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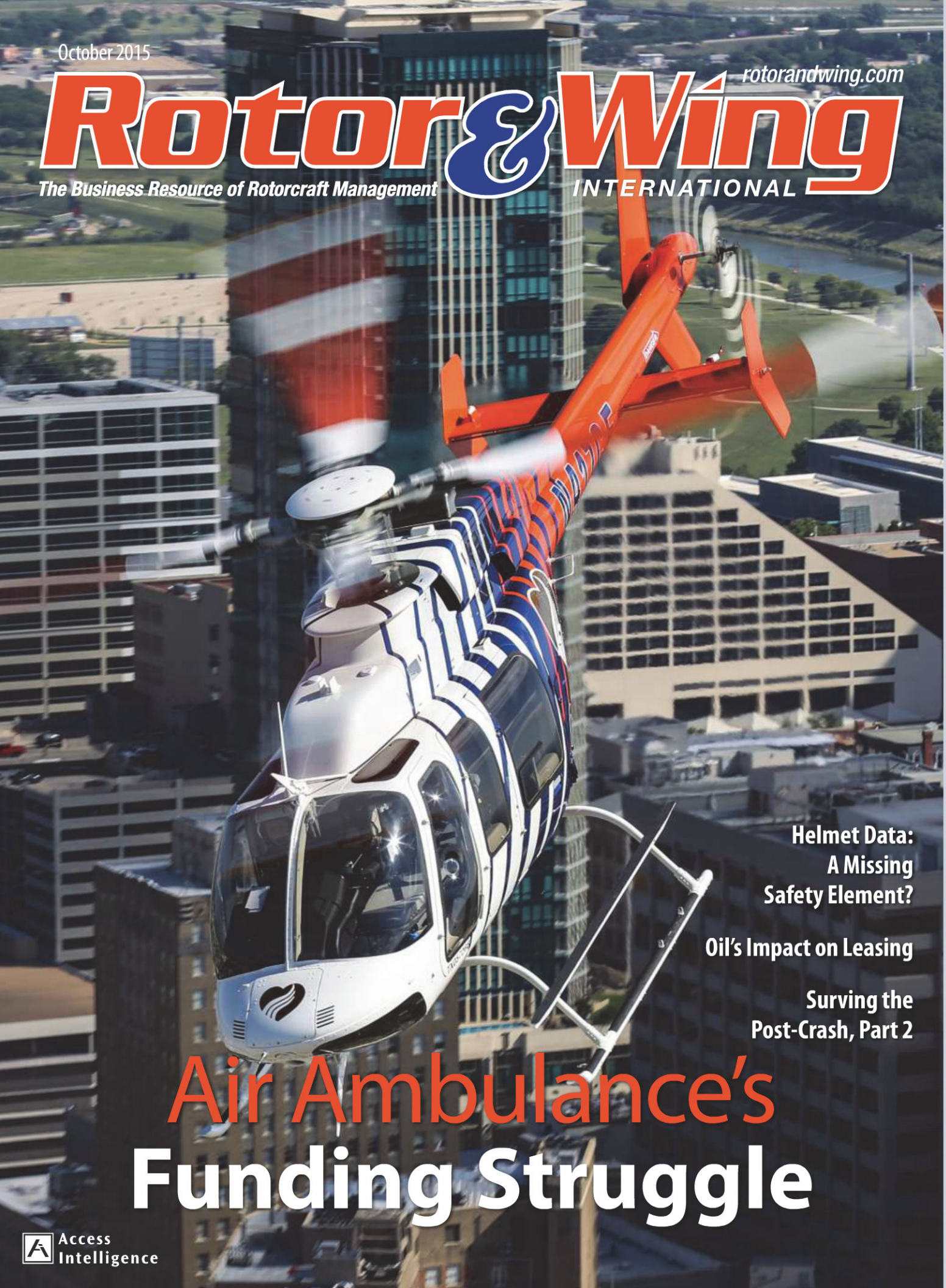


Helmet Data: A Missing Safety Element?

