Flightfax
Number 80 August 2019 Online Newsletter of Army Aircraft Accident Prevention

Winter Weather Characteristics

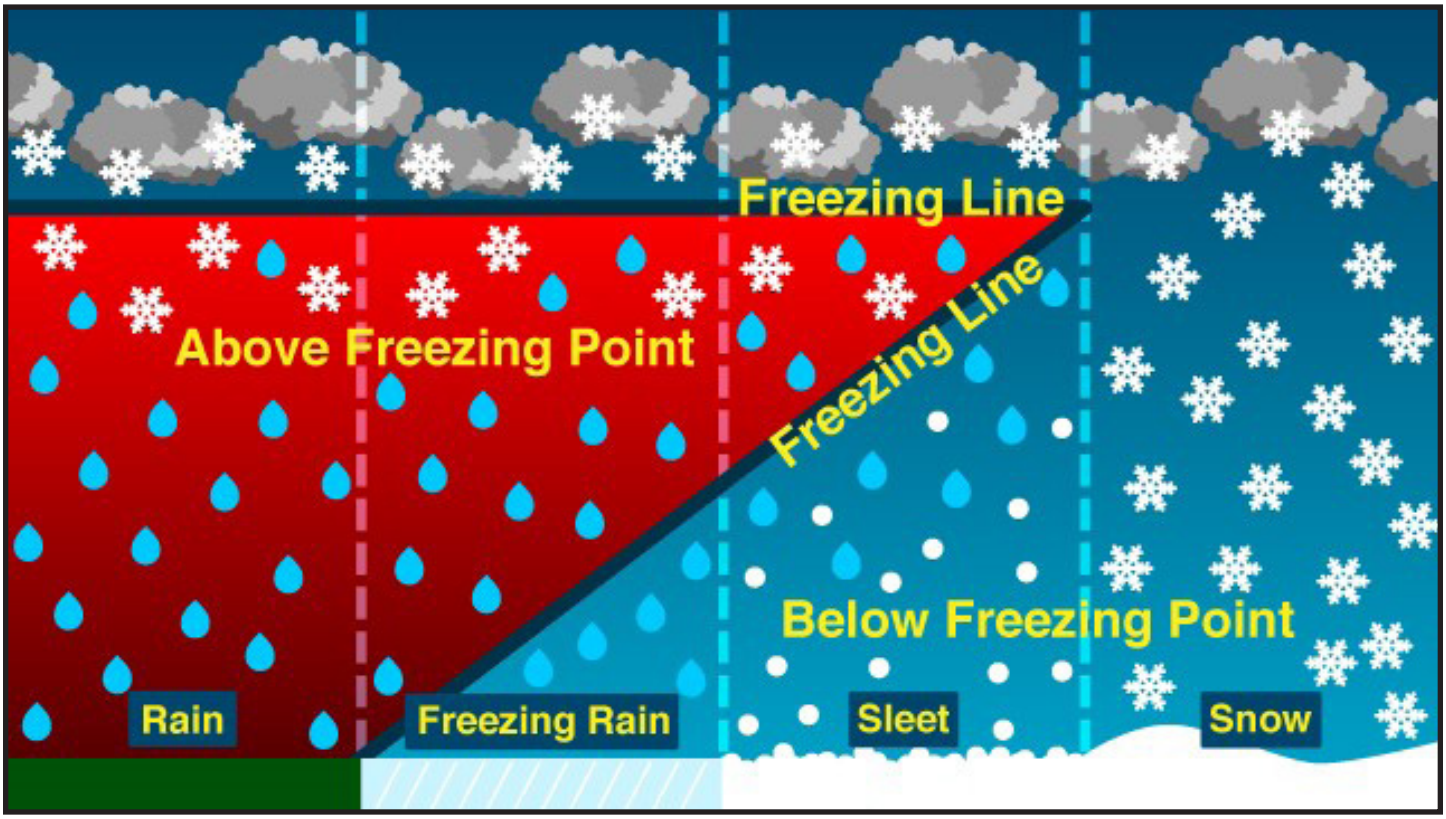


Figure 1. Profile view of environmental conditions for different types of precipitation.

As winter approaches, temperatures will drop, and when precipitation occurs, it can take several forms. Depending on where you live, you can expect to see rain, freezing rain, sleet or snow. With these different types of precipitation, you can expect to also see different types of icing. ***Figure 1*** shows a profile graphic of environmental conditions for different types of precipitation.

