

# OrbitalElementsModel

## 5.0

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# Chapter 1

## Module Index

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## Chapter 2

# Namespace Index

### 2.1 Namespace List

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## Chapter 3

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## Chapter 5

# Module Documentation

### 5.1 Models

#### Modules

- [Utils](#)

#### 5.1.1 Detailed Description

## 5.2 Utils

### Modules

- [OrbitalElements](#)

### 5.2.1 Detailed Description



## 5.3 OrbitalElements

### Files

- file [orbital\\_elements.hh](#)  
*Orbital elements class definition.*
- file [orbital\\_elements\\_messages.hh](#)  
*Define the class `OrbitalElementsMessages`, the class that specifies the message IDs used in the orbital elements model.*
- file [orbital\\_elements.cc](#)  
*Define methods for the `OrbitalElements` class.*
- file [orbital\\_elements\\_messages.cc](#)  
*Implement the class `OrbitalElementsMessages`.*

### Namespaces

- [jeod](#)  
*Namespace `jeod`.*

### Macros

- `#define` [PATH](#) "utils/orbital\_elements/"

#### 5.3.1 Detailed Description

#### 5.3.2 Macro Definition Documentation

##### 5.3.2.1 `#define` PATH "utils/orbital\_elements/"

Definition at line 39 of file `orbital_elements_messages.cc`.



## Chapter 6

# Namespace Documentation

### 6.1 jeod Namespace Reference

Namespace jeod.

#### Data Structures

- class [OrbitalElements](#)  
*Represents state in terms of Keplerian orbital elements.*
- class [OrbitalElementsMessages](#)  
*Specifies the message IDs used in the orbital elements model.*

#### 6.1.1 Detailed Description

Namespace jeod.



## Chapter 7

# Data Structure Documentation

### 7.1 jeod::OrbitalElements Class Reference

Represents state in terms of Keplerian orbital elements.

```
#include <orbital_elements.hh>
```

#### Public Member Functions

- [OrbitalElements](#) ()  
*Construct a [OrbitalElements](#) object.*
- virtual [~OrbitalElements](#) ()  
*Destroy a [OrbitalElements](#) object.*
- const char \* [get\\_object\\_name](#) (void) const  
*Return the object name.*
- const char \* [get\\_planet\\_name](#) (void) const  
*Return the planet name.*
- void [set\\_object\\_name](#) (const char \*name)  
*Set the object name.*
- void [set\\_planet\\_name](#) (const char \*name)  
*Set the planet name.*
- int [from\\_cartesian](#) (double mu, const double pos[3], const double vel[3])
- int [to\\_cartesian](#) (double mu, double pos[3], double vel[3])
- int [nu\\_to\\_anomalies](#) ()
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- double [semi\\_major\\_axis](#)  
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- double [semiparam](#)  
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- double [e\\_mag](#)  
*Magnitude of eccentricity ( $e$ )*
- double [inclination](#)  
*Orbit inclination ( $i$ )*
- double [arg\\_periapsis](#)  
*Argument of periapsis ( $w$ )*

- double [long\\_asc\\_node](#)  
*Longitude of ascending node (Omega)*
- double [r\\_mag](#)  
*Magnitude of orbital radius.*
- double [vel\\_mag](#)  
*Magnitude of orbital velocity.*
- double [true\\_anom](#)  
*True Anomaly ( $v$ )*
- double [mean\\_anom](#)  
*Mean Anomaly ( $M$ )*
- double [mean\\_motion](#)  
*Mean motion of orbit ( $n$ )*
- double [orbital\\_anom](#)  
*Eccentric ( $E$ ), Hyperbolic ( $H$ ), or Parabolic ( $B$ ) anomaly.*
- double [sin\\_v](#)  
*Sine of the true anomaly.*
- double [cos\\_v](#)  
*Cosine of the true anomaly.*
- double [orb\\_energy](#)  
*Specific orbital energy.*
- double [orb\\_ang\\_momentum](#)  
*Specific orbital angular momentum.*

