

FRANK Zardecki

OV-10

ACCIDENT SUMMARY

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The United States Army Board for Aviation Accident Research, Fort Rucker, Alabama

OY-1 ACCIDENT SUMMARY

1 July 1963 through 30 June 1966

by
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OV-1 ACCIDENT SUMMARY

1 JULY 1963 THROUGH 30 JUNE 1966

I. INTRODUCTION:

a. This summary contains analyses and statistical reviews of all major and minor accidents, incidents, forced landings, and precautionary landings that occurred during the period 1 July 1963 through 30 June 1966. Aircraft losses or damages which were the direct result of hostile action in Vietnam are not included.

b. This summary is intended to help commanders develop programs and procedures to prevent accidents by acquainting aviation personnel with past accident experience, and to influence activities engaged in aviation research and development to eliminate similar problems in future aircraft design through a comprehensive system safety engineering program.

c. This is the second accident summary published for the OV-1. The first, published January 1964, covered the period 1 November 1961 through 31 October 1963.

d. The word "mishap," as used in this summary, includes accidents, incidents, forced landings, and precautionary landings.

II. SUMMARY:

a. Of the 235 mishaps which occurred during the period covered by this summary, 43 were reported as major and minor accidents (4 in RVN, 10 in other overseas areas, and 29 in CONUS). Incidents, forced landings, and precautionary landings accounted for the remaining 192 mishaps.

b. The OV-1 accident rate per 100,000 flying hours has decreased from a high of 52.1 during FY 1964 to 22.7 during FY 1966.

c. OV-1 accidents during this reporting period accounted for more than 24 million dollars in Army aircraft damages.

d. Materiel failures or malfunctions were involved in 69.3% (163) of all mishaps reported. Pilot factors ranked second, involving 15.7% (37) mishaps. Seventeen percent of mishaps reported were classified as major accidents. For major accidents, pilot factors were the greatest cause, followed by materiel failures or malfunctions.

III. MISHAP CLASSIFICATIONS: During the period 1 July 1963 through 30 June 1966, there were 235 OV-1 mishaps. Table 1 shows the areas in which these mishaps occurred. As indicated in Table 2, 40 were major accidents; three minor acci-

TABLE 1
OV-1 Mishaps

FY	CONUS	OVERSEAS AREAS (LESS RVN)	RVN	TOTAL
1964	67	19	2	88
1965	51	26	6	83
1966	42	11	11	64
TOTAL	160	56	19	235

TABLE 2
OV-1 Mishap Classifications

FY	MAJ	MIN	INCD	F/L	P/L	TOTAL
1964	17	1	26	17	27	88
1965	14	2	21	7	39	83
1966	9	0	15	0	40	64
TOTAL	40	3	62	24	106	235

dents; and the remainder (192) were incidents, forced landings, or precautionary landings.

IV. MAJOR/MINOR ACCIDENT RATES:

a. Table 3 compares major and minor accident rates with total flying hours. One major accident during FY 1966 occurred during a test and evaluation program and is not included in these rates. The OV-1 accident rate for the three fiscal years has shown a decrease. It is interesting to note that during FY 1966 more than 18 thousand flying hours were flown in Vietnam and only one major (noncombat) accident was reported, for a rate of 5.5; whereas, 13 thousand flying hours were flown in CONUS, with an accident rate of 43.5. The majority of the major accidents occurring in CONUS, however, happened during training programs.

b. The military services have developed a program for reducing high initial accident rates. This program, called system safety engineering, has been included in the development stages of the AH-56A and C-5A aircraft. Basically, system safety engineering, required by Department of Defense Military Specification 38130(A), dated 6 June 1966, establishes general requirements for applying safety engineering principles throughout the design, engineering and fabrication, test, installation, and aircraft opera-

tion. This means that manufacturers will conduct safety analyses from the very beginning of the planning stage for new aircraft. An independent safety engineering group will analyze the design to insure that past mistakes are not repeated. It means that aircraft designers must give consideration to operational and maintenance environments so that the capabilities of pilots and mechanics will not be exceeded. Failures of systems, components, and parts are studied in every mode to determine their effect on safe flight.

V. **COSTS:** The OV-1 major accident cost exceeded the 24 million dollar mark. Table 4 shows OV-1 accident costs by major areas and by fiscal years.

VI. **INJURIES:**

a. Table 5 shows injury classification and total personnel aboard OV-1 aircraft involved in major accidents. It also indicates whether accidents were survivable or non-survivable. A non-survivable accident is defined as one in which impact forces exceeded human tolerance levels or inhabitable areas were collapsed or disintegrated by impact to a degree where all occupants would have sustained crushing injuries to vital body areas.

b. Of 52 occupants involved in survivable accidents, nine major and two minor injuries occurred. Of 27 occupants involved in non-survivable accidents, there were 17 fatalities, one major injury, one critical injury, and two minor injuries.

c. Table 5 shows that out of a total of 43 accidents, 14 were non-survivable. Thus 67.5% of the OV-1 accidents were survivable. During this reporting period, the OV-1 survivability rate fell considerably short of the overall Army aircraft accident

survivability rate of 95%. The most probable cause of the high fatality rate was due to unfavorable attitudes in which the aircraft came to rest; wreckage configurations prohibiting escape; lethal defects in cockpit construction; and post-crash fires.

