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The Effects of Stress on Our Physiological, Perceptual, and Cognitive Performance

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In Part 2A of this series (Jan 2013 Flightfax) we looked at the five stages of the stress response. In this article we will discuss in detail the effects of stress on performance and use the Air France Flight 447 accident as a case study to demonstrate the learning points. You should download: How Panic Doomed Air France Flight 447 at www.cti-home.com under articles to refer to. The footnotes referenced in this article refer to the footnotes in the case study. You may not agree with all my personal thoughts in the case but the point is to help you think about and understand the points in this article.

Part 2B

Humans employ three primary systems that aid in survival. Each of these systems will be either enhanced or degraded depending on the perceived stress level.

1. **The Physiological System** is defined by elements of motor performance – simple, complex, and gross motor skills.
2. **The Perceptual System** relates to our ability to process input from our five senses – primarily visual and auditory.
3. **The Cognitive System** deals with the mind and includes the processing of information, judgment, decision making, and memory.

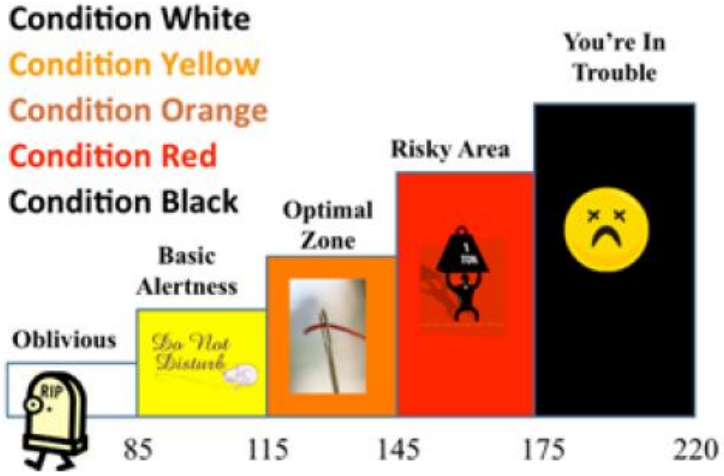

Figure 1: Hormonal Heart Rate & Cooper Color Codes

The color code reference in Figure 1 was originally presented by Lt.Col John Dean "Jeff " Cooper,

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United States Marine Corps, in his book *Principles of Personal Defense (1989).* According to Cooper, the most important means of surviving a lethal confrontation is neither the weapon nor the martial skills. The primary tool is the mindset of the individual. These codes originally designated the various states of awareness that one must have in preparing to handle a threat. Over time these color codes were also used to describe a person's level of alertness. I have adapted the color codes to describe levels of alertness, attention, and arousal associated with varying levels of hormonally reduced heart rates.

The following is a brief summary of performance associated with the hormonally induced heart rate in each zone. As you read, think about personal examples you have experienced and refer to the footnotes in the Air France 447 case study.

Below < 85 HBPM – Condition White: Oblivious to Our Surroundings

Physiological – No impairment, we still have total access to all our motor skills.

Perceptual – Even though all our senses are intact, we are not using them effectively because we are not paying close attention to our surroundings. Our attention process lacks a clear focus and we are susceptible to missing important cues.

Cognitive – Arousal level is low in this zone; therefore the brain is not operating at an efficient level. I call this the FDAH (fat, dumb, and happy mode). This is the zone in which complacency is most likely to occur. [2, 3, 6]

85 – 115 HBPM – Condition Yellow: Basic Alertness

Physiological – This zone is good for the use of fine motor skills and the smaller muscle groups. Hand and eye coordination is excellent for any task requiring precision and accuracy.

Perceptual and Cognitive – This is the perfect zone for solving complex mental tasks and doing meticulous planning. Global attention occurs in this zone, so general awareness and discrimination of tasks is very good.

115 – 145 HBPM – Condition Orange: Optimal Zone

Physiological – At 115 HBPM our fine motor skills start to degrade because blood starts to move away from the fingertips toward the larger muscle groups. The ability to coordinate and execute a series of motor tasks that don't require a great deal of strength will be excellent.

Perceptual – Hearing and eye sight actually improve in this zone.

Cognitive – The brain is active, but not too active, so we aren't at the level at which the mind is overloaded by inputs. We are able to easily discriminate between various inputs and to process the information coming in from our senses. In Condition Orange, we are able to shift from global attention to selective attention easily when the need arises. When one input presents itself as a possible threat we are easily able to shift to selective attention.

