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OH-6A

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MISHAP EXPERIENCE REPORT

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OH-6 MISHAP EXPERIENCE REPORT

1 July 1967 through 30 June 1971

by
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and
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Directorate for Aircraft Accident Analysis and Investigation



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Commander

FOREWORD

Cause factors which contributed to mishaps involving the OH-6A aircraft during the period 1 July 1967 to 30 June 1971 are identified and analyzed in this report. Recognition and analysis of these factors are important today if better operating procedures, maintenance techniques and training methods are evolved for tomorrow. A study of these factors can also provide statistical data useful in demonstrating a need for additional design and quality control requirements in the future. This cumulative report should be of interest to all of us in aviation since any change in the above related fields would serve to affect and improve our current flying operations.

As evidenced in this report, materiel and operational problems were the two major concerns involving OH-6A mishaps during this period. Materiel problems were predominately caused by engine failures and engine malfunctions. Operational errors were primarily attributed to low level operations resulting in the aircraft colliding with obstructions such as wires and trees. Other operational problems involved autorotation/emergency landing techniques and violation of regulations and/or unit SOP's.

A review of mishaps involved in low level operations which were not required by the mission or dictated by weather conditions indicates many mishaps could have been prevented through proper supervision and training. With this kind of knowledge, I am confident that commanders at all levels in the Army can meet the challenge of insuring an effective accident prevention and safety program within their commands.

I urge you to review this report and apply the lessons in it along with your professional expertise to the betterment of the Army aviation program.

FRANCIS MAX McCULLAR
Colonel, Infantry
Commanding

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1 JULY 1967 THROUGH 30 JUNE 1971

INTRODUCTION. This report was prepared to aid commanders, aviation safety officers, maintenance officers, aviators, and related aviation personnel in accident prevention and the preservation of combat resources through a review of past OH-6A mishaps and their cause factors. The term "mishap" includes accidents, incidents, forced landings, and precautionary landings as defined in AR 385-40. "Damaging mishaps" are those reported as major accidents, minor accidents, and incidents. "Nondamaging mishaps" are forced and precautionary landings. Aircraft losses or damages which were the direct result of combat action are not included in this report.

SYNOPSIS. The OH-6A was involved in 1,554 mishaps from 1 July 1967 through 30 June 1971. There were 563 accidents (of which 241 were classified as total losses), 357 incidents, 187 forced landings, and 447 precautionary landings. Based on 1,229,271 flying hours reported during this 4-year period, the accident rate per 100,000 flying hours was 45.81. These accidents involved 93 fatalities and 362 nonfatal injuries. There were six in-flight fires and 34 postflight fires. Aircraft damage occurred in 920 of the 1,554 mishaps, costing about \$31,470,000.

Personnel factors were involved in approximately 55 percent of the accidents and incidents and materiel factors were involved in 83 percent of the forced and precautionary landings.

The primary types of crew errors reported in damaging mishaps involved practice autorotations and striking wires, trees, and other objects. Engine and tail rotor problems were involved in the majority of materiel failure/malfunction mishaps which resulted in damage.

CONCLUSIONS. During this reporting period, Vietnam accounted for 89 percent of all OH-6A reported flight time (1,166,827 hours), 99 percent of the fatalities (92), 97 percent of the injuries (351), and 98 percent of the accident/incident cost (\$31,023,000).

Crew error was reported as the principal cause for the majority of damaging mishaps. Lack of discipline on the part of the operators—stretching the limitations of the aircraft plus failure to use standard procedures—was evident.

Supervision-related mishaps were minimal. The supervisory factor may be one of omission rather than commission. An active command-controlled program is required to generate knowledgeable, skillful, disciplined aviators.

Mishaps caused by materiel failures and mal-

TABLE 1
Number and Classification of Mishaps

Classification	Total	FY 1968	FY 1969	FY 1970	FY 1971
Accidents	563	60	204	193	106
Incidents	357	16	124	124	93
Forced Landings	187	17	85	49	36
Precautionary Landings	447	44	103	113	187
Total	1554	137	516	479	422

functions can be reduced by adherence to established maintenance procedures, an effective quality control program, and by involved supervisors.

DISCUSSION. Table 1 shows the number and classification of OH-6A mishaps reported during this period.

Of the total mishaps reported, approximately 36 percent were classified as accidents. Forty-two percent of the accidents were classified as total losses. Fiscal year 1969 shows a definite increase in all categories of mishap classifications. This increase could be attributed to: (1) the total number of aircraft deployed to RVN during that year; (2) the increase in flying hour program; (3) the rapid influx of newly trained aviators; and (4) the environmental condition in which the OH-6A was being operated. Although the number of mishaps increased in FY 1969, the accident rate decreased by comparison to FY 1968.

Figure 1 shows annual OH-6A accident rates, based on the number of accidents per 100,000 flying hours.

The accident rate has gradually declined from 66.7 accidents per 100,000 flying hours in FY 1968 to 36.8 accidents per 100,000 flying hours in FY 1971. During FY 1971, the flying hour program and number of aircraft in the Army inventory were also reduced.

Of the 1,554 mishaps reported, approximately 89 percent, or 1,382, occurred in Vietnam. These mishaps by classification and location are shown in table 2.

TABLE 2
Types of Mishaps by Location

Classification	Total	CONUS	Vietnam
Accidents	563	23	540
Incidents	357	25	332
Forced Landings	187	26	161
Precautionary Landings	447	98	349
Total	1554	172	1382

As shown in table 3, 455 personnel were injured or killed during this 4-year period. Fatality rates per 100,000 flying hours are shown in figure 2. The overall fatality rate for the 4-year period was 7.56 per 100,000 hours.

TABLE 3
Injuries

Location	Total	Fatalities	Injuries
CONUS	12	1	11
Vietnam	443	92	351
Total	455	93	362

The total cost of all mishaps which resulted in damage during this period was \$31,470,000. Figure 3 shows the total mishap dollar cost, plus the dollar cost per flight hour, for each fiscal year. Approximately 98 percent (\$31,023,000) of the total cost resulted from mishaps which occurred in Vietnam.