TABLE 3
Major/Minor Accident Rates
Per 100,000 Flying Hours

LOCATION	NO ACDTs	HRS FLOWN	RATE
FY 1964			
CONUS	15	23,254	64.5
OVERSEAS (LESS RVN)	2	7,140	28.0
RVN	1	4,171	24.0
TOTAL	18	34,565	52.1
FY 1965			
CONUS	7	25,350	27.6
OVERSEAS (LESS RVN)	7	9,017	77.6
RVN	2	6,717	29.8
TOTAL	16	41,084	38.9
FY 1966			
CONUS	6	13,801	43.5
OVERSEAS (LESS RVN)	1	7,695	13.0
RVN	1	18,182	5.5
TOTAL	8	39,678	22.7

TABLE 4
OV-1 Accident/Incident Dollar Costs

FY	CONUS	OVERSEAS AREAS (LESS RVN)	RVN	TOTAL
1964	11,315,666	1,086,240	2,525	12,404,431
1965	3,821,221	2,056,838	14,240	5,892,299
1966	4,755,387	57,192	1,720,228	6,532,807
TOTAL	19,892,274	3,200,270	1,736,993	24,829,537

TABLE 5
OV-1 Occupant Injury Experience

FY	ACDTs		INJURY CLASSIFICATION					PERSONNEL ON BOARD SURVIVABLE ACDTS	PERSONNEL ON BOARD NON-SURVIVABLE ACDTS
	S	N/S	MIN	MAJ	CRITICAL	FATAL	NO INJURY		
1964	12	6	3	6		8	17	22	12
1965	12	4	2			4	23	22	7
1966	5	4		4	1	5	6	8	8
TOTAL	29	14	5	10	1	17	46	52	27

S - Survivable N/S - Non-survivable

FIGURE 1
Phase of Operation in Which Mishap Started

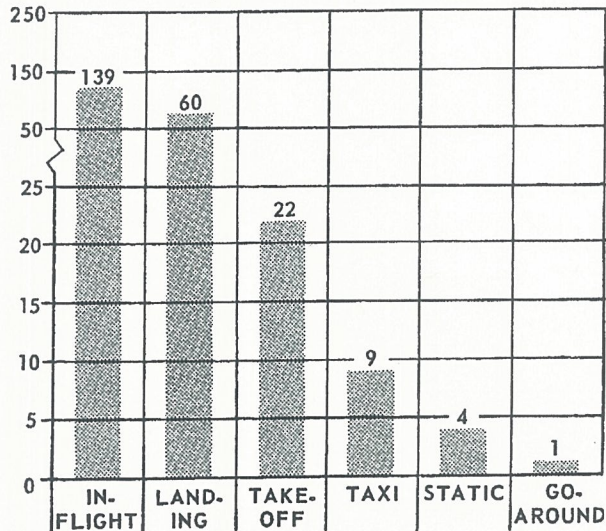


TABLE 6
OV-1 Seat Ejections

FY	EJECTIONS	INJ	FATALITIES	NO INJ	MISSING
1964	16	11	1	4	
1965	5	4	1		
1966	13	11			2
TOTAL	34	26	2	4	2

TABLE 7
Total Mishap Primary Cause Factors

FACTOR	FY 64	FY 65	FY 66	TOTAL
MATERIEL	60	56	47	163
PILOT	15	15	7	37
UNKNOWN OR NOT REPORTED	6	2	4	12
MAINTENANCE	3	6	3	12
INSTRUCTOR PILOT	3	0	3	6
SUPERVISORY	0	3	0	3
WEATHER	1	1	0	2
TOTAL	88	83	64	235

TABLE 8
Major/Minor Accident Primary Cause Factors

FACTOR	FY 64	FY 65	FY 66	TOTAL
PILOT	11	10	2	23
MATERIEL	6	3	3	12
MAINTENANCE		2	1	3
SUPERVISION	1	1		2
UNKNOWN		1	1	2
INSTRUCTOR PILOT			1	1
TOTAL	18	17	8	43

VII. SEAT EJECTIONS:

a. During the period covered by this report, there were 34 seat ejections in combat and noncombat situations. Of the 34 ejections, two fatalities occurred. These were the result of ejecting outside the ejection seat envelope. Two ejectees are missing and details of the ejections are unknown.

b. The overall ejection experience during the past three years shows that 94.1% of all ejections were successful. This can be attributed to better pilot confidence in and knowledge of the ejection seat.

VIII. PHASE OF OPERATION: Figure 1 shows the phases of operations in which mishaps started. The inflight phase accounted for 59% of all mishaps and the landing phase accounted for 25%. The majority of mishaps were caused by materiel failures or malfunctions.

IX. CAUSE FACTORS:

a. Materiel failures or malfunctions accounted for 69.3% of OV-1 mishap cause factors. Engine problems accounted for approximately 40% of all materiel failures or malfunctions while the landing gear system was responsible for approximately 34%.

b. The second major cause factor for all OV-1 mishaps and the number one cause factor in major accidents were pilot factors (see Table 8). Those mishaps attributed to pilot, maintenance, and supervisory factors can best be controlled by command action. Training programs for flight and maintenance personnel, as well as unit SOP's, must be based on the operating conditions in which OV-1 aircraft are flown and maintained. A comprehensive standardization program is needed to prevent pilot and maintenance factors listed in this summary. Where possible, flying and maintenance schedules should always match experienced personnel with inexperienced personnel.

c. Accidents which result from materiel failures or malfunctions could often be prevented if timely information were provided pilots. A voice warning system, such as the one planned for incorporation in the AH-56A, can provide pertinent and timely information concerning failures or malfunctions. Warning systems currently in use, except for the rpm audio warning device in UH-1 aircraft, require pilots to visually detect and identify the presence of a failure or malfunction. A voice warning system has the advantage of immediately alerting pilots of a specific failure or malfunction at any time. This feature is essential when pilots must direct their attention outside the cockpit, as they must to detect obstacles during low level flight.

d. Some cause factors are shown in Table 7 as "unknown" or "not reported." Cause factors are

known in most instances, but there is a lack of follow-up action on the part of the reporting units to furnish this information. To make accident summaries more meaningful, cause factors should be reported as supplemental data as soon as detailed information is available.

e. Primary cause factors for major and minor accidents are shown in Table 8. Pilot factors present the number one problem in major accidents.

f. A detailed listing of all OV-1 cause factors follows:

MATERIEL FAILURE OR MALFUNCTION

Power plant	70
Landing gear	24
Hydraulic	15
Propeller	13
Electrical	11
Fuel	7
Airframe	5
Warning lights	5
Brakes	3
Oil	3
Flight controls	2
Ejection seat	1
Heating system	1
Auxiliary equipment	1
Weapons	1
Photo equipment	1

MAINTENANCE

Improper assembly	8
Improper maintenance of engine components	2
Improper safetying	2

