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Flightfax®

Online newsletter of Army aircraft mishap prevention information

Happy New Year!! In January's edition of Flightfax, we are adding in a new column called the "Flightfax Forum" which will serve to generate professional discussion. The Forum will be published approximately quarterly and will serve to expand our thought process into the "why" instead of just the "what" when covering topics that influence the safety of aviation operations. Please provide us feedback on the new feature or send us topics that are of professional interest to the community.

As many have said, "There are no new lessons, just new Soldiers", and this adage is very evident in the lessons communicated by BG Konitzer in our Blast from the Past article, "The Challenges of Change". The opening paragraph states, "The Army's gone through a lot of it in the past five years. We've become a new force, a smaller force, a force that not only defends the nation militarily but also takes on new, nontraditional missions. And much of the time, we conduct operations as part of a joint and combined force. We've transitioned from a forward-deployed, forward-defense, major-land-war Army to a CONUS-based, contingency-force-oriented, crisis-response Army that must prepare to react to uncertain threats." If we change the wording in this paragraph slightly from a "forward-deployed, forward-defense, major-land-war Army" to "an Army concluding a decade of persistent combat", this article might as well have been written this year. We need to continue the cultural change described in the article where we have clear communications in the chain of command about levels of risk, understanding necessary risk and the approval levels required, and adherence to training standards so that all of our aircrew are proficient at their tasks.

The BG Konitzer's comments compliment perfectly CW4 Edgette's article, "Does the Risk Assessment Worksheet Help You Forecast the Future?" CW4 Edgette outlines best practices for implementing an effective risk assessment and mitigation program with the ERAW as a tool. As always, the ERAW is only the starting point for a risk conversation, and Mission Briefing Officers and Mission Approval Authorities must be actively involved in the process for it to work properly.

Thank you for your selfless service and dedication to this Nation's freedom. Until next month, fly safe and manage your risk levels!

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Does the Risk Assessment Worksheet Help You Forecast the Future?

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Recently I heard the statement: "This was an unavoidable situation for which the crew could not have planned," effectively implying that the accident itself was completely unavoidable. This statement generates the question then, "Where could have or where should have the crew planned for this particular situation/accident?"

According to AR 385-10, The Army Safety Program, all accidents, that are not the result of human error or environmental conditions, must be the result of material or mechanical failure. In these situations (material or mechanical failure) one would tend to agree that the 'crew' or the 'pilots' may not have been able to plan, forecast, or suspect a materiel failure that would result in an accident. However, how could and how does the 'crew' plan/look into the future for human and environmental factors that could cause a situation which ultimately results in an accident?

Currently, Army aviation units utilize a 'Risk Assessment Worksheet' (RAW) to qualify or quantify the level of risk associated with a particular flight/mission. The purpose is to 'mitigate' the risk associated with the particular flight/mission. Mitigating risk is a term where the crew, after listing or checking their associated risk, provide some level of associated risk, either numerically or via a matrix hierarchy, to the briefing officer and ultimately the risk approval officer for flight/mission approval; and, depending on the mission complexity, necessity, and purpose, the briefing and approval officer implement steps or measures to reduce the risk, thereby mitigating the risk to the lowest level possible.

With just about every Combat Aviation Brigade having their own RAW, there are several different versions being utilized within the Army aviation community. Some people believe there should be a standardized RAW to encompass all airframes and all missions, but, this would not allow the 'commander' to manipulate and or modify his/her RAW to accommodate their unit's capability, operational location and mission set. So, as a result, we are left with several different styles of RAWs all aimed at 'mitigating risk.' Or, to say it differently, RAWs are an attempt to look into the future and reduce the risk associated with the mission, paying particular attention to human and environmental conditions that could affect the mission. Yet, how could one forecast the future and mitigate all hazards associated with human and environmental conditions?

A RAW capable of this could potentially be in excess of 50 pages. Since most environmental conditions can generally be forecast and are therefore 'known' (because in order for environmental factors to be causal to an accident they must <u>not</u> be known or forecast) mitigating a mission due to environmental conditions is actually more feasible than not. The mission can be adjusted around the weather conditions or 'rolled' to a later date. This then leaves human factors as the last mitigation item that must be viewed and forecast as potentially occurring in the future on the RAW.

Since human factors are associated and causal in more accidents than are materiel and environmental conditions, it would make sense that we as a community pay particular attention to these factors. If you believe that a RAW capable of depicting all possible future human factors would have to be very lengthy, then how is it that our current RAWs are generally no more than a

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page or two in length?

For one thing, most items on a RAW are and have been derived from lessons learned or as the result of time-proven risk reduction measures. For example, minimum weather categories were originally derived from AR 95-1 legal weather and have been modified to create varying levels of risk: low, medium, and high based on ceiling and visibility.

Originally, you would have seen a category on a RAW that would have assigned a numerical value to a crew/pilot based on night unaided flight and the requirement to carry a flashlight. If the flashlight was present, then the value assigned would be low, but if the flashlight was not available, then the value assigned would be higher. This was probably first added to an initial RAW from lessons learned, night unaided, single pilot, and the inability to read instrumentation during an electrical or battery failure. Eventually though, these types of requirements, like the flashlight, were added to minimum equipment lists or AR 95-1 or to unit SOPs and therefore the need to add to the RAW became unnecessary since it was addressed as a flight requirement elsewhere. This is how we as an aviation community has been able to reduce the human factors/conditions on a RAW to something more manageable than a 50+ page document.

There are implied factors that reside within AR 95-1, SOPs and TTPs that are intended to be followed with regards to human factors and conditions. Still, a regulation, a SOP and/or a TTP are only valuable as guidance and/or a requirement for flight, if everyone knows, understands, and follows the guidance. To simply assume that the SOP and its requirements are known by everyone is incorrect. Human beings forget, confuse one requirement with another and may not even have read the SOP. So to assume that the regulatory requirements and guidance are going to be followed because an SOP or a regulation requires it, and, therefore there is no need to address it on the RAW, sets bad precedence. The professional aviator will make every effort to comply, always, with known rules and regulations and the majority of aviators will make sound decisions based on guidance and regulatory requirements.

Why, then, do human errors and factors account for the vast majority of aviation accidents? Does the RAW help you forecast the future? The answer is no, not always. But the RAW should not be a mere paper shuffle, the swipe of a pencil, or a flight requirement drill. Material factors are difficult to determine and forecast and they account for a small percentage of aviation accidents. Environmental factors are easier to forecast and understandably, by Army safety standards, account for even fewer causal factors contributing to aviation accidents. So what's left is the human factors as expressed on your particular RAW. The ultimate intent for the RAW, as stated above, is to mitigate risk and since the ability to forecast the future is almost an impossibility, just don't pass on the opportunity to interact, on a personal level with your aviators, crews and planners.

Know the mission, intent, and operational necessity from concept to conclusion. Ask tough questions; integrate changes and triggers that have a realistic expectation of mitigating human error and risk. With the advent of the 'eRAW', electronic risk assessment worksheet, we have almost taken the personal interaction out of the equation. Maybe the reiteration of the commander's intent or the value of the mission accomplishment with regards to the bigger picture may be enough to cause a decision to be made during the conduct of mission execution that makes the difference between execution and accident.

Don't try to forecast the future. But don't pencil whip the RAW either. Treat the RAW as a living document. Modify it for your particular mission situation and continually change factors that could affect safe and risky operations. Continue to interact with crews on a human/personal level and pass on experiences from one generation to the next. ◆

STACOM Information

DAC Charles W. Lent
Directorate of Evaluation and Standardization
U.S. Army Aviation Center of Excellence
Fort Rucker, Ala

ATZQ-ES 30 January 2014

MEMORANDUM FOR ALL CONCERNED

SUBJECT: Active STACOM Listing

1. The Directorate of Evaluation and Standardization (DES) publishes Standardization communications (STACOM) to provide guidance to the field and which may precede formal staffing and distribution of Department of the Army official policy.

2. In an effort to ensure the field has the most current information a review of all active STACOMS was conducted. On a recurring basis DES will review and publish a listing of current STACOMS and publish the listing on the AKO portal.

3. The following is a list of active STACOMS:

STACOM #	Date Published	Title
09-01	Apr 09	H60 ATP Guidance
09-03	Aug 09	CH47F ATP Guidance
10-01	Jan 10	LUH PPC and ATM Tasks
10-07	Aug 10	H-60M Series Transition
10-10	Sep 10	Clarification of FM 3-04.11
11-02	Aug 11	SUAS Master Trainer
12-01	Apr 12	UH72 SI FI Qualification Requirements
12-03	Dec 12	AH-64E Series Transition
13-01	Jan 13	CBRN Requirement
13-02	Mar 13	CH47 F Qualification Guidance
13-03	Apr 13	C-12 Torque Limitations
13-05	Jul 13	OH-58D FADEC Training Guidance
13-06	Dec 13	UAS FAD Clarification
14-01	Jan 14	FAC 4

4. All previously published STACOMS not listed above have been rescinded.

5. The POC for this action is DAC Chuck Lent at (334) 255-9098, email charles.w.lent.civ@mail.mil.

PAUL F. DRUSE JR.
CW5, AV
Chief of Standardization

Mishap Review: NTC QRF Support Training

During the conduct of a night emergency landing approach following a suspected fire in flight, the AH-64E encountered brown-out conditions. The aircraft touched down with a right roll resulting in the main rotor blades striking the ground. The aircraft came to rest on its right side with major damage and no injuries to the crew.

History of flight

The mission was a two-ship QRF standby in support of night force-on-force training. The two QRF crews reported for duty at 1230L. The AMC conducted an air mission brief followed by aircraft pre-flight and run-up. The crews assumed standby duties at 1500L. The mission risk was moderate with the task force commander as the final mission approval authority. The weather forecast was for broken sky conditions at 21,000 feet and seven miles visibility. Winds were out of the northwest at 2 knots. Moon illumination was 19 percent with a moonset of 2014L. No watches, advisories, or warnings were in effect.

On its first mission set, the flight departed at 1550L and conducted QRF support missions until returning at 1925L. At approximately 2100L, the team launched again to conduct additional support missions with the accident aircraft in lead position. At 2140L, the lead aircraft experienced a MTADS failure requiring the CPG to fly with NVGs. Additionally, the team conducted a lead change with the accident aircraft moving to Chalk 2. The team continued their reconnaissance mission until 2230L when they broke station to return to home plate.

At 2233L, the crew smelled smoke in the cockpit area accompanied by a severe vibration in the tail rotor pedals. The crew notified their sister ship of the possible fire and began the process of identifying a landing area. Shortly thereafter, the #2 generator failed followed by failures in the night vision systems to both crew stations, loss of the Flight Management Computer (FMC), BUCS, and the pilot displays in both crew stations.

The PC, flying unaided, with degraded flight controls, conducted the approach to a flat, dusty, unimproved area with sparse vegetation. Dust engulfed the aircraft as it touched down. The main rotor blades contacted the ground resulting in the aircraft rolling on its right side. There was extensive damage but no injuries.

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Crewmember experience

The PC, sitting in the back seat, had just over 1,000 hours total flight time, 875 in the AH-64 (135 E model) with over 600 hours combat time. He had accumulated 295 NS hours, 190 NG and 10 night unaided hours. The PI had 288 total hours with 207 in the AH-64 (88 E model); 69 NS/6 NG and 2.4 night unaided.

Commentary

The accident investigation determined the #2 generator malfunctioned due to an internal generator bearing and spline adapter failure. This failure introduced the tail pedal vibrations and produced smoke, which penetrated the crew station through the air particle separator blower. The crew suspected an aircraft fire, anticipated a tail rotor malfunction and began an immediate descent for landing. Additional complications arose when the electrical system failed to complete transfer to the #1 generator power supply resulting in loss of the FMC, night systems, and BUCS. During the night, unaided landing to a dusty environment, the aircraft landed with excessive right cyclic input resulting in the aircraft's main rotor blades striking the ground.

All information contained in this report is for accident prevention use only. Additional information may be found on the CRC RMIS at https://rmis.safety.army.mil/ AKO Password and RMIS Permission required.

Manned Aircraft Class A – C Mishap Table as of 30 Jan 14

	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	1	2	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	0	0	3
	February	0	0	2	0					
	March	2	1	5	6					
3rd Qtr	April	1	1	6	2					
	May	0	0	6	0					
	June	1	1	4	0					
4th Qtr	July	0	0	7	0					
	August	1	1	9	0					
	September	0	1	1	0					
	Total for Year	8	7	58	8	Year to Date	7	1	10	3

Mishap Review: NVG Training Flight

During the conduct of a NVG training mission, the OH-58D experienced a low rotor RPM condition. The aircraft lost altitude and impacted with trees during landing. The aircraft was destroyed from a post-crash fire with no significant injuries to the crew.

History of flight

The mission was a single ship NVG RL Training/Evaluation flight. The instructor pilot reported to work at 1030L. The PI had a show time of 1300L. The IP completed the mission brief/Risk Assessment Worksheet (RAW), which was signed by the mission briefing officer. The mission was assessed as low. The commander approved the mission brief/RAW. Weather was sky conditions broken at 15,000 feet with unrestricted visibility; winds 360/03 knots; temperature 6°C and the altimeter setting was 30.19 in/Hg.

At 1630L, the PI completed the preflight. The crew brief was conducted at 1740L followed by the aircraft run-up, communications check with flight operations, and take-off at 1810L.

Following departure, while en route to the training area, the IP directed a test of the infrared (IR) laser, also known as IZLID. The PI attempted to activate the IR laser three times without success. Due to the concentration of man-made lighting in the area, it was decided to troubleshoot the laser when they arrived in the training area.

At 1833, shortly after turning left to avoid a no-fly area, the accident crew first noticed the aircraft's rotor indicating below 98%. The next indication of a low rotor condition was the sounding of the low rotor audio warning. The IP directed a transfer of the flight controls and reduced collective to restore rotor RPM. The accident crew checked the engine throttle to ensure it was full open. The IP then paused to listen for engine noise, noted the engine was still running, and started searching for a landing area. The rotor RPM then stabilized, but did not returned to 100%. The accident IP then increased collective to arrest his rate of descent and started searching for a landing area. The low rotor audio warning sounded again with the collective being lowered for the second time. The aircraft's rotor system made contact with several trees branches before striking a larger tree as the aircraft settled and came to rest suspended approximately five feet off the ground. From onset of the emergency to contact with the trees was approximately 40 seconds.

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Crewmember experience

The IP, sitting in the left seat, had over 2,500 hours total flight time, 2,300 in the OH-58D with over 800 hours combat time, 600 NG, and 400 IP. The PI had 250 total hours, 170 OH-58D and 39 NG.

Commentary

The accident investigation suspected that during the initial IZLID test, the engine's RPM trim switch was inadvertently activated resulting in a decreased engine RPM reference outside of acceptable limits. In responding to the engine underspeed emergency procedure, the engine trim switch – increase step was not accomplished prior to the aircraft settling into the trees.

All information contained in this report is for accident prevention use only. Additional information may be found on the CRC RMIS at https://rmis.safety.army.mil/ AKO Password and RMIS Permission required.

UAS Class A – C Mishap Table as of 30 Jan 14

	FY 13 UAS Mishaps					FY 14 UAS Mishaps			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	1	1		2
MQ-5	2	0	3	5	Hunter	1			1
RQ-7	0	4	10	14	Shadow		5	1	6
RQ-11					Raven				
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
Aerostat	2	3	1	6	Aerostat	1			1
Total for Year	9	8	20	37	Year to Date	3	6	2	11

The challenges of change Oct 96 *Flightfax*

Change. The Army's gone through a lot of it in the past five years. We've become a new force, a smaller force, a force that not only defends the nation militarily but also takes on new, nontraditional missions. And much of the time, we conduct operations as part of a joint and combined force. We've transitioned from a forward-deployed, forward-defense, major-land-war Army to a CONUS-based, contingency-force-oriented, crisis-response Army that must prepare to react to uncertain threats.

The new reality

All this is now reality. It's not just coming, it's here. The radical changes we're dealing with as well as those we have yet to face require corresponding changes in the way we look at doing our business. Why? Because one thing has not changed: accidents are still a major threat. And, as the Army has shrunk in size even as our missions have grown, every accident has become more expensive not only in terms of manpower and money, but also in terms of readiness. Today, more than ever before, every mission requires precise evaluation, precise planning, and precise execution.

Risk management integration into all three is the key to protecting the force. We have a simple risk management process that we can apply to everything we do. All we have to do when we receive a mission is work the hazards and controls in the five-step process:

Step 1. Identify hazards.
Step 2. Assess hazards.
Step 3. Develop controls and make risk decisions.
Step 4. Implement controls.
Step 5. Supervise and evaluate.

Simple, right? So how come we're not all doing it? It has to do with our culture.

Our cultural dilemma

Some aspects of Army culture effectively exclude the risk management process. After all, risk management leaves no place for:

- The 'Hooah Factor,' the 'We can do anything, anywhere, anytime, at any cost' attitude that's so much a part of our Army culture.
- The need to 'do more with less' mindset.
- Our inbred reluctance to say 'No.'
- Making decisions based on the way we've always done it.
- Letting 'somebody else' worry about the hazards involved in our missions.
- Doing only what we *have to do* and not giving a thought to what we *ought to do,* such as wearing flak jackets in all live-fire training even when it's not required by regulation. In other words, doing the harder right versus the easier wrong. The solution to this cultural dilemma seems to be pretty straightforward: change the culture.

Can we change our culture?

Absolutely we can. And it doesn't have to take forever. We've made some huge changes in our culture during the relatively recent past. We've seen:

-Yesterday's macho image of the hard-drinking, hell-raising soldier replaced by today's image of the responsible, self-disciplined soldier.
- Yesterday's attitude that accidents are simply the cost of doing the Army's business replaced by today's attitude that accidents are neither necessary nor acceptable.
- Yesterday's attitude that high risk is inherent in hard, tough, realistic training replaced by today's

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attitude that risk management enables us to train harder, train tougher, and train even more realistically with less risk.

- Yesterday's acceptance, even celebration, of a Class A accident rate of 5, 8, and even 10 accidents per 100,000 flying hours replaced by today's attitude that a rate of less than 1 is still too high.

So, no, cultural change is not impossible. But it's not going to be easy for a number of reasons.

Barriers to cultural change

Certain of today's realities stand in the way of our easily changing the way we do business. For example:

- **Smaller Army with more missions.** Doing more and more with less and less results in little or no time to learn the lessons of the last mission or to adequately prepare for the next. Leaders and their staffs are so busy that they are off planning the next mission while the troops are executing the current one. There's so much to do, we stay with what we know, '*the way we've always done it.'*
- **Personalities.** We have leaders at all levels whose style it is to say, "I don't want to hear excuses; if you can't do the job, I'll find somebody who can." And there are soldiers of all ranks who simply don't have it in them to tell the boss something he or she doesn't want to hear. And so we are encouraged to stay with what we know, '*the way we've always done it.'*
- **Competition.** It's a hard thing to point out a problem, especially when nobody else is complaining. Doing so could be perceived as whining and give our peers an edge over us. So we go along, staying with what we know, '*the way we've always done it.'*
- **Career aspirations.** Today's Army consists of quality competing with quality. May heaven forbid that leaders become more concerned about their careers than about
their troops, but the opportunity exists. We all have career aspirations and, therefore, walk a cautious line. As a result, we tend to stay with what we know, '*the way we've always done it.'* The Army has experienced significant change, creating a cultural dilemma we must overcome.

How do we do it?

Leaders at all levels are responsible to protect the force. They are required to make unencumbered, *conscious* (vice *unconscious*) decisions to either eliminate hazards or accept risks. The mindsets previously discussed are encumbrances to clear decision making. A standard process linked to proactive leadership can be the effective means to overcome our cultural dilemma. Risk management is that process. When it comes to payoff versus effort, consistent use of the five-step risk management process offers an unparalleled win-win opportunity, a way to get any job done with a clear focus on hazards and controls to mitigate risks. The risk management process gives us a standard procedure, regardless of mission or force mix or location, to deal with today's realities of uncertainty and high optempo, which demand that.

- We know and perform to established standards, every time, in everything. Using our standard five-step risk-management process is a credible way to challenge and eliminate the 'That's the way we do it in *this* unit' mentality and get everybody doing things right to Army standards.
- We make effective communication the norm up and down the chain of command. A by-product of the risk management process will be improved communication as we make it not only *acceptable* but *expected* for everyone involved at every level to articulate to the boss the hazards, controls, and resources required to mitigate the risk of every mission. Risk management becomes the standard way of doing business. It is linking a process with leadership; that's capturing the power of risk management. Consider how it is in the cockpit, where we stress aircrew coordination and cockpit communication. Every crewmember is *expected* to speak up, which eliminates many of the inhibitors to effective communications: rank, age, experience, job, and so forth. Combining this idea with the risk

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management process outside the cockpit would improve communications throughout the chain of command.

- We make good decisions based on facts, not on fear of being perceived as weak or negative. If we all speak the same language and work the same process of risk management, everybody will understand and no one will mistake the articulation of hazards ("Here's the level of risk for this mission (or task), Boss, and I need your help to bring it down to an acceptable level and still accomplish the mission without any loss") for making excuses ("What's the matter? You can't do it?").
- We make it not just *acceptable,* but *mandatory,* to tell the boss "No, we can't do that" when risks are too high. If we work the five-step risk-management process at every level, the yes will come, but only after the risks have been controlled to an acceptable level or someone with the proper authority at the proper level makes a *conscious, fully informed* decision to accept that risk.
- We once and for all destroy the notion that we'll do things differently when the shooting starts, that we'll abandon standards and all that other 'training stuff.' Risk management is not only an enabler to realistic training, its across-the-board, methodical use will be the best method we have of making sure that the only threat we face in combat is the enemy.

Where do we start?

We start by making risk management, identifying hazards, putting controls in place, the standard way we do business in the Army. So, how do we do that? We base it on doctrine. Doctrine is the engine of change in the Army; it drives change not only in training, equipment, and organization but also to a large extent in Army culture, those attitudes and thought processes that make the Army what it is. This being the case, the catalyst for embedding risk management in our culture is already in our doctrine. FM 100-5: *Operations,* our keystone warfighting text, was significantly updated in 1993 to stress the principles we need to learn and understand to maintain the edge in future theaters of war. A key update was the addition of safety as a component of the protection element of combat power. Safety has also been included in joint-operations doctrine since 1995 (Joint Pub 3-0: *Doctrine for Joint Operations*). That doctrine specifies that protection of the force through the integration of safety into all aspects of planning and execution is crucial to successful operations. Just as doctrine and policy changes are capturing the top-down approach to risk-management integration, so too TRADOC is working the bottom-up approach through the integration of risk management into officer, NCO, and civilian schools. All that's left is for the field to shoot to the middle and *just do it*, just integrate risk management into all that we do.

Summary

The Army has done remarkably well in reducing accidents, thus saving lives, especially in the past few years even as global responsibilities have increased. A combination of factors has had a direct impact on this success. First and foremost is proactive leadership at all levels. Second is the fact that we have clear and achievable standards for every individual and collective task soldiers are required to perform. Third is teamwork. It is the essence of how we do business. The fourth is the information flow to enhance communications between decision makers. These four elements are institutionalized throughout our Army today. The fifth ingredient that needs to be institutionalized is a process, the risk-management process. Once embedded as a systems approach to business, we can consistently achieve world-class safety performance. We must embrace risk management as a sound investment in readiness, not as just another 'safety requirement' that has nothing to do with our *real* mission. The true cost of our failure to protect the force through risk management will be paid out of lives and equipment, and thus out of readiness. And that's a price we simply cannot afford to pay.

BG Thomas J. Konitzer, Director of Army Safety and Commanding General, U.S. Army Safety Center from September 1995 to June 1997

Flightfax® Forum Op-ed, Opinions, Ideas, and Information

[Views expressed are to generate professional discussion and are not U.S. Army or USACR/SC policy]

Welcome to a new feature that will appear periodically in Flightfax. The intent of *Flightfax Forum* is to provide the writers and readers of this newsletter an outlet to express ideas, concerns and/or insight to topics that are aviation safety relevant from the user perspective. We welcome your input.

An AH-64D crew experienced a NR exceedence and engine-out warning during RL progression training (DECU Lock-out procedure/task). Crew conducted single-engine landing to the runway. MDR read-out confirmed NR at 120% requiring MRS replacement. ECOD reported at $332K.

Without delving too deeply into exactly what happened in the above incident, a reasonable scenario would be that during an AH-64D DEC (digital electronic control) lockout procedure, the power lever was not retarded in a sufficient manner or time to prevent the engine Np (and associated rotor rpm) from accelerating to the overspeed trigger point. As designed, when the overspeed protection kicked in, the engine shutdown. With the shutdown you get to perform a single-engine landing, terminate training, and seek maintenance action to determine the extent, if any, of damage that may have been incurred. In the above case, it was significant.

From the AH-64D operators manual: *When an Np overspeed condition is sensed (Np meets or exceeds 119.6 ± 1%) a signal from the DEC 701C causes the Overspeed Drain Valve (ODV) to shut off fuel flow to the engine. The engine flames out and does not automatically restart.*

So what am I angling at? A couple things. First, the UH-60L, with the same 701C engine, when the overspeed is triggered and shuts down the engine, it re-lights the engine when the Np drops below the reference and continues the cycle until manual control is gained. I can't think of a good reason for not having the built-in safety capability of a re-light system on all airframes, when it is available.

UH-60L operators manual: *Overspeed protection protects the power turbine from destructive overspeeds. The system is set to trigger at 120% +/- 1% RPM 1 or 2 and will result in a fuel flow shutoff causing the engine to flame out. When % RPM is reduced below the overspeed limit, fuel flow is returned to the engine and engine ignition will come on to provide a re-light. This cycle will continue until the overspeed condition is removed.*

Second point. When the A model Black Hawk first came on line, it had overspeed protection set to trigger around the 106% mark. An activation of the system would not incur exceeding any Np or Nr limitations. It was a great feature. There were few worries when a power lever missed a detent and bumped the overspeed. You reset and went about your business. No harm, no foul. In the event of a real failure, the aircraft would fly fine with the Np/Nr bumping 106% until you could gain control. Here's the rub. When the UH-60A, with the -700 engine, transitioned to the UH-60L, it received several upgrades, including the more powerful 701C engine. One sidebar to the new engine was that the overspeed protection reference point was moved from 106% to the 120% mark. Now , if a Np high-side situation occurs, such as that listed in the opening of this article, the overspeed activates at the 120% mark and you get to terminate your training and complete maintenance actions because you have exceeded limitations. I've asked numerous folks smarter than me (and there are a bunch) why the reference jumped to 120% with the 701C. You'd typically get the Cav salute (that's a shoulder shrug with accompanying hand gestures, if you weren't aware) which inferred they did not know the answer. I developed my own theory based on the no re-light

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capability of the AH-64. Having overspeed protection set at 106%, with an engine that would shut down, would not allow much reaction time for a crew to respond to a high-side failure or training glitch. So it would make sense, without re-light capability, to set the reference higher and allow the crew reaction time to gain control of an engine surging high. Thus, an overspeed trip point at 120% is born. To gain as much commonality between the 701C DECs of the UH and AH required the reset of the previously lower UH-60 reference point to the unnecessarily higher one.

So what is the food for thought? How about this for an idea that should have occurred 30 plus years ago. We put the existing re-light capability found in the UH-60 DEC into the DEC of the AH-64 AND set all the trip points to a number that does not exceed any limitations. The enhancement to safety, training, and reduced maintenance costs is worth the effort.

Robert (Jon) Dickinson

THE 10 COMMANDMENTS OF GOOD CREW COORDINATION

I Aircraft Commanders THINK PEOPLE!
Remember you are working with people who have feelings of worth, need and dignity.

II Aircraft Commanders SET THE TONE!
If you're the director of a one-man band, you won't foster much crew coordination. You, the pilot, set the tone of the crew. If you encourage and are receptive to an exchange of information, you'll probably get it. Also, let each crew member know what you expect of him.

III Aircraft Commanders SOLICIT INFORMATION!
Ask for opinions or suggestions. It's not a sign of command weakness to ask what the other crew members think.

IV Aircraft Commanders USE OTHER CREW MEMBER'S EXPERIENCE!
That old engineer probably has a lot of experience which can help you. Use it.

V Crew Members DON'T BE SHY!
If you've got something bothering you, speak up. You may know something that someone else doesn't know.

VI Crew Members BE PERSISTENT!
Keep the pilot and other crew members informed. Don't let one crew member snuff you out.

VII Crew Members REMEMBER WHO'S IN COMMAND!
Make your input to the boss but remember he makes the final decision.

VIII Aircraft Commanders and Crew Members BE TACTFUL!
Don't close the channels of communication in crew coordination through immature or unprofessional behavior.

IX Aircraft Commanders and Crew Members REINFORCE GOOD COORDINATION!
When your crew flies a successful mission, it involves a lot of successful efforts by your crew and other support people. Reward people for special efforts with a thank you or a letter to their commander. Remember, a small "thank you" goes a long way with the other crew members and team players.

X Aircraft Commanders DON'T SHIRK YOUR RESPONSIBILITY!
Think people; set the tone for crew coordination; solicit information; use experienced people; reinforce good coordination; BUT, remember you must make the final decision and be responsible for it.

—Reprinted from AEROSPACE SAFETY

Flightfax 8 Feb 1978

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in December 2013.

Observation helicopters

OH-58D

-Aircraft was in low-level flight when it experienced a low rotor RPM warning. Crew initiated autorotation and the aircraft descended into trees. Crew egressed and the aircraft was destroyed in a post-crash fire. (Class A)

-Crew experienced a Np exceedence (120.1%/6 sec) during a maintenance test flight to adjust throttle rigging. (Class C)

Utility helicopters

HH-60

-M Series. Post-flight inspection revealed damage to the FLIR lens due to suspected bird strike. (Class C)

Observation helicopters

MH-6M

-Aircraft main rotor blades contacted vehicle during training. Damage reported to all blades and vehicle antenna. (Class C)

Unmanned Aircraft Systems

RQ-20A

-Controller lost link with the system and reported as a total loss. (Class C)

RQ-7B

-Crew experienced an auto-pilot failure and initiated recovery chute deployment. (Class B)

The principle is this: no safety check can ever be routine, no matter how often performed, when the lives of men are involved. It is an insidious temptation to slight checks on regulations when things have been going safely for days - but this is the danger - because it dulls alertness.

Major General Aubrey "Red" Newman Follow ME, 1981

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If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness/Safety Center at com (334) 255-3530; DSN 558

U.S. ARMY COMBAT READINESS/SAFETY CENTER

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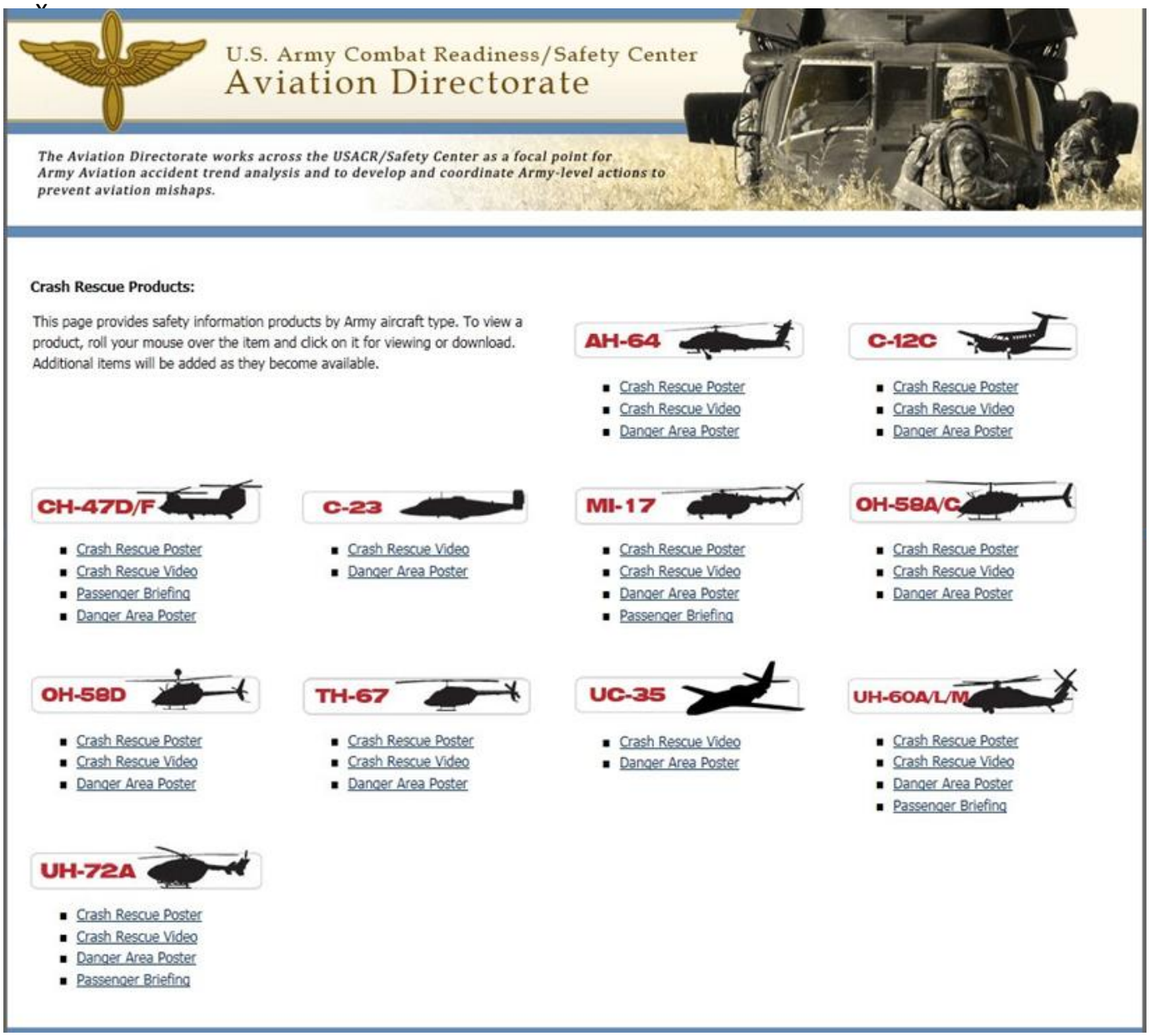
Aviation Safety Products Now Available Online

Army aviation safety professionals can now access the complete library of print and video safety products for Army aircraft at one location. The Aviation Directorate at the USACR/Safety Center has built or updated the following products:

- Crash Rescue Videos
- Crash Rescue Posters
- Danger Area Posters
- Passenger Briefing Cards
- Passenger Briefing Videos (Not yet available; currently under development)

To access these products, visit:

https://safety.army.mil/atf/GeneralResources/CrashRescueProducts/tabid/2173/Default.aspx



Number 34 February 2014

Flightfax®

Online newsletter of Army aircraft mishap prevention information

The accident numbers for the first quarter of FY14 are in, and the news is not good. So far in this FY, we have experienced 8 Class As, 1 Class B, and 12 Class C accidents, compared to FY 13 with 3 Class A, 2 Class B, and 17 Class C and to FY12 with 8 Class A, 6 Class B, and 43 Class C. These statistics present an even more challenging reality given that our flying hour programs show that we are flying about 20% fewer flight hours than the previous three years. While one can objectively measure the number of past accidents along with flight hours to come up with accident rates, it is a bit more difficult to use OPTEMPO numbers as a predictor of the future. There are several factors that influence safe aviation operations as our flying hour program decreases. None of these can be statistically proven by data analysis, but they are known to commanders and experienced aviators that have lived through the reduced flight hours of the 1990s.

First and in the aggregate, accident rates tend to decrease as flight hours decrease. This seems counter-intuitive, but I believe it is a measure of exposure to risk. When an organization has fewer flight hours we tend to focus on the basic tasks of RL progressions, NVG currency, and continuation training, and not conducting the larger combined arms training events. When the majority of our flight hours are spent on lower risk crew level training, the risk we take is reduced but our overall proficiency in complex tasks is also less.

Second, accident rates tend to increase when organizations transition from steady state training into a deployment or contingency operation. As with any transition, we are asked to execute more complex operations, and then we add in the pressure of mission success for our air mission commanders and pilots in command. These factors, coupled with different terrain and threat from the enemy, significantly increases our exposure to risk. For example, this type of spike in accident rates (number of Class A accidents per 100K flight hours) was very evident in the beginning phases of both OEF and OIF with an almost 300% increase as we transitioned into a combat focused aviation force. In FY00 our Class A accident rate was 0.62 and in FY01 the rate was 1.08, which almost tripled to 2.67 in FY01 and 2.74 in FY02.

Which leads to my last point and the good news. The single most influential force in reducing aviation accidents is leadership. Engaged leaders at all echelons, air mission commanders, and pilots in command were able to drive down the accident rates once they gained situational understanding of their environment through sound operational planning, not accepting any unnecessary risk, and clear command guidance to their subordinates to guide their decision making. The accident statistics reveal that, despite increasing deployed OPTEMPO, the accident rates were decreasing. Through leadership, we went from 26 Class A accidents in FY02 while flying approximately 970K hours down to 14 Class A

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accidents in FY 11 with over 1.27 million flight hours. The numbers don't lie, leadership works.

So the question that I will ask is, are you ready for your next transition? Do you understand impact of reduced flight hours on your own proficiency, and that of those in your unit? Have we established the right command climate and emplaced the right control measures within our organizations that balance risk against mission requirements? What are you personally going to do to maximize the training value of every flight hour to ensure we are as ready as possible for the next contingency mission? Lastly, are you prepared to have the honest conversation with your commander to truly convey the levels of risk we are accepting and your crews proficiency levels in meeting those mission tasks?

Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
Aviation Director, Future Operations
US Army Combat Readiness/Safety Center
email: michael.d.higginbotham.mil@mail.mil

Manned Aircraft Class A – C Mishap Table as of 25 Feb 14

	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	1	2	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	0	2	3
	February	0	0	2	0		1	0	0	0
	March	2	1	5	6					
3rd Qtr	April	1	1	6	2					
	May	0	0	6	0					
	June	1	1	4	0					
4th Qtr	July	0	0	7	0					
	August	1	1	9	0					
	September	0	1	1	0					
	Total for Year	8	7	58	8	Year to Date	8	1	12	3

My Memorable Flight:
Reap the Benefits of Your Training

CHIEF WARRANT OFFICER 3 BRIAN SPOTTS
Standardization Instructor Pilot
Flatiron, 1-223rd Aviation Regiment
Fort Rucker, Ala.

When I was a 2,000-hour CH-47D Chinook instructor pilot in a heavy lift unit deployed to Bagram Army Airfield (BAAF), Afghanistan, my crew was tasked to conduct a six ship night vision goggle (NVG) air assault in support of Operation Enduring Freedom. In addition, I was providing a local area orientation and air assault familiarization flight for a "torch party" commander who would assume operations in FOB Sharana, Afghanistan.

Our mission was to depart BAAF and pick up troops at a neighboring airbase for insertion 60 miles to the south. We were an "ideal" crew for the mission: I was a flight lead instructor pilot and my copilot was a skilled pilot-in-command with 1,200 hours. Just minutes before departure we completed our mission briefing, battle rehearsal, and weather update. The weather forecast was beautiful, sky clear with unrestricted visibility.

To mitigate risk, we elected to depart as three serials, two CH-47Ds, two UH-60Ls, and two AH-64Ds with five minutes of separation between each flight. About 15 minutes after departure, we could see lightning strikes in the distance. However, because of the light intensification capabilities of the NVGs, we were unable to determine the exact location of the strikes. We promptly passed a PIREP for lightning near the proposed LZ and an overcast ceiling to the battalion commander who was the air mission commander (AMC) positioned in the second UH-60L.

We informed him we would like to continue along the route and update weather upon arrival to determine mission impacts on the air assault. This was the first opportunity to break the chain of the near catastrophic events that would follow. We were still in a position to pause, contact our weather forecasting agency, address the unforecast lightning and make an informed decision before continuing. In fact, our third serial had not even departed BAAF.

We were flying at 1,000 AGL and nearly 10,000 MSL in a three mile wide valley with mountaintops that surpassed 15,000 MSL. As we continued along the route, the lightning activity intensified and each strike seemed closer than the last. However, it appeared to be south of our objective and flight visibility remained unrestricted. We began to fly underneath an overcast layer of clouds with light rain and reduced visibility (approximately five statute miles). With each lightning strike, I started to question our ability to complete the mission. We quickly realized the lightning was much closer than we estimated and we were flying directly into a heavy rain storm.

I passed information to the AMC that the lightning and distant rain seemed to obstruct our flight path to the forward operating base where we would be picking up our troops. I made the recommendation to abort the mission, return to Bagram, and reevaluate the weather.

Unfortunately, it was too late! As we began a slow turn back to BAAF, the overcast clouds began to produce heavy rain. As we continued our turn, visibility dropped from five miles, to three miles, to a half mile in a matter of seconds. About midway through the turn I believed the aircraft had been struck by lightning (our countermeasure system had in fact launched a volley of inadvertent flares), all visual reference with the ground was lost and I couldn't see past the windscreen. Our uneventful flight had turned into an emergency! I announced "inadvertent IMC right seat," began

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a turn to my last heading and immediately initiated a 1,500 fpm rate of climb. My copilot and crewmembers followed suit and announced “inadvertent IMC.”

Chalk 2 began a steep descent, maintaining visual references with a single light on the ground. I announced to the AMC I was inadvertent IMC and had initiated a climb. I instructed my copilot we were going to climb to 12,000 MSL and begin a turn back to Bagram. This would provide obstruction clearance in our immediate vicinity, but we would need to climb higher as we continued north towards Bagram. At 12,000 MSL I began a standard rate turn to the north, and announced I would continue my climb to 13,000 MSL while we worked our exact position.

Every mile counted, if we were off course by as little as a mile, it would be the difference between life and death. We had flown much of the year with electronic kneeboards (EDM) and had augmented our situational awareness with commercial off-the-shelf GPS receivers with terrain banding. However, with the lightning activity in the area, the GPS receiver signal was interrupted and failed. I had relied so heavily on the GPS for terrain avoidance I failed to utilize the EDM held by the pilot in the troop commander seat for situational awareness.

As we passed through 13,000 MSL we contacted Bagram approach control, declared an emergency and requested radar vectors for the ILS approach. The controller informed us we were outside of the radar coverage area and suggested we contact Kabul approach control. However, Kabul approach control was difficult to understand given the strong language barrier. We reiterated we were declaring an emergency and requested radar vectors from our position to intercept the localizer and complete the ILS approach into Bagram. The controller stated in broken English, “Say again, over.” Ultimately, radar services were never established and we continued our climb to 14,000 MSL and attempted to determine our exact location.

Throughout the climb we performed the task precisely to the standards prescribed in the CH-47D aircrew training manual. I announced and selected the heading select mode and positioned the cursor for a twenty degree right-hand turn in an effort to turn towards the smallest ridgeline within the valley. In a steady climb, overwhelmed and task saturated, I focused my attention away from the attitude indicator. My copilot, exactly as instructed, announced “the wings are not level.” Indeed, the attitude indicator showed a standard rate turn to the right and I applied cyclic to level the wings.

I began to feel hypoxic with the high altitude and announced it to my copilot. As we passed through 14,000 MSL my copilot stated “14,000, what altitude are you going to level off at?” Simultaneously, several radios transmitted. I could hear the AMC announce that the flight would posture on Alpha ramp, contact the pilot to metro service and readdress weather for the assault. At this point I became extremely frustrated and angry, a clear symptom I was becoming hypoxic. Regretfully, I snarled on the radio we were in an emergency, we did not know our exact position, and he needed to stop talking over the radio. I knew my harsh tone was a mistake, but I was in self preservation mode and I clearly had my hands full.

I was still task saturated and overwhelmed when my copilot announced “the wings are not level.” The attitude indicator again showed a standard rate turn to the right and I applied cyclic to level the wings. Frustrated, I turned off the heading select feature, leveled the wings and announced my intent to climb to 15,000 MSL. I made a judgment call, balancing a safe altitude to recover back to Bagram and prolonged hypoxia. At 14,700 MSL we climbed out of the massive storm and above the highest terrain. To my disbelief, Chalk 2 was exactly 10,000 feet directly below us. We had flown the centerline of the valley for nearly seven miles. We contacted Bagram

Continued from previous page

approach, now within range, and maintained positive radar control as we descended towards Chalk 2. The weather over Bagram matched the forecast, sky clear with unrestricted visibility.

My crew and I walked away from an undamaged aircraft after a memorable flight. We survived this emergency because of the training emphasis we placed on inadvertent IMC procedures. Fortunately, my crew correctly responded to the emergency and I am not writing about an unusual attitude recovery procedure. I am thankful we were able to reap the benefits of our training and prevent a catastrophic loss. I have and will continue to stress the importance of breaking the accident chain and training inadvertent IMC in realistic scenarios. Emphasis that was drilled time and time again by a previous instructor and mentor who placed great emphasis and intensity on training inadvertent IMC.

CW3 Spotts is the Standardization Instructor Pilot of FLATIRON, 1-223rd AVN REGT, Fort Rucker, Ala. He may be contacted at brian.j.spotts@us.army.mil.

UAS Class A – C Mishap Table									as of 25 Feb14
	FY 13 UAS Mishaps					FY 14 UAS Mishaps			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	2	1	1	4
MQ-5	2	0	3	5	Hunter	1			1
RQ-7	0	4	10	14	Shadow		5	1	6
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
Aerostat	2	3	1	6	Aerostat	1			1
Total for Year	9	8	20	37	Year to Date	4	6	4	14

Two things are needed to prevent wire strikes – Brains and Altitude. If you are low on one, you'd better have more of the other…

Aviation Basic Knowledge

Chief Warrant Officer 5 Paul F. Druse
Directorate of Evaluation and Standardization
U.S. Army Aviation Center of Excellence
Fort Rucker, Ala
Chief of Standards

*(**ba·sic**: Adjective \ˈbā-sik also -zik\ : forming or relating to the most important part of something.)*

Over the past year I have had the pleasure of traveling with DES and seeing the finest aviation units in the world. We have changed greatly in the last 12 years as a result of fighting two wars. Our pilots have arguably flown more and had the opportunity to experience more than I did in my first 12 years of Army aviation service. Unfortunately, a trend we at DES are seeing during our unit visits is a decrease in our basic aviation knowledge.

For those who have not experienced a DES visit recently, we issue a 50 question written examination during the unit assessment. Our goal is a 100% evaluation (written, oral, or flight) of all available crewmembers assigned to the Aircrew Training Program (ATP). Ideally, the written test is the easiest way to evaluate a majority of the unit. The written exams are broken into subject areas such as: aircraft specific, instruments, Standing Operating Procedure (SOP) and emergency procedures/limitations. Statistically, instruments, EPs/limitations, and Standing Operating Procedure (SOP) are among the weakest subject areas.

If I had to pick a group that is most vulnerable to fail the exam, it would be the RL1 non-tracked pilot in command (PC), Warrant or Commissioned. These individuals are generally mission focused and not taking the time to ensure their basic knowledge is maintained. These individuals are flying most of the unit's missions and usually have an additional duty or leadership position that tends to deflect their attention. They are no longer in the crosshairs of instructor pilots since the latter are busy with progressions or conducting APART evaluations.

Arguably, the group identified above (non-tracked PCs) will have more of an influence on your newly progressed aviator or crewmember than any other individual. These individuals essentially become your primary day-to-day trainer for the aspiring PC's. They must continue to train and challenge less experienced aviators on aviation basic knowledge subjects found in the ATM in order to maintain a fundamentally sound unit.

Instructors, I challenge you to not lose sight of the unit no-notice and academic training programs. These two programs have an immediate effect on the overall depth of knowledge within your organization. Do not become fixated with progression and APART evaluations, as this is but a small part of your job. Challenge your aviators to conduct classes and lead discussions as a way for them to develop.

Ultimately, all aviators are responsible for maintaining basic aviation knowledge of subjects found in the ATM. As the definition states: "basic" knowledge is "the most important part of something" and that is our aviation knowledge. Our aviation knowledge is the foundation that we all use as we integrate into different positions throughout our careers in Army aviation. In order to be true professionals we must all be responsible and stay in the books.

--CW5 Paul Druse, DES Chief of Standardization, may be contacted at (334) 255-1582, DSN 558.

Mishap Review: Loss of Tail Rotor Control

During the conduct of a NVG VMC approach to the runway, at approximately 80 feet AGL, the H-60M began an un-arrested right yaw. The aircraft rotated several times before impacting the ground. One crewmember was killed and two crewmembers received serious injuries.

History of flight

The mission was single-ship day, night and NVG continuation training for the crew. The risk assessment worksheet and mission brief were completed the day prior with the initial and residual risk being low. The crew show time was 1300L with the pre-flight being performed at 1330L. At 1500L the crew conducted their mission brief at the aircraft . The weather was scattered clouds at 5,500 feet, broken layer (ceiling) at 10,000 feet. Visibility was unrestricted. Winds were out of the northwest at 9 knots with gusts up to 20 knots. The moon was full with no significant weather phenomenon reported in the local area.

The aircraft departed at 1527L en route to a distant airfield destination with practice approaches along the way. The aircraft arrived at its destination airfield at 1830L and shutdown. Following dinner, the crew departed on their return flight home under NVGs at 2039L.