### Protected Member Functions

- int [KepEqtnE](#) (double  $M$ , double  $e$ , double  $*E$ )
- int [KepEqtnH](#) (double  $M$ , double  $e$ , double  $*H$ )
- int [KepEqtnB](#) (double  $M$ , double  $*B$ )

### Protected Attributes

- char \* [object\\_name](#)  
*Name of orbital object.*
- char \* [planet\\_name](#)  
*Name of planet about which the object orbits.*

### Private Member Functions

- [OrbitalElements](#) (const [OrbitalElements](#) &)
- [OrbitalElements](#) & [operator=](#) (const [OrbitalElements](#) &)

### Friends

- class [InputProcessor](#)
- void [init\\_attrjeod\\_\\_OrbitalElements](#) ()

#### 7.1.1 Detailed Description

Represents state in terms of Keplerian orbital elements.

Definition at line 50 of file orbital\_elements.hh.

## 7.1.2 Constructor & Destructor Documentation

7.1.2.1 `jeod::OrbitalElements::OrbitalElements ( const OrbitalElements & ) [private]`

7.1.2.2 `jeod::OrbitalElements::OrbitalElements ( void )`

Construct a [OrbitalElements](#) object.

Definition at line 64 of file `orbital_elements.cc`.

References `arg_periapsis`, `cos_v`, `e_mag`, `inclination`, `long_asc_node`, `mean_anom`, `mean_motion`, `orb_ang_momentum`, `orb_energy`, `orbital_anom`, `r_mag`, `semi_major_axis`, `semiparam`, `sin_v`, `true_anom`, and `vel_mag`.

7.1.2.3 `jeod::OrbitalElements::~~OrbitalElements ( void ) [virtual]`

Destroy a [OrbitalElements](#) object.

Definition at line 97 of file `orbital_elements.cc`.

References `object_name`, and `planet_name`.

## 7.1.3 Member Function Documentation

7.1.3.1 `int jeod::OrbitalElements::from_cartesian ( double mu, const double pos[3], const double vel[3] )`

Definition at line 236 of file `orbital_elements.cc`.

References `arg_periapsis`, `e_mag`, `inclination`, `long_asc_node`, `mean_motion`, `nu_to_anomalies()`, `orb_ang_momentum`, `orb_energy`, `r_mag`, `semi_major_axis`, `semiparam`, `true_anom`, and `vel_mag`.

7.1.3.2 `const char * jeod::OrbitalElements::get_object_name ( void ) const`

Return the object name.

### Returns

Const pointer to name

Definition at line 187 of file `orbital_elements.cc`.

References `object_name`.

7.1.3.3 `const char * jeod::OrbitalElements::get_planet_name ( void ) const`

Return the planet name.

### Returns

Const pointer to name

Definition at line 200 of file `orbital_elements.cc`.

References `planet_name`.

7.1.3.4 `int jeod::OrbitalElements::KepEqtnB ( double M, double * B ) [protected]`

Definition at line 977 of file `orbital_elements.cc`.

Referenced by `mean_anom_to_nu()`.

**7.1.3.5** `int jeod::OrbitalElements::KepEqtnE ( double M, double e, double * E )` `[protected]`

Definition at line 848 of file orbital\_elements.cc.

Referenced by `mean_anom_to_nu()`.

**7.1.3.6** `int jeod::OrbitalElements::KepEqtnH ( double M, double e, double * H )` `[protected]`

Definition at line 907 of file orbital\_elements.cc.

Referenced by `mean_anom_to_nu()`.

**7.1.3.7** `int jeod::OrbitalElements::mean_anom_to_nu ( )`

Definition at line 720 of file orbital\_elements.cc.

References `jeod::OrbitalElementsMessages::convergence_error`, `cos_v`, `e_mag`, `KepEqtnB()`, `KepEqtnE()`, `KepEqtnH()`, `mean_anom`, `orbital_anom`, `sin_v`, and `true_anom`.