PILOT/CREW

Misuse of flight controls	9
Misjudged distance, altitude, or position	7
Failure to see other aircraft or object	4
Failure to extend landing gear	3
Misuse of power plant controls	3
Improper use of or inattention to fuel system	2
Failed to maintain flying speed	2
Failed to recognize a dangerous situation	2
Inadequate flight preparation	2
Improper level-off	1
Used poor takeoff technique	1
Premature retraction of landing gear	1

INSTRUCTOR PILOT

Misjudged distance, altitude, or position	3
Inadequate flight preparation	1
Failed to determine proper clearance	1
Failed to take specific necessary action	1

SUPERVISORY

Improper training and/or supervision of flight personnel	1
Inadequate supervision of airport facilities	1
Handled equipment carelessly	1

WEATHER

Gusty wind conditions	2
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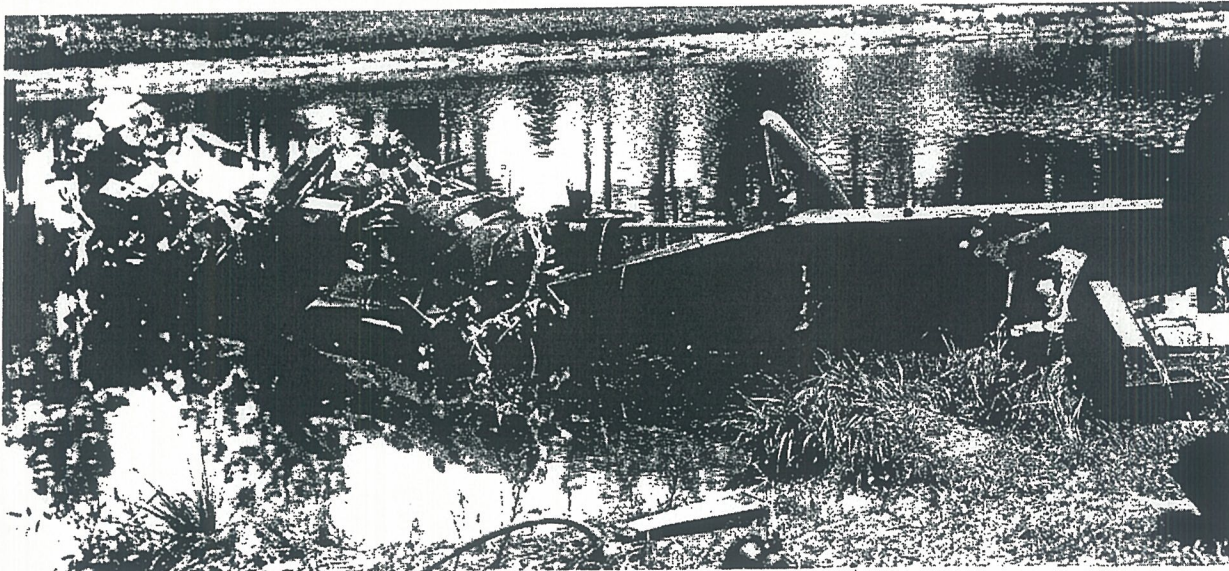
Selected Major Accident Briefs

06759—Pilot used reverse thrust to reduce landing roll and right main landing gear failed. Propeller of right engine struck ground as right wing moved downward. Aircraft veered approximately 55° to the right and came to a full stop as right propeller struck the ground. It came to rest with the right wing, pylon and right propeller supporting the right side of the aircraft. Caused by failure of the web portion of the right landing gear cylinder and failure of the down lock pin.

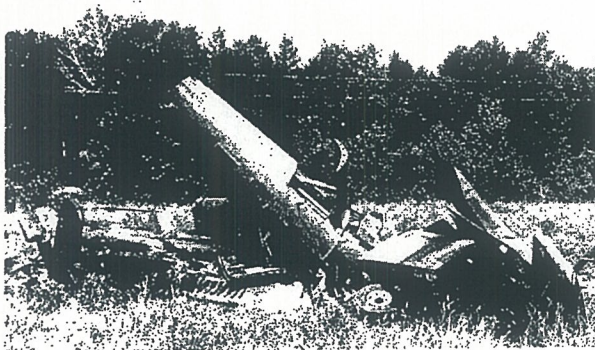
08141—Clearance was received to taxi back for another takeoff after landing. After traveling an estimated 800 feet on the takeoff roll, the aircraft became airborne and the pilot raised the gear. The aircraft started to settle back to the runway. It struck the runway in a tail low attitude 1,100 feet from takeoff point and slid 1,250 feet further down the runway. There were no injuries to the crew. Lower fuselage, antennas, right tip tank, and both propellers damaged. Caused by pilot retracting landing gear prematurely after breaking ground.

06734—Aircraft departed for a combined infra-red/photographic reconnaissance flight. The mission was to take infra-red imagery and aerial photographs of a suspected maneuver enemy command post. The photographic run was started at approximately 1,000 feet above terrain. As aircraft passed over target area, the pilot activated the camera and had two or three normal flare firings. Then an explosion occurred, causing tail section to separate from fuselage aft of the wing trailing edge. The pilot found the aircraft uncontrollable, attempted to warn observer, then ejected. The forward section of the aircraft descended on approximately the original heading, rolled inverted, and crashed. The tail section landed approximately 550 feet short of the main wreckage. The observer ejected or was ejected just prior to impact and received fatal injuries. Caused by malfunction of type M-143 flares. Forty-nine or fifty photo flash cartridges exploded in left pod of aircraft.

