01:jdg
Ser: 6-56
15 December 1956

SUPPLEMENTARY REPORT on VMA-332 AAR 6-56, Concerning AD-6, BuNo. 134509, accident occurring 30 October 1956, pilot MACKIN

From: Commanding Officer, Marine Attack Squadron 332
To: Chief of Naval Operations (Op-57)
Commanding Officer, Marine Aircraft Group 31 (Reinf)
Commanding General, Aircraft, Fleet Marine Force, Atlantic
Chief, Bureau of Aeronautics (Aer 512)
Director, U. S. Naval Aviation Safety Center

Subj: Supplementary Report on VMA-332 AAR 6-56; submission of

Ref: (a) CO, AirFTFLant THIRD ENDORSEMENT on VMA-332 AAR 6-56 dtd 27 November 1956.

Encl: (1) Supplementary Report by the AAR Board.

1. Forwarded as requested by reference (a).

D. M. DA SER

Copy to:
CNO (AAP)
ComAirLant
BAR, Douglas, El Segundo, Calif.
BAR, Wright Aeronautical, Woodridge, N. J.

SUPPLEMENTARY report by the AAR Board.

History of Aircraft.

AD-6, BuNo. 134509 was sent to Headquarters and Maintenance Squadron 31 in late September 1956 for an engine change and was returned to VMA-332 on 11 October 1956. Headquarters and Maintenance Squadron 31 replaced the DC generator and the bus control relay. The following is a list of electrical discrepancies and corrective action from the time it was returned to VMA-332 until the day of the crash:

Date	Discrepancies as listed by the pilot on the yellow sheet.	Corrective action taken by maintenance personnel.
17Oct	1. Inverter light comes on No. 2 inverter (both inverters OK). (pilot indicated that no equipment failed other than the inverter light)	1. OK, checked circuit breakers, checked circuit load, checked fuses, reset voltage.

Note: This failure could have been caused by low voltage, failure of the auto-pilot fuse, gyro-horizon fuse, or inverter light sensing relay. This failure was attributed to low voltage on No. 2 inverter.

18Oct	1. No. 1 inverter down, light on for No. 2 inverter but appeared to be operating satisfactory.	1. OK, checked circuit breakers, checked circuit load, checked fuses, reset voltage on No. 2 inverter.

Note: No. 1 inverter circuit breaker had pulled and was the cause of No. 1 inverter failure. Low voltage attributed to the No. 2 inverter warning light difficulty.

18Oct	1. No. 2 inverter light on. 2. Flight instrument lights out.	1. Replaced inverter No. 2 2. Replaced flight instrument fuse and ground checked for 15 minutes.

Note: (1) Repeated difficulties with low voltage on the No. 2 inverter prompted it's being changed.

Note: (2) A blown fuse in the flight instrument circuit was replaced and following a satisfactory ground check, the aircraft was put in an "up" status.

21Oct	1. All interior lights out.	1. Replaced flight instrument light fuse, non flight instrument light fuse and console light fuse and ground checked for 15 minutes.

Note: This failure could have been caused by a short in the interior light control panel, a loose cannon plug leading from the interior light

Enclosure (1) Continued.

control panel, or a surge of voltage through all interior lighting circuits. No shorts or loose plugs were found in the interior light control panel and the source voltage was found to be normal. Blown fuses were found and replaced, restoring the lights to normal operation. A ground test failed to reveal any further difficulties.

22Oct. 1. Radar and radar altimeter operated on NC-5 power, not on aircraft power, Check AC generator. 2. AC generator out. Replaced AC generator.

Note: The failure in the AC generator system cannot be related to the previous electrical failures in the aircraft. The aircraft flew fourteen sorties, including the final flight during this period. Included in these sorties were three flights totaling 4.1 hours, of which, 0.4 hours were actual instruments after the last electrical difficulty and prior to the fatal flight.

During the period covered, the DC generator, AC generator and the No. 2 inverter were replaced. Failures re-occurred in the case of the No. 2 inverter and the flight instrument lights. All remaining discrepancies were of the single non re-occurring type.

The difficulties with the No. 2 inverter were rectified by replacement of the inverter. The difficulties with the AC generator is not considered related to possible difficulty leading up to the accident and as the pilot was transmitting at the time the emergency developed, it is known that the DC generator was functioning.

SPECIAL HANDLING REQUIRED
IN ACCORDANCE WITH
PART VII, OPNAVINST 2760.03

Aer-MA-612/77

FOURTH ENDORSEMENT on VMA-332 AAR ser 6-56 concerning AD-6, BuNo 134509, accident occurring 30 Oct 56, pilot MACKIN

28 NOV 1957

From: Chief, Bureau of Aeronautics
To: Chief of Naval Operations
Via: Director, U. S. Naval Aviation Safety Center

Subj: Aircraft Accident Report; forwarding of

1. Forwarded.

F. W. Snyder

F. W. SNYDER
By direction

Copy to:
CG, AIRFMFLANT
CO, MAG-31 (Rein)
CO, VMA-332

4

A25
Ser: 5142

27 NOV 1956

THIRD ENDORSEMENT on VMA-332 AAR ser 6-56 concerning AD-6, BuNo. 134509, accident occurring 30 Oct 1956, pilot MACKIN

From: Commanding General, Aircraft, Fleet Marine Force, Atlantic
To: Chief of Naval Operation (Op-57)
Via: (1) Chief, Bureau of Aeronautics (Aer-512)
(2) Director, U. S. Naval Aviation Safety Center

Subj: VMA-332 AAR ser 6-56; submission of

1. Forwarded, concurring with the conclusions and recommendations contained in the Aircraft Accident Report and with the comments contained in the endorsements thereto.

2. In view of the strong suspicion that an inverter and/or lighting failure caused the pilot to experience vertigo or loss of control of his aircraft, it is requested that a supplementary report be submitted covering in detail, the history of previous failures of this equipment in this aircraft as mentioned in the AAR. In order to expedite receipt of the supplementary report, it is suggested that it be mailed direct to all addressees rather than forwarded via channels.

V. J. MC CAUL

Copy to:
CMC (AAP)
BUAER (Aer-512)
NAVAVNSAFCEN (2)
CO MAG-31 (Rein) (2)
COMAIRLANT
BAR, Douglas, El Segundo, Calif.
BAR, Wright Aeronautical, Woodridge, N. J.
CO VMA-332

SPECIAL HANDLING REQUIRED
in Accordance with Part VII
OpNav Inst. 3750.6B

ORIGINAL

5

ORIGINAL

33:chs
16 November 1956

SECOND ENDORSEMENT on VMA-332 AAR ser 6-56 concerning AD-6, BuNo 134509, accident occurring 30 October 1956, pilot MACKIN

From: Commanding Officer, Marine Aircraft Group 31 (Rein)
To: Chief of Naval Operations (OP-57)
Via: (1) Commanding General, Aircraft, Fleet Marine Force, Atlantic
(2) Chief, Bureau of Aeronautics (Aer 512)
(3) Director, Naval Aviation Safety Center

Subj: VMA-332 AAR ser 6-56; submission of

1. Forwarded concurring with the conclusions and recommendations of the accident board and the comments contained in the first endorsement.

