Executive Summary

This study was initiated to investigate the jet engine noise problem that U.S. Navy and Marine Corps personnel experience on carriers and amphibious assault ships and propose actions to reduce noise in existing and next generation tactical jet aircraft engines.

An overarching finding of this study is the paucity of engineering quality data. Standardized engine noise data to compare the engine noise among different aircraft or among various engines do not exist, and the available data do not correlate Sailor or Marine hearing loss with their respective noise exposure environments. Also, standards do not exist for acquiring engine noise data for tactical aircraft. Although the U.S. Department of Veterans Affairs (VA) is spending over $1 billion per year for hearing loss cases, there are no data to correlate hearing loss claims to flight deck noise exposure. Approximately 28% of the VA hearing loss claims are for the Department of the Navy, but data do not exist on the environment that caused the hearing loss.

Flight deck noise is a serious health risk. The noise levels on Navy flight decks – up to 150+ dB – exceed the ability of currently available hearing protection to attenuate the noise to safe levels for the time that our personnel are exposed to high noise. On a positive note, significant progress is being made in the development of improved hearing protection equipment, such as the deep insert ear plugs which are undergoing a fleet survey onboard USS Dwight D. Eisenhower (CVN-69). However, without better data on noise exposure, both intensity and duration, for personnel exposed to high noise environments the Navy will either over- or under-estimate individual noise exposure risks, and hence the costs for providing the needed hearing protection

Although the noise levels of commercial jet airliners have been decreasing, the noise levels of tactical jet aircraft have not. In all likelihood, tactical jet noise levels have increased as the velocity and airflow from these engines have increased to produce added thrust. There are exceptions, such as the RA-5C which made its last deployment in 1979, which is reported to have had the highest noise level of any Navy tactical jet aircraft. The Navy has not routinely measured aircraft noise and does not maintain a data base of the noise levels of its aircraft. Only limited measurements of flight deck noise have been documented, and the Panel cannot determine if the noise levels on the flight deck are increasing. There has never been a requirement for a maximum noise level in military aircraft, and today the Department of Defense does not have adequate understanding of supersonic jet engine noise to establish a realistic maximum noise requirement.

There will be no single solution for addressing the jet engine noise problem, but for progress to be made a DOD champion for noise reduction needs to be identified. DOD must identify a senior person who will be a strong advocate to organize and focus the work for jet aircraft noise reduction. The solution will require reducing the source noise of supersonic jet engines which requires a long-term research program to understand the fundamental

mechanics of flow-generated noise. These fundamental mechanics are not well understood today, but when fully understood they should provide insight into new techniques for reducing supersonic jet noise. It will also require continuing investment from the Office of Naval Research (ONR) and OPNAV funding support for the Naval Air Systems Command (NAVAIR) hearing protection programs. It will require finding ways to limit the exposure of flight deck personnel to areas of high noise. It will require the development of better procedures to monitor the noise exposure and hearing loss of personnel. It will require further development of noise abatement procedures to minimize the noise footprint around Naval and Marine Air Stations. And finally, it will require more research into the physiological effects of the full spectrum of noise – including low frequency pressure levels – on humans