**7.1.3.8** `int jeod::OrbitalElements::nu_to_anomalies ( )`

Definition at line 644 of file orbital\_elements.cc.

References `cos_v`, `e_mag`, `mean_anom`, `orbital_anom`, `sin_v`, and `true_anom`.

Referenced by `from_cartesian()`.

**7.1.3.9** `OrbitalElements& jeod::OrbitalElements::operator= ( const OrbitalElements & )` `[private]`

**7.1.3.10** `void jeod::OrbitalElements::set_object_name ( const char * name )`

Set the object name.

Parameters

<i>in</i>	<i>name</i>	Orbital object name
-----------	-------------	---------------------

Definition at line 115 of file orbital\_elements.cc.

References `object_name`.

**7.1.3.11** `void jeod::OrbitalElements::set_planet_name ( const char * name )`

Set the planet name.

Parameters

<i>in</i>	<i>name</i>	Name of planet about which the object orbits
-----------	-------------	--

Definition at line 150 of file orbital\_elements.cc.

References `planet_name`.

**7.1.3.12** `int jeod::OrbitalElements::to_cartesian ( double mu, double pos[3], double vel[3] )`

Definition at line 489 of file orbital\_elements.cc.

References `arg_periapsis`, `cos_v`, `jeod::OrbitalElementsMessages::domain_error`, `e_mag`, `inclination`, `long_asc_node`, `semiparam`, and `sin_v`.



### 7.1.4 Friends And Related Function Documentation

7.1.4.1 `void init_attrjeod__OrbitalElements ( ) [friend]`

7.1.4.2 `friend class InputProcessor [friend]`

Definition at line 52 of file orbital\_elements.hh.

### 7.1.5 Field Documentation

7.1.5.1 `double jeod::OrbitalElements::arg_periapsis`

Argument of periapsis ( $w$ )

trick\_units(radian)

Definition at line 77 of file orbital\_elements.hh.

Referenced by from\_cartesian(), OrbitalElements(), and to\_cartesian().

7.1.5.2 `double jeod::OrbitalElements::cos_v`

Cosine of the true anomaly.

trick\_units(—)

Definition at line 116 of file orbital\_elements.hh.

Referenced by mean\_anom\_to\_nu(), nu\_to\_anomalies(), OrbitalElements(), and to\_cartesian().

7.1.5.3 `double jeod::OrbitalElements::e_mag`

Magnitude of eccentricity ( $e$ )

trick\_units(—)

Definition at line 69 of file orbital\_elements.hh.

Referenced by from\_cartesian(), mean\_anom\_to\_nu(), nu\_to\_anomalies(), OrbitalElements(), and to\_cartesian().

7.1.5.4 `double jeod::OrbitalElements::inclination`

Orbit inclination ( $i$ )

trick\_units(radian)

Definition at line 73 of file orbital\_elements.hh.

Referenced by from\_cartesian(), OrbitalElements(), and to\_cartesian().

7.1.5.5 `double jeod::OrbitalElements::long_asc_node`

Longitude of ascending node ( $\Omega$ )

trick\_units(radian)

Definition at line 81 of file orbital\_elements.hh.

Referenced by from\_cartesian(), OrbitalElements(), and to\_cartesian().

#### 7.1.5.6 `double jeod::OrbitalElements::mean_anom`

Mean Anomaly (M)

trick\_units(radian)

Definition at line 99 of file orbital\_elements.hh.

Referenced by `mean_anom_to_nu()`, `nu_to_anomalies()`, and `OrbitalElements()`.

#### 7.1.5.7 `double jeod::OrbitalElements::mean_motion`

Mean motion of orbit (n)

trick\_units(radian/s)

Definition at line 103 of file orbital\_elements.hh.

Referenced by `from_cartesian()`, and `OrbitalElements()`.