07357—Pilot was making a 360° overhead approach to the runway. On final, instructor pilot noticed aircraft's speed was too great and told pilot to go around. Pilot applied full power and No. 1 propeller feathered. IP placed landing gear handle in UP position. However, pilot decided to land because of the feathered propeller, not knowing that the gear had been retracted. The aircraft landed on its belly and skidded to a stop. Caused by: 1. Close inter-



08113



C664



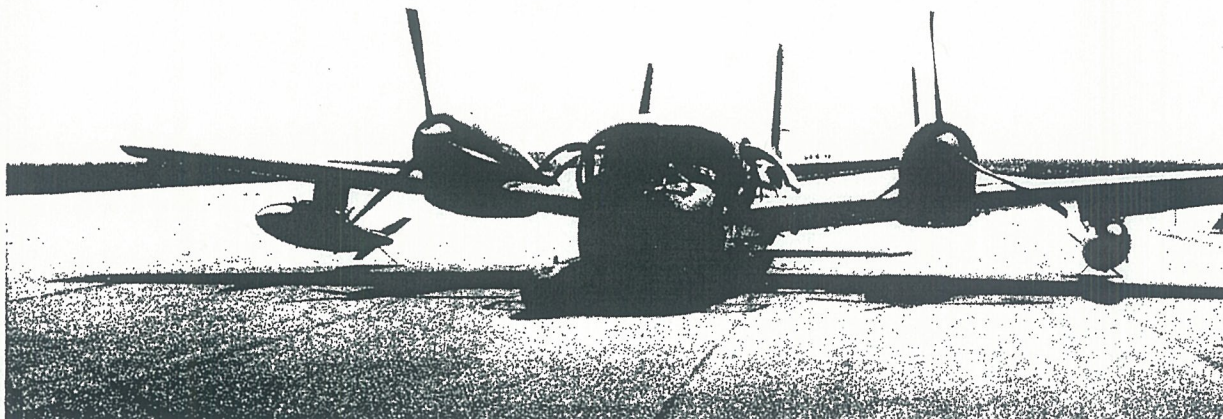
E421

val in landing pattern between three aircraft. 2. Tailwind on pattern base leg. 3. Rapid power application from a power setting below 10 psi torque. 4. Lack of communication to pilot by instructor pilot that landing gear had been retracted. 5. Retarding of power levers by pilot when No. 1 propeller feathered. 6. Retracting of gear by IP out of sequence of normal go-around procedure. 7. Autofeather/synchrophaser switch was in the autofeather position.

08113—Aircraft struck two 3/8" ground cables located above high tension electrical power lines. The wires broke and aircraft hit a 40-foot pine tree, coming to rest in the center of a pond, and scattering debris throughout the pond and 55 yards up the side of a hill. Caused by: 1. Aircraft flying into 3/8" steel ground cables. 2. Difficulty in detecting wires from low altitude. 3. Failure to indicate location of a known flight hazard on maps used during low level flight. 4. Lack of positive instructions on gunnery procedures to be used during combined arms training exercises. 5. Conducting instruction in low level gunnery techniques to a non-gunnery qualified pilot during a combined arms training exercise.

08291—Aircraft was flying at 4,000 feet when it entered a steep dive (approximately 70°) to initiate a high speed pass over an airport. On pull-up, aircraft struck tops of pine trees and continued level flight at approximately 100 feet altitude. Cockpit was filled with pieces of tree and fluids, blinding the crew. Immediately after striking trees, copilot ejected. Unable to determine attitude of the aircraft, the pilot ejected a few seconds later. As pilot ejected the aircraft entered a left diving turn and crashed into trees. Pilot sustained minor injuries. Copilot was not injured. Cause factors for this accident were: 1. Inattention to aircraft altitude and attitude in a dive. 2. A hasty decision to execute simultaneous slow speed and high speed passes over an airfield. 3. Failure to use the altimeter as an aid in determining a safe recovery altitude. 4. Initiating pull-up from an altitude too low for airspeed and dive angle. 5. Blinding of crew by flying debris and fluids. 6. Pilot's tendency to continually push himself and his aircraft to the maximum performance limits.

A163—Shortly after takeoff, left engine failed and aircraft went into a 360° roll to the left. At the 90°



C122

point in the roll, the infra-red operator ejected. The aircraft continued in the roll, lost altitude rapidly, and crashed in a wings level, 40° nose low attitude. Aircraft was destroyed and both the pilot and operator sustained fatal injuries. Cause factors for this accident were: 1. Failure of the No. 1 engine. 2. Insufficient altitude or airspeed at time of engine failure. 3. Flaps were not retracted to help regain single engine flying speed. 4. Probability that on full reversal landing, foreign material was injected into the engine, causing compressor stall and severe surging. 5. Pilot did not make a complete engine run-up prior to takeoff. 6. Inexperience of the pilot.

A434—At touchdown, pilot reversed propellers with No. 2 propeller failing to go into reverse. Aircraft veered off runway onto sod. Right gear collapsed and aircraft came to rest on a heading of 245°. Caused by field maintenance personnel reversing control cable clamp during propeller installation. The control cable was not properly installed in the clamp groove and the clamp could only hold pressure on part of the cable. This allowed the cable to slip on the pulley when the propeller control was put into reverse with 75-80% power applied. A contributing factor was failure of technical inspector to properly inspect the maintenance performed on the propeller assembly.

C122—Aircraft was landed gear-up. Caused by failure to lower landing gear. Pilot did not use pre-landing checklist.

B456—Aircraft was leaving 5,500 feet to enter landing pattern after photographic mission. After passing through 2,000 feet, the aircraft was leveled off. At 1,600 feet a click and a change in engine sound was heard. No warning lights registered. Pilot attempted to maintain altitude while going through emergency procedures. Aircraft was maintained in a nose-up attitude while continuing to lose altitude. Observer ejected at an unknown altitude and pilot ejected between 300 and 500 feet. Aircraft



E103

nosed over and crashed on an uphill slope of a stream bed. Water in the fuel caused both engines to flame out simultaneously. Contributing cause factors were: 1. Fuel drain valves on drop tanks were located above the bottom of the tanks. This permitted approximately two gallons of water, which could not be drained, to accumulate in the bottom of each tank. 2. Drop tanks were only partially serviced during the three-day period preceding the flight. Due to high humidity and changing temperatures, condensation contaminated fuel in the drop tanks.

C020—After landing, pilot taxied from the hard-surfaced runway onto sod area to facilitate reaching the parallel hard surface taxiway. During taxi, right landing gear wheel rolled into a hole. Landing gear collapsed and aircraft sustained major damage. The primary cause of this accident was supervisory error, in that airfield inspections had failed to detect existing deficiencies. Contributing factors were: 1. Undercut area was not visible from aircraft. 2. Specific areas of the sod had not been designated as taxi lanes.