2. The information contained in this report has been disseminated to other squadrons of this command.

J. R. BAILEY

Copy to:
CMC (Code AAP) (1)
NavAvnSafCen (2)
BuAer (Aer 512) (1)
CG, AirFMFLant (1)
BAR, Douglas, El Segundo, Calif. (1)
BAR, Wright Aeronautical, Woodridge, N.J. (1)
ComAirLant (1)
VMA-332 (2)

SPECIAL HANDLING OF THIS REPORT IS REQUIRED
IN ACCORDANCE WITH PART VII OPNAV INST 3750.6B

ORIGINAL

ORIGINAL

FF14/VMA-332
DM:rrd
Ser: 6-56
15 November 1956

FIRST ENDORSEMENT on VMA-332 AAR Serial 6-56 concerning AD-6, BuNo 134509, accident occurring 30 October 1956, pilot MACKIN

From: Commanding Officer, Marine Attack Squadron 332
To: Chief of Naval Operations (OP-57)
Via: (1) Commanding Officer, Marine Aircraft Group 31 (Rein)
(2) Commanding General, Aircraft, Fleet Marine Force, Atlantic
(3) Chief, Bureau of Aeronautics
(4) Director, Naval Aviation Safety Center

Subj: VMA-332 AAR ser 6-56; submission of

1. Forwarded concurring with the conclusions and recommendations of the accident board.

2. This squadron is currently reemphasizing the need for all pilots to be aware of and not to exceed their capabilities, and to realize the limitations of the navigational aids available in the AD-6 type aircraft.

3. Procedures are presently being established to insure that a list of previous discrepancies accompany the aircraft on all flights where there is a possibility of changing pilots enroute.

D. M. DANSER

Copies to:
CMC (Code AAF) (1)
NavAvnSafCen (2)
BuAer (Aer 512) (1)
CG, AirFMFLant (1)
BAR, Douglas, El Segundo, Calif. (1)
BAR, Wright Aeronautical, Woodridge, N. J. (1)
ComAirLant (1)

"SPECIAL HANDLING OF THIS REPORT IS REQUIRED IN ACCORDANCE WITH PART VII OPNAVINST 3750.6B

ORIGINAL

AIRCRAFT ACCIDENT REPORT
OPNAV FORM 3750-1 (REV. 11-55)
PAGE 1

See Instructions for completion prior to filling out

OPNAV REPORT 3750-1

PART I - GENERAL

SECTION A - IDENTIFICATION

1. AIRCRAFT ACCIDENT BOARD CONVENED BY: Marine Attack Squadron 332
2. DATE OF ACCIDENT: 30 October 56 | TIME: 1822R | 3. AN SERIAL NUMBER: 6-56
4. TO: CHIEF OF NAVAL OPERATIONS (Op-07)
5. VIA: (1) CO, MAG-31 (Reinf) (2) CO, AirFPlant (3) BuAer (Aer-512) (4) (Last) Naval Aviation Safety Center (5) (6) (LAST) DIRECTOR, U.S. NAVAL AVIATION SAFETY CENTER
6. ENCLOSURES: (1) Flight Surgeon's Statement (2) Statement of Tower Operator (3) Witnesses Statements (4) Captain MAY's Statement (5) Flight Plan (6) Crash and Fire Report (7) Photographs A to E (8) Wreckage Diagram (9)
7. REPORTING CUSTODIAN (If different from item number 1.): —
8. ACTIVITY OPERATING AIRCRAFT (If different from item 7): —
9. KIND OF FLIGHT:
10. TIME OF DAY: ☐ DAWN ☐ DAY ☐ DUSK ☒ NIGHT
11. LOCATION OF ACCIDENT: 0400 22 MI. from NAS, Chincoteague
12. ELEVATION ABOVE SEA LEVEL: 3 ft.
13. PLACE OF LAST TAKE-OFF: NAAS, Edenton, North Carolina
14. ROUTE: FROM NAAS, Edenton TO NAS, Lakehurst
15. TYPE CLEARANCE: ☒ IFR ☐ VFR ☐ LOCAL ☐ OPERATIONAL ☒ AIRWAYS ☐ DIRECT ☐ OTHER (Specify)
16. TIME IN FLIGHT: 0-56
17. TYPE ACCIDENT: (B-5) Collision w/Ground Undetermined
18. PHASE OF FLIGHT: (5) In Flight

AIRCRAFT

19. MODEL: AD-6
20. SERIAL NUMBER: 134509
21. DAMAGE TO AIRCRAFT: ☒ A. ☐ B. ☐ C. ☐ D.
22. DOLLAR COST: $318,000
23. AIRSPEED (Kts): UNKNOWN AT IMPACT
24. A/C WEIGHT: 15,900
25. LIST MODEL, SER. NO., REPORTING CUSTODIAN AND DAMAGE CLASSIFICATION OF ANY OTHER A/C INVOLVED (Complete separate OPNAV Form 3750-1 for each A/C): None.

SECTION B - PERSONNEL INFORMATION

PILOT AND CO-PILOT

1. PERSONNEL	2. NAME (Last, first and middle initial)	3. RANK/RATE	4. FILE/SERV. NO.	5. DESIGNATOR	6. DATE DESIGNATED	7. DATE OF BIRTH	AGE
PILOT (Person at controls at time of accident)	MACKIN, Frank J.	Capt.	(b) (6)	7331	5 May 1954	(b) (6)	31
CO-PILOT							

8. PERSONNEL	9. OPERATIONAL FLIGHT TRAINER AVAILABLE?	USED?	10. UNIT TO WHICH ATTACHED	11. TYPE INSTRUMENT CARD
PILOT	☐ YES ☒ NO	☐ YES ☒ NO	MARINE ATTACK SQUADRON 332	☒ STANDARD ☐ SPECIAL
CO-PILOT	☐ YES ☐ NO	☐ YES ☐ NO		☐ STANDARD ☐ SPECIAL

12. PILOT, CO-PILOT, STUDENT EXPERIENCE — TOTAL FLIGHT HOURS

ITEM	PILOT	CO-PILOT	STUDENT	ITEM	PILOT	CO-PILOT	STUDENT
ALL MODELS	923.9			CV LANDINGS DAY/NIGHT	20/0		
ALL MODELS IN LAST 12 MONTHS	278.3			ECLF LANDINGS DAY/NIGHT	115/0		
ALL MODELS IN LAST 3 MONTHS	87.8			INSTRUMENT HOURS, LAST 3 MONTHS	4.6		
ALL SERIES THIS MODEL	681.0			NIGHT HOURS, LAST 3 MONTHS	8.6		
ALL SERIES THIS MODEL, LAST 12 MONTHS	278.3			(Jet accidents only) TOTAL JET PILOT HOURS			
ALL SERIES THIS MODEL, LAST 3 MONTHS	87.8			DATE LAST FLIGHT, ALL SERIES THIS MODEL	30Oct56		
				DURATION LAST FLIGHT, ALL SERIES THIS MODEL	1.0		

