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USAF Declass/Release Instructions On File

A12

BCS 2848-63 OXC
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ACCIDENT

Excess copy was destroyed 13 Nov 70 KV B... 4 Oct 72

REPORT

OXCART SECRET

6924
123

Reference A-12 Accident Report

With regard to the Board recommendations in reference report, request you advise ASAP of your specific planned action on each of the items and estimated completion dates.

For your guidance, our assessment of the recommendations is as follows:

1. Recommendations for Primary Causes:

   a. Concur

   b. Concur

2. Recommendations for Contributing Causes:

   a. Concur

   b. Even if 1a above results in an alternate pitot source, the TDI must still be capable of a decision in case of two different readings. This might require, for example, that the TDI compare the angle of attack, if such an indicator is installed, with the two airspeed readings and accept the most reasonable combination.

   c. Concur

   d. Concur

   e. This item is redundant and is covered in 1b above.

   f. Concur

3. Recommendations on Non-Contributory Findings:

   a. Prior to installation of a crash resistant flight recorder, an investigation should be conducted to determine what parameters should be monitored to provide the necessary data for any future investigations. Recorders with a capability for monitoring at least the minimum number of required data channels should then be installed.

b. Concur

c. An investigation should be conducted to determine the best solution.

d. Concur

e. Concur

f. Concur

g. Concur

h. Concur

i. Concur if what is meant is a self monitoring warning device to indicate that the TDI is giving erroneous readings.

j. Concur

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USAF ACCIDENT/INCIDENT REPORT CHECKLIST AND INDEX

TAB LETTER		NOT APPLICABLE	APPLICABLE NOT ATTACHED	ATTACHED	NO. FORMS ATTACHED
A	AF FORM 711			X	
B	AF FORM 711a	X			
C	AF FORM 711b			X	
D	AF FORM 711c			X	
E	AF FORM 711d	X			
F	AF FORM 711e	X			
G	AF FORM 711f	X			
H	AF FORM 711g			X	
I	UNSATISFACTORY REPORT	X			
J	TEARDOWN DEFICIENCY REPORT See Tab W Maintenance & Records Group			X	
K	LIST OF TECHNICAL ORDERS NOT COMPLIED WITH See Tab W Maintenance and Records Group			X	
L	AFTO FORMS 781 SERIES See Tab W Maintenance and Records Group			X	
M	AF FORM 5			X	
N	STATEMENTS			X	
O	REBUTTALS	X			
P	ORDERS APPOINTING INVESTIGATING BOARD			X	
Q	BOARD PROCEEDINGS See Tab "A"			X	
R	DD FORM 175 OR DD FORM 1080			X	
S	DD FORM 365 (Weight and Balance Clearance Form F) See Tab W Maintenance and Records Group			X	
T	STATEMENT OF DAMAGE TO PRIVATE PROPERTY			X	
U	CERTIFICATE OF DAMAGE (List of Parts Damaged), MANHOURS REQUIRED TO REPAIR, AND COST			X	
V	TRANSCRIPTS OF RECORDED COMMUNICATIONS			X	
W	ANY ADDITIONAL SUBSTANTIATING DATA REPORTS			X	
X	OTHER AF FORMS (Failure and Consumption Reports, Etc.) See Tab W Maintenance and Records Group			X	
Y	DIAGRAMS (Fall Out--Impact Area, Etc.)			X	
Z	PHOTOGRAPHS			X	

Whenever "Applicable but not attached" column is marked for any of the above items, information must be entered under remarks to indicate what action has been taken or will be taken to obtain the required attachment. Lettered tabs shown above will be inserted for corresponding attached items, i.e.; Tab N will always be used for Statements, Tab P for Orders Appointing Investigating Board, etc. Tabs will be omitted on those items not applicable.

REMARKS:

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USAF ACCIDENT/INCIDENT REPORT

(Fill in all spaces applicable. If additional space is needed, use additional sheet(s).)

1. DATE OF OCCURRENCE *(Year, month and day)*	2. VEHICLE(S)/MATERIEL INVOLVED *(TMS & Serial Nr., if applicable)*	3. FOR GROUND ACCIDENTS ONLY *(Base Code and Report Serial Nr.)*
1963-MAY-26	A-12	N/A

4. PLACE OF OCCURRENCE: STATE, COUNTY; DISTANCE AND DIRECTION FROM NEAREST TOWN. IF ON BASE, IDENTIFY. IF OFF BASE GIVE DISTANCE FROM NEAREST BASE.	5. HOUR AND TIME ZONE LOCAL	6.
Utah, Tooele County, fourteen NW from Wendover, Utah. 102NM, 252° T/Hill AFB	1205 MST	☒ DAY ☐ NIGHT ☐ DAWN ☐ DUSK

7. ORGANIZATION POSSESSING OWNING VEHICLE OR MATERIEL AT TIME OF MISHAP

Major Command	Subcommand or AF	Air Division	Wing	Group	Squadron or Unit	Name and Base Code
NA						

8. *(List organizations of second vehicle, if they differ from Item 7 above)*

NA	25X1A					

9. BASE AND COMMAND SUBMITTING REPORT *(Do not Abbreviate)*

[redacted]

10. **LIST OF PERSONNEL DIRECTLY INVOLVED**

(For aircraft include operator and all other persons whether in plane or not. If more space is required to list all personnel, use additional sheet(s).)

Last Name	First Name	M.I.	Grade	Service No.	Assigned Duty	Aero Rating	Injury to Individual
[redacted]			CIV	-	TEST	PILOT	NA

25X1A

11. NARRATIVE DESCRIPTION OF ACCIDENT: Give a detailed history of flight, or chronological order of facts and circumstances leading to the mishap as applicable, the results of investigation and analysis to include discussion of all cause factors listed, findings, and recommendations, and any corrective action taken. *(Continue on reverse, if more space needed.)*

Coordinating Group Report (Tab "A") as follows:

History of Flight
Investigation and Analysis
Findings
Recommendation

NOTE: The following detailed group reports are Tab "B"

Operations, Witness and Medical Group
Oxygen, Pressurization, Ejection Seat and Physiological Groups
Power Plant Group
Fuel Group
Flight Controls and Hydraulics Group
Aircraft Instrumentation and Electrical Group
Maintenance Inspection and Records Group
Structural, Fire and Explosion Group
Aerodynamics Group

25X1A

12. **AUTHENTICATION**

CERTIFICATION BY *(Title)*		DATE
Recorder	App[redacted]	26 May 63

AF FORM DEC 62 711 PREVIOUS [redacted] OFFICE : 1962 OF—669566

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25X1A

HISTORY OF FLIGHT

1. A-12 aircraft, S/N 60926, and pilot, [redacted] was scheduled for an Inertial Navigation System and V/H Sensor test mission. The mission was to be flown along a pre-planned route, selected to fulfill equipment test requirements. Originally scheduled for a 1030 PDT take-off but, due to forecast weather, was re-scheduled for a 1000 PDT departure. The pilot was briefed concerning primary purpose of the mission and was instructed to abort the mission if cloud cover precluded visual fixing over planned turn points and that flight altitude should be selected to remain above cloud level. After checking weather and filing a VFR local clearance, [redacted] arrived at the aircraft at 0925 PDT. Aircraft exterior inspection was performed by qualified ground crew members in accordance with the Flight Handbook and established organizational procedures. The personal equipment hook-up was performed by a qualified personal equipment technician. The pilots cockpit check and engine start were accomplished with the left engine exhibiting some flame from the tail pipe but indicating no hot start. This was caused by the throttle being in the idle rather than the shut-off position at engine start. Taxi and takeoff appeared normal, official takeoff time was 0957 PDT.

25X1A

a. The aircraft gross weight was 85,000 pounds including 35,000 pounds of fuel loaded in a manner to give an aircraft center of gravity of 19.8% MAC. The flight was normal and as briefed until Wendover was reached on the second circuit of the course. At an INS indication of 33NM to go to Wendover, the following transmission was recorded: (Mach 0.84, 9.5. The 9.5 is assumed to be 9,500 pounds of fuel remaining and is supported by the chase pilot's statement). Time of this transmission is computed to be 1152 PDT.

25X1A

b. No visual fix could be made over Wendover and the computed time of the turn is 1156 PDT. During this turn, the pilot stated on the radio and tape recorder, "Seems to be building up airspeed in the turn." [redacted] statement indicates that as altitude was gained to approximately 38,000 ft mach number increased to 1.05.

c. The turn was continued to the desired true heading of 200° where roll-out occurred at approximately 1202 PDT and near latitude 41-00N and longitude 114-30W.

d. The next recorded transmission from the pilot was, "200°", which is the desired rollout heading. The next transmission was, "I think my airspeed is fouled up"; however the time of this transmission is not accurately fixed.

e. The last recorded transmission by the pilot was: "I got troubles; I'm in a spin ______."

f. Course reconstruction places the aircraft at approximately 40-41N and 114-19W at the ejection time of 1205 PDT.

2. Investigation and Analysis:

a. Aircraft SN 60926 first flew on 9 Oct 1962 and had accumulated 135:28 hours of flight time at the time of the accident.

b. The aircraft impacted 14NM south southwest of Wendover, Utah at 1205 PDT on 24 May 1963. Initial impact was on a hill of approx 30° slope, with the aircraft inverted and on an angle of approximately 20° to the terrain. The aircraft therefore was at a dive angle of 50° relative to the horizontal and inverted at the time of impact. Upon impact, the aircraft disintegrated with resultant explosion and fire. The scatter pattern along the flight path from the point of impact is shown on the map in Tab Y. Several small pieces of aircraft were located back along the flight path. These pieces were identified and it was determined that upon impact the resulting disintegration explosion and fire caught small pieces of aircraft in the rising currents of air from which they landed mostly forward but several landed aft. Burned structural parts found in the impact area were examined to determine whether or not the burning took place prior to impact. All burning was determined to have taken place after initial impact. All extremities of the aircraft and all doors and hatches were accounted for in the impact area. This is positive evidence the aircraft was structurally intact at the time of impact.

3. The flight control and hydraulic system components were examined in detail and no indication of malfunction was found. All control cables including elevons, rudders and throttle levers were connected at impact as evidenced by the tension breaks in these cables. The "A" and "B" hydraulic systems were operating as evidenced by the retraction of the rudder servo stops when the control surface limiter handle was actuated which was below 147 knots equivalent airspeed.

a. The elevon trim actuator was found extended to a position of 5° nose down and the elevons were found in this position at impact.

b. The cockpit throttle levers were found jammed at 64° which corresponds to an engine rpm of 93%. However, it could not be determined if this was the throttle position at initial impact since the breaking of the cables could have moved the throttles before the jamming took place.

c. The pilot reported no stability augmentation system force feed back at anytime of the flight and did not report any unusual aircraft yawing or pitching movements until the aircraft reached its stall speed, indicating the stability augmentation system functioned properly throughout the flight.

4. All recovered oxygen system components were exami ed in detail. All components were broken loose from this location by impact and showed severe impact danage. No evidence of functional system failure was found which would indicate this system contributed to the accident. The oxygen remaining in the cylinders used to fill the aircraft system prior to this flight was checked for purity and moisture content. Both checks proved to be satisfactory. During the ejection sequence the oxygen hoses pulled loose from the under parachute leg straps. Although the pilot did not receive any injuries from the loose hose the possibility of injury does exist and a positive restraint must be provided. A small pencil point hole was found in the accordian hose at the end where it attaches to the F2700 regulator. Evidence of dirt and twigs found at the hole location indicates hole was caused at touch down and roll over.

5. Ejection equipment worked satisfactorily with the following exceptions:

a. Pilot experienced singeing of hair on the back of his neck and on his legs just above the top of his boots. The pilots visor was covered with rocket powder residue.

b. The seat cushion/sleeping bag separated from the survival kit during the ejection process.

c. The left main parachute canopy release lock could not be released by the pilot after touch down. Pilot stated the left riser was under full open canopy strain at the time. The right side did release.

6. Weather in the area of the crash and for the flight path previous to the crash was "as forecast". Tops of the overcast in the Wendover area at the time of the crash was 34,000 ft MSL with scattered cirrus extending to 36,000 ft. There was a thunderstorm reported west thru northwest of Wendover on the 1200 PDT Wendover observation. Pilots reports located an area of thunderstorm activity west of a line from Wendover to 40 miles north of Ely, Nevada.

Temperatures and winds for the flight path are shown on the cross section attached to the operations and witness group report.

7. Examination of the J75 engines installed in the aircraft at the time of the accident revealed that the left-hand engine was rotating at a substantial RPM at impact where as the right-hand engine had flamed out as evidenced by low RPM. Examination of all engine bearings on both engines revealed no indication of failure and the bearings had been adequately lubricated.

a. At subsonic speed the engine inlet spikes are normally fully extended and locked and the bypass doors are normally closed. Examination of these components revealed they were in the appropriate position at impact.

b. An attempt was made to establish the throttle lever position at the time of impact. The following indications were found:

(1) Cockpit throttles 64° corresponding to 93% of RPM.

(2) Fuel control throttle positions left-hand engine 35° or 97% RPM, right-hand engine 45° or 87% RPM.

(3) Fuel flow indicator readings of 4600 pounds per hour and 2600 pounds per hour. It could not be determined which readings corresponded to which engine. These readings correspond to 38° and 23° throttle angle. Since none of the readings corresponded the throttle position at impact could not be determined.

c. Review of the aircraft fuel system revealed that in the inverted position and within nose angles of 10 degrees above and 17 degrees below horizontal, it is not possible to supply fuel to the engines. However with roll and/or lateral "G" forces, it is possible to supply fuel to one of the engines, within a narrower nose angle band. It is entirely conceivable that the RH engine flamed out due to fuel flow interruption during aircraft maneuvers between inversion and impact.

3. Examination of the electrical system components did not reveal any indication of malfunction and it was concluded that the electrical system did not contribute to the accident. The air data computer and triple display indicator were subjected to an intensive investigation to determine what if any malfunction could be induced in this system which would cause erroneous airspeed indications reported by the pilot. It was determined that blockage of the pitot total pressure line produced the most realistic TDI readings that agree with the pilots observations. Bench check of the air data computer and triple display indicator revealed that blockage of the pitot total pressure port will result in the mach and KEAS readout on the TDI remaining constant as long as altitude is held constant. If the pitot system is blocked as above and a climb is initiated as described in the accident to approximately 38,000 ft the mach will increase to 1.05 and the airspeed to 310 KEAS which are the conditions reported by the pilot. The auto trim function of the air data computer would also receive the erroneous indication of increasing mach and would take the appropriate corrective action of nose up trim. This would add to the climb established by the pilot. (An aerodynamic analysis was made of the flight conditions as described by the pilot and chase pilot. Based on their testimony and airplane performance parameters, it is not possible that airplane 123 could have attained 1.05 mach for the flight conditions immediately after passing over Wendover). The combination of the established climb plus that angle added by the erroneous mach trim increased the climb and reduced the airspeed so that at approx 38,000 ft the aircraft had slowed to the point that it could not maintain altitude. The drag associated with the high angle of attack had put the aircraft on the back side of the power curve. With no change in power setting the aircraft

continued to settle at an increasing angle of attack and increasing drag, leading to a further increase in angle of attack, further bleed off of airspeed, and ultimate stall at approx 30,000 ft.

1. Primary Cause: The primary cause of this accident was materiel failure in that the total pressure ports of the pitot system probably became blocked by ice, which gave the pilot false increased airspeed and Mach readings on both the TDI and conventional indicated airspeed system, this was followed by unplugging which caused rapid rundown of Mach and KEAS back to correct readings at approximately 160 KEAS, further confusing the pilot. NOTE: This pitot heating system was designed and qualified in accordane with MIL-P-25632A.

2. Contributing Causes:

a. The pilot failed to comply with briefing instructions that he abort this mission if he encountered IFR conditions and/or any undercast that would prevent visual observations for the INS and V/H sensor.

b. The Mach Trim subsystem of the AFCS, receiving the same erroneous Mach signals as the TDI, added nose up trim to the aircraft, thus further increasing the angle of attack and increasing the rate of airspeed bleed off which led to the stall.

c. Pilot failed to take adequate corrective action after evaluation of instrument readings.

d. Weather contributed to this accident in that pitot icing most probably occurred when flying thru visible moisture just prior to the turn at Wendover, and instrument conditions existed during the final phase of flight.

e. There is no alternate pitot-static source which the pilot could have used to check instrument readings.

f. The F-101B aircraft was unable to provide chase support during the critical time the A-12 was experiencing pitot-static difficulty and airspeed was bleeding down, due to the wide margin in sub-sonic flight performance between the two aircraft.

3. Non-contributory Findings:

a. Although this aircraft was designed for a relatively unexplored flight envelop, there were no provisions for an inflight recorder. A crash resistant flight recorder would have been invaluable in re-constructing this accident.

b. A direct reading angle of attack indicator if available to the pilot during this situation, would have provided him with a positive indication of his true angle of attack and the approaching stall condition.

c. Electrical distribution of AC power is unsatisfactory in that there is no back up for inverter failure.

d. When operating on the TDI, at other than design cruise speed, cross checking of normal pressure indicators should be emphasized.

e. Pilot did not follow check list on engine start this flight.

f. The left main parachute canopy release lock could not be released by pilot after touch down.

g. Seat cushion was lost during ejection. Loss of the seat cushion itself is not hazardous, but ordinarily the seat cushion is a compact-light weight sleeping bag needed for cold weather survival.

h. Personal oxygen hoses were pulled loose from under parachute leg straps. At ejection these lines pull from beneath the leg straps and could cause damage to the suit.

i. No warning device is incorporated into the triple display indicator.

j. No hypoxia warning device (a suitable cockpit gauge with red light/ or horn is available) is installed in this type aircraft.

k. Sabotage was not a contributing factor in this accident.

RECOMMENDATIONS

1. Recommendations for Primary Cause:

a. Further testing and/or evaluation of the A-12 pitot static system for adequacy of heating and wiring realiability, with appropriate modifications if indicated, be accomplished prior to releasing the aircraft from its present VFR restrictions.

b. A study to determine the feasibility of the installation of an alternate pitot source and a cockpit warning device to indicate pitot heat failure should be accomplished as soon as possible. If this study indicates the practicability of these installations they should be accomplished prior to release from VFR restrictions.

2. Recommendations for Contributing Causes:

a. The necessity of strict adherence to briefing instructions should be stressed with all pilots.

b. None.

c. None.

d. All A12 flights should be restricted to VFR conditions until the pitot-static system has adequately been modified as outlined above.

e. An alternate pitot-static source should be installed in A12 type type aircraft to provide pilot the opportunity to switch to this source to check his instruments should they appear strange at any time.

f. The problem of chase support of the A12 aircraft should be reviewed to determine the changing requirements from here forward and to suggest changes in the type or types of chase aircraft should such be required.

3. Recommendations on Non-contributory Findings:

a. A crash resistent flight recorder should be installed in A12 type aircraft for all test and training missions.

b. A direct reading angle of attack indicator should be developed for this aircraft capable of operation throughout the flight envelope.

c. A spare inverter should be provided with switching provisions to any one of the three primary inverters.

d. Pilot training should emphasize that when operating at other than design cruise speed cross checking of the normal pitot-static indicators is required.

e. Pilot training will emphasize the importance of following the check list.

f. Evaluate the present parachute canopy release for the purpose of making improvements which will make the release more compatible with the parachute and full pressure suit.

g. A nylon lanyard should be attached to the seat cushion to prevent its loss during ejection.

h. Provide a hose restraint to prevent flaying of oxygen hoses during ejection.

i. Evaluate, and if feasible, incorporate a self monitoring warning device for the TDI.

j. Provide a hypoxia warning device to monitor pilots' oxygen supply system.

The above findings and recommendations were drafted and approved by the following members of the board.

CHARLES E. WIMBERLY
Colonel, USAF
Board President

DOUGLAS T. NELSON
Colonel, USAF
Coordinating Group

JOHN R. KELLY, JR
Lt. Col. USAF
Coordinating Group

EDWARD P. MARTIN, JR
Coordinating Group

NORMAN E. NELSON
Coordinating Group

SECRET

AIRCRAFT ACCIDENT/INCIDENT REPORT

To be filled out for principal aircraft involved. *(Appropriate blocks only should be filled out on secondary aircraft.)*

1. ACCIDENT/INCIDENT CLASSIFICATION *(Check one)*

	Major	Minor		
Flight Accident Resulting in Aircraft Damage	X		Accident Not Resulting in Aircraft Damage	
Aircraft Non-flight Accident			Air Force Aircraft Incident	

2. Aircraft/Serial Number	3. Type, Model, Series, Block No.	4. Assignment/Status Code (AFM 65-110)
-6926	A-12	Test

5. If aircraft was being ferried or delivered indicate gaining and losing organizations, date of transfer, ultimate destination.

N/A

25X1A

6. [redacted] To Round Robin

7. Filed:
VFR X VFR— ON TOP ____ IFR ____ Local X Other ____ Direct ____ Airways ____ (Controlled) ____

8. Flight reference at time of accident	9. Duration of Flight Hrs.	Mins.	10. Mission of flight
Contact ____ Instrument Actual X Sim. ____ Other ____ Unk. ____	2	08	Equipment Test

11. ALTITUDE DATA	Cleared Alt. MSL	Altitude above terrain acdt sequence began	Altitude MSL impact point	Highest altitude MSL flown	Time flown highest alt.
	VFR Ft.	30,000 Ft.	5,120 Ft.	37,750 Ft.	Hrs. 0 Min. 07

12. Fire and explosion data

a. Fire:
None ____ Inflight ____ Ground X
Result of grd. impact? Yes X No ____

b. Explosion:
None ____ Inflight ____ Ground X
Result of grd. impact? Yes X No ____

13. Airfield data: Applicable to takeoff and landing accidents occurring within 2 miles of airfield

Field elevation in use N/A Ft.
Length of runway in use ____ Ft.
Length of overrun ____ Ft.
Distance of touchdown from runway ____ Ft.
Heading of runway ____ °

Composition of rnwy. Asphalt ____ Concrete ____
Other *(Specify)* ____
Composition of overrun *(Specify)* ____
Surface condition. Dry ____ Wet ____ Icy ____
Other *(Specify)* ____

Conditions affecting occurrence; e.g., type of instrument or lighting approach aid used, obstructions, barrier, airspeed, gross weight, forced landing

14. *(If answer is "Yes," to either question, discuss under item 11, AF Form 711)*
Violations ☐ Yes ☒ No Breaches of air discipline ☐ Yes ☐ No

15. PHASE OF OPERATION: e.g. take off roll, initial climb, normal flight, acrobatics, landing approach, flareout	16. TYPE OF ACCIDENT: e.g. gear-up landing, mid-air collision, abandoned aircraft, fire or explosion in flight, undershoot, overshoot
Normal Flight	Abandoned Aircraft

17. WEATHER AT TIME AND PLACE OF ACCIDENT: *(If a factor in the accident, attach statement of weather officer)*

Sky conditions	Visibility	Wind direction and velocity	Temperature	Dew point	Alt. setting	Other weather conditions
Wendover 45⊖55⊕140 ⊕	50	SSE7	60	48	30.01	ThunderstormW-NW

PILOT(S) INVOLVED (FLIGHT CREW)

18. OPERATOR *(Person at controls at time of accident)*

a. LAST NAME *(Jr., II, etc.)* FIRST NAME MIDDLE NAME	GRADE	COMPONENT	SERVICE NUMBER	NATIONALITY	YR. OF BIRTH
[redacted] 25X1A	CIV			US	1929

b. POSITION IN AIRCRAFT AT TIME OF ACCIDENT
Front or Left Seat X Rear or Right Seat ____

c. ASSIGNED DUTY ON FLIGHT ORDER
AC ____ IP ____ P X CP ____ Other *(Specify)* ____

d. ASSIGNED ORGANIZATION

Major Command	Subcommand or AF	Air Division	Wing	Group	Squadron or Unit	Base
		N/A				

e. ATTACHED ORGANIZATION FOR FLYING

Major Command	Subcommand or AF	Air Division	Wing	Group	Squadron or Unit	Base
		N/A				

f. ORIGINAL AERONAUTICAL RATING AND DATE RECEIVED	g. PRESENT AERONAUTICAL RATING AND DATE RECEIVED	h. INSTRUMENT CARD	i. AFSC
Pilot 9 Feb 52	Senior Pilot 9 Feb 59	Type FAA Instrument Date of expiration ____	Primary ____ Duty ____

19. OTHER PILOT

a. LAST NAME *(Jr., II, etc.)* FIRST NAME MIDDLE NAME	GRADE	COMPONENT	SERVICE NUMBER	NATIONALITY	YR. OF BIRTH
N/A					

b. POSITION IN AIRCRAFT AT TIME OF ACCIDENT
Front or Left Seat ____ Rear or Right Seat ____ Other ____

c. ASSIGNED DUTY ON FLIGHT ORDER
AC ____ IP ____ P ____ CP ____ Other *(Specify)* ____

d. ASSIGNED ORGANIZATION

Major Command	Subcommand or AF	Air Division	Wing	Group	Squadron or Unit	Base

e. ATTACHED ORGANIZATION FOR FLYING

Major Command	Subcommand or AF	Air Division	Wing	Group	Squadron or Unit	Base

f. ORIGINAL AERONAUTICAL RATING	g. PRESENT AERONAUTICAL RATING	h. INSTRUMENT CARD	i. AFSC
		Type ____ Date of expiration ____	Primary ____ Duty ____

NOTE: IF MORE THAN TWO PILOTS ARE INVOLVED (FLIGHT CREW) REPORT SAME INFORMATION REQUIRED ON ADDITIONAL SHEET FOR EACH.

AF FORM DEC 62 711b PREVIOUS EDITION OF THIS FORM IS OBSOLETE.

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20. FLYING EXPERIENCE (Attach ... for Pilot ...)

ASSIGNED DUTY ON FLIGHT ORDERS: (Give last names only. List all flight times to nearest hour.)	Pilot	Co-Pilot	Inst. Pilot	Acft. Cmdr.	Student Pilot
	[redacted]				25X1A
a. Total flying hours (Including AF time, student and other accredited time):	3176:00				
b. Total Jet Time:	2054:00				
c. Total 1st Pilot/IP hours, all Aircraft:	2816:00				
d. Total Weather Instrument Hours:	357:00				
e. Total 1st Pilot/IP hours this Model:	24:00				
f. Total 1st Pilot/IP hours last 90 Days:	51:00				
g. Total 1st Pilot/IP hours last 90 Days this Model:	20:00				
h. Total 1st Pilot/IP hours weather and hood last 90 Days:	5:00				
i. Total Pilot hours night last 90 Days:	3:00				
j. Total Pilot hours last 30 Days:	21:00				
k. Total 1st Pilot/IP hours last 30 Days:	19:00				
l. Total 1st Pilot/IP hours last 30 Days this Model:	4:00				
m. Date and Duration last previous flight this Model:	14May2:00				
n. Date of last proficiency flight check:	22Jan63				

21. CAUSATIVE AGENCY

Cause Factors (Check one primary and all applicable contributing and probable factors.)

	Primary	Contributing	Probable
Operators			
Pilot		X	
Co-Pilot			
Controller (Drones)			
Crewmembers (Other than Operator) (Specify)			
Supervisory Personnel (Specify)			
Maintenance Personnel — Type of pers. and orgn. level			

	Primary	Contributing	Probable
Other Personnel (Specify)			
Materiel Failure or Malfunction			
Engines			
Airframe			
Landing Gear			
Other (Specify) AFCS Trim) (Mach		X	
Pitot System	X		
Airbase or Airways			
Weather		X	
Misc. Unsafe Conditions (Specify)			
Undetermined ☐			

22. DAMAGE

Damage to Aircraft	Damage Beyond Economical Repair	Manhours to Repair	Cost (Est.)
☒ Destroyed ☐ Minor ☐ Substantial ☐ None	☒ Yes ☐ No		$

Description of Damage (Describe briefly extent of damage to aircraft and any property damage incurred)

Aircraft totally destroyed (See Tab U)

No damage to property (See Tab T)

23. AUTHENTICATION (Signature and grade)

...nt [illegible signature]	Accident Investigation Officer
Maintenance Officer	Medical Officer
AACS Representative N/A	AWS Representative
Member	Recorder [illegible signature] USAF

AF FORM DEC 62 711b

★ U.S. GOVERNMENT PRINTING OFFICE : 1963 OF—669740

SECRET

D

SECRET

OXCART SECRET

AIRCRAFT MAINTENANCE/MATERIEL REPORT

Use this form when AF aircraft accident/incident involves inadequacy, malfunction or failure of AF materiel.

1. AIRCRAFT TM & SERIAL NUMBER

A-12

AF 60-6926

Prod Art 123

2. SPECIAL REPORTS DATA

a. Were Previous UR's Submitted on Factor(s) Involved? ☐ Yes ☒ No

b. No. and Date of UR's Submitted as Result of This Accident *(Attach copy)*: N/A

c. Is TDR Requested? ☐ Yes ☒ No

d. No. of T.O.'s Not Complied With at Time of Accident *(List T.O. Nos. and titles on separate sheet(s)—Tab K)*: See maintenance records report.

3. AIRCRAFT HISTORICAL DATA

Item	Aircraft	Part, Component or Accessory
Identification of Aircraft/Part, etc.	AF 60-6926	N/A
Air Force Acceptance Date First Flight	09-10-62	
Total Flight Hours	133:20	
Last Overhaul Date	N/A	
Overhauling Activity *(Name and location)*	N/A	
Hours Since Overhaul	N/A	
Hours Since Last Periodic Inspection	48:20	
Date of Last Periodic Inspection	08-03-63	
Type of Last Periodic Inspection	100 Hour	

4. ENGINE HISTORICAL DATA

(Complete a separate column for each engine involved. Also, complete a separate column for each power plant component involved.)

Installed Position	1	2	N/A	N/A
Engine Model and Series	J75-P19W(SS)	J75-P19W(SS)		
Engine Serial Number	P612091	P612143		
Total Engine Hours	31:04	49:24		
Number of Major Overhauls	0	0		
Hours Since Last Major Overhaul	N/A	N/A		
Date of Last Overhaul	N/A	N/A		
Overhaul Activity	N/A	N/A		
Date Last Installed	22-04-63	22-04-63		
Hours Since Last Installed	26:57	27:15		
Date of Last Periodic Inspection	N/A	N/A		
Type of Last Periodic Inspection	N/A	N/A		
Fuel *(Type and octane rating)*	PWA 523B	PWA 523B		

5. FIRE DATA N/A

(To be completed when fire or chemical explosion occurs, not resulting from ground impact. Indicate: P—Probable or K—Known, in squares below.)

a. MATERIEL FAILURE CAUSING THE FIRE				b. IGNITION SOURCE				c. COMBUSTIBLE MATERIAL			
Electrical System		Propulsion System		Electrical System		Static Electricity/ Lightning		Cargo		Hydraulic Fluid	
Fuel System		Other *(Specify)*		Pneumatic System		Other *(Specify)*		Electrical Insulation		Lubricating Oil	
Hydraulic System				Propulsion System				Explosives		Other *(Specify)*	
Pneumatic System		Unknown				Unknown		Fuel		Unknown	

d. AIRCRAFT FIRE EXTINGUISHING SYSTEM	Fixed	Portable		Fixed	Portable
Extinguished Fire			Not Activated and Not Near Fire		
Reduced Fire			If Discharged, Chemical Used		
No Effect When Discharged			If Discharged, Amount of Chemical Used		
Activated but Did Not Discharge			Other Pertinent Info.		
Not Activated but Near Fire					

e. FIRE/OVERHEAT WARNING	Fire Detector	Overheat Indicator
Operated Properly		
Not Operated, but Near Fire		
Not Operated and Not Near Fire		
Not Installed		
Other *(Specify)*		

f.	SHUT OFF PROCEDURE	RESULTS OF ALLOWING FIRE TO BURN OUT
Extinguished Fire		
Reduced Fire		
No Effect		
Not Accomplished		
Unknown		

g. EFFECT OF FIRE	MARK ONE
Catastrophic	
Increased Severity of Mishap	
No Change in Severity of Mishap	
Unknown	

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6. LOCATION OF INITIAL FIRE N/A

	Known	Probable		Known	Probable		Known	Probable
Baggage Compartment			Aft of Firewall			Wheel Well		
Bomb Bay			Forward of Firewall			Cargo-Passenger Compartment		
Cockpit/Crew Quarters			Rocket Pod			Other *(Specify)*		
Engine Section			Tire/Wheel/Brake			Unknown ☐		

7. MISCELLANEOUS CHEMICAL EXPLOSION DATA N/A

	Known	Probable		Known	Probable
Initial Ignition Occurred in an Explosive Manner Prior to Ground Impact.			Intensity of Explosion Was Sufficient To Cause or Appreciably Contribute to In-Flight Airframe Break-Up.		
Explosion Occurred After Fire and Before Ground Impact.			Other Significant Data *(Specify)*		
Explosion Occurred Subsequent to Ground Impact.			Unknown or Not Available.		

8. AIRCRAFT MAINTENANCE OFFICER'S ANALYSIS AND SPECIFIC ACTION TAKEN

Describe difficulties involved and relationship of the various components to the accident. Describe specific action taken. For Fire Data describe the fire and/or chemical explosion. Cover in detail any noted deficiencies, malfunctions of fire detecting and extinguishing equipment, or questionable procedures. When discussing specific equipment, give the name of manufacturer, part numbers, etc., and state whether or not a UR has been submitted. Include any additional information or opinion of possible value to future technical analysis of this report.

Covered in other specialized reports.

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LIFE SCIENCES REPORT OF AN INDIVIDUAL INVOLVED IN AN AF ACCIDENT/INCIDENT
SECTION A. AIRCRAFT ACCIDENT/INCIDENT

1 GENERAL

a. [redacted] 25X1A

b. Assigned Base and Command

c. Aircraft Type, Model, Series (as applicable) A-12

d. Primary AFSC	e. Duty Assignment	f. Current Rating	g. Age	h. Height	i. Weight	j. Years of Educ.	k. Activity at time of Accident/Incident
			34	70½"	154	14	Pilot

2 MEDICAL DATA

a. Degree of Injury: None ___ Minor X Major ___ Fatal ___ Missing ___

b. Days Hospitalized 0 c. Days in Quarters 0 d. Total Days to be Lost 0

e. Waiver X ___ No ___ Specify ___

f. If Fatal: Was Autopsy Form Submitted to AFIP? Yes ___ No ___
Were Specimens Submitted to AFIP? Yes ___ No ___ Frozen ___ Fixed ___

g. Diagnosis: Describe Fatalities, Injuries and Causes (Use Basic Diagnostic Nomenclature, AFR 160-13). Specify Primary Injury in non-fatal or primary cause of death in fatal.
8331 Strain, left paravertebral musculature, at T-6 level

3 PHYSIOLOGICAL INCIDENT (Complete Items 1, 2, 3, 4, 5, 6, 7, and 10 as applicable)

a. Type Mission Special b. Duration of Flight 2:05 c. Single Ship [ ] Formation [X] d. Ind. Alt at time of inc. 35M

informal: Previous flight: 22 May 63
formal: Date of manufacture

e. Cabin Alt at time of inc. 26M f. Time at Alt. 2:00 hrs. Aircraft Pressurization ground checked on

g. Did you use O_2 Preflight? Check: Yes [ ] No [X]

h. Regulator Setting both on Last Check on 20 May 63
Type Regulator Used Special - 100% F2700

i. Oxygen System Pressure at takeoff #1-1850 #2 - 1900 psi
at time of incdt Unknown Capacity 4+ hours

j. Last Check of System preflight on 24 May 63

k. Type of Mask MBU-5/P Adequate Fit: Yes [X] No [ ]
Checked within 15 days [X] 30 days [ ] Over 30 [ ]

l. Time Lapse between incident and examination 5 hours

m. Specify Tests (Specify Type and Results): not done (time lapse)
CO Blood Sugar High CO_2

n. Attach a diagram of the flight profile involved, use additional sheet(s)

4 PSYCHOPHYSIOLOGICAL FACTORS

Check only factors present. Explain the basis for your determination in Item 10. Cite all clinical and lab evidence

FACTOR	Not Sig	Contributed to Accident: Definite	Probable	Possible	FACTOR	Not Sig	Contributed to Accident: Definite	Probable	Possible
Aging					Preoccupation/Channelized Attention				X
Alcohol					Other				
Air Sickness					Fatigue				
Auditory Interference					G-Forces				
Body Build					Hyperventilation				
Boredom					Hypoxia				
Cardiovascular					Illness				
Discipline					Language Barrier				
Distraction					Missed Meals				
Drugs and/or Self-Medication					Motivation/Morale				
Dysbarism (Specify)					Spatial Disorientation				
Emotional Disturbances					Task Over-saturation				
Anxiety					Unconsciousness				
Fear					Vertigo				
Get-Homeitis					Visual Restriction				
Irrational Behavior					Other Related Factors (Explain)				
Over Confidence				X	No Factors Present				
Panic									

5 ENVIRONMENTAL FACTORS (Check only factors present. Explain the basis for your determination in Item 10. Cite all clinical and lab evidence)

FACTOR	Not Sig	Contributed to Accident: Definite	Probable	Possible	FACTOR	Not Sig	Contributed to Accident: Definite	Probable	Possible
Air Pressure, i.e. Rapid Decompression, Pressure Loss, Etc., Specify					Smoke, fumes				
Cold					Vibration				
Deceleration Forces					Weather			X	
Heat					Windblast				
Light Intensity					Other Related Factors, Specify				
Noise					No Factors Present				

6 TRAINING RELATED TO THIS ACCIDENT/INCIDENT (Give Dates Accomplished)

a. Ejection Seat Training: Seat Simulator ___ Ejection Seat Tower ___ Previous Ejection no
included with physiological training
Lectures/Demonstrations ___ Other (Explain) ___

HOURS: Total Flying Time 3,175:45; This model 26:05

b. Survival Training: Basic: 11 Sep 62 Shaw AFB Special: 6 Jan 63 - 14 Jan 63
AF School: Ground ___ Water ___ Arctic ___ Jungle ___ Lectures/Demonstrations ___ Other ___

c. Parachute Training no 0 with physiological training
Jump School: ___ Nr. Previous Jumps ___ Lectures/Demonstrations ___ Other (Incl R.C.)

d. Physiological Training 3 Nov 62 Date; Shaw AFB S.C. Place
e. Last Chamber Flight 5 Nov 62 Date; Shaw AFB Place
f. Type Flight Refresher

g. AFSC or Other Training	h. Name of Course or OJT	i. Dates Attended	j. Aptitude Scores Applicable
Special Course	Pressure suit training	5 Oct 62 - 12 Oct 62	N/A

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7 PERSONAL PROTECTIVE AND SURVIVAL EQUIPMENT

Specify all applicable items of equipment on appropriate line and specifically indicate all types of clothing worn and any other equipment that influenced operation.

ITEM	EXAMPLE	TYPE	NOT AVAILABLE	AVAILABLE Not Used	AVAILABLE Used Functioned	AVAILABLE Used Failed
Head Protection	P-4B, HGU-2/P, HGU-6/P	HGU-2/P			X	
Eye Protection	Visor, Glasses	Visor			X	
Ear Protection	Ear Plugs, Muff	Headset			X	
Oxygen Mask	MBU-5/P MBU-3/P	MBU-5/P			X	
Clothing Worn	K-2B, A/P-22S-2	K-2B			X	
Clothing, Survival	Sleeping Bag, Down-Filled Suit		X			
	B-3A, MG-1	B-3A		X		
Footgear	Alert Boots, Combat Boots	Thermal boots			X	
Body Restraints	Seat Belt, Shoulder Harness	Seat belt-Shoulder Harness			X	
Life Vest	LPU-2/P		X			
Life Raft	PK-2, E-2B		X			
Survival Kit, Container	Global, MD-1	Global		X		
Communications	URC-11, SARAH	URC-11		X		
Other Signaling Devices	Flares, Mirrors, Whistle	Flares, mirror, whistle			whistle	
Rations	Food/Water, Provided/Forged	Water and food		X		
Survival Equipment	Rifle, Fishing Gear	Fishing gear		X		
Seat	Fwd/Rear Facing, Side, Fixed, Etc.	Forward			X	
Other Equipment	Flashlight, etc. (Specify)	Flashlight		X		

8 **ESCAPE**

a. General: (Check or fill in as appropriate)

Ejection [X] Bailout [ ] Landing Surface: Ground [X] Flat ___ Mtns ___ Ice/Snow ___ Hilly X Desert X Wooded ___ Swamp ___ Other (Exp) ___

Water [ ] Calm, Shallow ___ Deep ___ Rough, Shallow ___ Deep ___ Unknown [ ]

b. Surface Winds, Knots Calm (estimate if unk) Dragged: Yes [ ] No [X] Difficulty releasing Chute Canopy: Yes [X] No [ ]

c. Reason for Jump (if more than one indicate):

Fuel Exhaustion ___ Fire ___ Engine Failure ___ Mid-Air Collision ___ Loss of Control X Other (Exp) ___

d. Attitude of Aircraft:

Level ___ Inverted X Dive ___ Bank ___ Spin X Spiral ___ Climb ___ Other (Exp) ___

e. Altitude above Surface 25,000 IAS 150K (if not known, approx.) Seat Catapult: Ballistic ___ Rocket X

f. Difficulties Initiating Escape: none

Centrifugal Force ___ Canopy/Hatch Failure ___ Injury ___ Actuating Controls (Specify) ___ Other (Exp) ___

g. Difficulties During and After Escape:

Clothing/Equipment Interference ___ Seat entangled in Shroud Lines ___ Legs/Arms entangled in Shroud Lines ___ Automatic Lap Belt Malfunction ___

Held onto Seat Actuating Controls ___ Did not Separate ___ No Diff X Other (Exp) ___

h. Seat Separation Device Installed: Yes X No ___ Functioned Properly: Yes X No ___

Failed: Webbing ___ Initiator ___ Other (Exp) ___

i. Type Parachute: Seat ___ Back X Canopy release: Single [ ] Double [X] Canopy: 28' ___ 30' ___ 35' X | Parachute equipped with Zero Delay Lanyard: (speed sensor) Yes ___ No X | Connected to D-ring: N/A Yes ___ No ___ | Automatic Lanyard Connected: Yes X No ___

NOTE: A narrative statement will be prepared by each ejectee and/or survivor to include all information pertinent to escape and survival. The statement will be attached to this form. In the event of a fatality, the statement will be prepared by the Flight Surgeon.

9 **RESCUE AND/OR SURVIVAL**

a. Survival involved (Survival implies any water landing and anytime over 1 hour before rescue on land) Yes ___ No X

b. Distance nearest Rescue (military base) 102 NM Time before Rescue 1 Hrs. Transmitted distress signal: Yes X No ___ Transmitted position fix: Yes X No ___

c. Effects of Exposure: Frostbite Immersion Sea Sickness Insect Bites Sunburn Dehydration Other (Explain) none

d. Primary Factor in Rescue: Radio/Beacon (Specify) ___ Flares ___ Mirror ___ Flashlight ___

Sea Marker Dye ___ Position Fix ___ Chaff ___ Local Population X Other (Specify) ___

e. Type Rescue: None Required ___ Ground Party, Military ___ Local Population X Helicopter/other Aircraft (Specify) ___

Boat ___ Self Rescue (Walked Out) ___ Other (Specify) ___

10 **MEDICAL OFFICER'S RATIONALE, COMMENTS**

This section is to include comment on medical, personal, social, family, industrial hygiene and allied factors in incident causation, and a description and analysis of the factors in injury causation. Injuries should be correlated with the operations of personal equipment, malfunctions and failures of structures, systems, etc. Pertinent contributing factors in Items 3 through 9 should be commented upon. Include X-ray and laboratory findings. Pertinent recommendations are encouraged. Physical and mental qualifications are high and are not believed to have been contributing factors. The pilot relates an apparent malfunction of airspeed, initially reading too high, later too low, uncorrelated with attitude or altitude change. Apparently he did not cross check other available instruments, or else cannot recall their reading. Thinking he [illegible] instrument failure, he made only small pitch corrections as air speed steadily fell to stall, spin and ejection. A probable factor was weather, as he was on instruments during the final events and had no visual attitude reference. Further, he was reluctant to make a large pitch correction on instruments and also because the aircraft is not stressed for G's which might be required in pull out. It may be argued that a) He showed relative unconcern (overconfident) over airspeed [illegible], and/or b) overfixation on airspeed instrument to detriment of cross checking and/or c) a cautious approach (continued)

Date	Typed Name, Grade and Title of Medical Officer	Signature
6 JUN 63	BRUCE E. KIMB[illegible], Major, USAF MC, Flt Surgeon	Bruce E. Kimbel

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M

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PILOT INDIVIDUAL FLIGHT RECORD

25X1A

[redacted]

1. AF OR COMMAND | 2. WING, GROUP, AND SQUADRON OR UNIT | 3. PERIOD COVERED: Apr-May 63 | 4. SHEET NO: 91 | 6. SERVICE NUMBER

7. BASE AND LOCATION | 8. BIRTH (Day, month, year) | 9. DUTY AFSC | 13. INSTRUMENT CERTIFICATE: WHITE | GREEN | NONE | 14. GRADE AND COMPONENT

10. ORIGINAL RATING AND DATE | 11. PRESENT RATING AND DATE | 12. DATE PHYSIOLOGICAL TRAINING CERTIFICATE EXPIRES | DATE OF EXPIRATION

SECTION 1

DATE	TYPE MODEL SERIES	MISSION SYMBOL	LANDINGS	INSTRUCTOR PILOT TIME	FIRST PILOT TIME	CLASSIFICATION OF INSTRUCTOR AND FIRST PILOT: DAY VFR	DAY WEATHER	NIGHT VFR	NIGHT WEATHER	HOOD	COMMAND PILOT TIME	CO-PILOT TIME	CLASSIFICATION OF COMMAND AND/OR CO-PILOT: DAY VFR	DAY WEATHER	NIGHT VFR	NIGHT WEATHER
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
NOT PREVIOUSLY RECORDED - MARCH 63																
29	A-12	X-1	3		1:55	1:30				:25						
APRIL																
2	A-12	S-8	2		2:55	2:55										
2	A-12	X-1	0		1:50			1:50								
3	F-101B	X-2	1		1:15	1:15										
10	A-12	0	2		2:00	1:30				:30						
18	F-101B	S-7	1		1:20	1:20										
18	A-12	0	3		2:00	2:00										
24	F-101B	S-7	1		2:15			2:15								
25	F-101B	X-2	1		1:55	1:55										
25	A-12	X-1	0									2:15	2:15			
MAY																
1	A-12	X-1	1		2:25	2:25										
2	F-101F	X-2	1		1:40	1:40										
13	F-101B	S-7	1		1:35	1:35										
14	F-101B	X-2	1		2:00	2:00										
14	A-12	S-7	2		1:40	1:40										
21	F-101B	X-2	1		2:00	1:40	:20									
22	F-101B	X-2	1		1:55	1:55										
22	F-101B	S-7	1		2:15		1:00	:05	1:10							
23	F-101B	S-7	1		1:45	:15	1:30									
24 - PILOT INVOLVED IN MAJOR AIRCRAFT ACCIDENT.																
15. TOTALS THIS SHEET			24		34:40	25:35	2:50	4:10	1:10	:55		2:15	2:15			
16. TOTALS BROUGHT FORWARD FROM SHEET NO 90			1156	714:50	2066:20	2201:25	170:50	228:20	31:25	149:10		50:40	41:55	5:05	3:40	
17. TOTALS TO DATE			1180	714:50	2101:00	2227:00	173:40	232:30	32:35	150:05		52:55	44:10	5:05	3:40	

18. TYPED NAME AND GRADE OF OPERATIONS OFFICER OR AUTHORIZED DEPUTY: HAROLD E. BURGESON, Captain, USAF

19. SIGNATURE (Sign original and duplicate): Harold E. Burgeson

PILOT INDIVIDUAL FLIGHT RECORD OXCART SECRET 93 [redacted] 25X1A

SECTION II - MISCELLANEOUS ENTRIES

DATE	TYPE MODEL SERIES	AUTH MISSION SYMBOL	RADIO CONTROL PILOT TIME	AIRCRAFT COMMANDER TIME	CLASSIFICATION OF AIRCRAFT COMMANDER TIME: DAY VFR	DAY WEATHER	NIGHT VFR	NIGHT WEATHER	APPROACHES: DATE	TYPE	RADAR	NON-RADAR	INSTRUMENT TRAINERS	FLIGHT SIMULATOR	[illegible]	[illegible]		AR/Ds
						NOT PREVIOUSLY RECORDED -			29 Mar	H	3							
									10 Apr	H	2							
									25 Apr									0/2
									21 May	W	1	1			1			
									22 May	W	1	1			1			
									23 May	W	1	1			1			
20. TOTALS THIS SHEET											8	3			3			0/2
21. TOTALS BROUGHT FORWARD FROM SHEET NO. 90											438	262	[illegible]:45	57:00	36	20		
22. TOTALS TO DATE											446	265	[illegible]:45	57:00	39	20		0/2

SECTION III - SUMMARY OF PILOT EXPERIENCE

DUTY	SINGLE ENGINE	TWO ENGINES	MORE THAN TWO ENGINES	SINGLE JET PROPULSION	MULTI-JET PROPULSION	JET ROCKET	ROCKET	ROTARY WING TYPE	GLIDER	TURBO-PROP: TWO ENGINES	MORE THAN TWO ENGINES		TOTAL
23. INSTRUCTOR PILOT				[illegible]18:40	96:[illegible]								[illegible]4:50
24. FIRST PILOT	[illegible]	39:3[illegible]		[illegible]03:4[illegible]	647:50								2[illegible]1:00
25. COMMAND PILOT													
26. CO-PILOT		[illegible]	4.[illegible]	:[illegible]	[illegible]								[illegible]:[illegible]5
27. AIRCRAFT COMMANDER													
28. RADIO CONTROL PILOT													
29. TOTAL USAF RATED TIME	[illegible]	72:[illegible]	[illegible]	[illegible]	749:[illegible]								[illegible]

FLIGHT COMBAT TIME: 34. INSTRUCTOR | 35. FIRST | 37. COMMAND | 38. CO-PILOT | 39. RADIO CONTROL | 40. A/C COMDR. | 41. TOTAL COMBAT TIME

30. AF STUDENT PILOT TIME

REMARKS

31. CIVILIAN (OVER 400 HP)

32. FOREIGN MILITARY

33. OTHER U.S. MILITARY

34. TOTAL FLYING TIME

N

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STATEMENTS

This is an extract of taped interview discussing in detail the statement signed by [redacted], 24 May 63. Interview conducted by members of coordination group. Each sentence was discussed individually to obtain additional information.

25X1A

[redacted] I am going to read down your written statement sentence by sentence and then ask you the questions to try to obtain the information that we are after and I'll ask you specific questions and hopefully you can give me the answers to the question and then any additional information that you feel is pertinent to that particular point. I would like to have you just go ahead and volunteer it at that time so that we can record it on tape. This is your statement that you rendered on the 24th of May and I'll start by reading the first sentence and asking the questions as we go. "At 33 nautical miles to go, before turning at checkpoint Wendover, I asked [redacted] what his fuel was. His reply was 9500 lbs". My first question Jack, is how did you know 33 miles to go. Had you obtained this from Ken?

25X1A

25X1A

[redacted] Yes sir, I had asked him just previous to this, in fact the preceding transmission was how many miles have we got to go for the turnpoint. He came back with 33.

25X1A

[redacted] Okay, and how did he reply to the fuel reading, did he say 9500 or do you remember how it was given to you.

25X1A

[redacted] As opposed to nine thousand five hundred?

Yes.

25X1A

[redacted] 9500 lbs. (Ninety-five hundred)

9500 lbs. Thank you very much. "At the time about 1150 local I was in close formation and we were just above an overcast at 34,000 mean sea level". Jack, how far above? Are you able to estimate 2,000 feet above , or 200 feet above, or what do you think it was?

25X1A

[redacted] It was between 500 and a 1000 feet above.

1.

25X1A [redacted] Above the overcast. Okay, can you define close formation for us, were you really in tight or how many widths?

[redacted] I was within one wing span of the 101 and tucked in good.

Okay, and which side were you on, Jack?

25X1A I was on the right side.

You were on his right?

On his right wing.

Did you by any chance, and I knew that you were real busy at this time, notice Mach number, or true airspeed, or indicated, or altitude on your panel?

25X1A [redacted] I had looked at it within the last four minutes, or last four or five minutes just prior to that. We were, or I was, indicating .80. And this is also indicated altitude that I gave you, 34,000. So there would have to be a correction put in.

25X1A [redacted] Right.

This last paragraph we didn't talk over.

Okay, but you don't remember indicated airspeed. You don't recall having looked at it at this point?

25X1A [redacted] No sir, the needle was right around the 300 mark, but I don't remember exactly what it said.

25X1A [redacted] Okay. And for the benefit of those of us who aren't familiar with the F-101. If [redacted] read [redacted] on his mach, his true mach number was about

25X1A [redacted] in that area. This jibes pretty well with what Ken was indicating at this time in mach. You don't remember altitude do you Jack?

25X1A [redacted] It was 34,000 even.

He was still at 34?

I don't know exactly what it equates but it was 34 indicated.

25X1A [redacted] This equates to about 35 mean sea level. This would be about a thousand and fifty feet error as I recall. Okay, next sentence. "Entry into left turn at Wendover, seemed normal except that at about 1/3 of the way through

I started getting the warning horn". Had you penetrated the tops of the clouds yet at this point Jack?

[redacted] Yes sir, we had picked up one little puff, not puff but a little patch of cirrus, we had gone through this in the turn, and just prior to this point. It was in and out, about one or two second duration at this stage.

[redacted] In other words before you reached the 1/3 point. Wasn't this when this happened.

[redacted] It was very thin.

[redacted]: Now when you got the pitch of warning horn, Jack, did you look at that time at your indicated air speed?

[redacted] Yes sir.

[redacted]: Do you remember what it said?

[redacted] 290.

[redacted]: 290. How about angle of attack. Do you happen to remember that?

[redacted] No sir, I just noticed that the alpha needle was sitting real close to the warning needle.

[redacted] Did you estimate the degree of separation?

[redacted] It was right on it.

[redacted] Were you getting any buffeting at this time?

[redacted] Yes sir, I picked up the buffet and the warning horn about the same time.

[redacted]: Did you, by chance, check altitude or rate of climb at this time?

[redacted] I remember looking at rate of climb and there wasn't any. I didn't check the altitude.

[redacted] Just prior to this, Jack, had you had to make any throttle change, to stay with him, an increase or decrease?

[redacted] No sir.

[redacted]: He seemed to be at a constant velocity. What was your bank angle about this time, do you recall?

[redacted] I didn't look at the bank angle.

[redacted] ...y on his wing.

25X1A

[redacted] No sir, it didn't feel excessive, in fact I was just mildly surprised that I got this, because I wasn't expecting it. This is my story, I rolled out some of my bank and started separating.

25X1A

[redacted] Had there been any stick rate introduced by yourself, Jack, in trying to stay in with him; was he tightening up the turn or did you get the feeling that he was accelerating in the turn?

25X1A

[redacted] No sir, it wasn't noticeable.

[redacted]: And at this time then you were back in the tops of the cirrus, you say?

[redacted] We were still on top, except there was an occasional little thin wisp of cirrus clouds.

25X1A

[redacted] I see. Did you notice by any chance, Jack, as you hit this puff of cirrus whether there was any precip in it?

25X1A

[redacted] Oh, no sir, it was real thin.

25X1A

[redacted]: Okay next sentence. "I told [redacted] that he was getting too slow for me and that I was sliding to the outside of the turn to gain airspeed". Could you estimate the speed differential, Jack, were you over running him badly?

25X1A

[redacted] No sir. I was falling behind.

[redacted]: At this point you began to fall behind.

[redacted] I began to fall behind and actually this reference to speed is not exactly right in that I should have said bank angle in that I couldn't maintain his turn radius with him, and I remember looking at the airspeed and said well I'm all right. So I just rolled out my bank angle to be able to turn with him, but at a greater rate or I should say a larger diameter or turn radius.

25X1A

Question: Have you had that trouble on any of the previous turns?

[redacted] No, but on any of the previous turns I was not this close to him I was flying about a mile in trail. We had only made one other previous turn and that was over Austin.

[redacted] You hadn't been in close formation at any prior turns to this one?

No sir.

Did you crowd on any throttle at this point Jack, to try to stay with him?

25X1A [redacted] Yes sir, I put on throttle, I don't know how much. I didn't put on full throttle.

25X1A [redacted]: You didn't go to military?

No sir, and I know that I would be separating since the radius of turn would be different. I was slowly slipping behind at this point. I remember picking up my Mach and lowering the nose just slightly.

25X1A [redacted]: Do you remember what the Mach number was that you read at this point?

Accelerated up to an indicated Mach of .84.

: .84, this would put you at about .88. Did you see any sign of afterburner from Ken. Did you notice any afterburner puffs?

25X1A [redacted] No sir.

: Was he doing any gyrations at all?

No sir. He looked completely normal, he looked like he was still in his level turn to me because I was slightly back and slightly separated. I pushed the power up and never did come up to him.

25X1A [redacted] You got no feeling that his bank angle increased or that he nosed down or anything of this nature?

25X1A [redacted] No sir.

: Next sentence then. "As the distance between us became greater I intermittently lost sight of him due to the cirrus overcast". What distance, Jack, is this the distance separation, in other words, he was pulling away from you at this point?

25X1A [redacted] It's hard for me to say whether or not he was pulling away from me; he was in front of me and I was sliding to the outside of the turn and the greatest separation we had was when we both rolled out at the completion of the turn at an

25X1A estimated 4,000 feet separation.

[redacted]: Okay.

[redacted] I was level with him at this time.

[redacted]: And there was some lateral separation because you slid out of the turn?

25X1A [redacted] Yes sir.

[redacted] Jack, could you estimate the bank angle, 30 degrees, 45 or 20? What do you think he had in this turn?

25X1A [redacted] This would be sheer speculation on my part, sir, I would say between 30 and 40 degrees of bank and I thought level.

25X1A [redacted] Was the horizon of the tops of the cirrus available to you in this turn?

25X1A [redacted] No sir.

[redacted] In other words you were pretty much reference his airplane or the gages, one or the other?

25X1A [redacted] I was reference his aircraft or my gages because at that time I was looking northwest and the background was ragged and it wasn't a good reference.

25X1A [redacted] Okay. Now as the distance between us became greater, I intermittently lost sight of him due to the cirrus overcast. Here again Jack, now the question in our minds I think is, what distance was becoming greater; was he still pulling away or had you overtaken him or what had happened here?

25X1A [redacted] It was just lateral separation becoming greater, but he was still maintaining his position in front of me as far as fore and aft separation.

Col Nelson: Now at this point do you recall your airspeed or Mach number, or altitude?

25X1A [redacted] No sir, other than just the .84 I knew. I pushed it up though.

[redacted]: Were you still holding .84 do you suppose?

25X1A [redacted] As far as I know.

[redacted]: And still no sign of afterburner from Ken?

[redacted] No sir.

[redacted]: As distance became greater were you both in cirrus tops at this time?

Yes sir. Now I say cirrus overcast, but actually it was a real solid overcast below us and these were just wisps of cirrus clouds that were above us and one would come between my line of sight; none of them were very big or very thick.

25X1A [redacted] Could you estimate the visibility while you were in the stuff? Do you think you had a couple of miles, or could you guess at it?

25X1A [redacted] Well, the little wisp wasn't any bigger than this building.

Did you lose sight of him when you went through this little wisp of cloud?

25X1A [redacted] Yes sir, but it wouldn't last a second or two.

I see. So you, you wouldn't say that you were continously in the cirrus, you were just intermittently passing through?

25X1A [redacted] No sir. We had been in the cirrus where the visibility was down to maybe a mile prior to the turn, but as we turned north we left most of this behind us. This was a fairly clear area that we were in except for these little wisps.

25X1A [redacted]: Okay. "When we rolled out of the turn, I was slightly ahead and above and advised him that I was crossing in front of him and was climbing higher to stay VFR". Now Jack, at what point did you get ahead of him?

25X1A [redacted] Just prior to the roll out. Just a matter of guessing, I'd say that I was slowly catching up to him because of my Mach, and I could see that by the time that I could join up we would probably hit another little puff. Rather than join up just at the most inopportune time I started a slight climb and started closing in and just about the time we were rolled out is when I passed by him. Well, as we rolled out I was just slightly ahead of him, just completed passing him.

25X1A [redacted] Did you overtake him rapidly? Did you get the feeling that he, he was decelerating rapidly at this time or was it a normal closure that you'd planned?

25X1A [redacted] Well, to me it didn't seem unusual in that I closed on him at about the speed I expected to with the increased Mach that I had.

25X1A

[redacted] t was normal?

I'd say it was completely normal.

Now you say you went slightly above, Jack, you remember what altitude you were indicating during this closure?

25X1A

[redacted] The first time I looked at my altitude was after I passed him and had rolled out. Up to this time I'd been watching him and not my own gages. I was indicating 36,000 feet.

[redacted]: At the time you checked it just after passing?

25X1A

Just after passing and with wings level.

: You indicated 36, then your actual altitude was very near 37.

Question: Were you still in this little bit of cirrus at this time?

25X1A

[redacted] No. I was above it at this time because the last 45 degrees of turn I'd started climbing and figured that I couldn't join him in time to be VFR.

25X1A

[redacted]: You were definitely above the cirrus then at this 36 indicated?

Yes sir.

Was there any turbulence Jack, or was it smooth?

It was very smooth.

Okay. "And at this time he said his heading was 200° and he said he saw me"? How did that statement of heading check out with what you thought he was flying? In other words, were you near that same heading to keep him in sight?

25X1A

[redacted] Yes sir. I checked it and it was normal and I don't remember anything unusual about it.

Question: When you checked your altitude and you said you were above him, how high above him. In otherwords when you were at say 37, where was he?

25X1A

[redacted] Not more th n 1,000 feet separation, if that much.

: He looked to be in straight and level flight to you?

He looked normal.

: No unusual angles of attack, or anything of that nature?

No sir.

25X1A [redacted] Okay, next sentence then Jack, "[illegible] again and I saw that he was straight and level". How did you ~~know this~~, because you knew you were straight and level and you weren't deviating as far as your paths were concerned? Did you have a good horizon reference at this time?

25X1A [redacted] Yes sir, we were looking to the south and the stuff that was in front of us was below us and it seemed to be breaking away from us.

25X1A [redacted] At this point how were your pitot static instruments, did you get any indication of erratic airspeed or rate of climb or anything? Did everything look normal to you?

25X1A [redacted] Yes sir, everything looked normal.

[redacted] Did it appear to you that distance wise you were staying pretty close or were you still over running him at this point? With your 36 indicated?

25X1A [redacted] I'd reduced power to slow back down to my .80 Mach. I figured he was still holding his eight four. I didn't notice anything unusual.

25X1A [redacted] Did this seem to be slowing you down then to where you were relatively the same speed as Ken?

25X1A [redacted] I didn't notice anything unusual there. I didn't immediately notice a closure rate or anything.

25X1A Question: Did you still have him visual when you cut back to .80 Mach?

[redacted] I don't really know where in there I reduced power, somewhere along in passing him up or crossing in front of him that I had reduced power because I had been holding power on to stay with him. I don't know where I reduced it but I remember that I'd planned to reduce my power to help me slow down.

25X1A [redacted] Jack, just an academic question for our interest. Flying the 101 what's your primary instrument for power control, in other words, when you want a quick power change, to get an idea of how much change you made what do you look at?

25X1A [redacted] It depends on how quick, I just push the throttle in and I look at EPR's.

You look at EPR's?

To see if I get my increase, they are the highest ones up and I look at those, then depending on what else I'm doing I run on down to RPM and fuel flow.

25X1A

I guess EPR then fuel flow.

[redacted] EPR then fuel flow?

Normally it would be fuel flow.

Do you feel, I'm not trying to pin you down, I just want an opinion, what do you feel is your primary instrument if you want a quick power change and you are in a situation like this? What gives you the best indication and the quickest on a power change?

25X1A

[redacted]: Well, EPR again. If I am flying instruments where I want a small change I use the fuel flow. EPR is usually what I use when I'm changing.

Question: At this time you were a thousand feet above the cirrus?

25X1A

[redacted] Somewhere near a 1,000, I don't know exactly.

Question: Was Ken in the clouds at that time?

25X1A

[redacted] No.

Question: You were both in the clear?

25X1A

[redacted] When I looked to see him, he was.

: Jack, looking down at him like this you didn't see him enter any cumulus tops or anything of this nature?

25X1A

[redacted] No sir, there wasn't any of those right in that area.

: You couldn't see any down below?

No sir.

: Okay then, the next sentence. "I told him that I would maintain heading and altitude and to keep me posted of any change in heading". I assume from this Jack, that you were beginning to lose sight of him and you wanted to know if he made a change so that you could hopefully keep tabs on where he was.

25X1A

[redacted] Yes sir. Well, I'd crossed in flight in front of him and was going off to his left and was rolling back when I picked him up one time there and I could see we were going to go into this cirrus and I wouldn't be able to see him and I wasn't going to slow down too much anyway. Rather than S - Turn back and forth I was just going to roll out and stay VFR and let him accelerate and come by me as I slowed down.

25X1A

[redacted] Okay. "It was planned to let him pass me up then I would rejoin". That was my planning, I didn't make any transmission to this effect.

Can you give us a feel for the time span, Jack, from the time you rolled out of the turn and you passed the point where you no longer had him in sight, how long would you say this was? How many minutes?

25X1A

[redacted] Until the last time I saw him or when I heard his transmission?

[redacted]: No, I think that down a little farther, you do have that time estimate, but I am trying to get a little feel here for how long it took you from the time you rolled out of the turn until you passed him up and definitely were aware of the fact that you were over running him, [redacted] answers but drowns out the rest of the question) in other words, he had dropped behind.

25X1A

25X1A

[redacted] Well, actually I passed him up with about 15° of turn to go or right near the roll out point, as we rolled out, I had just passed him not more than a minute or two.

25X1A

[redacted] In a minute or two you had already gone by the point where you felt you couldn't see him any longer?

25X1A

[redacted] Well sir, it wasn't because of visibility, it was because of where my aircraft was, he was slightly below me and behind me and I just couldn't see him.

25X1A

[redacted] That's what I mean, I am trying to get the time span from the time that you rolled out of the turn and suddenly you were pulling out ahead of him at this .84 Mach.

25X1A

[redacted] Now I was slowing down.

Rapidly do you think?

No, just a slight reduction. This all transpired in a minute or two, it all seemed normal. I didn't go booming by him, I went just floating by him what appeared to me would be the differentials in the Mach that I thought we had.

25X1A

[redacted] Did you get the feeling during this time that Ken was going through rapid and large changes of airspeed.

[redacted] No sir.

Everything looked normal to you.

25X1A

[redacted] The angle of attack and everything still looked normal?

Yes sir.

Okay, "Shortly after completing roll out of the turn he said I think I have airspeed trouble". Jack, was this about coincident with your having passed him up and crossing over in front of him?

25X1A

[redacted] Yes sir. Well, I had rolled out and looked at him and looked back at my gages and was checking my heading and that is when he said I think I'm having airspeed trouble.

25X1A [redacted] Do you recall at that time what you were reading, had you decelerated back to what?

25X1A [redacted] Specifically I don't remember but I remember just generally that it was indicating about .80.

25X1A

[redacted] You were back to about point 8 then?

Yes sir.

Altitude wise?

Still 36.

Still indicating 36? Shortly after completing roll out of the turn, Jack, do you by any chance know how long you were in this turn?

25X1A

[redacted] The duration of the turn?

Yes.

No sir I don't.

But you didn't get the feeling at any time that you were in excessive rates or angles of bank and this sort of thing?

25X1A

[redacted] No sir I didn't.

"I asked him how serious and he gave no reply. I could intermittently see him in the top of the overcast and he appeared level and on a heading of 200 degrees". I just asked you Mach number and altitude and you said .80 and 36. Were you still able to detect the differential in speed? Jack, this last time you saw him when he appeared level and on course did you feel that your .80 Mach number had just about [illegible] ahead?

25X1A

[redacted] Yes sir, it looked like we were status quo as far as differentials in speeds. But of course now, this was a real short period of time. It just looked normal.

Question: But you saw him after he said he was having airspeed troubles and you noticed nothing about his pitch?

25X1A

[redacted] No sir.

[redacted] Nothing unusual coming out of the tail pipes to indicate that he might have blown an engine and the fuel was coming out or anything like this? Was he conning at this time?

25X1A

[redacted] He had been conning heavily for the last hour, well for the last 45 minutes I guess.

25X1A

[redacted] Was he still conning at this time do you remember?

[redacted] I don't remember specifically seeing the cons but I think maybe that if didn't see the cons I would have remembered it.

25X1A

[redacted] Still no sign of afterburner on his part?

[redacted] No sir.

[redacted] And you hadn't had to light burner for any reason?

[redacted] No sir.

