

Aerospace Toolbox Release Notes

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Aerospace Toolbox 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.

| Version (Release) | New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|--------------------------|---------------------------------|---|--------------------------------------|
| V2.8 (R2011b) | Yes Details | Yes Summary | Bug Reports |
| V2.7 (R2011a) | Yes Details | No | Bug Reports |
| V2.6 (R2010b) | Yes Details | Yes Summary | Bug Reports |
| V2.5 (R2010a) | Yes Details | No | Bug Reports Includes fixes |
| V2.4 (R2009b) | Yes Details | No | Bug Reports Includes fixes |
| V2.3 (R2009a) | Yes Details | No | Bug Reports Includes fixes |
| V2.2 (R2008b) | Yes Details | No | Bug Reports Includes fixes |
| V2.1 (R2008a) | Yes Details | No | Bug Reports Includes fixes |
| V2.0 (R2007b) | Yes Details | Yes Summary | Bug Reports Includes fixes |

| Version (Release) | New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|------------------------------|---------------------------------|---|--------------------------------------|
| V1.1 (R2007a) | Yes Details | No | Bug Reports Includes fixes |
| New Product V1.0 (R2006b) | Yes Details | Not applicable | Bug Reports |

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 for the latest release and for previous releases:

- Latest product documentation
- Archived documentation

Version 2.8 (R2011b) Aerospace Toolbox

This table summarizes what's new in Version 2.8 (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
- “Demos” on page 5
- “Function and Function Element Being Removed” on page 5

Conversion of Error and Warning Message Identifiers

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

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 `Aero:FlightGearAnimation:NeedTimeData` identifier has changed to `aero:FlightGearAnimation:NeedTimeData`. If your code checks for `Aero:FlightGearAnimation:NeedTimeData`, you must update it to check for `aero:FlightGearAnimation:NeedTimeData` 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.

Demos

The following demos are new:

- Visualizing World Magnetic Model Contours for 2010 Epoch — Visualize contour plots of the calculated values for the Earth’s magnetic field using World Magnetic Model 2010 (WMM-2010) overlaid on maps of the Earth.
- Visualizing Geoid Height for Earth Geopotential Model 1996 — Calculate the Earth’s Geoid height using the EGM96 Geopotential Model.

Function and Function Element Being Removed

The following table lists the function and function element name being removed for R2011b.

| Function or Function Element Name | What Happens When You Use the Function or Element? | Use These Functions or Function Elements Instead | Compatibility Considerations |
|--------------------------------------|--|--|--|
| wrldmagn '2000' or '2005' epoch year | Warns | For model years between 2000 and the start of 2010, use <code>igrf11magm</code> . For model years between 2010 and the start of 2015, use <code>wrldmagm</code> . | For model years between 2000 and the start of 2010, use <code>igrf11magm</code> . For model years between 2010 and the start of 2015, use <code>wrldmagm</code> . |

Version 2.7 (R2011a) Aerospace Toolbox

This table summarizes what's new in Version 2.7 (R2011a):

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

- “New LLA to Flat Earth Function” on page 6
- “New Flat Earth to LLA Function” on page 6
- “New International Geomagnetic Reference Field 11 Function” on page 6
- “The gravitysphericalharmonic Function Supports New Planet Model” on page 6

New LLA to Flat Earth Function

The `lla2flat` function estimates a flat Earth position from geodetic latitude, longitude, and altitude coordinates.

New Flat Earth to LLA Function

The `flat2lla` function estimates geodetic latitude, longitude, and altitude coordinates from a flat Earth position.

New International Geomagnetic Reference Field 11 Function

The `igrf11magm` function calculates the Earth's magnetic field using the 11th generation of the International Geomagnetic Reference Field.

The gravitysphericalharmonic Function Supports New Planet Model

The `gravitysphericalharmonic` function now supports the EIGEN-GL04C gravity field model.

Version 2.6 (R2010b) Aerospace Toolbox

This table summarizes what's new in Version 2.6 (R2010b):

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

- “New Geoid Height Function” on page 7
- “Support to Read File Types 6, 21, and 42 for 2008 Version of DATCOM” on page 7
- “Support for FlightGear 2.0” on page 7
- “Functions and Function Elements Being Removed” on page 8

New Geoid Height Function

The `geoidheight` function calculates the height of geoid undulations/height using one of three geopotential models.

