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Aviation Safety FY2016 Review

The preliminary numbers are in for FY16 and there is some good news. The manned Class A flight accident rate stands at 0.87 mishaps per 100,000 flight hours. To put the FY16 rate into perspective, this is only the fifth time since the early 1970's, when more specific record keeping started, that the Class A flight mishap rate has fallen below the 1.0 mark per 100,000 flight hours. Additionally, the combined Class A through C rate also decreased to 6.31 flight mishaps per 100,000 flying hours. For broader term comparisons, the 10 year rate stands at 1.46 for Class A and 7.74 for Class A through C. The most recent five year marks are 1.25 and 6.88 respectively, demonstrating continued progress in reducing aviation mishaps.

Human error remains the leading causal factor in mishaps, having historically contributed to approximately 80 percent of all Army aviation accidents. For FY16, 16 of the 21 Class A and B mishaps were human error mishaps with three additional unknown or not yet reported. Crew coordination errors were cited in three of the Class A mishaps.

Enduring success in the aviation accident prevention effort requires proper implementation of the risk management process in aviation operations and adherence to the three-step mission approval process. Engaged leadership can, and will, have an effect in reducing accidents as demonstrated in the first quarter of FY16. Several commands conducted aviation stand-down activities to review the flight mission briefing process with an emphasis on risk mitigation, planning, briefings and After Action Reviews (AARs). They conducted analysis of Aircrew coordination and pre-accident plans and reviewed unit maintenance training, procedures and supervisory responsibilities. Aircrews reviewed adherence to flight operations standards and discipline. One AAR comment from the reviews stated "The safety stand-down, with emphasis at the highest level of command, seems to have generated open discussion, a thorough review of procedures and a mental re-caging of the importance of pre-mission planning and standards in aviation."

Can the safety stand-down effects be measured? Hard to say, but the accident rate at the time (1st QTR) was over 2.0 and trending up. The year finished with the previously mentioned FY rate of below the 1.0 mark.

Aviation Division
U.S. Army Combat Readiness Center
Fort Rucker, AL
334-255-3530
DSN 558-3530

Preliminary Report on FY16 Aircraft Mishaps

In the **manned aircraft** category, Army aviation experienced 65 Class A through C aircraft mishaps in FY16, a decrease of 18 percent from last year. Of those, nine were Class A accidents. This is 36 percent less than the Class A mishaps reported in FY15. There has also been a measured decrease in flight accident rates from last year. The Class A flight accident rate decreased nearly 43 percent from 1.52 in FY15 to 0.87 accidents per 100,000 flying hours in FY16. The Class A through C flight accident rate decreased 24 percent, from 8.32 to 6.31. Additionally, there was a reduction in total fatalities from 13 in FY15 to eight in FY16.

	2015	2016
CLASS A	14	9
CLASS B	14	12
CLASS C	51	44
TOTAL	79	65
FATALITIES	13	8

CLASS A Summary: There were nine (seven flight, one flight related, one aircraft ground) Class A mishaps, three of which occurred at night. One mishap occurred in Iraq/Afghanistan. A total of eight mishaps were attributed to human error with one not yet reported. Three of the flight mishaps resulted in 8 fatalities. The flight category Class A mishap rate (RW+FW) for FY16 was 0.87 (Class A flight mishaps per 100,000 hours of flight time). For FY 15 and FY14, the rate was 1.52.

CLASS B Summary: 12 (all Flight) Class B incidents were reported, seven with a human error cause factor, one materiel failure one environmental (lightning strike) and three not yet reported. A total of five mishaps occurred at night and five occurred during deployed operations.

CLASS C Summary: 44 (32 Flight, nine Ground, three flight-related) Class C mishaps reported with eight occurring at night. Cause factors included 22 human error, two materiel failures, two environmental (one bird, one lightning), and 18 unknown or not reported.

Operational Assessment :

Human Error: Degraded visual environment was a contributing factor in two Class A and two Class B aircraft mishaps. There were three associated with dust landings, and one with reduced visibility resulting in a wire strike. There were two fatalities resulting from one of the DVE mishaps. Power/maneuver management contributed to one Class A resulting in four fatalities. Additional Class A mishaps included three object/terrain strikes, one maintenance related and one external hoist mishap.

Materiel Failures: There was one Class A involving an engine failure (C-12) and one Class B engine failure mishap (TH-67).

2016 breakdown by aircraft type:

	Class A	Class B	Class C
UH-60	3	3	18
AH-64	4	5	4
CH-47	1	0	5
OH-58D	0	0	2
LUH-72	0	0	5
TH-67/OH-58	0	1	2
Mi-8/17	0	3	0
Fixed wing	1	0	8

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Synopsis of selected FY16 accidents (* denotes night mission)

Manned Class A

- AH-64D: Aircraft struck terrain while maneuvering. Class A damage reported.
- UH-60L: Aircraft struck trees while conducting combat maneuvering flight training. Four fatalities.

