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Flightfax®

Online newsletter of Army aircraft mishap prevention information

Solid maintenance forms the foundation of an effective aviation training program. When the maintenance system operates effectively, we are able to safely generate the needed operational tempo to train the unit's pilots. However, if the maintenance program struggles, an increased level of risk is introduced as organizations perform their flight training. In the cockpit, human error mishaps increase as the complexity of the aviation environment increases. Maintenance errors follow the same pattern. As operational tempo increases, the pressures of repairing the aircraft will correspondingly increase, and unit commanders must make good risk management decisions on how to best balance their unit training programs and unit maintenance operations.

Material failure is loosely defined as a component that did not operate as intended or designed, and caused, allowed, or contributed to the malfunction. When an accident board investigates material failure, the basic question that must be answered is whether the malfunction was caused by a design defect or whether the failure was caused by an improper maintenance practice. Straight out of DA PAM 385-40, which describes the methods to conduct accident investigations, the first two steps when investigating a material failure are to "examine records and unit operating procedures", and "the materiel factors investigation must interface with human factors investigation to search for [Soldier] mistakes that may have resulted in the materiel failure." In other words, did the unit's maintenance program cause the mishap?

Unit commanders have the very challenging task of balancing the competing requirements of aviation flight training, aircraft maintenance, and external unit taskings. But this is not a new problem, just one that we have not seen for the past decade. One way to think about this is to approach maintenance operations with the same rigor as a flight operation. Have we clearly identified the maintenance mission tasks we are to perform? Have we conducted a risk assessment and mitigated all of our maintenance risks to the lowest level (who is our "maintenance MBO" that expertly looks at our risks and recommends controls), and have we performed our "crew selection" to assign the right Soldiers and leaders to the maintenance mission that are properly trained and qualified in these tasks. Like I said, not a new problem as this procedure sounds strikingly similar to our existing maintenance of P4T3 (problem, people, parts, plan, tools, time, and training). All we need now is to properly assess our maintenance risk and approve these actions at the right level of command and we will be on track for a solid maintenance program.

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

COL Mike Higginbotham
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Materiel Related Five Year Accident Review

During the last five fiscal years (FY10 – 14), there were 16 recorded materiel failure Class A flight or flight-related mishaps resulting in 14 fatalities. Additionally, there were five Class B and 36 Class C mishaps. Eight (50%) of the sixteen material failure Class A mishaps resulted in fatalities.

Leading accident events (Class A) Materiel Failure.

OH-58D/H-6

(1) The OH-58D was in cruise flight when a FADEC failure occurred. As the crew attempted a precautionary landing, the aircraft crashed and both crew members sustained fatal injuries.

(2) The H-6 experienced a Full Authority Digital Electronic Control failure. As the crew was attempting a precautionary landing, the aircraft crashed and both crew members sustained fatal injuries.

(3) The OH-58D experienced a suspected a materiel failure resulting in a limited power situation in which the crew was unable to sustain flight. The aircraft descended into trees destroying the aircraft, fatally injuring one pilot and seriously injuring the other.

(4) The OH-58D splined steel trunnion in the tail rotor assembly failed in flight. The aircraft sustained a loss of tail rotor thrust. The aircraft developed a rapid and uncontrollable right yaw and a vertical descent of approximately 4,000 feet/minute, impacting the ground. The aircraft fuselage was damaged and both crew members sustained fatal injuries.

(5) The OH-58D's electronic control unit (ECU) failed in flight. 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.

(6) At a hover, the OH-58D 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 (changed) and the aircraft impacted the terrain causing severe damage to the aircraft and one minor injury.

(7) 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.

(8) 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 crew was forced to execute a low-level autorotation to a level, plowed field. The aircraft was destroyed and the two crew members sustained injuries.

H-60

H-60M. 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 the pilot’s flight control inputs. The aircraft entered an uncontrollable yaw with increasing rate. The aircraft impacted the ground destroying the aircraft. Two crew members were seriously injured and one crew member was fatally injured.

CH-47F

While conducting CH-47F sling load operation, the sling load separated from the aircraft and impacted the ground. It was determined the 11K reach pendant failed.