[redacted] Intermittently seeing him in the top of the overcast, you got the feeling he was going intermittently through the cirrus? Then you would lose sight of him occassionally and then see him again?

25X1A

[redacted] Yes sir.

[redacted] Can you estimate the differential in altitude at this point, had he changed any?

25X1A

[redacted] No sir, we seemed to be maintaining about the same differential.

[redacted] Both speed and altitude?

[redacted] Yes sir.

[redacted] And his heading was still right where you'd expect it?

[redacted] Yes sir.

[redacted] "Now after this I never did see his aircraft again". Was this because he suddenly disappeared down into the cirrus, Jack, or were you occupied otherwise and weren't looking for a few seconds here?

[redacted] Well, it might have been a combination of several things in that to see him I would have to roll up the aircraft and pull it a little bit to look behind me and I was more intent in keeping my heading and staying VFR.

[redacted] Right.

I didn't roll it up and look back at him at the time.

When was the next time you remember trying to see him?

It was just before he made this transmission and then when he did make the transmission I started looking for him.

[redacted] In other words this next one, the time you hacked was 1202 Jack, and then you say about 4 or 5 minutes later he made a garbled transmission saying I think I'm in trouble, I'm in a (blank), was this 4 or 5 minutes after the 1202 or after rolling out of the turn?

[redacted] This was about 4 or 5, well, we'll say 3 or 4, 4 or 5 seems a little long there, now that I think about it this was after I had looked at my watch.

[redacted] Now was that consisent with your last glance at Ken, in other words 1202 was about the time you had your last look at him and had rolled back level again?

[redacted] Right.

When did you try another look at him? Can you remember?

Seems to me I rolled up just to look back to see if he was there just before he made this transmission.

[redacted] The transmission about I think I'm in trouble. You didn't see him?

No sir, but this didn't seem unusual because of my position in relation to him and he could have been on the other side.

[redacted] During this interval then, between your last look and your last attempt, you were on the same heading and the airspeed etc, was constant?

[redacted] Yes sir.

As far as you were concerned if he had been there and not in the clouds you would have expected to see him right where you saw him the last time, relatively speaking?

25X1A

[redacted] Relatively speaking, yes sir.

: "I did not hear anymore as he was becoming very garbled", question here Jack, in these last few words that you heard from Ken during this thing, anything unusual about his voice, or anything to indicate to you that he didn't sound normal to you?

25X1A

[redacted] No sir, not at all.

He sounded lucid and clear?

Yes sir, and even this I think "I'm in trouble" wasn't in a few notes higher scale than what the usual transmissions are when you are excited; it was the same tone quality, a little more than just matter-of-factly, but it was very calm. And this being garbled was the kind of garbled that I would say was not his voice being garbled. It was the transmission itself, there seemed to be static, such static as you would pickup in a precipitation static in the ADF.

25X1A

[redacted] At the time of this had you noticed any cumulus activity coming up through the cirrus?

25X1A

[redacted] No sir.

: Did you brief together with Ken on the mission?

No sir.

: You briefed separately?

Yes sir.

: Had you seen Ken that morning and did you have breakfast with him or walk out to the aircraft with him or anything, any close personal contact with Ken before you got in the airplane?

25X1A

[redacted] We talked in the Operations building, I didn't have breakfast with him.

: And that was how long before you went out to the airplane or rather how long before he went out? You were the second chase so you would have been off about an hour later.

25X1A

[redacted] This was 45 minutes or so, I'm not sure of the [illegible]

25X1A [redacted] Did he seem normal to you? Anything different about Ken that you might have noticed?

25X1A [redacted] No sir. He seemed normal.

Question: How long was it from that point where you last saw him until you got the garbled transmission?

25X1A [redacted] Well, I was estimating here 4 or 5 minutes, but in thinking about it it seems to be more like 3 or 4 minutes, not quite 5 minutes. I don't have any specific idea but it wasn't too long a period of time, it was in the range of 3 or 4 minutes.

Question: Now that transmission was, "I think I'm in a __________?"

25X1A [redacted] Yes sir, that's the last one and I think the one you are referring to.

Question: The conclusion is or the picture appears to be that everything went from normal or what appeared to be normal, to the chase pilot to a stall in the period of about 3 or 4 minutes.

25X1A [redacted] But sir; when I asked him about the airspeed trouble, or asked him how serious it was; I got no reply but he had said earlier, or said about that time that he saw me and I was in the clear and I knew he just had this one little puff to go thru then he would see me and we would be maintaining our visual contact of some type.

Question: Along these lines did he say I'm having airspeed trouble after he rolled out of the turn?

25X1A [redacted] Yes sir, he said, "I think I am having airspeed trouble", this was just after rollout or maybe 30 seconds thereafter somewhere right in there.

Question: As you said you are not sure, but from there until he said I'm in trouble I'm in a "something" and the tape sounds like it might say a spin, was around 3 minutes?

25X1A [redacted] Yes sir.

[redacted] I have one question Jack, did Ken by any chance indicate to you when the INS showed him passing over Wendover?

25X1A [redacted] No sir, only that he had said earlier how far out we were to go and it seemed about, well, making roughly 8 miles a minute or so, we had turned at the right time but I didn't make any notice of how long it took us to go there to turn, but well we are getting about due to turn, so we turned without any comment.

[redacted] I am trying to get a feel for how far beyond Wendover you might have gone on this first heading to get some idea whether or not he rolled out anywhere near Wendover, in other words, did he have quite a long run prior to getting back to Wendover and departing Wendover on course, was there any indication to you as to when he crossed Wendover either on the leg previous to the turn or following the turn.

25X1A

[redacted] There is no positive indication.

As far as you were concerned you had no way of knowing this?

No way at all.

You could not see Wendover?

No sir, it was solid undercast. I don't know, I might could put what I think our flight plan was on the board and show you what my positions were at these different times. Sometime it is a little hard for me to sit here and talk with my hands.

25X1A

[redacted] I guess it would be very interesting, why don't you go ahead.

Question: His altitude the last time you saw him looked normal to you yet in three or four minutes we go from a normal condition into either a stall or a spin. Do you have any ideas or any theories on the thing. We don't want to put you on the spot by testifying against Ken in that respect but it is important that we try to find out really what caused this thing, because now we have lost confidence in the capability of the system.

25X1A

[redacted] No sir, I don't know. His comment, and the way he made it about his airspeed trouble, I'm sure he had a backup system. Of course I didn't get an answer when I ask him how serious it was. At the moment it didn't seem like this was a big problem, everything was going as planned, airspeeds were up, everything looked good, now along this portion here he was in a little puff or two, I don't know how many, but it was real solid, say 2,000 feet below me, 1,000 feet below him, just fairly close to him. He said I think I'm in trouble, I'm in a, I didn't hear the last word but the first word that came to my mind was spin, then I keyed the mike and [illegible] ... It was just like a bolt out of the blue, totally unexpected.

Question: Jack, you went from 34 to 36 thousand feet on this turn here and as you got periodic glimpses of him did it appear to you that he was rising up right with you or did he drop down and then all of a sudden this last time you saw him, was he suddenly much closer to you in elevation than he was elsewhere around the turn? In other words, did it seem, to you that he was sort of following you up in this climb as you went around?

25X1A

[redacted] No sir. In this area here I dropped slightly below him and was picking up speed and I was low with him here, and it looked like the two of us may have climbed jointly about 1,000 feet from this point here to this point here. I don't remember thinking about it too much and then I had climbed another 1,000 feet above him in this portion here. It looked like a 1,000 feet. At no time did I ever see the aircraft do anything except what I expected it to do.

Question: Well, I was trying to get a feel for whether he was making the same kind of decisions you were. Going up for the reasons that you were going up.

25X1A

[redacted] He might have.

Question: I was just wondering if there was anything you might have noticed about vertical separation that might strike you as unusual.

25X1A

[redacted] No sir, there was nothing that happened that was any form of being fast, everything was real bright. We did, at least I did, I gained 2,000 feet from this point here to this point here.

25X1A

Question: Does that point show about a 1,000 feet above him?

[redacted] Yes sir. By rough estimates he must have gained about a 1,000 feet around the turn himself.

25X1A

[redacted] Jack, did you notice in the process of this turn and the roll out and the couple of minutes that you did see him, any large changes in the intensity of his contrails to indicate to you that he might have had had large throttle movements?

25X1A

[redacted] No sir, we were conning heavy all the time I belive we would have contrailed heavy even in ice.

[redacted] Any other questions gentlemen?

25X1A

This is extract of taped interview discussing in detail the statement signed by [redacted] 25 May 63. Interview conducted by members of coordination group. Each sentence was discussed individually to obtain additional information.

25X1A

[redacted] Ken, what I am going to do is take your written statement and try to add essential pieces of information that will help guide these people on what to look for. Let me give you a copy, I think we should go thru sentence by sentence. Just before you got here we went thru this same statement, Ken and had this group of people here and said to them, "now, as we take this statement sentence by sentence what additional information do you need to do your job?" This is what we hope to do here. OK let me take the first sentence then, I'd like to take this sentence, Ken and ask you the list of questions here. There are many on practically every sentence. First Sentence; "Prior to reaching the Vendover checkpoint, I was at 34,000 feet indicating point eight five Mach on the triple display indicator". The first question that was asked was, do you recall up to that point what your fuel flow RPM and EGT had been?

Ken: Yes, during the entire flight the RPM was very near 97 or 98 percent. The fuel flow, I believe, was right around 530 or 540 right in there.

25X1A

[redacted] This is fuel flow was it?

Ken: No, EGT.

25X1A

[redacted] EGT, I'm sorry.

Ken: And the fuel flow it seems to me that it was around 8100, but I am not positive of this, I believe I checked on my RPM because I was checking my altitude and speed. I wasn't really noticing the fuel flow and EGT, as much as I was altitude and speed for the INS, and so forth.

25X1A

[redacted] You mean the total fuel flow, 8100/Hour?

Ken: Yes

25X1A

[redacted] Were they pretty well divided between the two engines?

Ken: They were 4,000 each, again I didn't take any particular note because

everything seemed to be running normal at this time of the flight, and the duration up to that time had been approx two hours, I'd made the route before, and was repeating the same route.

25X1A

[redacted] My question next on this same, Ken, you mentioned triple display indicator. Had you been cross checking triple display with your indicated air speed?

Ken: No

25X1A

[redacted] OK next sentence. Upon reading zero on the "Distance to go" indicator, INS, I began a left turn in accordance with the pre-briefed flite plan. The first question on this was, "what mode were you on in the turn, did you use the turn knob or CSC (Control Stick Command)"?

25X1A

Ken: CSC.

[redacted] CSC. Do you recall your angle of bank in this turn?

25X1A

Ken: It didn't exceed 30 degrees.

[redacted] OK, were you in the clear at this time, were you on top of the clouds?

25X1A

Ken: Beginning the turn, I was in the clear. Yes I was VFR.

[redacted] Next sentence. "At approximately half way thru the left turn, I noticed the Mach Dial increasing". Were you on Mach hold at this time?

Ken: No, the Mach hold we don't use. Mainly it was, I believe, malfunctioning and we didn't use it. I didn't use the Mach hold at all during any portion of the flight. I was on CSC as far as the control of the aircraft just as I had started into the turn.

25X1A

[redacted] Was the Mach hold written up on the aircraft as in-operative? How did you know this?

Ken: This flight; I don't know, we just haven't been using the Mach Hold. I remember I checked it one time and we got some porpoise out of it and we had not been u[...]icular

flight or not. But, the only thing I used was Auto-Nav and CSC. The auto pilot was engaged in pitch and roll, and using CSC I disengaged the auto-Nav
25X1A portion of the auto-pilot.

[redacted] Well, had you been controlling pitch with pitch knob?

Ken: On the straight and level flight I had been controlling it and checking it and using very minute changes in pitch control wheel. What do I want to say, changes in the wheel, the pitch trim wheel, yes, because I was attempting to
25X1A keep the vertical speed and altitude right on with very minimum trim.

[redacted] OK. Ken at this time you mentioned the mach dial increasing, was KEAS increasing also at this time?

Ken: Yes, it was. However I think the thing that caught my eye so much was that the mach was increasing and seemed to be increasing very rapidly. Of course I'm sure the air speed, the KEAS, was going up, but I just watched that and when I saw it, of course, go up to 1.05, this is the thing that registered in my mind, one,
25X1A point, zero five on the mach triple display.

[redacted] All right, let me go to the next sentence. I began a climb while in the turn, however, the air speed and mach number continued to increase, do you remember what your rate of climb was, did you check that?

Ken: No, I don't recall the rate of climb, it wasn't much of anything, I mean really, I just had begun a slight increase in the climb, mainly to keep, just to get above, the weather that I saw that we were going to be getting into, and also to try to keep my airspeed as constant as possible for the chase. Because the 101 can't make the rate of climb and change of airspeeds as we do.
25X1A

[redacted] Did you notice a change on your triple display indicator altimeter at this time, is this how you knew you were climbing?

Ken: Yes, it was changing very slowly, it was increasing slowly.

[redacted] Then, did you check this against your normal altimeter, your back-up?
25X1A

Ken: No, I was cross-checking my attitude indicator with my altimeter on the triple display, and of course this was when I was noticing the climb. Practically the entire flight is flown off the triple display indicator because the numbers are read out on it and it is more easy to read.

25X1A

[redacted] All right, you mentioned your attitude indicator, Ken, was there a noticeable pitch change?

25X1A

Ken: No, just slight pitch change as I had intended for the aircraft to be in.

[redacted] Do you remember roughly how many degrees nose high it was indicating.

25X1A

Ken: I would say that the dot was about one dot width above the bar.

[redacted] "The maximun mach was one point zero five." This indicated Ken, to you that you had gone supersonic, did you recall any structural buffeting or any indication that you had gone thru Mach one?

Ken: This indicated only that in this I didn't believe at the time, I thought maybe we were having a malfunction and maybe the thing was, some times like the TACAN will do if it starts running off, and I thought this thing was doing the same thing at that time, so I wasn't too concerned with it; everything else was normal.

25X1A

[redacted] OK, if you recall, Ken, when this thing goes supersonic there is a change in the pitot-static instruments that is somewhat similar to the F101, only not as much. You do get about a thousand foot altitude jump in the altimeter.

Ken: Well, the mach increased rather quickly and as I think back, I don't know if I mentioned here, it started going back down somewhere at about the time I was leveling off, so I didn't pay any attention. Then I thought it was just going to settle down, and then I thought that it was a transient error of some kind.

25X1A

[redacted] OK, next sentence. "I could not figure out why thisshould occur since the throttle setting had remained constant throughout the flight and I was climbing". Here again I had asked the question fuel flow and RPM, the same as you previously gave me roughly 8130 and 97 percent.

Ken: I am not positive of the fuel flow as far as making a definite statement on it. The RPM, I know remained the same.

[redacted] You mentioned climbing. Here again, did you notice the rate of climb?

25X1A

Ken: The rate of climb was about the same, I didn't increase it any. I just had a very moderate rate of climb. It was about the same as we had mentioned earlier.

[redacted] Can you state approximately what this was? In hundreds of feet per minute?

25X1A

Ken: Well as I say, I was checking the attitude indicator and it was just a dot above the bar. The triple display indicator, altitude indicator, was increasing slowly.

25X1A

[redacted] What was the highest altitude that you reached in this slow climb?

Ken: During the climb? Yes, I believe I was very near 38,000. I would say about 37,750. That was the peak altitude during this cycle. That's when I leveled off and I rolled out of my turn. I rolled out on the INS needle, the number two needle. Then at the time of leveling off I went back into Auto-Nav.

25X1A

[redacted] Now just to deviate a little, Ken, on type of information, at any time during this turn and while you were climbing, did you have the feeling that you were having trouble breathing or that you might not be getting sufficient oxygen?

Ken: No, Sir.

25X1A

[redacted] No sensation of that at all?

Ken: None at all.

25X1A

[redacted] Did you at this stage of the flight ever check oxygen supply or low pressure indications on your console or check that your oxygen was flowing normally.

Ken: I had turned on the number two oxygen system on the ground. I had not turned the number one on prior to takeoff. I did somewhere between the first leg and I, after checking oxygen again, turned the number one on primarily because the number two system usually stays up higher and it just sticks or stays there. We don't use it and we use the number one, so I turned the number one on, and they were both reading out, the number two being slightly below the number one. As far as the breathing and the pressure, those gauges were working normally.

25X1A

[redacted] OK. "While in the turn my wingman, [redacted] said that he could not keep the same rate of turn, therefore making a larger turn. "Ken, had Jack had any trouble on any of the previous turns. Had he mentioned having any problems:

25X1A

Ken: No he didn't. Well, he just couldn't make the same radius of turn and I assumed that air speed and my speed had slowed down some because of the climb. As I mentioned the reason I didn't make such a steep turn is because of this, and the 101's inability to maintain that attitude. We started out at 34,000, and for the 101 this is about max for making any more than a 20 degree turn.

25X1A

[redacted] So you had his turning capability in mind?

Ken: Yes sir, because if I was turning 20 I'm sure that he was turning a little more than 20 degree bank, but not over 30.

25X1A

[redacted] OK next sentence. "He said he still had me in sight. "Was he above you at that time to your knowledge?

Ken: I don't personally know because I didn't see him, but he said he had me in sight and I didn't really think anymore about it.

25X1A

[redacted] OK. "During this time, I was flying the aircraft with the CSC stick button". Ken did you feel that when you mashed the button for CSC that the auto pilot was indeed disengaging and that you were flying it manually?

Ken: I made, as I say, this was the second time around the course, and all of my turns were done on CSC, and I thought that it was working properly.

25X1A

[redacted] Did you feel that you were disengaging, making the manual turn, and then reengaging the CSC.

Ken: Yes.

[redacted] "After observing the increase in the mach and airspeed of the triple display indicator I retarded the throttle slightly to see what effect this would have". Do you remember the magnitude of retarding Ken, was it a long way back or just a slight reduction?

Ken: No, it was just the, this goes all the way thru the entire flight because of the throttle and the right throttle creeping back out of the water injection portion, and of course I pushed the friction knob all the way up and it was quite tight. I came back at the most a half inch.

25X1A

[redacted] Do you recall what the change in fuel flow was, or RPM?

Ken: No. I was watching my indicator, my INS number two needle, and my attitude indicator and my triple display. I didn't check.

25X1A

[redacted] Did pulling the throttles back have any immediate effect on KEAS or Mach?

Ken: Not that I could tell.

25X1A

[redacted]: Next sentence. "I then leveled off on top of the cirrus and engaged the auto-navigation position to the INS". Do you recall the altitude at which you leveled off?

Ken: I leveled off at about 37,750. I was thinking of about 38,000 and I don't know about that.

25X1A

[redacted] Is this the first time that you got in the cirrus clouds, or had you been in them before?

Ken: We had been in the tops of them. It was just a thin cirrus condition that I had no difficulty thru most or the majority of it. Either in the wingman seeing me or me seeing the wingman. At one time, where we were coming in to clouds he did move in a little closer. I imagine its because he knew I was getting into thicker clouds. This was prior to the turn however. We had been in and out of the tops, of these ragged tops, which was cirrus. No horizon.

25X1A

[redacted] Was there any indication Ken, did you see any cumulus activity?

Ken: Yes, just the very tops of it on the first run from Wendover down to the base here. I had gotten into it because of the course and because the package and INS, and the needle was just on the heading it was supposed to fly. I went through the top of one, and [redacted] asked if it was a little rough in there. No, I said, it wasn't too rough in there. I was noticing or interested in how the stability augmentation system and how the hydraulic gages were functioning, and the INS. You get a little shimmying I think primary because of the length of the fuselage. But nothing unusual about it.

25X1A

25X1A

[redacted] Right at the time of this turn now that we have just been through at Wendover was there any cumulus activity there at that time?

Ken: No.

25X1A

[redacted] Just cirrus?

Ken: Yes sir.

25X1A

[redacted] You mentioned going into auto-nav. Did you turn the airplane to center up the number two needle or did the steering needle take over, and start you turning toward course.

Ken: Yes, I rolled it out manually and I was practically right on course. There was maybe just the slightest degree of correction.

25X1A

[redacted] "During this time the airspeed indication began to decrease". At this time do you remember, did you check the triple display, against indicated airspeed, (IAS)?

25X1A

Ken: No.

[redacted] You did not.

Ken: No, it wasn't immediate--, during this time, this thing all took just a matter of a few minutes, and it was just a matter of getting on the course, checking it. I noticed that the thing did start coming down and of course then I went on to check my needle which was about 200 degrees into the station and going over to the auto-nav course.

25X1A

[redacted] When you noticed the airspeed begin to increase did you check the attitude indicator at this time, do you remember?

Ken: Yes the attitude as I say, I was flying off the attitude indicator because actually there was no horizon other than the cirrus that we were going into, and as I repeated there was just slight climb indication.

25X1A

[redacted] Normal?

Ken: Yes sir.

25X1A

[redacted] OK. Did you happen to notice Mach number changes or altitude changes on the triple display coincident with these airspeed changes?

Ken: Well the altitude was increasing slightly with my climb of course which I do recall.

25X1A

[redacted] Oh, you were still climbing at this time?

Ken: Oh, I am sorry, you mean after level off?

25X1A

[redacted] Yes.

Ken: No, I didn't climb then.

25X1A

[redacted] Well, right here where it says during this time the airspeed indication began to decrease, you were level at this time?

Ken: Yes sir. Yes I am sorry, I misunderstood you. Yes I was level.

25X1A

[redacted] Do you remember if Mach was decreasing at this time?

Ken: Yes both Mach and the KEAS was decreasing.

25X1A

[redacted] "Assuming that it was a temporary malfunction I began checking my mission equipment and instruments". Engine instrument-wise did you notice fuel flow at this time Ken?

Ken: Not that I could say exactly what it was. I looked down at the instruments and checked them over and I assume that they were all normal or I would probably have noticed it.

25X1A

[redacted] You don't remember specifically EGT or low RPM?

Ken: No sir, I do not.

[redacted] Checking mission equipment. What, just your steering needle?

Ken: My INS, my auto-nav, I was looking at the instruments, the airspeed, and of course flying off of my attitude indicator, my altitude, seeing that it started to go down, which I assumed once it has hit it's peak it started down. I went over to auto-nav after I had leveled off so that I could continue on with the mission, or the flight plan, although it was at a higher altitude, and seeing that the cirrus was as it was I was almost certain I could continue. I wouldn't have turned the package on at all. This of course was only momentary just to go over punch this on, and check everything else.

25X1A

[redacted] Did you at this time by any chance look at ground speed on the INS display?

Ken: No, I didn't.

25X1A

[redacted] Lets take the next sentence. "I checked pitot heat switch which had been on during the entire flight, turning it on and off three times, then leaving it on". The question came up, Ken, was there any chance that you could have confused this switch with the trim power switch?

Ken: I turned the pitot heat on between 20 and 30 thousand after takeoff, in the clear, and it was on, the entire flight, although, during the portion of the first turn around the route we were never in weather, other than just very, very light cirrus. Although it did start picking up on the second go around and at this time I felt there was a possibility of a bad system, I've had them before, and I know the indications. It should give fluctuations in your airspeed and so forth. So I checked it on. Well maybe switches sometimes malfunction so I turned it off, turned it on, turned it off, turned it on quite a few times, I don't know.

25X1A

[redacted] Have you ever had occasion to confuse trim power with pitot heat, that you can remember?

Ken: It's two different switches, they are two different size switches.

satisfactory and RPM reading read above 98%.

Ken: And that should have been "about".

25X1A

[redacted] About? OK. Above should have been about 98%. Do you recall at this time pushing the throttles back up again, by any chance?

Ken: Right at this time?

25X1A

[redacted] Well, coincident with the loss of airspeed and the fact that you checked RPM, do you recall moving the throttles back up? At this time?

Ken: During this period I am almost certain that I pushed the throttles all the way back.

25X1A

[redacted] All the way, to military?

Ken: To in military, yes sir.

25X1A

[redacted] OK, do you remember - -

Ken: Wait til I check here, one minute please. Well in my notes, I wrote this at Wendover when I was just sitting around waiting for the aircraft to come up there, I have indicated here approximately 38,000 feet, or flight level 380, and decreased the climb, level, checked throttles to assure full forward and friction tight.

25X1A

[redacted] Do you remember, Ken, let me ask you again, with the movement of throttles forward do you recall a response, an increase in fuel flow or RPM or EGT?

Ken: No, I checked the RPM but there is such little bit that I actually had retarded the throttles before, then pushed them up, that it made the RPM very little different. Unless you get down there and really look at the gauges you don't really notice it, I noticed that it was about where it should be. Thats all.

25X1A

[redacted] You didn't, by any chance, remember going into AB at this time.

25X1A

Ken: No, I did not go into AB at any time, other than takeoff.

[redacted] OK. Next sentence. Ken you say "I believe that the fuel flow was reading 1800 pounds per engine" ... of the above statement concerning fuel flow".

Ken: I'm not ... in my mind, but when I say I was writing this down and this fuel flow and the number of 1800 and fuel flow seemed to be in my mind, and thats what I wrote down.

25X1A

[redacted] Just as a matter of opinion, Ken, I am not going to try and pin you down, but wouldn't 1800 pounds strike you as being awful low for this situation of military power?

25X1A

Ken: At that time, yes sir.

[redacted] Do you recall, coincident with reading 1800, Ken, noticing RPM or EGT?

25X1A Ken: The RPM as I checked was still about 98.

[redacted] You don't remember EGT to you at this time?

25X1A Ken: No sir, I don't.

[redacted] Was there any indication to you, Ken, that you might have been getting a compressor stall?

Ken: The only feel that I got of a stall in the aircraft was after the thing I believe really did stall, and the indication was down below 101 on the KEAS.

25X1A

[redacted] But no clue of compressor stall, or anything.

25X1A Ken: There was no shuddering, no unusual vibrations in the airplane at all.

[redacted] OK. Coincident with this, roughly at the time of your 1800 pounds fuel flow do you recall any warning lights, fuel low level or others?

25X1A Ken: No, there wasn't any. Tanks 1, 2 and 6 were empty, red lights were on, and 4 and 5 green, 3 had fuel in it, but wasn't on at that time.

[redacted] 4 and 5 were transferring?

25X1A Ken: Yes sir, they were green.

[redacted] And what were empty did you say?

25X1A Ken: 1, 2 and 6.

[redacted] 1, 2 and 6.

25X1A Ken: Yes sir.

[redacted] Do you remember what your total fuel was at this time, roughly?

25X1A Ken: Seems t[illegible] pounds.

[redacted] OK. "After this check which required only a second or so, I immediately noticed the airspeed, KEAS, decreasing below cruise". I assume you meant 300 KEAS.

Ken: No, 290. Below 290 is what I was trying to maintain, and that was what I meant when I say below cruise. I should have written 290 on there.

25X1A

[redacted] At this time, Ken, had you by any chance checked your decreasing KEAS against the indicator?

25X1A Ken: The indicated airspeed?

[redacted] The indicated airspeed, yes.

Ken: No sir I hadn't. I used the triple display.

25X1A

[redacted] With this decreasing airspeed had there been any significant change in pitch as far as the attitude indicator was concerned?

25X1A

Ken: No.

[redacted] You still felt you were about the same?

25X1A Ken: Yes.

[redacted] Altitude, and so forth?

Ken: Well, again this is a very short period of time and of course I noticed the attitude indicator was really just about normal. I didn't change the pitch control wheel and the contrail I noticed when [redacted] went by me, and of course the contrail was fairly straight I think that he went just past me. Probably, or I assume because I was either losing airspeed, or he'd increased, but I don't believe he increased his airspeed.

25X1A

[redacted] His contrail was above you?

Ken: No, his contrail just off the right side.

25X1A

[redacted] You would say you were about the same altitude, roughly?

Ken: Yes sir.

25X1A [redacted] "When I observed the airspeed, KEAS, dropping below 160 I increased the nose down attitude of the aircraft with the auto pilot pitch control wheel". Ken, the question comes up about how long was this interval, if you can recall, between reading 290 and seeing it start to decrease and getting down to 160?

Ken: Well it was below 290 at this other time, and I don't think it took very long, I don't, it was a matter of a few seconds.

25X1A [redacted] Quite a rapid decrease?

Ken: It was just going down it wasn't just dropping like you'd drop something, it was just continually going down.

25X1A [redacted] Was the Mach –

Ken: The Mach was going down also, yes sir.

25X1A [redacted] Did you, when you got down into this area, had you checked against indicated airspeed by any chance?

Ken: No.

25X1A [redacted] OK, attitude still looked –

Ken: The attitude was still normal.

25X1A [redacted] Next sentence. "When I increased the nose down attitude of the aircraft with the auto pilot pitch control wheel". Do you recall Ken, about how much you increased the nose down?

Ken: From the wheel I would say from a quarter to a half inch, or how you judge that thing.

25X1A [redacted] Well, with relation to the attitude indicator, did you give a significant nose down.

Ken: I put it down just about a dot below, just about a dot below the horizon. That was all because actually that is just a trim, and I try to use it just for that, but I just wanted to get some nose down attitude, is about all.

25X1A [redacted] Do you think the aircraft actually responded to this, did you feel you were nosing over, you know the lessening of weight in your seat?

Ken: No, because I don't think, I don't think I felt it. I don't think the change was that great.

25X1A

[redacted] We were wondering, Ken, why you used the pitch control wheel instead of going back to CSC at this time and getting a stick push over. Any particular reason?

Ken: Well yes, if the instruments were goofing up or were not responding the way they should be, I felt that the auto pilot system would have better control or maybe the airspeed indicators were goofing up or maybe even the attitude indicator so I thought a small correction was, in the weather, would be the best thing to do.

25X1A

[redacted] Rely on the auto pilot?

Ken: Yes sir.

25X1A

[redacted] OK, next sentence. "This was a small correction of the pitch control which would lower the nose slightly, not wanting to descend to, into, more dense weather".

Ken: Thats just what we did sir.

25X1A

[redacted] Dense weather, Ken. Were you aware that there might have been cumulas clouds beneath you that you didn't want to get into?

Ken: No, its just that I knew we were just in the tops of the cirrus at the time, and the wingman, [redacted] had already gone by and if he was going to go around and pick me up again then we should stay at that altitude where he knew I had been previously. Be easier for him to see me, and I didn't know what was down below me.

25X1A

25X1A

[redacted] OK.

Ken: I know that there was some buildups, in fact, as I say, when we went down before we had gotten into the top of one buildup. Fairly isolated though.

25X1A

[redacted] Any indication of precip on the wind screen?

Ken: None that I noticed, No.

25X1A

[redacted] OK, next sentence. "The airspeed continued to decrease, and upon reaching 147 KEAS I utilized the CSC on the stick to increase the rate of descent, attempting to increase the airspeed". Here's apparently where you pushed over a little bit more with CSC?

Ken: I did, I took it off the auto nav and used the CSC and it wasn't any great deal of correction I noticed on attitude for the same reason I didn't use much on the pitch wheel.

25X1A

[redacted] Did you notice Ken, on your attitude indicator that you got a response to this and that you did nose down?

Ken: Well I glanced at it and it was still below the bar and I went over looking at the airspeed, and the airspeed, I believe, picked up about 150/151, and I felt for the amount that I had, that it should have increased more with the power that I had on already. Therefore I went back to the CSC or to the auto pilot, assuming there was something wrong with the airspeed indicator or maybe even the attitude indicator of the flight instruments, and hoping that that thing would go ahead and fly it out.

25X1A

[redacted] Do you recall looking at the fuel flow or anything engine wise?

25X1A

Ken: RPM.

[redacted] That the RPM was roughly 97%.

25X1A

Ken: 97 or 98 percent, yes sir. Throttles hadn't been changed.

[redacted] But you don't remember fuel flow?

Ken: I don't remember checking it and seeing exactly what it was.

25X1A

[redacted] Okay. Coincicent with this control movement Ken, do you remember any excessive rate of descent in weather with the instruments being possibly unreliable".

As you say y... ...ssure on it.

Ken: That is what I would physically notice.

25X1A

[redacted] "Also the airspeed did not improve directly with the rate of descent". This indicated, Ken, that you might have checked rate of descent, do you remember what it was, at this point?

Ken: No, I think the reference to rate of descent was bad usage of words here. This is just what I explained a minute ago. I didn't feel that for the amount that I had pushed nose down on the attitude indicator, which of course had gone down more than just the one dot below the bar, make it two at the most and, that the airspeed was picking up as fast as it should. I didn't feel any adverse pull one way or the other. If I was going up, I think I would have felt it or even down. It was straight and level, the wings were straight and level, and being in the weather again I felt it would be best to try to level it up and make the thing feel the way it should.

25X1A

[redacted] Again I mention the fact that you got rate of descent here. What gave you the feeling that you had a descent. Was it the altimeter was unwinding.

Ken: Mainly I was checking almost totally the attitude indicator and the airspeeds, the mach, and the KEAS.

25X1A

[redacted] OKay, next sentence: "There was no improvement in the airspeed. The airspeed indicator showed a continued decrease, and I immediately disengaged the auto-nav and flew with CSC." When you say airspeed indicator, do you mean triple display here or by any chance - - - - -?

25X1A

Ken: Yes Sir, triple display.

[redacted] You still hadn't gone back and checked indicated airspeed?

Ken: No, it was the triple display.

25X1A

[redacted] You immediately disengaged auto-nav and flew with CSC. Ken, at this point, when you hit the button again did you notice any changes in control responses? In other words, any pitching moments, or anything, on disengagement of the auto-pilot?

Ken: No Sir. You could feel it a little but when you punch the button but there's nothing unusual.

[redacted] But, no unusual forces or anything?

25X1A

Ken: No sir.

[redacted] No hard-over?

25X1A

Ken: No sir.

25X1A [redacted] Next sentence: "I called [redacted] my chase wingman, and told him I

25X1A was having airspeed troubles. During this period I was gradually descending". Here again the question of rate comes up. By any chance had you yet checked your rate of descent, Ken, to correlate this with triple display.

Ken: No, I don't believe that the thing exceeded 1,000 feet. I know that it was down below the line, but I didn't check to see exactly what I had. I was flying the attitude indicator, or, hoping I was flying the attitude indicator, and that's why I made no large correction for nose down, and then, of course, I assumed I was leveling off and I think I went back to the auto-pilot, or auto-nav.

25X1A

[redacted] Okay Ken, with the decreasing of KEAS did you get any warning light indications from the panel?

Ken: Yes after the mach went down to about .47 the surface limiter light came on. This is when I really began to wonder about it, because I wasn't really believing my airspeed. I thought there was just something wrong with the triple display indicator. But when this thing came on and shortly there after, of course this all happened rather suddenly, even on the airspeed. This light came on and I assumed the only time it would come on was when we were at that air speed. And then of course when we reached 101 and I felt the shudder, I felt then that the airspeed must be correct.

25X1A

[redacted] This was the first warning light you'd had?

25X1A

Ken: That was the only light that had anything to do with this.

[redacted] You said the only light that had anything to do with this. Did you have more warning lights in the cockpit.

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OXCART SECRET

Ken: Well these two lights, the bypass doors closed lights were on. That's why I say that [illegible] light that was the only significant light.

[redacted] Okay. "About 120 KEAS, I again informed him that I was having troubles".

Ken: This is an estimate, I don't recall exactly when it was that I called him or the precise times that I called him during that period.

[redacted] Did he give any indication to you that he still had you in sight?

Ken: He didn't. I know he had gone by me, so I felt sure he didn't have me in sight at that time, or I didn't think he did. I am not sure whether he did or not.

[redacted] "When the airspeed dropped to 101 KEAS, the aircraft began to shudder and stall". Did this happen right at 101 or did it start above that?

Ken: It was going from fairly smooth flight, actually, for the aircraft. I could start feeling the shudders but of course the airspeed caught my undivided attention here. At 101 was where the shudders began. Or if they began earlier before I glanced at it, it may have been a notch above that.

[redacted] Do you remember checking the attitude indication about this time?

Ken: The attitude remained the same. Still slightly nose down.

[redacted] Wings level?

Ken: Wings level and slightly nose down.

[redacted] You were at this time you still had the CSC button down.

Ken: Yes.

[redacted] How did control responses feel?

Ken: Well, I had no reason to turn one way or the other and feeling the stick forces and I of course felt the shudder through the stick, and then through the whole fuselage of the aircraft, as it stalled and snapped. Moving the stick or the rudders didn't make any difference. This was in the cirrus. I had no horizon to judge, in what actual attitude I was or if I was other than what the indicators were saying.

OXCART SECRET

[redacted] You didn't refer to attitude indicator coincident with the snapping,

25X1A

or do you know which way the airplane rotated by any chance?

Ken: I believe it went to the right, but I couldn't really swear.

[redacted] It snapped to the right.

25X1A

Ken: Yes

[redacted] OK let me read that sentence Ken. "I attempted to lower the nose

25X1A

with reference to the flight instruments". Here again I am assuming attitude indication as you have been saying. But the aircraft snapped two or three times and went into an inverted flat spin at approximately 30,000 feet.

Ken: This is pretty much of an estimate. I assumed, I was just before reaching 101 on the KEAS about 32,000 because the indicated rate of descent actually hadn't been that great, and this again is just an estimate as I say approximately 30,000.

25X1A

[redacted] Do you recall what you did with the controls, Ken, did you try a spin recovery with it?

Ken: I moved them to either side, the ailerons, and pushed the nose forward and pushed in one rudder, the left rudder, the right rudder, and the stick did nothing. I mean the aircraft did nothing in response to the stick.

25X1A

[redacted] Did you have negative "G'S" at this time?

Ken: At the time of snap I don't believe that I did.

25X1A

[redacted] During the spinning motions do you remember anything regarding "G's"?

Ken: No.

25X1A

[redacted] OK, next sentence. "I informed [redacted] that I was in a spin. After

25X1A

an unknown number of rotations, I would estimate near 25,000 feet". Are you just guessing here, Ken, or do you remember reading it:

Ken: No, at that time I didn't read it, in fact I would say that they weren't negative "G's", that there were positive "G's". Somewhere along the line here, because I know that I was pulled forward. It was very easy to look down in the position that I had assumed, and reached down and pulled the lanyard.

[redacted] OK. I'll finish reading the sentence. "And after attempting to right the aircraft or gain control which was futile I decided to eject". Ken, during this attempt to recover did you do anything with throttles?

Ken: No, the throttles were forward. I didn't think afterburner would make any difference. This happened very suddenly.

25X1A

[redacted] So far as you can recall they were still in military.

Ken: Yes Sir.

[redacted] During any of these oscillations, the last stages of slowing up and spinning and so forth, do you remember seeing any breaks in clouds or any horizon, or reference you could cross check?

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Ken: Not at all, completely on the gauges.

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[redacted] "I looked down at the ejection, got a firm grip, and tried to position my head in the head rest and pulled". The statement, tried to position my head. I assume that this was because of the positive "G's".

Ken: Well that and I didn't know exactly, either, as I say, when you pull the handle it goes up very rapidly too. But I assumed that it was more because of the thickness of the chute and the position of the head rest, that I couldn't get my head all the way back.

25X1A

[redacted] You weren't having to move your head against any forces?

Ken: I'm not really sure of what it was, either the chute or some of the "G" forces.

25X1A

[redacted] Then you say I was in an inverted position thus ejecting downward. Why did you feel that you were inverted Ken, I keep coming back to this, negative "G's" or what?

Ken: The airplane snapped and it stayed that way. Just sort of the sensations that I had, that the aircraft went to the right in it's flat inverted spin. This may be more of an assumption than anything else.

[redacted] "The canopy and ejection seat apparently functioned properly, I felt the seat push away straps separate me from the seat and then the drogue chute deployed. At that time I checked my watch which read 1205".

Ken: Right. Thats not exactly the time of the deployment. After the chute had deployed, the drogue chute, and I was descending. Assuming that I was righted by the drogue chute, I had looked at my watch and it was 1205.

25X1A [redacted] You were just hoping to time your fall is that why you looked at the watch?

Ken: Well that and I don't know, I guess there is nothing else to do at that time.

25X1A [redacted] "Shortly after the drogue chute separated, deploying the main chute".

Ken: It gave me a start.

25X1A [redacted] The cut away of the drogue, the interval between that and the main chute opening?

Ken: Yes. I thought for a moment I had lost the entire chute.

25X1A [redacted] In other words noticeable acceleration.

Ken: Well at the moment it just sort of feels like you're holding on to a rope and someone cut a rope.

25X1A [redacted] Right.

Ken: You know, its just sort of you drop, and then the main comes out very nicely.

25X1A [redacted] Ken, you had mentioned previously in conversation that you noticed precip, rain, hail, snow.

Ken: No, snow and no hail.

25X1A [redacted] No snow and hail?

Ken: No hail, there was snow during the descent and it was raining, there was a thunder storm near where I was descending or along side me. After I got on the ground I was [illegible] towards where I had touched down.

[redacted] Alright, do you recall, was this through the entire nylon descent?

Ken: No, I got a little snow and then I got a bit of rain, very little actually. The majority of the descent it was just a very light rain.

[redacted] I see. You see what we are after here, you hadn't mentioned any turbulence associated with cumulus clouds.

Ken: No.

[redacted] Through out the entire aircraft activity you mentioned no cumulus. We were wondering where the rain came from.

Ken: Well coming down I could see the clouds.

[redacted] We have completed reviewing the 25 May statement. I would like now to open this session up for questions by members of the coordinating group and advisors.

Question: On the RPM you had maintained in the neighborhood of 97 and 98%.

Ken: Yes.

Question: Most of the flight you made a small reduction and later advanced the throttles to full throttle. This is what I understood you to say, full throttle, and then you continued talking of 98%. At this altitude had you been experiencing 98% at full throttle?

Ken: I can't rightly say. The decrease in the throttles, when I mentioned the decrease, was very slight and as far as the RPM, I don't believe that there was a significant change maybe one or two percent. With the gauge as it is, and as small as it is, there is no way of knowing precisely when you have 96, 97, and 98. It's about there, and I did retard the throttles slightly, probably very insignificantly, and I assured myself that the throttles were full forward when I checked.

Question: When you went to full throttle?

Ken: Yes, to check, to make sure.

Question: But during your cruise earlier in your flight, did you have a feeling that you were running at full power?

Ken: Well, my mach had varied from [redacted] No I don't believe it was full throttle at the time. I mean not max.

Question: Question on your afterburners. When you were dropping speed rapidly you indicated here from 300 down to 160, did you ever consider using afterburner to see whether it was something wrong with engines.

Ken: This is not clear in my mind. But I felt the use of afterburner was not the proper procedure, due to being in the weather, and the possibility of the adverse effect or possibility one afterburner or maybe not any afterburner. And I felt it would be better to maintain a --, say that the instrument I was reading was not necessarily right, I had no way of confirming that at all. I assume my attitude indicator was correct because [redacted] had been flying my wing during the entire mission and when you're in the weather you have to rely on your instruments until they just completely fail you, or something else shows you that they're not reliable.

Question: Well, then at the time that you were indicating Mach 1.05, [redacted] was passing you because you are going to slow for him.

Ken: No. (I didn't believe so)

Question: It is the indication that we have here anyway.

Ken: I don't believe that is what was said exactly, he was having to make a larger turn than I did. I assume that he increased his RPM on the 101. I don't know that he was passing me. He passed me after I had leveled out, and I'd seen the contrails. I think he said he was passing me and I had seen contrails. I did not see him.

Question: I asked a question earlier. If he had any indication during the turn that the chase was overrunning, and you said at the time that you didn't know until you saw him pass you.

Ken: That is correct, not unless he'd called me and said he was overrunning me. Which he did. Prior to that I assume that he had not.

Question: Ken, how long would you say this all happened, the time you started decreasing below cruise until you hit the stall speed? Was it a matter of 15 seconds, thirty seconds, two minutes?

Ken: I would say it was less than five minutes, I can't honestly say what it was exactly.

Question: Next couple of questions I am going to ask may appear a little blunt, they are not meant as a criticism but only to develop all possibilities.

Ken: Yes sir.

Question: You indicated that you went back to auto-pilot because you felt it would take over and correct, did you have any lack of confidence in your flight indicator?

Ken: No, I didn't have a lack of confidence as such, because I had no real reason to. As I just stated, the entire aircraft had been functioning properly, and I couldn't understand why, all of a sudden, this thing should start happening, what ever it was that was happening, and I assumed that the airspeed was going the way it was, apparently, that the airspeed indicator was malfunctioning, and not the attitude indicator. The contrail was straight by me, or seemed to be straight by me. I assumed he was in level flight about the same attitude I was in. The attitude indicator had been working properly. It seemed to be within a very small degree of being straight and level. I had checked the instruments during the flight for the entire route. The vertical speed and the attitude I had checked those two against each other and making just very minor adjustments on the pitch control wheel to try to maintain altitude. This does not have an altitude hold, and I was trying to maintain a precise altitude for the V over H factor on the package, and even though it was staying within just a fraction of the width of the needle on the vertical speed, and on the attitude indicator, the thing would still gain slightly. I don't remember the distance from here to Wendover when I came back but I think it was more than two hundred miles.

From the floor: About 223 miles.

Ken: It gained some. On the first run I gained, I think, four hundred/five hundred feet. Not over, I'd say, about four hundred feet in that instance, in just letting it control itself, and just having made my minor adjustments on the thumb screw to see what it would do. Well this isn't too bad, but as for the aircraft and system itself, I don't believe even to this day. I have no reservations about flying the aircraft or the equipment that is in it, or the reliability of the equipment.

Question: Well let me ask you a couple questions. It appears to me that you had diagnosed your trouble as airspeed indicator malfunction. As you started approaching a pretty low indicated airspeed, if you had made this diagnosis, why didn't it occur to you to cross check with your indicated airspeed? To confirm that your diagnosis was correct? Now here again I am not aiming this as a criticism but just to determine any pertinent factors here.

Ken: Well, I understand. That's quite alright, and I am not sure that I didn't but I can not recall, in fact, having flown for a while, and so forth, I know on normal instrument flights you check your instruments, I check my instruments. But I could not recall and say, the same for the fuel flow or the EGT. I can't say exactly what it was. I assume that I had checked my instruments normally and the flight instruments during this procedure. I can not honestly say that I know what it was or that I did do this. I wasn't sure, the only thing I assumed at the time, I thought I could assume at that time, that it was airspeed difficulty and I think your question is very valid. I wondered this myself.

Question: Do you think its possible you did check it and saw that it was in normal operating range, and this more or less confirmed your decision or you can't say one way or the other?

Ken: I can't say, I was thinking about the indicated airspeed when I was writing my notes at Wendover and I was trying to think what did it say. Just about the same as your question and I could not recall.

Question: Same way with altitude, excuse me Jack, your altimeter, your conventional altimeter was that checked against the triple display?

Ken: No, no, the altimeter never particularly entered my mind. I mean, I knew that I had the approximate altitude that I wanted and I had no reason to doubt that I was any other place.

Question: Again, you know this would lead to wondering about the whole triple display gauge, as to its reliability.

Ken: The whole gauge, yes sir.

Question: Now, we know your past record, Ken, and capabilities and we know that reactions are fast and normal. The normal reaction is as you went through about 140 indicated and your limiter light came on, and this confirmed your airspeed, this put you in a dilemma because it went against your original diagnosis, if this was your diagnosis.

Ken: Well, it was my assumption that something was wrong with the airspeed.

Question: Normally the reaction here would be to trade off altitude, to make a large nose down correction and possibly go into AB.

Ken: Well I wasn't sure what the AB would do, whether it would make more adverse effects on the aircraft, or not, and until just at the last moment, there, actually when the aircraft stalled, I assumed that the airspeed was malfunctioning. The attitude indicator and all. I was descending some, and with full power, I, of course, having nothing to make a reference to, other than what I had in the aircraft. Maybe with another aircraft I could have said, well yes, he is way ahead of me, or he is just sitting on my wing, or wherever he was at the time.

Question: How long would you say between the limiter light coming on, which would cause any individual to start wondering what was going on, and the time you reached the stall speed, can you estimate that time?

Ken: I would say a matter of seconds. It wasn't a slow process you know, a knot or two here or there over the long period of time.

Question: At this time do you feel that you had full power, or I mean high power at least 98%?

Ken: The throttles and the RPM are more, I know what they read. I know the throttles were pushed forward. Oh, I don't know that they were full, there is really no stop that you push up to, because of the water injection, so I feel that they were pushed full forward.

Question: If this were the case, that you had full power on, and we know the aircraft stalled, you would have had to be at about a 25 degree pitch up attitude. Was there any indication at all other than your instruments that you might have been in a high nose up attitude?

Ken: Other than the fact that it stalled, I assumed that I was descending slightly - gradually.

Question: Well you could have been settling, but if you had power in order to get the stall and if the instruments were correct, then you must have been at a very high nose up attitude. And you didn't get any indication of this, you were in solid overcast at this time.

Ken: I was in cirrus. I had no visual reference, you know, outside the aircraft.

Question: Ken, did you see the sun at all through the cirrus.

Ken: Not the sun as such, it was light above us.

Question: What would you estimate your visibility in the cirrus at that time.

Ken: Oh, I don't know.

Question: You were able to see the contrails from the other aircraft?

Ken: I saw them yes, he went just off my right wing.

Question: So it wasn't real heavy cirrus, it was thin?

Ken: Well this was of course at the beginning of it and prior to any descent that I was making, so at that time, couple thousand feet, maybe.

Question: Turbulence.

Ken: There was no turbulence.

Question: Assuming that you were considering you had an airspeed malfunction and all, and this was a problem, [illegible] something was radically wrong?

Ken: Well, just about the time that the light came on, and then of course shortly after that, a matter of seconds, the speed was down to 101 and it was stalling, and that's naturally when it was in the stall that I felt something was radically wrong.

Question: Then in other words, during this preceeding time, you were making an assumption that the airspeed indicator was in error, and all your actions were taken just rather matter of factly and almost with this assumption in mind. I don't think that is a fair statement, in other words my first question was, what I was interested in, when did you feel the "boy, something, something, is really going haywire here", rather than just a question of my instruments in error.

Ken: Well that was it, just about that time.

Question: You can't recall any feeling or indications or changes in your physical condition, such as hypoxia, or vertigo, disorientation?

Ken: No, sir I did not have vertigo, that I know of, I didn't have hypoxia, I think if I had, when I'd gotten my, this is an assumption, when I'd gotten the emergency oxygen I would have noticed a difference. If it were something, say, in the ships oxygen system, something malfunctioning there that I did have hypoxia, then I would have noticed. But as far as my faculties I thought I had complete control of those most of the time. The time from when the drogue chute opened, and the main chute opened, I'm exactly sure. But, I didn't feel light headed, not that I know of, or that I can honestly say right now. I didn't feel that way when I was on the ground. I think there is a certain, oh, not a sense of real fear, you know, but there is a sense of anxiety about the thing when you get out of the aircraft. I'm sure I felt this on the way down.

Question: That is adrenalin working.

Ken: That is probably so.

Question: Ken, from your physiological training in your background, you know the old routine about, what are your symptoms for hypoxia, and the emphasis on this in physiological training. Do you recall what yours are in particular? Lightheadedness, or dizziness, blurred vision, or do you have any particular symptoms?

Ken: I have never known that I really had any. I have had vertigo many times.

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Question: Have you ever, in the chamber, undergone the experience of going without

your mask for a period of time to actually get into it.

Ken: Well they do this. This is a standard procedure in the chamber. While in the Air Force, there are times that you go in the chamber that they remove your mask and you write your numbers or you write your name and this sort of thing. I knew these sensations.

Question: When you get back on oxygen, do you recall having written things this way and done things this way.

Ken: Oh, I don't know. I haven't noticed. They only do that every three years.

Question: Ken, you say you know dizziness and this sort of thing accompanies this?

Ken: Once you get the oxygen back.

Question: But you don't recall any of this type thing associated with this experience?

Ken: No.

Question: So the mask fit fine, no difficulty in breathing?

Ken: Correct, no difficulty.

Question: Have you ever had occasion in this aircraft to have hooked up your mask before you turned the oxygen on so you know what that feels like.

Ken: Yes, I do that almost all the time, you know, because you think you got the hose plugged in, and put it on. I put the mask on and of course you can't breath very well.

Question: It's very noticeable.

Ken: Yes sir.

Question: You didn't notice that at all.

Ken: No sir, I didn't.

Question: There were no other indications of loss of power?

Ken: None that I could recall sir.

Question: There are two possibilities that it could stall out, when level in flight like that if you have a loss of power. The other one is that if you hadn't lost power, you must have been at a pretty high angle of climb.

Ken: You mean with full power, climbing up?

Answer: Yes.

Ken: I think had I been in that attitude of climb over a period of time, although it was short, a short duration of time, I think I would have been out of this cirrus.

Question: You would think so. Although the other possibility is - - -

Ken: I would have felt it.

Question: Felt it or ---

Ken: The attitude indicator, I assume, unless something was wrong with it. But why would it be, well why did any of this happen all suddenly?

Question: Well, let me ask this one question. What would the speed of the aircraft be in a nose down attitude. I don't mean exact speed but we would be well above these sort of speeds if the aircraft actually was pointed down, whether it had power or not. Is this not true?

Ken: I don't quite understand.

Question: With the aircraft at a nose down attitude even with power, with a loss of power, you would be having a lot higher speed than you had, which would lead us to believe that it would have to be at a nose up attitude to slow down.

Question: I think the interesting question here is with the roughly two bar widths nose down, Ken, it would be interesting to examine, and say roughly 1800 pounds per engine fuel flow, which is just above idle, really at this point, what the rate of bleed-off speed would be if you held that attitude.

Ken: Yes, that would be interesting.

Question: It would be very interesting to check this out and see. This might give us a clue as to what we are talking about here.

Ken: Well, we had burned more than half the amount of fuel at that time and the aircraft wasn't by any means at maximum weight, and this aircraft will fly very comfortably at 170. When I say maximum fuel load, I'm talking about the amount that we've been flying around with on most of our training missions. It flys around comfortably then, which I've done. And I don't know what the precise stall speed is. Of course, I think you would have to figure out the CG and then all of this other, assuming you know the gross weight of the aircraft and so forth. I don't know what the stall speed is. But with what I assumed I had, even say about 147 knots KEAS, which is actually higher indicated, I assume that this would give adequate amount of airspeed for, with the set I had, to keep the aircraft going, and descending at, shall we say, a moderate rate of descent.

Question: Well, that's one of the reasons I have asked this question about a possibility of hypoxia. That is, I understand, with power off, that this aircraft you have to have a pretty steep nosedown to maintain flying speed. With something like hypoxia you could have pulled the power off, and yet not remembering that, yet still having enough consciousness to be flying just the attitude horizon, perhaps, and the thing could have gone right into a stall, about the way you described it.

Ken: Well, to the best of my ability that I can remember here, the throttles were full forward and I can only go of course on the way I felt at the time, that I do not believe that I had hypoxia or hyperventilation, or even vertigo. It seemed to me that it would be more of a tendency to get vertigo, if something was happening to the aircraft, and the instruments were not functioning properly. You get the feeling of not really being right. And I didn't experience any of these symptoms that I know of. And hypoxia, I am familiar enough with that, I believe, to know.

Question: You mentioned before that because of the throttle creep, you had the throttle friction on full, and you had this jammed as far as it would go.

Ken: The throttle creep is not really the creep of the throttle, as much as it is the right throttle did not stay to the full forward position to get water. Now, this I had not experienced myself. The first time I had used the water was on this flight. Someone mentioned this to me, I think it was one of the other pilots, and they said to make sure, in fact I think it

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was [redacted] Make sure you keep your hands on the throttles and keep it pushed up because even with the friction full forward, the right one will come back a bit.

Question: So you had the friction full forward?

Ken: I had the friction up, of course I use the friction about all the time I'm in the aircraft anyway.

Question: It was left this way during the flight?

Ken: Yes.

Question: Ken, a question on controls. Did you ever at any time during the whole flight, particularly during this time, notice any stick movement introduced somewhere in the system?

Ken: No, I felt no adverse stick forces, or aircraft forces, or anything on the aircraft other than the stall and the shudder and the gyrations.

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[redacted] During your attempts to recover, and moving your controls around, did you ever feel that there was something wrong control wise, or did you feel that it was responding?

Ken: Well, I think in that condition that the controls may not be very effective, so you can't tell. As far as the movement of the stick, I think I can truthfully say that I moved the stick to various corners of the cockpit and that there was no binding feel in the stick. I'm sure that I did not go clear from one stop to the other. I don't believe that I did, unless it was full forward. But the stick seemed to have about the same stick force as I recall.

Question: You can't remember any indications of power loss?

Ken: No sir. This is again, a repeat, of course most of these questions are repititious. Everything for the two hour flight had gone normal, there seemed to be no malfunctioning of the instruments, and I was just surprised that this airspeed indicator would start going up in a climbing left turn. All of a sudden the thing just sort of started increasing to the point that it did. And at the time of the turn, I don't know how long it took, I wasn't timing that, I was checking the airspeed, but this thing went up, and I thought of calling [redacted] about it, but I thought, well, I guess he takes care of his aircraft, and so forth. This just passed through my mind and having very little significance here, and then when the thing started going down, why, I was about ready to level off so I guess my attention was diverted to the rolling out and leveling off and starting of the INS again and the auto-nav.

Question: Well, you see my point is that, from all of the things we have been discussing here, the only thing that fits in all the flight attitudes and the fact that the diagnosis that you were thinking of at the beginning which I think probably all of us would have thought of at first. When the air speed starts going down like that, was the pitot failure, or instrument failure, obviously this was not what happened, because you actually stalled out and went into a spin. So, therefore, from all of the other indications of a fairly level flight and so forth, you must have had a power loss. This is the only thing that could have happened. You would wonder if you have a power loss then if you didn't, why weren't there any other indications. You were sure that you were still 98% and you should have been about 75% if you had gotten a power loss, there should have been other decelerations.

Ken: Yes.

[redacted] Coming back to this 1800 pound fuel flow, he would have already had the power loss.

Answer: Yes, but that doesn't match up very well with 1.05 mach number either.

Question: I would like to ask a question about that 1.05 mach number, were you VFR at this time?

Ken: Well, yes.

Question: And I would like to ask another question of Glenn or Ed. What would you expect in level flight velocity in full military power? If we tie this down to VFR conditions with a known source of attitude on the outside of the airplane?

Glenn: Straight and level it wouldn't do 1.05 mach number. This is far in excess of its capability.

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[redacted] You normally expect probably about 315-320 KEAS max at these altitudes. This is roughly what number 4 does, 316-320 as I recall - full max. Not AB.

[redacted] If there are no more questions we will cut this off at this time.

25X1A

S T A T E M E N T

25 May 1963

Flight #79, on aircraft 926, was scheduled for v/h sensor type II test package and INS navigation. The primary purpose being the v/h sensor type II test package. Takeoff was scheduled for 1030 hours local and specialized briefing was scheduled for 0900 hours local, due to possibility of cloud buildup in the general route area, takeoff time was moved to 1000 hours local and the specialized briefing started at 0840 hours.

Personnel present at the specialized briefing were as follows:

a. [redacted] - Pilot

b. [redacted] - INS representative

c. Briefing Officer

Personnel absent was:

[redacted] FK representative for the test package. [redacted] was at the south pad preparing the test package for flight.

[redacted] was also present at the briefing but did not take an active part.

The briefing was normal and followed the flight plan step by step (Atch 1). Questions from the pilot on the operation of the test package control panel and the INS control were answered by the briefing officer and [redacted] Briefing aids consisted of the flight plan in a scroll, an extra copy of the flight plan, a route map and photographs of the test package control panel and INS panel. After the specialized briefing the following points were emphasized by the briefing officer:

a. The primary purpose of the flight was to gather test data for the v/h Sensor type II package.

b. If cloud cover was such as to preclude the pilot from fixing his position within reasonable limits the mission should be aborted.

c. Pilot was briefed to fly briefed altitudes if possible; cloud cover permitting, but to stay above cloud level.

d. Due to the fact that the total fuel load was 5000 pounds less than normally loaded, the pilot should monitor his fuel remaining and if fuel became questionable he should abort the mission.

The specialized briefing was concluded and the pilot was transported to the aircraft.

William D. Corbin
WILLIAM D. CORBIN
Major, USAF
Specialized Briefing Officer

2 Atch
1. Flight Plan
2. Map

25X1A

Ser #123

24 May 1963

Flt #79

Pilot: [redacted]

Gross Weight 85,00 lbs. C.G. 19.8%

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1. Engine Start at [redacted]
   a. Start engines.
   b. Accomplish INS power switch over.
   c. Select NAV on INS mode switch.
   d. Select Pos #2 and push the store button. (INS should slew to [redacted] and read 150 miles).

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2. Before Takeoff:
   a. Record the max speed on the INS distance to go ground speed indicator while taxiing and record the speed when stopped at the end of the runway.
   b. At the end of the runway select the fix position and push the store button.
   c. Select Pos #2 and push the store button.

3. Climb:
   a. Climb at 300 FAS to 30M.
   b. Use A/B to 20,000 feet then military power.
   c. Main equipment power switch ON.
   d. Climb out manually towards CHUB to avoid target range, then fly #2 needle towards Austin TH333°.

4. Cruise:
   a. Check ADF on Ely (KELY-1230) and Earth (XTB-377).
   b. Engage A/P and use on all runs.
   c. The aircraft must not be banked more than 5° at any time the #1 equipment switch is ON.
   d. The aircraft must be level and the #1 equipment switch ON for 15 minutes prior to the first target run and for 5 minutes prior to all succeeding target runs.
   e. When turning equipment switches off, the #2 switch should be turned OFF first, then wait until the light goes out before turning off the #1 equipment switch.

5. ADF Homing & Signal Strength Check:
   Tune in the following stations and check the signal strength and homing capabilities.

LAS	Las Vegas	206	KNPC	Burbank	710
TPH	Tonopah	221	KCBS	San Francisco	810
EED	Needles	269	KSUB	Cedar City	590
DAG	Daggett	365	KOB	Alburquerque	770
KFSD	San Diego	600	KSL	Salt Lake	1160
KFI	Los Angeles	640	KELY	Ely	1230
KOA	Denver	850	XTB	Earth	377

6. First INS Check Point: [redacted]

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   This check point is the center of the airport at Austin, Nevada.
   a. Store the INS fix.
   b. Record time, alt, mach, KEAS, GS, DTG and aircraft position.

Atch 1

7. Change Course:
   a. Select position #3 on the INS and push store button.
   b. INS should slew to 40-44N 114-02W and read 165 miles.
   c. Fly #2 needle towards Wendover TH-064°.

8. Equipment Stabilization (30M, 290EAS, GS 470)
   a. After lining up on course, trim aircraft to within ± 5° in pitch and roll.
   b. Turn #1 equipment switch ON, after approximately 5 minutes, the light above the switch should come ON.
   c. Continue towards Wendover and when the DTG on INS reads 10 miles turn the #1 equipment switch OFF.

9. Second INS Check Point (40-44N 114-02W)
   This check point is the center of the airport at Wendover. Fly 290 KEAS and 30M.
   a. Store INS fix.
   b. Record time, alt, mach, KEAS, GS, DTG and aircraft position.

10. Change Course:
    a. Select position #1 on INS and push the store button.
    b. INS should slew to (37-14N 115-48W) and read 224 miles.
    c. Make a manual left turn to avoid the restricted area and line up on course at COD lake. DTG should read approximately 183 miles. TH 200°.
    d. Fly #2 needle towards target.

[redacted]

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12. Change Course:
    a. Select position #2 and push the store button.
    b. INS should slew to (39-28N 117-12W) and read 150 miles.
    c. Make manual turn to avoid target areas then fly #2 needle towards Austin, TH 333°.

13. 5th INS Check Point & 2nd Target Run: (30M, 290 EAS, GS 470)
    This check point is the center of the airport at Austin, Nevada.

ITEM	AIRCRAFT LOCATION	INS DTG	SW #1	SW #2
a.	CHUB Lake	126	ON	OFF
b.	Opposite Warm Springs	86	ON	ON
c.		8	ON	OFF
d.	Austin Airport	0	Store INS fix	
e.		4	OFF	OFF

14. Change Course:
   a. Select position #3 on INS and push store button.
   b. INS should slew to 40-44N 114-02W and read 165 miles, TH 064°.
   c. Fly #2 needle towards Wendover.

15 6th INS Check Point/3rd Target Run: (30M, 290 EAS, GS 470)(26M, 325 EAS, GS 494)
This check point is the center of the airport at Wendover, Utah.

ITEM	AIRCRAFT LOCATION	INS DTG	SW #1	SW #2
a.	Edge of Barracuda	105	ON	OFF
b.		64	ON	ON
c.		8	ON	OFF
d.	Wendover	0	Store INS fix	
e.		4	OFF	OFF

   f. Over fix point record time, alt, mach, KEAS, GS, DTG and aircraft position.

16. Change Course:
   a. Select position #1 on INS and push the store button.
   b. INS should slew to (37-14N 115-48W) and read 224 miles.
   c. Make a manual left turn to avoid restricted area and line up on course at COD lake, DTG should read approximately 183 miles, TH 200°.
   d. Fly the #2 needle towards Earth.

17. [redacted]

25X1A

18. Before Landing:
   a. Transfer at least 2000# to tank #1.
   b. Main equipment power switch OFF.

19. After Landing:
   a. Taxi aircraft to Hangar area.
   b. Stop on signal from crew chief.
   c. Select position on INS and push the store button.
   d. Select position #2 and push the store button.
   e. Record GS and DTG.

20. After INS Check:
   a. Turn mode selector from NAV to OFF.
   b. Shut off engines.

STATEMENT

25 May 1963

The following statement is true to the best of my knowledge. At approximately 1215 local Bud Tower received a call from Boxer 10. At this time Boxer 10 advised the tower that he had lost visual and radio contact with Dutch 26. Boxer 10 also stated he was declaring an emergency for Dutch 26 and that the last radio contact he had was that Dutch 26 was having difficulty and that it sounded like Dutch 26 had declared an emergency but Boxer 10 did not know the nature of the emergency. During this time the tower was advised by GCA that Boxer 10 was squawking emergency on his IFF.

The above conversation with Boxer 10 was on Primary and Back-up channel two.

At 1218 the primary crash telephone was activated and the crash station, hospital and Boxer Control was advised of the pending emergency and that the emergency was being declared for Dutch 26 by Boxer 10.

The Control Tower did not have contact with Dutch 26 after he approached the base from the north and picked up his second chase aircraft which was Boxer 10.

Billie A Brown
BILLIE A. BROWN, AF18323055
TSGT, USAF

STATEMENT

24 May 1963

I took off 20 seconds behind 926 and joined in close formation at 28,000 feet indicated about 30 miles from home plate. (Altimeter was left at field elevation thru out flight). At join up, my fuel flow was 3500 lbs per engine which seemed a bit high. TAS was 526 kts at one point on the leg to Austin.

We started picking up high cloudiness and climbed to stay above. We were in and out of the clouds going to Austin and the same was true during the trun to Wendover.

I noticed that we came out of the turn to Wendover heading about 120° or 130°. We made a correction back to about 360°. Another correction put us close to on course.

On the leg to Wendover we were staying fairly level at 34,000 feet, my fuel flow was 2800 lbs each engine and the one time I checked TAS, it
25X1A was 485, IAS, the best I can recall, varied from 280 kts to 305 kts. We were in the clouds the majority of this leg. [redacted] made two transmissions, one shortly after departing Austin, asking my fuel state. The second, he asked how I was doing, since we were IFR and it was a little turbulent.

25X1A We broke out about 30 miles from Wendover. [redacted] asked if I could see the airfield as it should be about 6 miles ahead. I could
25X1A not and then [redacted] said he had it in sight. We turned for our leg to home plate.

On our leg home, our airspeed increased as I was holding about 3150 lbs per engine fuel flow and IAS was about 325. As we got out of

25X1A

the high cloudiness, I told [redacted] we were conning real good if he wanted to descend before we went thru the airways. He said he was trying to stay up to keep me from flying in the weather. We ended up over home at 32,000 feet.

25X1A

[redacted] called me for a fuel check and also told me when we were 112 miles from home plate. I stayed in close formation thru out the turn to the Austin leg. My relief aircraft was trying to join us, so as we approached Baldy, I told Boxer 10 that I would climb above 926 to the contrail level so he could find 926. I did not see 926 after I passed 34,000 feet and as I indicated 35,500 feet, Boxer 10 said he had 926 in sight.

I told them I would break left for descent to landing.

Donald J. Donohue

DONALD J. DONOHUE, 46576A
Captain, USAF

AF Form 711g, Life Sciences Report of an Individual Involved in an AF Accident/Incident, Section A Aircraft Accident/Incident

section 10, Medical Officer's Rationale, Comments (cont'd)

which was inadequate to the circumstances. Ejection was normal, although exposed hair was singed by rocket blast. All equipment functioned well, in sequence; touchdown was feet, left side and shoulder (probable cause of muscle strain). Physical exam and X-rays of back normal.

