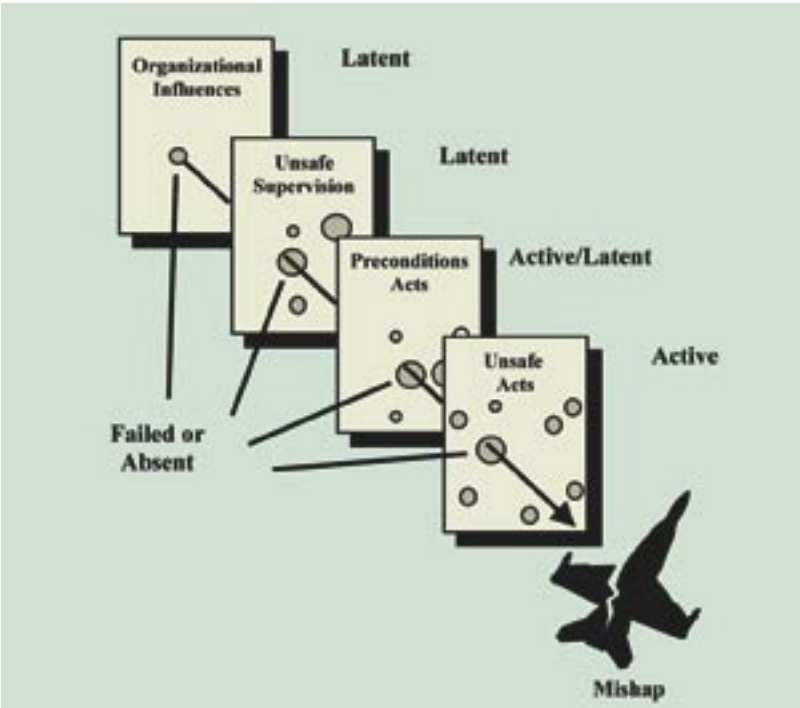
Unsafe Acts *in the* Hornet

By LCdr. Steve Kiggans

Despite intense proactive efforts, the Hornet community continues to struggle to make a significant dent in Class A-mishap rates. As we focus on the root causes of how aircrew have caused mishaps in the recent past, the analysis shows training and equipment upgrades can be improved to permanently reduce overall Hornet mishap rates.

Human-aircrew errors comprise 80 percent of all Hornet Class A mishaps. The Navy's Human Factors Analysis Classification System (HFACS) of accident causation defines the logical progression through which these errors can be traced and causal factors explained. The actual aircrew action that precedes the accident is known as an unsafe act, the final link in the chain. Aviation-mishap boards avoid labeling the unsafe act as the root cause of a mishap. Rather, they look holistically at the deep chain of events where all the holes line up in the Swiss cheese that led to the mishaps. The intent is to give a comprehensive picture of the myriad links in a chain of events. Though comprehensive and thorough, this approach can distract the force from seeing the most definitive events that led to the mishap. The purpose of this article is to be more direct in identifying the reasons why accidents happen in the Hornet community and to get to the root cause of mishaps.

To capture recent trends, Class A mishaps were researched using data from a six-year period, starting in FY2000. Of 65 mishaps, 52 were caused primarily by aircrew. This article attempts to distill each mishap to its primary causal factors by classifying each human-factors mishap strictly by the HFACS unsafe-acts definition of each category. Throughout the research, every effort was made to determine root causes by the aviators' action that led to each mishap. The results are not surprising: They offer a clear view of where the risk is greatest in strike-fighter aviation, and that the focus needs to be placed in the simulators, briefing spaces, ready rooms, and the leaders. By looking at the primary cause of accidents, training and aircraft systems can be optimized to protect our aircrew and aircraft while enhancing combat effectiveness.

