

TECHNICAL BRIEF ABSTRACT SUBMISSION TO PARARI 2019

Submitting Organisation: Defence Science and Technology Group

Title: Applied Weapon Vibration Expertise in Support of Aerospace Explosive Ordnance Safety

Type: Technical Brief

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Presenters:

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CVs: Presenter 1: David Conser works in DSTG's Aerospace Division as the Vibration and Aeroelasticity Science Team Leader. He has over 31 years in ground/flight vibration test and analysis in Defence Aerospace applications. David's work experience covers a broad range of airframe structural integrity and dynamic loading analyses, as well as weapon system integration, vibration characterisation and certification support. These tasks have involved numerous fixed/rotary wing platforms and weapon systems employed within the Australian Defence Force.

Presenter 2: Chris Olorenshaw works for QinetiQ Australia and is currently embedded within DSTG's Vibration and Aeroelasticity Team. He has worked extensively as a vibration engineer, gathering expertise on ADF platforms, weapon systems and their associated Aerospace and Maritime environments. His experience in vibration includes testing, characterising and assessing the structural integrity of military systems under dynamic loads.

Technical Brief Abstract:

The vibration environment present during a weapon's life cycle is of critical importance with respect to explosive ordnance (EO) safety. While research continues to investigate EO/energetic material vulnerability to vibration, prediction of its behaviour to vibration and or a combined thermal/vibration environment remains problematic. Thus environmental testing is the foundation of many EO safety and weapon certification assessments.

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The vibration environment present during transport or deployment vary considerably over the range of operational conditions involved in a weapon's life cycle. To facilitate applicable vibration certification testing, the environments can be measured or more often must be inferred from standards or manufacturer documentation. Military standards, while aiming to be conservative regarding vibration, typically fall short with respect to the currency of data used in their development, the fidelity of the environments provided and their relevance to a specific weapon, platform and associated operational life cycles. As such, standards generally recommend measuring the vibration environment applicable to a life cycle whenever possible. Manufacturer environments may represent what the weapon was designed and certified to, but may not 'cover' its intended life cycle in terms of vibration severity and exposure. These limitations effect the fidelity of subsequent vibration certification test programs and associated 'desk top analyses' and thus, can impact interpretation of manufacturer Safety and Suitability for Service (S³) findings for a weapon's intended service life.

This presentation will discuss Defence Science and Technology Group's support and lesson's learned in the area of vibration characterisation, analysis and testing in support of Australian Defence weapon programs. Both captive carriage and transport vibration experience and insights will be discussed, as will aspects specific to the employment of military standards when addressing vibration environmental requirements and associated certification testing.

The presentation intends to provide a high level awareness of specific and critical vibration matters to improve the EO community's knowledge of the discipline, specifically to support acquisition, sustainment and safety. Understanding and addressing a weapon's vibration life cycle versus associated environmental certification testing and analyses are essential if Objective Quality Evidence is to be obtained and used to establish EO safety for the war fighter.