Bruce K. Kimbel
BRUCE K. KIMBEL
Major, USAFMC
Flight Surgeon

STATEMENT

25 May 1963

Dutch 26 departed at 0957 local with his primary chase, Boxer 11. 25X1A Everything seemed normal except [redacted] reported a weak transponder. Dutch 26 reported back over the station to pick up his secondary chase, Boxer 10. Radio contact was lost approximately 60 miles north. No further radio contact was made with Dutch 26. At approximately 1215 local, I received a call from Boxer 10 on channel 2, UHF. He was partially broken up but I did receive a word that I thought was "emergency". I gave Boxer 10 several more calls but no answer. A 25X1A minute or two later Boxer 10 came in loud and clear. He stated that "I have lost contact with Dutch 26 and I think he's in trouble. His transmission was broken up but I think I heard the word emergency". I had Sgt Brown activate the crash telephone circuit and all parties were notified. I tried repeatedly to contact Dutch 26 on channels 2, 6, 14 and Guard, plus Swab voice and Agnes voice.

James C. Green
JAMES C. GREEN, AF20524871
SMSGT, USAF

STATEMENT

25 May 1963

On 24 May 1963, I MSGT Paul A. West was on duty in the Radar Room. At 1215 local, while monitoring the flight of Dutch 26 and Boxer 10, I observed an emergency IFF squawk on a bearing of 338 degrees and 140 miles out coming straight in. At about the same time, I heard Boxer 10 advise that he was declaring an emergency for Dutch 26 and that he had lost contact with Dutch 26 but that on his last radiocontact with Dutch 26 he had heard a broken transmission that sounded like Dutch 26 was having serious trouble. I advised Boxer 10, on Channel Two, that I was picking up an emergency squawk and gave the position, range and heading to Home Plate. I asked Boxer 10 if he was squawking emergency and he replied affirmative. Boxer 10 stopped squawking emergency when 110 miles out.

I continued trying to pick up a target that could be Dutch 26 and on one occasion I did pick up a target heading south that I thought could possibly be Dutch 26, but the target turned right and flew west for about 50 miles before the target faded out. I also alerted all AFCS maintenance personnel to stand by their NAVAIDS equipment to make sure nothing went wrong.

Paul A. West

PAUL A. WEST, AF44181495
MSGT, USAF

25X1A

STATEMENT

24 May 1963

At 33NM to go before turning at check point (Wendover), I asked [redacted] what his fuel was; his reply was "9500#." At the time (about 1150L) I was in close formation, and we were just above an overcast at 34,000' MSL.

25X1A

Entry into left turn at Wendover seemed normal, except that at about one third of the way through I started getting the warning horn. I told [redacted] that he was getting too slow for me and that I was sliding to the outside to gain airspeed. As the distance between us became greater, I intermittently lost sight of him due to the cirrus overcast. When we rolled out of the turn, I was slightly ahead and above [redacted] and advised him that I was crossing in front of him and was climbing higher to stay VFR. At this time he said his heading was 200° and that he saw me. I picked him up visually again and saw that he was straight and level. I told him that I would maintain heading and altitude and to keep me posted on any change of heading. It was planned to let him pass me up and then I would rejoin.

25X1A

Shortly after completing roll out of turn, he said, "I think I am having airspeed trouble." I asked him how serious and he gave no reply. I could intermittently see him in the top of the overcast and he appeared level and on a heading of 200°. After this, I never did see his aircraft again. Time was 1202L. About 4-5 minutes later he made a garbled transmission saying, "I think I am in trouble; I'm in a ''''." I did not hear anymore as he was becoming very garbled.

I started a 360° turn and tried to raise him on the radio; I never received another transmission of any kind from him.

My first thought was that he was in a spin. I switched to guard and started squawking MAYDAY on the IFF. I specifically called Salt Lake Center on guard with a MAYDAY, hoping they could at least fix my position with their radar. They never answered. I also specifically called Cedar City radar to get a fix but they never answered. I did get an unrealible fix on Elko Vortac of 62NM/135 radial. Cedar City radio answered my call, and I asked them to relay via Los Angeles Center that "Boxer 10's wingman was in trouble approximately 70NM southeast of Elko" to Boxer Control.

I headed for home and told all ground stations that were calling me, "to disregard."

As soon as I was in range of Bud Tower, I gave them all the data that I had.

After thought: Around 1120-1125L, I called him to make an airspeed check since I was having trouble keeping up with him. He said he was holding .86 Mach and would slow up to .84 Mach. At the time I was indicating .92 Mach and was very slowly catching up. Once I was in close formation I was able to maintain my position with an indicated Mach of .80. He was still indicating .84 Mach.

[redacted]

25X1A

S T A T E M E N T

25 May 1963

Prior to reaching the Wendover checkpoint I was at 34,000 feet indicating 0.85 mach on the triple display indicator. Upon reading zero on the distance-to-go indicator (INS) I began a left turn in accordance with the pre-briefed flight plan. When approximately half way through the left turn I noticed the mach dial increasing. I began a climb while in the turn; however, the airspeed and mach number continued to increase. The maximum mach was 1.05. I could not figure out why this should occur since the throttles setting has remained constant through out the flight and I was climbing. While in

25X1A

the turn my wing man, [redacted] said that he could not keep the same rate of turn, therefore making a larger turn. He said that he still had me in sight. During this time I was flying the aircraft with the CSC stick button. After observing the increase in the mach and airspeed of the triple display in-dicator, I retarded the throttles slightly to see what effect this would have. I then leveled off in the top of the cirrus and engaged the auto nav position of the INS. During this time the airspeed indication began to decrease. Assuming it was a temporary malfunction I began checking my mission equipment and engine instruments. I checked the pitot heat switch which had been on during the entire flight turning it on and off three times, then leaving it on. Mission equipment was operating satisfactory and the RPM read above 98%. I believe that the fuel flow was reading 1800 pounds per engine. I am not pos-itive of the above statement concerning the fuel flow nor as to when I observ-ed this. After checking the mission equipment which required only a second or so, I immediately noticed the airspeed (KEAS) decreasing below cruise. About

25X1A

that time [redacted] stated that he was passing me and I saw his contrail off my right although we were in the cirrus. When I observed the airspeed (KEAS) dropping below 160, I increased the nose down attitude of the aircraft with the auto pilot pitch control wheel. This was a small correction of the pitch control which would lower the nose slightly, not wanting to descend in to more dense weather. The airspeed continued to decrease and upon reaching 147 KEAS I utilized the CSC on the stick to increase the rate of descent attempting to increase the airspeed. I felt that it was not good procedure to get in to an excessive rate of descent in the weather with the instruments being possibly unreliable. Also, the airspeed did not improve directly with the rate of descent. I believed that the pitot system or the airspeed indicators were malfunctioning, therefore, I leveled off and engaged the auto nav switch of the auto pilot system hoping it would maintain level flight, if I was getting erroneous reading from the flight instruments. There was no improvement in the airspeed-the indicator showed a continued decrease and I immediately disengaged the auto nav and flew with the CSC. I called [redacted] my chase wing man, and told him I was having airspeed troubles. During this period I was gradually descending. At about 120 KEAS I again informed him that I was having troubles. When the airspeed dropped to 101 KEAS the aircraft began to shudder and stall. I attempted to lower the nose with reference to the flight instruments, but the aircraft snapped two or three times and went into a inverted, flat spin at approximately 30,000 feet. I informed [redacted] that I was in a spin. After an unknown number of rotations, I would estimate near 25,000 feet, and after attempting to right the aircraft or gain control which was futile, I decided to eject. I looked down at the ejection, got a firm grip, tried to position my head in the head rest and pulled. I was in an inverted position, thus ejecting downward. The canopy and ejection seat apparently functioned properly. I felt the seat pushaway straps separate me from the seat and then the drogue chute deployed. At that time I checked my watch which read 1205. Shortly after the drogue chute separated deploying

25X1A

25X1A

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25X1A

25X1A

the main chute. The main chute opening shock was moderate. With the survival kit to sit on I was quite comfortable. At exactly eight minutes after I checked my watch (1213) I pulled the survival kit release, the kit dropping to the length of the lanyard throwing off the cushion. The kit then began rotating, which I tried to diminish with my feet attempting to dampen the oscillations. I retained my helmet, having the mask snug and and the visor down. The visor fogged up and I could not see, so I raised it. As I descended I saw the ejection seat pass me, then I saw the aircraft below which appeared to still be in an inverted, flat spin. I saw the aircraft again after it had hit and was burning. When the survival kit made contact with the ground I prepared myself for the touch down. I landed on my feet, falling to the left on my back and left shoulder. I tried to unlatch the right riser release to collapse the chute, because of the wind, latch was too hard to open. I then released the left riser release and removed the parachute harness and collected the chute. I had landed about one and a half to two miles from the aircraft, but I could only see the smoke. Making two trips to another hill I moved all of my gear in an effort to get nearer to the aircraft. As I was going to pick up the drogue chute which was about 2,000 feet from me, I saw a red pick-up truck with its lights on. Not being certain that they had seen me I walked back to the first hill where they saw me. There were four men in the truck. They said that they were on the highway and saw me in the chute. They traveled over very rough ground to pick me up. Enroute they had found the ejection seat which they had in the truck bed. They put my gear into the truck, retrieved the drogue chute. We then drove to the highway where we saw Deputy Sheriff Ed Boyce. We transferred all the gear except the ejection seat to his station wagon.

I talked to Utah Patrol Station Number 8 on his radio requesting they contact [redacted] I provided his number. Deputy Boyce drove me to Station Number 8 in Wendover and L.A. Hewitt, (Salt Lake City, phone AMherst 5-1976) driver of the pick-up brought the ejection seat in shortly after my arrival at Station Number 8, I was in telephone contact with [redacted] The highway patrolmen were cooperative and eager to assist. Highway Patrolman Roger Skougard was exceptionally helpful in coordinating transportation and phone calls. They all accepted instructions and requests readily.

25X1A

25X1A

Kenneth S Collins
KENNETH S. COLLINS
Pilot

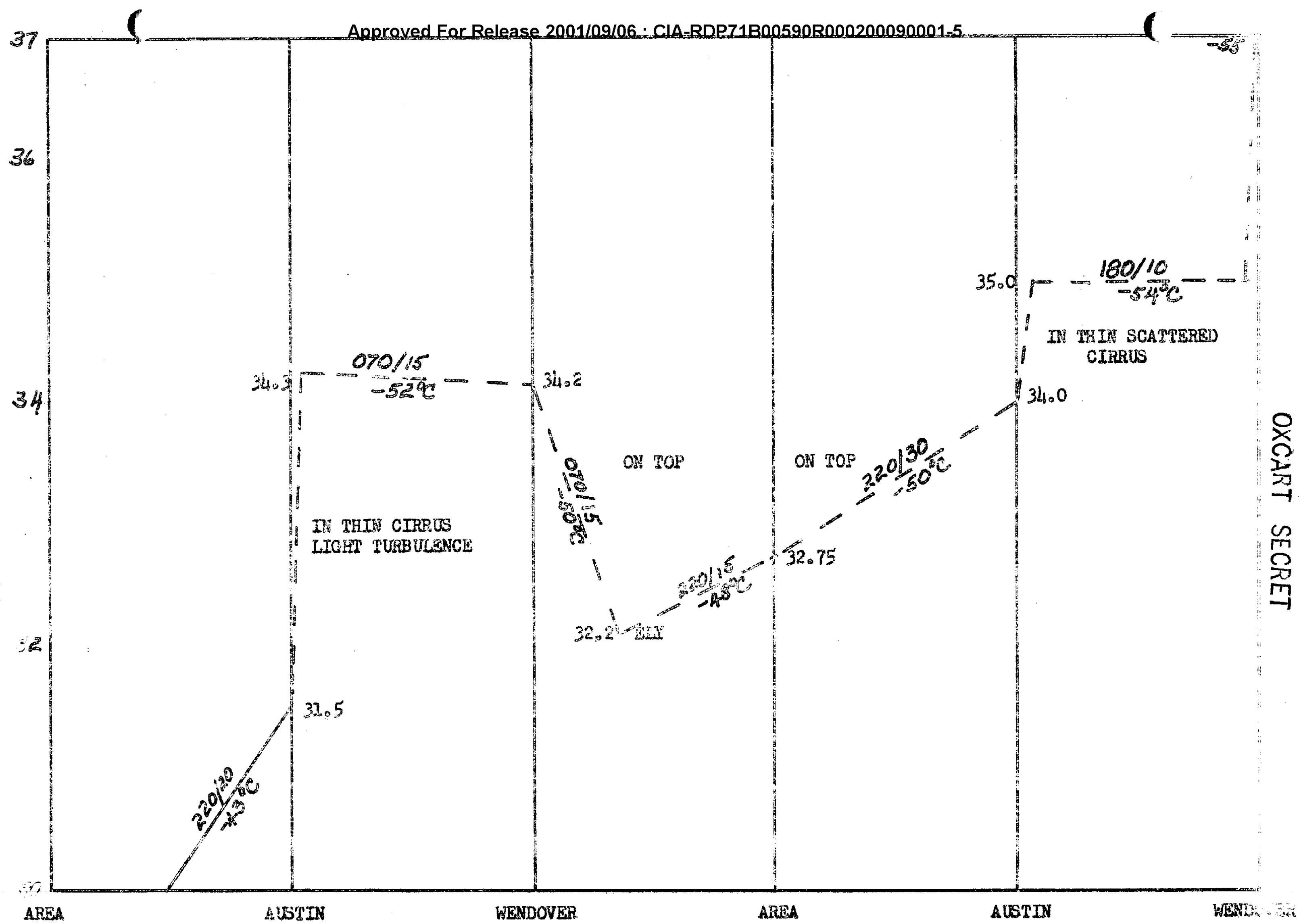
Statement By the Weather Officer

1. Tops of the overcast in the Wendover area at the time of the crash was 34,000 ft ASL with scattered cirrus extending to 36,000 ft. There was a thunderstorm reported west thru northwest of Wendover on the 1200 PDT Wendover observation. Pilot reports located an area of thunderstorm activity west of a line from Wendover to 40 miles north of Ely, Nevada. Temperatures and winds for the flight path are shown on the attached cross-section.

2. Weather in the area of the crash and for the flight path previous to the crash was "as forecast".

Daniel B. Mitchell

Daniel B. Mitchell
LTCOL, USAF



OXCART SECRET

SECRET

1. The attached interrogation of [redacted] took place on 9 June 1963, using approximately 0.8 grams of intravenous sodium amytal, under the supervision of [redacted]. In addition, in attendance were [redacted]. During the later portions of the interview, [redacted] was also present.

25X1A

25X1A

25X1A

2. In my opinion, narcosynthesis was fully achieved. This, however, does not mean that all questions are properly interpreted or answered by the subconscious memory. Specifically, it was [redacted] opinion, and my opinion that the following key points were established: 25X1A

a. Climb was begun prior to observing increase in Mach.

b. Indicated airspeed was observed to increase during the time that triple display, EAS and Mach were increasing.

3. It should be noted that the original transcript of the taped interview was unsatisfactory and was corrected by me from the tape.

Bruce K. Kimbel
BRUCE K. KIMBEL
Major, USAFMC
Flight Surgeon

25X1A

[redacted] is asking the questions.

Q: What are you flying by now? What are you flying on? Are you using instruments or are you going by sight? -- Are you going visually? Are you using instruments? Ken, where are you over now?

A: Thousand oaks.

Q: Where?

A: Thousand Oaks.

Q: You are flying an A-12, you are Dutch 26; you just got into some clouds and you are trying to go above them, you are trying to look into the triple indicator. Look at it. What does it say?

A: I don't know.

Q: Look at it, Ken, read it. Read it.

A: 457.

Q: 457? What else can you see? Look at it. Read it. Read the rest of it. What does the Mach indicator say? Ken, read it. What does it say? Ken, you are flying through clouds, cirrus clouds. You are trying to get up over the clouds. You are flying by instruments. You are Dutch 26.

25X1A

[redacted] is your wing man. You are trying to get over the clouds. Read your instruments. What does the triple indicator say? Read, Ken, read. It's important. Read. Look at the triple indicator--read the triple indicator, Ken. What does it say, Ken? You are having trouble seeing, you are in clouds, you're flying through clouds, you cannot see where you are going. You are flying by instruments. Read the instruments. Read them. Read the instruments. What does the triple indicator say?

A: Mach and air speed.

Q: What Mach are you at now? Read it, read the Mach. What is it?

A: 363.

Q: That is EAS. Now, what's the mach? Read it, read the mach indicator. Look down. Read it, Ken. It is important. You are flying through clouds. You have got to look down. Look at it. It is important. What does it say, Ken? What are the clouds like? Are they bothering you?

A: They're cirrus.

Q: You have got to try to go above them. Check your instruments now. Give me a readout.

A: Attitude gyro's OK.

Q: Fine. Go on. What's your KEAS?

A: About 290.

Q: What's the IAS?

A: Maybe 270.

Q: Are you sure?

A: The altimeter is about 34,000.

Q: What's the Mach?

A: About 85.

Q: Are you climbing?

A: No.

Q: What is your fuel flow?

A: I don't know.

Q: What's your RPW?

A: The PM is about 98.

Q: What is your fuel flow? Check it once.

A: Maybe 50, 5000.

Q: What is your indicated air speed?

A: Maybe 270.

Q: You're climbing now, trying to get up above the clouds. You are climbing up. What is happening to your Mach?

A: It keeps going up in the climb.

Q: What is your indicated air speed?

A: I don't remember.

Q: Look at it. Is your indicated air speed going up?

A: A little maybe, yeh----

Q: What's your Mach say now?

A: 1.05.

Q: What is your indicated air speed now?

A: Maybe 12, maybe, no, no---

Q: Look at it. Is your airspeed climbing?

A: A little bit.

Q: What is your rate of climb?

A: 500 feet, maybe 1,000.

Q: What's your altimeter show?

A: About 34.

Q: Is it going up? Are you climbing?

A: Yeh, I'm climbing a little bit.

Q: What is your Mach doing?

A: Going up.

Q: In the climb?

A: Yes.

Q: How about the indicated airspeed? Is that going up too?

A: A little bit, yes.

Q: What is your fuel flow? Are you checking that?

A: I don't remember what it was.

Q: Are you pulling back on the power?

A: No. Got to push power up there, to get up the hill.

Q: Where are you pushing it to?

A: To get above the Cirrus. Full forward.

Q: How high are you climbing? How high are you now?

A: 35.

Q: Before you started to climb what was your Mach?

A: .85 maintain the 85 I guess.

Q: And what is it now?

A: When I climbed, it got up to 1.05.

Q: What is the indicated airspeed when you climbed? Ken, look at the indicated airspeed. You can see it. Look at it, the Mach is 1.05 and you're worried about it. Look at the indicated airspeed? Is your altitude on the TDI the same as your other altitude?

A: Uh huh.

Q: What is the indicated airspeed? Look at it. It is important. Look at it now!

A: I can't see it.

Q: What is your RPM?

A: 98.

Q: On both engines?

A: Mm hm (yes).

Q: You looked at them both?

A: Yeh.

Q: How about your fuel flow? What's your fuel flow? Ken....Ken, look at it. Look at it. Look at your fuel flow. Look at the fuel flow. Look at the fuel flow, Ken. Ken. Look at it.

A: It may be 45 — 41.

Q: Do you put throttles up yet?

A: No, I put them up in the turn.

Q: You put them up in the turn? Even when your mach was going up?

A: No, no. That was just before that, I did that. When it started going down, I pushed them up.

Q: How fast did it go down?

A: The throttles?

Q: The Mach?

A: Sort of rapidly.

Q: Sort of rapidly? Tell me, what were the numbers after 1.05? What were the numbers?

A: I don't know. I didn't look at them, that--uh--I was--gotta fly The airplane, you know. Had a package goin'.

Q: I know you had a package. You had to pay attention to that, too. But, tell me, what were the numbers that you remember after 105?

A: It was passing down 1.01. 101.

Q: Any other number?

A: I don't remember.

Q: Was your pitot heat on?

A: Yes, I checked it on. It was on from the first of the flight.

Q: Did you check it just now?

A: Uh huh (yes).

Q: Are you sure you couldn't have mixed up the buttons?

A: No, it was on.

Q: What was your air speed when you checked the pitot heat?

A: Oh, about 280, maybe.

Q: 280? Was it going down?

A: A little bit.

Q: Did you see any ice or moisture hitting against the windshield?

A: No, there wasn't any

Q: There wasn't any at any time?

A: Don't think so.

Q: You're now rolling out at a heading of 200 degrees

A: It's on INS, that INS rolls it out you know.

Q: What's your KEAS?

A: About 280. No, it's less than that.

Q: Less than that?

A: Yes. A little bit less, you know when you're climbing you gotta go—

Q: Is the Mach working OK now? How is the Mach working?

A: It's going down a little bit.

Q: Do you believe the Mach? Or do you think there's something wrong with it?

A: Well, it shouldn't have gone up.

Q: Are you worried about this now?

A: No.

Q: What are you going to do?

A: Try to check, I guess, and fly home.

Q: What's your IAS?

A: About 240, I guess.

Q: Is it going up or down?

A: It's going down.

Q: Fast or slow?

A: Oh, I don't know.

Q: What's the matter with it?

A: It's a malfunction of the pitot, I guess.

Q: Are you worried?

A: No.

Q: What are you going to do next?

A: Check the INS.

Q: What does it say?

A: It's clicking off the minutes. The needle's pointing 200° and....

Q: Do you feel lightheaded?

A: What?

Q: Do you feel funny like?

A: No,

Q: Are you OK?

A: Yes. I checked the oxygen.

Q: You checked the oxygen?

A: Uh huh (yes).

Q: What did it say?

A: 800 pounds.

Q: Both oxygen?

A: No, that was the highest one. One was about 600.

Q: One was about 6? What are you doing now?

A: Trimming the autopilot.

Q: What's happening to air speed?

A: It's going down a little bit.

Q: What's your attitude?

(Can't make out this section)

Q: Are your wings level?

A: Yes, according to the attitude indicator they are.

Q: Are you pointing up or down?

A: The vertical climb and the attitude indicator are right on.

Q: Are you descending at all?

A: It doesn't appear so, I don't know. Can't tell.

Q: What's your rate of climb?

A: Straight and level.

Q: What's your air speed? About 240?

Q: What's your KEAS?

25X1A [redacted] asks all questions from this point on)

Q: Ken, let's go back to Mach 1.05. You got M 1.05 there? Can you see it?

A: Yes, just in the turn.

Q: Had you climbed first?

A: Just started.

Q: You started to climb and then it went up to 1.05. What's your IAS? Look at your IAS, Ken. It's right there. What does it say?

A: I can't see that.

Q: Look again. What's your EAS? You're on the triple display, Ken, and the Mach is 1.05. What's the EAS? What's your equivalent? Come on, Ken, you're back at Mach 1.05. You've got to check your instruments.

A: It shouldn't go up like that.

Q: Why did it go up.

A: Oh, I don't know. There's something wrong with those things.

Q: Is the pitot heat on?

A: Yes. ....been on. Climbing to 34.5, 35

Q: How high do you get?

A: Oh, up to 37, 38.

Q: Will that get you above the clouds?

A: Looks like it.

Q: Are you in the clouds right now?

A: No, not quite.

25X1A

Q: Where is [redacted] right now?

A: Off to the right somewhere.

Q: You can't see him?

A: No.

Q: Are you getting to slow for him?

A: No, I turn better.

Q: When your Mach goes to 1.05 you pull back on the throttles?

A: A little bit. I don't think it really went that fast.

Q: But you did pull back on the throttles?

A: Yes.

Q: What was the rpm after you reduced power?

A: About 95, 96, 97.

Q: What was your fuel flow? What's your fuel flow, Ken? Your rpm is 95 or 96.

A: Oh, it seems sort of low.

Q: Look over there at it. What's it read? What's the fuel flow, Ken?

A: I don't know.

Q: I want you to read your IAS again for me, Ken. Your Mach is 1.05. I want you to look at your IAS. What's your airspeed?

A: That's before.

Q: What's before?

A: 1.05.

Q: All right, Ken. We're back in the turn now. You said first you start to climb. Is that right?

A: I don't know.

Q: First you start your climb. You said you started your climb, then the Mach went nuts?

A: Yes, that's Wendover.

Q: What was the Mach before then?

A: Oh, that was good. It was good for two hours.

Q: What was it?

A: Oh, about 86 all the way.

Q: Stayed steady all the time?

A: Yeh.

Q: Then you went into your turn over Wendover, Ken, and it went from 86 to what?

A: Climbed right up through to 1.05.

Q: Real fast?

A: Pretty fast.

Q: Now, was that before you climbed or after you climbed?

A: Just about the middle of the climb.

Q: You started your climb and the Mach ran up?

A: Uh huh (yes).

Q: That's right. What's the IAS?

A: That's the indicated airspeed.

Q: That's right. What does it read.

A: Oh, let's see. See if I can see it.

Q: Look at it. Look at it--come on now, look at it. It's right above your altimeter? What's it say?

A: It shouldn't be--just about 400.

Q: 400? What is the EAS? What's the equivalent?

A: It went up, I don't know.

Q: Your Mach is 1.05 and your IAS is 400?

A: Yea. That's something else.

Q: Read it again. Does it say 400?

A: I turned the INS on there.

Q: After you turned the INS, what's your fuel flow right now? You are in a climb but your speed's building up.

A: Not really, it's just that old instrument you know.

Q: How about the IAS? How about the indicated?

A: Yeh, that's not much good either.

Q: It's not much good either, huh? You think it is bad?

A: None of them are working too good now.

Q: Both the equivalant and the indicated are both bad?

A: It looks that way.

Q: What's the fuel flow now? How high do you get in the climb, Ken?

A: About 38. Should get to about 51. You have to have about 51 to stay up there.

Q: You mean the fuel flow?

A: Yea.

Q: You're climbing to about 38 now. Are you on top of the clouds?

A: Just right in the tops of them.

Q: What's happening to your EAS right now?

A: That is going down like the rest of them.

Q: How about your rate of climb? Your wings level?

A: Not yet, I haven't quite rolled out yet.

Q: What is your rate of climb?

A: Just a little bit, about a pip or two.

Q: Up or down?

A: Climbing up.

Q: Is your airspeed, mach still 105?

A: No, it's going down.

Q: How fast?

A: Oh, about 78 I guess.

Q: Now it's 78. What's your IAS now Ken?

A: Indicated air speed

Q: That's right. What does it say? Have you got the throttle back up yet?

A: Yeh.

Q: Where are they?

A: They are on the left side of the airplane.

Q: Where would you push them to, Ken?

A: They're full forward — got to check those.

Q: What's the RPM?

A: RPM is a little over 98.

Q: Why aren't you getting about 100 or 101?

A: Nah, it must be the airspeed.

Q: OK. The RPM is 98. Did you look at both of them.

A: Sure.

Q: You checked them both?

A: Yep.

Q: Both engines 98.

A: Yes.

Q: What's your fuel flow now? Check your fuel flow, Ken. Your RPM is 98, What's your fuel flow now? Look down at it.

A: It is 49.

Q: Both engines?

A: Yes.

Q: Did you look at both engines?

A: Yea.

Q: Both working good?

A: (not readable)

Q: What is happening to your airplane?

A: It is flying good. It is a good airplane.

Q: No problems? What's wrong with the airspeed?

A: Funny.

Q: You got the pitot heat on?

A: Been on.

Q: Did you double check it?

A: Sure.

Q: And it was on when you looked.

A: (not readable)

Q: Did that make any change?

A: Nope.

Q: What's the airspeed doing now?

A: Going down, down.

Q: How fast?

A: ---- I guess.

Q: Are you worried?

A: No.

Q: Everythings OK? What is your rate of decent now?

A: Very little.

Q: What's your altitude now?

A: Just below 38.

Q: Are you in the clouds yet?

A: Oh, yes. Got to be in the clouds, I guess.

Q: 38 didn't clear the clouds?

A: No.

Q: Are the clouds getting higher?

A: No they're staying the same.

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Q: Where is [redacted]

A: He's gone, I guess.

Q: When did you put the power back up?

A: In the turn.

Q: You only pulling 98%?

A: Sure.

Q: You think your AB's will work?

A: If I wanta try them.

Q: Do you want to try them?

A: No. Might give adverse effect to the airplane.

Q: Why is that?

A: I don't know. They just boom, boom......

Q: Is it flying good right now?

A: It seems to. Why use the AB?

Q: How far does the air speed go down?

A: Right now the air speed is down to 260.

Q: It's falling, isn't it?

A: Sure is.

Q: Is the indicated falling the same as the equivalent?

A: I'd better check the throttles again, don't you think?

Q: Yes, I think you'd better. Where are they?

A: In the airplane, on the left side.

Q: That's very good. How far forward? How far up?

A: I don't have to push them very far.

Q: And then you check the rpm. What does it say?

A: RPM

Q: What's the RPM, Ken?

A: Hmm.

Q: What's the RPM Right over on the right side. Take a look at it. Right by the attitude indicator.

A: The attitude stayed the same, but there's just down a little bit.

Q: What's your RPM now? You shoved the throttles up. What kind of RPM you got?

A: About 95. Possibly nine eight five.

Q: 95. What's your air speed?

A: Bleeding off the rpm.

Q: RPM's 95?

A: Right.

Q: Are you still in the turn or have you leveled out?

A: Just about leveled out.

Q: You put your power up and all you get is 95? Something wrong with your engines? What's your fuel flow?

A: About 800.

Q: Don't you think you'd better double check your throttles?

A: Oh, I always keep my hand on those.

Q: You got them all the way up?

A: Sure.

Q: Why are you only getting 95? You told me you were getting 98.

A: Why, you don't want me to run at full power all the time.

Q: But your airspeed falling, isn't it?

A: Must be something wrong with that.

Q: There must be something wrong with the air speed. Will 95 RPM hold you up?

A: Any other airplane it will.

Q: Will it the A-12? What's your fuel flow when you got 95?

A: 454.

Q: Is that both engines?

A: Sure.

Q: I want you to check your rpm for me again. Your wings are level now, your air speed's dropping down. It's about 240 EAS, right now. What's your RPM? Look at your RPM, Ken. What's it say? Let's get back. What's your RPM say? Your ~~wings are level~~, your air speed's dropping off.

A: RPM same.

Q: How much RPM you got, Ken?

A: Hm. 94.

Q: How come your RPM's dropping down? You got the throttles back?

A: Can't tell. It doesn't look like it.

Q: Something wrong with your engines? You sure you got the throttles up?

A: Some.........

Q: What did you say?

A: ....some, I guess.

Q: What's your EGT? What's your EGT, Ken? How hot are they getting?

A: Not real warm. OK. They're real low but not real warm.

Q: How low?

A: Oh, about 490.

Q: That both engines 490?

A: Yes

Q: What's your RPM? Check your RPM.

A: About 98%. 98 - 99.

Q: That both engines?

A; Sure.

Q: What's your fuel flow?

A: Checked it once.

Q: Yes you checked it once. Check it again. Look down there and see what it says. How much fuel flow you got?

A: About 55.

Q: Is that both engines? Is that enough, or is that too much, or how do you feel about that?

A: That's good.

Q: You got 98%. How come your air speed's falling off?

A: Must be air speed indicator.

Q: How's your rate of climb right now?

A: Same, pretty much normal.

Q: What's your equivalent now? Where we are right now.

A: About the same.

Q: 240? Is that the last time you told me?

A: Mm hm.

Q: Is it still dropping?

A: No.

Q: It stopped at 240?

A: Yes.

Q: Everything's nice, huh?

A: Yep.

Q: Back on course?

A: I've always been on course here. INS is good.

Q: What's your heading?

A: Time's good. Everthing's fine.........that old air speed though they ought to take out.

Q: The clouds aren't so good, are they?

A: Sure, for weather.

Q: OK, Ken. We are still at 240 now on the air speed?

A: I guess so.

Q: Is that the equivalent or indicated?

A: EKS, KEAS equivalent.

Q: That's right. What's the indicated air speed? What's the indicated right now?

A: Oh, about 210.

Q: And it's going down?

A: Sort of.

Q: How fast is it going down?

A: About as fast as the other one.

Q: Are you sure you got your throttles up?

A: Oh, I checked them a number of times.

Q: Did you check your pitot heat?

A: Yes, three times.

Q: OK. Now your air speed's going down. It started to go down. It's going down. Do you see it going down?

A: Yes, maybe that heat element isn't working, you know?

Q: So you tried it again? Was your air speed already going down?

A: A little bit.

Q: How fast is it going down?

A: I didn't time it.

Q: Is it down to 200 yet?

A: No.

Q: What is it right now?

A: It's down to 200.

Q: Is your equivalent down to 200 yet? The airspeed's falling off, Ken. You've got problems.

A: It was the climb I guess, that made it fall off.

Q: You climbing again?

A: Well, when I first started.

Q: What's your rate of descent now?

A: Now it starts climbing.

Q: You're still climbing but your air speed's going down.

....

....

Q: You still at 38?

A: Pretty close.

Q: Not quite 38? The airspeed's going down?

A: Yes.

Q: You worried about it?

A: No.

Q: You got the power all the way on?

A: Yes.

Q: What kind of RPM you got now?

A: It'll fly.

Q: What's your RPM?

A: About 98.

Q: You got the throttles back up?

A: Sure.

Q: What's your fuel flow? Come on Ken, this is very important.

A: Oh, about 5,000 pounds.

Q: Both engines running?

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A: I guess so.

Q: You got about 98% on both of them?

A: Yes.

Q: You look at both of them? Look at both of them. Check them right now.

A: They're both the same.

Q: OK, now, Ken, you got 240 equivalent. OK? Can you see it there? You see the 240 there? What's your Mach right now?

A: Hm.

Q: Wake up Ken.

A: Well, maybe.

Q: You got airspeed troubles, Ken. It's falling off on you. What's it saying?

A: Got to do something there, I guess.

Q: Yes, you got to do something. What are you going to do?

A: Better call my wing man.

Q: Yes. What do you say?

A: Tell him I got troubles.

Q: What did he tell you?

A: He just repeated it. He didn't say anything.

Q: Where was he right now?

A: In front of me.

Q: He crossed over in front of you?

A: Yes. That's no place to be.

Q: You think you might run into him?

A: NO, he's looking out. He's a good man.

Q: Can you see him?

A: No.

Q: Is he in the clouds?

A: Yes.

Q: What's your altitude?

A: About 33.

Q: 33? You losing altitude?

A: Well, I have to put the nose down to see if I can get the speed up.

Q: Yes. What is your rate of descent?

A: Slight.

Q: You are down to 33, is your airspeed building up?

A: No. It's sort of holding its own.

Q: What's it reading now?

A: At 33,

Q: At 33, what's your airspeed?

A: Oh, around 260 I guess.

Q: Around 260. You got lots of airspeed.

A: Yes.

Q: What you letting down for?

A: Well it's not normal. You got to have 280 to 290.

Q: 260's not enough?

A: No.

Q: You're letting down. You're at 33,000. You got 260.

A: It got higher there, too.

Q: So what do you do now? You're at 33,000 and reading 260. What do you do? Come on, Ken. Get with the program. You're at 33,000, your airspeed is 240 right now. Is it 240 or 260?

A: 240.

Q: What's your rate of descent?

A: It was indicating pretty nice -- just a pip, maybe 200 to 300 feet.

Q: Is your airspeed dropping?

A: Yes, that thing just won't keep dropping. It just keeps on.

Q: OK. You're at 33,000, air speed at 260, you just keep dropping, right? Tell me the figures you see as they go by. What's it saying now in the old EAS?

A: Oh, it's down about 230, I guess.

Q: 230? What's your altitude: You still at 33,000?

A: 37,000.

Q: No, you said you were down to 33,000. You still up at 37 now?

A: Oh, on the climb we rolled out. We were still climbing at 33.

Q: That's right.

A: (not readable)

Q: Yes, you said you rolled out at 37, almost 38. Something like that.

A: Yes that's a good altitude.

Q: Tell me about your airspeed going down. I want you to watch it go down. I want you to tell me about it.

A: Going up or down?

Q: The airspeed going down. We already talked about it going up.

A: ———

Q: Did it go down real fast?

A: Oh, no, I don't think so.

Q: Going down slow?

A: Reasonable.

Q: Airplane flying real good?

A: Felt good, real smooth. Good plane.

Q: You sure you got the power up?

A: I'm positive. Up and locked.

Q: Ken, I want you to tell me about the airspeed going down. You with me?

A: Yep.

Q: OK. You're about 37,500 or 38,000. You got about 260 and it starts going down.

A: Yawn.

Q: Now you are a little bit worried about it. You put the nose down, right?

A: Well I thought maybe I'd better back up a little speed for the package.

Q: You got to get down for the package?

A: I've gotta get up.

Q: You got to get the airspeed up for the package?

A: Sure.

Q: You got to do just what you want to do and fly that mission, huh?

A: Mm Hm (yes).

Q: If you don't believe your airspeed, if it's lying to you, why worry about it?

OXCART

A: Well, you just can't tell. It might just go on down, and mayby the nose is up too high.

Q: How do you know that the nose is up too high?

A: I thought maybe it is, I don't know, you're on instruments.

Q: How about the artificial horizon? How about your attitude? Doesn't that tell you that your nose is too high?

A: It's OK, it's up a little bit.

Q: How much is it up?

A: Oh, not over a pip.

Q: Where are we now? Are we still in the turn?

A: No, we are stright and level, headed for home.

Q: Headed for home and you got your nose up. You are climbing?

A: Little bit.

Q: Why you got your nose up?

A: So we can climb.

Q: Stay out of the clouds, huh?

A: Yes.

Q: How high do you get to?

A: Almost 38.

Q: This is after you're stright and level? What's your heading right now?

A: 202 or 200.

Q: 200, huh? What the KEAS, Ken? You're at 38,000. Just about 38,000. Just on top of the clouds. What's the KEAS? What's the equivalent? Look at it for me. Come on, Ken. What's the equivalent? Get with it. What's your equivalent.

A: Must have been 280 or so.

Q: You think the airspeed is working all right now?

A: Oh, a little bit off.

Q: When did it start going down, Ken? Ken, let's go back now. We got up to Mach 1.05. Check?

A: Yea.

Q: OK, you see it there?

A: Sure. In the turn.

Q: OK. Now she unrolls and she comes back where? When she stops, what is your Mach when it stops moving?

A: My altitude-----

Q: Have you got back to your .86 yet?

A: Yea-------over-running them.

Q: Who are you over-running? You over-running Jack?

A: A little bit.

Q: Is this in the turn?

A: Um.

Q: You are not over-running Jack. You are not over-running, but he swung out wide, right?

A: Yea, he had to do that.

Q: Are you trying to slow down so he can get back up with you?

A: Oh, just slightly. He's my wing man, he's gotta stay with me.

Q: That is his job, that's not your job. You're supposed to fly the airplane and it is his problem to stay up there, is that right? That's right?

A: That's right.

Q: So what's your equivalent now, you are rolling out of the turn, what's your equivalent?

A: Altitude?

Q: No, your equivalent airspeed, Ken. KEAS. Rolling out of the turn on a heading of 200°.

A: Oh, about 250, I think.

Q: About 250? Is it falling off?

A: Just a bit.

Q: Put your nose down.

A: Maybe I should have more airspeed.

Q: Did you put your nose down, did you put the power in?

A: I didn't put the nose down, I was straight and level.

Q: You put the power in?

A: Yea, what I needed.

Q: You real sure you got lots of power?

A: Oh, yea, suppose got a lot of power.

Q: You are flying real good?

A: Sure

Q: What's your fuel flow?

A: Oh, I still got fuel flow.

Q: How much is your fuel flow?

A: Oh, about 54 to 53.

Q: OK. Let's go back now; let's start the turn. We're over Wendover, OK? You told Jack you had 33 miles to go. You with me? 33 miles to go to Wendover you told Jack, that right? OK, now you are over Wendover and you start your turn, is the Mach working OK?

A: 1.5.

Q: NO. No. You start the turn, what's your Mach? It's been steady as a rock.

A: Second one or first one?

Q: Second time over Wendover.

A: When I started Mach it was all right,--then it ended up it 1.5.

Q: Yes, it ended up 1.05, right? Now we are back over Wendover, the second time around, OK? Jack's right there with you. You see some clouds off over there, don't you? And you are going to have to climb over the clouds, you're over Wendover and your Mach is .86, is that right? Steady as a rock?

A: Yeh.

Q: Is it .86? You start your turn.

A: --------

Q: You're starting your turn now, you push the CSC and you start your turn, is that right?

A: --------

Q: OK, now you are going to start your climb now.

A: We should, I don't know if I will.

Q: How is the Mach?

A: The Mach's all right.

Q: Ken, you are over Wendover. You got that? You are on your second crossing right now. When you turn you got old [redacted] right on your right wing, OK?

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A: OK.

OXCART SECRET

Q: You are over Wendover and you start your turn. Your Mach is real good. It's .86, O.K. You start your turn. What are you going to do now? Are you going to climb?

A: Look at Jack.

Q: What's he say?

A: He's out far.

Q: He's out too far?

A: Should be.

Q: Why?

A: Just the way the briefing went.

Q: You worried about weather? You want Jack in tight so he can still see you?

A: I don't want to loose him.

Q: Thats right, but thats his job, isn't it? That's his problem.

Q: O.K. Whatta you got. .86, O.K. to start the turn. Are you starting your climb yet? When's the Mach go up? When's the Mach go up?

A: Halfway through the climb.

Q: You are climbing first, is that right? You are on the way up?

A: Yea

Q: Your altitude goes up and all of a sudden something happens to the Mach. Does it spin right around to 105 or does it go slow?

A: It goes slow, it shouldn't do that.

Q: What's happening to the IAS? The indicated airspeed, look at it. It's right above the altimeter.

A: It's going up a little bit.

OXCART SECRET

Q: It's going up too? It's gone up the same amount or different?

A: Oh, same amount, I don't know.

Q: But you are in a climb and your indicated airspeed is going up? Is that right, Ken?

A: Hmmm-----

Q: That doesn't seem right, does it?

A: What?

Q: The indicated going up in the climb.

A: I don't really know what he did.

Q: Where you got the power right now?

A: Full power.

Q: Full power. And your Mach's going up? And you're climbing?

A: Yes.

Q: You pull back on the power?

A: A little bit.

Q: How much?

A: A little bit.

Q: What's the rpm?

A: Oh, about 94.

Q: Is that enough?

A: Well, I just pulled back. I don't know if it's enough or not.

Q: And what's your fuel flow?

A: Oh, about 49.

Q: About 49. That's both engines?

A: Yes.

Q: You got about 94 to 95 on both engines? O.K. Ken, this is very important. When you going to add that power back in?

A: Oh, just a minute.

Q: You roll out of the turn first, or you put the power back in first?

A: Hm. Put the power in the turn before we made it.

Q: Yes, you put the power back in before you rolled out?

A: Yes.

Q: O.K. You put your power back in, you're rolling out on a heading of 200 - 202, which was it? 200?

A: Hm. 200.

Q: O.K. You see that 200 right there.

A: Right on the INS needle.

Q: Right on the INS needle. Right on the button, boy. Just the way you want it. Right on the old button. O.K., what's your rpm?

A: Oh about 98.

Q: You got it back up, huh? You check your fuel flow? Look at it and tell me what it is.

A: Hm.

Q: Check your fuel flow, Ken. Come on.

A: It's about the same, I guess.

Q: Same as it was before?

A: Yes.

Q: You got 98 on both engines?

A: Oh, not 98. 98 is the rpm.

Q: You got 98% rpm on both engines?

A: No, that's too much. That's not right.

Q: Yes, can you read that little needle on the rpm? You know there's a big needle and a little needle. Can you read the little needle?

A: Hm. I didn't look at it.

Q: Didn't you read that?

A: No.

Q: You like the big needle, huh?

A: Yes.

Q: You think you got power?

A: It feels like it.

Q: You think you got power on both sides?

A: Can't tell. The SAS is O.K.

Q: No thrust problems, huh?

A: No.

Q: Lots of power? You need the AB's?

A: AB's in weather.

Q: Yes. O.K., Ken. Now we're out of the turn. We got 98% rpm on both sides. What's your Mach right now? You're level at about 38,000, maybe less. What's your Mach?

A: We're dropping down to .6.

Q: .6? What's your equivalent air speed doing?

A: Everything is dropping.

Q: Is your rate of descent dropping, too?

A: Just a little bit.

Q: Not very much?

A: No.

Q: The needle almost level?

A: Yes.

Q: It's not pointing straight down or anything like that?

A: No.

Q: How about your altimeter? What's it doing?

A: There's something wrong with that.

Q: Something wrong with the altimeter?

A: Well, it's going down a little bit. But it shouldn't with the needle.

Q: O.K. Your Mach is .60, is that right?

A: - -

Q: What's the KEAS?

A: Oh, KEAS is about 150.

Q: About 150? And your Mach is .6?

A: I guess.

Q: You sure you got 98%?

A: Oh, yes.

Q: You got them shoved all the way forward?

A: Yeh, locked. I checked'em locked.

Q: Now how fast is your rate of descent, your rate of climb. How fast are you going down?

A: Rate of descent isn't....? A pip or two.

Q: That's your altitude indicator. What's your rate of descent?

A: Just a little bit. Yes, maybe 500 feet at the most.

Q: What's your altitude when you're reading Mach .6?

A: I don't know. I didn't look at that.

Q: You losing altitude?

A: Yes. I must be.

Q: You think you're really losing altitude?

A: Oh, not rapidly, but some.

Q: You're putting the nose down?

A: Mm hm. (Yes)

Q: What happens about this time, you see lights flashing around there?

A: Lights?

Q: Yes, you got a master caution showing?

A: Not until later the surface limiter came on.

Q: The master caution light came on, you looked down, and what did it say?

A: "Master caution"

Q: Yes, what did the panel say when you looked at it?

A: The surface limiter is on.

Q: Did you pull it?

A: Sure

Q: How come?

A: It's too low. You're not supposed to fly that low without it on.

Q: Do you think your air speed's right now?

A: I don't know. I'm beginning to think so.

Q: You shove the nose down?

A: Yes, some.

Q: Why not, why not very much?

A: Oh, this thing is no good for adverse effects.

Q: You don't like those g's on this airplane?

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A: Oh, I don't mind, but somebody else does.

Q: You think old [redacted]ight not like that?

A: He'd probably be mad.

Q: Yes, Keith might get mad, too.

A: Yeh, he's a good troop.

Q: Yes, Keith is a real good guy, isn't he?

A: Yes.

Q: C.K. How come you don't try those old afterburners? You're losing air speed.

A: Oh, you're in the weather. Never use afterburners in the weather.

Q: Never use afterburners in the weather?

A: No.

Q: In the 101 you ever use afterburners in the weather?

A: No.

Q: What if you're losing air speed, though?

A: You put the nose down and put full power on.

Q: Yes, you sure you got full power on?

A: Sure.

Q: Is it still 98%?

A: Yes, it might be a bit better.

Q: Can't you get more out of it than that?

A: Not much more.

Q: Not much more than 98? What's your altitude right now, when the limiter light goes on?

A: Oh, that doesn't have anything to do with the altitude.

Q: No, I know. But did you cross check the altitude? How high were you?

A: Oh, 33, a little less.

Q: You been losing altitude all the way down from 38?

A: Yes.

Q: And you're losing air speed, too?

A: Yes.

Q: And your limiter light's on?

A: Yes.

Q: You sure you got all the power on?

A: Well, I think so. It's pushed up.

Q: You going to push your nose down now?

A: It is down some.

Q: How far down on the attitude?

A: Just a little bit.

Q: You going to push it down more?

A: Adverse effects you know. It's not good.

Q: Yes, you worried about those g's on that airplane?

A: Sure.

Q: What are you doing now?

A: Nothing. Just sitting there.

Q: Don't you think you ought to do something right now? You pulled the limiter handle and you twisted it. Isn't there anything else you can do right now? What can you do?

A: Well, I can eject, but I don't just yet.

Q: Yes, O.K. So you just sat there. How long has this taken now? Is that air speed really winding down now? Wake up, old boy. Come on back. You with us?

A: Yes.

Q: The air speed going down real fast?

A: Yes, going down. It still goes down. And 147, I think.

Q: 147. You saw 147? Is that when the limiter light came on?

A: Yes. That shouldn't have come on. That's probably a malfunction, too. But I turned it off.

Q: You turned what off?

A: I pulled the knob out.

Q: You think it's a malfunction:

A: Not really.

Q: Do you believe it or not?

A: Positive. Got to.

Q: Got to. Why don't you shove your nose down?

A: Nose is down some. Mountains, you know.

Q: Mm hm. Why don't you hit the AB's?

A: It would be assymetrical.

Q: Why?

A: Oh, I don't know. Maybe one wouldn't light at 40,000 feet.

Q: Oh, you mean maybe you might not get a good light, huh?

A: Yes.

Q: Wouldn't the airplane handle all right if just one went on?

A: No. Acts sorta lopsided.

Q: You think it'd be lopsided? You don't like this in the soup?

A: Oh, no. Not with the wing man, if he ever comes back.

Q: What about the wing man?

A: He might come back.

Q: You think old Jack might got back there? How's he going to see you in the soup?

A: Well, he's got good eyes. He's a pretty good guy.

Q: Is he in the soup right now?

A: Yes.

Q: Do you think you got on your power?

A: Oh, yes.

Q: What's your percent?

A: Oh, just a little over 97.

Q: 97?

A: 98.

Q: What's your fuel flow?

A: Don't know.

Q: Are you sure they're both working?

A: Well, they seem to be. Though you can't tell. It's maybe 500.

Q: 500?

A: Or 5,000.

Q: What's your EGT?

A: It's 1, 2, maybe 660.

Q: 660 EGT building up?

A: Well maybe 550, I don't know.

Q: That's higher than it was before, isn't it?

A: I don't know.

Q: Do you think the EGT is O.K.?

A: It sounds like it's a little weak, doesn't it?

Q: O.K., Ken, is it getting slower now, Ken?

A: What?

Q: Is it getting slower? The limiter light came on. You pulled it and you twisted it. It gets slower - - - .

A: It was down to 120, it keeps going and pretty soon, zoop.

Q: What do you do at 120?

A: Well I just about bailed out.

Q: Yes, Was it still flying at 120?

A: Well sort of, but it didn't feel good.

Q: Why didn't you shove your nose down?

A: My nose was down.

Q: Pretty far? How far?

A: I don't know.

Q: What's your rate of descent right now? This is real important.

A: 1,000 feet.

Q: 1,000 feet. You're down to 120, your wings are level, you checked your rate of descent and what did it say?

A: Rate of descent?

Q: Rate of descent!

A: Oh, about 1,000 feet.

Q: What's your altitude right now when you see 120?

A: Oh, about 32, 31,000.

Q: O.K. What happens now? What do you see after 120? What do you feel?

A: Feel? I got trouble.

Q: How does the stick feel?

A: Good.

Q: You sure you got full power?

A: It feels that way.

Q: You double check those throttles?

A: Yes.

Q: What's the rpm?

A: Full.

Q: What do you see after 120, Ken? The air speed's going down. What do you see? Get with the program. Wake up. What do you see after 120? Your air speed's dropping. You got air speed troubles.

A: Oh. 120, oh. I was looking at the INS, you know, and next thing I looked down there's 101 or a little bit more.

Q: Why did you look at the INS, Ken?

A: Well, because I was flying it for a few minutes, and I thought I'd take it off because it wasn't doing any good.

Q: The INS wasn't flying the airplane good?

A: It seemed to be straight and level but apparently it wasn't.

Q: So did you take it off?

A: Yes. CBC.

Q: You punched the CSC?

A: Yes.

Q: Did you punch the autopilot? Did you trigger it off?

A: No, the CSC does that.

Q: You didn't use the autopilot disconnect?

A: No.

Q: O.K. You're down to 101. What's going to happen now, Ken?

A: What's going to happen?

Q: Yes, what do you do? You're down to 101.

A: I just hang on then.

Q: Mm. Hm. What does the airplane do?

A: It shudders and stalls.

Q: How do you feel right now?

A: I'm a bit busy.

Q: But you feel O.K.? You know what's happening and all? You feel real good?

A: Oh, fine.

Q: You're a bit busy. What are you doing?

A: Well it stalls and you check the controls and just checking the throttle full up. Looking at instruments.

Q: What are you reading on the instruments?

A: Don't know.

Q: What do you read on the power, Ken?

A: It's supposed to be the same place.

Q: What's the airplane do when she stalls?

A: Snap.

Q: It's just a regular old-fashioned PT-17 snap roll, or what?

A: Well, maybe up and snap and maybe a pitchup.

Q: You think it was a pitchup, maybe?

A: I'd say it was more like a snap.

Q: Did you go upside down?

A: Sure did.

Q: Which way were you turning?

A: Right.

Q: To the right? Upside down? How long do you stay?

A: Upside down?

Q: Yes.

A: No, I didn't stay long, because my drogue chute deployed.

Q: Do you think you ejected upside down?

A: Yes.

Q: Why?

A: My helmet and mask stayed on and....... Just didn't feel like I had a lot of wind blast. Just felt like I was straight down when the ejection seat deployed.

Q: Ken, are you pretty sure that the whole time you had lots of power on those engines?

A: Yes.

Q: You don't think, it was no problem with the engines, huh?

A: No.

Q: Engines working good?

25X1A A: Yes.

Q: [redacted] When you pulled the surface limiter, was it to shut off the light?

A: Yes.

Just let yourself relax. You did very well, Ken. We think you did a real good job. You were up and flying the airplane. We want you to know we think you did a real good job, and after today you'll feel comfortable about it. Do you think it was a good flight?

Didn't get home.

There's something you want to tell me before you get up, Ken? There's something you'd like to tell me still? Anything bug you now? You feel comfortable about everything you said? Good. You can relax now. You can have a nice sleep. You have had lots of drug and you will have a nice sleep for awhile now. You just turn over and go to sleep. That's good. You did real well. And you'll remember that you did well when you wake up. You did fine.

P

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P. O. Box 23, Fort Myer Station
Arlington 11, Virginia

SPECIAL ORDER
XB-130

25 May 1963

The following named Officers and Civilians organization indicated, are appointed members of a Aircraft Accident Investigation Board, under the provisions of AFR 127-4. Note: (*) indicates orders published with approval of DIG/Safety, Norton AFB, Calif. (**) indicates for Technical consultants when required.

GRADE, NAME, AFSN	DUTY	ORGANIZATION
*COL CHARLES L. WIMBERLY, 5067A	President	DIG/Safety, Norton AFB, Calif
COL DOUGLAS T. NELSON, 11124A	Operations	Det 1, 1129 USAF Sp Acty Sq
LT COL JOHN R. KELLY JR, 35737A	Materiel	Det 1, 1129 USAF Sp Acty Sq
MR NORMAN E. NELSON	Contractor	Det 1, 1129 USAF Sp Acty Sq
MR EDWARD MARTIN	Contractor	Det 1, 1129 USAF Sp Acty Sq
**LT COL DANIEL B. MITCHELL, 14354A	Weather	Det 1-3, 3rd Weather Wing
**MAJOR BRUCE K. KIMBEL, AO2083741	Medical	Det 1, 1129 USAF Sp Acty Sq
**MR GLENN C. FULKERSON	Contractor	Det 1, 1129 USAF Sp Acty Sq
**MR ARTHUR G. SMITH	Contractor	DIG/Safety, Norton AFB, Calif
**MR LOUIS W. SCHALK JR,	Contractor	Det 1, 1129 USAF Sp Acty Sq
MAJOR SAMUEL E. PIZZO, 41538A	Recorder	Det 1, 1129 USAF Sp Acty Sq

FOR THE COMMANDER:

Harold E. Burgeson
HAROLD E. BURGESON
Capt. USAF
Asst Administrative Officer

DISTRIBUTION
D

R

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LOCAL FLIGHT CLEARANCE

STATION [redacted]

TYPE A/C —— 926

DATE 24 May 62

MISSION ——

OCCUPANTS (State whether crew or passenger. List additional passengers on reverse.)

DUTY SYMBOL	NAME AND INITIALS	GRADE	SERVICE NO.	HOME STATION
P	[redacted]	Civ	—	—

ETD	ETE (Home base)	HOURS OF FUEL	AUXILIARY BASE OF 1ST INTENDED LANDING
1000	240	3400	NR

FORM "F" FILED AT NR

DATE FILED (Day, month, year)

WEATHER IS FORECAST TO REMAIN VFR FOR THE DURATION OF THIS FLIGHT. I AM FAMILIAR WITH ALL CURRENT REGULATIONS AFFECTING THIS FLIGHT AND THIS FLIGHT WILL BE CONDUCTED IN ACCORDANCE WITH SUCH REGULATIONS.

CLEARANCE AUTHORITY [redacted]

ACTUAL DEPARTURE 0957

REMARKS

(Crashed approx 1205 PST
Emergency status received
from B-10 Chase acft.)

P. A. ....

TEMP. ....

T/O ROLL ....

L/ROLL ....(W/CHUTE)

........................(W/O CHUTE)

BEST COPY

Available

OXCART SECRET

FLIGHT ORDER

(If additional space is required, continue on reverse, identifying items by number)

1. DATE OF ORDER
2. ORDER NUMBER

3. NAME OF UNIT ISSUING ORDER: Det [illegible], [illegible]

4. LOCATION: Nellis AFB, Nevada

5. Crew members listed below will proceed in aircraft indicated — ON OR ABOUT (Date): [illegible] May 1963

6. Upon completion of flight, crew members will return to proper stations — ON OR ABOUT (Date): 24 May 1963

ITINERARY (List complete address)

FROM (Place flight will originate): [illegible], Nevada

TO: (Variation in itinerary authorized): Local Area

7. MISSION

8. CREW NR.

9. TAKE-OFF TIME: [illegible] local

10. DURATION OF FLIGHT: [illegible]

11. SPECIAL INSTRUCTIONS

II. CREW MEMBERS

(Personnel listed below are subject to provisions of the Uniform Code of Military Justice while performing this duty. Indicate Commander of aircraft by placing asterisk next to his name.)

12. CREW NR. (A)	CREW POSITION[1] (B)	13. LAST NAME - FIRST NAME - MIDDLE INITIAL (Include grade, service no., security clearance for period of flight duty)	14. ORGANIZATION AND MAJOR AIR COMMAND (If not issuing agency)	15. AIRCRAFT TYPE (A)	SERIAL NR. OR TACTICAL CALL SIGN (B)	FUEL LOAD (lbs./gals.) (C)
	P	[illegible]		[illegible]	[illegible]	

16. CREW POSITION ABBREVIATIONS AND CODES[1]

AC	Aircraft Commander	FE	Flight Engineer	Nav	Navigator
		FltSt	Flight Steward	Obsr	Observer
Bmbdr	Bombardier	FN	Flight Nurse	Plt	Pilot
BmOp	Boom Operator	FltSg	Flight Surgeon	RadrOf	Radar Officer
CP	Co-Pilot	Gnr	Gunner		
[illegible]	Crew Chief	IP	Instructor Pilot	RadOp	Radio Operator
[illegible]ob	ECM Observer				

[illegible]ITIONAL CODES

17. FOR THE Commander

18. SIGNATURE ELEMENT OF ORDERS ISSUING OFFICIAL (Seal or typed name and signature)

[signature]

[illegible] THORNTON
Major, USAF
Base Ops Officer

AF FORM 615 NOV 58

OXCART SECRET

T

STATEMENT OF DAMAGE

25 MAY 1963

Investigation has revealed no damage to private property as a result of this accident. The aircraft struck the ground at a location which neither vegatation nor habitation was situated.

U

CERTIFICATE OF DAMAGE

25 MAY 1963

The aircraft was totally destroyed upon impact.

V

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PILOTS TAPE RECORDER COMMENTS

FLT #79, S/N 123, 24 MAY 63

25X1A [redacted]: "I guess we should have checked them (throttles), but I just looked at them and pulled them back, you know".

25X1A [redacted] "Unfortunately, all you could do was pull back into that ledge (idle stop).

25X1A [redacted] "Russ, you got that switch set up? (INS switch in nose wheel well).

25X1A [redacted]: "Switch is ready for power switchover".

25X1A [redacted] "OK. I'm going to switchover generators. OK., we're Okay on ships power".

25X1A [redacted] "OK., stand by one".

25X1A [redacted] "Keith, are you going to have to wait on "[redacted] (F-101 chase)?"

25X1A

[redacted] "He (chase) should be on his way down. We don't have to wait on though". ? ? ? ? ? ? ?

25X1A

25X1A [redacted] "Its about a minute and a half here till next torque out, and if we're going to wait, I'd just as soon wait before we go to "Nav" (position on the INS panel)".

25X1A

[redacted] "OK, we'll go through some more of the check list up here".

25X1A

[redacted] "Just continue with the check list before we go to Nav".

"By-pass doors??".

"By-pass doors check OK".

"Power check number one and two inverters now". - - -

"One and two".

25X1A [redacted] "Roger".

"One and two".

[redacted] "Roger, looks good".

[redacted] "Can we pull external power off??".

"Roger, external power off".

25X1A

"? ? ? ?together"? "Russ - - - - -".

"Wait a minute, you give us a NO GO (when) you pulled that power".

"Did they pull it??"

"Yes we did".

"OK, lets stand by for this torque out.

"Roger".

"OK, it should be torqing out".

25X1A

[redacted] "43-58". (INS error indications, 50-50 is zero error).

25X1A

[redacted] "Well - - -all I can say is, it- -it- - it could be marginal, because we - - -when he pulled that external power, it gave our computer a NO GO, and I don't know what happened. So we'll go ahead and go, and just take what comes, thats all".

25X1A

[redacted] "Roger".

"OK, go to NAV".

25X1A

[redacted] "Hit your (Ins) store button".

25X1A

[redacted] "In NAV".

25X1A

[redacted] "Russ, we came back to 39° 28' and 117° 12'(first destination).

25X1A

[redacted] "Roger, how about ground speed and distance to go? Has it stopped slewing yet?"

25X1A

[redacted] "Roger, 150 miles (to go), and zero knots (ground speed)".

"Looks Good".

25X1A

[redacted] "Where are we in the check list?" - - - -"OK, going nose down (controls check)", - - - -"coming nose up", - - - -"left roll", - - - -"right roll" - - - - -"left rudder", - - - - -"right rudder". "Hey, if I may be so stupid, what is the F.A.R.L. (check)??".

25X1A

[redacted] "Must be flaps, aileron, rudder, and - - - - - - -".

[redacted] "I couldn't figure it out, reading the check list over". - - - - "Ready for your LID (canopy closing)??".

25X1A [redacted] "Rog, lets go". - - - - "Locked and pressure (canopy locked and seal pressure on)".

25X1A [redacted] "When you pull out, pull out straight until I tell you to turn".

25X1A [redacted] "Roger" - - - - "Dutch two six, taxi?" (Radio Transmission), "Two six cleared on the active? Cleared to go?" "? ? ? ? ? ?" "? ? ? ? ? ?" INS distance to go 150 nautical (miles) (ground) speed is zero, zero, zero." "Two six ready to roll".

(After takeoff)

"A/B's off". "Little hazy up here isn't it (Don). We should check into the possibility of putting a haze filter on the periscope". "One-one (chase, Boxer 11), we'll be making a right turn up here in about another ten miles. "The time is ten eighteen, altitude is thirty one five hundred, mach eight - - point eight five, KEAS two nine six, ground speed is five sixteen - - - - distance to go right on the button. There's no (INS) fix at this time". "Wendover is loud and strong on the VOR". - - - "I turned the number one system on. The ? ? ? ? ?(light) came on in four minutes and fifty five seconds. - - - -(repeated) four minutes and fifty five seconds, and the weather's bad". - - - - -(Radio transmission) "How you doing there Don?" - - - -"I guess!!" (into recorder) "the calibration is reading forty six. Number one is reading twenty eight. Number two is reading thirty seven. Number three is reading twenty". (Radio transmission) "one-one, what's your fuel? Roger. ? ? ? "number one station off at ten nautical miles". "Can you see the Wendover airport there?" - - "I can't either". "It should be about six miles in front of us". "What did you say"? (Into recorder) "Time is ten forty two and a half, we're at thirty four three hundred, Mach is eight point six, (EAS), two hundred and eighty one, ground speed is five one five. Distance to go at the time was zero. Aircraft was right on the edge of the runway - - -(repeated) edge of the runway". (Radio Transmission) "Well, I just hate to get you down in all that weather. We may drop down some". (Into Recorder) "Number one station (switch??) on as of one hundred and eighty three nautical miles opposite ? ? ? ? ?". "Number two - - (repeated) number two switch on at one three eight nautical, at ten fifty eight. Flight level three two two zero zero, mach point point eight six, two nine four EAS, and the weather is scattered to broken, but clear. Very little haze below. Was not able to take a fix (INS) on Ely". (Radio transmission) "One-one, whats your fuel? - - - - "Roger, we're a hundred and twelve out. - - -"is your TACAN picking up the station?". - - - -"OK" - - -"Saucy this is two six, how do you read?" - - "Saucy, two six". - - -"I guess nobody can read us out here". (Into Recorder) "Picking up a layer of cirrus here at ninety out". (Radio transmission) "Saucy, Dutch two six, how do you read?" "- - -" "Rog, I'm squawking ? ? ? ? ? ? ? ? now". (Into Recorder) "Left the clouds and the cirrus back about seventy two nautical. Clear below. I've got this vertical needle, verticle climb needle - - - -centered just about as best I can. I still gained about two hundred feet. Number two station off eight nautical miles. Flight level three two seven fifty, (Repeated) thirty two thousand seven hundred and fifty. Number one station (switch?) off at four. Left turn. Flew over the station at eleven fourteen when I got my fix. Altitude was thirty two seven fifty, mach was point eight six, KEAS was two nine five, ground speed was five - 0 - four, distance to go was zero. Aircraft was five and a quarter marks to the left of target. "? ? ? ? ?" "This time was sixteen thousand pounds of fuel. Number one system was turned on only to avoid more clouds at one forty two, just opposite to the south pad. Flight level three two nine hundred, two eight two indicated equivalent (KEAS), point eight four mach." (Radio Transmission) "Saucy, this is Dutch two six, if you like I could squawk for you". (Into Recorder) Number two switch turned on at ninety eight nautical. That's five minutes and twenty seconds for the number one light to come on". (Radio Transmission) "We're surrounded". "I've got a time of last years, Jack". - - -"Rog". (Into Recorder) Number two station off at fifty three nautical because of the clouds. Turning number one station off at forty five nautical. (Radio Transmission) "Rog". - - -"Still have you in sight". - - - -"Say again" - - - -"Rog", on same heading". "Rog". I'll be turning right in ten miles, approximately zero-six-zero degrees. Rog. - - eight - - -six - - - -three miles, beginning turn at this time. ? ? ? ? ? ? ? ? ? ?at this time either". "Not bad!!" "Thing does pretty good in a - - - -" "You calling two six?" "Roger, I'm indicating just about a - - - -, on the airspeed indicator eight four. I'll slow down a little bit". - - - - - - - "Thirty three miles". "Last time we were up here we keep ? ? ? ? ? we could see the airfield, I don't think we will this time". - - - -"Rog, I got nine and a half". - - - - "Rog, we'll be making a left turn shortly". "Rog, left turn now". (Into Recorder) "Unable to get a fix at Wendover due to the overcast condition". (Radio Transmission) ? ? ? ? ? ?, all this thing does is keep building up airspeed in the climb". "Yeah", - - - -"Ah, two zero zero". "Say again?" ? ? ? ? ? "Rog". "I think my airspeed's fouled up here". "Yeah". "No". "Rog". "I've got troubles here, ? ? ? ?in a spin and I don't - - - - - - - - -."

W

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OPERATIONS

AND

WITNESS

GROUP

OPERATIONS, WITNESS AND MEDICAL GROUP

Investigation of major accident involving A-12 aircraft, S/N 60-6926 which occurred south southwest of Wendover, Utah, at 1205 PDT, 24 May 1963.

1. Investigation and Analysis:

25X1A

a. History of flight. (See Tab W, Briefing Officer's Statement).

(1) A-12 aircraft, S/N 60-6926 and pilot [redacted] was scheduled for an Inertial Navigation System and V/H Sensor test mission. The pilot's last previous flight in the A-12 occurred on 14 May 1963. He had flown 26 hours in the A-12 and was initially checked out on 8 February 1963.

(2) The mission was to be flown along a pre-planned (canned) route, selected to fulfill equipment test requirements. This same route had been flown on several earlier occasions. Mission planning was performed by the Detachment Flight Planning Section and the pilot attended specialized mission briefing at 0840 hours, 24 May 1963. The briefing covered all applicable requirements. This mission was originally scheduled for a 1030 PDT take-off but due to forecast weather was rescheduled for a 1000 PDT departure. The pilot was briefed concerning primary purpose of the mission, that if cloud cover precluded visual fixing over planned turn points the mission should be aborted and that flight altitude should be selected to remain above cloud level. Two chase pilots were required, they were briefed separately. Mission planning, briefing, physical and physiological factors are not considered as primary or contributory causes of this accident.

(3) Weather is not a direct cause of this accident, it is a contributing factor to the extent indicated in findings, para 6e. Chase pilot's statement indicate that the aircraft had been in clouds during portions of the flight prior to the accident.