Table 4 shows the number of cause factors by type mishap. Mishap cause factors outnumber

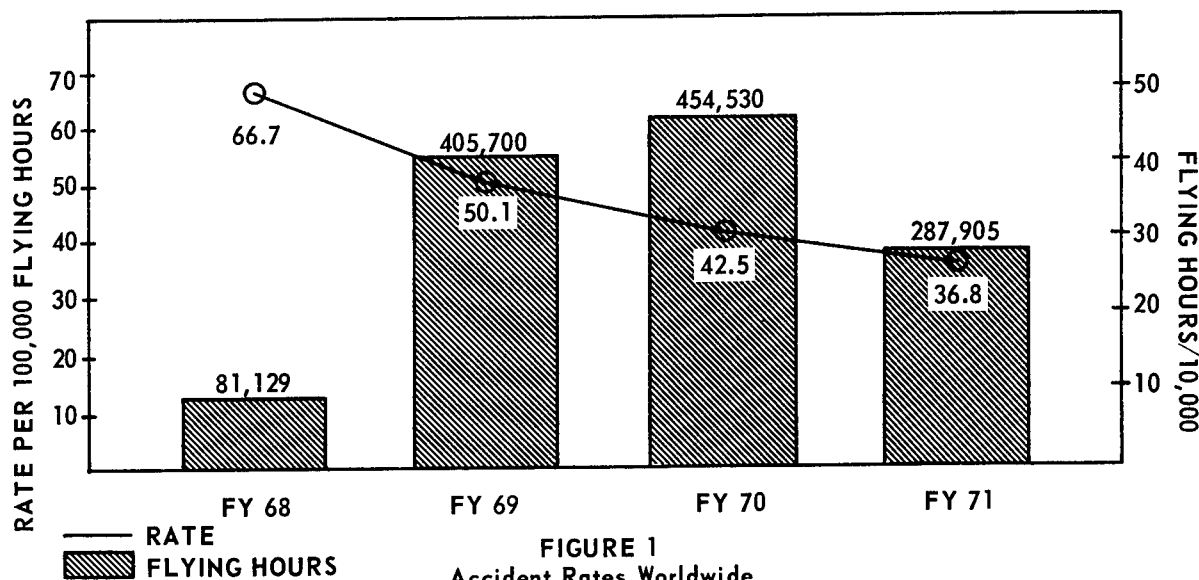


FIGURE 1
Accident Rates Worldwide

TABLE 4
Mishap Cause Factors

Cause Factors	All Mishaps	Total Losses	Accidents	Incidents	Forced Landings	Precautionary Landings
Materiel (fail/mal)	848	123	130	44	168	383
Flight crew	668	169	240	237	8	14
Unknown/other	144	6	20	104	1	13
Maintenance	104	14	20	5	28	37
Supervision	76	28	42	5	1	0
Weather	58	20	16	17	0	5
Facilities	47	14	18	13	1	1
Training	21	11	10	0	0	0
Design	17	8	7	0	0	2
Ground crew	8	0	3	2	1	2
Command	4	3	1	0	0	0
Total	1995	396	507	427	208	457

the total reported mishaps. This is usually the case because mishap investigation often reveals that more than one cause contributed to the mishap.

Materiel factors accounted for approximately 42 percent of all causes, and crew errors accounted for approximately 33 percent. If mishaps which resulted in damage were grouped together (discount forced and precautionary landings), cause factors would realign as crew error approximately 49 percent and materiel as 22 percent.

Table 5 shows significant materiel and crew error causes. Cause factors resulting in major accidents were, in order of frequency: engine

malfunctions, unsuccessful emergency autorotations, practice autorotations, and tail rotor system malfunctions and strikes (aircraft struck trees, wire revetments, antennas, etc.). Of the 409 crew accidents (including total losses), 194 (48%) resulted from a single phase of operation—autorotation. There were 95 practice autorotation accidents and 99 emergency autorotation accidents.

In table 5, the line "antitorque control" refers to mishaps identified with the warning note in chapter 8 of TM 55-1520-214-10, change 4, concerning abrupt turn maneuvers. The problem, normally called "tail spins," can result from

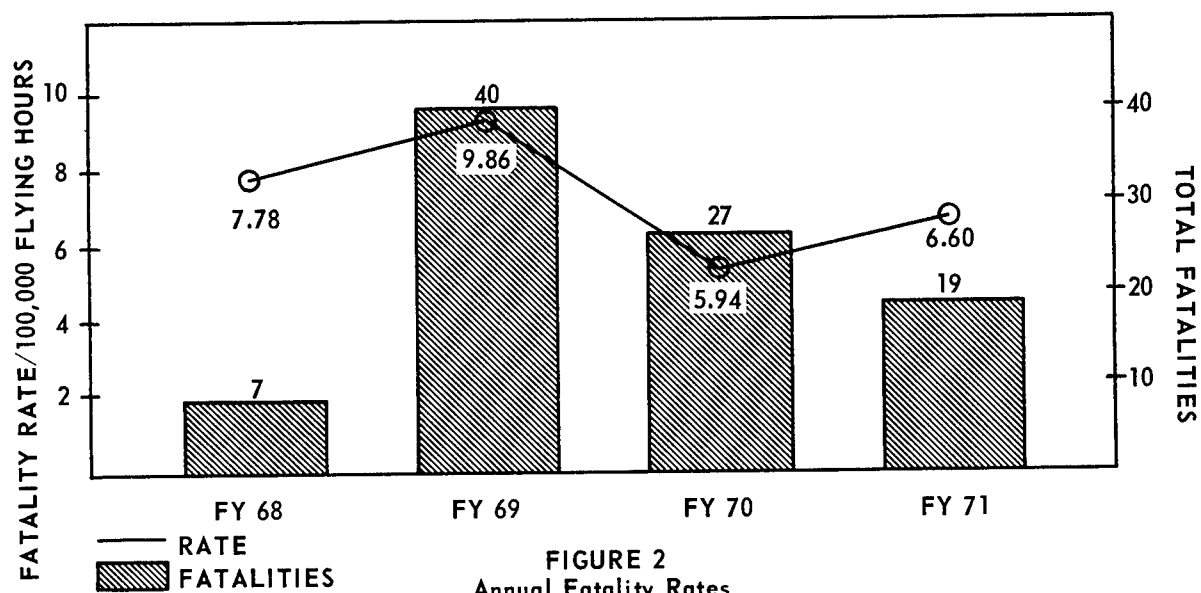


TABLE 5
Material and Crew Error Causes

Causes	All Mishaps	Total Losses	Accidents	Incidents	Forced Landings	Prec. Landings
Material						
Engine system	390	79	89	17	119	86
Tail rotor system	146	32	36	13	34	31
Flight controls system	12	6	0	0	3	3
Chip detector lights	136	0	0	0	0	136
Main rotor system	43	0	3	0	3	37
Battery	43	0	0	5	5	33
Other	78	6	2	9	4	57
Total	848	123	130	44	168	383
Crew						
Strikes (trees, wires, etc.)	141	27	22	90	0	2
Practice autorotations	117	10	85	22	N/A	N/A
Emergency autorotations	104	35	64	5	0	N/A
FOD into main or tail rotor	49	8	5	36	0	0
Improper landing technique	43	9	16	18	0	0
Improper takeoff technique	42	6	8	28	N/A	N/A
Lost control	41	17	13	11	0	N/A
Antitorque control (tail spin)	15	10	4	1	0	N/A
Fuel exhaustion	25	10	12	1	2	N/A
Other	91	37	11	25	6	12
Total	668	169	240	237	8	14