* AH-64D: During NVD training, after encountering DVE (reduction in visibility from rain showers) aircraft struck a set of high power lines. Two fatalities.
* AH-64E: During NVD training, aircraft experienced a failure of the main rotor system. Two fatalities.

- UH-60M: During dust landing aircraft rolled onto its side.
- C-12: Aircraft landed without power following engine malfunction.
- HH-60M: External hoist training. Service member fell resulting in injury.
- AH-64D: During runup aircraft spun on the pad and contacted an adjacent parked aircraft.

* CH-47: Main rotor blade struck terrain while conducting two-wheel landing.

In the **unmanned aircraft systems** (UAS), there were 40 Class A through C mishaps reported in FY16, an increase of 48% over the 27 in FY15. Of the 40 Class A through C total, there were 14 Class A mishaps reported compared to four in FY15. The most dramatic rise occurred in the MQ-1C Gray Eagles with 11 Class A mishaps compared to three the prior year, and reflected in the MQ-1C Class A – C rate increase of 80 percent from 13.76 mishaps, per 100,000 hours in FY15 to the recorded rate of 24.88 in FY16. For the RQ-7 Shadow the numbers were similar to last years with 17 Class B and C mishaps reported in FY16 to the 18 reported in FY15. There was a five percent rise in the mishap rate from 34.81 in FY15 to the FY16 rate of 36.62. Primary cause factor in UAS mishaps remain materiel failures with engine-related failures as a dominant cause. Human error cause factors center on failing to follow the checklist or designated procedures. 2016 breakdown by aircraft type:

	Class A	Class B	Class C
MQ-1	12	1	1
MQ-5B	2	0	0
RQ-7B	0	4	13
RQ-11	0	0	4
Aerostats	2	1	0
Total	16	6	18

The spike in Gray Eagle mishaps prompted senior Army leadership to establish a Gray Eagle (GE) Assessment Team. Comprised of SMEs from across various Army commands and led by the TRADOC Capability Manager (TCM) UAS, the team's mission was to direct and synchronize Army efforts to determine mishap root cause(s) and provide recommendations to prevent future incidents. The team's work has concluded and they have staffed their recommendations.

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Synopsis of selected accidents (FY16):

UAS Class A

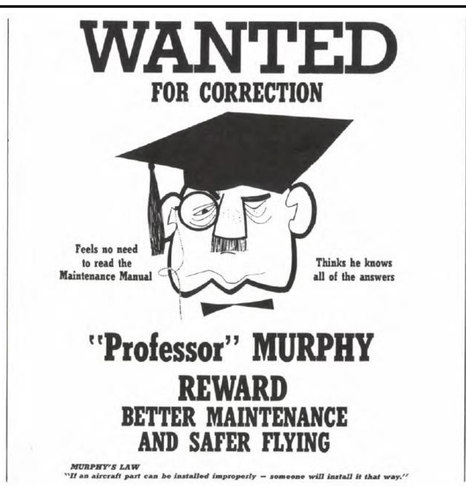
- MQ-1B: Unmanned Aircraft (UA) was unable to maintain altitude and lost link.
- MQ-1C: Following aborted landing, crew guided UA to open terrain for crash landing.
- MQ-1C: While maneuvering to land, UA lost altitude below recovery minimums and crashed.
- MQ-5B: System impacted terrain.
- MQ-1C: Engine lost power and crashed in the training area.
- MQ-1C: System entered un-commanded descent with decrease in manifold pressure. Crashed.
- MQ-5B: Vehicle lost power and crashed on short final of approach.
- MQ-1C: Engine overspeed occurred and vehicle lost altitude impacting the ground.
- MQ-1C: Engine failed in flight.
- MQ-1C: Crew reported engine temperature spike followed by engine failure.
- MQ-1C: Engine malfunction/failure occurred in flight.
- MQ-1C: High oil temp indications with loss of link. UA impacted the ground.
- MQ-1C: Loss of altitude in conjunction with a high OIL TEMP indication. System crashed.
- MQ-1C: Failure of the fuel system caused loss of engine power.

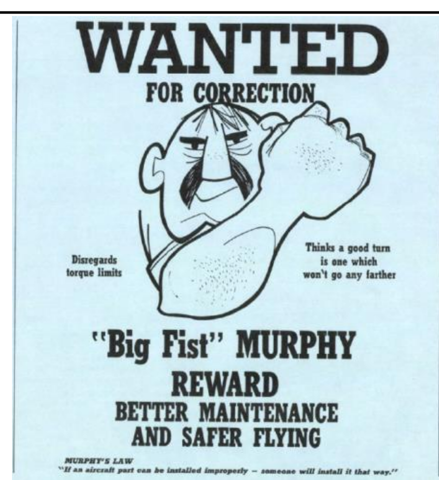
Aerostat Class A

- Aerostat separated from its mooring station and was destroyed.
- Aerostat struck by lightning.