Support to Read File Types 6, 21, and 42 for 2008 Version of DATCOM

The `datcomimport` function has been enhanced to read file types 6, 21, and 42 for 2008 DATCOM files. In previous releases, the Aerospace Toolbox read only file type 6 and 21.

Support for FlightGear 2.0

Aerospace Toolbox now supports FlightGear Version 2.0.

For more information on working with FlightGear, see “Using Aero.FlightGearAnimation Objects” in the *Aerospace Toolbox User's Guide*.

Functions and Function Elements Being Removed

| Function or Function Element Name | What Happens When You use the Function or Element? | Use This Instead | Compatibility Considerations |
|--|---|-------------------------|--|
| geoidegm96 | Warns | geoidheight | Replace all existing instances of geoidegm96 with geoidheight. |

Version 2.5 (R2010a) Aerospace Toolbox

This table summarizes what's new in Version 2.5 (R2010a):

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

- “New Gravity Centrifugal Effect Function” on page 9
- “New Spherical Harmonic Gravity Model Function” on page 9
- “New Gas Dynamics Functions” on page 9
- “Updated World Magnetic Function” on page 9
- “Demos” on page 10

New Gravity Centrifugal Effect Function

The `gravitycentrifugal` function implements the centrifugal effect for eight planets and the Moon, plus the capability to customize this effect.

New Spherical Harmonic Gravity Model Function

The `gravitiesphericalharmonic` function implements the spherical harmonic gravity models for Earth (EGM2008, EGM96), Moon (LP100K, LP165P), and Mars (GMM2B), plus the capability to customize these models.

New Gas Dynamics Functions

New gas dynamics functions, including isentropic flow (`flowisentropic`), normal shock (`flownormalshock`), Rayleigh flow (`flowrayleigh`), Fanno flow (`flowfanno`), and Prandtl-Meyer flow (`flowprandtlmeyer`).

Updated World Magnetic Function

Updated `wrldmagm` function to include world magnetic model for years 2010-2015 (WMM-2010).

Demos

The Comparing Zonal Harmonic Gravity Model to Other Gravity Models demo has been updated to include comparison of other gravity models.

Version 2.4 (R2009b) Aerospace Toolbox

This table summarizes what's new in Version 2.4 (R2009b):

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

- “New Zonal Harmonic Gravity Model Function” on page 11
- “Support for FlightGear 1.9.1” on page 11

New Zonal Harmonic Gravity Model Function

The `gravityzonal` function implements the zonal harmonic gravity model.

Support for FlightGear 1.9.1

Aerospace Toolbox Version 3.4 now supports FlightGear Version 1.9.1.

For more information on working with FlightGear, see “Using Aero.FlightGearAnimation Objects” in the *Aerospace Toolbox User's Guide*.

Version 2.3 (R2009a) Aerospace Toolbox

This table summarizes what's new in Version 2.3 (R2009a):

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

- “Support to Read File Type 21 for 2007 Version of DATCOM” on page 12
- “Using FlightGear Version 1.9.0 with Aerospace Toolbox” on page 12

Support to Read File Type 21 for 2007 Version of DATCOM

The `datcomimport` function has been enhanced to read file type 21 for 2007 DATCOM files. In previous releases, the Aerospace Toolbox read only file type 6.

Using FlightGear Version 1.9.0 with Aerospace Toolbox

Aerospace Toolbox Version 2.3 does not support FlightGear Version 1.9.0. You can use this procedure.

- 1 In the MATLAB Command Window, create a FlightGear animation object.

```
h = Aero.FlightGearAnimation;
```

- 2 Set the FlightGear animation object property `FlightGearVersion` to 1.0.

```
h.FlightGearVersion = '1.0';
```

- 3 Set the FlightGear animation object property `FlightGearBaseDirectory` to the location of FlightGear Version 1.9.0.

```
h.FlightGearBaseDirectory = 'C:\Program Files\FlightGear190'
```


- 4 Generate the run script.

```
GenerateRunScript(h)
```

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

For more information on working with FlightGear, see “Using Aero.FlightGearAnimation Objects” in the *Aerospace Toolbox User’s Guide*.