145 – 175 – Condition Red: Risky Area – Hypervigilance Zone [1, 7, 14]

Physiological – At the 145 HBPM level not only are fine motor skills gone for all practical purposes, but the complex motor skills start to degrade as well. Reaction time slows, hands may get shaky, but gross motor skills increase making us stronger and faster.

Perceptual – Perceptual narrowing/attention blindness is one of the most important issues when you are in the Red Zone. Because of increased selective attention, most of our informational processing resources are devoted towards that which we are attending to. However, those things

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we are not attending to are not processed – we are essentially blind to those things; hence the term *attentional blindness*.[13] Perceptual narrowing applies to hearing as well and it is called *auditory exclusion*.[11, 12, 15] Sounds either disappear or appear muffled. Often times we are unable to hear what others are saying and miss key information about the threat.

Cognitive – In this zone, our brain is doing something called sensory gating.[9] This occurs when the brain concentrates its mental energy on one stimulus at a time, and shuts out or blunts other stimulus. This is an evolutionary mechanism that is present under stress to help prevent the brain from getting over stimulated. In the 145-175 HBPM zone, we are also going to see decision making problems, and irrational behavior at the top end of this range.[8] We may become distracted when presented with multiple stimuli. We will also see processing times slow down, as well as delays in making decisions.[21] Memory is affected because the stress hormones block access to the long term memory system. Delay begins at 145 HBPM and the brain starts to "lock up" at 175 HBPM. So, at best we have slower reaction times and decision making. At worst we are approaching confusion and panic.

175 – 220 HBPM – Condition Black: Serious Trouble – Confusion and Panic

Physiological – Blood flow is moving rapidly to the large muscle groups which give us maximum gross motor skills and strength resulting in extreme rigidity and clumsiness. A person may experience exaggerated actions when attempting to perform a physical task, even one well established by habit pattern.[10] For example, a non-instrument rated pilot is more likely to over control the aircraft in an inadvertent IMC condition because of their stress level. This phenomena is often seen in "loss of control" accidents.

Perceptual – From the point of view of the perceptual processes, we go on "auto-pilot." It is not unusual to see individuals experience childish or irrational thoughts. At the high end of the Black Zone we also have reports of disassociation, or "out of body experiences."

Cognitive

- The frontal lobe shuts down and the mid-brain takes over. The frontal lobe is responsible for a number of key functions including: short term memory, judgment, impulse control, concentration, inhibition, and rational thought. The frontal lobe is important, so losing access to it makes it impossible to process rational options.[18] The mid-brain is where unconscious processes occur, so in this zone we are only able to employ those things that are either reflexive or those that have been ingrained into our neural pathways because of habit patterns (pre-programmed muscle responses).

- Access to short and long-term memory is greatly affected. The loss of memory precludes any ability to concentrate.[17] Imagine if your computer lost its RAM. Everything you typed into your computer would be lost as soon as you hit the keys on the keyboard. This simulates the challenge the human mind has when the frontal lobe is missing from the equation.

- Overload and confusion: So much data is coming into the brain that it is impossible to process it all. Without a frontal lobe we have no way to discriminate and sort the inputs and we essentially cannot process anything. With no processing power left, we get confused and panic sets in. Because we cannot find a solution to deal with the threat we feel like we are running out of time. Finally, a sense of helplessness creeps in,[19] we experience negative thinking,[20,24] and often employ childish or nonsensical actions. Examples of taking actions in the Black Zone that make no sense include jumping from a skyscraper that is burning, or taking out carry-on baggage after an airplane crash.

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- Negative thinking and acting: The term for this is *perseveration*.[16,22,23] What happens with perseveration is that when presented with a stimulus one reaches back and brings forward the most familiar solution/action to deal with the situation. This is called the default option. However, when the default option does not work, they continue to persist in the course of action because they can't come up with any logical alternatives. For example, settling with power generally requires three key elements to occur, and these conditions should be avoided in combination with one another. These are: A near zero airspeed, up to 100 percent power applied, and a better than 300 foot per minute rate of descent. Once you have all of these situations in occurrence, the aircraft will settle in its own downwash from the rotor system. The only way to recover is to gain forward airspeed and allow the rotor system to fly into "clean air." An example of perseveration is when a pilot just continues to attempt to pull additional power to stop the descent. At this level of stress they can't come up with the logical alternative of gaining airspeed and flying into clean air.
- The phenomenon of *capture error* is prevalent in the Black Zone. As you will recall from Section 1, an intended action can slip off its intended path and be captured by a more ingrained habit pattern or motor response.[16]
- As we continue higher, we move to fixation as the nervous system locks in exclusively on what it thinks is the greatest threat and excludes everything else.
- Our muscles become rigid and stiff and we exceed motor capacity to perform, then we greatly exaggerate the action.
- At 220 HBPM, mental shutdown occurs as the pre-frontal cortex (thinking part of the brain) shuts down. Thinking stops and reflexes take over (fight, flee, submit, freeze).