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AH-64

(1) The crew of an AH-64D noticed a burning smell in the cockpit followed by CHIPS MAIN TRANSMISSION caution warning indications. On final approach to the landing area, the collective position did not correlate to the torque output of the engines. The aircraft impacted the ground in a level-roll attitude, approximately thirteen degrees nose up, and with approximately nine Gs of force. The aircraft sustained major structural damage and the co-pilot gunner in the front seat received significant facial fractures. Over-torqueing of the main rotor hub nut retention ring at the factory created improper pre-loading of the bearings and led to a catastrophic bearing failure and over-heating of the static mast.

(2) During level cruise flight under night vision systems/goggles (NVS/NVG), the AH-64E No. 2 generator malfunctioned due to an internal generator bearing failure. The generator developed a short resulting in smoke in the back cockpit, severe vibrations in the crew member's tail rotor pedals, and complete loss of A/C power to the aircraft No. 2 AC panel. The crew suspected an aircraft fire, anticipated a tail rotor malfunction, and began an immediate descent for landing. During the landing, the aircraft's main rotor blades contacted the ground, causing extensive damage to the aircraft.

(3) The AH-64D's lateral-servo actuator malfunctioned. This resulted in the lateral-servo actuator back driving the flight controls through the mechanical control input that was connected to the servo. The cyclic moved uncommanded to the left, rolling the aircraft approximately 60 degrees and causing an impact with the ground. The aircraft was destroyed, with no significant injuries to the crew.

(4) AH-64D suffered a catastrophic failure of the main rotor system. The aircraft crash resulting in two fatalities.

(5) During the termination phase (less than five feel AGL and less than six knots groundspeed) of a VMC approach in the NVS mode with the front-seat PI on the controls, the Flight Management Computer (FMC) commanded the backup control system (BUCS) ON in the roll channel and disabled roll channel stability and command augmentation system (SCAS). Full BUCS ROLL channel authority washed-in less than one second after BUCS was commanded ON, resulting in increased aircraft roll response and decreased control input dampening. The crew was unable to stabilize the aircraft attitude, resulting in roll attitude changes of 40 degrees to the right, 44 degrees to the left, and 78 degrees to the right in less than 3.5 seconds resulting in contact with the ground. The aircraft came to rest on its right side.

C-12

The C-12C departed controlled flight and crashed. A suspected materiel failure of unknown origin caused the aircraft to initiate a near-vertical descent from 25, 000 feet and impact a ridgeline. All three crew members were fatally injured and the aircraft was destroyed.

Flight Mishap Rate FY10 – 14

Total FY 2010 -2014 manned flight and flight-related mishaps

Hours flown: 5.8 million

CLASS A (80) Cause factor			CLASS A - C (442) Cause factor		
Human Error :	61 (76%)	Rate/100K: 1.05	HE:	334 (76%)	Rate: 5.75
Materiel Failure:	16 (20%)	Rate/100K: 0.28	M:	57 (13%)	Rate: 0.98
Environmental:	0		E:	20 (4%)	Rate: 0.34
Unknown:	3 (4%)	Rate/100K: 0.05	U:	31 (7%)	Rate: 0.53
Overall	80	Rate/100K: 1.38		442	Rate: 7.60

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Materiel Failure CLASS A – C Mishaps																
FY	Class A (16)						Class B (5)					Class C (36)				
	AH-64	H-47	H-60	OH	FW	Fatal	AH-64	H-47	H-60	OH	FW	AH-64	H-47	H-60	OH	FW
2010	1	1	0	1	1	5	1	0	0	0	2	1	1	3	2	1
2011	1	0	0	4	0	3	1	0	0	1	0	4	1	4	7	0
2012	0	0	0	2	0	2	0	0	0	0	0	2	0	2	1	1
2013	1	0	0	1	0	3	0	0	0	0	0	0	1	1	2	1
2014	2	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0
Total	5	1	1	8	1	14	2	0	0	1	2	8	3	10	12	3

No matter what goes wrong, there's always someone who knew it would

ALSE Video now available

A new product to assist flight crews with Aviation Life Support Equipment (ALSE) training has been added to the Aviation Directorate, USACRC website. It can be found at the following link:

https://safety.army.mil/ON-DUTY/Aviation.aspx

Click on Aviation Life Support Equipment

If you have ideas for future aviation products that you would like to see included with the products we already have, send us an email and we will review for possible production. Fly Safe!