Other UAS mishaps

- RQ-7B: UA lost altitude one mile short of the runway. Generator failure suspected. (Class B)
- RQ-7B: System experienced an engine failure with crew deploying the recovery chute. (Class B)
- MQ-1C: Loss link while ground taxiing. Vehicle struck a barrier with the left wing. (Class B)
- RQ-7B: Engine TEMP spike. UA lost altitude and impacted the range. (Class B)
- RQ-7B: Lost link on climb-out. Vehicle descend and impacted the ground. (Class B)





MURPHY'S LAW: "If an aircraft part can be installed improperly – someone will install it that way."

Maximizing Aircrew Coordination Training Effectiveness; A Reflection

WO1 Troy Smith and MAJ Mark VanVelduizen

On December 3, 2015, U.S. Army Forces Command (FORSCOM) - and soon after, National Guard Bureau, NGB - issued directives to cease flight operations in response to a rash of tragic Class A accidents in the Army aviation community; three in seven days. According to the FORSCOM memorandum, units were to accomplish several tasks during the stand-down, including "a review of Army Aircrew Coordination Training (ACT) with emphasis on overconfidence, complacency and excessive professional courtesy." Even with little available information regarding the nature of the recent accidents, the ACT review directive was no surprise. Aircrew coordination is frequently cited as a contributing factor in military and civilian aviation incidents. How could units ensure they were maximizing the effectiveness of their ACT reviews in complying with this memorandum? Is there a way to prove that a unit's ACT implementation methods are effective? How does leadership maintain awareness of their unit's aircrew coordination proficiency as a "soft" or non-technical skill (NTS)?

Perhaps a brief review of what ACT is and was intended to be from its inception is in order. From FY 84 to 89, Army aviation saw 147 lives and $292 million lost to accidents in which crew coordination was cited as a contributing factor. In response, the U.S. Army Research Institute (ARI) was directed to conduct aviation training research with the intent of improving crew performance. Crew Resource Management (CRM) training had already been widely implemented in civilian aviation circles, so the Army naturally adopted, modified and tested their own form of CRM. In the early 1990s, Aircrew Coordination Training was born.

When ACT was released Army-wide in 1994, the training was intended to be taken only once in an aviator's career. The class appeared to have been effective; according to ARI Special Report #56, published in May 2003, the Class A accident rate was cut in half from 1994 to 1995. However, over the next four years, the lack of sustainment training and other extraneous factors appear to have cost the Army in the form of consistently increasing accident rates. Research in CRM routinely supports that theory, showing that the absence of training reinforcement causes losses in CRM proficiency.

After the Army conducted another study to determine the best response for correcting the wayward accident trend, the Aircrew Coordination Training Enhancement (ACTE …not to be confused with Aircrew Coordination Training-Enhanced, from Training Curricular 3-04.11, Commander's Aircrew Training Program [ATP] for Individual, Crew, and Collective Training) program was initiated. Key objectives of the ACT re-boot included a campaign for ACT as a peer to technical skills, an emphasis on sustainment training, revision of evaluation tools and methods and internal continuing program evaluation. In essence, the Army wanted to explore ACTE as a program, rather than a one-time class.

In field studies, the new ACTE program showed promise, with marked improvement noted in both safety and mission performance simulations, despite the participants already having been certified in the original ACT, as discussed in ARI Special Report #56 (written during the development of ACTE).

The ARI report also identified training concepts that previous research had shown to be successful in long-term effectiveness for the "new" ACT.

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Such concepts included ACT integration into daily operations, continuous sustainment training and program evaluation to ensure relevance to the unit's unique aircraft, environment, METL, etc. and emphasis and encouragement of ACT behaviors and skills (what we commonly call ACT objectives and qualities) through instruction and evaluation.

Fast forward. Army aviation is again victim to rising accident rates and just recently, ACT was tapped via a FORSCOM memorandum as a tool to possibly curtail the trend. The September-December 2015 issue of Flightfax noted that "Army Aviation has seen a 30% increase in Class A-C mishaps over Fiscal Years 2013-2015, with a corresponding decrease in flying hours by approximately 25%." Combat losses? Generally not. 70% of Class A mishaps during the same time period occurred in non-deployed environments. Furthermore, as seen in the context of ACT's initial implementation, the force is downsizing and financially constrained. Although these are significant challenges, the branch has seen it before and adapted.

In the 1990's, the answer to dismal mishap rates came in the form of application, emphasis and sustainment of ACT, identified in ACTE program development and ARI Special Report #56. Perhaps ACT is the answer again today. But in order to save money – to, in fact, eliminate the need for any monetary funding of the effort – unit leaders should take it upon themselves to implement a research based, multi-faceted program to prevent the accident rate spike seen in the mid to late 1990s. What does that program look like?

Well, it doesn't look like a single class. Even if well-liked and executed, "one-shot" training has proven to be only temporarily effective. The single-class program results speak to the reason ACTE was created. It seems that the Army aviation community has forgotten the recommendations of the ACTE program and ARI Special Report #56. Human factors experts would propose that the aviation community holistically does not train CRM/ACT skills to the same standard as technical skills, and would further argue that empirical research that could guide a training program like ACT is largely ignored or underutilized by organizations. The result is either misguided training or neglected training.

