

## AerodynamicsModel

5.3

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# Chapter 1

## Module Index

### 1.1 Modules

Here is a list of all modules:

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## Chapter 2

# Namespace Index

### 2.1 Namespace List

Here is a list of all namespaces with brief descriptions:

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## Chapter 3

# Hierarchical Index

### 3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

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## Chapter 4

# Data Structure Index

### 4.1 Data Structures

Here are the data structures with brief descriptions:

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<a href="#">jeod::AeroDragParameters</a>	Contains parameters associated with aerodynamic drag . . . . .	18
<a href="#">jeod::AerodynamicDrag</a>	The main class for calculating aerodynamic drag . . . . .	19
<a href="#">jeod::AerodynamicDrag_aero_model_default_data</a>	. . . . .	25
<a href="#">jeod::AerodynamicsMessages</a>	Messages associated with use of the aerodynamics model . . . . .	25
<a href="#">jeod::AeroFacet</a>	An aerodynamic interaction specific facet for use in the surface model . . . . .	28
<a href="#">jeod::AeroParams</a>	A base class for all aerodynamic parameters used in the surface model . . . . .	31
<a href="#">jeod::AeroSurface</a>	The aerodynamic specific interaction surface, for use with the surface model . . . . .	33
<a href="#">jeod::AeroSurfaceFactory</a>	The surface factory that creates an aerodynamic specific surface from a general surface . . . .	37
<a href="#">jeod::DefaultAero</a>	The simple, default, aerodynamic drag model, including coefficient of drag, ballistic coefficient, etc . . . . .	40
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<a href="#">jeod::FlatPlateAeroParams</a>	Used in the <a href="#">FlatPlateAeroFactory</a> to create a <a href="#">FlatPlateAeroFacet</a> . . . . .	54
<a href="#">jeod::FlatPlateThermalAeroFactory</a>	Creates a <a href="#">FlatPlateAeroFacet</a> from a FlatPlate . . . . .	59



## Chapter 5

# File Index

### 5.1 File List

Here is a list of all files with brief descriptions:

<a href="#">aero_drag.cc</a>	Orbital aerodynamic force and torque computation, and related classes . . . . .	63
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<a href="#">aero_facet.hh</a>	Individual facets for use with aero environment interaction models . . . . .	64
<a href="#">aero_model.cc</a>		64
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<a href="#">aero_params.hh</a>	A virtual base class for aero facet parameters, used to create interaction facets for aero in the InteractionSurfaceFactorys . . . . .	65
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<a href="#">default_aero.cc</a>	Implement a virtual base class for aerodynamic drag calculations . . . . .	69
<a href="#">default_aero.hh</a>	An implementation of ballistic coefficient and coefficient of drag for use in the AerodynamicDrag object . . . . .	70
<a href="#">flat_plate_aero_facet.cc</a>	Individual facets for use with aero environment interaction models . . . . .	70
<a href="#">flat_plate_aero_facet.hh</a>	The aerodynamic specific implementation of flat plate . . . . .	71
<a href="#">flat_plate_aero_factory.cc</a>	Factory that creates a FlatPlateAeroFacet from a FlatPlate, using a FlatPlateAeroParams object	71

<a href="#">flat_plate_aero_factory.hh</a>	
Creates a flat plate aero facet from a basic flat plate facet . . . . .	72
<a href="#">flat_plate_aero_params.hh</a>	
The set of parameters used to create an aerodynamic interaction specific flat plate facet from a general flat plate facet . . . . .	72
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Factory that creates a FlatPlateAeroFacet from a FlatPlateThermal, using a FlatPlateAero↔ Params object . . . . .	73
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## Chapter 6

# Module Documentation

### 6.1 Models

#### Modules

- [Interactions](#)

#### 6.1.1 Detailed Description

## 6.2 Interactions

### Modules

- [Aerodynamics](#)

### 6.2.1 Detailed Description



## 6.3 Aerodynamics

### Files

- file [aero\\_drag.hh](#)  
*Orbital aerodynamics parameter definitions and the main class for calculating aerodynamic drag.*
- file [aero\\_facet.hh](#)  
*Individual facets for use with aero environment interaction models.*
- file [aero\\_params.hh](#)  
*A virtual base class for aero facet parameters, used to create interaction facets for aero in the InteractionSurfaceFactory.*
- file [aero\\_surface.hh](#)  
*Vehicle surface model for aerodynamics.*
- file [aero\\_surface\\_factory.hh](#)  
*Factory that creates an aerodynamic interaction surface from a surface model.*
- file [aerodynamics\\_messages.hh](#)  
*Aerodynamics message for message handling.*
- file [class\\_declarations.hh](#)  
*Forward declaration of classes defined in the aerodynamics package.*
- file [default\\_aero.hh](#)  
*An implementation of ballistic coefficient and coefficient of drag for use in the AerodynamicDrag object.*
- file [flat\\_plate\\_aero\\_facet.hh](#)  
*The aerodynamic specific implementation of flat plate.*
- file [flat\\_plate\\_aero\\_factory.hh](#)  
*Creates a flat plate aero facet from a basic flat plate facet.*
- file [flat\\_plate\\_aero\\_params.hh](#)  
*The set of parameters used to create an aerodynamic interaction specific flat plate facet from a general flat plate facet.*
- file [flat\\_plate\\_thermal\\_aero\\_factory.hh](#)  
*Creates a flat plate aero facet from a flat plate thermal facet.*
- file [aero\\_drag.cc](#)  
*Orbital aerodynamic force and torque computation, and related classes.*
- file [aero\\_surface.cc](#)  
*Vehicle surface model for the aerodynamic interaction models.*
- file [aero\\_surface\\_factory.cc](#)  
*Factory that creates an aerodynamics surface, from a surface model.*
- file [aerodynamics\\_messages.cc](#)  
*Implement aerodynamics\_messages.*
- file [default\\_aero.cc](#)  
*Implement a virtual base class for aerodynamic drag calculations.*
- file [flat\\_plate\\_aero\\_facet.cc](#)  
*Individual facets for use with aero environment interaction models.*
- file [flat\\_plate\\_aero\\_factory.cc](#)  
*Factory that creates a FlatPlateAeroFacet from a FlatPlate, using a FlatPlateAeroParams object.*
- file [flat\\_plate\\_thermal\\_aero\\_factory.cc](#)  
*Factory that creates a FlatPlateAeroFacet from a FlatPlateThermal, using a FlatPlateAeroParams object.*

### Namespaces

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

#### 6.3.1 Detailed Description



## Chapter 7

# Namespace Documentation

### 7.1 jeod Namespace Reference

Namespace jeod.

#### Data Structures

- class [AeroDragEnum](#)  
*Contains enumerations associated with aerodynamic drag.*
- class [AeroDragParameters](#)  
*Contains parameters associated with aerodynamic drag.*
- class [AerodynamicDrag](#)  
*The main class for calculating aerodynamic drag.*
- class [AerodynamicDrag\\_aero\\_model\\_default\\_data](#)
- class [AerodynamicsMessages](#)  
*Messages associated with use of the aerodynamics model.*
- class [AeroFacet](#)  
*An aerodynamic interaction specific facet for use in the surface model.*
- class [AeroParams](#)  
*A base class for all aerodynamic parameters used in the surface model.*
- class [AeroSurface](#)  
*The aerodynamic specific interaction surface, for use with the surface model.*
- class [AeroSurfaceFactory](#)  
*The surface factory that creates an aerodynamic specific surface from a general surface.*
- class [DefaultAero](#)  
*The simple, default, aerodynamic drag model, including coefficient of drag, ballistic coefficient, etc.*
- class [FlatPlateAeroFacet](#)  
*The aerodynamic specific version of a flat plate.*
- class [FlatPlateAeroFactory](#)  
*Creates a [FlatPlateAeroFacet](#) from a [FlatPlate](#).*
- class [FlatPlateAeroParams](#)  
*used in the [FlatPlateAeroFactory](#) to create a [FlatPlateAeroFacet](#).*
- class [FlatPlateThermalAeroFactory](#)  
*Creates a [FlatPlateAeroFacet](#) from a [FlatPlate](#).*

#### 7.1.1 Detailed Description

Namespace jeod.



## Chapter 8

# Data Structure Documentation

### 8.1 jeod::AeroDragEnum Class Reference

Contains enumerations associated with aerodynamic drag.

```
#include <aero_drag.hh>
```

#### Public Types

- enum [CoefCalcMethod](#) { [Specular](#) = 0, [Diffuse](#), [Mixed](#), [Calc\\_coef](#) }  
*Dictates how the coefficients of drag will be calculated when using a flat plate model.*

#### 8.1.1 Detailed Description

Contains enumerations associated with aerodynamic drag.

Definition at line 87 of file `aero_drag.hh`.

#### 8.1.2 Member Enumeration Documentation

##### 8.1.2.1 CoefCalcMethod

```
enum jeod::AeroDragEnum::CoefCalcMethod
```

Dictates how the coefficients of drag will be calculated when using a flat plate model.

#### Enumerator

Specular	
Diffuse	
Mixed	
Calc_coef	

Definition at line 94 of file `aero_drag.hh`.

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

- [aero\\_drag.hh](#)

## 8.2 jeod::AeroDragParameters Class Reference

Contains parameters associated with aerodynamic drag.

```
#include <aero_drag.hh>
```

### Data Fields

- double `dynamic_pressure` {}  
*dynamic pressure,  $0.5 * \text{density} * \text{velocity}^2$*
- double `gas_const` {}  
*gas constant, ala  $PV = mRT$ ;  $R = 287$  for air.*
- double `temp_free_stream` {}  
*temperature of the incident stream of free molecular flow.*

### 8.2.1 Detailed Description

Contains parameters associated with aerodynamic drag.

Definition at line 114 of file `aero_drag.hh`.

### 8.2.2 Field Documentation

#### 8.2.2.1 dynamic\_pressure

```
double jeod::AeroDragParameters::dynamic_pressure {}
```

dynamic pressure,  $0.5 * \text{density} * \text{velocity}^2$

trick\_units(N/m2)

Definition at line 120 of file `aero_drag.hh`.

