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## 直升机尾传动系统扭转振动建模与特性

### Torsional vibration characteristics analyzing and modeling for helicopter tail drive system

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中文关键词: [直升机](#) [尾传动系统](#) [扭转振动](#) [轴段和圆盘](#) [多支点传动轴](#) [数值积分法](#)

英文关键词: [helicopter](#) [tail drive system](#) [torsional vibration](#) [shaft segment and disk](#) [multi-supporting drive shaft](#) [numerical integration method](#)

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中文摘要:

将直升机传动系统简化为轴段和当量圆盘的串联系统,建立了直升机尾传动系统扭转振动的等效多自由度动力学模型.模型中考虑了啮合齿轮对的综合啮合误差激励和尾减齿轮的啮合刚度.针对系统的扭转动力学方程,求得了系统的扭转振动响应,分析了直升机尾传动系统在轴的不同扭转刚度和齿轮的不同啮合刚度下的扭转振动的特性,结果表明:与尾斜轴相联的当量圆盘的扭转角位移始终比与水平轴相联的当量圆盘的扭转角位移的数值大,即与尾斜轴相联的尾减输出齿轮振动大于输入齿轮;当轴的扭转刚度变化时,水平轴相联的当量圆盘与尾斜轴相联的当量圆盘的扭转角位移变化的趋势相反;啮合刚度对系统扭转角位移的影响比较大,在建模时应当给予重视.

英文摘要:

The helicopter tail drive system was simplified to a series system with shaft section and equivalent disk. A equivalent dynamic analysis model with multiple degrees of freedom, in which the transmission error of meshing gear pair and meshing stiffness of tail-decelerated gear were included, was established for this simplified helicopter tail drive system. According to the torsional dynamics equation of helicopter tail drive system, the torsional vibration response of system was obtained, and the torsional vibration characteristics of the system with different torsional stiffness of the shaft and meshing stiffness of the gear were discussed. The following conclusions may be drawn from the analysis result. The torsional displacement of tail rotor is larger than the torsional displacement of driven gear of tail gearbox, namely the vibration response of output gear of tail gear box is larger than the input gear. The variation tendency is opposite of the torsional angle displacement between the equivalent disk connected to the horizontal shaft and oblique shaft respectively. The meshing stiffness has more influence on the system than the shaft torsional stiffness, it should be taken account into the modeling of helicopter tail drive system.

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