abrupt right or left turns, performed downwind at low altitude, low airspeed, and especially when the aircraft is over maximum gross weight. Right turns (to the pilot's side) tend to cause the problem much more often than left turns. When abrupt

uplift is induced on the horizontal stabilizer, a tendency to spin to the right occurs. An ECP has been approved to replace the tail rotor blades (P/N 369A1710) with new all-metal blades (P/N 369A1613). These new all-metal blades have a

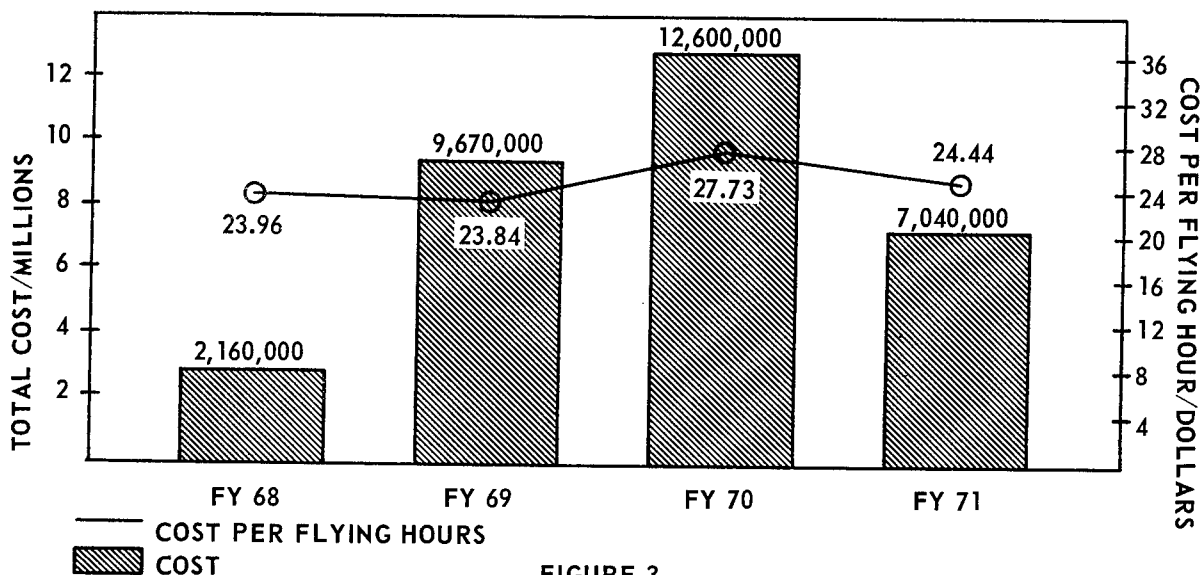


FIGURE 3
Accident/Incident Dollar Cost

modified camber, increased chord, and an increased tail rotor thrust of at least 25 percent. The increased thrust will do much to reduce the occurrence of the problem, but aviators could eliminate all of them by avoiding operation within the combination of conditions that creates the problem.

Table 6 further identifies materiel mishap causes.

The phase of operation during which the mishap began is shown in table 7. Approximately 66 percent of the mishaps occurred during cruise flight. When only accidents (including total

losses) are considered, cruise flight remains predominate at 62 percent. The majority of cruise flight accidents occurred during low level flight where there is little margin for error or inattention.

The period of operation during which the mishap occurred is shown in table 8.

As expected, the greatest number of mishaps (92%) occurred during the day. However, the 74 mishaps occurring during twilight hours (dawn and dusk) are not in proportion to exposure time and warrant more attention in aviation accident prevention programs.

TABLE 6
Materiel System Causes

	All Mishaps	Total Losses	Accidents	Incidents	Forced Landings	Prec. Landings
Engine system—total	390	79	89	17	119	86
Fuel Control	96	19	17	6	36	18
Bearings	27	6	7	2	4	8
Compressor	23	3	11	0	2	7
FOD	15	5	7	0	3	0
Other	104	6	17	2	29	50
Unknown	125	40	30	7	45	3
Tail rotor system—total	146	32	36	13	34	31
Drive shaft	45	13	7	8	15	2
Coupling	25	5	10	2	7	1
Blades	25	1	2	0	3	19
Gearbox	17	2	7	1	5	2
Pitch control	5	3	1	0	0	1
Other	11	1	6	1	1	2
Unknown	18	7	3	1	3	4
Main rotor system—total	43	0	3	0	3	37
Transmission	25	0	3	0	3	20
Blades	10	0	0	0	1	9
Dampers	3	0	0	0	0	3
Other	5	0	0	0	0	5
Flight control system—total	12	6	0	0	3	3
Cyclic	3	1	0	0	1	1
Swashplate	3	2	0	0	0	1
Collective	2	1	0	0	0	1
Other	3	1	0	0	2	0
Unknown	1	1	0	0	0	0
	All Mishaps	Metal Particles	Short/ Broken Wire	Other	Unknown	
Chip detector lights—total	136	67	13	4	52	
Main rotor	73	38	7	2	26	
Engine	41	18	4	2	17	
Tail rotor	22	11	2	0	9	

TABLE 7
Phase of Operation

Phase of Flight	All Mishaps	Total Losses	Accidents	Incidents	Forced Landings	Precautionary Landings
Cruise	1023	184	166	166	122	385
Autorotation	171	16	100	24	27	4
Landing	150	27	27	42	21	33
Takeoff	97	12	19	37	18	16
Static	98	0	9	81	2	6
Hover	8	1	0	5	1	1
Other	7	1	1	2	1	2
Total	1554	241	322	357	187	447

Problem Areas (EIR's). USAAAVS records indicate that only 360 EIR reports were submitted against the 848 materiel failures and malfunctions in which EIR's should have been submitted. This, however, is only a small portion of the complete EIR picture for the 4 years. Of the total EIR's submitted against the OH-6A to USAAVSCOM, those of significant value were assigned an AVSCOM case number and were reported as deficiencies in the Department of the Army Technical Bulletins (TB 750-992 series), "Equipment Improvement Report and Maintenance Digest." Several of the EIR deficiencies published in the Digest are being repeated here for informational purposes and as a reminder to commanders, supervisors, and maintenance personnel of specific OH-6A problem areas and what corrective actions were taken or are being taken to eliminate those deficiencies.