Additionally, a successful multi-faceted ACT program doesn't look like a "likeability" survey. For example, although the current ACT class is generally well liked and there is some value in "liking of training," whether a unit likes the training is not an accurate assessment of the training's effectiveness. Behavior change as a result of positive attitudes toward training cannot reliably be expected. In Kirkpatrick's typology of training evaluation, whether or not a participant likes the training is the lowest level (least accurate form) of program assessment.

There are several methods that leaders – commanders, standardization pilots, instructor pilots, safety officers, unit trainers, pilots-in-command, etc. – can utilize to take ownership of their ACT program. Referring back to Kirkpatrick's typology, the highest level of training evaluation is commonly called the "Results Level." This is the assessment method that answers that big question for unit leadership … "Is my unit safer and more effective as a result of this training program?" In order to determine that, unit leaders should establish a definition – via safety metrics or otherwise – of training success in implementing ACT at their level and periodically assess their progress toward their desired results.

Mishap and incident causation trends are typically very difficult to determine due to the numerous variables involved and the relative rarity in which they occur. The subjective nature of "mission performance" is problematic in assessment as well. Because of this, Results Level assessments may be difficult to perform. However, there is good news.

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The second highest level of training program assessment is the "Behavioral Level." This assessment option calls for the evaluation of behavioral change due to training. The current ATP (2009) requires standardization personnel to instruct ACT in the context of the Directorate of Training and Doctrine, Flight Training Branch provided online courseware.

However, ACT focused, unit-level operations could feasibly be observed, trained, and informally evaluated by Standardization Personnel, Safety Officers, designated Instructor/Observers (IO), or simply Pilots-in-Command during simulation, crew brief, mission planning, rehearsal and debrief, among others. Evaluation tools for observation of ACT/CRM at the Behavioral Level already exist. Perhaps during a simulated flight, an evaluator stealthily observes - unbeknownst to the aircrew - and presents them with a Behaviorally Anchored Rating System (BARS) sheet and debrief upon completion of the flight. Maybe an evaluator rides in the aircraft and provides real-time feedback. Each individual aviator's ACT proficiency is assessed and documented, formally or informally. As individual proficiency is gained, training application can extend into more complex missions, mixed/multi-aircraft operations, ACT in the context of digital communication, etc. Note that this program is tailored individually and based on aircraft, aircrew role, unit mission, environment, etc.

Is there a need to develop and implement additional Army-wide ACT requirements? As General George S. Patton said, "Never tell people how to do things. Tell them what to do and they will surprise you with their ingenuity." Most units probably don't desire to incur additional reporting requirements. Alternatively, commanders could request ACT back-briefs in which units describe their ACT implementation, sustainment, and evaluation methods (which would be based on research in CRM training effectiveness and the units own Results/Behavior Level assessments). Upon realizing the effectiveness of a unit program, leaders should develop techniques to reinforce desired behaviors. This may include assignment as an IO for interested and apt individuals, designation as an ACT Program Lead for the unit, formal or informal awards, or simply public praise.

It has been proven that ACT/CRM training has statistically significant effects on both safety and mission performance aspects. Therefore, the Army aviation community should strive to apply and emphasize ACT/CRM as a continuing, progressive program and peer to other technical skills. This program may be most effective if designed and implemented at the unit level by interested individuals with a desire to improve unit performance and safety. The program would address how the unit applied, emphasized, sustained/reinforced, and evaluated ACT proficiency. It could be executed immediately, at no cost to the Army.

Units need to take ownership of their ACT programs and execute them in the spirit of what was intended when ACTE was developed. Unfortunately, there is no way to completely rid aviation of accidents, and human factors (i.e. aircrew coordination errors) are always present. However, the importance of ACT emphasis is undeniable. In doing so, future safety stand-down events should reflect a reduction in crew coordination errors as contributors to mishaps/incidents.

WO1 Troy Smith is an Instructor Pilot and Aviation Mission Survivability Officer in Company A, 1-130th Attack Reconnaissance Battalion. He is pursuing a Master of Science Degree in Aeronautics with a Human Factors specialization.

MAJ Mark VanVeldhuizen is the 449 Theater Aviation Brigade Logistics Officer, having prior training experience as a Battalion S3 and Brigade Assistant S3.

Mishap Review: MQ-1C Training Support

After conducting tasked flight operations, the MQ-1C Gray Eagle was returning to base when it experienced loss of command link. The aircraft then flew to the programmed contingency mission area and began orbiting. After command link was re-established, the crew observed an ENGINE OUT warning. The aircraft glided into the impact area and impacted the ground, resulting in a total loss of the aircraft.

History of flight

The mission of the Unmanned Aircraft (UA) was to perform reconnaissance and security, target handover and calls for fire for a combined arms training exercise. The crews arrived at the unit hangar for a 0400 show time and conducted a crew brief. The crews conducted pre-flights on the MQ-1C Gray Eagle UA and two separate One Station Ground Control Stations (OSGCS). After a weather delay, the UA departed at 0945 en route to a restricted area of the installation. A pre-planned crew change was conducted at 1130.