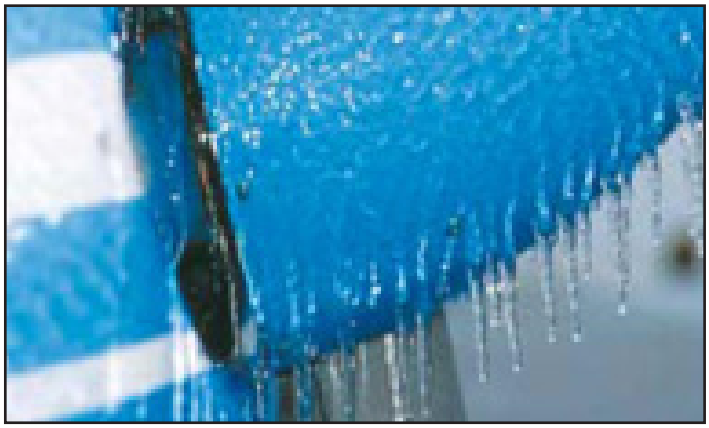
Precipitation

All precipitation starts off as ice crystals in the clouds. As the ice crystals fall through layers in the atmosphere, the temperature of the layer will determine whether the crystals will become rain, snow, freezing rain or sleet. Rain in the winter is just like rain in any other season. Ice crystals fall through a warm layer in the atmosphere and melt before hitting the surface of the earth as rain. When snow falls, it falls through a cold layer in the atmosphere and, with freezing temperatures at the surface, it will remain snow. Freezing rain occurs when ice crystals fall through a warm layer before hitting the surface as rain but, with the surface already at freezing temperature, it freezes on contact. And lastly, sleet occurs when ice crystals fall through a warm shallow layer and refreeze before hitting the surface as ice pellets. The big difference between freezing rain and sleet is that freezing rain freezes on contact at the surface while sleet is already frozen when it hits the surface. ***Figure 2*** on page 2 shows examples of freezing rain and sleet.

Icing

Icing can cause adverse effects to the lift, drag, weight and thrust of an aircraft depending on the type of icing and intensity. Three different types of icing that can occur are rime, clear and mixed icing. Most icing tends to happen in the temperature

Figure 2. Freezing rain and sleet examples.



Freezing Rain

Sleet/Ice Pellets

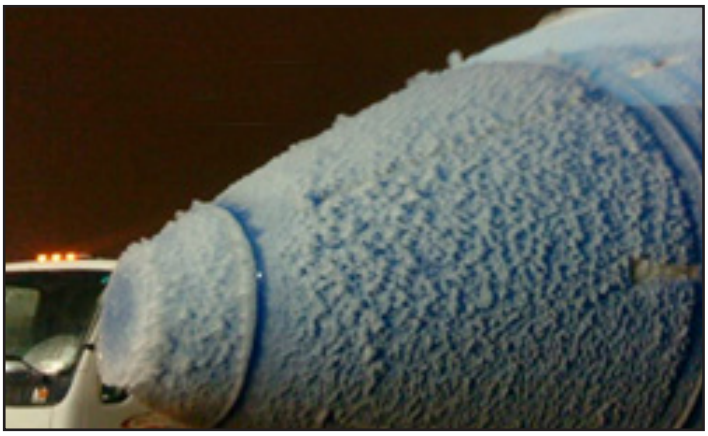
range of zero C and minus 20 C. Rime icing is small super-cooled droplets that freeze on contact and have a milky white or opaque color due to trapped air. Clear icing has a clear, smooth or glaze-like appearance. This type of icing is considered the most dangerous. It forms when larger, super-cooled droplets hit the aircraft and freeze gradually. Mixed icing has both rime and clear icing characteristics. It appears white, rough and irregular in shape. ***Figure 3*** to the right shows examples of the three types of icing that can occur.

The intensity of icing can be put into four categories: trace, light, moderate and severe. A trace of icing has no significant accumulation and usually is not hazardous. Light icing is significant accumulation when the aircraft is exposed over a prolonged amount of time, usually over an hour. If de-icing equipment is used during light icing, it can prevent accumulation. Moderate icing is when significant accumulation occurs during short flights and, if no de-icing equipment is used, can become hazardous. Severe icing is rapid and dangerous accumulation on an aircraft and de-icing equipment fails to reduce the accumulation.

