

Kerbal Space Program - Feedback #23330

Reduce the offsets in forces on Propeller Blades

08/12/2019 07:55 AM - Anonymous

Status:	New		
Severity:	Low		
Assignee:			
Category:	Physics		
Target version:			
Version:	1.7.3	Language:	English (US)
Platform:	Windows	Mod Related:	No
Expansion:	Breaking Ground		

Description

The aerodynamic forces on propeller blades seem to be calculated using the relative airspeeds at points beyond the tips. Then those forces seem to be applied at points very near the root of each blade.

If the velocity of the part is different at the point where the force is applied, compared to where the force is calculated, then a damping force can turn into an accelerating force. The attached example displaces the blades slightly so that the roots move slightly in the opposite direction of the tips, creating a perpetual-motion prop that is driven by prop drag once it is started.

More subtle exploits of this loophole use props in normal position, along with regular aerodynamic surfaces (<https://kerbalx.com/ZobrAz/plane-Glitch-Glider>) letting normal aerodynamic surfaces act as a windmill, with forces applied to the center of the part, produce enough torque to overcome the very small back-torque of the Propeller Blades that apply their forces near the rotor pivot.

Another artifact of shifting the point where forces are applied, is the reduction of torques on props from side-wind. A helicopter drifting sideways, would usually have the blades moving into the drift be lifted more, causing the helicopter to tilt away from the drift and stop the motion. This is the effect that makes helicopters start to swing. KSP helicopters with normal elevons show this effect, but those with Helicopter Blades do not, because the forces are applied to the root so do not tilt the rotor.

The aerodynamic forces could be applied at the same points where the airspeeds are computed, to restore physical consistency. The back-torque from drag would increase, but the custom lift and drag curves for the new Propeller Blades and Helicopter Blades could further reduce the drag coefficient to compensate.

Files

PerpetualMotion.craft

38.9 KB

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