At 1340, the second crew commanded the UA to begin a descent in preparation to return to base, due to mission completion. The UA immediately exited the restricted area as programmed and entered the Class D airspace. At 1414, while the UA was preparing to turn final, the crew reported to the Mission Commander (MC) that the "vehicle was not responding" and that they had lost link from the OSGCS to the UA. The UA initiated lost link procedures and immediately turned toward the restricted area and exited Class D airspace. Once established in the restricted area, the UA flew to the programmed contingency mission area and began orbiting. The crew began troubleshooting and attempted to re-establish link with the UA. An additional crew began configuring a second OSGCS. At 1445, the crew in the second OSGCS re-established link with the UA. At 1446, the crew observed an ENGINE OUT warning and also observed the UA losing altitude and airspeed. The crew switched to knobs mode to steer the aircraft back to the airfield and conduct a power-off landing; however, they identified the UA did not have the glide distance required and maneuvered back out to the restricted area and lowered the landing gear. At 1451, the crew lost link with the aircraft. The aircraft continued to lose altitude and descended behind terrain near the impact area. The UA impacted terrain at 1452.

Operator experience

The Aircraft Commander (AC) in the Aircraft Operator seat (AC-A), had 398 hours of total time, all in the MQ-1C, with 43 hours as an AC. The Aircraft Operator in the Payload seat (AO-P), had 243 hours total time, all in the MQ-1C.

Commentary

While conducting UA operations, it is imperative that operators utilize the correct procedures for all phases of flight. After the appropriate procedure is selected in the operators checklist, each step must be followed. During a crew handover, especially under emergency circumstances, effective crew coordination must be utilized to ensure a shared understanding of the situation with all operators assisting in the recovery.

Mishap Review: AH-64 wire strike

While performing a visual meteorological conditions (VMC) flight at night using night vision systems (NVS), the aircraft impacted a set of high voltage power cables resulting in two fatalities and destruction of the aircraft.

History of flight

The mission was to conduct the PI's annual proficiency and readiness test (APART) standardization evaluation. The accident aircrew was briefed by the Mission Briefing Officer (MBO) and approved by the company commander with an overall residual risk of LOW. Forecasted weather for the mission window was: 9 degrees Celsius, seven miles visibility, ceilings broken at 1,500 and 3,000 feet AGL, winds 010@06 knots, and a tempo condition of ceilings broken at 1,200 feet AGL. The aircrew started their duty day at 1200L. The accident aircrew conducted a crew brief at 1245 followed by the preflight inspection on the accident aircraft.

After preflight, the aircrew assessed weather and generated a new Risk Assessment Worksheet (RAW) in which the only change was lowered weather minimums of 1,000 feet ceilings and one mile visibility. The new residual risk was MODERATE. The aircrew was re-briefed by the MBO in a face to face meeting and approved by the battalion commander via telephonic communications.

The accident aircrew took off at 1700L and completed a traffic pattern prior to departing the airfield. Then they flew to a nearby flight area and conducted combat maneuvering flight. The aircrew then flew to a training area where they conducted terrain flight maneuvers. The aircrew departed the area at 1811L en route to a second training area. While transitioning to the new training area, rain caused the visibility to drop and a degraded visual environment (DVE) ensued. The aircraft impacted a large set of powerlines at 1821L followed by impact with the ground and a post-crash fire. Both crew members were fatally injured. Predominate weather conditions in the area were ceilings broken at 1,500 feet AGL, winds 030@08 knots, and unrestricted visibility. Weather radar showed isolated rain showers moving west to east in the vicinity of the accident site.

Crewmember experience

The IP, sitting in the front seat, had 3,200 hours of total time, 3,100 in the AH-64D, 900 NVS, 333 NVG, 900 IP and 1,100 PC. The PI, operating from the back seat, had 1,800 hours of total time, 1,700 hours in the AH-64D, 550 NVS, 140 NVG, 230 IP and 890 hours PC.

Commentary

When operating in DVE, crewmembers must announce the conditions and adjust the flight parameters/path as necessary to ensure safe flight. Prior to entering known DVE or deteriorating conditions leading to DVE, the crew needs to discuss what their actions will be and if they should proceed as planned, adjust the plan, or abort all together. The crew was aware of the wires they were approaching.

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Commentary cont.

In DVE conditions, overall situational awareness is reduced and can hinder the visual identification of hazards in time to properly negotiate or avoid them. Negotiating wire hazards or other obstacles in DVE should be avoided, if possible.

When negotiating wire hazards identified on a map or display, it is important to confirm the location of the wire obstacles with the other crewmember and to announce when the wires and other obstacles are seen. Announcement should give adequate warning to avoid the wires and poles or support structures. Callout the location of the obstacle by the clock position, altitude, and distance method (The 12 o'clock position is at the nose of the aircraft). Give distance in kilometers or fractions of kilometers. Crew will announce the method of negotiating the wires and when the maneuver is initiated. The crew must maintain proper scanning techniques to ensure obstacle avoidance and aircraft clearance and communicate when the aircraft is clear of the wires.

