D50 Engineering Ethics and an Aircraft Crash

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After attending this presentation, attendees will understand that an engineering code of ethics should be a way of life for those practicing the art and science of engineering design. This presentation will show that engineers require sound judgment to interpret how the code would apply to specific circumstances. An example of an injury to a helicopter pilot during a crash that was due to failure to follow through on a recognized hazard will demonstrate the consequences of that failure.

This presentation will impact the forensic science community by educating the community of the need to know that commitment to serving society and attending to the welfare and progress of the majority has the highest priority. When there is a basic ethical dilemma, an engineer has a duty to report to the appropriate authority a possible risk to others from a client or employer failing to follow the engineer's directions. The obligation to report overrides the duty to a client and or employer.

A military helicopter was hovering on station in a combat zone waiting for the rest of the force to arrive when the main coupling between the engine and transmission failed. The crew conducted an autorotation landing resulting in injuries to both crew members. The pilot's injuries required extrication from the aircraft while his copilot was able to exit the aircraft without additional help. The pilot sustained a burst fracture of the L1 vertebral body with sudden onset of paraplegia and bowel and bladder dysfunction.

This military helicopter had been recently upgraded to include a larger engine, a six-blade prop, and new landing gear. This increased both its internal and external gross weight capacity. The design modification company that supplied the upgrade kit recommended that the government include a Voice Warning System (VWS) with the new engine although no location for the VWS was included in the modification drawings and specifications.

The purpose of occupant restraint systems in helicopter crashes is the protection of occupants to increase their probability of survival during crashes and hard landings. Another critical feature in modern helicopters is that seats are designed to reduce lumbar spine loading during hard landings by energy transfer during impact as referenced in the Federal Aviation Regulations (FAR) 14 CFR Section 27.561 and 562.

Each front seat was equipped with a five-point harness and a seat structure that consisted of a crushable box structure and a seat cushion. The crush box was designed to deform and attenuate the kinetic energy of the load as it moves over the stroking distance, thereby transferring the kinetic energy away from the passenger.

Space was limited within the aircraft cockpit so the installers placed the VWS within the crush box. This effectively placed a vertical beam between the top and bottom of the box and defeated its purpose. During an inspection of a test helicopter, the supplier of the upgrade kit verbally recommended to the military that the voice warning box not be located within the crush box structure. No written record was ever made of the conversation and no follow up was done.

This Code of Ethics was not followed by the modification kit supplier engineer in charge or other personnel present who had observed the dangerous installation location of the VWS in the test helicopter and did not take any steps to remedy the defective condition.

Alerting the intended users and purchasers of the helicopter of this dangerous condition is an expected industry standard, as is also the correction of the problem.

Ethics, Helicopter, Crush Box