Unequality of mutual actions and powers exchanged between solids S_6 et $S_7^k n$

Mutual actions between both solids

It is interesting to note following both expressions :

$$T\left(S_6 \overset{C}{\rightarrow} S_7^k n / R_0 , A_7^k n\right) = _{A_7^k n}\begin{pmatrix} \frac{Mg}{8}.\vec{X}_0 \\ 0 \end{pmatrix}$$

and

$$T\left(S_7^k n \overset{C}{\rightarrow} S_6 / R_0 , A_7^k n\right) = _{A_7^k n}\begin{pmatrix} \frac{rMg}{8R}.\vec{Y}_1 n \\ 0 \end{pmatrix}$$

The unequality is due to the state of permanent instability of the engine. We notice that vectors action and reaction to contact points $A_7^k n$

- are not equal in module,
- form a variable angle during the rotation.

We have the following unequality: r<<R, where in points $A_7^k n$.

$$|\vec{F}| \left\{S_6 \overset{C}{\rightarrow} S_7^k n / R_0 , A_7^k n\right\} \gg |\vec{F}| \left\{S_7^k n \overset{C}{\rightarrow} S_6 / R_0 , A_7^k n\right\}$$

The punctual speed of points $A_7^k n$ is equal to $\vec{V}_{A_7^k n} = R\,\Omega \cdot \vec{Y}_1 n$. In point $A_7^k 1$, we can write: $\vec{V}_{A_7^k 1} = R\,\Omega_{12}^0\ \vec{Y}_1 1 = R\ \Omega_{12}^0\ \left[-\sin(\Omega_{12}^0 \cdot t)\vec{X}_0 + \cos(\Omega_{12}^0 \cdot t)\vec{Y}_0\right]$.

The instant power exchanged at time t in the point $A_7^k 1$ is then equal to:

$$P_{A_7^k 1}(S_7^k 1 \overset{C}{\rightarrow} S_6 , t) + P_{A_7^k 1}(S_6 \overset{C}{\rightarrow} S_7^k 1 , t) = \left[\frac{rMg}{8R}.\vec{Y}_1 1 + \frac{Mg}{8}.\vec{X}_0\right] \cdot \vec{V}_{A_7^k 1}$$

$$P_{A_7^k 1}(S_7^k 1 \overset{\leftarrow}{\rightarrow} S_6 , t) = \Omega_{12}^0 \left[\frac{rMg}{8} - \frac{RMg}{8}\sin(\Omega_{12}^0 t)\right] \neq 0$$

This expression shows that the Newton's 3rd law is violated in the particular point $A_7^k 1$.

From this formula, we can show that at the instant t of the cycle, the power transmitted in the point $A_7^k 1$ fluctuates around a constant value. The maximum value of the power, when $\Omega_{12}^0 \cdot t = \frac{3\pi}{2}$, is worth :

$$P_{A_7^k 1}\left(S_7^k 1 \overset{\leftarrow}{\rightarrow} S_6 , t = \frac{3\pi}{2\,\Omega_{12}^0}\right) = \Omega_{12}^0 \left[\frac{rMg}{8} + \frac{RMg}{8}\right] > 0$$

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