At 2300L the crew reported to the tower they were inbound for landing. The tower cleared them for entry with airfield traffic landing to the west. Turning base, the tower cleared the aircraft for the option. While the crew conducted the VMC approach to the runway, at an AGL altitude of approximately 80 feet, the aircraft began to yaw/spin to the right with full left pedal applied. The aircraft completed several rotations before the PCLs were pulled off. With high G forces the aircraft impacted nearly upright with approximately 10 degrees left wheel low and 10 degrees nose up attitude. At impact, the aircraft rolled onto the left side of the airframe where it came to rest. The PI sustained fatal injuries with the PC and CE being seriously injured.

Crewmember experience

The PC, sitting in the left seat, had more than 2,160 hours total flight time, 773 as a PC, with 2,000 hours in the UH-60 (300 H-60M) and 890 hours NVG time. He had 800 hours of combat time. The PI, flying in the right seat, had over 1,200 hours total time, nearly 300 as a PC, with 1,100 hours in the UH-60 (180 H-60M) and 300 hours NVG time. His combat

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time was 677 hours. The CE, located in the right crewchief seat, had a total of 289 hours with 13 NVG.

Commentary

The accident investigation determined that the tail rotor pitch change shaft failed. This failure separated the linkage of the tail rotor pitch change shaft and the tail rotor servo, allowing the tail rotor to seek a neutral pitch and to be unresponsive to pilot flight control inputs. This caused the aircraft to enter an uncontrollable yaw with increasing rate.

SAFETY OF FLIGHT (SOF), H-60-14-SOF-02 requiring a one-time visual inspection of the Pitch Change Shaft Assembly (Servo Coupling Assembly) for proper installation of a cotter pin on the "Spanner Nut" on the outside of the Shaft Housing.

Shipboard operations involving wave action/swells

A Navy rotary wing aircraft was conducting passenger and cargo transfers between ships in the Carrier Strike Group. Upon completion of its replenishment mission, the helo maneuvered to recover to its assigned destroyer. The ship maneuvered to the southeast to achieve wind, pitch, and roll limits for the recovering aircraft. Winds were out of the northwest at 25 – 30 knots with seas at 5-7 feet. As the aircraft made its approach the officer of the Deck directed a wave-off when relative winds fluctuated outside of the green deck parameters. The ship's speed was increased to flank to attain a green deck. The aircraft made a safe approach and landed on the centerline with the main landing gear inside the wheel boxes. The aircraft was safely chocked and chained and a red deck was set. After setting the red deck, the ship's course was changed to the south, southeast while still at flank speed. During the turn the ship rolled 12 degrees to starboard followed by a 13 degrees to port and then a 16 degree roll back to starboard. When the destroyer rolled hard to starboard, a large wall of water came up and over the starboard side of the flight deck, exceeded the height of the aircraft rotor system and engulfed the still running aircraft. Immediately after water impact, the aircraft began breaking apart, shaking violently, and hopping/bouncing on the flight deck. The aircraft experienced multiple airframe failures, including separation of the main rotor blades, the tail cone, the left MLG and the tail rotor gearbox. The aircraft then slid off the left side of the flight deck into the water resulting in the loss of the two pilots.

Lessons learned

Both the ship and aviation communities lacked awareness about documented hazards presented by wave intrusion of the flight decks of destroyers. Past reports of similar, but less catastrophic incidents had been documented on other ships for several years. The lower flight decks combined with other factors, such as ship speed, relative seas, and sea state can create the potential for a high risk aviation environment not involving actual flight. With Army aircraft increasingly becoming involved with operating off of ships, it is important that aircrews and shipboard counterparts coordinate actions to raise awareness and mitigate the risk of this hazard. For additional information contact the Naval Safety Center at http://safetycenter.navy.mil/

Mishap Review: CH-47D Air Assault

During the conduct of a day, multi-aircraft landing, the CH-47D drifted right after contacting the ground, followed by the aircraft rolling onto its right side. Significant damage to the aircraft was incurred with minor injuries to the crew.

History of flight

The mission was a multi-ship, day, insertion of troops into unimproved HLZs. The flight consisted of three UH-60s and two CH-47s. The crews began their duty day at 0200L with an air mission brief at 0300L. The brief called for repositioning the flight to the PZ and stand-by for a trigger based air assault to a preplanned objective. After the AMB, the crews went to the aircraft and conducted crew briefs. The weather was clear conditions with unlimited visibility.

The aircraft departed home plate at 0450L with an arrival at the PZ of 0458L where the aircraft were shutdown to await the on-call departure. At 0715L and update brief was given, followed by aircraft run-ups. The flight departed the PZ at 0804L and arrived at the objective six minutes later. The two CH-47s held at the RP while the UH-60s proceeded to the objective. At 0820L, the CH-47s, with the accident aircraft in trail position, proceeded to the HLZ in stag right formation with 5 – 10 rotor disk separation. The lead CH-47 landed in moderate dust, creating a dust cloud. Chalk 2 reached the dust cloud and continued in a landing profile. Following touchdown of the aft wheels, and as the forward wheels came down, the aircraft began a rolling motion resulting in the aircraft impacting the ground on its right side. The aircraft sustained major damage with minor injuries to the occupants.

Crewmember experience

The PC, sitting in the left seat, had more than 630 hours total flight time, 100 as a PC, with 550 hours in the CH-47D. He had 385 hours of combat time. The PI, flying in the right seat, had nearly 2,300 hours total time, 986 as a PC, with 876 hours in the CH-47D and 528 hours combat time.

Commentary

The accident investigation determined that the crew failed to maintain visual orientation and to execute a go-around when visual contact with the intended point of landing was lost. Additionally, passengers removed their restraints in anticipation of exiting the aircraft prior to completion of the landing.

Creatures of the Night – Tricking the aviator's body into night alertness April 2002 Flightfax

The issue of working reverse cycle in aviation is a complicated one. While aviators may be restricted by crew rest guidelines in how many hours they may fly, there is no restriction on *when* these hours may be flown. Many times aviators and other air crewmembers are required to fly or work at various times in the 24-hour day where they may need to reverse their work hours from typical duty day times to nights, early mornings, or late evenings. When this rotation occurs, aviators and crew members become "shift workers," in that they no longer work set hours, and may change their work hours every week, every 2-3 days, or possibly even on a daily basis, whether for the short-term or the long-term. When this happens, all the physiological symptoms typically experienced in shift work occur -- fatigue, sleepiness, insomnia, moodiness, etc. Along with these symptoms come performance problems and mistakes that can have disastrous consequences when flying.

The feelings of fatigue that people have when they rearrange their schedule (trying to stay awake at night and then sleeping during the day) are not unique. Almost everyone who works varying schedules feels sleepy or tired during the night, when they need to be alert and working. In addition, they experience difficulty sleeping during the day, when trying to recoup from a night of work. This is a normal feeling because night activity and day sleep are in opposition to the body's natural programming, or circadian rhythm.

The rhythms of wake and sleep, hormonal secretions, performance, and core body temperature, rise and fall in predictable patterns over the 24-hour day. As the day begins, body temperature, alertness, and performance are rising. This continues into the day, with a slight dip in the mid-afternoon, and then begins to fall as the day ends and night begins. In contrast, sleepiness declines as the day begins, has a small increase in the mid-afternoon, and then steadily increases as the day ends and night begins. The ability to go to sleep and stay asleep becomes increasingly difficult as the day progresses. One can readily determine why it is so difficult for shift workers to remain awake while on night shift, and sleep during daylight hours.

A host of activities—work, safety, health, family and social life—are affected when an individual experiences a constant change in schedules. So, what can the aviator or crewmember who works shifts do to make life easier and minimize feelings of irritability and tiredness? These suggestions can help:

+ Avoid caffeine 4-6 hours before bedtime.
+ Avoid sunlight after a night shift by wearing dark sunglasses while driving home.

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+ Stay indoors and avoid sunlight as much as possible until your sleep period is complete.

+ Relax before sleep time. Avoid stimulating activities, such as house and yard work.

+ Avoid alcohol for at least 3 hours before bedtime.

+ Avoid strenuous exercise at least 3 hours before bedtime.

+ Get a minimum of six hours of sleep; take naps if you cannot get enough sleep at one time.

The above strategies are very good at promoting sleep. However, other strategies may be needed to stay asleep.

- Sleep in your regular bedclothes and in your usual bed.
- Have a comfortable mattress and pillow.
- Make the bedroom cool and very dark.
- Remove the phone from the room and discourage daytime visitors.
- Disconnect the doorbell and hang a sign indicating a shift worker is sleeping.
- Use earplugs and a masking noise like a fan to cover outside distractions.
- Develop a sleep schedule.
- Communicate with family and friends your need to sleep and your sleep schedule.

Although sleeping as well as possible during the day is a great start to being alert during the night, sleepiness at night will continue to occur. One cannot completely trick the body into being alert during the night, because there is a strong physiological drive for sleep at night. The human body can adapt somewhat to staying awake all night, but it takes many days of strict schedules before it adjusts, and most shift workers are off the night shift by the time this occurs. However, there are some strategies that can improve alertness at night.

+ Use caffeine carefully; wait until you need a boost.

+ Eat low carbohydrate, low fat, high protein foods.

+ Use social interactions and physical activity/postural changes to help stimulate your environment.

+ Stay cooler than usual.

+ Prepare in advance for changes in sleep schedules by gradually adjusting your sleep time.

+ Use naps to obtain as much sleep as possible before the night's work begins.

It's important to be aware that adjusting to rotating schedules and reverse cycle is not easy. However, taking care of some of the manageable variables will lead to improved safety on the ground and in the air, better work performance, better relationships with family and friends, and better general health.

—Dr. Lynn Caldwell, USAARL J. Lynn Caldwell, Ph.D. U.S. Army Aeromedical Research Laboratory Fort Rucker, Ala

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in January 2014.

Observation helicopters

OH-58D

-Aircraft experienced an NP exceedance (124%/10 sec) during run-up/FADEC system check. (Class C)

Utility helicopters

HH-60

-L series. Aircraft was being ground-taxied for parking when it made contact with the wing of a parked privately owned plane. Aircraft was shut down w/o further incident. (Class A)

MH-60

-M series. Crew was conducting routine ATM training in the traffic pattern when the aircraft impacted the ground. One crewmember sustained fatal injuries in the crash and the remaining crew (pilot and CE) sustained survivable injuries. (Class A)

Attack helicopters

AH-64D

-Crew experienced a bird strike during RL Progression check ride. Aircraft left wing store sustained damage, requiring replacement.(Class C)

Fixed Wing

KA300

-Aircraft was on base leg approach when approach tower personnel lost radio contact with the crew and observed smoke and flames emanating from the aircraft. Aircraft crashed approx. 1.8nm from the runway. Three fatalities. (Class A)

Unmanned Aircraft Systems

MQ-1C

-System touched down hard during TALS approach to the runway. Damage: Internal structural damage and to the brake area and possibly payload bracket assembly. (Class C)

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If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness/Safety Center at com (334) 255-3530; DSN 558

U.S. ARMY COMBAT READINESS/SAFETY CENTER

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Number 35 March 2014

Flightfax®

Online newsletter of Army aircraft mishap prevention information

Fiscal Year 14 continues to be a difficult year for Army Aviation. This year through the end of March, we have already exceeded the total number of Class A mishaps during all of FY13. By all objective measures, this year should have been better - reduced OPTEMPO, significant residual aircrew experience from those aviators that have deployed, and leaders that are focused on safe operations. Yet, something is different. The single most influential force in reducing aviation accidents is leadership. It is leadership within the command to promote and sustain the culture within their organizations that makes safety an imperative to readiness, and it is leadership inside the aircraft with pilots in command that have the moral courage to make the right decisions when faced with difficult choices or complex situations. In one of the mishaps investigated by CRC this year, it was openly recognized within the organization that the unit was an "accident waiting to happen" because of the high OPTEMPO and low state of proficiency of the crews. So the question is, are we as leaders doing everything possible to turn around the trend of FY14 and keep our accident rates as low as possible?

One of the chain of command's most effective tools in managing aviation risk is proper crew selection. A thorough understanding of a pilot's skill on the controls, knowledge of administrative and tactical SOPs and doctrine, and recency in the various mission tasks within the unit will allow leaders to properly assign them to the upcoming mission schedule. It is very easy to select the best aviators within the unit, but have we also identified those who should be paired with the best aviators for increased development?"

Somebody in your unit already knows which aviator will have the next accident. For as long as aviation has been aviation, there have been those pilots that enjoy pushing the limits, demonstrate questionable judgment, or put forth minimal effort to sustain their skills. In many of CRC's centralized accident investigations, the unit interviews contain the predictable statements of "I just knew he would be the next one to have an accident…." Aviators who fly without regard to regulations or who place others at risk due to their apathy are not a new problem. This month's Blast From the Past, titled "The Best Pilot In the Squadron", from the July 1980 edition of *Flightfax*, clearly articulates this concern was on leader's minds even 30 years ago. To stick with this theme, we have also included a DES STACOM dated 28 Feb 1979 that expands upon this concept.

It is good aviation leadership that properly assigns quality aircrews to complete the unit's assigned mission. It is great aviation leadership that actively seeks to identify those aircrew members that take unnecessary risk, demonstrate poor judgment, or are not sufficiently trained for the task. Once identified, these leaders will correct undisciplined behavior through remediation, or will provide the necessary training to ensure our aircrews can survive the unforgiving aviation environment. The other face of great aviation leadership is the individual moral courage of aircrew members to speak up when circumstances align against them. The chain of command needs to know when crew selection is not sufficient for the task, when aircrew are not proficient or prepared for their assigned task, or if individuals don't have the judgment or responsibility to execute their flight in accordance with standards. If you are an aircrew member, rated or non-rated, don't be afraid to speak up…..because your life is literally on the line.

Thank you for your incredible dedication to the Aviation Enterprise and to our customers, the troops on the ground. Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
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FORSCOM Aviation Resource Management Survey (ARMS) Safety Program Management Trends Analysis Summary

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Each year, FORSCOM performs ARMS on hundreds of different organizations ranging from small detachments to battalion sized organizations and aviation support facilities. ARMS Trends for each functional area are posted on the ARMS web portal (https://www.us.army.mil/suite/page/962726) at the end of the fiscal year. The discussion presented here focuses on the trends for the functional area of Safety Management.

The major deficiencies identified during ARMS of safety management programs have been consistently the same for past years, but are identified as failing at a lower percentage. Those deficiencies are: untrained or inexperienced program mangers, inadequately written procedures specifying how the program objectives are met in the organization, inconsistent or incomplete historical documentation, and finally command and management failures to emphasize or establish programs to meet safety management and risk mitigating requirements.

Turnover of personnel and the continuous deployment, redeployment cycles complicate the training process of newly assigned aviation safety officers (ASO)/safety managers. Poorly written procedures (SOP) and no overlap (hand off) for program management further reduces the effective transition between program managers. The first critical step in reducing this deficiency is to ensure new program managers have received the training necessary to manage their program. One cannot expect an individual to manage a program and effectively accomplish program objectives without the appropriate training. The next step is to ensure step by step procedures (tasks) to accomplish program requirements are clearly established in writing. Establish a files management system for the program to ensure the required historical documentation is created and maintained to facilitate the transition between incoming and outgoing program managers. This historical documentation aids the incumbent program manager's analysis in determining trends, recurring or future program initiatives and tracking deficient program elements until corrective actions are implemented. Accountability for this task is crucial to the success of the program.

Safety Management Sub-areas with significant trends are:

SAFETY ADMINISTRATION: Individual and unit safety awards programs were neglected with few awards presented. Documentation of the adequacy of the pre-accident plan suffered, reviving previous trends of a few years ago.

INFORMATION COLLECTION: Failure to conduct and document aviation accident

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prevention surveys is a reoccurring trend. New programs or programs that are being reestablished often fail in their efforts to conduct an adequate accident prevention survey. Surveys must be conducted at least annually for the organization and for a program whenever a new program manager is appointed to any functional area or sub-area. This is the foundation for monitoring all functional areas of the organization. Programs with more frequent survey or inspection requirements such as maintenance, FOD and fire prevention tend to suffer from lack of evidence the programs are consistently monitored by the ASO.

HAZARD ANALYSIS AND TRACKING: Poorly developed hazard tracking systems, failure to discuss hazards on the hazard log at council meetings and assigning suspense dates and action officers to deficiencies identified in the council meetings is a reoccurring trend, but to a lesser extent now than previous years. The hazard tracking logs are the focal documents for the hazard tracking system and represent a window for viewing the overall success of a safety management program. Step by step, block by block written instructions must be established in the unit SOP to ensure continuity and ease of transfer of program responsibilities. New safety personnel generally have difficulty establishing and managing this simple form unless they have received hands-on assistance from an experienced safety manager. Action items identified in the council meetings must have someone assigned to address the issue and a suspense date for the corrective actions to be completed.

SAFETY COUNCILS: Often, safety council meetings were not occurring on a quarterly basis and/or council minutes did not reflect the business conducted during the meetings in sufficient detail. The requirements are quarterly safety council meetings and two years of minutes on file in the organization. The safety council's primary function is to support the safety program and assist the commander in the management of the organization. The minutes of the council provide documentation of policy implementing decisions as well as implementing control measures for hazards and command directives to correct identified deficiencies in the operating systems of the organization. The minutes are placed on safety bulletin boards for access by all unit personnel and need to be informative enough to explain the decisions of the council.

SAFETY EDUCATION AND TRAINING: Common deficiencies are: poor documentation of completed training and poor make-up procedures for missed mandatory training or failure to implement make-up training. The program requirements for aviation organizations are simple. Everyone in the organization must receive the same quality of safety training-monthly for full-time organizations and quarterly for part time (NG/RC) organizations. Safety training should be mission supportive and reflect METL tasks, deployment requirements, or other subjects to improve awareness and safe, efficient operations. Once the training is completed, retain copies of class detailed lesson plans, subject summaries, slides with detailed notes, and/or videos of safety training meetings. Provide these in a format/medium that is easily accessible to personnel for make-ups or provide additional classes/briefings for individuals who do not attend the scheduled meeting.

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Summaries should capture any additional information presented during the conduct of the meetings, i.e. commander's comments, answers to relevant questions, awards presented, discussions about relevant issues, etc. This will assure personnel who missed the scheduled safety training meeting receive all the information presented to meet the regulatory requirement of "same quality safety training for all personnel."

The FORSCOM ARMS team continues to gather, produce and update Safety Management SOPs that helps to standardize safety program processes from brigade level down to supported units. The ARMS web portal contains many "how to" examples of management techniques for various programs that are updated regularly. The level of detail in the examples may not be all inclusive for your particular unit's program and will probably need some revision, but it will provide the basis for adding your own management style. When time permits during ARMS visits, team evaluators perform safety program management training for surveyed units' safety managers. This one-on-one time with aviation safety officers (ASO) is crucial to their professional development and the commander's assurance the ASO is prepared to manage a safety program in the full spectrum environment. We view the ARMS as more than just an evaluation of the program, but we consider it a seminar – a sharing of information and mentorship to improve the program. There is no need to wait until an ARMS for this sharing of information. Contact the ARMS team members anytime there are questions regarding your program. We are always glad to help!

WE STILL WANT YOUR INPUT

Do you have an aviation related story, information brief, or lessons learned type event you would like to share with the aviation community? Pass on your experience with an article in Flightfax.

Send them via email to the Aviation Directorate, U.S. Army Combat Readiness/Safety Center:

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AVIATION STANDARDIZATION
DIRECTORATE OF EVALUATION AND STANDARDIZATION, USAAVNC, FT. RUCKER, AL 36362

DES Flashback: STACOM 40 published 28 February 1979

"Am I my brother's keeper?"

The three most abused statements in American society are:

- "The check is in the mail."
- "My wife doesn't understand me."
- "I'll have it tomorrow."

Of equal repute are the two statements most often heard following an aircraft mishap:

- "Everyone in the outfit knew that he was the most likely one to have the next accident."
- This ranks second only to "He was the best pilot in the unit."

The statement that everyone knew he was the one to have the next accident is akin to closing the barn door after the horse has disappeared. There is concern because this problem has surfaced in accident investigations of the past. It was cited again in a recent wire strike accident which occurred outside the authorized terrain flight area.

If everyone knew, why wasn't something done about the situation? In this business you must be your brother's keeper if only out of a sense of self-preservation. As an aviator, I would not want to fly with such an individual. As an operations officer, I would hesitate to assign such an aviator to any mission. As a commander, I would have to seriously consider drastic remedial measures. The point is that apparently **everyone** did not know.

Very often some pilot-to-pilot discussion can be helpful in enlightening the errant aviator in safe and sane operation in accordance with standardized procedures and the unit's SOP. If this method is not successful, it will probably be necessary to bring in the IP/SIP; maybe his platoon leader; and in some exceptionally difficult cases, the unit commander.

The problem aviator must be recognized for what he is. He must not be kept hidden. It is incumbent upon all members of the unit to try to "turn this individual around." This is true whether the problem is air discipline, standardization, training, or unsatisfactory performance. The point is that supervisors cannot operate a viable standardization program in a void. Let's keep one another informed so that we may all maintain a high level of standardization and professionalism. •

Mishap Review: KA-300 final approach

During the conduct of a night VMC landing approach following a C-17 transport, the KA-300 fixed wing aircraft crashed two miles short of the runway. The aircraft was destroyed and all three crewmembers perished.

History of flight

The mission was a night single ship intelligence, surveillance, and reconnaissance (ISR) operation in support of theater forces. The crew of three reported for duty at 1830L, two hours before scheduled departure. They confirmed completion of the mission briefing sheet. The flight was briefed as a moderate risk due to night conditions, approach and landing environments in a mountainous region, and the PI's local flight time. The crew brief was conducted followed by a weather update and final coordination. The weather was clear sky conditions; visibility of 6,000m with mist; winds 250 degrees at 5 knots; temperature -5C and pressure altitude of 5,500 feet. Illumination was 57 percent.

Following aircraft run-up, the crew departed for their collection mission at 2041L. They maintained communication with their unit and ATC at all times and reported nothing significant for the mission duration. At 0000L the crew reported mission complete and broke station to return to base.

At 0006L the accident aircraft contacted the tower for landing instructions. The tower informed the crew they had "traffic ahead, heavy, C-17, altitude eight thousand descending. Caution wake turbulence. Report three mile final." The crew acknowledged the traffic and three mile final call and continued the approach. At 0007L the tower advised the accident aircrew that the traffic they were following had a ground speed indicating 130 knots and if they would like to 'S' turn on final it was approved. The crew advised tower they could slow down. At 0008L tower told the aircraft to report "half mile final" which was acknowledged. No further communication was reported from the accident aircraft and radar contact was lost at 0009L. At 0010L tower attempted to contact the aircraft several times with no success. Another aircraft on approach reported a large fire two miles off the approach end of the runway. Search and rescue confirmed the crash site.

Crewmember experience

The PC, sitting in the left seat, had 4,300 hours total flight time, 1,100+ hours multi-

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Engine fixed wing and nearly 600 hours in the KA-300. The PI had 1,600+ hours total time with 360 fixed wing and nearly 200 hours in the KA-300 and was also PC qualified. The sensor operator had 250 hours total time.

Commentary

The accident investigation determined that the crew flew the aircraft within two miles of the C17 and entered into the wake turbulence at approximate 400-500 feet AGL. The aircraft departed controlled flight and crashed into the ground at a high velocity and high angle of impact. The crew were fatally injured and the aircraft was destroyed.

All information contained in this report is for accident prevention use only. Access additional accident report information on the CRC RMIS https://rmis.safety.army.mil/ AKO Password and RMIS Permission required.

Wake turbulence is turbulence that forms behind an aircraft as it passes through the air. This turbulence includes various components, the most important of which are wingtip vortices and jet wash. Jet wash refers simply to the rapidly moving gases expelled from a jet engine; it is extremely turbulent, but of short duration. Wingtip vortices, on the other hand, are much more stable and can remain in the air for up to three minutes after the passage of an aircraft.

Wingtip vortices occur when a wing is generating lift. Air from below the wing is drawn around the wingtip into the region above the wing by the lower pressure above the wing, causing a vortex to trail from each wingtip. Wake turbulence exists in the vortex flow behind the wing. The strength of wingtip vortices is determined primarily by the weight and airspeed of the aircraft.[1] Wingtip vortices make up the primary and most dangerous component of wake turbulence.

Lift is generated by high pressure below the wing and low pressure above the wing. As the high-pressure air moves around the wingtip to the low pressure, (high pressure always moved towards lower pressure areas) the air rotates, or creates a horizontal "tornado" behind the wings. This tornado sinks lower and lower until it dissipates.

Wake turbulence is especially hazardous in the region behind an aircraft in the takeoff or landing phases of flight. During take-off and landing, aircraft operate at high angle of attack. This flight attitude maximizes the formation of strong vortices. In the vicinity of an airport there can be multiple aircraft, all operating at low speed and low height, and this provides extra risk of wake turbulence with reduced height from which to recover from any upset. Wikipedia definition

Mishap Review: AH-64D Mid-air Collision

While conducting night security operations in support of an emergency deployment readiness exercise (EDRE), two AH-64Ds collided in flight. One aircraft made an immediate emergency landing with major damage. The second aircraft landed safely under power with significant damage. Only minor injuries to the crew were reported.

History of flight

The mission was aerial weapons team (AWT) support of a night air assault conducted as part of an EDRE exercise. The midnight insertion was located 250 miles from home station. Designated to support the assault of a planned objective (Alpha) were two AWTs with an additional AH-64D conducting a separate airborne intelligence collection mission at another objective (Bravo) located six kilometers to the west of the assault site. Flight crews attended a final air mission brief at 1600L. At 1930, the AWTs conducted an update brief. The plan called for staggered departures from home base with an initial landing at a FARP prior to the assault. The weather was few clouds at 13,000 feet with visibility of 7 miles. Winds were out of the northwest at 6 knots with a temperature of -1C. Moonrise was 0337L with illumination of 23%.

At 2045L team 1, containing accident aircraft (AA) #1 flying trail, departed home station en route to the FARP arriving at 2230L. Following refuel, the team departed the FARP to arrive on station at 2300L to over-watch objective Alpha. At 2233L AA #2 departed home station with an arrival at the FARP of 0018L. Following refuel AA #2 departed at 0035L to take up position vicinity of objective Bravo. At 2041L, AA #1, while in a slow left turn detected AA #2 in close proximity and attempted an evasive maneuver inducing a dive and right bank. Contact was made with the main and tail rotors of AA #1 with the nose and left landing gear assembly of AA #2.

Aircraft #1, with damage to the main rotor blades and loss of its tail rotor assembly, made an autorotational descent to an open field. On impact, the aircraft pivoted to the right causing the tail boom to detach, right main landing gear to collapse, and the main

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rotor blades to strike the ground. AA #2 sustained damage to its night vision system, left landing gear strut and back seat overhead canopy. The crew transitioned to NVGs, assessed damage, and landed at a nearby open field.

Crewmember experience

Accident aircraft 1: the PC, sitting in the back seat, had 1,100 hours total flight time, 1,000 hours in the AH-64D, 275 hours NVS and 700 hours combat. The PI, located in the front seat, had nearly 1,000 hours total time, 900 in the AH-64D, 360 hours NVS and 650 hours combat.

Accident aircraft 2: the PC, sitting in the back seat, had 1,500 hours total flight time, 1450 hours in the AH-64D, 380 hours NVS and 900+ hours combat. The PI, located in the front seat, had over 200 hours total time, 125 in the AH-64D and 50 hours NVS time.

Commentary

The accident investigation determined both crews failed to properly scan for other aircraft and maintain airspace surveillance. This resulted in the aircraft colliding in flight with subsequent emergency landings and significant damage to both aircraft. Additionally, the board determined there were inadequate airspace de-confliction measures in the mission planning process.

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The National Transportation Safety Board released its findings on the crash of a light plane which was flying low over a residential area and struck the top of a 65-foot utility pole.

Commenting on the accident, the safety board had this to say : " A great deal of the pleasure of flying stems from a pilot 's control of an added travel dimension height. Since the earliest days of aviation, this pleasure has become-for all too many pilots-an irresistible temptation to sample the apparent thrill of low-level flight where the sensation of speed is the greatest. 'Buzzing' or ‘flat-hatting' is a deceptive thrill.

Whatever his total time, the pilot may be supremely confident of his control of the aircraft and his ability to avoid any object on the surface-until he encounters an obstruction which he couldn't or didn't see. Then he often discovers tragically just how narrow is his margin of error at low altitude.

“The safe pilot always remembers that a price he pays for the pleasure of flying is reasonable care, and adherence to minimum flight altitudes is basic to such care.“
Flightfax July 1973

Class A – C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 26 Mar 14
	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	1	2	0
	November	0	1	5	0		3	0	4	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	1	2	3
	February	0	0	2	0		1	0	2	0
	March	2	1	5	6		1	1	1	
3rd Qtr	April	1	1	6	2					
	May	0	0	6	0					
	June	1	1	4	0					
4th Qtr	July	0	0	7	0					
	August	1	1	9	0					
	September	0	1	1	0					
	Total for Year	8	7	58	8	Year to Date	9	3	14	3

UAS Class A – C Mishap Table									as of 26 Mar 14
	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	2	1	1	4
MQ-5	2	0	3	5	Hunter	1			1
RQ-7	0	4	10	14	Shadow		5	2	7
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
Aerostat	2	3	1	6	Aerostat	1			1
Total for Year	9	8	20	37	Year to Date	4	6	5	15

The best pilot in the squadron

6 August 1980 *Flightfax*

Not long ago, as an unproductive hour at the bar wound to a close, several of my flying colleagues and I were gathered around the dregs of the last pitcher, which was rapidly approaching being too flat to drink. As is often the case when aircrew members "stand to their glasses," the conversation drifted from war stories through "where is ol' so-n-so," to memories of those no longer with us.

Some had been recruited by the airlines and some had gone to rated sup, but the talk centered on one of our number who had met an untimely end on a desert gunnery range. If there is a special eulogy for pilots, it is not delivered by a chaplain from a pulpit - it is spoken by his messmates in the bar as the happy hour crowd thins out and the beer gets warm. No congregation could be more sad-faced. No higher praise could be given. The ceremony is as predictable as any formal funeral. Sometimes there are even hymns of a sort, and green Nomex is a kind of vestment. It was an unfortunately familiar scene to most of us who had been around for a few years. Inevitably, someone said, "Yeah, he was the best pilot in the squadron." All who knew him nodded their heads in silent accord.

He certainly had been a memorable figure. He had been assigned to standboard as a lieutenant. An academy graduate, his bearing and conduct were exemplary. He knew the operators manual down to the publisher's initials and was an authority on all the "nonboldface boldface" published by the major command on down. Though he got to SEA too late for the hot part of the conflict, he extended until the very end and played a highly decorated part in the evacuations and the Mayaguez affair. He was always chosen to lead the tough missions and earned the total respect of his superiors at all levels. His exploits were legendary. He was the one who went to the development conferences and flew the test program. His physical appearance was striking, he was well ahead in his PME, he was always available when the schedule changed at the last minute, and he more than pulled his weight in the additional duty department. Besides that, he was a nice guy. No one was surprised when he was selected for major below the zone.

He was the best pilot in the squadron.

It does not pay to speak ill of the dead, but wait a minute! If he was so good, why is he dead? At the risk of asking a sacrilegious question, how about those other well-remembered colleagues who have been honored with the posthumous title of "best pilot in the squadron?" Is there something about being the best which is fatal? What good is being the best if it kills you? What good is having the best in the squadron end up in a box when he is needed in the cockpit? Let's take another look at this paragon of pilot virtues.

He was aggressive, ambitious, and confident. These are admirable qualities - in fact, they are requirements for the job. There is, however, an important distinction between confidence and overconfidence, aggressiveness and over-aggressiveness, and even

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achievement may be overdone, or done too fast.

He had required a little command assistance to transition into a new weapons system when he did, and no one was surprised when he got it. That he was killed on a range **was** a surprise. He had a lot of low level experience. He liked being down in the weeds, and he was good at it. The investigators found nothing wrong with the aircraft. It appears that he simply flew into the ground after pulling off the target. He either didn't hear the "knock it off" call or it came too late. In any case, he got low enough to prompt a call and apparently did not react to it prior to impact.

Could there have been a malfunction? He had previously demonstrated exceptional ability to bring the aircraft home when another pilot might have landed at an intermediate point, even though maintenance would have been inconvenient and the squadron would have bought a bunch more down time. He was good enough (and mission oriented enough) to take a bird with minor discrepancies, work around them, and get the job done. He was a mission hacker. "Ya gotta be tough ... " he had said more than once. It probably wasn't a malfunction. He could have handled any malfunction small enough to be missed by the investigators.

The flight was a late afternoon launch, but there is no reason to believe that he had been fatigued. He was not a heavy drinking man and he had had no duties which would have conflicted with crew rest. Besides, during the Mayaguez mission he had demonstrated that he could perform when tired. He had flown sortie after sortie, on his own adamant insistence, even though there were more rested pilots available. He kept getting an airplane despite fatigue. After all, he was the best pilot in the squadron, and that was one tough mission. A little fatigue wouldn't have bothered him.

He bought the farm on a checkride, but stress couldn't have been a factor - he always did well on checkrides. In fact, stress may actually have improved his performance. At Kho Tang Island he earned a medal for going in on the hottest objectives. In one case, he went in a third time after being shot off twice. Now, that's stress! No, he was not one to choke under pressure.

In the final analysis the report concluded that the cause of the accident was "pilot distraction" or "disorientation" In other words, what used to be called pilot error. But errors are not something one would expect from the best pilot in the squadron. On the other hand, if he had not "gotten caught," no one would have ever suspected that he had been disoriented or distracted. He had exhibited no such tendencies, or at least none had been recognized.

But it only takes once, and it's hard to make a habit out of having fatal accidents. The diagnosis has to come before the fact in order to do any good, and it's no easy task.

The distinction between the spirit of attack and dangerous lack of caution is not always readily apparent. What passes for aggressiveness may be found to be (or at least labeled) recklessness after an accident. Spirit, however, is a prerequisite, and an excess of caution is

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self-defeating. A force of timid pilots, reluctant to take any risks, is not acceptable. Neither is a corps with the disdain for death of kamikazes (especially if training flights are required). What is required are pilots with the will to accomplish the task at hand, but the sense to recognize that a given result is not worth the loss of an aircraft and crew. This is especially true in a training environment.

During the early 70's, when Vietnamese aviation cadets were receiving primary training in the United States, one Vietnamese training officer would address each arriving class with the following safety philosophy: Each student must become the best possible pilot. That requires both nerve and skill. Since the mission doesn't end with a single sortie, a good pilot must be available to fight tomorrow. Good pilots bring both themselves and their airplanes home. Dead pilots are bad pilots. The loss of an airplane in training is as detrimental to the war effort as a direct hit from an SA-7. Sometimes it takes nerve to refuse an aircraft or abort a mission. That's part of what it takes to be a good pilot-nerve.

So what does this have to do with the pilot who is the subject of this tale? Little or nothing. Flying safety lectures will do him no good now and apparently didn‘t do him enough good when he was alive. All those monthly meetings, special briefings, and bulletin boards weren‘t enough to keep him alive. Neither were his skilled, highly trained hands and feet, vast knowledge of regulations and procedures, or extensive experience. For all his education, ability, and desirable attributes, his final professional act was costly and wasteful. He destroyed a valuable aircraft and killed its pilot. At the very best, he did not prevent the loss, and he was the last person who could have done so.

The best pilot in the squadron? He's still in the squadron. He, too, knows the books, has the skills of a brain surgeon, and reeks of moxie, but he comes home with his airplane intact. Maybe it's that little bit of extra for Mom and the safety officer. Who knows? One thing is for certain though. The best pilot in the squadron will get the job done without unnecessary losses. While he's there to fly and fight, he knows that broken birds stay on the ground and dead pilots don‘t defeat anybody.

The pilot's epitaph will, unfortunately, be occasionally intoned in the bar while the ice melts and the happy hour crowd drifts out the door with the smoke. It's a traditional way to honor our dead. But in the meantime, let's be honest - here's to the real best pilot in the squadron. The one who's still with us .

-from AEROSPACE SAFETY

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Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in February 2014.

Attack helicopters

AH-64D

-Mid-air collision occurred between two AH-64D aircraft supporting separate missions. Both aircraft crash-landed. No significant injuries. Damage to both aircraft.(Class A)

Cargo helicopters

H-47

-Aircraft's aft landing gear and ramp made contact with a 20 foot high perimeter wall during approach to land. (Class C)

Fixed wing aircraft

UC-35B

-Crew experienced a #2 Engine N1 exceedance during altitude flight. Crew conducted emergency crosscheck procedures and aborted the mission. Engine replacement required.(Class C)

Unmanned Aircraft Systems

MQ-1

-C series. Uncommanded high speed taxi resulted in UA striking hangar. (Class A)

-B series. On a takeoff roll the aircraft veered off the right side of the runway. The aircraft's right wing struck a taxiway sign causing damage to the wing and fuselage. (Class B)

RQ-11

-Three minutes after launch the Raven locked into the preprogrammed waypoints no longer responding to the manual directional controls. The Raven crashed into the impact area and deemed unrecoverable (Class C)

Before you criticize OH-58D pilots you should walk a mile in their shoes. That way, when you do criticize them, you are a mile away and have their shoes.

If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness/Safety Center at com (334) 255-3530; DSN 558

U.S. ARMY COMBAT READINESS/SAFETY CENTER

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Online newsletter of Army aircraft mishap prevention information

This issue of *Flightfax* is the midpoint review of the FY14 mishaps. The intent behind this issue is to learn the lessons of other pilot's mistakes so that we can reduce the accident trend for the remainder of the fiscal year. The consistent trend that has remained true within Army Aviation is that human error causes the majority of our mishaps, and this year is no different.

To date, we have had nine Class A mishaps resulting in four fatalities (3x military, 1x contract) which is higher than the total number of Class A accidents for all of FY13. Of the nine Class A accidents, six resulted from human error and three are attributed to material failure. Within the six human error accidents, two have elements of improper training, three have individual failure / decision making errors, one has pre-mission planning failures, two mishaps had power management failings, and two mishaps occurred during DVE.

A common thread within each of these human error accidents can be traced to the decision making process of the pilot in command and aircrew. The aircrew's challenge, though, is to have sufficient situational understanding of their circumstances in enough detail to make the right decision. A good way for a pilot in command to think about this, is to constantly ask the question "is my risk increasing or decreasing?"

The answer to this question will vary over the course of the flight depending on the circumstances. Given that we often ask aircrew to execute dangerous missions, there are numerous situations where the answer to the increasing risk question is a definite "yes", but it is a command approved risk inherent in completing your assigned task; such as landing in dusty HLZs with suspected enemy presence, MEDEVAC missions to points of injury, and hasty attacks supporting troops in contact in rapidly changing conditions.

On the other hand, the most dangerous circumstances are those where you notice your risk is increasing but the commander has *NOT* approved operating within those hazards. Flying toward decreasing weather, unforecast adverse weather conditions, HLZs dustier than reported, unexpected enemy threat, and longer-than-planned duty days are good examples. A pilot in command earns his pay in these situations, and the decisions made at these points will have the biggest impact on the safe completion of the flight and the unit's safety program. Commanders should clearly articulate their intent for the mission to be flown, and the pilots in command / air mission commanders should be empowered to make decisions in the flight within the scope of this intent to modify the mission as necessary to remain within their approved risk levels. The Army's new ATP 5-19 Risk Management an excellent decision making model with four principles: *Integrate RM into all phases of missions and operations, make risk decisions at the appropriate level, accept no unnecessary risk, apply RM cyclically and continuously*. If you follow these principles and constantly assess your changing risk levels during the flight, the decisions you make will lead you to safe mission accomplishment.

Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
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Preliminary Report on 1st Half FY14 aircraft mishaps

In the **manned aircraft** category, Army aviation experienced 28 Class A - C aircraft accidents the first half of this fiscal year. These mishaps resulted in four fatalities. Nine of the accidents were Class A's, four were Class B's, and 15 were Class C's. For comparison, the first half of FY13 had 33 Class A – C aircraft accidents – five Class A's (six fatalities), three Class B's, and 25 Class C's.

For the first half of FY14, six of the nine Class A mishaps and three of the four Class B mishaps were the result of human error (69%) with three materiel failures and one unknown/not yet reported. All of the 9 Class A and two of the B mishaps occurred at night. Materiel failure was contributing in three Class A's. There were two bird strike Class C mishaps. Six of the 13 Class A and B mishaps occurred in OEF.

Dust landings were contributing factors in two Class A and one Class B mishap. Additionally, there was one Class A UH-60 ground taxi incident and one AH-64 mid-air collision.

	Class A	Class B	Class C
UH/MH-60	2	1	4
AH-64	4	2	3
CH/MH-47	0	1	2
OH-58D	2	0	4
LUH-72	0	0	0
TH-67/OH-58A/C	0	0	0
AH/MH-6	0	0	1
C-12/KA-300/UC-35	1	0	1
Total	9	4	15

Synopsis of selected Class A accidents (OCT – MAR 14). N/NVD denotes night/night vision device mission:

Manned Class A

-AH-64D (NVS). Crew was conducting aircraft qualification training, conducting slope landing when crew reported un-command cyclic input. Aircraft contacted the ground and sustained class A damage.

-AH-64E (NVS). Crew was participating in night operations when they detected smoke odor in the cockpit. While conducting emergency landing, the crew experienced electric power outage in the cockpit and subsequently impacted the ground. All four MRB's made contact. Crew was able to egress.

-AH-64D (NVS). Aircraft crashed just after take-off from the airfield and came to rest on its left side. Class A damage reported. One CM suffered abrasions in the impact.

-OH-58D (NVG). Crew was en route for range training when they experienced a low rotor RPM warning while at low-level flight. Crew initiated an autorotation and the aircraft descended into a tree line. Crew was able to egress with minor injuries and aircraft was destroyed in post-crash fire.

- KA-300 (N). Aircraft was on base leg approach when approach tower personnel lost radio

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contact with the crew. Aircraft crashed approximately 1.8nm from the runway. All crew members were fatally injured in the crash.

-HH-60L (N). Aircraft was being ground-taxied for parking when it made contact with the wing of a parked privately owned plane. Aircraft was shut down w/o further incident.
-MH-60M (NVG). Crew was conducting routine ATM training in the traffic pattern when the aircraft impacted the ground. One crewmember sustained fatal injuries in the crash and the remaining crew (pilot and CE) sustained survivable injuries.

-AH-64D (NVS). Crew of aircraft #1 was conducting assault training with a sister ship when it collided with aircraft #2 whose crew was conducting aerial RECON of an objective in the vicinity. Both aircraft crash-landed but crewmembers suffered no significant injuries.

-OH-58D (NVG). Crew was conducting take-off during NVG environmental training when they experienced dust conditions Aircraft entered an uncontrolled descent and contacted the ground hard. Aircraft came to rest upright but sustained separation of the tail rotor and vertical fin. Class A damage reported.

In the **unmanned aircraft systems** for the first half FY14, there were 17 Class A–C incidents with four Class A's, six Class B, and 7 Class C's. For the same time period in FY13 there were four Class A's, two Class B's, and 14 Class C mishaps. The four FY14 Class A's were two MQ-1C Gray Eagles, one MQ-5B Hunter and one aerostat. The six Class B's included five RQ-7B Shadows and one MQ-1B. The seven UAS Class C's included three RQ-7Bs, one MQ-1C, one RQ-20A, one RQ-11, and one aerostat.

	Class A	Class B	Class C
MQ-1	2	1	1
MQ-5B Hunter	1	0	0
RQ-7B Shadow	0	6	3
Aerostat balloon	1	0	1
RQ-11 Raven	0	0	1
RQ-20A Puma	0	0	1
Total	4	1	14

Synopsis of selected UAS Class A mishaps (OCT 12 – MAR 14):

UAS Class A

-MQ-1C. Controller lost link with the system as it was descending to land on the runway and it crashed, resulting in Class A damage.

-MQ-5B. System had reached 250' AGL following launch when it initiated an un-commanded descent and impacted the runway. System was deemed a total loss as a result.

-MQ-1C. UAS had uncommanded movement during taxi, the ground crew pulled GDT and LGDT circuit breakers but the vehicle continued forward until striking a hangar, Class A damage reported.

-Aerostat. Balloon suffered loss of helium at 13,000 feet and descended to ground contact.

Unmanned Aircraft Systems (UAS) Integration into Aviation Branch

Chief Warrant Officer 5 Paul F. Druse
Directorate of Evaluation and Standardization
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Fort Rucker, Ala
Chief of Standardization

Since the inception and integration of UAS into Army Aviation, the methods for maintaining standardization and managing the Aircrew Training Program (ATP) have been treated separately from manned requirements. In regards to regulations and doctrine, they have been operating with a separate capstone regulation (AR 95-23), and standardization and training manuals (Training Circulars (TC)1-600, 3-04.61, 3-04.62, 3-04.63). Due to decisions made early in the fielding of these units , UAS units were not located or integrated with manned aviation units until deployed and assigned to a CAB. The end result was the loss of the expertise and lessons learned from manned aviation in terms of standardization and ATP.

The Directorate of Doctrine and Training at Fort Rucker has recently staffed TC 3-04.11, Commander's Aviation Training and Standardization Program, which will serve to integrate UAS requirements into one capstone branch training and standardization document. This will ensure commanders are developing and maintaining a standardized training program for both manned and unmanned aircraft. Standardization personnel will have one reference for managing the ATP for both manned and unmanned aircraft.

During a recent assessment visit to the Army's first full spectrum CAB, (101st CAB, Fort Campbell, Ky), the positive effects of integrating the UAS unit into the unit were noted and specifically lauded during the out-brief to the chain of command. The integration of the UAS into the CAB SOPs, pilots' briefs and overall flight operations has demonstrated that when commanders, senior standardization and safety personnel are involved in UAS operations, the outcome is positive, leading to a more tactically proficient and cohesive unit.

There is no doubt the experience of manned aviation has been slow going in terms of fully integrating UAS into manned aviation units. The integration will not only be required in the regulatory, doctrinal, and training publications but a mindset to fully integrate UAS into as part of the unit under the same SOP. Commanders, standardization and safety personnel at all levels will be required to reach out to assigned UAS units and offer the same mentorship and oversight of the standardization and training programs as required by manned units.

--CW5 Paul Druse, DES Chief of Standardization, may be contacted at (334) 255-1582, DSN 558.

Don’t Let the Automation Fly You

Chief Warrant Officer 3 Matt Loiacono

(Editor’s note: Aviation technology in both Army and civilian aircraft has changed since this article was written in 2009, but the lessons learned by this pilot are timeless and apply today as much as they did then.)

As a National Guardsman and regional airline pilot, I have the opportunity to straddle several decades of automation in the matter of a few hours.

In the Guard, I am lucky enough to fly the OH-58A (yes -‘A’-, not ‘C’ or ‘D’) dating back to 1970. When I fly as an airline pilot, I fly a Canadair CRJ-200 which is a 50 passenger jet with a moderately automated flying deck from the early 90s.

Compared to the OH-58A, the cockpit automation of the CRJ is ‘Star Wars’ technology. While the mission equipment on the OH-58A is getting continuously updated with moving maps, third generation FLIRs, and complex law enforcement radio units, the operation of the aircraft itself is virtually the same as it was 38 years ago.

The CRJ, on the other hand, is extensively automated and has computers integrated into nearly every function a pilot needs. In the CRJ you become a ‘systems manager’ and assume ‘stick and rudder’ operation generally only on take-off and landing phases.

When climbing or descending, you get a tone 1,000 feet before the altitude that has been entered into the altitude selector. This, along with the ‘pilot flying’ call out of: “One thousand to go,” are two items designed to keep the crew in the loop.

Another helpful automation feature of the CRJ is the blinking altimeter setting display. The altimeter setting displayed on the primary flight display begins blinking prior to the aircraft climbing or descending through 18,000 feet. This is to alert the crew to set the appropriate setting because of the use of 29.92 above 18,000 feet altitude. Failing to reset the altimeter to the local altimeter setting on descent can cause large errors when there is a large deviation between the local altimeter setting and 29.92. If the crew becomes distracted with other cockpit duties, loses situational awareness and fails to see the blinking reminder, then trouble can ensue.

On the day I failed all three of the above nothing happened beyond bruised pride, but we could not have been in a worse place to try our luck. I was the ‘pilot flying’ (PF) on a flight from Buffalo, N.Y., to LaGuardia International Airport in New York City. During the Rockdale 2 STAR, we were given a last minute hold at VALRE intersection as published but with 10 NM legs. In violation of the procedures outlined in our flight operations manual, as the PF, I became overly focused on the programming of the flight management system (FMS) for the hold. The captain encountered an error in the hold programming that she had not seen before. In the recent past I had watched another captain clear this particular issue and began to explain the procedure to this captain.

We had already briefed the approached listed on ATIS and loaded the ILS 04 approach at KLGA in the FMS. Due to the associated hold at GREKO (MAP holding fix for ILS04), the FMS took an extra step to correctly establish the assigned hold at VALRE given to us by ATC.