AVIATION MAINTENANCE STANDARDIZATION

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AH-64D/E Maintenance Test Pilot Evaluator

During all Directorate of Evaluation and Standardization (DES) unit assessments, maintenance management and Maintenance Test Flight (MTF) standardization are assessed and results out-briefed to the appropriate levels of command. Additionally, DES Maintenance Test Pilot Evaluators (ME) provide mentorship and insight to unit Maintenance Test Pilots (MTP) in order to leave the unit with valuable tools to manage the commander's maintenance programs. Whereas the FORSCOM Aviation Resource Management Survey (ARMS) provides a well-rounded, generic assessment of unit resource management, DES MEs administer a more airframe-specific assessment of unit readiness and maintenance standardization. These assessments are based on, but not limited to, the following references: AR 95-1, AR 700-138, DA Pam 738-751, TC 3-04.7, TM 1-1500-328-23, Aircrew Training Manual (ATM), MTF manual, and appropriate IETM. The purpose of this article is to provide insight on noted trends across the Army aviation enterprise where it pertains to aviation maintenance standardization and to provide solutions to these trends.

PREPARATION FOR TRIAL

In the unfortunate event of an aircraft accident investigation, some of the maintenance-specific items a unit can expect to be inspected include: aircraft historical records, MTF sheets, and ULLS-A(E) maintenance and flight records. I refer to this record keeping as "preparation for trial," because we never know the day or the hour that our practices might be inspected for adherence to all applicable publications. Every maintenance action performed, MTF sheet filed, historical record entry made, and flight logged might just be the last opportunity to tell the airworthiness story. When considering maintenance documentation in this way, the importance of day-to-day maintenance management and historical record upkeep becomes obvious. How well has your unit prepared for that trial we hope never comes?

MAINTENANCE TEST FLIGHT SHEETS

The MTF sheet is signed proof that the aircraft has met the airworthiness standards of the appropriate MTF manual, but it's only as good as the data that is recorded on it. Task 4000 of each ATM describes the actions an MTP will take prior to performing a MTF, and should be the starting point for any MTF. Once the MTP inspects the aircraft logbook, he/she references TM 1-1500-328-23 and the appropriate IETM, determining whether to perform a General Test Flight (GTF) or Limited Test Flight (LTF) based on the maintenance performed. They then reference the appropriate MTF manual and review the maneuvers to be performed. Upon successful completion of the MTF, the MTP signs the MTF sheet and it becomes part of the aircraft historical records maintained in Quality Control (QC) to serve as proof of airworthiness. Lastly, the MTP completes all aircraft logbook and historical record entries IAW DA Pam 738-751.

A GTF is a detailed flight to test the airworthiness of the entire aircraft and prove all systems/components are functioning as prescribed in applicable aircraft maintenance manuals. It includes every maneuver in the MTF manual performed cover-to-cover to the standards of the appropriate ATM; however, one of the most common trends among assessed units is that GTFs are not being annotated as being completed. In other cases, the MTF sheet shows that a maneuver was

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performed incorrectly or the aircraft did not perform within allowable tolerances. Examples of this in the AH-64 include: Auto-rotational RPM check, maximum power check, TGT limiter/contingency power check, and emergency hydraulics check. In more severe cases, flight critical maneuvers and engine performance checks have not been performed at all and the aircraft has been released for flight.

An LTF evaluates the operation of specific items or systems. Only the applicable maneuvers or portions of the MTF manual required to verify satisfactory functioning of the item or system need to be completed. It is performed IAW TM 1-1500-328-23, appropriate MTF manual, and ATM when the completed maintenance does not warrant a GTF. Although MTF manuals prescribe the minimum checks that will be performed on every MTF (specified by double asterisks), the MTP must decide which additional LTF maneuvers will validate airworthiness based on maintenance performed. However, many MTPs are not performing MTF maneuvers that apply to the maintenance that was performed. Examples include: stabilator actuator replacement with no stabilator checks performed and flight control servo replacement with no hover maneuvering checks performed.