C921—At touchdown, pilot reversed propellers and

No. 1 engine failed or was slow to reverse, causing aircraft to veer to right. In an effort to regain directional control, pilot applied full power on both engines. However, before directional control was regained, aircraft swerved to right side of runway, struck concertina wire, fence, and a gate, causing damage to right wing and right auxiliary fuel tank. This accident was caused by the pilot displaying poor judgment in applying reverse thrust and improper technique in recovery. Actuation of the reversing valve did not begin until the left power lever had traveled through 70% of the reverse quadrant, 3/8" before hitting the reverse thrust stop. A contributing factor was failure of maintenance personnel and pilots to recognize a potentially dangerous condition as write-ups indicated left engine was slow to reverse.

C664—Aircraft departed airfield and was climbing through 4,200 feet when the No. 1 engine caught fire. Fire could not be extinguished with internal fire bottles. Both the instructor pilot and pilot made a safe ejection at 1,600 feet and received only minor injuries. The primary cause of this accident was a fire in the area of the No. 1 engine caused by misalignment of the dowel pin located in the No. 4 bearing pump housing and retainer ring, causing pressurization of the No. 3 and 4 bearing package. Pressurization resulted from inability of the front pump located forward of No. 3 bearing to evacuate the additional oil. The oil was then forced between the carbon seal and the power turbine stub shaft seal journal. This resulted in the erosion of the carbon seal, loss of lubrication, and subsequent failure of the No. 3 and 4 bearings.

D768—During descent from 8,500 feet, aircraft lost all electrical power. No. 2 engine failed between 5,000 and 6,000 feet and No. 1 engine failed shortly thereafter. Pilot and student failed to eject and the aircraft crashed 1,615 feet short of the runway. Both pilot and student received injuries. The primary

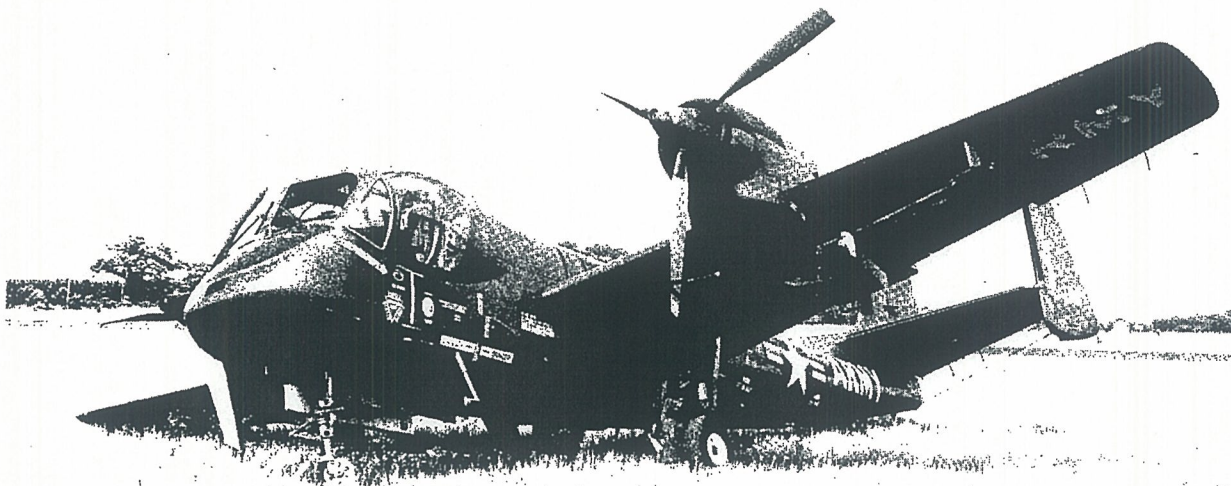
C020

cause of this accident was malfunction of the flapper valve assembly (P/N RB 11957) in the aft boost pump, which allowed air to cavitate the engine driven fuel pumps. This caused the total loss of power in both engines. Contributing factors were: 1. Improper air restart procedures. 2. Improper emergency procedures employed. 3. Nose low attitude caused aft boost pump to be uncovered. 4. Loss of electrical power due to improper pilot technique.

C835—Canopy blew off aircraft during takeoff roll, striking the dorsal fin and vertical stabilizer before falling to runway. The primary cause of the accident was maintenance error. The canopy was not locked in place after the last ejection seat inspection. During canopy reinstallation, the clevis rod end with attaching parts, P/N 243294, FSN 1680-014-1027, was not centered. This prevented the torque tube assembly, P/N 134 AM 10202-1, from rotating into the fully locked position. The technical inspection, following reinstallation of the seat and canopy, did not show that the canopy was not securely locked in place.

E103—Aircraft was on an authorized night VFR training flight. Clearance had been obtained for a touch-and-go landing from an ILS approach. Landing was completed at approximately mid-field and power applied for takeoff. Aircraft became airborne about three-quarters of the distance down the runway. Aircraft veered to the right 45° from the takeoff heading, traveled a distance of 1,500 feet, crashed and burst into flames. Both occupants received fatal injuries. Probable cause of the accident was inadvertent feathering of the No. 2 engine propeller on takeoff. Contributing factors were: 1. Inability of the flight crew to cope with an emergency that was self-induced. 2. Lack of standardization of instructor pilot. 3. Touch-and-go landings at night.

E421—On completion of a short field landing, takeoff was attempted with approximately 3,600 feet of runway remaining. At an undetermined point in the



takeoff sequence, No. 1 engine failed. Aircraft struck the tops of trees, left wing low, and crashed in an inverted position approximately 1,500 feet from end of runway. The instructor pilot received fatal injuries and the pilot received major injuries. The primary cause of this accident was failure of the left engine due to intergranular stress corrosion of the disc in the 5th stage compressor. Contributing factors were: 1. No. 1 propeller was not feathered. 2. The flight crew, for reasons unknown, most probably did not arm the auto-feather circuit. 3. Engine failure occurred at a relatively low airspeed. Coupled with the propeller not being feathered, this set up an uncontrollable flight condition.