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After the hold programming was completed, we discussed the 45 minute expect further clearance (EFC) that ATC advised, fuel considerations, and the possibilities of diversion airfields. Because I focused too much on the programming of the FMS, we missed the "18,000 descending, altimeters 30.14" call. I did not prompt the other crew member to switch her setting as well. After we entered the hold and flew several circuits we were given a second descent with an improper altimeter setting. The setting in the primary flight display (PFD) was 220 feet off the local setting because it was still set at 29.92. Once noticed, I immediately corrected the error. ATC did not query us nor correct us and we had no traffic collision avoidance system (TCAS) warnings.

While our altitude error was not extreme and did not endanger other aircraft, it was bordering on the level that begins 'certificate action' (suspension, revocation, etc.) on the part of the Federal Aviation Administration. While I need to keep my career intact and certificate action would be unfortunate, the consequences of this in perhaps the most congested airspace on earth was bad. We were flying in the vicinity of LaGuardia, Newark and JFK. The ATC system there is very compact and usually operating well above 100 percent of its capacity.

There were several causal factors that lead up to the situation we found ourselves in, the overriding issue was my failure to maintain situational awareness because of my overconfidence in the automation systems. Because I didn't stay in my lane and relied on the automation to do everything while we as a crew corrected a 'software glitch' in the FMS programming, we descended 220 feet below our assigned altitude. Everything looked right on the surface. The altitude shown on the PFD was the right number. It was just useless information because the altimeter setting next to it was wrong.

There are several different methods I could have used to correctly perform my duties and show the captain what I had been taught just a few days prior. When I identified that the captain was experiencing difficulties I could correct, I should have stepped back and assessed the flight environment (past, present, & future) and the timing and sequence of upcoming critical tasks. When I had 're-caged my gyros' and with an updated view of the current situation and the next few minutes of our flight, I could have prioritized the required tasks (transitioning to local altimeter setting & subsequent level off) and corrected the FMS programming when workload subsided. Once we passed through 18,000 feet, had the altimeters set correctly, and leveled off; I could have begun to help fix the problem.

Another possibility was to transfer controls to the captain and corrected the issue myself. This would have saved critical time by distributing workload during a dynamic period of high demands, so that one person was always primarily focused on flying the plane. Upon arrival at the gate, with passengers safely offloaded, I could have explained why the problem arose and how I fixed the FMS issue with no distractions or degradation to operations or safety. This is a direct correlation to my days flying AH-64As, where both pilots could become fixated with an issue inside the aircraft and the one flying let his duties become secondary to fixing the issue.

While automation is a great tool if it is used properly, when used as a crutch it can lead you down a path of complacency.

Class A – C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 20 Apr 14
	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	1	2	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	1	2	4
	February	0	0	2	0		1	0	3	0
	March	2	1	5	6		1	2	0	0
3rd Qtr	April	1	1	6	2				2	
	May	0	0	6	0					
	June	1	1	4	0					
4th Qtr	July	0	0	7	0					
	August	1	1	9	0					
	September	0	1	1	0					
	Total for Year	8	7	58	8	Year to Date	9	4	17	4

UAS Class A – C Mishap Table									as of 20 Apr 14
	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	2	1	1	4
MQ-5	2	0	3	5	Hunter	1			1
RQ-7	0	4	10	14	Shadow		6	3	8
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
Aerostat	2	3	1	6	Aerostat	1		1	2
Total for Year	9	8	20	37	Year to Date	4	7	7	17

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[Views expressed are to generate professional discussion and are not U.S. Army or USACR/SC policy]

TGT limiting and warning devices.

A few years back there was a Class A accident with fatalities involving a UH-60:

While initiating a go-around under night vision goggles from a mountaintop helicopter landing area, the pilot on the controls applied excessive forward cyclic and collective, entering the aircraft into a descent with a 19-degree nose low attitude. When additional collective power was applied, the rotor rpm decreased and the aircraft descended, impacting a rock formation.

Essentially, the aircraft exceeded the power available for the maneuver that was being performed. The engines reached the TGT limiting value, fuel flow was regulated to hold that value, the crew asked for more power through their application of the collective, power wasn't available, the rotor bled and the aircraft crashed. No question that there were errors made in the application of power and improved situational awareness on power management would go along way to prevent future occurrences of this type of event. Sounds good, done deal - except - this type of event has occurred time and time again over the last 30 plus years. Let's take a closer look.

Although all of the big four (UH-60, AH-64, CH-47, OH-58D) address TGT limiting in some form or fashion, it's the UH-60 and AH-64 that actually limit during the production of power. From the Black Hawk operator's manual: The temperature limiting system limits fuel flow when the TGT TEMP reaches the dual engine 10-minute limiting value of approximately 866°C. The automatic contingency power limiting will switch to a higher single engine 2 ½ minute temperature limiting value of approximately 891°C when the opposite %TRQ is less than 50%. Fuel flow is regulated to hold a constant TGT. With the ENG POWER CONT lever at LOCKOUT, the automatic TGT limiting system is deactivated and TGT must be manually controlled.

The description is similar in the Apache manual (should be – it's the same engine) but they do caveat one very important note: *An impending engine TGT limiter activation will not provide any cues prior to functioning.* Performance limiting will continue to display normal NG and oil pressure indications; as power demand increases, NP and NR will collectively decay and the TGT will remain at the engine limiter setting; torque indications will vary as a result of collective manipulation. Proper use and understanding of the PERF page and the application of PERF calculations will significantly reduce the potential for engine performance limiting. Caution must be exercised when operating close to an engine performance limit. For example, when operating near the dual engine TGT limiter setting, a gust of wind from the aircraft's rear or left, or an activation of the engine anti-ice could result in a reduction of available engine power.

Basically, under normal circumstances, the engines will limit their power at the 10-minute limiting value. Under single engine conditions it will allow your good engine to go to the 2½ minute temperature limit. If you want to bypass limiting altogether ,you have to go to LOCKOUT and control it manually. You will also be controlling your NP manually as well.

I was a big fan of TGT limiting when I got out of the Black Hawk transition 30 plus years ago. Never having to worry about exceeding TGT limitations appealed to me. I'm sure there were maintenance advantages. The A model had plenty of power to shuttle around a full load of troops. Our PPC wasn't as refined as it is today, but careful planning, especially with sling-loads, prevented

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most occurrences of decreasing RPM R conditions due to TGT limiting. But they did occur. Ten ships in a PZ trying to pick up a heavy load would tax the aircraft. Apaches coming out of FARPs, fully loaded, faced much of the same. The same could occur occupying battle positions with narrow power margins and encountering not so favorable winds. Later, as performance improved with upgraded aircraft models, the load requirements also increased. Slim power margins still remained with the emergence of more challenging operating environments. High and hot became the expectation, not the exception.

Flying an approach with slim power margins to the taxiway is pretty straight forward when all you have to do is monitor approach angles and engine performance. It becomes a whole new animal under goggles with talcum dust climbing your windshield, turbulence from other aircraft in the formation, and mission urgency pushing your limits. Your visual senses become saturated as the complexity of the situation rises. Your scan can become more channelized omitting or not comprehending some of the information you are monitoring, especially the info that requires concentration and interpretation, like many of our numerical digital displays.

I am no longer a fan of TGT limiting. My simple rationale is this: It restricts access to power that could be usable but is not available - by design. Segmenting the bands of limits (10 min, 2½, 12 sec) makes little sense. If both engines are on line you can go to one limit, but if only one engine is operating you get to go to a higher setting. I don't think the temperature comfort level in an engine cares if one or both engines are online when a temperature is applied to it. Generally, that little extra you get in the single engine zone you don't need for 2½ minutes, just a few seconds to get out of a difficult situation. Something to get you through the dust cloud a little quicker or handling that unexpected wind gust or change in direction. In some occurrences there may be a need to pull more than the maximum posted limit to prevent a mishap. Over-temping engines should always be preferable to having an accident.

Compounding the issue of having engines that limit themselves is the fact you don't get a heads up when it is activated unless your focus is glued to the gauges. There are no warnings as you approach a TGT limit. In the spotlight mishap for this article, the low rotor audio was the main indication the accident crew noticed when they were in performance limiting. Under their circumstances, the warning occurred too late in the accident sequence to overcome. The rotor was already well below operating parameters to recover at their altitude. Had the crew received an audio prior to activation of limiting rather than at the low rotor indication, measures might have been taken to adjust the demands placed on the aircraft.

So what am I trying to say? Yes, responsibility lies with the pilots to monitor their power requirements and adjust as necessary. How about a little help to the aircrews that are placed in those narrow power margin situations where high visual work loads tend to cause one to rack and stack the critical tasks as they pop up? OH-58D and CH-47s have limiting during starting but no top end limiting. What they do have is advisories/warnings that tell the pilots when operating limits are being approached. Integrating a similar system into the Black Hawks and Apaches would add situation awareness to the crews during critical times of their flight and allow adjustments to be made before a more dangerous emergency develops with decreasing RPM R.

Do I conceive a change to the fleet that would disable TGT limiting functions and/or add advisories when limitations are being met? That would be nice, but of course not. Would I like the acquisition folks who will be developing the follow-on engines and upgrades to take this into consideration? Absolutely.

--Robert (Jon) Dickinson

Human factors - errors in judgment 22 Aug 1984 Flightfax

The following article by L. Homer Mouden and John H. Enders, Flight Safety Foundation, was adapted for our readers from **Flight Safety Digest.**

It is only relatively recent that the term "human factors" has really become recognized as a discipline in its own right within aviation. Earlier aviation human factors work was often done in an incomplete fashion and within a highly skeptical aviation community.

Evolution years

In the years following World War II, the continual search for higher performance military aircraft also placed more demands upon the control systems and the display of flight and systems information in the cockpit.

This evolution was happening to the airplane, not to the man. No such improvements were concurrently taking place in man's physical capabilities: his speed of reaction, the power in his muscles, the strength of his skeletal structure, or the overall capacity of his brain. Today, we are operating newer, more sophisticated aircraft with the same type of human beings. We face the problem, therefore, of making it possible for that same human to assimilate the vast amounts of information necessary to make the proper judgments and decisions and to control the modern, high-performance machine in a safe and efficient manner.

At the same time, we recognize that the man is the most versatile factor in the man/ machine flight "system." If properly maintained, the machine will repeatedly operate as designed. Man is less predictable. He is subject to moods, to the lack of timely information, to fatigue, to illness, and to damage to his ego. Yet, the human mind possesses remarkable capabilities to receive, process, and store information, to recall that information and use it in a decision-making process. Judgment is a unique attribute of the human mind, drawing on far more bits of information and experience and making decisions based upon the assembly of this knowledge and experience than any computer yet designed.

We tend to think of human error mostly occurring in the cockpit. We used to call it "pilot error." We tend to forget that human error can be - and often is - committed in design, in maintenance, in ramp servicing, in weather forecasts, and even in the board room or operations directorates. Human error on the flight deck gets most of the attention, however, because that is where everything comes together to present the pilot with a decision problem at a critical time in flight.

With adequate training and a thorough knowledge of the capabilities and limitations of himself, the aircraft, the environment, and the operating system and if he has received timely and effective information - each crewmember will be able to exercise good judgment in evaluating any operating problems, and taking the correct action. Then why do they fail?

Human judgment factor

We have built much of our safety record on lessons learned from accident investigations. Whether the probable cause was determined to be materiel failure, power plant failure, pilot confusion, or inadequate fuel load, there was a human judgment problem associated with it.

Unfortunately, accident investigators are sometimes unsure why the flight crew took certain reactions that have been deduced from an examination of the wreckage. The tragedy about

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accident-derived information is that it is after the fact. Incident data, on the other hand, can be a gold mine of information. Incidents that involve design faults or maintenance problems are generally shared - eventually. However, if we are concerned about human error and want to collect incident data about human mistakes, the attitude quickly changes.

Admitting a mistake is sometimes a difficult thing to do. So, every day, somewhere, people are making mistakes. In the design process, mistakes are made, but several levels of checking catch most of the errors. In manufacturing, mistakes are made, but there are procedures for detecting faulty parts or misassembled pieces.

Operational disadvantages

In maintenance, a mechanic or engineer may make a mistake, but inspection procedures are developed to discover these mistakes. When we get into the operational regime, however, the pace quickens and mistakes do not enjoy the luxury of comparatively leisure re-inspection.

If these potentials for incidents or accidents were known before they eventually became an actual incident or accident, it might be possible to analyze them and identify the real reasons why they happened. It would then be possible to identify the actual contributing factors.

With an accurate indication of what occurs, the frequency of similar occurrences and the benefit of self-analysis by the individual involved as to why it occurred, it should be possible to identify the real contributing factors even human factors. Was it a design deficiency, inadequate marking, insufficient knowledge of the system or procedures, or information which had been presented in such a way that it could be misunderstood?

Such questions can seldom be answered with the knowledge gained from one single accident or incident, but all are the result of errors in judgment somewhere in the system.

Pilots, engineers, controllers, and, in fact, all employees of an organization know this. And, yet, they are often reluctant to disclose the information which could contribute to corrective action.

Incident reports are some of the most valuable tools available to management for assessing the validity or effectiveness of an airline's policies, procedures, and practices. However, unless all incidents are reported objectively and factually, an analysis of such incident reports as are available could present a false or unreliable picture of the real problems.

Thus, any program that can encourage the reporting of incidents, occurrences, or events that could have been serious or hazardous will assist in evaluating the potential problems. If these are identified and can be eliminated or modified, the next catastrophic accident may have been averted. We may have increased the overall margin of safety for one flight-or for the entire aviation industry.

Army hazard report

The Army has a means of reporting aviation hazards. The Operational Hazard Report (OHR) , DA Form 2696- R, can be signed or submitted anonymously. The purpose of the OHR program is to obtain information pertaining to mishap-producing conditions before mishaps occur and to take timely corrective action to change or eliminate the conditions. The OHR program has brought about many changes in aviation operations, maintenance, and systems during its lifetime, increasing the margin of safety for the aviation user.

There are many aviation hazards out there yet to be identified. Old ones abound and new ones crop up every day. You see them, but do you report them so they can be corrected?

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in March 2014.

Observation helicopters

OH-58D

-Crew was conducting take-off during NVG environmental training when they experienced dust conditions (at mast-torque limit). Aircraft entered an uncontrolled descent and contacted the ground hard. Aircraft came to rest upright but sustained separation of the tail rotor and vertical fin. (Class A)

Attack helicopters

AH-64D

-Aircraft experienced an Nr exceedance (132%) during descent for landing. Crew was able to land w/o further incident. Component-replacement required. (Class B)

-On approach, aircraft lost altitude and contacted the ground with the tail wheel. Aircraft sustained damage to the tail and left main landing struts, gun turret, and rear airframe mounts. Suspect aircraft experienced rotor wash effects of Chalk 1. (Class B)

Unmanned Aircraft Systems

RQ-7B

-Crew experienced a suspected engine failure during flight and initiated the FTS. System was recovered with minimal damage. (Class C)

-Crew lost link with the system while loitering in preparation for landing. UA descended to ground contact on a public road and was struck by an approaching vehicle. UA was destroyed and the privately owned vehicle sustained minor damage. No reportable injuries. (Class C)

Aerostat

-Tether snapped at the base trailer as the system was being lowered in response to a lightning advisory and elevated winds. Aerostat descended to the ground. Payload was destroyed. (Class C)

FAA Safety Briefing is the FAA safety policy voice of non-commercial general aviation. Published six times a year, FAA Safety Briefing, formerly FAA Aviation News, promotes aviation safety by discussing current technical, regulatory, and procedural aspects affecting the safe operation and maintenance of aircraft. Visit http://www.faa.gov/news/safety_briefing/

If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness/Safety Center at com (334) 255-3530; DSN 558

U.S. ARMY COMBAT READINESS/SAFETY CENTER

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Online newsletter of Army aircraft mishap prevention information

Army Aviation has a problem with spatial disorientation while operating in Degraded Visual Environments (DVE). Last year (FY13), we experienced two (of eight total) Class A accidents due to loss of orientation in DVE; five of 18 Class As in FY12; two of 14 in FY11; and eight of 21 in FY10. My point is that the historical trend for losses due to orientation miscues within DVE over the last several years matches exactly the trend Army Aviation has experienced since USACRC/SC established their consolidated database in 1972. Historically, approximately 20 percent of our Class A/B mishaps are attributed directly to spatial disorientation / loss of situational awareness in DVE. In other words, we as an institution have made no progress, in either enhanced training methods or with a technical solution, in reducing the accident rates for this loss factor.

Two definitions are important in understanding the significance of the historical loss rate percentages introduced above. The first is the term "*spatial disorientation*" which is defined as "*when the aviator fails to sense correctly the position, motion or attitude of his aircraft or of himself within the fixed coordinate system provided by the surface of the earth, and the gravitational vertical,*" and the second is the term "*degraded visual environment*" which is defined as "*reduced visibility of potentially varying degree, wherein situational awareness and aircraft control cannot be maintained as comprehensively as there are in normal visual meteorological conditions and can potentially be lost.*"

I contend that the full implication of spatial disorientation is poorly understood by Army rotary wing aviators. I freely admit that I was guilty of this misunderstanding also for the first 21 years of my career until I had the opportunity to research this topic in more detail with the assistance of the technical experts in the United States Army Aviation Research Laboratory (USAARL). The common perceptions of spatial disorientation are the well known visual and somatogyral/somatogravic illusions taught in flight school to prepare students to operate in Instrument Meteorological Conditions. Loss of spatial disorientation in a rotary wing aircraft, however, is very different from what we commonly think. USAARL has studied spatial disorientation extensively and noted in their 1995 report (volume 95-25), "Spatial Disorientation: A Survey of U.S. Army Helicopter Accidents 1987 – 1992," on the nature of spatial disorientation (my highlighting for effect):

> ***The well known causes certainly exist but do not appear to be predominant****. For example, brownout, whiteout, or inadvertent entry to IMC account for a total of only 25 percent of the SD accidents. By contrast, aircrew distraction was thought to play a part in 44 percent of SD accidents,* ***while misjudgment of clearance to the ground or a terrestrial obstacle was thought to play a part in 65 percent****. The typical picture is less one of a classical illusion or an environmental problem* ***than one of hard-pressed aircrew, flying a systems intensive aircraft under NVD, failing to detect a dangerous flight path****…*
>
> *Other textbook conditions, such as flicker vertigo or illusions due to downwash, proved almost* ***nonexistent*** *in our accident database. Similarly, there were* ***no obvious cases of vestibular illusions****, although we cannot by any means rule out low grade vestibular disturbances. By comparison,* ***the role of poor visual cues was highlighted by the relationship between SD and night flight and by the high percentage of accidents*** *in which the inadequacies of NVDs were considered to have played a part.*

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It is worth emphasizing the key phrase that the typical rotary wing spatial disorientation scenario is the "hard-pressed aircrew….failing to detect a dangerous flight path" while faced with internal and external distractions and crew coordination challenges. In this context, the USACRC/SC accident statistics, in particular those occurring during the past 12 years of conflict, clearly show the depth of our problem. More than 20 years ago, we recognized all of this but we are still struggling with these issues today. We know that poor visual cues negatively affect the pilot's sense of position and motion, and contribute to a disproportionate number of rotary wing accidents, which segues into the next topic of DVE.

Spatial disorientation and DVE are linked. Where spatial disorientation is what happens to the pilot, degraded visual environment is the condition of reduced visibility in which the loss of orientation occurs. Think of it as a "what happens" and a "where it happens" inter-relationship. With that said, DVE is an intentionally broad definition that, in essence, covers any restriction to visibility: smoke, rain, night, dust, haze, brownout, whiteout, etc. The restriction to visibility could be induced by the weather, the lack of illumination at night, or even a helicopter's own rotor wash with the recirculation of dust or snow during brownout and whiteout. Identifying the "where it happens" aspect of a mishap is critically important and the trending information from the past 12 years of Class A and B mishaps shows that operating in DVE accounts for 24 percent of our accidents. Not surprising that this is roughly in line with the 20 percent historical loss rate for spatial disorientation. Since the initiation of combat operations for OEF/OIF, there have been a total of 367 Class A/B accidents with 88 mishaps involving DVE. Of the 88 mishaps, 67 percent occurred in combat; 52 percent happened during the landing phase of flight, and 57 percent involved brownout conditions. Recall the nature of spatial disorientation mishaps defined by USAARL as the hard-pressed aircrew, with internal and external distractions, failing to recognize a dangerous flight path and one can clearly see the relationship between DVE and disorientation.

In this issue of *Flightfax*, we are going to deep dive into this topic with an overview of spatial disorientation, a *Flightfax* Forum with thoughts on operating in DVE, and concluding with a Blast from the Past covering the role of vision in spatial disorientation accidents.

So the real question is how we move forward to break the continued cycle of 20 percent annual losses attributed to SD/DVE. In my opinion, it is a three step process. The first is education, all Army aviators must be informed that losses due to spatial disorientation / DVE in the mission profiles that we normally fly is completely different than our typical idea of classic illusions. The second is training, we should update our training POIs to target how RW pilots normally experience spatial disorientation (dark, dusty, in the landing profile, while task saturated) followed by both training in our simulators and live in the aircraft. Lastly, the aviation enterprise needs to field a technical solution to increase aviator's situational awareness while operating in DVE. A significant research effort is on-going to improve aircraft handling qualities through the use of digital flight controls, sensor systems that will be able to penetrate obscurants, and on improved symbology to present position and orientation information effectively to the pilots. Until the technical solutions are ready, commanders need to rely on education and good risk decisions to reduce spatial disorientation accidents.

Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham,
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Spatial Disorientation

Overview

Spatial disorientation (SD) occurs when a pilot does not correctly sense the position, motion and attitude of an aircraft relative the surface of the Earth. It is often simply described as the inability to determine 'which way is up,' although the effects of disorientation can be considerably more subtle than that description.

Pilots obtain information about their orientation from:

- The visual system (eyes), which can obtain information from a range of cues outside the aircraft and relevant flight instruments inside the aircraft.
- The vestibular system, which consists of the balance organs located in the inner ears. The semicircular canals provide information about angular or rotational accelerations in the vertical (yaw), horizontal (pitch) and longitudinal (roll) axes, and the otolith organs provide information about linear accelerations.
- The somatosensory system, which includes a range of receptors in the muscles, tendons, joints and skin that sense gravity and other pressures on the body. Such perceptions are often known as the 'seat of the pants' aspect of flying.

The visual system generally provides about 80 percent of a person's raw orientation information, with the remainder provided by the vestibular and somatosensory systems, both of which are prone to misinterpretation and illusions during flight (Newman 2007). Although the visual system can overcome these limitations, the risk of SD is significantly increased if the relevant visual cues are absent, ambiguous or not attended to.

Nature of spatial disorientation accidents

Almost all pilots will experience SD events at some time, but the events are usually recognized and do not result in adverse consequences. Nevertheless, SD has always been involved in a significant proportion of aviation accidents, particularly those with more serious consequences. Statistics from the United States show that SD was involved in:

- 11 percent of fatal general aviation accidents during 1976–1992 (Collins and Dollar 1996)
- 2 percent of general aviation accidents during 1983–1992, with 92 percent resulting in fatalities (Mortimer 1995)
- 1.2 percent of civil helicopter accidents during 1983–1996, with 61 percent resulting in fatalities (Mortimer 1997)
- 11 percent of United States Air Force accidents during 1990–2006, with 69 percent resulting in fatalities (Lyons and others 2006)
- 11 percent of helicopter accidents and 31 percent of fatal helicopter accidents in the United States Army during 2002–2011 (Gaydos and others 2012).

Many authors have indicated that accident statistics often underestimate the proportion of accidents that are associated with SD due to the difficulty in establishing the contributing factors in some accidents and differences in the use of definitions (Gibbs and others 2012, Mortimer 1997, Newman 2007).

When SD does result in an accident, it is usually in the form of a controlled flight into terrain or in-flight loss of control, resulting in a collision with terrain or in-flight break-up. With most SD accidents, the pilot does not recognize the problem, or at least does not recognize it in time to effectively recover the situation. This unrecognized SD, often known as Type I, can occur for an extended period of time lasting up to tens of seconds or even longer (Previc and Ecoline 2004).

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Recognized SD, or Type II, is a more common event and occurs when the pilot is aware that their perception is incorrect, aware there is inconsistency in the information from the different sensory systems, or aware that the sensory information does not agree with the aircraft's flight instruments. Usually the situation is able to be recovered before an accident.

When Type II SD accidents do occur, they generally involve erratic flight paths resulting from the pilot having difficulty maintaining control of the aircraft's flight path. A range of factors can influence the extent to which a pilot may experience SD or be able to recover from SD. Common factors include limited or ambiguous visual cues outside the cockpit, not directing sufficient attention to the flight instruments due to workload or distraction, and not being proficient in instrument flying skills. McGrath and others (2003) stated:

> The typical SD mishap occurs when visual attention is directed away from the aircraft's orientation instruments and/or the horizon (due to, for example, temporary distraction, increased workload, cockpit emergencies, transitions between visual and meteorological conditions, reduced visibility, or boredom). Most SD mishaps are not due to radical maneuvers. When a pilot looks away from the horizon (loss of focal and peripheral visual cues), or looks away from his artificial horizon in instrument weather (loss of focal visual cues), the central nervous system computes spatial orientation with the remaining information at its disposal, vestibular and somatosensory. The vestibular and somatosensory information are concordant, but frequently incorrect. In such circumstances, it is physiologically normal to experience spatial disorientation.

Misperceptions associated with a gradually increasing bank angle

There are many misperceptions and illusions that can occur during flight, and these are discussed by many reference sources (such as Benson 1999, Gillingham and Previc 1993, Newman 2007). This section briefly reviews some misperceptions that can be associated with a gradually increasing bank angle.

Movement below the detection threshold

If a roll movement occurs gradually, it may be below the level that a pilot can detect. The threshold for the detection of short-duration roll movements (5 seconds or less) is usually reported as an angular or rotational velocity of about 2° per second. For longer durations the threshold is usually reported as an angular acceleration of about 0.5° per second squared (Cheung 2004). In operational settings these types of sensory thresholds are often higher, particularly when a pilot's attention is directed elsewhere (Benson 1999a, Gillingham and Previc 1993).

The 'leans'

Sometimes a pilot either intentionally or unintentionally initiates a roll at a rate below the detection threshold, and then notices the problem and initiates a roll in the opposite direction at a rate above the threshold in order to get the aircraft back level. The semicircular canals detect the acceleration of the corrective roll but not that of the original roll. As a result, a pilot can perceive that the aircraft is actually banking in the direction of the corrective roll even though it is level.

This is one of the most common forms of SD, and usually results only in a pilot leaning their body in the direction of the initial roll. However, it can also result in a pilot rolling the aircraft back in the direction of the original roll if they are not monitoring their instruments (Benson 1999).

Somatogyral illusion

During the entry into a turn, the semicircular canals will detect the initial angular acceleration. If the rotation is continued at a constant rate the canals will soon no longer be stimulated (or 'wash out'). This can occur after 10 - 20 seconds (Cheung 2004). If the pilot then attempts to roll out of the turn, they can falsely perceive an undesired, ongoing turn in the opposite direction. This

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illusion is usually discussed in terms of aircraft spinning in the yaw axis, but it also is relevant to movement in the roll axis. As described by Gillingham and Previc (1993):

> …when trying to stop the turn by rolling back to a wings-level attitude, the pilot feels not only a turn in the direction opposite to that of the original turn, but also a bank in the direction opposite to that of the original bank. Unwilling to accept this sensation of making the wrong control input, the hapless pilot rolls back into the direction of the original banked turn. Now the pilot's sensation is compatible with a desired mode of flight, but the flight instruments indicate a loss of altitude (because the banked turn is wasting lift) and a continuing turn. So the pilot pulls back on the stick and perhaps adds power to arrest the unwanted descent and regain the lost altitude. This action would be successful if the aircraft were flying wings-level, but with the aircraft in a steeply banked attitude it tightens the turn, serving only to make matters worse. Unless the pilot eventually recognizes what is occurring and rolls out of the unperceived banked turn, the aircraft will continue to descend in an ever-tightening spiral toward the ground, hence the name graveyard spiral.

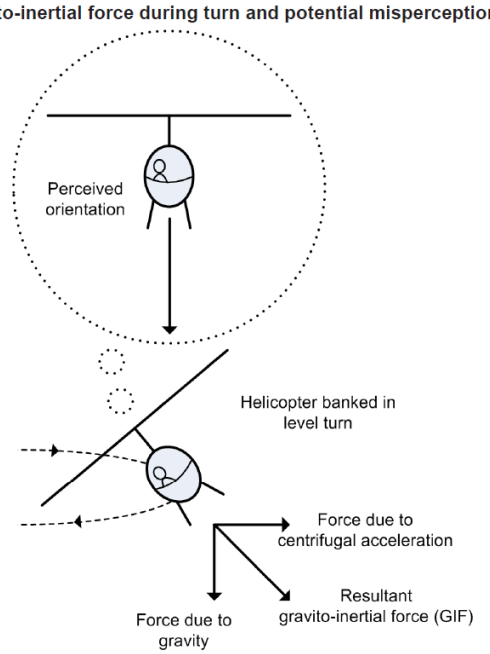
In summary, for the somatogyral illusion to occur, there has to be sustained rotation above the detection threshold.

Somatogravic illusion

During some aspects of a flight, a pilot is exposed to linear accelerations in various directions in addition to the normal gravitational force (g). The resultant total force vector is known as the gravito-inertial force (GIF). When a pilot misinterprets the GIF vector to indicate that they are tilted at a different attitude than they actually are, the pilot is experiencing the somatogravic illusion. Although the somatogravic illusion is usually discussed in terms of false pitch illusions that can occur when an aircraft accelerates during a take-off, it can also occur during turns.

During a constant airspeed turn, a pilot feels a centrifugal force as well as the gravitational force. If an aircraft yaws or turns without banking, the pilot will feel a sideways force because the resultant GIF vector points towards the outside of the turn. During a coordinated or balanced turn, the pilot manipulates the aircraft's controls to minimize any such sideways forces. Consequently, the resultant GIF vector points towards the floor of the aircraft (or from the pilot's head to feet), which is a similar perception to when the aircraft is in straight and level flight (Figure 19).

Figure 19: Gravito-inertial force during turn and potential misperception



Source: ATSB

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As previously discussed, in a gradual or prolonged turn the semicircular canals do not contribute to the pilot's perception of bank. In the absence of visual cues, the pilot may then interpret the direction of the resultant GIF vector during a coordinated turn as being the same as that during straight-and-level flight.

In addition to level turns, misperceptions of the GIF vector can occur during a descending turn and result in a spiral descent. As described by Gillingham and Previc (1993):

A pilot who is flying "by the seat of the pants" applies the necessary control inputs to create a resultant G-force [GIF] vector having the same magnitude and direction as that which the desired flight path would create. Unfortunately, any particular G vector is not unique to one particular condition of aircraft attitude and motion, and the likelihood that the G vector created by a pilot flying without reference to instruments is that of the flight condition desired is remote indeed. Specifically, once an aircraft has departed a desired wings-level attitude [or other desired bank angle] because of an unperceived roll, and the pilot does not correct the resulting bank, the only way he can create a G vector which matches that of the straight and level condition is with a descending spiral… a skillful pilot can easily manipulate the [flight controls] to cancel all vestibular and other non-visual sensory indications that the aircraft is turning and diving.

In terms of the ability to detect changes in the angle of the GIF vector, Benson 1999 stated:

Typically, an individual can set or determine bodily attitude with respect to the gravitational vertical with an accuracy of ±2°, but if the rate of movement is very slow (0.1°/s) body tilt of 10° or more can take place before deviation from verticality is detected.

In terms of the magnitude of the GIF vector, a level turn at a 60° bank angle would result in a GIF magnitude of 2 g, which would be easily detectable to a pilot. However, a 30° bank angle would result in a GIF magnitude of only about 1.15 g. However, when the aircraft is also accelerating downward the resultant force is decreased, which may lead a pilot to believe the aircraft is in a bank of less magnitude than it actually is. An increase in the magnitude of the GIF vector would also be harder to detect if it was gradual.

As previously noted, detection thresholds can be higher in operational settings. In particular, helicopter flights involve continual small variations in movement.

In summary, an undetected increasing bank angle can result in a somatogravic illusion, which can result in a descending, spiral turn. A pilot can easily and automatically manipulate the flight controls to cancel any non-visual sensory indications that the aircraft is turning or descending, which will maintain a GIF vector oriented close to the pilot's head-to-feet axis.

NOTE: The information in this article was extracted from the Australian Transport Safety Bureau (ATSB) Transport Safety Report, Aviation Occurrence Investigation, AO-2011-102, Final – 14 November 2013 - involving a helicopter flying VFR flight into dark night.

They say milk is good for your teeth. You know what else is good for your teeth?

Minding your own business…

Defragging the Hard Drive: A Change in Aviation Training Philosophy

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Deputy Director

One of the most grating problems that we deal with in today's business environment is a computer that is so bogged down with extraneous information that it is no longer able to perform even the most mundane tasks in a timely manner. We can feel our blood pressure rise as we watch that hourglass spin and spin when we are simply trying to open an email. Only a year earlier, this very same computer probably worked with lighting-like speed but slowly over time, we have bogged it down with information so that it is now an actual hazard to our health because of its blood pressure elevating properties.

Given how exasperating this is, it is amazing that we, the aviation branch, do the very same thing to our Aviators' organic hard drives – their brains. We at DES routinely observe instructor pilots demanding that their aviators commit to memory every pressure, temperature, and voltage possible on their aircraft. We have observed pilot in command (PC) oral evaluations that lasted two hours and never got beyond the performance planning card and the electrical system. Given that these PC evaluations were for AH-64 PCs, I was surprised that the instructor pilots were so concerned that their students could regurgitate the voltage required to operate a pressure regulator shut-off valve (PRSOV) but did not ask them any questions regarding tactical employment.

Let's face it, today's aircraft are so technologically advanced that they can and will provide vast amounts of information to the pilot that formerly had to be committed to memory. I can still remember the days of memorizing every conceivable pressure and temperature of the AH-1 because that venerable old airframe was instrumented with nothing but steam gages with slippage marks on the glass. The lack of technology required that an aviator memorize that type of data. However, today's aircraft are equipped with digital indications that warn an aviator of impending exceedences with everything from count-down timers to color codes to human voices. We have systems that record temperatures and pressures out to the third decimal point and times out to the millisecond. We even have systems that will display emergency procedures to the aircrew automatically.

With that being the case, why are we not unburdening our aviators of the requirement to fill up their hard drives with this type of information – information that the aircraft is quite capable of managing on its own? Why are we not spending more time requiring our aviators to know and understand aviation doctrine and tactics? Apache pilots should spend the vast majority of their study time ensuring that they are experts at employing weapons systems. Blackhawk pilots should spend the majority of time becoming subject matter experts at conducting air assaults. We as standardization leaders should be creating tactically proficient war fighters as opposed to competitors for the show Jeopardy.

We started to embrace technology when we first fielded the AH-64D. DES sent a memo to the field that relieved aviators of the responsibility of memorizing a significant amount of data because the aircraft did an excellent job of managing that information. However, over time, the community slid back to the old habits of playing "I'm a drop of oil" again.

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It is time that we embrace the advantages that our advanced technology offers. We have to break the bonds of inertia and unburden our aviators of the requirement to spend so much time with rote memorization. Instructor pilots must shift their focus and require their pilots to become true subject matter experts in their mission and the associated doctrine, tactics, techniques and procedures. Does an aviator really need to be able to recite each and every monocular cue from memory or be able to draw the eyeball? We believe that the branch would be much better served if our aviators had a good general knowledge of this type of information and spent more study time on how to tactically employ their respective aircraft.

Obviously, there are things that we will continue to have to commit to memory. Underlined steps of emergency procedures are a good example. Pilots will always have to have an intuitive understanding of how to manage aircraft emergencies. This level of knowledge will require some rote memorization no matter how much technology resides on an aircraft. However, if the aviator can't use a particular piece of information from the cockpit, did he ever really need to commit it to memory in the first place?

There is no doubt that this is a topic that will require some focused discussions within the standardization community. DES will be taking a very hard look at how we can manage effective change in this area. We are interested in hearing from the field on this subject and are challenging the branch to take an honest look at our training philosophies and make a real effort to figure out how we can use our technology to more efficiently unburden the most important processor on the aircraft….the aviator's brain.

--LTC Josh Sauls, DES Deputy Director, may be contacted at (334) 255-3589, DSN 558.

Actual Accident Finding: Learn from the experience of others

FINDING: While leading a nine-aircraft night formation flight encountering decreasing weather conditions, flight lead, in an AH-64A, violated the control measures which were established by the unit standing operating procedures (SOP) for en route weather minimums.

As the weather forced the flight to descend below the established, briefed, 500-foot AGL minimum flight altitude, to altitudes as low as 120 feet AGL, flight lead did not properly modify the flight planning and procedures. That is, he elected to continue with the planned mission in unsafe weather while attempting to maintain visual contact with the ground rather than divert or delay the flight for the required minimum mission weather.

He and his flight descended and continued in the unsafe weather without advising the other crews or advising the air mission commander (AMC) for approval, and chalk 7 struck high-tension wires. The wires were struck as the PI of chalk 7 was attempting an immediate landing to ensure safe separation from chalk 6. Chalk 7 sustained visible windscreen damage during that wire strike.

The actions by flight lead were a result of overconfidence and inadequate supervision by the AMC. Flight lead was confident he could continue even with the decreasing weather in that he had use of the forward looking infrared (FLIR).

Additionally, the AMC, in Chalk 4, provided no guidance to flight lead or initiated any on-the-spot corrections to flight lead even after the AMC also flew into the decreasing weather that was below the SOP - established minimums for operation.

Mishap Review: Shadow currency training

While conducting unmanned aircraft operator currency training, a RQ-7B Shadow unmanned aircraft struck a utility pole while the operator was attempting to land it. The collision with the utility pole resulted in the destruction of the unmanned aircraft.

History of flight

The operators of an RQ-7B Shadow unmanned aircraft unsuccessfully attempted to land their unmanned aircraft (UA) after completing four hours of currency training. The aircraft commander (AC), a 15W, had a total of 590 RQ-7B flight hours with 520 hours in theater. The aircraft operator (AO), also a 15W, had a total of 503 RQ-7B hours with 273 hours in theater. The operators attempted twice to land their UA in the designated landing area utilizing the automatic landing system, but were at a wrong altitude for the system to acquire the aircraft. The aircraft commander adjusted the aircraft to the correct transition altitude and attempted to land it two additional times, again with no success. Following the check list and standing operating procedures, the AC transferred the control of the aircraft to a back-up control station to make another landing attempt. After the transfer, the AO erroneously adjusted the altimeter settings on his control screen twice, which lowered the UA's altitude dangerously low without the operator's knowledge. Just prior to attempting to land, the aircraft, the aircraft struck a utility pole adjacent to an elementary school. After the collision, it fell to the ground and came to rest on a road near the front of a school. A civilian vehicle traveling on the road collided with the wreckage. The utility pole and vehicle collision resulted in the total destruction of the UA and minor damage to the civilian vehicle. There were no injuries.

Commentary

The investigation determined the aircraft operator (AO) of the RQ-7B failed to follow a caution defined in the operator's manual in that the AO twice changed the altimeter setting while operating below 3,000'. The operator's manual cautions against changing the altimeter settings while flying under 3,000 feet AGL, as it may cause the UA to descend to a low altitude without the crew being aware. As a result, the RQ-7B dropped in altitude to such a degree that it struck a utility pole resulting in catastrophic damage. Additionally, The AO's aircraft commander failed to provide correction when the AO asked for the altimeter setting and allowed the change while the UA was below 3,000' AGL.

Class A – C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 27 May 14
	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	0	1	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	1	3	4
	February	0	0	2	0		1	0	3	0
	March	2	1	5	6		1	3	0	0
3rd Qtr	April	1	1	6	2		1	0	4	0
	May	0	0	6	0		1	1		1
	June	1	1	4	0					
4th Qtr	July	0	0	7	0					
	August	1	1	9	0					
	September	0	1	1	0					
	Total for Year	8	7	58	8	Year to Date	11	5	19	5

UAS Class A – C Mishap Table									as of 27 May 14
	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	2	1	3	6
MQ-5	2	0	3	5	Hunter	1			1
RQ-7	0	4	10	14	Shadow		6	3	9
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
Aerostat	2	3	1	6	Aerostat	1		2	3
Total for Year	9	8	20	37	Year to Date	4	7	10	21

You may have noticed a theme in this month's *Flightfax* - spatial disorientation (SD). A couple of articles are provided for you to refresh your mind on what it is, why it happens, and what can be done about it as well as the definition of degraded visual environment (DVE).

So what does spatial disorientation have to do with DVE? Quite a bit actually. Until only a few years ago I had never been exposed to the term "Degraded Visual Environment." I was familiar with dust landings, white-outs, IIMC, black hole approaches, etc., but had never characterized them under one hat. DVE includes many conditions: IMC, low illumination, low contrast, brownout, whiteout, blowing sand, dust, smoke, fog, heavy rain, salt spray, etc. Just about anything that partially or completely reduces aircrew visibility and could cause a loss of situational awareness for the crew. So whether you punched into a low cloud deck trying to scud run or you're engulfed in a dust cloud at the bottom of a VMC approach, the potential effects of DVE and spatial disorientation have been thrust upon you. Luckily, we have been trained for such occurrences – right? Everyone has to demonstrate proficiency in doing a go-around, instrument take-off and recovery from an unusual attitude. These are staples in a pilot's proficiency training. They have not changed significantly in years. There are plenty of notes in the ATMs regarding NVG/snow/dust considerations for various maneuvers. If you lose visual contact execute a go-around – correct?

In the last five and one-half years there have been 23 Class A mishaps (out of a total of 96) that can be attributable to DVE. Seven of the 23 were fatal mishaps resulting in 24 fatalities. Total cost of over $260 million. The predominant aircraft were the UH-60 and CH-47 tallying 19 of the mishaps. Dust landings or take-offs accounted for the majority with 15 mishaps and one fatality. What of the others? Of the eight not included with the dust, there was one IIMC and seven associated with operating in low contrast conditions and/or low illumination. These eight accounted for the remaining 23 fatalities. It can be expected, on a yearly average, of having at least one full blown spatial D mishap with fatalities.

The dust landings are more prevalent but not as deadly. Typically they occur at lower speeds within a few feet of the ground when an unregistered drift, unseen obstacle, or unintended hard landing is the result. Until technologies mature that will see through the dust or snow and assist the pilot in landing the aircraft, it is still experience, training and techniques that control the outcome of the approach.

It's the other categories that present different challenges, such as the spatial disorientation that can develop when confronted with operating in low contrast/low illumination conditions. Ask any group of lift pilots about the most challenging flight conditions they face and invariably these flight conditions rise to the top. Read the following excerpts from accidents that occurred over 25 years apart –

During a night vision goggle training mission flown at 100' above the trees and 40 knots airspeed, Chalk #2 in a flight of three aircraft was observed to make an abrupt right turn and crash into the trees. All four crewmembers sustained fatal injuries during the crash sequence. Aircraft was totally destroyed and consumed by post-crash fire.

While flying as Chalk 3 in a flight of four aircraft, using night vision goggles, in a staggered trail left formation, at approximately 650 feet above ground level and 120 knots indicated airspeed, the pilot (PI) experienced spatial disorientation and lost control of the aircraft. As a result, the aircraft struck the ground in a nose low, left banking attitude. The aircraft was destroyed and all seven Soldiers onboard the aircraft were fatally injured.

Both aircraft were operating visually in good weather. What isn't readily identifiable from the

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description is that each of the aircraft were operating without a visible horizon – one deep in a forested mountain valley and the other over featureless desert terrain.

All Army aviators are instrument qualified and maintain currency in instrument tasks. They associate these tasks with operating in IMC conditions – either planned or unplanned. They have developed their instrument scan pattern to overcome the challenges of operating in the clouds. So how does this relate to operating in VMC conditions? I refer back to a line from the first article: *The visual system generally provides about 80 percent of a person's raw orientation information…the risk of spatial disorientation is significantly increased if the relevant visual cues are absent, ambiguous, or not attended to.*

Essentially, if your aircraft is venturing into low contrast/low illumination with no visible horizon or lacking the needed visual cues, then your need for instrument reference increases dramatically. Whereas you normally refer to your flight instruments occasionally while operating VMC in good conditions, it changes significantly at night under challenging conditions. The instruments become your primary means of maintaining orientation. The same for snow covered terrain or over water flight. This seems to be an area, in my view, that training within our aviation community falls short.

How many times has the phrase "it sure is dark out here" or "I can't see anything" been communicated within your crew? That's a subtle code telling the crew the conditions are very challenging and they need to step up their game. Rather than subtle codes, wouldn't a better solution be to announce the degraded visual condition and coordinate crew actions to over come them? Different pilots will tell you how they respond to these type of situations or how they increase coordination between crewmembers as conditions become more challenging. That's developed through their experience operating in those conditions.

How about the less experienced that have not been exposed to this arena? You put them in Chalk 3 thinking they'll be tucked within the safety of the rest of the flight. The double-edged sword is that they may spend most of their visual energy trying to maintain formation instead of maintaining aircraft orientation. The potential failure is not recognizing that, although they are flying VFR, they are actually flying the equivalent of IMC and need the instrument scan to assist.

Operating in degraded visual conditions is a challenge. Coordinating actions within your crew and your flight to reduce the effects can go a long way to minimize the potential disorienting effects that can occur. Do you have to fly directly into the abyss? Or can your flight route be modified to include more ground references. Does the 180 turn around have to be done in steep turns or can they be flattened out in a more gradual manner? How about modifying a pattern rather than orbiting your flight? The potential effects of spatial disorientation should be considered well before you're in the aircraft. Flight routes, weather, illumination data, as well as the risk assessment worksheet can all give indicators of where mitigation measures should be applied. You may check the block on low illumination but have you combined it with the effects of cloud cover, featureless terrain, no ground lights and dust at the objective? These are examples of cues to flying that are not seen from the aircraft.

Technology solutions are coming but they're not here yet. Training is still key to overcoming DVE. When was the last time you flew a VMC mission in the simulators with the visibility and illumination turned down low? It's a great place to practice those crew coordinating actions. Hangar flying with other pilots will help you refine your techniques and broaden your own experience base, but other things can be included. Discussions on decision points, such as when to make a go-around or changing routes or even when to mission abort will strengthen your ability to make the correct decision when you're faced with challenging circumstances.

Jon Dickinson, Aviation Directorate, USACRC/SC, (334)-255-3530, DSN 558-3530

The role of vision in spatial disorientation 12 Oct 83 *Flightfax*

This article, by Colonel Grant B. McNaughton, MG, Directorate of Aerospace Safety, is reprinted from **Flying** Safety.

We normally think of spatial disorientation (SD) or pilot's vertigo as due to tumbling of our gyro-the balance organ or vestibular apparatus in our inner ear. While it is certainly true that vestibular inputs can cause vertigo, the vestibular apparatus is not the only source of conflicting information leading to SD. Other sources of orientation information (hence conflicting inputs) include vision, the somato-sensory (feel of the aircraft and seat of the pants) system, and, to some extent, hearing. Of all these sources, the most consistent and possibly most important cause of SD is conflict between two functional components within the visual system itself.

Though in some respects an oversimplification, the concept of a two mode visual system is important to understanding the role of vision in SD. The two modes are:

• A **focal** mode, which "focuses," used for tasks requiring acuity or resolution; e.g., reading the *20/20* line or the letdown plate, identifying the bogey, or aiming the gun. The focal mode is exclusively visual and requires good lighting and good optical resolution. It also requires conscious attention.

• An **ambient** mode, which orients us to the "ambient" environment, tells where we are, and whether we or the environment is moving. The ambient mode is hard-wired to the same terminals in the brain into which feed our other sources of orientation information-vestibular, somato-sensory and hearing (figure 1). Rather than being an isolated ambient visual system, we actually have an ambient orientation system. In this system, vision and the other senses each contribute a share of the inputs. The ambient mode functions quite well at low light levels and does not require acuity correction. For example, though you can't read in the dark, you can orient, provided there is some light (figure 2). The ambient mode functions at a reflex rather than a conscious level and, provided the stimulus is visible, orientation responses appear to occur on an "all or none" basis. The ambient mode acts in concert with the other senses to sub-serve spatial orientation, balance, posture and gaze stability.