Referenced by `jeod::AerodynamicDrag::aero_drag()`, `jeod::FlatPlateAeroFacet::aerodrag_force()`, and `jeod::↵  
DefaultAero::aerodrag_force()`.

## 8.2.2.2 gas\_const

```
double jeod::AeroDragParameters::gas_const {}
```

gas constant, ala  $PV = mRT$ ;  $R = 287$  for air.

trick\_units(N\*m/kg/K)

Definition at line 125 of file `aero_drag.hh`.

Referenced by `jeod::FlatPlateAeroFacet::aerodrag_force()`, and `jeod::AerodynamicDrag_aero_model_default_↔data::initialize()`.

## 8.2.2.3 temp\_free\_stream

```
double jeod::AeroDragParameters::temp_free_stream {}
```

temperature of the incident stream of free molecular flow.

trick\_units(K)

Definition at line 130 of file `aero_drag.hh`.

Referenced by `jeod::FlatPlateAeroFacet::aerodrag_force()`, and `jeod::AerodynamicDrag_aero_model_default_↔data::initialize()`.

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

- [aero\\_drag.hh](#)

## 8.3 jeod::AerodynamicDrag Class Reference

The main class for calculating aerodynamic drag.

```
#include <aero_drag.hh>
```

## Public Member Functions

- [AerodynamicDrag](#) ()  
*default constructor Return: – void*
- virtual [~AerodynamicDrag](#) ()=default
- [AerodynamicDrag](#) (const [AerodynamicDrag](#) &)=delete
- [AerodynamicDrag](#) & operator= (const [AerodynamicDrag](#) &)=delete
- void [aero\\_drag](#) (double inertial\_velocity[3], AtmosphereState \*atmos\_ptr, double T\_inertial\_struct[3][3], double mass, double center\_grav[3])  
*Calculates the total aerodynamic drag force and torque, from the information given.*
- void [set\\_aero\\_surface](#) ([AeroSurface](#) &to\_set)  
*Set the surface this AeroDrag object will calculate drag for.*
- void [clear\\_aero\\_surface](#) ()  
*Remove any [AeroSurface](#) being used for calculation.*

## Data Fields

- bool `active` {true}  
*On = aerodynamics enabled.*
- bool `constant_density` {}  
*Use constant density for aero drag?*
- double `density` {}  
*Density of the last time `AerodynamicDrag` was used.*
- double `aero_force` [3] {}  
*Total Force due to aero drag, resulting from all plates combined.*
- double `aero_torque` [3] {}  
*Total torque due to aero drag, resulting from all plates combined.*
- `AeroDragParameters` param  
*parameters shared with plate model*
- bool `use_default_behavior` {true}  
*Use the default behavior?*
- `AeroSurface` \* `aero_surface_ptr` {}  
*Pointer to the current aero surface.*
- `DefaultAero` \* `default_behavior`  
*Pointer to an object that defines the default aero behavior.*
- `DefaultAero` `ballistic_drag`  
*Spherical, ballistic drag.*

### 8.3.1 Detailed Description

The main class for calculating aerodynamic drag.

Definition at line 136 of file `aero_drag.hh`.

### 8.3.2 Constructor & Destructor Documentation

#### 8.3.2.1 `AerodynamicDrag()` [1/2]

```
jeod::AerodynamicDrag::AerodynamicDrag ( )
```

default constructor Return: – void

Definition at line 68 of file `aero_drag.cc`.

#### 8.3.2.2 `~AerodynamicDrag()`

```
virtual jeod::AerodynamicDrag::~~AerodynamicDrag ( ) [virtual], [default]
```



### 8.3.2.3 AerodynamicDrag() [2/2]

```
jeod::AerodynamicDrag::AerodynamicDrag (
    const AerodynamicDrag & ) [delete]
```

## 8.3.3 Member Function Documentation

### 8.3.3.1 aero\_drag()

```
void jeod::AerodynamicDrag::aero_drag (
    double inertial_velocity[3],
    AtmosphereState * atmos_ptr,
    double T_inertial_struct[3][3],
    double mass,
    double center_grav[3] )
```

Calculates the total aerodynamic drag force and torque, from the information given.

#### Parameters

in	<i>inertial_velocity</i>	vehicle velocity in inertial RF Units: M/s
in	<i>atmos_ptr</i>	Pointer to the AtmosphereState used for density and wind information
in	<i>T_inertial_struct</i>	Transformation matrix from the inertial frame to the structural
in	<i>mass</i>	kg Mass of the vehicle
in	<i>center_grav</i>	position of the center of gravity, in the structural frame Units: M

Definition at line 83 of file `aero_drag.cc`.

References `active`, `jeod::AeroSurface::aero_facets`, `aero_force`, `aero_surface_ptr`, `aero_torque`, `jeod::AeroFacet::aerodrag_force()`, `jeod::DefaultAero::aerodrag_force()`, `constant_density`, `default_behavior`, `density`, `jeod::AeroDragParameters::dynamic_pressure`, `jeod::AeroSurface::facets_size`, `param`, `jeod::AerodynamicsMessages::runtime_error`, and `use_default_behavior`.

### 8.3.3.2 clear\_aero\_surface()

```
void jeod::AerodynamicDrag::clear_aero_surface ( )
```

Remove any `AeroSurface` being used for calculation.

Note: The variable "use\_default\_behavior" must be set to true if there is no set aero surface

Definition at line 182 of file `aero_drag.cc`.

References `aero_surface_ptr`.

### 8.3.3.3 operator=()

```
AerodynamicDrag& jeod::AerodynamicDrag::operator= (
    const AerodynamicDrag & ) [delete]
```

### 8.3.3.4 set\_aero\_surface()

```
void jeod::AerodynamicDrag::set_aero_surface (
    AeroSurface & to_set )
```

Set the surface this AeroDrag object will calculate drag for.

#### Parameters

in	to_set	The <a href="#">AeroSurface</a> to be used
----	--------	--

Definition at line 172 of file `aero_drag.cc`.

References `aero_surface_ptr`.

## 8.3.4 Field Documentation

### 8.3.4.1 active

```
bool jeod::AerodynamicDrag::active {true}
```

On = aerodynamics enabled.

trick\_units(-)

Definition at line 142 of file `aero_drag.hh`.

Referenced by `aero_drag()`, and `jeod::AerodynamicDrag_aero_model_default_data::initialize()`.

### 8.3.4.2 aero\_force

```
double jeod::AerodynamicDrag::aero_force[3] {}
```

Total Force due to aero drag, resulting from all plates combined.

trick\_units(N)

Definition at line 159 of file `aero_drag.hh`.

Referenced by `aero_drag()`.

#### 8.3.4.3 aero\_surface\_ptr

```
AeroSurface* jeod::AerodynamicDrag::aero_surface_ptr {}
```

Pointer to the current aero surface.

trick\_units(-)

Definition at line 179 of file aero\_drag.hh.

Referenced by aero\_drag(), clear\_aero\_surface(), and set\_aero\_surface().

#### 8.3.4.4 aero\_torque

```
double jeod::AerodynamicDrag::aero_torque[3] {}
```

Total torque due to aero drag, resulting from all plates combined.

trick\_units(N\*m)

Definition at line 164 of file aero\_drag.hh.

Referenced by aero\_drag().

#### 8.3.4.5 ballistic\_drag

```
DefaultAero jeod::AerodynamicDrag::ballistic_drag
```

Spherical, ballistic drag.

The default, default behavior. Can be overridden by resetting the "default\_behavior" pointertrick\_units(-)

Definition at line 193 of file aero\_drag.hh.

#### 8.3.4.6 constant\_density

```
bool jeod::AerodynamicDrag::constant_density {}
```

Use constant density for aero drag?

trick\_units(-)

Definition at line 147 of file aero\_drag.hh.

Referenced by aero\_drag().

#### 8.3.4.7 default\_behavior

```
DefaultAero* jeod::AerodynamicDrag::default_behavior
```

Pointer to an object that defines the default aero behavior.

This is used if the [AeroSurface](#) pointer in `aero_drag` is set to NULL. Defaults to ballistic drag, but can be overridden `trick_units(-)`

Definition at line 186 of file `aero_drag.hh`.

Referenced by `aero_drag()`.

#### 8.3.4.8 density

```
double jeod::AerodynamicDrag::density {}
```

Density of the last time [AerodynamicDrag](#) was used.

If `constant_density` is set true, then this is the density that will be used `trick_units(kg/m3)`

Definition at line 154 of file `aero_drag.hh`.

Referenced by `aero_drag()`.

#### 8.3.4.9 param

```
AeroDragParameters jeod::AerodynamicDrag::param
```

parameters shared with plate model

`trick_units(-)`

Definition at line 169 of file `aero_drag.hh`.

Referenced by `aero_drag()`, and `jeod::AerodynamicDrag_aero_model_default_data::initialize()`.

#### 8.3.4.10 use\_default\_behavior

```
bool jeod::AerodynamicDrag::use_default_behavior {true}
```

Use the default behavior?

`trick_units(-)`

Definition at line 174 of file `aero_drag.hh`.

Referenced by `aero_drag()`.

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

- [aero\\_drag.hh](#)
- [aero\\_drag.cc](#)

## 8.4 jeod::AerodynamicDrag\_aero\_model\_default\_data Class Reference

```
#include <aero_model.hh>
```

### Public Member Functions

- void [initialize](#) ([AerodynamicDrag](#) \*)

#### 8.4.1 Detailed Description

Definition at line 55 of file `aero_model.hh`.

#### 8.4.2 Member Function Documentation

##### 8.4.2.1 initialize()

```
void jeod::AerodynamicDrag_aero_model_default_data::initialize (
    AerodynamicDrag * AerodynamicDrag_ptr )
```

Definition at line 28 of file `aero_model.cc`.

References `jeod::AerodynamicDrag::active`, `jeod::AeroDragParameters::gas_const`, `jeod::AerodynamicDrag::param`, and `jeod::AeroDragParameters::temp_free_stream`.