During the winter, precipitation and icing can cause adverse effects on aircraft. Knowing what to expect can minimize the hazards of winter flight by allowing crews to make better preflight mission risk decisions based on the forecasted weather. ■

Master Sgt. Amy Montoya
Detachment 1, 1st Weather Squadron
U.S. Air Force
Fort Shafter, Hawaii

Figure 3. Rime, Clear and mixed Icing on aircraft



Rime Icing

Clear Icing

Mixed Icing

In-flight Icing and the Helicopter

Results of a U.S. Army investigation into the unique hazards facing rotary wing operations in the winter environment offers timely tips for all helicopter flight crews.

Traditionally, helicopter operating manuals have addressed the issue of in-flight icing and its effect on helicopter performance with a caution or a warning to the pilot to avoid an icing environment. Such restrictions and limitations were acceptable when helicopters were viewed as aircraft operating primarily in visual meteorological conditions (VMC). Since early helicopters lacked the equipment and sophisticated systems normally employed for flight in instrument meteorological conditions (IMC), there was little justification for expending valuable time and resources on helicopter icing research and development.

However, modern helicopters have a greatly expanded concept of operations, and today they routinely perform a broad range of tasks in IMC and marginal VMC. It is this expansion of the helicopter's operating envelope that compels a more thorough understanding of the hazards associated with in-flight icing.

Hazards of In-flight Icing

The risks associated with flight in subzero precipitation or moisture have been known since the pioneering days of fixed-wing flight. Typically, we have characterized icing problems by their effect on lift, drag, weight and thrust. It is readily accepted that in-flight icing reduces thrust and lift and increases drag and weight, all to the detriment of aircraft performance.

Rotary-wing aircraft also suffer from these effects when exposed to icing conditions and, in addition, are susceptible to various complications that are not common to fixed-wing aircraft. Although many questions remain regarding helicopter icing and its impact on aircraft performance and mission effectiveness, researchers are uncovering significant insights into this facet of helicopter development.

Rotor Ice vs. Wing Ice

The rotor blade icing process and its subsequent effect on helicopter performance cannot be analyzed in the straightforward manner used to explain ice accretion on the leading edges of a fixed-wing aircraft. Span wise elements of a rotor blade, unlike the leading edges of an airplane's wing, move through the air at various airspeeds.

Rotor blade icing is made even more complex by the constantly changing angle of attack experienced by the helicopter's main rotor blades in normal forward flight. These obvious and unique characteristics of the helicopter's lifting system, combined with differing surface temperatures along the blades' span wise sections and smaller airfoil thicknesses, make helicopter rotor blade icing complex and extremely hazardous.

Autorotational Qualities Degrade

A major operational hazard is the deterioration of normal autorotational qualities. The adverse effect of main rotor icing on autorotational performance was documented during artificial and natural icing tests conducted by the U.S. Army. A major finding was that moderate ice accumulation (approximately one-half inch) on inboard portions of the Bell UH-1H Huey rotor blade (and those on similar type aircraft) was sufficient to seriously deteriorate autorotational qualities by causing a loss of 22 rpm during autorotation at 70 knots indicated airspeed (KIAS). Deterioration of normal autorotational rpm results from ice accumulation in greater amounts near the inner portions of the rotor disc, which directly affects blade efficiency with respect to upward airflows during autorotation.

The reported result is that with about one-half inch of ice on the inner portion of the main rotor blades, minimum (safe) rotor rpm cannot be maintained during autorotation. Helicopter pilots cannot judge or estimate main rotor blade ice accumulation by observed buildup on the windshield or other parts of the aircraft, because icing occurs at an accelerated rate on the rotor blade as compared to accumulation on the fuselage. A more reliable method for monitoring the buildup of rotor blade ice on UH-1 type aircraft is to compare power requirements

after the formation of in-flight ice to power settings prior to ice detection.

Researchers indicate that blade icing of one-half inch or greater on the UH-1 will be accompanied by a 5 to 6 pound per square inch (psi) torque increase over the no-ice power requirement. Icing tests conducted in the United Kingdom document cases where significant autorotational rpm deterioration occurred with only 6 percent power increase over the no-ice power requirement.

Helicopter pilots should remember that even small buildups of ice on the main rotor blades can significantly deteriorate the available autorotational rpm to a level where safe landings cannot be assured. When in-flight icing occurs, most of the damage to autorotational performance is done by the initial ice accumulation, i.e., the first one-quarter inch of ice on the rotor blade. For helicopter pilots, this means that every encounter with icing should trigger an expanded crosscheck with careful attention to power settings.