For additional detailed information regarding any of the EIR deficiencies listed below, refer to the appropriate TB 750-992, referencing the USAAVSCOM case number.

TITLE: Tail Rotor Blades—USA AVSCOM case number SA-60-190-369A1710.

DEFICIENCY: Tail rotor blades cracking. Skin cracks occur at all locations and fiberglass bonding separates at leading and trailing edges of blades.

ACTION TAKEN: An all-metal tail rotor blade is currently being developed by Hughes Tool Company. New blades will also improve tail rotor thrust.

TITLE: Tail Rotor Drive Shafts—USA AVSCOM case number SA-90-585-369A5518.

DEFICIENCY: Tail rotor drive shaft shears in flight, or is found twisted.

ACTION TAKEN: ECP 2672 was approved for retrofit by attrition through spares replacement which provides a more rugged drive shaft featuring an increased wall thickness. This shaft is identified as P/N 369A5518-601.

TITLE: Tail Rotor Drive Shaft Couplings—USA AVSCOM case number SA-90-070-369A5501.

TABLE 8
Period of Operation

Mishap Classification	All Mishaps	Dawn	Day	Dusk	Night
Total loss accident	241	1	224	6	10
Major accident	322	3	300	12	7
Incident	357	4	330	18	5
Forced landing	187	2	169	7	9
Precautionary landing	447	3	410	18	16
Total	1554	13	1433	61	47

DEFICIENCY: Tail rotor drive shaft couplings, P/N 369A5501, break in flight, resulting in loss of antitorque control.

ACTION TAKEN:

a. Properly shim drive shaft per TM 55-1520-214-35, section V, chapter 7, and inspect couplings and drive shafts for damage as specified in TM 55-1520-214-20, chapter 3, section II, "Special Inspections."

b. ECP 2672 was approved for retrofit through attrition by spares replacement which is part of the more rugged drive shaft assembly.

TITLE: *Tail Rotor Transmission*—USAAVSCOM case number SA 80-190-369A5401.

DEFICIENCY: Tail rotor transmission housing cracks and breaks in flight, allowing output shaft support section of housing, together with attached output shaft and tail rotor assembly, to separate from aircraft, resulting in loss of anti-torque control.

ACTION TAKEN: Cause of broken housings is generally a result of an unbalanced condition of tail rotor blades as a result of loss of abrasion strip. Hughes Tool Company is developing an all-metal tail rotor blade which should help eliminate this problem.

TITLE: *Tail Rotor Transmission*—USAAVSCOM case numbers SA 80-020-369A5408 and SA 80-372-369A5400.

DEFICIENCIES:

a. Tail rotor transmission output shafts, P/N 369A5408, developed axial and/or excess radial play, generally causing high frequency vibration.

b. Tail rotor transmissions are being prematurely removed due to internal failures, normally indicated by chip detector illuminations.

ACTION TAKEN: ECP 2890 replacement of automotive type bearings with higher capacity aircraft quality bearings at next overhaul period should correct both deficiencies.

TITLE: *Support, Push-Pull*—USAAVSCOM case number SA 01-020-369A3506.

DEFICIENCY: Push-pull support frames, P/N's 369A3506, 369A3507, and 369A3588, were found to be wearing excessively around push-pull tube grommets, P/N 369A3509.

ACTION TAKEN: In an effort to reduce tail boom frame wear, a class II ECP was approved which adds a 0.020-inch-thick steel doubler to tail boom frames.

TITLE: *Main Transmission*—USAAVSCOM case number SA 70-381-369A5167.

DEFICIENCY: Main transmissions of 369A5100 series are occasionally found contaminated with water after flying in rain.

ACTION TAKEN: Investigation reveals that water may enter transmission near top through transmission seal (369A5167). A product improvement program will be initiated with prime contractor to develop an improved seal assembly.

TITLE: *Main Rotor Blade Pins*—USAAVSCOM case number SA 05-190-369A1004.

DEFICIENCY: Main rotor blade pins (369A1004) are cracking and corroding in pivot area of handle.

ACTION TAKEN: A product improvement program has been initiated with the prime contractor to redesign this item. During the interim, continue to inspect pins daily and occasionally apply a light coat of turbine engine oil to handle-barrel nut mating surface and cam portion of handle. Do not oil expanding bushing portion.

TITLE: *Main Rotor Blades*—USAAVSCOM case number SA 05-020-369A1100.

DEFICIENCY: Main rotor blades (369A1100) eroding at leading edges, sometimes to the point where brass weights are visible.

ACTION TAKEN: Apply or reapply antierosion tape per TM 55-1520-214-30, section II, chapter 8, whenever operating in rain or an abrasive environment.

TITLE: *Rotor Systems*—USAAVSCOM case number SA 50-790-369A1400.

DEFICIENCY: Complaints have been received concerning rotational drag check on main rotor dampers. Available breakaway type torque wrenches are not effective in this application.

ACTION TAKEN: TM 55-1520-214-20, paragraph 8-8b(3), will be changed to require a dial type torque wrench for this check. Torque wrench, FSN 5120-288-8865, has been established as a special tool for the OH-6A and should be requisitioned by all units supporting OH-6A helicopters.

TITLE: *Oil Pressure Senders*—USAAVSCOM case number SA 09-374-369A4534.

DEFICIENCY: Inaccurate oil pressure readout attributed to defective or internal failure of oil pressure sender, P/N 369A4534.

ACTION TAKEN: The oil pressure sending unit

has been redesigned, eliminating calibration provisions of oil unit. A PIP program will be initiated to reinstate a means of calibration. In the interim, when installing a new (black) sender and the cockpit gauge is known to be good, scrape black paint of sender body at grounding strap to insure a good ground and hook a direct reading gauge into oil system. Keep trying different senders until one is found where tolerances of gauge and sender cancel each other and cockpit readout is reasonably accurate.

TITLE: *Blower Scrolls*—USAAVSCOM case number SA 07-190-369A5306.

DEFICIENCY: Blower scroll assemblies of 369A5306 series are cracking, mainly at attaching points.

ACTION TAKEN: Cracking and cold-flow of plastic parts at attachment points are generally indications of fastener overtorque. Also, the prime contractor has found this type of plastic susceptible to damage by hot turbine engine oil and is in the process of developing a suitable coating. This coating will be incorporated on subsequent spare parts.

