Stateflow software installed or do not want to use the reactive controller, click the **No Logic** button in the **Redundant controller settings** block.
- The Quadcopter Project example has been updated with a trajectory generator.

# R2015a

**Version: 3.15**

**New Features**

**Bug Fixes**

## **Earth-centered inertial to azimuth, elevation, and range block**

The ECI Position to AER block calculates azimuth, elevation, and slant range coordinates for Earth-centered inertial position.

## **Additional ephemerides coefficient support for celestial phenomena blocks**

The Planetary Ephemeris and Moon Libration blocks now support the DE432t ephemerides database.

## **New World Magnetic Model 2015 block**

The World Magnetic Model 2015 block implements the world magnetic model for years 2015 to 2020 (WMM-2015).

## **Updated Example**

The NASA HL-20 with Optional FlightGear Interface example has been updated to take advantage of Simulink Projects.



# R2014b

**Version: 3.14**

**New Features**

**Bug Fixes**

**Compatibility Considerations**

## Horizontal Wind Model 07 block

The Horizontal Wind Model 07 block implements the U.S. Naval Research Laboratory HWM™ routine to calculate the meridional and zonal components of the wind for a set of geophysical data.

## Flight simulator interface block support for FlightGear Version 3

These blocks support FlightGear v3.0:

- FlightGear Preconfigured 6DoF Animation
- Generate Run Script
- Pack net\_fdm Packet for FlightGear
- Receive net\_ctrl Packet from FlightGear
- Unpack net\_ctrl Packet from FlightGear

For more information on working with FlightGear, see Flight Simulator Interface.

## Additional ephemerides coefficient support for celestial phenomena blocks

The Planetary Ephemeris, Earth Nutation, and Moon Libration blocks now support the DE430 ephemerides database.

## Examples

- Quadcopter Project — New example that shows how to use Simulink Projects and Aerospace Blockset blocks to model a quadcopter. It uses the Flight Simulation Example Simulink project template to manage the model and source files. For more information on this template, see Simulink Projects Template for Flight Simulation Applications.
- NASA HL-20 with FlightGear Interface — Existing example updated with a Run FlightGear block to help you get started using FlightGear for the example.

## Receive net\_ctrl Packet from FlightGear data storage change

The Receive net\_ctrl Packet from FlightGear block no longer stores the UdpRecvPkt signal at simulation when you select the **Data Import/Export** > **States** or **Final states** checkbox. In previous releases, the block stored this signal.

---

## **Equations of motion 3DOF and 6DOF acceleration values**

The equations of motion 3DOF and 6DOF blocks now include the gravity and rotating frame terms when calculating the accelerations of the body with respect to the inertial frame. As a result, you may notice different acceleration values.

## **Compatibility Considerations**

If your model has 3DoF and 6DoF blocks from library versions prior to 3.13 (R2014a), you can use the Aerospace Blockset check in the Simulink Upgrade Advisor to identify the blocks in your model to replace. For more information, see [Check model for legacy 3DoF or 6DoF blocks](#).



# R2014a

**Version: 3.13**

**New Features**

**Bug Fixes**

## **Blocks to convert between latitude, longitude, altitude and Earth-centered inertial coordinates**

The LLA to ECI Position block in the Utilities/Axes Transformations sublibrary converts geodetic latitude, longitude, altitude (LLA) coordinates to Earth-centered inertial (ECI) position coordinates, based on the specified reduction method and Universal Coordinated Time (UTC), for the specified time and geophysical data.

The ECI Position to LLA block converts Earth-centered inertial (ECI) position coordinates to geodetic latitude, longitude, altitude (LLA) coordinates, based on the specified reduction method and Universal Coordinated Time (UTC), for the specified time and geophysical data.

## **Flight simulator interface block support for FlightGear Version 2.12**

These blocks support FlightGear v2.12:

- FlightGear Preconfigured 6DoF Animation
- Generate Run Script
- Pack net\_fdm Packet for FlightGear
- Receive net\_ctrl Packet from FlightGear
- Unpack net\_ctrl Packet from FlightGear

For more information on working with FlightGear, see Flight Simulator Interfaces.

