

Aerospace Blockset™

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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	Related Documentation at Web Site
Latest Version V3.1 (R2008a)	Yes Details	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation
V3.0 (R2007b)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V2.3 (R2007a)	Yes Details	Yes Summary	Bug Reports Includes fixes	No
V2.2 (R2006b)	Yes Details	No	Bug Reports Includes fixes	No
V2.1 (R2006a)	Yes Details	No	Bug Reports at Web site	No
V2.0.1 (R14SP3)	No	No	Bug Reports at Web site	No
V2.0 (R14SP2+)	Yes Details	Yes Summary	Bug Reports at Web site	No
V1.6.2 (R14SP2)	No	No	Bug Reports at Web site	No
V1.6.1 (R14SP1)	No	No	No	No
V1.6 (R14)	No	No	Fixed bugs at Web site	No
V1.5.1 (R13SP2)	No	No	No	V1.5.1 product documentation
V1.5 (R13SP1)	Yes Details	Yes Summary	No	No

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®) for enhancements, bugs, and compatibility considerations that also might impact you.

If you are upgrading from a software version other than the most recent one, review the release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

What's 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 is released appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so you should also review the fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

The 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. This includes 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.

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	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation

New features and changes introduced in this version are

- “Quaternion Support for the Embedded MATLAB™ Function Block” on page 4
- “New Aerospace Blockset™ Demos” on page 5
- “Using FlightGear Version 1.0 with Aerospace Blockset™ Software” on page 5

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 directory 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	Related Documentation at Web Site
Yes Details below	Yes—Details labeled as Compatibility Considerations , below. See also Summary.	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation

New features and changes introduced in this version are

- “Direction Cosine Matrix to Rotation Angles Block Replaces Direction Cosine Matrix to Euler Angle Block” on page 7
- “Rotation Angles to Direction Cosine Matrix Block Replaces Euler Angle to Direction Cosine Block” on page 7
- “New CIRA-86 Atmosphere Model Block” on page 7
- “New NRLMSISE-00 Atmosphere Model Block” on page 7
- “New EGM96 Geoid Block” on page 8
- “Quaternions to Rotation Angles Block Replaces Quaternions to Euler Angles Block” on page 8
- “Rotation Angles to Quaternions Block Replaces Euler Angles to Quaternions Block” on page 8
- “New Aerospace Blockset™ Demo” on page 8
- “Enhanced HL-20 Demo” on page 8

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.

New Aerospace Blockset™ Demo

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

Enhanced HL-20 Demo

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

Version 2.3 (R2007a) Aerospace Blockset™

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

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

New features and changes introduced in this version are

- “New MATLAB® Animation Block” on page 9
- “New Pilot Joystick All Block” on page 9
- “WGS84 Gravity Model Block Modified” on page 9
- “New Aerospace Blockset™ Demo” on page 10

New MATLAB® Animation Block

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

New Pilot Joystick All Block

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

WGS84 Gravity Model Block Modified

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

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

Compatibility Considerations

The old WGS84 Gravity Model block is deprecated. Models built with the old block continue to be supported from an obsolete library that ships with 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	Related Documentation at Web Site
Yes Details below	No	Bug Reports Includes fixes	Printable Release Notes: PDF Current product documentation

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

- “Aerospace Toolbox Product Replaces Control System Toolbox™ Product as Requirement for Aerospace Blockset™ Product” on page 11
- “Interpolate Matrix Blocks Modified” on page 12
- “Aerodynamic Forces and Moments Block Extended” on page 12
- “New Digital DATCOM Forces and Moments Block” on page 12
- “FlightGear Version 0.9.10 Is Supported by FlightGear Simulator Interface” on page 12
- “Pack net_fdm Packet for FlightGear Now Supports Code Generation” on page 13
- “New SimViewingDevice Block” on page 13

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	Related Documentation at Web Site
Yes Details below	No	Bug Reports at Web site	No

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

FlightGear Version 0.9.9 Is Supported by FlightGear Simulator Interface

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

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

3DoF Animation and 6DoF Animation Blocks Support Code Generation

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

Version 2.0.1 (R14SP3) Aerospace Blockset™

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

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

Version 2.0 (R14SP2+) Aerospace Blockset™

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

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

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

Flight Simulator Interface

Aerospace Blockset™ 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.

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.

Version 1.6.2 (R14SP2) Aerospace Blockset™

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

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

Version 1.6.1 (R14SP1) Aerospace Blockset™

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

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

Version 1.6 (R14) Aerospace Blockset™

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

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

Version 1.5.1 (R13SP2) Aerospace Blockset™

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

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

Version 1.5 (R13SP1) Aerospace Blockset™

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

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

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

New Aerospace 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 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.

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 V3.1 (R2008a)	None
Version V3.0 (R2007b)	<p>See the Compatibility Considerations subheading for this new feature or change:</p> <ul style="list-style-type: none"> • “Direction Cosine Matrix to Rotation Angles Block Replaces Direction Cosine Matrix to Euler Angle Block” on page 7 • “Rotation Angles to Direction Cosine Matrix Block Replaces Euler Angle to Direction Cosine Block” on page 7 • “Quaternions to Rotation Angles Block Replaces Quaternions to Euler Angles Block” on page 8 • “Rotation Angles to Quaternions Block Replaces Euler Angles to Quaternions Block” on page 8
Version V2.3 (R2007a)	<p>See the Compatibility Considerations subheading for this new feature or change: “WGS84 Gravity Model Block Modified” on page 9</p>
Version V2.2 (R2006b)	None
V2.1 (R2006a)	None
V2.0.1 (R14SP3)	None

Version (Release)	New Features and Changes with Version Compatibility Impact
V2.0 (R14SP2+)	See the Compatibility Considerations subheading for this new feature or change: “Mach Number and Dynamic Pressure Blocks Input” on page 19
V1.6.2 (R14SP2)	None
V1.6.1 (R14SP1)	None
V1.6 (R14)	None
V1.5 (R13SP1)	See the Compatibility Considerations subheading for this new feature or change: “Block Implementation Improvements” on page 26