Accident findings: From the archives for your review

FINDING (Present and Contributing: Human Error) While conducting an ATLS aborted landing with an MQ-1C Gray Eagle Unmanned Aircraft (UA), the Standardization Instructor Operator (SO) failed to recognize the aerodynamic effects of disengaging the ATLS, lowering the landing gear, and increasing the commanded airspeed on an aircraft with a known, power limiting mechanical failure. As a result, the aircraft was unable to climb and perform a second ATLS landing attempt. The actions of the SO caused the unmanned aircraft to descend prematurely and crash, prior to the runway, causing civilian property and total destruction of the aircraft.

FINDING (Present but Not Contributing): While operating an MQ-1C Gray Eagle UA, Performance Planning Cards (PPC) were not being completed prior to flight. The ATM requires the Aircraft Commander (AC) to compute or direct other crewmembers to compute the PPC to verify the aircraft meets the performance requirements necessary to complete the mission. Failure of ACs to properly prepare and apply performance planning could contribute to future accidents.

FINDING (Present but Not Contributing): While conducting emergency procedures during an attempt to land an MQ-1C Gray Eagle, the flight crew demonstrated a lack of positive crew coordination. This error in coordination occurred when the Standardization Instructor Operator (SO) did not announce his actions when making critical flight profile changes and potentially inappropriate actions were not questioned. The flight crew's lack of crew coordination was due to their overconfidence in the SO's ability to control the aircraft as well as the SO's haste to accomplish a second landing attempt.

FINDING (Present and Contributing: Human Error) While performing Combat Maneuvering Flight (CMF), at terrain flight altitudes, the Non-Rated Crewmember Flight Instructor (FI) and the Crew Chief (CE) failed to properly crew coordinate. That is the FI and CE failed to announce that the aircraft was operating at excessive bank angles and aggressive roll rates during terrain flight CMF training. This is in contravention to TC 3-04.33 Task 2127 and Chapter 6 "Aircrew Coordination". The aircraft descended into the trees and was destroyed with all crew members suffering fatal injuries.

FINDING (Present and Contributing: Human Error) While performing a VMC approach with sand and dust considerations in a UH-60M, the Pilot-in-Command (PC), on the controls, failed to announce his actions. That is, the PC failed to brief his crew on the approach he was conducting and failed to announce his desired point of touchdown. This is in contravention to TC 3-04.33 "Conduct a VMC Approach" and Chapter 6 "Crew Coordination". As a result, the crew was not aware of the intended point of touchdown and was not able to effectively assist in calling out hazards for the intended point of touchdown. The ACFT was severely damaged and the crew received minor injuries.

FINDING (Present and Contributing: Human Error) While responding to IIMC at night, using NVGs, in a UH-60M, the PI failed to take action in a timely manner to maintain aircraft control. That is, after flying into a layer of fog, the PI failed to take the flight controls from the AMC/PC who was spatially disoriented and had placed the aircraft in an unusual attitude. This is in contravention of TC 3-04.33, Chapter 6, Aircrew Coordination. The aircraft subsequently crashed resulting in multiple fatalities and destruction of the aircraft.

The Hawthorne effect and accident reduction...

Should an upward trend in accidents occur, this phenomenon can be used as a short-term fix but be wary of failure to identify underlying causes.

I was stationed in Korea during the summer of 1994 when Eighth U.S. Army (EUSA) had a series of aviation mishaps. About 12 major accidents occurred within a 3-month period –a totally unacceptable upward trend in accidents. The Commanding General held a meeting with aviation commanders to determine what could be done to reverse the trend. The inevitable safety stand-down days were held, and the mandated training in aircrew coordination was completed in record time.

A curious phenomenon regarding accident trends sometimes happens in Army aviation safety. After the Commanding General's meeting with aviation commanders, which was followed by increased unit emphasis on safe operations, the accidents mysteriously stopped. My battalion commander also noted this phenomenon and asked, "Why did the accidents stop after the Commanding General became involved?"

As a safety officer, I was also puzzled. I in turn asked a senior safety officer, CW5 Windell Mock, about this. He said, "Al, it's easy to explain. Think of it in terms of the Hawthorne effect." The Hawthorne effect? What is the Hawthorne effect?

The study

Webster's defines the Hawthorne effect as "the stimulation to output or accomplishment that results from the mere fact of being under concerned observation. "It refers to an interesting discovery made during a study at the Hawthorne plant of the Western Electric Company in Cicero, IL, from 1924 to 1932. The study focused on the effect that raising and lowering work area light levels would have on productivity.