#### 7.1.5.8 `char* jeod::OrbitalElements::object_name` [protected]

Name of orbital object.

trick\_units(-)

Definition at line 130 of file orbital\_elements.hh.

Referenced by `get_object_name()`, `set_object_name()`, and `~OrbitalElements()`.

#### 7.1.5.9 `double jeod::OrbitalElements::orb_ang_momentum`

Specific orbital angular momentum.

trick\_units(m2/s)

Definition at line 124 of file orbital\_elements.hh.

Referenced by `from_cartesian()`, and `OrbitalElements()`.

#### 7.1.5.10 `double jeod::OrbitalElements::orb_energy`

Specific orbital energy.

trick\_units(m2/s2)

Definition at line 120 of file orbital\_elements.hh.

Referenced by `from_cartesian()`, and `OrbitalElements()`.

#### 7.1.5.11 `double jeod::OrbitalElements::orbital_anom`

Eccentric (E), Hyperbolic (H), or Parabolic (B) anomaly.

trick\_units(radian)

Definition at line 107 of file orbital\_elements.hh.

Referenced by `mean_anom_to_nu()`, `nu_to_anomalies()`, and `OrbitalElements()`.

#### 7.1.5.12 `char* jeod::OrbitalElements::planet_name` [protected]

Name of planet about which the object orbits.

trick\_units(-)

Definition at line 134 of file orbital\_elements.hh.

Referenced by get\_planet\_name(), set\_planet\_name(), and ~OrbitalElements().

#### 7.1.5.13 double jeod::OrbitalElements::r\_mag

Magnitude of orbital radius.

trick\_units(m)

Definition at line 87 of file orbital\_elements.hh.

Referenced by from\_cartesian(), and OrbitalElements().

#### 7.1.5.14 double jeod::OrbitalElements::semi\_major\_axis

Semi-major-axis (a)

trick\_units(m)

Definition at line 61 of file orbital\_elements.hh.

Referenced by from\_cartesian(), and OrbitalElements().

#### 7.1.5.15 double jeod::OrbitalElements::semiparam

Semiparameter (p)

trick\_units(m)

Definition at line 65 of file orbital\_elements.hh.

Referenced by from\_cartesian(), OrbitalElements(), and to\_cartesian().

#### 7.1.5.16 double jeod::OrbitalElements::sin\_v

Sine of the true anomaly.

trick\_units(-)

Definition at line 112 of file orbital\_elements.hh.

Referenced by mean\_anom\_to\_nu(), nu\_to\_anomalies(), OrbitalElements(), and to\_cartesian().

#### 7.1.5.17 double jeod::OrbitalElements::true\_anom

True Anomaly (v)

trick\_units(radian)

Definition at line 95 of file orbital\_elements.hh.

Referenced by from\_cartesian(), mean\_anom\_to\_nu(), nu\_to\_anomalies(), and OrbitalElements().

#### 7.1.5.18 double jeod::OrbitalElements::vel\_mag

Magnitude of orbital velocity.

trick\_units(m/s)

Definition at line 91 of file orbital\_elements.hh.

Referenced by `from_cartesian()`, and `OrbitalElements()`.

The documentation for this class was generated from the following files:

- [orbital\\_elements.hh](#)
- [orbital\\_elements.cc](#)

## 7.2 jeod::OrbitalElementsMessages Class Reference

Specifies the message IDs used in the orbital elements model.

```
#include <orbital_elements_messages.hh>
```

### Static Public Attributes

- static char const \* [domain\\_error](#)  
*Issued when a value / set of values is invalid.*
- static char const \* [convergence\\_error](#)  
*Issued when a numeric search fails to converge.*

### Private Member Functions

- [OrbitalElementsMessages](#) (void)
- [OrbitalElementsMessages](#) (const [OrbitalElementsMessages](#) &)
- [OrbitalElementsMessages](#) & `operator=` (const [OrbitalElementsMessages](#) &)

### Friends

- class [InputProcessor](#)
- void [init\\_attrjeod\\_\\_OrbitalElementsMessages](#) ()

#### 7.2.1 Detailed Description

Specifies the message IDs used in the orbital elements model.