If continuous increases in power are required to maintain altitude and airspeed, there is reason to suspect that autorotational rpm has been compromised and the aircraft should be removed quickly from the icing environment.

If the accumulation of rotor blade icing deteriorates autorotational rpm, then it would seem that the shedding of rotor blade ice would be welcomed. In-flight shedding of rotor ice can and does occur. Unfortunately, it is as likely to create a problem as it is to relieve one.

Symmetrical (affecting all rotor blades simultaneously in the same way) shedding of ice in flight can be beneficial by restoring the rotor blades to a more efficient or clean configuration and by reducing the weight of the aircraft. Asymmetrical shedding (affecting fewer than all of the main rotor blades), however, can create extremely severe vibrations depending on the amount of ice discharged, the type of rotor system and other factors. The severity of these vibrations has been documented by test pilots engaged in conducting natural icing studies with helicopters. Their reports identify numerous occasions where in-flight icing tests have been aborted because of main rotor blade icing and subsequent asymmetrical shedding which caused vibrations so severe that it became all but impossible to read the instrument panel.

The severity of vibrations resulting from asymmetrically shedding rotor ice is generally thought to be a function of the unbalanced weight of the rotor system and therefore may be expected to be greater for two-bladed and three-bladed systems than those rotor systems employing four or more blades.

Frozen FOD

Ice shedding from the main or tail rotor can also produce problems apart from an unbalanced rotor system. Although documentation is less than authoritative, researchers have expressed a concern for structural or foreign object damage (FOD) to the helicopter's fuselage, rotors or engines resulting from rotor blade shedding. This particular hazard appears to be more threatening to large multi-engine aircraft (more than 12,500 pounds) and especially for tandem rotor systems.

Asymmetrical shedding of rotor blade ice can be minimized by avoiding static temperatures lower than minus 5 C (23 F). Research tests with UH-1 type aircraft suggest that by rapidly varying main rotor speed or entering autorotation, symmetrical shedding may be induced when static temperatures are minus 5 C or warmer. Collective and cyclic inputs were generally ineffective in producing symmetrical shedding and may result in asymmetrical shedding. At temperatures below minus 5 C, it is generally not possible for a pilot to induce shedding.

The disastrous effects of in-flight icing on helicopter engines have been reported in many publications. In-flight icing presents a hazard to normal engine performance in two major ways — ice ingestion and air starvation. Ice ingestion is minimized on many helicopters by the availability of engine anti-icing systems used to prevent the accumulation of ice deposits in the area immediately forward of the compressor section. When operating normally and not overtaxed by environmental conditions, these systems considerably reduce the potential for damage from ice ingestion.

Even when aircraft are equipped with engine anti-icing systems, there remains a need for caution to ensure normal operation of the engines. Engine

anti-icing systems will prevent the buildup of ingestible ice deposits only when outside meteorological conditions or aircraft operating conditions (most notably forward airspeed) do not exceed system design capabilities. As an example, when operating normally the engine air inlet anti-icing system on the Sikorsky HH-3 (S-61) helicopter will maintain the engine inlet surfaces at or above 37.8 C (100 F). However, if outside air temperatures are very cold, extremely heavy icing conditions prevail, or the helicopter is maintaining a high forward airspeed, the engine air inlet anti-icing system will not be capable of maintaining a high enough temperature to prevent the buildup of ice in the engine inlet duct, and the potential for subsequent ingestion of ice deposits will exist.

Many HH-3 pilots have experienced occasions where cruise speeds in excess of 100 KIAS could not be maintained without illuminating the engine inlet anti-ice caution lights — an indication that the temperature of inlet air surfaces is not being maintained above 37.8 C and that the potential for ice ingestion has increased significantly. A common remedy for such conditions is to reduce airspeed to about 70 knots indicated airspeed (KIAS) which gives the anti-ice system a chance to recover from the high airspeed or harsh outside conditions.

Skip the Ice Cubes, Please

Even when the engine air inlet anti-icing system is capable of sufficiently heating the engine inlet surfaces, there is still the threat of random ice ingestion if deposits on rotors, fuselage sections, antennas or windshield surfaces shed ice and it is directed into the engine air intake stream. Shedding ice deposits from the helicopter, often larger than household ice cubes, can be devastating to engine compressor blades.

Perhaps the most insidious aspect of engine anti-icing is the case where an engine anti-icing system has been activated and failed to perform as expected. When a failure or malfunction in the anti-icing system does occur and there is no accompanying cockpit annunciator light or instrument to alert the pilot of a failure in the anti-icing system, it may create a false sense of security and no warning that an engine failure may be imminent.