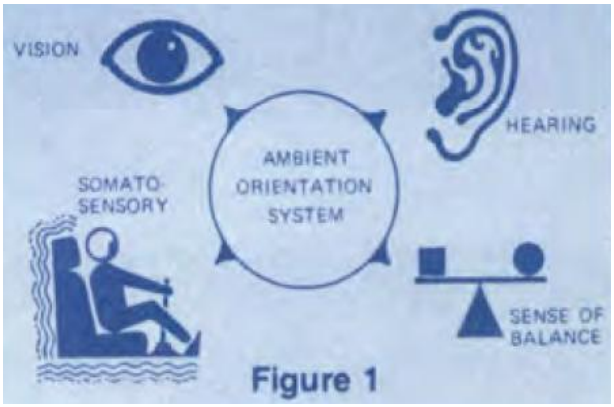

Figure 1

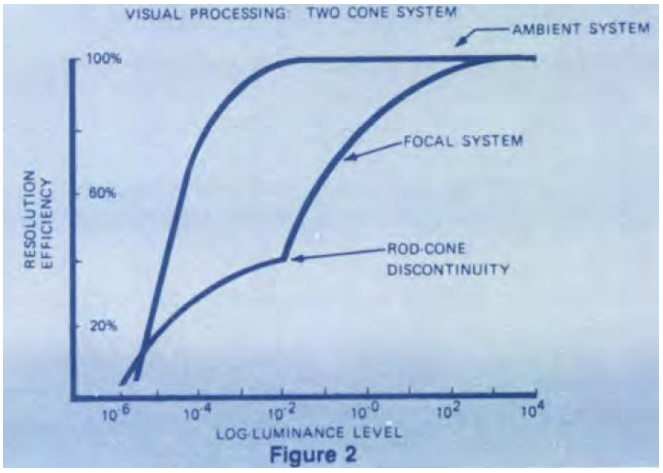

Figure 2

An important aspect of these two modes of processing is that they can be dissociated, as demonstrated by the fact that you can read while walking. This dissociation has some impact on night driving, for example. You steer by your ambient mode, which is relatively unaffected at night.

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As long as you can steer, you have confidence in your ability to drive, so you drive at the same speed as during daytime, or commonly a little faster. The problem is that your focal vision (hence hazard recognition) has been selectively degraded, and you may not see obstructions such as joggers, animals, or potholes in time. (Also, your reactions are slower at night.)

There are other fundamental differences between the two modes. The focal mode is confined to the optical center of the eye but the ambient includes the entire retina-over 3,000 times as much area. The ambient mode functions on the "mass rule" and reacts in proportion to the amount of it that is stimulated. Big objects or big motions are more commanding. This, coupled with the fact that the ambient mode is not particularly discerning (i.e., it can be fooled), provides the basis for the overwhelming sense of self-motion, known as the "vection" illusion-generated by full visual simulators. It also accounts for the disorienting "Star Wars" effect of bubble-type canopies at night.

Another difference: Whereas the focal mode actively focuses on objects for recognition and detail, the ambient passively takes in the "quality" of the surroundings-for example, the quality of "surfaceness" of a surface, or the "horizoness" of a horizon.

Of interest is the discovery that visual areas of the brain sub-serving the ambient mode appear to contain receptors specifically responsive to lines, and are quite ready to accept uncritically any line with the quality of "horizoness" as a horizon line. Thus, the commanding nature of sloping cloud decks or terrain, of a lighted shoreline or highway through an uninhabited region at night, or other false or misplaced horizons can subtly misorient the pilot. In keeping with the mass rule, the larger or longer the horizon, the more commanding.

Think of the most disorienting situations: formation, flying in and out of clouds, then, suddenly, totally IMC; flying high above the desert on a moonless night, no discernible horizon, and stars and ground lights blending; taking off into weather; night weather penetration with your external lights on; approaching through rain, snow, or weather with landing lights on. And you can think of others. In all these situations, you're visual; you're not under the bag. This does not imply you can't get disoriented under the bag; you can, from your unbridled vestibular inputs, but not nearly so easily as when your ambient visual system is bombarded with confusing and reflecting stimuli.

What's common to these situations is:

- Lack of a true horizon or reference to the surface.

- Mass stimulation of the ambient visual system (by watching your flight lead, canopy reflections, clouds, stars, rain, blowing snow, lights, etc.) causing the vection illusion.

- Situation worsened by anything which tumbles your gyros, such as accelerations (linear or angular), or abrupt head motions.

Whereas excessive erroneous inputs to the ambient mode cause one type of SD (the powerful vection illusion), lack of ambient inputs causes another: the target displacement illusion. This can occur in shooting an approach over "black hole" terrain, devoid of lights or any visual clues to the ambient mode. As you maneuver toward the distant approach lights, with no ambient inputs as a "reference point," it may appear that the target lights, not you, have moved. This is something akin to the autokinetic effect in which a stationary light wiI appear to move when gazed at; it can be somewhat confusing. Point sources of light provide no orientation information-either in relative attitude or in distance. Yet there is a common tendency to "go visual" too soon despite the lack of

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valid external orientation cues upon which to establish visual dominance. As a result, you become a set-up for the powerful vestibular illusions and can get into some unplanned attitudes.

If the runway lacks VASIs, the lack of ambient cues allows for another tendency: that is to fly a "banana" shaped approach, convexity downward. (The reason for this is that the eye, lacking other references, will attempt to maintain the same angle subtended by the visible runway-the near and far ends. In order to hold that same angle, you wind up flying the arc of a big circle, the chord of which is the visible portion of the runway, landing short or bending things shy of the runway.)

To cope effectively with spatial disorientation, you must establish visual dominance on valid, orientation cues. In other words, increase the ratio of "matching" cues to " mismatching" or conflicting cues. Under IMC, the only valid orientation cues are your instruments - primarily the attitude indicator. If single ship, reduce the disorienting mismatching visual inputs by turning down/ off unnecessary light, inside and out, to reduce canopy glare and reflections; by lowering the seat; or by going heads-down. Then simultaneously expand the effectiveness of your valid orientation cues by leaning forward and concentrating on them-again primarily the attitude indicator. Make the attitude indicator indicate straight and level for at least 30 - 60 seconds (to allow the vestibular inputs time to subside).

Unfortunately, the most disorienting situation is formation flight in reduced visibility-IMC or at night. Though you may not be able to go heads-down (or sneak a peek) at the attitude indicator, tell lead you're disoriented and request flight parameters-primarily attitude. If possible, have him fly straight and level 30 - 60 seconds to settle your own gyros. If that doesn't help, try getting to VMC for reference to a horizon or the surface. Lead should also consider transferring lead to you-to let you get your ambient mode out of "Star Wars" and devote the full attention of your focal mode to the necessary gauges. (This should all be briefed ahead of time.)

Spatial disorientation is a common problem. It is to be expected under situations in which your visual system is either bombarded with disorienting cues or denied valid orienting cues true horizon or surface-thus setting you up for the equally disorienting vestibular illusions. The best course is prevention by maintaining visual dominance (focal mode) on valid orientation cues (gauges). If SD occurs, increase the ratio of matching to mismatching orientation cues by getting your head out of the Star Wars reflections and focusing on the appropriate gauges. In formation flying, have a plan and brief it. SD is a killer. Don't take it lightly.

NIGHT OR NIGHT VISION GOGGLE (NVG) CONSIDERATIONS: Instrument meteorological conditions (IMC) is not a prerequisite for an unusual attitude. Low level ambient light may induce visual illusions and spatial disorientation. During night vision goggle (NVG) operations, video noise may contribute to loss of visual cues.

SNOW/SAND/DUST CONSIDERATIONS: Obscurants other than weather can induce loss of visual contact. At low altitudes where these conditions would be encountered, it is extremely important that these procedures be initiated immediately to prevent ground contact.

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in April 2014.

Attack helicopters

AH-64

-D Series. Aircraft experienced an NR overspeed (125%) during maneuvering flight training. Aircraft was landed w/o further incident. (Class C)

Utility helicopters

UH-60

-A Series. Flight of 2 UH-60A were ground-taxing to parking when the lead aircraft contacted a light pole with the main rotor system. Flying debris damaged the trail UH-60, as well as other parked fixed-wing aircraft. (Class A)

-M Series (HH). Post-flight inspection revealed damage to the FLIR; subsequent inspection confirmed right main landing gear strut damage as well. Both components require replacement. (Class C)

-A Series. Crew was performing an aero-dynamic braking technique during a roll-on landing when the main rotor struck the tail rotor drive shaft. (Class C)

Observation helicopters

OH-58D

-Aircraft experienced an over-torque condition (123% Mast Torque/2 sec; 132% Engine Torque) during RL progression training, Task 1074: Respond to Engine Failure at Cruise Flight (terminating with power). (Class C)

If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness/Safety Center at com (334) 255-3530; DSN 558

Unmanned Aircraft Systems

MQ-1C

-System was ground-taxiing for take-off when the tail section contacted the runway. System was shut down w/o further incident and turned over for inspection. Reportedly the craft entered a dip in the runway, resulting in glare and loss of visual acuity by the operator. (Class C)

-The system propeller was damaged during engine run-up following maintenance. Reportedly the 'rudder rigging fixture, which was positioned by the aircraft, blew up into the propeller, damaging the fuselage and tail section as well. (Class C)

RQ-7B

-Crew experienced a 'Flap Servo Failure' during UAS flight training and the system reportedly exceeded its roll tolerance during recovery. System descended to ground contact inverted and was recovered with damage. (Class B)

-Crew lost link with the UA in preparation for landing during ATP currency training. The UA descended to ground contact on a public road within Class D airspace. The wreckage was struck by an approaching vehicle. (Class B)

U.S. ARMY COMBAT READINESS/SAFETY CENTER

Report of Army aircraft mishaps published by the U.S. Army Combat Readiness/Safety Center, Fort Rucker, AL 36322-5363. DSN 558-2660. Information is for accident prevention purposes only. Specifically prohibited for use for punitive purposes or matters of liability, litigation, or competition.

Number 38 June 2014

Flightfax®

Online newsletter of Army aircraft mishap prevention information

Army Aviation has a problem with spatial disorientation (SD) while operating in Degraded Visual Environments (DVE). We introduced this topic last month with a recap of the definitions of spatial disorientation and DVE, followed by the three recommendations that we as a professional community need to implement to reduce our losses from SD/DVE. The three actions we should take are to first educate ourselves that SD losses in a helicopter are different than a fixed wing; secondly adjust our formal POIs and instructional materials to account for the differences, and finally for PEO-Aviation to work with industry to field material solutions to help pilots to operate while in DVE.

Last month's issue stated that spatial disorientation is poorly understood by Army rotary wing aviators. I will take a step further and contend that spatial disorientation within rotary wing aircraft is also poorly understood in academia. There is significant literature on the results of SD and there are many inferences as to the causes. But these are just inferences, because all of the studies conducted on helicopter SD losses were performed using the Safety Center's written accident investigation reports. It is very difficult to determine exactly what happened from an accident after-the-fact by reading a short paragraph of analysis and accident investigators opinion (albeit a very educated and informed opinion) of the circumstances. Therefore, every academic report that I have read on spatial disorientation draws conclusions on the aggregate of statistics but does not describe in any authoritative detail how rotary aviators become disoriented and what circumstances lead to the loss of aircraft control.

Within the scope of my responsibilities within USACRC to identify aviation mishap trends, I have direct access to a phenomenal resource within this organization that clearly shows the circumstances of each aviation mishap…the post crash animation. Unfortunately, animations are not available for every crash but between 2006 and 2014, there are ten files for mishaps with spatial disorientation as primary contributing factor. Of the ten recorded mishaps, two accidents were caused by the pilots failing to recognize their vertical descents and flew into the terrain (one from a 100ft hover and one during cruise). The other eight are more enlightening. Recall that there is a common misperception of spatial disorientation as consisting of only the well known visual and somatogyral/somatogravic illusions taught in flight school. When we think of losing aircraft control due to SD, one imagines that we would over control the aircraft in the roll axis because of our many years of conditioning and because that is how it happens in a fixed wing. However, much to my surprise, in a rotary wing aircraft and in every one of the eight SD mishaps we have animations for; every pilot incorrectly controlled the pitch axis. Each occurred while in some form of DVE while flying with night vision goggles/night system. The loss of control in every mishap followed almost the same pattern. The pilot on the controls begins losing situational awareness and begins to slowly over control the aircraft. The animations show constant collective changes along with frequent pitch and roll adjustments. The transition from loss of awareness into full spatial disorientation is extremely fast and in almost every case, the pilot on the controls incorrectly inputs 20-30 degrees of pitch followed by varying degrees of roll, and places the aircraft into an unrecoverable attitude.

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We need to continue to educate ourselves on why and how rotary wing aviators become spatially disoriented. Why do the pilots on the controls begin the slow, repetitive control oscillations as they lose awareness? What causes the pilots to rapidly apply forward or aft cyclic when they become fully disoriented? Two preventative measures that spring immediately to mind are that a leading indicator of disorientation could be the oscillating control movements. The other preventative measure is as a pilot, never allow the person on the controls to pitch the aircraft forward more than 10 degrees while in DVE unannounced. There is no guarantee this observation learned in the review of 10 animations is universal, but this could generate additional research by AMEDD and USAARL to figure out why this is happening.

In this issue of Flightfax, we continue to address the topic of DVE/SD. The good news is that the first in a series of technical solutions, the helmet mounted display with conformal 3D symbology, is described by PM-Air Soldier for fielding in FY16. Lastly our Blast from the Past reminds us that the problem of DVE/SD is not new and we should push for a solution as a professional community.

Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
Aviation Director, Future Operations
US Army Combat Readiness/Safety Center
email: michael.d.higginbotham.mil@mail.mil

Mishap Review: CH-47F HAMETS training

During the conduct of a NVG two-wheel pinnacle landing, the CH-47F's aft main rotor system contacted adjacent terrain. The aircraft impacted on a steep slope, rolling several times. A post-crash fire consumed the aircraft. There was one fatality and three injuries to the crew.

History of flight

The mission was a scheduled day/NVG single-ship pinnacle training and local area orientation in support of the unit's high altitude mountain environmental training strategy (HAMETS) rotation. The crew reported for duty at 1300L with a scheduled take-off of 1700L. The mission risk

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assessment and brief were completed the day prior. The flight was briefed as a moderate risk due to low illumination in a mountain area, pinnacle/ridgeline operations, and possible brown out landings. The weather was clear sky conditions with 12 miles visibility. Winds were 110 degrees at 11 knots. Temperature +22 C. Sunset 1945L. Moon illumination 5 percent with a moon angle greater than 30 degrees NLT 2120L. Accident site elevation was approximately 6,200 feet MSL.

The aircraft departed the airfield at 1844L to the training area and conducted a day LAO, finishing with a four-wheel landing to a planned pinnacle. A second approach was completed followed by the crew adjusting their night vision goggles and discussing of the two-wheel landing they planned for the next approach.

They departed the pinnacle unaided and put their NVGs down during the right closed traffic pattern. The PI brought the aircraft to a hover approximately 100 feet short of the intended landing point with the FE on the right side calling instructions to move the aircraft forward then stopping above the intended touchdown point. At this time the front of the aircraft was hanging over the edge of the pinnacle and the FE and CE cleared the left and right sides for the remaining descent. The aircraft descended with some drift with the FE counting down the last several feet until the aft wheels made contact with the ground. At that instant, the aft rotor system made contact with the top of the hill. The rotor system began to shed components and impacted the steep slope to the front left and rolled, eventually settling into a narrow ravine. One crewmember was fatally injured with three others receiving injuries. The aircraft was destroyed.

Crewmember experience

The IP, sitting in the right seat, had 1,000 hours total flight time, 920 in the CH-47F, 130 as an IP, with 497 NVG and 508 combat. The PI had more than 700 hours total time, 467 NVG and 466 combat. The FE had 950 hours, 580 NVG, 600 combat and the CE had 875 hours, 600 NVG with 325 combat.

Commentary

The accident investigation determined that during the conduct of the rear two-wheel landing, the crew drifted forward of the intended landing area to a location further downhill that did not allow necessary clearance for the aft rotor. The crew did not detect the hazard and the aft rotor system contacted the terrain as the aft wheels touched down, causing the aircraft to shed main rotor components and loss of aircraft control.

Additionally, the crew failed to properly coordinate with each other when the IP became involved with making a radio call when the aircraft was approximately five feet off the ground and descending to land on a steep slope.

Air Soldier System (Air SS) 3D conformal symbology

"… we as an institution have made no progress, in either enhanced training methods or with a technical solution, in reducing the accident rates for this [DVE] loss factor..the aviation enterprise needs to field a technical solution to increase aviator's situational awareness while operating in DVE. A significant research effort is on-going…on improved symbology to present position and orientation information effectively to the pilots. Until the technical solutions are ready, commanders need to rely on education and good risk decisions to reduce spatial disorientation accidents."

- - Excerpt from an article authored by LTC Mike Higginbotham, the US Army Combat Readiness/Safety Center Aviation Director, Future Operations in the May 2014 issue of *Flightfax*.

The degraded visual environment (DVE) is problematic due to the spatial disorientation induced from the reduced and conflicting sensory information pilots experience with the horizon obscured and overall visibility reduced. Furthermore, the swirling dust in the rotor down wash can create vection, the visually induced sensation of self motion, leading the pilot to make erroneous control inputs and potentially causing a mishap. The potential for spatial disorientation is also exacerbated by vestibular system inadequacies during the complex motion of aviation. These perceptual issues are further compounded by aggravating factors experienced by pilots such as fatigue, high workload, unexpected mission changes, and inexperience.

However, what if we could replace some of the lost external visual cues with virtual references? We could expect to reduce spatial disorientation during DVE and allow for safe maneuvering. One such concept is "augmented reality," which combines the view of the real world with conformal (aligned) computer generated graphics in real-time on a see-through visual display, typically a head/helmet worn display. Since the display is see-through, it allows the user to see the real world combined (or augmented) with additional information.

To help address the DVE problem, Product Manager Air Warrior in Huntsville, Ala. is developing the Air Soldier System (Air SS), part of which is a head-tracked helmet mounted display (HMD) capable of displaying 3D conformal symbology (e.g. augmented reality). This 3D conformal symbology aids pilots in DVE takeoff, hover, and landing, as well as en route navigation and crew coordination by providing a virtual world overlaid over the real world, such that the virtual reference can be used to safely maneuver when a DVE disrupts the pilot's normal external references.

The Air SS 3D conformal symbology leverages the technology developed for the United Kingdom (UK) Ministry of Defence in 2008-2010 for their Low Visibility Landing (LVL) program. Simulator trials of a number of 3D conformal symbology systems demonstrated that the technology had the potential to improve handling qualities in brownout. As a result, flight trials were conducted with systems from two vendors which resulted in a design that was recommended as a field able solution. For a variety of reasons, the UK has not actually fielded a 3D conformal symbology system.

Product Manager Air Warrior has performed a series of crew station working groups and simulator trials over the past three years, continuing to develop and evolve the 3D conformal symbology, and importantly, combining the 3D conformal symbology with advanced 2D hover symbology (similar to the BOSS – BrownOut Symbology System) for a hybrid solution with redundant cueing. Throughout all of these events, the Air SS 3D conformal symbology continually shows benefits to the Army aviator in a DVE by significantly improving crew situation awareness, reducing pilot workload, improving usability, and improving takeoff and landing performance.

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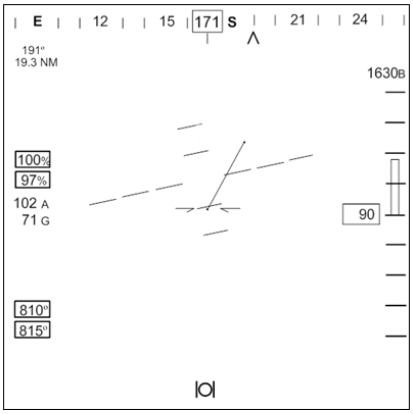
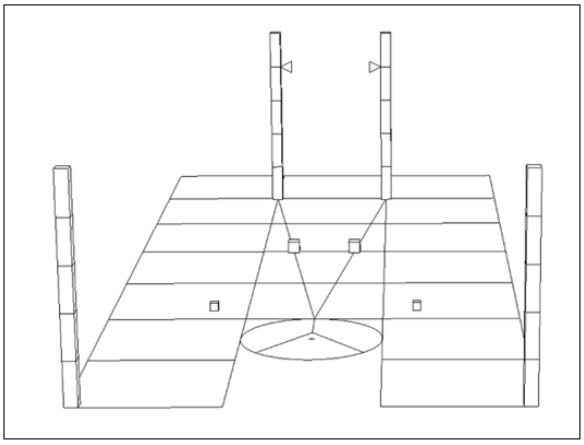
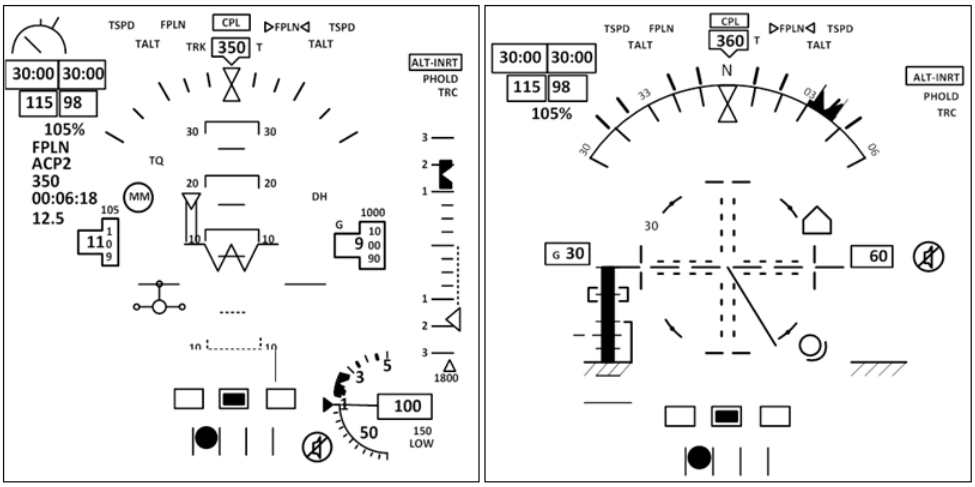


Legacy 2D symbology.



3D conformal symbology example.

In recent simulator trials, two types of 2D flight symbology (legacy and advanced hover symbology) were combined with and without the 3D conformal symbology in CH-47F and UH-60L fixed-base simulators. A dozen Army aviators with a wide range of experience participated in the event at the AMRDEC-SSDD Advanced Prototyping and Experimentation lab. Operationally realistic scenarios were flown over desert terrain (NTC at Ft. Irwin) which included multiple takeoffs, hovering maneuvers, and landings with very challenging DVE conditions under 35’ AGL. The scenarios were repeated in both day and night (w/NVG) environments. Human factors measures administered by the Army Research Laboratory, Human Research and Engineering Directorate (ARL-HRED) included aircraft performance, situation awareness, mental workload, and usability. The investigation indicated that the advanced 2D hover symbology significantly improved crew situation awareness, reduced pilot workload, improved usability, and improved takeoff and landing performance over the legacy 2D symbology (regardless of 3D symbology presence or absence). Likewise, but to a greater magnitude, the presence 3D conformal symbology significantly improved crew situation awareness, reduced pilot workload, improved usability, and improved takeoff and landing performance over the absence of 3D symbology (regardless of 2D symbology type). Furthermore, the combination of the advanced 2D hover symbology with the presence of 3D conformal symbology proved to be the optimal combination with a synergistic or near-synergistic effect on performance, situation awareness, workload, and usability.



CH-47F Advanced 2D hover symbology: cruise page (left) and hover page (right).

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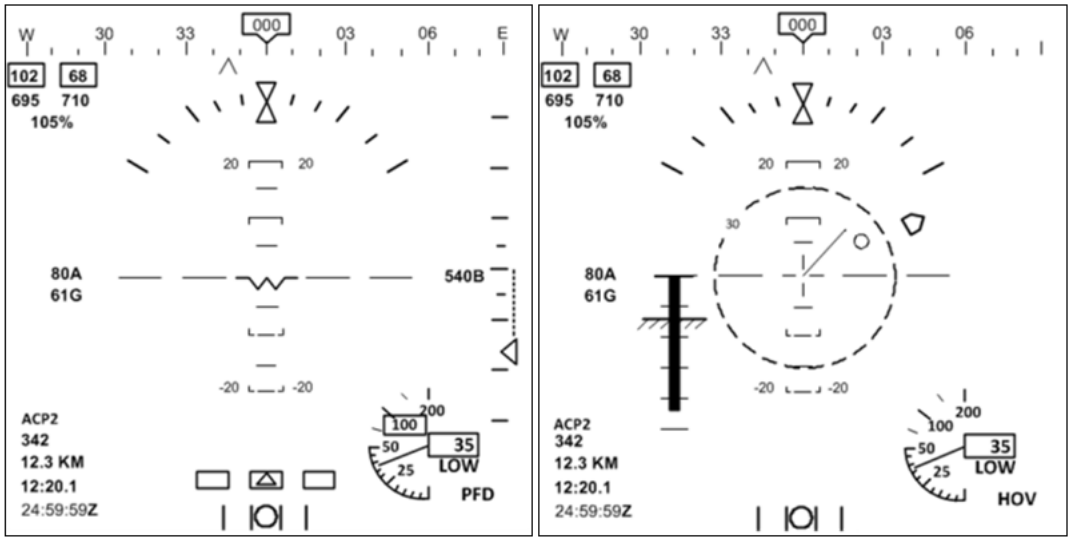

UH-60L Advanced 2D hover symbology: cruise page (left) and hover page (right).

The PM Air Warrior is currently integrating a material solution for the advanced 2D hover symbology with the presence of 3D conformal symbology in the Black Hawk and Chinook platforms. The Air SS solution does not mount any new sensors on the platform to "see" through obscurants. Rather, the Air SS is the pilot-vehicle interface (PVI) that provides enhanced flight symbology to the HMD. Symbology is generated from existing aircraft systems in combination with Digital Terrain Elevation Data to provide virtual ground references and drift, rate of closure, and lateral and vertical acceleration cues. Developmental tests of the head tracking capability required to implement full 3D conformal symbology is underway on the CH-47F at the Redstone Arsenal, Ala. Aviation Flight Test Directorate. Operational tests of the full Air SS 3D conformal symbology solution begins in FY15, followed shortly by a production and fielding decision. The Air SS will provide an enhanced Situational Awareness (SA) solution with the goal of reducing aircraft mishaps and crewmember injuries and fatalities due to conditions of reduced aviator visibility. LTC Spence Guida is the Product Manager, Air Warrior, Huntsville, Ala.

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Life is like wrestling a gorilla. You can't quit when you get tired. You quit when the gorilla gets tired.

Electronic Flight Bag (EFB)

CW5 Steve Lott
Directorate of Evaluation and Standardization
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Fort Rucker, Ala.
FW SP/IE

Civilian aviation operators have embraced the flood of new technology as it applies to air operations, and there are two major airlines that have now implemented full paperless cockpits. Although Army aviation has vastly different restraints and demands than the civilian community, hopefully we won't be too far behind.

DES has received several questions from the field regarding the use of Electronic Flight Bags due to recent changes in Army regulations. AR 95-1 paragraph 5-1 h (5) states: "*Current DOD and/or U.S. Government FLIP and/or approved commercial and/or non-U.S. Government approved products will be carried and accessible at all times when using IFR databases. U.S. Army approved electronic flight bags and/or FLIP may also be used*." Although Electronic Flight Bags are authorized for use in Army aircraft, there are many considerations and restrictions that apply. The Army Aviation Engineering Directorate (AED) has issued Air Worthiness Releases for the use of EFB's in AH-64, UH-60, CH-47 and multiple fixed wing aircraft.

Although there are some minor variations in what is authorized in each of these AWR's, there are many commonalities between them. Currently, the only authorized product that can be used in Army aircraft are military purchased iPad II and iPad III. A few of the common restrictions include: the use of GPS devices is not authorized, does not replace the paper products, and will not be used during in-flight emergencies. The individual AWR's address all of the limitations and restrictions for each aircraft, and should be used by the commanders as a guide in developing procedures for their units.

The main driving force behind the civilian push to go paperless is cost and weight savings. Beyond the ability to have every conceivable aviation map at your fingertips, EFBs can store operator's manuals, SOP's, regulations, performance calculators etc, for a total weight of zero pounds, and no trees lost. Unfortunately, the current AWRs issued by AED still require the use of paper products, so there is not going to be an initial cost or weight savings.

Although there are many uses of a Commercial Off-The-Shelf (COTS) Personal Electronic Device (PED) for easy access in the cockpit, they still fall short of what tactical units really desire for their missions. To be truly useful to a pilot in a tactical environment, EFBs need the ability to store and display classified information pertinent to the theater of operations. A handheld device with any level of classification would obviously need to be safeguarded appropriately, which detracts significantly from the convenience desired from the EFB concept, especially for fixed wing and other units that routinely remain overnight at various locations worldwide. This would also require a product that may not be available commercially, and that would mean a very costly and time consuming research and development process. For the Army to begin development of its own stand-alone EFB, it would require an Operational Needs Statement (ONS), to justify the expense. Currently, the Army only spends about $3 million per year to maintain current Flight Information Publications (FLIP), and there is no pressing need to actually have paperless cockpits. Of course we don't need to be paperless to take advantage of what we are able to use.

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Commanders are encouraged to develop training programs to standardize the use of these products in their units. There are several commercial products available that offer free or very low cost FLIP downloads and navigation planning programs; and the National Geospatial-Intelligence Agency (NGA) provides a very comprehensive no cost program called Phaero. The benefit of Phaero is the inclusion of all DOD FLIP, to include the Area Planning series (AP), General Planning (GP), Flight Information Handbook (FIH) etc. This program is Windows based, but is loadable onto iPads though a PC connection, which also installs the Phaero app onto your device. Many new IERW students are well versed on the use of these planning tools before they start instrument training, so it should be an easy transition for them arriving at a unit utilizing a similar program.

The direction the Army moves with the EFB will largely depend on the input from commanders and aviators that are utilizing the available devices and software. Although there are currently many restrictions in the AWRs, it would be wise to stay ahead of the technology as it becomes available. With proper testing, some of the current limitations in the AWRs may be lifted, which could bring significant capabilities, but will require training and standardization to properly implement.

--CW5 Steve Lott may be contacted at (334) 255-2453, DSN 558.

ATZQ-ES June 23, 2014

MEMORANDUM FOR ALL CONCERNED

SUBJECT: Active STACOM Listing

1. The Directorate of Evaluation and Standardization (DES) publishes Standardization communications (STACOM) to provide guidance to the field and which may precede formal staffing and distribution of Department of the Army official policy.

2. In an effort to ensure the field has the most current information a review of all active STACOMS was conducted. On a recurring basis DES will review and publish a listing of current STACOMS and publish the listing on the AKO portal.

3. The following is a list of active STACOMS:

STACOM #	Date Published	Title
09-01	Apr 09	H60 ATP Guidance
09-03	Aug 09	CH47F ATP Guidance
10-01	Jan 10	LUH PPC and ATM Tasks
10-07	Aug 10	H-60M Series Transition
10-10	Sep 10	Clarification of FM 3-04.11
11-02	Aug 11	SUAS Master Trainer
12-01	Apr 12	UH72 SI FI Qualification Requirements
13-02	Mar 13	CH47F Qualification Guidance
13-03	Apr 13	C-12 Torque Limitations
13-04	May 13	TC 3-04.21 (TC 1-272) FAD Clarification
13-05	Jul 13	OH-58D FADEC Training Guidance
14-01	Jan 14	FAC 4
14-02	Jun 14	SUAS Master Trainer Requirements
14-03	Jun 14	AH-64E Series Transition and ATP Guidance

4. All previously published STACOMS not listed above have been rescinded.

5. The POC for this action is DAC Chuck Lent at (334) 255-9098, email charles.w.lent.civ@mail.mil.

Accident findings: From the archives for your review

FINDING 1: (Present and Contributing: Human Error - Individual/Training Failure) The accident occurred during an attempted takeoff during a night environmental training flight in known adverse environmental conditions (dust), with a known crosswind of 20 - 30 knots. During the takeoff, the instructor pilot (IP), using ANVIS-6 night vision goggles (NVGs) and the ANVIS-7 Heads-Up Display, became spatially disoriented. The aircraft descended, impacted the ground, and was destroyed. All crewmembers received major injuries. The two rated passengers received minor injuries.

The actions by the IP were a result of inadequate recent experience, self-induced fatigue, and overconfidence. The inadequate recent experience was a result of personnel turbulence, worldwide deployments, aircraft availability, and the lack of available environmental training time during the Reception, Staging, Onward Movement, and Integration (RSOI) Week. During RSOI Week, only four hours of optimum illumination were available for NVG training. The IP had flown less than eight hours of NVG flight in the last 90 days and did not attend the key training event for the NTC rotation. Additionally, the IP had gotten only four hours of uninterrupted sleep the night before and was at the tenth hour of the duty day when the accident occurred. However, the IP had expressed confidence that he could conduct the mission and elected to continue.

FINDING 2: (Present and Contributing: Human Error - Individual/Training Failure) In preparation for an NVG, terrain flight-training mission in known environmental conditions (dust), the IP did not coordinate the actions of the crew in accordance with TC 1-212 by not directing the crew provide critical flight information. As a result, during a takeoff in dusty conditions, neither the PI nor the crew chiefs provided needed, critical flight information to the IP on the controls. The aircraft descended, impacted the ground, and was destroyed. All crewmembers received major injuries. The two rated passengers received minor injuries.

The IP's actions demonstrated a high level of confidence in the ability to safely operate the aircraft in the dusty conditions without assistance. The actions were also a result of a lack of uniform crew coordination sustainment training.

FINDING 3: (Present and Contributing) Human Error - Individual/Leader Failure) During planning for a night, environmental training mission, the battalion commander approved the minimally current IP to conduct flight training for other unit members in zero illumination conditions, waiving the controls established by the brigade commander. The controls established by the brigade commander required the training be conducted with 23-percent illumination with the moon 30 degrees above the horizon. Even though the IP had successfully completed an evaluation flight the night prior to the accident, it was the IP’s only flight in the night environmental conditions of the National Training Center. The IP was current using NVGs, but was only minimally current in that the IP had logged only about eight NVG flight hours within the past 90 days. Also, the IP did not attend the unit train-up conducted prior to deployment. The battalion commander did not consider the minimal currency and lack of zero illumination flying experience when he approved the zero illumination mission for the IP. The IP became spatially disoriented in the zero illumination, dusty conditions, allowing the aircraft to descend to impact. The aircraft was destroyed, and the crewmembers received major injuries. The two rated passengers received minor injuries.

The actions by the battalion commander demonstrated a high level of confidence in the IP to safely conduct the training mission in the extreme dusty conditions with zero illumination. Additionally, even though the brigade commander authorized the battalion commander to waive the training minimal illumination control established by the brigade commander, the brigade commander allowed what he had directed to be a case-by-case waiver to become routine. The brigade commander had assessed the National Training Center rotation as high risk in that ample training time was not available. A review of the illumination tables for RSOI Week indicated that only two two-hour periods would be optimum for NVG training. He directed that if the illumination were not optimum to train, the risks for the missions would automatically require approval by the battalion commander. He had directed the waiver authority by the battalion commander be case-by-case; however, due to the extensive lack of illumination, the waivers became routine prior to beginning mission training.

Class A – C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 25 Jun 14
	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	0	2	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	1	4	4
	February	0	0	2	0		1	0	3	0
	March	2	1	5	6		0	3	0	0
3rd Qtr	April	1	1	6	2		1	1	4	0
	May	0	0	6	0		3	1	2	2
	June	1	1	4	0		1		1	
4th Qtr	July	1	0	6	0					
	August	1	1	9	0					
	September	0	1	1	0					
	Total for Year	9	7	57	8	Year to Date	13	6	24	6

	UAS Class A – C Mishap Table								as of 25 Jun 14
	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	3		4	7
MQ-5	2	0	3	5	Hunter	1	1		2
RQ-7	0	4	10	14	Shadow		7	3	10
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV			1	1
Aerostat	2	3	1	6	Aerostat	3	2	3	8
Total for Year	9	8	20	37	Year to Date	7	10	13	30

"We are strongly supporting the program so we can expedite the concept into a fielded reality." I'm probably jumping the gun a bit by including a line of the Blast from the Past article in this month's *Flightfax* because you probably haven't even read it yet, if you were going to read it at all. I hope you do. The article, "Blowing the Dust Off Brownout Initiatives" looks a bit dated and it should. It was first run ten years ago. I'm concentrating my comments on the TSAS portion.

To bring you up to date, *the tactile situation awareness system (TSAS) was developed to provide continuous, non-visual awareness of spatial orientation intuitively to permit pilots additional cognitive reserve to deal with other tasks visually. Using data from existing aircraft sensors, TSAS provides touch cues using an array of electromechanical tactile stimulators (tactors) on the skin. The system can be as simple as a single eight tactor belt to provide drift information to helicopter pilots or a more complex matrix array to provide full pitch and roll information. Additional tactors placed in seat cushions and shoulder straps provide low and high altitude warning. A single belt with seat and shoulder tactors permits helicopter pilots to hover non-visually.** Article: "A Materiel Solution to Aircraft Upset" by Amanda M. Kelly, Richard Newman, Ben D. Lawson, and Angus H. Rupert

I like TSAS. So do a lot of people who have received the demonstration. I like the concept of having a non-visual cueing system that helps the pilot maintain orientation and gives a warning of uncommanded drift or turns. It's great for low visibility situations but is an aid in other situations. Such as when a pilot is distracted or his/her visual senses are task saturated. Sometimes when you're just not paying attention. Simple accidents like occupying a battle position, then drifting rearward into a tree because the crew became distracted. Trust me there are more than a few of those in the database. Or at a range with side-by-side firing positions and drifting into one another while doing internal coordination. How about those situations where the ground "snuck up" on you when you were operating over low contrast terrain and had your low bug/audio turned down? These are just a few of the examples where a buzz in the butt, side, or back from the TSAS could have alerted the crew to a developing situation and averted an accident.

I like TSAS because eventually, after getting used to it, the pilot would be making corrections without thinking, even as other tasks are being worked. I don't know if there is solid data available, but I'll bet a new pilot could learn to hover in significantly less time, even at night, using TSAS. This efficiency would also be gained on other tasks, such as high/OGE hover or slingload operations. Wouldn't it be great to be inside the cockpit bus driving the map or programming avionics and, without looking up, know how steep a bank your copilot just initiated to make that turn? And whether it was being done in a level attitude without loss of altitude.

I like TSAS because it was developed within the services (the U.S. Army Aeromedical Research Laboratory is championing the system), is relatively cheap, and could be available very quickly.

There is no single solution to operating in degraded visual environments. The strategy is to find a solution based on sensors, flight handling/controls, and displays/symbology/cueing. Funding being what it is these days requires prioritization because there isn't enough money to go around. Getting the right sensor is the current priority so the money will flow that direction. TSAS is on the list but as a cueing component so the priority is low. USAARL has done a great job in keeping the program going but has been operating by hook and crook to keep the development going.

I've always maintained the single greatest invention for Army rotary wing flight during my flight career was the radar altimeter. Going from the Huey to the radar altimeter equipped Black Hawk was a quantum leap in situational awareness for aided and unaided missions. The TSAS has that same potential 'leap' capability for RW operations. Ten years is too long to wait.

Jon Dickinson, Aviation Directorate, USACRC

Blowing the Dust Off Brownout Initiatives Jan 2004 Flightfax

Last fiscal year brought some sobering statistics for Army Aviation: 35 crewmembers (including one Department of the Army Civilian) died in aviation mishaps. That number doubled from the aviation related fatalities in FY02 (17), and more than tripled the number from FY01 (11). We are going in the wrong direction and getting there fast!

From my experience in Afghanistan and Iraq, I know commanders and aviators are doing everything in their power to mitigate risk. However, the high cost of training, combined with the harsh environments we expect our aviators to operate in daily, equals high risk. Some level of risk simply must be accepted in order to accomplish missions, but the risk must be acknowledged and accepted at the right level.

We at the Safety Center recognize this challenge and are committed to helping commanders mitigate risk at all levels to preserve combat power. Specifically, we are applying modern technology to attack brownouts. Brownouts caused 39.1 percent (11) of the Army's Class A aviation accidents last year. In Operation Iraqi Freedom (OIF), 75 percent of Class A accidents were attributed to brownout situations, resulting in one fatality. Since we can't change the environment, we must change our crews' ability to handle the environment. These are three of the Army's initiatives on the forefront.

Advanced simulators

Most units lack the resources to take their aircraft into desert environments on a regular basis; therefore, the effectiveness of our simulators is an extremely important factor. Our current simulators lack the proper feel and visual cues to build muscle memory and improve our aviators' confidence and control. The next generation of simulators have the capability to provide excellent training. I recently visited an advanced simulator complex that can develop a country database in 30 hours. The terrain replicates visual cues, such as grass moving while at a hover and the building of brownout at slow airspeeds. I see future simulators allowing units to fly collective missions at home station, preparing them for any possible area of responsibility (AOR).

Tactile Situation Awareness System (TSAS)

The Navy has developed a vest with a series of quarter-sized vibrotactile stimulators, known as tactors, embedded in strategic locations. The tactors will add light pressure to the pilot in the direction of movement (e.g., starting a roll will put pressure on the pilot's right or left side, allowing for a natural correction in the opposite direction). During testing, the vest allowed Navy helicopter pilots to land with their eyes closed, using only the tactors' pressure as cues. The 160th Special Operations Aviation Regiment (SOAR) is currently exploring the TSAS for their aviation life support equipment (ALSE) suit. We are strongly supporting the program so we can expedite the concept into a fielded reality.

Aircrew coordination training

No one doubts the importance of crew coordination; 66 percent of the Class A accidents in OIF had "lack of crew coordination" as a contributing factor. Recognizing the need for training to help compensate for the reduced flight hours of today's crews, Army Aviation's leadership has re-energized the program. The new program provides computer simulation training at home station,

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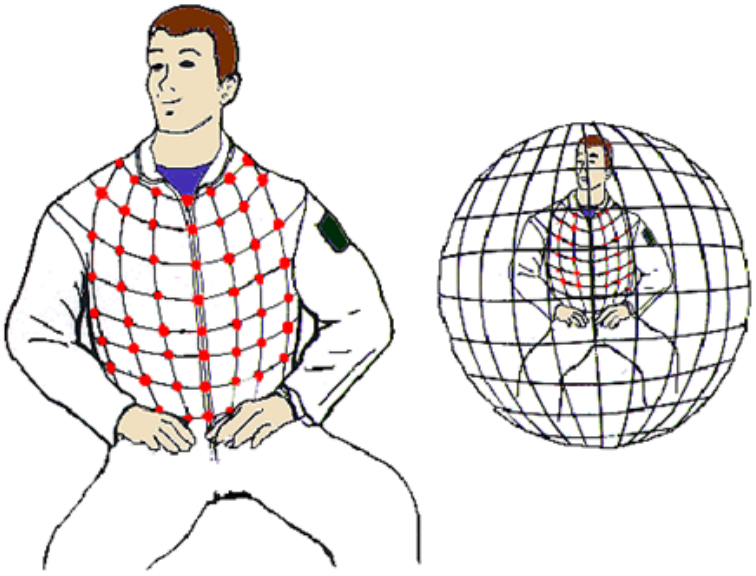
developing positive habits prior to deploying to theater. The next generation of crew coordination training will be integrated into the Centralized Aviation Flight Record System (CAFRS), currently beginning an 18-month development fielding process.

Until technology becomes fielded in equipment and programs, I encourage you to use innovation and flight discipline to lower your environmental risk. Just because you don't have the resources to train in the desert doesn't prevent you from training. To mitigate your risk, consciously limit your power while flying at home station and develop good habits in the simulator. Furthermore, by complementing a well-planned reception, staging, onward movement, and integration (RSOI) training program, good units can and are overcoming these challenges.

Operating in limited-visibility conditions, whether those conditions are caused by the weather or blowing dust or snow, can be challenging, risky, and potentially destructive. But it can be done safely and without the loss of life or equipment. There isn't a single golden nugget to significantly reduce brownouts, and nothing is going to take the place of safe, well-executed desert training. However the Army Safety Center, in conjunction with Army Materiel Command, Assistant Secretary of the Army for Acquisition and Logistics Technology, and the Army Aviation Center, is aggressively pushing tools through the acquisition process to provide the future Army aviator with a safer way to fly and win our Nation's wars. FY04 can be the best year ever in aviation safety. It's up to all of us to make it happen through reinforcing the basics each and every day!

Keep your leader lights on!

BG (R) Joseph Smith, was the CG, USACRC/Director of Army Safety from June 2003 – August 2006.



Tactile Situation Awareness System

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in May 2014.

Cargo helicopters

H-47F

-Crew was conducting a pinnacle landing in conjunction with high altitude environmental training when the rotor system contacted terrain. The aircraft descended into a ravine ravine and crashed. Post-crash fire ensued. One fatality. (Class A)

H-47E

-Aft main rotor system made contact with the runway during RL-progression roll-on training. (Class A)

Utility helicopters

UH-60

-M Series. Aircraft crashed while on short final to an HLZ for passenger drop-off. Aircraft was reportedly destroyed and one passenger sustained fatal injuries. (Class A)

Observation helicopters

OH-58D

-Aircraft experienced a Mast-Over-Torque condition during manual FADEC operations (Class C)

Attack helicopters

AH-64

-E Series. Crew experienced an over-speed condition during flight and landed hard, resulting in damage to the main landing gear and fuselage. (Class B)

Unmanned Aircraft Systems

Aerostat

- Aerostat was aloft during an un-forecast 30-knot wind gust/downdraft when slack in the cable resulted in contact with a structure. Tether broke and the aerostat drifted approx. 4K outside of the perimeter. (Class B)

- Aerostat was being lowered in response to a 30-MPH wind gust when the tether contacted concertina wire and broke free. System was not recovered; total loss reported. (Class B)

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If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness/Safety Center at com (334) 255-3530; DSN 558

U.S. ARMY COMBAT READINESS/SAFETY CENTER

Report of Army aircraft mishaps published by the U.S. Army Combat Readiness/Safety Center, Fort Rucker, AL 36322-5363. DSN 558-2660. Information is for accident prevention purposes only. Specifically prohibited for use for punitive purposes or matters of liability, litigation, or competition.

Number 39 July 2014

Flightfax®

Online newsletter of Army aircraft mishap prevention information

The past two months of *Flightfax* focused on mishaps due to loss of situational awareness while operating in degraded visual environments that has historically contributed to around 24 percent of our aviation flight mishaps. We also highlighted the aircrew coordination objective "cross monitor performance" as one of the pilot in command's key tools that can be used to counter the effects of spatial disorientation. In a larger sense, aircrew coordination is a pilot's main method in preventing the mistakes that lead to human error mishaps. The implementation of our formalized aircrew coordination training program has been the single most important factor in reducing Army Aviation's flight mishaps down to historic lows.

In a study published in 1990, and referenced in this month's Blast from the Past article, it was noted that over 74 percent of the Army's Class A-C mishaps were attributed to crew coordination errors. This significant crew error rate, combined with aircraft flight mishap rates averaging over 3.0 Class A accidents per 100K flight hours, clearly highlighted that something needed to change. The good news is the ACT program has been proven to be very effective. The most recent U.S Army Combat Readiness/Safety Center loss statistics show that despite operating in the complex operating environment of OEF and OIF, the FY02-FY14 percentage of Class A mishaps with aircrew coordination as a contributing factor has been reduced down to 42 percent (128 Class As with crew coordination errors out of 304 total Class A flight mishaps) while at the same time our total Class A mishap rates have been reduced to less than 1.5 per 100K flight hours.

The lesson learned from this is that our ACT program works...BUT MOST IMPORTANTLY it is that aircrews have to use the principles of aircrew coordination to reap the benefits. USACRC/SC analyzes flight recorder data, including the recorded voices of the crew's interactions, to help determine the contributing factors in mishaps. In the majority of the mishaps, most aircrews are communicating positively and are working through their problems. However, in a sizable percentage of the mishaps, it is appalling to hear the lack of crew coordination from our RL1 ACT qualified aircrews. In one glaring example, an aircrew, during a NVG combat operation, while conducting an approach to an unprepared HLZ, did not say a SINGLE word in the cockpit for over three minutes even though they were RP inbound for landing. No before landing checks, no LZ brief, no discussion of go-around plans or actions to be taken in a contingency, no conversation about weapons control status, no announcement of HLZ suitability or calls of dust by the non-rated crew members. Complete silence in the cockpit until the aircraft terminated at an OGE hover in a dust cloud. The crew subsequently lost control of the aircraft and struck an obstacle. This is an extreme example, but it is happening in everyone's formation. USACRC/SC's key buzzwords, like complacency and over-confidence, leads to circumstances like this. This crew thought they had it…when in reality they didn't and the end result wasn't good.

Pilots in command are the key to establishing a positive crew coordination environment. It starts with good pre-mission planning, continues through a good crew brief where everyone's role in the mission is openly discussed, and is reinforced in the aircraft with the upcoming phases of flight continually discussed. When a PC actively communicates, good things happen. If the PC is not talking, then the pilot or NRCM should begin the dialog by offering assistance or asking questions to get the information flow going. Your announcement in the cockpit could be the one piece of information needed that could potentially break the accident chain and prevent the mishap.

ACT is proven. The USACRC/SC mishap statistics clearly show that the system works. Now it is up to you to put it into action.

Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
Aviation Director, Future Operations
US Army Combat Readiness/Safety Center
email: michael.d.higginbotham.mil@mail.mil

Sometimes experience doesn't come from flying

Experience is something you don't get until just after you needed it…

If you couple that line with the phrase "there are no new accidents" then you are left with the thought of why do we continue to repeat the hard lessons from bad experiences. There is no real answer to the question other than we continue to re-learn the lessons because experiences fade with time or are not distributed to the masses. If solutions are not engineered or procedurally corrected, then the same accidents will periodically re-appear to those who were never exposed, and thus, never learned from someone else's bad experiences.