Key Points to Remember:

1. Depending on the level, stress can have both a positive or negative effect on our physiological, perceptual, and cognitive performance.
2. It is the perception of the stressor/situation that drives our hormonally induced heart rate, not the actual stressor. Everyone will perceive a stressor differently.
3. The White Zone (<85 HBPM) is just as dangerous as the higher stress zones because we are not paying close attention to our surroundings and have a higher probability of being unprepared and caught by surprise. Surprise causes a hormone dump and drives us to the highest stress levels and lowest performance levels.

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What Really Happened Aboard Air France 447

This case is designed to accompany the article "The Effects of Stress on Our Physiological, Perceptual, and Cognitive Performance." The author uses the Air France 447 case to demonstrate the principles that have been addressed in his series of articles.

To download go to:

www.cti-home.com -> Under the Articles TAB -> click on Air France 447 Transcript.

Risk vs. Continuation Training

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We have all seen this scenario: Your unit is preparing to deploy to a high risk environment, RL progressions still need to be completed, and environmental training needs to be conducted as time continues to move faster and faster. Once the RL progressions have been completed and they have arrived at the deployment site, the trainers can breathe a sigh of relief because everyone is trained to standard.

What about continuation training? Do we really need to worry about it? Once a crewmember completes RL progression or completes a new task, they are then considered trained to the proficiency level necessary to conduct collective training as a member of an aircrew, per TC 3-04.11. What about continuation training?

Army crewmembers fly highly complex and dangerous missions and if a unit is given a mission, they will execute it to the best of their ability using the tools they are given. However, what about the unit which performs the high risk mission without a continuation training plan, or has a plan but is not allowed to complete it due to risk aversion by leadership? This is a recipe for disaster.

The risk of not completing continuation training far outweighs the risk of completing it. Case in point: multi-ship dust landings in the middle of the desert, zero illumination, and limited lead time for mission planning. No worries, we tell ourselves, we completed our environmental qualifications when we arrived in the AO so we are good. Why add the risk of training during combat operations?

Risk Management provides the tools for leadership to properly assess risk and implement controls, keeping risk as low as possible. However, this does not mean we risk ourselves out of either training for the mission or completing the mission. They go hand in hand. You cannot complete one without the other. For success, complete the training at night with a selected number of aircrew and keep it confined to a given area (inside the wire). If necessary, elevate the risk approval to a higher level. These are all tools that can be used to mitigate the risk . By completing a continuation training plan, leaders are providing the skill sets and confidence for their aircrew to complete the higher risk missions safely.

Remember, just because your crewmember has completed required training doesn't mean they can remain proficient in individual tasks indefinitely. They must be provided the opportunity to practice those tasks.

RL progressions will always be a priority in pre-deployment, as will a collective training program. However, once in the deployment, work with leadership to devise a realistic continuation training plan.

Mishap Review: NVG Multi-Ship Insertion

During a multi-ship insertion under NVGs in mountainous terrain, the pilot on the controls placed the aircraft in an excessive nose low attitude while executing a take off from an aborted landing. When power was applied to arrest the rate of descent, the rotor speed bled off and the aircraft struck a rock formation nose first.

History of flight

The mission was a NVG three-ship insertion of ground forces into three separate but nearby mountain HLZs located at an altitude of approximately 8650 feet MSL. The designated flight lead PC conducted the mission planning with the assistance of the other pilots assigned to the mission. On the day prior to mission execution, an air mission crew brief was conducted with all pilots and crewmembers present. Additionally, the AMC completed the risk assessment with an overall risk for the mission calculated as moderate due to NVG mixed aircraft multi-ship; potential brownout conditions; and low illumination. Risk reduction measures included dual PC cockpit and all landings would be into the predicted winds or adjusted for actual. A unit instructor pilot was the mission briefing officer (MBO) and the task force commander provided final mission approval. Both the MBO and commander were involved in the planning and briefings for the mission.