Selected Minor Accident Briefs

A247—At touchdown, pilot reversed propellers and No. 2 propeller failed to go into reverse. Aircraft veered off the runway and turned to the left in the soft dirt, causing the right wing tank to drag the ground. After traveling approximately 55 feet, aircraft spun to the right and came to rest on a heading of 290°. The cause of this accident was mechanical failure of the propeller dome assembly due to a missing retainer ring, P/N 536600, which allowed the spring seat to unscrew approximately 15 turns, increasing the length of the low pitch piston one inch. The added length allowed the spring seat to come in contact with the dome cap, limiting its travel. This prevented the stop levers from collapsing, preventing the propeller from going into reverse. A contributing factor was supervisory error in the quality control section where the part was assembled.

A484—During an orientation training flight, pilot was flying the aircraft in a valley which is a training area for the surveillance platoon. Aircraft struck several wires at an altitude of approximately 30 feet. Wires caused cuts in aircraft skin and one deep cut on propeller. Pilot proceeded to the nearest airfield and landed. This accident was caused by the pilot flying too low and using poor judgment in attempting to demonstrate the difficulties of low level navigation to an aviator who had stated, on occasion, that this type of flying was not difficult.

Selected Incident Briefs

06828—Aircraft struck tree during low level training flight. Front canopy dented. Caused by pilot misjudging distance.

06855—No. 2 engine upper access cowling lost in flight. Caused by failure of cowling latches.

06875—Aircraft struck birds during demonstration low altitude, high speed penetration. Incident damage to engine cowling, wing leading edge slat, vertical fin, horizontal stabilizer, and empennage de-icer.

06993—Nose wheel compressed during reverse thrust application for short field landing. Nose wheel strut extended and aircraft rocked back on tail cone. Incident damage to APX-44 antenna cover and tail cone. Gusty surface wind (14-18 knots) considered factor.

07375—Aircraft vibrated severely after touchdown and pulled to the right. Aircraft came to a halt on runway with right wheel assembly rotated 180° in main landing gear strut assembly. Incident damage to shrink rod assembly and upper scissor arm assembly. Caused by sheared scissor arm bolt.

07445—Pilot's window came open in landing pattern after maintenance test flight. Incident damage to pilot's window and spring bungee assembly. Suspect pilot's oxygen hose assembly depressed window release lever in flight, moving window lever forward, and enabling window to open.

07769—Nose wheel tire blew out during landing roll. Incident damage to tire. Caused by failure of tire.

07945—Center point refueling door came off in flight and struck fuselage bottom and right flap. Incident damage to fuselage, right flap, and pressure switch. Door could not be found.

08194—No. 1 engine cowling skin came off in flight. Caused by failure of stud and retaining ring which holds cowling skin.

08279—Left main tire blew out while aircraft was taxiing on ramp. Blowout caused incident damage to left main landing gear door. Caused by failure of tire.

A835—Aircraft struck power lines during maximum performance takeoff from parade field. Incident damage to wheel skirts.

A887—Right drop tank separated from A6A bomb rack as aircraft broke ground during takeoff. Drop tank destroyed. Caused by malfunction of bomb rack.

A962—Lower scissors assembly arm wedged into left landing gear cylinder lock during landing. Incident damage to lower scissors arm assembly and lock. Caused by failure of left landing gear scissor assembly retaining bolt (FSN 1620-994-3272).

B198—Copilot hatch came open in flight. Incident damage to hatch frame. Suspect hatch was improperly locked.

B199—Right wing came up and left propeller struck runway during propeller check of engine run-up. Caused by surface wind of eight knots, gusting to 15 knots.

B553—No. 1 propeller failed to reverse during landing roll and aircraft swerved to right. Pilot used heavy braking action to correct for swerve and left tire blew out. Incident damage to wheel. Caused by failure of No. 3 wire in pedestal.

B895—Left main tire blew out during landing roll.

Selected Forced Landing Briefs

Incident damage to tire, gear fairing, and nacelle. Caused by failure of tire.

C047—Right main tire blew out during landing roll. Incident damage to wheel. Caused by failure of tire.

C286—Nose gear collapsed during landing. Incident damage to SLAR antenna. Caused by hydraulic leak in line to pump connection.

C312—Right wheel well door came off during high speed letdown at 300 knots. Incident damage to door and fuselage skin. Caused by improper adjustment of door.

C339—Right aileron cap assembly struck power line guy wire while aircraft was taxiing from hangar to runup area. Incident damage to cap assembly. Caused by deviating from center line of taxiway.

C549—Hydraulic system failed in flight. Pilot applied brakes during landing and hydraulic pressure surged, locking right main wheel and causing tire to blow out. Incident damage to tire. Caused by failure of preformed packing between elbow tube and hydraulic priority valve.

D648—Pilot noted fluctuation in torque gauge, followed by loud noise and rise in egt to 800°C. Engine was shut down and propeller feathered. Directional control maintained during landing roll by power steering and use of left brake. Left tire failed and aircraft swerved off runway. Incident damage to tire.

D697—Aircraft made ADF approach, broke out at 900 feet, and pilot saw runway lights. Pilot continued to descend to maintain sight of runway and aircraft struck tree. Pilot missed approach and landed at another airfield. Incident damage to wing and gear fairings. Low thin clouds below overcast considered factor. No ground control or weather advisories available at point of intended landing.

D783—Left main tire blew out during cross wind landing. Incident damage to tire, tube, and wheel. Caused by excessive use of left brake. Wind, gusting 20-30 knots, variable from 20° to 150° contributing factor.

D842—Aircraft landed with excessive sink rate. Incident damage to radio antennas and tail skid. Downdraft from gusty surface wind considered factor.

E389—Top ring on No. 1 engine came off in flight and struck center vertical stabilizer. Incident damage to stabilizer. Suspect cowl was improperly secured.

E947—Tire blew out while taxiing for takeoff. Incident damage to tire, wheel, and wheel fairing. Suspect defective tire.