## **Equations of Motion 3DOF and 6DOF handle large mass changes**

- The following 3DOF and 6DOF blocks have been extended to handle large mass changes over time:
  - Custom Variable Mass 3DOF (Body Axes)
  - Custom Variable Mass 3DOF (Wind Axes)
  - Simple Variable Mass 3DOF (Body Axes)
  - Simple Variable Mass 3DOF (Wind Axes)
  - Custom Variable Mass 6DOF (Euler Angles)
  - Custom Variable Mass 6DOF (Quaternion)

- Custom Variable Mass 6DOF ECEF (Quaternion)
- Custom Variable Mass 6DOF Wind (Quaternion)
- Custom Variable Mass 6DOF Wind (Wind Angles)
- Simple Variable Mass 6DOF (Euler Angles)
- Simple Variable Mass 6DOF (Quaternion)
- Simple Variable Mass 6DOF ECEF (Quaternion)
- Simple Variable Mass 6DOF Wind (Quaternion)
- Simple Variable Mass 6DOF Wind (Wind Angles)

For more information, see “Blocks being removed or changed” on page 6-3.

- The Equations of Motion 3DoF and 6DoF libraries have been renamed to 3DOF and 6DOF.
- The names of all blocks in the Equations of Motion/6DOF and 3DOF libraries have changed to contain DOF instead of DoF.

## Blocks being removed or changed

Block or Block Element Name	What Happens When You Use the Block or Element?	Use This Block or Block Element Instead
3DoF (Body Axes)	Still works. Help button redirects to 3DOF (Body Axes) block.	3DOF (Body Axes)
3DoF (Wind Axes)	Still works. Help button redirects to 3DOF (Wind Axes) block.	3DOF (Wind Axes)
Custom Variable Mass 3DoF (Body Axes)	Still works. Help button redirects to Custom Variable Mass 3DOF (Body Axes) block.	Custom Variable Mass 3DOF (Body Axes)
Custom Variable Mass 3DoF (Wind Axes)	Still works. Help button redirects to Custom Variable Mass 3DOF (Wind Axes) block.	Custom Variable Mass 3DOF (Wind Axes)
Simple Variable Mass 3DoF (Body Axes)	Still works. Help button redirects to Simple Variable Mass 3DOF (Body Axes) block.	Simple Variable Mass 3DOF (Body Axes)

<b>Block or Block Element Name</b>	<b>What Happens When You Use the Block or Element?</b>	<b>Use This Block or Block Element Instead</b>
Simple Variable Mass 3DoF (Wind Axes)	Still works. Help button redirects to Simple Variable Mass 3DOF (Wind Axes) block.	Simple Variable Mass 3DOF (Wind Axes)
6DoF (Euler Angles)	Still works. Help button redirects to 6DOF (Euler Angles) block.	6DOF (Euler Angles)
6DoF (Quaternion)	Still works. Help button redirects to 6DOF (Quaternion) block.	6DOF (Quaternion)
6DoF Wind (Wind Angles)	Still works. Help button redirects to 6DOF Wind (Wind Angles) block.	6DOF Wind (Wind Angles)
6DoF Wind (Quaternion)	Still works. Help button redirects to 6DOF Wind (Quaternion) block.	6DOF Wind (Quaternion)
6DoF ECEF (Quaternion)	Still works. Help button redirects to 6DOF ECEF (Quaternion) block.	6DOF ECEF (Quaternion)
Custom Variable Mass 6DoF (Euler Angles)	Still works. Help button redirects to Custom Variable Mass 6DOF (Euler Angles) block.	Custom Variable Mass 6DOF (Euler Angles)
Custom Variable Mass 6DoF (Quaternion)	Still works. Help button redirects to Custom Variable Mass 6DOF (Quaternion) block.	Custom Variable Mass 6DOF (Quaternion)
Custom Variable Mass 6DoF ECEF (Quaternion)	Still works. Help button redirects to Custom Variable Mass 6DOF ECEF (Quaternion) block.	Custom Variable Mass 6DOF ECEF (Quaternion)
Custom Variable Mass 6DoF Wind (Quaternion)	Still works. Help button redirects to Custom Variable Mass 6DOF Wind (Quaternion) block.	Custom Variable Mass 6DOF Wind (Quaternion)