A mission update/go-no go briefing was conducted at 2300 hours the night of the mission, reflecting no changes. The weather forecast for the objective called for clear skies, 5 miles visibility, and winds 200/10 gusting to 16 knots. Temperature was +9 C. with a PA of +8460 feet. Moon illumination was forecast at 95 percent, however, moon set was 0305, effectively making illumination 0 percent at arrival time for the objective. There were no warnings, watches or advisories in effect.

The flight of three Black Hawks departed the airfield at 0227 hours en route to an intermediate location for refuel and then a short flight to a FOB to pick up the designated ground force element. At 0351 the flight departed the PZ for the night insertion. The accident aircraft (Chalk 3) had a total of 12 personnel on board – four crewmembers and eight passengers with combat gear. Planned en route to the HLZ was 13 minutes. At the release point, Chalk 3 shifted to the left of Chalk 2 to line up for approach to their assigned LZ. Arriving at the LZ, the pilot attempted several times to land on the rocky terrain from a hover for approximately one minute. The PC then instructed the PI to execute a go-around to the left. The PI applied forward cyclic and increased collective power. Approximately nine seconds later, the low rotor audio alarm sounded and the aircraft impacted the ground two seconds later. The aircraft was destroyed in the crash sequence resulting in 10 fatalities and two serious injuries.

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Crewmember experience

The PC, sitting in the right seat, had more than 1300 hours total flight time, with 1100 in the UH-60 (480 as a PC) and 340 hours NVG time. He had 680 hours combat time with 312 hours in the current AOR and had been out of flight school just over seven years. The PI, flying in the left seat, had nearly 800 hours total time, 616 hours in the UH-60 (209 PC hours) and 166 hours NVG time. His combat time was 448 hours with 233 in the current AOR. He had completed flight school four years prior to the accident. The CE/SI, located in the right crewchief seat, had a total of 1530 hours with 520 NVG and 235 in the AOR. The gunner, in the left crewchief seat, had 237 hours total time with 98 NVG and 225 in the AOR.

Commentary

The accident board determined that while initiating a takeoff for a go-around, the power demanded exceeded the power available resulting in a decrease in rotor RPM. The aircraft descended and impacted a rock formation. Contributing to the power demand was an excessive nose low attitude on takeoff, requiring additional power that was not available due to environmental conditions. Additionally, the board noted inadequate crew coordination in that over a seven second period the aircraft torque readings increased to max torque available and the pitch attitude lowered to greater than 15 degrees nose low without any verbal or physical reaction from the other crewmembers. After seven seconds, the PC responded verbally, but the crew did not have the power required to recover the aircraft.

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Manned Aircraft Class A – C Mishap Table as of 25 Mar 13

	Month	FY 12 Class A Mishaps	FY 12 Class B Mishaps	FY 12 Class C Mishaps	FY 12 Fatalities		FY 13 Class A Mishaps	FY 13 Class B Mishaps	FY 13 Class C Mishaps	FY 13 Fatalities
1st Qtr	October	2	2	6	1		1	0	7	0
	November	0	1	13	0		0	1	3	0
	December	2	2	6	4		2	1	0	0
2nd Qtr	January	2	0	11	0		0	0	6	0
	February	2	1	6	0		0	0	2	0
	March	1	2	12	0		3	1	1	7
3rd Qtr	April	2	1	6	4					
	May	1	0	4	0					
	June	1	0	2	0					
4th Qtr	July	3	3	9	1					
	August	2	5	5	0					
	September	2	0	2	2					
	Total for Year	20	17	82	12	Year to Date	6	3	19	7

Mishap Review – A Closer Look

The Mishap Reviews found in Flightfax are designed to inform the readers of recent accidents that have occurred in Army Aviation. Typically, they provide a general synopsis of the event and basic findings an accident board produces during the conduct of their investigation. Units often hear about an accident that occurred but have little knowledge on what caused the crash.

Our goal is to provide general information to the field on reported mishaps as quickly as the preliminary information is available. Final reports, with the associated staffing requirements, can take several months to compile before a final version is documented into the USACR/SC database. Personnel having access to the database through RMIS (typically safety officers), may review accident reports to glean information useful in developing their safety programs. That said, the general information presented in the Mishap Reviews may not be enough to properly address all issues that surface during the conduct of an investigation. As an example – the Mishap Review (NVG Multi-ship Insertion) in this March 2013 Flightfax issue provides a general description of the accident. By reading the commentary, it can be surmised that the aircraft suffered a decreasing rotor condition on an attempted takeoff which led to the crash. Some of the basic elements were included to understand the situation: mountain LZ at 8600'; temp +9; winds out of the SW. Illumination was 0 percent. The accident board determined the pilot on the controls used excessive forward cyclic and collective to conduct the takeoff and the PC was late with corrective action. To assist in fully capturing lessons learned, a closer look at the mission and accident is provided.