Version 2.2 (R2008b) Aerospace Toolbox

This table summarizes what's new in Version 2.2 (R2008b):

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

New features and changes introduced in this version are

- “Support for 2007 Version of DATCOM File” on page 14
- “FlightGear Version 1.0 with Aerospace Toolbox” on page 14
- “FlightGear Animation Object play Method Now Supports Custom Timers” on page 15

Support for 2007 Version of DATCOM File

The `datcomimport` function has been enhanced to support the 2007 DATCOM file in addition to the 1976 and 1999 DATCOM files.

FlightGear Version 1.0 with Aerospace Toolbox

Aerospace Toolbox Version 2.2 now supports FlightGear Version 1.0. To access this version of FlightGear, you can use this procedure.

- 1 In the MATLAB Command Window, create a FlightGear animation object.

```
h = Aero.FlightGearAnimation;
```

- 2 Set the FlightGear animation object property `FlightGearVersion` to 1.0.

```
h.FlightGearVersion = '1.0';
```

- 3 Set the FlightGear animation object property `FlightGearBaseDirectory` to the location of FlightGear Version 1.0.

```
h.FlightGearBaseDirectory = 'C:\Program Files\FlightGear10'
```

For more information on working with FlightGear, see “Using Aero.FlightGearAnimation Objects” in the *Aerospace Toolbox User’s Guide*.

FlightGear Animation Object play Method Now Supports Custom Timers

The FlightGear animation object play method now supports custom timers.

In previous releases, you needed to create your own play method if your FlightGear animation object was used with custom timers. This is no longer necessary.

Version 2.1 (R2008a) Aerospace Toolbox

This table summarizes what's new in Version 2.1 (R2008a):

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

- “Support for 1999 Version of DATCOM File” on page 16
- “Using FlightGear Version 1.0 with Aerospace Toolbox” on page 16

Support for 1999 Version of DATCOM File

The `datcomimport` function has been enhanced to support the 1999 DATCOM file in addition to the 1976 DATCOM file.

Using FlightGear Version 1.0 with Aerospace Toolbox

Aerospace Toolbox Version 2.1 does not support FlightGear Version 1.0. You can use this procedure.

- 1 In the MATLAB Command Window, create a FlightGear animation object.

```
h = Aero.FlightGearAnimation;
```

- 2 Set the FlightGear animation object property `FlightGearVersion` to 0.9.10.

```
h.FlightGearVersion = '0.9.10';
```

- 3 Set the FlightGear animation object property `FlightGearBaseDirectory` to the location of FlightGear Version 1.0.

```
h.FlightGearBaseDirectory = 'C:\Program Files\FlightGear10'
```

For more information on working with FlightGear, see “Using Aero.FlightGearAnimation Objects” in the *Aerospace Toolbox User's Guide*.

Version 2.0 (R2007b) Aerospace Toolbox

This table summarizes what's new in Version 2.0 (R2007b):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|--------------------------|---|-------------------------------|
| Yes Details below | Yes—Details labeled as Compatibility Considerations , below. See also Summary. | Bug Reports |

New features and changes introduced in this version are

- “Virtual Reality Toolbox Animation Object” on page 17
- “Support for the COSPAR International Reference Atmosphere 1986 Model” on page 17
- “Support for 2001 United States Naval Research Laboratory Mass Spectrometer and Incoherent Scatter Radar Exosphere ” on page 18
- “Support for the EGM96 Geopotential Model” on page 18
- “quat2angle Function Replaces quat2euler” on page 18
- “angle2quat Function Replaces euler2quat” on page 18

Virtual Reality Toolbox Animation Object

This release introduces the following new objects and their associated methods to visualize flight data using the Virtual Reality Toolbox™ product:

- Aero.VirtualRealityAnimation
- Aero.Node
- Aero.Viewpoint

Support for the COSPAR International Reference Atmosphere 1986 Model

The `atmoscira` function implements the COSPAR International Reference Atmosphere (CIRA) 1986 environmental model.

Support for 2001 United States Naval Research Laboratory Mass Spectrometer and Incoherent Scatter Radar Exosphere

The `atmosnrlmsise00` function implements the 2001 United States Naval Research Laboratory Mass Spectrometer and Incoherent Scatter Radar Exosphere (NRLMSISE) environmental model.

Support for the EGM96 Geopotential Model

The `geoidegm96` function implements the 1996 Earth Geopotential Model (EGM96).

quat2angle Function Replaces quat2euler

The `quat2angle` function converts spatial representation from any of 12 standard sequences of rotation angles to quaternions.

