Design and Testing of a Pan-Tilt Mechanism for Severe Environments

by
Nathan Mills

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Abstract

U.S. Navy ships have non-rotating radar and electronic warfare devices installed, which are often supported and trained by two-axis gimbals. In current shipboard solutions the payloads are often placed on a platform above the gimbal drive train, which results in high moment loads on drive components during a wave impact. As the payloads grow in size, the moment grows as well, and the current gimbal design is insufficient to support some payload geometries. This thesis presents a novel design for a low-mass two-axis machine that supports large payloads without large impact moments by locating the center of action along the axis of rotation. A functional prototype intended for shipboard installation was manufactured, assembled, and characterized in laboratory tests. The prototype was also subjected to environmental testing to military standards for temperature, vibration, and shock. Future improvements in machine function, promising areas for optimization, and an initial direction for taking the machine from prototype to product are presented.

Thesis Supervisor: Alex Slocum
Title: Pappalardo Professor of Mechanical Engineering