Bottom line up front (BLUF). The aircraft crashed because the power demanded exceeded the power available for the environmental conditions causing a decreasing RPM-R (rotor droop) and associated loss of lift.

Point 1. Mission planning. The unit was well trained and exceeded requirements in regards to the mission planning process, products, rehearsals and briefings. The mission was authorized and within the capabilities of the unit, aircraft and crew. No issues with the mission.

Point 2. Risk Assessment and mitigation. As stated in the Mishap Review, the mission was assessed as a moderate risk due to low illumination and the potential for brown-out conditions. The crew itself was considered a low risk based on qualifications and experience. Total time for the two pilots was greater than 2000 hours. Risk mitigation controls included: 1) dual PC qualified pilots; 2) all landings and formations planned into predicted winds and adjusted for actual. The greatest risk for the flight and where it would occur was listed as 'NVG multi-ship dust landing under low illumination'. Mitigation controls were the planned landing into the wind as well as on-call illumination. The unit also had a requirement to maintain a 1000 pound buffer in performance planning to provide the aircrews with an additional 5 percent of out of ground effect power margin. There were no issues with the risk assessment procedures.

It should also be noted the unit conducted extensive pre-deployment training including mountain environmental training in Colorado, as well as continuous training in theater for the mission tasks involving dust, pinnacles, low illum and one/two wheel landings.

Point 3. Performance planning as computed by the accident board: With the stated conditions at the LZ, the aircraft had a max allowable gross weight OGE of 18,400 pounds; 20,500 pounds IGE. Landing weight at the LZ was approximately 17,900 pounds. Predicted hover was 78 percent IGE and 92 percent OGE . Max torque available was 94.5 percent . The aircraft had OGE power

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available but did not meet the unit's 1000lb/5 percent OGE power margin requirement. Power was sufficient for mission requirements.

Point 4. Mission en route. The mission was flown as briefed. The flight stopped en route at a FARP before proceeding on to the PZ. Each crew determined how much fuel they took on at the FARP to meet weight and power requirements. Power checks were completed at the PZ after loading and prior to departure. Power checks were consistent with the aircraft weight. No flight anomalies were noted en route.

Point 5. RP to landing. At the RP, the accident aircraft (Chalk 3) shifted to the left of Chalk 2 to line up for the approach to their assigned LZ. Approach heading was approximately 350 degrees. The PI was flying the aircraft with the PC shadowing the controls.

Point 6. LZ operations. The crew executed the approach to a hover at the LZ. During the next minute, the PI attempted several times to land from a hover to the rocky ridgeline terrain. Light dust was announced but not a factor. Some aircraft drift was discussed by the crewmembers during the hover which the PI acknowledged. Aircraft power required to hover at the LZ was approximately 90 percent at a hover altitude of 20 feet. Following communication by the crewchief that the aircraft could not set down at the current location but needed to go left, the PC announced a go-around. The PI acknowledged the go-around verbally and initiated with a power increase and accelerative attitude. The PC then transmitted the go-around to the rest of the flight. Review of recorded flight data showed the aircraft power was increased to the max torque available/TGT limiting approximately three seconds after initiating the go-around. At that point, the accelerative attitude was five degrees nose low. With the engines at TGT limiting ,the nose down attitude progressed to 14 degrees nose low before the PC verbally questioned the procedure. The low rotor warning sounded and the aircraft impacted a rock formation two seconds after the PC's inquiry. Total time from the initiation of the go-around to aircraft impact was approximately 11 seconds. The time from the announcement of the go-around to the PC asking about the takeoff was approximately seven seconds.