There are a lot of different ways to exploit the experience factor, especially as it pertains to the accident prevention effort. You can have the first-hand experience where you are involved in the act or incident. Or you may be one of those who are present to observe an event but were not totally involved. Both of these experiences will generally leave a lasting impression that you will carry throughout your aviation career, lowering your probability of repeating the occurrence. You have learned from it, stuck it in your rucksack and pull it out when similar circumstances arise.

A third, and probably the most popular and frequent way of gaining experience, is to have it come to you via some form of presentation. Whether it is in the classroom, hangar flying with peers, mentoring, tribal lore or through the more formal process of AARs and lessons learned, you absorb someone else's previous encounters. You may just read about it and identify with it by placing yourself in the situation and thinking what actions you would have done. The whole concept is that of passing on someone else's experiences (the good and the bad things) so that the good can be built upon and the bad can be discarded.

In conducting evaluations, I was somewhat old school. I liked to train, even while evaluating. One of my favorites was in the realm of performance planning. During training or evaluations, I typically had the individual complete the performance planning card manually using the charts in the operator's manual. This went out of vogue as the automatic programs came into play but I held on as long as possible. Yes, the programs were quicker and accurate, but I always felt a pilot was better served knowing how the numbers came about and the best way was with the good old fashioned chart and pencil. I'm not talking all the crazy stuff they added to the card over the years, just the basic, important stuff.

"Give me the emergency procedure for a single-engine failure at cruise" would be a typical start point. Relatively easy, not too many underlined steps. Response was always quick and sharp "collective adjust, external stores, continued flight not possible – land as soon as possible, continued flight possible – land as soon as practicable…" Very good, young Lindberg.

"Now tell me about your decision making process in determining whether single engine flight is possible." A general quizzical look would often be the reply. "You know – what factors are you taking into consideration in making your decision that you can no longer keep it airborne," I would prompt. "Like - what airspeed are you using?" "80 knots" was a typical response. "Perhaps, yeah, that may be a good starting point, but is it the best airspeed?" I would return. Again, fluctuations in the response mechanisms would be noted. You could sometimes drag out single-engine airspeed ranges as depicted on the card but I seldom got a full sense of understanding from the less experienced.

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To cut to the quick I would boil it down to "At conditions that are on the margin for single-engine flight, based on your PPC data – what are you reading for torque, TGT, airspeed, and VSI (that's old school vertical speed indicator) in determining if further flight is possible?" Rather than walk through the tooth extraction exercise of how I would pull this information from the individual, I'll just summarize the discussion:

Answers to the above question would be: 1) Airspeed at or near your max rate of climb/endurance airspeed. This "bucket" speed would require the least amount of power to be applied to maintain level flight which means that it allows the maximum amount of power that is available to be applied to your emergency situation; 2) Torque should be at your max torque available single engine. Ideally, this would be the structural/transmission limit outlined in Chapter 5, but generally it is less due to environmental conditions limiting the output of your engine. Which leads into 3) TGT. Your numbers should be at the TGT limiting factor which should correlate to the max torque available if it is an environmental restriction to your power. So, if you've applied the max power you have available via your TGT and torque and have your airspeed at your max rate of climb, you've done everything you can do to make this aircraft fly (OK - check your trim). Look at your VSI. Are you level or climbing? If you are, then you are in a land as soon as practicable situation. Are you descending? If yes, guess what, you are in a land as soon as possible mode and must consider other options such as jettisoning the wing stores or releasing the external load that may be hanging below you. The more altitude you have, the more time for decision making. If you are close to the margins, you may be able to maintain a descent until the environmental conditions get within parameters that allow further flight. In any case, holding those parameters should get you near the least rate of descent. If you don't have altitude, many of your decisions are made before you take-off. Hauling a sling load with no single engine capability lets you know you have to get rid of it quickly to keep flying. Are you working the mountain tops with no single-engine capability? Then keeping your airspeed up, dumping your stores and pointing it toward a valley when the engine conks should be in the back of your mind as you pass beyond the limits of single-engine flight capability.

Often, showing how to correlate the numbers was like turning on a light switch. Having them walk through the charts helped imprint in them where these magical numbers were created and what they meant. Once the light was on, additional factors could be brought into play such as wind, calibration factors, angles of bank, drag, etc. that could also affect performance, capability, and indications.

This method of presentation was passed to me from one of my instructors. It could be reinforced in the simulator or demonstrated in the aircraft. Once learned, whenever you see practical versus possible, you can't help but bring those gauges into your decision making process.

'Learn from the mistakes of others - because you won't live long enough to make them all yourself' is a phrase that captures the idea of transferring experience. Substitute the word 'experience' in place of 'mistakes' and the meaning broadens to include the positive events that are of equal importance in in building your own knowledge/experience base.

Jon Dickinson, Aviation Directorate

Emergency Procedures

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Flying and maintaining helicopters in today's modern Army is a rewarding and gratifying experience. With the advancements in aircraft performance and avionics that were not available a decade ago, we as aviators find ourselves operating some of the most advanced military helicopters in the world. Because of these advancements in technology, aviators are finding themselves operating as system managers instead of the hands-on aviators we envisioned in flight school. If set up properly, the aircraft of today have the ability to fly from Point A to Point B, VFR or IFR, with little input by the aviator.

Area navigational equipment, three and four axis autopilots, flat panel displays, and engine monitoring systems are all designed to reduce pilot error and workload. Aviators today can quickly and accurately monitor the health of their aircraft while maintaining their exact location in all modes of flight, to include nap-of-the-earth and IMC conditions. The situational awareness provided by these systems is allowing aviators to concentrate more on mission execution instead of aircraft control or pending limitations. The shortfall of these advantages is the need for higher skilled and competent aviators to fly these advanced systems, aviators who can confront unplanned mission changes or aircraft emergencies and effectively and accurately diffuse the situation without compounding the issue through system ignorance.

Emergency procedure training is critical to every aircraft that is flown by the Army, more so now than ever due to the multitude of systems that can fail. The saving grace is that the majority of the helicopters in the inventory have similar emergency procedures and therefore make standardization throughout the fleet easier. One particular procedure common within the UH-72A community and the AH-64 community is Single Engine Failure Out of Ground Effect. For the UH-72 mission set, out of ground effect engine failure could occur during confined area departures, during hoist operations, or when implementing the mission equipment package during drug interdiction missions. If properly diagnosed, there are two safe courses of action: a commitment to a forced landing, or a transition to One Engine Operating (OEI)-Flight.

Procedure

1. Collective lever - Adjust to maintain rotor RPM
2. Airspeed – Increase if possible

FORCED LANDING

3. Landing attitude – Establish
4. Collective lever –Raise as necessary to stop descent and cushion landing.

After Landing:

5. Affected engine – Identify
6. Single engine emergency shutdown – Perform

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TRANSITION TO OEI – Flight

3. Collective lever – Adjust to OEI-Limits or below
4. Rotor speed – Trim to maximum
5. Airspeed – Gain, 65 KIAS (Vy)

After reaching safe altitude:

6. Collective lever – Reduce to OEI MCP or below
7. Affected engine – Identify
8. Single engine emergency shutdown – Perform
9. LAND AS SOON AS PRACTICABLE

The ATM states that when performing this maneuver during training, a minimum out of ground effect hover (HOGE) of 250 feet above ground level (AGL) and only the fly away procedure will be used due to run-on landing restrictions in the UH-72. Standard bullet #4 for the maneuver, **Trim Rotor RPM to Maximum**, requires that the pilot on the controls, after identifying an engine failure, immediately lower the collective and gain airspeed and determine if the landing will be a forced landing or a transition to OEI-flight. When transitioning to OEI-flight, #4 of the emergency procedure requires the rotor speed be trimmed to maximum. Additionally, this particular aspect of the emergency procedure, if not executed properly, could lead to a low rotor condition in addition to the operating engine not being utilized properly. The trim actuators are controlled thru a 4-way trim switch located on the collective. Four different engine trim operations are possible through this switch:

- Forward: The power of each engine is increased simultaneously; i.e. NR is increased
- Backward: The power of both engines is decreased; i.e. NR is decreased
- Left: The power of Engine No. 1 is increased, while the power of Engine No. 2 is decreased; NR remains constant.
- Right: The power of Engine No. 2 is increased, while the power of Engine No. 1 is decreased; NR remains constant.

One area that is not covered in the manual or ATM, is the relationship between the pilot and copilot's trim switch when performing this maneuver and the proper application of trimming the rotor to maximum. Upon identifying an engine failure, the pilot will execute the emergency procedure. By pressing forward on the trim switch, the pilot is not trimming to either one engine or the other, but instead is increasing the power output of whichever engine is operating correctly, thus increasing NR rpm. If the pilot on the controls inherently slews the trim switch to the failed engine, NR will not increase and, if the collective was not reduced properly, a low rotor condition may occur. Secondly, if either the instructor pilot or co- pilot recognizes the incorrect application of the switch they will not be able to override the pilot on the controls who has already manipulated the trim switch to the failed engine. The pilot on the controls will have to disengage their switch in order for the copilot's switch to operate. With the low altitude and the reaction time associated with this maneuver, crew coordination, reaction time and correct manipulation of the flight controls is critical to the safety of flight and the well being of the flight crew.

From the archives

During readiness level progression training, the standardization pilot (SP) was performing a one engine inoperative (OEI) simulated engine failure. The SP climbed to 150 feet above ground level, just behind the precision approach path indicator (PAPI) lights and initiated the maneuver. During the landing portion of the maneuver, the aircraft struck the PAPI light which forced the aircraft nose forward and the right skid struck the ground. The aircraft bounced into the air and made a 360 degree rotation to the right before hitting the ground again. The aircraft continued to rotate another 90 degree before coming to rest facing 070 degrees. The SP sustained minor injuries and the aircraft received Class B damage.

All information contained in this report is for accident prevention use only. Access additional accident report information on the CRC RMIS https://rmis.safety.army.mil/ AKO Password and RMIS Permission required.

For your consideration… You're down-range in a single-engine aircraft. You're doing your business and get an engine chip light. Somewhere in the response you are supposed to land as soon as possible. There are open areas in which the aircraft can be landed, but due to threat considerations your definition of nearest suitable landing area includes security. The FOB is a bit farther away, but definitely more secure than open bad guy country. Talk amongst yourselves on what decision you would make in similar circumstances.

Let's say you elect to push for home base. Fine – decision made - head for home. I'm neither for or against your decision, but I do question the need to fly at max power and airspeed at 75' AHO to get there. You have indications of an engine problem. Do you really need to apply max power on an engine that may have a problem and could quit at any time? No, you don't. Set the parameters so that, if you have to, you are able to initiate an autorotation in the event the engine should fail. Seventy-five feet at max speed with a heavy aircraft is not where you need to be with an engine chip light. Set yourself up for success.

Mishap Review: UH-60M NVG Insertion

During the conduct of a NVG troop insertion in degraded visual conditions, the UH-60M's main rotor RPM decreased. The aircraft descended and contacted an obstacle with the main rotor. The aircraft crashed. There was one fatality and nine injuries.

History of flight

As part of a 24 hour stand-by duty cycle, the crew reported at 0900L, received their O & I brief at the TAC followed by preflight, run-up and a HIT check before assuming a stand-by/rest posture. The mission risk assessment and brief were completed the day prior. The mission was briefed as a medium risk due to threat, low (red) illumination, brown-out conditions and crew experience. The risk assessment was reviewed and signed by both the CAB commander and the DCG as the final risk approval authority. The weather was clear sky conditions with seven miles visibility. Winds were 310 degrees at 03 knots. Temperature +26 C. Sunset 1945L. Moon illumination 0% with a moon angle below the horizon. Accident site elevation was approximately 5,500 feet MSL.

At 2215L the crews were alerted to report for an air mission brief. The mission was a two-ship NVG insertion of a QRF for LZ security in support of an un-partnered MEDEVAC mission. Included in the package was an aerial weapons team (2 x AH-64s) and two MEDEVAC UH-60s. The air mission brief was conducted at 2235L. The weapons team departed at 2305L followed by the QRF at 2210 and the MEDEVAC aircraft at 2215L. At 2230 the QRF arrive vicinity of the HLZ with the accident aircraft in the lead position of the flight of two.

The accident aircraft conducted an approach to a high hover (100') approximate 300 meters north of the designated HLZ. Unable to see the intended landing site due to the forming dust cloud, the crew decided to go around, find the HLZ and re-attempt the landing. While initiating the climb, the main rotor rpm drooped. The aircraft moved forward and down through the dust cloud and struck a cell phone tower located to the front of the aircraft. The impact with the tower and subsequent ground impact caused catastrophic damage to the aircraft, one fatality, and nine serious injuries.

Crewmember experience

The IP, sitting in the left seat, had 840 hours total flight time, 750 in the UH-60, 41 as an IP, with 135 NVG and 36 combat. The PI had 700 hours total time, 575 UH-60, 115 NVG and 37 combat. The left rear CE had 220 hours, 55 NVG, 20 combat and the right rear CE had 290 hours, 85 NVG with 30 combat.

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Commentary

The accident investigation determined that while attempting an NVG takeoff from an OGE hover in a degraded visual environment, the crew failed to maintain rotor RPM and inappropriately responded to the emergency. It also determined the selected crew experience levels did not match the requirements needed for the hasty mission execution into dusty landing areas under zero illumination with narrow power margins.

Additionally, the crew failed to properly communicate and coordinate with each other in that they did not offer assistance, share work load, or cross monitor the performance of the pilot on the controls.

It was also determined that the aerial reaction force (ARF) team unbuckled their seat belts prior to landing in contravention of AR 95-1. As a result, part of the team was thrown from the aircraft during the crash resulting in one fatally.

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Class A – C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 29 Jul 14
	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	0	1	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	1	4	4
	February	0	0	2	0		1	0	3	0
	March	2	1	5	6		0	3	0	0
3rd Qtr	April	1	1	6	2		1	1	4	0
	May	0	0	6	0		3	1	2	2
	June	1	1	4	0		2	0	5	0
4th Qtr	July	1	0	6	0		2		1	
	August	1	1	9	0					
	September	0	1	1	0					
	Total for Year	9	7	57	8	Year to Date	16	6	28	6

UAS Class A – C Mishap Table									as of 29 Jul 14
	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	3		4	7
MQ-5	2	0	3	5	Hunter	1	1	1	3
RQ-7	0	4	10	14	Shadow		11	3	14
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
Aerostat	2	3	1	6	Aerostat	3	2	3	8
Total for Year	9	8	20	37	Year to Date	7	14	13	34

"Our accident rate would certainly be better if Black Hawk drivers would learn to ground taxi and Apaches could get out of a FARP."

As strange as it may sound, I actually heard that phrase in a discussion (not word for word but close). To be truthful, I can find no fault in it.

On the surface, it's not obvious to understand the meaning behind the phrase but it is really not that difficult. Last year was one the best years for Army aviation with nine recorded Class A flight mishaps. Two of those were ground taxi mishaps. There have been two again this year. And in previous years, you will find several more sprinkled throughout the wheeled aircraft fleet. In my view, all of them were preventable. Just step on the brakes and don't take chances. Simple solutions for a simple problem. I refer you to the September 2013 issue of *Flightfax* for a more detailed discussion on taxi mishaps.

As far as the Apaches and the FARP situation, that is a subtle reference to power management issues. An Apache flies into a FARP empty of fuel and ordnance, replenishes, and then, while attempting to depart heavy, encounters a decreasing rotor situation resulting in a mishap. Obviously, power management isn't an Apache-only issue, and it certainly isn't a FARP-only situation. But the pretext is the same. Aircraft operating hot, high and heavy have to pay attention to the numbers as well as the other things. Things like ensuring you're utilizing the wind to your advantage, even if it is a bit more inconvenient to reposition into it. Or reminding yourself that fudging the numbers on performance capabilities by trying to catch the needle (digit) bounce to make those power check numbers fall within parameters so it's 'legal' to pull pitch won't help you when the low rotor sounds. Did you even do a power check? Does the crew discuss the power requirements, wind, and obstacles on every take-off and landing so the crew situational awareness is at its peak during the maneuver?

Without delving into all the crew coordination elements, basic qualities, and objectives, it should be recognized that good crew coordination will help eliminate the two above mentioned situations. It is hard to imagine a ground taxi situation that puts a rotor system in close proximity to a hazard without some form of crew discussion. Most obstacles that are struck are readily identifiable to the crew. What apparently isn't readily identifiable is the required clearance from said obstacle. That's where 'don't take chances' comes in play. If there are doubts - discuss it. If you are in an unfamiliar location with limited visibility (i.e. night) then the crew talk should be addressing how to proceed in the most cautious manner with all crewmembers focused on hazard identification.

When an aircraft is operating close to power limitations the crew should be communicating what they have available and what they need - as well as the factors that may influence those requirements. A few knots of wind from the wrong direction can negate the safe operating margins that were planned. It goes without saying you need to know and understand what the numbers mean. Just because your wingman scraped by getting airborne doesn't me it will happen for you. He/she is probably a better pilot.

Talking amongst yourselves (or as the ATM might say it - the exchange of information that allows for the flow of essential data between crewmembers and cross monitoring each other's actions and decisions to reduce the likelihood of errors) will always have a positive impact on mission performance and safety. Crewmembers need to keep each other informed about the status of the aircraft and the mission. Information exchange helps that aircrew maintain a high level of situational awareness. **Jon Dickinson, Aviation Directorate**

Aircrew coordination: Don't take it for granted 5 Dec 1990 *Flightfax*

Crew coordination: **The interaction between crewmembers (communication) and the actions (sequence or timing) necessary for tasks to be performed efficiently, effectively, and safely.**

Most aircrew tasks have elements that require crew coordination; however, until recently, the importance of crew coordination had not been fully addressed in policy, procedures, training, or operations. The impact of this was revealed in a recent study of rotary wing accidents occurring during the past six years. The study determined that crew coordination failures were responsible for approximately 74 percent of all Class A - C rotary wing flight accidents. These failures doubled over the period studied, primarily because of the high coordination demands of night operations. Six types of crew coordination failures were identified:

1. Failure of the pilot on the controls to properly *direct assistance* from other crewmembers; for example, to direct the pilot not on the controls to provide information on airspeed, altitude, rate of closure, engine/flight instruments, or assist with aircraft clearance and control. The increased demands of night-aided tactical terrain missions require the pilot on the controls to use all available resources for assistance. Crew coordination and tactical coordination are competing demands, but crew coordination, especially to ensure obstacle clearance, must be top priority in operational situations where flight safety might be compromised.

2. Failure to *announce a decision* or *action* that will affect the ability of other crewmembers to properly perform their duties. Examples include discontinuing outside clearance to tune radios or read maps, initiating NOE turns, and making inputs or assuming flight controls unannounced. A crew cannot be an effective team if any member operates independently.

3. Failure to maintain *positive communication* (verbal and nonverbal). Positive communication implies that transmitted information is clear and unambiguous. Three key words define communication as being "positive": transmit, acknowledge, and confirm. For communications to be complete and effective, the transmitter must ensure that the receiver has heard and understood the message. This is accomplished by acknowledgment on the part of the receiver (for example, "Roger") and verification that the meaning of the transmission was understood (such as repeating the original transmission). Positive communication is further enhanced by using standard terminology with specific qualifiers. This ensures that the words used have the same meaning to all parties concerned. The following example of positive transfer of controls is a good illustration of what we mean by positive communication:

"I've got the controls" (transmit).
“You've got the controls" (acknowledge).
"I've got the controls" (confirm).

Communications critical to safe aircraft operation cannot be assumed simply because the message was transmitted.

4. Failure of the PIC to properly *assign crew responsibilities* prior to the mission during the crew briefing or during the mission for situations encountered. Responsibilities for aircraft clearance and assistance to the pilot on the controls must be clearly assigned and understood during the crew briefing. Desired assistance to the pilot on the controls should be specified in terms of what, who, when, and how. For aircraft clearance (what), who (which crewmember), when (priority), and

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how (technique) should be addressed.

5. Failure of the pilot not on the controls or other crewmembers to *offer assistance or information* that is needed or has been previously requested by the pilot on the controls. Crewmembers must anticipate when assigned assistance will be needed and not wait until the pilot on the controls requests it. Also, each crewmember must be alert and ready to assist in unanticipated situations requiring teamwork; for example, aircraft emergencies and environmental obscurations to vision.

6. Failure of the pilot on the controls to execute flight actions in *proper sequence* with actions of other crewmembers. Examples include initiating taxi turn before crew chief can clear the tail, releasing sling-load before receiving crew chief's clearance, and taking off before completing before-takeoff checks. Actions that are executed out of sequence - too soon or too late in conjunction with the actions of other crewmembers - can disrupt the entire "flow" of a mission or even bring it to an abrupt end.

Following are the operational profiles in which these crew coordination failures most frequently occurred. Included are summaries of actual accidents that illustrate the operational profiles and crew coordination failures involved.

Profile 1

Failure of pilot on controls to properly direct assistance from pilot not on controls during night tactical missions.

An AH-64 was on a tactical terrain night systems currency evaluation mission, flying NOE, when the PNVS video imagery deteriorated. The IP (rear seat) decided to troubleshoot the PNVS without first directing assistance from the CP; i.e., telling him to take the controls. While both pilots had their attention inside the cockpit (CP was reading a map), the aircraft went into a gradual undetected descent and struck trees.

Profile 2

Failure of pilot not on controls to announce decisions during en route phase of day tactical terrain missions.

While on a day NOE tactical training mission, an AH-IF was descending to mask behind trees. The PIC (rear seat) diverted his attention from outside (where he was assisting in obstacle clearance) to inside the cockpit (to establish his location on a map). He failed to announce this decision to the CP (who was on the controls) so the CP would assume total responsibility for clearing the aircraft. As a result, the main rotor struck a tree on the right side of the aircraft.

Profile 3

Lack of positive communication by pilot not on controls during landing phase of day missions.

A UH-60A on a day tactical troop insertion mission was making an approach to a large open field bordered by trees. On short final, the IP told the pilot on the controls (right seat) that they were getting too close to the tree line on the left. However, he failed to confirm that the pilot understood the warning and took necessary corrective action (lack of positive communication). Instead, after warning the pilot, the IP started looking at his map. The aircraft hit the trees. When questioned, the pilot said he had not heard the IPs warning.

Profile 4

Failure of pilot not on controls to offer assistance to pilot on controls during day missions.

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A UH-l was on a day cross-country administrative mission over snow-covered terrain. The CP was attempting to maintain a stationary 25-foot OGE hover while awaiting return of the lead aircraft (which had turned around because of adverse weather). The PIC was focusing his attention inside the aircraft and failed to **offer assistance** to the CP in maintaining altitude through use of outside references. The CP fixed his attention on the returning aircraft and failed to detect rearward drift and descent, resulting in impact with the ground.

Profile 5

Failure of PIC to properly assign responsibilities during crew briefing.

An OH-58A was on a day search and rescue mission. While both pilots had their attention on the ground search, the tail rotor hit a tree, and the aircraft crashed. The PIC failed to properly **assign responsibilities** during the crew briefing; i.e., one crewmember responsible for obstacle clearance while the other crewmember conducted ground search.

Profile 6

Failure of pilot on controls to properly coordinate (sequence) action with crew chief in clearing aircraft during hover/taxi phase of administrative/support missions.

A CH-47, on a day support mission, landed at a small airfield (with no taxiway markings) for refueling. The PIC ground-taxied the aircraft near a hangar and, concerned that the aircraft was too close, decided to reposition. He received clearance to the right from the flight engineer but failed to wait for clearance from the crew chief **(improper sequence of actions)**, who was lowering the ramp in order to clear aircraft's left rear. Consequently, when the aircraft turned right, the rear of the aircraft swung left, and the aft rotor struck the hangar.

Where do we go from here?

This study has generated actions to focus the Army aviation system on crew coordination requirements. Critical crew coordination actions are being included in each ATM task for all aircraft, and changes to training and evaluation will follow. At the same time, in order to prevent accidents, it is imperative that every Army aviator understand the importance of crew coordination. It is easy to become complacent and assume the other crewmember knows your intentions; however, failure to "crew coordinate" can lead to disastrous consequences. •

Don’t hold your flatulence. It travels up the spine to the brain causing crappy ideas and decisions that stink.

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in June 2014.

Observation helicopters

H-6M

-Aircraft experienced a rotor overspeed during FADEC manual operations. (Class C)

Attack helicopters

AH-64D

-Aircraft drifted into trees during NVD training mission. Aircraft came to rest on its right side. (Class A)

-Aircraft experienced an overtorque during a single-engine roll-on landing maneuver. (Class C)

Cargo helicopters

H-47

-Aircraft sustained damage to the left aft landing gear during an insertion. (Class C)

Fixed Wing Aircraft

C-37B

-Crew experienced a bird strike during a touch and go landing. Post landing inspection revealed damage to the right engine cowling. (Class C)

Unmanned Aircraft Systems

MQ-1C

-System crashed while on normal approach to land. (Class A)

RQ-7B

-Following climb-out to altitude, UA experienced engine failure. Crew activated the FTS. UA recovered with damage. (Class B)

MQ-5B

-During touchdown, the UA contacted the arresting gear system on the side of the runway with the stabilizer and right landing gear. (Class C)

Experience is something you don't get until just after you needed it…

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AH-64 Safety Performance Review

This edition of *Flightfax* highlights the leading causes of AH64 accidents Army-wide over the past five years both during combat operations and in garrison training. Ask yourself the question; do I operate in similar mission profiles and could these situations apply to me? We encourage you to discuss these hard lessons learned by others during your pilot's briefs and classes in order to understand the causes and circumstances under which they occurred. Use these scenarios for practice in the simulator, and exercise good crew coordination by discussing before every flight, what each crewmember should do if you find yourself in a similar circumstance.

Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
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AH-64 Safety Performance Review

In the nearly five-year period FY10 through present (960,000+ flight hours), 73 Class A through C AH-64 mishaps have been recorded. There were 17 Class A, 12 Class B, and 43 Class C with a cost of $187.2 million in damage and injuries; there were five fatalities. The Class A flight mishap rate per 100,000 hours is 1.68. Review of these mishaps shows that human error was the primary cause factor in 70% of the incidents; materiel failure accounted for 25% and 5% was environmental/unknown (two Class C bird strikes and two unknown/not yet reported - one Class B, one Class C). Highlights from some of the more frequent types of mishaps:

Power Management

Power management/aggressive flight maneuvering was involved in six of the 12 Class A human error accidents. There were also two Class B and two Class C mishaps. These mishaps demonstrate a lack of understanding and poor decision making while operating in high altitude/heavy gross weight conditions where power margins are limited. Crew situational awareness is the main risk mitigation for this type mishap. This includes proper pre- and in-flight mission planning, crew understanding of power requirements, monitoring environmental conditions that affect aircraft performance, and maintaining appropriate safety margins in challenging conditions. Summaries of some of the power management mishaps include:

Scenario 1

While conducting a visual meteorological condition, night vision system approach in an AH-64D to a pinnacle/ridgeline helicopter landing zone at 12,200 feet mean sea level, the aircraft's airspeed decreased below effective translational lift while airspeed decreased below effective translational lift while still in an out-of-ground effect condition. The aircraft's rotor RPM decreased and the aircraft settled and impacted the terrain. The aircraft was destroyed and the two crew members were injured.

Scenario 2

While conducting a reconnaissance mission in mountainous terrain, the pilot made a tight right turn and the aircraft decelerated to 34 knots true airspeed and 70 feet above ground level. When the rotor RPM drooped, the aircraft did not have enough airspeed and altitude to maintain powered flight. The aircraft descended into a steep walled canyon and impacted the ground. The aircraft was destroyed, one crew member sustained fatal injuries and one crew member sustained serious injuries.

Scenario 3

Crew reportedly experienced a tail wind and airspeed/rotor droop, once airborne from refuel, followed by loss of tail rotor effectiveness. Aircraft descended to ground impact, rolled and came to rest on its left side. Crew was able egress with minor/superficial injuries.

Scenario 4

During take-off from a FARP, a AH-64D conducted a take-off in OGE conditions without OGE power available. Upon decent of the aircraft outside of the FOB perimeter, the aircraft encountered brown-out conditions and impacted the ground in a wadi. The impact caused damage to the right front strut and right wing of the aircraft.

Object Strikes

There were six tree strikes recorded in the 73 incidents, two resulting in Class A damage. Additional object strikes included three aerostat tethers (Class B), and one wire/cable strike (Class A). Examples of aircraft object strikes include:

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Scenario 1
Aircraft was Chalk 2 in a flight of two, conducting mission training when it descended into a wooded area and crashed. Crewmembers were extracted with treatable injuries, aircraft reported as destroyed.
Scenario 2
While conducting NVS confined area operations, aircraft drifted into trees. Aircraft came to rest on its side with potential class A damage.
Scenario 3
Upon completion of a day, low-level and contour flight, the crew shutdown the aircraft and executed a post fight inspection. Their inspection revealed a vegetation “strike” to all four tail rotor blades and the stabilator. The exact location and time of the tail rotor strike was unknown. (Class C)
Scenario 4
While conducting a day, nap of the earth flight at 50 feet above ground level and 111 knots true airspeed, the accident crew struck a one-inch ferry cable that was strung across the river. The aircraft struck the cable midway up the forward windscreen, bisecting the gunner station, and severely damaging the forward canopy. The pilot-in-command was fatally injured.

Maintenance error

Scenario 1
While reinstalling the Number 5 tail rotor drive shaft, the maintainers failed to apply the proper torque and conduct follow-on inspections to the Number 5 tail rotor drive shaft bolts. Consequently, the Number 5 tail rotor drive shaft vibrated and caused the aft hanger bearing coupling to shear. The aircraft crashed, causing significant damage to the airframe.
Scenario 2
During the conduct of a precautionary landing following detection of smoke/fumes in the cockpit, the collective position did not correlate to the torque output of the engines. At some point during the landing, the rotor head was out of position and not being driven by the transmission and not responsive to collective input. The aircraft impacted the ground in a level roll attitude, approximately thirteen degrees nose up, and with approximately nine Gs of force sustaining major structural damage and injuries to the co-pilot gunner in the front seat. Suspected over-torque of the main rotor hub nut retention ring at the factory created improper pre-loading of the bearings and lead to a catastrophic bearing failure and over-heating of the static mast. The heating event on the mast lead to the rotor head separation (held only by the PC-links).
Scenario 3
While conducting a maintenance test flight, top end check at 9,200 ft AGL, the wire bundle supplying 115VAC power to the Nitrogen Inerting Unit was chafed causing an electric arc with the frame. The wire bundle failed due to improper installation in that the wire bundle was in contact with the frame without chafe tape installed. The electric arc allowed hydraulic fluid in the vicinity to heat up and exceed its flash point and ignite, causing damage to the hydraulic fluid line and airframe.

Materiel failure

Scenario 1
Crew was participating in night operations when they detected smoke odor in the cockpit caused by a #2 generator bearing failure. While conducting an emergency landing, the crew experienced electric power outage in the cockpit and loss of night vision systems. During the unaided landing to

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a dusty environment, the aircraft's main rotor blades contacted the ground with the aircraft coming to rest on its side.

Scenario 2

Crew was conducting night, NVG/hood training when they encountered un-commanded control input at a 5-foot hover. Aircraft main rotor system contacted the ground and the aircraft sustained class A damage.

Scenario 3

While on the ground at 100 percent rotor rpm, 17 percent engine torque, after the collective was placed in the full down position, the AH-64D experienced a high cycle fatigue failure of the mast base support assembly. The main rotor system and mast tilted forward, causing the main rotor to impact the forward fuselage. The mast contacted the ground and rotated in front of the aircraft, causing the rotor blades to strike the forward fuselage and copilot/gunner (CPG) cockpit area. The main rotor system and mast assembly came to rest forward and left of the fuselage and the aircraft came to rest on the right weapons pylon rocket pod. The CPG was fatally injured and the pilot in command was seriously injured.

Scenario 4

During a day reconnaissance mission, a catastrophic failure of the main rotor system occurred in flight. The aircraft crash resulted in two fatalities.

Miscellaneous

Scenario 1

Aircraft encountered reduced visibility and IMC conditions and initiated a climb to avoid known obstacles. The Pilot not on the controls (PI) announced there was terrain to the left. The Pilot on the controls (PC) made a slight right hand turn to avoid terrain on the left and inadvertently struck terrain on the right. Forward motion never ceased, and the crew continued to maneuver the aircraft in an attempt to clear the remaining obstacles. Aircraft broke out of the clouds (VMC on top) and proceeded back to base for landing. (Class C)

Scenario 2

Aircraft experienced an Nr exceedance (132%) during descent for landing to the FOB. Crew was able to land w/o further incident. AED confirmed component-replacement requirement/Class B damage.

Scenario 3

#1 Engine nacelle was observed to be in the open position and damaged during aircraft refuel. Crew did not properly verify latches on the nacelle were properly latched. Nacelle required replacement.

Scenario 4

During flight using Night System (FLIR) in support of an operation, the Co-Pilot Gunner's Power Lever malfunctioned and initiated lockout without an input from the Co- Pilot Gunner. As a result, the main rotor peaked at 111% and #2 engine peaked at 131% as the crew initiated the emergency procedure for an Np overspeed. The crew safely recovered the aircraft, and conducted an emergency landing at home base with no injuries. The Power Lever malfunction was caused by an "orange gooey substance" (suspected spilled soda) which had gotten into the Pilot Quadrant Assembly. The foreign substance prevented the Power Lever from securely setting in the fly position and led to an uninitiated lockout condition. The fact that a liquid (suspected soda), at some point prior to this flight, had been spilled on the Power Lever Quadrant in the Pilot's station,

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and had not been reported or properly cleaned is what led to the unsafe flying conditions and root cause of the emergency.

Scenario 5

Crew of aircraft #1 was conducting assault training with a sister ship when it collided with aircraft #2 whose crew was conducting aerial RECON of an objective in the vicinity. Both aircraft crash-landed but crewmembers suffered no significant injuries. Collective damage to both aircraft reported at the Class A level.

Summary

Thirty-two (44%) of the events occurred under N/NVS conditions. Thirty-four (47%) occurred in OEF/OIF. Not all of the 73 mishaps have been listed. Missing are several open cowlings, inlet covers left in place during start, single-engine over-torques from attempted aircraft movement with a PL pulled back, Np/Nr overspeeds due to DECU malfunctions or training, etc. As with all types of airframes, human error continues to be the primary cause factor in aircraft mishaps. Addressing human performance issues relating to training and proficiency, maintaining standards – at both the individual and supervisory level and demonstrating discipline and professionalism in required tasks help ensure successful mission accomplishment.

	AH-64D CLASS A – C Mishaps			
FY	Class A	Class B	Class C	Fatal
2010	3	3	7	1
2011	3	3	18	1
2012	3	3	8	1
2013	1	0	4	2
2014	7	3	7	0
Total	17	12	44	5

"A crude measure of the right thing beats a precise measure of the wrong thing." John Carver

Lockout May NOT be the Solution

DAC Charles W. Lent
Directorate of Evaluation and Standardization
U.S. Army Aviation Center of Excellence
Fort Rucker, Ala

Since 2005, a tactic, technique and procedure (TTP) has been slowly gaining acceptance in the UH-60 community that may not be the correct response in all decreasing rotor situations. The mission requirements in Afghanistan have forced H-60 aircrews to perform missions at the limits of aircraft engine performance. Most Army aviators have not experienced these environmental conditions, which require an understanding of engine gas generator speed (N_G) and fuel flow limiting.

Although the operator's manual includes information on turbine gas temperature (TGT) limiting, there is little information on fuel flow and N_G limiting. Because TGT is the only method of engine limiting mentioned, pilots may believe that bypassing the TGT limiting function of the Electronic Control Unit/Digital Electronic Control Unit (ECU/DECU) will always offer additional power. It is critical for aviators to understand the conditions that cause the engine limiting before placing an engine in lockout.

The General Electric (GE) T700-series engine limits maximum torque available in one of three ways: TGT, N_G or fuel flow. Typically, H-60 pilots have been trained to rely on TGT as the best indicator of aircraft power. Until recently, most H-60 pilots flew missions in environments in which TGT was generally the engine-limiting factor. When limited by TGT, bypassing the ECU/DECU limiting function would allow the pilot to increase torque by 2 to 4 percent beyond the dual-engine limiter. When operating in cold environments (below 0 C), the T700-series engine may reach an N_G or fuel flow limit before a TGT limit. Below minus 20 C, the engine will always be N_G limited and TGT will not reach the dual-engine limiter value.

Here is the danger. Pilots who rely only on TGT and fail to consider N_G or fuel flow limitations when determining the additional power beyond the maximum torque available may be in for a nasty surprise. That additional power may not be there, a situation that could delay a successful recovery or escape plan. The current charts in the operator's manual, tabular data and the integrated performance aircraft configuration (IPAC) software do not specify whether the maximum torque available figure is TGT, N_G or fuel flow limited. However, all give an accurate maximum torque available value regardless of the limiting factor.

Power Limited Approaches and the Value of Escape Routes

Rotary-wing aircraft supporting Operation Enduring Freedom (OEF) are often required to take off and land at high gross weights in power-limited situations. Anytime a pilot determines he is in a power-limited situation, it becomes even more imperative to have an executable escape plan for the entire takeoff or landing sequence. A limited power situation is not a go/no-go event since conditions such as wind, turbulence, pilot control input and power required for the deceleration for landing aren't precisely predictable and aren't factored into torque values. Variables may change during the takeoff or landing, causing pilots to exceed the planned and calculated power limit. It is critical while conducting landings during TGT, N_G or fuel flow limited power situations that an escape must be executed whenever a rotor droop occurs or anytime power is in question.

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Limited power margins should be an indicator to the pilot in command as to whether to attempt the maneuver. As the margin between power available and power required becomes smaller, the quality and necessity of an executable escape plan should be the determining factor in deciding to conduct an approach. Issues such as power to overcome wind, turbulence, downdrafts and deceleration must be factored into the maneuver. Climb/descent power available must be determined before beginning the maneuver and the ability to execute an escape at any point is critical. Where power requirements may be marginal and cannot be accurately calculated, it may be necessary to verify power available by applying power at the same conditions as the landing zone (LZ) before the approach.

When conducting limited power approaches, Task 1011 of the aircrew training manual (ATM) states: "Determining aircraft performance using tabular data, requires that aircrews update performance data when there is an intent to take off or land when operating within 3,000 pounds MAX ALLOWABLE GWT OGE and when there is an increase of 1,000 feet pressure altitude and/or 5 C from the planned PPC." Currently, the only method of calculating the data to meet this standard is the tabular data located in the operator's checklist or by using the charts in the operator's manual. During the next revision of the ATM, Task 1011 will be updated to include the use of IPAC software to derive values.

Landing Zone Sequence a Proven Procedure

The Directorate of Evaluation and Standardization, in coordination with U.S. Army Forces Command and 21st Cavalry Brigade, have been involved in training units before deployment to Afghanistan in these limited power situations. The High Altitude Mountain Environmental Training (HAMET) package includes mountain flying considerations, power management, multi-aircraft and night vision goggle operations. It also includes an LZ sequence that is used for all approaches, simulating marginal power and includes terrain analysis. Originally adopted from the High Altitude Aviation Training Site program of instruction taught at Eagle, Colo., it is an invaluable and proven technique for determining margin available versus power required, a vital consideration when conducting limited power operations. Although trained in mountainous conditions, the techniques can apply to takeoffs and landings in any limited power environment. The next revision of the H-60 ATM will include the following procedure:

LANDING ZONE SEQUENCE

1. **ENVIRONMENTAL**
 -Note temperature at LZ.
 -Note pressure altitude of LZ on altimeter setting of 29.92.
2. **SUITABILITY**
-Size, slope, surface, long-axis, obstacles.
3. **POWER REQUIREMENTS**
-Tab data/IPAC Max OGE wt _____
-A/C wt (zero fuel wt + fuel) _____
-Difference (+/-) _____
-Percent torque (TQ) (+/-) _____
-Max TQ (Verbalize) _____
-Hover TQ (Verbalize) _____

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4. **WIND**

-Assessment of the direction and velocity of the wind by cockpit indicators, visual indicators, GPS, last known forecast wind, or flight maneuvers.

-Analysis of terrain, trees, buildings and their effects upon wind creating updrafts, downdrafts, headwinds, tailwinds, crosswinds and demarcation lines from a large scale down to the touchdown point.

5. **ROUTE IN/OUT /ESCAPE**

-Wind should dictate route in, out and escape.

-In calm wind, use the route that affords the best escape.

6. **LOW RECONNAISSANCE**

-Verify wind by using cockpit indicators.

-Ground track versus heading.

-Airspeed versus true airspeed (convert IAS to TAS to make this step accurate).

-A/S versus TQ versus VSI (vertical speed indicator).

-Verify escape.

- Verify touchdown point and suitability.

7. **APPROACH/TAKEOFF**

-Predicted TQ for approach, hover and takeoff. This is an adjustment of the hover TQ, considering level surface and zero wind.

-Expended TQ is the highest amount of TQ used during any part of the maneuvering, approach and takeoff.

-Actual TQ is the amount of TQ to hover.

-If there is a difference between TQ values, discuss why.

Conclusion

In summary, the GE T700 engine limits maximum torque available in one of three ways: TGT, N_G or fuel flow limiting. Pilots must have an understanding of the conditions that cause each type of limiting and should rely on the maximum torque available figure derived from the IPAC software, operator's manual or tabular data when determining maximum power available. Pilots should not focus on TGT as the sole indicator of engine power below 0 C when operating with a T700 engine. Nor should they make the false assumption that placing an engine in ECU/DEC lockout will offer additional power in all environmental conditions. The torque increase of 2 - 4 percent gained when the T700 series engine limits by TGT and is placed to lockout must be secondary to having an accurate knowledge of power margin available and an executable escape plan during limited power approaches. Reprinted from *Knowledge* magazine, June 2011 issue.

"Our greatest weakness is habit. Our most lethal foe is routine."
Craig E. Geis

Mishap Review: UH-60 Ground Taxi

While ground taxiing to parking at a civilian FBO, the UH-60A's main rotor contacted a 25 foot light pole resulting in significant damage to the aircraft. Chalk 2, two civilian fixed-wing aircraft, and an Air force jet were also damaged by flying debris. There were two injuries to FBO personnel.

History of flight

The mission was a day VFR multi-ship formation training flight involving two aircraft. The purpose of the flight was to conduct formation training, LZ/PZ reconnaissance, VMC flight maneuvers, FARP operations, and a local area orientation. The crews reported for duty at 0700L for the 1015L planned departure. The crew completed their mission planning and conducted an air mission brief at 0915L followed by the crew brief and run-ups at 0940L. Reported weather was clear with unlimited visibility throughout the entire phase of flight. The crew briefed the mission as low-risk mission and the company commander approved the mission.

The flight departed at approximately 1015L en route to the planned training location. At approximately 1220L, both aircraft landed for hot refuel. Following refuel the aircraft departed for the second phase of their planned training.

At 1335L the two aircraft landed at a commercial field for refuel with the accident aircraft (Chalk 1) leading into parking at the FBO ramp. While positioning into their parking spot, Chalk 1's main rotor system contacted a 25-foot light pole located on the edge of the parking ramp. The collision severely damaged the accident aircraft main rotor system, drive train and engines. Chalk 2 sustained minor airframe skin damage and FOD to the #1 engine. Flying debris damaged an Air Force jet and two civilian fixed wing aircraft. Injuries occurred to two FBO employees, one an abrasion to the right calf, and the other a broken foot.

Crewmember experience

The IP had 900 hours total flight time, with 190 NVG and 200 combat. The PI had 290 hours total time, with 58 NVG. There were no non-rated crewmembers in the back.

Commentary

The accident investigation determined that while maneuvering to parking, the crew failed to properly scan resulting in failing to detect and avoid the light pole at the edge of the ramp. Additionally, the IP was distracted as he attended to tasks inside the cockpit.

DEPARTMENT OF THE ARMY
NIGHT VISION DEVICES BRANCH
110th AVIATION BRIGADE
FORT RUCKER ALABAMA 36362-5000

ATZQ-ATB-NS 25 July 2014

MEMORANDUM FOR U.S. ARMY COMBAT READINESS/SAFETY CENTER, BLDG 4905, FORT RUCKER, AL 36362

SUBJECT: Light Emitting Diodes (LEDs) and NVG Compatibility

1. The rapidly increasing transition from incandescent lights to Light Emitting Diodes (LEDs) has caused a significant amount of concern in the aviation community since obstructions identified by LED beacons are much more difficult to detect, as are aircraft using LED position lights. There is a trend to convert to LEDs for obstacle illumination because LEDs are more energy efficient with much lower operating cost than incandescent lights. LEDs have a narrow emission band and do not emit unused infrared (heat) energy like incandescent or fluorescent lights.
   a. An incandescent light emits approximately five times the visible wattage in waste infrared energy. Much of this infrared energy is detectable by NVGs, which are sensitive into the near-infrared spectrum. LEDs, by contrast, emit barely one-fifth of the visible wattage in waste infrared energy. This makes obstruction lights much less visible by NVGs, even in open and unlighted terrain. The most significant hazards occur in dense urban environments.
   b. Consider the following illustration: A 1,500-foot tower in an urban environment is illuminated using a 1,000-watt incandescent bulb. A pilot using NVGs will see 1,000 watts of light and, because the NVGs see into the near-IR portion of the spectrum, the majority of the 5,000 watts of waste heat, producing the unaided equivalent of a 6,000-watt bulb. Now assume that the tower operator converts the obstacle light to an LED. The NVG-equipped pilot will now see 1,000 watts of visible light plus only 200 watts of waste heat, for a severely reduced visual signature equivalent to a 1,200 watt light. Most street lights in North America use 250-400 watt street lights. Assume a 250-watt street light (non-LED). The pilot's NVGs encounter 250 watts of light plus 1,250 watts of heat, for a 1,500 watt equivalence. Since the relative brightness of the LED-equipped tower is only 1,200 watts, it disappears in the city lights.
2. The other substantial change involves the color of the lights and how those lights are filtered by the NVGs for cockpit use.
   a. The objective lens of NVGs contains a "minus-blue" coating. This is a special coating on the objective lenses that reduces interference from NVG-compatible instrument panel and supplemental cockpit lights. It makes the ANVIS "blind" to this lighting so that glare does not interfere with viewing outside the aircraft. The minus blue filter is the primary difference between ANVIS-6, military ANVIS-9 and civilian ANVIS-9 (F-4949) NVGs. As shown below, light becomes harder for NVGs to detect as it gets closer to the purple end of the visible spectrum. The minus blue filters used in the military and civilian ANVIS-9 block more light than those used in the ANVIS-6. This is primarily due to the requirement to block the light from the red Head-Up Displays and full-color Multi-Function Displays used in those cockpits.
   b. Obstruction lighting is designed around the human visual response. Human visual response ranges from approximately 400 to 700 nanometers (nm), while normal NVG response to light energy occurs

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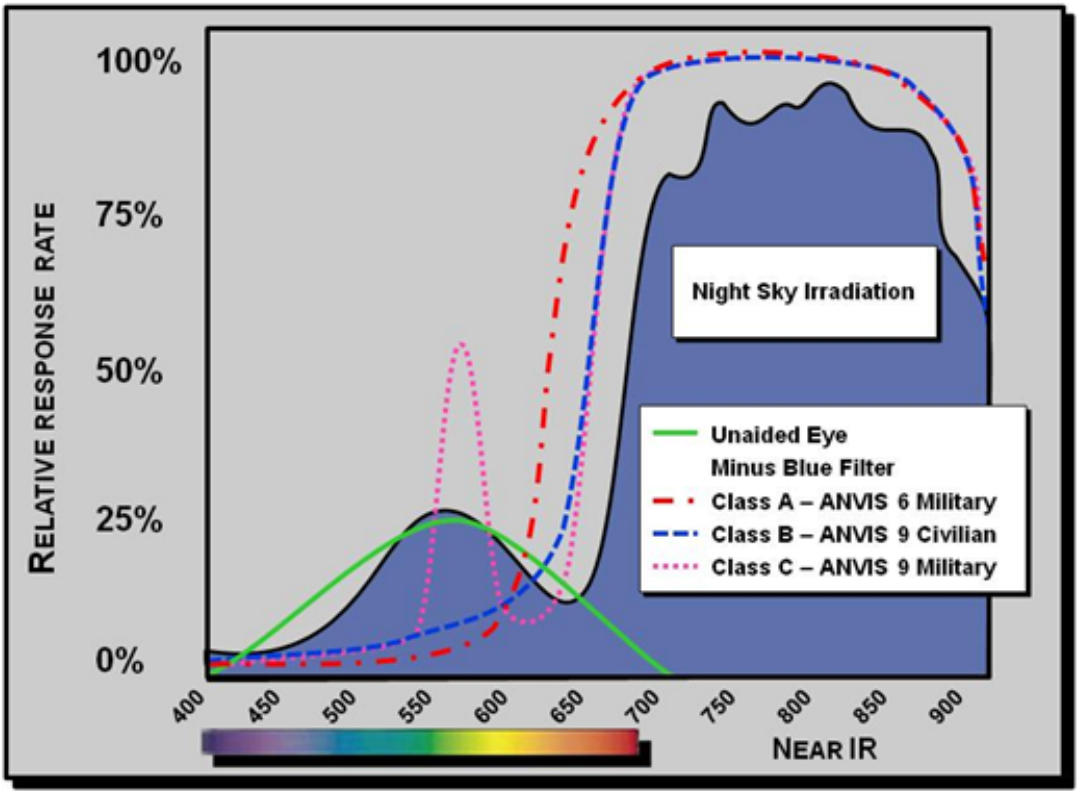
from about 645 nm to 930 nm with the peak sensitivity occurring between 660 to 850 nm. Aviation NVGs are only minimally responsive to light below about 645 nm.

c. Aviation Red lighting ranges from about 610 to 700 nanometers (nm). Additionally, current regulation allows for the performance characteristics for red obstruction lights to be measured in white light



then calculated based on manufacturer-provided values for the glassware, allowing some uncertainty about the actual wavelengths produced. NVGs approved for civil aviation (having a Class B Minus Blue Filter) are only sensitive to energy ranging from 665 to about 930 nm. Because LEDs have a relatively narrow emission band and do not emit infrared energy like incandescent lights (above), it is quite possible for them to meet regulatory requirements for Aviation Red but be below the range in which NVGs are sensitive. As a result, a red-orange LED can appear red to the human eye and meet the requirements for Aviation Red, but still not be visible to aircrews wearing NVGs.