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

- [aero\\_model.hh](#)
- [aero\\_model.cc](#)

## 8.5 jeod::AerodynamicsMessages Class Reference

Messages associated with use of the aerodynamics model.

```
#include <aerodynamics_messages.hh>
```

### Public Member Functions

- [AerodynamicsMessages](#) ()=delete
- [AerodynamicsMessages](#) (const [AerodynamicsMessages](#) &rhs)=delete
- [AerodynamicsMessages](#) & [operator=](#) (const [AerodynamicsMessages](#) &rhs)=delete

## Static Public Attributes

- static const char \* [initialization\\_error](#) = "interactions/aerodynamics/" "initialization\_error"  
*Associated with errors during initialization of the drag model.*
- static const char \* [runtime\\_error](#) = "interactions/aerodynamics/" "runtime\_error"  
*Associated with errors during the runtime of the drag model.*
- static const char \* [pre\\_initialization\\_error](#) = "interactions/aerodynamics/" "pre\_initialization\_error"  
*Associated with errors during the setup of the system, before runtime.*
- static const char \* [runtime\\_warns](#) = "interactions/aerodynamics/" "runtime\_warns"  
*Associated with warnings given at runtime.*

## Friends

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

### 8.5.1 Detailed Description

Messages associated with use of the aerodynamics model.

Definition at line 85 of file aerodynamics\_messages.hh.

### 8.5.2 Constructor & Destructor Documentation

#### 8.5.2.1 AerodynamicsMessages() [1/2]

```
jeod::AerodynamicsMessages::AerodynamicsMessages ( ) [delete]
```

#### 8.5.2.2 AerodynamicsMessages() [2/2]

```
jeod::AerodynamicsMessages::AerodynamicsMessages (
    const AerodynamicsMessages & rhs ) [delete]
```

### 8.5.3 Member Function Documentation

#### 8.5.3.1 operator=()

```
AerodynamicsMessages& jeod::AerodynamicsMessages::operator= (
    const AerodynamicsMessages & rhs ) [delete]
```

## 8.5.4 Friends And Related Function Documentation

### 8.5.4.1 init\_attrjeod\_\_AerodynamicsMessages

```
void init_attrjeod__AerodynamicsMessages ( ) [friend]
```

### 8.5.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 87 of file aerodynamics\_messages.hh.

## 8.5.5 Field Documentation

### 8.5.5.1 initialization\_error

```
char const * jeod::AerodynamicsMessages::initialization_error = "interactions/aerodynamics/"  
"initialization_error" [static]
```

Associated with errors during initialization of the drag model.

trick\_units(—)

Definition at line 95 of file aerodynamics\_messages.hh.

Referenced by jeod::AeroSurface::allocate\_array(), jeod::AeroSurface::allocate\_interaction\_facet(), and jeod::Flat↔PlateAeroFactory::create\_facet().

### 8.5.5.2 pre\_initialization\_error

```
char const * jeod::AerodynamicsMessages::pre_initialization_error = "interactions/aerodynamics/"  
"pre_initialization_error" [static]
```

Associated with errors during the setup of the system, before runtime.

trick\_units(—)

Definition at line 103 of file aerodynamics\_messages.hh.

Referenced by jeod::AeroSurfaceFactory::add\_facet\_params().

### 8.5.5.3 runtime\_error

```
char const * jeod::AerodynamicsMessages::runtime_error = "interactions/aerodynamics/" "runtime↵
_error" [static]
```

Associated with errors during the runtime of the drag model.

trick\_units(-)

Definition at line 99 of file aerodynamics\_messages.hh.

Referenced by jeod::AerodynamicDrag::aero\_drag(), jeod::FlatPlateAeroFacet::aerodrag\_force(), and jeod::↵
DefaultAero::aerodrag\_force().

### 8.5.5.4 runtime\_warns

```
char const * jeod::AerodynamicsMessages::runtime_warns = "interactions/aerodynamics/" "runtime↵
_warns" [static]
```

Associated with warnings given at runtime.

trick\_units(-)

Definition at line 110 of file aerodynamics\_messages.hh.

Referenced by jeod::FlatPlateAeroFacet::aerodrag\_force(), and jeod::DefaultAero::aerodrag\_force()).

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

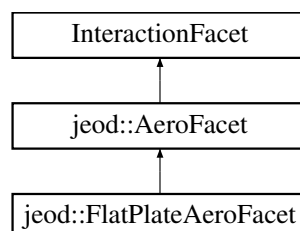
- [aerodynamics\\_messages.hh](#)
- [aerodynamics\\_messages.cc](#)

## 8.6 jeod::AeroFacet Class Reference

An aerodynamic interaction specific facet for use in the surface model.

```
#include <aero_facet.hh>
```

Inheritance diagram for jeod::AeroFacet:





## Public Member Functions

- [AeroFacet](#) ()=default
- [~AeroFacet](#) () override=default
- [AeroFacet](#) & [operator=](#) (const [AeroFacet](#) &)=delete
- [AeroFacet](#) (const [AeroFacet](#) &)=delete
- virtual void [aerodrag\\_force](#) (const double velocity\_mag, const double rel\_vel\_hat[3], [AeroDragParameters](#) \*aero\_drag\_param\_ptr, double center\_grav[3])=0

*A pure virtual function defining the interface for all aerodynamic interaction facets.*

## Friends

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

### 8.6.1 Detailed Description

An aerodynamic interaction specific facet for use in the surface model.

Definition at line 77 of file [aero\\_facet.hh](#).

### 8.6.2 Constructor & Destructor Documentation

#### 8.6.2.1 [AeroFacet](#)() [1/2]

```
jeod::AeroFacet::AeroFacet ( ) [default]
```

#### 8.6.2.2 [~AeroFacet](#)()

```
jeod::AeroFacet::~~AeroFacet ( ) [override], [default]
```

#### 8.6.2.3 [AeroFacet](#)() [2/2]

```
jeod::AeroFacet::AeroFacet (
    const AeroFacet & ) [delete]
```

### 8.6.3 Member Function Documentation

#### 8.6.3.1 [aerodrag\\_force](#)()

```
virtual void jeod::AeroFacet::aerodrag_force (
    const double velocity_mag,
    const double rel_vel_hat[3],
    AeroDragParameters * aero_drag_param_ptr,
    double center_grav[3] ) [pure virtual]
```

A pure virtual function defining the interface for all aerodynamic interaction facets.

All aerodynamic interaction facets inherited from [AeroFacet](#) must implement this function

**Parameters**

in	<i>velocity_mag</i>	The magnitude of the relative inertial velocity, including wind, of the vehicle Units: m/s
in	<i>rel_vel_hat</i>	The Unit vector of the relative inertial velocity
in	<i>aero_drag_param_ptr</i>	The parameters used to calculate aerodynamic drag
in	<i>center_grav</i>	The position of the center of gravity of the vehicle, in the structural frame Units: m

Implemented in [jeod::FlatPlateAeroFacet](#).

Referenced by `jeod::AerodynamicDrag::aero_drag()`.

**8.6.3.2 operator=()**

```
AeroFacet& jeod::AeroFacet::operator= (
    const AeroFacet & ) [delete]
```

**8.6.4 Friends And Related Function Documentation****8.6.4.1 init\_attrjeod\_\_AeroFacet**

```
void init_attrjeod__AeroFacet ( ) [friend]
```

**8.6.4.2 InputProcessor**

```
friend class InputProcessor [friend]
```

Definition at line 79 of file `aero_facet.hh`.

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

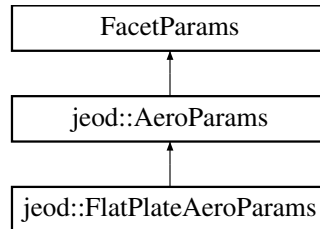
- [aero\\_facet.hh](#)

## 8.7 jeod::AeroParams Class Reference

A base class for all aerodynamic parameters used in the surface model.

```
#include <aero_params.hh>
```

Inheritance diagram for jeod::AeroParams:



### Public Member Functions

- [AeroParams](#) ()=default
- [~AeroParams](#) () override=default
- [AeroParams](#) & [operator=](#) (const [AeroParams](#) &)=delete
- [AeroParams](#) (const [AeroParams](#) &)=delete

### Friends

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

### 8.7.1 Detailed Description

A base class for all aerodynamic parameters used in the surface model.

Definition at line 76 of file `aero_params.hh`.

### 8.7.2 Constructor & Destructor Documentation

#### 8.7.2.1 AeroParams() [1/2]

```
jeod::AeroParams::AeroParams ( ) [default]
```

#### 8.7.2.2 ~AeroParams()

```
jeod::AeroParams::~~AeroParams ( ) [override], [default]
```

#### 8.7.2.3 AeroParams() [2/2]

```
jeod::AeroParams::AeroParams (
    const AeroParams & ) [delete]
```

### 8.7.3 Member Function Documentation

#### 8.7.3.1 operator=()

```
AeroParams& jeod::AeroParams::operator= (
    const AeroParams & ) [delete]
```

### 8.7.4 Friends And Related Function Documentation

#### 8.7.4.1 init\_attrjeod\_\_AeroParams

```
void init_attrjeod__AeroParams ( ) [friend]
```

#### 8.7.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 78 of file `aero_params.hh`.

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

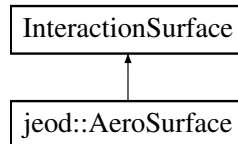
- [aero\\_params.hh](#)

## 8.8 jeod::AeroSurface Class Reference

The aerodynamic specific interaction surface, for use with the surface model.

```
#include <aero_surface.hh>
```

Inheritance diagram for jeod::AeroSurface:



### Public Member Functions

- [AeroSurface](#) ()  
*Default Constructor.*
- [~AeroSurface](#) () override  
*Destructor.*
- [AeroSurface](#) & [operator=](#) (const [AeroSurface](#) &)=delete
- [AeroSurface](#) (const [AeroSurface](#) &)=delete
- void [allocate\\_array](#) (unsigned int size) override  
*Allocates an array of [AeroFacet](#) pointers, of the size indicated by the input variable.*
- void [allocate\\_interaction\\_facet](#) (Facet \*facet, InteractionFacetFactory \*factory, FacetParams \*params, unsigned int index) override  
*Allocates a particular interaction facet, from an inputted general facet, using the inputted parameters and interaction facet factory.*

### Data Fields

- [AeroFacet](#) \*\* [aero\\_facets](#) {}  
*An array of pointers to aerodynamic interaction facets.*
- unsigned int [facets\\_size](#) {}  
*Size of the [aero\\_facets](#) array.*

### Friends

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

#### 8.8.1 Detailed Description

The aerodynamic specific interaction surface, for use with the surface model.