Observations and Discussion Topics

1. Power is important. It needs to be continuously checked and confirmed with the crew. From the time the crew completed the power check following loading in the PZ, there were no additional references to aircraft power requirements. There was no verbal before landing check or confirmation of planned power requirements prior to the aircraft landing or while conducting the LZ operations. There was no confirmation of power prior to initiating the takeoff for the 'go-around.' This wasn't a case of the aircraft not having the power to perform the task. It was a case of not properly using the available power.
2. Wind is important. Wind was forecast to be out of the SW at 200/10 G16. Landing direction was a planned 347 degrees resulting in a possible quartering tailwind condition. En route to the RP one reference was made by the crew describing the winds as light. Confirm forecast winds if possible, prior to landing. Attack and reconnaissance aircraft providing security to the air movement or air assault can be a source to wind direction and velocity. Just because you can land in a certain direction doesn't mean the takeoff in the same direction is worry free. Optimize the winds.
3. Communication is important. Before-landing and takeoff checks provide the crew with the opportunity to review critical items in the landing and takeoff sequence. What is said is also important. Hovering for over a minute, then calling for a 'go-around' conveys an elevated sense of

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urgency to the situation. Announcing a takeoff and return for another landing sets up the crew to complete a before takeoff check, review winds, power, and discuss departure procedures.

4. Use your resources. Difficulties, including aircraft drift, were encountered in trying to find a place to set down for a one or two wheel landing. The IR searchlight or the other available illumination may assist in maintaining a stabilized hover.

5. Do your jobs. The pilot in command (PC) is the individual responsible for and having final authority for operating, servicing, and securing the aircraft he or she pilots. At one point, during the attempt to set the aircraft down, the PI asked the PC to stop fighting him on the controls. If the PC's comfort level is such that guarding the controls to the extent it interferes with the pilot's control inputs, then the PC should consider taking control of the aircraft or query the pilot. The PC must act in a timely manner when tasks are not performed to standard or outside his/her comfort zone. Do not become complacent in the performance of even the most basic tasks. A review of the standard VMC takeoff task reveals several opportunities to prevent this mishap:

Extracted from TC 1-237 - PERFORM VISUAL METEOROLOGICAL CONDITIONS TAKEOFF

Crew actions.

a. The pilot in command (PC) will determine the direction of takeoff by analyzing the tactical situation, the wind, the long axis of the takeoff area, and the lowest obstacles, and will confirm that required power is available by comparing the information from the performance planning card (PPC) to the hover power check.

b. The pilot on the controls (P*) will remain focused primarily outside the aircraft throughout the maneuver to provide obstacle clearance. The P* will announce whether the takeoff is from the ground or from a hover and his intent to abort or alter the takeoff. The P* will select reference points to assist in maintaining the takeoff flight path.

c. The pilot not on the controls (P) and nonrated crewmember (NCM) will announce when ready for takeoff and will remain focused primarily outside the aircraft to assist in clearing and to provide adequate warning of obstacles.

d. The P will monitor power requirements and advise the P* if power limits are being approached. The P and NCM will announce when their attention is focused inside the aircraft and again when attention is reestablished outside.

Note. *Avoid unnecessary nose low accelerate attitudes;* five degrees nose low is recommended for acceleration. However, 10 degrees nose low should not be exceeded.

MOUNTAIN/PINNACLE/RIDGELINE CONSIDERATIONS: Analyze winds, obstacles, and density altitude. Perform a hover power check. Determine the best takeoff direction and path for conditions. After clearing any obstacle(s), accelerate the aircraft to the desired airspeed.

Note. Where drop-offs are located along the takeoff path, the aircraft may be maneuvered down slope to gain airspeed.

Fly with the full awareness of the nature and effects of your decisions.

U.S. ARMY COMBAT READINESS/SAFETY CENTER

During a multi-ship insertion under NVGs in mountainous terrain, the pilot on the controls placed the aircraft in an excessive nose low attitude while executing a take off from an aborted landing. When power was applied to arrest the rate of descent, the rotor speed bled off and the aircraft struck a rock formation nose first.

While conducting a multi-ship deliberate insertion under NVGs in mountainous terrain, the pilot on the controls aborted the landing attempt. As he was executing the takeoff from a pinnacle at approximately 8,650 MSL, he placed the aircraft in an excessive nose low attitude. When the pilot in command recognized the nose low attitude and increasing rate of descent, he applied power to arrest the descent. The environmental conditions, coupled with the aircraft weight, resulted in the rotor speed bleeding off as the pilot in command increased the collective. As a result, the aircraft was unable to produce the power demanded of it and descended nose first into a rock formation. The cabin area and fuselage were torn from the cockpit upon impact and several passengers were ejected from the aircraft as the fuselage rotated in the air. The fuselage came to rest on its right side approximately 50 meters from the cockpit.