Oil's Impact on Leasing

Surving the Post-Crash, Part 2

Air Ambulance's Funding Struggle

Access Intelligence

Meet the Contributors

JAMES T. MCKENNA

An aviation journalist for more than 25 years, James T. McKenna served as *R&WI's* editor-in-chief from 2003 to 2008. He then worked on communications projects for Bell Helicopter and numerous consulting clients, including the Aerospace Industries Association, Helicopter Association International and AHS International. He has completed aircraft accident investigator courses of the U.S. National Transportation Safety Board and the Air Line Pilots Association and the NTSB's crisis communications course.

JOSEPH AMBROGNE

Joseph Ambrogne is the technical editor of *R&WI*. He earned a bachelor's degree in English from Christopher Newport University in Newport News, Virginia, and spent eight years as a technical writer in the software and manufacturing industries. He holds a commercial pilot license and instrument rating and has been flying helicopters since 2010.

PAT HOST

Associate Editor Pat Host, in five years with our sister publication *Defense Daily*, has developed a stable of inside sources to gain access to sensitive documents and stories that impact readers. He has conducted one-on-one interviews with high-ranking members of Congress and military and executive branch officials, all the while honing the skills to break down official policy statements, memos and complex scientific information and explain their real-world business implications.

REX J. ALEXANDER

Rex Alexander is a 30-year veteran of military, general and commercial helicopter and fixed-wing aviation. Currently a senior consultant, member and co-founder of HeliExperts International, he also serves—among other positions—as a member of the National Fire Protection Assn. committee on the NFPA 418 standard for heliports and HAI's Heliport Committee. He works with the FAA and states, cities and counties on rule making, infrastructure design, research, safety and risk mitigation.

MIKE HANGGE

Mike Hangge is an active-duty U.S. Army warrant officer with an elite aviation unit. With more than 25 years experience, he has performed duties as a mission, medevac, maintenance and developmental pilot. He has received numerous awards, including the Distinguished Flying Cross. He also is a novelist under the pen name mjHangge.

ERNIE STEPHENS

Ernie Stephens, editor-at-large, spent 27 years with a major county police department, retiring as the chief pilot of its aviation section. He began his flying career in the late 1980s when he earned his rotorcraft license and incorporated a small aviation company as a sideline to his law enforcement career. Ernie holds a naste in aeronautical science from Embry-Riddle Aeronautical University, where he is also an assistant professor and former director of academics at one of the school's satellite campuses. He has been writing for *R&WI* since 2003 and has performed evaluation flights in some of the latest, most technologically advanced rotorcraft in the world.

TERRY TERRELL

Terry Terrell gained his early aviation experience as a U.S. Navy fixed-wing instructor and U.S. Coast Guard aircraft commander, his service including search and rescue in Sikorsky S-61s. Terry served as a cross-qualified captain and safety special projects officer with Houston's Transco Energy and later with Atlanta's Kennestone AVSTAT Helicopter Ambulance Program and Georgia Baptist LifeFlight.

FRANK LOMBARDI

An ATP with both fixed-wing and rotary-wing ratings, Frank began his flying career in 1991 after graduating with a bachelor's degree in aerospace engineering. He has worked on various airplane and helicopter programs as a flight test engineer for Grumman Aerospace Corp. Frank became a police officer for a major East Coast police department in 1995 and has been flying helicopters in the department's aviation section since 2000. He remains active in test and evaluation and holds a master's degree in aviation systems flight testing from the University of Tennessee Space Institute.

The Hangman Cometh?

NVG helmet mounts are designed to reduce injuries, but misusing them for convenience may pose risks.