(4) After checking the weather and filing his VFR local clearance at Base Operations, [redacted] went to the aircraft, arriving at the aircraft at 0925 PDT. The aircraft exterior inspection was performed by qualified ground crew members in accordance with the Flight Handbook and established organizational procedures. The personal equipment hook-up was performed by a qualified personal equipment technician. The pilot's cockpit check and engine start were accomplished with the left engine exhibiting some flame from the tail pipe but indicating no hot start. This was caused by the throttles being in the idle rather than the shut-off position when the pilot entered the cockpit and by the pilot not detecting this fact when the throttles were checked during the cockpit check. Taxi and take-off appeared normal, official take-off time was 0957 PDT.

(5) Engine start was accomplished on the south runup pad where the aircraft had been placed for Inertial Navigation System warmup and stabilization. The aircraft G.W. was 85,000# which included 35,000 pounds of fuel properly loaded in appropriate tanks to give an aircraft C.G. of 19.8 % Mac.

b. Reconstruction of route. (Altitudes, airspeeds and actual turn times extracted from aircraft recorder tape). (See Tab U, transcript of recorder tape and flight map photograph 3-18-13).

(1) Take-off occurred at 0957 PDT, climb and level off were normal. The route was flown as briefed except for altitude variations caused by cloud conditions; briefed flight altitude was 30,000 feet MSL.

(2) On the first circuit around the route the first check point at the Austin, Nevada airport (39-28N 117-12W) was made using INS. No visual fix could be made and a manual turn to the right was made at 1018 PDT to set course for check point number two, Wendover Air Base, Utah. Altitude during this turn was 31,500 feet, Mach number 0.85, EAS 296 knots and INS ground

speed 516 knots. The pilot corrected to course after the turn and established a true heading of 064° for Wendover. The flight continued to Wendover at approximately 34,300 feet MSL.

(3) The second fix over Wendover Air Base, (40-44N 114-02W) was made at 1042½ PDT at 34,300 feet MSL, Mach 0.86, EAS 281 knots and ground speed 515 knots. INS distance to go was zero and visual fixing placed the aircraft over the edge of the runway at Wendover Air Base. After fixing over Wendover the pilot made a left turn, as briefed, established a true heading of 200° and engaged the auto nav function of the autopilot. The flight continued toward the third and fourth check points. At 1058 PDT INS distance to go indicated 138 NM to check point number four placing the aircraft at 39-24N 114-47W, 6 NM north east of the Ely, Nevada airport (the third check point) and on course; altitude at this time was 32,200 feet MSL, Mach 0.86 and EAS 294 knots. Flight was continued toward check point number 4, home station.

(4) The pilot stated on the recorder that he was picking up cirrus clouds 90 miles from home station. Cloud cover ceased at 72 NM from home station and weather was clear below the aircraft. Check point number 4, home station, was reached at 1114 PDT at 32,750 feet MSL, 0.86 Mach, EAS 295 knots and G.S. 504 knots. Visual fixing placed the aircraft 2 to 3 NM left of the desired turn point. The pilot reported 16,000 pounds fuel remaining at this point. The pilot turned to the left and set course towards Chub dry lake (37-42N 115-49W) and thence to Austin for his second circuit of the course, altitude was approximately 32,900 feet. The turn over the fifth check point, Austin, Nevada airport was made at 1135 PDT when the INS indicated 3 NM to go. This time was computed from last available altitude, airspeed and ground speed data. No visual fix was made.

(5) Course was set for Wendover on a true heading of 064°. At an INS indication of 33 NM to go to Wendover (40-28N 114-40W) the following transmission was recorded on the aircraft recorder: (Mach 0.84, 9.5, 9.5 is assumed to be 9,500 pounds remaining fuel, this assumption is supported by the chase pilot's statement). Time of this transmission is computed by postflight reconstruction of flight plan to be 1152 PDT and estimated by the chase pilot as 1150 PDT. Accuracy of the chase pilot's watch is undetermined. From the 0.84 Mach data and the pilot's stated altitude of 34,000 feet MSL the remainder of the flight path was computed.

(6) Time over Wendover was estimated as 1156 PDT. The pilot stated at 1152 PDT that he would make a left turn shortly. No visual fix could be made over Wendover and the pilot is assumed to have started his turn at 1156 PDT. During this turn the pilot stated on the radio and tape recorder, "seems to be building up airspeed in the turn". [redacted] statement indicates that altitude was gained to approximately 37,700 feet MSL during the turn. The turn was continued to a true heading of 200° and roll out occurred at approximately 1202 PDT and near 41-00N 114-03W. [redacted] stated he looked back and saw the aircraft straight and level at this time. The next recorded transmission from the pilot was, "200°", assumed to be roll out heading. His next transmission was, "I think my airspeed is fouled up". Time of this transmission is not accurately fixed. The pilot's last recorded transmission was, "I got troubles, I'm in a spin - - -".

(7) Continuing course reconstruction after completion of the turn over Wendover places the aircraft at approximately 40-41N 114-19W at the ejection time of 1205 PDT. Ejection time is based on the pilot's statement. During this period the aircraft was assumed to be flying with wings level, losing airspeed and descending into the clouds. Pilot ejection is assumed

to have occurred in the vicinity of 25,000 feet MSL. The aircraft crashed at 40-34N 114-12W.

2. Records and Documents: See Tabs L, Forms and Tab Q for flight clearance and flight orders.

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3. Pilot's Qualifications: [redacted] graduated from Pilot's Training School with Class 52-A at Vance Air Force Base, Oklahoma on 9 February 1952. During pilot training he flew T-6 and B-25 type aircraft.

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[redacted] was then transferred to Moody Air Force Base, Georgia where he was assigned to the 3550th Training Group and flew T-33 and F-80 aircraft. In May 1952 he was assigned to Shaw Air Force Base, South Carolina where he flew RF-80A aircraft until July 1952. He was then transferred to the 15th Tactical Reconnaissance Squadron, Fifth Air Force, APO 970 where he continued to fly RF-80A, RF-80C and RF-86A aircraft. During this assignment he logged

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149 hours of combat time. During March 1953 [redacted] was rotated to Shaw Air Force Base, South Carolina where he continued to fly F-80, RF-80A and T-33 aircraft until December 1954 when he transitioned into the RF-84F.

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During September 1955 [redacted] was transferred to 10th Tactical Reconnaissance Wing, APO 123 where he continued to fly T-33, RF-80A and RF-84F aircraft until 3 December 1957. He was next assigned to the 7367th Flying Training Group (MAP, Det 6) APO 207. In this assignment he continued to fly the same type aircraft. In June 1959 he rotated to Shaw Air Force Base, South Carolina where he flew T-33 aircraft until transitioning into RF-101 aircraft in January 1960 where he continued to fly RF-101 aircraft until his resignation from the Air Force on 6 November 1962. His total time to date

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is 3,175:45 of which 697:40 was flown in the F-101 and 26:05 was flown in the A-12. [redacted] attended a factory conducted A-12 ground school during December 1962 and received his initial checkout in the aircraft on 6 February

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1963. The checkout was administered by a factory test pilot. [redacted] physiological training certificate expires on 3 November 1964, he is still in transition training in the A-12 pending completion of night transition training, has a current FAA instrument card and received an F-101 standardization proficiency check on 31 January 1963. His current medical recommendation for flying duty expires 5 February 1964.

4. Summary and Analysis of Witness Statements:

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a. [redacted] chase pilot, is the only witness who observed the aircraft either immediately prior to difficulty or after the emergency had developed. Correlation of his statement with information from the pilot's statement and the aircraft recorder tape follows: (See Tab N, [redacted] statement, [redacted] statement and Tab U, transcript of recorded communications).

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(1) The flight of the aircraft appeared normal during the first leg of the second circuit around the planned route. Altitude varied from 32,750 feet MSL to 34,000 feet MSL due to clouds underlying the route of flight. This mission was planned at 30,000 feet MSL.

(2) During the following leg the flight progressed at 34,000 feet MSL which placed the aircraft just above an overcast. No indication of difficulty appeared during the enroute portion of this leg. Weather at Wendover, Utah was overcast and the turn point was based upon INS indications. During the turn at Wendover [redacted] observed the Triple Display Indicator to show 1.05 Mach, at cruise power setting. [redacted] then began a climb during the turn and retarded the throttles slightly. Mach 1.05 is beyond the performance capability of the A-12 aircraft during level flight with full military power on the J-75 engine. Near the same time that Mr [redacted] was observing the Mach 1.05 indication [redacted] was unable to maintain chase formation position through the turn without getting a pitchup warning horn. He advised [redacted] of his predicament and moved to the

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outside of the turn to increase his airspeed. As the turn progressed the chase aircraft reached a position slightly above and ahead of the A-12, remaining sub-sonic and on the outside of the turn. This roll-out position verifies the fact that the A-12 never attained the Mach [redacted] speed which [redacted] read from the TDI. [redacted] correctly assumed the TDI was malfunctioning and elected to control his aircraft with the autopilot. The aircraft had flown normally during the preceeding portions of the mission on autopilot and the turn at Wendover was made using control stick command. Airspeed indications on the TDI continued to decrease as the aircraft entered the tops of cirrus clouds. [redacted] rechecked pitot heat on, engine RPM about 98% and fuel flow not positively remembered at 1,800 pounds per hour per engine (an unrealistically low figure). [redacted] advised [redacted] that he was having airspeed problems, [redacted] confirms that he intermittently saw the A-12 in the tops of the clouds coincident with this call and that the aircraft appeared to be straight and level on an approximate heading of 200°. [redacted] then lost sight of the A-12 and while remaining in the clear did not re-establish visual contact at any time. [redacted] heard [redacted] transmit: "I think I am in trouble; I'm in a - - - (end of transmission)". [redacted] then attempted to re-establish radio contact and when unsuccessful declared an emergency with ground radio stations.

(3) No further correlation of the two statements is possible. Subsequent to the loss of visual contact between the chase aircraft and A-12 [redacted] continued to make small nose down pitch corrections which did not stop the decay of airspeed. Pitot instrument indications during this time are unknown as are exact engine instrument readings. No large nose down attitude change was made since [redacted] was concerned about entering an excessive nose down condition in the clouds with an assumed flight instrument problem. Control stick command was utilized to fly the aircraft and a gradual

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descent was maintained. Airspeed continued to decrease to 101 KEAS on the TDI where the aircraft went out of control. [redacted] apparently ejected while the aircraft was inverted; the ejection was successful with all escape systems functioning.

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(4) [redacted] sighted the aircraft after the parachute opened and the aircraft appeared to be in an inverted flat spin. He again sighted the aircraft after it had crashed and was burning.

5. Flight Surgeon's Narrative:

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a. [redacted] was, so far as can be determined, physically and mentally qualified on 24 May 1963 for full flying duties. He received a thorough Lovelace evaluation including psychiatric and psychological, 22 July 1961. His current annual was accomplished 1 February 1963 at [redacted] 25X1A

25X1A [redacted] He has had no subsequent illnesses. He is observed almost daily by a flight surgeon, and a social visit to his home was made by a flight surgeon on 2 May 1963. These observations indicated a high level of function without impairment or evidence of emotional stress or ill health. Questioning of persons who observed him prior to take-off indicates no abnormality.

b. On the day prior to the flight he flew an F-101 mission, ate normal meals, drank one bottle of beer in the evening, and obtained eight hours of sleep. He ate a good breakfast prior to flying.

c. That portion of the flight up to the second crossing of Wendover has been evaluated by taped voice transmissions of the pilot, by his own statement, by questioning of chase pilots, and by reconstruction of the flight plan. It is evident that he was functioning efficiently and was concentrating on flying the mission as briefed. In fact, since he was apparently told to abort if weather precluded ground sighting, it would appear that he was "pressing on" to mission completion in spite of handicaps. There is an indication also, that even in the early portions of the flight he was either not observing or cannot recall reading of various instruments. That is, he was totally concentrating on those instruments inportant to the prebriefed plan (Triple Display, attitude and INS gauges).

d. In the apparent series of events just prior to ejection there exists a presumption that the pilot failed to crosscheck other available instruments, or if checked, failed to properly interpret them. (Particularly, IAS, rate of descent, engine instruments, especially fuel flow). This apparent failure to check, interpret and react raises the question of hypoxia. It is not believed that hypoxia was present for the following reasons:

(1) All oxygen equipment was normal on preflight. Adequate oxygen was aboard, all equipment found postflighted normally except for damage attributable to impact events.

(2) This is a 100% system and any leakage should have been outboard. He was receiving 270mm partial pressure of oxygen and 100mm is adequate. Flight level was around 34,000 feet and cabin altitude was 26,000 feet.

(3) About two hours of flight has been normal. Classically, oxygen failures occur early in flight.

(4) Pilot states he never removed the mask. The anti-suffocation device (which is the only point in the system when cabin air can be introduced) requires quite forceful inspiration to activate (and no oxygen pressure in system) and is usually quite obvious to the pilot. This was not observed. This valve still functions normally on test and teardown reveals no malfunction.

(5) While important instruments were not observed or else readings were not recalled, as noted previously this was also true of early, normal portions of the flight. Many items are recalled: trying pitot heat, airspeed (TDI) readings, surface limiter light.

(6) After noting airspeed difficulties to chase pilot, he was observed in apparent straight and level flight.

(7) His voice was classed as normal (except for static) by chase pilot. Quality of the tape recording made in flight and recovered is unsatisfactory for confirmation. He called off a correct heading at this point.

(8) Position of the scroll check list (recovered) was current to that portion of the flight.

(9) He ejected normally. Classically, hypoxia cases do not get out.

(10) He functioned remarkably well in the drogue chute. (Fastened chin strap, observed time). While he was on the emergency system at this time, these steps were probably taken before full recovery from hypoxia would have been expected.

e. Decision to eject was made coincident with initiation of action. He had no difficulty in grasping the "D" ring, which required only about a two inch pull. Simultaneously he attempted to position his head, but the thickness of his parachute and/or G forces gave some difficulty here---meanwhile the seat fired. At ejection, he was wearing an HGU-2/P helmet with the visor down (usually flies with it down) but the chin strap unfastened; thermal boots with strap-on spurs; summer flying suit (K-2B); light weight flying jacket with his gloves in the pocket; MBU-5/P oxygen mask, special parachute with self-contained emergency oxygen and special survival kit. His estimated altitude was 25,000 feet and speed under 150 knots, his aircraft was described as being in an inverted spin.

f. Canopy ejection, foot retraction, leg restraint, seat firing and rocket blast all occurred normally. However, singeing of exposed hair and powder markings on visor and boots were apparently incurred from rocket blast at ejection. Foot cable cutters, automatic lap belt firing and positive seat separation webbing functioned as designed. The pilot experienced some flailing but it was not severe. The drogue chute deployed normally and gave stabilization but with relatively rapid descent. The pilot states he did not notice mask pressure, nor did he feel light-headed or have any other subjective sensation of recovering from hypoxia. At this point, in drogue, he checked his watch at 1205 and fastened his helmet chin strap. When the drogue separated (automatic at about 17,000 feet) he felt "as if had lost everything" as he accelerated. He was about to use the manual release when the main canopy automatically deployed at about 15,000 feet. He states the opening shock was "moderate". While descent was being made through light snow and rain, he raised the visor of his helmet because of fogging and put on his gloves. After eight minutes had elapsed (1213) he released his seat kit, since he could not see the ground because of clouds. When the seat kit separated, the seat cushion detached and fell separately. Some gyrations were then experienced as the kit swung about on its lanyard. These were diminished by shortening the lanyard with his feet.

g. Touchdown was on feet with knees bent, more weight on left foot, falling to left and striking left shoulder. Terrain consisted of rolling foothills, desert, with scrub bushes, sand and rock. He had some difficulty with the quick releases on the risers, but was not dragged as the wind was relatively calm at this time. He collapsed the chute by pulling on the lower riser. When he removed mask, he noted hiss of escaping oxygen. He began carrying equipment toward the smoke of wreckage, making several trips to the next hill but still not sighting his plane. The rain then increased so he sat down and put the parachute over his head. Tried URC-11 and got hum of function. He looked for flares in the seat kit but found none. (They were present but in a separate compartment of the kit). Chute in air had been sighted by a truck on a nearby highway and the pilot was rescued after being on the ground about 30 minutes. After rescue, he made notes on these series of events.

h. The Flight Surgeon arrived at about 1700, some five hours after the ejection. Clinical physical examination was accomplished at that time. The pilot was calm, rational and integrated. He exhibited only mild signs of stress (smoking several cigarettes when normally rarely uses, mild tachycardia of 100). The examination was completely normal except for the following:

(1) The only complaint was mild soreness of upper back. There was a mild tenderness in the left paravertebral musculature about the level of T-6. There was no limitation of motion and no pain on precussion of the dorsal processes. Reflexes were normal.

(2) There was superficial singeing of a line of hair across the occiput below the helmet line. Other superficial singeing of the hair of dorsum of both hands, anterior legs above boot line, and right calf.

(3) There were mild petechial hemorrahages in both auxillary areas.

(4) There were mild strap marking on both buttocks. The initial medical impression was muscle strain probably secondary to impact on left shoulder during parachute landing.

i. Examination of clothing and personal equipment showed:

(1) Dirt markings on left shoulder area of flying jacket and parachute.

(2) Powder markings on boots, spur straps and helmet visor.

(3) No burns of lap area of clothing.

(4) Almost all of loose items were retained, as pencils in jacket. Several items lost from unzipped leg pocket in flying suit.

(5) Oxygen mask accordian hose partially separated from connector with dirt and debris in separated area; however, connection was still airtight.

j. On 25 May 1963 a further orthopedic evaluation with xray was conducted at Lovelace Clinic to rule out vertebral compression fracture. These studies were normal but with an incidental finding of an old fracture of the anterior superior lip of C-6, possibly secondary to high G forces experienced in an F-80 in a thunderstorm in August 1954.

6. Findings:

a. During the cockpit check the pilot did not positively check the throttles in the OFF position.

b. The Triple Display indication of Mach number and possibly of equivalent airspeed and altitude, was erroneous during the second turn over Wendover. These indications probably remained inaccurate until airspeed had decayed to some value between 295 KEAS and 101 KEAS. This would account for a rapid loss of airspeed on the TDI just prior to loss of aircraft control. Concurrent with these Triple Display indications the aircraft continued to decelerate.

c. The pilot was adequately qualified to perform this mission.

d. The pilot apparently did not use all available instruments to confirm or contradict Triple Display indications.

e. The pilot did not make sufficient nose down pitch corrections due to his concern over entering the clouds with questionable performance from his flight instruments. This (combined with his failure to apply maximum thrust) caused his aircraft to lose flying speed and stall.

f. At the time of the flight, the pilot was physically and mentally qualified for full flying duty.

g. There is no evidence to affirmatively support a diagnosis of hypoxia.

h. There is no evidence to affirmatively support any other physical or mental condition which might have impaired his performance.

i. Escape equipment functioned well, although a blast burn effect was apparently produced by the rocket blast.

7. Recommendations:

a. That an audible warning system be installed in the A-12 to provide warning of impending low speed loss of control which is now masked by a properly functioning stability augmentation system.

b. Re-emphasize that primary airspeed and altitude data during subsonic low and medium altitude flight will be obtained from pitot static instruments. The Triple Display Indicator will be used as a supporting instrument under these circumstances.

c. That a warning device be incorporated into the Triple Display Indicator to indicate unreliable operation.

d. Further investigation into the cause of burns and powder deposits experienced by the pilot.

e. That an hypoxia warning device (a suitable cockpit gauge with red light and/or horn is available) be installed in this type aircraft.

f. That the seat cushion, if it is functional (as a sleeping bag), be attached by lanyard to the seat kit to preclude loss.

g. That all pilots be indoctrinated to:

(1) Wear gloves in flight.

(2) Keep helmet chin strap fastened during flight.

(3) When time permits, to lower visor before ejecting.

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OXYGEN - PRESSURIZATION - PHYSIOLOGICAL & EJECTION SEAT

OXYGEN, PRESSURIZATION, EJECTION SEAT, AND PHYSIOLOGICAL SYSTEMS

SUMMARY

The basic aircraft dual oxygen, pressurization, ejection seat, and physiological systems are described. There is no evidence in the remains to indicate that an oxygen or pressurization malfunction may have been the cause of this accident. The ejection seat performed correctly when used.

The oxygen bottles which were used to supply the aircraft have been checked at -89°F dew point. No freezing in reducers was possible. A laboratory analysis shows no oxygen contamination. There is no evidence of fire having been started or fed by the oxygen system. All components and areas through which the oxygen lines passed are free of evidence of any fire both before and after impact. The seat disconnect closed the oxygen lines after seat ejection and there was no flow of oxygen into the cockpit before impact. Recent flights with masks at 27,000 feet cabin altitude indicate that adequate oxygen was available.

The #2 oxygen cylinder is intact. Its reducer and relief valve were recovered and leakage tests indicate 95 CCM leakage, which is still within specification. The output pressure is 112 psi at 1000 psi inlet pressure which is also within specification. Maximum acceptable is 140 psi at 100 CCM. The body on this reducer is severely distorted and the plunger to the self opening valve is bent, but otherwise it is apparently a serviceable unit. The #1 cylinder was destroyed on impact. Three pieces of this cylinder have been found and indicate that the cylinder broke after impact. The reducer for this cylinder was found but cannot be tested for function because of attachment mutilation.

2. Oxygen System Investigation:

a. There is no evidence of fire having been started by the oxygen system. All components and areas through which the oxygen lines passed are free of evidence of any fire both before and after impact. The seat oxygen-disconnect closed the oxygen lines after seat ejection and there was no flow of oxygen into the cockpit after seat ejection and before impact.

b. The high pressure gauge was badly mutilated and no evidence of the amount of oxygen remaining in the systems is available except the pilot's affirmative statement. The pilot checked the oxygen supply shortly before the accident and said that the supply was adequate, which is born out by his statement that no oxygen low pressure warning lights came on. These warning lights come on when the supply pressure in the cylinders is reduced below 385 psi. After this warning, the pilot still can use the oxygen remaining until the supply pressure reaches 60 psi, which at 19 LPM consumption equals about 45 minutes remaining in each cylinder after the warning light appears.

c. The oxygen cylinders were charged to 1900 and 1850 psi respectively before take-off; and normally at the end of two hours at 27,000 feet approximately 1000 psi should be remaining in each supply cylinder.

d. The low pressure gauge mounted on the side console aft of the throttles was not found. The pilot's assurance that the system was functioning normally would have been read from this gauge and that normal pressure was being supplied to the breathing regulator.

e. The lower oxygen supply cylinder, No. 2 system, is intact and shows marking to indicate how it was torn away from its support brackets on impact (negative 31773). Its reducer was recovered and the relief valve and reducer valve were operationally tested and indicated a leakage of 95 CCM, which is within the acceptable leakage specification of 100 CCM.

The output pressure is 112 psi @ 1000 psi inlet pressure with 100 CCM flow. This also is within the acceptable maximum 140 psi at 100 CCM. The body on this reducer is severely distorted including the on-off valve and plunger to the self opening valve which obviously occured at impact. This oxygen cylinder is still in serviceable condition and its oxygen supply was depleted when the reducer valve was broken off at impact.

f. The upper cylinder, system no. 1, was destroyed on impact. Three pieces from this broken cylinder have been found. Two of the pieces fit together and indicate that the cylinder disintegrated at impact because of the continuity of the paint scratches across the fragments. The fragmentation of the two pieces that fit together suggests that disintegration resulted from a crushing force. This cylinder was on the top and since the aircraft impacted upside down, it obsorbed the initial impact forces. The reducer for this cylinder was found, but it could not be functionally tested because of the severely mutilated attachments. Repairs are being made to functionally test this reducer.

g. The oxygen supply from which the airplane system was filled was checked for moisture. This report confirms that no freezing of the oxygen system components was possible since the maximum outside air temperature was -55°C. The dew point of the oxygen was lower. A purity analysis was made of the

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oxygen supply by [redacted] and the report indicates pure oxygen.

3. Oxygen Moisture Analysis:

a. The oxygen cart serial number 60 delivered gas of an extremely low dew point - below -80°F. This indicates that the equipment was adequately maintained and that the desiccant cartridge was performing its normal function. Cylinders which had been removed from the cart were tested individually, and in all cases the dew point of the gas was below -90°F.

b. As indicated, both the cascade cart and the cylinders which had been used with it delivered extremely dry gas. In checking the records, it should be noted that all cylinders had been individually tested (using the Foxboro equipment) prior to installation on the cascade carts. In all cases the cylinders were read at -74°F dew point. This is actually the lower limit for the Foxboro equipment and indicates that all cylinders had less than 12 parts per million water content.

c. The CEC Model 26-303 instrument was used for these tests since it had greater dynamic range. The characteristics of this instrument are a range of 1-1000 parts per million, or equivalent dew points of -105°F up to -4°F. It has an accuracy of 5% of full scale on any attenuator range for a sample flow of 100 ml per minute. This particular instrument is extremely sensitive, and measures water content by means of a special electrolytic cell which absorbs the water with phosphorus pentoxide, and the current flow with a given impressed voltage is proportional to the concentration of water in the gas sample. This particular equipment had been in operation for the past month on special hose permeability measurements, and was in excellent condition.

d. Prior to testing the cascade cart and additional bottles, a new oxygen cylinder was connected and the water content was determined to be below 3.2 points per million (-91°F dew point). The instrument was then coupled to the cascade cart and the individual cylinders analyzed with the gas being delivered through the cart delivery system. It was necessary to replace the cart pressure reducer with another Victor model which had better low pressure control, since the moisture model (26-303) was built to handle gas inlet pressures between 20 and 100 psi. For the tests the inlet gas pressure was maintained at 30 psig to the moisture monitor, and the various dew points and parts per million were recorded.

e. As can be seen from the accompanying table, all dew points were very low. As a matter of interest, all gas was drier than any specification requirement. As a supplementary check on the accuracy of the instrument, a special "oxygen hose" which had been used in tests in our laboratory was inserted in the supply line in order to provide a higher dew point gas. The information received from this test correlated with that from previous tests with this same hose.

f. All cylinders were removed from the cascade cart, and together with those which had been removed on 5-23-63 and 5-24-63, were sent out for purity analysis.

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g. An independent analysis was made by the [redacted]

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[redacted] Dry gas absorption-analysis equipment was used and in addition certain samples were cross-checked using gas chromatographic techniques.

h. In the cylinders which had been removed from oxygen cart serial number 60 an analysis for purity and/or contaminents was made. The following are the results:

Cylinder Serial No.	% Oxygen	PSIG	Dew Point
230863	99.9%	1500	Less than -89°F
489462	100%	950	Less than -89°F
2886335	100%	1100	Less than -91°F
326956	100%	1820	Less than -92°F
233104	100%	1100	Less than -92°F
2879181	100%	820	Less than -94°F
26819	100%	1100	Less than -96°F

4. Recommendations: None

5. Cockpit Pressurization System: The air supply for the cockpit is extracted from the left hand engine's compresser section and cooled by the left hand air conditioning system. An entirely separate parallel system supplies right hand engine air to the E-Bay, normally; however, in case of left engine or air conditioning system failure, a "crossover" mode transfers the entire right hand air supply directly to the cockpit instead. Dual reliability of cockpit pressurization is inherent in the series flow arrangement of control valves, the Q-Bay valves serving as a back-up system, at only slightly lower pressure, in case one of the cockpit's valves fails to open. The pilot can energize both safety valves to full-open by selecting PRESSURE DUMP position of a guarded dump switch; this depressurizes all compartments. Both safety valves feature automatic opening for vacuum relief operation (reverse airflow).

a. Pressurization Investigation: The cabin pressurization components were too badly damaged to determine their functional state prior to impact. The pilot's comments prior to bail-out with regard to cabin attitude and manual comfort indicated that the pressurization system did not contribute to this accident.

b. Recommendations: None

6. Ejection Seat Description: The ejection seat system consists of a modified C-2 rocket-catapult upward ejection seat, an adjustable seat guide rail assembly, a jettisonable canopy, and necessary controls and ballistics for seat operation and ejection. The metal bucket-type seat is mounted on the guide rails so that during ejection it will be catapulted up the rails clear of the aircraft. The seat incorporates the following design features:

a. Contoured headrest for positioning and support of the pilot's head during ejection.

b. Centrally located D-ring which initiates the entire ejection sequence and precludes arm flailing after ejection.

c. Shoulder harness and inertia reel lock assembly which locks the shoulder harness automatically during ejection or anytime a forward acceleration in excess of 2 to 3 g is exerted on the harness.

d. MA-5 automatic-opening seat belt.

e. Leg guards which automatically rotate forward to protect the pilot's legs during ejection.

f. Positive automatic foot retraction, retention, and separation system.

g. Speed sensor which automatically selects one of two seat separation delays depending on airspeed at ejection.

h. Positive, automatic pilot-seat separation device.

i. Auxiliary, manually controlled foot-retention separation system.

j. Automatic disconnect of all seat to aircraft and pilot to seat connections.

k. A control lever located on the left side of the seat bucket is used to manually lock or unlock the shoulder harness.

l. The D-ring is safetied in position by a single safety pin inserted through the D-ring housing. This secures the D-ring in its stowed position and prevents accidental actuation of the ejection system on the ground.

m. The dual-oxygen system disconnect is attached to the forward edge of the seat bucket. A bayonet fitting is safety-wired into the disconnect casting and when in position secures the pilot lines and aircraft lines to the disconnect fitting. A lanyard secures the bayonet fitting to the cockpit floor so that when the seat moves up the rails, the bayonet is pulled, freeing the lines on both sides of the disconnect.

n. Pilot - Seat separation system consists of a ballistic rotary actuator mounted behind the headrest, and a Y-shaped harness assembly which is attached to the rotary actuator reel lays over the front face of the seat and attaches at two points on the front lip of the seat bucket. Upon ejection, gas pressure from the seat belt and separation initiator (1982-10) fires the cartridge in the rotary actuator. The gas pressure forces the actuator to rotate and wind up the strap reeling in the webbing. This pulls the webbing taut between the actuator and the front of the seat bucket, forcing the pilot from the seat.

o. The emergency oxygen actuating lanyard and automatic disconnect consists of two lanyards; one connected to the oxygen actuator in back pack and one to the aircraft. The two cables are secured together by a ball-lock disconnect fitting. The disconnect fitting consists of a casing which houses a notched fitting and a ball. The casing is attached to the parachute with flexible conduit. The notched fitting and ball mate together and are free to slide in the casing. They are locked together as long as they remain in the case. The lanyard which attaches to the emergency oxygen supply lever on the parachute is attached to the notched fitting through the flexible conduit. The lanyard which is secured to the aircraft (left guide rail) attaches to the ball through a hole in the vent suit fitting. When the seat begins to move during ejection, the notched fitting and ball are pulled from the casing by the lanyard attached to the aircraft. Before they leave the case, the emergency oxygen supply is actuated. As the end of the disconnect casing is reached the lanyards separate. The ball is pulled through the hole in the vent suit fitting on the seat back and remains with the aircraft and the notched fitting remains with the parachute.

7. Seat Ejection Investigation:

a. The seat was recovered and the damage to the seat resulted from ground impact. All functions and sequencing on the seat appeared to have performed in the normal manner during ejection.

b. The pilot's helmet visor (negative #31948) had some fogging on it which upon analysis was determined to be residue from the catapult at separation from the rocket. Numerous slow speed and static dummy seat ejections have been made using the subject seat and no burning of the dummy around the head, feet or any other parts of the body were ever detected from the catapult or rocket blast. In the slow speed tests a helmet without a visor was used on the dummy. This is perhaps why no catapult residue was noted because there was no smooth surface to show up the residue. The visor plastic seems to have an affinity for this residue (negative #31809).

c. The sequence of seat ejection is shown and it is noted that for an instant as the seat reaches the top of the rails, and as the catapult separates the blast impinges on the seat rail structure momentarily and is deflected upward. This appears to be the reason for the deposits on the visor. Analysis of the visor after ejection indicated that the deposit was a light powder deposit and showed no abrasion or pitting. Spectrographic analysis of this deposit revealed:

(1) Silicon, iron and magnesium, predominant.

(2) Traces of iron, lead (0.1%) sodium, zinc, titanium, calcium and tin.

d. The predominant parts of the residue can be part of the catapult propellant. It should be noted this deposit was not formed in any quantity on the helmet itself or the seat structure. It was not oily such that it might have been caused by a hydraulic or fuel fire.

e. Additional dummy inflight seat ejections will be made in an F-106 in the near future. On these seat ejections the dummy will be fitted with a visor and close inspections will be made to determine a pattern of deposits on the visor and other parts of the dummy.

8. Ejection Seat Summary: Seat ejection and pilot recovery were satisfactory and the pilot made no serious criticism of the seat or parachute recovery system. The pilot reported fogging of the helmet visor and upon analysis this was determined to be residue from the catapult. No hazard would have resulted if visor had not been down. The seat on inspection after ejection appeared to have functioned properly throughout the ejection sequence.

9. Recommendations: In view of the finding of the catapult residue on the helmet visor, it is recommended that the pilots always have their helmet visors down during seat ejection. When using the pressure suit the sun visor should be down also to avoid fogging of the clear visor. Any fogging resulting from the catapult may be removed by a wipe of glove across the visor.

10. Physiological and Personal Equipment:

a. Physiological: Pilot statement (several hours after touchdown). Felt mentally and physically normal throughout flight. Did not experience any unusual pains, hazy sight or worn/flustered feeling. Did not feel physically or mentally improved after "going on" emergency oxygen. Had no feeling of change from aircraft oxygen system to emergency oxygen system. Did not have desire to adjust or insure mask positive fit during flight. Observed oxygen supply and Lo psi readings several times during flight - all readings normal. At touchdown emergency oxygen was still flowing from mask. Very smooth, light shock and complete automatic action of parachute from ejection to touchdown, no manual operation necessary. Pilot was asked if he could suggest any improvements in the oxygen or parachute system operation. Pilot could think of no changes or improvements.

b. Personal Equipment:

(1) Parachute assembly (Neg #31775): The parachute assembly is a two-stage system. It uses a 78" drogue parachute to slow and stabilize the pilot in the initial phase of the ejection on descent at altitudes above 17,000 feet. An automatic drogue parachute release feature in the system is triggered prior to the opening of the main canopy to eliminate the possibility of entanglement. The drogue release occurs at 15,000 M/ft. plus or minus 400 feet. The main canopy is 35' and deploys at 15,000 M/ft. plus or minus 400 feet. A manual over-ride is provided on the main parachute. The emergency oxygen system is an integral part of the parachute assembly.

(2) Emergency Oxygen System: The emergency oxygen subsystem is the back-up for the vehicle system for breathing and suit pressurization. As it must accompany the pilot on ejection it is located in the anterior portion of the parachute pack. The 100 percent "backup" philosophy requires that the system supply be split into two independent sources to the pilot. Each system provides 60 cu/in of oxygen at a stored pressure of 2,000 PSI.

(3) Investigation: The parachute operation was satisfactory in all respects. Periodic and routine inspections were accomplished on schedule. No damage of any kind was noted on the parachute or its attachments. The parachute will be returned to the manufacturer for complete engineering functional analysis. The left main canopy release lock could not be released by the pilot after "touch-down". The right side released with no difficulty. Pilot stated left riser was under full open canopy strain at the time. Post accident investigation showed no damage to the release, but difficult to open when tension was applied to both the parachute riser and the parachute lift web. Similar difficulty was observed with other releases of the same type when

tested in this manner.

(4) Recommendations: A survey should (will) be made to determine a canopy release compatible with this type parachute.

(5) Breathing Regulator:

(a) F2700 Regulator: The F2700 regulator is designed to deliver 0 to 100 LPM at 50-90 PSI oxygen supply pressure and at least 70 LPM at 40 PSI oxygen supply. In both cases, the differential pressure is maintained at from 0 to 1.5" H_2O positive pressure when the regulator is used from ground level to 35,000 feet. When the regulator is exposed to altitudes above 35,000 feet and aneroid senses the ambient pressure and provides additional oxygen under pressure.

(b) Investigation: Preflight inspection of the regulator was performed with appropriate forms used and filed on 24 May 1963. Regulator periodic tests were performed on the regulator on 20 May 1963. Post accident operational test performed 27 May 1963 indicated normal function.

(6) MBU 5/P Oxygen Mask and Personal Oxygen Hoses: (Negative #31775)

(a) Description: The equipment consists of a standard Air Force MBU 5/P Oxygen Mask and Breathing Hose.

(b) Investigation: A routine preflight was accomplished on the morning of the flight and appropriate forms were filed. A post accident investigation revealed normal function. A small, pencil point size hole was found in the accordian hose at the end where it attaches to the F2700 Regulator and adjacent to the edge of the Timmerman hose clamp. The hose was found to be pulled slightly from its normal mated position. Evidence of dirt and particles of twigs were found between the hose and hose clamp at the hole location, indicating the hole was caused at "touch-down and roll over" from distortion of the mask hose against the Timmerman clamp. The pilot revealed additional rough handling of the equipment until it was picked up at Wendover Field.

Contractor analysis showed leakage through the hole to be zero at ground level and at altitude unless the hose was abnormally stretched.

(7) Seat Kit:

(a) Description: The seat kit is a modified F-104 kit with a standard F-104 cushion. The emergency oxygen cylinders are not located in the seat kit.

(b) Investigation: The seat kit functioned satisfactorily during ejection and bailout. The seat cushion was lost during parachute descent when the survival kit was deployed. Kit and survival contents were not damaged on landing.

(c) Recommendations: A nylon lanyard should attach the seat cushion to the seat kit. Loss of the seat cushion itself is not hazardous, but ordinarily the seat cushion is a compact-light-weight sleeping bag needed for cold weather survival.

(8) General Recommendations:

(a) Personal oxygen hoses were pulled loose from under parachute leg straps. At ejection these lines pull from beneath the leg straps and could cause damage to the suit. Suggest providing hose restraint to prevent flaying of hoses during ejection.

(b) Pilot should record oxygen supply every fifteen minutes. The procedure would insure a constant reference to the oxygen supply and provide data for more accurate oxygen consumption curves.

(c) Oxygen supply gages on cockpit panel are difficult to read. Gages should be placed in a position for more accurate reading.

(d) Insure zipper closure on all areas of flying suit prior to ejection. The procedure would reduce possibility of loss of items or physical injury from pocket contents.

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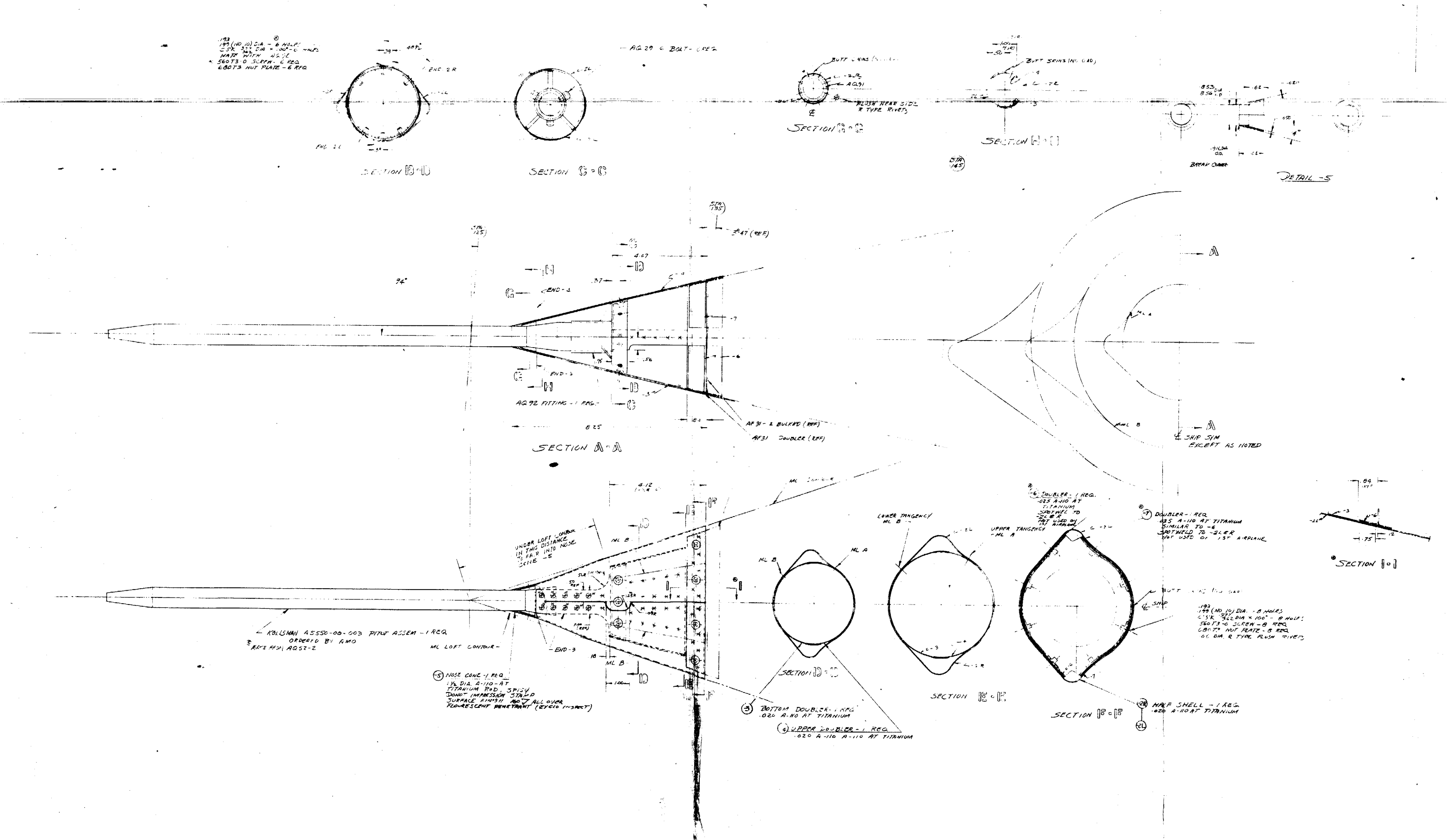
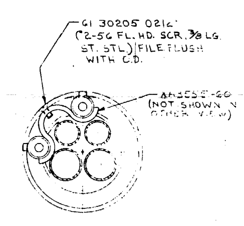
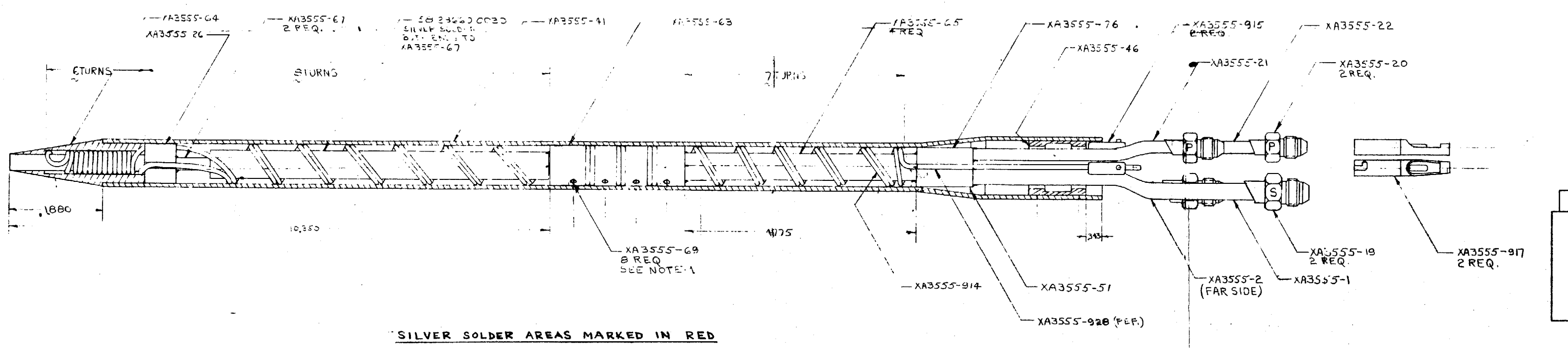




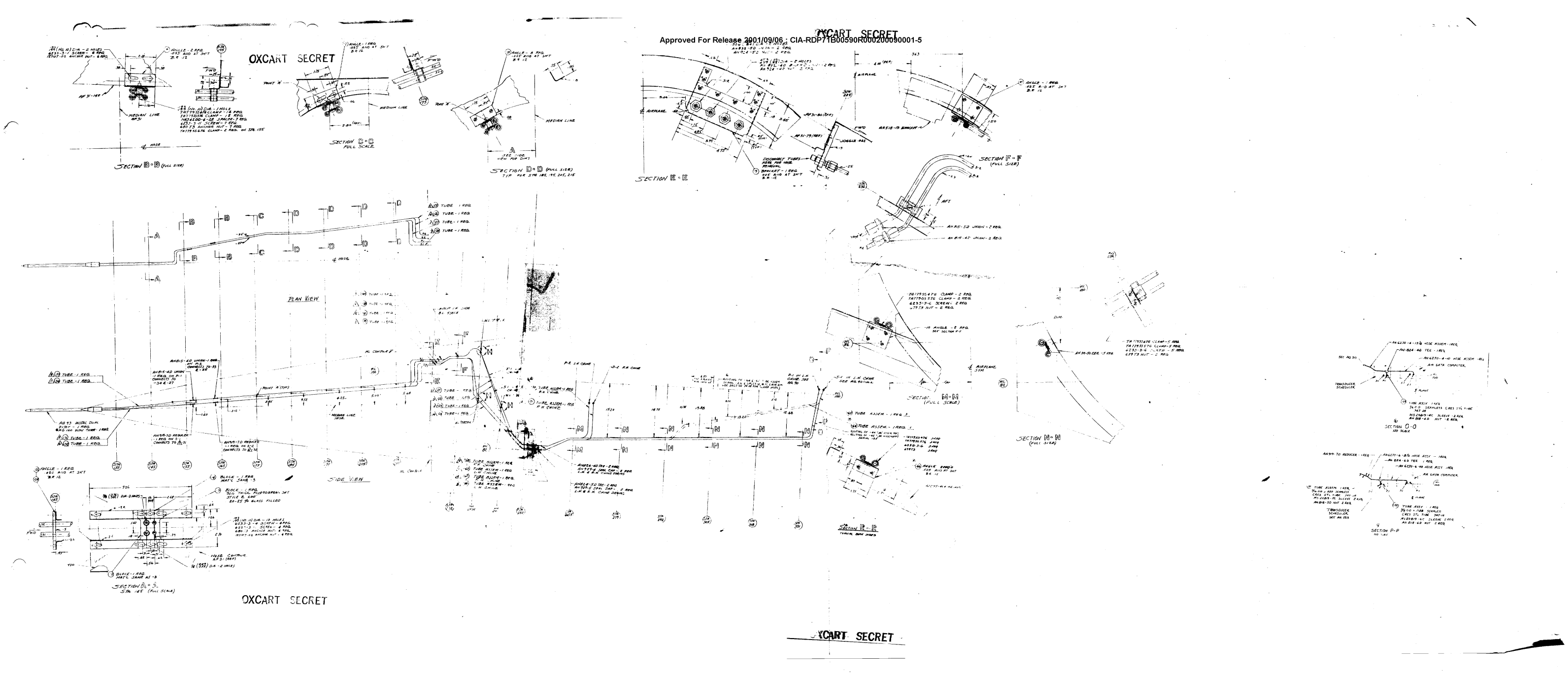
VIEW OF HEAD
SCALE 2:1



SILVER SOLDER AREAS MARKED IN RED

2. BEFORE SHIPPING, FASTEN CAUTION TAG XA3555-79 TO TUBE
1- FLATTEN CROWN FOR LEAKPROOF JOINT
NOTES

OXCART SECRET



OXCART SECRET

POWER PLANT

POWER PLANT AND ENGINE INLET SECTION

1. Powerplant:

a. Description: The powerplants installed in aircraft S/N 926 were J75-P-19W(SS). The basic engine is a J75-P-19W (which is the engine used in the F-105D) and the afterburner is a J75-P-17 (A/B used in the F-106). The combination of engine and A/B was selected due to geometric considerations of the existing A12 nacelles. The J75-P-19W(SS) engines are interim powerplants, the aircraft having been designed to use the J58 engine. The J75-P-19W(SS) engine incorporates certain improvements over the J75-P-19W engine to permit more extensive operation at high Mn's. These improvements are denoted by "(SS)". The J75-P-19W(SS) engine is a continuous flow gas turbine incorporating an eight stage low pressure compressor, a seven stage high pressure compressor, an eight unit can annular combustion chamber, a split three stage turbine and an afterburner with an iris-type automatic two position nozzle. The compressor rotor assemblies are mechanically independent of each other. The high pressure compressor rotor is connected to, and driven by the first stage turbine by a hollow shaft. A shaft, rotating within the hollow shaft, independently joins the low pressure compressor rotor to the combined second and third stage turbine wheels. Provision is made for thrust augmentation during take-off by means of water injection at the compressor inlet. This engine has the following static thrust ratings at S.L. standard day conditions:

TAKE-OFF (A/B with Water Injection)	26,500 lbs.
MAXIMUM (A/B)	24,500 lbs.
MILITARY (Non A/B)	16,100 lbs.

The TAKE-OFF rating is time limited to 2½ minutes; MAXIMUM rating is time-limited to 60 minutes; MILITARY rating is not time-limited.

b. Investigation and Analysis:

(1) Aircraft 926 was equipped with the following J75-P-19W(SS) engines:

POSITION	TYPE	SER. NO	FLT TIME SINCE NEW
LH Nacelle	J75-P-19W(SS)	P-612091	19:46
RH Nacelle	J75-P-19W(SS)	P-612143	32:00

(2) History of Engines: There were 9 flights prior to this flight during which there were no engine squawks except item 9 below on P-612091 and items 12 and 13 on P-612143:

 P-612091

 1. Converted to Super Special configuration during week of 30 July 1962 at [redacted], Burbank, California.
2. Delivered from [redacted] to Skunkworks for build-up during week of 8 November 1962.
 3. Received at [redacted] 24 November 1962.
 4. Portable test stand run indicated engine was a heavy breather and was returned to [redacted] during week of 10 December 1962.
 5. Found No. 3 bearing compartment leak, repaired and returned to [redacted] during week of 1 January 1963.
6. Leak and operational check satisfactory on portable test stand during week of 14 January 1963. Held as spare in engine shop.
7. During week of 28 January 1963 engine was used to check-out 12000 test stand.
8. Installed in Article No. 123 (926) left-hand position during week of 22 April 1963 while Article was involved in 100 hour inspection.
9. Engine received very minor F.O.D. during initial ground run, one Compressor blade received minor nick and was blended within T.O. limits.
10. Strike engine 24 May 1963. Total Flite Time 19:46.

P-612143

25X1A

1. Received at [redacted] 7 June 1962 following modification to Super Special configuration at Pratt & Whitney Aircraft overhaul facility, Southington, Connecticut.
2. Operation and leak checked satisfactorily on portable test stand during week of 25 June 1962.
3. Installed in left-hand side of Article No. 121 (924) prior to flight No. 27.
4. Removed after flite No. 36 on 16 August 1962 in order to facilitate J-58 installation. Total Flite Time this installation 12:14.
5. Assigned to Article No. 123 (926) left-hand position.
6. During week of 1 October 1962 engine sustained F.O.D. and was removed from nacelle. F.O.D. occurred during ground-run prior to first flight.
7. Airlifted to overhaul facility, Southington, Conneticut, 9 October 1962 for repair of damage.
8. Received at Area 29 January 1963 following F.O.D. repair.
9. Received operational and leak check on portable test stand during week of 11 February 1963.
10. Assigned to Article No. 123 (926) right-hand position during week of 15 April 1963.
11. Installed in Article No. 123 (926) right-hand position during week of 22 April 1963 while Article was involved in 100 hour inspection.
12. Engine received F.O.D. on 15 May 1963, 1st and 9th stage compressor blades were inspected. 3 each 1st stage and 2 each 9th stage compressor blades were slightly damaged. 1st stage compressor blades were blended within T.O. limits and engine was returned to serviceable condition.
13. Changed main fuel control following flight No. 74 due to high idle R.P.M.
14. Strike engine 24 May 1963. Total Flite Time 32:00 hours.

(3) Description of Damage (Accessories and Components):

(a) P-612091(LH): (Refer to photos #3-1792 thru 3-1796, 3-1801, and 3-1802). The following major portions of the engine were recovered:

(1) Aft half of high pressure compressor plus burner and turbine section.

(2) First 3 stages of low compressor.

(3) Afterburner and aft turbine case.

(4) All of the compressor and turbine discs. All of the major pieces were severely damaged by the impact. The condition of the turbine shows that this engine had substantial rotational speed at impact.

There is a large amount of blade tip rub. The number 6 bearing inner race shows skid marks which occurred when the engine came apart. These skid marks confirm rotation at impact. There is no sign of internal overtemp either in flight or from torching during start. The main oil screen was found intact. Disassembly inspection showed that the screen was in normal condition. No abnormal deposits were found. There is no indication of internal parts failure. (The engine was cut open to substantiate that no bearing failure had occurred). The number 2½ bearing was destroyed by impact. The condition of pieces of the main gearbox found and the examination of the N_2 gearbox tower shaft indicate there was no accessory drive failure. The main fuel pump drive shaft was sheared at impact in such a way that rotation at impact is confirmed. The A/B nozzle segments were found in the nozzle "open" position. The A/B nozzle actuator rods were found in random positions - some fully retracted, others extended. This indicates that the nozzle moved toward the open position at impact due to inertia forces. There is some "metalization" in the hot section parts, but this is believed to be the result of the previous FOD history of this engine (see items 9 under History of Engines - 091).

(b) P-612143(RH): (Refer to photos #3-1790, 1791, 1797 thru 1800). The following major portions of this engine were recovered:

(1) First 4 stages of the low compressor.

(2) A large section consisting of the aft ½ of the low compressor, the high pressure compressor, burner section, and the turbine section.

(3) Aft turbine case.

(4) Afterburner.

(5) All of the compressor and turbine discs. All of these

pieces show severe impact damage. There is no indication of internal parts failure. (The engine was cut open to confirm that no bearing failure had occurred). Some of the number 4½ bearing rollers were broken on impact. The main oil screen was found intact. Disassembly showed that the screen was in normal condition. No abnormal deposits were found. There is no sign of internal overtemp. There is some "metalization" of hot section parts, but this is believed due to the prior FOD history of this engine (see items 6 and 12 under "History of Engines - 143). The pieces of the main gearbox, the condition of the tower shaft drive train, and the shear pattern of the main fuel pump drive shaft all confirm there was no accessory drive failure. The appearance of the low rotor blades and evidence of small amount of tip rub on the low rotor, confirm that the low compressor rotor of this engine had a relatively slow rotational speed at impact. In fact, the score marks on the number 6 bearing inner race indicate that the low rotor actually stopped turning at impact and prior to break up of the engine. Apparently the aft turbine case rotated off the engine after the low rotor had stopped. The score marks are in a direction of scroll opposite to that which would be made by separation with a rotating low rotor. The condition of the blades of the high pressure compressor rotor indicate some rotational speed at impact. The A/B nozzle segments were found in the "open" position. Although all of the A/B nozzle actuators appeared to be in relatively uniform positions (toward nozzle "open"), an actuator was disassembled and the position of the actuator piston was confirmed to be intermediate. The actuator piston had 1 3/4" travel remaining after impact. Since this is strictly a two-position nozzle, it is apparent that the nozzle went open at impact due to inertial loads.

25X1A

c. Engine Accessories and Components: It should be stated that in the course of recovery and transfer of wreckage from the crash site to [redacted] all of the parts and components were handled several times. This handling had occurred prior to the examination of these parts. This being the case, the only conclusive information which can be expected will be obtained by detailed investigative teardown. All of the engine accessory components were recovered. These have all been shipped (as of 5-28-63) from [redacted] 25X1A to United Airports Departments (P&WA Overhaul Facility) at Southington, Connecticut. A high priority has been set up at UAD for teardown investigation. The detailed reports of the investigations on each of the component accessories will be submitted as addenda to this report as soon as available. Where available, partial results of detailed teardown have been included in this report.

(1) Main Engine Fuel Controls: The engine is equipped with a Holley R-95 hydromechanical fuel control. The fuel control establishes the engine thrust called for by the cockpit throttle position. Fuel is metered to the engine with automatic compensation for compressor inlet pressure (PT_2). The control senses an overspeed or underspeed condition and provides "on-speed" high pressure compressor rpm (N_2) operation. The control also senses compressor inlet temperature (TT_2) and limits acceleration fuel flow accordingly. The LH engine was equipped with main fuel control (MFC) S/N 76-474-D (See photo 1-1749). This MFC was recovered in two major sections, one of which included the power lever shaft, pointer and lever. The pointer indicated 62 deg power lever angle (P.L.A.), but it was loose and this number is probably not significant. Detailed teardown of this unit indicated a PLA at impact of 85 deg. The RH engine was equipped with MFC S/N 76-420-A (See photo 1-1749). This MFC was recovered largely intact, but with power lever shaft broken and the pointer missing. Detailed teardown of this unit indicated a PLA at impact of 45 deg.

(2) Main Engine Fuel Pumps: The Thompson TG 122501-7 Main Fuel Pump (MFP) consists of a certrifugal boost stage supplying three parallel gear stages. Fuel from one of the gear stages supplies main engine fuel flow requirements, while the remaining two gear stages supply A/B fuel flow requirements. Should the gear stage supplying the main engine fuel system fail, a transfer valve is provided to direct, automatically, the output from one of the A/B gear stages into the main engine fuel system. The LH engine was equipped with MFP S/N 24411; (Photo No 1-1750), RH was equipped with S/N 24508; (Photo 1-1750). Both MFP's were recovered largely intact. The shear patterns of the MFP drive shafts both indicate rotation at impact.

(3) Main Engine Fuel System Pressurizing and Dump Valves: The pressurizing and dump valve (P&D) (P&WA P/N 353345) divides metered fuel flow between the primary and secondary manifolds, and at engine shut-down drains residual fuel from both manifolds. The LH engine was equipped with P&D Valve S/N 6152468; and RH engine had S/N 6152524. Both P&D valves were broken at impact, but the majority of the pieces of each unit were found. (Refer to photo 1-1747)

(4) Afterburner Fuel Controls: The CECO AR-7 A/B fuel control meters fuel to the afterburner, on demand, as a function of engine burner pressure (pb). The LH A/B fuel control was S/N 614AH411, and RH was S/N 614AH442. Both were found mainly intact. (Refer to photo 1-1751). Only one of the Geneva-loc actuators, which could provide the most positive check on use of A/B, was found. It is impossible to determine whether this unit came from the LH or RH A/B fuel control.

(5) Afterburner Igniters: The Afterburner Igniter (P&WA P/N 391891) injects a predetermined quantity of fuel into a nozzle in the #3 burner can providing a streak of burning fuel through the turbine to ignite the afterburner fuel. Fuel pressure from the A/B fuel manifold initiates the hot streak while high compressor pressure (PT4) provides the motive force. The LH igniter was S/N 6001091; the RH was S/N 6001150. Both of these units were recovered intact (See photo 1-1753).

(6) Exhaust Nozzle Controls: The Exhaust Nozzle Control (ENC) (PWA P/N 443303) consists of a two position shuttle valve that directs high compressor air pressure to either the open or closed side of the exhaust nozzle actuating cylinders and a dual converter valve which operates in conjunction with an altitude setting valve to determine the sequencing of A/B ignition and nozzle actuation. Up to approximately 25,000 feet, either sub or supersonic, and above 25,000 feet supersonically, the A/B will light with nozzle open. Above 25,000 feet subsonically, the A/B will light with the nozzle closed. The LH ENC was S/N 60820574 (See photo 1-1752) and the RH was S/N 60820661. Both units were recovered, battered but intact.

(7) Water Regulators: The Water Regulators, (P&WA P/N 386292) maintains a constant water flow to the engine and supplies a reset signal to the MFC to adjust the fuel metering for water operation. Water Regulator S/N's 6159678 (LH Engine) and 61510225 (RH Engine) were recovered intact. (Refer to photo 1-1748).

(8) Starters: (See photos 1-1811 and 1-1812). The Airesearch Starters P/N 210250, S/N 46P-143(LH), and P/N 350520, S/N 87P-5476(RH) were both found in two major pieces - rotor and housing. There is nothing to indicate any failure of these units prior to impact.

(9) Summary Chart - Accessories and Components:

LH P-612091

RH P-612143

NAME	MFG & P/N	S/N	INST	COMPONENT T.T.	PHOTO NO.
MFC	Holley	76-474-D	L.H.	54:19	1-1749
	11811	76-420-A	R.H.	26:09	1-1749
MFP	Thomspon	24411	L.H.	31:04	1-1750
	112501-7	24508	R.H.	49:24	1-1750
FP&DV	PWA	6152468	L.H.	31:04	1-1747
	353345	6152524	R.H.	49:24	1-1747
A/B Meter	CECO	614AH411	L.H.	31:04	1-1751
	45500A9	614AH442	R.H.	49:24	1-1751
A/B Igniter	PWA	6001091	L.H.	31:04	1-1753
	391891	6001150	R.H.	49:24	1-1753
ENC	PWA	60820574	L.H.	31:04	1-1752
	443303	60820661	R.H.	49:24	1-1752
Water Reg	PWA	6159678	L.H.	UNK	1-1748
	386292	61510225	R.H.	UNK	1-1748
Starter	AIRESEARCH				
	210250	46P-143			1-1811
	350520	87P-5476			1-1812

d. Inlet Control System: The control system for the air inlet duct consists of the main control, a spike actuator and bypass actuator. The purpose of the control system is to schedule the inlet spike and bypass doors so that the inlet shock is positioned properly for optimum inlet performance. During ground operation, the spike is forward and bypass doors are open. Shortly after takeoff the bypass doors are closed as a result of an electrical signal initiated by the main gear retraction. In flight the spike is forward and the bypass doors are closed until the doors are opened at about 1.35Mn. The spike starts to move aft at about 1.6Mn.

COMPONENTS INSTALLED

	MAIN CONTROL	SPIKE ACTUATOR	BYPASS ACTUATOR
	P/N 551662	551773	565735
Left Nacelle	S/N 24509	24508	30558
	P/N 551662	551773	578388
Right Nacelle	S/N 31003	30450	31050

(Refer to Photos No's 1880 thru 1883.) The normal flight programs for aircraft S/N 926 were conducted at subsonic airspeeds so the inlet contol system was not active. The spikes were manual forward and the bypass doors were manual closed. Examination of the inlet control components verifies that the spike locks were in place (spike full forward) and the bypass actuators retracted (bypass doors closed). The spike emergency bottles were recovered and were charged. The bottles contain Helium at about 3000 psi and provide a source for moving the spikes forward in the event of a hydraulic failure. The components were damaged by impact but nothing was found to indicate that the inlet control system contributed to the accident.

2. Analysis of Discussion: The pilot's and chase pilot's statements indicate normal engine operation up to the start of the incident. The Rpm's (97 - 98%), fuel flows (4000 - 4050 per engine), and EGT's (530 to 540°C) indicate that the power used throughout the flight was somewhat below military. Although in his statement the pilot said that he decreased power slightly, then advanced PLA's to military, there is nothing to indicate that military power was achieved. The pilot repeatedly stated that rpm's held constant at 97 - 98%,

which is a further indication that military power was not achieved. The pilot's recollection of 1800 pph fuel flow per engine while in the turn, is not compatible with the simultaneous 97 - 98% rpm, nor can it be reconciled with any other available evidence. (There is no recollection of EGT). There was no report from either the pilot or the chase pilot of attempted or inadvertent use of A/B. There was no indication (according to the pilot's statement) of compressor stall, decrease of thrust, or loss of fuel supply (pilot stated no abnormal panel lights). Both engine air inlet icing and engine fuel system icing were considered and eliminated. Air temperatures were too low for engine inlet surface ice formation. Fuel temperature at the engine pump inlet, by comparison with a similar flight condition in Article 924 (see curve figure 1), were well above plus 32°F; and the laboratory analysis of fuel samples from the supply source which had fueled Article 926 indicated 117 ppm dissolved water and no entrained water. The aircraft fuel system section further discusses the improbability of fuel system icing being a factor in this accident. The LH engine (P-612091) was rotating at a substantial rpm at impact. It is not possible to determine the speed of rotation. An attempt was made to calculate rpm from the number 6 bearing inner race score marks which occurred when the engine came apart. These calculations had to assume the engine separation occurred at a relative speed of 150 kts (the approximate article forward speed at impact). The result was 15,900 rpm N_1, which is impossible. With no other means of estimating the relative velocities of the two engine parts at separation, it is not feasible to calculate even an approximate rpm at impact. Estimates of engine rpm were made based on (1); assumption that impact fuel flow meter read-outs were correct, (2); assumption that the three evidences of P.L.A. at impact were correct. Impact fuel flows were 4600 pph and 2600 pph - no evidence as to which was L.H. or R.H. Assuming 4600 pph fuel flow at impact, the engine would have approximately 85% rpm. If continuous fuel flow and airflow as required by the engine were both available, the P.L.A. would be 38 degrees. Assuming 2600 pph fuel flow, rpm would be 75% and P.L.A.(on same basis) would be 23 deg. Either 75% or 85% would probably account for the impact rotational damage to engine P-612091 (LH), however there is obviously more than 10% spread between engine rpms at impact. This indicates that one or both of the impact fuel flow read-outs is invalid. There are two separate indications of P.L.A.'s at impact: (1) The cockpit quadrant indicated the LH throttle was in a position corresponding to 64 degrees at the MFC (see Flight Controls Section), and the RH throttle was at some higher but unknown angle. (2) Teardown investigation of the two MFC's showed that at impact the LH PLA was 85 degrees, and the RH PLA was 45 degrees. Either the MFC PLA's, the cockpit quadrant PLA's, or both, were shifted by impact break-up of the article. Further, none of the PLA evidence is compatible with PLA's estimated using impact fuel flows. Assuming that the MFC PLA's are valid, estimates of fuel flow and rpm yielded 12,100 pph and 97% rpm for LH engine P612091 and 5,530 pph and 87% rpm for RH engine P612143. The same estimates using cockpit quadrant PLA yielded 8400 pph and 93% rpm for LH engine P612091. Neither PLA evidence nor fuel flow read-outs at impact yields results compatible with the obvious difference in impact damage between the two engines. The impact readings of the EGT gages were 536 deg C and 733 deg C, with no way to identify RH or LH gages. Neither of these read-outs could be considered compatible with the obviously low (windmilling) rpm of RH engine P612143 at impact. Either reading could be compatible with LH engine P612091 rpm at impact but both are high when compared to impact fuel flow read-outs. The 733 deg C reading is especially high, but this in relation to RPM would not be unreasonable if it were assumed that engine air supply was below demand (a reasonable assumption for high angle of attack on the inlet). The combination of 4700 pph fuel flow (impact read-out) and 530 deg C EGT (impact read-out) might not be too unreasonable for 35,000 ft cruise conditions, but since there is no reason to suspect that the instruments suffered a failure at altitude; and since it is impossible to relate EGT's to one engine or the other, the use of impact EGT values becomes very speculative. Most probably after the aircraft became inverted the LH engine P612091 continued to run with a fuel flow less than engine demand, while the RH engine P612143 flamed out due to fuel flow and/or airflow interruption. In the inverted position and within nose angles 10 degrees above and 17 degrees below horizontal (neglecting G forces) it is not possible to supply fuel to the engines. However with roll and/or lateral G forces, it is possible to supply fuel to one of the engines, within a narrower nose angle band. With nose angles greater than plus 10 deg or minus 17 deg it is possible to supply both engines. It is entirely conceivable that the RH engine flamed out due to fuel flow interruption during aircraft maneuvers between inversion and impact. The run-down time from military rpm to windmill rpm in this installation with the accessory loads is approximately 45 seconds at essentially constant altitude and airspeed, ref curve figure 2 (flight test data). The condition

j. It is concluded from the above that engines were not a cause of this accident.