Findings:

- PI* over-controlled the aircraft
- PC failed to act in a timely and appropriate manner
- Aircrew failed to utilize proper crew coordination

Recommendations:

- Emphasize importance of proper power management flight techniques
- Reinforce importance of crew coordination
- Ensure tabular data is utilized for performance planning before and during flight

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Mission briefings – necessary for mission success 14 Mar 1984 Flightfax

Too many times, people undertake tasks they don't fully understand or for which they are not prepared. This includes aircrews. If a crew is not properly briefed as to what a mission is all about and is not fully prepared for the mission, the mishap record shows that the results are usually a great deal less than desirable. If there is a gap in communications or a misunderstanding anywhere along the line in planning, coordinating, and briefing the mission, the operation can be in deep trouble before the rotors turn.

Lack of or incomplete mission briefings were cited as factors in the following mishaps. Although this did not definitely contribute to the crash in every case, it could have.

- The aviation company was on a three-day training exercise. The aviation personnel did not receive a briefing before the exercise began. The unit commander was not familiar with the requirement for a briefing, and the unit aviation safety officer did not attend the key personnel planning conference conducted before the exercise. The crews of three UH-1 aircraft were assigned a tactical air assault insertion mission. The air mission commander (AMC) attended a briefing given by the operations officer, but the briefing was not conducted in accordance with the unit field standard operating procedures. The operations officer did not use the checklist to brief the flight crews. Several required items were not briefed. It was almost midnight, and everyone was anxious to get to bed because of the early morning flight. The unit commander created an atmosphere of urgency associated with mission accomplishment. He was trying to make up time lost because of a weather delay. Because of the perceived sense of urgency, the flight was launched the next morning without a weather briefing. The aircraft had been pre-flighted the night before. A walk-around inspection, without the aid of a checklist, was done before the start of the mission. The crew of the lead aircraft checked the aircraft weight and balance computations but did not consider or prepare a performance planning card.

The three aircraft took off and flew to the pickup zone. The commander had told the crews to remove the passenger seats and to hurry up with the mission since they were late. Landing at the pickup zone, the three aircraft were loaded with seven passengers each. The crew of the lead aircraft did not brief their passengers and took off without one of the passengers being secured because they did not want to take the time for the passengers to rearrange themselves so everyone would have a seatbelt. There was also no passenger manifest on file. A few minutes after takeoff, the pilot of the lead aircraft began a shallow approach to a sloping area. The right skid hit the ground about 100 yards short of the intended touchdown point. The pilot tried to maintain control of the aircraft with cyclic inputs, but the aircraft rolled onto its right side. One passenger, who was not wearing his seatbelt correctly, sustained minor injuries. The pilot of the lead aircraft, in addition to operating under an atmosphere of perceived mission urgency, was suffering from fatigue. He had exceeded the unit's established limits for duty for the past 24-, 48-, and 72-hour periods and had slept only five hours in the past 24 and 11 hours during the past 48-hour period.

- Another UH-1 was the lead aircraft of a flight of four moving soldiers from one location to another. The copilot of the lead aircraft, who was at the controls, was unable to attend the pre-mission briefing and received summary-type information from the other pilot on board. There was not a wire hazard map in the field operations office, and a route recon was not done before the

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flight, which was to be conducted below the highest terrain feature.

After flying along a highway for several minutes, the flight went into a tactical trail formation, flying about 125 feet above the ground and 90 knots airspeed. The copilot saw one set of wires and flew over them, watching them out the right side of the aircraft. When he looked back to the front of the aircraft, he saw more wires in his flight path. The pilot, who was navigating, looked up about the same time. The Huey hit the wires and crashed into trees.

- A flight of six aircraft took off in weather conditions below that required for night VFR. The pilot of the No. 2 aircraft lost sight of the lead aircraft and inadvertently placed his UH-1 in a descending left turn after becoming spatially disoriented. The aircraft crashed and the three crewmembers were killed. A current weather briefing was not obtained before the flight, and the mission briefing did not include information on inadvertent IMC breakup procedures. The pilot had graduated from flight school a few months before the crash and had done no instrument work since graduating. The IP on board the aircraft had been on duty more than seven hours beyond the maximum allowable limit and was known to be fatigued.

- A unit was engaged in a field training exercise. The unit had no specific procedures for night operations or airfield operations, and a pre-exercise maneuver briefing was not conducted for the aviation personnel. An AH-1 pilot was assigned a night mission. The pilot did not get a weather briefing, did not prepare or consider a performance planning card, did not determine the correct weight and balance of the helicopter, and completed a through-flight inspection without the aid of a checklist. As the pilot prepared to take off from an unlighted confined area, the aircraft drifted aft and right at hover altitude. The main rotor blades hit several trees, and the AH-1 crashed.