Air starvation of the engine due to accumulation of ice on the engine inlet screens has been reported by the U.S. Navy and by other operators. Several helicopters had engine flameouts due to ice accretion on the engine inlet screens, and, in one case, air starvation of both engines occurred only a few minutes after ice was first noticed forming on the aircraft. Flight in icing conditions with inlet screens installed is extremely dangerous and must be avoided if at all possible.

Using Archaic Criteria

Icing forecasts may be of little use to helicopter pilots if they are not informed about how the various forecast icing rates were first determined. The standard weather service methodology and terminology used to characterize and classify the icing environment was developed from in-flight icing tests conducted on Douglas DC-4 and DC-6 type aircraft. Thus, such labels as trace icing, light icing, moderate icing and heavy icing, which are used to relate the rate of ice accretion on a fixed cylindrical probe on a DC-6, are of little use to the helicopter pilot in ascertaining or predicting the rate of ice accretion on a complex rotor system.

As an example, light icing is defined as an accumulation of one-half inch of ice on a small probe after 40 miles of flight. The rate of accretion is sufficient to create a hazard if flight is prolonged in these conditions, but insufficient to require diversionary action.

Although the prior definition may well be appropriate for a 100,000-pound airplane, there is no assurance that the rotating surfaces of a helicopter will accumulate only one-half inch of ice over the same 40 miles. Further, while one-half inch of ice on the wing of a large airplane might appropriately be called "light icing," there is every reason to believe that one-half inch of ice on the leading edge of most helicopter rotor systems could result in tragic consequences if autorotation became necessary.

HELICOPTER SAFETY
Vol. 16 No. 6 Nov/Dec 1990
Flight Safety Foundation

Mishap Review - UH-60L Flat Light Degraded Visual Environment

While aircrew members conducted a civilian search and rescue (CIVSAR) on a mountainous glacier, their aircraft descended below effective translational lift. The aircraft impacted the glacier and rolled approximately 210 degrees to the right, coming to rest inverted. The aircraft sustained damages. The crewmembers were not injured.

History

The mishap crew just completed a VIP mission when the state army aviation officer notified the pilot in command (PC) that the rescue coordination center for the area requested CIVSAR assistance for a small aircraft crash and personnel rescue from a glacier area. The mission was approved as medium risk and two aircraft were utilized for the mission. Mishap crewmembers obtained a weather briefing and determined the weather was acceptable. Crewmembers of the two aircraft departed their home base and, while en route, encountered marginal visual flight rules (VFR) weather. Crewmembers continued the mission, maintaining VFR to their refuel stop. They departed the refuel site and continued mission to the location of the downed aircraft personnel.

Pilot reports from the area stated the weather was deteriorating. While Chalk 2 personnel initiated contact with the crash personnel, mishap aircraft crewmembers (Chalk 1) maintained communications on the common traffic frequency for the area of the crash. Chalk 1 continued to the crash site while Chalk 2 remained in orbit about 3 miles away to monitor the operation. By the time the aircraft arrived on-site, the visual conditions were reduced to a degraded visual environment (DVE) induced by flat light conditions from ice and snow on the ground. During the execution of a low recon and while in a left turn to evaluate the crash site for a usable landing zone; the aircraft entered a descent and contacted the terrain. The aircraft rolled approximately 210 degrees to the right onto its roof and came to rest inverted. No injuries were sustained by crewmembers.

Crew

The PC had 2,182 hours in mission, type, design, and series (MTDS), and 2,850 hours total time. The pilot (PI) had 74 hours in MTDS and 3,259 hours total time.

Commentary

The aircraft PC had experience operating in the flat light conditions encountered during the mishap. While conducting the reconnaissance to determine the condition and location to land near the crash site, the PC failed to maintain orientation of the aircraft due to the DVE created by the flat light environmental conditions. The aircraft was allowed to begin an uncommanded descent while decreasing airspeed to below effective translational lift (ETL). Accompanying the PC's loss of orientation and situational awareness was the crewmembers' failure to use proper communication to assist the pilot on the controls in maintaining altitude and airspeed, both necessary to maintain flight and prevent controlled flight into terrain.