Block or Block Element Name	What Happens When You Use the Block or Element?	Use This Block or Block Element Instead
Custom Variable Mass 6DoF Wind (Wind Angles)	Still works. Help button redirects to Custom Variable Mass 6DOF Wind (Wind Angles) block.	Custom Variable Mass 6DOF Wind (Wind Angles)
Simple Variable Mass 6DoF (Euler Angles)	Still works. Help button redirects to Simple Variable Mass 6DOF (Euler Angles) block.	Simple Variable Mass 6DOF (Euler Angles)
Simple Variable Mass 6DoF (Quaternion)	Still works. Help button redirects to Simple Variable Mass 6DOF (Quaternion) block.	Simple Variable Mass 6DOF (Quaternion)
Simple Variable Mass 6DoF ECEF (Quaternion)	Still works. Help button redirects to Simple Variable Mass 6DOF ECEF (Quaternion) block.	Simple Variable Mass 6DOF ECEF (Quaternion)
Simple Variable Mass 6DoF Wind (Quaternion)	Still works. Help button redirects to Simple Variable Mass 6DOF Wind (Quaternion) block.	Simple Variable Mass 6DOF Wind (Quaternion)
Simple Variable Mass 6DoF Wind (Wind Angles)	Still works. Help button redirects to Simple Variable Mass 6DOF Wind (Wind Angles) block.	Simple Variable Mass 6DOF Wind (Wind Angles)

## Add ephemeris and geoid data

Use the **Get data** button to add ephemeris and/or geoid data for the following Aerospace Blockset blocks:

- Geoid Height

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**Note:** This works only for the EGM2008 Geopotential Model. The software provides EGM96 Geopotential Model data.

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- Earth Nutation

- Moon Libration
- Planetary Ephemeris

## **New example Simulink project template**

A new example Simulink project template is available to help you create a flight simulation application project. To open this template, in MATLAB<sup>®</sup>, select **New > Simulink Project > Flight Simulation Example**. Follow the directions in the template. For more information, see Simulink Projects Template for Flight Simulation Applications.

# R2013b

**Version: 3.12**

**New Features**

**Bug Fixes**

**Compatibility Considerations**

## **Flight simulator interface block support for FlightGear Version 2.10**

These blocks support FlightGear v2.10:

- FlightGear Preconfigured 6DoF Animation
- Generate Run Script
- Pack net\_fdm Packet for FlightGear
- Receive net\_ctrl Packet from FlightGear
- Unpack net\_ctrl Packet from FlightGear

For more information on working with FlightGear, see Flight Simulator Interface.

## **Direction Cosine Matrix ECI to ECEF block to convert Earth-Centered Inertial to Earth-Centered Earth-Fixed coordinates**

The Direction Cosine Matrix ECI to ECEF block in the Utilities/Axes Transformations sublibrary calculates the position direction cosine matrix (ECI to ECEF), based on the specified reduction method and Universal Coordinated Time (UTC), for the specified time and geophysical data.

## **Julian Date Conversion block to convert specified calendar date to Julian date or modified Julian date**

The Julian Date Conversion block in the Utilities/Unit Conversions sublibrary converts the specified date to the Julian date or modified Julian date.

## **Latitude inputs outside +90 and -90 degrees**

These blocks now correctly take into account latitude inputs that are outside +90 and -90 degrees.

- NRLMSISE-00 Atmosphere Model
- Geoid Height
- WGS84 Gravity Model
- Geodetic to Geocentric Latitude
- Geocentric to Geodetic Latitude

- 
- LLA to ECEF Position

## **Phaseout of FlightGear versions earlier than 2.0**

The Aerospace Blockset software will not support FlightGear versions earlier than 2.0 in a future release of Aerospace Blockset. For a list of FlightGear versions that the Aerospace Blockset software supports, see Supported FlightGear Versions.

