Aerospace Blockset Release Notes

The "Aerospace Blockset 2.0 Release Notes" on page 1-1 describe the changes introduced in the latest version of Aerospace Blockset. The following topics are discussed in these Release Notes:
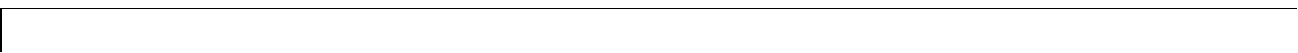
- "New Features" on page 1-2
- "Major Bug Fixes" on page 1-5
- "Known Software and Documentation Issues" on page 1-6

If you are upgrading from an earlier release, you should also see these sections:

- "Aerospace Blockset 1.6 Release Notes" on page 2-1
- "Aerospace Blockset 1.5 Release Notes" on page 3-1

Printing the Release Notes

If you would like to print the Release Notes, you can link to a PDF version.

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Aerospace Blockset 2.0 Release Notes

New Features

Flight Simulator Interface

The Aerospace Blockset 2.0 supports an interface to the third-party FlightGear Flight Simulator, an open source flight simulator software package.

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.

You can obtain FlightGear Flight Simulator from

```
http://www.flightgear.org
```

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 issue 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

Major Bug Fixes

The Von Kármán Wind Turbulence Model (Continuous) Block MIL-HDBK-1797 Implementation

We have verified that the descriptions of the continous Von Kármán wind turbulence transfer functions in the MIL-HDBK-1797 were not adjusted for the change in scale length from MIL-F-8785C to MIL-HDBK-1797. The continuous Von Kármán transfer functions from MIL-HDBK-1797 have been corrected in this release.

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.

Known Software and Documentation Issues

Error Using the NASA HL20 with FlightGear Interface Demo

We have verified that there is a bug in Simulink 6.0 (Release 14) in the way that it handles model referencing with a Stateflow chart when Real-Time Workshop is not installed. To work around this issue, go to

```
http://www.mathworks.com/support/solutions/data/
1-YCPFP.html?solution=1-YCPFP
```

and follow the solution for Release 14 with Service Pack 2.

Real-Time Workshop and Real-Time Workshop Embedded Coder Support

Most blocks in the Aerospace Blockset library support the Simulink Accelerator mode, as well as code generation with Real-Time Workshop and Real-Time Workshop Embedded Coder. The following blocks are exceptions.

Blocks Not Supported by Real-Time Workshop and by Real-Time Workshop Embedded Coder

Block	Library
3DoF Animation	Animation
6DoF Animation	Animation

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Aerospace Blockset 1.6 Release Notes

Major Bug Fixes

The Aerospace Blockset 1.6 does not have any signficant new features.

The Aerospace Blockset 1.6 includes the following bug fixes.

Correction to Wind Turbulence Model Magnitudes

The Discrete Dryden Wind Turbulence and Continuous Dryden Wind Turbulence blocks did not produce output values of the same magnitude.

The power of the noise within the wind turbulence blocks has been scaled to correct the magnitudes of the turbulence models.

Correction for Von Karman Wind Turbulence Scaling Factors

The longitudinal, lateral and vertical turbulence filters for the Von Karman blocks had incorrect scaling factors. An additional sqrt(2/pi) for longitudinal and an additional sqrt(1/pi) for lateral and vertical were added.

Known Software and Documentation Issues

Real-Time Workshop and Real-Time Workshop Embedded Coder Support

Most blocks in the Aerospace Blockset library support the Simulink Accelerator mode, as well as code generation with Real-Time Workshop and Real-Time Workshop Embedded Coder. The following blocks are exceptions.

Blocks Not Supported by Real-Time Workshop and by Real-Time Workshop Embedded Coder

Block	Library
3DoF Animation	Animation
6DoF Animation	Animation

3

Aerospace Blockset 1.5 Release Notes

New Features

Note The Aerospace Blockset 1.5 is a version of the Aerospace Blockset that was made available after Release 13. It updates Version 1.0.1, which was distributed via Web download after Release 13.

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 the 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.

Block Implementation Differences

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 10e-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 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.