Group A employees were *told* their work performance was being studied and monitored while the researchers *increased* light levels in their work areas. When higher light levels were applied, a corresponding increase in worker productivity occurred. Meanwhile, a control group was not informed about the close scrutiny of their performance with varying light levels. Although light levels were increased, their productivity remained the same. Group B employees were also *told* their work performance was being studied while researchers *decreased* their available light. Amazingly enough, their productivity also *increased* even though lights were turned down so dim they could barely see what they were doing.

The conclusion

It was not the increase or decrease in light levels that changed productivity. Productivity changed because workers became aware of the fact that they were part of a special group. Because they were being monitored and attention was being given to their work, the workers felt special, as if they were an elite group.

How does this apply to Army operations?

The Hawthorne effect may have been evident during the Desert Shield buildup. Following several early Class A accidents, it became evident that aviation units were operating in an environment like none they had encountered before. The Army's senior leadership quickly focused on this problem area and formed a team of experts to assess the hazards, particularly during NVG operations.

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Attention by the chain of command, the public, and the media put Army aircrew members in the limelight. Aware that they were the focus of intense efforts to establish more effective techniques for operation in the desert terrain, aircrew members took pride in knowing that America's Army was counting on them to perform as disciplined professionals in as safe a manner as possible until more effective NVG desert flying techniques could be determined. Consequently, even in preparing for imminent war in a harsh, unfamiliar environment, aircrew members began exercising more caution while an operations planning guide with a crawl-walk-run progression of unit NVG training programs in desert operations was being prepared. The result: a decrease in the accident rate.

Considering that at least 75 to 80 percent of all accidents are attributed to human performance, commanders and leaders at all echelons must consider and use principles such as the Hawthorne effect when attempting to control accident cause factors. The obvious lesson is that if you make a group or person feel special, they will usually respond in proportion to the degree of importance they feel. Our Army leadership recognizes this point and continually stresses that we have a trained and ready Army - one that is capable of decisive victory. America counts on them, and individual Soldiers can take pride in knowing that they are part of an elite group of warfighters trained to serve the Nation at home and abroad and to defend the interests of our country and those of our allies. Conversely, those same individuals and groups may perform in a proportionately negative manner if they do not feel that their superiors and peers view them in a positive manner.

A word of caution

The Hawthorne effect can also work in reverse. Historically, there are higher rates of accidents during static displays and air shows. This can be explained because aircrews fly to the limits of their abilities and the capabilities of their aircraft (and sometimes beyond) to satisfy their perceived notion that the public expects them to put on an exciting show.

There is another equally important consideration regarding this phenomenon. While intense command interest in aviation safety issues is certainly important and does appear to "activate" the Hawthorne effect, commanders should be aware that they have in many cases done nothing more than buy time if they do not discover the root cause of an upward accident trend. The true causes of the rising accident rates cannot be eliminated or positively controlled until they are identified. Unidentified, the real problems will only lie dormant until the focus of the command has relaxed, then the same problems often reoccur.

This is not to say that the Hawthorne effect is a good or bad thing. Actually, it is neither. It is simply a phenomenon that can be used to affect human behavior. Understanding and effectively using the Hawthorne effect is the key to its positive application. We must constantly strive to convey to our Soldiers that they are an elite group-the best-trained, best-equipped fighting force the world has ever known and demand nothing short of excellence from them.

We are coming off a great year in Army aviation safety. But when the attention afforded our significant FY 95 accomplishments subsides and accident rates begin to rise, we must remember to focus our efforts on identifying the underlying causes. At the same time, we can rely on short-term fixes such as the Hawthorne effect to remind aviation team members that they are indeed an elite group of warfighters and that the Army leadership is counting on each of them to curtail any upward trend in accidents.

Authors for the article were (in 1995) CW3 Alfred Rice and CW5 Windell Mock

Class A – C Mishap Tables

Manned Aircraft Class A – C Mishap Table										as of 1 Mar 17
	Month	FY 16					FY 17			
		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities		Class A Mishaps	Class B Mishaps	Class C Mishaps	Fatalities
1st Qtr	October	1	3	7	0		0	0	6	0
	November	2	1	1	6		1	0	3	0
	December	1	1	4	2		1	0	2	2
2nd Qtr	January	0	0	4	0		1	0	0	0
	February	1	1	3	0			1	1	
	March	1	3	2	0					
3rd Qtr	April	0	1	3	0					
	May	0	1	6	0					
	June	1	0	3	0					
4th Qtr	July	0	0	5	0					
	August	1	1	3	0					
	September	1		3						
	Total for Year	9	12	44	8	Year to Date	3	1	12	2
	Class A Flight Accident rate per 100,000 Flight Hours									
	5 Yr Avg: 1.25		3 Yr Avg: 1.32			FY 16: 0.87			Current FY: 1.05	

UAS Class A – C Mishap Table									as of 1 Mar 17
	FY 16					FY 17			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	12	1	1	13	W/GE	5		1	6
MQ-5	2			2	Hunter	2			2
RQ-7		4	13	17	Shadow		2	11	12
RQ-11			4	5	Raven				
RQ-20					Puma				
YMQ-18									
SUAV					SUAV				
UAS	14	5	18	37	UAS	7	2	12	21
Aerostat	2	1		3	Aerostat	2			2
Total for Year	16	6	18	40	Year to Date	8	2	12	23

Selected Aircraft Mishap Briefs

Information based on preliminary reports of aircraft mishaps reported in July thru December 2016.