The situation these crewmembers found themselves in can occur anytime certain mission types are performed in like conditions for multiple hours. Aircrew members can lose that fear of the unknown while becoming overconfident in their abilities to manage the mission and the environmental conditions. In this mishap, crewmembers fell prey to overconfidence and lacked execution of base task crew coordination. The flat light conditions which produce an optical illusion and cause pilots to lose their depth of field and contrast in vision produced a DVE due to light and snow/ice conditions in the CIVSAR location. Pilots and crewmembers must maintain their vigilance and verbally assist the pilot on the controls with input on aircraft and flight status. Simple crewmember actions as stated in the aircrew training module and training support packages, e.g., PI calling out airspeed and altitude, acknowledging DVE conditions, and verbally identifying current threats to flight, make the difference between accomplishing the mission or a mishap. ■

Class A - C Mishap Tables

	Manned Aircraft Class A – C Mishap Table									as of 25 Sep 19
	Month	FY 18					FY 19			
		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		1	1	4	0
	November	0	1	4	0		0	0	4	0
	December	1	0	8	0		1	1	2	0
2nd Qtr	January	1	1	4	2		1	1	0	0
	February	0	0	2	0		2	0	0	0
	March	0	1	11	0		0	1	5	0
3rd Qtr	April	1	1	4	2		0	1	3	0
	May	1	0	5	0		2	2	5	1
	June	1	0	5	0		0	0	5	0
4th Qtr	July	1	0	6	0		2	1	2	0
	August	3	1	8	1		1	0	3	1
	September	1	1	8	1		1	1	4	
	Total for Year	11	9	72	6	Year to Date	11	9	37	2
	Class A Flight Accident rate per 100,000 Flight Hours									
	5 Yr Avg: 1.23		3 Yr Avg: 0.97			FY 18: 1.19			Current FY: 1.11	

UAS Class A – C Mishap Table 19									as of 25 Sep 19
	FY 18					FY 19			
	Class A Mishaps	Class B Mishaps	Class C Mishaps	Total		Class A Mishaps	Class B Mishaps	Class C Mishaps	Total
MQ-1	3	1	4	8	W/GE	9	2	3	14
MQ-5	1	0	1	2	Hunter	1	0	0	1
RQ-7	0	7	20	27	Shadow	1	12	37	50
RQ-11	0	0	0	0	Raven	0	0	0	0
RQ-20	0	0	0	0	Puma	0	0	1	1
SUAV	0	0	0	0	SUAV	0	0	0	0
UAS	4	8	25	37	UAS	11	14	41	66
Aerostat	3	3	1	7	Aerostat	1	1	1	3
Total for Year	7	11	226	44	Year to Date	12	15	42	69
UAS Flight Accident rate per 100,000 Flight Hours									
MQ-1C Class A	5 Yr Avg: 9.56		3 Yr Avg: 9.87		FY 18: 3.52			Current FY: 8.89	
RQ-7B Class A-C	5 Yr Avg: 52.84		3 Yr Avg: 52.31		FY 18: 43.34			Current FY: 108.90	

Fleet Notes of Interest

Enhanced Inlet Barrier Filter (EIBF) Installation, Usage and Data Gathering throughout the Fleet / Currently not Fleet wide air worthiness release (AWR)

SUBJECT: EIBF installation and usage data gathering throughout the fleet. Specific units are currently operating under a limited AWR, and it is not qualified fleet wide.

In the past, Utility Helicopter Project Office (UHPO) mined logbook entries for statistical indication of actual use and then applied the findings as an estimation to the fleet. We're seeking to identify a confident means to build statistically relevant answers to these type questions.

UHPO's best estimate is less than 1 percent of total operating time is recorded utilizing EIBF systems on all airframe models (A/L/M). The system is utilized during operational missions, combat, qualifications, environmental and other desert/dust training by designated units.

UHPO is reaching out to H-60A/L/M end users for input to help document actual operations of EIBF systems under any flight conditions.

Best guess is a given for this informational gathering.

Please provide the following to the best of your knowledge as a maintainer, pilot, etc.:

1. Roughly how many are/were installed?
2. Roughly what percentage(s) of flights or flight hours included actual operation of EIBF?
3. What conditions were they used under?
4. What issues did you have (bird strike, failures, etc.)?
5. Were there any failures of the EIBF that caused the aircraft to be grounded or caused an in-flight emergency?
6. What positive statements can you provide?
7. Any other information that you might find supportive for this effort?

The end state is that your input will be used to provide data to support a fleet-wide full qualification. More responses will provide a collection of valuable information to support this effort so please forward this data search to others who might have knowledge or experience in EIBF operation.