13. ALL PERSONNEL

	NAME (Last, first and middle initial)	RANK/RATE	FILE/SERVICE NO.	ORG. TO WHICH ATTACHED	INJURY CODE	BILLET	POSITION
1	MACKIN, Frank J.	Capt.	(b) (6)	VMA-332	A	Pilot	Cockpit
2							
3							
4							
5							

8

(If additional space is necessary, attach additional sheet(s))

OPNAV FORM 3750-1 (REV. 11-55)
PAGE 2

AIRCRAFT ACCIDENT REPORT

OPNAV REPORT 3750-1

SECTION C - WEATHER

1. CEILING	2. VISIBILITY	3. WIND DIRECTION AND VELOCITY	4. TEMPERATURE	OUTSIDE AIR RUNWAY	5. DEW POINT	6. ALTIMETER SETTINGS
700 ±	2 Miles	090°/22-30Kts				

7. OTHER WEATHER CONDITIONS (winds aloft, wind levels, state of sea, etc., if pertinent to accident)

Rain and Fog

SECTION D - CAUSE FACTORS (P = Primary Factor, S = Secondary Factor)

ITEM	P	S	ITEM	P	S	ITEM	P	S
PILOT ERROR			LANDING SIGNAL OFFICER ERROR			MATERIAL FAILURE OR MALFUNCTION		
CREW ERROR			OTHER PERSONNEL ERROR, Specify.....			MATERIAL INADEQUACY		
SUPERVISORY PERSONNEL ERROR			ADMINISTRATIVE ERROR			ROLLING AND PITCHING DECK/ROUGH SEAS		
MAINTENANCE PERSONNEL ERROR			AIRPORT OR CARRIER FACILITIES			UNDETERMINED	X	
SERVICING PERSONNEL ERROR			WEATHER			OTHER, Specify.....		

SECTION E - DEPLOYMENT

FOR ACCIDENTS ABOARD DEPLOYED CARRIERS (Complete following Section on Pilot.)

1. DATE DEPLOYED	2. DAY - HOURS/LANDINGS LOGGED SINCE DEPLOYED	3. DAY - HOURS/LANDINGS LOGGED LAST 30 DAYS
4. INSTRUMENT HRS. LOGGED SINCE DEPLOYMENT	5. NIGHT - HOURS/LANDINGS LOGGED SINCE DEPLOYED	6. NIGHT - HOURS/LANDINGS LOGGED LAST 30 DAYS

PART II - MAINTENANCE, MATERIAL AND FACILITIES DATA

SECTION A - AIRCRAFT AND ENGINE DATA

1. AIRCRAFT HISTORY

DATE OF MANUFACTURE	SERVICE TOUR	MONTHS IN THIS TOUR	TOTAL NO. OF OVERHAULS	FLIGHT HRS. SINCE LAST OVERHAUL	FLIGHT HRS. SINCE ACCEPTANCE	TYPE CHECK LAST PERFORMED	FLIGHT HRS. SINCE LAST CHECK	NO. OF DAYS SINCE LAST CHECK
10-9-53	2	11	2	552.5	1272.7	1st INT.	16.5	12

2. ENGINE HISTORY

		ENGINE MODEL	SERIAL NO. OF ENGINE						
NO. 1	12-23-53	R3350-26WA	C-591028	1	30.0	283.2	1st INT.	16.5	12
NO. 2									
NO. 3									
NO. 4									

3. GENERAL

a. DID FIRE OCCUR: [ ] BEFORE ACCIDENT [X] AFTER ACCIDENT [ ] DID NOT OCCUR

b. DID EXPLOSION OCCUR IN FLIGHT? [ ] YES [X] NO

c. CHECK IF APPLICABLE [ ] AMP FOR SERIAL

d. HAS DIR BEEN REQUESTED? [ ] YES [X] NO

e. FAILED COMPONENTS INVOLVED: None Known.

4. A/C MAINT. AND ENG. FACTORS

CHECK BELOW ITEMS PRESENT IN THIS ACCIDENT

a. [ ] AIRCRAFT DESIGN

b. [ ] AIRCRAFT EQUIPMENT

c. [ ] MAINTENANCE

d. [X] UNDETERMINED

e. [ ] TECHNICAL INSTRUCTION

f. [ ] OTHER, Specify.....)

g. [ ] SURFACE FACILITIES

h. [ ] HUMAN ENGINEERING (e.g. cockpit configurations)

9

5. UNDERSTANDING DATA

a. ALTITUDE AT MALFUNCTION	b. AIR SPEED (KTS)	c. OPERATING TEMPERATURE	d. WEIGHT OF AIRCRAFT	e. C.G. (% MAC)	f. KIND OF FUEL	g. FUEL PRESSURE
11,000 Ft.	180	UNKNOWN			115/145	

h. EVIDENCE OF FUEL CONTAMINATION

i. CAUSE OF ENGINE FAILURE OR FLAMEOUT

j. FUEL CONTROL REGULATOR/CARBURETOR (List Stock and Dyr. nos., give time since new or overhauled): Not Involved

k. EXTERNAL STORES ABOARD A/C: None

(If additional space is necessary, attach additional sheet(s))

AIRCRAFT ACCIDENT REPORT

PART II - MAINTENANCE, MATERIAL AND FACILITIES DATA (Cont'd)

SECTION 5 - FACILITIES DATA (GENERAL FACILITIES PROVIDED, ESCAPE ROUTES IN THE INCIDENT SECTION)

- a. ☐ CLEARANCE AUTHORITY
- b. ☐ FLIGHT PLANNING INFORMATION SOURCE
- c. ☐ LANDING AIDS (GCA, CCA, ILS, etc)
- d. ☐ TRAFFIC CONTROL TOWER (Field or Ship)
- e. ☐ APPROACH AND ENROUTE AIDS TO NAVIGATION
- f. ☐ RUNWAY WATCH
- g. ☐ LANDING SIGNAL OFFICER
- h. ☐ OTHER (Specify) .....
- i. ☐ RUNWAY
- j. ☐ WATER LANDING AREA
- k. ☐ APPROACH ZONE
- l. ☐ END ZONE
- m. ☐ SHOULDERS
- n. ☐ TAXIWAY
- o. ☐ PARKING AREA
- p. ☐ EMERGENCY ARRESTING GEAR (Runway)
- q. ☐ AIRCRAFT SERVICING, HANDLING AND DIRECTING (Field or Ship)
- r. ☐ CRASH AND RESCUE
- s. ☒ SEARCH AND RESCUE
- t. ☐ CATAPULT
- u. ☐ ARRESTING GEAR (Carrier)
- v. ☐ BARRIER OR BARRICADE (Field or Ship)
- w. ☐ FLIGHT DECK

SECTION 6 - SHIPS DATA

a. EQUIPMENT INVOLVED: ☐ CATAPULT ☐ ARRESTING GEAR | b. PRESSURE SETTINGS | c. WIND OVER DECK | d. RELATIVE HEADING | e. APPROACH SPEED (SPECIFIC READING)

f. MARK NUMBER | g. MODEL NUMBER | h. LOCATION ON SHIP | i. LANDING GROSS AND CONFIGURATION USED

j. CATAPULT/ARRESTING GEAR BULLETINS OR NOMOGRAMS USED

k. This portion shall be completed whenever (1) a major aircraft accident involves arresting gear, barrier and/or barricade equipment, or (2) an aircraft accident involves malfunctioning of arresting gear, barrier and/or barricade equipment. Minor accidents or routine damage to cables, weldings and other expendable components need not be reported.

