

Kerbal Space Program - Bug #23290

Helicopter rotor blades behave erratically on Eve

07/31/2019 06:53 PM - Brikoleur

Status:	Confirmed	Start date:	07/31/2019
Severity:	Low	% Done:	10%
Assignee:			
Category:	Physics		
Target version:			
Version:	1.7.3	Language:	English (US)
Platform:	Windows	Mod Related:	No
Expansion:	Breaking Ground		

Description

To reproduce:

- 1 Launch the supplied .craft file from Eve surface (ca 500 m altitude) and enable aero overlay
- 2 Engage motor (action 1), increase collective to about 70% (up/down), set RPM limit to 80 (forward/back)
- 3 Set SAS to radial out
- 4 Take off by increasing throttle
 - Observed: Craft takes off as intended
- 5 Gradually increase RPM limit
 - Observed: Thrust/lift from the lower rotor starts flipping between up and down until it stabilises to point down canceling out the upper rotor; at some point frame rate drops to single digits

History

#1 - 08/03/2019 02:14 PM - Geschoskopf

- Subject changed from *Helicopter rotor blades behave erratically on Eve* to *Motorless Rotors/Servos are Not Frictionless (was Helicopter rotor blades behave erratically on Eve)*

- Status changed from *New* to *Confirmed*

- % Done changed from *0* to *10*

If you could provide a mission with this craft already on Eve, I'd appreciate it. That way, I could test this in a pure stock+DLC installation.

I did test this craft on Kerbin and never got the lift vector switch. HOWEVER, I have seen such a switch on Kerbin with some of my own designs. The underlying cause is that motorless servos/rotors are no longer frictionless bearings. Thus, the top and bottom halves of a powered rotor sitting on such a "bearing" do not rotate at the same speeds. The blades closest to the "bearing" are always slower than the others. This results in the following behaviors:

- Contra-rotation using 1 powered and 1 unpowered rotor no longer totally cancel torque. Observe that your craft here will roll about its longitudinal axis even in space with the blades flat and no aerodynamic forces being generated at all.
- Because the blades are moving at different speeds relative to the air, they require different amounts of pitch to provide the same thrust. For a certain combination of blade speed, blade pitch, and air density, thrust always reverses for any set of blades.

That's why this happens. Because the blades are moving at different speeds but have the same pitch (the set closest to the "bearing" is always slightly slower), the slower, lower set reaches this critical situation and reverses thrust.

So, this is not a bug with rotors, it's a bug with motorless rotors/servos no longer being frictionless. This is particularly crippling for autogyros.

#2 - 08/03/2019 06:29 PM - Brikoleur

- File *Eve Mission.zip* added

The problem doesn't manifest on Kerbin. I think it has to do with the thick atmosphere on Eve. I'll attach a mission that starts on Eve.

I'm not sure about your diagnosis however, I think it might be a separate issue. The vectors flip back and forth abruptly like a sign got reversed; there is also the framerate slowdown to single digits.

#3 - 08/12/2019 06:28 AM - Anonymous

- Tracker changed from *Bug* to *Feedback*

- Subject changed from *Motorless Rotors/Servos are Not Frictionless (was Helicopter rotor blades behave erratically on Eve)* to *Helicopter rotor blades*

behave erratically on Eve

- *Start date deleted (07/31/2019)*

I can confirm the strange reversal of lift, using the mission file attached earlier.
You can see the lift change sign, on all blades simultaneously, even with collective set very near zero blade-pitch.
The alt-F12 option to show lift in right-click menus shows the same reversal of sign as do the alt-F12 lift vectors.

I cannot see any significant friction (mentioned in the comment above) in the free rotor in the design attached above, nor in my own free-rotating pairs of counter-rotating props. So, I suppose we should put the title back to describe the problem that the attachments demonstrate.

#4 - 08/13/2019 03:32 AM - Anonymous

- *Tracker changed from Feedback to Bug*

- *Start date set to 07/31/2019*

- *% Done set to 10*

Files

BAK-9802F Gaudium.craft	76.2 KB	07/31/2019	Brikoleur
Eve Mission.zip	826 KB	08/03/2019	Brikoleur