- A UH-1 pilot had no formal mountain training or mountain flying experience, and the copilot's most recent mountain flying experience was nine years before. The aviators were assigned a mission to transport some soldiers to a mountain range, but neither aviator was briefed on the mountainous terrain flight. The helicopter was landed on a mesa, and the soldiers got out and completed their mission. They then got back in the aircraft and takeoff was made. The pilot tried to take off without considering the effects of weight, density altitude, and wind on aircraft performance. The commander did not require pilots to consider and plan operating limits of aircraft in relation to environmental conditions expected during the mission. The aircraft entered effective translational lift and the pilot increased power, reducing the availability of left pedal control. The aircraft then encountered adverse winds near the mesa edge which increased the requirement for left pedal beyond that available. The aircraft spun to the right and crashed.

Planning a unit's mission is management's job. And the chain of command up to the commander must become involved. Mission briefings which define all the parameters of the mission should be given by a member of the chain of command or by the operations officer in accordance with the unit SOP. This is particularly critical for single-ship , single-pilot missions, where the pilot is on his own, out from under direct supervision. While commanders and operations officers can't go on every flight, they can make sure the aircraft crew is prepared for the flight in every way possible. They can make sure before the flight that the crew has a thorough understanding of the mission, how the mission is to be flown, and the risks involved. Making sure the crew is fully briefed is the first critical step toward insuring mission completion.

Selected Aircraft Mishap Briefs

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

Utility helicopters

UH-60

-A Series. #2 engine inlet plug was reportedly still in place during start-up and the experienced a TGT over temp condition. Engine replaced. (Class C)

-A Series. Pilot initiated a hard right bank to avoid a flock of birds. Aircraft contacted a trees resulting in damage to the stabilator. (Class C)

Unmanned Aircraft Systems

MQ-5B

While on takeoff the UA veered off the runway into a concrete drainage ditch. System sustained significant damage. (Class A)

RQ-7B

Crew experienced failure of the right flap servo during landing. FTS chute was deployed and system was recovered with damage. (Class C)

System experienced a right Elerudder failure in flight. Recovery chute deployed and system recovered with damage. (Class C)

Preliminary Loss Reports (PLR)

ARMY PRELIMINARY LOSS REPORT 13043

AVIATION MISHAP CLAIMS FIVE SOLDIERS' LIVES

Five 3rd Combat Aviation Brigade Soldiers were killed in a UH-60L Black Hawk helicopter mishap that occurred on 11 March 2013 at approximately 2130 local in Afghanistan. The UH-60L was on an orientation flight when the mishap occurred. The aircraft was destroyed and all occupants were killed in the crash. The crew and passengers consisted of a CPT, CW2, SSG, SGT and a SPC. Details of the crash are not available at this time. A Centralized Accident Investigation (CAI) team from the US Army Combat Readiness/Safety Center is investigating.

These are the 1st Class A **Aviation** fatalities in FY13 compared to **4** for the same time frame in FY12. This PLR does not identify specific root causes of this incident as the investigation is ongoing. Further details will be available at a later date on RMIS (RMIS Login Required).

Preliminary Loss Reports (PLR) are ***For Official Use Only*** and are to provide leaders with awareness of Army loss as we experience it and to point out potential trends that affect our combat readiness.

Our Army depends on you to use these PLRs to help Soldiers understand the impact of decisions made on and off duty.

The U.S. ARMY COMBAT READINESS/SAFETY CENTER is interested in your comments; please click here to provide feedback on the Preliminary Loss Reports (PLR). FAQs Additional resources can be found on the USACR/Safety Center website at https://safety.army.mil

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

UAS Class A – C Mishap Table as of 18 Mar 13

	FY 12 UAS Mishaps					FY 13 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		6	W/GE	2	0	0	2
MQ-5	1		2	3	Hunter	2	0	3	5
RQ-7		5	20	25	Shadow	0	1	7	8
RQ-11			1	1	Raven				
RQ-20			4		Puma	0	0	4	4
YMQ-18	1			1					
SUAV			1	5	SUAV				
Aerostat	2	5		7	Aerostat				
Total for Year	9	11	28	48	Year to Date	4	1	14	19

U.S. ARMY COMBAT READINESS/SAFETY CENTER

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