ENGAGED	DECK RUNOUT (FT.)	RAM TRAVEL (IN.)	CONTROL VALVE SETTINGS: CONSTANT PRESSURE: CONE (P.S.I.)	CONTROL VALVE SETTINGS: CONSTANT PRESSURE: RATIO	CONTROL VALVE SETTINGS: CONSTANT RUNOUT (WT. LBS.)	ACCUMULATOR PRESSURE (PSI)	COMMENTS (for cable failure specify number of landings and months in service)
DECK PENDANT							
DECK PENDANT							
BARRIER							
BARRIER							
BARRICADE							

PART III REMARKS (continue on separate pages if necessary)

PART	SECTION	ITEM	

IV - SIGNATURES (INDICATE DA

(b) (6) [redacted]

(senior member)

Training Officer

UNIT BILLET

(b) (6) [redacted]

(b) (6) [redacted]

Captain (b) (6) [redacted] Safety Officer

(b) (6) [redacted]

(member)

UNIT BILLET

PART V - THE ACCIDENT. Captain MACKIN accepted 134509 at Cherry Point, N. C. from Lt. (b) (6) on 30 October 1956 and flew the aircraft to NAS Edenton. On 30 October 1956 Captain Frank J. MACKIN took off from NAAS Edenton N. C., at 1726 on an IFR flight to NAS Lakehurst (see encl (5) for flight plan) Captain MACKIN flying Marine 134509 reported over Harrelsville intersection on course, at 11,000 feet, his altitude. Marine 134509 reported next, over Norfolk, on course and on altitude. At the next reporting point the following message was given to Salisbury radio, by Captain MACKIN flying Marine 134509 "Salisbury radio, Marine 134509, position over", followed by, "Salisbury radio, Marine 134509 over Chincoteague 15, Standby Standby". This report was heard at approximately 1820. At 1830 Salisbury radio received phone reports of an aircraft crash in the vicinity of Public Landing, Snow Hill, Maryland.

At 1847 local police had located the wreckage and verified that there had been an aircraft crash. At 2010 a report was received by Chincoteague that the aircraft had been identified by aircraft logs as Marine 134509.

An immediate search was started in attempt to locate the pilot. However the following morning all search and rescue attempts were discontinued when the pilots remains were found in the aircraft wreckage.

PART VI - DAMAGE TO AIRCRAFT. The aircraft struck the ground at an estimated angle of 70 degrees nose down and slightly right wing down. The impact with the ground was followed by a severe explosion and fire. The fire was quickly extinguished by water which filled the crater almost immediately after the crash. Witnesses indicate that the crater was approximately 12 to 15 feet deep when they arrived shortly after the crash. Further information as to the damage to the aircraft is not available due to the fact that the aircraft is uncoverable due to terrain conditions at the crash site. The wreckage was released to NAS Chincoteague.

PART VII- THE INVESTIGATION. Captain Frank J. MACKIN was designated a Naval Aviator on 5 May 1954 and had a total flight time of 923.9 hours of which 681.0 hours was in AD type aircraft. Captain MACKIN had 111.6 hours of instrument flying time of which 9.8 hours were actual instruments. Captain MACKIN was considered a well qualified pilot by his squadron mates. He was a mature individual noted for his attention to duty, sound judgment and ability to organize and lead.

The AAR Board departed from MCAS, Miami for NAS, Chincoteague at 1300 on the 31st October 1956. Upon arrival at NAS, Chincoteague the investigation of the accident was begun. The aircraft wreckage is located one and a half miles south of Snow Hill Public Landing, Maryland. The majority of the wreckage was located in a crater 40 feet long, 15 feet wide, and approximately 15 feet deep (see enclosure 7A-7D). The aircraft contacted the ground in a steep nose down altitude and slightly right wing down. Most parts outside of the crater were thrown to the north of the original point of contact. The aircraft exploded immediately after contact with the ground.

11

PART VII - INVESTIGATION. (continued)

Due to the terrain in which the aircraft crashed the wreckage is considered to be unrecoverable. It is impossible to move closer than 200 yards of the crash site with any type of equipment capable of recovering the aircraft (see enclosure 7A-7D). Several pieces which were recovered outside of the main crater indicated the aircraft struck at high speed. Witnesses that heard the aircraft indicated it was developing power just before the crash. Investigation revealed there were no actual eye witnesses to the flight before the crash. Several people indicated they did see the actual crash and explosion. Several witnesses heard the aircraft pass over their homes at an extremely low altitude.

Weather at the time of the crash was extremely bad. NAS, Chincoteague was reporting 700 foot overcast and 2 miles visibility with rain and fog.

The right wing-tip of the aircraft was found at the southern tip of the crater. Remains of the cockpit were found near the center of the eastern edge of the crater. The left landing gear (still in the retracted position) was found on the western edge of the crater, slightly to the north of the crater.

The only other large piece of the aircraft was a two by three foot portion of the left side of the fuselage normally located just above the tail wheel , which was found slightly to the north of the crater. The metal sheeting was crumpled in an accordian fashion (see enclosure 7E).

Investigation revealed the tower operator at NAS, Chincoteague overheard Captain MACKIN's last transmission, a position report to Salisbury radio (see enclosure 2).

Investigation revealed the aircraft (Marine 134509) had a past history of inverter trouble and cockpit lighting trouble. These discrepancies had been corrected previously to the time the aircraft left MCAS, Miami for MCAS, Cherry Point. Captain MACKIN in accepting the aircraft at Cherry Point did not have the opportunity to inspect the previous yellow sheets. He did however, have the opportunity to check the aircraft during his flight from Cherry Point to Edenton.

PART VIII - THE ANALYSIS. Due to the lack of any conclusive evidence, reliable eye witnesses, or survivors of the accident, the cause shall remain undetermined. However, the indications are that this accident may have been caused by one of two things. The loss of orientation by the pilot or failure of the instrument or lighting system.