By Rex J. Alexander

NEED TO KNOW

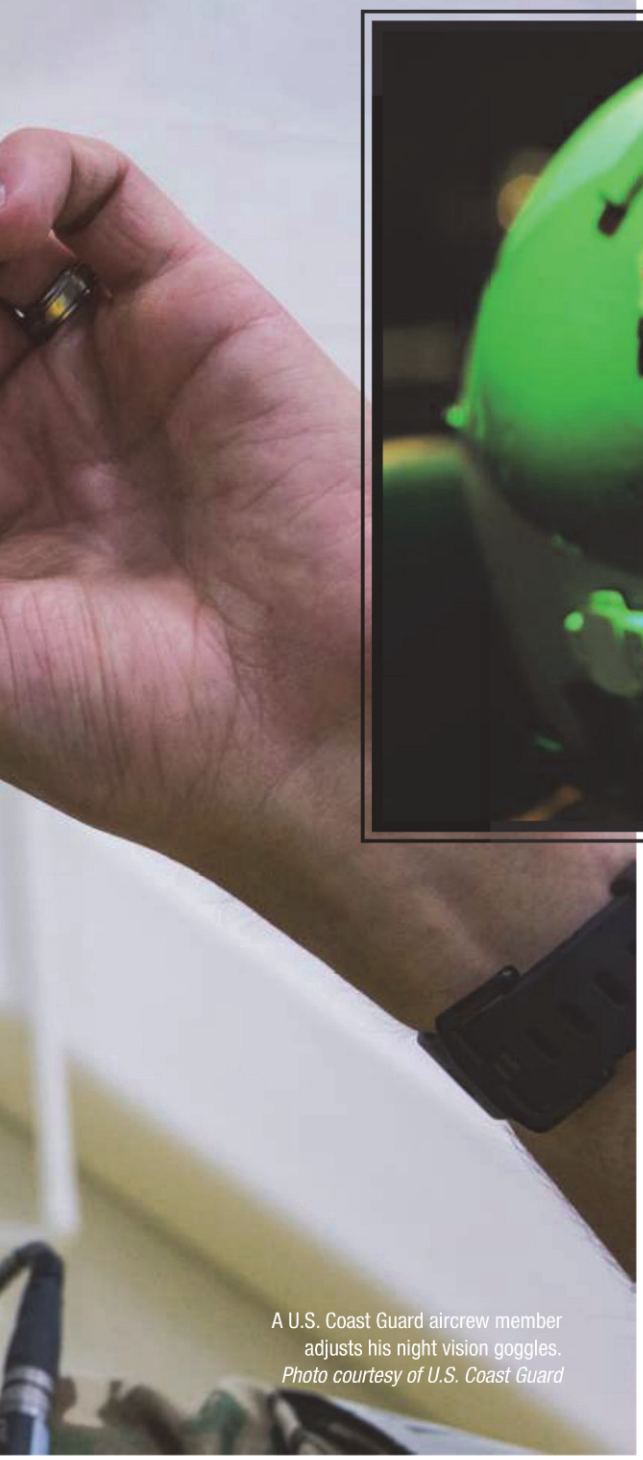
The ITT NVG and U.S. Marine Corps manuals advise against attaching neck cords to helmets.

Improper use of NVG neck cords can result in head, neck or facial injuries.