4. Recommendations: None.

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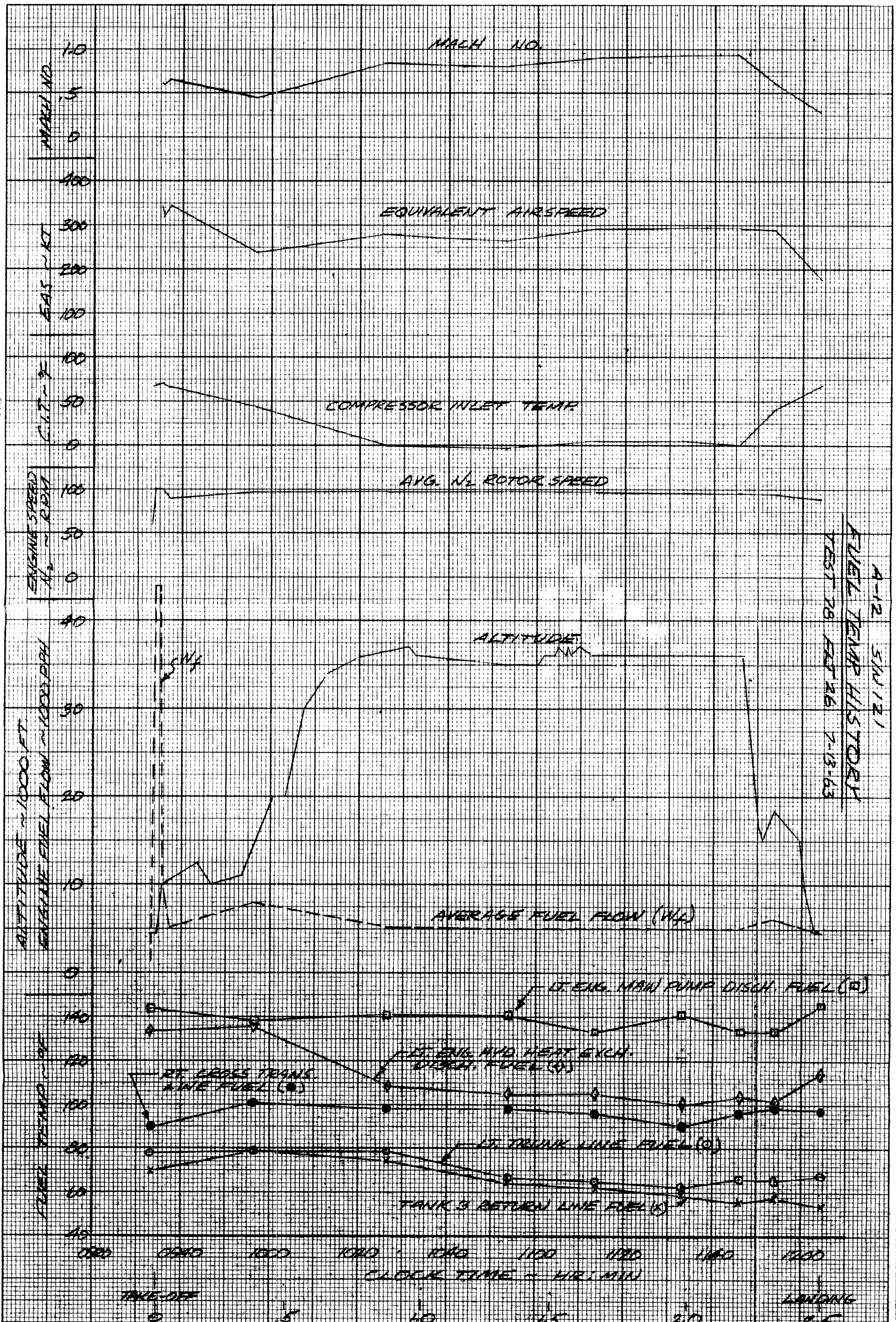

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LOCKHEED AIRCRAFT CORPORATION
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MODEL
REPORT NO.

A-12 S/N 121

TIME HISTORY OF LEFT ENGINE SHUTDOWN AND AIRSTART ~ 19000 FT ~ J-75 ENGINE

TEST 65 FLT 14 6-25-62

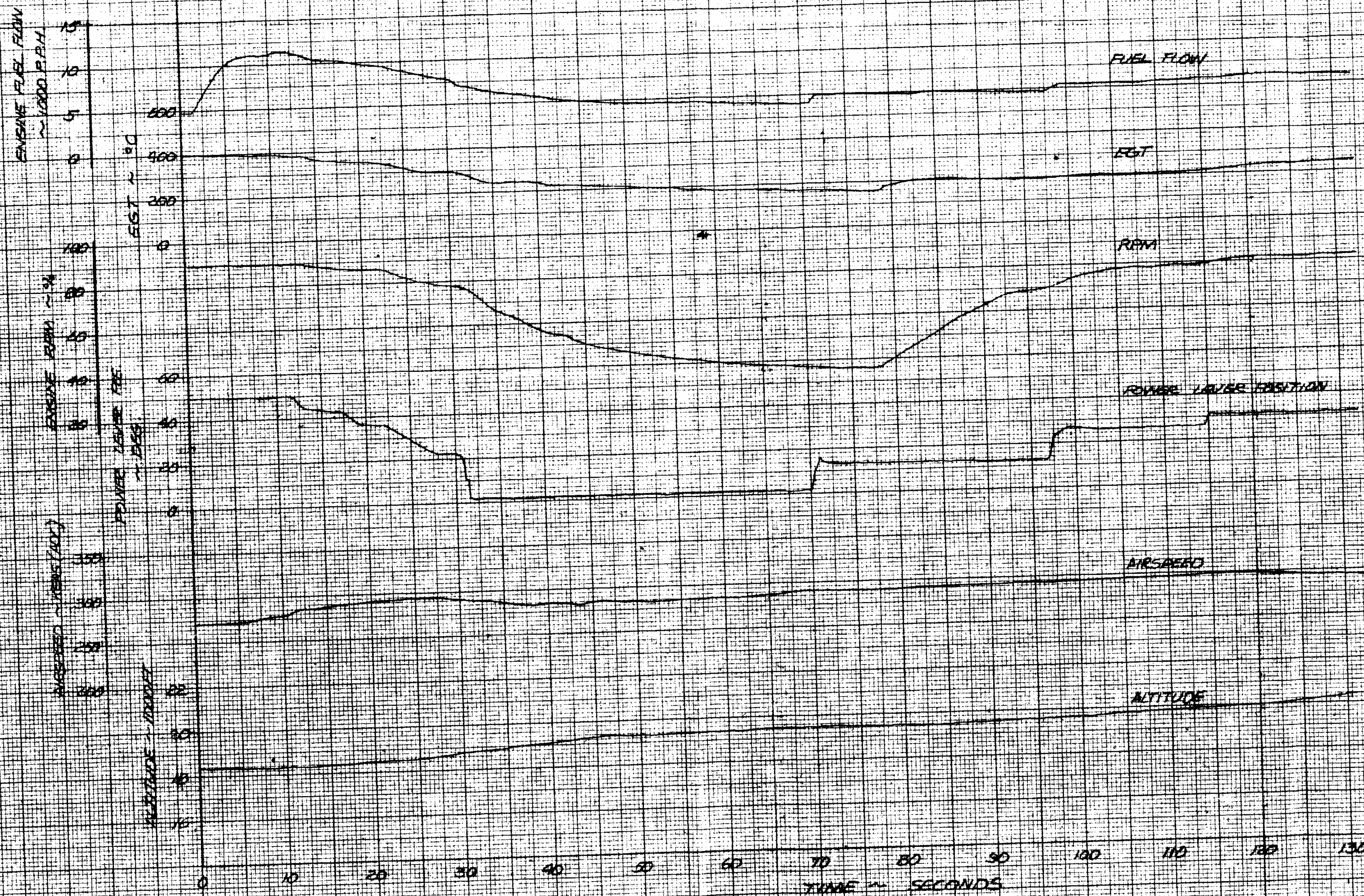

FIGURE 2.

FORM 5276C

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FUEL

SUMMARY

The fuel system is described and typical flight test results of the lowest fuel temperatures measured for flights similar to that experienced prior to this accident are shown. Some of these flights are so similar to the Airplane 123 flight that accurate fuel temperatures for this flight can be predicted. The lowest feed line and filter fuel temperature experienced is predicted to have been 52°F on this flight.

These flights also indicate that temperatures of small amounts of fuel in the tanks may reduce to 15°F as a tank pumps completely dry, but with 117 PPM water content this could only yield one ounce of water. Samples of fuel similar to that used on this flight are determined to have 117 PPM soluble water content and 0 PPM discrete water content. Typical samples of fuel from Airplane 124 are determined to have a maximum of 108 PPM soluble water content and 0 PPM discrete water content.

Laboratory checks of the right and left fuel strainer-flowmeter assemblies show no entrapped water.

The pilot's comments reveal that the fuel system operated normally during the flight. No fuel system icing or malfunction is suspected as a contributing factor in this accident.

1. General Description:

a. Fuel Tank System (See Figure 1): The fuel supply is carried in 6 internal tanks that are integrally sealed and use most of the fuselage volume. The tanks are numbered consecutively #1 through #6 from fore to aft and are adjoining to each other with the exception of a dry bay between tanks #4 and #5. This bay is used as a wheel well for the main landing gears and as a terminus area for controls to the rudders and powerplants, and plumbing to the powerplants. Also, numerous hydraulic components are located in this area. The measured tank capacities are as follows:

TANK		GALLONS	POUNDS
#1		1110	7,215
#2		1595	10,367
#3		1572	10,218
#4		2130	13,845
#5		2142	13,923
#6		1975	12,838
	TOTAL	10,524	68,406

b. Refueling System (See Figure 2): All refueling is accomplished through the inflight refueling (IFR) receptacle located on the forward top side of the fuselage as station F.S. #475. The ground refueling will be accomplished with a special equipment truck (#AG107) fitted with a hose and nozzle to fit this IFR receptacle. From the receptacle, the fuel will flow to each tank through a fueling manifold running thorugh all the tanks in the upper L.H. quarter of the fuselage. Each tank has a dual automatic shutoff to stop the flow when the tank is full. A method of testing each half of the dual shutoff is made possible by plugging test box #AG128, #AG137 or #AG240 into the nose wheel well receptacle. Specially sized orifices make it possible to fill all tanks from empty to full in 12 minutes with 50 psi fueling pressure.

c. Fuel Feed System (See Figure 3): A manifold running through the fuel tanks in the lower L.H. quarter of the fuselage provides fuel for the L.H. engine from tanks #1, 2, 3, and 4. A similar manifold in the lower R.H. quarter of the fuselage provides fuel for the R.H. engine from tanks #1, 3, 5, and 6. In case of necessity, fuel may be used from one manifold to the opposite engine by opening a crossfeed valve between the two manifolds. Two boost pumps are provided for each tank outlet, consequently, tanks #1 and #3 have 4 pumps each and tanks #2, 4, 5, and 6 have 2 pumps each. Making a total of 16 boost pumps. The fuel usage sequence keeps the C.G. within the desired limits of travel. An aft C.G. is desired for high speed and a forward C.G. is desired for slow speed flight, take-offs, and landings. A forward transfer system is provided from the R.H. fuel manifold, making it possible to transfer fuel into tank #1 from tanks #3, 5, and 6 before landing, thus moving the C.G. forward. The normal usage sequence is:

L.H. Engine	R.H. Engine
#1 and #2	#1 and #6
#2	#6
#4	#5
#3 or #1 and #3	#3 or #1 and #3

d. Defueling System (See Figure 3): A defuel fitting is installed in the lower R.H. side of tank #4 and connected to the R.H. manifold. To defuel tanks #2 and #4 from the L.H. manifold, it will be necessary to open the crossfeed valve.

e. Fuel Dumping System (See Figure 3): There is an electrically operated dump valve connected to each of the two fuel feed lines. The valve connected to the L.H. feed line is located aft of #4 tank with continuing line into the tail cone area. The dump valve connected to the R.H. fuel feed line is located in the tail cone area. Fuel from each dump valve passes through a pressure relief valve in the tail cone area to assure that the pressure in the fuel line does not drop below 10 psi. The fuel is dumped from the larger of 2 concentric tubes in the tail cone.

f. Fuel Tank Venting System (See Figure 4): There are two concentric tubes in the tip of the tail cone. The large tube is for fuel dumping and the smaller tube is for venting. A common vent line runs through all the tanks and has two vent valves in each tank except #1 which has one valve and an opening at the forward end of the vent line. The forward valve in each of tanks #2, 3, 4, 5, and 6 is a float valve that shuts off when full, and a relief valve that will relieve pressure into the vent line at 1.5 psi. The aft valve in each of the 6 tanks is just a float actuated shutoff.

There are two vent drain valves, one is #5 and one in #6 tank. These are float actuated shutoff valves and allow fuel in the vent line to drain into these tanks when they are not full.

The common vent line tees to two lines in tank #6 and they both go through the rear bulkhead. In the tail cone area there is a relief valve in each line. The L.H. valve relieves when tank pressure exceeds ambient pressure by 3 psi. Should this valve fail, the R.H. valve relieves at 3 - 1/2 psi.

A suction relief line and valve connect to the common vent line in tank #1. This relief line terminates at a bell-mouth fitting in the aft end of the nose wheel well.

Two valves are provided in the vent system to prevent fuel from slamming forward in the vent line when the aircraft is decelerated.. One of these is a check valve located in the wheel well at station #937, so that fuel coming forward from tank #6 can go not farther than tank #5. The other valve (called a python valve) is located in tank #3 and prevents fuel in tank #4 from going any farther forward than tank #3. This is a float actuated valve and shuts off the vent when fuel is moving forward in the vent line, and diverts it into tank #3. Fuel in tank #2 can go forward into tank #1.

Acceleration presents no problem of fuel shift as the float actuated vent valve with pressure relief feature is only located in the forward end of each tank.

g. Fuel Tank Inerting System (See Figure 5): Two liquid nitrogen Dewar containers are located forward of #1 fuel tank in the nose wheel well to supply gaseous nitrogen pressure and volume to the fuel tanks. Liquid nitrogen is taken from the bottom of the Dewars, regulated to 1.5 $\pm$ .25 psi fuel tank pressure above ambient by two regulators in parallel (for reliability). One of these regulators has a solenoid actuator on it, controlled by a pressure switch that will cause the regulators to open and allow LN_2 flow if tank pressure should drop to 1.0 $\pm$ .25 psi. From the regulators the LN_2 passes through 2 heat exchangers, submerged in fuel to assure that all nitrogen has become gaseous. The gaseous nitrogen is then ported to the common vent line and to the top of all tanks.

h. Heat Sink System (See Figure 6): When operating the aircraft at high speed the fuel supply is used as the medium to absorb the heat as required to keep the temperature within operating limits for certain critical items such as the cockpit and windshield, oil for the powerplants, hydraulic system and spike system, electrical components and the gyros.

For most of the flight period it will be possible to burn the fuel in the engine as soon as it has been through the cooling loops. However, the engine limit of 500°F at the burner nozzle limits us to 300°F as the maximum temperature of the fuel before it is delivered to the engine. During the latter portion of the flight, when the fuel tank quantity is reduced and the remaining fuel has taken on heat from the fuselage skin, it becomes necessary for the temperature sensing valve ("smart" valve) to return the hot fuel to the tank. The temperature at the smart valve is limited to 295°F. The smart valve will modulate between open and close position to allow as much hot return fuel to go to the engine as possible but will not allow it to exceed the temperature of 295°F.

1. Fuel Description: The fuel used is designed as PWA523B. This fuel is similar to kerosene, and can be handled in the same manner as JP4. This fuel has the following characteristics at sea level pressure (14.7 psi):

Flash Point	150°F minimum
Initial Boil Point	375° minimum
Freeze Point	-40°F maximum
Luminometer Number	100 minimum
Viscosity at -30°F	15 Cs maximum
Gravity, Degrees API	47 to 53 maximum
Specific Gravity	.767 to .793 60°/60°F

2. <u>Condition of fuel system prior to accident</u>: During the last ten flights and even prior to this time the fuel feed system had been operating in a normal manner.

a. Airplane 123 fuel management: The fuel load carried in Airplane 123 on flight #79 was as follows:

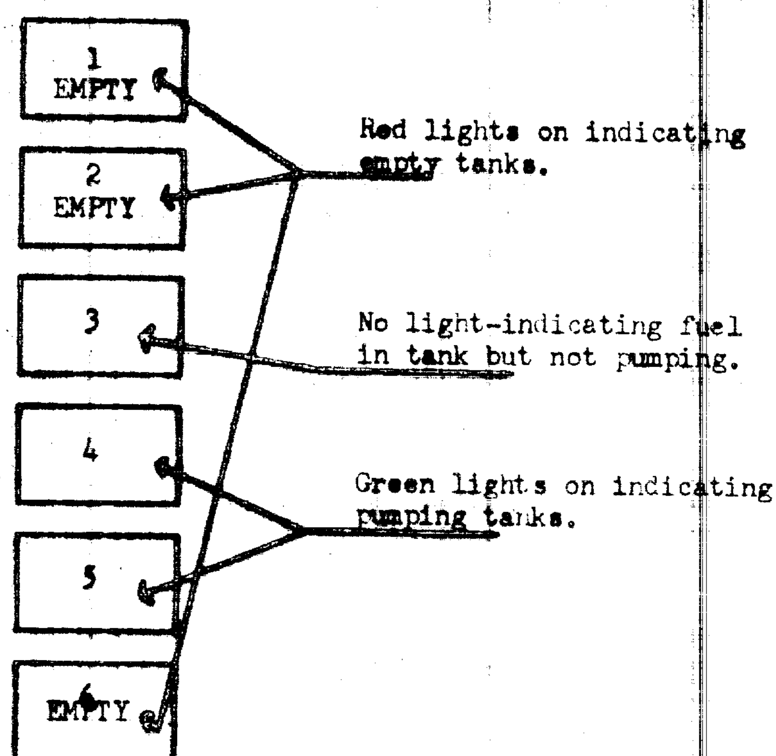
TANK	POUNDS
1	3,825
2	6,750
3	10,050
4	4,100
5	3,725
6	6,900
TOTAL	33,350

The manner in which the fuel was pumped from each tank with respect to time is shown in Figure 7. This assumes that 750 pounds was used for taxi and takeoff. Normal automatic fuel management is assumed to be used throughout the flight.

b. The pilot reported the fuel system was operating properly. Tanks 1, 2, and 6 had emptied in their normal sequence and tanks 4 and 5 were operating. Tank #3 had not yet started. One hour fifty-nine minutes after takeoff the pilot reported 9500 pounds of fuel remaining. Since this reading was taken with the fuel quantity selector switch in the "total" position, it is not considered as reliable as it would have been had the individual tank quantities been recorded. However when existing corrections are applied, 9500 lbs. indicated becomes 10,400 pounds calibrated. It is estimated the aircraft burned approx 1400 lbs of fuel in the nine minutes prior to the stall, leaving 9,000 pounds of fuel on board. This would bring the gross weight to 57,796 pounds and the aircraft C.G. to 23.3% as shown on Figure 8.

When the above point is plotted on the mission curve of gross weight vs C.G. position, it falls in an area where only tank #3 would normally be operating. This discrepancy amounts to 1325 pounds, i.e., at a gross weight above 59,121 pounds, tanks 4 and 5 would be operating together. The reasons for this discrepancy are probably twofold. The normal ullage circuit pumps approximately 900 pounds from tank #3 early in the flight, and, the gaugeing error with the selector switch in the "total" position could easily be 500 pounds.

3. Fuel system condition at the time of the accident: The only indications of fuel system performance at the time of the accident come from the pilots comments. Since the "low fuel pressure" lights on the annunciator panel were not illuminated. It is reasonable to assume the fuel pressure to the engines was above 7 psig. In normal operation this pressure would be expected to be 26 - 30 psig. The pilot had good fuel system pumping indications. At the time of the accident the fuel panel was read as follows:



His comments indicate that fuel system operation was normal throughout the flight except when he reported his last fuel flow reading to have been 1800 PPH per engine. The pilot reported that his last fuel flow reading was 1800 PPH per engine which will give 600 pounds of thrust at .8 mach and 37,000 feet altitude. This corresponds to approximately 28° power lever position on the fuel control. However, he also reported that he had retarded the throttles only .5 inches from the 98% RPM position. This would result in 93% RPM or 64° power lever position corresponding to 3200 pounds of thrust and a fuel flow of 4350 PPH per engine at 37,000 feet and .8 Mach. This conflicting data could possibly be caused by the following conditions which were examined in detail:

a. Fuel temperatures causing water or fuel icing conditions.

b. Fuel filter blockage.

c. Boost pump water freezeout.

d. Flowmeter malfunction.

After the aircraft stalled and became inverted, most of the boost pumps were uncovered and engine fuel starvation could easily have occurred. There is a possibility however that if the aircraft attitude was in excess of 17° nose down (or 10° nose up), some of the fuel outlets in tank #3 would have been submerged and the 1½ psi nitrogen pressure could have supplied fuel to the engine(s).

4. <u>Fuel Temperature Analysis</u>: In order to establish the possibility of fuel icing or freezeout, an investigation was made to determine the fuel temperature at different areas at the time of flight termination.

Records on Aircraft 121 were reviewed, and four typical subsonic mission flights were selected: Flights 23, 26, 34, and 36 respectively. Flight 26 was the flight which most resembles Flight 79, Airplane 123 on point of entrained water and far from the freezing point of the fuel itself which is -40°F. The last bit of fuel in each tank may get as low as 15°F but as will be seen, this small amount of fuel does not contain enough entrapped water to cause a freezeout problem on pump or filter screens.

5. <u>Fuel Filter Blockage</u>: The fuel filter incorporates an integral bypass so that th fuel flow cannot be stopped should the filter surface becomes loaded with any foreign substance. To ensure that this protection will be available during icing conditions, a test run with super cooled fuel at 15°F containing 2 cc of water per gallon which is equivalent to 500 + PPM. Figure 14 shows the time history of the pressure drop through the filter when flowing 10,000 PPH. Note that after approximately 12 minutes, the bypass opened and the pressure drop remained constant. Figures 15 and 16 show the condition of the filter immediately after the test when it was completely covered with ice. This test showed conclusively that icing of the fuel filter will not interrupt the flow of fuel to the engine. To further check the strainers from Airplane 123, they were sealed at the site of the crash and sent to the labratory for examination. Two assemblies consisting of the right and left fuel filters and fuel flow transmitters were sent in for examination, with particular emphasis to determine presence of moisture. The fuel strainer was disassembled from the GE fuel flow rate transmitter, and the screen and spring-loaded metal cap examined for the presence of trapped moisture. The spring-loaded cap contained small droplets which were hydrocarbon soluble. There was no evidence of discrete water in the fuel strainer. At the same time the strainer was flushed with a small quantity of Super VM & P Naphtha,

May 24, 1963. A comparison of the trunk feed line to the left engine for the different flights listed above is shown in Figure 9. This fuel temperature is measured in the left hand trunk line, a few feet ahead of the fuel filter. This would be representative of the filter temperatures. Based on Figure 9, an estimate was made for the trunk line temperature for Flight 79, of Airplane 123, and is presented in Figure 10. This curve allows for the lower ambient temperatures on May 24 and therefore shows a slightly lower initial temperature. From flight test data, it was noted that the fuel temperature was always higher than the ambient temperature by a minimum of 12°F. From Figure 10 it is noted that at point of flight termination temperature was approximately 50°F after 128 min. flight time, or 20°F less than initial fuel temperature. These temperatures all show temperatures well above the freezing point of water of 32°F. Figure 9 also shows the comparison of fuel loading for various flights on Airplane 121 as well as Flight 79, Airplane 123.

According to the postflight record of the pilot, tanks 1, 2, and 6 were empty. The pilot states he was using tanks 4 and 5 at time of the incident. Therefore, an estimate of tank usage was made and presented in Figure 7, using data from Flight 26 (Figures 9 and 10) for fuel flow history. Then using the above fuel history an analysis was further made of the fuel temperature of tank #5 during the mission. The estimated fuel temperature is presented in Figure 13. The data show tank temperature was approximately 37°F at flight termination. Thus, by comparison with similar subsonic flights it can be seen that the fuel in the main engine feed lines into the strainers and flowmeters was always above the freezing with no moisture detectable. It should be realized that the entire assembly was completely battered, so that a more detailed examination was not possible. The above statements were also true for the second assembly which was submitted. The disassembled fuel strainers are shown in Figures 17 and 18. Thus, there is no evidence to indicate that the fuel filter could have caused the drop in fuel flow since there was no water present to ice. Furthermore, if it had any icing problem, it would have bypassed the blockage and continued to flow fuel to the engine.

6. Boost Pump Water Freezeout: The foregoing fuel temperature analysis points out that fuel in bottom of a tank just prior to running dry could have reached 15°F on this Airplane 123 flight. At these temperatures any water in the fuel would tend to freezeout on the screens to the inlets of the boost pumps. However, it should be noted that this occurs only when the tank has less than 500 pounds of fuel remaining and less than 5 minutes to go completely dry. Assuming that there is 117 PPM water content in the fuel as noted in the fuel analysis, then there will be .058 pounds of water in the 500 lbs of fuel; approximately one fluid ounce. This small amount of water could not possibly freeze the two large boost pump screens even if all of it could deposit on the screens.

7. Flowmeter Malfunction: It is certainly possible for a flowmeter to malfunction and give an erroneous reading such as 1800 PPH but it is hardly likely for two flowmeters to fail simultaneously in the same manner. The two flowmeters on the right and left engines are completely separate circuits on different inverters. A dual malfunction under conditions wherein no other electrical troubles are occurring is remote.

8. Fuel Analysis: Analysis were made to determine the soluble and discrete water content of fuel samples which were representative of that used in Airplane 123. A sample was taken from the pit used to fuel Airplane 123 and in addition to this, samples were taken from tanks #3, 4, and 5 of Airplane 124. Airplane 124 has been used in similar activity, but was usually fueled from the R-2 trucks. The primary concern here was to determine the amount of water which could be concentrated in the bottom of the fuselage after repeated flights at low temperature. The water contents have been determined by the Karl Fischer method.

Standard practice in the flight line has been to drain the sumps of all tanks, either after fueling, or, if there was sufficient fuel on board, after the structure had been warmed to room temperature for a sufficient time so that no ice could remain. This practice has been in effect since the airplanes were first delivered and as a result the fuels are very dry. In addition to this, the samplings are always tested with hydro-kit, which will detect discrete water if any is present.

KEITH BESWICK
A-12 Flight Test Engineer - Fuel

Keith L. Beswick

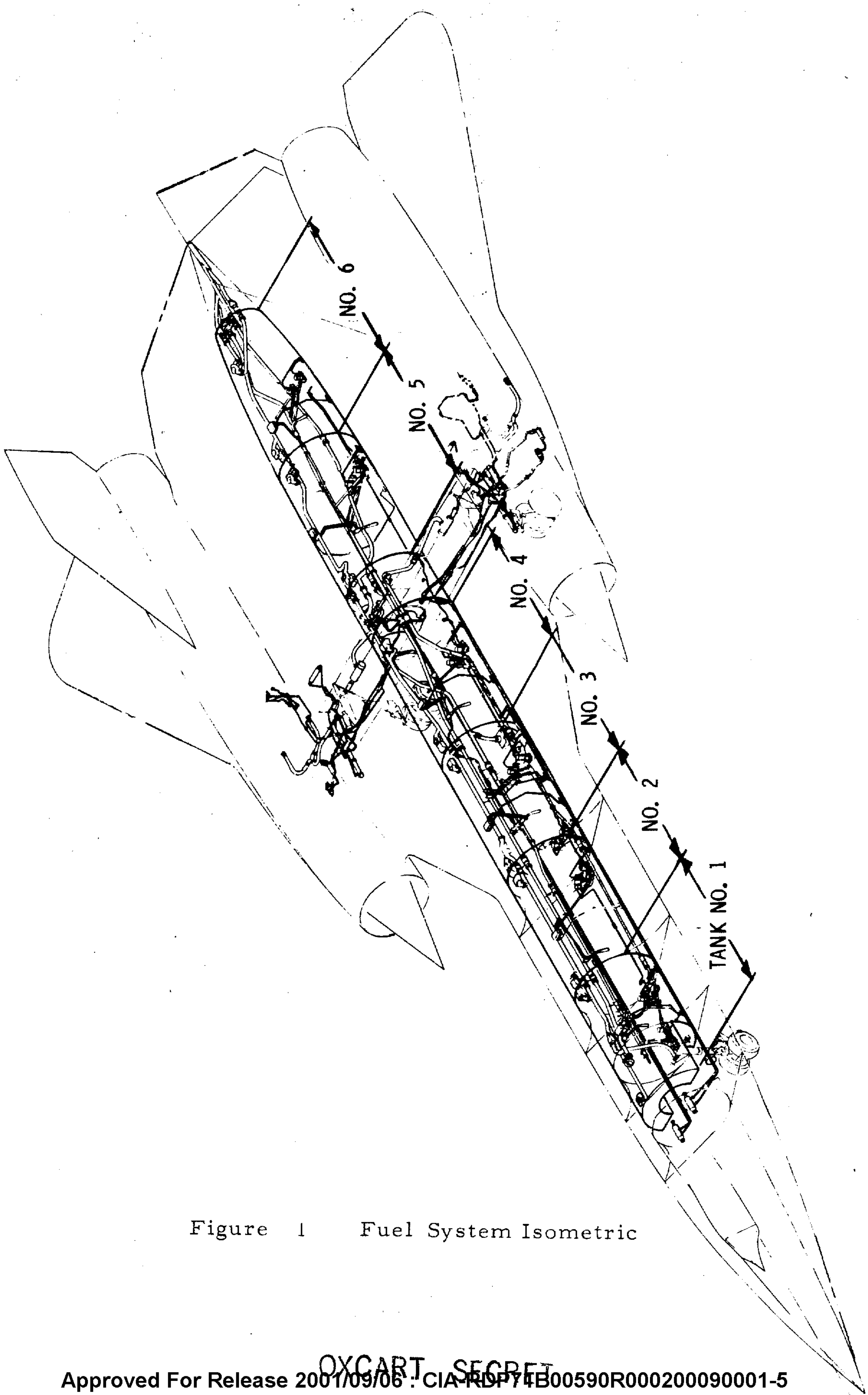


Figure 1 Fuel System Isometric

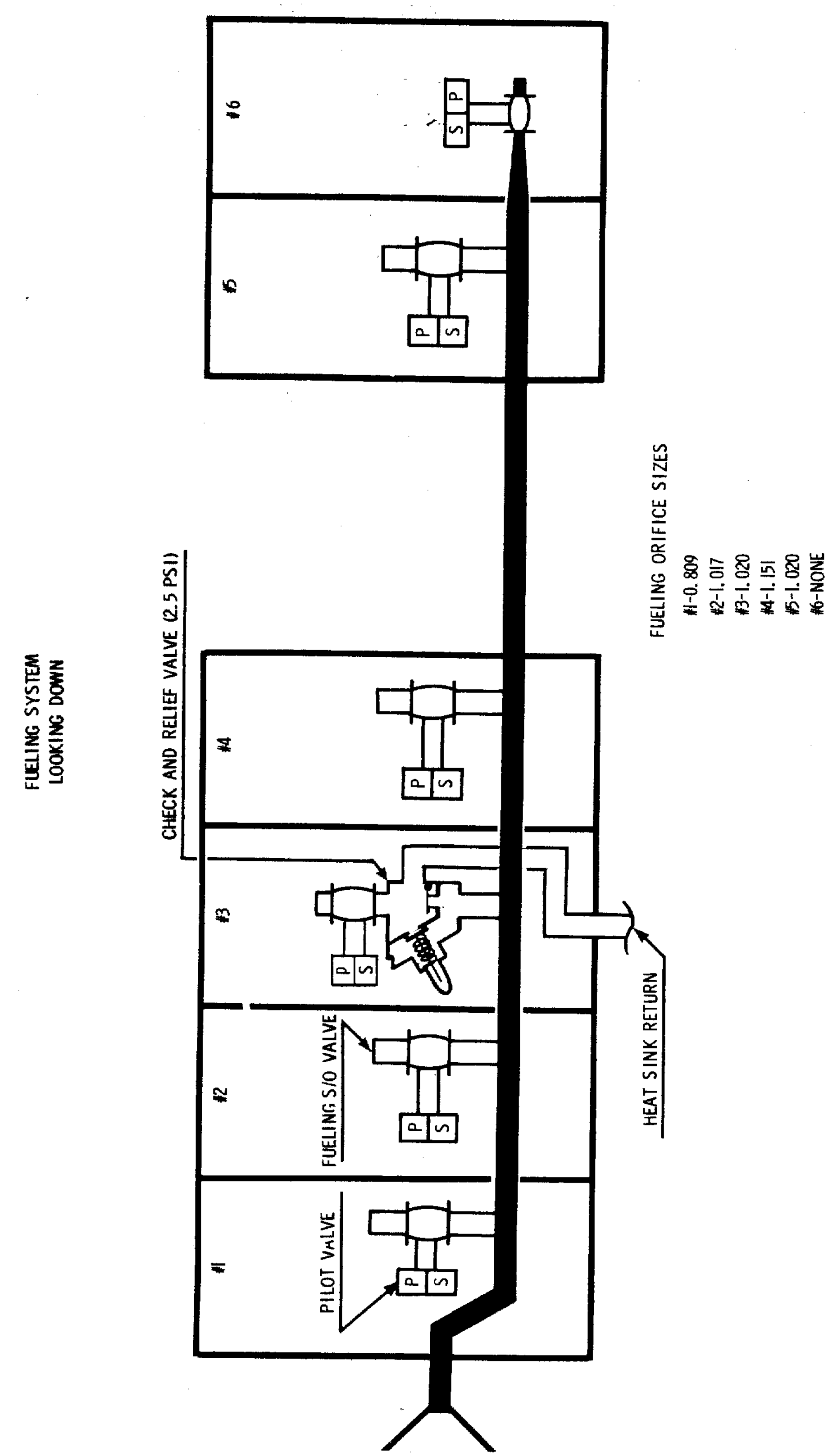


Figure 2 Fueling System

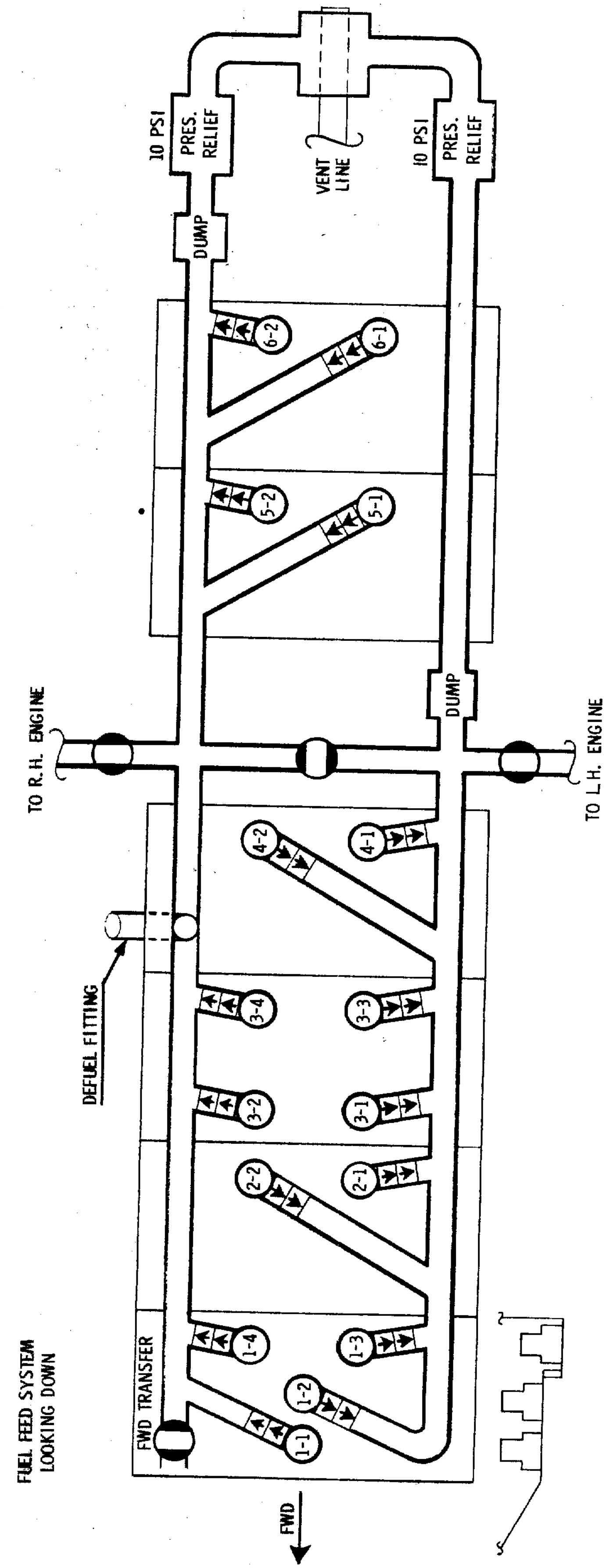


Figure 3 Fuel Feed System

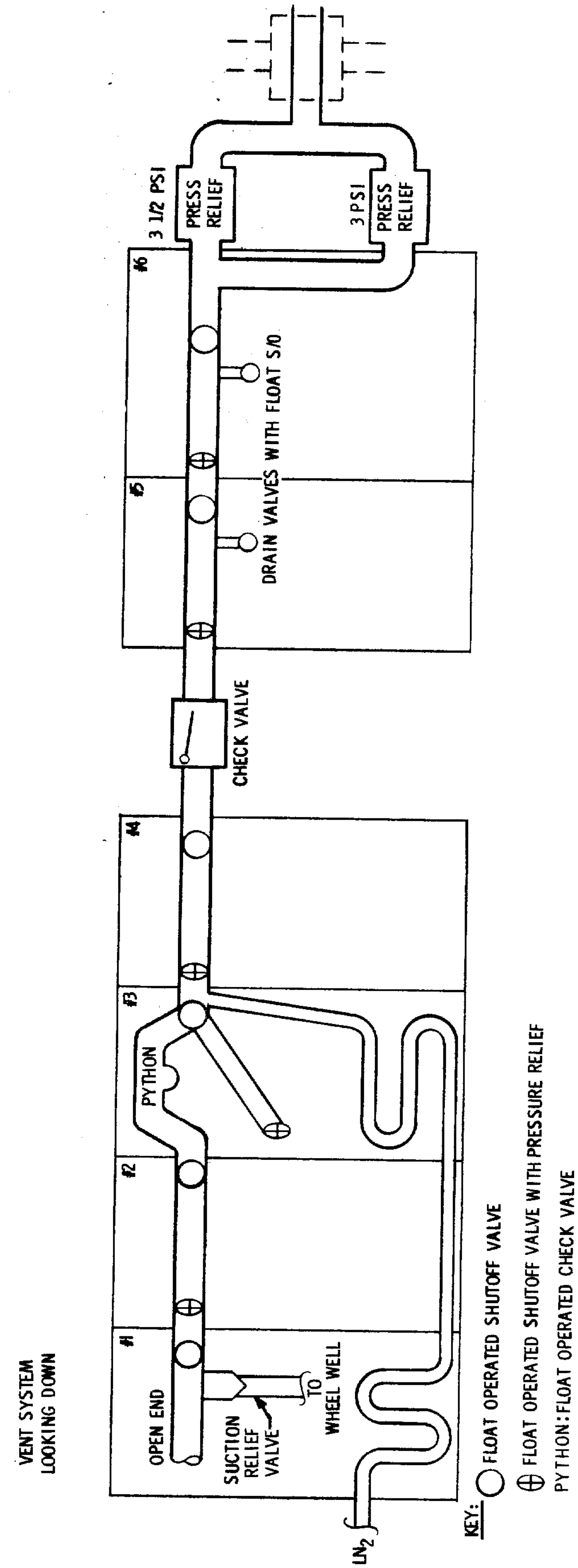


Figure 4. Vent System

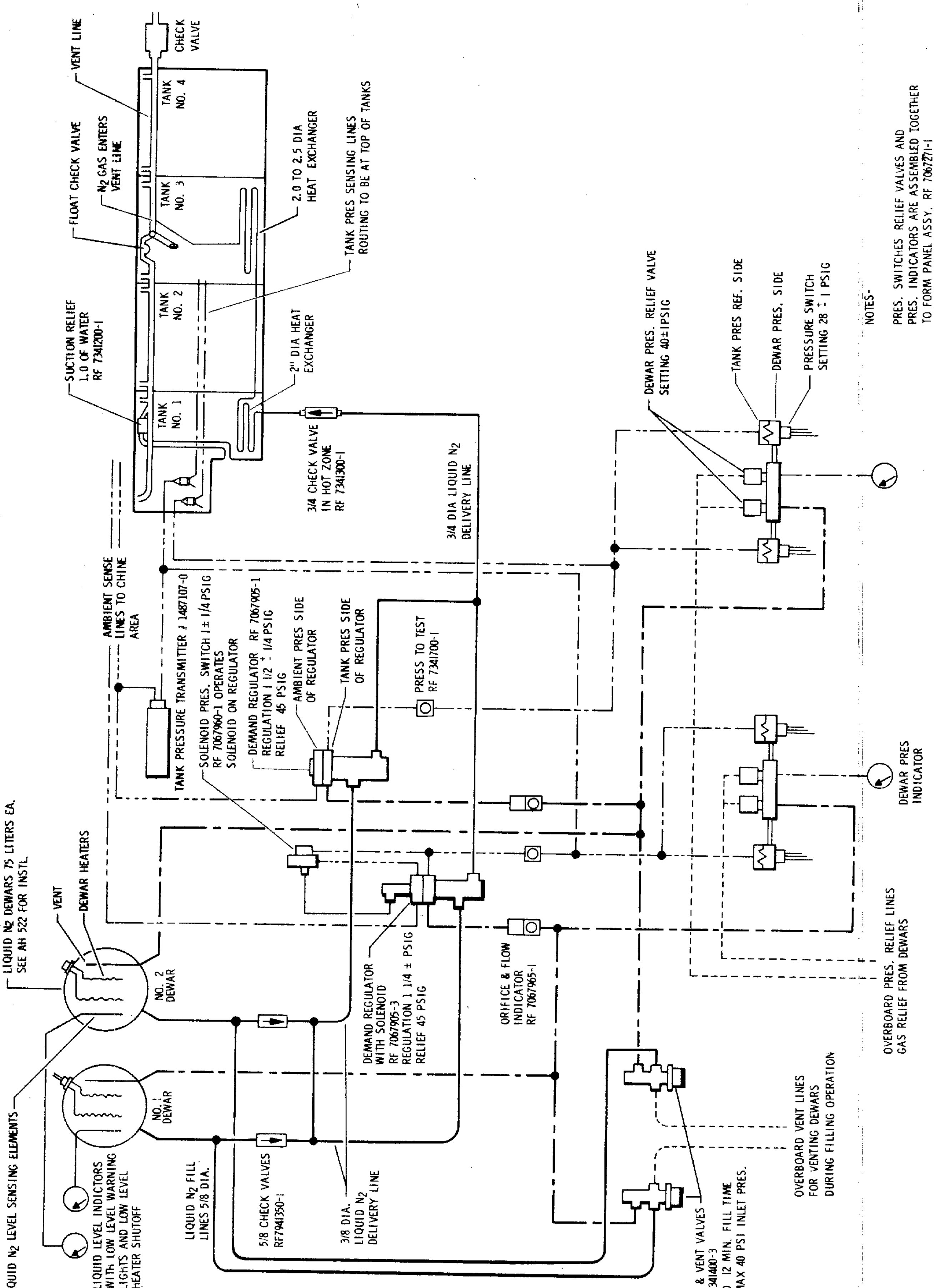


Figure 5 Inerting System

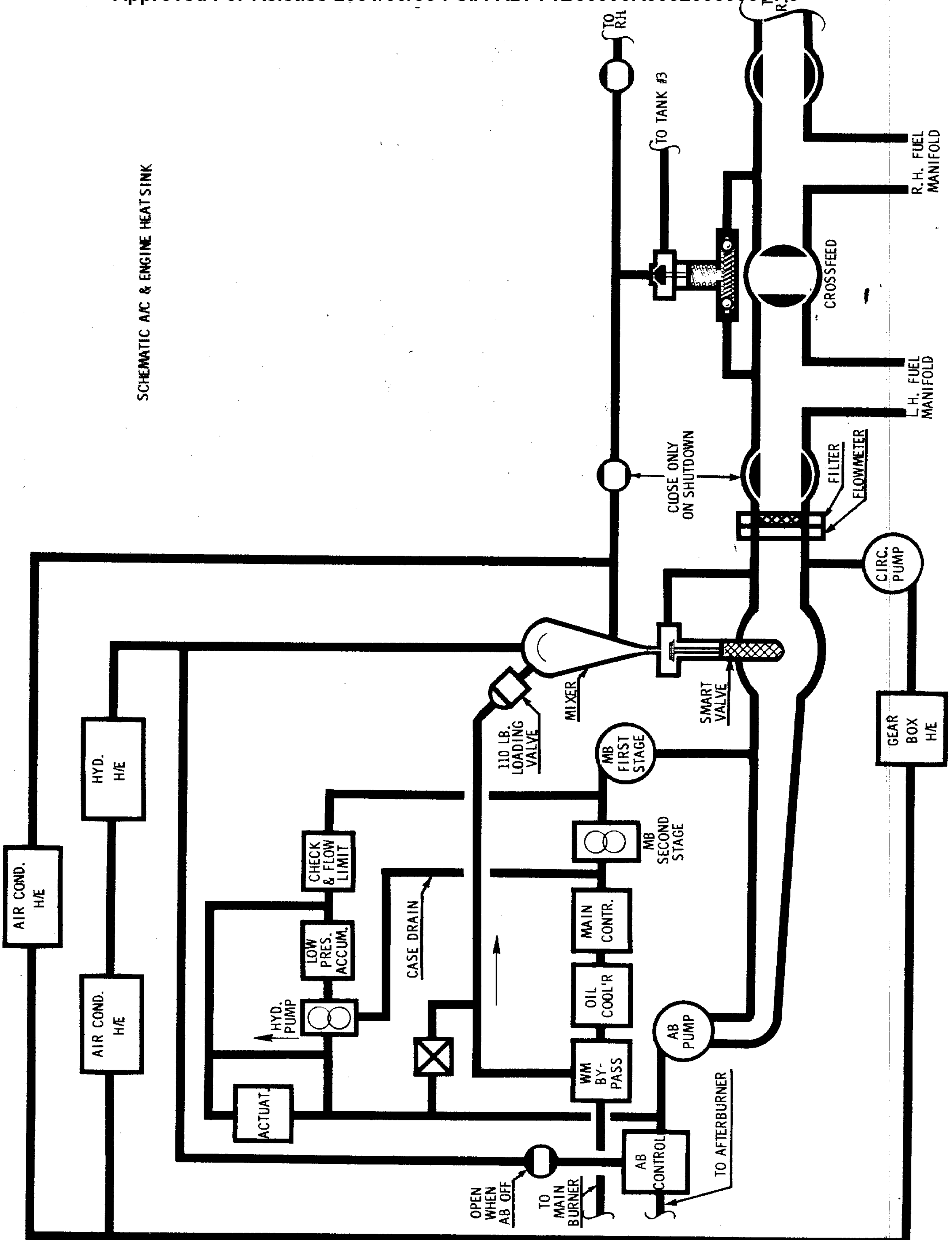


Figure 6. Heat Sink System

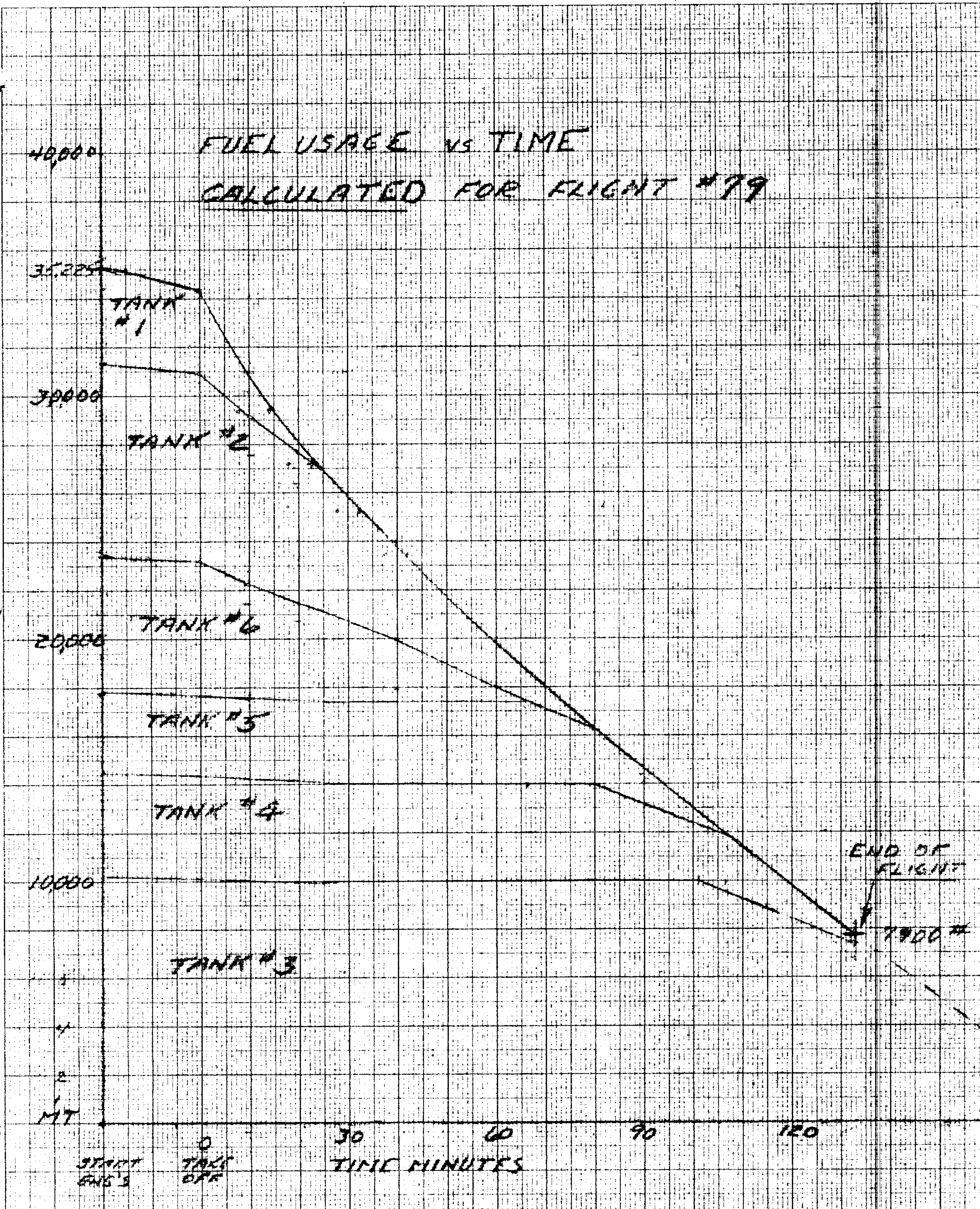

FUEL USAGE vs TIME
CALCULATED FOR FLIGHT #79
40,000
35,225
30,000
20,000
10,000
TANK #1
TANK #2
TANK #6
TANK #5
TANK #4
TANK #3
END OF FLIGHT
7900 #
MT
0
30
60
90
120
START ENG'S
TAKE OFF
TIME MINUTES

FIGURE 7

PREPARED BY KJO
DATE 3 JUN 63
CHECKED BY

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MODEL
REPORT NO.

GROSS WEIGHT VS. C.G. POSITION

S/N 123 ~ FLT. #79 ~ 24 MAY 63

ZFW = 48,796 LBS. (29.8 %) INCLUDES: PILOT, DRAG CHUTE, 200 LBS. LN_2, INS, & 550 LB. PACKAGE

FUEL LOAD:

TANK	LOAD
1	3825
2	6750
3	10,050
4	4100
5	3725
6	6900
TOTAL	35,350

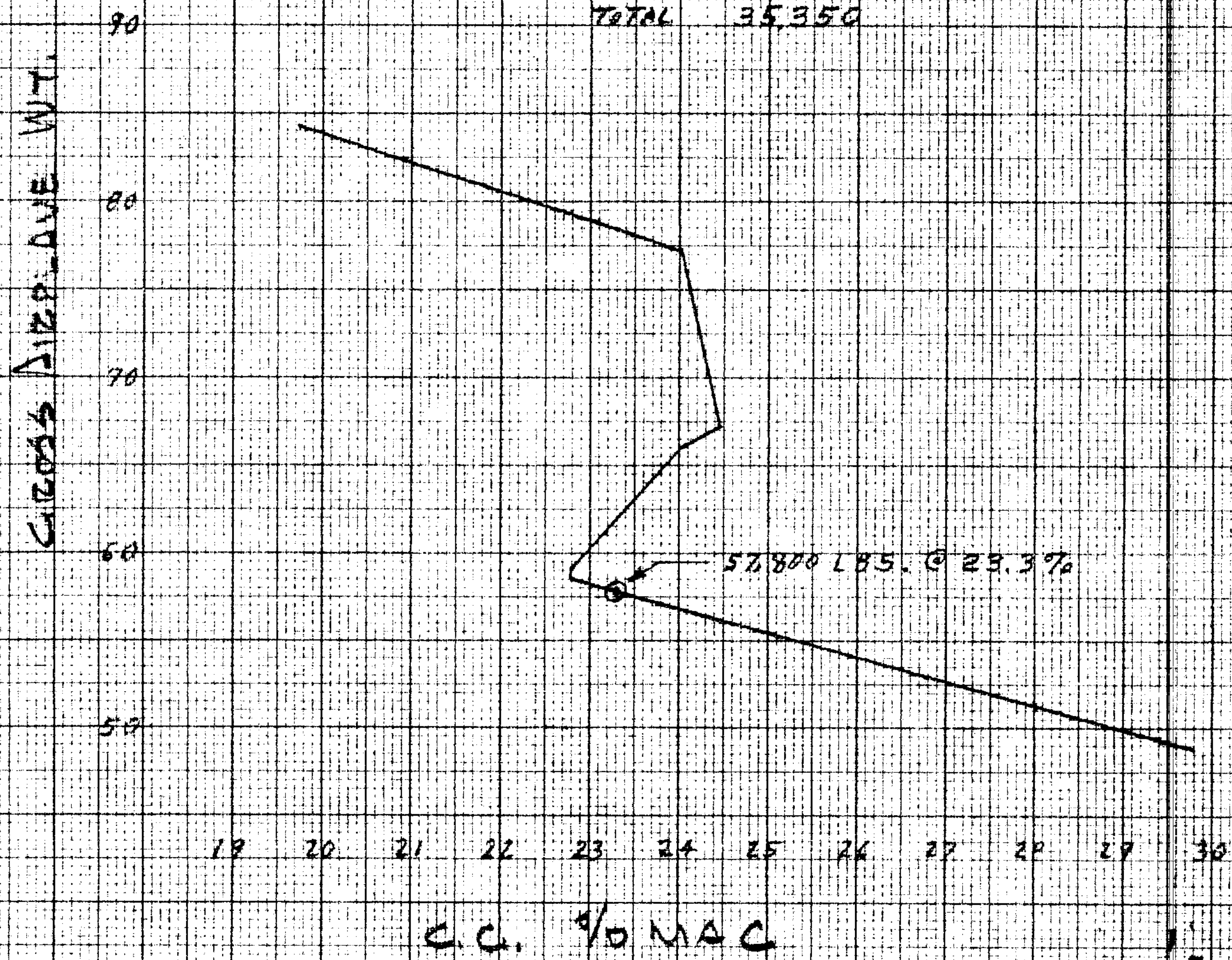

FIGURE 8

FORM 5278

S/N 121

COMPARISON OF SEVERAL SUBSONIC MISSIONS OF FUEL TRUNK LINE TEMPERATURE - TIME HISTORY

FUEL LOADING

TANK #	1	2	3	4	5	6	FLT #	T AMB @ T.O. °F	OAT
FUEL-LB	3730	6800	5900	4000	3910	11600	23	68	-64°F.
	3625	6640	5895	4245	2970	11700	26	68	-63°F.
	3600	6400	7750	4550	2580	11800	34	70	-66°F.
	4000	7000	8375	4980	3000	12300	36	68	-68°F.
	3875	6750	10025	4650	3125	6700	79	60	S/N 123

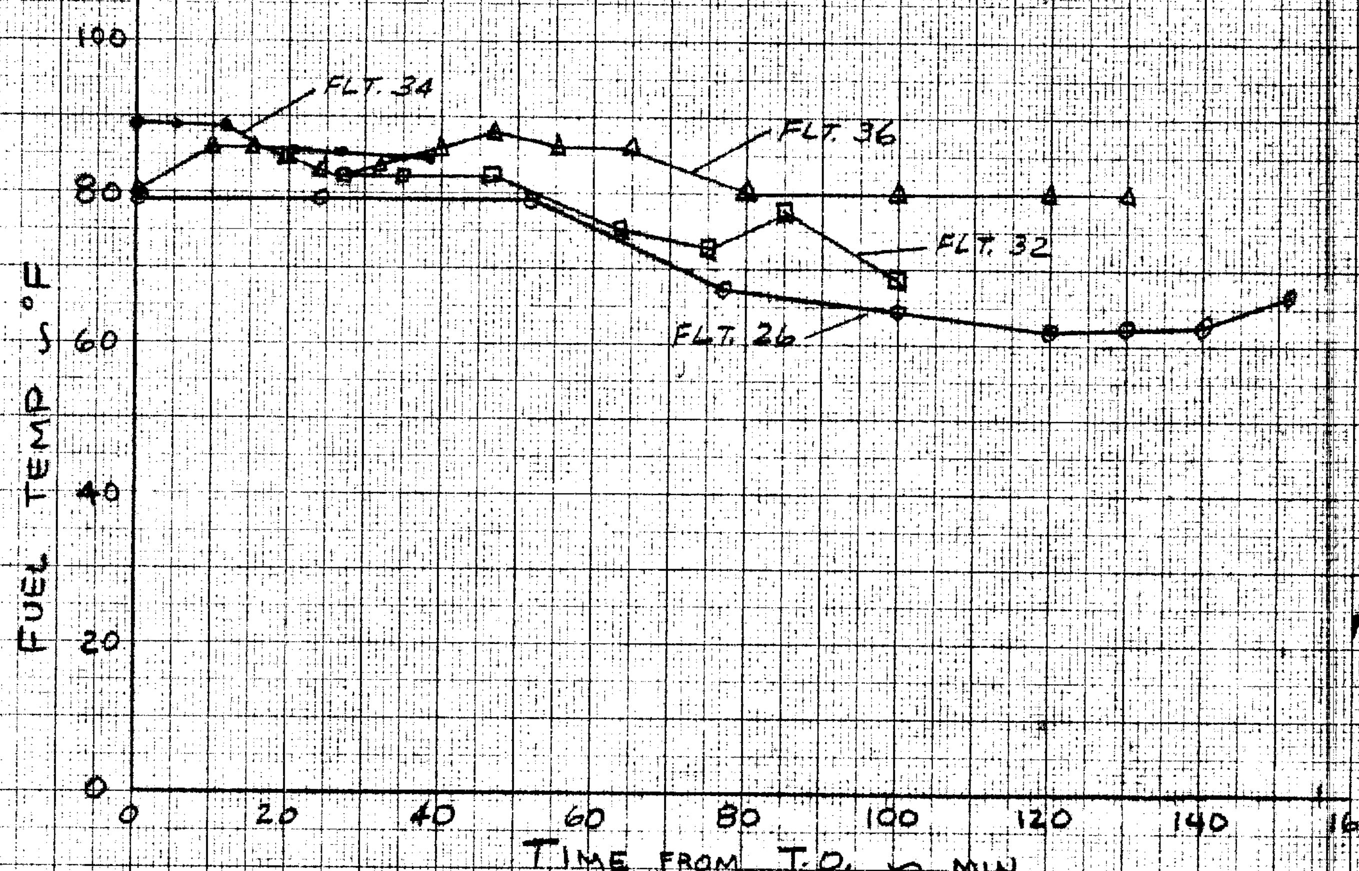

FIGURE 9

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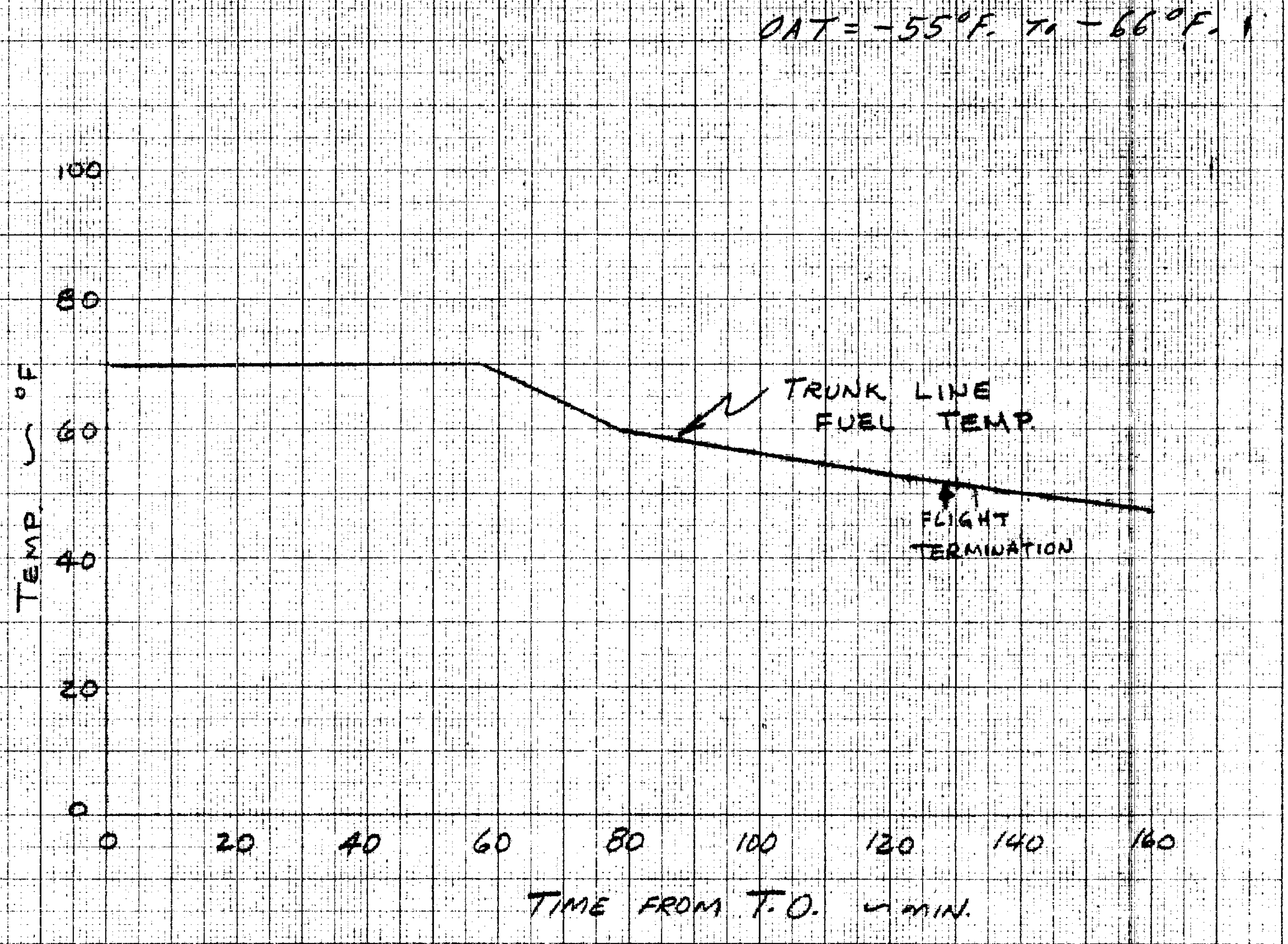
ESTIMATED FUEL TRUNK LINE TEMP. PROFILE FOR FLIGHT 79, AIRPLANE S/N 123



FORM 5278A

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FIGURE 10

ESTIMATED #5 FUEL TANK TEMPERATURE - TIME HISTORY FOR FLT. 79, AIRPLANE S/N 123

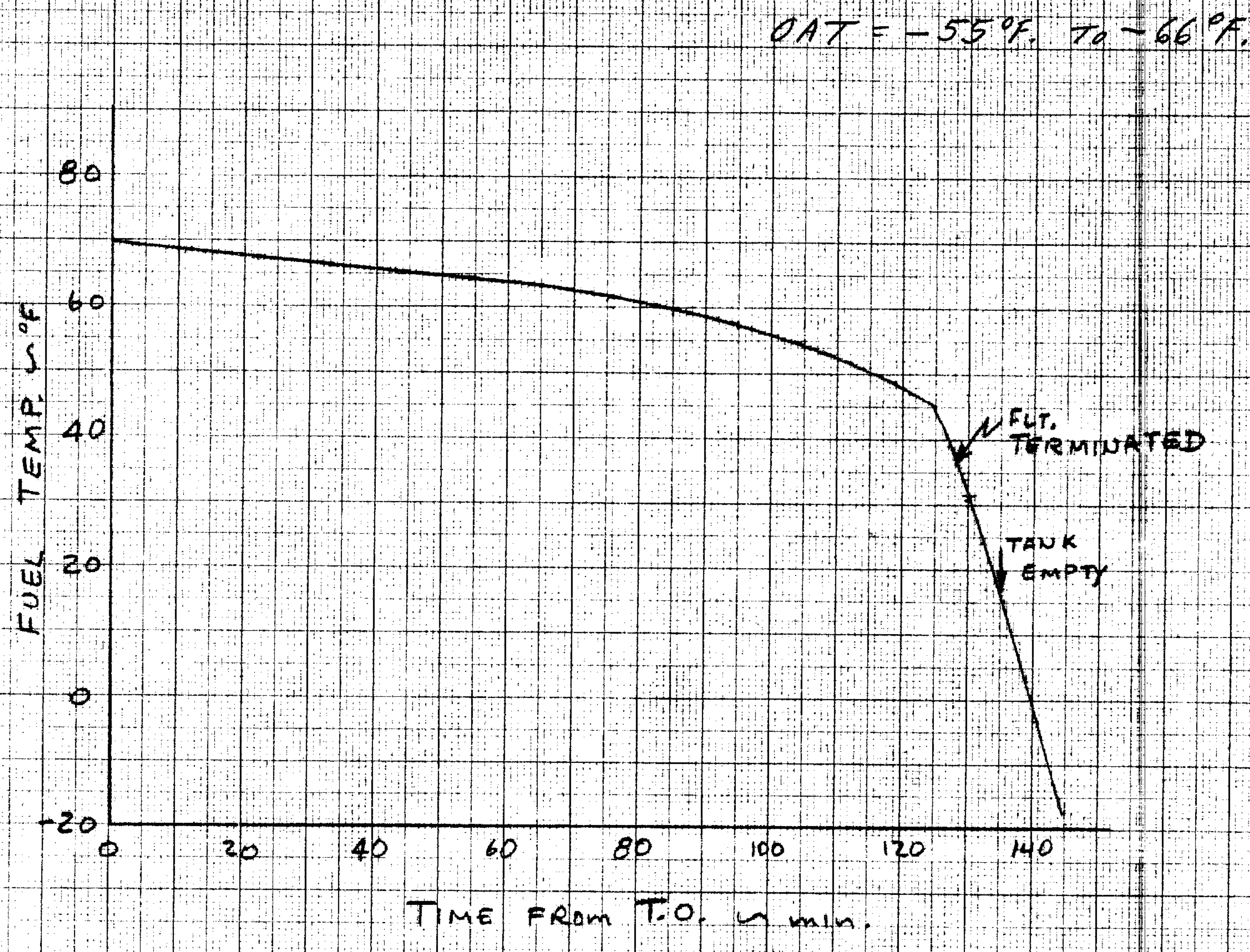

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FIGURE 13

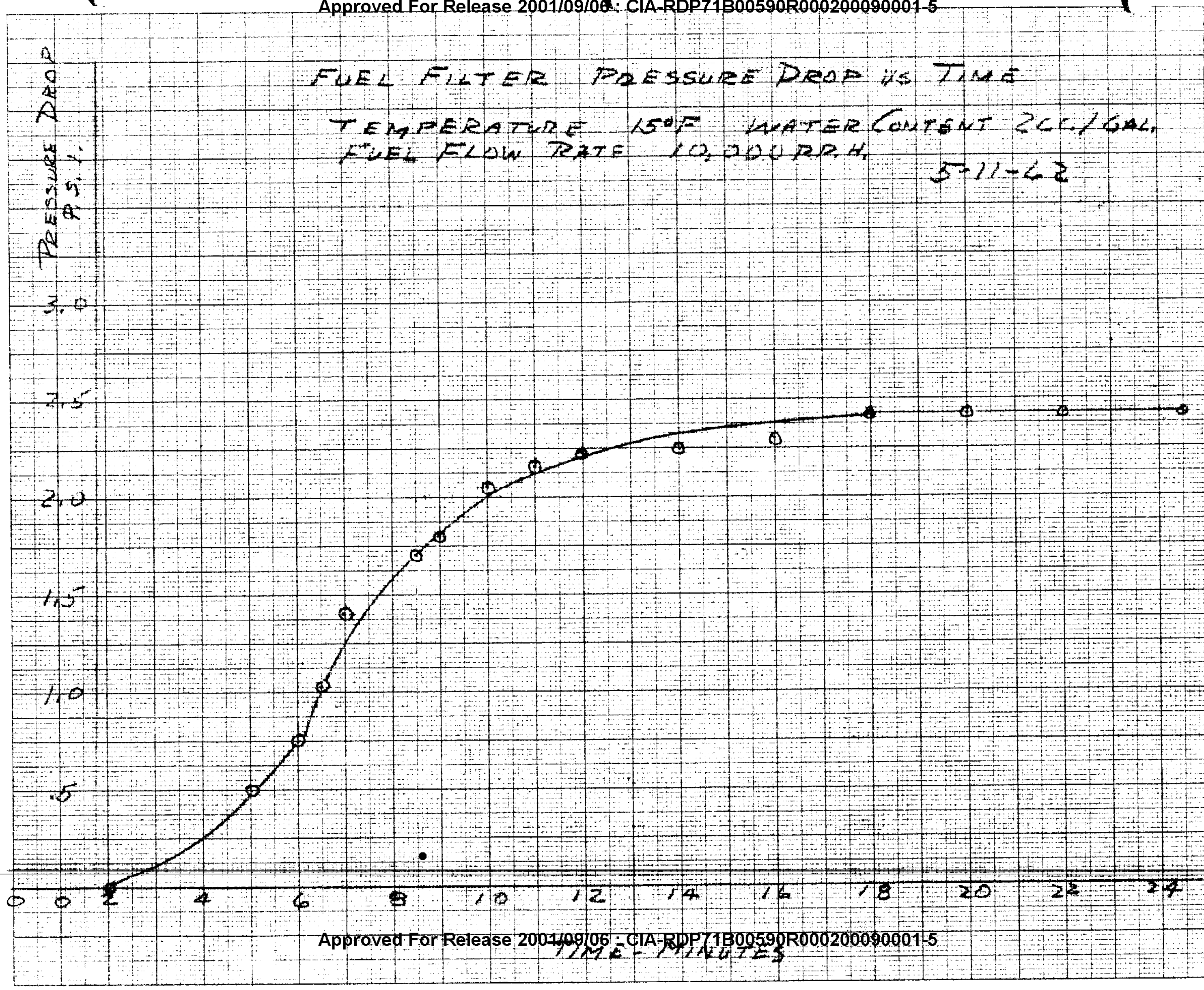

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FIGURE 14

FLIGHT

CONTROL AND

HYDRAULIC

AIRCRAFT 123 FLIGHT CONTROLS AND HYDRAULICS

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d. Findings of the Investigation.

e. Recommendations.