TITLE: *Engine Power-Out Warning Unit*—USAAVSCOM case number SA 09-374-26530332.

DEFICIENCY: Engine power-out warning unit (26530332) becomes unserviceable due to internal failure.

ACTION TAKEN: The prime contractor is currently developing an improved engine-out warning which provides an earlier indication, coupled with an automatic restart device.

TITLE: *Fuel Quantity Transmitters*—USAAVSCOM case number SA 09-374-369A4245.

DEFICIENCY: Internal failures of fuel quantity transmitters of 369A4245 series, usually detected by erroneous low fuel light illumination.

ACTION TAKEN: Failures are mainly attributable to shorting, caused by wetting unit with water, and to corrosion. The prime contractor has developed a -603 version of the 369A4245 tank unit which has sealant applied to cover terminals and wiring to eliminate shorting and corrosion. New version will be implemented on an attrition basis. As an interim fix concerning this matter, refer to the above USAAVSCOM case number in change 1 of TB 750-992-4, dated July 1971.

TITLE: *Fuel Shut-Off Valve Control*—USAAVSCOM case number SA 10-497-369A8136.

DEFICIENCY: Fuel shut-off valve control assembly rusts at cockpit end and becomes immovable or fails to actuate shut-off valve from full off to full on.

ACTION TAKEN: The prime contractor is currently redesigning entire fuel system. In the interim, lubricate and rig control assembly per TM 55-1520-214-20, section V, chapter 5. Check and cycle daily.

TITLE: *Helicopter (OH-6A)*—USAAVSCOM case number SA 01-381-369A2030-1.

DEFICIENCY: Water has been accumulating in fuel tank cover (369A8130), creating corrosion problems.

ACTION TAKEN: Adding a gasket between the access cover, P/N 369A2030-1, and the cargo floor will eliminate water entry.

TITLE: *Oil Cooler*—USAAVSCOM case number SA 07-381-369A8302.

DEFICIENCY: Oil cooler assembly leaks, mainly at inlet boss.

ACTION TAKEN: Leaks are generally the result of twisting inlet hose when removing/installing mating check valve. Use special wrench (VS-5236) when performing this operation and follow procedures contained in TM 55-1520-214-35, section IV, chapter 5.

TITLE: *Overrunning Clutch*—USAAVSCOM case number SA 04-381-369A5350.

DEFICIENCY: Overrunning clutches of 369A-5350 series are leaking oil at output shaft, sometimes followed by smoke in cabin and shearing of output shaft.

ACTION TAKEN: Previously, oil leaking past engine shaft seals (6854086) would fill clutch housing until oil would leak out top of clutch. This oil would wash grease out of bearing (R20FOILO), causing it to overheat and shear output shaft. TB 55-1520-214-20/38, dated 29 September 1970, was issued to correct this unsatisfactory condition.

TITLE: *Landing Gear Dampers*—USAAVSCOM case number SA 02-374-369A6300.

DEFICIENCY: Landing gear dampers of 369A-6300 series are experiencing internal failures characterized by collapsing or extending beyond

normal limits.

ACTION TAKEN: The contractor is currently redesigning dampers to increase service life and correct current deficiencies.

TITLE: *Damper Assembly-Landing Gear*—USA-AVSCOM case number SA 02-247-369A6300-501.

DEFICIENCY: Dampers were being received in the field with ears of cap assemblies at 90° angles to each other. Ears must be parallel for proper installation of damper assembly.

ACTION TAKEN: Landing gear damper assemblies received in above condition can be corrected by attaching lower end of damper to landing gear strut as directed by TM 55-1520-214-30, change 3, page 4-32A. Insert bolt into top mounting bearing hole and turn strut clockwise until cap assembly ears are parallel. Strut should be turned *clockwise* to prevent loosening of end caps on damper.

TITLE: *Horizontal Stabilizer*—USAAVSCOM case number SA 01-070-369A3600.

DEFICIENCY: Outboard sections of horizontal stabilizers of 369A3600 series tear off in flight.

ACTION TAKEN: Structural failure of these stabilizers is the result of vibration-induced fatigue, resulting mainly from tail rotor imbalance. Under a product improvement program, the

contractor has designed a new strut to replace the present 369A2001 strut. In the interim, maintain tail rotor balance per TM 55-1520-214-35, section III, chapter 8, and emphasize stabilizer and strut check on each preflight as required by TM 55-1520-214-10, chapter 3, section II.

TITLE: *Lower Vertical Stabilizer*—USAAVSCOM case numbers SA 01-750-369A3650 and SA 01-730-369A3650.

DEFICIENCY: ABC adjustable bolts presently used in mounting holes of lower vertical stabilizers of 369A3650 series allow stabilizers to vibrate, resulting in failure of ABC bolts and in-flight loss of the stabilizer.

ACTION TAKEN: MWO 55-1520-214-30/36 was initiated for correction of this problem.

TITLE: *Troop Seat and Harness Fitting*—USA-AVSCOM case number SA 17-020-369A3037/9.

DEFICIENCY: Troop seat and shoulder harness fittings on airframe (369A3037-1, -2 and 369A-3039-1, -2) are wearing out since mating seat and harness fittings are of harder metal. Replacement parts could not be obtained through supply.

ACTION TAKEN: These fittings have been resource coded and can now be requisitioned and replaced. Refer to TM 55-1520-214-34P.

Selected Accident Briefs

ACCIDENT NO. 1—Aircraft was flying in marginal weather on a mission to carry maps and other papers. Pilot called for and received special VFR clearance to a field. Weather was reported as -XM17 + 1 SW. Before arrival at the field, light snowshowers were encountered. Navigation to the field and over a GCA unit was accomplished. By this time, the light snowshowers had turned heavy and the aircraft was at 15-20 feet and 20-30 knots. The pilots decided to land near the GCA unit and in doing so all visual reference was lost due to blowing snow. Both pilots experienced vertigo and the

aircraft hit hard with a slight rearward motion and left side low. The two pilots sustained minor injuries and the aircraft was destroyed. The primary cause factor was listed as loss of ground contact due to heavy snowshowers and blowing snow from rotorwash. Suspected factors were a 30° wind shift, pilot disorientation, not making a go-around, and pilot's inexperience.

Editor's note: Was this trip really necessary? Hardly, with snow and icing conditions, inexperienced pilots, and an aircraft not IFR instrumented.



ACCIDENT NO. 1—Both pilots experienced vertigo in blowing snow.