Please send responses to:

Tom Migliozzi, 256-955-7357
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Comm: 256-955-7357 C: 256-690-8036

Small Unmanned Aircraft System (SUAS) Parts Needed

SUAS users,

In order to maintain good configuration management and provide timely replacement of SUAS parts, we need each unit that owns Raven and Puma SUAS to contact our warehouse at the email below. PM-UAS uses a supply chain management tool called COLTS to document supply transactions and configuration management. It's very important for each unit to provide their:

- UIC
- Unit home location
- System serial numbers.

Without accurate information on file, parts requisitions will be delayed. Thank you for your support. Contact at: usarmy.redstone.peo-avn.list.avn-uas-suas-parts@mail.mil or call (256) 327-7271.

SUAS Logistics Team

Blast From The Past: *Articles from the archives of past **Flightfax** issues*

PRELIMINARY ARMY AIRCRAFT MISHAP DATA

USAAAVS FLIGHTFAX

VOL. 2, NO. 6 • 14 November 1973

Icing Information Needed

Information is needed to continue research dealing with the operations of Army helicopters in icing conditions. If you experience icing effects during any helicopter flight, please fill out this questionnaire and mail to USAAAVS. The information will be used strictly for accident prevention purposes. Help us help you!

1. Aircraft: ☐ LOH ☐ UH ☐ AH ☐ CH
2. Time: Winter ☐ Spring ☐ Summer ☐ Fall ☐ Time of day: _____
3. Type of mission: _____ Location: _____
4. Flight Plan: ☐ VFR ☐ IFR
5. Weight: ☐ At max gross ☐ Slightly below gross ☐ Far below gross
6. Forecasted weather (temperature/dewpoint/precipitation): _____
7. Actual weather (temperature/dewpoint/precipitation): _____
8. Phase of flight icing occurred (mark each appropriate block): ☐ Takeoff ☐ Climb ☐ Cruise ☐ Landing ☐ Hover
9. Altitude: AGL _____
10. Indicated airspeed: _____ knots: _____
11. Type icing: ☐ Clear ☐ Rime ☐ Frost
12. Intensity: ☐ Trace ☐ Light ☐ Moderate ☐ Heavy (TM 1-300)
13. Rate of buildup: _____
14. Problems encountered:

	Yes	No
Navigation	☐	☐
Communication	☐	☐
Control	☐	☐
Visibility	☐	☐

15. Where was ice first noticed? ☐ Rotor head ☐ Blades ☐ Intakes ☐ Windshield ☐ Landing gear ☐ Other (specify)
16. Was anti-ice equipment used? ☐ Yes ☐ No What and how effective? _____
17. Vibrations encountered? (Describe) _____
18. Effects on power? _____
19. Pilot experience: Hood or weather last 30 days _____ Last 60 days _____ Last 90 days _____
20. Other pertinent remarks: _____

Mishap Briefs #80

ROTARY WING

Attack

H-64

E Model – Reported main rotor blade contact with vegetation/ tree branch during flight. Post-flight inspection revealed damage to blades #2 and #3. (Class C)

FIXED WING

C-12

D Model – Crew was negotiating a turn while ground taxiing the aircraft when the right propeller made contact with a taxi light. Aircraft was parked without further incident. (Class C)

UNMANNED

MQ-1

C-ER Model – Crew experienced loss of line of sight (LOS) with the unmanned aircraft system (UAS) during final approach and reported attempts to gain alternate ground and satellite terminal linkage were unsuccessful. Aircraft was recovered following crash. (Class A)

– Unmanned aircraft system (UAS) sustained damage from unforecasted weather/hail while in flight. (Class C)

RQ-7BV2

– Crew experienced a reported power surge just short of touchdown on landing and the aircraft subsequently impacted the arresting gear drum on roll-out. (Class B)

– During the mission, the air vehicle (AV) experienced a flap servo failure and was returned to base (RTB). On the second attempt to land, the main landing gear separated from the fuselage, causing the AV to skid and impact the arresting cable. Data transfer cartridge (DTC) software allowed the AV to land with increased airspeed with reported prior landing attempt anomalies. (Class C)

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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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Flightfax 5