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a. General Description.

b. System Usage.

c. Conclusions.

d. Recommendations.

5. Figures and Photos Included:

Fig #1: Hydraulic Schematic Systems "A" and "B"

Fig #2: Hydraulic Schematic Systems "L" and "R"

Fig #3: Elevon System Mechanical Schematic

Fig #4: Rudder System Mechanical Schematic

Fig #5: Throttle Lever Calibration

Fig #6: Power Lever Position vs RPM

Photographs: Neg #:

1-1754: Cockpit Control Package

1-1755: Rudder Servo

1-1756: 6 L.H. Inb'd Elevon Cylinders

1-1757 Rudder Servo

1-1758 6 R.H. Inb'd Elevon Cylinders

1-1760: Elevon Mixer - Melted Roll Trim Actuator

1-1761: Cockpit Throttle Quadrant - Inb'd Side

1-1762: Pitch Trim Actuator

1-1763: 3 Outb'd Cylinders

1-1764: R.H. Outb'd Servo & Input Push Rods

1-1765: Inb'd Elevon Servo - Serial 1007

1-1766: Roll & Pitch Mixer Quadrants

1-1767: Inb'd Elevon Servo - Serial 1008

1-1768: Elevon Mixer

1-1769: Cockpit Throttle Quadrant - Outbd Side

1-1770: R.H. Outboard Servo & Input Push Rods

1-1771: Cockpit Throttle Quadrant - Outbd Side

3-1777: Rudder Actuators

3-1778: Rudder Actuators

3-1779: Rudder Link Attachment

3-1780: R.H. Outboard Elevon Actuators

3-1783: L.H. Outboard Elevon Actuators

3-1785: L.H. Outboard Elevon Actuators

3-1786: Rudder Actuators

3-1787: Rudder Link Attachment

3-1788: Rudder Actuator Fwd Attachment

3-1789: L.H. Outbd Elevon

Photos Taken By Aircraft Manufacturer

Hydro Pump 1	3-1935
Hydro Pump 1 - Tear Down	3-1938
Hydro Pump 2 - Tear Down	3-1945
Hydro Pump 3	3-1943
Hydro Pump 3 - Tear Down	3-1944
Hydro Pump 4	3-1934
Hydro Pump 4 - Tear Down	3-1937

FLIGHT CONTROLS AND HYDRAULICS

SUMMARY

The flight controls, servos, and hydraulic systems are described. Based upon pilot comments prior to bailout and examination of the flight control components, this system appears to have been intact and operable to the point of impact.

The control surface limiter system was correctly actuated prior to bailout; all controls were connected at impact; the hydraulic systems were running; the elevon was trimmed down 5° as explained in the Aerodynamics report; roll and yaw trim could not be determined.

The cockpit throttle controls were continuous and intact at impact. They were found fixed in the 93% RPM position. This is .75 inches from 98% RPM. The throttle friction was in the full tight position. However, throttle position could have been affected by impact.

1. Hydraulic System:

a. General Description:

(1) There are four hydraulic systems installed on the A12 airplane to provide power to the various hydraulically actuated units. Under all normal operating conditions the systems are independent of each other. All systems are closed center systems providing 3350 psi. Each of these systems is served by its own engine driven, fixed angle, variable volume, piston type pump.

(2) The "A" hydraulic system provides power to two rudder cylinders, seven outboard elevon cylinders and three inboard elevon cylinders (see Figure #1).

(3) The "B" hydraulic system provides power to the two remaining rudder cylinders, the seven remaining outboard cylinders and the three remaining inboard elevon cylinders.

(4) The "L" hydraulic system provides power to the left engine air inlet control, the landing gear (including uplocks and door cylinders), brakes, refueling system door and probe latch cylinders, UHF antenna cylinder and nose steering control (see Figure #2).

(5) The "R" hydraulic system provides power to the right engine air inlet control, to the landing gear for emergency gear retraction when the "L" hydraulic system has failed and to the brakes for emergency operation when a loss of "L" hydraulic system pressure has occurred.

(6) The hydraulic fluid used on the A12 aircraft is a highly refined petroleum base oil for use throughout the temperature range of -30° to +650° F. It is referred to as SP 302 hydraulic oil, high temperature.. It contains an anti-wear additive, Tricresyl Phosphate (TCP) and an oxidation inhibitor, Ethyl 702. The fluid has a maximum power point of -75° and a minimum flash point of 380° F.

b. After external examination all four hydraulic pumps were disassembled and examined internally, In general, no internal damage was found in any pump that could not be directly attributed to impact forces. All pumps had much sand in their inlet and outlet ports. There was also some sand throughout their internal mechanism which probably indicates that all pumps were rotating at the time of impact. A detailed description to the pumps' conditions follows:

(1) Pump number 1:

(a) Shaft broken at shear section and splide drive is internally bent and frozen.

(b) Mounting housing bent and has bulge at flange end.

(c) Mounting housing flange distorted and not perpendicular to pump.

(d) Inlet and outlet ports, thread damage.

(e) Case drain port scuff andcracked.

(f) Compensator housing has flatten or dent section.

(g) Fill port seal surface badly scuff.

(h) Angle housing and mounting flange bolt circle bent and badly distorted.

(i) Angle housing mounting surface bent, twisted approx 10°.

(j) No name plate, or serial number.

(k) Pump is not in running condition. See photographs number 3-1935 and 3-1938.

(2) Pump number 2:

(a) Pump frozen - Applied 600 #. Would not turn.

(b) Inlet port deformed - Oval shape. Outlet port torn threads.

(c) Case drain fitting deformed and mounting flange deflected.

(d) Mounting flange ribs shear, broken near flange.

(e) Angle housing to mounting housing bolts are bent.

(f) Pump serial 225933C-B-2.

(g) Compensator end cap has dent.

(h) Inlet fitting intact.

(i) Valve cock end cap has dent and scuff areas.

(j) Pump is not in running condition. See photograph number 3-1945.

(3) Pump number 3:

(a) Could rotate pump shaft manually - Took 250 in #.

(b) Shaft broken at shear section.

(c) Case drain fitting bent and mounting flange warped.

(d) Ball and inlet fitting intact.

(e) Fill port completely damage. Threads stripped.

(f) Compensator cap has dent. Bolts sheared off.

(g) Angle housing and mounting flange bolts bent several places.

(h) No nameplates, or serial number.

(i) Case drain fitting twisted and bent.

(j) Pump is not in a running condition. See photographs 3-1943 and 3-1944.

(4) Pump number 4:

(a) Mounting flange warped and deformed badly. Mount flange bent approx 5°

(b) Case drain port and thread damaged.

(c) Mounting flange ribs bent.

(d) Inlet port fitting intact. Outlet port badly mangled. Thread torn and boss O.D. caved in.

(e) Valve plate scuff and flange in part as being sheared off.

(f) Angle housing and mounting flange cuff and in part is missing.

(g) Compensator body is bent slightly.

(h) Valve block and cap bolts sheared. Cap is dented.

(i) 600 # would not rotate.

(j) No nameplate, or serial number.

(k) Pump is not in running condition. See photographs 3-1934 and 3-1937.

(5) The most significant fact pertaining to the functioning of the "A" and "B" hydraulic systems is that all four surfaces limiter stops on the rudder servos are in the retracted position. The forward stops on each assembly show no damage. One of the aft limiters has a nick out of the edge and heavy marks on the piston housing in line with the nick. Releasing the seal compression nut so that this piston could be moved manually showed no damage or visable marks. The piston slid freely in its lap fit housing. The other aft limiter piston had very minor marks, and when the seal pressure was released manual operation showed it to be in fine working condition. Because of the significance in the position in these surface limiters it can be definitely concluded that the "A" and "B" hydraulic systems were functioning properly prior to bailout. For a detailed description of the limiters see paragraph 3a(4).

c. Summary of findings:

(1) Condition of hydraulic pumps indicate that all four hydraulic systems were powered at time of impact.

(2) Position of hydraulically actuated rudder travel limiter shows definitely that full flight control hydraulic pressure was available at the time the surface limiter handle, in cockpit, was pulled.

(3) Pilot's report gives no evidence of any hydraulic system low pressure warning lights actuated prior to impact.

(4) It is concluded that there was no malfunction of the hydraulic systems and was therefore not a factor in the accident.

d. Recommendations: None.

2. Flight Controls & Aircraft Throttle Controls:

a. Elevon System.

(1) Elevon System Description (see Figure 3). The pilot input for pitch and roll is applied to a conventional stick in the cockpit. From the stick the roll motion is transmitted through a torque tube, crank, and pushrod to the roll cable tension regulator in the cockpit. From the stick the pitch motion is transmitted through pushrods and cranks to the pitch tension regulator in the cockpit. Both the pitch and roll tension regulators are designed to operate also as cable slack absorbers. Motion of pitch or roll tension regulater is transmitted through a dual closed loop cable system which is routed through the fuel tanks inside a tube on each side of the upper fuselage. The cables terminate on a pitch or roll cable quadrants located in the tail cone. From the pitch and roll quadrants the motion is transmitted through torque tubes to the mixer in the tail cone. The mixer is a mechanism of levers and links that uses inputs of pitch or roll motion or combinations of both, and converts them into a single output motion to control the elevon surface position on one side of the airplane. The mixer includes one spring for pitch and one spring for roll which produces the control stick forces felt by the pilot. The mixer has two output rods, one to control L.H. elevons and one to control R.H. elevons. These two mixer output pushrods move independently

of each other being controlled by the combination of pitch and roll input position. The mixer contains one electro-mechanical trim actuator for pitch and one electro-mechanical trim actuator for roll. The pitch trim actuator has, in addition to the pilot controlled trim motor, a second lower speed motor controlled by the autopilot or mach trim systems. Either of these motors through gearing within the actuator, drive the same jack screw which changes the extension or retraction of the actuator. The mixer output rod transmits motion to a crank on the inboard servo package. The follow-up rod from the surface is connected to the same crank but on the opposite end. This crank with the input and follow-up rods on its end is pivoted on another lever that transmits motion into the servo package and through a linkage to the dual hydraulic control valve. The dual hydraulic control valve controls the direction and rate of 6 actuating cylinders on the inboard surface, three on hydraulic system "A", and three on hydraulic system "B". A second means of surface control to satisfy the need of stability augementation and autopilot is through the use of the mod pistons within the inboard servo packages. There are three mod pistons in each inboard servo package controlled by separate electro-hydraulic transfer valves. Two mod pistons are used for pitch control and one for roll. A more detailed explanation of the operation of the servos can be found in the servo, hydraulic and electronic sections 1a, 2b(1), and 2c(1). Motion of the inboard surface is transmitted through a system of push rods, cranks and torque tubes through the inner wing, under the engine and through the outer wing to the outboard servo input lever. The second push rod in the inner wing of this transmission system is a preload spring cartridge to protect the transmission system from overload during manufacture and testing as this system is power-driven by the inboard cylinders. Motion at the outboard servo input lever is transmitted through a linkage into the outboard servo package to the dual hydraulic control valve. Position of this hydraulic control valve controls the direction and rate of the 14 actuating cylinders on the outboard surface. 7 on hydraulic system "A" and 7 on hydraulic system "B". The follow up rod is connected to the surface and to the outboard servo input lever at the opposite end from the input push rod and serves to center, the dual hydraulic control valve when the proper surface position is reached. The dual hydraulic valve in the outboard servo package includes a bias spring that loads the valve and transmission linkage to eliminate lost motion. In order to keep the outboard surface from going to the full down position in the event of a failure in the transmission the outboard servo installation includes a spring loaded cartridge set at the 2° down surface position which is capable of over powering the bias spring. To limit elevon roll control surface travel for high speed flight there is a pilot operated surface limiter control handle in the cockpit. This handle when in the forward (or on) position engages a spring loaded stop that limits control stick motion in the roll direction only. Engagement or disengagement of this stop operates electrical switches that are used in the visual warning indication for incorrect handle position. The roll surface limiter stops are connected to the rudder limiter stops mechanically and the same handle operates both.

(2) Elevon Control System Investigation.

(a) The surface limiter control handle assembly was found in the out and locked position indicating that the pilot had operated the limiter release and it was in a position to permit full surface travel.

(b) The cockpit stick and control package was found broken into many separate pieces (see photograph negative #1-1754). Because of the extensive damage to this assembly no pertinent information on the control system was gained. This assembly showed evidence that its first major impact was primarily with it moving in a forward direction and that some pieces were badly burned while other pieces of the same part showed no evidence of fire. This would indicate the fire damage to this assembly was after impact.

(c) A large section of the tubes in which the cables are routed through the fuel tanks were recovered through badly damaged. These tubes carry the cables for all cable operated systems with the exception of the nose gear steering. All cables in both tubes were accounted for and all showed tension failures except where cut with cutters or torch for removal. The fact that all cables show this type failure indicate that all the cable systems were rigged at impact. This was further verified in the case of the elevon system by the pitch and roll mixer cable quadrants which were recovered with the cable fittings in place and all 8 cables broken in tension. (see photograph negative #1-1766).

(d) The mixer was recovered in one piece with minor impact and fire damage. The roll trim actuator was melted so no roll trim position could be determined from this source. (See photographs negative #1-1760 and #1-1768). The pitch trim actuator was recovered with the movable shaft fully extended and bent. This position would be a maximum nose down pitch trim position equal to 5^{o} down of the inboard surfaces from faired. (See photograph negative #1-1762).

(e) Both inboard servos were recovered. The R.H. servo was apparently torn from its installed position and has remains of all four push rods still connected. The L.H. servo was removed from its installed position although broken from its mounting. In this case three of the four push rods were still connected and part of the fourth rod end remained with the crank. (See photograph negatives #1-1765 and 1-1767). The indication is that the eight push rods fastened to the inboard servo packages were all connected at impact.

(f) All the push rods, cranks and torque tubes forming this connection between the inboard surface and the outboard servo that could be checked were either still connected or had been torn loose at impact.

(g) An attempt to determine elevon surface position at impact was made by examination of the linkage between the inboard surface and the outboard servo. Because this system is directly connected to the inboard surface, and is the controlling linkage to position the outboard surface, it should provide good surface position information if a positive location can be established for some part of this linkage at impact. The R.H. outboard torque tube in the nacelle shows a well defined flat spot where it passes through a heavy structural member. If it is assumed this flat spot was produced at initial impact, which is likely, the R.H. inboard surface calculated to have been at $5\frac{1}{2}^{\circ}$ down. The R.H. outboard surface would have been at $2\frac{1}{2}^{\circ}$ down as the outboard surfaces are rigged 3° higher than the inboard. This spot also exists on the L.H. torque tube, however, the position is not so easily checked because this torque tube was cut with a torch to facilitate moving and the crank remaining on end of the torque with the flat spot was damaged at impact. It is possible that the alignment can be established across the torch cut to the remaining good crank and a position obtained.

(h) Both outboard servo packages were recovered in place in their installed position with little apparent damage. The push rods connected to these packages were either still connected or torn loose at impact.

(3) Elevon control system conclusions.

(a) The surface limiter release handle had been pulled and was in a position for low speed flight.

(b) Fire damage to the cockpit control package occured after impact.

(c) All the cables in this system were connected at impact.

(d) The pitch trim motor position indicated maximum nose down trim.

(e) The mechanical connection between the inboard and outboard servos was apparently still intact at impact.

(f) An indication of R.H. surface position was found that seemed to verify the pitch trim actuator position if it is assumed no roll trim existed.

(g) Hardware recovered showed no evidence of malfunctioning or that the elevon control system was a contributing factor to the accident.

b. Rudder system.

(1) Rudder system description (see figure 4). The pilot input to the rudder servos is taken from conventional rudder pedals through tension

rods to a cable tension regulator in the cockpit. From the cable tension regulator the motion is transmitted through two closed loop cable systems, one for each rudder, to a terminal quadrant in each wing just in board of the nacelle. From these terminal quadrants the motion is transmitted through torque shafts and pushrods to the servo input levers in the fins. The trim actuators which include the feel springs and trim position transmitters are connected in parallel with the pilot. The rudder trim and feel spring assembly is supported such that all its loads are reacted through a shear pin. In the event either trim actuator should seize, the resistance from that actuator can be removed by applying sufficient rudder pedal force. Motion from either the pilot or the trim actuator is transmitted from the servo input lever into the rudder servo package. This motion is then carried through levers and rods to the dual hydraulic control valve which controls the direction and rate of the surface actuating cylinders. There are two cylinders on hydraulic system "A" and two cylinders on hydraulic system "B" for each rudder. From the actuating cylinders the motion is transmitted through an intermediate crank and link to the rudder surface. The motion of the intermediate crank is also used to drive the follow-up rod which centers the dual hydraulic control valve when the proper surface position is reached. A second means of surface control, to satisfy the need of stability augmentation is through the dual mod. piston in the servo package. One mod. piston is on hydraulic system "A", the other is on hydraulic system "B" and each is controlled by separate electro-hydraulic transfer valves. The electro-hydraulic transfer valves receive electrical control signals from the stability augmentation system. These electrical signals are used to control hydraulic flow to the mod. pistons. Motion of the mod. pistons is transmitted through a linkage to the same dual hydraulic control valve actuated by the pilot or trim actuator. To limit control surface travel for high speed flight there is a pilot operated surface limiter control handle in the cockpit. This handle when in the forward (or in) position restricts the movement of the rudder pedals and cable tension regulator in the cockpit. Movement of the control handle also operated three electrical switches used in the circuits to control the servo surface limiter solenoid valve and the visual warning indication for correct handle position. The rudder limiter stops in the cockpit are mechanically connected to the roll stops on the stick and the same handle operates both.

(2) Rudder control system investigation.

(a) Recovered parts of the cockpit control package were broken in many pieces and obviously scattered at impact. The surface limiter handle was in the retracted-position (see photograph negative #1-1754)

(b) A long section of tube through which the rudder cables pass on their routing from the cockpit to the main gear wheel well was recovered. These tube section were extensively damaged but still contained all the cables routed through them. All of the cables in these tubes show tension failure which indicates the rudder cables as well as the cables in the other systems were connected at impact.

(c) Parts of the control system from the fuselage through the main gear wheel well and nacelle were examined but due to the amount of damage to these parts no significant information was obtained.

(d) Both rudder servo packages were recovered with pilot input, trim actuator and follow-up rods either still connected or showing evidence of being torn loose at impact. (see photograph negative #1-1755). The hydraulically operated surface limiter pistons were all found in the retracted or the full surface travel position. The position of these stops serve to verify the surface limiter handle position found.

(e) The rudder actuating cylinder assembly with the intermediate crank (gudgeon arm) in place and both in a position corresponding to an almost perfectly faired rudder.

(3) Rudder control system conclusions.

(a) The surface limiter handle was out at impact.

(b) The cable systems were connected at impact.

(c) All push rods and trim actuators were connected to the servos at impact.

(d) The servo stop piston positions indicate this system was functioning at least until the cockpit release handle was pulled which should have been below Mach .50.

(e) The rudders were both faired at impact.

(f) From the hardward recovered the indications are that the rudder control system was functioning normally and was not a contributing factor to the accident.

c. Aircraft throttle control system.

(1) System description: The aircraft throttle control system originates in the cockpit throttle quadrant assembly which is located in the left hand side console. This assembly contains two cable tension regulators attached to the pilot's power levers. This assembly includes

a third lever used to vary the throttle system friction and also includes the water injection, landing gear warning and afterburner switches. The cables are attached to the tension regulators and form a single closed loop system for each engine. The cables are routed from the cockpit thru the fuselage out the main gear wheel wells to the nacelle area where they terminate on a cable quadrant. This quadrant is mounted on a short torque tube which actuates the engine fuel control thru a bell crank and push rod linkage.

(2) Throttle control system investigation.

(a) The cockpit throttle quadrant assembly, with considerable impact damage and some fire damage, was examined and found to have evidence of tension regulator position imprinted on the package cover from the initial impact on this item. The path of this assembly when it struck whatever item caused the initial damage, with reference to itself, was primarily outboard with some forward direction. The manner in which the cover was wrapped around the tension regulator did not move after this major impact. However, it cannot be positively said that the throttle quadrants did not move in the process of this assembly being torn from its mounting. (See photograph negatives #1-1761, 1-1769 and 1-1771). The position of the regulator referred to above would put the left hand throttle lever in a vertical position and the right hand lever was noted to be slightly forward of the left hand lever. This side of the quadrant assembly was burned and the cover missing and no imprints of the tension regulator were available for reference. For the sake of investigation, It is assumed that the left hand or outboard position is the most significant.

The position of the left hand tension regulator in the vertical position locates the cockpit power lever approximately 29° forward of the idle position. This would position the fuel control lever on the engine at approximately 64°. (see figure 1). This fuel control lever position (from flight test data on S/N 121 F-23 T-24 10 July 1962 J-75 engines) would result in engine RPM of 93% (see figure 2).

(b) The throttle friction lever was approximately 30° forward of vertical or full on.

(c) The tension regulators were found jammed due to impact in a normal regulating position and with all the cable balls still connected. This would indicate that both cable systems would have had to be complete otherwise these regulators would have been found in a position of full regulation.

(d) All of the aircraft linkages that could be identified from the engine section showed no evidence of damage prior to the accident.

(3) Throttle control system conclusions.

(a) A cockpit quadrant assembly lever was recovered jammed in a verticle position which in a normal system would result in a fuel control power lever position of 64°. However, it cannot be positively stated that it did not move during impact. It is worthy of note that one engine fuel control was found with the external lever at 62°.

(b) The throttle cables were connected before impact.

(c) The hardware recovered showed evidence that it was functioning properly and that the throttle system was not a contributing factor to the accident.

3. Flight control components.

a. General description.

(1) The flight control surfaces are powered by hydraulic servos (operating with 3350 psi high pressure and 140 psi return) at each of the six moveable surfaces; two rudder, two inboard elevons and two outboard elevons. All flight direction and stability augmentation is performed by these six servos. All servo power is dual. Each system is supplied by a separate hydraulic pump. Each system has the capability of completing the mission as each operates independent of the other. Levers and links are duel where possible. Where doubling up is not possible, high margins of safety are used. Most pin joints are dual and are retained in position in most cases by two separate and independent methods.

(2) The servo valves are of single spool design with each hydraulic system occupying one half of the spool. The mechanical input signal to the valves is by rotary motion through a carbon-ring seal to internal lever submerged in return hydraulic fluid under 140 psi pressure.

(3) The stability augmentation system (SAS) is a dual electro-hydraulic. It is part of each servo valve assembly except the two outboard surface servos which receive their SAS signals through mechanical connection to the inboard surfaces. The rudder servos have two electro-hydraulic transfer valves one on each hydro system ("A" and "B"). The inboard elevons have three valves on each servo. Two valves are paired up for pitch augmentation, one on hydro system "A" and the other on "B". The third valve on left and right servos is for roll augmentation. Single valves on roll were used because adequate roll correction could be made

with either right hand or left hand surfaces. The transfer valves cause hydraulic flow to move separate pistons and linkage within the servo package. This linkage is submerged in the return oil. Motion of these pistons adds to or subtracts from any pilot motion on the internal summing lever. The stroke of these pistons or of levers is limited so as to limit the authority of the SAS. Closing of the servo loop around each piston to the transfer valve is accomplished by linear voltage differential transformers (L.V.D.T.). Each mod piston has one L.V.D.T. except the roll where 2 L.V.D.T's are used on each because of the malfunction comparision system. A solenoid operated shut off and bypass valve normally in the off or bypass position unless the SAS system is on, form a part of each transfer valve. By comparison of the positions of the modulating pistons as sensed by the L.V.D.T. for any axis on either hydraulic system, a malfunction from any cause is made to open the circuit of the affected or malfunctioning system. Opening the circuit places the transfer valve in bypass allowing that mod piston to return to its spring loaded neutral position. The other system is left operating in a normal manner with no loss of control.

(4) Because of the design of the rudder servo travel limiters their position can tell a very definite story. To understand their operation a detailed description follows: The travel limiters at each rudder servo are two hydraulic actuated pistons with limited travel. They form stops for the rudder servo summing lever and contact the lever above the follow up link attachment. This position is necessary first so that lever contact with the stop is able to shut off the servo valve. Second its position must be such that it knows the sum of the surface angle instigated by SAS and that added by the pilot. The sum of which are not to exceed 10° by any combination. The size of these pistons must be such that they cannot be over powered by

the pilot, SAS, or any combination thereof as long as the limiter handle in the cockpit is pulled out. The design of the cylinder is such that at all times the rod end is under full hydraulic pressure, i.e. no valve is in this pressure supply line. The other side of the piston receives its full hydraulic pressure through a normally open solenoid valve of "micro seal" design. Excitation of the solenoid is necessary for retraction of the cylinder. This opens the large side of the piston to return. Because of the friction exerted by the bar "X" dynamic seals, full hydraulic pressure is usually required on the rod end to retract the stop. The limiters on the left rudder servo are on the "A" hydraulic system, the stops on the right on the "B" system. Electrical wiring to each servo is separate running down the left side of the aircraft and energized by separate switches acutated by the limiter handle in the cockpit. This arrangement of components was selected to give maximum safety in case of single electrical or hydraulic failure. Since with no stops on one side do to single hydraulic failure, surface stops on the other rudder leaves the airframe in a safe condition because of loss of available hinge movement on both rudders.

(5) Actuating cylinders: Each rudder stub fin contains four hydraulic cylinders all alike. Diagonally opposite cylinders are on one hydraulic system. The installation on each rudder is identical. One hydraulic system on each rudder is capable of producing full required hinge moment. The two systems together give twice the required amount. This necessitated the previously covered surface limiter stops (para 5a(4)). These cylinders act on a torque member with connecting arm. A link between this arm and the surface causes the surface to move. The inboard elevon surfaces are driven by six cylinders arranged in three banks of two each. One cylinder of each bank is on system "A" and the other on system "B". The outboard elevon

surfaces are driven by fourteen cylinders at each surface. Alternate cylinders taking their hydraulic flow from hydraulic system "A" and "B".

(6) Filtration: To protect the servo valving from foreign particles of harmful size, all servos have ten micron filters on the pressure supply on each hydraulic system. On the elevons ten micron filters are used between the cylinders and the valving to protect against any particles that may be built into the hydraulic lines or enter the system while servicing cylinders. The rudder package, having fewer cylinders and a single piece of brazed plumbing which is ultrasonically cleaned, has no filters between the cylinders and servo valving.

(7) General schematic diagrams of the servos are shown on figures 3 and 4.

b. Servo system hardware investigation.

(1) The servo valve packages varied greatly in degree of damage, some looking like new equipment.

(a) The rudder valve packages were each broken apart at the face of the main manufacturing joint. Internal links between the two halves were broken at the ends or in the main portion of the link. Transfer valve damage varied and three out of four L.V.D.T. coil sections were off. The servo package input summing levers were in place and input cranks still moveable. All joints and pins were intact although follow up links were torn free. Surface limiter pistons were in the retracted position and operable. The solenoid valves that energize the limiter stop were intact, except for electrical connectors (see photograph negatives #1-1755 and 1-1757).

(b) The inboard elevon servo valve assembly for the right hand surface was broken free on impact. All four pin joints that connect input, follow-up and controls leading to the outboard surface were still intact.

The pitch SAS spring cartridge with its L.V.D.T.'s was broken free from the main body at the assembly joint. The three transfer valves were intact. Electrical connectors were intact although tubing protecting the wiring to solenoid portion of valve was destroyed. Transfer valves may be operable after any electrical shorts caused by physical damage are removed. (see photo 1-1767).

(c) The inboard elevon servo valve assembly for the left hand surface was still in place although broken free from its main shear support. The four mechanical input and output rods attaching to it had to be removed to remove the servo from the surface. The assembly is in generally good condition. The pitch spring cartridge assembly was racked out of position at the assembly joint. (See photograph negative #1-1765).

(d) The right hand outboard elevon servo was in place; the followup rod to the surface was torn free at the summing lever and the input rods were still intact. The servo showed very little external damage. Internal damage is not known at this time, however, it is felt that this unit is still operable. (See photograph negative #1-1764).

(e) The left hand outboard elevon servo was completely intact at all points and looks like a new unit. It is felt that except for some unknown internal damage the servo will be operable when placed on the test bench. (See photograph negative #3-1789).

(2) Actuators and supporting structure varied greatly in degree of damage. Fifty percent of the actuators appeared to be in first class condition.

(a) Each rudder actuator support structure was broken apart forward of the main actuator torque arm. The arm was in the surface faired condition held in place by the aft two actuators which were in place between their respective structural members. All actuator attachment pins were still inplace at time of impact. (See photograph negatives #3-1777, 3-1778 and 3-1788).

(b) Actuators for the right hand inboard elevon were still in place. All trunion pins were still in place. Several of the actuators had come free at the surface attachment. The outer two cylinders were exposed to the highest heat during fire after impact.

(c) Actuator for the left hand inboard surface were all in place. All pins were intact and the cylinders were in very good condition. All these cylinders were in operating condition. (See photograph negatives #1-1758 and 1-1756).

(d) Actuators in the right hand outboard surface were all in place. Some were broken in various ways due to structural damage at the inner end. The outer half were in good condition. All pins were in place. The outer portion of cylinders were in functional condition. (See photograph negatives #3-1780 and 1-1763).

(e) Actuators in the left hand outboard surface were all in place. One actuator near the center had the bracket on the movable surface torn free due to impact. All other actuators appeared to be in good working condition. (See photograph negatives #3-1783, 3-1784 and 3-1785).

(3) Rudder to actuator attachment through the actuating arm and link showed that links had been torn from rudder by fitting attachment failure. However, pin was still in place. (See photograph negative #3-1779). The other rudder had the link still in place. (See photograph negative #3-1787). In both cases the other end is torn free by failure of actuating arm.

c. Maintenance history shows that three transfer valves were replaced on this article. In December 1962 a rudder valve was replaced at time of check out. In February 1963 a valve was replaced because of null shift.

On 1 May 1963 a valve was replaced because it could not be nulled. No mandatory service bulletins are outstanding.

d. The findings of this investigation shows that:

(1) The servo packages with all their attachments were intact at time of impact.

(2) The actuators were all intact and properly attached at time of impact.

(3) The pilot reported no SAS force feed back at any time of the flight, which would indicate a servo problem in flight.

(4) The pilot reports no unusual aircraft yawing or pitching movements until the last moment.

(5) The pilot reports no unusual stick forces at any time of flight.

(6) All evidence indicates that the stability augmentation system was functioning properly as well as the manual controls.

(7) It can be concluded that the flight control servo systems did not contribute to the accident.

e. Recommendations: None.

4. Flight Control Electrical Components.

a. General Description:

(1) The automatic flight control system for the A-12 airplane is made up of an autopilot, stability augmentation, air data computer, LG55 gain scheduling, and mach trim.

(a) The stability augmentation system controls the vehicle by means of rate sensors thru series servos directly controlling the surfaces. The SAS electronics is designed to have three redundent channels with a logic monitor system to detect a failed channel and desengage the appropriate servo. The hydraulic servos are also monitored on a comparative basis only to disengage a failed hydraulic channel. The roll axis has no logic failure detection but has separate systems for left and right aileron operation. The gain of all three axis channels are scheduled by means of an LG55 pressure transducer having three pitot-static and three static sensors to position signal gain potentiometers.

(b) The mach trim subsystem is operable when the pitch autopilot is disengaged and the vehicle is on SAS control. This system receives its command from the air data computer mach output and drives the auto-trim actuator to command up elevation proportional to the increase in mach number. The only control of this required by the pilot is through an on-off circuit breaker in the cockpit.

(c) The autopilot portion of the AFCS is designed to provide pilot relief by means of hold modes in pitch and roll attitudes. Selection of heading and mach hold are available by separate switch engagement at the descretion of the pilot. An auto-nav mode is also incorporated and receives the required information from the inertial navigation computer. The signals produced by the autopilot control the vehicle by summation into the SAS electronic servo amplifiers and hydraulic series servos. The autopilot system incorporates an emergency disengage switch on the pilot's control stick to disengage the A/P and revert to SAS operation only. A control stick command switch (CSC) temporarily reverts to manual operation as long as it is depressed. When the switch is released the autopilot is automatically reengaged at the existing vehicle attitude. The two active channels in all three axis are supplied by separate electrical and hydraulic power. The third monitor channel in the pitch and yaw axis is supplied by a third electrical power source. While on pitch autopilot the mach trim feature is automatically synchronized and an automatic trim mode takes priority.

(d) The air data computer is operated by the total and static pressures received from one of the dual sensing probes and converts this information to electrical outputs for the autopilot gain scheduling and mach hold command inputs.

b. System usage inflight (airplane 123): Prior to the loss of control of the vehicle, the stability augmentation system and the autopilot were in continuous usage. The A-12 had completed one triangular inertial navigation system test course and was two-thirds around the second. Between legs the autopilot was engaged and was steering the aircraft on the auto-navigation mode, receiving steering signals from the INS for this purpose. As each check was passed, the pilot depressed the CSC switch (Control Stick Command) causing the autopilot to revert to its synchronization mode. This retains stability augmentation, but upon release of the CSC switch the autopilot is reengaged. At no time during the flight did the pilot utilize the "Mach Hold" mode of the autopilot. Pitch attitude, and therefore airspeed, was controlled by making small changes in the position of the autopilot trim wheels. Upon reaching the Wendover check point, the pilot retained the use of the autopilot, using the CSC switch to enter the turn. Changes from CSC to autopilot attitude hold to CSC were made several times during the turn and rollout. At the time of loss of control, the CSC switch was depressed and the pilot was manually controlling the aircraft with the aid of the stability augmentation system. At no time did the pilot report a warning light on the AFCS function selector panel. Switch from autopilot to CSC was made without difficulty and no aircraft trim problems were reported. As the aircraft stalled and rolled over, the autopilot modes switches would automatically disengage at 50° of bank leaving only the stability augmentation system engaged.

c. Conclusions: The automatic flight control system functioned satisfactorily during the entire flight, and the stability augmentation system was engaged when the vehicle struck the ground.

d. Recommendations: None.

5. Figures and Photos: See Table of Contents.

Earl Johnson
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Automatic Flight Control Engineer

Vic Sorensen
VIC SORENSEN
Control Design Engineer Mechanical

Robert Rapp
ROBERT RAPP
Control's Design Engineer Hydraulic

Bert MacMaster
BERT MACMASTER
Aerodynamics Engineer

OXCART SECRET

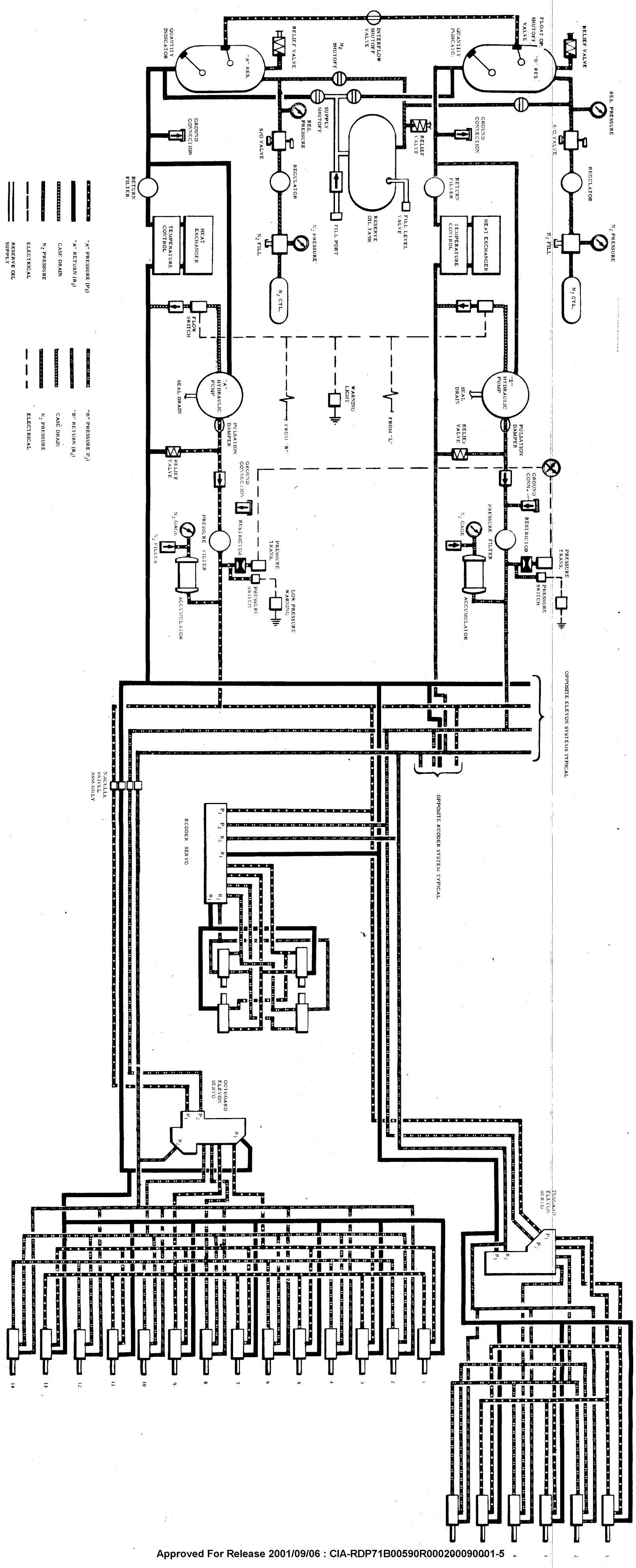

Figure 1. Hydraulic Schematic Systems "A" and "B".

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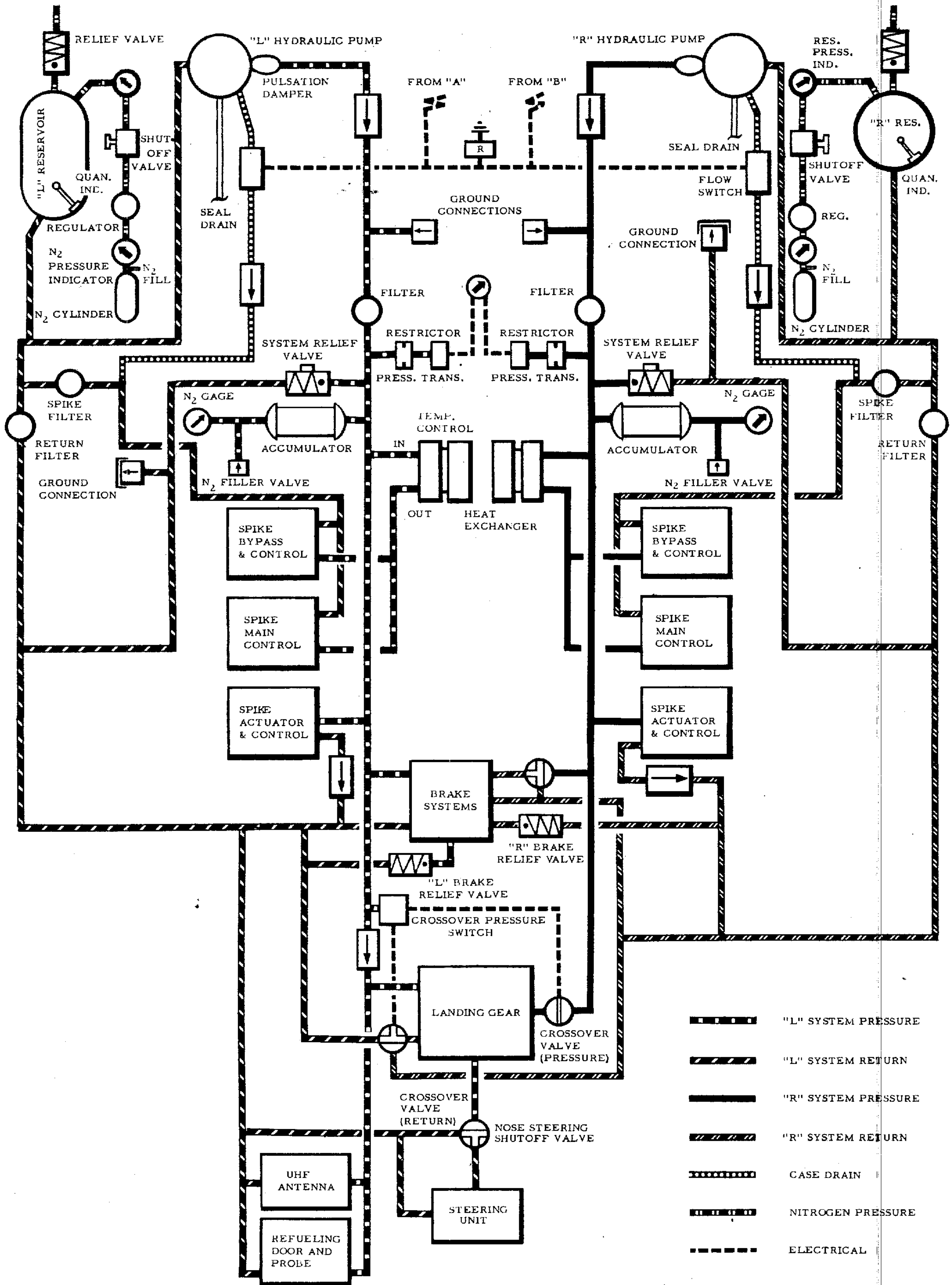

Figure 2 Hydraulic Schematic
Systems "L" and "R"

Fig #3

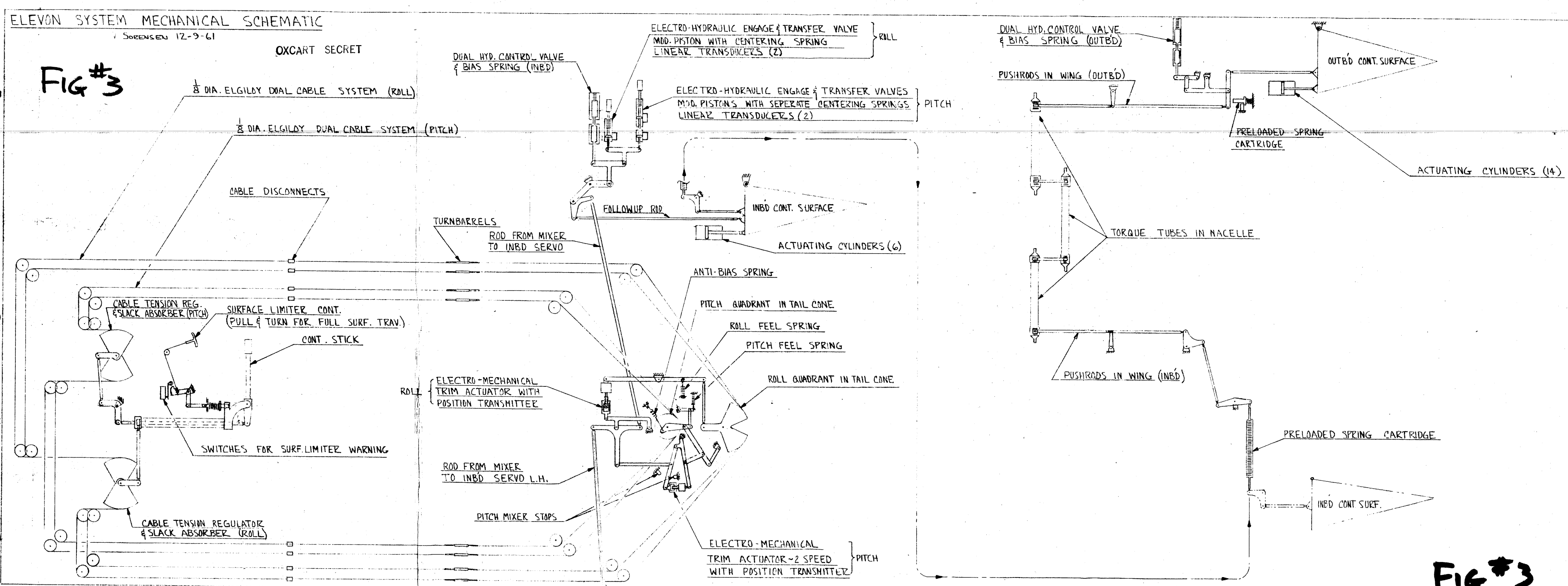

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Fig #3

RUDDER SYSTEM MECHANICAL SCHEMATIC

V SORENSEN 12-5-61

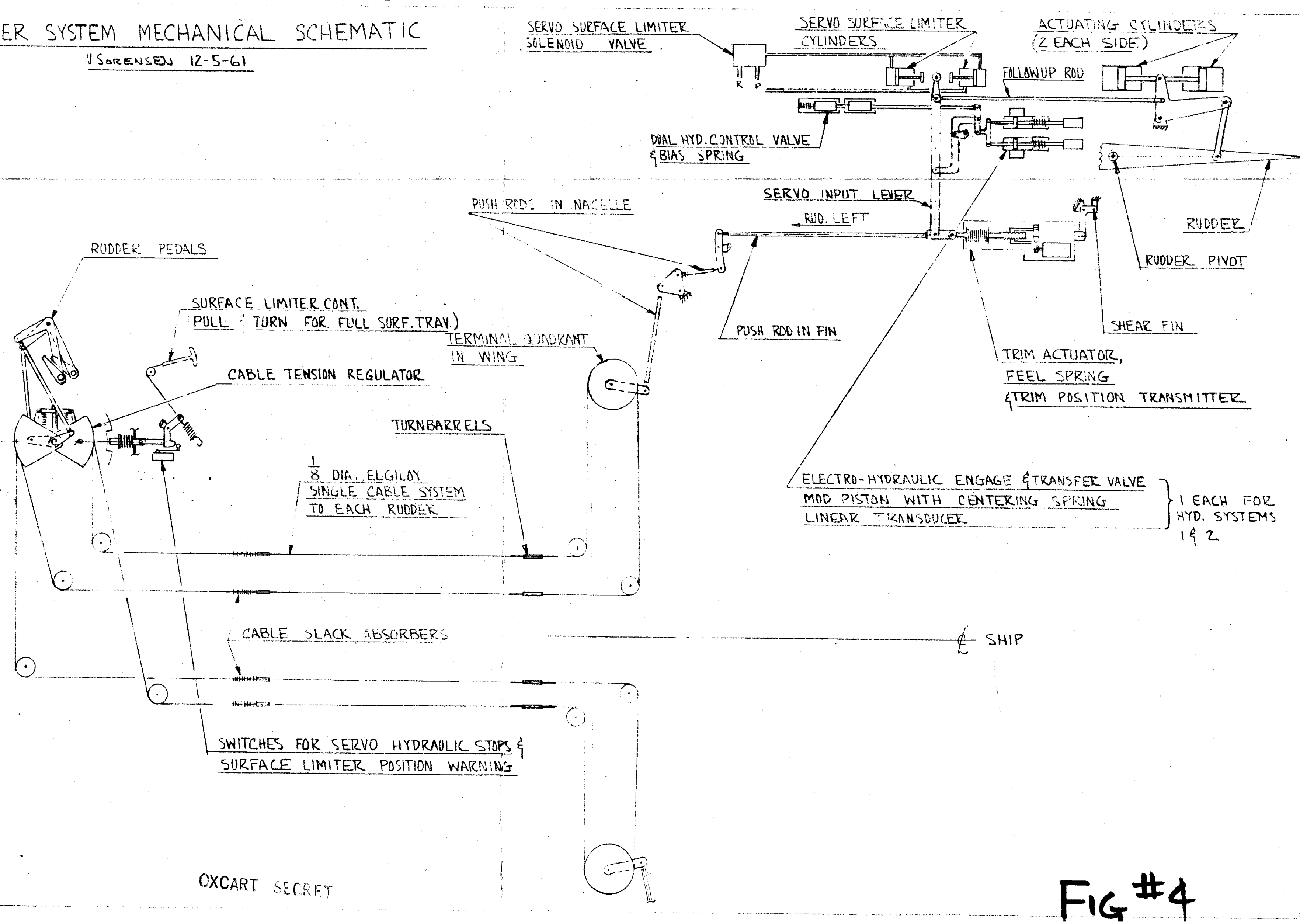

FIG #4

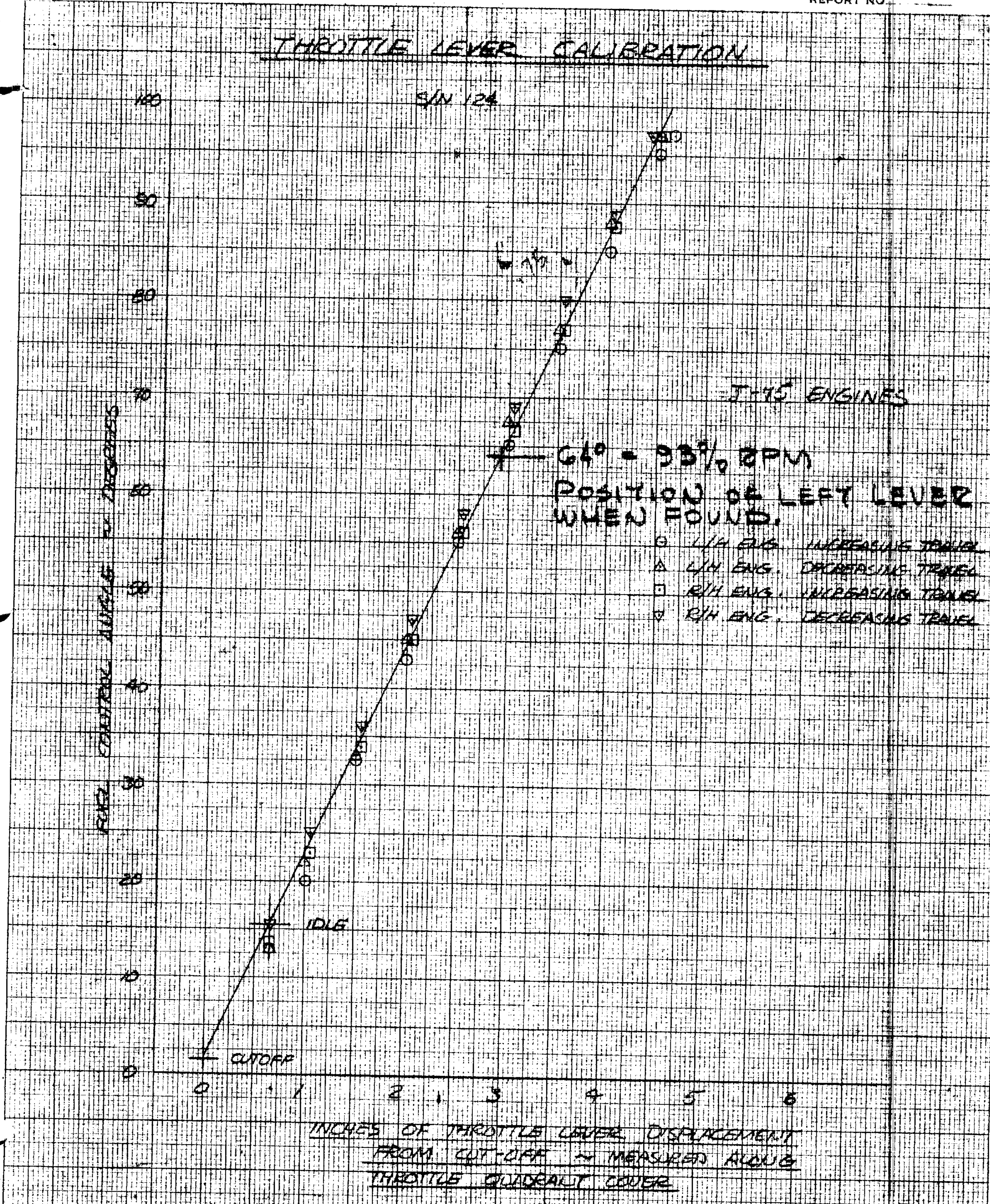
THROTTLE LEVER CALIBRATION
S/N 124
J-75 ENGINES
64° = 93% RPM
POSITION OF LEFT LEVER WHEN FOUND.
L/H ENG. INCREASING TRAVEL
L/H ENG. DECREASING TRAVEL
R/H ENG. INCREASING TRAVEL
R/H ENG. DECREASING TRAVEL
IDLE
CUTOFF
FUEL CONTROL ANGLE ~ DEGREES
INCHES OF THROTTLE LEVER DISPLACEMENT FROM CUT-OFF ~ MEASURED ALONG THROTTLE QUADRANT COVER
0
1
2
3
4
5
6
10
20
30
40
50
60
70
80
90
100

FIGURE 5

PREPARED BY
DATE
CHECKED BY

LOCKHEED-CALIFORNIA COMPANY
A DIVISION OF LOCKHEED AIRCRAFT CORPORATION

PAGE
MODEL
REPORT NO.

POWER LEVER POSITION vs RPM

S/N 121 F-25 T-74 10 JUL 62
J-75 ENGINES

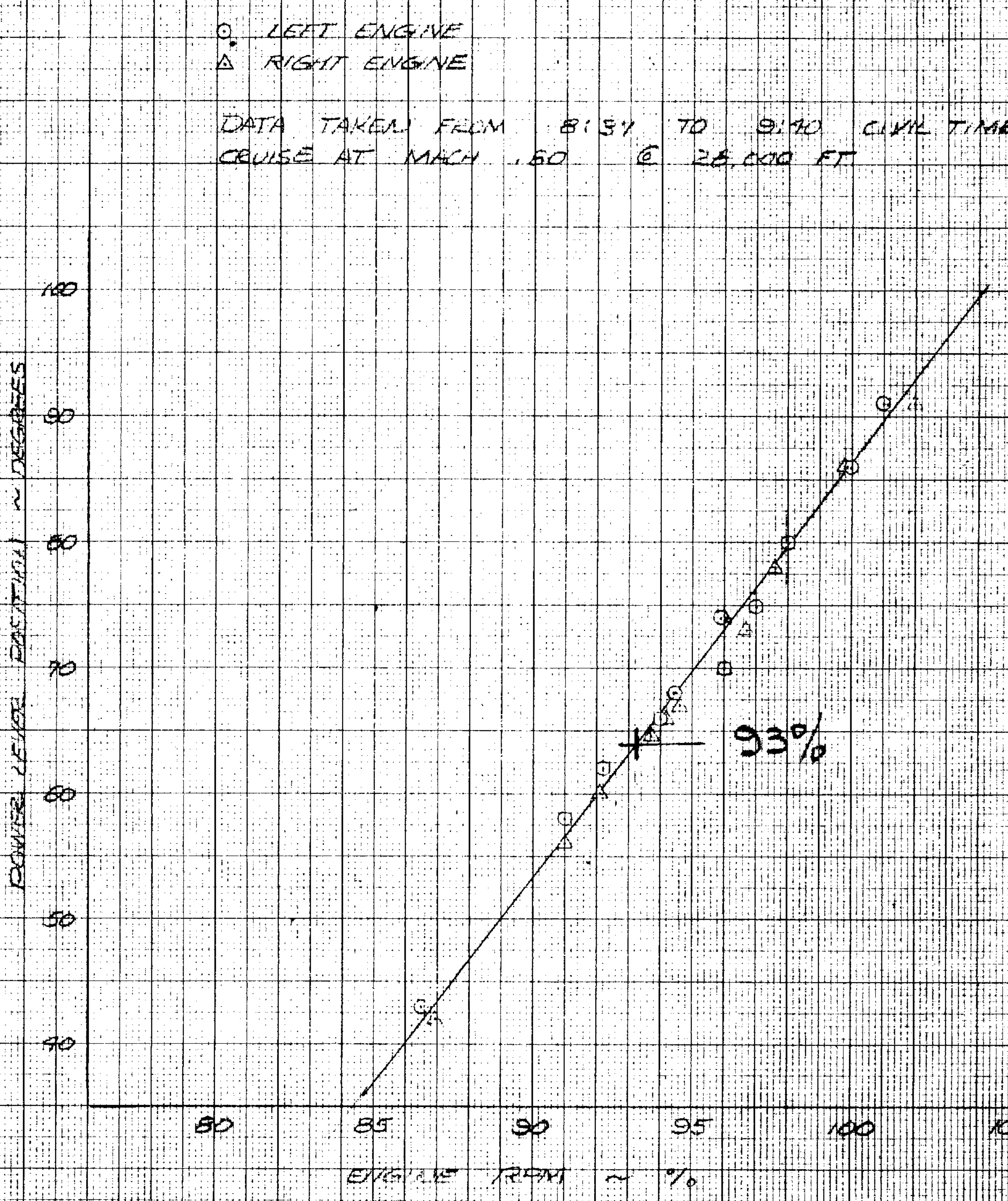

FIGURE 6

INSTRUMENTS

AND

ELECTRICAL

AIRCRAFT 123 INSTRUMENTATION AND ELECTRICAL

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SUMMARY

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4. Air Data Computer and Triple Display Indicator: (Photograph negative numbers)

3-1877 ADC, ADF Receiver, VOR Converter, INS Control and (2) Air Condition Controls

3-1946 Triple Display Indicator

5. Internal Navigation System: (Photographic negative numbers)

3-1873 INS Equipment

6. Pitot Static System.

SUMMARY

The basis aircraft electrical system is described. Based upon the pilot's report of the cockpit condition prior to bailout, no electrical system malfunction is suspected. The state of the debris makes it impossible to vertify this completely. The pitot-static probe system is described and icing tunnel test results are included to corroborate the pitot heater functions. Examination of a recovered section of the pitot probe indicates that the heater was probably operating to point of impact. A weather profile for the flight does not indicate that an icing condition was prevalent at the time. The instruments were located in the debris; except in a few cases, their condition obviates any reading on impact. The triple display instrument read 143 KEAS, 2.4 Mach, and 5150 ft altitude. The inertial navigation system read 308 knots ground speed and 216 N miles to go. Because of the pilot's report that the TDI read 1.05 mach, an intensive study has been made to determine how such a malfunction could have occurred. No pitot static malfunction can be devised to produce the reading observed by the pilot. Bench tests of the ADC and TDI system indicates that it is possible by electrical aircraft wiring malfunctions to readout high mach numbers on the TDI. A break in the S3 stator lead to the mach synchro in the TDI caused a readout of 1.36. A short between S2 and S3 caused a readout of 1.73. In this flight, however, the wiring malfunction, if any, was intermittent for the ADC and TDI operated correctly before and after the reported difficulty.

It is recommended that the (2) receptacles on the ADC be re-located on an elbow extension to eliminate 135 degree bends in the aircraft cables.

1. Electrical System:

a. Investigation and analysis.

(1) The electrical system for this aircraft with J-75 engines is powered by (2) 30KVA brushless and oil-cooled AC generators driven by CSDs mounted on the front accessory engine pads. 200/115V - 3 phase - 400 cycle AC power is supplied to the buses. Each generator is connected to a separate bus until one generator is tripped, then the other generator is connected to both buses to maintain normal operation.

(2) Following are comments on the AC generator system components which are recovered:

(a) Both AC generators are intact and attached to a portion of the CSDs. There is no evidence of fire in the generators or aircraft wiring.

(b) Both AC generator controls are broken apart, but most of the parts are available. There is no evidence of fire in the controls or aircraft wiring.

(c) The R. generator and bus tie contactors are intact except for the top covers which contain the terminal studs. There is no evidence of fire. The L. generator contactor is available and will be checked.

(d) The AC external power receptacle has (2) large contacts bent, but the cover is intact and the attached wires show no evidence of fire.

(e) The AC phase sequence indicator is broken, but the wiring is OK.

(f) The AC external power control relay is OK.

(g) Both AC bus frequency relays are intact and appear to be OK.

(h) The load center circuit breaker panel is broken into several pieces. The buses and wire terminals show no evidence of fire. There are no circuit breakers attached to the panels.

(3) The DC electrical power is supplied by (2) 200 ampere trans-

former-rectifiers. Normally, each T-R is supplied AC power from a separate generator. The T-R outputs are paralleled to supply the monitored and essential DC buses. DC system operation is normal with the loss of either T-R.

(4) One 25 ampere/hour silver-zinc battery is installed to provide essential DC bus power with both T-Rs out. The battery is connected to the DC bus at all times to reduce transients and prevent dropout of the INS and SAS equipment.

(5) Following are comments on the DC system components which are recovered:

(a) The L. T-R is badly damaged, but the R. T-R is still cylindrical. There is no evidence of fire in the T-Rs or aircraft wiring. The T-R ground studs, structure, and wiring are OK.

(b) The sealed battery is intact and bashed in on one end. There is no evidence of fire or explosion.

(c) The 200 amp essential DC bus relay is OK.

(d) The 100 amp battery relay is OK.

(e) Only (1) reverse current relay case (less parts) has been located.

(6) Three 600 VA static inverters provide 200/115V - 3 phase - 400 cycle AC power. Each inverter supplies a separate bus for instrument and special equipment.

(7) Following are comments on the inverter system components which are recovered:

(a) The (3) inverters are broken apart, but most of the parts are available. There is no evidence of fire.

(b) The (3) inverter power relays are intact and appear to be OK.

(c) The (3) inverter warning relays are OK.

b. Findings: It is concluded that the electrical power system had no bearing on this accident for the following reasons:

(1) The pilot reports that none of the electrical power system warning lights were on, which indicates that both AC generators, both T-Rs and the (3) inverters were probably operating satisfactorily.

(2) The pilot also reports that all the systems, except Mach readout on the triple display indicator, appeared to be operating normally.

(3) The surface limiter handle was pulled out and the stops have been retracted, which gives evidence of DC electrical power to both rudders after the surface limiter warning light came on. The rudder limit solenoids were energized to allow hydraulic pressure to retract the stops.

(4) Inspection of the electrical power system equipment discloses no evidence of inflight overheat or fire.

(5) Inspection of the aircraft wiring discloses local burned sections which were probably caused on impact, in the left chine, load center, (L. side of the nose wheel well), and air conditioning bay. Refer to figure 1 for wiring diagram and comments.

c. Recommendations: None

2. Electronics:

a. Investigation and analysis:

(1) The following electronic equipment is installed for communication, navigation, landing and identification. All equipment operates from DC power except the IFF set which operates from AC generator power.

(a) AN/ARC-51 UHF Comm.

(b) AN/AIC-10 Interphone

(c) A.R.C. 15F VOR and localizer

(d) AN/ARN-58 Glide slope and marker

(e) AN/ARN-41 ADF

(f) AN/APX-46 IFF

(2) Following are comments on the electronic sets which are recovered:

(a) The IFF and VOR sets, located in the nose, and the UHF and Glide Slope sets, located in the E-bay, are fairly intact except for the cases. These sets do not appear to be burned.

(b) The ADF set located in the E-bay is fairly intact, but has been burned.

b. Findings: It is concluded that the electronic system had no bearing on this accident for the following reasons:

(1) The pilot reports that all the systems appeared to be operating normally.

(2) The UHF set was operating as evidenced by reports from both pilots and the tape of radio transmissions from the pilot.

(3) The aircraft was on course as planned, which indicates that the navigation sets did not contribute to the accident.

(4) It is impossible to conclude anything from the inspection of the electronic equipment although all sets are fairly intact, only the ADF set, located in the E-Bay, shows evidence of fire.

c. Recommendations: None.

3. Instruments.

a. Investigation and analysis.

(1) Inverter power is supplied to the SAS(each channel is on a separate inverter), auto pilot, INS, Q-bay equipment, flight instruments, engine instruments and miscellaneous instruments.

(2) The turn and slip indicator operates from DC power.

(3) Following are listed the instruments which are recovered in a damaged condition. Six small pieces of the instrument panel and the inverter circuit breaker panel with 3½ breaker hanging on are also available.

(a) Flight instruments consist of the MM-3 attitude indicator, MD-1 displacement gyro, MA-1 amplifier and gyre, MA-1 transmitter, distance-to-go indicator (216NM and 308K), altimeter, roll trim indicator, and yaw trim indicator.

(b) Engine instruments consist of (2) tachometers, Oil temperature (145°C), (2) oil pressure fuel flow, and (2) EGT (250° and 770°C).

(c) Miscellaneous instruments consist of nitrogen quantity, Fuel quantity switch, fuel tank pressure, hydraulic pressure, cabin pressure altitude (15,000 ft.), (2) nacelle temperature indicators and switch, VOR, RMI, and (5) unidentified indicaters.

(4) The pilot reports extensive use of the attitude gyro, triple display, tachometer, EGT and fuel flow indicaters. Since they are suspected a more detailed analysis of these indicators is given:

(a) Attitude gyro: This GFE system consists of an MS-1 displacement gyro, and MM-3 indicator, and an MC-1 rate turn switch. The MD-1 displacement gyro supplies pitch and roll data to the MM-3 indicator continuously and to the autopilot as a backup attitude system. The MC-1 rate switch cuts out the roll erection of the vertical gyro during turns of 15 degrees per minute or greater. The pilot reports that the autopilot was on INS, therefore could not be on the MD-1. Three phase inverter power is supplied to the MD-1 for the vertical gyro, pitch and roll torques, and the starting and erection control transformer and relays. Single phase inverter power is supplied to the MD-1 and MM-3 for pitch and roll synchro excitation. Tests on the attitude gyro indicate that the indicator operates normally with one or two phases of the three phase gyro out. The off flag appears only if the rotor excitation is out or if all three phases are out. The amount of pitch attitude change referred to as a dot by the pilot is 2°. This dot is located at the center of the horizon line. Protractor readings on the MD-1 and readout on the MM-3 indicate a very accurate system. The equipment manufacturer, Lear, will be contacted regarding the accuracy of operation when on one or two phases. The MD-1 and MM-3 although damaged, are intact, and will be returned to Lear for analysis.

(b) Tachometer: The GFE type MU-1 indicator and the MS25038-4 generator comprise an independent system for each engine and required no electrical power. The indicator operates from the varying frequency alternating-current output of the generator and indicates 100 percent speed of the engine when the generator is driven at 4200 rpm. Readings are 0 - 100 percent speed in 2 percent increments and to 110 percent with the vernier in 1 percent increments. The pilot expressed some confusion about reading this indicator. Apparently he was not using the vernier dial for it can be easily read to .5 percent.

(c) EGT: The BH185T-1 Autotemp is a continuous null-balance servo indicator calibrated from 0 to 1200 degrees C in increments of 2 degrees C to the output of the standard chromel-alumel thermocouple. The indicator includes a Zener reference, power supply, amplifier, servo motor, cold junction compensation and a 144 inch slidewire and punched tape to linearize thermocouple e.m.f. for exact, counter-type digital readout. A pointer and digital counter readout is accurate within 1°C at any point on the scale at normal ambient temps and within 5°C from -55 to 70 degrees C. The response rate of the indicator is greater than 300°C per second. The indicator is connected to (6) averaging type engine thermocouples by a 7 ohm per 25 feet thermocouple cable. Inverter power at 115V 400 cycle - 1 phase is supplied to the indicator. Calibration of the instrument is accomplished through two adjustment potentiometers located on the rear cover.