Compatibility Considerations

The `quat2euler` function is deprecated. Applications that contain this function continue to be supported, but an error message will be displayed. Use the `quat2angle` function instead.

angle2quat Function Replaces euler2quat

The `angle2quat` function converts spatial representation from quaternions to any of 12 standard sequences of rotation angles.

Compatibility Considerations

The `euler2quat` function is deprecated. Applications that contain this function continue to be supported, but an error message will be displayed. Use the `angle2quat` function instead.

Version 1.1 (R2007a) Aerospace Toolbox

This table summarizes what's new in Version 1.1 (R2007a):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|--------------------------|--------------------------------------|-------------------------------|
| Yes Details below | Not applicable | Bug Reports |

New features and changes introduced in this version are

- “New Aerospace Toolbox Objects” on page 19
- “New Aerospace Toolbox Demo” on page 19

New Aerospace Toolbox Objects

This release introduces the following new objects and their associated methods to create a six-degrees-of-freedom animation of multiple bodies that have custom geometries:

- Aero.Animation
- Aero.Body
- Aero.Camera
- Aero.Geometry

New Aerospace Toolbox Demo

The Aerospace Toolbox product has a new demo, Overlying Simulated and Actual Flight Data, which illustrates the use of the Aero objects.

Version 1.0 (R2006b) Aerospace Toolbox

This table summarizes what's new in Version 1.0 (R2006b):

| New Features and Changes | Version Compatibility Considerations | Fixed Bugs and Known Problems |
|--------------------------|--------------------------------------|-------------------------------|
| Yes Details below | Not applicable | Bug Reports |

New features introduced in this version are described here.

Introduction of Aerospace Toolbox Product

This product extends the MATLAB technical computing environment by providing reference standards, environment models, and aerodynamic coefficient importing for performing advanced aerospace analysis to develop and evaluate your designs. An interface to the FlightGear flight simulator enables you to visualize flight data in a three-dimensional environment and reconstruct behavioral anomalies in flight-test results. To ensure design consistency, the Aerospace Toolbox software provides utilities for unit conversions, coordinate transformations, and quaternion math, as well as standards-based environmental models for the atmosphere, gravity, and magnetic fields. You can import aerodynamic coefficients directly from the U.S. Air Force Digital Data Compendium (DATCOM) to carry out preliminary control design and vehicle performance analysis.

The toolbox provides you with the following main features:

- Provides standards-based environmental models for atmosphere, gravity, and magnetic fields.
- Converts units and transforms coordinate systems and spatial representations.
- Implements predefined utilities for aerospace parameter calculations, time calculations, and quaternion math.
- Imports aerodynamic coefficients directly from the U.S. Air Force Digital Data Compendium (DATCOM).

- Interfaces to the FlightGear flight simulator, enabling visualization of vehicle dynamics in a three-dimensional environment.

The Aerospace Toolbox software has the following limitation:

- The FlightGear animation object can not be compiled with the MATLAB® Compiler™ software to create a standalone application.

Aerospace Toolbox 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 in the description of the new feature or change.

| Version (Release) | New Features and Changes with Version Compatibility Impact |
|---|---|
| Latest Version V2.8 (R2011b) | See the Compatibility Considerations subheading for this new feature or change: <ul style="list-style-type: none"> • “Conversion of Error and Warning Message Identifiers” on page 4 • “Function and Function Element Being Removed” on page 5 |
| V2.7 (R2011a) | Not applicable |
| V2.6 (R2010b) | See the Compatibility Considerations subheading for this new feature or change: <ul style="list-style-type: none"> • “Functions and Function Elements Being Removed” on page 8 |
| V2.5 (R2010a) | Not applicable |
| V2.4 (R2009b) | Not applicable |
| V2.3 (R2009a) | Not applicable |
| V2.2 (R2008b) | Not applicable |

| Version (Release) | New Features and Changes with Version Compatibility Impact |
|--------------------------|--|
| V2.1 (R2008a) | Not applicable |
| V2.0 (R2007b) | See the Compatibility Considerations subheading for this new feature or change: <ul style="list-style-type: none">• “quat2angle Function Replaces quat2euler” on page 18• “angle2quat Function Replaces euler2quat” on page 18 |
| V1.1 (R2007a) | Not applicable |
| V1.0 (R2006b) | Not applicable |