Definition at line 85 of file [aero\\_surface.hh](#).

## 8.8.2 Constructor & Destructor Documentation

### 8.8.2.1 AeroSurface() [1/2]

```
jeod::AeroSurface::AeroSurface ( )
```

Default Constructor.

Definition at line 53 of file `aero_surface.cc`.

### 8.8.2.2 ~AeroSurface()

```
jeod::AeroSurface::~~AeroSurface ( ) [override]
```

Destructor.

Definition at line 63 of file `aero_surface.cc`.

References `aero_facets`, and `facets_size`.

### 8.8.2.3 AeroSurface() [2/2]

```
jeod::AeroSurface::AeroSurface (
    const AeroSurface & ) [delete]
```

## 8.8.3 Member Function Documentation

### 8.8.3.1 allocate\_array()

```
void jeod::AeroSurface::allocate_array (
    unsigned int size ) [override]
```

Allocates an array of [AeroFacet](#) pointers, of the size indicated by the input variable.

#### Parameters

in	size	The size of the needed array Units: cnt:
----	------	---

Definition at line 74 of file aero\_surface.cc.

References `aero_facets`, `facets_size`, and `jeod::AerodynamicsMessages::initialization_error`.

### 8.8.3.2 allocate\_interaction\_facet()

```
void jeod::AeroSurface::allocate_interaction_facet (
    Facet * facet,
    InteractionFacetFactory * factory,
    FacetParams * params,
    unsigned int index ) [override]
```

Allocates a particular interaction facet, from an inputted general facet, using the inputted parameters and interaction facet factory.

This facet is then placed at the index given. If the correct InteractionFacetFactory and Facet Params are not given for the aerodynamic interaction or for the type of facet given, a fail message will be sent

#### Parameters

in	<i>facet</i>	The basic facet used to create the interaction facet
in	<i>factory</i>	The factory used to create the interaction facet
in	<i>params</i>	The aero params used to create the interaction facet
in	<i>index</i>	Where the new interaction facet will be placed in the <code>aero_facets</code> array Units: cnt

Definition at line 123 of file aero\_surface.cc.

References `aero_facets`, `facets_size`, and `jeod::AerodynamicsMessages::initialization_error`.

### 8.8.3.3 operator=()

```
AeroSurface& jeod::AeroSurface::operator= (
    const AeroSurface & ) [delete]
```

## 8.8.4 Friends And Related Function Documentation

### 8.8.4.1 init\_attrjeod\_\_AeroSurface

```
void init_attrjeod__AeroSurface ( ) [friend]
```

#### 8.8.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 87 of file `aero_surface.hh`.

### 8.8.5 Field Documentation

#### 8.8.5.1 `aero_facets`

```
AeroFacet** jeod::AeroSurface::aero_facets {}
```

An array of pointers to aerodynamic interaction facets.

AeroFacets is a pure virtual, so these will all be pointed to inheriting classes through `polymorphismtrick_units(-)`

Definition at line 98 of file `aero_surface.hh`.

Referenced by `jeod::AerodynamicDrag::aero_drag()`, `allocate_array()`, `allocate_interaction_facet()`, and `~AeroSurface()`.

#### 8.8.5.2 `facets_size`

```
unsigned int jeod::AeroSurface::facets_size {}
```

Size of the `aero_facets` array.

`trick_units(count)`

Definition at line 103 of file `aero_surface.hh`.

Referenced by `jeod::AerodynamicDrag::aero_drag()`, `allocate_array()`, `allocate_interaction_facet()`, and `~AeroSurface()`.

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

- [aero\\_surface.hh](#)
- [aero\\_surface.cc](#)

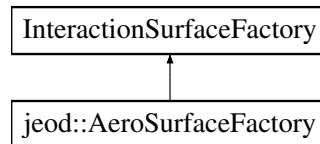


## 8.9 jeod::AeroSurfaceFactory Class Reference

The surface factory that creates an aerodynamic specific surface from a general surface.

```
#include <aero_surface_factory.hh>
```

Inheritance diagram for jeod::AeroSurfaceFactory:



### Public Member Functions

- [AeroSurfaceFactory \(\)](#)  
*Default Constructor.*
- [~AeroSurfaceFactory \(\)](#) override=default
- [AeroSurfaceFactory & operator= \(const AeroSurfaceFactory &\)=delete](#)
- [AeroSurfaceFactory \(const AeroSurfaceFactory &\)=delete](#)
- void [add\\_facet\\_params](#) (FacetParams \*to\_add) override  
*Add a named set of facet params to the surface factory.*

### Protected Attributes

- [FlatPlateAeroFactory flat\\_plate\\_aero\\_factory](#)  
*A factory that can create a flat plate aero facet from a flat plate.*
- [FlatPlateThermalAeroFactory flat\\_plate\\_thermal\\_aero\\_factory](#)  
*A factory that can create a flat plate aero facet from a flat plate.*

### Friends

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

#### 8.9.1 Detailed Description

The surface factory that creates an aerodynamic specific surface from a general surface.

Used with the surface model.

Definition at line 87 of file `aero_surface_factory.hh`.

#### 8.9.2 Constructor & Destructor Documentation

**8.9.2.1 AeroSurfaceFactory()** [1/2]

```
jeod::AeroSurfaceFactory::AeroSurfaceFactory ( )
```

Default Constructor.

Definition at line 47 of file `aero_surface_factory.cc`.

References `flat_plate_aero_factory`, and `flat_plate_thermal_aero_factory`.

**8.9.2.2 ~AeroSurfaceFactory()**

```
jeod::AeroSurfaceFactory::~AeroSurfaceFactory ( ) [override], [default]
```

**8.9.2.3 AeroSurfaceFactory()** [2/2]

```
jeod::AeroSurfaceFactory::AeroSurfaceFactory (
    const AeroSurfaceFactory & ) [delete]
```

**8.9.3 Member Function Documentation****8.9.3.1 add\_facet\_params()**

```
void jeod::AeroSurfaceFactory::add_facet_params (
    FacetParams * to_add ) [override]
```

Add a named set of facet params to the surface factory.

Intended to be used when an aerodynamic specific surface is created, to convert a basic facet to an aerodynamic interaction facet. This MUST be a parameter inheriting from `AeroParam`, or the function will fail and send a failure message

**Parameters**

<code>in</code>	<code>to_add</code>	The facet parameters to add
-----------------	---------------------	-----------------------------

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

References `jeod::AerodynamicsMessages::pre_initialization_error`.

### 8.9.3.2 operator=()

```
AeroSurfaceFactory& jeod::AeroSurfaceFactory::operator= (
    const AeroSurfaceFactory & ) [delete]
```

## 8.9.4 Friends And Related Function Documentation

### 8.9.4.1 init\_attrjeod\_\_AeroSurfaceFactory

```
void init_attrjeod__AeroSurfaceFactory ( ) [friend]
```

### 8.9.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 89 of file `aero_surface_factory.hh`.

## 8.9.5 Field Documentation

### 8.9.5.1 flat\_plate\_aero\_factory

```
FlatPlateAeroFactory jeod::AeroSurfaceFactory::flat_plate_aero_factory [protected]
```

A factory that can create a flat plate aero facet from a flat plate.

trick\_units(-)

Definition at line 107 of file `aero_surface_factory.hh`.

Referenced by `AeroSurfaceFactory()`.

### 8.9.5.2 flat\_plate\_thermal\_aero\_factory

```
FlatPlateThermalAeroFactory jeod::AeroSurfaceFactory::flat_plate_thermal_aero_factory [protected]
```

A factory that can create a flat plate aero facet from a flat plate.

trick\_units(-)

Definition at line 111 of file `aero_surface_factory.hh`.

Referenced by `AeroSurfaceFactory()`.

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

- [aero\\_surface\\_factory.hh](#)
- [aero\\_surface\\_factory.cc](#)

## 8.10 jeod::DefaultAero Class Reference

The simple, default, aerodynamic drag model, including coefficient of drag, ballistic coefficient, etc.

```
#include <default_aero.hh>
```

### Public Types

- enum [DragOption](#) { [DRAG\\_OPT\\_CD](#) = 0, [DRAG\\_OPT\\_BC](#) = 1, [DRAG\\_OPT\\_CONST](#) = 2 }  
*Specifies how drag is to be computed.*

### Public Member Functions

- [DefaultAero](#) ()=default
- virtual [~DefaultAero](#) ()=default
- [DefaultAero](#) & [operator=](#) (const [DefaultAero](#) &)=delete
- [DefaultAero](#) (const [DefaultAero](#) &)=delete
- virtual void [aerodrag\\_force](#) (const double velocity\_mag, const double rel\_vel\_hat[3], [AeroDragParameters](#) \*aero\_drag\_param\_ptr, double mass, double force[3], double torque[3])  
*The implementation for this aerodynamic drags force and torque calculations.*

### Data Fields

- double [Cd](#) {}  
*Coefficient of drag.*
- double [BC](#) {}  
*Ballistic Coefficient.*
- double [area](#) {}  
*Vehicle aerodynamic area.*
- double [drag](#) {}  
*Drag calculated during use.*
- [DragOption](#) option {[DRAG\\_OPT\\_CONST](#)}  
*The type of simple drag to use.*

### Friends

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

#### 8.10.1 Detailed Description

The simple, default, aerodynamic drag model, including coefficient of drag, ballistic coefficient, etc.