3. In general terms, NVG users should be aware that LED lighting systems falling outside the combined visible and near-infrared spectrum of an NVG (approximately 665 to 930 nm) will not be visible to their goggles. This includes aircraft lighting systems as well as obstruction lights. This is a problem in higher light conditions, when the contrast between the light sources and the background is reduced, as well as in lower light conditions, when towers and other obstructions are less visible, regardless of lighting.

4. Risk Assessment/ Risk Management: Institutionally, the US Army has identified that LED obstruction and aircraft lighting is a hazard to flight operations when using NVGs. It has instituted the control measure of training every aircrew member regarding these hazards during their initial entry training, and it is included as information in the ANVIS Operator Manual. It is incumbent upon the commander of each unit to identify the LED illuminated flight hazards in their area of operations and brief their aircrews. As of the date of this memorandum, there is no comprehensive, current database available to the aviator which

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differentiates between obstructions illuminated by incandescent versus LED lighting. There is also no mention in operational risk management tools relating to NVGs and obstruction lighting.

5. Recommendations:
   a. Do not rely solely on NVGs for obstacle detection. LED-lighted obstructions or aircraft may be difficult or impossible for NVG-equipped aircrews to detect. Viewed unaided, however, the lights in the flight environment reassume their accustomed relationships. It is therefore imperative that aircrews periodically cross-check the NVG view of their flight environment with unaided vision.
   b. Exercise caution not to out-fly visibility. Use extra caution when flying near obstacle areas and to report any hazardous sites as appropriate.
   c. Ensure flight navigation information is accurate and current. Ensure navigation equipment is updated and fully functional.
6. References:
   a. FAA SAFO 09007 Night Vision Goggle (NVG) Advisory Pertaining to Certain Red Color Light Emitting Diodes (LED) 6 Mar 09
   b. FAA Engineering Brief No.67D Light Sources Other Than Incandescent and Xenon For Airport and Obstruction Lighting Fixtures 6 Mar 12
   c. FAA Advisory Circular 20-74 Aircraft Position and Anti-collision Light Measurements 29 July 71 (current)
   d. FAA Advisory Circular 150/5345-43F - Specification for Obstruction Lighting Equipment 12 Sep 06
   e. US Army Aeronautical Design Standard ADS-74-SP US Army Aircraft Lighting, 19 Dec 2008.
   f. MIL-STD-3009, Lighting, Aircraft, Night Vision Imaging System (NVIS) Compatible, 2 Feb 01.
   g. TM 11-5855-313-10, Operator's Manual For Aviator's Night Vision Imaging System (ANVIS) AN/AVS-6(V)3, Aug 14.
   h. NVESD Test Report Analysis of Resolution vs. Light Level Performance for Class A ANVIS vs. Class B ANVIS Rev 2, 28 Feb 05.
   i. US Army Night Vision Systems Guide Rev 2, Dec 13.
   j. Special thanks to Dr. Bill McLean at USAARL for additional spectral response information for Class A, B and C filters, 7 May 14.
7. The information in this memorandum is releasable without restriction.
8. POC for this memo is the undersigned at 334-255-9515, usarmy.rucker.avncoe.mbx.atzq-atb-ns@mail.mil.

//Signed//
KEITH BARKER
CW4, USA
NVD Branch Chief

The U.S. Army Combat Readiness/Safety Center recommends this memo for inclusion in your unit reading file.

Class A – C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 27 Aug 14
	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	0	2	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	1	4	4
	February	0	0	2	0		1	0	3	0
	March	2	1	5	6		0	3	0	0
3rd Qtr	April	1	1	6	2		1	1	4	0
	May	0	0	6	0		3	1	2	2
	June	1	1	4	0		2	0	5	0
4th Qtr	July	1	0	6	0		2	0	4	0
	August	1	1	9	0					
	September	0	1	3	0					
	Total for Year	9	7	59	8	Year to Date	16	6	32	6

UAS Class A – C Mishap Table									as of 27 Aug 14
	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	5		4	9
MQ-5	2	0	3	5	Hunter	1	1		2
RQ-7	0	4	10	14	Shadow		11	11	22
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
Aerostat	2	3	1	6	Aerostat	3	2	3	8
Total for Year	9	8	20	37	Year to Date	9	14	20	43

There was little margin for safety. 17 Jan 1990 *Flightfax*

There was nothing unusual about the mission. Two UH -60s would transport two M102s and 14 passengers to a firing point for an artillery training raid. Each aircraft would carry seven passengers and slingload an M102. After arriving at the landing zone, they would set down the M102s, land and unload their passengers, then proceed to a laager area. When firing was completed, the aircraft would return to the LZ, pick up the passengers and M102s and return to the PZ.

The morning of the mission, the air mission commander (AMC) briefed the aircrews, and the aircraft proceeded to the PZ, arriving at 1000 hours. Each aircraft carried a crew of three.

The passengers boarded and the M102s were slingloaded. When the lead aircraft attempted to hover, the pilots saw that the aircraft go-no-go criteria for power had been exceeded, and the load was set down. When the second aircraft attempted the same maneuver, the results were the same. The crews decided to remain on the ground with the aircraft operating and burn off fuel to reduce their gross weight.

After enough fuel had been burned off, the crews repositioned their aircraft to a northerly heading to take advantage of the wind. This time when the aircraft picked up their loads, the go-no-go criteria were acceptable.

The trail aircraft took off first and circled, waiting for the lead aircraft. Then the lead aircraft took off and linked up for the flight to the LZ.

The flight was uneventful. Arriving at the LZ, the lead aircraft made a high recon to determine suitability of the LZ, wind direction, and the appropriate landing direction. Performance planning for the LZ indicated the aircraft would be operating at or near maximum power available, and landing into the wind would be of utmost importance.

The planned landing direction was 320 degrees. Winds appeared to be from the west, but the AMC called the control tower about 10 miles north of the LZ to get a reading on the wind. He was told the wind was 240 degrees at 4 knots. The pilot of the lead aircraft planned his approach for a landing direction of 240 degrees and began his approach.

The lead aircraft came to a hover at 30 - 40 feet over the LZ, with 0 knots IAS. The M102, on its extended sling, was about 10 feet above the ground. The aircraft hovered for 10 - 15 seconds, then the pilot felt it start to descend, and he increased power. Main rotor rpm decreased to 80 percent, and the aircraft began yawing to the right as it continued to descend. Then the low rotor audio sounded. The PIC took the controls, reduced power, and attempted to increase airspeed, but the aircraft yawed farther to the right.

Both the pilots attempted to release the load, using the cargo hook release switch, but the load wouldn't release. The switch was pressed three times, and the crew chief could see the hook opening and closing, but the sling didn't release. The PIC told the crew chief to manually release the load. But as the crew chief reached down to release the load, the pilot and PIC pressed the emergency cargo hook release switch, and the load released. Once the load was released, the aircraft regained power, and the crew flew to the LZ and landed.

When the crew of the trail aircraft saw the MI02 from the first aircraft lying on its side in the LZ, they made a go-around to the south and landed at the base of the hill on which the LZ was located.

One of the artillery battery commanders was in the LZ as the lead aircraft made its final approach. He later told the crew that when the aircraft was on short final, the wind was turbulent and

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appeared to be coming from behind the helicopter (from the east).

The aircraft performed as predicted by the performance planning charts in the operator's manual, but the crew had allowed only a slim margin for safety-too slim as it turned out.

The ground commander had made a mistake when he briefed the AMC on the weight of the M102. It weighed 3,475 pounds, not 3,300 pounds as he had said. The scales tipped even further against a safe operation when the wind at the LZ suddenly shifted, creating a tailwind condition. The aircraft required more power than was available and it began losing altitude.

When the aircraft started descending, the pilot increased collective. That only aggravated the situation. The collective increase further decayed rotor rpm, resulting in loss of tail rotor effectiveness. The aircraft spun to the right with the M102 still attached. A wheel on the M102 struck the ground and the load had to be released to save the aircraft.

There were other factors that might have made a difference in the outcome of this mission.

- The small LZ was located on a pinnacle at 7,100 feet. The size and location of the LZ did not permit use of ground guides and the aircrews were unable to contact the ground unit on the briefed radio net.
- Smoke would have given the aircrew a reliable indication of wind direction for their approach. However, ground guides or smoke would not be available when performing an artillery raid without an advance party during wartime operations.

In a mountainous area such as this, where wind directions are known to shift abruptly, a 1,000-pound reduction in maximum allowable gross weight would have provided a greater margin for safety by giving the aircrews a power reserve to be used in case adverse environmental conditions were encountered. •

For your consideration…AH-64 loss of NVS (from actual events)

Event 1: Without power to the number two AC Bus, the aircraft's Flight Management Computer (FMC) failed, Backup Control System (BUCS) failed and the crew member's night systems capabilities were lost. As a result, the pilot in command had to execute a night unaided landing to a dusty, unimproved/desert environment which resulted in the pilot landing with a right bank angle allowing the main rotor blades to contact the ground and the aircraft rolling onto its right side.

Event 2: Both the TADS and PNVS video immediately stopped so both crewmembers donned their night vision goggles (NVG). Upon donning NVGs, the crew was able to maintain aircraft control.

Keep those goggles handy!

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in July 2014.

Observation helicopters

OH-58D

-Crew experienced an in-flight anomaly while at a hover which prevented application of aft cyclic. Aircraft landed hard with damage. (Class C)

OH-58C

-During engine start temperature exceeded 1,000 degrees C. (Class C)

Attack helicopters

AH-64D

-On movement from refuel point, aircraft descended to ground impact. Rolled, and came to rest on its left side. (Class A)

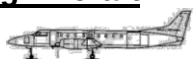
-Post-flight revealed transmission access panel missing. Damage to two main rotor blades and two tail rotor blades. (Class C)

Cargo helicopters

CH-47F

-Aircraft was on climb-out at 150 feet AGL 40 KIAS when all 3 cargo hooks reportedly opened and released the M777 howitzer sling-load. (Class A)

Fixed Wing Aircraft

C-26B 

-Aircraft experienced a hard landing during a training flight. Damage reported to the landing gear, prop and runway light. (Class C)

Unmanned Aircraft Systems

RQ-7B

-Crew received generator and ignition FAIL warnings during flight. Recovery chute was activated at 500' AGL at a suitable area for recovery. (Class C)

-Crew reported loss of engine power during flight. System descended below altitude for recovery chute deployment and crashed sustaining major damage. (Class C)

-UAS was in a landing phase under TALS when it reportedly initiated an uncommanded pitch-up of the nose until it was near vertical/perpendicular to the TALS station at which time the engine failed. UAS then entered a nose down attitude until ground impact. (Class B)

-System was in a landing phase when it experienced an uncommanded control input and crashed resulting in damage. (Class C)

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U.S. ARMY COMBAT READINESS/SAFETY CENTER

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OH-58D Safety Performance Review

This edition of *Flightfax* continues the five year safety reviews with a look at the OH-58D. Challenges associated with a single-engine aircraft are evident. However, many of the types and causes of mishaps span all airframes and can be used to increase awareness in your unit independent of any particular type of aircraft.

Also found in this issue: DES discusses IMC flying in the AH-64, my thoughts on transferring experience, input from a USAF member for the *Flightfax* Forum, and a Blast from the Past. Please note the back page - there were no reported Class A thru C manned aircraft mishaps in the month of August.

Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
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OH-58D Safety Performance Review

In the nearly five-year period FY10 - present (630,000+ flight hours), 74 Class A - C OH-58D mishaps have been recorded. There were 14 Class A, 3 Class B, and 57 Class C with a cost of $106 million in damage and injuries; there were 16 fatalities. The Class A flight mishap rate per 100,000 hours was 2.21. Review of these mishaps shows that human error was the primary cause factor in 52 (71%) of the incidents, materiel failure accounted for 15 (21%) with 5 (7%) unknown or not yet reported with a cause factor. There was one reported bird strike. Of note in Class A mishaps, materiel failure was a primary cause factor in 7 of the 14 mishaps. Highlights from some of the more frequent types of mishaps:

Engine Failure/malfunction

Engine failure or malfunction played a role in five Class A and five Class C mishaps.
Summaries of selected engine malfunction mishaps include:

Scenario 1 *ECU failure*

While conducting a daytime, multi-ship, Readiness Level progression flight in an OH-58D, at 80 knots and 400 feet above ground level, the OH-58's electronic control unit (ECU) failed in flight. The ECU experienced an overspeed failure on the power supply board, which resulted in an overspeed power supply fault. This triggered an erroneous overspeed solenoid activation, which resulted in the fuel supply being reduced to the engine. The rotor RPM rapidly decayed, resulting in a low rotor RPM condition, a rapid descent, and catastrophic impact with the ground. One crew member was fatally injured, one crew member was critically injured, and the aircraft was destroyed.

Scenario 2 *Engine chip light followed by engine failure*

While conducting a route security/reconnaissance mission at 90 knots and 150 feet above ground level, the aircraft experienced an in-flight engine failure. The pilot in command was forced to execute a low-level autorotation to a level, plowed field. The aircraft was destroyed and the two crew members sustained serious injuries.

Scenario 3 *Fuel check valve failure*

During a general maintenance test flight, the OH-58D's fuel boost fail caution light illuminated, followed by low fuel pressure warning. The low rotor audio was activated, followed by an engine failure indicated by an engine out warning. The maintenance test pilot (MTP) descended in a power off autorotation and impacted the ground. The MTP and non-crew member were not injured. The aircraft was damaged.

Scenario 4 *FADEC failure*

While the OH-58D was in cruise flight at 90 KIAS and approximately 1,200 feet AGL in Full Authority Digital Electronic Control (FADEC) auto mode, a FADEC failure occurred. This caused the aircraft's fuel flow to remain fixed at a cruise power setting, requiring execution of the emergency procedure for FADEC manual operation. As the crew attempted a precautionary landing, the aircraft crashed and both crew members sustained fatal injuries.

Scenario 5 *FOD*

Crew experienced a partial engine failure during a maintenance test flight and landed. Inspection revealed that the engine compressor had ingested a mirror that was apparently left in the plenum chamber resulting in in-flight anomalies and partial power loss.

Scenario 6 *Engine oil cooler*

Aircraft was performing a combat aerial recon mission and experienced a high oil temperature light with smoke and fumes in the cockpit. Engine cooler failed causing the engine to catch fire and conduct of an immediate landing.

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Object Strikes

There were three wire strikes recorded in the 74 incidents, two resulting in Class A damage and four fatalities. Additional incidents included one mid-air collision (four fatalities), one tail rotor tree strike, one aerostat tether and a bird strike. Summaries include:

Scenario 1 *Mid-air collision*

While performing night vision goggle training in an OH-58D at 220 feet AGL, aircraft #1 maneuvered toward a HLZ where another OH-58D, aircraft #2, was operating. Aircraft #1 impacted the left rear quadrant of aircraft #2 causing both aircraft to crash. All four crew members were fatally injured and both aircraft were destroyed.

Scenario 2 *Wire strike*

While conducting terrain flight navigation in the local flying area, the pilot struck a set of high power lines. The aircraft's left skid caught the lines, it rolled left, and descended into the trees. The impact fatally injured the two pilots and destroyed the aircraft.

Scenario 3 *Wire strike*

While conducting night vision goggles, live-fire weapons training at approximately 110 feet AGL and 90 KIAS, the OH-58D(R) struck a set of wires and crashed. The two crew members were fatally injured and the aircraft was destroyed.

Scenario 4 *Aerostat tether strike*

Aircraft was in a flight of two when it contacted the tether of an unlit aerostat. Post-flight inspection revealed no damage to the aircraft, but evidence of the strike (plastic sheathing on one blade.) Class C damage reported to the aerostat system.

Scenario 5 *Tree strike*

Aircraft contacted a tree canopy with the tail rotor system during NOE training. Post-flight and subsequent maintenance inspections revealed that one tail rotor blade required replacement as the result of damage.

Power management/maneuvering flight

Scenario 1 *Failed to arrest descent*

While engaging enemy combatants during a Quick Reaction Force mission, the pilot in command maneuvered the aircraft at a high airspeed below a recoverable altitude at a high rate of descent and impacted the ground. The aircraft tumbled through a tree line, coming to rest over 100 meters from initial impact. The two pilots were fatally injured and the aircraft was destroyed.

Scenario 2 *Power management*

While in a turn during the conduct of a reconnaissance and security operation, the crew allowed the airspeed to become too slow to maintain altitude without increasing the collective. The aircraft could not sustain level flight in the turn and an excessive descent rate developed from which the aircraft could not be recovered. The aircraft crashed and was destroyed. One pilot received serious injuries.

Scenario 3 *Downwind takeoff*

While attempting a NVG take-off with a slight tail wind (< 5 knots) the aircraft flew into the lead aircrafts rotor wash culminating into a settling with power condition. In response, the PC attempted to terminate the takeoff, clear of the obstacles adjacent to the HLZ. The aircrew lost visual reference with the ground as a result of browning out and ultimately impacted an obstacle adjacent to the HLZ. Extensive damage to the aircraft occurred. The aircrew received only minor injuries.

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Scenario 4 *Power and Dust*
Crew was conducting take-off during NVG environmental training when they experienced dust conditions (at mast-torque limit). Aircraft entered an uncontrolled descent and contacted the ground hard. Aircraft came to rest upright but sustained separation of the tail rotor and vertical fin.

Materiel failure

Scenario 1 *Loss of tail rotor thrust*
While conducting aerial support to troops in contact, the aircraft experienced a loss of tail rotor thrust. The aircraft developed a rapid and uncontrollable right yaw rate with a vertical descent at 4,000 feet/minute and impact force of 23G's. The aircraft was destroyed and both crew members sustained fatal injuries.

Scenario 2 *Servo malfunction*
During the conduct of an OH-58D NVG/N evaluation, while hovering forward in a confined area with the IP on the flight controls in the left seat, the right flight control hydraulic servo malfunctioned and jammed and would not allow the pilot to apply aft cyclic. The aircraft nose low attitude could not be corrected and the aircraft impacted the ground causing severe damage to the aircraft and one minor injury.

Scenario 3 *Fire in flight*
While in flight at approximately 80 knots during daylight conditions, the crew of the lead OH-58D identified smoke which was accompanied by several failures due to AC power loss. Trail aircraft confirmed smoke and fire from the engine compartment. The fuel differential pressure switch input fuel line burst and sprayed fuel onto the AC generator causing AC power loss and ignition of fuel in the engine compartment fire. Crew completed an emergency landing and shutdown. The aircraft incurred extensive engine and structural damage. There were no injuries. Closer examination of the fuel line shows that the fuel line ruptured near the bend and failed toward the input connector.

Scenario 4 *Running landing*
During the ground run of an approach to a running landing the forward cross-tube of the OH-58D helicopter broke. A fatigue crack that had developed over an unknown period of time on the inside bottom portion of the right mounting bracket reached a point of critical failure. The weight of the aircraft came to rest on the main assembly of the lower WSPS causing minor structural damage. There were no injuries.

Miscellaneous

Scenario 1 *Trim switch versus laser switch*
During a NVG training mission in an OH-58D flying at 1,800 feet MSL, the pilot mistakenly actuated the engine's RPM trim switch located on the pilot side collective. As a result, the aircraft lost altitude and impacted trees during the landing. The aircraft sustained catastrophic damage from a post-crash fire, with no significant injuries to the crew.

Scenario 2 *Foreign object damage*
Crew experienced a partial engine failure during a maintenance test flight and landed, conducting an emergency shutdown. Inspection revealed that the engine compressor had ingested a mirror that was apparently left in the plenum chamber, resulting in in-flight anomalies and partial power loss.

Scenario 3 *Hot start*
OH-58D start was initiated with a weak battery. Hot start ensued with temperature reaching 1,174 degrees Celsius requiring engine replacement.

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Scenario 4 *Failure to follow the checklist*
While conducting aircraft run up for a combat mission, the crew split the checklist after the radar altimeter check. During the FADEC system check the PC failed to return the system switch to the AUTO position resulting in an overspeed.

Training

In training related incidents there were 16 Class C and 1 Class B mishaps related to FADEC manual mode operations generally related to overspeeds. There were four overtorques during the conduct of SEF/autorotations. Six overspeeds occurred during run-up/FADEC system checks.

Scenario 1 *FADEC manual*
Aircraft touched down hard during a demonstrated FADEC manual approach. Damage reported to the skids (spread) and airframe.

Scenario 2 *FADEC manual*
Crew was recovering from a FADEC training approach to a hover. PI in left seat rolled throttle in the wrong direction (down), and simultaneously increased collective pitch once the Low Rotor Warning tone was heard. As the aircraft descended the IP applied all remaining collective before the aircraft came in contact with the ground. Aircraft landed hard resulting in spread skids, destroyed antenna and damage to underbelly.

Scenario 3 *Autorotation*
During autorotation the pilot on the controls observed his airspeed decreasing to 55 knots and adjusted his attitude to increase airspeed. The pilot made a rapid collective application to arrest the rate of descent prior to impact resulting in an overtorque.

Scenario 4 *Degraded visual environment*
While conducting environmental training under night vision goggles the pilot on the controls (P*) lost visual contact with the ground. The aircraft made contact with the ground on its tail stinger and rocked forward onto the skids. The lower WSPS embedded itself into the ground causing the aircraft to come to a sudden stop. There were no injuries. The sudden stop combined with the hard landing caused the rotor system to flap down and make contact with the upper WSPS. The aircraft's main rotors, rotor hub and engine were also damaged.

Summary

18 (24%) of the events occurred under N/NVG conditions. 34 (47%) occurred in OEF/OIF. Not all of the 74 mishaps have been listed in the scenarios. Missing are additional FADEC manual operations, an open cowling, one fratricide Class C, one blade delaminating, hot starts, a whiteout, and a .50 cal. ricochet on a range. More detailed information, for accident prevention purposes, may be obtained by your safety officer through the Risk Management Information System (RMIS) on the safety.army.mil website. Registration is required.

	OH-58D CLASS A – C Mishaps				
FY	Class A	Class B	Class C	Class A Rate	Fatal
2010	4	0	11	2.53	4
2011	5	1	16	3.49	5
2012	3	0	14	2.22	6
2013	1	1	8	0.98	1
2014	1	1	8	1.06	0
Total	14	3	57	2.21	16

A Bucket Instead of a Rag

The Simple Trick to Transfer Experience

Thoughts from an Aviation Task Force Commander

In my position as the Aviation Director within the U.S. Army Combat Readiness / Safety Center, I have had the incredible opportunity to speak with the leaders and Soldiers within many of our combat aviation brigades. Over the course of many conversations about safety and risk management with brigade and battalion commanders, company commanders, senior warrant officers, senior NCOs, and Soldiers, the almost universal safety concern is low Soldier experience levels combined with reduced leader-to-led rations given current HRC manning policies. This poses a very challenging Catch-22 situation for commanders because they need to generate enough aviation flight OPTEMPO to train their aviators, but increasing OPTEMPO may be beyond the capability of their aviation maintainers. If we reduce flight OPTEMPO to focus on aviation maintenance training, we decrease proficiency for the aviators. If we focus only on generating OPTEMPO to train aircrew, we put aircraft maintenance at risk for possible mistakes. It is a difficult balance to strike. While this specific example is aviation centric, this concept applies universally to any Army formation.

I faced a similar circumstance as an Aviation Task Force Commander deployed to RC-South, Afghanistan. The unit's aviation maintenance company was very junior and only manned at 70% for many reasons. Given the high OPTEMPO required to support the CJTF and SOF, we were very concerned about proper maintenance practices. The command group discussed at length how to position leaders correctly to supervise maintenance and how to build experience on the junior maintainers.

One afternoon, the CSM and I were walking past one of the clamshell hangars, and we noticed a group of Soldiers clustered around the front left strut of a CH47F. Naturally, this piqued our curiosity and we moved to investigate. Once at the aircraft, I saw an aircraft mechanic with a rag and tools in his hand, the panels around the left front strut removed to service the brakes, and a large puddle of hydraulic fluid on the ground. Not very happy with the scene I was looking at, I began to dig into why and how this event occurred. First question was "where is your IETM and are you following the procedure correctly." The Soldier immediately pointed to his open aircraft notebook computer with the IETM manual open to the task. Next question was show me the steps in the task and what step were you on when the fluid leaked. He walked me through his actions until he got to step #9 in the task which states "Catch leaking fluid in a container or rag. Wear gloves." The immediate investigation revealed the Soldier followed the procedure in the book correctly.

As I finished watching the Soldier demonstrate his actions after reading the maintenance task, the CH47 TI arrived at the aircraft. When I asked him about the procedure and the amount of hydraulic fluid that leaked, he nonchalantly stated that you definitely need more than a rag to catch the fluid. It was normal, depending on the residual pressure within the system, for quite a bit of fluid to leak when the brake fitting was loosened. It was at this moment that I had my epiphany about experience.

The young Soldier performed his task exactly according to the book, yet we did not get our desired outcome. The experienced Soldier knew, probably from making this same mistake in the past and that even though the maintenance manual outlines the procedure, there are sometimes additional steps one has to perform to ensure a safe outcome. A bucket instead of just a rag.

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The lesson I took from this event is that we needed some type of method to shepherd the lesser experienced Soldiers through every task so that we transfer experience through instruction instead of "trial and error." The way I solved this problem is that I made it a reportable event to a first line supervisor anytime anyone did something for the first time. The first time performing a maintenance procedure, the first time driving to a location on the base, the first time a pilot flies to an established HLZ, etc. This report serves as the trigger for the leader to take special precaution in this circumstance, and to assign the Soldier a mentor to shepherd them through the task. An experienced maintainer to teach a maintenance task, an NCO that has driven on the base to all locations, or the pilot that has flown to the HLZ and knows the landing direction and obstacles.

Unit manning levels, large populations of inexperienced Soldiers, and low leader-to-led ratios will become the normal in the post conflict era and during our end-strength manning reductions. We need solid methods to build the experience of our Soldiers, and the first step is identifying what specific experiences Soldiers don't have. By making "this is my first time for …." a reportable event, we can clearly identify when we need to implement additional steps to shepherd them through the process. I have seen the results. I know this works.

LTC Mike D. Higginbotham, Aviation Director, Future Operations, US Army Combat Readiness / Safety Center

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Manned Aircraft Class A – C Mishap Table as of 17 Sep 14

	Month	FY 13 Class A Mishaps	FY 13 Class B Mishaps	FY 13 Class C Mishaps	FY 13 Fatalities		FY 14 Class A Mishaps	FY 14 Class B Mishaps	FY 14 Class C Mishaps	FY 14 Fatalities
1st Qtr	October	1	0	7	0		0	0	2	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	1	4	4
	February	0	0	2	0		1	0	3	0
	March	2	1	5	6		0	3	0	0
3rd Qtr	April	1	1	6	2		1	1	5	0
	May	0	0	6	0		3	1	2	2
	June	1	1	4	0		2	0	6	0
4th Qtr	July	1	0	6	0		2	0	5	0
	August	1	1	9	0		0	0	0	0
	September	0	1	3	0				2	
	Total for Year	9	7	59	8	Year to Date	16	6	37	6

Class A Flight Accident rate per 100,000 Flight Hours

5 Yr Avg: 1.34	3 Yr Avg: 1.31	FY 13: 0.81	Current FY: 1.66

AH-64s Flying in Instrument Meteorological Conditions - A Culture Change

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AH-64D/E SP/IE

The mission of the attack helicopter has not changed, however the tools to accomplish it have. Instrument meteorological conditions (IMC) is defined as a flight category that describes weather conditions requiring pilots to fly primarily by reference to instruments, and therefore under Instrument Flight Rules (IFR). A large percentage of AH-64D pilots are uncomfortable with instrument conditions. Outside of an APART instrument evaluation, IMC or IFR is infrequently uttered within the community. When was the last time an AH-64 pilot executed a Standard Instrument Departure, an ILS approach, intersection holding or flew in IMC? The resounding answers would be "back in flight school" and "never in an AH-64."

Since entering the inventory in 1997, the AH-64D has been restricted from flight into IMC. This has resulted in a generation of aviators who consider instrument flying as an emergency procedure. Instrument flying is often viewed as a recovery option should weather deteriorate, or given consideration annually during an evaluation. The fact is, the AH-64 community has not had a stake or purpose in prioritizing IMC flight. Understandably, we have neglected flight into IMC and IFR, however; the negative connotation associated with "instruments" must change.

The era of VFR only flying is ending, as AH-64E fielding is well underway. The E model enters service as a fully certified IMC aircraft. It possesses dual VORs, and is ILS/ RNAV capable (en route RNAV with version 4.0 software, est. FY15). With new expanded capabilities comes an inherent responsibility. The attack standardization community must now place a greater emphasis on equipping aviators to fly into IMC.

One cannot expunge the past seventeen years, however it is possible to correct our faults. How do we do this? We need to make a concerted effort to mitigate the risk of our newfound opportunities (IMC flight) while simultaneously instilling confidence and building proficiency.

The first step in the evolution requires updating our SOPs and Mission Risk Assessment Worksheets (MRAW) to emphasize instrument flight in the Aircrew Training Program. The fact that we can now legally fly into IMC does not mean we should without restrictions. Units should implement control measures to ensure we do not rush to failure. For example, consideration should be given to imposing specific weather minimums and pilot experience in order to fly into IMC. Also, MRAW values should reflect the increased risk associated with IMC flight and crew experience. As crew confidence and proficiency is gained, units should reassess control measures and amend them as necessary. That said, human nature dictates that a person will rarely perform tasks that are outside their comfort level. Control measures need not be so stringent as to make training and building proficiency unattainable or unrealistic.

Second, a greater importance must be placed on instrument tasks during RL progressions. Traditionally, if an aviator could perform his/her instrument tasks to standard once, it met the standard for what we do. We need to separate ourselves from the "good enough" mentality and embrace proficiency. A robust instrument centric phase (academics, LCT and flight) that dedicates more time and resources will serve as a foundation that will pay dividends in the end.

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Third involves changing how we look at instrument sustainment training. Instrument Examiners (IEs) must actively and routinely participate in the training of all aviators within his/her unit. In general, PICs and IPs train instruments and IEs evaluate. The drawback to this approach is an aviator rarely flies with an IE. An aviator should fly with an IE throughout the year, and not just on his/her APART Instrument Evaluation / RL Progression. In addition, IEs must be proactive in developing and standardizing beneficial training and realistic evaluation scenarios. Consider integrating instrument flying into daily operations. Some methods of incorporating instruments into daily operations could include mandating that every mission/ATM flight will be concluded with an instrument approach or including instrument topics into weekly pilots' briefs. Get creative. The bottom line is that without a change to the status quo, instrument proficiency is unlikely.

Fourth, ATP commanders must emphasize the importance of instrument proficiency. ATP commanders should increase 7120-R series flying hour requirements for hood/weather and tailor task iterations to the individual aviator. Changes need not be extreme, but the point needs to be made that instrument flying is a priority within the ATP.

Finally, a comprehensive no-notice evaluation program is a valuable tool that allows commanders to monitor aviator proficiency. No-notice programs should place a greater importance upon hands-on instrument evaluations (preferably in the aircraft under IMC). Evaluations in the LCT are beneficial, but it is only simulated. There is no better barometer to determine proficiency than a hands-on evaluation in the aircraft under IMC.

Our paradigm shift creates more issues than our aviator's requirement to "re-learn" IFR/IMC flight. Units must take a hard look at their LCT DAC/contractor IOs. Civilian IOs often function with little supervision from unit SPs/IPs, however; they interact with our aviators on a regular basis. IAW AR 95-1, DAC and contractor IOs will be trained and evaluated as necessary to meet the requirements of their job description or statement of work and shall be IEs (if they conduct instrument training or evaluations). An IE must also evaluate them annually. Unit IEs need to oversee and conduct periodic checks to ensure realistic and appropriate training is being conducted. If IOs are not providing beneficial instrument training, we are squandering a valuable asset when it comes to building instrument flight proficiency.

Employing a crawl, walk, run mentality to IMC flight, we will recover from instrument atrophy in the attack community. If we make it a priority, we can begin to instill confidence within the community to safely fly into IMC. Updating our SOPs to reflect the reformed mindset, emphasizing instrument tasks during RL progressions, tailoring the 7120 series, getting IEs more involved in sustainment training and conducting no-notices in actual IMC will assist us in changing how our community perceives IMC/IFR. Train, sustain, evaluate, and implement control measures.

-- CW4 Glen Blanche ***may be contacted at (334) 255-2532, DSN 558***

Safety – it never ends. There is always something more to accomplish.

Pressures of Making Mission

It would be untruthful to say that all aircraft accidents can be eliminated. As long as a human is piloting an aircraft, accidents and incidents will happen and mistakes will occur no matter how much training and resources are put into safety and training programs. That being said, accidents and incidents can be greatly reduced by focusing on proper training and safety programs. Human error continues to be the primary factor in aircraft accidents. In FY 11-14 there was 60 Class A flight mishaps with 80% of these accidents due to human error overall. Of these accidents nearly 57% of the 60 accidents occurred in combat with an 86% human error rate. These numbers reflect the enormous pressure of mission success in a combat environment.

When an aircraft accident occurs, an aircraft investigation team evaluates the scene and crew in great detail. Pilots behind the controls are normally the main focus during an investigation. An accident investigation team will break down all aspects of those pilots to include crew mix criteria, experience, training and personal lives, just to name a few. Pilots have problems just like everyone else, their minds may be on all sorts of topics while at the controls. Normal problems such as marriage, money, kids, health are things that all of us worry about at various times in our lives and the pilots at the controls are no different. Pilots need to know their personal limitations, that is usually found with experience and time. I am a different pilot than I was 20 years ago. There had been times in the past when I was so tired I shouldn't have been flying. The drive to make a mission happen was my motivation, but it could have been my downfall. I can honestly say I nearly fell asleep one night while on the controls of a helicopter in combat in the middle of the night. After that particular flight I re-evaluated my sleep schedule and coffee became my best friend.

When pilots start out they are normally hesitant but eager to learn like most type "A" personalities. But as time goes on they become braver, taking more risks when it comes to factors such as bad weather conditions. But after a bad day or experience most pilots learn to evaluate each flight more carefully, looking harder at weather briefs and their crew mix. I was told two important lessons from pilots that had a lot of flight time. Always look at every flight like a lawyer, meaning ensure you have checked all the requirements needed for that flight. These items may include a proper risk assessment, a current weather brief and a proper preflight, just to name a few. The second item that was told to me is there is a fine line between brave and stupid. Taking unnecessary risks can lead to catastrophic results. All pilots need to evaluate themselves from time to time, remembering that there are many people that will be affected if an accident where to occur. The effect on a unit or, more importantly, the families involved are limitless.

There are many external pressures that can effect a crews mind set beyond their own personal lives. Being part of a unit that has a toxic environment can cause all kinds of issues. This not only affects flight crews but affects the maintainers as well. Good leadership has a huge impact on a unit's safety program. It is important for leadership to remember that they are not only affecting the Soldiers but they are affecting the families in the unit as well. This is a trying time for Army leadership, with the current draw-downs and poor promotion rates in all ranks across the board, it is making things difficult to keep unit moral and readiness up.

The civilian sector has been impacted by human error as well. The Federal Aviation Administration (FAA) has made it mandatory that all new pilots hired by the airlines have at least 1,500 Hours of flight time. This rule took affect due to the fact that it was found that some crews had not been adequately trained and lacked the necessary experience for the airline industry.

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In conclusion, all pilots at every level in their careers need to self-assess themselves each time they step onto an aircraft. Leadership must create an atmosphere within a unit that promotes both safety and training programs. It is important that leadership listen to the smart individuals around them.

Everyone involved needs to remember what far reaching impacts accidents can create not only to the personnel involved but the families as well. I lost one of my best friends nearly five years ago to an aviation accident. I have been unable to remove his cell phone number from my contact list. It reminds me of what is important.

CW5 Adam Duszak, Aviation Directorate, USACRC/SC, Email: adam.b.duszak.mil@mail.mil

UAS Class A – C Mishap Table as of 17 Sep 14

	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	6		4	10
MQ-5	2	0	3	5	Hunter	1	1		2
RQ-7	0	4	10	14	Shadow		11	11	22
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
Aerostat	2	3	1	6	Aerostat	3	2	3	8
Total for Year	9	8	20	37	Year to Date	10	14	20	44

"If people concentrated on the really important things in life, there'd be a shortage of fishing poles." - Doug Larson

How to Demo a New Helicopter Brownout system with a Smartphone and a Cardboard Box

The challenge to fixing helicopter brownout may not be dusty landing zones, but cloudy thinking. Twenty years and 5,000 flight hours ago, I was hovering my HH-60 (with great effort) looking inside, using only the crappy ball and stick fighter HUD mimicking hover cues. I remarked to my copilot: "Great, we have Pong. When do we get Tron (the first home video game, and the first 3D computer graphics movie and game of the same name)?"

Two groups of us saw the solution was obvious. One looked at the video screen as a video game. We just needed to turn our GPS and RADALT information into a second generation wireframe video game: "Land the Helicopter." After all, millions of people were landing virtual helicopters in their living rooms. Our computers were plenty fast to synch the real chopper with the simulation. The crazy idea was to make a helicopter landing system simulate a landing helicopter.

The other group saw the solution not as a new way to use 3D simulation, but as a way to apply old fighter heads up display methodology. They won. So for the last 20 years, we have taken the helicopter's 3D position and turned it into lots of abstract balls, noodles, sticks, digits and pseudo-analog needles; all competing for space in the middle of my screen like a spoonful of lucky charms sloshing around as I hover over the dark ocean.

A Matter of Perspective:

As anyone who has ever played a helicopter video game, you know you fly via first person view, but you land via third person "off your tail" view. That's for the simple reason that you can see both the helicopter and the landing spot in the same frame and scale. You might as well call this takeoff and landing mode.

Here is an easy way to envision what this might look like. You need a Smartphone (or tablet, camera, etc. with video screen), a cardboard box, a stick about 1-2 feet long, and an LED keychain light. Cut a hole in the lower bottom of the box for the camera to view the scene.

Now put your head into the box and see a first person view that doesn't allow you to see the helicopter and the LZ at the same time. Try setting the camera down accurately on the far edge of a table or chair. It isn't really possible. The textbook answer would be to fill the screen with all sorts of abstract references for you to translate.

Now mount the light out on the stick, pointing straight down. The light simulates a helicopter with its landing light on. This tells the helicopter's 2D ground location and its altitude via the size of the circle.

Now turn the room lighting dim enough to see both the room and the light spot from the viewfinder. Notice that not only can you land the "helicopter" with extreme precision, you can also hover at an exact height by keeping the circle a precise size – all without any translation.

The display system would be a Tron-style ground grid to represent the ground and the horizon. The virtual helicopter body would be minimized to avoid clutter. The virtual landing light would be a "laser circle" with indexes for height, and/or an adjustable index for your desired height.

There you go – a system that not only allows you to land your helicopter in a brownout as easy (probably easier) as a video game, but the "game" is also designed for accurate high altitude zero visual reference hovering.

And speaking of old solutions, an RFID tag system that displays the position of moving objects such as boats or swimmers would solve our other big hovering challenge.

These solutions have been around for 20 years. We really should take a break from emulating Top Gun fighter HUDS. Maybe solving what is essentially a helicopter simulation problem should be done by displaying a simulated helicopter.

Lt Col Robert Haston, USAF, Camp Lemonier, Djibouti

Perceived or real... urgency can kill (Aug 1992 Flightfax)

The medical company was formed on 1 April by combining three detachments from one state with one detachment from another state. On 23 May, the company received notice that they were to be activated for a duty assignment in the Middle East. On 29 May, unit personnel were ordered to report to their mobilization station on 2 June.

Following an emotional farewell, members of one of the detachments departed for their mobilization station with six aircraft. However, because of weather, they were forced to return their aircraft to home station and report to their mobilization station without the aircraft. Another six aircraft from a second detachment departed their home station only to get weathered in en route. Personnel from this detachment were forced to leave their aircraft at an en route station and also report without their aircraft.

These crews were safety-oriented and made good decisions. They knew it would be unsafe to push on in adverse weather. However, this was not to be the last time that weather would hamper this unit during its mobilization.

Mobilization

During the next 2 weeks, the entire unit processed for mobilization while checkrides were given and crew mix for the deployment to port was established. A couple of days after reporting to the mobilization station, crews were sent to recover the aircraft left at the en route station. They were to relocate all aircraft to another station where a modification work order (MWO) installing erosion tape to the leading edges of main and tail rotor blades was to be completed by a contractor. Port dates and locations as well as the completion date for the MWO installation changed several times during this short period. A requirement received from FORSCOM was for all 12 aircraft to be on the docks at the port at 0800 on 16 June. Based upon the projected 13 June completion of the MWO, the unit elected to deploy to port in one day – 14 June.

Crew assignments were made on 12 June. The next afternoon, all flight crews boarded a bus for the trip to the flight facility where the MWO was being performed. As projected, test flights following the MWO were completed on 13 June, and the crews pre-flighted all 12 aircraft late on the same day. The crews completed route planning and conducted air mission briefs that night. Crewmembers stayed at a local hotel or commuted home if they lived nearby, with orders to report to the flight facility at 0600 hours on 14 June for a 0700 departure.

Deployment

The 12 aircraft were divided into three flights of four aircraft each. The planned 0700 takeoff on 14 June was delayed for over an hour because of en route weather. The lead flight finally departed at about 0845 and arrived at designated refueling points as planned. The first legs of the flight were uneventful. However, due to weather near one refueling point, the flight route was changed. All three flights diverted to a new refueling point without any further weather problem en route. The lead flight arrived at the last scheduled refueling point at about 1900 and encountered some difficulty in refueling. There was only one refuel point, so an extended time was required for refueling. The crews obtained a weather update that stated VFR through arrival time with IFR weather forecast for the following 2 days. So the flight decided to continue even though it was now dark.

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At about 2000, the unaided flight (their night vision goggles had already been packed and shipped to port) departed the refueling point. During this last leg of the flight, Chalk 2 was having problems with its radios and on occasion could not receive the lead aircraft's radio transmissions. Chalk 3 would relay what the lead aircraft was saying.

About 2105, Chalk 1 encountered instrument meteorological conditions (IMC) and called for IMC breakup procedures. As briefed, Chalks 1 and 3 conducted inadvertent IMC breakup procedures. Chalk 2 never acknowledged the IMC breakup call and visually went under the cloud layer and turned 180 degrees. Chalk 4 followed Chalk 2, and during the turn, the Chalk 4 crew saw airport lights and called for Chalk 2 to follow them. Chalk 2 never acknowledged this call either. It cannot be determined whether Chalk 2 heard the IMC breakup call or the call from Chalk 4 concerning the lighted airport to the north.

While Chalk 4 continued its turn and approach to the airport, the crew heard radio transmissions they attributed to Chalk 2. The first call seemed to be the pilot calming the PC. In later calls, the pilot sounded more anxious and seemed to be trying to take control of the aircraft. The last sound was described as three or four beeps from the emergency locator transmitter.

According to ground witnesses, Chalk 2 was at a high hover, appeared stable, and had its lights on. Chalk 2 then flew at low level and slow speed toward a dark wooded area. At 2110, Chalk 2 hit numerous trees, entered an 80- to 90-degree left roll, and disintegrated. All three crewmembers were killed.

Analysis

After descending from altitude to avoid night IMC, the crew lost control of the aircraft and crashed while flying low level over an unlit wooded area with no visible horizon. The cause of control loss could not be determined. However, it is suspected that one of the pilots became spatially disoriented and a struggle developed over the controls. The crew had never flown together before this cross-country flight, and as a result of the breakdown in crew coordination and communications, the aircraft crashed.

Other factors were present in this accident that did not directly contribute to it; however, if left uncorrected, they could adversely affect the safety of future operations.

• **Urgency.** Members of the unit perceived an excessive sense of urgency toward getting the aircraft to port for overseas deployment. Flight leads and unit standardization personnel were hesitant to stop before arriving at port. It was perceived that the established time for aircraft arrival and loading could not be met if a weather delay was incurred. Consequently, the unit flew longer and later than normal and in worsening weather conditions.

• **Time and equipment.** Sufficient time and aircraft were not available between the date the unit was activated and the date of the accident to conduct required evaluations of new unit members in accordance with the aircrew training program. The best possible aircrew mix was accomplished by unit safety, standardization, and command personnel, using available data. However, data on the new pilots was limited because they had flown with unit IPs only once or twice. Pilots from the detachments were mixed to attempt unit integration. Most of the crews in the flight had never flown together before this cross-country flight.

Additionally, once the unit was activated, they had no support agency. When they were directed to move their 12 aircraft to port, they did not have sufficient current publications and maps to

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equip each aircraft as required by AR 95-1 and there was not enough time to acquire them.

The 11 days from the date the crews reported to the unit were not sufficient time to adequately prepare for deployment. With so many tasks to be completed in such a short time, unit personnel quickly went into a hurry-up mode. Therefore, the unit did not perform a complete mission risk assessment and plan for all contingencies. The hurry-up situation created an atmosphere of urgency. Time was not allowed to plan for unexpected weather delays or for adherence to minimum altitudes and visibilities. Had ample time for complete flight planning been available, the mission risks could have been reduced.

• **SOP directives.** The unit SOP-directed minimum en route altitude was not followed as required by the unit mission briefing sheet. Minimum altitude as stated in the SOP was 500 feet agl. Two of the four aircraft crews in the flight stated that they had descended to 300 or 350 feet agl. It may be that this happened because the unit was new and most of their reading files, regulations, and other non-personal documents and equipment had already been shipped to port. This resulted in a portion of the unit having no access to much of the unit safety and standardization data. All unit personnel should have been aware of the contents of the unit SOP pertaining to their area of operation. And once aware, good flight-crew discipline should have ensured compliance with the 500-feet-agl rule.

• **Weather.** During the weather check for the flight to the port, unit pilots were informed that 15 and 16 June would be the worst weather days to fly. With that thought in mind, the pilots departed on the 14th in three flights of four aircraft each. But because of the unexpected en route delays, the flights fell behind their planned arrival time. As a result, the lead flight did not leave the last refuel stop until 2000. Well after dark, the unaided flight departed on the final leg of flight.

Once the flight started encountering unforecast clouds at flight level, they decided it was closer to port than to return to the last refuel point. At this time, the flight fully believed their aircraft had to be in port that night and allowed that thought to influence their judgment. Under adverse weather conditions, they decided to push on.

• **Command pressure.** Not only did the crews feel pressured to get to port that evening because of forecast poor weather conditions for the next 2 days, they also felt pressured by their higher command. Previous instances of canceled passes and prompting to hurry, hurry had already occurred during the mobilization.

Summary

During their activation, the crews used good judgment and didn't push on when they encountered adverse weather. One detachment returned to their departure station, and another stopped at an en route station. However, during the deployment, they allowed a sense of urgency to cloud their judgment. Whether it's real or perceived, a sense of urgency is a risk to safe operations . Commanders must ensure that unit personnel are informed that common sense and good judgment should never be sacrificed because of a real or perceived sense of urgency.

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Selected Aircraft Mishap Briefs

Information based on preliminary reports of aircraft mishaps reported in August 2014.