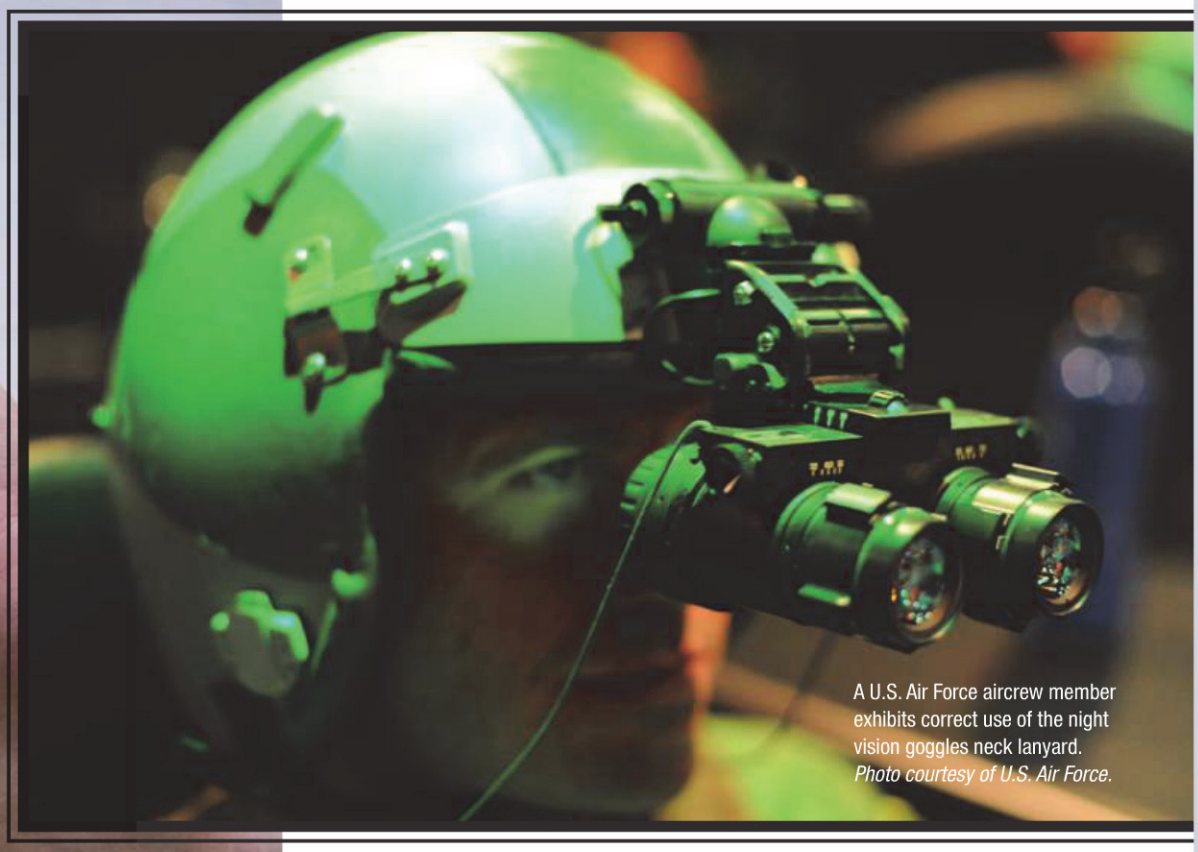
Most military, emergency medical service, search and rescue, law enforcement and firefighting aviation crewmembers today would never consider flying without night vision goggles (NVGs).

As with any technological advancement, however, we must be on guard for unintended consequences of NVG use. One such consequence is the practice of tying the NVG neck lanyard to your flight helmet rather than actually wearing it around your neck.

Having begun my helicopter aviation career in the U.S. Army more than 30 years ago with the AN/PVS-5 "cutaway" NVGs, I respect those who came before me and conducted the original testing with the first-generation, full-face systems. I can only imagine how challenging it must have been to focus one tube into the cockpit to see the instrument panel and one tube out to view the surrounding landscape. Attempting something like a full touchdown autorotation with absolutely no peripheral vision or depth



A U.S. Coast Guard aircrew member adjusts his night vision goggles. *Photo courtesy of U.S. Coast Guard*



A U.S. Air Force aircrew member exhibits correct use of the night vision goggles neck lanyard. *Photo courtesy of U.S. Air Force.*

perception takes a very special kind of chutzpah. When the original NVG full-face and cutaway AN/PVS-5 systems were first fielded, there was little to no available data showing how this new head-supported device was going to affect the wearer. Since then, however, significant efforts toward research and testing have resulted in a great deal of valuable information.

Based on a retrospective analysis by the Army in 1997, individuals using the older AN/PVS-5 goggles were found to have a 162% greater likelihood of suffering a head or neck injury compared to non-NVG users. (The AN/PVS-5s were affixed to the helmet with a Velcro-like fastener and surgical tubing with snaps.) Conversely, individuals wearing the newer ANVIS goggles tended to have a higher (but not significant) risk for injury compared to non-NVG users. The reason for this difference in risk exposure was basically that the newer system had a breakaway, or frangibility, feature incorporated into the helmet. The older system did not.

But using 6.5-lb helmets that incorporated enhanced visual capabilities without overloading the neck in severe crashes posed problems. Therefore, the Army's Night Vision Laboratory at Fort Belvoir, Virginia, developed a spring-loaded, ball-socket mount that allowed the newer-generation, AN/AVS-6 night vision devices to detach during a crash at a goggle deceleration of 10g to 15g.