ENGINE PERFORMANCE CHECKS

The Engine Torque Factors (ETF) and Aircraft Torque Factor (ATF) required for accurate performance planning are derived from data noted by the MTP during the maximum power check. Once this data is taken and calculations made, it is transcribed onto the DA Form 2408-19-2 in the aircraft historical records for that particular engine as well as the engine HIT check log. In the AH-64 series aircraft, the ETFs are also entered into the aircraft ENG/ ETF page, and included in Performance Page (PERF) calculations. This creates four areas where an inspector can check to see if engine performance has been properly calculated and annotated: MTF sheet, DA Form 2408-19-2, HIT log, and aircraft ENG/ ETF page (if applicable). When these values differ, historical records are in error, true engine performance values are unclear, and the probability of crews inaccurately calculating aircraft performance planning increases.

USE OF TECHNICAL MANUALS AND DOCUMENTATION

DES MEs witness maintenance actions and note whether approved maintenance manuals are on hand while performing maintenance, often they are not. This occurrence has been noted throughout the range of maintenance tasks, from Preventative Maintenance Daily (PMD) inspections through tasks as intrusive as a main transmission replacement. The institutional knowledge that a seasoned maintainer possesses is a valuable asset, but is never a viable substitute for by-the-book practices. Additionally, many maintainers have lost familiarity of the 204-series manuals, most evident in incorrect application of safety wire and cotter pins. Although the MDS-specific IETM provides detailed maintenance task descriptions, maintainers are reminded that the 204-series technical manuals not only still apply to all aviation maintenance tasks, but are the foundation of sound aviation maintenance.

The most efficient maintenance program is only as good as its documentation; documentation that accurately describes aircraft status, fault, and corrective actions taken. Some aircrews are reluctant to make aircraft deficiency entries or rely on the crew chiefs to make these entries for them. By not committing to making an aircraft fault entry, aviators are allowing faults to continue on the aircraft, or encouraging undocumented maintenance. Additionally, it has been noted that maintainers' corrective action entries do not reflect proper actions or man- hours IAW IETM. Keep in mind that DA Form 2408-13-1 entries tell the story of what fault was encountered and action

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taken to correct the fault; detailed, by-the-book entries prevent ambiguity in determining faults and corrective actions performed.

Unfamiliarity with AR 95-1, AR 700-138, and DA Pam 738-751 leads to units assigning a status symbol that incorrectly reflects the seriousness of a fault. At best, this results in a low supply priority and longer repair part wait times; at its worst, it results in crews flying aircraft with “Red X” deficiencies that aren’t entered as such. Continuous training of airworthiness standards contained in AR 95-1, AR 700-138, and applicable IETM prevents erroneous status reporting.

STANDING OPERATING PROCEDURES (SOP)

Unit maintenance SOPs are written by maintenance managers and signed by the commander. However, junior Soldiers who perform the bulk of the maintenance actions rarely know what their unit SOPs say, much less comply with them. During ARMS, units are inspected and expected to have SOPs that address particular maintenance areas, but is your unit following the SOP signed by the commander? It’s common for maintainers at all levels to be unfamiliar with the SOPs they’re bound to abide by.

MSPU and IVHMS

The Modernized Signal Processing Unit (MSPU) and the Integrated Vehicle Health Management System (IVHMS) are invaluable in monitoring component health, vibration levels, and increasing Time Before Overhaul (TBO) intervals. Many units are reaping the benefit of reduced track and balance times afforded by these systems without paying due diligence to required recurring download requirements IAW applicable AWRs. This trend is discovered when Directorate MEs check the latest MSPU download and find aircraft that have been operating on vibration exceedances that require maintenance action. The trend is caused when maintainers download the data on time, but are unaware of the limitations stipulated in the applicable AWR and Condition Based Maintenance (CBM) manual. Additionally, increased TBO intervals occur when units report vibration trends to Huntsville for analysis, however, these increased intervals are slower in coming when units fail to report this data. These systems are great systems, but benefits are only realized when used to the system’s full potential.

WHY THE TRENDS AND WHAT’S THE FIX?