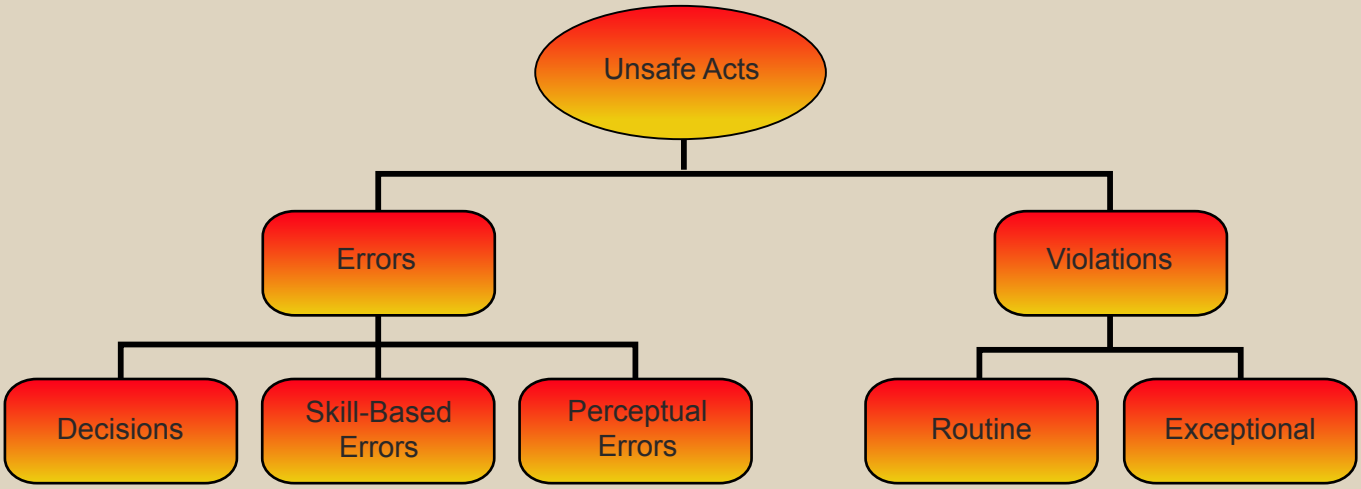


The Swiss Cheese Model

Human Factors Analysis and Classification System (HFACS)

Unsafe Acts

The two types of Hornet unsafe acts specified in HFACS are errors and violations. There are three main causes of errors: skill-based errors, decision errors, and perceptual errors. Violations of rules and regulations define a pilot's action or decision as a willful departure from authority.



Skill-Based Errors (SBE)

Skill-based errors were involved in 73 percent of the human-factors mishaps analyzed over the six-year period. Skill-based errors come from the basic operations of the aircraft: from control manipulation to normal and emergency-procedure execution. Basic skills are defined as all the normal abilities to safely fly your aircraft as a NATOPS-qualified aircrew. The most prevalent skill-based errors, along with the number of occurrences, are listed below:

- Inadequate collision-avoidance scan and procedures - 8
- Departure from controlled flight - 7
- Improper emergency-procedure execution - 5
- Poor CV/runway-environment scan - 3
- Improper power application - 3
- Improper normal-procedure execution - 3
- Inadequate terrain avoidance - 2
- Failure to monitor fuel consumption - 2
- Failure to maintain directional control on runway - 2

The hazard of out-of-control flight (OCF) has been significantly reduced by improved software. In the past, OCF mishaps regularly occurred, but since the flight-control-software change over three years ago, no Hornets have been lost because of OCF. The greatest risk for the community remains the midair-collision threat. Second to that, the proper execution of emergency procedures remains a serious deficiency. Runway accidents indicate a prominent skill deficiency throughout the community, clearly indicating a need for more effective training in admin basics.