ACCIDENT NO. 2—Two aircraft responding to a distress call (a land vehicle had hit a mine and personnel were injured) tried to occupy the same space at the same time. One aircraft was flying at 100 feet in a right turn looking for the vehicle. The second aircraft approached the zone in a fast descending right turn and a collision occurred. There were five fatalities and both aircraft were destroyed. Caused by failure of both pilots to properly clear themselves.

Editor's note: The day was absolutely clear, too!

ACCIDENT NO. 3—One aircraft in a flight of two radioed that trouble existed in controlling excessive engine rpm. For 10 minutes this excessive engine rpm problem continued when finally the pilot said, "I think I just lost everything." Witness statements indicated that the engine and rotor had revved up. This was followed by relative silence. The main rotor severed the tail boom and the aircraft fell from approximately 1,500 feet, spinning clockwise, nose low and erratic. Ground impact showed the rotor to be nearly, if not completely, stopped. Pilot was killed and aircraft was destroyed. Fuel control malfunction caused an overspeed, but the pilot failed to land following numerous indications of a malfunction. Suspect failure of main rotor dynamic stop or control system component caused tail boom chop.

Editor's note: 1. ARADMAC analysis did not agree with the conclusion that engine had oversped. It was concluded that the turbine wheels did not exhibit overspeed stretching.

They recommended that castellated type nuts (with cotter pin) be used on the power turbine governor and fuel control adjusting levers.

2. We suspect there was some overspeed and the pilot used high rotor blade pitch angle to minimize the rotor overspeed. The engine quit or was stopped immediately followed by gross blade stall, coupled with a large aft cyclic input that caused the tail boom chop and practically stopped the blades.

ACCIDENT NO. 4—Aircraft departed on staff reconnaissance mission. It was later seen to be descending at about a 30° angle. It crashed in a wooded area, exploded, and burned. The four occupants were killed. Suspect aircraft was in autorotation due to some failure, perhaps a fuel control or tail rotor malfunction.

ACCIDENT NO. 5—Aircraft lifted off ship about 1925 hours with four people aboard. Surviving witness indicated they took off straight up, turned 90° to the right, accelerated forward, and struck the water about 500 meters from the ship. Two occupants were killed, one sustained major injuries, and one is missing. Aircraft was destroyed. Suspect marginal weather obscured horizon and pilot, inexperienced in night shipboard operations, allowed disorientation to occur.

Editor's note: Shipboard night operations at upper limit gross weights with marginal weather conditions are demanding of even the most experienced aviators. Untrained aviators should not be used.

ACCIDENT NO. 6—Gunner was dropping fragmentation grenades from aircraft in attempt to destroy footbridge. Explosion occurred in passenger compartment and compartment was engulfed in flames. Explosive force knocked pilot's feet off pedals and broke out chin bubble. Emergency landing was made and pilot and observer escaped. Aircraft was consumed by fire with the gunner still in his seat. There was one fatality and one major injury. Aircraft was destroyed. Caused by gunner dropping live grenade on passenger compartment floor.

ACCIDENT NO. 7—Pilot accepted aircraft from maintenance and was returning it to his parent organization. Shortly after takeoff about 1730 hours, aircraft struck guy wire attached to 400-foot radio tower and disintegrated. The three occupants were killed. Suspect pilot was not familiar with the location of the towers and that the angle of the sun caused sun blindness.

ACCIDENT NO. 8—Aircraft was flying low level down highway and hit lambretta. Damage to



ACCIDENT NO 4—The four occupants of this aircraft were killed.

lambretta and injury to passengers are unknown. Major damage to aircraft. Caused by unnecessary low-level flight.

ACCIDENT NO. 9—Pilot accepted aircraft without visually checking amount of fuel aboard. Fuel quantity gauge was known to be inaccurate. Sometime into the mission, pilot reported 80 pounds of fuel remaining, after which he flew for approximately 5 minutes, then landed for 2-3 minutes. This time he reported 40 pounds of fuel and took off heading home. The flight home was at 90 knots low level. Engine stopped just after cyclic climb to clear row of trees. Pilot entered autorotation and aircraft hit nose low on left side at an estimated 30-50 knots. There were two fatalities and one major injury. Aircraft was destroyed. Caused by improper pre-flight, improper judgment in taking off with 40 pounds of fuel, and unnecessary and erratic low level flight. Suspect insufficient autorotation training. Recommendations were: (1) Terminate flight with 40 pounds of fuel indicated, (2) a flight time limit based on engine time, and (3) emphasize autorotational proficiency.

ACCIDENT NO. 10—Aircraft landed and crew chief and observer exited. Pilot frictioned down the collective control and exited. Aircraft lifted off the ground and tilted forward. Main rotor blade struck pilot in the chest, causing major injuries. Aircraft came to rest against revetment. While being sling loaded, OH-6A began to oscillate, was released, crashed and burned. Cause of accident was listed as unknown.

ACCIDENT NO. 11—Aircraft was one of a flight on an early morning mission. About 10 minutes after launch, pilot called and reported his engine chip detector light was on and that he was returning to base. The last radio transmission heard was that the TOT was "out of sight," aircraft was vibrating severely, and that he intended to land at the closest helipad. A witness stated that he saw the aircraft circling with the landing light on and that flames were coming out the rear. The flames stopped and the engine quit. The aircraft hit a 60-foot tree, crashed into a hut, and sank in about 8 feet of water. The three occupants were killed and the aircraft was destroyed. The second stage compressor rotor blade fractured from fatigue, causing engine

failure. Suspect No. 2 main bearing froze, creating vibrations and fatigue of rotor blade. Pilot pulled pitch extremely high, causing low rotor rpm.

Editor's note: The investigation revealed there were other landing areas safer than the one selected. Body identification was hindered because dog tags were not worn.

ACCIDENT NO. 12—Weather was below minimums for takeoff from LZ, and the en route and destination weather was unknown to the pilot. He took off and disappeared through a small hole in the clouds. He reported clear at 1,700 feet and then later transmitted a Mayday call that he had lost control. Aircraft was next seen at 90 feet where the tail boom separated. Right spin developed and ground impact was near vertical and hard. Pilot sustained major injuries and aircraft was destroyed. Investigation revealed that the pilot experienced vertigo and panicked. When the aircraft broke out of the clouds, the pilot abruptly lowered collective and made a right rear cyclic movement. The main rotor blades severed the tail boom. Pilot failed to maintain VFR in an aircraft not equipped for IFR.