The Directorate doesn’t have access to any special references or publications that the unit doesn’t have access to. Maintenance assessments are based on the above references and all pertinent Airworthiness Releases (AWR), Aviation Safety Action Messages (ASAM), Aviation Maintenance Action Messages (AMAM), and Safety of Flight Messages (SOF). So, why are these trends so common? In some cases it’s that one maintainer is trying to perform too many roles while others fail to perform the role they’re assigned; some units claim they’re too busy to always do business by the book; in others, the experience level just isn’t there. In all cases, it’s lack of accountability.

The unit maintenance program belongs to the commander. It is supervised by the executive officer (XO), managed by the production control (PC) section, and enforced by the quality control (QC) section, MTPs, and platoon sergeants. The unit’s ME, or AMO if assigned, is the standardization officer for all aviation maintenance actions who synchronizes capabilities, resources, and training opportunities into an efficient maintenance program that maintains forward momentum. Holding maintainers accountable in their assigned roles is key in reversing these trends and maintaining an airworthy fleet.

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The PCOIC must be a trusted, quality-minded technical expert who understands the commander's intent and makes sound decisions accordingly. Likewise, the QCOIC must be a technical expert who understands the operational need for combat power generation. Historical records that are routinely inspected by the QCOIC and Technical Inspectors (TI) IAW applicable publications are normally well maintained and inspection-ready. MTPs must be unrelenting in the pursuit of airworthiness, paying equal attention to MTF maneuvers, maintenance documentation, and correct historical record entries while continuing to learn their craft.

The value of engaged platoon sergeants and TIs who maintain a presence on the hangar floor and flightline cannot be underestimated. TIs should possess unquestionable professional credentials and unrelenting adherence to Army-level maintenance publications as well as local SOPs. Soldiers who routinely perform undocumented maintenance or maintenance without required manuals are a product of habitual maintenance without supervision, mentorship, and continued training. Engaged TIs, whether they're NCOs or MTPs, reduce the probability of incorrect maintenance practices.

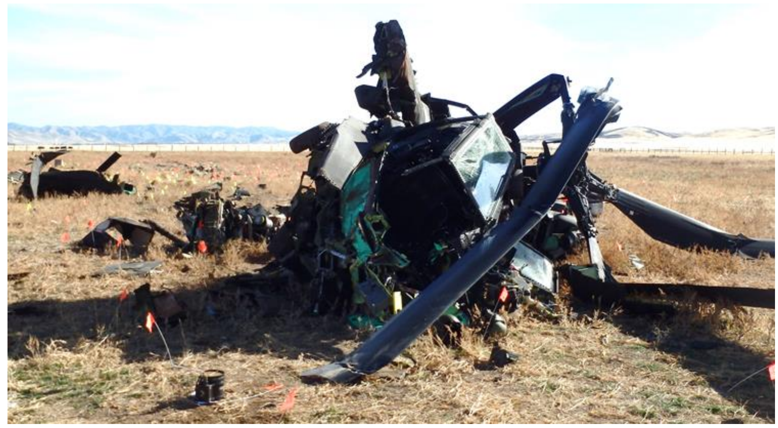
THE DEFENSE RESTS

The end state of all aviation maintenance tasks is mission accomplishment in airworthy aircraft. Army aviation maintenance programs are proven to be true to meet this end state by training maintenance Soldiers, MTPs, technical inspectors, and commanders to perform assigned duties. However, graduating aviation programs of instruction is just the beginning of the learning process. Involved, decisive leadership must encourage the continual education of the enterprise while demanding accountability in attaining prescribed standards. Encourage learning in your formations, trust your maintenance managers, but demand proper maintenance practices. In the end your unit will be prepared for the trial we hope never comes.

UAS Class A – C Mishap Table									as of 28 Feb 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	2
RQ-11			1	1	Raven				
RQ-20			1	1	Puma				
YMQ-18									
SUAV					SUAV				
UAS	7	13	16	36	UAS	1	1	2	4
Aerostat	3	2	3	8	Aerostat	0	0	0	0
Total for Year	10	15	19	44	Year to Date	1	1	2	4

Mishap Review: AH-64D EP Training

While conducting night, emergency procedures training, the NP speed of both engines increased to the overspeed protection setting resulting in a dual engine shutdown. The aircraft lost rotor RPM and crashed. Both pilots were fatally injured.