Decision Errors

Decision errors are where a seemingly good decision goes bad, a poor decision is made, or where no proper decision takes place at all. These were cited in 37 percent of Hornet Class A mishaps. The most prevalent decision errors, along with the number of occurrences, are listed below:

- Failure to execute timely go-around on runway - 3
- Failure to choose and execute proper emergency procedures - 2
- Continued unstable approach - 2
- Continued below-minimum altitude - 2

Failure to analyze an emergency situation and conduct the proper procedure led to most decision errors. These errors mostly occurred following a brake or landing gear planning-system malfunction. The runway

continues to be where most bad decisions are being made by our pilots.

Perceptual Errors

Perceptual errors were involved in 22 percent of human-factor mishaps. These errors include misjudged distance, altitude or airspeed, as well as instances of spatial disorientation and visual illusions. The most prevalent of perceptual errors, along with the number of occurrences, are listed below:

- Spatial disorientation - 5
- Misperception of landing environment - 2
- Somatogravic illusion - 1

Spatial disorientation is dominant in this category because it is the leading factor that causes midairs and OCF occurrences. Visual misperceptions in the landing environment typically occur in night-carrier and reduced-visibility field operations. The risk of a somatogravic illusion induced controlled-flight-into-terrain (CFIT) remains during night-carrier operations; this problem is the perception of high pitch from acceleration off the catapult.

Violations

Violations were cited in 15 percent of the human factor Class A mishaps studied. Routine and exceptional violations remove established controls put in place to prevent aircrew errors. Although violations may be interpreted into the causal factors of many more mishaps, the eight mishaps noted below were the only ones that listed a violation as a causal factor.

- Standard operation procedure (SOP) violation - 3
- Breaking NATOPS limitations - 3
- Training-rules violation - 2

Other Human Factors in Mishaps

Physiological Factors

Physiological factors are most often a precondition for a mishap in HFACS; however, they realistically can be shown to be the root cause of many accidents. Gravity-induced loss of consciousness (GLOC) and hypoxia continue to kill Hornet pilots. Six Hornets were lost directly because of physiological factors: three to hypoxia, two to GLOC, and one with vertigo as a contributing cause.

Maintenance procedures

Of course, human-factor mishaps are not solely for aviators. The maintenance personnel have had their fair share of mistakes that have led to Class A mishaps. Eight maintenance human-error mishaps, 12 percent of the entire Class A group, were noted. The most prevalent type of human error continues to be "improperly following procedures." Also, two Hornets have been lost to human error by flight-deck personnel in a mishap involving an arresting-gear cross-deck pendant that parted.

How aircrew can prevent accidents

The path to human-error mishap reduction is clear: Training to the hazardous activities that have caused Class A mishaps in the recent past can reduce accidents. Skill-based errors, which overwhelmingly comprise the greatest number of unsafe acts, can be minimized by refocusing on emergency-procedure execution in the safest place they can be practiced: the simulator. The community must enhance frequent emergency-procedure (EP) simulators; the only time to practice handling the toughest situations shouldn't only be on an aviator's annual NATOPS check. Minimizing the risk of midair collisions should become the forefront of any ORM discussion in the flight brief, especially if the flight involves multiplane engagements and basic fighter maneuvering (BFM). Midair collisions are a hazard that must be accepted for mission success on most flights, but flight leads can shape training rules, mission scenarios, and designate reserved altitudes to manage risk.

Decision-making can be enhanced by a reinvigorated focus on NATOPS system knowledge and emergency-procedure (EP) execution. The best method for practicing decision-making and intense CRM is, again, through EP simulator events.

All aviators are susceptible to perceptual errors and physiological factors. With flight proficiency and knowledge of the hazards, the risks can be minimized. The Hornet community needs to continue to incorporate perceptual and physiological hazard discussion into the briefs of hazard-laden flights to make sure every attempt is made to minimize risk and train to the appropriate level.

Conclusion

A thorough understanding of the risks involved will allow Hornet aircrew to make tangible efforts to reduce mishaps. Training, planning, and open discussion of the hazards of midairs, runway emergencies, and disciplined basic-aircraft operations will reduce mishap rates and increase the effectiveness of the force.

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