(d) Fuel flowmeter: The heart of the G. E. system is the angular momentum type mass flow sensor. Output of the flow sensor is a signal proportional to true mass rate of flow and independent of fuel density and viscosity. The G. E. 8TJ62GAH transmitter will operate satisfactorily in a service air ambient of -65 to + 580 degrees F with fuel flowing at 300 degrees F maximum. Elements of the transmitter include flow sensing means, synchronous drive motor, restraining spring and a transducer that converts mechanical rotation to an electrical position signal. The G. E. 8DJ113GAH indicator operates directly from a three-wire synchro position transmitter. It consists basically of a 3 stage transistor-amplifier, power supply, motor-generator, and synchro. It is servo operated for accuracy and fast response (8 seconds from zero to full scale) and contains a damping circuit to minimize any oscillation in indication which might occur as the result of flow oscillations in the fuel line. Pointer and counter indications of fuel-flow rate to 68,000 pounds per hour are presented to provide both relative position reference and accurate readability. The system operated on inverted power at 115V - 400 cycles - 1 phase. The accuracy of the basic system is not affected in a greater proportion on a percentage basis than the frequency variations itself. The frequency of this inverter did not vary more than .3 cycle during all of the qualification tests.

b. Findings. From the condition of the instruments when found, pilot's statements, and disassembly of instrument remains, it appears that all instruments referred to in this section were working at time of ejection.

c. Recommendations: none.

4. Air data computer and triple display indicator. The DYG759A2 Air Data System is made up of the DHG72A2 Air Data Computer and the DJG245B1 Triple Display Indicator. The ADC provides air data parameters for use by the Automatic flight control system, the Inertial navigation system and to the TDI which is a flight reference instrument. The ADC receives total and static pressure from one of the two completely separate aircraft pitot-static systems and is plumbed together with the DLG-55 Stability Augmentation System Pressure Transducer. Direct driven barometric type primary flight instruments are connected to the second pitot-static system. This Complete separation of systems was done to provide the pilot with a backupreference in the event of failure of either system. Within the ADC, the

total and static pressures are converted to shaft rotations by means of two force rebalance pressure transducers with their associated servo amplifiers, motors and gear trains. Output parameters are compensated for thermal changes and for static pressure errors as a function of mach number. The electrical outputs to the Triple Display Indicator are from synchros connected to Mach, Equivalent Air Speed, and Altitude Output Shafts. Presentation of these parameters to the pilot is by three independent counters located in the single instrument. The ranges of these parameters are - 1000 to 110,000 ft, .2 to 3.5 M, and 90 to 560 KEAS.

a. Investigation and analysis. The TDI was one of several flight instruments receiving a major portion of the pilot's attention prior to loss of control of the aircraft. Unfortunately, once the pilot suspected difficulty there is no evidence that the verified TDI reading by observation of direct reading barometric instruments providing similar information. A review of the comments of the A12 pilot and the pilot of the chase plane, indicates that prior to passing over the Wendover check point the ADC and TDI combination was providing correct information. Additional analysis comparing the inertial Navigation System and computed position using air data parameters also verifies information provided. The 1.05 Mach reported by the pilot after starting turn around past Wendover cannot be verified, and is in excess of the performance capability of the aircraft in substantially level flight, therefore, it is assumed that erroneous instrument reading were seen by the pilot (possible reasons for this are discussed in paragraph 4a(6)). The resulting corrective action by the pilot did produce a reduction in air data readout. As mach and KEAS readouts decreased the surface limiter warning light came on at .47 mach. This is correct and indicates that the ADC was functioning at this time. The 102 KEAS is the last indication read by the pilot and is in agreement with the expected stall characteristics of the A12. These circumstances indicate that the incorrect information supplied to the pilot was temporary and any air data malfunction was self correcting prior to loss of control. The TDI, parts of the ADC, and the SAS pressure transducer were recovered. Although badly damaged, the TDI was substantially intact. The counters on the instrument read 143 KEAS, 5150 Ft. and 2.4 Mach. Of these three reading only the altitude can be verified as approximately correct for the point of impact. A small portion of the ADC was recovered, and no conclusion can be reached regarding operation on the basis of physical evidence. The DLG-55 which is connected to the same pitot-static system as the ADC was badly damaged and burned. Pneumatic connections and hoses were broken and charred too badly to indicate possible leakage in the pitot-static system. Since the possibility does exist that momentary incorrect information was read by the pilot, tests were conducted on two similar ADCs to determine possible causes of error. These tests involved simulated leakage of the Equipment Bay pressure into the ADC sensors or into the pitot-static lines; simulated block pitot line, and simulated power interruptions, shorts and opens in wiring between the ADC and TDI. Results were as follows:

(1) Leakage of the E bay pressure into the p_s sensor or static line had the effect of driving the mach down and not up as indicated by the pilot.

(2) Leakage of the E bay pressure into the p_t sensor of the ADC or

into the pitot line did drive the mach and EAS up. However, the E bay pressure of 4.85 PSIA simultaneously required an ambient altitude of 42,000 ft to produce a mach reading of 1.05. This altitude of 42,000 ft is in excess of flight level reported. (See figure 1)

(3) Interruption of power to ADC caused a very slow drift downward for all parameters. This was true of both units tested.

(4) Shorts to ground of the synchro output wiring to the TDI had no effect on readout. Opening the external leads individually did, however, produce a change in TDI reading. A break in the S_3 external stator lead to the mach synchro in the TDI caused a reading of 1.36. Opening the other two external leads caused a lower than normal reading. Shorts between S_2 and S_1 caused downward readout. S_3 and S_1 caused readout of 1.0. S_3 and S_2 caused readout of 1.73. These results indicate that external or internal breaks or wire to wire shorts of an intermittant nature might produce an erroneous mach reading. This is a very remote possibility.

(5) Tests on the ADC involving vibration and shock indicated no problem.

(6) Blockage of the pitot line produced the most realistic TDI readings that agree with the pilot's observations. It has been determined through bench check that a blockage of the pitot feeding the ADC will cause the mach and KEAS indication on the TDI to remain constant as long as altitude is held constant. If the pitot system is blocked as above and a climb is initiated as described in the accident to approximately 38,000 feet.

the altitude would read correct and the mach and KEAS would erronously read 1.05 and 308 respectively.

b. Findings. The air data system operated correctly prior to and immediately after the reported difficulty. The pilot reported TDI readings which were incorrect when compared to the observed and calculated flight path. These readings could have been produced by a pitot line blockage as demonstrated in the system bench check. Leakage to E-bay pressure or intermittant shorts and opens in the cabling system did not produce the same erroneous readings. The pitot blockage could have been caused by not turning on the pitot heat, a malfunctioning switch, or untrapped water in the pitot plumbing. The only other means to cause the TDI to read incorrectly as stated would be a malfunction in the internal circuits of the air data computer. Bench checks have not uncovered such a malfunction. Minneapolis-Honeywell is continuing this investigation.

5. Inertial Navigation system:

25X1A

a. This report consists of findings and theories pertaining to the incident of 24 May 1963, involving Article 0926 and Pilot [redacted]. The material herein contained is based upon the condition of the "Inertial Navigation System" equipment only. Further it is based upon the condition of this equipment as viewed after removal from the impact area.

b. System description: The INS is utilized for primary guidance of this vehicle in conjunction with the auto-pilot in the "Auto-Nav" mode of operation. It provides roll, pitch, and azimuth references and a steering signal to the AP. Preselected destinations are inserted prior to flight and may be selected in any sequence by the pilot. The INS calculates a great circle path to the selected destination. It then provides a steering signal to the AP based upon the vehicles present position, heading, and velocity with respect to the desired path as previously calculated. This system may be disengaged at anytime, thus referencing the AP to other references as backup modes of operation. The AP "steering" may be referenced to the MA-1 Compass without changing the pitch and roll reference from the INS if desired.

c. History: The INS that was lost (H6-8), had been in service since 29 Apr 1963. There had been no hardware problems in this period of time with this system.

d. Preflight: The runup and preflight as pertaining to the INS was normal. The only exception was that a member of the vehicle ground crew pulled the ground power cable to the vehicle before the INS personnel had pulled the "Umbilical Cable". At this instant our "trouble sense logic" indicated a "NO-GO" condition. It was very likely due to a transiet between grounds. Upon further investigation and monitoring of the system, all appeared to be normal. The "NO-GO" circuitry was "reset" and did not reappear.

e. Flight: The flight results just prior to the accident indicate that the INS was functioning properly and well within specification. There were no indications of malfunction or otherwise degraded operation of the INS. As the final moments of flight approached, the pilot switched out of "Auto-Nav", which eliminates our "steering signal" output as a reference to the AP. The pitch, roll and azimuth references were still being utilized by the AP to the best of our knowledge.

25X1A

f. Wreckage evaluation: Upon examination of the INS packages, after they were moved back to [redacted] the following pertinent observations were made:

(1) The 'distance-to-go' indicator jammed at 216 n.m.

(2) The ground speed indicator jammed at 308 knots.

(3) The present position indicators were jammed at Lat. 40°36' and long. 114°09'.

(4) The computer drum was almost intact.

(5) The coupler was partially intact at the foreship end, with some modules jammed in place.

(6) The stable element or inner gimbal of the "Inertial Platform" was partially intact. Two of the six inertial components were still in place in the block casting. The two that were in place were located at the bottom of a normally oriented or vertical azimuth axis.

(7) I will now attempt to point out the significance of the above six items.

(a) In item (1) the DTG was 216 n.m. This is approximately the distance from the impact area to Earth. The distance from our "Fix" point at Wendover to Earth is 224 n.m.

(b) In item (3) the present position indicators defined a set of coordinates which were approximately those of the impact area.

(c) The ground speed of 308 knots from item (2) indicates that the system was functioning for all or part of the time between deceleration and impact since the cruise velocity for this flight was around 500 knots of ground speed.

(d) Items (4) and (5) indicate that the attitude of the vehicle at impact was nose down and inverted.

(e) Item (6) suggests that at some time before impact the inertial platform lost reference. If it has been oriented properly at impact the components that stayed intact would have been first to leave their mounting holes. Also, the components that did leave the azimuth gimbal would tend to be driven into the gimbal, on impact, in the normal orientation. This disorientation could have been caused by an excessive pitch over attitude, probably in excess of 75 degrees, or a loss of power in the system. This power loss could have been either the 28 VDC from the transformer rectifiers or the number 3 inverter power. A further possibility is that if for any reason the vehicle went on "emergency power", that is, if the "Monitorable Buss" excitation were removed, the INS would stop functioning as it is fed from this buss.

g. Findings: From the above discussion it is concluded that the INS was in no way responsible for this unfortunate incident.

6. Pitot Static System:

a. General Description:

(1) The pitot static system is a single probe boom, divided into two separate systems mounted to the nose section at fuselage station 135. The system consists of the pitot static probe, disconnect couplings, drains, tubing and associated instruments.

(2) System 1 connects to the DLG-55 "Q" Transducer Scheduler and Air Data Computer only. These units sense pressure differentials delivered from the pitot head and translate them through electrical impulses into command signals and cockpit display read-out values for the Stability

Augmentation System and Automatic Flight Control System.

(3) System 2 is connected to the airspeed indicator, altimeter, and rate-of-climb indicator. In addition it is connected to the Speed Sensor Actuator in the seat ejection system. Depending on airplane speed, the speed sensor will select one of two delay intervals, 0.6 seconds or 4.0 seconds, in firing of the seat catapult.

(4) Pitot Static Probe: The pilot static probe is a single boom, divided into two static pressure chambers and two dynamic pressure chambers. The static chambers connect to eight, 0.0625-inch orifice holes, four each on the bottom outboard sides of the head. The static chambers are inter-connected by cross-over ports to provide compensating static pressure balance to the flight instruments during yawing maneuvers of the airplane.

(5) The head contains a self-regulating electrical heater, which automatically compensates for changes in ambient temperature; i.e., the power (heat) dissipated through the heater is an inverse function of the heater element temperature. The heating element in the head is supplied by A.C. power by a switch on the center stand instrument panel.

(6) System Operation: The pitot static system supplies the total and static pressures necessary to operate the basic flight instruments and air data computer system components. The pressures are sensed by the electrically heated probe.

(7) The routing of the pitot-tubing in the aircraft for 7 feet aft of the pitot static probe has an upward slope of 8°. Farther aft there is an abrupt rise of about 10 inches to a point about eleven feet aft of nose of pitot probe. This will cause moisture accumulation to drain forward and out of the pitot lines and the probe.

(8) Drains are located at one low point in the routing of the pitot tubing in the chine area aft of Sta. 252. These drains are periodically opened and checked for moisture entrappment.

b. Pitot System Calibration: Figure 8 presents the position error corrections at subsonic speed as obtained by flight test versus the cam correction utilized in the Air Data Computer. The flight test data was obtained from tower flybys and by correlation with pacer aircraft. The cam correction of the ADC is based upon wind tunnel tests of the probe. It is indicated that the maximum error to be expected in the triple display indicator is approximately .020. These errors are based on nominal angles of attack, however, wind tunnel data indicates that an angle of attack change of 10 degrees would only result in an additional error of .012 in Mach. A change in sideslip angle of 6 degrees would create an additional error of ± .006. Thus, the total error could conceivably be of the order of .038 if gross attitude changes are considered. This is substantially below any magnitude necessary to explain the sequence of events on S/N 123. Therefore it can be concluded that the position errors in the Mach readout of the triple display indicator could not be a significant factor in the crash of S/N 123.

c. Wind Tunnel Icing Tests of the Dual Pitot Static Tube:

(1) Under purchase order E-24280 with Kollsman Instrument Corporation, Elmhurst, New York, a windtunnel program was conducted in the Cook Technological Center Wind Tunnel Facility to investigate the de-icing characteristics of an electrically heated dual-pitot-static tube (type no. A3555000-003). Tests were conducted on the 22nd and 23rd of February 1962 according to conditions and requirements as specified by paragraph 4.5.8 of MIL-P-25632A. Mr A. Kasdan was on hand to observe tests for Kollsman. An additional test specifically requested by Mr Kasdan was also conducted to permit further evaluation of the tube heater power requirements.

(2) The test item was mounted in the wind tunnel test section. Tests were conducted under conditions shown in following table.

TEST NO	ANGLE OF ATTACK(DEG)	FREE STREAM VELOCITY(KTS)	FREE STREAM TEMP (°C)	WATER CONTENT GMS/M^3
1	0	350	-22	1.5
1a	25	350	-20	1.5
2	25	350	-22	1.0
2a	25	350	-20	1.0
3	25	350	-21	1.0

In tests 1 and 2 the formation of ice was allowed to accumulate until approximately ½ inch extended in front of the tube. This technique was found to present extremely severe de-icing conditions, consequently, the less stringent option of the specification was considered in tests 1a and 2a. This option stated that ice be allowed to form until total pressure openings were sealed. Actually tests no 1 and 2 were repeated to investigate de-icing under the optional initial conditions. Test 3 was the additional run authorized to evaluate the effect of applying increased wattage to the heater elements. The last test was accomplished at the request of the Kellman representative and does not comply with the Military Specification regarding rated voltage.

(3) The results of the test program may be summarized as follows:

(a) At zero angle of attack the Kollsman tube meets the requirements of the applicable specification.

(b) Once de-iced the tube under the rated voltage input remains clear of ice for the specified period of 15 minutes.

(c) At 25 degrees angle of attack the tube meets the power on requirements of the Military Specification.

d. Investigation:

(1) The pitot mast, although severly mutiliated, was disassembled, checked for heater operation, and checked for foreign particle obstruction. (Negatives Nbr 1905 and 1906). The pitot-static orifices were packed with soil which resulted from impact and no air flew through the static orifices was possible. After clearing the soil from these orifices there was unrestricted flew through the static ports. There was unrestricted flew through what remained of the pressure tubing. No foreign matter, ether than soil which was impacted on impact, was detected. X-ray pictures reveal continueus and correct lines. The pitot mast was cut to expose the undamaged heater wires and to complete the electrical circuit. A ten volt current was applied and this remaining section of the pitot heater performed normally, heating up this section of the tube to a temperature too hot te touch in about 2 minutes.

(2) At the time of ejectien, pitot system #1 was functioning correctly because of the manner in which the seat release system operated.

(3) At the time of airplane stall, pitot system #2 was functiening correctly because of correlatien with airplane stall speed.

(4) Pitet system #2 may have become blocked and caused the TDI te read incorrectly. This bleckage had to be temporary in nature in order te preduce correct headings later in the flight. If the pitet probe heater was eperating correctly, the possibility of icing is very remote. Te permit icing the heater had te be turned off or the switch manfunctiened.

(5) The effect of plugging the total pressure port of the pitet static system has been investigated in an effort to explain the sequence of events reperted by the pilet in the crash of S/N 123. Te summarize the pilet's comments, the pilet reported that upon appreaching the Wendever check point that he was on the Autopilet Aute-Nav. mode with the following

flight conditions:

Mach .85

Altitude 34,000 feet

KEAS 280 Kts

The pilot had maintained and was maintaining a constant throttle setting throughout most of the flight. The pilot also reported maintaining altitude within a close tolerance. Prior to the turn it was reported that some flying had been done in clouds especially through the tops of cirrus cloud cover. The above flight conditions were maintained to the Wendover check point. At the Wendover check point a left turn was initiated during which the Mach number and KEAS were noticed to increase though throttle setting had not been changed. A slight climb was initiated and throttle was retarded slightly. The Mach and KEAS continued to increase until the rollout from the climbing turn. Peak readings as reported were approximately 38,000 feet and Mach 1.05. Reference is made to the altitude decreasing after reaching this peak and Mach and altitude also started to decrease. Pitot heat was checked. From this point on KEAS and Mach number were noted to continue to decrease. Reported KEAS numbers were 290, 160, 147, 151, and 101 knots even though the throttle had been advanced slightly and minor nose down attitude had been initiated by the pilot. Keeping the above summary of pilot comments in mind, let us now analyse the effect of a plugged total pressure port in the pitot static system. The most logical way of plugging this port would be by ice formation. Mention had been made of flying through clouds prior to the turn but the turn itself was VFR. Now assume that the pitot heat was malfunctioning or was in the off position and an ice buildup occurred and plugged the total pressure port sometime in

2 hours of flight or more likely after the Austin check point. On Auto-Nav with constant throttle position and close control of altitude the Mach, KEAS and altitude readings would be normal at the pre-established conditions. However, as the turn over Wendover was initiated without increased throttle the aircraft would start to decelerate, however, the Mach and KEAS readings would be constant as long as altitude was held constant with a plugged total pressure port in the pitot static system. If the pilot started a slow climb the Mach and KEAS readings would be seen to increase and pilot corrective action of increasing the climb angle would tend to further increase the Mach and KEAS readings. However, the airplane is continuing to decrease speed throughout the turning climb. The following is a summary of a bench test of the triple display indicator readings during a climb with a plugged total pressure port in the pitot static system:

Altitude	KEAS	Mach
34,000	280	.85
35,000	289	.90
36,000	294	.94
37,000	299	.98
38,000	304	1.02
38,800	308.5	1.05

If the pilot now leveled off and started a slow descent Mach and KEAS would similarly decrease with altitude. The aircraft had been constantly decelerating throughout the turn. If it is now assumed that he was at a KEAS of from 180 to 160 knots and the pitot total pressure port was opened due to pitot heat being turned on or back pressure resulting from the decreased speed and altitude, the TDI was observed to establish the true speeds in approximately 20 seconds. At this point, however, the aircraft is on the back side of the drag curve and would continue to decelerate even with slight nose down attitudes. Thus, recovery would require gross thrust or nose down attitude changes.

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Electrical

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RUSSELL H. SITTLOH
Inertial Navigation System
Engineer

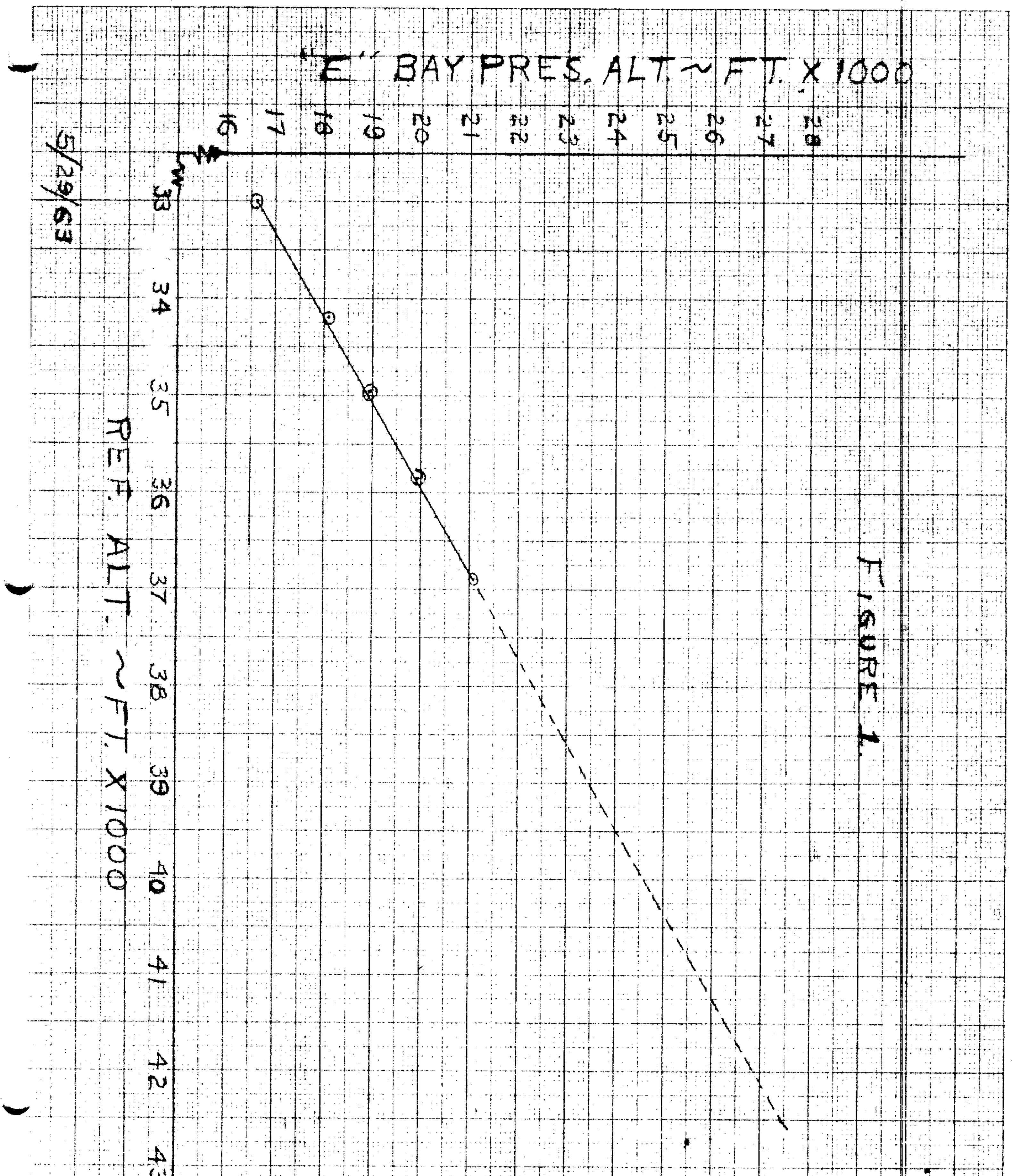
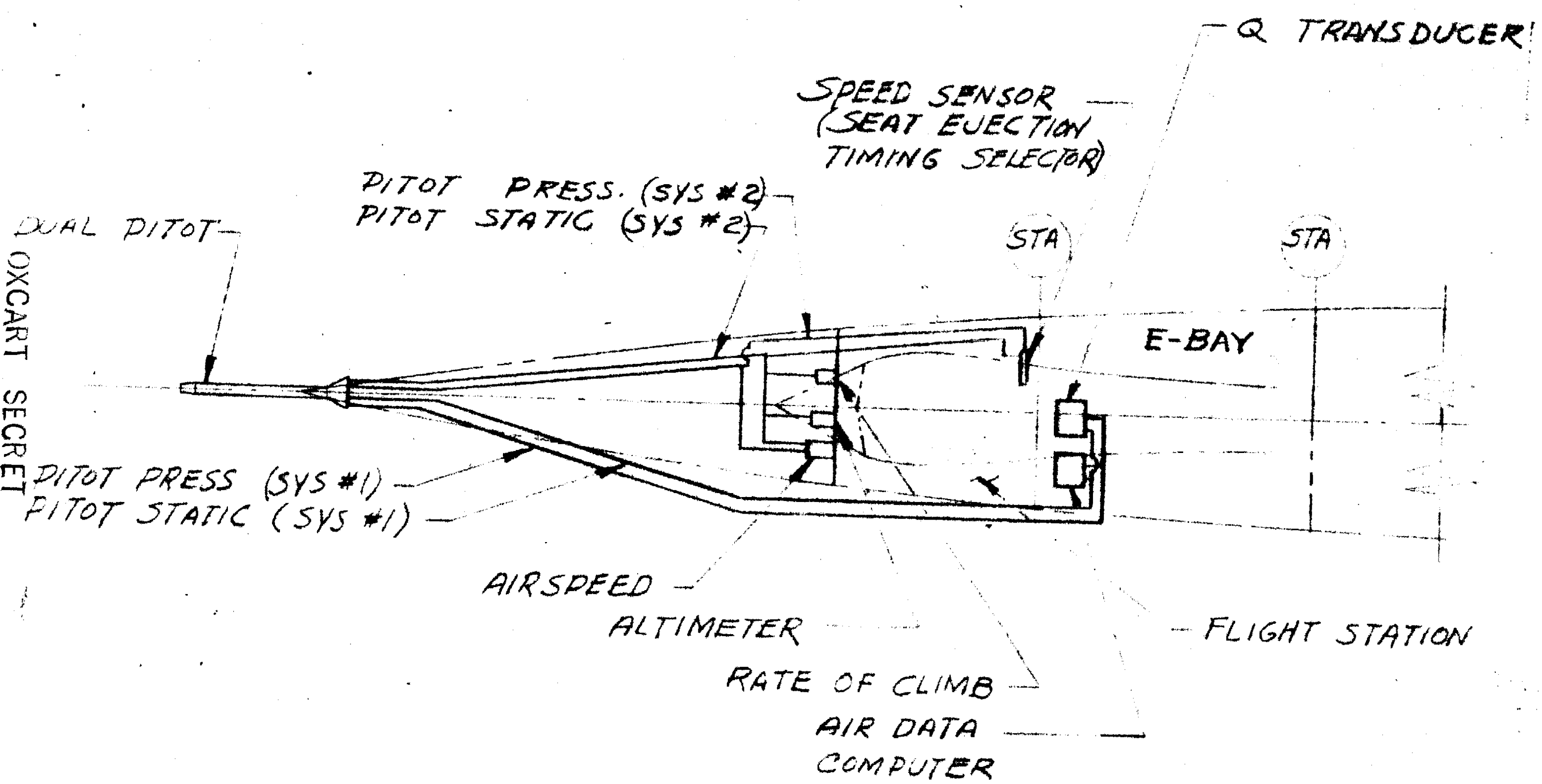

"E" BAY PRES. ALT. ~ FT. X 1000
16 17 18 19 20 21 22 23 24 25 26 27 28
REF. ALT. ~ FT. X 1000
33 34 35 36 37 38 39 40 41 42 43
5/29/63

FIGURE 1.



PITOT - STATIC SYS.

PREPARED BY M.K.
DATE 6-1-6_
CHECKED BY

OXCART SECRET

PITOT-STATIC SYSTEM CALIBRATION

KOLLSMAN PITOT STATIC TYPE NO. A35550 00 003

NO BOOM EXTENSION

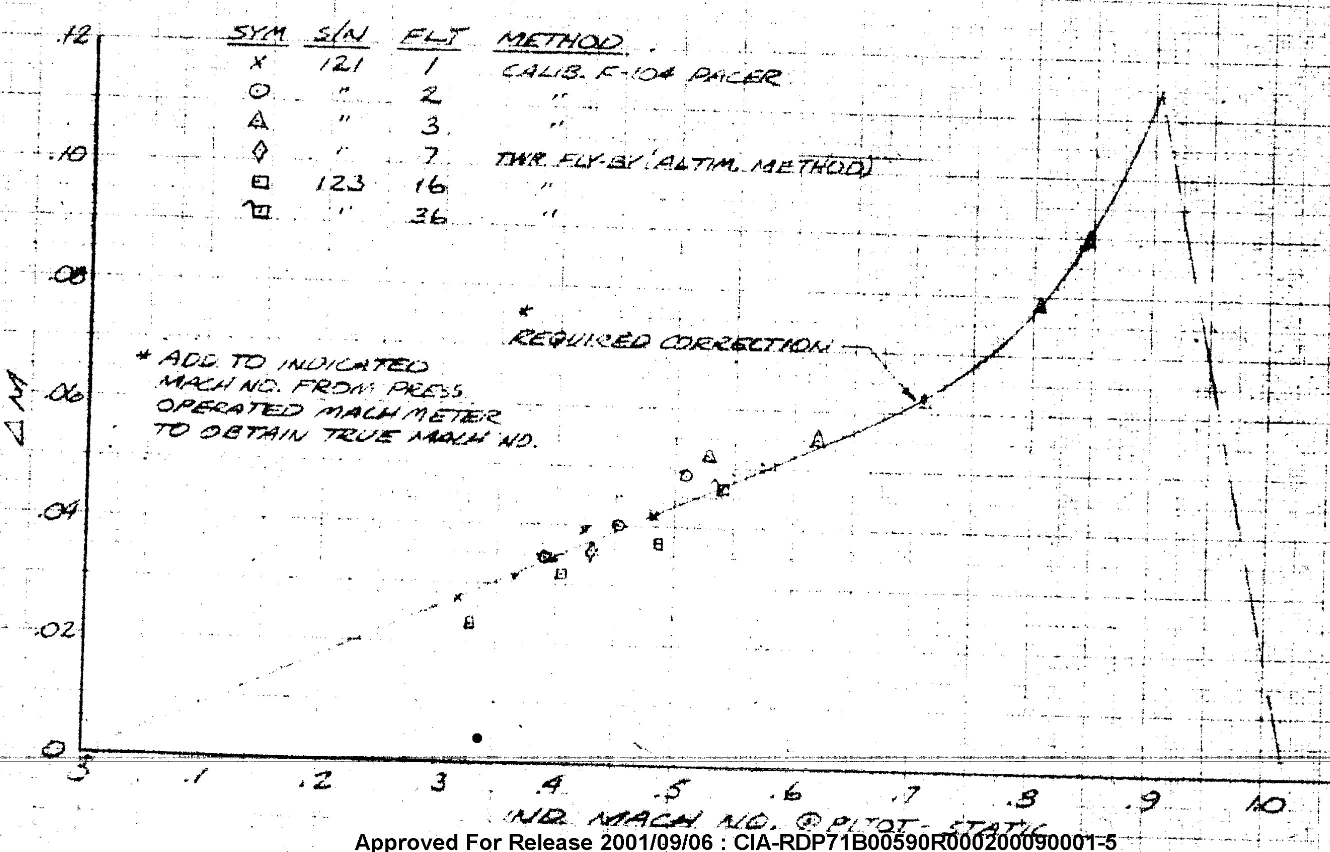


FIG 8

OXCART SECRET

MAINTENANCE

AND

RECORDS

Investigation of the major accident involving A-12 aircraft A.F. S/N 60-6926 (Production Article Number 123) which occurred near Wendover, Utah 24 May 1963:

1. Investigation and Analysis:

a. Documentary Sources.

(1) Form DD 829 "Historical Record for Aeronautical Equipment", for aircraft, engines and afterburners.

(2) Form DD 829-1 "Historical Record - Technical Instruction Compliance Record" for aircraft, engines and afterburners.

(3) Form DD 829-2 "Historical Record - Significant Historical Data" for aircraft.

(4) AFTO 781 series forms.

(5) AFTO Form 44 "Turbine Wheel Historical Record".

(6) AFTO Form 98 "Engine and Afterburner Replacement Record".

(7) AFTO Form 100A "Accessory Replacement Record".

(8) Pertinent contractor inspection records - including established inspection forms, equipment removal records, engineering work orders, inertial navigation system and stabilization augmentation system records.

2. Historical Data:

a. The subject article was first flown 9 October 1962. At the time of dispatch 24 May 1963, total accumulated flight time was one hundred thirty three hours, twenty minutes (133:20).

b. Review of the maintenance records disclosed the following information:

(1) Post-flight inspection completed 22 May 1963.

(2) Pre-flight inspection begun 23 May 1963 and completed 24 May 1963.

(3) Summary of outstanding delayed discrepancies as extracted from 781B, Part "E".

NOTE: Discrepancies (a) thru (b) were encountered during high speed flight tests, and are not normal to the current mission of this aircraft.

(a) "L" Hydro system pressure fluctuated 1000# after 1.8 M/N.
30-10-62 05:43 A/C Hours

(b) Left spike moves erratically above 1.75 M causing yaw and eventual engine stall. 01-12-62 26:07 A/C Hours

(c) From above 1.8 to 2.05 M, and deceleration, a pitch oscillation occurred. It was not noticeable during letdown.
01-12-62 26:07 A/C Hours

(d) At 1.4 M/N 1 cycle directional oscillations are present.
11-04-63 108:13 A/C Hours

(e) Hydro pump case flow light came on in flight.
27-04-63 114:56 A/C Hours

NOTE: A temporary fix was made per engineering disposition to stow "R" switch cannon plug pending S/B 268 compliance.

(4) The following in-flight discrepancies and corrective actions were recorded (781A) for the last ten (10) flights:

(a) 18 April 1963: No discrepancies reported.

(b) 27 April 1963: MA-1 compass is inoperative. Corrective action: Replaced gyro and amplifier assembly. Ground checks OK per pre-flight. Hydro pump case flow light came on. Corrective action: Cannon plug stowed for "R" switch per engineering instructions for temporary fix. C/F to 781B, delayed discrepancy.

(c) 30 April 1963: Severe pitch oscillations in Mach hold at 300 knots EAS 30M. Corrective action: Checked and corrected per SAS pre-flight dated 14 May. Rt throttle seems to be rigged a little tight, won't go back as far into cut-off as left one and it slips into idle very easily. Corrective action: Replaced Rt fuel control, removed A/B stops and re-checked rigging.

(d) 1 May 1963: Oxygen cylinder #2 needle remained at 2000#. Corrective action: #2 system used OK lowest pressured system is used first down to approximate 475# then other system cuts in.

(e) 2 May 1963: No discrepancies reported.

(f) 3 May 1963: No discrepancies reported.

(g) 14 May 1963: Rt fire light blinked once on a letdown at 250 knots, 11,500 feet 100% power ← 20 min. → then on go around from low approach light came on steady at 100%, throttle was retarded, then light went out, then came on, throttle to idle and light went out, throttle left in idle until landing was made, then shut off. Corrective action: Replaced the PG cannon plug, reworked conduit, added insulation to wires, continuity checked, operational check OK.

(h) 15 May 1963: Flight attempt aborted due to Rt fire warning light. Corrective action: Replaced plug P/N 42232, repaired (silver soldered) plug P/N 42233, replaced damaged element P/N 363A 228AB.

(i) 18 May 1963: No discrepancies reported.

(j) 21 May 1963: Mach hold very erratic. Corrective action: C/F 781A.

(k) 22 May 1963: Flight attempt aborted. SAS channels A and M in both pitch and yaw inoperative. Corrective action: Change "A" logic power supply.

(1) 22 May 1963: Mach hold very erratic. Corrective action: C/F 781A. #1 tank pump light on very dim. Corrective action: Replaced bulbs. ADF inoperative on all bands, only noise received. Corrective action: Ground checks OK, check next flight. Loose screw visible in viewfinder. Corrective action: C/F to 781A.

(5) Aircraft manufacturing Service Bulletins (Technical Orders).

(a) The nature of the A-12 program has been such that a regular time compliance Technical Order system has not been initiated. In lieu of this, the contractor has established a Service Bulletin system for incorporating aircraft changes.

(b) There had been 185 Service Bulletins issued which were applicable to A-12 S/N 60-6926. Of these 146 Service Bulletins were outstanding; 34 of which could not be accomplished because they pertained to J-58 engine and ARC 50 radio installations. None of the remaining 112 outstanding Service Bulletins were overdue compliance or significant to the accident. The following is a summary of the outstanding Service Bulletins:

OUTSTANDING MANUFACTURING S/B's

RELEASED DATE	S/B#	TITLE
16-08-62	#87	Fix starter access panel.
13-09-62	#92	Engine rear mount revision.
28-08-62	#96	Louvered vents installation aft upper and lower fillet panels.
28-08-62	#98	Modification to method of retaining AC1286-1 pin, gudgeon installation.
29-08-62	#101	Gudgeon trim actuator replacement.
20-09-62	#106	Suit vent valve relucation.

RELEASED DATE	S/B#	TITLE
17-09-62	#107	Rework control bracket installation nacelle Sta. 1098 - 1088.
04-10-62	#109	Installation of nacelle short hinge pins.
24-09-62	#112	Rework AP 100 gearbox access door.
27-09-62	#116	Drain line support (AP 573 drain line install.).
10-10-62	#118	CIS access door fastener change.
05-10-62	#119	Fuel pilot valve power.
10-10-62	#129	Gudgeon Fwd. cylinder three piece pin keeper.
11-10-62	#134	Skinner seal spacers - gudgeon.
27-10-62	#142	Bracket assembly rudder limiter multi switch.
19-10-62	#144	Installation of reinforced bracket fuel system.
02-11-62	#145	Fuel control valves - replacement with high temp.
19-10-62	#146	Duct installation afterburner fuel pump exhaust.
22-10-62	#149	Installation spike emergency bottle.
25-10-62	#150	Remote gearbox installation.
25-10-62	#151	Breatherline installation - engine.
29-11-62	#121	Exhaust nozzle position (ENP) indicator removed.
29-11-62	#122	Wiring - J58 engine hydraulic pump pressure switch.
14-11-62	#136	J75 engine wiring - removal of.
06-11-62	#153	Installation - brake system master cylinder.
14-11-62	#164	Ejector flap stop Reinf.
15-11-62	#165	Nose landing gear door Mech. nuts.
26-11-62	#176	Pilot's foot ramp flap spring force increase of.
13-11-62	#163	Rework oil drain installation engine gear box.
28-11-62	#181	Drag chute ball deflector installation.
29-11-62	#182	Fuel control under Freq. sensor - removal of.
29-11-62	#123	Warning light - engine bleed open.

RELEASED DATE	S/B#	TITLE
30-11-62	#155	Wiring revision turbine inlet temp. (TIT).
28-11-62	#180	Antenna stop installation.
30-11-62	#186	Tailcone fillet modification.
05-12-62	#188	Speed sensor plumbing fitting.
10-12-62	#192	Door installation - 10 squirt left.
07-12-62	#194	PT5 plumbing revision.
07-12-62	#198	Center axle bushings - main landing gear.
07-12-62	#195	Drain line installation.
12-12-62	#201	Chine panel beef up - AD163-70 skin.
12-12-62	#113	AP-559-gearbox installation.
09-10-62	#114	ARC 50 nose structure.
30-11-62	#173	Addition of altitude switch in spike actuator.
13-12-62	#184	Drains installation - engine forward.
18-12-62	#200	Venturi bell mouth rework.
02-01-63	#208	Nose landing gear scissors switch.
18-12-62	#209	Drain line installation - drive shaft.
26-12-62	#214	Main landing gear door cylinder modification.
28-12-62	#216	Emergency gear release cable change.
31-12-62	#217	Remote gear box installation.
02-01-63	#174	Oxygen panel.
09-01-63	#223	Cable assembly - rudder pedal adjust.
21-01-63	#236	"Added Power" detent and stop.
15-01-63	#232	Guide assembly - eject flap rev.
29-01-63	#187	Hi-temp updating servo hardware.
23-01-63	#218	Flight control mixer pitch and roll quadrant support assembly.
28-01-63	#235	Inertial navigation system ground test plug provision.

RELEASED DATE	S/B#	TITLE
23-01-63	#242	Drag chute mechanism mat'l.
24-01-63	#243	Landing gear packings.
16-01-63	#234	Heat shields - nacelle, elevon and rudder controls.
05-02-63	#246	Shield installation - ADF sense antenna.
29-01-63	#247	Drain line Rev. hydraulic pump.
06-02-63	#197	Install windmill bypass plumbing.
15-02-63	#258	Access - pitot line drain.
11-02-63	#263	Install - redesigned rudder limiter stops.
06-02-63	#255	Install - spike roller guide.
13-12-62	#257	Spring replacement - UHF antenna actuator.
01-02-63	#203	Landing gear warning light dimming.
15-02-63	#269	W.S. 107.50 Rib Rev. at O/B M.L.G. door hinge attachments.
06-11-62	#126	ARC-50 hydraulic installation.
24-10-62	#128	ARC-50 periscope installation.
20-02-63	#138	Special protection - fin and nacelle wiring.
15-02-63	#220	Sun compass window installation.
31-01-63	#249	Battery disconnect plug replacement.
21-02-63	#276	Modification - inboard main landing gear door.
19-02-63	#125	ARC-50 air conditioning.
26-02-63	#132	Adjustable uplock piston.
16-02-63	#193	Door installation - 10 squirt R/H NAC.
26-02-63	#260	Change stub fin attach bolts from A-286 material to rene 41.
27-02-63	#282	Main landing gear actuator cylinder.
25-02-63	#233	Install hi-temp fuel quantity tank connectors.

RELEASED DATE	S/B#	TITLE
20-02-63	#274	Main landing gear inboard door rework.
28-02-63	#277	4.0 second seat - man separation.
28-02-63	#280	Circuit breaker barriers, stiffening of.
01-03-63	#268	Removal - pump case flow switch.
26-02-63	#284	Outer M/L/G door modification.
26-02-63	#286	Blow in door attach screw revision.
09-03-63	#8	Tire container - main landing gear.
09-03-63	#259	Periscope projector control provisions.
18-03-63	#29	Equipment bay inner can installation.
12-03-63	#199	Install platform temperature control.
11-03-63	#266	Canopy remover - thruster reposition.
11-03-63	#294	Installation hydraulic access door.
08-03-63	#295	Door installation - exhaust nozzle control.
11-03-63	#297	Pilot's foot ramp flap.
14-03-63	#94	Seat lowering.
15-03-63	#301	Door installation Eng. control access.
13-03-63	#302	Fuel hose clamp.
21-03-63	#303	Door installation - pilot valve access, NAC, Sta. 954, to 970.75.
21-03-63	#300	Bolt changes - B.S. 954.0.
23-03-63	#296	Install access doors for fuel and afterburner controls.
27-03-63	#231	Switch installation - microphone, throttle knob.
22-03-63	#283	Installation - offset rudder pedal.
22-03-63	#304	RMI converter.
01-04-63	#308	Pilot control stick.
28-02-63	#77	Revision - supporting structure for hydraulic reservoirs.

RELEASED DATE	S/B#	TITLE
10-04-63	#78	Bull nose and fairing installation outboard elevon.
03-04-63	#210	Revision - inlet spike roller.
04-04-63	#313	Replacement periscope push pull cable assembly.
04-04-63	#314	Periscope projector mirror push pull cable.
10-04-63	#319	Filler installation - Fus. Sta. 164.
10-04-63	#318	Reinforcement - inner wing aft closing rib.
09-04-63	#321	Emergency gear release pulley bracket.
28-03-63	#273	Dual anti-skid.
11-04-63	#316	M/L/G inboard door actuator with internal value.
09-04-63	#227	System installation - hydraulic reserve oil.
25-04-63	#324	Drainlines installation engine main gearbox.
17-04-63	#326	Rework of AW248 left and right.
25-04-63	#331	Drain lines installation.
23-04-63	#124	ARC-50 electrical nose installation.
12-04-63	#307	Outboard servo modification.
23-04-63	#328	Spike actuator mount assembly.
03-05-63	#191	Throttle control system - J58.
01-05-63	#211	ARC-50 (Equipment Group).
14-05-63	#261	Hydraulic pump drain separate return.
27-04-63	#262	Seat - increased maximum vertical adjustment up and down.
29-03-63	#270	Anti-collision lights.
03-05-63	#275	Anti-collision light installation.
03-05-63	#309	Right hand engine throttle arm.
06-05-63	#312	Electronic nose rework.
02-05-63	#327	Taxi light - nose landing gear.
14-05-63	#329	"Q" bay inner can rework.

RELEASED DATE	S/B#	TITLE
06-05-63	#333	Fuel Qty. system modification.
02-05-63	#334	Feel spring assembly revisions - mixer.
07-05-63	#272	Brake damper valve system installation.
14-05-63	#320	Strainer installation - auxiliary fuel circ. system.
09-05-63	#335	Transmitter replacement.
14-05-63	#250	Data monitor installation (Mag. Recorder).
13-05-63	#264	Fitting's installation O.W. hold open bar.
13-05-63	#279	Door access installation NAC 970.75 to 986.75.
08-03-63	#292	Inspection hole addition - spike Sta. 121 (NAC).
15-05-63	#306	Inboard servo assembly revision.
15-05-63	#337	Ejector flap filler revision.
13-05-63	#339	NAC temperature detector system modification.
17-05-63	#340	F.S. 398.0 Blkd. modification.

(6) Engine Technical Orders: There were no outstanding engine Technical Orders.

(7) Afterburner Technical Orders: The following Technical Orders were outstanding on afterburner S/N 6007592 (Left Position):

30-06-63	2J-J75-578	Rework of A/B flameholder weldments.
24-03-61	2J-J75-618	Rework of A/B nozzle actuating cylinder piston bushing.

(a) These were routine action Technical Orders and were scheduled to be accomplished at depot overhaul.

(8) Summary of Record Examination: Inspection and maintenance records were found to be satisfactory, except for the following conditions:

(a) A preliminary copy of a work order was originated 22 May 1963 following the post-flight briefing of that date. This work order included one item which required removal of the air data computer, replacement of the servo amplifier, and reinstallation of the air data computer. Because there was only a single work order copy, and due to oversight, the removal and reinstallation was not documented or submitted to inspection.

(b) The following items were included in the work order dated 22 May:

"Remove air data computer and replace servo amplifier - then reinstall computer before installing Type II package".

"Drag chute did not eject. Check chute rigging during periodic inspection".

"Move A/C to bldg 120 and remove Type I".

"Check water injection pumps for operation. Pilot did not think he was getting water on T.O.".

"#2 LN_2 fill and vent valve leaks - Remove and replace".

"Prepare A/C for Type II and INS flight Thur. 23 May 10:30".

(c) The conditions of this summary are being submitted to the instruments and electrical group of the accident investigation committee for their consideration.

3. Findings:

a. Maintenance records for the aircraft and engines were found to be satisfactory except one workorder request of 22 May 63.

b. All required maintenance and inspections had been performed except air data computor re-installation inspection and SAS pre-flight for flight of 24 May 63.

c. There were no overdue outstanding manufacturing service bulletins.

d. Unaccomplished manufacturing service bulletins were not a contributing factor to the accident.

e. Delayed discrepancies were not a factor in the accident.

f. There is no pattern of repetitive or significant malfunction trends that can be related to the accident.

4. Recommendations: None.

R. J. Ermisch
R.J. ERMISCH
Field Service Rep
Pratt & Whitney

E. G. Reynolds
E.G. REYNOLDS
Inspection Supervisor
LAC

STRUCTURE EXPLOSION AND FIRE

STRUCTUAL, FIRE AND EXPLOSION REPORT PERTAINING TO AIRCRAFT 123 ACCIDENT

24 MAY 1963, WENDOVER, UTAH

From observation of the impact marks on the ground and examination of the wreckage, the aircraft contacted the earth in an inverted position on the top of the two fins. The contact was made on the approximately 30 degree downward slope of a hill. The inverted nose down attitude of the aircraft with respect to the hill was estimated as 20 degrees. Hence the approximate attitude of the aircraft to the horizontal would be 50 degrees. Upon impact, the aircraft disintegrated with resultant explosion and fire. The scatter pattern along the flight path from the point of impact is shown in Figure 2. Figure 1 shows the location of the escape items back along the flight path as well as several small pieces of aircraft also located back along the flight path. Figure 3 is the location of these small pieces of aircraft parts found before the impact identified as to position on the aircraft.

1. Investigation:

a. Each of these pieces found before impact were properly identified. The identification was made either by part number, type of material, material thickness, peculiar shape, and lastly, by fitting jig saw puzzle fashion to other parts of the wreckage. Examination of Figure 3 reveals no sequence, nor established pattern for these parts to separate from dispersed location on the aircraft, other than they were light small parts, some burned and some not. The logical reason is that upon impact of the aircraft with the ground, the resulting disintegration; explosion and fire caught small pieces of aircraft and parts in the entrapped rising currents of air from which they landed mostly forward but several aft. A good example to verify this is a part of the right hand forward fixed drive skin AF 163-70, see Figure 3.

This piece was covered with soot and blacked on both sides, on the edges and in the rivet holes. Picture Number 3-1825 shows a paper facsimile placed along side the structure from which it came. To be noted is that the adjoining structure is clean. This is proof that the part was torn free at impact, moved up in a draft of hot air through a ball of burning fuel and there thrown rearward from the impact zone.

b. Burned structural parts found in the impact area were examined to determine whether or not the burning took place prior to impact. In no piece examined was this evident. All burning was indicative of post impact fire. The primary fire regions of structure examined were the cockpit area, the wheel wall area, and the inboard wing and fuel section. Picture Number 3-1824 is indicative of ground impact fire. By placing the two pieces of the torn titanium adjacent, one is discolored and the matrix part as pointed to by the pen is clean. Picture Number 3-1826 shows the characteristic mottled appearance of ground fire. Picture Number 3-1817 shows the congealed aluminum alloy rivulets from ground fire; note they contained dirt.

c. All extremities of the aircraft were accounted for in the impact area as well as all doors and hatches.

2. Conclusions:

a. There was no fire or explosion in flight.

b. The aircraft was structurally airworthy prior to impact.

3. Recommendations: None.

Arthur L. Smith for -
SYDNEY D. BERMAN
Technical Consultant
Directorate of Aerospace Safety
Office of Inspector General
Norton AFB

Henry G. Combs
HENRY G. COMBS
A-12 Project Engineer
Structures

AD 163-70 - .019" thick.

Color - mottled medium brown inside and outside, portion of outer surface has gray deposit adhering to it. Deforming force was applied to inside of piece, rivet holes were counter sunk. Inner surface has what appears to be small spatter deposit of molten aluminum. All fracture edges are discolored, some rivets pulled through holes with almost no deformation, other rivets tore sheet while pulling through.

Microsection shows material in No. 3 is annealed B120VCA.

A bright metal splatter was removed from the inside surface and checked by spectrochemical methods. The predominant metallic elements were Al, Cu, and Mn in approximately the same proportions as in dural type alloys.

The scrapings from the outside surface showed Si, Al, and Mg as principal metallic elements with small amounts of Na and Ca. Such an analysis is typical of earth.

This part is positively identified by fit with unburned structure as shown in photograph 3-1825.

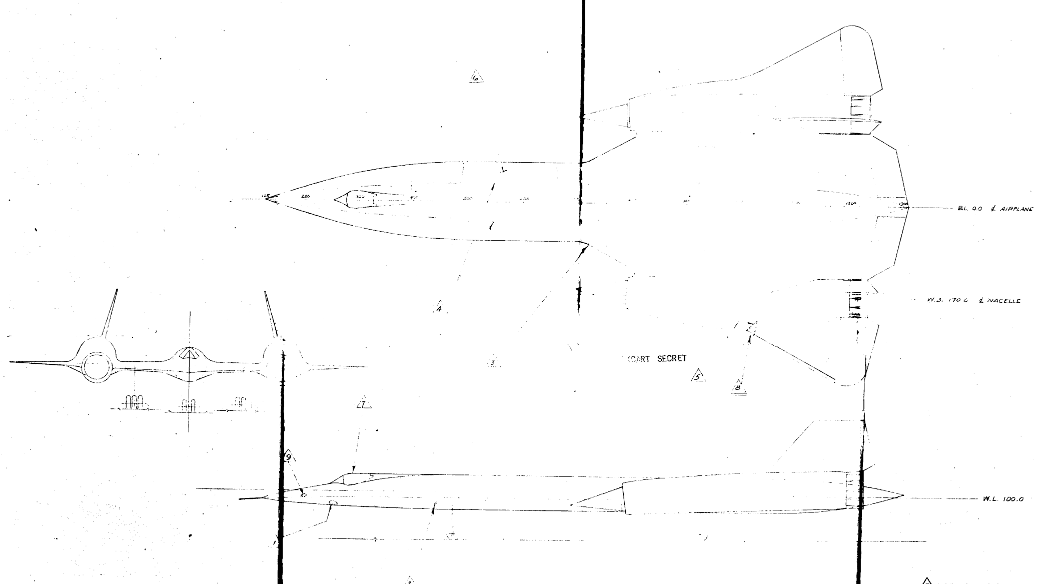


FIG. 3

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8. AD 142-14 PANEL ASSY (FWD HALF) FOUND AT IMPACT SITE. (MATES 5 PERFECTLY.)

7. CANOPY, SEAT, SEAT CUSHION & TAPE RECORDER.

6. FUSELAGE CHINE BLANKET SKIN & INSULATION (SCORCHED.) (UPPER OR LWR., LEFT OR RIGHT)

5. AD 142-15L PANEL SKIN . (CHINE TOOTH LAYER - UNBURNED) (LOWER LEFT)

4. AA 73 PIPE INSULATION & TINFOIL; ANYWHERE ALONG AA 70, 71, & 72. (F.S. 398 1/2 TO PRIMARY HEAT EXCHANGERS IN WING, 1/2)

3. AD 180-2 NOSE PANEL, LWR. LEFT. (F.S. 722.495 & B.L. 76.981)

2. AA 86-37 INSULATION PANEL ASSY.; R.H. SIDE, AFT END LOWER. (F.S. 477 & W.L. 78 ; NOSE GEAR WELL)

1. AD-163-70 SKIN. R.H. FWD. FIXED CHINE. (F.S. 252)

NOTE:

9. FRAGMENT - NOSE SKIN - FWD. OF COCKPIT.

AIRPLANE DIAGRAM SHOWING ORIGIN OF PARTS FOUND BACK OF IMPACT.

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AERODYNAMICS

TABLE OF CONTENTS

FIGURE INDEX

SUMMARY

An aerodynamic analysis is made of the flight conditions as described by the pilot and chase. Based on their testimony and airplane performance parameters, it does not seem possible that Airplane 123 could have attained 1.05 Mach for the flight conditions immediately after passing over Wendover. The flight description also indicates that the airplane gradually lost airspeed after the turn. This airspeed loss would occur in the time recorded, if the thrust were decreased to 50% of that required for cruise.

The loss of airspeed could also have occurred when thrust was reduced in the climbing turn, but upon rollout and advancing the throttle the airplane would have returned to .84 Mach.

SECTION I

Flight Profile

A graphic layout of the approximate flight sequence and flight profile of S/N 123 from a point thirty-three nautical miles southwest of Wendover, Utah, to the impact point as obtained from the subject aircraft's pilot and chase pilot's comments and investigation of the crash scene is presented in Figures 1 and 2. These figures were prepared as an aid in analyzing and explaining the sequence of events leading up to the crash of S/N 123.

Figure 1 was constructed on the following basis:

1. Straight and level flight at Mach .85 at 34,000 feet for thirty-three nautical miles to the Wendover check point. Starting time 11:52.
2. A 30 degree banked climbing left turn through 224 degrees at Mach .85 at which point S/N 123 rolled out on a heading of 200 degrees at 37,750 feet.
3. Straight and level flight while speed decreased to 160 KEAS.
4. A descending straight course while speed bled to 101 KEAS, time approximately 12:02.
5. An approximate path required to reach the crash scene.

One item is not reflected in Figure 1 because of inconsistencies in pilot reports. This is discussed below.

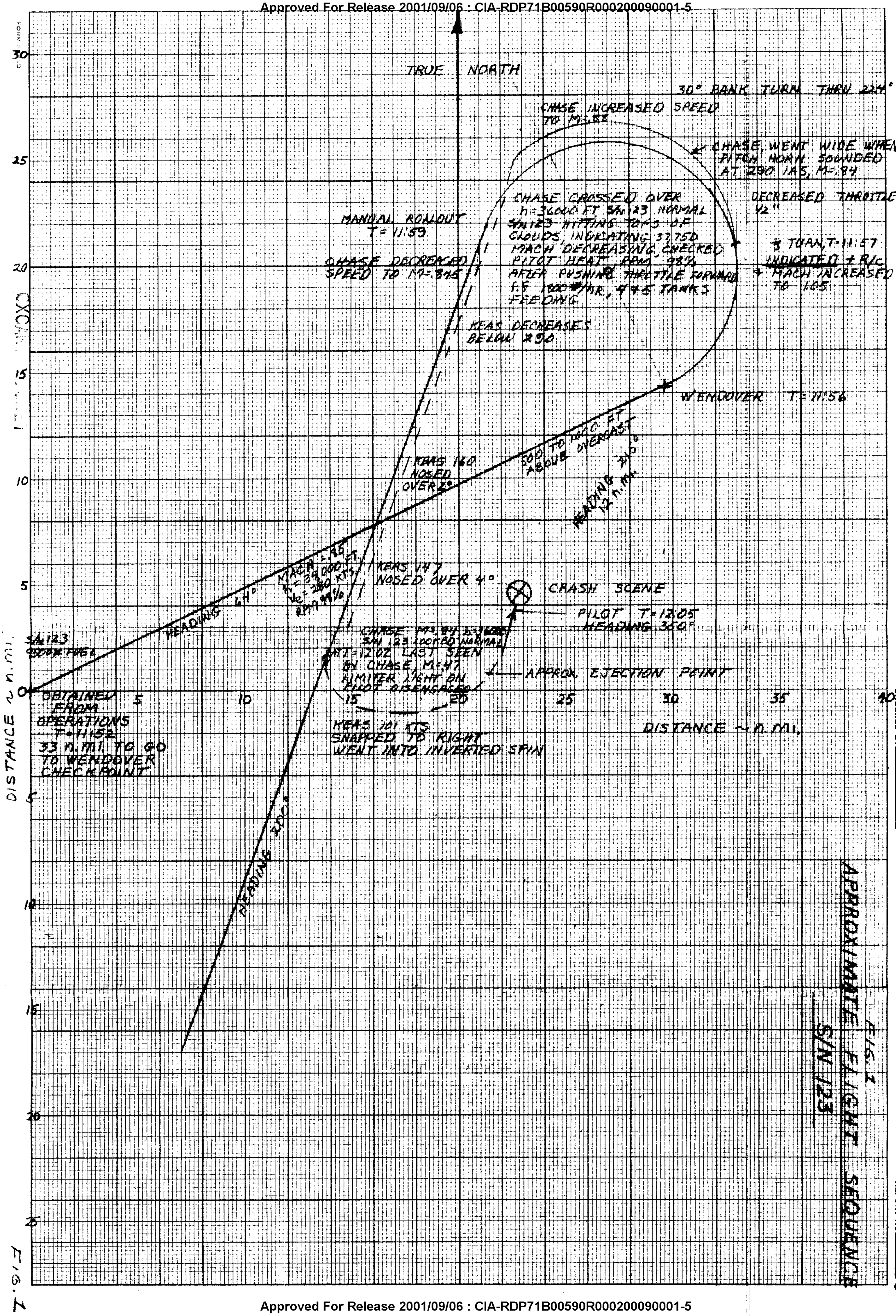
At approximately one third of the way around the turn, the chase slid to the outside in a larger diameter turn which yielded a 4,000 ft. lateral separation at the end of the turn. During this time the chase speed was increased to Mach .88. The 4,000 ft. separation is attained by either maintaining a 30 degree bank at the increased speed or by reducing bank angle to 28.6 degrees at Mach .85. At the end of the turn the chase was level with and just passing S/N 123.

S/N 123 reported that halfway through the turn the Mach number started increasing. To keep speed down, a 2 degree climb was initiated and throttle was reduced one-half inch. Near the end of the turn S/N 123 indicated a Mach number of 1.05 and an altitude of 37,750 feet.

The impossibility of this acceleration in a climbing turn at something less than Military power is discussed in Section II. However, it is interesting to note that in Figure 1 S/N 123 would have been approximately three nautical miles ahead of and 8,000 feet outside of the chase at the end of the turn, if the acceleration had occurred. Thus, the acceleration is not substantiated by the observations of the chase pilot and the fact that the chase overtook, passed and climbed above S/N 123 at the end of the turn.

Figure 2 presents the approximate flight profile of S/N 123 and the chase plane. This figure reflects the reported positions per the individual aircraft's instruments, as well as the reported relative positions of the vehicles. It is to be noted that the elevator angles specified in Figure 2 would be trim positions.

A preliminary investigation indicates that the elevons were trimmed to +5 degrees, which is a hardover nose down trim position. This trim position is an incremental +10 degrees from the required trim position at the last reported speed just prior to the stall and inverted spin. Thus, if this trim position actually existed prior to the stall, there existed a pitching moment equivalent to +10 degrees elevator, which would have tried to nose the aircraft over into a -.5 "g" pushover. A pushover of this magnitude would develop a descent angle at the rate of 10 degrees a second at 101 KEAS at 30,000 feet. A descent angle of 10 degrees, combined with Military power and the drag at -.5 "g's", would have resulted in an acceleration even at 101 KEAS. It can, therefore, be concluded that the trim actuator input was being counteracted by pilot input. The above conclusion is further substantiated by the fact that the autopilot, when in the Auto-Nav mode, utilizes an attitude hold mode in the pitch axis; thus, the autopilot would be putting in nose down elevon to oppose the buildup in angle of attack due to the deceleration. When the autopilot is disengaged with the CSC button, the Mach Box would continue to put nose down elevon in with decreasing speed. In terms of stick force, the pilot effort required to counteract the trim actuator input is approximately 20 pounds.



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CALIFORNIA DIVISION

FIG. I

APPROXIMATE FLIGHT SEQUENCE S/N 123

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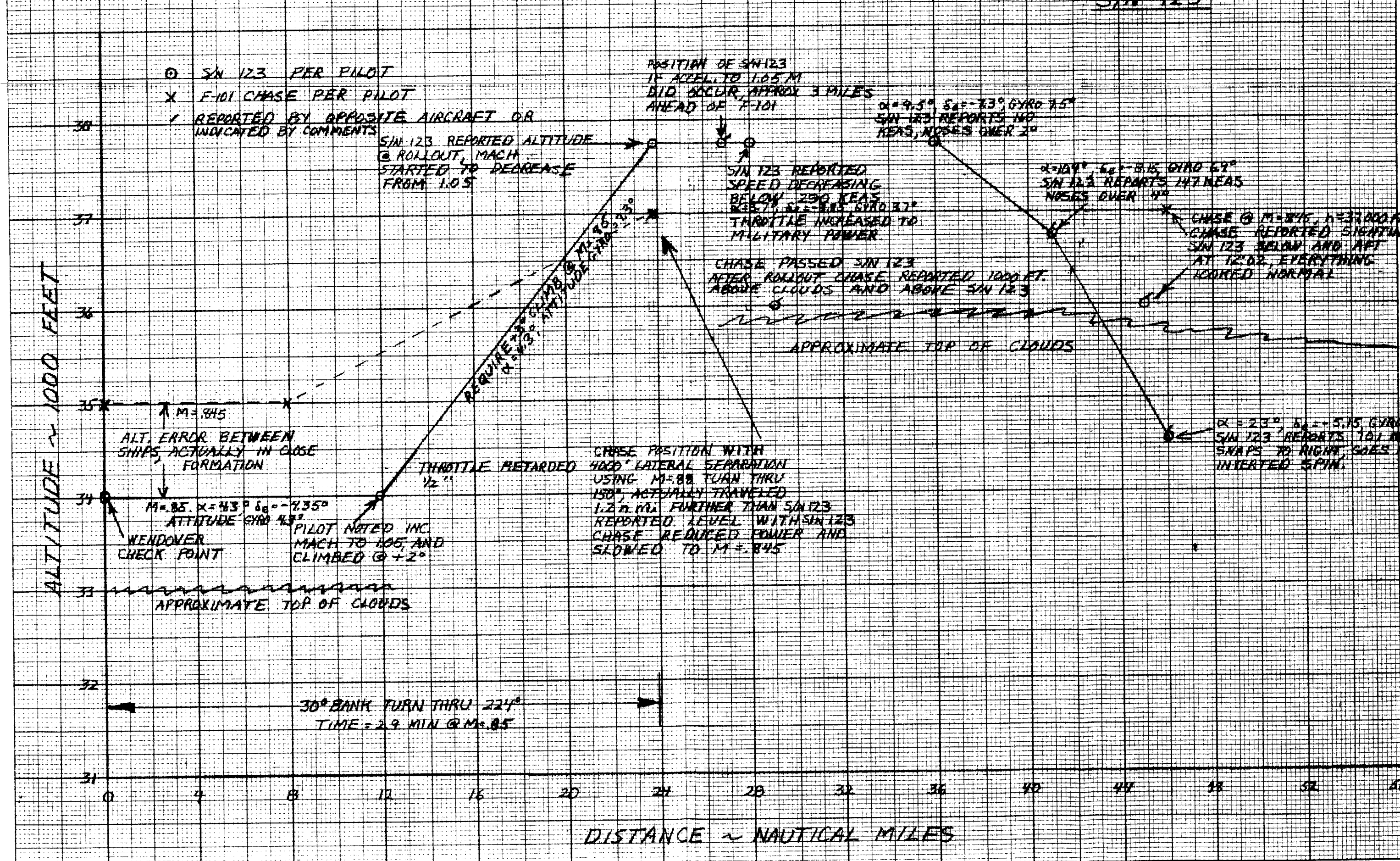
FIG. 2
APPROXIMATE FLIGHT PROFILE
S/N 123



SECTION II

Flight Path to Mach 1.05

The pilot of S/N 123 reported that, during the turn near his Wendover check point, the triple display indicator showed Mach number increasing to Mach 1.05. His statement was: "At approximately halfway through the left turn, I noted the Mach Dial increasing. I began a climb while in the turn. However, the airspeed and Mach number continued to increase. The maximum was 1.05. I could not figure out why this should occur, since the throttle setting remained constant throughout the flight and I was climbing."

The flight path required to reach Mach 1.05 without the use of after-burner is shown, using the following assumptions:

1. Altitude at start of acceleration is 34,000 feet. This is the lowest altitude reported by the pilot of S/N 123, at the start of the turn. The chase pilot in close formation reported an altitude of 35,000 ft. at the start of the turn. The lower altitude provides a more favorable relationship between thrust and drag for acceleration.

25X1A

2. The initial airspeed and Mach number is 280 KEAS and .85 respectively. The chase pilot reported a Mach number of .845 just prior to entering the turn, and 280 KEAS corresponds to this Mach number and altitude.
3. The engines were operating at full Military power. Full Military power gives 4,400 pounds of thrust per engine, or 8,800 pounds

total. The drag of the airplane for the initial conditions is 6,500 pounds at 58,200 pounds weight and 23% C.G. This Military power is greater than required for level flight at these conditions.

4. The weight and center of gravity location are 58,200 pounds and 23% of the mean aerodynamic chord. These are the loading conditions that existed on S/N 123 prior to the turn.

5. The aircraft is at zero "g" load factor. The aircraft drag is lowest at zero "g". At the initial conditions, the drag is decreased to 3,600 pounds compared to a level flight drag of 6,500 pounds. Thus, the excess thrust for acceleration is the highest.

The resulting flight path, Figure 3, shows that the airplane will accelerate to Mach 1.05 in 19.2 seconds. At Mach 1.05 the flight conditions are:

Altitude	27,700 feet
Flight Path Angle	37° Nose Down
Angle of Attack (Zero "g")	0°
Airplane Attitude	37° Nose Down
EAS	410 KEAS

Figure 4 presents a similar acceleration, except that once a descent angle of 10 degrees is attained, this angle is maintained for the rest of the acceleration by bringing the airplane to approximately 1 "g" flight. The resulting flight path shows that the airplane will accelerate to Mach 1.05 in 55 seconds. At Mach 1.05 the flight conditions are:

Altitude	25,000 feet
Flight Path Angle	10° Nose Down
Angle of Attack	1.7°
Airplane Attitude	8.3° Nose Down
EAS	422 KEAS

Both pilots reported an undercast at 32,000 to 33,000 feet. Thus, in order to accelerate to Mach 1.05, S/N 123 would have entered the undercast. During the time that the pilot of S/N 123 reported Mach 1.05, both he and the chase pilot were in visual contact and were above the undercast and indicating 37,000 to 38,000 feet altitude. Furthermore, the chase pilot reported that S/N 123 remained in a normal attitude, and a dive of 10 to 37 degrees would certainly not qualify as a "normal attitude." It is of further interest to note that if the acceleration to Mach 1.05 followed the path shown on Figure 3, and was subsequently followed by a 2-1/2 "g" pullup, the acceleration would continue to increase until the nose down attitude was decreased to 15 degrees and an additional altitude loss of 5,000 feet. At this time the equivalent airspeed would exceed 450 KEAS. The maximum Mach number that could be attained started at 34,000 feet before entering the undercast at 32,000 feet would be 0.95, and the flight path angle would be 24 degrees nose down.