History of flight

The mission was a single aircraft night and night vision device (NVD) APART evaluation. The accident standardization pilot (SP) started his day at 0700 working as a technician at the support facility until 1730 hours. During the day the SP completed the aircraft preflight and the mission brief/risk assessment worksheet which was briefed by the mission briefing officer. The mission risk was LOW with the supervisor of flight (SOF) as the final mission approval authority. The instructor pilot (IP) receiving the evaluation reported for duty at 1745L. The weather forecast was for broken sky conditions at 10,000 feet and 7 miles visibility. Winds were out of the southeast at 12 knots. Temperature was 19 degrees C and altimeter 30.12 in/Hg. Sunset was 1728L, EENT at 1833 and illumination forecast of 100 percent. Moon was 19.75 degrees above the horizon.

The crew brief was conducted at the aircraft at 1810L followed by aircraft run-up and communications check with flight operations. At 1845L the aircraft departed the airfield en route to an assault strip training area located approximately two miles southwest of the airfield with an arrival time of 1850L. In the first traffic pattern, the crew conducted a simulated engine failure maneuver. The second traffic pattern the crew conducted a simulated NP fail low emergency procedure with the IP in the front seat initiating the maneuver from approximately 450 feet AGL. While performing the DECU lockout procedure, both engines accelerated to the engine overspeed protection limit resulting in a dual engine shutdown. The aircraft crashed resulting in destruction of the aircraft and fatal injuries to the crew.

Crewmember experience

The SP, sitting in the back seat, had 4,000 hours total flight time, 2,800 in the AH-64, 950 NVS, 600 combat and 1300 hours as an IP. The PI/IP located in the front seat, had over 4,600 hours total time with 2,500 in the AH-64, 950 NVS, 1,700 combat hours and 1,000 IP hours.

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Commentary

The accident investigation determined that during the conduct of the DECU lockout procedure with the #1 engine, the IP had started the maneuver by inadvertently taking the #2 engine out of the fly detent before confirming and then re-directing the procedure to the #1 engine. When the #1 engine was placed in lockout and the #2 engine not being seated in the fly detent, both engines accelerated to the overspeed protection trip point resulting in a dual engine shutdown. Rotor RPM rapidly decayed and the aircraft impacted the ground.

Note: The NP overspeed protection system was addressed in Flightfax Forum, January 2014 Flightfax.

	Manned Aircraft Class A – C Mishap Table									as of 28 Feb 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	1	2	0
2nd Qtr	January	2	2	4	4		2	0	5	0
	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	5	2	12	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: 1.80	

There is no "I" in "team," but there are four in "platitude-quoting idiot."

Risk Management for maintenance NCOs and mechanics

May 1994 Flightfax

Checking his watch on his way to work to make sure he wouldn't be late for the 0530 first sergeant's meeting, SSG Smith was thinking about the helicopter in phase and the one that had been grounded following weekend missions. After providing support for the first sergeant's taskers he was sure he was about to get, he was worried about how many people he would have left in his maintenance platoon to actually work on the aircraft.

1SG Jones looked up from the mound of paperwork to make sure all of his platoon sergeants were present. Today, he was going to need all the support he could get to fill the sergeant major's detail requirements. After all, he had promised the sergeant major that A Company would pull their weight at the battalion's annual weapons qualification range.

At 0530, 1SG Jones began issuing assignments for the day and requesting people from each of the platoons. He then turned to SSG Smith and said "John, I need you to be in charge of the range detail. You're the only available NCO. Any questions?" he asked quickly. "If not, it's time for PT formation."

After PT, SSG Smith took all but three of the people in his maintenance platoon to report to the sergeant major for range-detail assignments. Before leaving, he turned to SPC Pierce and said, "You take PFC Wilson and PVT Oates and go to the hangar. Work on the phase aircraft and see what's wrong with the one that was red X'ed this weekend."

Once SPC Pierce, PFC Wilson, and PVT Oates got to the hangar, the production control (PC) NCO and the maintenance officer called them together along with the technical inspector (TI) to set the priorities for the day. SPC Pierce was tasked to work on the phase aircraft along with PVT Oates. PFC Wilson was assigned to repack a tail-rotor quill on an AH-l.

