

Propeller

A propeller rotates around a spinning driveshaft which acts a torque onto the propeller. In the Aerofly FS 2 there are two kinds of propellers: the `propeller` class implements a propeller behavior in a rotating reference frame, attached to a rotating `PropellerBody` ([rigidbody](#)) whilst an `aeropropeller` uses a stationary `Body` and rotates itself. In all default Aerofly FS 2 aircraft only the `propeller` class is used.

Body and EngineRotationSpeed

A `propeller` object will use the velocity of its `Body` ([rigidbody](#)) and the `EngineRotationSpeed` from the [driveshaft](#) and calculate a thrust value from that and a torque value to create that amount of thrust. It then adds that force and torque onto the `Body` which will accelerate/decelerate the body and speed it up or slow it down over time.

Airfoil

The same [airfoil](#) class is used for the [aerowing](#) and the propeller class. Using the properties of the `AirfoilPropeller` it is possible to fine-adjust the torque and thrust produced by the propeller. A typical propeller airfoil is designed for a lift coefficient of about 0.5.

Geometry

R0, X0, Y0, Z0

The position of the propeller hub is defined by the `R0` position vector.

- `X0` is the local forward,
- `Y0` is the local left,
- `Z0` is the local upwards direction.

In the example of the Extra 330 LX below the propeller is slightly angled to the right (side thrust).

Radius

The `Radius` of the propeller class is the physical radius of the actuator disk in meters. When converting from inches to meters simply multiply the radius in inches by 0.0254 m/inch. The radius of the propeller is of course half the diameter, which is usually given in the specifications.

$$\text{Radius} = 0.5 * \text{Diameter}$$

Pitch

The pitch of a propeller is roughly the blade angle at 75% of the radius. The pitch is the distance in meters that the propeller corkscrews through the air in one full rotation (geometrically). If a propeller pitch is given in inches multiply that figure by 0.0254 m/inch to convert it to the meter length unit used here. With a given blade angle (alpha) and a radius r the blade pitch is calculated to:

$$\text{Pitch} = 2 * \pi * r * \tan(\alpha)$$

PitchControl

The name is self-descriptive here. A input can be given to change the pitch of a propeller. That way a constant speed propeller can be controlled by a [governor](#), reversed into beta or reverse thrust or feathered.

AspectRatio

The AspectRatio of a propeller is a factor that can be used to influence the rotationspeed - velocity relation ship. Physically it describes the ratio of the blade radius and the mean chord length of a blade.

Example Code

Simple Fixed Propeller

Caution: Requires a [rigidbody](#) called PropellerBody inside the dynamics section of the [tmd](#).

```
<[string8][object][propeller]
  <[string8][Name][Propeller]>
  <[string8][Body][PropellerBody]>
  <[string8][EngineRotationSpeed][DriveShaft.GetRotationSpeed]>
  <[string8][DamageOnCrash] [Engine.Damage]>
  <[tmvector3d][R0][0.0 0.0 0.0]>
  <[uint32][NumberBlades][2]>
  <[float64][Radius] [1.00]>
  <[float64][Pitch] [1.50]>
  <[string8][PitchControl][0.32]>
  <[float64][AspectRatio] [7.00]>
  <[float64][CutOut] [0.20]>
  <[float64][LateralDragCoefficient] [0.005]>
  <[float64][LateralForceCoefficient][1.000]>
  <[float64][TorqueReduction][0.0]>
>
```

Extra 330 LX - Constant Speed Propeller

Caution: Requires a [rigidbody](#) called PropellerBody as well as an [airfoil](#) object with the name AirfoilPropeller and inside the dynamics section of the [tmd](#).

```
<[string8][object][propeller]
  <[string8][Name][Propeller]>
  <[string8][Body][PropellerBody]>
  <[string8][Airfoil][AirfoilPropeller]>
  <[string8][EngineRotationSpeed][DriveShaft.GetRotationSpeed]>
  <[string8][DamageOnCrash] [Engine.Damage]>
  <[tmvector3d][R0][1.9004 -0.0037 0.0064]>
  <[tmvector3d][X0][0.990279 -0.069798 0.000000]>
  <[tmvector3d][Y0][0.069798 0.990279 -0.000000]>
  <[tmvector3d][Z0][0.000000 0.000000 1.000000]>
  <[uint32][NumberBlades][3]>
  <[float64][Radius] [0.99]>
  <[float64][Pitch] [1.80]>
  <[string8][PitchControl][Governor.Output]>
  <[float64][AspectRatio] [9.00]>
  <[float64][CutOut] [0.20]>
  <[float64][LateralDragCoefficient] [0.005]>
  <[float64][LateralForceCoefficient][1.000]>
  <[float64][TorqueReduction][0.0]>
>
```

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