This can be overridden with a user defined model in the [AerodynamicDrag](#) class.

Definition at line 86 of file default\_aero.hh.

#### 8.10.2 Member Enumeration Documentation

##### 8.10.2.1 DragOption

```
enum jeod::DefaultAero::DragOption
```

Specifies how drag is to be computed.

## Enumerator

DRAG_OPT_CD	Use Coefficient of drag for drag computations.
DRAG_OPT_BC	Use Ballistic Coefficient for drag computations.
DRAG_OPT_CONST	Use specified constant drag.

Definition at line 92 of file default\_aero.hh.

### 8.10.3 Constructor & Destructor Documentation

#### 8.10.3.1 DefaultAero() [1/2]

```
jeod::DefaultAero::DefaultAero ( ) [default]
```

#### 8.10.3.2 ~DefaultAero()

```
virtual jeod::DefaultAero::~~DefaultAero ( ) [virtual], [default]
```

#### 8.10.3.3 DefaultAero() [2/2]

```
jeod::DefaultAero::DefaultAero (
    const DefaultAero & ) [delete]
```

### 8.10.4 Member Function Documentation

#### 8.10.4.1 aerodrag\_force()

```
void jeod::DefaultAero::aerodrag_force (
    const double velocity_mag,
    const double rel_vel_hat[3],
    AeroDragParameters * aero_drag_param_ptr,
    double mass,
    double force[3],
    double torque[3] ) [virtual]
```

The implementation for this aerodynamic drags force and torque calculations.

Can be overridden by an inheriting class to create extensibility

## Parameters

in	<i>velocity_mag</i>	The magnitude of the relative velocity of the vehicle; not used here but some child classes need it Units: M/s
in	<i>rel_vel_hat</i>	The unit vector of the relative velocity of the vehicle, in the structural frame
in	<i>aero_drag_param_ptr</i>	The aerodynamic drag parameters used to calculate drag
in	<i>mass</i>	The current mass of the vehicle Units: kg
out	<i>force</i>	The aerodynamic force, in the structural frame Units: N
out	<i>torque</i>	The aerodynamic torque, in the structural frame Units: N*M

Definition at line 59 of file default\_aero.cc.

References `area`, `BC`, `Cd`, `drag`, `DRAG_OPT_BC`, `DRAG_OPT_CD`, `DRAG_OPT_CONST`, `jeod::AeroDrag`, `Parameters::dynamic_pressure`, `option`, `jeod::AerodynamicsMessages::runtime_error`, and `jeod::AerodynamicsMessages::runtime_warns`.

Referenced by `jeod::AerodynamicDrag::aero_drag()`.

#### 8.10.4.2 operator=()

```
DefaultAero& jeod::DefaultAero::operator= (
    const DefaultAero & ) [delete]
```

### 8.10.5 Friends And Related Function Documentation

#### 8.10.5.1 init\_attrjeod\_\_DefaultAero

```
void init_attrjeod__DefaultAero ( ) [friend]
```

#### 8.10.5.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 88 of file default\_aero.hh.

### 8.10.6 Field Documentation

#### 8.10.6.1 area

```
double jeod::DefaultAero::area {}
```

Vehicle aerodynamic area.

trick\_units(m2)

Definition at line 124 of file default\_aero.hh.

Referenced by aerodrag\_force().

#### 8.10.6.2 BC

```
double jeod::DefaultAero::BC {}
```

Ballistic Coefficient.

trick\_units(kg/m2)

Definition at line 120 of file default\_aero.hh.

Referenced by aerodrag\_force().

#### 8.10.6.3 Cd

```
double jeod::DefaultAero::Cd {}
```

Coefficient of drag.

trick\_units(-)

Definition at line 116 of file default\_aero.hh.

Referenced by aerodrag\_force().

#### 8.10.6.4 drag

```
double jeod::DefaultAero::drag {}
```

Drag calculated during use.

Can be set by user and will then never be changed with a DRAG\_OPT\_CONSTtrick\_units(N)

Definition at line 130 of file default\_aero.hh.

Referenced by aerodrag\_force().

#### 8.10.6.5 option

```
DragOption jeod::DefaultAero::option {DRAG_OPT_CONST}
```

The type of simple drag to use.

trick\_units(-)

Definition at line 135 of file default\_aero.hh.

Referenced by aerodrag\_force().

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

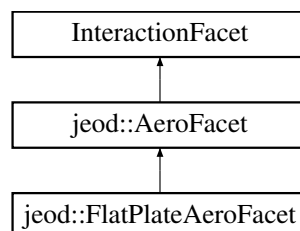
- [default\\_aero.hh](#)
- [default\\_aero.cc](#)

## 8.11 jeod::FlatPlateAeroFacet Class Reference

The aerodynamic specific version of a flat plate.

```
#include <flat_plate_aero_facet.hh>
```

Inheritance diagram for jeod::FlatPlateAeroFacet:



### Public Member Functions

- [FlatPlateAeroFacet](#) ()=default
- [~FlatPlateAeroFacet](#) () override=default
- [FlatPlateAeroFacet](#) & [operator=](#) (const [FlatPlateAeroFacet](#) &)=delete
- [FlatPlateAeroFacet](#) (const [FlatPlateAeroFacet](#) &)=delete
- void [aerodrag\\_force](#) (const double velocity\_mag, const double rel\_vel\_hat[3], [AeroDragParameters](#) \*aero←  
\_drag\_param\_ptr, double center\_grav[3]) override

*The [FlatPlateAeroFacet](#) specific implementation of aerodynamic drag force, based on the given parameters.*



## Data Fields

- double \* [center\\_pressure](#) {}  
*Flat plate center of pressure (in structural frame).*
- double \* [normal](#) {}  
*Unit vector normal to the plate surface, pointing outward (structural frame).*
- double [force\\_n](#) {}  
*Magnitude of the force normal to the plate.*
- double [force\\_t](#) {}  
*Magnitude of the force tangential to the plate, or parallel to the velocity vector, depending on application.*
- [AeroDragEnum::CoefCalcMethod](#) [coef\\_method](#) {[AeroDragEnum::Specular](#)}  
*Enum indicating which method of coef calculation to use: specular, diffuse, calculated, mixed.*
- bool [calculate\\_drag\\_coef](#) {}  
*whether to calculate the drag coefficient*
- double [epsilon](#) {}  
*fraction of molecules that "bounce"*
- double [temp\\_reflect](#) {}  
*temperature of reflected molecules*
- double [drag\\_coef\\_norm](#) {}  
*The coefficient for calculating drag normal to the plate.*
- double [drag\\_coef\\_tang](#) {}  
*The coefficient for calculating drag tangential to the plate.*
- double [drag\\_coef\\_spec](#) {}  
*The coefficient for calculating drag resulting only from molecules bouncing off the surface.*
- double [drag\\_coef\\_diff](#) {}  
*The coefficient for calculating drag resulting only from molecules sticking to the surface.*
- double [temperature](#) {}  
*Temperature of the plate.*
- double [area](#) {}  
*area of the plate*

## Friends

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

### 8.11.1 Detailed Description

The aerodynamic specific version of a flat plate.

Definition at line 84 of file `flat_plate_aero_facet.hh`.

### 8.11.2 Constructor & Destructor Documentation

### 8.11.2.1 FlatPlateAeroFacet() [1/2]

```
jeod::FlatPlateAeroFacet::FlatPlateAeroFacet ( ) [default]
```

### 8.11.2.2 ~FlatPlateAeroFacet()

```
jeod::FlatPlateAeroFacet::~~FlatPlateAeroFacet ( ) [override], [default]
```

### 8.11.2.3 FlatPlateAeroFacet() [2/2]

```
jeod::FlatPlateAeroFacet::FlatPlateAeroFacet (
    const FlatPlateAeroFacet & ) [delete]
```

## 8.11.3 Member Function Documentation

### 8.11.3.1 aerodrag\_force()

```
void jeod::FlatPlateAeroFacet::aerodrag_force (
    const double rel_vel_mag,
    const double rel_vel_struct_hat[3],
    AeroDragParameters * aero_drag_param_ptr,
    double center_grav[3] ) [override], [virtual]
```

The [FlatPlateAeroFacet](#) specific implementation of aerodynamic drag force, based on the given parameters.

#### Parameters

in	<i>rel_vel_mag</i>	The magnitude of the relative velocity Units: M/s
in	<i>rel_vel_struct_hat</i>	The unit vector of the total relative velocity, in the structural frame
in	<i>aero_drag_param_ptr</i>	The aerodynamic drag parameters used for drag calculation
in	<i>center_grav</i>	The center of gravity of the vehicle, in the structural frame Units: M

Implements [jeod::AeroFacet](#).

Definition at line 49 of file flat\_plate\_aero\_facet.cc.

References [area](#), [jeod::AeroDragEnum::Calc\\_coef](#), [calculate\\_drag\\_coef](#), [center\\_pressure](#), [coef\\_method](#), [jeod::AeroDragEnum::Diffuse](#), [drag\\_coef\\_diff](#), [drag\\_coef\\_norm](#), [drag\\_coef\\_spec](#), [drag\\_coef\\_tang](#), [jeod::AeroDragParameters::dynamic\\_pressure](#), [epsilon](#), [force\\_n](#), [force\\_t](#), [jeod::AeroDragParameters::gas\\_const](#), [jeod::AeroDragEnum::Mixed](#), [normal](#), [jeod::AerodynamicsMessages::runtime\\_error](#), [jeod::AerodynamicsMessages::runtime\\_warns](#), [jeod::AeroDragEnum::Specular](#), [jeod::AeroDragParameters::temp\\_free\\_stream](#), and [temperature](#).