Getting his assignment, PFC Wilson mused to himself, "I've never repacked a tail-rotor quill, but how hard can it be?" The PC NCO had told him that one of the TIs would supervise the job to make sure he was doing it right. PFC Wilson got out the manual, quickly scanned the maintenance task, put the book away, assembled the special tools along with his general mechanic's tool box, and started to perform the assigned task. He decided in the interest of time that he would do the paperwork after the job was done.

An hour later, the PC NCO called PFC Wilson and told him that he was needed to help with an engine flush on a UH-l because the crew chief was at the range and the aircraft was needed for an urgent mission. SPC Pierce was assigned to complete the job on the AH-l when he finished his present task.

About 45 minutes after starting work on the tail-rotor quill job, SPC Pierce walked to the TI shop and informed the TI that he needed someone to sign off the tail-rotor quill repack. When the TI and SPC Pierce arrived at the aircraft, the TI was surprised to find the tail-rotor drive shaft already installed. "Why did you install the drive shaft before I inspected the tail-rotor quill? I have to see if the grease was properly installed." SPC Pierce looked puzzled and replied "PFC Wilson had the quill installed when he had to go to the flight line. I just installed the drive shaft."

The TI went to his office and called the flight platoon and asked to speak to PFC Wilson. "That's the way I thought you did it" was the reply to the TI's questions. After several minutes of questioning the young private, the TI took SPC Pierce out to the aircraft and had him sign off the entry requiring the quill lube. Although the TI knew he should have SPC Pierce remove the

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drive shaft and plate assembly so that he could properly inspect the grease repack, he signed off the red X because he knew that SPC Pierce was needed to perform other tasks and PFC Wilson would be at the flight line for some time yet. The TI rationalized that surely no one could mess up a simple repack.

The next morning while the aircraft was being test flown for the tail-rotor repack and for rotor tracking, it experienced a complete loss of tail rotor thrust. The aircraft entered a right spin, rotated several times, and crashed. The aircraft was totally destroyed, but fortunately no one was seriously injured.

Inspection revealed that the tail-rotor quill output coupling had been improperly assembled. PFC Wilson had failed to install the centering spring, plate assembly, and retaining ring in the coupling as required by the maintenance manual, which caused the drive shaft coupling to disengage from the spherical coupling, resulting in loss of tail-rotor thrust.

This scenario is a composite of events from actual accidents and illustrates possible actions of sergeants and soldiers who, while trying to do a good job, get into trouble by failing to apply risk-management techniques in day-to-day business. How could a maintenance error of this magnitude have happened?

Applying risk management

Risk management is not a new concept. By now, everyone in America's Army should know the 5-step process (see below). If you still don't fully understand the process, invest some time in learning the basic concepts. Having a good theoretical understanding of the concept will make it a lot easier to apply the process to everyday situations.

Risk management is a tool that commanders, officers, NCOs, and mechanics alike can use to help them get the job done safely, but applying it effectively does take practice. Let's go back and see where and how the first sergeant, platoon sergeant, technical inspector, and mechanic could have more effectively used the risk-management process and principles to guide them in making some changes that might have prevented the serious maintenance error that resulted in the accident. While all the steps within the process are necessary, identifying the hazards and establishing control measures are key to success.

Hazards and control measures

First sergeant. The first sergeant failed to recognize the impact of taking so many people out of the maintenance platoon to support weapons qualification. At a minimum, he should have notified the commander to ensure the commander understood the impact on maintenance for that day. He should also have asked for guidance from the commander with regard to priorities in maintenance. If he had known the priorities, he could have selected better-qualified personnel to perform the maintenance tasks required and still supported the range detail. If necessary, he could have required personnel to be rotated from the range to ensure the maintenance work was continued throughout the day.

Platoon sergeant. The platoon sergeant failed to ascertain the tasks to be completed versus the capability of the mechanics left behind to do the work. He also failed to notify the PC NCO of their capabilities so that the PC NCO could assign tasks accordingly. This lack of communication led the PC NCO to believe the mechanics could do the work unsupervised. As a result, PFC Wilson was given a task he was not capable of doing without supervision. If the platoon sergeant had communicated the mechanics' general capabilities and limitations to the PC NCO, the PC NCO may not have assumed PFC Wilson was capable of accomplishing the quill repack without supervision.