F344—Left main landing gear broke during runup. Suspect failure of gear. Cause not reported.

06814—No. 2 engine failed in flight. Caused by failure of the power shaft.

06917—No. 1 engine froze in flight. Suspect failure of engine sun gear.

07109—No. 1 engine made loud noise, emitted bright flash, and failed during flight. Suspect failure of propeller shaft reduction gears.

07133—No. 1 engine lost hydraulic pressure, followed by complete hydraulic failure. Caused by failure of packing in hydraulic pump compensator.

08453—No. 1 engine failed in flight. Altitude could not be maintained and wing tanks were jettisoned. Left tank failed to release and control was difficult. Suspect power shaft failure and failure of the No. 3 and 4 main bearings.

Selected Precautionary Landing Briefs

07321—Main landing gear would not retract after takeoff. Gear was cycled and nose gear extended and locked with main gear. After this cycle, the gear would not respond. Emergency gear extension procedures used on base leg as safety precaution. Suspect malfunction of dump valve in main landing gear hydraulic system.

07449—Exhaust gas temperature gauge for No. 1 engine fluctuated in flight. No. 1 propeller was feathered and engine shut down. Caused by thermocouple malfunction.

07509—No. 2 engine emitted loud noise during visual photo surveillance flight at 100 feet. Propeller rpm oversped and engine failed. Suspect failure of sun gear.

07522—No. 1 engine oversped to 1800 rpm in level flight at 5,000 feet. Caused by ruptured hydraulic seals in propeller control.

07573—Landing gear failed to retract after takeoff. Gear was recycled and both main gear locked in half-way position with nose gear remaining up. Emergency gear handle was released and gear dropped down and locked. Suspect actuator failure.

07626—No. 1 engine torque pressure fluctuated from 10 to 40 pounds at 15,000 feet. No. 1 power lever was reduced to flight idle and descent started. After landing, No. 1 engine would not shut down,

even with switches in off position. After running five minutes with all switches off and prop lever in off position, propeller was feathered and engine stopped. Caused by failure of fuel control unit (FSN 2915-856-9539).

07640—Hydraulic failure in flight. Caused by hydraulic pump seal failure.

07823—Hydraulic pressure lost in flight. Landing gear was activated by emergency system. Suspect loose torquing of nut. Loose nut caused loss of all hydraulic fluid through hydraulic release valve.

07852—No. 2 engine vibrated and No. 2 propeller tachometer failed in flight. Engine was shut down and propeller feathered. Caused by loose engine cowling and failure of propeller tachometer generator (FSN 6680-526-8129).

07902—No. 2 engine backfired in flight. Engine was shut down and propeller feathered. Caused by broken "P" lead (FSN 5975-839-0986).

07938—Left engine chip detector warning light came on in cruise flight. Engine was shut down and propeller feathered. Caused by broken wire on chip detector warning light.

07958—No. 2 engine failed in flight. Caused by failure of the No. 2 engine N1, turbine wheel assembly, P/N 1-100-490-04.

08081—Torque pressure dropped to 10 psi and oil pressure dropped to 20-30 psi for No. 1 engine in flight. Engine seized. Caused by loss of engine oil through oil line to torque pressure transmitter. Oil line vibrated loose in flight.

08490—Hydraulic pressure on No. 1 system lost in flight. Approximately one minute later, pressure was lost on the No. 2 system. Caused by failure of the No. 1 hydraulic pump.

08611—Hydraulic pressure lost during instrument approach. Landing gear was blown down. Caused by failure of hydraulic line.

08630—Control of No. 1 propeller lost in flight. Engine was shut down and aircraft landed. Caused by blown propeller control seal.

A337—Aircraft vibration increased to a high level in flight. Suspect malfunction of No. 2 propeller or loose engine mounts.

A624—Hydraulic system failed in flight. Caused by failure of right main landing gear actuator piston (FSN 1600-772-0374).

A657—One engine failed at 200 feet in straight and level flight. Aircraft was flown to civil airport and landed. Caused by failure of No. 3 and 4 bearings.

A722—Pilot was unable to control No. 1 propeller rpm in flight. Engine was shut down and propeller feathered. Caused by low fluid in propeller.

A750—No. 1 engine oil pressure and torque meter indicators exceeded red line during flight. Shriill noise was heard and engine shut down. Suspect failure of sun gear (FSN 284-778-2278).

B038—Aircraft shuddered twice during takeoff and No. 2 engine failed immediately after the aircraft

broke ground. No. 2 propeller feathered automatically and aircraft was landed. Suspect failure of No. 3 and 4 main bearings.

B134—Engine oil pressure lost in flight. Engine was shut down and propeller feathered. Caused by oil pump failure.

B252—Muffled pop and grinding noises heard from No. 1 engine during flight. Oil pressure dropped rapidly. Caused by sun gear failure.

B339—No. 2 engine fire warning light came on in flight. Engine was shut down. Caused by electrical short in fire warning cable.

B356—No. 1 engine would not restart after it was shut down in flight. Caused by defective ignition exciter.

B400—Main landing gear failed to retract after takeoff. Gear indicated down and locked when lever was placed in down position. Suspect extreme cold (-15° to -45°) may have caused O ring in landing gear actuating cylinder to shrink, allowing hydraulic fluid to bypass pneumatic system and prevent gear operation.

B516—Pilot heard loud bang and No. 2 engine failed. Engine was shut down. N1 turbine buckets found in bottom of engine shroud assembly after landing. Caused by N1 turbine failure.

B676—No. 2 engine failed. Cracked compressor blades found. Suspect ice ingestion or ice blocking air flow, causing flameout.

B703—No. 1 engine upper ring cowling came loose and rose approximately six inches. Pilot shut down engine, feathered propeller and landed. Engine cowling had been removed for maintenance the previous day and reinstalled improperly.

B903—No. 2 engine chip detector warning light came on. Engine was shut down and propeller feathered. Metal sliver found on detector plug.

B912—No. 1 engine made loud banging noise and failed approximately 15 seconds after takeoff. Suspect N1 blade failure after previous high temperature for long period of time.