Attack helicopters

AH-64D 

-During runup, aircraft's main rotor blades made contact with the main rotor system of a non-operating AH-64D causing damage and minor injuries. (Class A)

-Aircraft experienced an in-flight breakup. Two fatalities. (Class A)

Utility helicopters

UH-60 

-A Series. Aircraft landed hard during slope landing causing tail wheel damage. (Class C)

-A Series. Post flight inspection revealed damage to main rotor blade tip cap. (Class C)

-A Series. Bird strike (Class C)

-L Series. Crew chief sustained injury from a hard landing to an unimproved LZ. (Class C)

L Series. Tail rotor made contact with a light pole while taxiing at a civilian airport. (Class C)

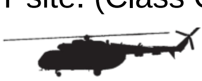
L Series. #1 engine high side failure resulted in TGT exceedance. (Class C)

-M Series. FLIR made contact with the ground during NVG approach. (Class C)

-M Series. Crew aborted takeoff for noise anomaly. FOD to #2 engine attributed to maintenance prior to flight. (Class C)

-M Series. While ground taxiing, the taxi matting material became unanchored striking the cockpit and damaging aircraft structure and components. (Class A)

-Aircraft experienced a main rotor blade strike during FRIES training in a confined area MOUT site. (Class C)

Mi17 

-On climb-out aircraft lost power and contacted the ground. (Class B)

Cargo helicopters

CH-47 

-Crew was conducting pinnacle landing training when the aft rotor system made ground contact causing aircraft damage and crew injuries. (Class A)

-#1 Engine cowling and work platform separated from the aircraft and made contact with one of the rotor blades. (Class C)

-F Series. During approach the left side cockpit door separated. (Class C)

-Aircraft experienced an over-torque condition following an NG over-speed of the #2 engine during hover check. (Class C)

Observation helicopters

OH-58D 

-Transmission over-torque occurred during gunnery training. (Class C)

H-6 

-N2/NR exceedance during manual FADEC training. (Class C)

Fixed-wing

C-12 

-U Series. At 1000 feet while on approach, the air stair door separated. (Class C)

-N Series. Aircraft experienced an over-speed condition during an in-flight climb, resulting in engine damage. (Class C)

-X Series. Crew experienced a dual engine N1 exceedance in conjunction with a power response to low indicated airspeed in flight. (Class C)

MC-12W 

During single-engine landing training, the #2 propeller contacted the ground causing damage. (Class C)

Continued on next page

Selected Aircraft Mishap Briefs

Information based on preliminary reports of aircraft mishaps reported in July thru December 2016.

Unmanned aerial systems

RQ-7B

-On landing UA veered off course and struck an object. (Class C)

-System experienced loss of RPM, followed by engine failure shortly after climb-out. Crew deployed the recovery chute and system was recovered with damage. (Class C)

-System became uncontrollable and the AC commanded the flight termination system (FTS) to be utilized, causing aircraft damage during landing. (Class C)

-System initiated an un-commanded descent during flight, followed by loss of control input. Recovery chute was deployed and system was recovered with damage. (Class C)

-Operator received an engine-failure notification and landed the system outside the perimeter. System was recovered with damage. (Class C)

-System was in flight when the crew experienced loss of altitude in conjunction with a high OIL TEMP indication. System crashed and deemed a total loss. (Class A)

-Low engine oil pressure. During RTB the vehicle crashed on base to final. (Class A)

-Military crew lost link with the system while ground-taxiing and the UA subsequently struck a barrier with the left wing sustaining damage. (Class B)

MQ-5B

-Primary engine failure. (Class A)

-Lost link. Vehicle not recovered (Class A)

-Crew experienced a TALS AS BIT FAIL indication at touchdown and system veered off course and struck an object. (Class C)

-System reportedly failed to gain altitude on climb-out from a failed TALS attempt and touched down off center on the taxiway contacting the left-side arresting net stanchion. (Class B)

MQ-1C

-System was in flight when it experienced a loss of power. The crew initiated the self-destruct command after the system descended below 2K feet. (Class A)

-Crew received indication of a temperature exceedance in engine operations. System reportedly experienced an engine 'flame-out' as the crew was attempting a descent. UA crashed. (Class A)

-Crew experienced a Manifold-Charge-Temp warning, followed by a 'FADEC Health Degrade' indication. Engine was observed to emit black smoke followed by impact with the -ground. (Class A)

-System was in flight when the crew experienced loss of altitude in conjunction with a high OIL TEMP indication and subsequent loss of contact/link. (Class A)

RQ-11B

-Crew reportedly lost link with the UA during initial take-off/climb-out and was unable to regain control through auto-correct or manual input. System deemed a total (unrecovered) loss. (Class C)

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

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