航空学报 » 2006, Vol. 27 » Issue (5) :763-767 DOI:



# 电控旋翼稳态操纵响应研究

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# Investigation of the Steady Control Response of Electrically Controlled Rotor

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**摘要** 电控旋翼是于21世纪初提出的一种新概念旋翼系统。为探索其操纵规律,首先给出电控旋翼的理论计算模型。以此为基础,对SA349基准电控旋翼的稳态操纵响应进行了计算分析。得出结论:(1)襟翼操纵可有效改变桨叶桨距,时滞约为1/10旋转周期;(2)前飞状态下,襟翼总距操纵会产生周期变距效应;(3)襟翼周期变距操纵响应与传统旋翼类似。在原理性电控旋翼系统上,进行了悬停和前飞状态下襟翼的总距和周期变距操纵试验。通过对操纵响应试验结果的对比分析,证明了理论计算模型的正确性,同时也说明电控旋翼完全可用于旋翼操纵。

**关键词:** 电控旋翼 襟翼 操纵响应 总距 周期变距

**Abstract:** The Electrically Controlled Rotor (ECR), or the so-called swashplateless rotor, is a new concept rotor system brought out at the beginning of the 21st century. To explore the control rules of ECR, first an aeroelastics analysis model is built up. Based on the model, research of the steady control response of SA349 baseline ECR is conducted. The following conclusions are reached: (1) ECR flap control can effectively change the blade pitch, and the time lag is about 0.1 rotary cycle; (2) In the forward flight, the flap collective control will cause significant blade cyclic pitch change; (3) The blade response of flap cyclic control is just similar to that of the conventional rotor. The flap collective and cyclic control experiments are also carried out at a set of testing ECR system. The tests results show good forecast ability of the ECR analysis model and the feasibility of ECR in the practical rotor control.

**Keywords:** electrically controlled rotor flap control response collective pitch cyclic pitch

Received 2005-01-11; published 2006-10-25

**引用本文**:

陆洋;王浩文;高正. 电控旋翼稳态操纵响应研究[J]. 航空学报, 2006, 27(5): 763-767.

LU Yang;WANG Hao-wen;GAO Zheng. Investigation of the Steady Control Response of Electrically Controlled Rotor[J]. Acta Aeronautica et Astronautica Sinica, 2006, 27(5): 763-767.