## **Compatibility Considerations**

If you are using a FlightGear version older than 2.0, update your FlightGear installation to a supported version.

You can use the Aerospace Blockset check in the Simulink Upgrade Advisor to identify the blocks in your model that refer to FlightGear versions that the software no longer supports, or will no longer support. For more information, see Check model and local libraries for legacy Aerospace Blockset blocks.



# R2013a

**Version: 3.11**

**New Features**

**Bug Fixes**

## **Flight simulator interface block support for FlightGear Version 2.8**

These blocks support FlightGear v2.8.0:

- FlightGear Preconfigured 6DoF Animation
- Generate Run Script
- Pack net\_fdm Packet for FlightGear
- Receive net\_ctrl Packet from FlightGear
- Unpack net\_ctrl Packet from FlightGear

For more information on working with FlightGear, see Flight Simulator Interface.

## **Planetary Ephemeris block to implement position and velocity of Solar System planets**

The Planetary Ephemeris block in the Environment/Celestial Phenomena sublibrary implements the position and velocity of an astronomical object.

## **Earth Nutation block to implement nutation in longitude and obliquity of Earth**

The Earth Nutation block in the Environment/Celestial Phenomena sublibrary implements the nutation in longitude and obliquity of Earth according to the International Astronomical Union (IAU) 1980 nutation series.

## **Moon Libration block to implement relative motion attitude of Moon**

The Moon Libration block in the Environment/Celestial Phenomena sublibrary implements the relative motion attitude of Earth's Moon.

## **Lowest altitude parameter for specifying altitudes below sea level using Lapse Rate Model block**

The **Lowest altitude (m)** parameter of the Lapse Rate Model block enables to specify an altitude below sea level to calculate varying values of temperature and pressure below mean sea level. For more information, see Lapse Rate Model.



---

## **Updated Demo**

The NASA HL-20 with FlightGear Interface example has been updated. You no longer need FlightGear software installed to simulate the example. Instead, you can choose an alternate data input source from the Variant block. For more information, see [NASA HL-20 with FlightGear Interface](#)



# R2012b

**Version: 3.10**

**New Features**

**Bug Fixes**

## **Flight simulator interface block support for FlightGear versions 2.4 and 2.6**

These blocks have been updated to support FlightGear Versions 2.4 and 2.6:

- FlightGear Preconfigured 6DoF Animation
- Generate Run Script
- Pack net\_fdm Packet for FlightGear
- Receive net\_ctrl Packet from FlightGear
- Unpack net\_ctrl Packet from FlightGear

The Aerospace Blockset product now supports FlightGear Versions 2.6 and 2.4.

For more information on working with FlightGear, see Flight Simulator Interface.

## **Crossover Pilot Model, Precision Pilot Model, and Tustin Pilot Model blocks for modeling human pilots**

The new Pilot library contains blocks that represent a human pilot:

- Tustin Pilot Model
- Crossover Pilot Model
- Precision Pilot Model

# R2012a

**Version: 3.9**

**New Features**

**Compatibility Considerations**

## Updated Actuator Blocks

The actuator blocks have improved dynamic behavior and give you more control over initial conditions. For more information, see “Blocks and Block Elements Being Removed” on page 10-2.

## Support for Bidirectional Communication Between FlightGear and Simulink

Using UDP packets, the Aerospace Blockset software can now send and receive data between a Simulink model and a running FlightGear Flight Simulator. The Aerospace Blockset software has been updated with new and updated blocks.

- New blocks:
  - Receive net\_ctrl Packet from FlightGear — Receives a network control and environment data packet net\_ctrl from the simulation of a Simulink model in the FlightGear simulator.
  - Unpack net\_ctrl Packet from FlightGear — Unpacks net\_ctrl variable packets received from FlightGear and makes them available for the Simulink environment.
- Updated block Generate Run Script, with the following new parameters:
  - **Select target architecture**
  - **FlightGear data flow**
  - **Origin address**
  - **Origin port**

## Blocks and Block Elements Being Removed

Block or Block Element Name	What Happens When You Use the Block or Element?	Use This Block or Block Element Instead
Second Order Linear Actuator	Still works. Help button redirects to Linear Second-Order Actuator block.	Linear Second-Order Actuator
Second Order Nonlinear Actuator	Still works. Help button redirects to Nonlinear	Nonlinear Second-Order Actuator

Block or Block Element Name	What Happens When You Use the Block or Element?	Use This Block or Block Element Instead
	Second-Order Actuator block.	