### 8.11.3.2 operator=()

```
FlatPlateAeroFacet& jeod::FlatPlateAeroFacet::operator= (
    const FlatPlateAeroFacet & ) [delete]
```

## 8.11.4 Friends And Related Function Documentation

### 8.11.4.1 init\_attrjeod\_\_FlatPlateAeroFacet

```
void init_attrjeod__FlatPlateAeroFacet ( ) [friend]
```

### 8.11.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 86 of file flat\_plate\_aero\_facet.hh.

## 8.11.5 Field Documentation

### 8.11.5.1 area

```
double jeod::FlatPlateAeroFacet::area {}
```

area of the plate

trick\_units(m2)

Definition at line 174 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.2 calculate\_drag\_coef

```
bool jeod::FlatPlateAeroFacet::calculate_drag_coef {}
```

whether to calculate the drag coefficient

trick\_units(-)

Definition at line 132 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.3 center\_pressure

```
double* jeod::FlatPlateAeroFacet::center_pressure {}
```

Flat plate center of pressure (in structural frame).

Once the aero surface is initialized, it points to the position found in FlatPlatetrick\_units(m)

Definition at line 103 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.4 coef\_method

```
AeroDragEnum::CoefCalcMethod jeod::FlatPlateAeroFacet::coef_method {AeroDragEnum::Specular}
```

Enum indicating which method of coef calculation to use: specular, diffuse, calculated, mixed.

trick\_units(-)

Definition at line 127 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.5 drag\_coef\_diff

```
double jeod::FlatPlateAeroFacet::drag_coef_diff {}
```

The coefficient for calculating drag resulting only from molecules sticking to the surface.

trick\_units(-)

Definition at line 164 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.6 drag\_coef\_norm

```
double jeod::FlatPlateAeroFacet::drag_coef_norm {}
```

The coefficient for calculating drag normal to the plate.

trick\_units(—)

Definition at line 147 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.7 drag\_coef\_spec

```
double jeod::FlatPlateAeroFacet::drag_coef_spec {}
```

The coefficient for calculating drag resulting only from molecules bouncing off the surface.

trick\_units(—)

Definition at line 158 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.8 drag\_coef\_tang

```
double jeod::FlatPlateAeroFacet::drag_coef_tang {}
```

The coefficient for calculating drag tangential to the plate.

trick\_units(—)

Definition at line 152 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.9 epsilon

```
double jeod::FlatPlateAeroFacet::epsilon {}
```

fraction of molecules that "bounce"

trick\_units(—)

Definition at line 137 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.10 force\_n

```
double jeod::FlatPlateAeroFacet::force_n {}
```

Magnitude of the force normal to the plate.

trick\_units(N)

Definition at line 115 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force().

#### 8.11.5.11 force\_t

```
double jeod::FlatPlateAeroFacet::force_t {}
```

Magnitude of the force tangential to the plate, or parallel to the velocity vector, depending on application.

trick\_units(N)

Definition at line 121 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force().

#### 8.11.5.12 normal

```
double* jeod::FlatPlateAeroFacet::normal {}
```

Unit vector normal to the plate surface, pointing outward (structural frame).

Once the aero surface is initialized, it points to the normal found in FlatPlatetrick\_units(-)

Definition at line 110 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

#### 8.11.5.13 temp\_reflect

```
double jeod::FlatPlateAeroFacet::temp_reflect {}
```

temperature of reflected molecules

trick\_units(K)

Definition at line 142 of file flat\_plate\_aero\_facet.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

## 8.11.5.14 temperature

```
double jeod::FlatPlateAeroFacet::temperature {}
```

Temperature of the plate.

trick\_units(K)

Definition at line 169 of file flat\_plate\_aero\_facet.hh.

Referenced by aerodrag\_force(), and jeod::FlatPlateAeroFactory::create\_facet().

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

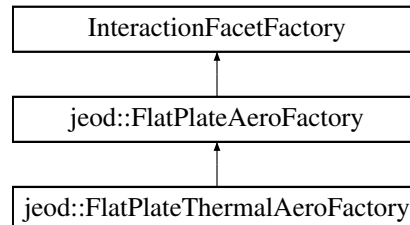
- [flat\\_plate\\_aero\\_facet.hh](#)
- [flat\\_plate\\_aero\\_facet.cc](#)

## 8.12 jeod::FlatPlateAeroFactory Class Reference

Creates a [FlatPlateAeroFacet](#) from a FlatPlate.

```
#include <flat_plate_aero_factory.hh>
```

Inheritance diagram for jeod::FlatPlateAeroFactory:



## Public Member Functions

- [FlatPlateAeroFactory](#) ()  
*Default Constructor.*
- [~FlatPlateAeroFactory](#) () override=default
- [FlatPlateAeroFactory](#) & operator= (const [FlatPlateAeroFactory](#) &)=delete
- [FlatPlateAeroFactory](#) (const [FlatPlateAeroFactory](#) &)=delete
- InteractionFacet \* [create\\_facet](#) (Facet \*facet, FacetParams \*params) override  
*Create a [FlatPlateAeroFacet](#) from a flat plate facet and a [FlatPlateAeroParams](#) object.*
- bool [is\\_correct\\_factory](#) (Facet \*facet) override  
*[FlatPlateAeroFactory](#) specific implementation of this function.*

## Friends

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

### 8.12.1 Detailed Description

Creates a [FlatPlateAeroFacet](#) from a FlatPlate.

Definition at line 83 of file flat\_plate\_aero\_factory.hh.

### 8.12.2 Constructor & Destructor Documentation

#### 8.12.2.1 FlatPlateAeroFactory() [1/2]

```
jeod::FlatPlateAeroFactory::FlatPlateAeroFactory ( )
```

Default Constructor.

Definition at line 53 of file flat\_plate\_aero\_factory.cc.

#### 8.12.2.2 ~FlatPlateAeroFactory()

```
jeod::FlatPlateAeroFactory::~~FlatPlateAeroFactory ( ) [override], [default]
```

#### 8.12.2.3 FlatPlateAeroFactory() [2/2]

```
jeod::FlatPlateAeroFactory::FlatPlateAeroFactory (
    const FlatPlateAeroFactory & ) [delete]
```

### 8.12.3 Member Function Documentation

#### 8.12.3.1 create\_facet()

```
InteractionFacet * jeod::FlatPlateAeroFactory::create_facet (
    Facet * facet,
    FacetParams * params ) [override]
```

Create a [FlatPlateAeroFacet](#) from a flat plate facet and a FlatPlateAeroParams object.

#### Returns

The new [FlatPlateAeroFacet](#). Note that this is allocated and YOU are responsible for destroying it at the end!



## Parameters

in	<i>facet</i>	The FlatPlate. This MUST be a flat plate or the algorithm will send a failure message
in	<i>params</i>	<a href="#">FlatPlateAeroParams</a> . This MUST be of the type <a href="#">FlatPlateAeroParams</a> , or the algorithm will send a failure message Units: The

Definition at line 68 of file flat\_plate\_aero\_factory.cc.

References [jeod::FlatPlateAeroFacet::area](#), [jeod::FlatPlateAeroParams::calculate\\_drag\\_coef](#), [jeod::FlatPlateAeroFacet::calculate\\_drag\\_coef](#), [jeod::FlatPlateAeroFacet::center\\_pressure](#), [jeod::FlatPlateAeroParams::coef\\_method](#), [jeod::FlatPlateAeroFacet::coef\\_method](#), [jeod::FlatPlateAeroParams::drag\\_coef\\_diff](#), [jeod::FlatPlateAeroFacet::drag\\_coef\\_diff](#), [jeod::FlatPlateAeroParams::drag\\_coef\\_norm](#), [jeod::FlatPlateAeroFacet::drag\\_coef\\_norm](#), [jeod::FlatPlateAeroParams::drag\\_coef\\_spec](#), [jeod::FlatPlateAeroFacet::drag\\_coef\\_spec](#), [jeod::FlatPlateAeroParams::drag\\_coef\\_tang](#), [jeod::FlatPlateAeroFacet::drag\\_coef\\_tang](#), [jeod::FlatPlateAeroParams::epsilon](#), [jeod::FlatPlateAeroFacet::epsilon](#), [jeod::AerodynamicsMessages::initialization\\_error](#), [jeod::FlatPlateAeroFacet::normal](#), [jeod::FlatPlateAeroParams::temp\\_reflect](#), [jeod::FlatPlateAeroFacet::temp\\_reflect](#), and [jeod::FlatPlateAeroFacet::temperature](#).

## 8.12.3.2 is\_correct\_factory()

```
bool jeod::FlatPlateAeroFactory::is_correct_factory (
    Facet * facet ) [override]
```

[FlatPlateAeroFactory](#) specific implementation of this function.

If the Facet is of type FlatPlate, returns true. False otherwise

## Returns

true if facet is a FlatPlate, false otherwise

## Parameters

in	<i>facet</i>	The facet to check
----	--------------	--------------------

Definition at line 134 of file flat\_plate\_aero\_factory.cc.