Unmanned Aircraft Systems

MQ-1

-System impacted mountain terrain during climb-out. System was destroyed/not recovered; total loss reported. (Class A)

-Operators received OIL PRESSURE and ENGINE-OUT indications during flight. System was crash-landed at an identified location and recovered as a total loss. (Class A)

RQ-7B

-UAS was on post-landing roll-out when the controllers reportedly lost link with the TALS. It subsequently veered into the arresting gear system on the runway, resulting in cumulative damage. (Class C)

-Operators experienced loss of power/link with the UAS during training flight at approx. 934 FT AGL, followed by loss of engine power. Recovery chute was unable to be deployed prior to loss of link but the last tracked grid location was identified and system was recovered. (Class C)

-UAS experienced an uncommanded engine failure during the landing phase and impacted the ground 60 feet short of the landing strip. UAS became airborne and came to rest again of the northern edge of the landing strip. Damage reported to the nose landing gear, center wing, antenna and payload. (Class C)

-Personnel were conducting flight training when they experienced a right elerudder FAIL warning during a landing-approach. Commander directed deployment of the recovery chute after failed attempts at landing from another control station. (Class C)

-Operators experienced loss of engine power during operation of the UAS. Recovery chute was deployed and system was recovered with damage. Fuel pump cited as preliminary loss of power. (Class C)

If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness/Safety Center at com (334) 255-3530; DSN 558

U.S. ARMY COMBAT READINESS/SAFETY CENTER

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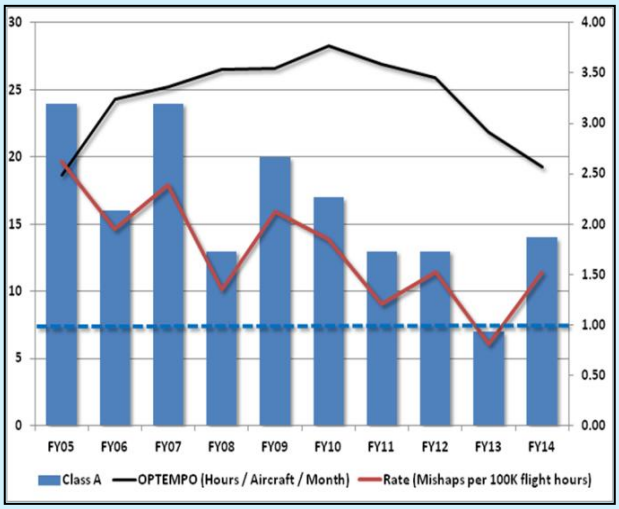
Online newsletter of Army aircraft mishap prevention information

Excerpt from the "Army Safety and Occupational Health Objectives for Fiscal Year (FY) 15"

Objective Three: Aviation Mishap Mitigation. Maintain aviation Class A accident rates at less than 1.0 per 100K flight hours. FY13 was the second safest year for Army Aviation with a Class A accident rate of 0.81 due to continued engaged leadership throughout the aviation chain of command. For special emphasis, spatial disorientation (SD)/degraded visual environment (DVE) is the human error mishap contributing factor that accounts for 24 percent of our aviation losses since the initiation of combat operations. Reduce SD/DVE accident by 50 percent through enhanced SD/DVE training and leader awareness of this loss contributing factor. GEN Odierno, Chief of Staff of the Army



Aviation leaders, air mission commanders, pilots in command, and non-rated aircrew members have been issued this challenge by the Chief of Staff of the Army… **reduce our manned aviation Class A mishap rate to below 1.0 per 100K flight hours.** Our 10 year trend is tracking toward meeting this goal, however, if we were measuring our FY14 results against this metric, we would have missed the mark with our mishap rate increasing from last year's rate of 0.81 up to this year's rate of 1.52.

When analyzing this year's mishaps and our operational trends, two factors are immediately evident. The first is that we flew fewer flight hours during this fiscal year with a 12 percent reduction in total number of hours flown. The Second factor is we reversed the trend of having more mishaps in combat than during training. In Fiscal Years 2010-13, 65 percent of the Class A mishaps occurred in combat. This year only 25 percent of the accidents occurred in combat, marking a significant shift in our operational environment and how leaders should evaluate their missions while operating at home station.

More importantly, pilots in command and air mission commanders must maintain their mission focus while in garrison with the same level of intensity as if they were still operating in the complex combat environment found in Operation Enduring Freedom. A sizable percentage of the mishaps that occurred during this fiscal year can be attributed to just plain not paying attention: two incidents with UH60s ground taxiing into stationary objects, two occasions of pilots in command becoming task saturated during training and drifting into trees, one incident of an instructor pilot not managing the workload in the cockpit properly and allowing the aircraft to drift into an unsuitable landing profile and one occasion of a mid-air collision resulting from poor airspace integration.

Human error contributed to 81 percent (13 of the 16 Class A) mishaps. If we are to meet the CSA's goal of a Class A mishap rate of less than 1.0 mishaps per 100K flight hours we, as a group of aviation professionals, need to work as a collective team to meet this threshold. We already have the tools on-hand to accomplish this feat: Engaged leadership to mitigate risks to the lowest level with good control measures enacted, crew selection that matches the correct levels of experience to the hazards present in the operation, good mission briefs to prepare us for execution, effective aircrew coordination during the flight to balance crew workload and manage emerging risks and post-mission after-action reviews to learn and capture the lessons that occurred during the flight.

There is nothing new in this process. If we apply what we know and fly as we were trained, then meeting the CSA's goal for Army aviation mishap rates should be readily attainable.

LTC Mike Higginbotham, Aviation Director, Future Operations, US Army Combat Readiness Center
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Preliminary Report on FY14 Aircraft Accidents

In the **manned aircraft** category, Army aviation experienced 60 Class A-C aircraft accidents in FY14. This is a decrease from the 75 Class A-C aircraft accidents in FY13, including a decrease in fatalities from 8 to 6. There was an increase in Class A mishaps from a total of 9 last year to 16 in FY14.

	2014	2013
CLASS A	**16**	**9**
CLASS B	**7**	**8**
CLASS C	**37**	**58**
TOTAL	**60**	**75**
FATALITIES	**6**	**8**

CLASS A and B Summary: There were 23 Class A and B mishaps, 18 of which occurred at night. Nine of the 23 occurred in OEF. Human error was the cause factor in 15 (83%) of the 18 mishaps reporting a cause factor. Materiel failure or suspected materiel failure was contributing in 3 (17%) of the 18 mishaps. Five of the 23 Class A and B mishaps had unknown or not yet reported cause factors.

The flight category Class A mishap rate (RW+FW) for FY14 was 1.52 (Class A flight mishaps per 100,000 hours of flight time). For FY 13, the rate was 0.81.

Operational Assessment Concerns:

Human Error: Dust landings were contributing factors in two Class A, one Class B, and one Class C aircraft mishaps. There was one fatality associated with the dust events. Power management contributed to three Class A, two Class B, and two Class C incidents. Additional Class A mishaps included two UH-60 ground taxi mishaps, one AH-64D mid-air, one KA300 (C-12 type), and three main rotor blade strikes during a NVD flight.

Materiel Failures: Class A materiel failures included one tail rotor gearbox failure, one electrical fire in flight, and one flight control malfunction.

2014 Breakdown by aircraft type:

	Class A	Class B	Class C
H-60	4	1	11
AH-64	7	3	7
H-47	3	1	3
OH-58D	1	1	8
LUH-72	0	0	0
TH-67/OH-58	0	3	0
AH/MH-6	0	0	2
Mi-8/17	0	0	0
C-12/UC-35/C-26/C-37	1	1	3
EO-5C	0	0	0

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Synopsis of selected FY14 accidents (* denotes night mission)

Manned Class A

- H-47: On climb-out at 150' AGL all three cargo hooks reportedly released and jettisoned a M777 howitzer sling-load.

* AH-64D: Departing refuel, aircraft experienced rotor droop followed by loss of tail rotor effectiveness. Aircraft descended to ground impact, rolled, and came to rest on its left side. Crew was able to egress with minor injuries.

* AH-64D: Aircraft drifted into trees during night vision system training. Aircraft came to rest on its side.

* AH-64D: Aircraft was Chalk 2 in a flight of two conducting mission training when it descended into a wooded area and crashed. Crewmembers were extracted with treatable injuries.

* H-60M: While conducting night insertion, crew encountered brownout conditions and power limiting factors. During a go-around the aircraft struck a cell tower and crashed. One passenger sustained fatal injuries. Aircraft was destroyed.

- H-47: Aft main rotor system made contact with the fuselage during a roll-on landing. Class A damage reported.

* H-47: Aircraft main rotor system contacted terrain during a pinnacle landing and crashed into a ravine. One crewmember fatality.

- H-60A: Flight of two were ground taxiing to parking when the lead aircraft contacted a light pole with the main rotor. Flying debris damaged the trail UH-60 as well as other parked aircraft on the ramp. Class A damage reported.

* AH-64D: Crew of aircraft #1 was conducting air assault training with a sister ship when it collided with a separate AH-64 conducting a recon in the vicinity. Both aircraft crash landed and were heavily damaged. No significant injuries reported.

* H-60M: Aircraft was conducting training in the traffic pattern when the tail rotor gearbox failed and the aircraft crashed. One crewmember sustained fatal injuries.

* KA300: Aircraft was on final approach when suspected wake turbulence from a preceding heavy aircraft caused loss of control. Aircraft crashed with three fatalities.

* H-60L: Aircraft was being ground taxied to parking when it made contact with the wing of a parked private plane. Class A damage reported.

* OH-58D: Crew was en route to a training area when they experienced a low rotor RPM warning while in low-level flight. Aircraft descended into tree line. Crew was able to egress with minor injuries. Aircraft was destroyed in a post-crash fire.

* AH-64D: Aircraft crashed just after take-off from the airfield and came to rest on its left side. Class A damage reported with one crewmember receiving minor injuries.

* AH-64E: Crew was participating in night operations when they detected smoke odor in the cockpit. While conducting an emergency landing the crew experienced a loss of night vision systems. The aircraft experienced brownout on landing and rolled on its side. Crew was able to egress. Class A damage.

* AH-64D: Crew was conducting aircraft qualification training. During a slope landing the crew reported un-commanded cyclic inputs. Aircraft contacted the ground and sustained Class A damage.

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In the **unmanned aircraft systems**, there were 44 Class A–C incidents with 10 Class A, 15 Class B, and 19 Class C mishaps reported. The Class A mishaps included three Aerostat balloons, six MQ-1s, and one MQ-5B. The RQ-7Bs comprised 23 of the 34 Class B and C mishaps with cause factors relating to engine failures, landing problems, and lost link.

2014 Breakdown by aircraft type:

	Class A	Class B	Class C
MQ-1	6	0	3
MQ-5B	1	1	0
RQ-7B	0	12	11
RQ-20A	0	0	1
RQ-11	0	0	1
Aerostats	3	2	3
Total	10	15	19

Synopsis of selected accidents (FY14):

UAS Class A

- MQ-1C: Aircraft was returning to base when it impacted terrain following an un-commanded turn.
- MQ-1: OIL PRESSURE and ENGINE OUT indication occurred in flight. System was crash landed at an identified location and recovered as a total loss.
- MQ-1: UA impacted mountain terrain during climb-out. Total loss reported.
- MQ-1C: System crashed while on normal approach to land.
- MQ-1C: UA had uncommanded movement during taxi. The ground crew pull the GDT and LGDT circuit breakers but the vehicle continued forward until striking a hangar. Class A damage reported.
- MQ-5B: System had reached 250’ AGL following launch when it initiated an uncommanded descent and impacted the runway. Total loss reported.
- MQ-1C: Controller lost link with the system as it was descending to land on the runway. UA impacted the runway. Total loss reported.

Aerostat Class A

- PTDS: Aerostat descended to ground contact after loss of helium.
- PTDS: Tether snapped in high winds. Class A damage reported.
- PTDS: Winds snapped tether while aloft.

Other UAS mishaps

-RQ-7B: Crew received generator and ignition FAIL warnings during flight. Recovery chute was activated at 500’ AGL. UA recovered with damage. (Class B)

- RQ-7B: Crew experienced a flap servo failure during UAS flight training and the system exceeded its roll tolerance during recovery. UA descended to ground contact inverted and was recovered with damage. (Class B)
- RQ-20A: Crew lost link during flight. System reported as total loss with no recovery. (Class C)

New Challenges with Decisive Action rotations from a Safety Perspective

CW4 GILBERTO G. MARTINEZ JR
Aviation Safety Trainer
National Training Center (NTC)

The National Training Center (NTC) can be one of the most challenging and demanding training environments we face. While there, you will have the important task of training in a demanding environment and protecting yourself and the lives of your Soldiers. Your ability to safely accomplish your unit's training objectives will be met if you follow your home station safety precautions, enforce discipline within your unit and use common sense. In the Decisive Action (DA) fight, the challenges are significantly increased. Operations within a tactical assembly area (TAA) and associated "jumps" to new locations create added challenges across the board.

Force protection is a command responsibility. Observer controller/trainers (OC/T) at the NTC provide safety observations and on the spot safety corrections to assist the commander in managing unit risk; however, units at all echelons are required to integrate risk management into all phases of missions, operational planning, preparation, execution, and recovery operations.

Here are some of the new challenges from a safety perspective associated with DA rotations at the NTC:

Soldiers - There is a significant increase in the physical demand placed on Soldiers, especially those involved in tear down, set up, convoys, perimeter security etc. In recent years a high percentage of Soldiers have become accustomed to working and sleeping in an air conditioned environment. Soldiers who work on aircraft usually had some sort of clam shell or hangar where they conduct maintenance along with swamp coolers. The physical demands of operating in an environment where those Soldiers are exposed to the potential extreme weather conditions and harsh environment can take its toll. Surface temperatures in the Mojave Desert can reach 125 degrees Fahrenheit during summer months, winter temperatures can fall below freezing for periods lasting over 48 hours. Heavy rains can cause flash flooding in some areas and wind storms, which occur year-round may ground aircraft and down tents and antenna if not properly secured. Fatigue and complacency can set in much earlier in the DA fight. There is a significant increase in heat related injuries during the summer months.

Aircraft/Pilots - For the most part, Army aviation personnel have become accustomed to operations at improved landing areas. One of the big challenges they face in the DA fight is take-offs and landings at unimproved landing areas. The most demanding of these are under night vision goggle conditions with at-or-near zero illumination in areas of low contrasts. Add to that a (potential) low-time newly assigned pilot in command with a low-time pilot, a crew unfamiliar with the landing area and procedures, inadequate markings of the landing area, uneven/sloping terrain, heavy sand and dust, obstacles within the landing area such as tents and generators and the risk goes up. It is imperative that aviation units conduct proper risk mitigation while operating in a DA environment. This will greatly increase their chances of completing a safe and successful rotation at the NTC.

Parking Plan- Consider rotor wash and how it will affect personnel, equipment and tents. Ensure adequate distance between aircraft. Landing in potential brown out conditions is a high probability on a regular basis due to operations within a TAA and "jumping" to new locations. The appropriate marking of parking pads will significantly reduce the chances of an accident/incident in your

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aircraft parking area and at forward arming and refueling points. Consider the risk associated with landing in the worst conditions. These conditions, if not mitigated, can lead to unfortunate significant events. Identify and mitigate the risk as much as possible in order to minimize your chances of having an accident or incident.

Selection and set up of the TAA - Ensuring adequate distance between aircraft parking areas, tents and equipment, while still taking security into account, can be difficult. Once established, it is important to mark aircraft parking pads in order to minimize risk and avoid confusion when landing. Vehicle movement through an aircraft landing/parking area has been an issue in the DA fight at times. It is important to ensure all personnel are aware of areas to avoid while maneuvering a vehicle within the TAA, especially at night. Every TAA location set up will not be the same and control measures must be taken to ensure Soldiers know which areas may be hazardous and to which areas to avoid if necessary.

General Flight Procedures - Procedures in and out of the FARP, parking areas and TAAs, along with challenging mission profiles, make operations more difficult while operating at the NTC. Other hazards include movement to a new TAA where crews are unfamiliar with the area. Procedures in and out of these areas must be published and briefed to all crews to minimize confusion and chances of mishaps/mid-airs.

ATC - Air traffic control personnel have their challenges with the tear down and setup of communications equipment. The reliability of adequate communications with the control tower can be intermittent and create a potential hazardous situation. In addition to getting clearance from tower, pilots must clear themselves visually. Pilots must also be prepared to utilize ATC briefed frequencies as a common air traffic frequency in order to de-conflict with other aircraft. Addressing any communications issues early will greatly decrease the chances of a mishap within the area of towers controls.

Severe Weather - Due to the potential of extreme weather conditions of NTC there is a good chance the rotational unit will execute their 'Severe Weather Plan.' The use of a hangar may not be as easy as it was on previous rotations. The proper coordination and utilization of vehicles to protect aircraft, tents, and personnel is key while in operating in a TAA.

Hazards Associated with Vehicle Operations - With the increase in the number of convoys and amount of equipment moving to occupy new TAAs, there has been a rise in vehicle related accidents. In addition to more convoys, Soldiers may have little to no experience with driving under NVG conditions. This has also caused a rise in vehicle related accidents. Enforce proper licensing; rollover drills, discipline and the use of ground guides when appropriate will significantly reduce accidents.

Living/Sleeping Areas - With increased traffic, the risk of potential injury or death obviously goes up if not mitigated. Whenever possible, Soldiers will sleep in the approved established sleep tents. The establishment of safe sleeping areas will be in accordance with the unit's SOP. At a minimum, sleep areas, which are established without tents or tents smaller than a GP medium, will be marked with white engineer tape that is hip high and approximately 20-feet from sleep area, with chem-sticks at night.

UXO - Since new ground is being occupied on a regular basis with the DA fight, unexploded ordnance is found almost at every new TAA. While many portions of the reservation have been surfaced-cleared of live and unexploded munitions, both live and dud munitions continue to be

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found. Mark the area without disturbing the UXO, report it through your chain of command to ensure Soldiers are aware of the location of the UXO and remain clear. Assist explosive ordnance disposal (EOD) personnel when they arrive and point out the location of the UXO.

CBRN - Soldiers are unfamiliar with operating in a chemical, biological, radiological, and nuclear environment may not be familiar with proper use of protective masks. Since all personnel are required to wear protective masks during CBRN attacks, the safety issues become obvious.

Lost in the Desert - It is deceptively easy to become lost at the NTC. With increased movement, the risk is elevated that a Soldier(s) can become lost. Report all Soldiers lost in the desert to an OC/T immediately. Using the buddy system when manning TCPs can also reduce the chances of a Soldier being lost during an attack, especially at night. The buddy system is mandatory during dismounted operations.

Fatigue/complacency - With the increased physical demanding conditions of a DA fight, it is imperative that fighter management is enforced and tracked. This can be an effective tool to use to identify individuals, crews and teams who may be at a higher risk due to fatigue. Work/rest cycles can greatly reduce risk of heat related injuries as well.

UAS - It is important that unmanned aerial systems units are familiar with the engineer assets and support which may be required to make improvements/repairs to take-off and landing areas. Prior coordination is the key. Severe weather conditions at NTC such as heavy rains and flash flooding have been the primary cause of damage to these areas during training events. Vehicles transitioning across the runway surface have also caused damage to the extent that repairs were needed and flight operations were halted.

Command Challenges - Keeping up with the pace of a DA fight for command means there is a need to simultaneously focus on wide area security while either planning for or conducting decisive actions operations as a maneuver element.

Focusing on these guidelines will assist your unit in achieving a successful and safe rotation into the National Training, Center, which can be one of the most challenging and demanding environments we face.

CW4 Martinez is an Aviation Safety Trainer assigned to the NTC. He can be contacted at (760) 380-2808 or email gilberto.g.martinez2.mil@mail.mil

Manned Aircraft Class A – C Mishap Table as of 21 Oct 14

	Month	FY 14 Class A Mishaps	FY 14 Class B Mishaps	FY 14 Class C Mishaps	FY 14 Fatalities		FY 15 Class A Mishaps	FY 15 Class B Mishaps	FY 15 Class C Mishaps	FY 15 Fatalities
1st Qtr	October	0	0	2	0		0	1	1	0
	November	3	0	5	0					
	December	1	0	3	0					
2nd Qtr	January	3	1	4	4					
	February	1	0	3	0					
	March	0	3	0	0					
3rd Qtr	April	1	1	5	0					
	May	3	1	2	2					
	June	2	0	6	0					
4th Qtr	July	2	0	5	0					
	August	0	0	0	0					
	September		1	2						
	Total for Year	16	7	37	6	Year to Date	0	1	1	0

Class A Flight Accident rate per 100,000 Flight Hours

5 Yr Avg: 1.33	3 Yr Avg: 1.28	FY 14: 1.52	Current FY: 0

Logging Pilot in Command

Chief Warrant Officer 5 Louis Papesca
Directorate of Evaluation and Standardization
U.S. Army Aviation Center of Excellence
Fort Rucker, Ala
Scout Branch Chief

During Directorate of Evaluation and Standardization (DES) unit assessment visits conducted over the last several years, inspectors have seen how aviators have confused -12 entries with authorized flight duties in their flight records when logging Pilot in Command. IAW AR 95-1, "An entry will be made on DA form 2408-12 for each flight in aircraft and flight simulators by all crewmembers indicating duties performed, mission, and flight condition." Use the additional pilot in command symbols in AR 95-1 when logging flight time and the mission brief sheet must clearly indicate which aviator is the pilot in command.

The additional symbols that may be used to indicate pilot in command are MP, ME, XP, UT, IP, SP, or IE when occupying a flight crew station with access to the flight controls. The recurring question is "Can multiple crewmembers with access to the flight controls simultaneously log any of the PC symbols?" The answer would be NO, except in a few instances that we will discuss.

When using the symbols MP or ME, simultaneous logging on the -12 may be utilized for both aviators on test flights. If using the symbol XP, the symbol may be used by both aviators on experimental test flights when assigned to a designated testing organization or activity. If any of these symbols are mixed or duplicated, the mission brief sheet must clearly state which aviator is the pilot in command. These are the only symbols that are authorized for both aviators performing duties with access to the flight controls.

The confusing circumstance occurs during formal evaluations. When two aviators have access to the flight controls, and both are SPs or IPs, only one can be briefed as the overall pilot in command of the aircraft. For example, when a SP evaluates an IP during an annual evaluation, the SP logs SP and the IP being evaluated will log PI on the -12 at the conclusion of the flight. Then, when updating the records and since the SP is evaluating the IP performing IP duties during the evaluation, the SP will record the event on the DA Form 7122 with the appropriate duty title for the IP.

Aviators should not confuse the duties they are authorized on their DA Form7120-R, with the duty symbols on the DA form 2408-12. Your duty description or title does not automatically allow you to log that symbol on the -12. You are only authorized to log what is briefed on the approved DA Form 5484-R for that flight. As an example, an SP only logs SP on the -12 during the time frame they are conducting training or evaluating another SP or IP. If an SP/IP is briefed to conduct emergency procedure training with a PC/PI in conjunction with a mission, they would log SP/IP time during the time period of the emergency training and PC during the mission block.

On many occasions commanders direct their standardization pilots to perform instructor/evaluator duties from the cabin so the aircraft and the mission ends up with more than one person logging SP or IE on the same flight. These are common cases where a SP or IE is at one set of the flight controls instructing/evaluating an IP, while another SP or IE is in the rear evaluating the front seat SP/IE or training/evaluating a non-rated crewmember in the cabin. In both cases the flight can end up with more than one individual logging IP/SP/IE on the same flight, however only the SP/IE at the flight controls can perform duties as pilot in command.

--CW5 Louis Papesca, SCOUT /ATTACK Branch Chief, may be contacted at (334) 255-9825, DSN 558.

Accident findings: From the archives for your review

FINDING 1 (Present and Contributing: Human Error- Individual Failure): While conducting a maximum gross weight takeoff, the crew failed to select the correct maximum gross weight takeoff procedure. The crew performed a level acceleration takeoff attempting to use IGE power but needed to use a vertical takeoff with at least OGE power. As a result, the crew departed with a tail wind. This caused them to use more power than necessary for an OGE takeoff and resulted in rotor droop and an engulfing dust cloud that caused the crew to lose all visual references as the dust cloud was moving with the aircraft to the west/northwest.

FINDING 2 (Present and Contributing: Human Error- Individual Failure): While conducting maximum gross weight takeoff, the PC failed to properly identify and brief maximum torque available, monitor torque and maintain positive aircraft control. As a result, the PI was unaware of maximum torque available and pulled seven percent more torque than available, causing the rotor system to droop. The aircraft descended into a dust cloud and all crewmembers lost visual references.

FINDING 3 (Present but Not Contributing): While conducting a maximum gross weight takeoff, the crew failed to respond to an in flight emergency procedure. Both crewmembers were on the controls after the PC noticed they were drooping the rotor resulting in confusion regarding pilot on the control duties and pilot not on the control duties. When the PC engaged the cyclic mounted stabilator slew up switch, the stabilator audio sounded which prevented the low rotor audio from being heard. Neither of the crew reset the master caution which would have allowed a low rotor audio to be heard and to know when rotor was regained. The board determined this was a factor in regaining aircraft control, as the lack of audio would have re-enforced correct pilot action.

FINDING 4 (Present and Contributing: Human Error- Individual/Leader Failure): While conducting a maximum gross weight takeoff the entire crew was in violation of fighter management policy. Six out of nine crewmembers interviewed believed fighter management was regulated by hours worked and flown within a set period. The requirement to have a day off every 14 days regardless of hours worked was completely unknown. All crewmembers on the aircraft had worked a minimum of 24 days consecutively; the next lowest number was 44 days in a row. The FI on board said it (14 days followed by one off) was impossible to do, the pilot who was attached was knowingly in violation, and the company commander, were the only ones who even identified the 14 day requirement. As a result, the crew failed to make accurate and timely decisions, conduct proper crew coordination, and maintain aircraft control. Whether the crew admitted to being tired or not, they were in clear violation of the policy set forth in the APG dated 10 June 2007 with change 1.

FINDING 5 (Present but Not Contributing): While conducting a maximum gross weight takeoff, the aircraft was engulfed in a dust cloud. As a result of rotor wash and a tailwind the aircraft entered a dust cloud causing the entire crew to lose visual references and situational awareness. As neither of the pilots was familiar with cockpit indicators for wind, they incorrectly chose a takeoff with tailwinds. This contributed to why they descended into the cloud because of the torque required to overcome the wind with close to maximum gross weight.

FINDING 6 (Present but Not Contributing): While preparing for Day Mission Ready (DMR), the crew failed to conduct a proper crew brief. As a result crew duties, responsibilities, performance planning, weather, and risk assessment considerations were unclear.

Class A – C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 1 Oct 14
	Month	FY 13					FY 14			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	0	7	0		0	0	2	0
	November	0	1	5	0		3	0	5	0
	December	2	1	0	0		1	0	3	0
2nd Qtr	January	0	0	6	0		3	1	4	4
	February	0	0	2	0		1	0	3	0
	March	2	2	5	6		0	3	0	0
3rd Qtr	April	1	1	6	2		1	1	5	0
	May	0	0	6	0		3	1	2	2
	June	1	1	4	0		2	0	6	0
4th Qtr	July	1	0	5	0		2	0	5	0
	August	1	1	9	0		0	0	0	0
	September	0	1	3	0			1	2	
	Total for Year	9	8	58	8	Year to Date	16	7	37	6
	Class A Flight Accident rate per 100,000 Flight Hours									
	5 Yr Avg: 1.33		3 Yr Avg: 1.28			FY 13: 0.81			FY 14: 1.52	

UAS Class A – C Mishap Table									as of 1 Oct 14
	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	5	1	0	6	W/GE	6		4	10
MQ-5	2	0	3	5	Hunter	1	1		2
RQ-7	0	4	10	14	Shadow		13	11	24
RQ-11					Raven			1	1
RQ-20	0	0	6	6	Puma			1	1
YMQ-18									
SUAV					SUAV				
UAS	7	5	19	31	UAS	7	14	17	38
Aerostat	2	3	1	6	Aerostat	3	2	3	8
Total for Year	9	8	20	37	Year to Date	10	16	20	46

Example of engaged leadership

Ask twenty people what engaged leadership means and you'll get twenty varying answers as to what their definition entails. Everyone knows what it is but the many nuances make it hard-pressed to stick an all encompassing definition to it. Kind of a "I know it when I see it" thing. Even before they brought the buzz words into play I observed a commander demonstrate it dead-on in a combination of a couple of events.

More years ago than I care to count, I signed into my first Black Hawk unit as a senior CW2 fresh out of the AQC. Although they called it a combat support aviation company, it was a standard assault helicopter company, recently organized under a J series MTO&E with a captain as a commander. It was still a large company along the lines of a H series unit with the associated maintenance platoon.

Stopping at the orderly room to begin my in-processing, I was greeted by the company first sergeant who immediately told me to stand-by while he checked with the commander on his availability to see me. After a few moments the commander emerged with a friendly greeting and an invite into his office. Over the course of the next few minutes we conversed on our experience levels, unit mission, new aircraft and personal info. He closed with the normal welcome aboard – glad to have you and extended an invite to join the pilot's meeting that was going to start in a couple minutes. As an opportunity to meet the folks in the unit, I accepted and was directed across the hall to the training room where the pilots were beginning to assemble.

In the exchange of introductions and small talk I learned the meeting was called to address an incident that had occurred the day prior. Apparently one of the aircraft had been training in a confined area and incurred a blade strike. Upon return to the airfield, the damaged tip caps were whistling up a tune as it taxied to parking. I had some thoughts but didn't express them. Prior to the arrival of the commander, the company SP (a senior CW4) addressed the room discussing the blade strike (he was one of the crew) - what they were doing and how, based on his extensive experience, and after evaluating the circumstances – no vibrations, type of tree, flying qualities, maybe even a Vietnam story etc., he made the decision to fly the short 10 minutes back to the airfield where proper inspections and maintenance could be performed. It all sounded very good but as I said I had my own thoughts.

In walked the commander. He was mid-grade with a good experience base as an aviator and 1,500 hours of blade time. His demeanor was calm and to the point explaining that, in the course of realistic training, he could accept incidents such as the blade strike that had occurred. However, what he would not accept is not performing a precautionary landing to check out the extent of damage that may have been incurred. "Rich (referring to the SP), your IP orders are pulled for 30 days," after which the commander released the group and departed the room. No gray area on where he stood with the issue. I didn't truly appreciate the decisiveness of the commander's comments until being absorbed into the unit and subsequently learning the overbearing nature of the standards officer and his interaction with the aircrews.

My first mission, following my day and night stan rides, was scheduled with the commander. It encompassed a day out night return doing some paradrops, LZ hopping, instrument approaches, etc. During the conduct of the mission it became apparent that he was conducting his own "commander's eval" on me. Testing my knowledge, flight skills, situational awareness, and other things over the course of a couple bags of gas. I was comfortable in what he was doing and how he was doing it. From my perspective it didn't hurt that he was a good stick himself. Later, I found out, he flew with all the new personnel as quickly as possible. It assisted him in monitoring crew selections and knowing his pilots and their capabilities. Risk management before they called it risk management.

Engaged leadership - I know it when I see it. That he went on to become a general officer was no surprise to me. **Jon Dickinson, Aviation Directorate**

"It's an ill wind. . . . 9 Jul 86 *Flightfax*

If you think wind is something only fixed-wing aviators need worry about, you obviously aren't one of the helicopter pilots who has experienced firsthand what wind can do to a rotary-wing aircraft. We aren't even talking about the kind of winds found in extreme weather, such as thunderstorms. We're talking about your everyday variety that can occur just about anywhere, at any time.

Of course in places where winds almost always prevail, caution is even more important. A helicopter was making an approach to a ridgeline to the northeast. About 10 feet from touchdown, the nose tucked and spun to the right. The pilot applied full left pedal, with no effect. He allowed the aircraft to continue forward and added additional forward cyclic. As the aircraft continued to spin right, both the low rpm audio and warning light came on. The aircraft spun around twice and the tail rotor hit the opposite slope. The aircraft crashed and rolled down the slope. A wind gust from the southerly quadrant caught the aircraft in a downwind condition during high power demand, on a day when pressure altitude was relatively high. The pilot's corrective actions- left pedal, forward cyclic-were too little, too late, or both. If it's been a while since you read FM 1-202: Environmental Flight, a quick review of some basic principles might be in order. In chapter 4, the manual says:

Determination of En Route Winds

Every effort should be made to determine the wind condition both before takeoff and while en route. Weather forecasters can provide general information, but accurate information for the specific area of concern is not available through this source. Where ground communications exist with units in the area of operations, contact should be made to ascertain the existing wind conditions. Aviators who have recently flown in the area can provide a valuable source of information concerning wind conditions. However, sources of wind information are not always available. Therefore, you must learn to use certain visual cues when estimating wind direction and velocity. The cues are divided into two categories.

Ground indicators

When using ground indicators to determine the wind condition, remember that surface winds are being indicated for that specific location. The wind characteristics a short distance away may be different.

• The upwind part of a small body of water is indicated by smoothness. It may be wavy or turbulent on the downwind side. Wind velocity is indicated by the turbulence of the water. A whitecap will occur on an unprotected body of water when the wind velocity reaches 20 miles per hour.

• Smoke provides the most accurate indication of wind direction. Wind velocity is indicated by the pattern the smoke forms on the ground. In light wind, smoke will rise vertically with little horizontal movement. In strong wind, the smoke will disperse horizontally with little vertical movement.

• A flag or any material that is free to blow in a breeze will indicate both wind direction and velocity. The angle a flag forms with the ground indicates wind velocity.

Continued on next page

• The color of the leaves on deciduous trees provides an indication of wind direction. If the leaves appear light in color (silver), you are flying downwind. If you are flying into the wind, the leaves will appear darker in color.

• Wind blowing over tall grass growing in open fields appears like waves on an ocean. Wind direction is indicated by the movement of the swells. The more frequent the swells, the greater the wind velocity.

• Man-made indicators, such as wind sock tetrahedron, or smoke, grenades, provide the most accurate information concerning wind direction and velocity. A wind sock should be installed at landing zones where repeated operations are conducted.

Aircraft indicators

As you become more proficient in mountain flying, you will develop the ability to determine wind conditions by the feel of the helicopter and its apparent movement over the ground. Aircraft indicators that you can use to determine the wind direction and velocity are as follows:

• Aircraft drifts from the desired ground track. This condition indicates a crosswind condition. The amount and direction of the crab required to maintain the desired ground track gives an indication of wind direction and velocity.

• The apparent ground speed appears to be either faster or slower than the indicated airspeed. This condition indicates the aircraft is being flown parallel to the wind. We aren't implying that if you are aware of these indicators you will always be able to avoid problems with wind gusts such as the one in the accident described, but you will certainly know more about what wind conditions you are likely to encounter rand be able to plan what to do to minimize their effects on your aircraft.

In another Incident, three Army helicopters were engaged in fighting a forest fire. One aircraft was diverted to another fire. After making a reconnaissance of the fire, the aircraft flew northeast to pick up water from a pond. As the aircraft descended, its rate of descent became excessive. The co-pilot, who was on the controls, pulled collective to stop the rate of descent. He said later that he hit the left pedal stop. As the pilot got on the controls, he saw the torque meter gauge going back down through 65 pounds of torque. The pilot reduced collective, flew to the nearest available landing area, and landed. The pilots said It "felt like the bottom fell out" during the descent. The aviators said winds appeared to be from the northeast (judging by smoke and ripples on the water). A flight service station reported that winds at that time of day were 230 degrees at 11 knots. It appears the aircraft may have been in a downwind condition and the copilot allowed an excessive sink rate to develop, going below barriers.

Early aircraft designers were careful observers of the original pioneers in flight-birds. Birds don't take off and land downwind and neither do prudent aviators. If a bird is flying with the wind, it will overfly the landing point, circle, and land into the wind. We've learned a lot since man first took to the skies but some things don't change. Know what to look for and how to identify wind conditions - and fly according to those conditions.

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Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in September 2014.

Utility helicopters

UH-60A

-Crew experienced a #2 engine TGT spike (975 degree C) following start. (Class C)

-The 'A' axis drive cover separated at a hover during a MTF resulting in leakage and loss of oil pressure. Crew conducted emergency landing. (Class C)

Fixed Wing Aircraft

UC-35A

-Aircraft experienced rapid decompression of the cabin during climb-out after the clam shell door released and partially opened. Crew conducted emergency landing and egress. (Class B)

Unmanned Aircraft Systems

RQ-7B

-Crew experienced an engine failure as system was in return/land mode and crashed short of the airbase. UA and payload were recovered with damage. (Class B)

-Crew lost link with the UA while it was in the return to base flight phase. Crew was unable to regain link and the UA was lost. (Class B)

MQ-1C

UA was returning to base due to degraded flight control assembly. While flying in autonomous mode, the aircraft made an uncommanded turn and impacted terrain. (Class A)

http://www.nasa.gov/larc/helicopter-drop-test-a-smashing-success/

"Be polite, be professional, but have a plan to kill everybody you meet."
~ Gen. James Mattis, USMC

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If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness Center at com (334) 255-3530, DSN 558-3530

U.S. ARMY COMBAT READINESS CENTER

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Online newsletter of Army aircraft mishap prevention information

Ten tactics

for better aviation operations

In-depth surveys of selected units, interviews with commanders and safety officers, and information from the Army Safety Management Information System show that units with successful safety programs share ten positive common denominators:

1. Direct command involvement and supervision of all flight operations.

2. Training tailored to specific mission requirements with aviation safety officer participation in planning phases.

3. Detailed briefing of every mission by the chain of command to ensure mission requirements and limitations are understood by all crewmembers.

4. Risk management practiced by everyone in the organization.

5. All risk factors identified and understood so good risk management decisions can be made.

6. Risk management decisions made at the proper level - the greater the risk, the higher the decision level.

7. Breaches of flight discipline not accepted by anyone in the organization.

8. High risk aviation personnel identified and eliminated.

9. Experienced aviators paired with the inexperienced.

10. Command attendance and participation in safety meetings that produce countermeasures.

These ten tactics pay big dividends by allowing high performance units to train smart and safe, achieving better mission results. (*Flightfax* 10 Apr 85)

The 11th Tactic for Better Aviation Operations: Leader Development

Thoughts from an Aviation Task Force Commander

Flightfax published the "Ten tactics for better aviation operations" in 1985 resulting from a series of surveys conducted with operational units, interviews with commanders and safety officers, and from a review of the accident cases in USACRC's mishap database. The striking fact is these ten tactics could have been written in 2014 instead of almost 30 years ago and would still apply directly to how we manage risk in aviation. However, there is one improvement to this list that needs to be made which is to "implement an aviation leader development program."

Our training doctrine (ADP 7.0) states that commanders are responsible for ensuring their units are capable of performing their missions, and that commanders are directly responsible, and accountable, for all aspects of unit training. As aviation units execute their collective training tasks to become proficient in their METL, the normal routine is the company commanders receive their missions, conduct an assessment to determine levels of risk, and then assign aircrews with the requisite experience to execute the training. The challenge in selecting the right aviators to perform the flight is that while the Commander's Guide (TC 3.04-11) states that a PC should be proficient in all tasks, the reality is that each aviator has a different level of flight skill, situational awareness, technical knowledge, and tactical proficiency. A common metric of aviator experience is total flight time and most units have developed a series of thresholds based on this flight time to measure ability. Below 500 flight hours is a "red aviator" restricted to only the lowest risk missions, between 500 and 1000 hours is an "amber aviator," and above 1000 hours is the "green aviator" which is assigned to the most complex and demanding missions. Since Soldiers do what leaders measure, there is the predictable push by pilots to fly enough flight hours to advance to the next higher category, often without regards to the quality of flight experience that they gain in the process.

So, the leader development opportunity we are missing by using predetermined flight hour thresholds is that total flight time doesn't allow for command discretion and has no quantifiable bearing on a pilot in command's maturity, judgment, and tactical proficiency. In the above scenario, a pilot with 990 hours would be restricted to the moderate complexity missions, and magically ten flight hours later, would be authorized to fly on the most difficult and dangerous missions. The amount of experienced gained in those ten flight hours is negligible and probably doesn't warrant this significant jump in mission proficiency.

Wouldn't it be better if the commander had a system that linked the objective metrics (total flight hours, NVG hours, METL task repetitions) with some of an aviator's subjective qualities (maturity, judgment, decision making, stress management, METL task proficiency), and then matched these qualities to the mission that the unit is assigned to perform? This type of system has been commonly referred to as "aircrew tiering" and was used by 25CAB and subsequent brigades to great success in OEF.

Incorporating subjective criteria for the assessment of aircrew members helps commanders select the best aircrews for each mission, instead of just selecting pilots that have met the flight hour thresholds. More importantly, it forms the basis for an incredibly effective aviation leader development and counseling program that can clearly show each aviator how to improve. The first step in this type of development program is for the commander to develop his/her subjective and

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objective criteria, conduct a leader assessment of their Soldiers, and then counsel each aircrew member on their initial levels. The second step is the selective assignment of aircrews to aviation missions targeted to increase their mission proficiency or the pairing of a pilot with a senior aviator to work on specific qualities (decision making in flight, air sense, maturity, etc). As part of the post-mission AAR, the senior pilots should provide feedback on the specifics of the flight along with reports back to the command on how the aviator is progressing. Lastly, the commander reviews each aircrew member's development and makes the decision to advance them to the next higher proficiency category or keep them at the same level. At each review, the aircrew members should receive feedback on their "tier level" and what is needed for them to progress. Almost exactly the process envisioned in ADP 7.0 where aircrew members "learn to adapt to new situations and develop on the job through training and education. More significantly, they develop through challenging, unfamiliar experiences that require them to adapt theory to reality. They learn through regular and as-needed feedback."

Leader development is fundamental to improving aviation operations. Whether through this example of a subjective assessment system, or by other methods, we owe constant and relevant feedback and developmental opportunities to our aircrew members. Let's make this the 11th tactic and watch the improvements!

Until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
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US Army Combat Readiness Center
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UAS Class A – C Mishap Table									as of 25 Nov 14
	FY 13					FY 14			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	6		4	10	W/GE				
MQ-5	1	1		2	Hunter			`1	1
RQ-7		13	11	24	Shadow		1		1
RQ-11			1	1	Raven				
RQ-20			1	1	Puma				
YMQ-18									
SUAV					SUAV				
Aerostat	3	2	3	8	Aerostat				
Total for Year	10	16	20	46	Year to Date	0	1	1	2

Chinook Safety Performance Review

In the five-year period FY10 – FY14 (493,000+ flight hours), the CH-47 series aircraft had 90 Class A - C mishaps recorded. There were 17 Class A, 11 Class B, and 62 Class C with a cost of $266 million in damage and injuries; there was 1 fatality. The Class A flight mishap rate per 100,000 hours was 3.04. Review of the Class A mishaps shows that human error was the primary cause factor in 14 (82%) of the incidents, materiel failure accounted for 1 (6%) with 2 (12%) unknown or not yet reported with a cause factor. Two of the mishaps were flight related (loss of external load). Highlights from some of the more frequent types of mishaps:

Engine failure/malfunction

Engine failure or malfunction played a role in one Class A.

Scenario *Engine failure*

Aircraft experienced #2 engine failure during approach to land. The #1 engine did not have sufficient power to maintain the aircraft's altitude at their slow airspeed and was forced to land short of the LZ, impacting on a stone wall. Four passengers received minor injuries and the aircraft was severely damaged. The failure was caused by improper measurements and clearance checks to verify that the 4th stage rotor was seated on the 3rd stage shaft during a hot end inspection of the engine that were performed by unit maintenance.

Degraded Visual Environment

Seven of the 15 Class A flight mishaps were associated with DVE.

Scenario 1 *Blade strike*

Chalk 2 trail aircraft contacted the VSP tower on the crew's 3rd landing attempt in dust conditions. The forward main rotor blades struck the mounted MK19 40mm launcher system resulting in ignition of some of the cartridges. Aircraft and VSP tower sustained explosion damage.

Scenario 2 *Dust landing*

While conducting an approach during an EXFIL mission under night vision goggles, the pilot lost visual references. The aircraft drifted aft, followed by a left drift and roll. The fore and aft rotor discs struck the ground simultaneously. The aircraft came to rest on its left side. The aircraft sustained extensive damage and the crew received minor injuries.

Scenario 3 *Dynamic rollover*

During an approach, the pilot on the flight controls was unable to maintain visual reference with the intended termination point. Prior to touchdown, the pilot induced a right drift. The landing gear made contact with the ground creating a pivot point. The right drift created a rolling motion and the aircraft exceeded the critical angle resulting in dynamic rollover. The aircraft was destroyed and there were minor injuries.

Scenario 4 *Blade strike*

During the conduct of a night vision goggle approach in low illumination conditions, the pilot allowed the aircraft to descend below his planned altitude approximately .5 nautical miles short of the intended landing zone. The aircraft’s forward rotor blades struck a sand dune. The aircraft spun counter-clockwise, striking the aft cabin area into the sand dune and coming to rest on its right side. Seven crew members and passengers were injured and the aircraft was significantly damaged.

Scenario 5 *Hard landing*

While conducting a night extraction of ground troops using night vision goggles, the pilot on the controls did not maintain proper control of the aircraft during an approach in a dusty environment,

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causing a hard landing. During the approach the rate of descent and ground speed became excessive and the aircraft impacted the ground at an estimated 400-800 feet per minute rate of descent and 22-26 knots ground speed into hard packed, up sloping, and terraced terrain. After impact, the aircraft continued to roll approximately 50 feet causing damage to the aft landing gear, aft cabin section and aft pylon section.

Scenario 6 *Dust landing*
While flying a night vision goggle approach to an unimproved landing area, the aircrew lost visual reference with the ground as a result of heavy dust conditions. The aircrew, attempting an OGE dust landing utilizing symbology, descended and bounced off the ground. The resultant ground contact of the aircraft landing gear caused the position hold function to disengage, thereby turning off all velocity stabilization modes. The pilot, at this time, applied right cyclic which caused the aircraft to slide right approximately 50 feet in 3 seconds into a ditch. The aircraft rolled right causing the blades to contact obstacles. While adding power to attempt a takeoff, the aircraft proceeded to roll over onto its upper right side. The aircraft was extensively damaged and the aircrew received minor injuries.

Scenario 7 *Ditch*
While performing a night vision goggle approach to an unimproved HLZ with dust conditions, the aircraft contacted the ground with approximately 15-20 knots ground speed, allowing the aircraft to roll after touchdown. Aircraft rolled forward dropping off of a level area into a four foot dry wadi. The right main landing gear sustained damage and the forward rotor system came into contact with the ground damaging all three forward rotor blades.

Blade Strikes

Six blade strikes not associated with DVE were reported.

Scenario 1 *Fuselage strike*
Aft Main Rotor System made contact with the fuselage during RL-progression roll-on training.

Scenario 2 *Terrain strike*
Crew was conducting a pinnacle landing in conjunction with high altitude environmental training when the rotor system contacted the mountainside. The aircraft descended into a ravine and crashed. One crewmember was fatally injured. Three crewmembers were able to egress with injuries. The aircraft was destroyed in a post-crash fire.

Scenario 3 *Terrain strike*
While conducting a hasty air assault utilizing night vision goggles, the pilot on the controls over controlled the aircraft during an up-slope landing in the vicinity of the landing zone. The pilot unintentionally activated the Common Missile Warning System (CMWS), causing numerous flares to deploy. The pilot reacted by displacing the cyclic control forward, driving the forward rotor disk into the ground. The rotor system became unbalanced and desynchronized, causing significant aircraft damage and four minor injuries.

Scenario 4 *Tree strike*
While conducting a NVG approach to an unimproved landing area at an elevation of 9814' msl, the blades of the aft rotor system contacted a tree during landing. The tree strike caused the tip caps and counter weights of at least one blade to break free, causing an imbalance that shook the aft pylon, causing either the #8 or #9 drive shaft to fail at the combining gear box which caused the

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blades to desynchronize, allowing the fore and aft blades to come in contact with each other. The resulting blade contact caused the aft pylon to shear away coming to rest along the right side of the aircraft after impacting the ground. After impact, small fires were scattered among the debris. The aircraft was destroyed and there were 8 personnel injured.

Scenario 5 *Air-to-air blade strike*
While conducting initial NVG helicopter aerial refueling training, while at 2500' AGL and 115 knots indicated airspeed, the aircraft initiated a movement to contact. The movement resulted in a miss in which the drogue became snagged on the probe tip. As the aircraft continued forward a main rotor blade contacted and severed the refuel hose and caused the drogue to be propelled up and into the rotor system resulting in main rotor blade damage. The aircraft landed as soon as possible to a rain-soaked field and executed a roll-on landing. The aircraft landing gear sank into the soft ground as the aircraft continued its ground run for 75 feet before the aft right landing gear sheared. The aircraft turned right approximately 15 degrees and continued the ground run for another 75 feet before coming to rest. The deceleration of the landing as the aircraft came to rest induced rotor blade flexing and main rotor blades contacted the ground and fuselage causing catastrophic damage to the aircraft.

Scenario 6 *Terrain strike*
While attempting a two wheel landing on a small pinnacle emerging from a steep rocky surface at approximately 13,000 feet, the aircraft contacted its aft rotor system with the steep, rocky surface removing an estimated 1-2 feet of the aft rotor system causing serious vibration in the cabin and pitching the aircraft nose downward. The damaged rotors maintained their integrity even with the loss of outer lift surface allowing continued controlled flight. The crew initiated an approach to an emergency landing area where ground contact with a large rock short of the landing area caused additional extensive aft rotor and fuselage damage.

Hard landing

Scenario
While conducting a hasty air assault at night in low illumination conditions, the crew began an approach to a pick-up zone to exfil ground troops. The pilot on the flight controls maneuvered the aircraft into an unperceived out of ground effect hover condition at a low torque setting with an excessive upward pitch attitude. The aircraft descended rapidly and impacted aft first with a significant right roll. The impact caused minor injuries to the crew and separated the aft pylon from the aircraft.

External loads

Scenario 1
Crew was on climb-out, at approx. 150 Feet AGL, at approx. 40KTS IAS, when all 3 cargo hooks reportedly released and jettisoned the M777 Towed Howitzer sling load. Aircraft was returned to the airfield and shut down w/o further incident. M777 deemed a total loss.