The critical nature of this mounting was made clear in research published by the Johns Hopkins University Applied Physics Laboratory's Impact Biomechanics Facility in 2005. Primary testing subsets were conducted at 40 fps, or 23.7 kt, which correlates to a peak deceleration of about 26g, or the equivalent of a very hard landing. Of utmost concern to the study's engineers were the two primary shear and tensile forces acting upon the wearer's neck during a horizontal crash

The neck lanyard can pose dangers to pilots who wear it incorrectly (above, left). Proper placement goes around the neck (above, right). *Photos by Rex J. Alexander*

in an impact scenario. These forces are the extension and flexion moments of the wearer's neck. By moving the center of gravity of any head-supported mass toward the top and back of the head in relation to the occipital condyles (the bumps behind the earlobes), the neck flexion moment would be expected to increase, thus increasing the risk of injury.

The ITT NVG operator's manual (TM-F4949-1) warns wearers to not attach the neck cord to the helmet. Doing so would "cause head and neck injuries in a survivable accident." The manual also provides a part number for the neck cord (P/N A3144306) with a description that says the neck cord "attaches to the night vision device," enabling it to be worn around the neck.

The U.S. Marine Corps' Helicopter Night Vision Devices Manual also warns against attaching the neck cord to the helmet. The manual says, "It is strongly recommended that the AN/AVS-6 neck cord not be attached to the helmet in any way," including wrapping the neck cord around the visor housing on top of the helmet. The neck cord should be long enough to allow it to hang around the base of the user's neck, the manual says, adding that securing the AN/AVS-6 to the helmet by means other than the breakaway mount defeats

the mount's purpose and "may cause the user's neck to be exposed to the deceleration forces of the head, helmet, and AN/AVS-6 in a crash." This would increase the risk of neck injury, it says, "even in a minor mishap."

Why then do individuals continue to tie the neck lanyard to their helmets despite research, data and warnings against doing so? Perhaps it is purely for convenience. If you leave the NVG attached when you remove your helmet, you wouldn't have to reattach it when you don the helmet again.

But tying the AN/AVS-6 neck lanyard to the helmet means the lanyard can no longer distribute impact loading from the NVG mass across the wearer's neck during a high-g incident. (Such an incident might be a hard landing; it even might be a simple fall while walking with the helmet on.) Depending where the lanyard is attached (generally the top and aft sections of the helmet visor housing), it would more than likely increase the neck flexion moment, which in turn increases the risk of injury.

If the NVGs manage to separate from the breakaway helmet mount with the neck lanyard attached to the helmet in any way, their mass more than likely would generate a force on the wearer's neck even greater than the older AN/PVS-5 series. This is because the lanyard would transmit the added NVG deceleration forces directly to the point at which it is attached to the helmet. This is very similar to the way a hangman's noose breaks someone's neck.

This practice also increases the potential that the wearer's helmet will be pulled from the head during a high-g incident (due to the increased deceleration forces imparted by the NVGs on the superior/posterior portion of the helmet). Additional concerns include the increased risk of facial injuries should the NVGs not completely clear the front of the helmet and the NVGs hampering of a water egress during an emergency ditching procedure.

Some NVG experts point to recurring physical damage to NVGs when they are tied to helmets that are set down. When a helmet is placed on its crown, it tends to rotate toward the heaviest point, such as the side to which the NVGs are attached. The resulting minor impact can cause costly damage to the goggle tubes and misalignment of their interpupillary adjustment mechanism and focus knobs.

Although current documentation and research highly discourage this practice, there are still organizations that teach and, in some cases, encourage it. In one flight department, an executive staff member recently wrote in a letter responding to a crewmember's safety concern: "The decision was made, and is still being taught today by the Flight Training Department, that the pilot or medical person has the option of securing the lanyard to their helmet, or, around their neck." The staff member said each method has "pros and cons" and individuals are informed of the warning about securing the lanyard to their helmets, "so it is their choice," adding "regardless of where it is secured, the goggles still have the capability to break away under specified g-loads."

I am not aware of published research, documentation or articles that recommend tying the lanyard to the helmet as an acceptable alternative to the manufacturer's recommended practices or describe advantages of doing so.

From a risk management and liability standpoint, the question then becomes: why, given the documented increase for risk in sustaining a neck injury, permanent paralysis or even death, would this practice be acceptable? It all comes down to a conscious and sometimes culturally driven decision to choose convenience over accepted standards and safety practices. However, in this case, doing something just for sake of convenience may spell disaster for the individual wearer even when he or she is involved in a completely benign and survivable incident.