C159—No. 2 engine oil pressure fluctuated from 50 to 70 psi, then dropped and stabilized at 20 psi. Oil pressure dropped to 10 psi during landing. Engine was shut down during landing roll. Suspect power turbine wheel failure.

C230—No. 2 hydraulic pressure lost, followed by loss of No. 1 hydraulic pressure approximately 10 minutes later. Caused by loose quick disconnect, No. 2 engine.

C303—No. 1 hydraulic pressure failed and No. 2 hydraulic pressure needle fluctuated. Landing gear was lowered with emergency system. Suspect No. 1 hydraulic pump failure.

C319—No. 1 hydraulic pump failed immediately after takeoff. Pilot used emergency blow-down procedure to lower gear and landed. Caused by hydraulic leak between hydraulic line manifold and main body of pump.

C372—Hydraulic fluid lost from left engine-driven

hydraulic pump. Pilot noted dropping pressure, lowered gear normally, and made no-flap landing. Caused by improperly seated fluid seal on elbow connecting pump and hose. Prefomed packing, found broken and jammed in threads, prevented jam nut from being backed off enough to seat seal properly when jam nut was tightened.

C405—Pilot heard whining noise from No. 1 engine and noted drop in torque pressure and rise in egt. Caused by failure of oil scavenge pump.

C541—No. 2 engine chip detector warning light came on. Carbon deposit found on chip detector.

C672—Landing gear indicated unsafe when handle was placed in down position and hydraulic pressure dropped to zero. Tower operator advised pilot that nose gear did not appear to be down and locked. Emergency system was used to lower gear. Suspect failure of left brake assembly which caused hydraulic fluid to be pumped from system during attempt to lower gear.

C754—No. 1 engine chip detector light came on. Engine was shut down and propeller feathered. Minute carbon deposit found on chip detector.

C762—One engine lost power and flamed out at 12,000 feet. Restart attempt was unsuccessful. Caused by crack in main fuel manifold.

D338—Chip detector light for No. 2 engine flashed approximately five times during takeoff. Suspect defective relay in instrument panel.

D569—No. 1 engine failed. Caused by fuel control malfunction.

D649—Complete hydraulic failure occurred five minutes prior to landing. Caused by cracked hydraulic tubing behind flared end. Tubing was located

outboard in leading edge of left wing at approximately station 83.

D721—Complete hydraulic failure occurred. Caused by failure of power steering unit.

D867—Nose wheel down indicator light did not function. Caused by broken electrical wire at strut.

D948—Pilot noted fumes and vapor in cockpit. When reverse thrust was used during landing, copilot saw right wing and engine nacelle engulfed in JP4 fuel vapor. Auxiliary fuel tank vent was emitting constant flow of fuel. Caused by failure of vent shutoff valve assembly (FSN 1560-M45-0471).

D963—No. 1 engine lost oil pressure. Caused by failure of oil filter O ring seal.

E029—Pilot received unsafe nose gear indication. Gear was blown down and aircraft landed. Caused by failure of nose gear actuator.

E072—Nose gear indicated unsafe and blow-down bottle was used with no effect. Aircraft was landed without incident. Caused by broken nose gear crank brace assembly down lock hook.

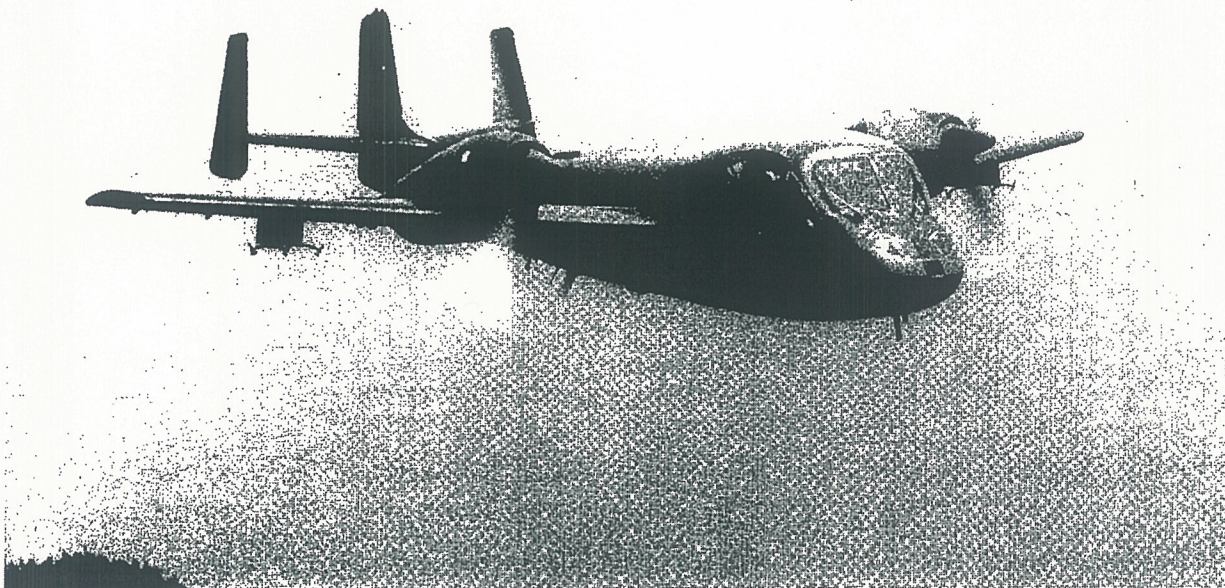
E367—Electrical fire started in gear handle. Caused by short in wire to gear handle light.

E472—No. 1 engine failed. Propeller was feathered. Caused by failure of No. 2 main bearing.

E679—Aircraft lost hydraulic pressure. Caused by failure of O ring seal in No. 2 engine hydraulic pump. All hydraulic fluid lost.

F224—Pilot heard loud noise from No. 2 engine. Engine was shut down and propeller feathered. Caused by failure of No. 2 engine main bearing.

F316—Hydraulic pressure lost. Gear was blown down. Caused by failure of No. 1 hydraulic pump which resulted in loss of fluid.



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