## 8.12.3.3 operator=()

```
FlatPlateAeroFactory& jeod::FlatPlateAeroFactory::operator= (
    const FlatPlateAeroFactory & ) [delete]
```

## 8.12.4 Friends And Related Function Documentation

#### 8.12.4.1 init\_attrjeod\_\_FlatPlateAeroFactory

```
void init_attrjeod__FlatPlateAeroFactory ( ) [friend]
```

#### 8.12.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 85 of file flat\_plate\_aero\_factory.hh.

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

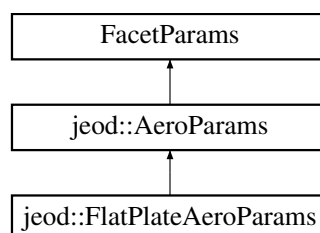
- [flat\\_plate\\_aero\\_factory.hh](#)
- [flat\\_plate\\_aero\\_factory.cc](#)

### 8.13 jeod::FlatPlateAeroParams Class Reference

used in the [FlatPlateAeroFactory](#) to create a [FlatPlateAeroFacet](#).

```
#include <flat_plate_aero_params.hh>
```

Inheritance diagram for jeod::FlatPlateAeroParams:



#### Public Member Functions

- [FlatPlateAeroParams](#) ()=default
- [~FlatPlateAeroParams](#) () override=default
- [FlatPlateAeroParams](#) & operator= (const [FlatPlateAeroParams](#) &)=delete
- [FlatPlateAeroParams](#) (const [FlatPlateAeroParams](#) &)=delete

## Data Fields

- [AeroDragEnum::CoefCalcMethod coef\\_method](#) {[AeroDragEnum::Specular](#)}  
*Enum indicating which method of coef calculation to use: specular, diffuse, calculated, mixed.*
- bool [calculate\\_drag\\_coef](#) {}  
*Whether to calculate the drag coefficient.*
- double [epsilon](#) {}  
*Fraction of molecules that "bounce".*
- double [temp\\_reflect](#) {}  
*Temperature of reflected molecules.*
- double [drag\\_coef\\_norm](#) {}  
*The coefficient for calculating drag normal to the plate.*
- double [drag\\_coef\\_tang](#) {}  
*The coefficient for calculating drag tangential to the plate.*
- double [drag\\_coef\\_spec](#) {}  
*The coefficient for calculating drag resulting only from molecules bouncing off the surface.*
- double [drag\\_coef\\_diff](#) {}  
*The coefficient for calculating drag resulting only from molecules sticking to the surface.*

## Friends

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

### 8.13.1 Detailed Description

used in the [FlatPlateAeroFactory](#) to create a [FlatPlateAeroFacet](#).

Definition at line 76 of file `flat_plate_aero_params.hh`.

### 8.13.2 Constructor & Destructor Documentation

#### 8.13.2.1 FlatPlateAeroParams() [1/2]

```
jeod::FlatPlateAeroParams::FlatPlateAeroParams ( ) [default]
```

#### 8.13.2.2 ~FlatPlateAeroParams()

```
jeod::FlatPlateAeroParams::~~FlatPlateAeroParams ( ) [override], [default]
```

### 8.13.2.3 FlatPlateAeroParams() [2/2]

```
jeod::FlatPlateAeroParams::FlatPlateAeroParams (  
    const FlatPlateAeroParams & ) [delete]
```

## 8.13.3 Member Function Documentation

### 8.13.3.1 operator=()

```
FlatPlateAeroParams& jeod::FlatPlateAeroParams::operator= (  
    const FlatPlateAeroParams & ) [delete]
```

## 8.13.4 Friends And Related Function Documentation

### 8.13.4.1 init\_attrjeod\_\_FlatPlateAeroParams

```
void init_attrjeod__FlatPlateAeroParams ( ) [friend]
```

### 8.13.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 78 of file flat\_plate\_aero\_params.hh.

## 8.13.5 Field Documentation

### 8.13.5.1 calculate\_drag\_coef

```
bool jeod::FlatPlateAeroParams::calculate_drag_coef {}
```

Whether to calculate the drag coefficient.

trick\_units(—)

Definition at line 93 of file flat\_plate\_aero\_params.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

#### 8.13.5.2 coef\_method

```
AeroDragEnum::CoefCalcMethod jeod::FlatPlateAeroParams::coef_method {AeroDragEnum::Specular}
```

Enum indicating which method of coef calculation to use: specular, diffuse, calculated, mixed.

trick\_units(-)

Definition at line 88 of file flat\_plate\_aero\_params.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

#### 8.13.5.3 drag\_coef\_diff

```
double jeod::FlatPlateAeroParams::drag_coef_diff {}
```

The coefficient for calculating drag resulting only from molecules sticking to the surface.

trick\_units(-)

Definition at line 125 of file flat\_plate\_aero\_params.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

#### 8.13.5.4 drag\_coef\_norm

```
double jeod::FlatPlateAeroParams::drag_coef_norm {}
```

The coefficient for calculating drag normal to the plate.

trick\_units(-)

Definition at line 108 of file flat\_plate\_aero\_params.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

#### 8.13.5.5 drag\_coef\_spec

```
double jeod::FlatPlateAeroParams::drag_coef_spec {}
```

The coefficient for calculating drag resulting only from molecules bouncing off the surface.

trick\_units(-)

Definition at line 119 of file flat\_plate\_aero\_params.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

#### 8.13.5.6 drag\_coef\_tang

```
double jeod::FlatPlateAeroParams::drag_coef_tang {}
```

The coefficient for calculating drag tangential to the plate.

trick\_units(-)

Definition at line 113 of file flat\_plate\_aero\_params.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

#### 8.13.5.7 epsilon

```
double jeod::FlatPlateAeroParams::epsilon {}
```

Fraction of molecules that "bounce".

trick\_units(-)

Definition at line 98 of file flat\_plate\_aero\_params.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

#### 8.13.5.8 temp\_reflect

```
double jeod::FlatPlateAeroParams::temp_reflect {}
```

Temperature of reflected molecules.

trick\_units(K)

Definition at line 103 of file flat\_plate\_aero\_params.hh.

Referenced by jeod::FlatPlateAeroFactory::create\_facet().

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

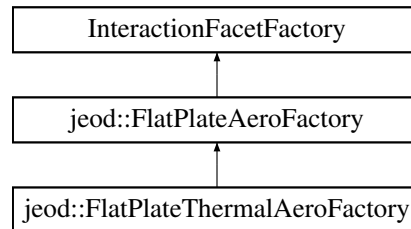
- [flat\\_plate\\_aero\\_params.hh](#)

## 8.14 jeod::FlatPlateThermalAeroFactory Class Reference

Creates a [FlatPlateAeroFacet](#) from a FlatPlate.

```
#include <flat_plate_thermal_aero_factory.hh>
```

Inheritance diagram for jeod::FlatPlateThermalAeroFactory:



### Public Member Functions

- [FlatPlateThermalAeroFactory](#) ()  
*Default Constructor.*
- [~FlatPlateThermalAeroFactory](#) () override=default
- [FlatPlateThermalAeroFactory](#) & operator= (const [FlatPlateThermalAeroFactory](#) &)=delete
- [FlatPlateThermalAeroFactory](#) (const [FlatPlateThermalAeroFactory](#) &)=delete
- bool [is\\_correct\\_factory](#) (Facet \*facet) override  
*FlatPlateThermalAeroFactory specific implementation of this function.*

### Friends

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

### 8.14.1 Detailed Description

Creates a [FlatPlateAeroFacet](#) from a FlatPlate.

Definition at line 81 of file flat\_plate\_thermal\_aero\_factory.hh.

### 8.14.2 Constructor & Destructor Documentation

#### 8.14.2.1 FlatPlateThermalAeroFactory() [1/2]

```
jeod::FlatPlateThermalAeroFactory::FlatPlateThermalAeroFactory ( )
```

Default Constructor.

Definition at line 48 of file flat\_plate\_thermal\_aero\_factory.cc.

#### 8.14.2.2 ~FlatPlateThermalAeroFactory()

```
jeod::FlatPlateThermalAeroFactory::~~FlatPlateThermalAeroFactory ( ) [override], [default]
```

#### 8.14.2.3 FlatPlateThermalAeroFactory() [2/2]

```
jeod::FlatPlateThermalAeroFactory::FlatPlateThermalAeroFactory (
    const FlatPlateThermalAeroFactory & ) [delete]
```

### 8.14.3 Member Function Documentation

#### 8.14.3.1 is\_correct\_factory()

```
bool jeod::FlatPlateThermalAeroFactory::is_correct_factory (
    Facet * facet ) [override]
```

[FlatPlateThermalAeroFactory](#) specific implementation of this function.

If the Facet is of type FlatPlate, returns true. False otherwise

##### Returns

true if facet is a FlatPlate, false otherwise

##### Parameters

in	<i>facet</i>	The facet to check
----	--------------	--------------------

Definition at line 61 of file flat\_plate\_thermal\_aero\_factory.cc.

#### 8.14.3.2 operator=()

```
FlatPlateThermalAeroFactory& jeod::FlatPlateThermalAeroFactory::operator= (
    const FlatPlateThermalAeroFactory & ) [delete]
```

### 8.14.4 Friends And Related Function Documentation



#### 8.14.4.1 init\_attrjeod\_\_FlatPlateThermalAeroFactory

```
void init_attrjeod__FlatPlateThermalAeroFactory ( ) [friend]
```

#### 8.14.4.2 InputProcessor

```
friend class InputProcessor [friend]
```

Definition at line 83 of file flat\_plate\_thermal\_aero\_factory.hh.

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

- [flat\\_plate\\_thermal\\_aero\\_factory.hh](#)
- [flat\\_plate\\_thermal\\_aero\\_factory.cc](#)



## Chapter 9

# File Documentation

### 9.1 `aero_drag.cc` File Reference

Orbital aerodynamic force and torque computation, and related classes.

```
#include <cmath>
#include <cstdlib>
#include "environment/atmosphere/base_atmos/include/atmosphere.hh"
#include "environment/atmosphere/base_atmos/include/atmosphere_state.hh"
#include "utils/math/include/vector3.hh"
#include "../include/aero_drag.hh"
#include "../include/aero_facet.hh"
#include "../include/aero_surface.hh"
#include "../include/aerodynamics_messages.hh"
```

#### Namespaces

- [jeod](#)

*Namespace jeod.*

#### 9.1.1 Detailed Description

Orbital aerodynamic force and torque computation, and related classes.

### 9.2 `aero_drag.hh` File Reference

Orbital aerodynamics paramter definitions and the main class for calculating aerodynamic drag.

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

## Data Structures

- class [jeod::AeroDragEnum](#)  
*Contains enumerations associated with aerodynamic drag.*
- class [jeod::AeroDragParameters](#)  
*Contains parameters associated with aerodynamic drag.*
- class [jeod::AerodynamicDrag](#)  
*The main class for calculating aerodynamic drag.*

## Namespaces

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

### 9.2.1 Detailed Description

Orbital aerodynamics paramter definitions and the main class for calculating aerodynamic drag.

## 9.3 `aero_facet.hh` File Reference

Individual facets for use with aero environment interaction models.