The loss of engine or fire in flight was considered but it is felt by the board that the pilot in both cases would have made some comment to Salisbury radio if either of these two emergencies had existed, seeing that he was already in contact with Salisbury radio giving a position report. Also there are no indications of fire in flight at the scene and none of the witnesses saw any indication of a fire before the crash. It is fairly well established that the aircraft was developing power at the time of the crash by examination of the witnesses statements. All witnesses were originally alarmed by the sound of the aircraft engine passing over or near their homes.

12

PART VIII- THE WRITER. (Continued)

One witness, a woman, stated the aircraft was missing but she had no previous aeronautical experience and the board does not consider her as a reliable witness (see enclosure 3).

The board feels that in a case where a pilot does lose radial orientation his first thought is to stop everything else and attempt to regain his orientation. The fact that Captain MACKIN stopped making his position report and repeated "stand-by, stand-by" in an excited voice tends to point toward this cause. Also the point at which he stopped in the position report (at the altitude) could be an indication that it was this instrument which caused him to realize his previous position. Another indication of disorientation is that witnesses on all sides of the crash site indicate the aircraft passed near their homes and some indicate he passed in two directions. This would indicate that the aircraft may have been in a spiraling course. Indications are that the aircraft hit in a steep, right hand, diving turn which also would point towards a disorientation type of accident.

Through thorough investigation of the reported inverter and lighting failure revealed by the yellow sheets, the board feels proper corrective action was taken by maintenance personnel, however, this does not preclude the re-occurrance of these failures or the possibility of an entirely different type of electrical failure.

The possibilities of hypoxia or carbon monoxide poisoning were also considered as possible causes of the accident. The clearness of the position report and the fact that the pilot seemed to realize he was in trouble as witnessed by his radio transmission tend to discount these two causes. No carbon monoxide tests were conducted after the accident because of the length of time the remains were under water.

Although many factors tend to point towards a general trend as to the cause of this accident the board feels that none of these factors are conclusive enough to pin-point a primary cause.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. The promary cause of this accident is undertermined due to the lack of conclusive evidence to establish any one cause factor.

2. Captain MACKIN's lack of actual experience flying in instrument weather (9.8 hours) indicates he extended his capabilities and the capabilities of the AD-6 to the fullest, or perhaps exceeded them when he filed for this flight after having been briefed for existing and forecast weather. (see enclosure 5)

3. Captain MACKIN did not have the opportunity to inspect the discrepancy reports for for previous flights. Had he had this opportunity it may have alerted him to the possibility of instrument or light failure or even caused him to reconsider making this flight in the weather which had been forecast.

13

CONCLUSIONS AND RECOMMENDATIONS 2 (CONT)

RECOMMENDATIONS

1. The board has no recommendations as to the primary cause of this accident.

2. The squadron re-emphasized the need for all pilots to know and not exceed their capabilities, pilots be made cognizant of the limitation of the navigational aids available in AD-6 type aircraft and although not particularly applicable to this accident, pilots be reminded of the effect rain has in restricting visibility in AD-6 type aircraft.

3. The board recommends that all flights where there is a possibility of changing pilots enroute (cross country, ferrying hops etc.) either the actual previous yellow sheets, or a list of previous discrepancies be taken with the aircraft, so that the new pilot will have the opportunity to note the previous discrepancies and corrective action taken to remedy them.

14

MEDICAL OFFICERS REPORT OF AIR[redacted]T ACCIDENTS/INCIDENTS AND GROUND ACCI[redacted]S

OPNAV FORM 3750-8 (REV. 3-54)
(Supersedes OPNAV Form 3750-22)

OPNAV REPORT 3750-7

GENERAL INSTRUCTIONS

1. This report shall be filed in the event of an aircraft accident/incident which involves one or more of the following:

Death
Injury,
Bail-out or Ejection (attempted or successful)
Whether physiological or psychological factors are involved
Aircraft Ground Accidents resulting in serious injury
Ditching
Water Crash

2. Completion of the form shall be the responsibility of the flight surgeon.
3. For type accident and damage code refer to OPNAV INSTRUCTION 3750.6A.
4. This form shall be prepared in quadruplicate. One copy shall be turned over to the Aircraft Accident Board (or the Survival and Intelligence Officer in the case of combat incidents), and the original shall be air mailed (regular mail within 210 miles of Washington, D.C.) direct to Chief of Naval Operations (OP-57) Navy Department, Washington 25, D.C. within 4 working days following the accident. The third copy shall be mailed direct to Safety Equipment Branch, BUAER, Navy Department, Washington 25, D.C. The fourth copy shall be forwarded direct via air mail (regular mail within 250 miles of Norfolk, Va.) to the U.S. Naval Aviation Safety Activity, Naval Air Station, Norfolk 11, Virginia. Where more than one aircraft is involved, separate forms must be completed for each aircraft wherein one or more of the requirements in paragraph 1. above are applicable. (Additional copies may be prepared for use of squadron flight surgeons and other interested individuals).

1. FROM (Ship or station address)	2. SERIAL NO.	3. ACCIDENT OCCURRED (Geographic location)	4. TIME (Local)	5. DATE
USNAS, Chincoteague, Virginia	6-56	15 miles OLO NAS, Chincoteague	1822R	10-30-56

6. PLANE COVERED BY THIS REPORT	MODEL	BU. NO.	NO. OCCUPANTS	UNIT OPERATING AIRCRAFT	TYPE ACCIDENT	DAMAGE
	AD-6	134509	One	VMA - 332	Major	A

7. OTHER PLANE (If involved)	MODEL	BU. NO.	NO. OCCUPANTS	UNIT OPERATING AIRCRAFT	DAMAGE
	None				

8. NAME OF PILOT IN CONTROL OF AIRCRAFT AT TIME OF ACCIDENT/INCIDENT (Last, first, middle): MACKIN, Frank Joseph

UNIT PILOT ATTACHED TO: VMA - 332

9. FLIGHT SURGEONS CHECK LIST: [X] ALL PARTS OF FORM COMPLETED [X] SURVIVOR NARRATIVES [X] PHOTOS AS NEEDED [X] RECOMMENDATIONS [X] COPIES FURNISHED

10. REPORT FILED BY: (b) (6) [redacted] SIGNATURE: LT MC USNR (b) (6) [redacted] DATE: 11-2-56

11. FORWARDED: USN OMC COMMANDING SIGNATURE: [redacted] DATE: 11-5-56

12. [X] AIRCRAFT ACCIDENT [ ] AIRCRAFT INCIDENT [ ] COMBAT INCIDENT [ ] GROUND ACCIDENT

13. ACCIDENT DESCRIPTION

INCLUDE HERE A PARAGRAPH GIVING A BRIEF BUT FACTUAL ACCOUNT DESCRIBING THE ACCIDENT/INCIDENT. INCLUDE SUCH CAUSES IS KNOWN, ESTIMATES OF "G" FORCES, ANGLES OF IMPACT, SPEED ON IMPACT, ATTITUDE ON IMPACT, ETC. ATTACH PHOTOGRAPHS WHEN PERTINENT.