ACCIDENT NO. 13—Aircraft was in cruise flight when tail rotor drive shaft failed. Tail boom chop occurred and aircraft crashed and burned. Pilot was killed. Suspect incorrect torquing

resulted in broken drive shaft and improper cyclic input chopped tail boom.

ACCIDENT NO. 14—In-flight fire occurred during maintenance test flight and aircraft crashed. Pilot and two passengers died of burns. Aircraft was destroyed. Suspect gasket/seal for fuel tank access cover was leaking due to improper maintenance. Two passengers should not have been on board during test flight.

ACCIDENT NO. 15—Engine stopped while aircraft was on low turning approach to landing. Aircraft crashed into trees and was destroyed. One occupant was killed and two sustained major injuries. A blade of the engine turbine assembly broke. Hot start was listed as the cause for the blade failure.

ACCIDENT NO. 16—Tail boom separated in cruise flight at 200 feet. Aircraft crashed and was destroyed. Pilot sustained minor injury. Cause unknown.

ACCIDENT NO. 17—Aircraft struck trees during low-level flight, crashed, and burned. The two crewmembers were killed. Caused by channeled attention. Suspect supervisor ordered flight beyond capability of aviators.

ACCIDENT NO. 18—Engine stopped in straight and level flight at 1,000 feet and pilot entered



ACCIDENT NO. 6—Gunner dropped live grenade on passenger compartment floor.

autorotation. During approach for touchdown, incorrect collective control (abrupt down) and excessive lateral controls were used. Aircraft struck ground, rolled over, and was destroyed. Observer was killed when his head hit the armored seat. Engine stopped because of fuel exhaustion.

Editor's note: The pilot factors read as: faulty flight plan, violation of flight discipline and navigation error, cold wind blast, and over-confidence. Fatigue and sleep deprivation were suspected.

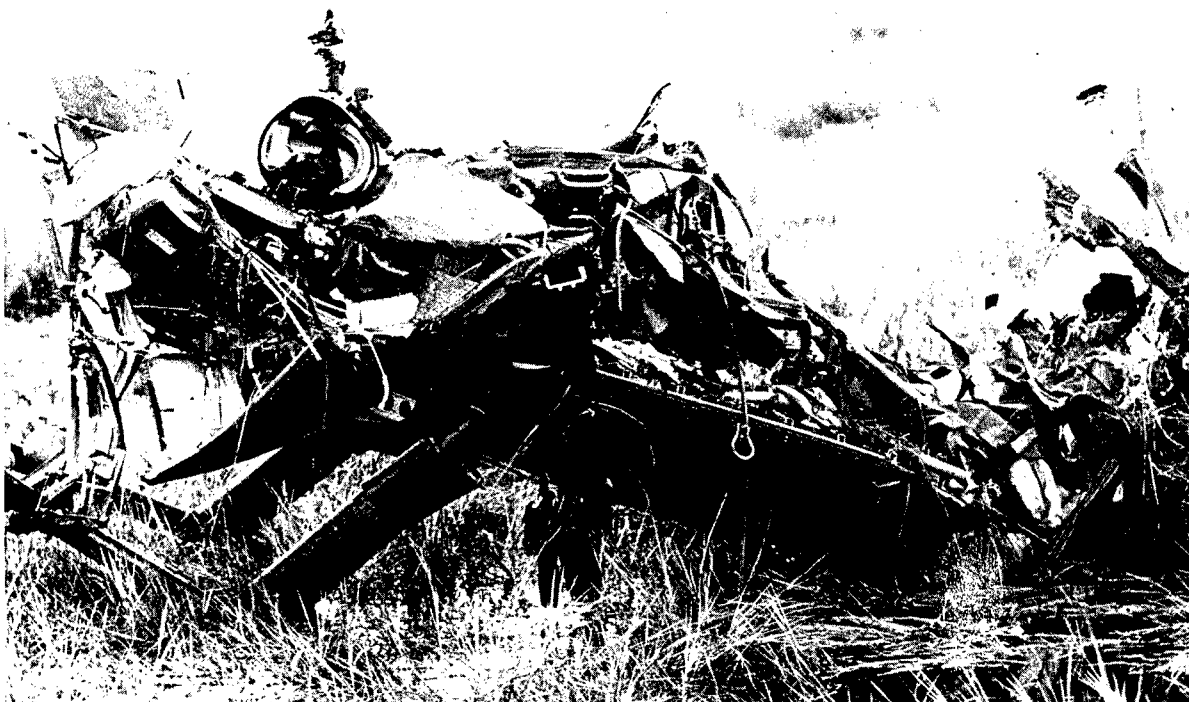
ACCIDENT NO. 19—Aircraft was making steep, low-level turn. Pilot applied abrupt up collective and excessive g forces resulted. Aircraft struck boulders and burned. One occupant was killed and the other sustained major injuries. Pilot selected wrong course of action and failed to use accepted procedures. Suspect supervisor ordered flight beyond capability of aviator.

ACCIDENT NO. 20—While aircraft was on the ground loading and unloading passengers, another person not boarding aircraft walked into tail rotor and was decapitated. Caused by inattention and failure to use accepted procedures.

ACCIDENT NO. 21—Tail rotor drive shaft sheared during climbing turn. Directional control was ineffective for touchdown and aircraft hit hard and was destroyed. There were four minor injuries. The wind caught unsecured poncho and blew it out of aircraft into tail rotor shaft.

ACCIDENT NO. 22—In response to a request by the battalion sergeant major, aircraft was to assist in raising a 25-foot flagpole adjacent to the operations center. The intent of the maneuver was to raise the flagpole from an inclined position to an upright position by use of ropes held in the cockpit. Upon reaching high hover, aircraft shuddered violently, crashed, and was destroyed. There were two major injuries and one minor injury. Accident report stated: "Main rotor blades came in contact with an obstacle"—i.e., the flagpole.

ACCIDENT NO. 23—Aircraft was at approximately 600 feet turning right base for landing when engine stopped. Pilot took controls from passenger, an E4, and attempted to enter autorotation. Entry to autorotation was somewhat late and rotor rpm was not regained. Exag-



ACCIDENT NO. 7—Aircraft struck guy wire attached to 400-foot radio tower.

gerated flare allowed tail rotor to strike ground and aircraft crashed and burned. Pilot and passenger sustained major injuries. Reason for engine stoppage is pending analysis.

ACCIDENT NO. 24—Aircraft was shutting down on landing pad when flight of UH-1H's landed close by. Decelerating rotor blades dipped down and severed tail boom. Rotorwash from UH-1H flight upset OH-6A rotor blades and caused tail boom chop.