Scenario 2
While conducting sling load operations, the sling load separated from the aircraft and impacted the ground. The rigged and certified TRICON and its contents were destroyed. Loss of the load was a result of an 11K reach pendant's failure.

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Summary

11 (65%) of the Class A events occurred under N/NVG conditions. 12 (70%) occurred in OEF. Class B incidents included two additional external load mishaps, two incidents where rotor wash caused blowing debris or blew over tents causing injuries, three DVE related mishaps; one wire strike; one hard landing; one blade strike with terrain and one rotor strike with the fuselage during shutdown in high winds. More detailed information, for accident prevention purposes, may be obtained by your safety officer through the Risk Management Information System (RMIS) on the safety.army.mil website. Registration is required.

	H-47 CLASS A – C Mishaps				
FY	Class A	Class B	Class C	Class A Flt Rate	Fatal
2010	5	3	11	3.49	0
2011	3	5	18	2.66	0
2012	5	0	19	5.19	0
2013	1	2	11	1.09	0
2014	3	1	3	2.56	1
Total	17	11	62	3.04	1

	Manned Aircraft Class A – C Mishap Table									as of 25 Nov 14
	Month	FY 14					FY 15			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	0	0	2	0		0	1	3	0
	November	3	0	5	0		2	0	1	2
	December	1	0	3	0					
2nd Qtr	January	2	2	4	4					
	February	1	0	3	0					
	March	0	3	0	0					
3rd Qtr	April	1	1	5	0					
	May	3	1	2	2					
	June	2	0	6	0					
4th Qtr	July	2	0	5	0					
	August	0	0	0	0					
	September	0	1	2						
	Total for Year	15	8	37	6	Year to Date	2	1	4	2
	Class A Flight Accident rate per 100,000 Flight Hours									
	5 Yr Avg: 1.31		3 Yr Avg: 1.25			FY 14: 1.42			Current FY: 1.39	

The Heart of Risk Mitigation - Be a Mentor

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UH60 SP/IE H60 Branch Chief

As part of the Profession of Arms, we have the responsibility to mitigate risk. Frequently, I see the paperwork get processed IAW a SOP or policy letter to be filed away as nothing more than a record. Only after being tasked to do the investigation of a Class A accident did I truly recognize how important risk mitigation is and how the process is largely misunderstood.

Early in my career, I had a number of misconceived notions. One of which was how the paperwork was in the way, consuming time and limiting my ability to operate. Over time, my opinion of the process has changed. As a current member of DES, I have had the opportunity to look at organizations from an outside perspective and now look at things considerably different than before. I believe we need to go back to the basics and look at some definitions to assure that the message I am trying to send is not lost. First, I would like to define mitigation as the action for reducing the severity, seriousness, or painfulness of something. It is amazing how often that definition can change the way we look at our process of risk assessment, mitigation and approval. It is not that we fail to do the steps; it is more about the recognition that what we do as aviators is dangerous and the ultimate outcome of a misunderstanding could be catastrophic. As an organization, we spend a significant amount of energy on our risk assessment and mitigation processes and place ownership of that process on the chain of command through the approval process. It took too long in my career to recognize that everything is subject to scrutiny from the accident backwards and success is not necessarily an indicator of competence. Without perspective, the process of assessment, mitigation and approval would seem to be somewhat of a legal action. However, I challenge everyone to recognize that the process is more about mentorship than the endorsement of legal procedure.

We, as a culture, accept the rule of law as a founding principle. It is easy to see how the intent is easily lost. At one point in most of our lives, we were willing to blindly follow an SOP, regulation, or policy in order to gain the permission of our leaders. Much like asking permission to take the car out for a drive, your parents probably gave you limitations based on their expectation of your abilities and past performance. If you stay within a set of boundaries, you can take the car to the store. In order to get that far you already had to meet the legal requirements and take your driver's test which was designed to verify your ability to understand and apply the rules entered into record. If you think about it, the rules are important to you for your safety but are only significant to establish liability after the accident. If running a stop sign is only important when you are caught by an authority or struck by another vehicle, you have demonstrated a weakness of character and risk losing trust. I challenge that risk assessment, mitigation and approval is as much about mentorship (mentorship - a personal developmental relationship in which a more experienced or more knowledgeable person helps to guide a less experienced or knowledgeable person) and assists in character development.

Attempting to mitigate risk is almost as detailed as planning the mission. There are an incredible number of rules and regulations related to every mission. Each briefer and approval authority is an additional set of eyes that should attempt to assure compliance to prevent exposure to ridicule that could affect the public trust even if there is no damage. If the rule of law is what binds us, we will

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always require more detail to ensure a common interpretation. If we have character and are moral, do we need regulation? Where moral is currently defined as being concerned with the principles of right and wrong behavior and the goodness or badness of human character. It is important to note the relationship between the level of professionalism within an organization and the rules needed to regulate its activities. Where professionalism is defined as the skill, good judgment and polite behavior is expected from a person who is trained to do a job well. The more professional a force we have the less we need to regulate it's activities. Unfortunately, the converse is true as well. This situation clearly identifies the paradox of command and control. The greater the trust a command has in an organization or individual, the lower the control mechanisms (e.g. regulation) required to keep it operating safely. Our leaders not only recognize the need to provide the foundation for our development as a profession at all levels within the Army, but know the common perceptions of others will enhance our capability by maintaining the public trust allowing us freedom to maneuver.

Trust is required at all levels, for the risk assessment, mitigation and approval process to work. As a recent participant in a Center for the Army Profession and Ethic (CAPE) lecture at Fort Rucker, I found an interesting connection that applies to maintaining trust as both an organization and individual. The facilitator asked the audience for a definition of trust and some interesting definitions were offered. Merriam-Webster defines trust as a belief that someone or something is reliable, good, honest, effective, etc. For the purpose of this discussion, I prefer one of the definitions offered during the presentation "an emotional expectation of future performance." When we use the word trust, we are making a decision that comes from the gut "do you trust him/her?" It is critical to remember that mitigation relies on an anticipation of upcoming events but your feelings about someone's performance and their decision making process is established over time. One slide in the presentation stood out. The word trust was in bold at the center of a Venn diagram. The diagram hypothesize that in order to maintain trust you must have competence, commitment, and character. Since character speaks to the values of a person and commitment relates to their dedication to the common goal, it is easy to see how someone's commitment and character are immediately brought into question when they have violated your trust or had an accident. To further complicate things, I believe that the technical expertise required in our profession leads us to super-elevate the importance of competence above commitment and character. Through the assessments that I have been part of, I have come to believe that an organization can be good when it is competent but will only be great when it has a balanced approach and does not forget about commitment and character. The Commanders Guide (TC 3-04.11) and Aviation Flight Regulations (AR 95-1) spend a significant amount of time talking about the maturity and judgment required in character, but fall short of explaining why they are so important. Consequently, mentorship is a key factor in developing the understanding related to our doctrine and regulation that comes from the wisest of our leadership. I only use wise to exemplify that mentors do not have to be old to be wise. Where wise is having or showing experience, knowledge, and good judgment. It is my assessment that time spent at the battalion level and above focused on character and commitment is every bit as valuable to the organization as the time spent on competence. The establishment of expectations related to character and commitment allow the organization and individual to maintain trust. We talk about maturity and judgment as selection criteria for AMC and PC, but we ultimately must be able trust each other to make the "right" decision.

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Finally, in order to mitigate risk, you must be able to see yourself to identify your weaknesses. However, it is difficult if not impossible to see yourself. As a member of DES, we attempt to help units and individuals see themselves. During our assessments, it is much easier to identify negative behavior than positive behavior and it is not always received well. Hence, it is critical to emphasize the positive. Not to ingratiate anyone, rather to communicate in a manner that is constructive and well received. I have used two lenses to help me identify an organization or individual with challenges to their professionalism. First, the July 2010 Knowledge magazine article by then Brig. Gen. Crutchfield on where he identifies the five most common words found in accident reports at NTC - Untrained, Unsupervised, Undisciplined, Overconfident and Complacent. Second, the recognition of hazardous attitudes within the context of factors affecting decision-making contained in chapter 8 of the October 2010 version of the Aviation Instructor's Handbook - Anti-authority, Impulsivity, Invulnerability, Macho, and Resignation. There are definite parallels between the two references, but I have yet to find a problem related to organizations or individuals that does not fit in one of the two lists. Going back to the positive, I believe the Army values are the best positive lens that can be used to see the professionalism of an organization - Loyalty, Duty, Respect, Selfless Service, Honor, Integrity, and Personal Courage. I encourage units to pay close attention to their attitudes related to the Army values, but it is difficult to objectively assess the values of an organization or individual within a short period of time or during an assessment.

If all we do in daily operations is run processes, we miss the greater good of engaging in professional dialog. The transfer of knowledge from one soldier to another is critical for individual development (aka mentorship). We have all known the next organization or individual that was competent but easily identified as on their way to the next accident. Please take the time to read the references provided in the previous paragraph. I postulate that it is a flaw of character or lack of commitment that will either cause them or prevent you from breaking the chain of events leading to that accident. If we are not engaged, thinking Soldiers, we are limited to individual discovery and doomed to repeat the failure of others. Together we will succeed and overcome events that would slow or stop any of us individually. Use your risk assessment, mitigation and approval process to mentor and develop our junior aviators. Don't just be part of our profession, be professional and be a mentor.

After about 30 minutes I puked all over my airplane. I said to myself, "Man, you made a big mistake."

— *Charles 'Chuck' Yeager, regards his first flight*

Mishap Review: The day the music died

A Beech Bonanza crashed at night approximately 5 miles northwest of the Mason City Municipal Airport, Mason City, Iowa, at approximately 0100 hrs, February 3, 1959. The pilot and three passengers were killed and the aircraft was demolished.

History of flight

The mission was a scheduled charter flight transporting three passengers from Mason City, Iowa, to Fargo, North Dakota. The passengers, Charles Hardin Holley, J.P. Richardson, and Ricardo Valenzuela were members of a group of entertainers appearing in Clear Lake, Iowa, the night of February 2, 1959. The following night they were to appear in Moorehead, Minnesota, and arrangements were made to charter an aircraft to fly to Fargo, North Dakota, the nearest airport to Moorhead.

Take-off was scheduled for approximately 0100 hours with an estimated en route time of two hours for the VFR flight. At approximately 1730, the pilot went to the Air Traffic Communications Station (ATCS) to obtain necessary weather pertinent to the flight. Initial weather indicated ceilings greater than 5,000 feet and visibility of 10 miles with light snow after 0200 hours. A final weather update at 2320 advised that the stations en route were reporting ceilings of 4,200 feet or better with visibilities 10 miles or greater. Conditions at the departure airport were ceilings at 5,000 feet, light snow falling, temperature 15 degrees with winds out of the south at 25 to 32 knots and an altimeter setting of 29.90.

The passengers arrived at the airport at 0040, stowed baggage and boarded the aircraft. The pilot's intention was to file the flight plan by radio when airborne. While the aircraft was being taxied to the end of Runway 17, the pilot called ATSC and asked for the latest local and en route weather. It was reported that en route weather had not changed materially but the local weather was reported as precipitation ceiling 3,000 feet, sky obscured, visibility 6 miles, light snow, wind south 20 knots, gusts to 30 knots, altimeter setting 29.85 inches.

A normal takeoff was made at 0055. The aircraft was observed to depart toward the south in a normal manner, turn and climb to an estimated altitude of 800 feet, and then head in a northwesterly direction. When approximately 5 miles had been traversed, the tail light of the aircraft was seen to descend gradually until it disappeared from sight. Following this, many unsuccessful attempts were made to contact the aircraft by radio. The time was approximately 0100.

After an extensive air search, the wreckage was sighted in an open farm field at approximately

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0935 that morning. All occupants were dead and the aircraft was demolished. The field in which the aircraft was found was level and covered with about four inches of snow.

Crewmember experience

The 21 year old pilot, sitting in the left seat and flying single-pilot, had 711 flying hours, of which 128 were in the Bonanza aircraft. Almost all of the Bonanza time was acquired during charter flights. He held an airman certificate for single-engine land and flight instructor ratings. He was not instrument rated but had approximately 52 hours of dual instrument training and had passed his instrument written examination. He failed an instrument flight check nine months prior to the accident.

Conclusion

At night, with an overcast sky, snow falling, no definite horizon, and a proposed flight over a sparsely settled area with an absence of ground lights, a requirement for control of the aircraft solely by reference to flight instruments can be predicated with virtual certainty.

The board concluded that the pilot, when a short distance from the airport, was confronted with this situation. Because of fluctuation of the rate instruments caused by gusty winds, he would have been forced to concentrate and rely greatly on the attitude gyro, an instrument with which he was not completely familiar. The pitch display of this instrument is the reverse of the instrument he was accustomed to; therefore, he could have become confused and thought that he was making a climbing turn when in reality he was making a descending turn. The fact that the aircraft struck the ground in a steep turn but with the nose lowered only slightly, indicates that some control was being effected at the time. The weather briefing supplied to the pilot was seriously inadequate in that it failed to even mention adverse flying conditions which should have been highlighted.

The board determined that the probable cause of this accident was the pilot's unwise decision to embark on a flight which would necessitate flying solely by instruments when he was not properly certificated or qualified to do so. Contributing factors were serious deficiencies in the weather briefing, and the pilot's unfamiliarity with the instrument which determines the attitude of the aircraft.

Commentary

Information for this mishap review was gleaned from the Civil Aeronautics Board aircraft accident report released September 23, 1959. Although the report noted the deteriorating weather conditions and the need for flying utilizing the instruments, it should be highlighted that the aircraft took off with ceilings of 3,000 feet and 6 miles visibility. Not necessarily considered poor weather, even for night VFR flight. The aircraft was barely out of the pattern when it crashed. What is important is it is believed that shortly after takeoff the pilot entered an area of complete darkness and one in which there was no definite horizon; that the snow conditions and the lack of horizon required him to rely solely on flight instruments for aircraft attitude and orientation. Dark, overcast, limited contrast and little cultural lighting - attempting to fly in VFR conditions without reference to a horizon, either visual or artificial, is a recipe for disaster.

The passengers were better known by their stage names – Buddy Holly, The Big Bopper, and Ritchie Valens.

Failures lead to accidents

April 1992 Flightfax

While participating in a medical readiness training exercise, two UH-60s were independently transporting medical personnel by multiple sorties to remote villages where they provided medical care. At the end of the day, the aircrews returned the medical personnel to a base camp for rest and resupply before the next day's mission. For 5 days, the mission had been completed without event.

On the sixth day, one of the UH-6O crews performed insertion of the medical personnel at the remote villages and then extracted them at the end of the day and returned to the medical base camp. At the base camp, the crew shut down the aircraft and conducted a debrief with the medical team commander, discussing the mission and ensuring that everyone would be ready for the mission the following day. With 700 indicated pounds of remaining fuel, the crew restarted the aircraft and departed for the approximately 15-minute flight to a local airport, where they were to refuel and remain overnight.

As the crew crossed the last ridgeline some 5 minutes away from the airport, the No. 1 low fuel quantity caution light came on. The fuel quantity caution light was quickly followed by the No. 1 low fuel pressure light, the No. 1 engine low oil pressure light, and then the No. 1 engine-out light and audio. Fearing the possibility of losing the second engine or inability to sustain single-engine flight, the PC, who was on the controls, chose to fly directly toward the airport to a point at midfield rather than continue in a normal traffic pattern. The aircraft continued in relatively level flight but soon began rapidly losing rotor rpm and altitude. As it became apparent that flight could not be sustained to the airport runway, the PC selected the only available open area - a soccer field located between some warehouses - and attempted to maneuver the aircraft to this spot. Approaching the soccer field, the aircraft struck a 20-foot-tall tennis court backstop, hit the ground, bounced up against one of the warehouses, fell back to the ground, and slid to a stop, coming to rest on its left side. Through his broken overhead window, the pilot in the left seat observed the bladeless rotor head still turning. He then placed the No.2 power control and fuel levers to the off position and watched as all motion ceased.

The crew then egressed the aircraft with little assistance. One injury occurred when the pilot, standing on top of the aircraft, helped a passenger egress by pulling him by one arm up through the open right crew door, dislocating the passenger's shoulder. The aircraft was a total loss.

In reviewing the circumstances that led to this accident, the following individual failures were identified:

- The unit maintenance officer and maintenance technician failed to properly diagnose the cause of an engine flameout that this aircraft had experienced about a month before the accident. Following the loss of the No.1 engine, the crew reduced airspeed, continued normal flight for about 15 minutes back to home base, and completed a successful roll-on landing. Following rollout, the crew, presuming that they had experienced a No. 1 engine problem, elected to cross-feed the operating No.2 engine from the No. 1 fuel system, which indicated significantly more fuel remaining than did the No. 2 fuel system. The No.2 engine immediately quit, and the aircraft coasted to a stop at the unit's refuel point. The maintenance crew then wrongly presumed that the fuel gauge was out of calibration and made the following entry in the logbook. ''No. 1 fuel gauge indicated 200 lbs more than actual. Flight below 400 lbs indicated is restricted." The intent of the write-up was to prohibit

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flight below an indication of 400 pounds on the No.1 fuel system indicator, *not* a combined indication of 400 pounds. That was the extent of the troubleshooting efforts by unit maintenance personnel, and no preliminary report of aircraft mishap was submitted on this incident.

- The accident PC failed to adjust airspeed and power requirements when he experienced failure of the No. 1 engine. Remembering the incident that the other two unit pilots had experienced a month prior, the PC was admittedly concerned with the possibility of a No.2 engine failure. Fortunately, this aircraft was equipped with a flight data recorder (FDR) that recorded all actions by the aircrew during the mishap sequence. The data showed that not only did the PC not reduce to single-engine airspeed, but he also increased both airspeed and power demanded of the No.2 engine. Although he was an experienced pilot with a total of 1,314 flight hours (879 of which were in the UH-60), his control inputs demanded performance the No. 2 engine was not capable of providing, and rotor rpm began progressively decaying until further flight was impossible.
- The pilot-a relatively new aviator with only 359 total flight hours, 205 of which were in the UH-60 also failed to accomplish his primary task of providing the PC with critical information on flight, rotor, and engine instrument indications during the in-flight emergency. The pilot was initially monitoring the No.2 Ng but diverted his attention when a stabilator – off caution light came on. He reset the stabilator and soon saw what he thought was the No.2 engine - out light coming on. The FDR established that the No.2 engine never failed, and in fact, power never decreased to the point that the engine-out light would have illuminated. At the time the stabilator failed, the rotor rpm had decreased to below 93 percent, thus it was understandable that the stabilator failure was due to the loss of electrical power.

The ifs

- *If* the maintenance personnel had conducted by-the-book troubleshooting procedures, they would have detected that the No. 1 fuel system boost pump output line had been disconnected and was loose in the cell, allowing the system to cavitate at about the 200 pounds fuel-remaining point. No records existed to show when, why, or by whom the line was disconnected but evidence did exist to show it had once been connected and torqued.
- *If the* PC had followed by-the-book procedures for single-engine operations, the aircraft could have successfully sustained single-engine flight to the civilian airport, where the fault could have been investigated and possibly corrected.
- *If* the pilot had completed his by-the-book crewmember responsibilities, he would have informed the PC of the deteriorating rotor rpm and helped talk the PC through performance of the proper single-engine procedure. *If* he had been more observant, he would have noted that the No.2 engine was running at maximum available power throughout the entire sequence. If anyone of these individual failures had been eliminated, this accident could have been prevented. And accidents can only be prevented by individuals following by-the-book procedures. Anything less will ensure that accidents like this one will continue to happen. +

Caution: Cape does not enable user to fly.

— Batman costume warning label, Wal-Mart, 1995.

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in October 2014.

Utility helicopters

H-60

-A Series. Post-flight inspection revealed that the oil cooler door was missing on the aircraft. Damage to one main rotor blade and a SATCOM antenna is associated with apparent separation in flight. (Class C)

-L Series. While conducting aerial gunnery, the left-side cockpit door came open into the stream of 7.62mm rounds being fired downrange. The left-seat pilot suffered lacerations to the face and upper torso as a result of flying shrapnel, requiring treatment and quarters beyond the day of the accident. (Class C)

-M Series. Crew was conducting dust-landing training in an improved area when the aircraft's stowed FLIR made contact with the sand during a landing iteration. Crew reported 'rapid' settling during which the FLIR released from the stowed position, causing the lens to crack. (Class C)

Observation helicopters

TH-67A

-Aircraft was repositioning from refuel to parking when it made contact with the ground and subsequently overturned, coming to rest on the right side. Both pilots sustained minor injuries (Class B)

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To err is human. To blame it on the computer, even more so.

If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness Center at com (334) 255-3530, DSN 558-3530

U.S. ARMY COMBAT READINESS CENTER

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Online newsletter of Army aircraft mishap prevention information

This edition of *Flightfax* continues the five year safety reviews with a look at the UH-60. Awareness of the types of mishaps occurring in our aviation fleet is key in addressing risk assessments and countermeasures, regardless of aircraft type.

Also found in this issue: DES discusses maintenance officer mentoring, a mishap review of a ground taxi incident – appropriate considering the UH-60 safety review, and with winter upon us, a Blast From the Past article on flying in the snow.

Happy Holidays from USACRC and until next month, fly safe and manage your risk levels!

LTC Mike Higginbotham
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Black Hawk Safety Performance Review

In the five-year period FY10 – FY14 (2,120,000+ flight hours), the UH-60 series aircraft had 163 Class A - C mishaps recorded. There were 24 Class A, 22 Class B, and 117 Class C with a total cost of $137 million in damage and injuries. There were 33 fatalities. The Class A flight mishap rate per 100,000 hours was 1.04. Review of the Class A mishaps shows that human error was the primary cause factor in 22 (92%) of the incidents, materiel failure accounted for 1 (4%) with 1 (4%) environmental cause factor. Two of the mishaps were flight-related (blade strike on dismounted individual and loose debris striking a Soldier). Highlights from some of the more frequent types of mishaps:

Degraded Visual Environment (DVE)

Eight (36%) of the 22 Class A flight mishaps were related to DVE resulting in 18 fatalities. Examples include:

Scenario 1 *Tower strike*
While conducting a night vision goggle take-off from an out-of-ground effect hover, the aircraft experienced a low rotor condition while attempting to climb up and forward out of a dust cloud. Losing altitude, the accident aircraft moved forward and down through the dust cloud, struck a tower and crashed. Nine Soldiers were seriously injured and one Soldier was fatally injured. The aircraft was destroyed.

Scenario 2 *Spatial disorientation*
While flying in trail formation at 1,200 feet above ground level using night vision goggles, the crew failed to maintain orientation while in a right-hand orbit. The aircraft was placed in an unrecoverable attitude and impacted the ground inverted, fatally injuring all five crew members. The aircraft was destroyed. Flight conditions included zero illumination and low contrast terrain.

Scenario 3 *Spatial disorientation*
While flying as a medical evacuation chase aircraft responding to a 9-line MEDEVAC request under night vision goggles, the pilot on the flight controls failed to maintain or recover orientation. Shortly after takeoff, the pilot on the controls unknowingly initiated a gradual left turn that was allowed to progressively steepen until the aircraft was in an approximate 110 degrees left bank in a very steep, nose low descent at an altitude where a successful recovery was not possible. The aircraft impacted the ground and fatally injured all four crew members. The aircraft was destroyed. Flight conditions included zero illumination, low contrast terrain and restrictions to visibility.

Scenario 4 *Release point inbound*
While conducting a night vision goggle assault mission in a low contrast environment with zero illumination, the aircraft descended from an altitude of 270 feet AGL at a rate of greater than 1,000 FPM for approximately 10 seconds. The aircraft impacted the ground, causing total destruction of the aircraft, 4 fatalities, and 11 injuries. The crew did not adequately monitor the cockpit indicators to identify the aircraft descent.

Scenario 5 *Desert approach*
While performing a visual meteorological condition approach under night vision goggles to an unimproved desert landing zone, with zero percent illumination and no cultural lighting, the aircraft impacted the ground and rolled. The aircraft tail wheel struck the ground with such lateral force it sheared the right landing gear strut and drag brace from the aircraft. The aircraft was destroyed, one Soldier sustained fatal injuries, and four sustained minor injuries. The crew became fixated on the landing area and did not adequately monitor rate of descent, closure, and drift.

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Ground taxi mishaps

There were four ground taxi Class A mishaps and seven Class B mishaps. This represents 27 percent (worth highlighting – 27%) of the 41 Class A and B flight mishaps:

Scenario 1 *Ground taxi*

While ground taxiing to a refuel point during day VMC conditions, the main rotor blades made contact with a hangar door. The aircraft continued forward resulting in additional contact with a structural beam (located at the corner of the hangar) causing destruction of all four main rotor blades, severe damage to the aircraft, damage to two civilian hangars, and three general aviation aircraft. The crew divided their attention between checklist procedures and ground taxi (attention inside and outside the aircraft) not recognizing the developing dangerous situation.

Scenario 2 *Ground taxi*

Flight of two were ground taxing to parking when the lead aircraft contacted a light pole with the main rotor system. The fiberglass pole reportedly shattered/splintered causing flying debris which damaged the trail aircraft as well as other parked fixed-wing aircraft - one USAF 'trainer' and two small civilian jets. Additionally, debris resulted in civilian injuries and temporary closing of the FBO.

Scenario 3 *Ground taxi*

Aircraft was taxiing on the ramp when the main rotor system contacted a concrete T-wall. Damage reported to all four main rotor blades, leading edge of the tail rotor and the stabilator was punctured by debris. Collateral damage occurred to a parked Gray Eagle and GDT equipment.

Scenario 4 *Ground taxi*

While conducting night unaided ground taxi on a marked taxiway illuminated by perimeter stadium lighting, Chalk 1 in a flight of two, taxied into a stationary Chalk 2. The main rotor blades of the taxiing aircraft made contact with the blades of the stationary Chalk 2. The strike caused Chalk 2 to rotate approximately 45 degrees to the left forcing its the tail rotor blades to come in contact with the main rotor blades of Chalk 1. Both blade strikes resulted in extensive damage to all eight main rotor blades, four tail rotor blades of Chalk 2, two tail rotor blades of Chalk 1, and holes in the fuselage from flying debris. There were no injuries. The PC failed to announce his actions by not informing his crew or his wingman of his intentions to taxi the aircraft to the side (right rear) of Chalk 2 and failed to detect the close proximity to the stationary aircraft.

Power management

Power management contributed to five Class A and two Class B mishaps:

Scenario 1 *Power management*

Crew was executing an air-assault mission when they received readings of a high TGT and Nr droop just prior to touchdown. Aircraft descended to ground contact and landed hard. Aircraft sustained significant damage to the airframe and tail boom.

Scenario 2 *High altitude*

While conducting a day, visual meteorological condition approach to a helicopter landing zone at 14,200 feet MSL, as power was applied to stop the descent, the main rotor RPM drooped below normal operating limits and the aircraft descended onto rocky terrain. Two crew members sustained minor injuries and the damaged aircraft was later destroyed on site. The adverse environmental conditions created a condition where power available could not meet the power demanded.

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Scenario 3 *Power management*
While initiating a takeoff for a go-around under night vision goggles on a mountaintop landing area, the pilot on the controls applied excessive forward cyclic and collective entering the aircraft into a descent with a 19 degree nose low attitude. When additional collective power was applied, the rotor RPM decreased and the aircraft descended, impacting a rock formation nose first. This caused total destruction of the aircraft, 10 fatalities, and 2 injuries.

Blade strikes

There were five Class A and seven Class B object/blade strike incidents:

Scenario 1 *Terrain strike*
Aircraft was on an NVG approach to a dirt/gravel road adjacent to a man-made pinnacle in the training area when the main rotor blades contacted the upslope of the pinnacle at approximately 20' AGL. The crew maneuvered the aircraft forward and set down on the road for shut-down. Damage sustained to all 4 MRB, tail rotor blades, vertical stabilizer and tail pylon, and possible damage to the tail rotor drive shaft. No injuries.

Scenario 2 *Blade strike - personnel*
Crew was conducting a pinnacle, single-wheel landing for exfil of passengers when a local national interpreter's helmet came into contact with the main rotors causing severe injuries. Minor damage occurred to all four main rotor blades.

Scenario 3 *Dismounted personnel*
While conducting a NVG patient evacuation during a two-wheel, pinnacle landing at an HLZ during combat operations, a single main rotor blade contacted the flight medic's ACH as he re-entered the rotor disk area, resulting in fatal injuries. The rotor disk was extremely low at the 12 to 2 o'clock position. There was no positive two-way communication with the flight medic as he exited and re-entered the rotor disk area and the flight medic did not receive clearance from the pilots before entering the rotor disk.

Scenario 4 *Blade strike – Dismounting personnel*
As personnel were mounting the operating aircraft at an HLZ featuring rising terrain, the local national interpreter appeared to have become disoriented, rose to the upright position, and moved rearward into the moving rotor blades.

Scenario 5 *Shipboard operations*
During night fast-rope insertion training, the aircraft's main rotor system struck the ship's exhaust stacks and fell approximately 40 feet onto the ship's deck. One crewmember received fatal injuries, nine other personnel were injured, and the aircraft sustained extensive fire and structure damage.

Scenario 6 *Drive shaft strike*
Crew experienced abnormal vibration during short final approach. Emergency shutdown was executed and inspection revealed the #3 section of the drive shaft was missing as a result of main rotor blade contact.

Scenario 7 *Wire strike*
Aircraft contacted wires with the WSPS during low level NVG training on an approved training route. Minimal damage reported to the aircraft but strike resulted in local power outage and associated costs.

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Materiel failure

Scenario *Tail rotor*

While conducting a VMC approach on a NVG continuation training flight, at 80 feet AGL, the tail rotor pitch change shaft failed. This failure separated the linkage of the tail rotor pitch change shaft and the tail rotor servo, allowing the tail rotors to seek a neutral pitch and to be unresponsive to pilot flight control inputs. The aircraft entered an uncontrollable right yaw and impacted the ground with high G forces destroying the aircraft. Two crew members were seriously injured, and one crew member was fatally injured.

Miscellaneous

Scenario 1 *Flight related*

Soldier was fatally injured while videoing/photographing hoist-training. He was struck in the head by a tree branch that was apparently knocked loose by rotor wash from the departing aircraft.

Senario 2 *Aircraft ground*

While advancing the power control levers from the idle detents during run-up the system went into "lock-out" mode. Overspeed of 120% in excess of 12 seconds reported.

Summary

16 (67%) of the Class A events occurred under N/NVG conditions, 16 (67%) occurred in OEF/OIF. Class B incidents included an additional seven ground taxi mishaps, five blade strikes, two power management, two DVE, two hard landings, one wire strike, one Np over speed, and two flight-related incidents (personal injury during mini-gun operations and rotor wash disrupting a UAV landing. More detailed information, for accident prevention purposes, may be obtained by your safety officer through the Risk Management Information System (RMIS) on the safety.army.mil website. Registration is required.

	H-60 CLASS A – C Mishaps					
FY	Class A	Class B	Class C	Class A Flt Rate	Fatal	Cost
2010	8	3	17	1.76	20	64,423,165
2011	2	5	26	0.21	0	10,766,392
2012	6	8	40	1.19	6	25,354,616
2013	5	3	22	1.22	5	25,535,368
2014	3	3	12	0.82	2	10,834,734
Total	24	22	117	1.04	33	136,914,275

MEs as Mentors – Room for Improvement

CW4 Jonathon Brecheisen
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As a CH47D/F Maintenance Test Pilot Evaluator (ME) for the Directorate of Evaluation and Standardization (DES), I have conducted many unit assessments both CONUS and OCONUS. While assessing units in theater, I noted a breakdown in the coaching, teaching, and mentoring relationship that should exist between our experienced maintenance officers that carry the ME designation and our first term, junior maintenance officers and MPs. The absence of this relationship, both stateside and abroad, has taken a toll on the growth and proficiency of both our junior and senior maintenance officers.

In the deployment setting under Task Force Organization it was apparent that many of the MEs were not travelling on a regular basis to check in on, and mentor maintenance officers. Many of which were first term maintenance test pilots (MTPs), operating as the lone maintenance officer at remote Forward Operating Bases (FOBs). This breakdown of supervision and mentorship created by the distance between the individuals or lack of interface while in the deployed setting has manifested itself in the observed degradation of maintenance officer knowledge and proficiency during subsequent DES unit assessments. More troublesome, the broken relationship between senior and junior maintenance professionals does not seem to repair itself as it should once the unit is redeployed and regrouped at home station.

Issue 1. While in the deployed setting, Maintenance Evaluators are not initially establishing the coaching, teaching, mentoring relationship with their junior maintenance officers via adequate Battle Field Circulation. Furthermore, the Maintenance Evaluators are not doing enough to bridge the gaps in this interaction once returned to home station. The relationship is required in order for MEs to effectively supervise, mentor, or evaluate proficiency of junior maintenance officers as they become maintenance leaders.

Maintenance Evaluators are often low density within Combat Aviation Brigades (CAB) and are normally appointed to critical positions in regards to the maintenance programs contained within. Some of these positions include: Production Control Officer, Quality Control Officer, Battalion Aviation Material Officer, and Brigade Aviation Maintenance Officer. These positions are critical to the multiple echelons of the maintenance program. Due to this fact, the officers normally assigned these positions cannot be absent from their duties for too long without significant degradation of the maintenance program. This often creates reluctance within the command to allow the ME qualified maintenance officer assigned to one of these positions to depart to visit the outlying FOBs where their junior maintenance officers are operating. Commanders should encourage and allow ME qualified senior maintenance officers to conduct Battle Field Circulation once per month to outlying FOBs where there are junior first-term maintenance officers operating by themselves to provide mentorship and check proficiency.

Lastly, the gap that is created while in the deployment setting between the junior and senior maintenance officers needs to be recognized and bridged upon returning to home station in order to ensure the coaching, teaching, mentoring relationship is established and strengthened.

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Issue 2: Junior maintenance officer knowledge and MTP proficiency is degraded from lack of interface with assigned MEs.

In the past several years, there has been a notable issue arising in some junior maintenance officer knowledge and MTP proficiency. These issues were discovered during multiple DES unit assessments of the maintenance officers and MTPs within the visited unit. Some issues were also discovered during DES conducted Maintenance Evaluator qualification evaluations. In all cases where there was a large discrepancy between the actual performance of the officer as MTP and the standards published, each of the officers had been assigned to an outlying FOB on their first deployment as a maintenance officer and MTP. When questioned about how often the ME of the unit had come out to perform mentorship or the occasional no-notice evaluation, the answer given was nearly never. The defects in performance of each of the aviators evaluated were quickly and easily corrected through academic and flight training. This indicates the fault does not lie in the performance or motivation of the officer themselves, but in the lack of supervision, evaluation, and training from the unit ME.

Units need to develop standing operating procedures (SOP) requirements that specifically address the training and periodic evaluation for junior maintenance officers and MTPs. MTPs should receive evaluations more often than once a year during their Annual Proficiency and Readiness Test (APART). Periodic no-notice evaluations required by SOP would allow MEs to better track and monitor junior maintenance officer and MTP proficiency, training needs, and growth. MTPs should receive at least one no-notice annually outside their normal APART MTP evaluation. Periodic academic instruction should also be written into SOP requirements for pilot classes specifically relating to maintenance knowledge and management. These types of classes would better prepare junior maintenance officers for assignments of increased responsibility within the unit's maintenance programs. These implementations would increase the interval that the ME and MTP interface and help improve the fledgling junior maintenance officer and MTP knowledge and proficiency that has been recently noted in past DES unit assessments.

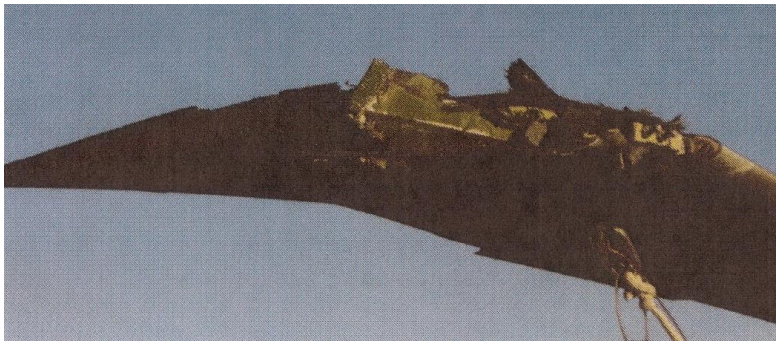
In summary, MEs need to interface with junior maintenance officers often to continue the growth and mentorship of these officers. This is especially important for officers deployed in theater that are on their first deployment and functioning as a maintenance officer. Without the expertise and guidance of the ME, the junior maintenance officer and MTP's knowledge and proficiency will begin to wilt. Commanders need to encourage and allow MEs within the unit to conduct battlefield circulation while in theater to ensure this prevalent issue is corrected before it becomes much worse. SOPs need to be updated to provide structure for scheduled academics and flight evaluations outside annual requirements so MEs may be keenly aware of knowledge and proficiency issues with their junior maintenance officers and MTPs.

FYI

Army Regulation 360-1 The Army Public Affairs Program.
Paragraph 10.5. Use of Army aircraft for non-media public affairs travel. Subparagraph c**.**
Army aviation assets are not used to transport persons costumed as Santa Claus, Easter bunnies, witches, or any other holiday-related character whether the person is military or civilian—on or off a military installation. Sorry Santa

Mishap Review: Night ground taxi

During night ground taxi for departure from a civilian airfield, the HH-60L's four main rotor blades contacted the winglet of a parked Gulfstream aircraft. Major damage occurred to both aircraft. There were no injuries.



History of flight

The mission was continuation training consisting of a day, IFR cross-country flight with a NVG VFR return flight home. Scheduled show time for the crew was 1400 hours local; however, several members arrived early to continue planning and conduct mission preparation as required. At approximately1500L all pre-mission planning, to include pre-flight, was completed by the crew. The mission brief was completed by the mission briefer with final mission approval by the company commander with an assessed mission risk of low. The weather forecast for the IFR destination was 2,500 scattered, 10,000 broken, visibility 7 miles, winds southeast at 10 kts. Return weather called for 2,000 scattered, 5,000 broken, 7 miles vis, winds southeast at 5 kts with a temperature of +21C. Moon illumination was greater than 50%.

The crew conducted a crew brief on the ramp at 1530L followed by engine run-up and departure at 1545L. The IFR leg was uneventful with the aircraft landing at the scheduled destination at 1745L. The aircraft taxied to parking at the FBO ramp, shut down and refueled.

Following refuel the crew updated their weather receiving an arrival forecast of a broken ceiling at 500 feet with 2 miles visibility. At approximately 1907L the crew initiated ground taxi for NVG flight home. Three minutes later the main rotor blades contacted the winglet of a parked Gulfstream G450. All four main rotor blades contacted the winglet and the winglet was completely sheared from its fixed position. The crew performed an immediate shutdown.

Crewmember experience

The PC, sitting in the left seat, had 600 hours total flight time, 115 in the HH-60, 120 NVG, 180 combat and 12 hours as a PC. The PI had nearly 540 hours total time with 64 in

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the HH-60, 100 NVG, and 150 combat hours. The FI, in the left crew seat, had 420 hours total time, 110 in the HH-60, 140 hours NVG and 115 combat. The CE, in the right crew seat, had nearly 200 hours total, 60 in the HH-60, 50 hours NVG and 90 hours of combat time.

Commentary

The accident investigation determined that the crew failed to clear the aircraft and communicate an obstacle that posed a threat to the aircraft. Additionally, the aircraft was not following an established taxi line but was on a non-movement area boundary marker.

The PC was the only crewmember operating aided. The lighting on the ramp allowed for both aided and unaided viewing. The PC directed the right side of the aircraft remain unaided since they were closest to the lights on nearby hangars and therefore would be most affected if aided.

It was also noted that the weather update the crew received was below weather approved for the NVG portion of the flight and no updated coordination had been completed with the mission briefing officer or final mission approval authority. In addition, the crew chief had exceeded his duty day crew endurance limits.

Accident findings: From the archives for your review

Finding 1 (Present and Contributing: Suspect Human Error – Individual and Support Failure): While conducting terrain flight operations at approximately 92 knots indicated airspeed and approximately 50 feet above a river in the local terrain flight area (TFA), the aircraft crew failed to detect hazards. That is, the crew failed to identify and avoid power transmission wires, in contravention of the Aircrew Training Manual (ATM) Tasks - Maintain Airspace Surveillance, Perform Terrain Flight Navigation and Perform Terrain Flight. As a result, the aircraft struck wires and crashed. The aircraft was destroyed and both crewmembers received fatal injuries.

Finding 2 (Present and Contributing: Suspect Human Error – Individual and Leader Failure): While preparing to conduct continuation training into the terrain flight area, the crew failed to complete adequate pre-mission planning, in contravention of the ATM and AR 95-1. That is, the crew did not obtain a weather briefing, file a flight plan, acquire a survival radio, or inform leaders of their crew endurance status.

Finding 3 (Present and Contributing: Human Error – Individual and Training Failure): While preparing to conduct continuation training into the terrain flight area, the briefing officer and approval authority failed to ensure the completion of adequate mission planning, in contravention of AR 95-1, FM 100-14, and the intent of the Vice Chief of Staff of the Army (VCSA) directive, dated 20 December 2004. That is, the briefing officer and approval authority did not ensure the crew obtained a weather brief, filed a flight plan, acquired a survival radio, and made adequate inquiries about the crew's endurance status.

Class A – C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 29 Dec 14
	Month	FY 14					FY 15			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	0	0	2	0		0	1	3	0
	November	3	0	5	0		2	0	2	2
	December	1	0	3	0		1	2	1	
2nd Qtr	January	2	2	4	4					
	February	1	0	3	0					
	March	0	3	0	0					
3rd Qtr	April	1	1	5	0					
	May	3	1	2	2					
	June	2	0	6	0					
4th Qtr	July	2	0	5	0					
	August	0	0	0	0					
	September		1	2						
	Total for Year	15	8	37	6	Year to Date	3	3	6	2
	Class A Flight Accident rate per 100,000 Flight Hours									
	5 Yr Avg: 1.31		3 Yr Avg: 1.25			FY 14: 1.42			Current FY: 1.93	

UAS Class A – C Mishap Table									as of 18 Dec 14
	FY 14					FY 15			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	6		3	9	W/GE				
MQ-5	1	1		2	Hunter	1		`1	2
RQ-7		12	11	23	Shadow		1		1
RQ-11			1	1	Raven				
RQ-20			1	1	Puma				
YMQ-18									
SUAV					SUAV				
UAS	7	13	16	36	UAS	1	1	1	3
Aerostat	3	2	3	8	Aerostat	0	0	0	0
Total for Year	10	15	19	44	Year to Date	1	1	1	3

Flying in the snow

January 2004 *Flightfax*

It's time to talk about snow. In some parts of the world, it's been here for months. In others, it's just getting ready to fall. Whichever is the case for you, it's never too late to get up to speed on winter flying.

Units that haven't reviewed training in cold weather flying should do so immediately. Once an aircrew is involved in a whiteout during an approach or experiences spatial disorientation over a snowy field, it's too late to talk about training.

Inexperience and lack of recent training are frequent contributors to snow-related accidents. If you are new to an area of frequent snows, get into Field Manual (FM) 1-202, *Environmental Flight*, as well as all the local standing operating procedures (SOPs). Also ask questions—lots of questions—of local safety folks and instructors.

Even if you have lots of winter flying experience, a few months time in temperate weather can erode winter flying proficiency. Remember, overconfidence can lead to an accident just as surely as inexperience. Consider the following accidents.

Blowing snow

The instructor pilot (IP) was fairly confident in his abilities. He had more than 2,200 hours of helicopter flying time, with more than 1,200 hours in the OH-58.

The crew was conducting a night vision goggle (NVG) blowing snow checkout. The pilot (PI) had completed three hover down approaches and five constant angle approaches into the training area. The crew departed that training area in order to continue training in a more restrictive landing zone (LZ). The PI successfully executed three approaches into the LZ and was attempting his fourth approach as a constant angle approach. As the aircraft proceeded inbound at an altitude of 8 to 10 feet, the IP announced that a snow cloud was at the rocket pods. The PI acknowledged this and proceeded forward and down. The snow cloud engulfed the aircraft as it approached the terrain. The PI lost his visual references, and the aircraft began to drift to the right. The IP announced they were drifting to the right, but the PI did not acknowledge the drift.

The aircraft continued to advance forward and drift right until the main rotor blades made initial contact with several small trees. The drift continued until the main rotor blades struck and severed an 11-inch diameter pine tree, upon which the fuselage began a rotation to the right. The rotational momentum continued as the main rotor blades disintegrated and the severed pine tree fell toward the aircraft. The aircraft came to rest among the trees in a level, upright position. The two crewmembers received minor injuries.

Lessons learned: No matter how many of these approaches you do, anticipate and prepare to go around at any time during the approach. IPs, be prepared to take the controls regardless of who you are flying with.

Snow-covered landing areas

It was winter, and two flights of five UH-60s were on a troop-insertion mission to unimproved landing areas. In one flight, the unit operations officer was piloting Chalk 3. Because of his unit duties, he had flown only 17 hours in the preceding 4 months. Moreover, he had not been able to attend mandatory unit training in which snow landing techniques and procedures were reviewed, nor did he attend make-up classes or engage in hands-on snow landing operations training.

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The flights were proceeding normally with 7 miles visibility and 1,000-foot ceilings in scattered snow showers. Then the two flights separated and began a series of false insertions.

Chalk 3's flight encountered a snow shower as they began a formation approach. Visibility was reduced to about a mile. The LZ was a large, open, snow-covered field with an apparent upslope in the direction of the landing. The crew of Chalk 3 could see a large amount of snow circulating through the rotor systems of the two aircraft ahead of them.

The pilot of Chalk 3 selected a touchdown point downslope and to the left rear of the lead aircraft. Using the upslope aircraft and distant tree lines as visual references, the pilot made his approach. A snow cloud enveloped the aircraft as effective translational lift was lost about 20 feet above the ground, with a left quartering tailwind of 15 to 25 knots.

The pilot decided to continue the approach without outside references and reduced power to put the aircraft on the anticipated upsloping terrain. In a complete whiteout condition, the UH-60 touched down hard on a combination upslope to the front and downslope to the left. The helicopter rolled over and came to rest on its left side. Fortunately there were no fatalities in this accident.

Several factors contributed to the difficulty of landing at this site:

+ The flight was landing downwind to an upslope.
+ The aircraft were landing during a snow shower to an LZ with very loose, dry snow.
+ There were only limited stationary visual clues.

The worst thing that happened was the pilot continued the approach when he lost visual contact with his ground references. He had to monitor two slopes and his position simultaneously. This would be a difficult task even if the pilot had a wealth of recent snow experience, which was not the case. Moreover, the rate of descent was excessive, even if the approach had been to level terrain. FM 1-202 states that an approach to the ground should not be made in dry, powdered snow unless the touchdown area is known to be level and free of obstructions. In this case, the pilot was aware of both the slope and the looseness of the snow. However, he was not aware of his downwind condition.

Lessons learned: Approach and go-around planning are essential for any formation flight; however, they are crucial in snow environments. Planning should include:

+ Instructions to execute a go-around if visual contact with ground references is lost or if it becomes apparent that visual contact will be lost.
+ Timing and spacing aircraft into LZs to reduce the effects of blowing snow.
+ Specific go-around instructions in pre-mission briefs (what direction to turn, where to land on subsequent approaches, and takeoff procedures).

Other snow hazards

One of the most dangerous snow environments just might be the main airfield. The large, open areas found at most airfields do not provide the contrast and definition needed to maintain orientation, especially when snow starts circulating through rotor blades.

Moving around the typical airfield is a little easier when you can "air taxi." When you are cleared by ground control, remember to keep a good scan going to keep from inadvertently descending.

Summary

Many aviators have their own ideas about how to mitigate risks associated with blowing snow. As part of the winter academic program, it might be useful to survey aircrews to determine which

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Blast From The Past continued from previous page

hazards they consider the most severe and evaluate the effectiveness of the controls that are in place. From such a survey, necessary upgrades to winter training plans and development of new controls can be put in place. Winter has been a regular on the calendar for a long, long time. There's nothing we can do about that, even if we wanted to. In fact, the very predictability of changing seasons gives us time to plan our training for the different kinds of flying problems each season brings. If you haven't already done it, get your refresher training, review FM 1-202, and be alert to the hazards associated with winter flying.

—Bob Brooks, Operations Division

Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in November 2014.

Attack helicopters

AH-64D

-During the conduct of night emergency procedures training the aircraft crashed. Two fatalities. (Class A)

Utility helicopters

UH-60A

-While positioning for a NVG take-off the aircraft contacted a barrier wall and crashed. (Class A)

Fixed-wing aircraft

DH-7

-Crew experienced a bird strike during night AQC training. Aircraft was landed without further incident. (Class C)

Unmanned Aircraft Systems

MQ-5B

-System departed the runway during a roll-out landing and sustained damage to the nose and main landing gears. (Class C)

RQ-7B

-Crew reported loss of computer link with the system as it was in RTB flight mode. (Class B)

I had amnesia once…maybe twice.

If you have comments, input, or contributions to Flightfax, feel free to contact the Aviation Directorate, U.S. Army Combat Readiness Center at com (334) 255-3530, DSN 558-3530

U.S. ARMY COMBAT READINESS CENTER

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