This pilot was on a night cross country flight in rainy weather from Edenton, N. C. to Lakehurst, N. J. when he crashed without announcing the he was in trouble. He was giving a position report to Salisbury radio at approximately 1822 when he said "Stand by, Stand by". A few moments later, a phone call was received from Snow Hill, Maryland telephone company stating that two women had reported a plane crash about ½ mile south of Snow Hill Public Landing. The site of the accident was in a marsh about 200 yards from land solid enough for any type of land vehicle. The site was under 12 to 18 inches of water at the time salvage operations were started. The plane apparently contacted the ground at a steep angle and exploded. The edge of the crater was out of water. Fragments of wreckage were scattered over a wide area of several hundred yards. (b) (6) [redacted]
(b) (6) [redacted] (b) (6) [redacted]

14. PILOT FACTORS (Check pertinent pilot factors listed below)

	PILOT	CO-PILOT		PILOT	CO-PILOT
IN CONTROL AT TIME OF ACCIDENT/INCIDENT	Yes		HYPOXIA SUSPECTED	Possible	
AMOUNT OF FLIGHT TIME IN LAST 24 HOURS	0.6		CARBON MONOXIDE POISONING SUSPECTED	Possible	
NUMBER OF FLIGHTS IN LAST 24 HOURS	1		FAULTY VISION	No	
NUMBER HOURS DUTY IN LAST 24 HOURS	None		AEROEMBOLISM	No	
HOURS SINCE LAST FULL MEAL	Unknown		BLACKOUT, GREYOUT, REDOUT	Possible	
TIME AT CONTROLS THIS FLIGHT	56 min.		VERTIGO	Suspected	
TOTAL FLIGHT TIME	923.9		NIGHT BLINDNESS	No	
TOTAL FLIGHT TIME IN MODEL	681		FATIGUE	No	
NUMBER PREVIOUS ACCIDENTS	None		DOMESTIC DIFFICULTIES	No	
DATE OF LAST ACCIDENT			UNFAMILIARITY IN TYPE AIRCRAFT	No	
NUMBER DAYS GROUNDED IN LAST MONTH	None		ANXIETY REACTION	No	
DATE LAST LOW PRESSURE INDOCTRINATION	April '56		LAST CSR (date and score)	1-5-55	Plus 12
AMOUNT SLEEP IN LAST 24 HOURS	Unknown		OTHER PERTINENT FACTORS IN ACCIDENT (describe below)		

15. COMMENTS ON ITEMS CHECKED UNDER ITEM 14 WHICH ARE PERTINENT TO ACCIDENT/INCIDENT. WHERE APPLICABLE, COMMENT BELOW ON ANY OF THE ABOVE FACTORS AFFECTING CREW PERFORMANCE.

(b) (5) [redacted]

Recommendations: None

16. INCL[redacted] NARRATIVES

OPNAV FO[redacted] (REV. 2-54)

SUMMARIES OF SAFETY EQUIPMENT, INJURIES AND CAUSE

DIRECTIONS

1. Use [redacted] for each person.
2. Indeterminary Class, use following key:

Class—"A" Fatal injury, is considered for reporting procedure as one that results in death prior to submission of the Aircraft Accident Report.
Class "B" Critical injury is considered for reporting procedure as injury which threatens to result in death either from injuries sustained in the accident or from complications thereof. Critical injuries resulting in death within 30 days shall be reported by letter to the original addressees.
Class "C" Serious injury is considered for reporting procedure as injury less than critical but definitely requiring five or more days hospitalization involving medical treatment but from which the individual will be expected to recover. Unexpected critical conditions or complications erroneously listed in this category which result in death within 30 days shall be reported by letter to the original addressees.
Class "D" Minor injury is considered for reporting procedure as any injury less than serious.
Class "E" No injury.
Class "F" Unknown injury - lost and presumed drowned.
Class "M" Unknown injury - missing.
Under disposition, use following key:
"U" - Unclaimed
"G" - grounded
"W" - treated and returned to duty
"X" - hospitalized
"Y" - remains recovered
"Z" - remains not recovered

1. NAME	2. SERIAL NO.	3. RANK/RATE	4. AGE	5. WEIGHT	6. HEIGHT
MACKIN, Frank Joseph	[redacted] (b) (6) USMC	CAPT.	31	147	68

7. DUTY ABOARD PLANE, ON DECK/GROUND	8. POSITION OCCUPIED AT TIME OF ACCIDENT	9. INJURY CLASS	10. DISPOSITION
pilot	Pilot's compartment	A	X

11. SAFETY EQUIPMENT	MODEL/TYPE	AVAILABLE	USED	NOT USED	DAMAGED	LOST
SHOULDER HARNESS		yes	Unknown			
LAP BELT		yes	Unknown			
INERTIA REEL		yes	Unknown			
"G" SUIT		yes	X			X
HELMET		yes	X		X	
OXYGEN MASK		yes	Unknown		X	
GOGGLES		yes	Unknown			X
GLOVES, (type)		yes	X		X	
FLIGHT SUIT, OTHER THAN "G" (type)		yes	Unknown			X
EXPOSURE SUIT (type)		No	Unknown			X
OTHER (specify)						

WAS OXYGEN BEING USED AT TIME OF ACCIDENT: Unknown [ ] YES [ ] NO

PREOXYGENATION: [ ] YES [X] NO

IF YES, OXYGEN SUPPLY PRESSURE PRIOR TO FLIGHT: Unknown

AT TIME OF ACCIDENT: Unknown PSI

WAS OXYGEN EQUIPMENT PRE-FLIGHTED BY PILOT: Unknown [ ] YES [ ] NO

IF SHOULDER HARNESS USED: LOCKED [ ] UNLOCKED [ ] TIGHT [ ] SLACK [ ] Unknown

[ ] PRESSED FORWARD AGAINST HARNESS: Unknown [ ] PRESSED AGAINST SEAT BACK

ON IMPACT SAFETY BELT: LOCKED [ ] TIGHT [ ] SLACK [ ] Unknown

12. COMMENT ON EFFECTIVENESS (Entries of "No," "None," "as designed," etc., will not be accepted. If any equipment failed, describe failure and probable cause. Use additional sheet, if necessary.)

No safety equipment was found following the accident except for shattered fragments of hard-hat and mangled oxygen mask.

IN CASE OF BURNS, FREEZING, OR FROSTBITE, LIST ALL CLOTHING WORN. USE ADDITIONAL SHEET, IF NECESSARY.