Definition at line 49 of file `orbital_elements_messages.hh`.

#### 7.2.2 Constructor & Destructor Documentation

7.2.2.1 `jeod::OrbitalElementsMessages::OrbitalElementsMessages ( void )` `[private]`

7.2.2.2 `jeod::OrbitalElementsMessages::OrbitalElementsMessages ( const OrbitalElementsMessages & )`  
`[private]`

#### 7.2.3 Member Function Documentation

7.2.3.1 `OrbitalElementsMessages& jeod::OrbitalElementsMessages::operator= ( const OrbitalElementsMessages & )` `[private]`

#### 7.2.4 Friends And Related Function Documentation

7.2.4.1 `void init_attrjeod__OrbitalElementsMessages ( )` `[friend]`

#### 7.2.4.2 friend class InputProcessor [friend]

Definition at line 52 of file orbital\_elements\_messages.hh.

### 7.2.5 Field Documentation

#### 7.2.5.1 char const \* jeod::OrbitalElementsMessages::convergence\_error [static]

##### Initial value:

```
=  
    "utils/orbital_elements/" "convergence_error"
```

Issued when a numeric search fails to converge.

trick\_units(-)

Definition at line 66 of file orbital\_elements\_messages.hh.

Referenced by jeod::OrbitalElements::mean\_anom\_to\_nu().

#### 7.2.5.2 char const \* jeod::OrbitalElementsMessages::domain\_error [static]

##### Initial value:

```
=  
    "utils/orbital_elements/" "domain_error"
```

Issued when a value / set of values is invalid.

trick\_units(-)

Definition at line 61 of file orbital\_elements\_messages.hh.

Referenced by jeod::OrbitalElements::to\_cartesian().

The documentation for this class was generated from the following files:

- [orbital\\_elements\\_messages.hh](#)
- [orbital\\_elements\\_messages.cc](#)



## Chapter 8

# File Documentation

### 8.1 orbital\_elements.cc File Reference

Define methods for the OrbitalElements class.

```
#include <cmath>
#include <stddef>
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/message/include/message_handler.hh"
#include "../include/orbital_elements.hh"
#include "../include/orbital_elements_messages.hh"
```

#### Namespaces

- [jeod](#)

*Namespace jeod.*

#### 8.1.1 Detailed Description

Define methods for the OrbitalElements class.

Definition in file [orbital\\_elements.cc](#).

### 8.2 orbital\_elements.hh File Reference

Orbital elements class definition.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

#### Data Structures

- class [jeod::OrbitalElements](#)

*Represents state in terms of Keplerian orbital elements.*

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 8.2.1 Detailed Description

Orbital elements class definition.

Definition in file [orbital\\_elements.hh](#).

## 8.3 orbital\_elements\_messages.cc File Reference

Implement the class `OrbitalElementsMessages`.

```
#include "../include/orbital_elements_messages.hh"
```

## Namespaces

- [jeod](#)

*Namespace jeod.*

## Macros

- `#define` [PATH](#) "utils/orbital\_elements/"

### 8.3.1 Detailed Description

Implement the class `OrbitalElementsMessages`.

Definition in file [orbital\\_elements\\_messages.cc](#).

## 8.4 orbital\_elements\_messages.hh File Reference

Define the class `OrbitalElementsMessages`, the class that specifies the message IDs used in the orbital elements model.

```
#include "utils/sim_interface/include/jeod_class.hh"
```

## Data Structures

- class [jeod::OrbitalElementsMessages](#)

*Specifies the message IDs used in the orbital elements model.*

## Namespaces

- [jeod](#)

*Namespace jeod.*



### 8.4.1 Detailed Description

Define the class `OrbitalElementsMessages`, the class that specifies the message IDs used in the orbital elements model.

Definition in file [orbital\\_elements\\_messages.hh](#).

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