ACCIDENT NO. 25—Fifteen-minute flight was made after passenger refueled aircraft. After another passenger was embarked, engine stopped at an unspecified altitude at 30 knots during takeoff. Aircraft landed hard, rolled over, and was destroyed. There were two major injuries and one minor injury. Suspect fuel contamination.

ACCIDENT NO. 26—Aircraft lost power during low-level recon mission. From 50 feet and 60 knots, pilot attempted to maneuver through dead trees to small stream clearing. Tail boom struck dead tree and aircraft crashed slightly nose low and rolled over. Fuel cell ruptured upon impact and pilot was pinned in aircraft when it rolled

over. Valiant efforts by crewmembers freed pilot. Shortly thereafter, spilled fuel ignited and burned wreckage. There was one major and two minor injuries. Cause of engine failure is unknown.

ACCIDENT NO. 27—Engine quit at approximately 400 feet during takeoff climb. Passenger blocked flight controls during autorotation and aircraft touched down hard. Landing gear strut broke and severed fuel hose, resulting in post-crash fire. Aircraft was destroyed. Two occupants were killed and one sustained major injuries. Main bearing failure caused engine stoppage. Suspect passenger panicked.

ACCIDENT NO. 28—After refueling, aircraft took off to 6- to 7-foot hover, with gross weight of 2,542 pounds. Pilot attempted 180° left turn from hover and lost control. Aircraft crashed, rolled over, and burst into flames from ruptured fuel cell. Two major injuries and one minor injury resulted. Cause was listed as overgross weight.

Editor's note: The high hover, over alternate gross weight, and extra power demands of a left turn indicate that power required exceeded power available.

ACCIDENT NO. 29—Aircraft started running into



ACCIDENT NO. 9—Result of improper preflight, low fuel, and unnecessary and erratic low level flight.

small patches of low clouds about midfield on downwind leg for landing at airport. Descent did not clear clouds and pilot started left turn. Aircraft was now in the clouds and attitude indicator didn't appear to work. Aircraft came out of clouds in a diving turn. A flare appeared to be conducted at about 150 feet, followed by impact on PSP taxiway. Initially, aircraft skidded 83 feet, then became airborne again for about 100 feet. Pilot remembers spinning. After second impact, aircraft traveled approximately 250 feet airborne, impacted into side of parked C-47, and was destroyed. Pilot sustained major injuries. Pilot experienced vertigo in the clouds and was in an unrecoverable attitude coming out of the clouds.

ACCIDENT NO. 30—Pilot was hovering to refuel when he heard loud noise and experienced complete loss of directional control. Aircraft began to spin in clockwise direction. Pilot closed throttle and made hovering autorotation. Aircraft rotated about two and one-half times before it struck the ground, with major damage. Failure of forward flexible coupling of tail rotor drive assembly was caused by corrosion and possible

improper shimming.

ACCIDENT NO. 31—During low-level cruise flight, aircraft began right turn, became uncontrollable, crashed, and was destroyed. One occupant was killed and two sustained major injuries. Cause undetermined.

ACCIDENT NO. 32—Hard landing at conclusion of practice touchdown autorotation severed tail boom. Caused by pilot applying collective pitch too early.

ACCIDENT NO. 33—While cruising low level to remain clear of low clouds, aircraft struck wire, crashed, and burned. There were two fatalities. Caused by low-level flight in limited visibility conditions and possible distraction or inattention.

ACCIDENT NO. 34—IP was demonstrating straight-in practice autorotation. Aircraft hit on heels of skid and main rotor blades flexed down and severed tail boom. IP misjudged altitude and had excessive aft cyclic applied at initial contact.

Selected Incident Briefs

- Man walked into main rotor blades and was killed.
- Sudden gust of wind caused hovering helicopter to drift into water tower.
- Pilot was observing results of WP grenade thrown by his observer and flew into tree.
- During shutdown, USMC CH-46 hovered nearby and rotorwash caused blade to flap down and strike tail boom.
- During shutdown, gust of wind caused main rotor blades to flex down and strike tail boom.
- Pilot started engine with one main rotor blade tiedown still attached.
- Pilot smelled smoke in cruise flight. Investigation revealed part of the battery was burned and charred. Results are pending analysis.
- Aircraft was shutting down when person stand-

ing on nearby revetment slipped, fell into rotor blades, and was killed.

- Tail rotor struck trees during low-level cruise flight.
- Pilot was cruising low level when main rotor blades hit pole. Pilot was distracted by bright light.
- Main rotor blades struck trees during low-level cruise flight.
- Aircraft vibrated severely during cruise flight. Tail rotor drive shaft sheared from an undetermined cause and skids were damaged during touchdown.
- Pilot landed on PSP for passenger pickup. During takeoff, right skid hooked PSP and nose pitched down. Pilot pulled aft cyclic, added power, and skid separated from aircraft. Pilot later landed on sandbags.

Selected Forced Landing Briefs

- Engine ran rough during initial start. It was shut down and no mechanical difficulty was found. When aircraft reached 1,000 feet after takeoff, engine quit. Fuel was contaminated with water.
- Amperage exceeded limits and pilot secured battery and generator switches. Cockpit filled with smoke and pilot landed. Caused by voltage regulator failure.
- Pilot smelled smoke during climbout and initiated landing. At 10 feet, overrunning clutch failed.
- Pilot was making low-level practice autorota-

tion. Zoom climb was initiated and throttle rolled to flight idle. Engine quit and actual autorotation resulted. Fuel control linkage had not been properly adjusted.

- Engine and tail rotor drive shaft failed almost simultaneously during cruise flight. Pilot autorotated successfully. Cause of engine and tail rotor drive shaft failure is undetermined.
- Engine stopped during autorotation. Cause unknown.
- Aircraft was on final at 600 feet and 60 knots when tail rotor drive shaft sheared. Pilot flew aircraft home and made running landing.

Selected Precautionary Landing Briefs

- Throttle froze during takeoff. Caused by dirt.
- Pilot heard loud noise and felt severe vibrations. Tail rotor tip came off.
- Pilot thought he had experienced tail rotor failure because of restricted directional control and landed to investigate. Minigun brass was found under tail rotor control pedals. Brass was removed and mission continued.
- Battery shorted out in cruise flight and part of battery burned.

- All emergency warning system lights illuminated during flight. Battery rack/mount had broken, allowing battery to short out.
- Fuel quantity gauge went to zero during flight and pilot landed. Gauge malfunctioned.
- TOT started to rise, power was reduced, and pilot landed. Reason for high TOT is unknown.
- Transmission chip detector light came on. Metal particle was found on magnetic plug.

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