[redacted] (b) (6)

[ ] BURNS	DEGREE	1ST	2ND	3RD	1ST	2ND	3RD	1ST	2ND	3RD	CARBONIZATION ENTIRE BODY
[ ] FROSTBITE	AREA	HEAD (ventral)	(dorsal)		TRUNK (ventral)	(dorsal)		EXTREMITIES (upper)	(lower)		

UNCONSCIOUSNESS: [ ] SHORT DURATION, LITTLE SIGNIFICANCE [ ] OTHER (time)

HEAD INJURIES: CEREBRAL CONCUSSION [ ] MINOR [ ] SERIOUS [ ] CRITICAL [ ] FATAL — MINOR FACIAL INJURIES — MAJOR FACIAL INJURIES

MINOR EYE INJURIES: [ ] RIGHT EYE [ ] LEFT EYE — MAJOR EYE INJURIES: [ ] RIGHT EYE [ ] LEFT EYE

TYPE BONES	SKULL CRANIAL	SKULL FACIAL	VERTEBRAE (specify no.) CERV.	THOR.	LUMBAR	SACRAL	COCCYX	SHOULDER GIRDLE	RIBS	PELVIS	UPPER ARM LEFT	UPPER ARM RIGHT	LOWER ARM LEFT	LOWER ARM RIGHT	HAND LEFT	HAND RIGHT	UPPER LEG LEFT	UPPER LEG RIGHT	LOWER LEG LEFT	LOWER LEG RIGHT	FOOT LEFT	FOOT RIGHT
SIMPLE FRACTURE																						
COMPOUND FRACTURE																						
COMMINUTED FRACTURE																						
DIS.		JAW									SHOULDER		ELBOW		WRIST		HIP		KNEE		ANKLE	
LG.															HAND						FOOT	
CA. TION																						

AMPUTATIONS - STATE PARTS

AREA OF INVOLVEMENT		LACERATIONS MILD	MODERATE	SEVERE	CONTUSION/SPRAIN/STRAIN MILD	MODERATE	SEVERE	ABRASIONS MILD	MODERATE	SEVERE
HEAD	VENTRAL									
	DORSAL									
NECK										
THORAX	VENTRAL									
	DORSAL									
ABDOMEN	VENTRAL									
	DORSAL									
EXTREMITIES (upper)										
EXTREMITIES (lower)										

[ ] DROWNED

SHOCK	EXPOSURE
[ ] MILD	[ ] MILD
[ ] MODERATE	[ ] MODERATE
[ ] SEVERE	[ ] SEVERE

14. CAUSE OF INJURIES (Give opinion as to cause of each injury indicated above. Give specific parts of aircraft involved. Entries of "No," "None," "Sustained on impact," or "Undetermined" with no amplification will not be accepted. Use additional sheet, if necessary.)

(b) (6)

(b) (5), (b) (6)

(b) (5), (b) (6)

(b) (5), (b) (6)

(b) (5), (b) (6)

(b) (5), (b) (6)

AIRCRAFT CLEARANCE

(DELIVER DUPLICATE TO BASE OPERATIONS AT DESTINATION)

DATE: 30 October 1956

A. OPERATIONS OFFICE: NAS, Norfolk, Va.

AIRCRAFT SERIAL NO: 145[illegible]

B. OCCUPANTS (State whether crew or passenger. List additional passengers on separate sheet and attach.)

DUTY	NAME AND INITIALS	GRADE	SERVICE NO.	ORGANIZATION	HOME STATION
POST IN COMMAND	ACKIN, F. J.	Capt.	(b) (6)	VX-[illegible]	[illegible]

C. FLIGHT PLAN

RADIO CALL: [illegible]

DEPART TIME: [illegible]

POINT OF DEPARTURE: NAS, Norfolk, Va.

BASE NAME OF DESTINATION: NAS, [illegible]

ROUTE TO BE FLOWN

DR	VFR	ALTITUDE	ROUTE	TO
		[illegible]	direct	Jacksonville
			direct	[illegible]
X			[illegible]	[illegible]
X			direct	[illegible]
X			direct	[illegible]
		[illegible]	[illegible]	[illegible]
X		11,000	direct	[illegible]
X			[illegible]	[illegible]
X			direct	[illegible]
X			direct	[illegible]

MILEAGE: [illegible] NAUT. | ETE: 1:25 [illegible]

CRUISING AIR SPEED: [illegible] KTS | ETA: [illegible]

ALTERNATE: [illegible] | ETE TO ALTERNATE: [illegible]

TAIL NO.: [illegible]

PILOT'S LAST NAME: [illegible]

FUEL ON BOARD: [illegible] HRS. [illegible] MIN.

INSTRUMENT RATING

NAVY	AIR FORCE	ARMY
SPECIAL PILOT	PILOT RATING	PILOT RATING
STANDARD PILOT	INST RATING	INST RATING

DATE INSTRUMENT CARD EXPIRES: 26 August 1957

DO YOUR ACK FILE AT: NAS

DATE FILED: [illegible]

HIGHEST RANK ON BOARD: [illegible]

REMARKS: Depart at [illegible] (EST) and reach at NAS.

/s/ Frank J. Ackin

(SIGNATURE OF PILOT)

D. WEATHER

DEPARTING: DESTINATION: NAS 30 10# 100# 40F 4 — TIME OF OBS: 1630Z

ALTERNATE: NAS 78 15# 40 NE 10 — TIME OF OBS: 1630Z

FORECAST: DESTINATION (ETA): 78 10# SW-SF 70F

ALTERNATE (ETA): [illegible] 15# 100# 40F NNE 10 +15

ROUTE FORECAST: MIN CIG 600 AT In route — MAX CLD TOPS 15000 FT MSL

MIN VIS FLY LVL: 2 miles — DUST OR HAZE

MIN FRZ LVL: 12,000 FT MSL — ICING

WINDS: 160 degrees 25kts 2000ft

THUNDERSTORMS — TURB — HAIL

SMOKE — RAIN: Not — FOG: L

FRZ PCPN — SNOW — BRIEFING VOID AFTER

SIGNATURE: [illegible] Wellerkell

E. FLIGHT CLEARANCE AUTHORIZATION

SUBMITTED TO — TIME — BY

INSTRUCTIONS AND APPROVAL TRANS. TO TOWER OR PILOT BY — ACTUAL T. O. TIME

STATION ARRIVED AT — TIME — NAME — GRADE OR POSITION

SIGNATURE OF CLEARING AUTHORITY: Capt. (b) (6)

DD FORM 1 MAY 54 175 PREVIOUS EDITIONS OF THIS FORM MAY BE USED. ENCLOSURE (5) TO VX-22 ASR 6-56

AIRCRAFT CRASH AND FIRE REPORT concerning AD-6 BuNo. 134509, accident occurring 30 October 1956, pilot MACKIN

Crash report negative. No crash equipment involved. Search and rescue operations conducted by NAS, Chincoteague.