## Updated Example

The NASA HL-20 with FlightGear Interface has been updated to show how you can receive FlightGear Flight Simulator data into a Simulink model.

## Using FlightGear Version 2.4.0 with Aerospace Blockset Software

Version 3.9 of Aerospace Blockset software does not support FlightGear Version 2.4.0. You can use this procedure to modify your FlightGear installation to use FlightGear Version 2.4.0:

- 1 In the Simulink model, if it contains these blocks, double-click them: FlightGear Preconfigured 6DoF Animation, Pack net\_fdm Packet for FlightGear, Receive net\_ctrl Packet from FlightGear, Unpack net\_ctrl Packet from FlightGear.

The block parameter dialog box opens.

- 2 In the **FlightGear version** parameter, select v2.0.
- 3 In the Simulink model, double-click the Generate Run Script block.
- 4 In the **FlightGear base directory** parameter, set the FlightGear base folder to the location of FlightGear Version 2.4.0.
- 5 Click the **Generate Script** button.

The block creates a custom FlightGear run script.

- 6 If you use the Receive net\_ctrl Packet from FlightGear, or Unpack net\_ctrl Packet from FlightGear, open the custom FlightGear run script with a text editor and change the input parameter ' - -fdm' parameter. In the run script, look for the following string:

```
--fdm=network,localhost,5501,5502,5503
```

Change this string:

```
--fdm=null --native-fdm=socket,in,30,127.0.0.1,5502,udp
```

**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*.



# R2011b

**Version: 3.8**

**New Features**

**Compatibility Considerations**

## 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:sltranslate` identifier has changed to `aeroblks:sltranslate:invalidVersion`. If your code checks for `aeroblk:sltranslate`, you must update it to check for `aeroblks:sltranslate: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*.

---

**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.

---

## 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

Blocks or Block Element Names	What Happens When You Use the Block or Element?	Use These Blocks or Block Element Names Instead	Compatibility Considerations
World Magnetic Model 2000	Nothing.	For model years between 2000 and	For model years between 2000 and

<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>
		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.	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 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.



# R2011a

**Version: 3.7**

**New Features**

**Compatibility Considerations**

## 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.





# R2010b

**Version: 3.6**

**New Features**

**Compatibility Considerations**

## 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 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.

# R2010a

**Version: 3.5**

**New Features**

**Bug Fixes**

## **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.

# R2009b

**Version: 3.4**

**New Features**

**Bug Fixes**

## **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 Simulink Real-Time Applications**

The Send net\_fdm Packet to FlightGear block now supports Simulink Real-Time™ applications.

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

# R2009a

**Version: 3.3**

**New Features**

**Bug Fixes**

## 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.



# R2008b

**Version: 3.2**

**New Features**

**Bug Fixes**

## 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

# R2008a

**Version: 3.1**

**New Features**

**Bug Fixes**

## 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.

# R2007b

**Version: 3.0**

**New Features**

**Bug Fixes**

**Compatibility Considerations**

## **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.





# R2007a

**Version: 2.3**

**New Features**

**Bug Fixes**

**Compatibility Considerations**

## **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.

# R2006b

**Version: 2.2**

**New Features**

**Bug Fixes**

## **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<sup>®</sup>, 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 Simulink Real-Time computer, use the Pack net\_fdm Packet for FlightGear block with the UDP Send block from the Simulink Real-Time 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.



# R2006a

Version: 2.1

New Features

## **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.



# R14SP3

Version: 2.0.1

No New Features or Changes



# R14SP2+

**Version: 2.0**

**New Features**

**Compatibility Considerations**

## 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.

---

**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.

---

## 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.

# R14SP2

**Version: 1.6.2**

**No New Features or Changes**