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

## Data Structures

- class [jeod::AeroFacet](#)  
*An aerodynamic interaction specific facet for use in the surface model.*

## Namespaces

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

### 9.3.1 Detailed Description

Individual facets for use with aero environment interaction models.

## 9.4 `aero_model.cc` File Reference

```
#include "interactions/aerodynamics/include/aero_drag.hh"  
#include "../include/aero_model.hh"
```

## Namespaces

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

## Macros

- `#define` [JEOD\\_FRIEND\\_CLASS](#) AerodynamicDrag\_aero\_model\_default\_data

### 9.4.1 Macro Definition Documentation

#### 9.4.1.1 JEOD\_FRIEND\_CLASS

```
#define JEOD_FRIEND_CLASS AerodynamicDrag_aero_model_default_data
```

Definition at line 16 of file aero\_model.cc.

## 9.5 aero\_model.hh File Reference

### Data Structures

- class [jeod::AerodynamicDrag\\_aero\\_model\\_default\\_data](#)

### Namespaces

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

## 9.6 aero\_params.hh File Reference

A virtual base class for aero facet parameters, used to create interaction facets for aero in the InteractionSurface↔Factorys.

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

### Data Structures

- class [jeod::AeroParams](#)  
*A base class for all aerodynamic parameters used in the surface model.*

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.6.1 Detailed Description

A virtual base class for aero facet parameters, used to create interaction facets for aero in the InteractionSurface↔Factorys.

## 9.7 aero\_surface.cc File Reference

Vehicle surface model for the aerodynamic interaction models.

```
#include <cstdint>
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/surface_model/include/facet.hh"
#include "utils/surface_model/include/interaction_facet_factory.hh"
#include "../include/aero_facet.hh"
#include "../include/aero_surface.hh"
#include "../include/aerodynamics_messages.hh"
```

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.7.1 Detailed Description

Vehicle surface model for the aerodynamic interaction models.

## 9.8 aero\_surface.hh File Reference

Vehicle surface model for aerodynamics.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "utils/surface_model/include/interaction_surface.hh"
#include "aero_facet.hh"
#include "utils/surface_model/include/facet.hh"
```

## Data Structures

- class [jeod::AeroSurface](#)

*The aerodynamic specific interaction surface, for use with the surface model.*

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.8.1 Detailed Description

Vehicle surface model for aerodynamics.

## 9.9 aero\_surface\_factory.cc File Reference

Factory that creates an aerodynamics surface, from a surface model.

```
#include <cstdint>
#include "utils/surface_model/include/facet_params.hh"
#include "../include/aero_params.hh"
#include "../include/aero_surface_factory.hh"
#include "../include/aerodynamics_messages.hh"
```

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.9.1 Detailed Description

Factory that creates an aerodynamics surface, from a surface model.

## 9.10 aero\_surface\_factory.hh File Reference

Factory that creates an aerodynamic interaction surface from a surface model.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "utils/surface_model/include/interaction_surface_factory.hh"
#include "flat_plate_aero_factory.hh"
#include "flat_plate_thermal_aero_factory.hh"
```

## Data Structures

- class [jeod::AeroSurfaceFactory](#)

*The surface factory that creates an aerodynamic specific surface from a general surface.*

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.10.1 Detailed Description

Factory that creates an aerodynamic interaction surface from a surface model.

## 9.11 aerodynamics\_messages.cc File Reference

Implement aerodynamics\_messages.

```
#include "utils/message/include/make_message_code.hh"
#include "../include/aerodynamics_messages.hh"
```

## Namespaces

- [jeod](#)

*Namespace jeod.*

## Macros

- `#define MAKE_AERODYNAMICS_MESSAGE_CODE(id) JEOD_MAKE_MESSAGE_CODE(AerodynamicsMessages, "interactions/aerodynamics/", id)`

### 9.11.1 Detailed Description

Implement aerodynamics\_messages.

### 9.11.2 Macro Definition Documentation

#### 9.11.2.1 MAKE\_AERODYNAMICS\_MESSAGE\_CODE

```
#define MAKE_AERODYNAMICS_MESSAGE_CODE(  
    id ) JEOD_MAKE_MESSAGE_CODE(AerodynamicsMessages, "interactions/aerodynamics/",  
    id)
```

Definition at line 43 of file aerodynamics\_messages.cc.



## 9.12 aerodynamics\_messages.hh File Reference

Aerodynamics message for message handling.

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

### Data Structures

- class [jeod::AerodynamicsMessages](#)  
*Messages associated with use of the aerodynamics model.*

### Namespaces

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

#### 9.12.1 Detailed Description

Aerodynamics message for message handling.

## 9.13 class\_declarations.hh File Reference

Forward declaration of classes defined in the aerodynamics package.

### Namespaces

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

#### 9.13.1 Detailed Description

Forward declaration of classes defined in the aerodynamics package.

## 9.14 default\_aero.cc File Reference

Implement a virtual base class for aerodynamic drag calculations.

```
#include <cmath>
#include "utils/math/include/vector3.hh"
#include "../include/aero_drag.hh"
#include "../include/aerodynamics_messages.hh"
#include "../include/default_aero.hh"
```

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.14.1 Detailed Description

Implement a virtual base class for aerodynamic drag calculations.

Also implement a specific version, in the base class, that contains ballistic coefficient and coefficient of drag options

## 9.15 default\_aero.hh File Reference

An implementation of ballistic coefficient and coefficient of drag for use in the AerodynamicDrag object.

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

## Data Structures

- class [jeod::DefaultAero](#)

*The simple, default, aerodynamic drag model, including coefficient of drag, ballistic coefficient, etc.*

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.15.1 Detailed Description

An implementation of ballistic coefficient and coefficient of drag for use in the AerodynamicDrag object.

This class can be inherited from and overridden for use with the AerodynamicDrag object.

## 9.16 flat\_plate\_aero\_facet.cc File Reference

Individual facets for use with aero environment interaction models.

```
#include <cstdlib>
#include "utils/math/include/vector3.hh"
#include "utils/message/include/message_handler.hh"
#include "utils/surface_model/include/facet.hh"
#include "../include/aerodynamics_messages.hh"
#include "../include/flat_plate_aero_facet.hh"
```

## Namespaces

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

### 9.16.1 Detailed Description

Individual facets for use with aero environment interaction models.

## 9.17 flat\_plate\_aero\_facet.hh File Reference

The aerodynamic specific implementation of flat plate.

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

## Data Structures

- class [jeod::FlatPlateAeroFacet](#)  
*The aerodynamic specific version of a flat plate.*

## Namespaces

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

### 9.17.1 Detailed Description

The aerodynamic specific implementation of flat plate.

## 9.18 flat\_plate\_aero\_factory.cc File Reference

Factory that creates a FlatPlateAeroFacet from a FlatPlate, using a FlatPlateAeroParams object.

```
#include <cstdint>
#include <typeinfo>
#include "utils/math/include/vector3.hh"
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/surface_model/include/facet.hh"
#include "utils/surface_model/include/flat_plate.hh"
#include "utils/surface_model/include/interaction_facet.hh"
#include "../include/aerodynamics_messages.hh"
#include "../include/flat_plate_aero_facet.hh"
#include "../include/flat_plate_aero_factory.hh"
#include "../include/flat_plate_aero_params.hh"
```

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.18.1 Detailed Description

Factory that creates a FlatPlateAeroFacet from a FlatPlate, using a FlatPlateAeroParams object.

## 9.19 flat\_plate\_aero\_factory.hh File Reference

Creates a flat plate aero facet from a basic flat plate facet.

```
#include "utils/sim_interface/include/jeod_class.hh"
#include "utils/surface_model/include/interaction_facet_factory.hh"
#include "flat_plate_aero_facet.hh"
#include "utils/surface_model/include/facet.hh"
```

## Data Structures

- class [jeod::FlatPlateAeroFactory](#)

*Creates a [FlatPlateAeroFacet](#) from a FlatPlate.*

## Namespaces

- [jeod](#)

*Namespace jeod.*

### 9.19.1 Detailed Description

Creates a flat plate aero facet from a basic flat plate facet.

## 9.20 flat\_plate\_aero\_params.hh File Reference

The set of parameters used to create an aerodynamic interaction specific flat plate facet from a general flat plate facet.

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

## Data Structures

- class [jeod::FlatPlateAeroParams](#)  
used in the [FlatPlateAeroFactory](#) to create a [FlatPlateAeroFacet](#).

## Namespaces

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

### 9.20.1 Detailed Description

The set of parameters used to create an aerodynamic interaction specific flat plate facet from a general flat plate facet.

## 9.21 flat\_plate\_thermal\_aero\_factory.cc File Reference

Factory that creates a FlatPlateAeroFacet from a FlatPlateThermal, using a FlatPlateAeroParams object.

```
#include <typeinfo>
#include "utils/memory/include/jeod_alloc.hh"
#include "utils/surface_model/include/flat_plate_thermal.hh"
#include "../include/aerodynamics_messages.hh"
#include "../include/flat_plate_aero_facet.hh"
#include "../include/flat_plate_aero_params.hh"
#include "../include/flat_plate_thermal_aero_factory.hh"
```

## Namespaces

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

### 9.21.1 Detailed Description

Factory that creates a FlatPlateAeroFacet from a FlatPlateThermal, using a FlatPlateAeroParams object.

## 9.22 flat\_plate\_thermal\_aero\_factory.hh File Reference

Creates a flat plate aero facet from a flat plate thermal facet.

```
#include "flat_plate_aero_factory.hh"
#include "utils/sim_interface/include/jeod_class.hh"
#include "utils/surface_model/include/facet.hh"
#include "utils/surface_model/include/interaction_facet.hh"
#include "utils/surface_model/include/interaction_facet_factory.hh"
```

## Data Structures

- class [jeod::FlatPlateThermalAeroFactory](#)  
*Creates a [FlatPlateAeroFacet](#) from a [FlatPlate](#).*

## Namespaces

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

### 9.22.1 Detailed Description

Creates a flat plate aero facet from a flat plate thermal facet.

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