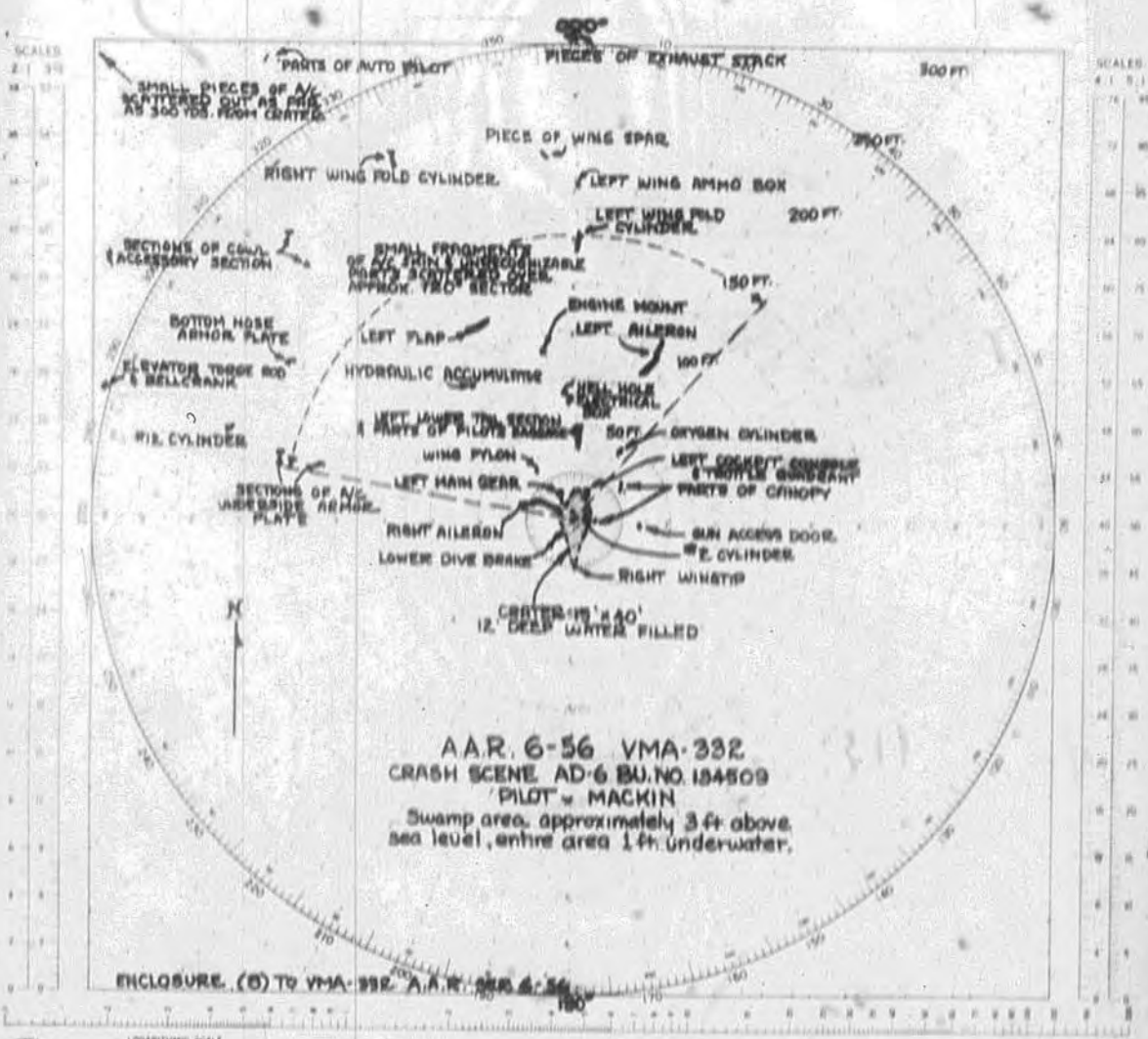
ENCLOSURE (7[illegible]) TO VMA-332 [illegible] 6-5[illegible] [illegible]
[illegible] VIEW OF CRATER CAUSED BY THE [illegible]
OF MARINE 131509. CRATER MEASURED 45 FT.
WIDE AT CENTER AND 40 FT. LONG.

ENCLOSURE (7B) TO [illegible]-332 [illegible] 6-56 SHOW-
ING CLOSE UP VIEW OF CRATER. RIGHT WING
TIP WAS FOUND AT TIP OF THE CRATER IN
THE RIGHT CORNER OF THE PHOTOGRAPH.

ENCLOSURE (7C) TO VMA-332 [illegible] SHOWING
GROUND VIEW OF CRATER LOOKING NORTH FROM
THE POINT WHERE THE RIGHT WING TIP WAS FOUND.
NOTE SMALL AMOUNT OF WRECKAGE REMAINING
ABOVE THE TERRAIN.

ENCLOSURE (7D) TO VMA-332 AAR 6-56 SHOWING GROUND VIEW OF CRATER LOOKING SOUTH. NOTE LEFT LANDING GEAR (STILL IN RETRACTED POSITION.) IN THE FOREGROUND.

YES


PIECES OF EXHAUST STACK
PARTS OF AUTO PILOT
SMALL PIECES OF A/C SCATTERED OUT AS FAR AS 300 YDS. FROM CRATER
300 FT.
PIECE OF WING SPAR
250 FT.
RIGHT WING FOLD CYLINDER
LEFT WING AMMO BOX
LEFT WING FOLD CYLINDER
200 FT.
SECTIONS OF COWL & ACCESSORY SECTION
SMALL FRAGMENTS OF A/C SKIN & UNRECOGNIZABLE PARTS SCATTERED OVER APPROX. 120° SECTOR
150 FT.
ENGINE MOUNT
BOTTOM NOSE ARMOR PLATE
LEFT FLAP
LEFT AILERON
100 FT.
ELEVATOR TORQUE ROD & BELLCRANK
HYDRAULIC ACCUMULATOR
HELL HOLE & ELECTRICAL BOX
LEFT LOWER TAIL SECTION & PARTS OF PILOT'S BAGGAGE
50 FT.
OXYGEN CYLINDER
#12 CYLINDER
WING PYLON
LEFT COCKPIT CONSOLE & THROTTLE QUADRANT
LEFT MAIN GEAR
PARTS OF CANOPY
SECTIONS OF A/C UNDERSIDE ARMOR PLATE
RIGHT AILERON
GUN ACCESS DOOR
#2 CYLINDER
LOWER DIVE BRAKE
RIGHT WINGTIP
CRATER 15' x 40'
12' DEEP WATER FILLED
N
A.A.R. 6-56 VMA-332
CRASH SCENE AD-6 BU.NO. 134509
PILOT - MACKIN
Swamp area, approximately 3 ft above sea level, entire area 1 ft. underwater.
ENCLOSURE (B) TO VMA-332 A.A.R. SER. 6-56
SCALES
LOGARITHMIC SCALE
TIME in minutes
DISTANCE in yards Relative or actual
DISTANCE in miles
SPEED in knots Relative or actual
Given any two corresponding quantities, solve for third by laying rule through points on proper scales and read intersection on third scale.
MANEUVERING BOARD
Price 75 cents (per pad of 50)