The Electronic Journal of Linear Algebra.
A publication of the International Linear Algebra Society.
Volume 5, pp. 53-66, March 1999.
ISSN 1081-3810. http://math.technion.ac.il/iic/ela

ELA

STRONGLY STABLE GYROSCOPIC SYSTEMS*

PETER LANCASTER†

Abstract. Here, gyroscopic systems are time-invariant systems for which motions can be characterized by properties of a matrix pencil $L(\lambda) = \lambda^2 I + \lambda G - C$, where $G^T = -G$ and $C > 0$. A strong stability condition is known which depends only on $|G|$ $(= (G^T G)^{1/2} \geq 0)$ and C. If a system with coefficients G_0 and C satisfies this condition then all systems with the same C and with a G satisfying $|G| \geq |G_0|$ are also strongly stable. In order to develop a sense of those variations in G_0 which are admissible (preserve strong stability), the class of real skew-symmetric matrices G for which this inequality holds is investigated, and also those G for which $|G| = |G_0|$.

Key words. Gyroscopic systems. Stability. Skew-symmetric matrices.

AMS subject classifications. 47A56, 15A22

*Received by the editors on 1 May 1998. Accepted for publication on 18 January 1999. Handling Editor: Daniel Hershkowitz.

†Department of Mathematics and Statistics, University of Calgary, Calgary, Alberta, Canada T2N 1N4 (lancaste@ucalgary.ca). Research supported in part by a grant from the Natural Sciences and Engineering Research Council of Canada.