COLD WEATHER QUERY

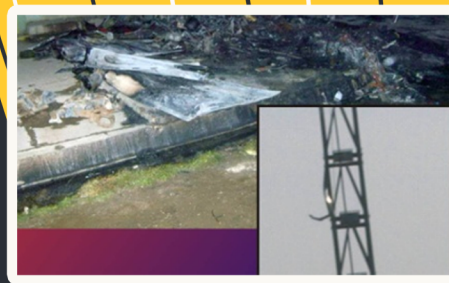
Cold weather operations are just around the corner, so how ready are you and your team for it? Your ability to operate your aircraft in varying weather conditions has a huge impact on being able to prevent damage to your system from improper preflight, run-up, or in-flight operations. Cold weather provides numerous threats to you, your crew, your supporting team and your aircraft. Take a look at some cold weather instructions that follow and see if you know the ones for your particular airframe:

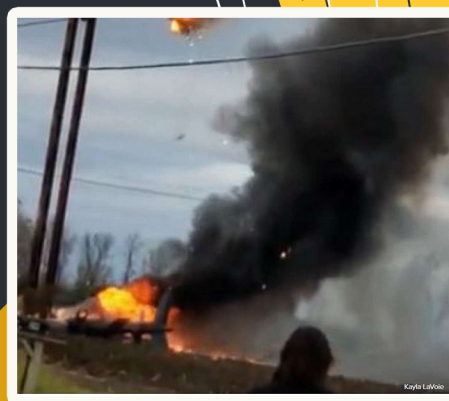
- **WARNING:** Static electricity generated by the helicopter should be discharged before attempting a sling or rescue hoist pickup. In cold, dry climatic conditions static electricity buildups are large. Use a conductor between the helicopter and the ground to discharge the static charge. Delay lowering rescue hoist hook until helicopter is over the load, to lessen static charge buildup.
- **NOTE:** During operation in cold weather, particularly when snow or moisture is present, the tail wheel locking indicating systems may give erroneous cockpit indications.
- **CAUTION:** Ice removal shall never be done by scraping or chipping. Remove ice by applying heat or deicing fluid. Blade de-ice operation with erosion strips installed may cause blade damage.
- Failure to remove snow and ice accumulations can result in serious aerodynamic, structural effects in flight and serious foreign object damage if ice is ingested into the engine.
- When cruising at cold temperatures (below minus 10 C), increased vibration levels may be encountered which can be alleviated by operating at 98 percent NR.
- While checking the engines, the compressor should be manually checked for freedom of rotation. Heat must be applied if the compressor is frozen.
- At temperatures below minus 18 C, preheating the aircraft is recommended for a minimum of 1.5 hours. Emphasis should be placed on engine fuel control units.
- **CAUTION:** Fuel draining from the affected component after several minutes of heat application does not necessarily indicate that all ice has melted. Ice may still remain in the unit and it could be a serious hazard to flight operations. Heat should be applied for a short time after fuel begins to flow from the drain and the drainage should be checked frequently until it is evident that all water has been removed.
- **Tail Rotor Teetering Bearings.** The tail rotor teetering bearings are made of elastomeric material which require special warm-up procedures prior to operation in cold weather flights. One member of the crew should apply a teetering motion by manually pushing back and forth at the tip of the tail rotor blade until the blade has reached its teetering stops. When the blade can be pushed to the stop, the bearing has been sufficiently warmed up.

5 Questions

1. **True or False**, according to the H-60M -10: At temperatures between minus 38 C and minus 54 C, cycle collective slowly for five minutes.
2. **True or False**, according to the H-64E -10: Abort start if oil pressure does not register within 30 seconds of initiating start.
3. **True or False**, according to the H-47F -10: Taxiing on the forward gear (aft wheels off the ground) is recommended to reduce poor visibility resulting from blowing snow.
4. **True or False**, according to the H-64E -10: TADS/PNVS may fail to initialize and experience erratic performance during cold starts at temperatures below minus 30 C.
5. **True or False**, according to the H-60M -10: When starting engines exposed to low temperatures, watch for rise in TGT within 30 seconds. If no TGT rise is evident, manually prime the engine and attempt another engine start.

WIRES & TOWERS are Killers





Follow the Seven Steps for Prevention

- Follow your TSPs and SOPs for Terrain Flight Operations
- Leader supervision - Enforce the standards in the TSP and SOP
- Daily updated operations master hazard map and updated software for aircraft map applications
- Mark wires and understand the pitfalls of wires through low barrier areas and flying in unfamiliar terrain
- Use terrain flight altitudes when necessary and avoid excessive speeds at low altitudes
- Maximize crew coordination and use every set of eyes
- Slower as you go lower, give yourself and crew time to identify the wires coming up

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