Technical inspector. This NCO made the most grievous of all the errors in this scenario: he took shortcuts. The TI failed to accurately assess the impact of the hazard of an improperly installed input-drive quill. Although the task might have been an easy one, the TI failed to assess its criticality. He also failed to identify as a hazard the fact that there were no write-ups in the logbook for the tasks completed by PFC Wilson. How could he possibly know what the mechanic had done? He also failed to see that changing mechanics in mid task was a potential hazard. Taken individually, these hazards may not seem to amount to much, but cumulatively, small, seemingly insignificant actions can lead to improper decisions and more critical actions. The TI should have immediately noted that the inexperience of PFC Wilson was a primary hazard.

The TI could have placed several controls on PFC Wilson to ensure he completed the task properly. The mechanic's inexperience was not a reason not to do the task but simply a warning to the supervisors to watch carefully and control his actions. The TI should have made absolutely sure PFC Wilson used the manual on site and reminded him to make the appropriate logbook entries. And he could have had one of the other mechanics work with PFC Wilson to guide him through the task properly. Failing to apply any controls before signing off the work the inexperienced mechanic had performed and his decision to sign off the work without seeing write-ups was not in accordance with the standards. The TI failed to accept the responsibilities placed on him to ensure quality work was accomplished and the aircraft was safe to fly. Don't think this couldn't happen. It did happen!

Mechanic. PFC Wilson failed to realize that not using the manual while performing the repack was a hazard. He thought he could do it without the book. He also failed to understand that not completing logbook entries created a hazard for the person who tried to complete his task after he was pulled away to do another job.

Individual responsibility

Discipline* is *doing the right thing without supervision. And individuals can apply risk management procedures through self-discipline. If you know the standard, perform to the standard. If you do not know the standards, find out what they are. Soldiers should know their capabilities and limitations. If assistance is needed, ask for it. Following by-the-book procedures is a simple control measure for all individuals, regardless of the task being performed. Applying the risk-management process to everyday situations is one means of helping ensure that the right decisions are made regardless of whether we're in the planning or execution phase of a task or mission.

Summary

Risk management is not conducted only during planning and is not performed only by leaders and primary staff officers. Although we hold leaders responsible and accountable for running their organizations, safe mission accomplishment depends on individual soldiers accepting responsibility for risks associated with hazards discovered at their particular level. Only when every individual soldier makes decisions on the spot to manage risks as they occur during the task will an organization function as safely and efficiently as possible.

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Selected Aircraft Mishap Briefs

Information based on Preliminary reports of aircraft mishaps reported in January 2015.

Utility helicopters

H-60

-A series. Aircraft crashed just off the runway while on return flight to home station following a training mission. Crew was evacuated for nonlife-threatening injuries. (Class A)

-L series. Crew experienced a TGT over-temp condition (996.5°C/3sec) during engine-shutdown. Engine replacement anticipated. (Class C)

-L series. Crew experienced a TGT over-temp condition during engine-shutdown in conjunction with rotational training. Maintenance inspection confirmed requirement for engine-replacement. (Class C)

-M series. Crew was conducting ‘restricted visibility’ landing training to a local LZ when the aircraft main rotor system made contacted a ‘small cropping’ of birch trees. Crew performed a precautionary landing and post-flight inspection revealed damage to all four MRB tip-caps and de-lamination damage. (Class C)

Observation helicopters

OH-58D

-Post-flight inspection revealed tail rotor paddle damage associated with a tree strike. Engine data assessment ruled out associated sudden-stoppage damage.(Class C)

H-6

- Aircraft was witnessed to be spinning out of control prior to contacting a tree and coming to rest on its left side. (Class A)

Fixed Wing

UC-35B

-Crew experienced an engine-exceedance warning while in flight. Post-flight maintenance confirmed #1 and #2 N1 exceedances (103.5%/11sec and 107.9%/19sec, respectively). (Class C)

The purpose of realistic training is to produce combat-ready aircrews and equipment. A smoking hole does neither. The resources lost or destroyed on the way to the battle cannot favorably influence the outcome.

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

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