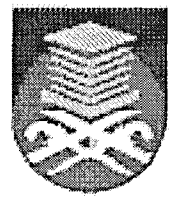
# NATURAL FREQUENCY ANALYSIS OF A LIGHT WEIGHT BOX STRUCTURE



**INSTITUT PENYELIDIKAN, PEMBANGUNAN DAN PENGKOMERSILAN**
**UNIVERSITI TEKNOLOGI MARA**
**40450 SHAH ALAM, SELANGOR**
**MALAYSIA**

**BY:**

**SAHRIL BIN KUSHAIRI**
**KAUSALYAH VENKATASON**

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UNIVERSITI TEKNOLOGI MARA
Institut Penyelidikan, Pembangunan dan Pengkomersilan (IRDC)
*Institute of Research, Development and Commercialisation (IRDC)*
*(Sebelum ini dikenali sebagai Biro Penyelidikan dan Perundingan)*
40450 Shah Alam, Malaysia
Website : http//: www.uitm.edu.my/brc

Surat Kami : 600-IRDC/ST 5/3/774
Tarikh : 30 Julai 2004

Encik Mohd Halil Marsuki
Penolong Akauntan
Unit Kewangan Zon 17
Universiti Teknologi MARA
Shah Alam

Tuan

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Sekian, untuk tindakan pihak tuan selanjutnya.

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s.k: 1. Dekan
Fakulti Kejuruteraan Mekanikal.

2. Prof. Madya Dr. Darius Ghnanaraj Solomon
Koordinator URDC
Fakulti Kejuruteraan Mekanikal

3. Encik Sahril Kushairi
Ketua Projek
Fakulti Kejuruteraan Mekanikal

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# NATURAL FREQUENCY ANALYSIS OF A LIGHT WEIGHT BOX STRUCTURE

Sahril Bin Kushairi, Kausalyah Venkatason
Faculty of Mechanical Engineering
Universiti Teknologi MARA
40450 Shah Alam, Selangor, Malaysia.

## ABSTRACT

Vibration is an important aspect to look at, especially for flexible structure. If two systems for example wing and aileron have the same frequency they will feed energy to each other, this is known as flutter. Flutter is a potentially phenomenon that occurs when an aerodynamics surface goes into resonance with another piece of airframe. This situation could lead to catastrophic situation. Thus the key to eliminate flutter is to prevent either the aileron or the wing from feeding vibratory to the other. It may be done by modifying them so that their natural frequencies are different.

Weight saving need to be considered when designing an aircraft. Therefore an aircraft structure including wing must be made light enough for the aircraft to fly. In order to achieve the wing structure are designed so that each part are load bearings. This wing structure is known as light weight box structure. It is basic structure of an aircraft wing.

Investigation on static analysis of a wing box structure was done by W. Kuntjoro during the design phase of aircraft structure, structural analysis employing simple equations is used for interim design evaluation. To evaluate the accuracy of simple classical method for structural design of wing panel in particular the associated formulae were used to analyze the response of the outer wing structure due to the static loading. The wing panel stresses due to an applied concentrated loading were calculated by using practical stress analysis methods. Parallel to that, a finite element analysis and a static experiment were performed to evaluate the performance of the employed practical analysis.

The main theme of the research to be proposed is the dynamic analysis of light weight box structure. A related research on the vibration characteristic of the wing box structure of a tilt rotor system was done by Brunson are examined. The structural analysis and designed in this study are conducted using MSC/NASTRAN finite element code. The analysis is part of the optimization of a composite wing box structure for a civil tilt rotor aircraft.

Another research which looked at the development of a finite-element model of a tilt rotor composite wing box with a tip nacelle was conducted by Clements. Results find out that the sensitivity coefficients of torsion natural frequencies with respect to each parameter are shown to be influenced the magnitude of the parameters.

The proposed research is to find the natural frequency of the light weight box structure using theory, experimental and finite element methods. The light weight box structure to be investigated had been developed by W. Kuntjoro where a preliminary analysis was performed to obtain the stress of the box for a certain loading. Manufacturing of the box consists of conventional sheet metal cutting, metal forming and sheet metal assembly.

The finite element analysis is going to be performed using ANSYS The theoretical analysis will be done base on the available method. This research is to find the natural frequency of the light weight box which has been develop in the FKM UiTM. This structure has gone through strength test (static test). Finding the natural frequency of the structure is necessary in order to understand the structure behavior towards dynamic loading. By doing the experiment and the finite element approach will enable us to understand fully the problem studied. Finally, upon completing this research it will be very useful for us to go deeper into aircraft structure research especially in the area of aero elasticity.