At the time that the pilot of S/N 123 reported reading Mach 1.05, he also reported that he was in a 30 degree banked turn and climbing at an angle of 2 degrees. The climbing turn was verified by the chase pilot. This combination of flight conditions would result in an airplane drag of 9,400 pounds. Thrust available, as noted earlier, at 34,000 feet is 8,800 pounds. Consequently, a climbing turn on full Military power would result in a slow deceleration rather than an acceleration.

From the above analysis it is apparent that S/N 123 could not reach Mach 1.05 during the Wendover turn without use of afterburner power.

The zero "g" load factor, the dive angle and the loss of contact in the overcast all required to accelerate to Mach 1.05 would have been readily noted by the chase pilot even if the pilot of S/N 123 did not report these conditions.

Figures 5, 6 and 7 present typical thrust, drag and rate of climb data used in the above analyses.

FORM 527BA

FIG. 3
RAPID ACCELERATION
S/N 123

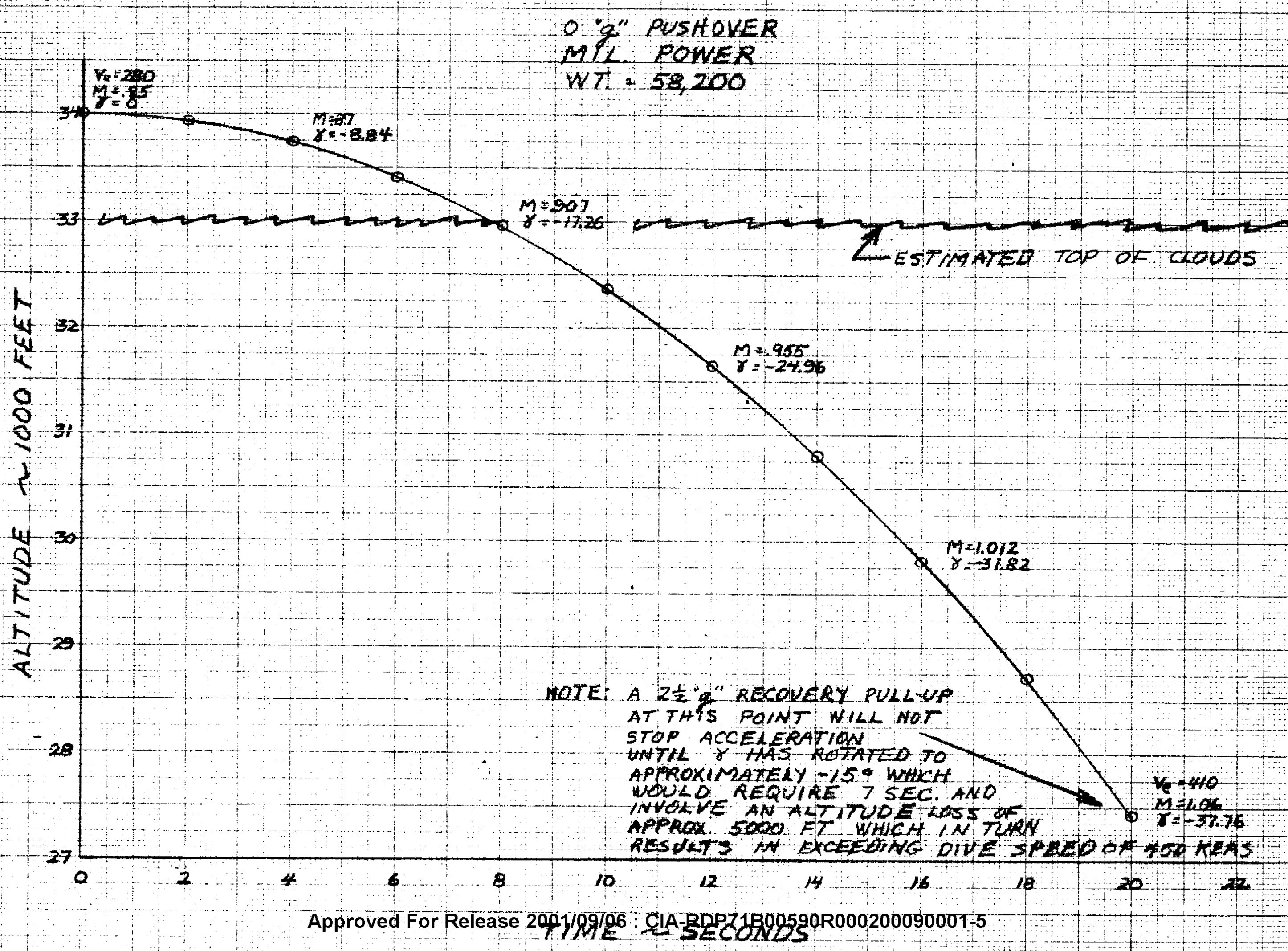


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Fig. 3

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DATE
CHECKED BY

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CALIFORNIA DIVISION

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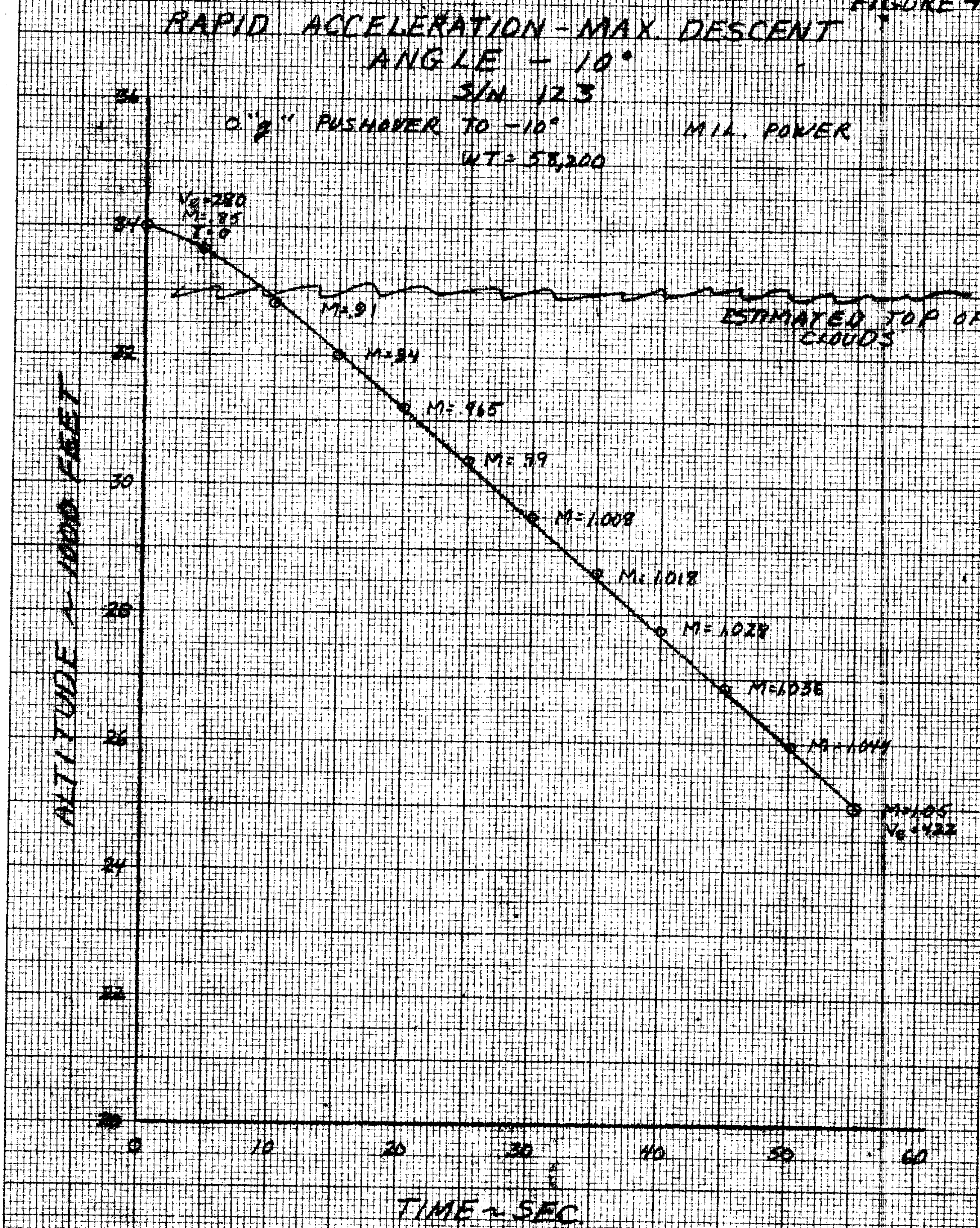
MODEL
REPORT NO. SP-598

FIGURE 4


RAPID ACCELERATION - MAX. DESCENT ANGLE - 10°
S/N 123
0 "g" PUSHOVER TO -10°
MIL. POWER
WT = 58,200
Ve = 280
M = .85
M = .91
M = .94
M = .965
M = .99
M = 1.008
M = 1.018
M = 1.028
M = 1.036
M = 1.044
M = 1.05
Ve = 422
ESTIMATED TOP OF CLOUDS
ALTITUDE ~ 1000 FEET
TIME ~ SEC.
36
34
32
30
28
26
24
22
20
0
10
20
30
40
50
60

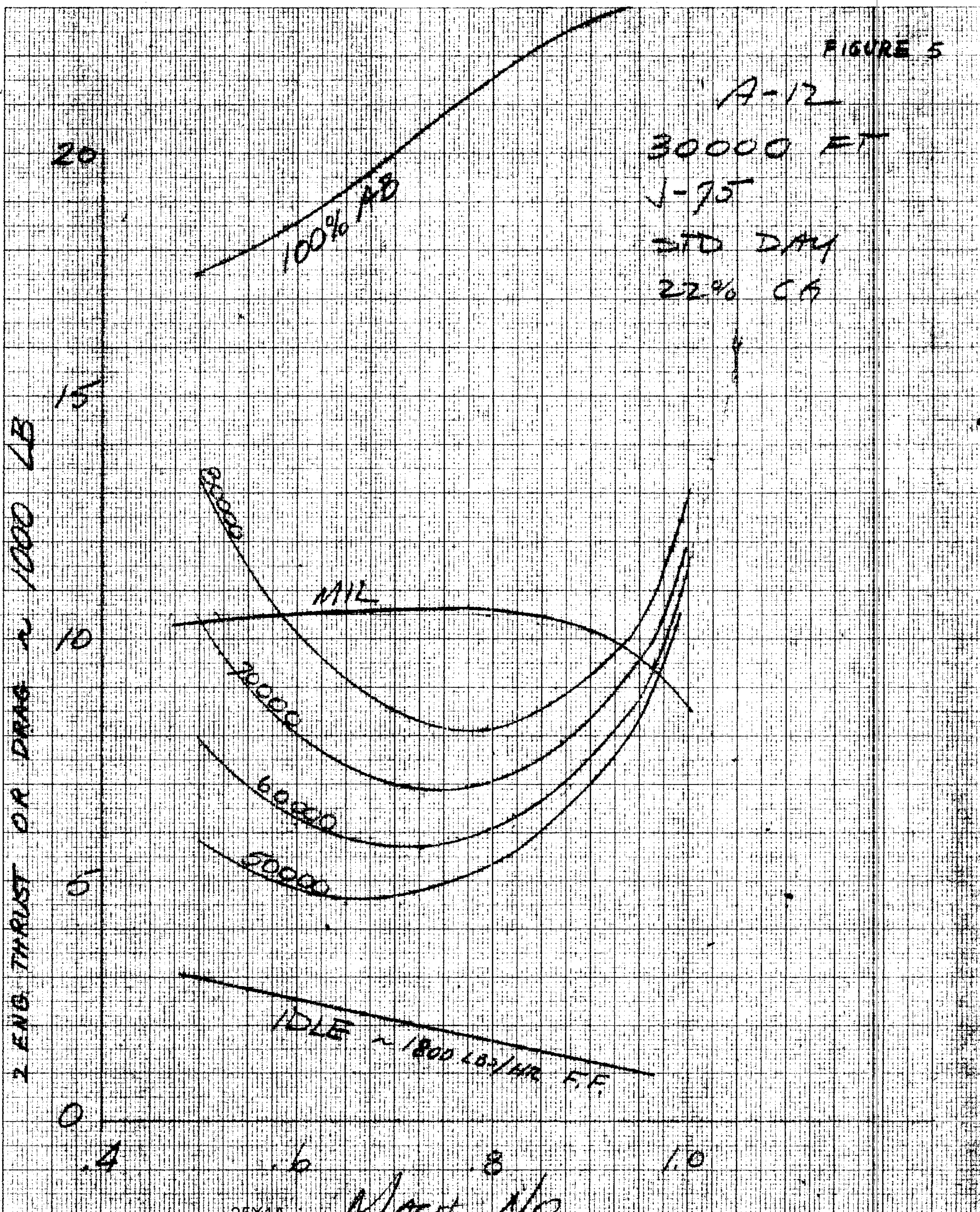


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FIGURE 6

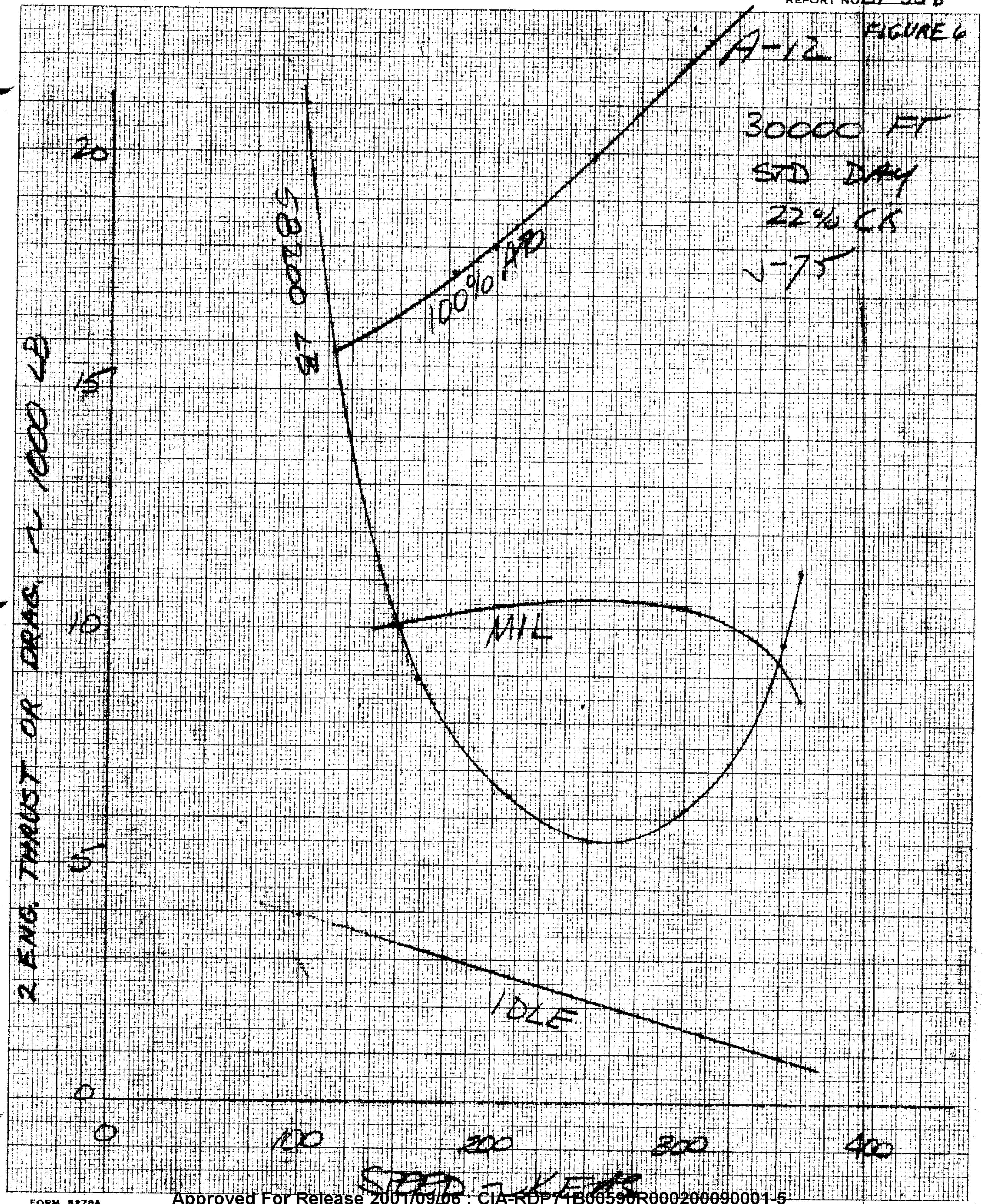
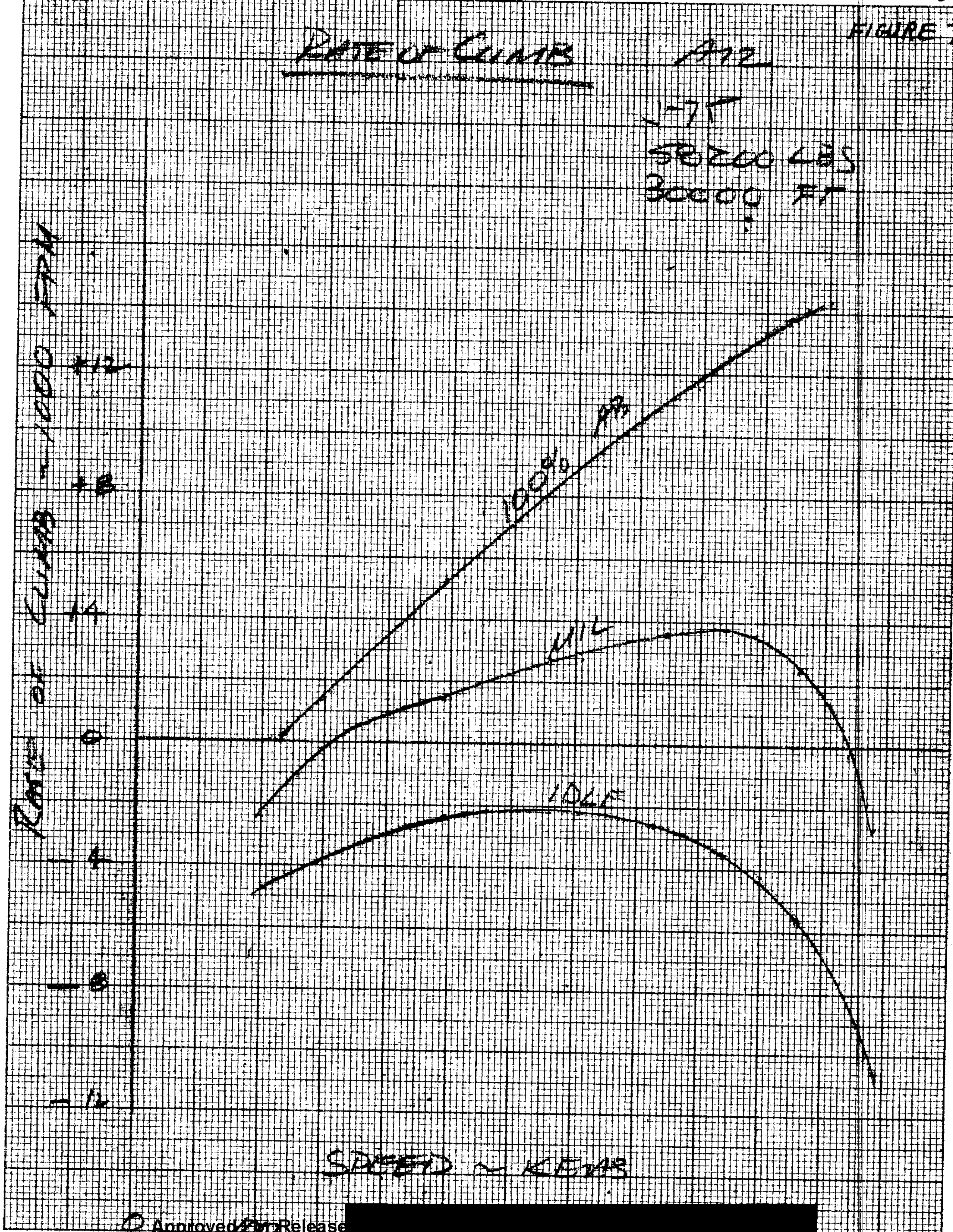

A-12
30000 FT
STD DAY
22% CR
J-75
57000 LBS
100% A/B
MIL
IDLE
2 ENG. THRUST OR DRAG ~ 1000 LB
20
15
10
5
0
0
100
200
300
400
SPEED ~ KEAS

FIGURE 7


RATE OF CLIMB A-12
J-75
58200 LBS
30000 FT
RATE OF CLIMB ~ 1000 FPM
+12
+8
+4
0
-4
-8
-12
100% AB
MIL
IDLE
SPEED ~ KEAS

SECTION III

Flight Path During A Turn

The variation of equivalent airspeed during a 224 degree turn and the subsequent rollout is shown on Figure 8. This flight path is based on events during the Wendover turn as reported by the pilots of S/N 123 and the chase. The sequence and timing of events is difficult to define from the transcript of the debriefing, and the actual magnitude of the throttle motions, bank angles, airspeeds, altitude, fuel flows, EGT's and RPM's are not available. Therefore, the following conditions are assumed:

1. Weight is 58,200 pounds.
2. Center of gravity at 23% of the mean aerodynamic chart.
3. Initial speed is 280 KEAS.
4. Initial Mach is .855.
5. Initial altitude is 34,000 feet.
6. Initial power setting is that required for the level flight condition defined in Assumptions 1 through 5. For this condition, thrust and drag are equal before the turn is started, and they are 6,700 pounds.
7. Bank angle in the turn is 30 degrees, with a corresponding load factor of 1.155 "g".
8. The flight path contains three segments using the parameters defined below:

Segment 1 - Level Turn

Segment 2 - Climbing Turn

Segment 3 - Rollout and Level Flight

Segment	Level Turn	Climbing Turn	Rollout to Level Flight
Climb Angle	0°	2°	0°
Power Setting	6,700 lbs. (See 6)	6,700-1,000 = 5,700 lbs.	6,900 lbs.

1. Segment 1 - Level Turn

This segment assumes a constant altitude turn at cruise power based on the report of the pilot of S/N 123. It is carried through 112 degrees and requires 87 seconds. During this period, speed gradually decreases from 280 KEAS to 270 KEAS. During this period the Mach number and KEAS readout on the TDI were observed to increase.

2. Segment 2 - Climbing Turn

Upon noting that Mach and KEAS were increasing, the pilot reduced power and started a shallow climb defined as one dot on his attitude indicator, or approximately 2 degrees climb angle. The Mach readout continued to increase to 1.05. The reduced power climb was continued until rollout. Using these conditions, and assuming that the pilot's throttle movement reduced thrust 1,000 pounds, from 6,700 to 5,700 pounds, for the Segment 2 results in a continuing speed bleedoff at a higher rate than for Segment 1. At the completion of the second 112 degree of turn, speed is 216 KEAS and Mach is 0.7.

The 2 degree climb during Segment 2, which continued for 87 seconds, would result in a gain of 2,500 feet in altitude, with rollout occurring at 36,500 feet.

3. Segment 3 - Rollout and Level Flight

At rollout, the pilot noted that his speed had decreased. He then pushed over to level flight and increased throttle back to the cruise setting. This maneuver would decrease drag to 6,200 pounds, and the thrust available would be 6,900 pounds. With this thrust setting, speed would have increased slowly back to cruise speed of Mach .85 in about six minutes. If the throttle setting had been increased to full Military power, or if a descent of 1 degree had accompanied the rollout, the acceleration to cruise speed would occur in about one and one-half minutes.

4. Remarks

From the foregoing, and in conjunction with the statements of both pilots, it appears that the S/N 123 reacted normally during the turn. Some speed was lost, due to: 1.) The increased load factor over the cruise condition; 2.) The climb; and 3.) The retarded throttles. The speed bleedoff could be more or less than shown on Figure 8, depending upon the amount of climb, the angle of bank, and the throttle setting.

It also appears that, after rollout, the speed would build up to cruise conditions in a reasonable period at any throttle setting between level flight cruise and Military power. Figure 9 shows the speed altitude spectrum to the right of the shaded area, where the use of Military power would cause the airplane to accelerate. The point shown at Mach .69 and 36,500 feet corresponds to the computed conditions at rollout shown in Figure 8. From the pilot's report it appears that at rollout S/N 123 was operating normally and that the KEAS and altitude readouts were indicating true conditions.

There is no way in which S/N 123 could have accelerated to Mach 1.05 during this turn without use of afterburners and, consequently, the readout of the TDI must be considered as a transient malfunction that had corrected itself at rollout, or as an erroneous reading by the pilot.

FIG. 4

SPEED-DISTANCE FROM START OF TURN

S/N 123

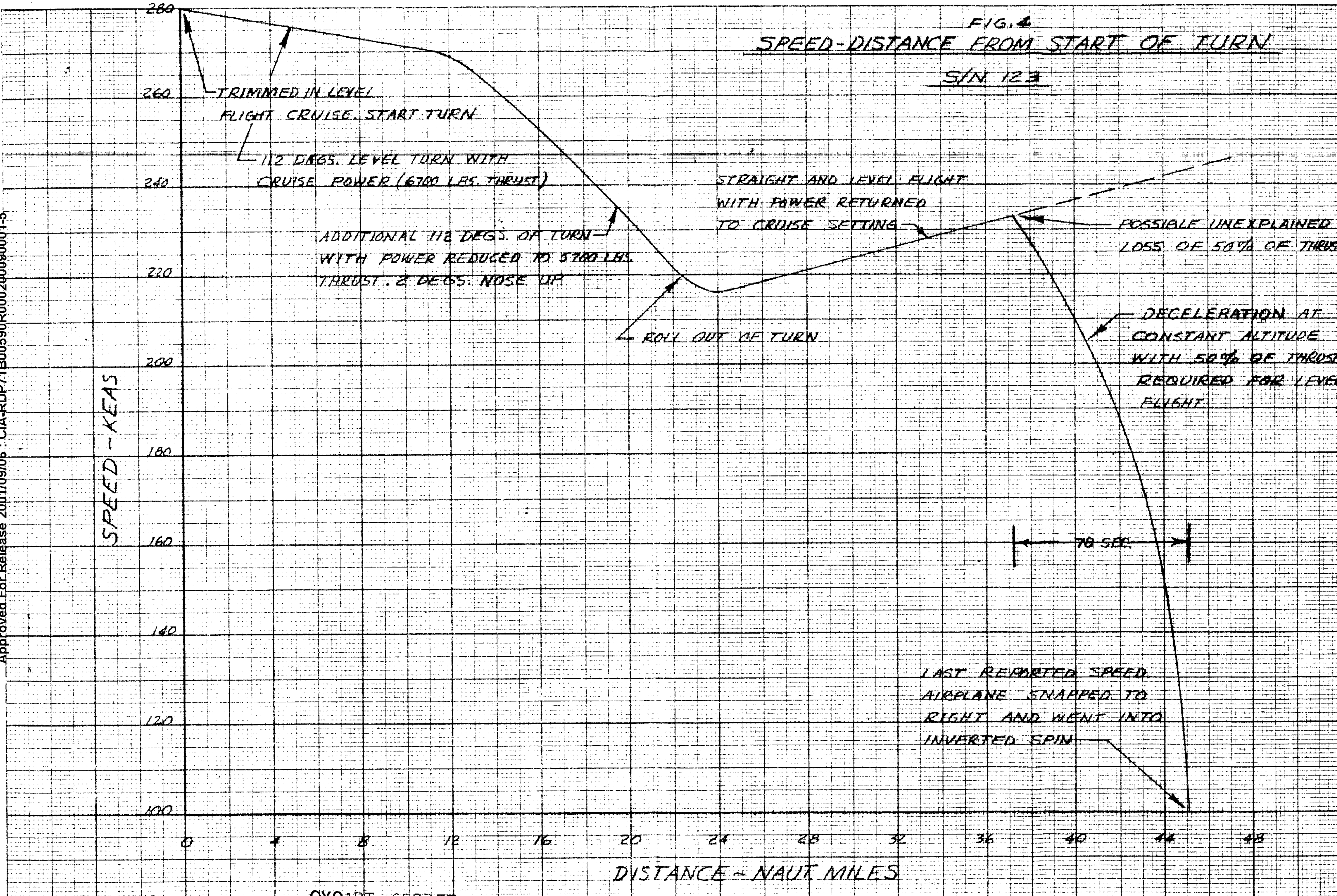


FIG. 8

FIG. 5

MINIMUM MACH NO. FOR THRUST EQUAL DRAG

S/N 123

MILITARY POWER

J-75 ENGINES 60,000 LBS. AIRPLANE WT.

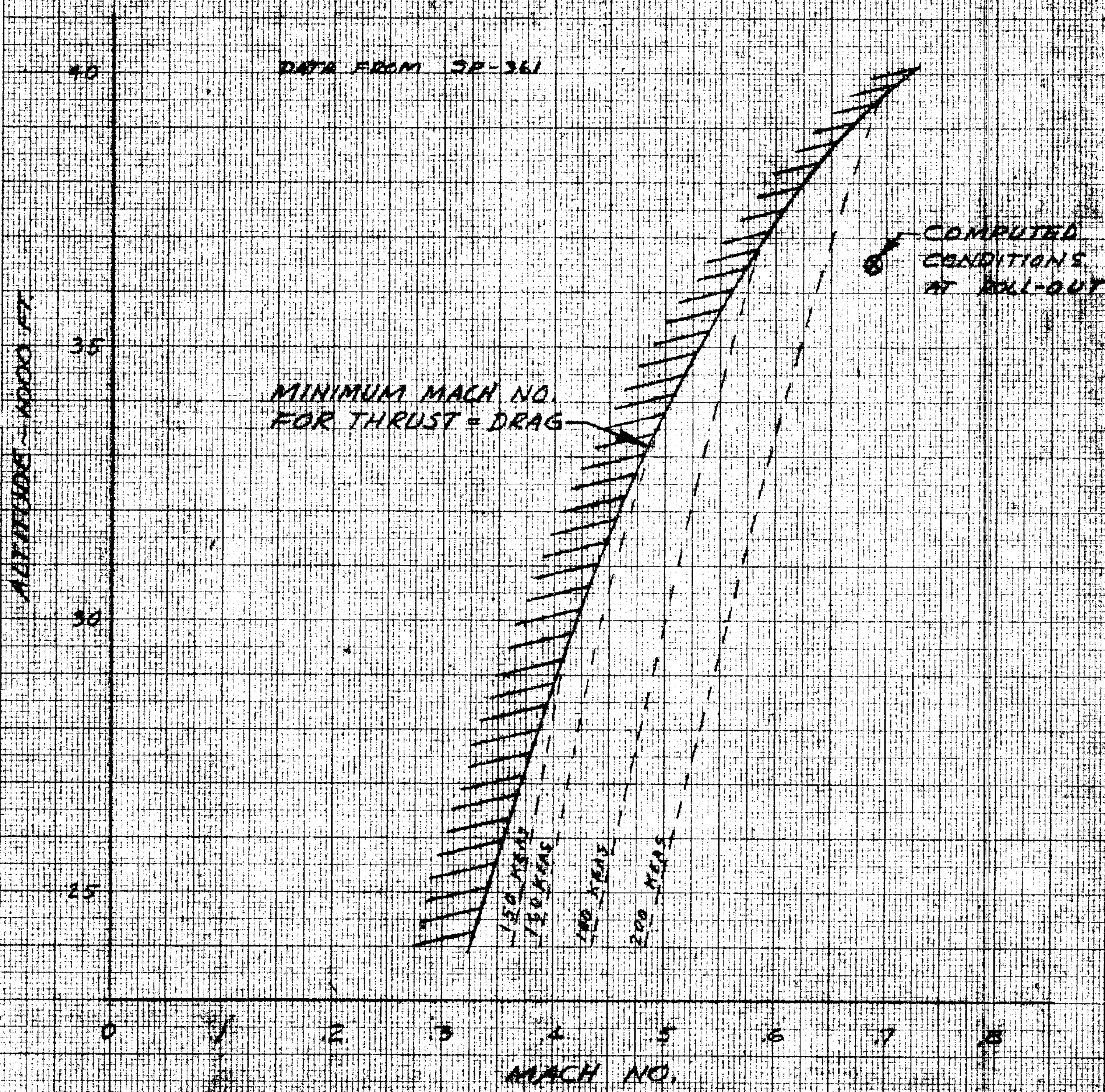


FIG. 9

SECTION IV

Deceleration with Partial Power

Following the turn and rollout, the pilot of S/N 123 reported that KEAS was decreasing. It was pointed out in the previous section that, with any thrust level above that required for level flight at Mach .85, KEAS would increase. The flight path during a deceleration is shown in this section, assuming that a loss in thrust occurred for some undefined reason. Without knowledge of the magnitude of the thrust loss, this flight path is shown for a thrust level of 50% of thrust required for cruise at 280 KEAS at 36,000 feet. The following additional assumptions apply:

1.	Weight	58,200 lbs.
2.	C.G.	23% MAC
3.	Initial Drag	7,200 lbs.
4.	Thrust Available	3,600 lbs.
5.	Initial Speed	280 KEAS
6.	Initial Altitude	36,000 ft.
7.	Initial Mach Number	.89
8.	Altitude Variation	Constant Altitude

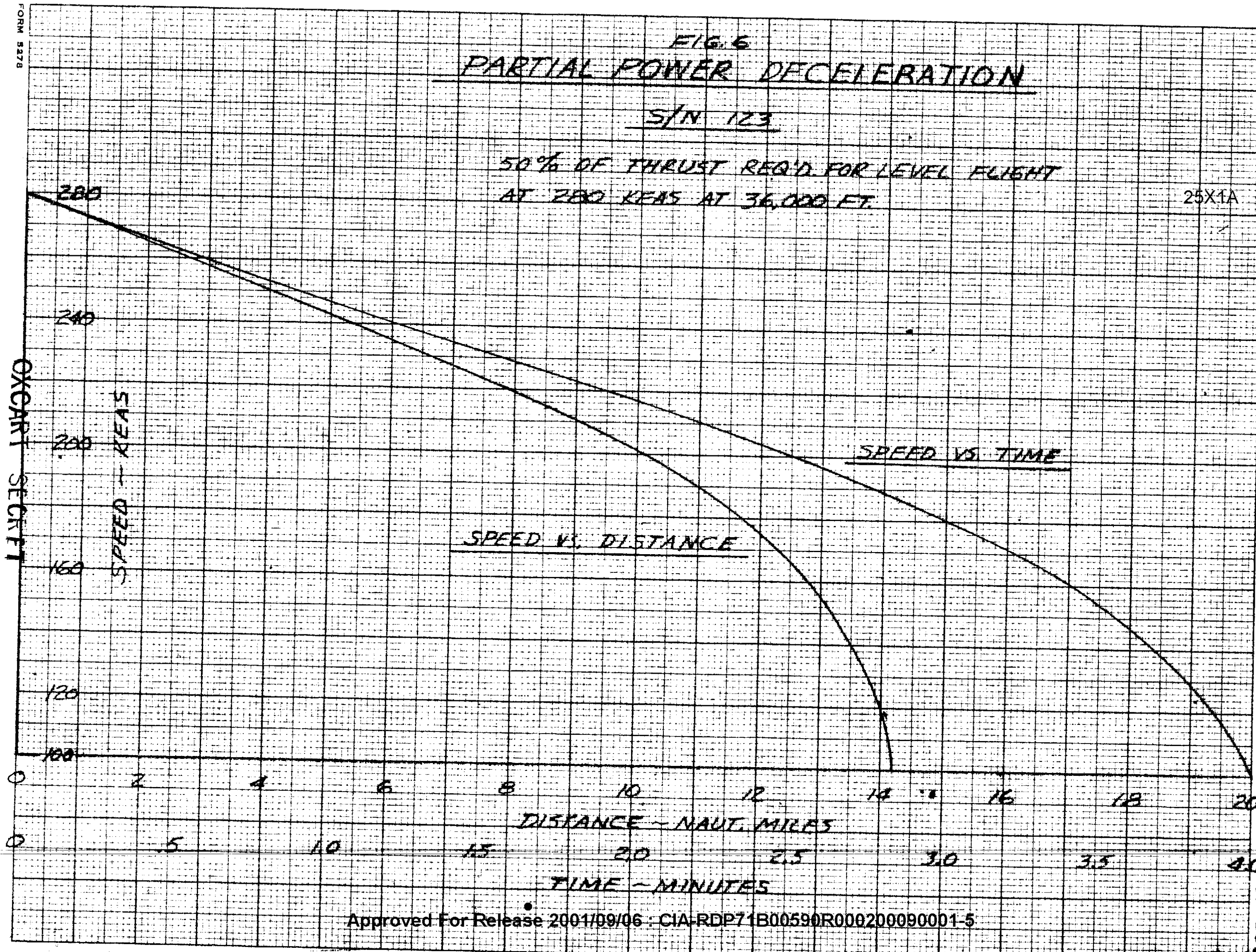
The decrease in KEAS is shown on Figure 10 as a function of time and distance. Speed decreases slowly at first, since the airplane drag remains nearly constant between 280 and 200 KEAS. The thrust decrement during this time averages about 3,000 pounds. Below 200 KEAS, the drag increases rapidly with further speed reductions, since the airplane is on the back side of the drag curve. Consequently, the deceleration becomes more rapid as the speed decreases. When the speed drops below 170 KEAS, Mach .55, the drag is greater than full Military power.

The total time required to decelerate to 100 KEAS is four minutes, and the distance covered is fourteen nautical miles. The time and distance are subject to variation, depending upon actual thrust level and flight path angle. Higher thrust levels or a descending flight path would increase the deceleration time and distance. The pilot reported that at 160 KEAS he nosed down one dot (about 2 degrees) on his attitude gyro. At this point the airplane drag exceeds the thrust by nearly 6,000 pounds. The 2 degree descent decreases the thrust decrement about 2,000 pounds, but the decelerating force is still 4,000 pounds. At 147 KEAS the pilot reported increasing his descent to two dots (about 4 degrees). This maneuver again would decrease the thrust decrement, but the thrust decrement at 147 KEAS is about 7,000 pounds and the descent decreases this by 4,000 pounds, leaving a 3,000 pound decelerating force. The amount of nose down pitch commanded at 160 and 147 KEAS was insufficient to arrest the deceleration.

Although the times and distances covered during the period of deceleration reported by the pilot of S/N 123 cannot be accurately defined, it appears that a thrust loss of the order assumed above correlates well with the pilot's recollection of events. There are many engine operating conditions that provide the power level assumed. Typical conditions are:

Condition	1	2	3
One Engine			
Thrust - lbs.	3,300	4,000	1,800
Fuel Flow - PPH	4,100	5,140	2,500
% RPM	93	99	86
Throttle Angle	60°	83°	40°
Other Engine			
Thrust - lbs.	Idle - 300	Windmilling	1,800
Fuel Flow - PPH	1,800	0	2,500
% RPM	83	-	86
Throttle Angle	30°	-	40°

The partial power deceleration is shown on Figure 8, assuming that the turn and rollout had proceeded as described earlier and that a 50% thrust loss occurred at 233 KEAS fifteen nautical miles following rollout. Under these conditions, S/N 123 would decelrate to 100 KEAS in an additional eight nautical miles.



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PREPARED BY [redacted]
DATE
CHECKED BY

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A DIVISION OF LOCKHEED AIRCRAFT CORPORATION

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REPORT NO. SP-538

SECTION V

Stall

The pilot reported "When the airspeed dropped to 101 KEAS, the aircraft began to shudder and stall." Data derived from wind tunnel tests are shown on Figures 11 and 12, showing pitching moment and angle of attack as a function of lift coefficient. The pitching moment data shows the aircraft is stable at a center of gravity of 23% MAC up to a lift coefficient of about .6 and is neutrally stable from a lift coefficient of .6 to 1.0. Beyond 1.0 a sharp, unstable brake occurs which would result in an uncontrollable pitchup. The stall described by the pilot at 101 KEAS would correspond to a lift coefficient of 1.08 at 58,200 pounds. This stall experienced by the pilot, and the predicted pitchup, are in good agreement. The angle of attack required for this condition is of the order of 20 to 24 degrees. The normal flight range of the airplane is below 11 degrees angle of attack. Thus the angle of attack for pitchup is more than twice the maximum angle for flight. Even at the lightest weights, this corresponds to a speed margin of 40 KEAS, since the lowest speed at the lightest weight for an angle of attack of 11 degrees is 140 KEAS.

FIG. 7

PITCHING MOMENT AT HIGH ANGLES OF ATTACK

S/N 123

LOW SPEED WIND TUNNEL DATA

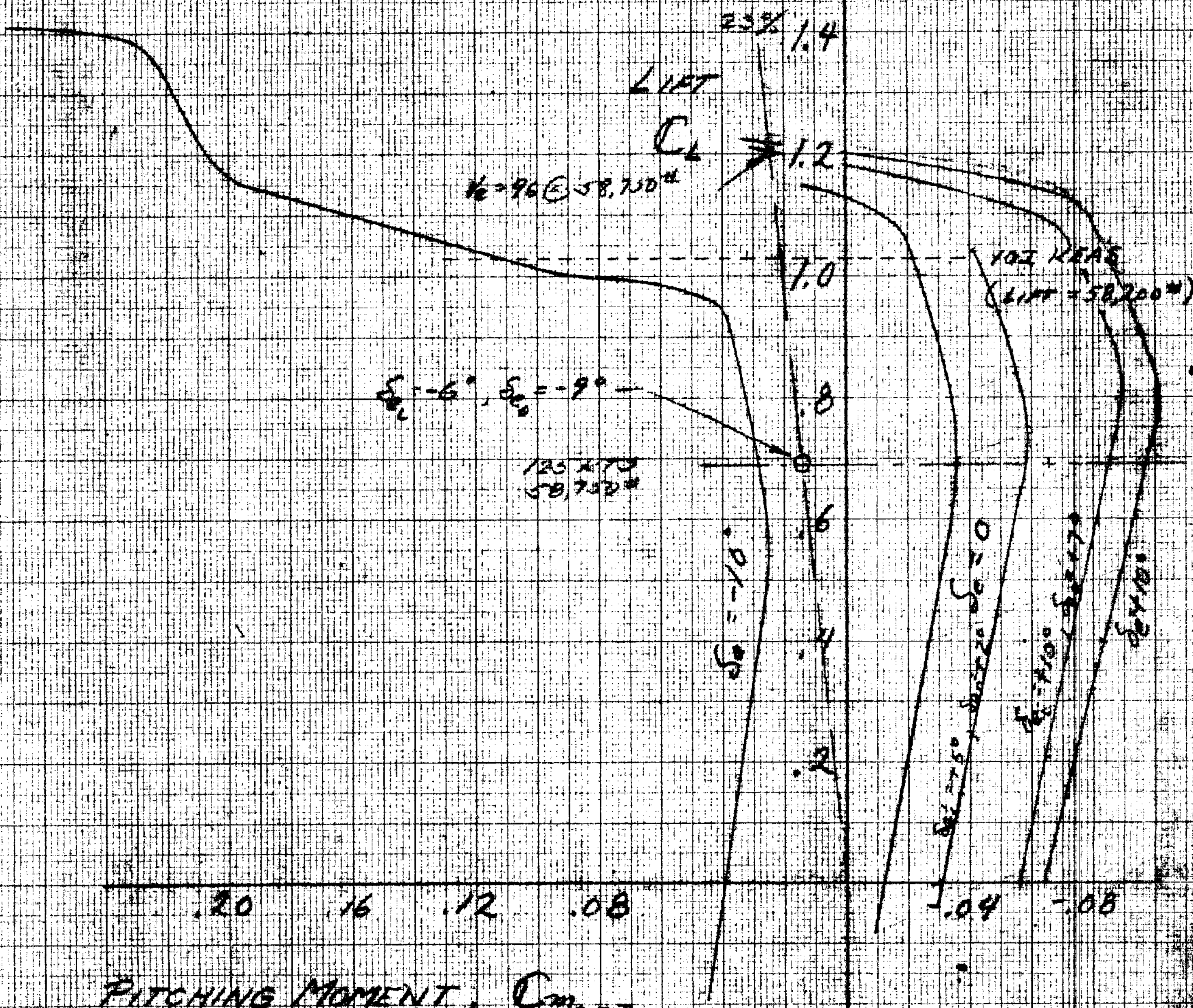

FIG. 8

LIFT AT HIGH ANGLES OF ATTACK

S/N 123

LOW SPEED WIND TUNNEL DATA

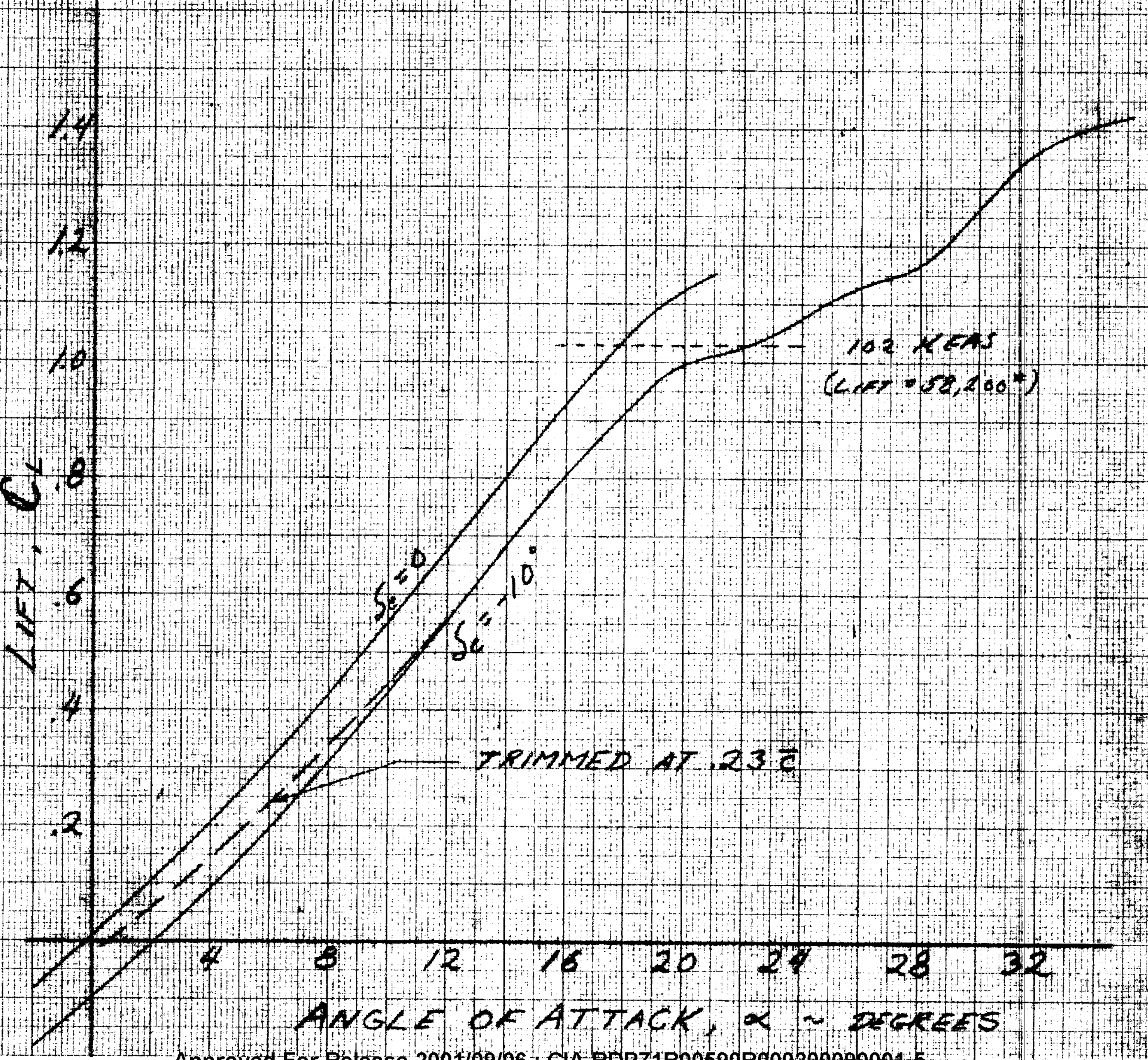

FIG. 12

SECTION VI

Trim Actuator

A preliminary investigation indicates that the elevons were trimmed to +5 degrees at impact, which is a hardover nose down trim position. This trim position is an incremental +10 degrees from the required trim position at the last reported speed just prior to the stall and inverted spin. Thus, if this trim position actually existed prior to the stall, there existed a pitching moment equivalent to +10 degrees elevator, which would have tried to nose the aircraft over into a -.5 "g" pushover. A pushover of this magnitude would develop a descent angle at the rate of 10 degrees a second at 101 KEAS at 30,000 feet. A descent angle of 10 degrees, combined with Military power and the drag at -0.5 "g", would have resulted in an acceleration even at 101 KEAS. It can, therefore, be concluded that the trim actuator input was being counteracted by pilot input. The above conclusion is further substantiated by the fact that the autopilot, when in the Auto-Nav mode, utilizes an attitude hold mode in the pitch axis; thus, the autopilot would be putting in nose down elevon to oppose the buildup in angle of attack due to the deceleration. When the autopilot is disengaged with the CSC button, the Mach Box would continue to put nose down elevon in with decreasing speed. In terms of stick force, the pilot effort required to counteract the trim actuator input is approximately 20 pounds.

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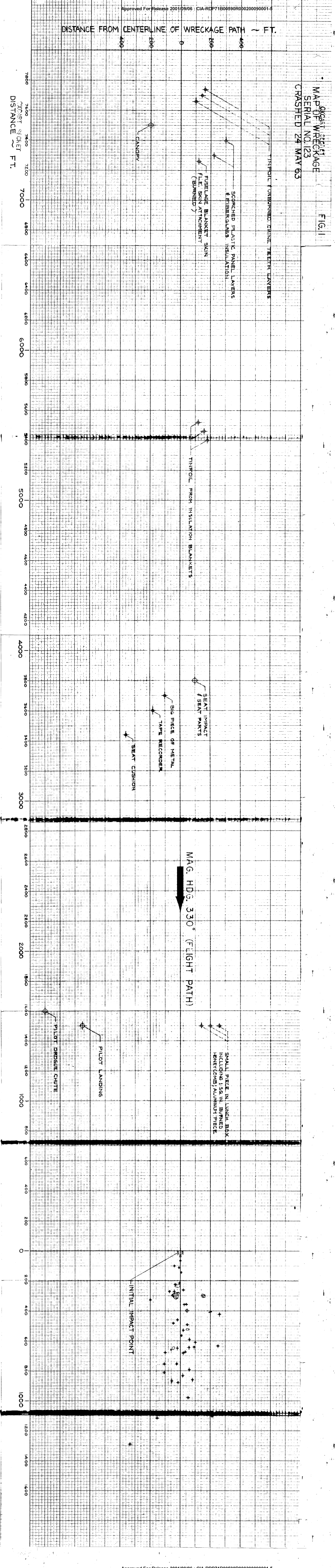
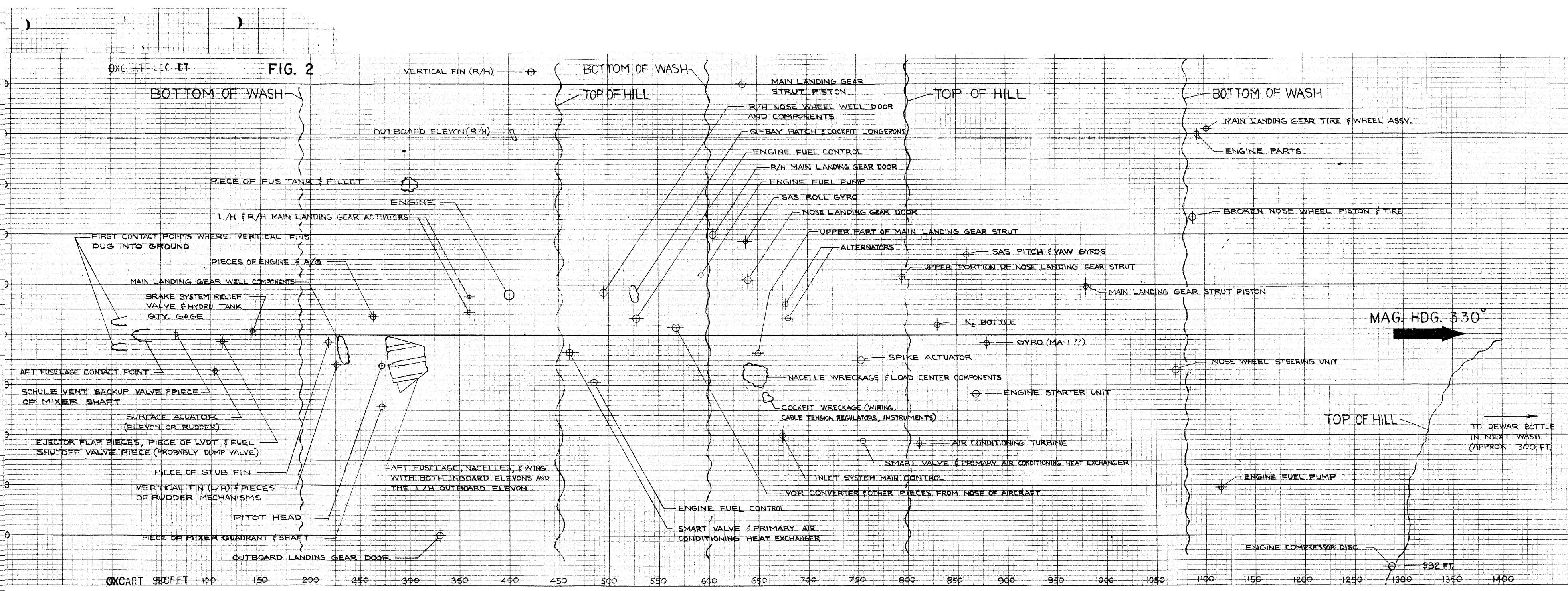

OXCART SECRET
MAP OF WRECKAGE
SERIAL NO. 123
CRASHED 24 MAY 63
FIG. I
DISTANCE FROM CENTERLINE OF WRECKAGE PATH ~ FT.
DISTANCE ~ FT.
CANOPY
FUSELAGE BLANKET SKIN
& L.E. SKIN ATTACHMENT
(BURNED)
SCORCHED PLASTIC PANEL LAYERS
& FIBERGLASS INSULATION
TINFOIL & UNBURNED CHINE TEETH LAYERS
TINFOIL FROM INSULATION BLANKETS
SEAT IMPACT
& SEAT PARTS
BIG PIECE OF METAL
TAPE RECORDER
SEAT CUSHION
MAG. HDG. 330° (FLIGHT PATH)
PILOT DROGUE CHUTE
PILOT LANDING
SMALL PIECE IN BLACK BOX
INCLUDING 1 SQ. IN. BURNED
HONEYCOMB ALUMINUM PIECE
INITIAL IMPACT POINT

FIG. 2



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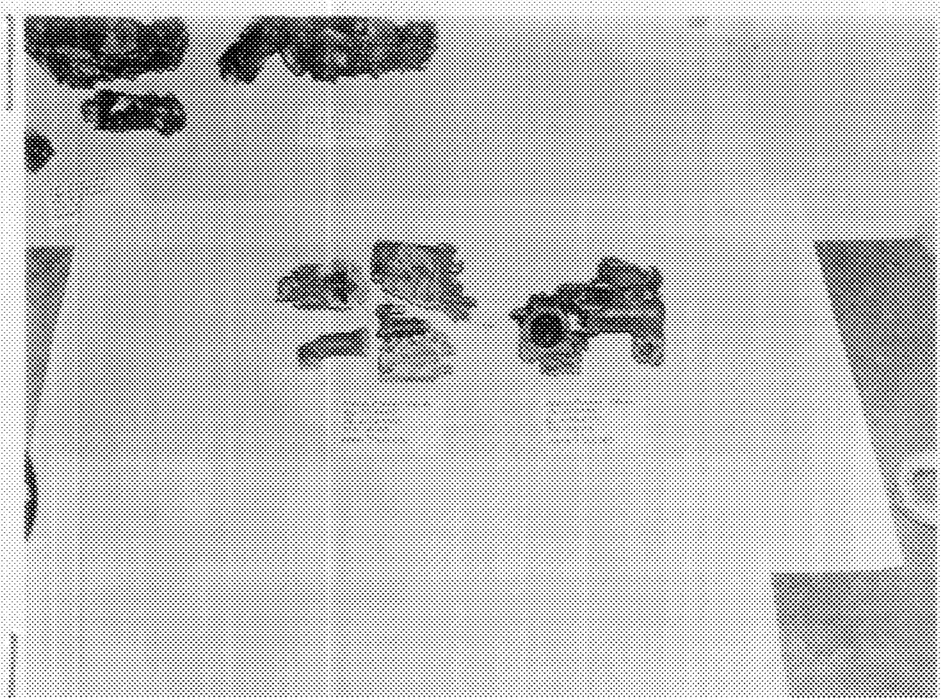

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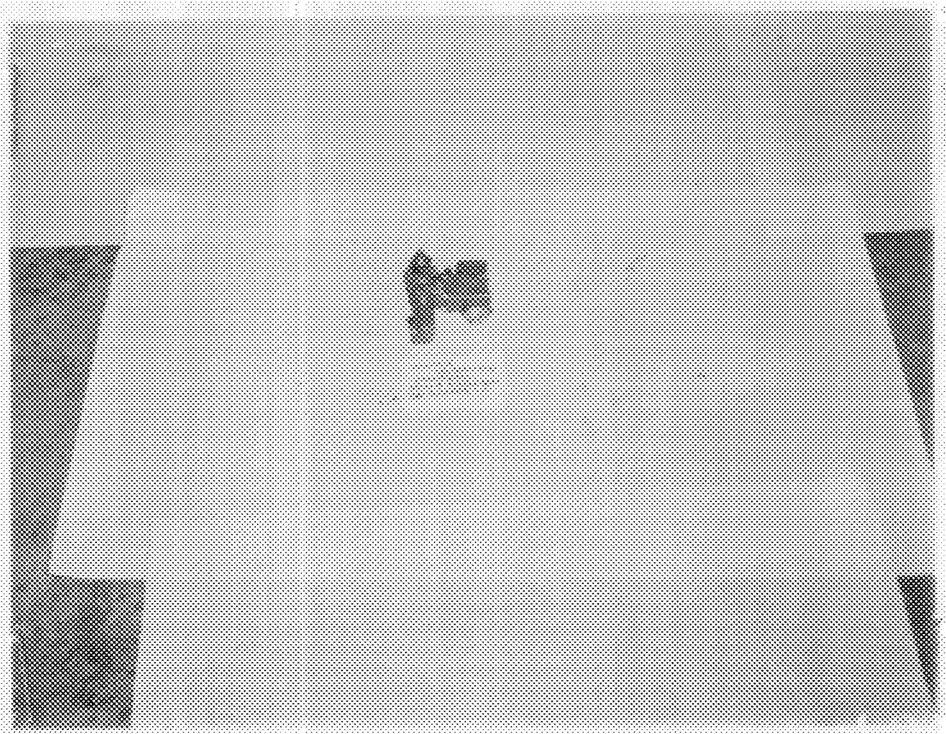

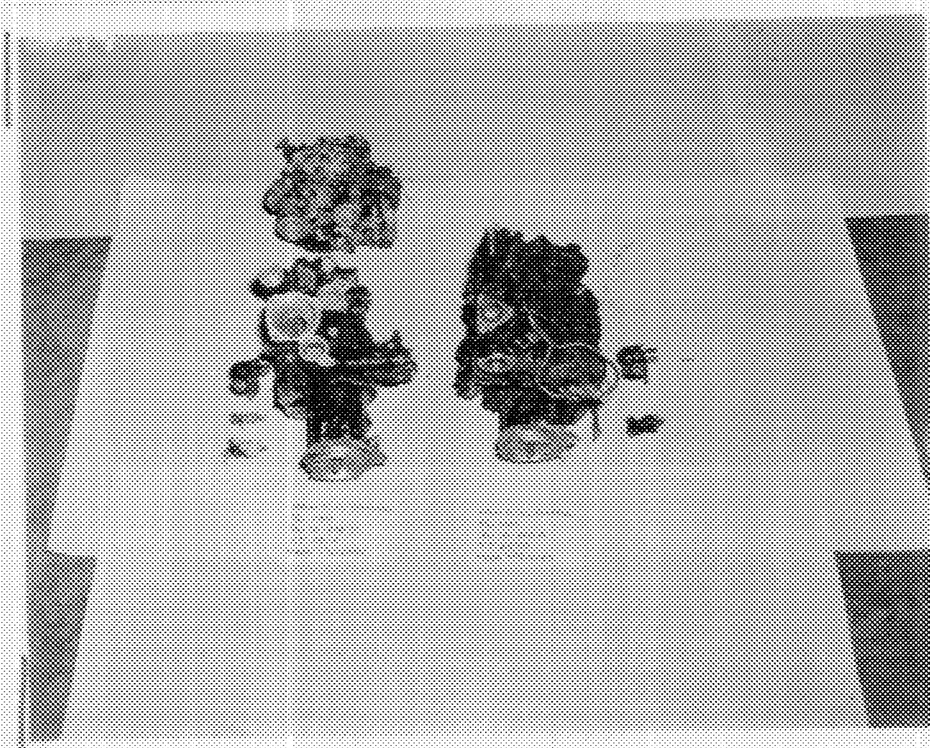

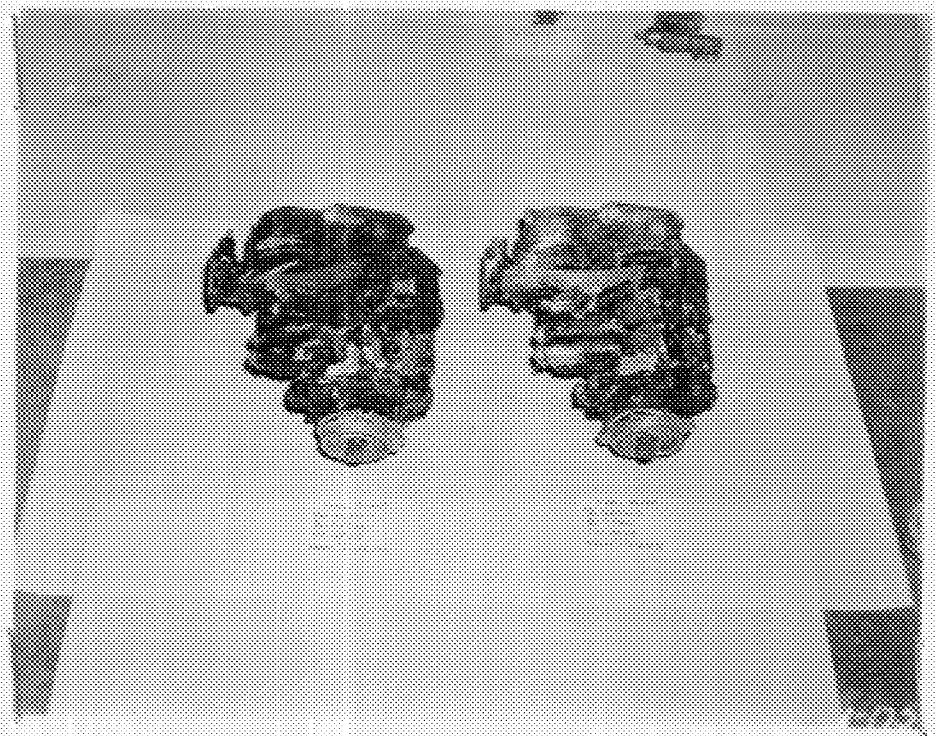

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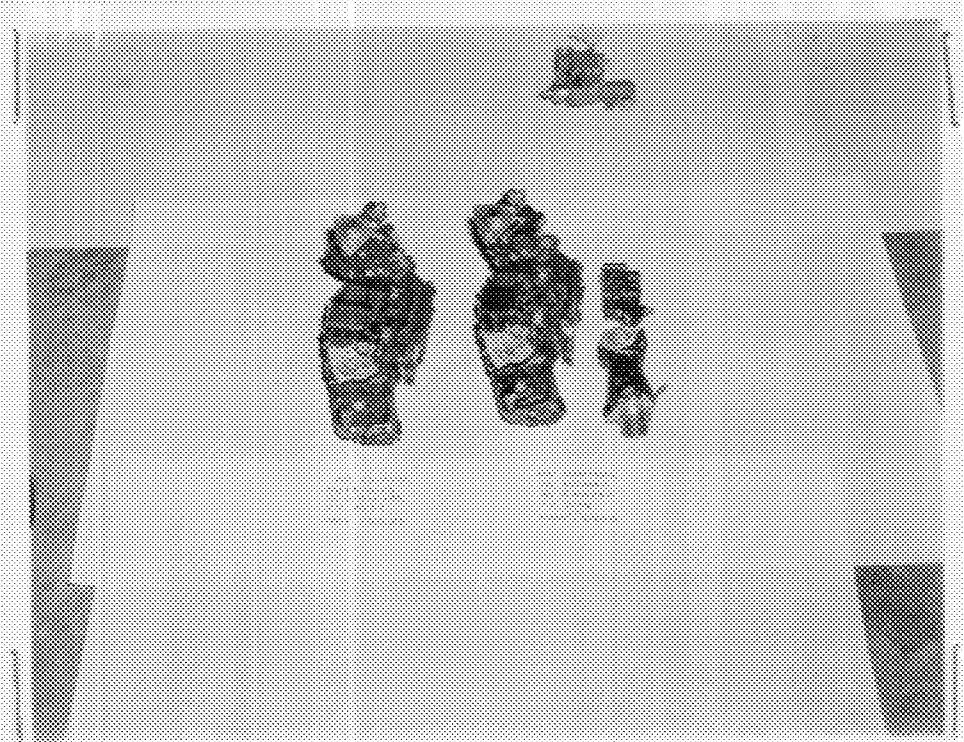

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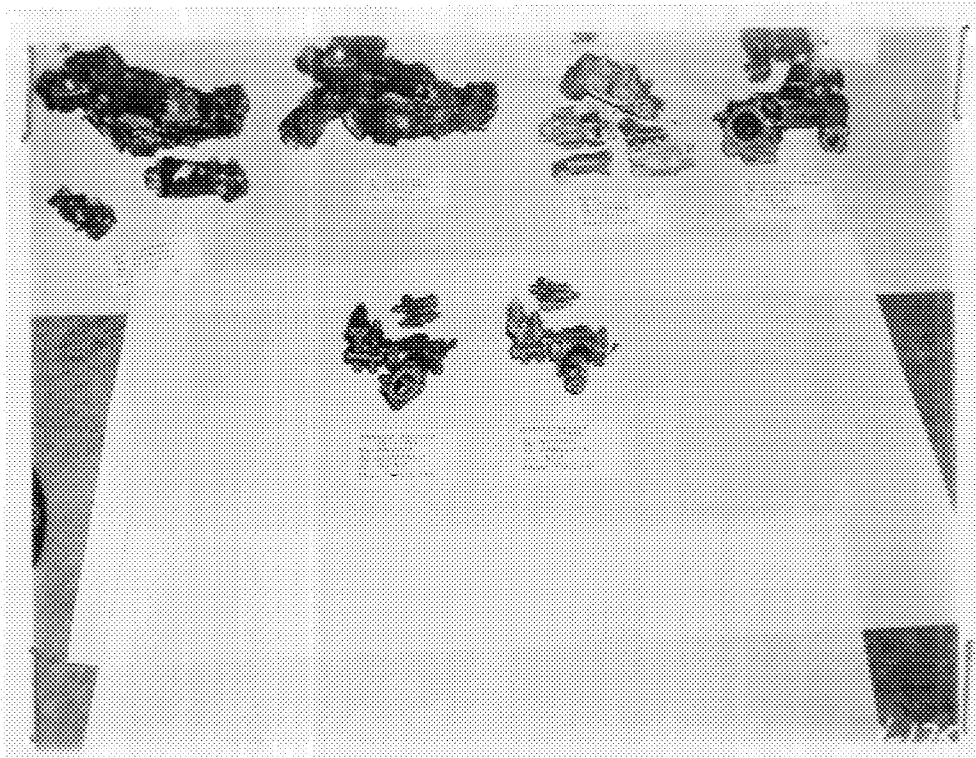

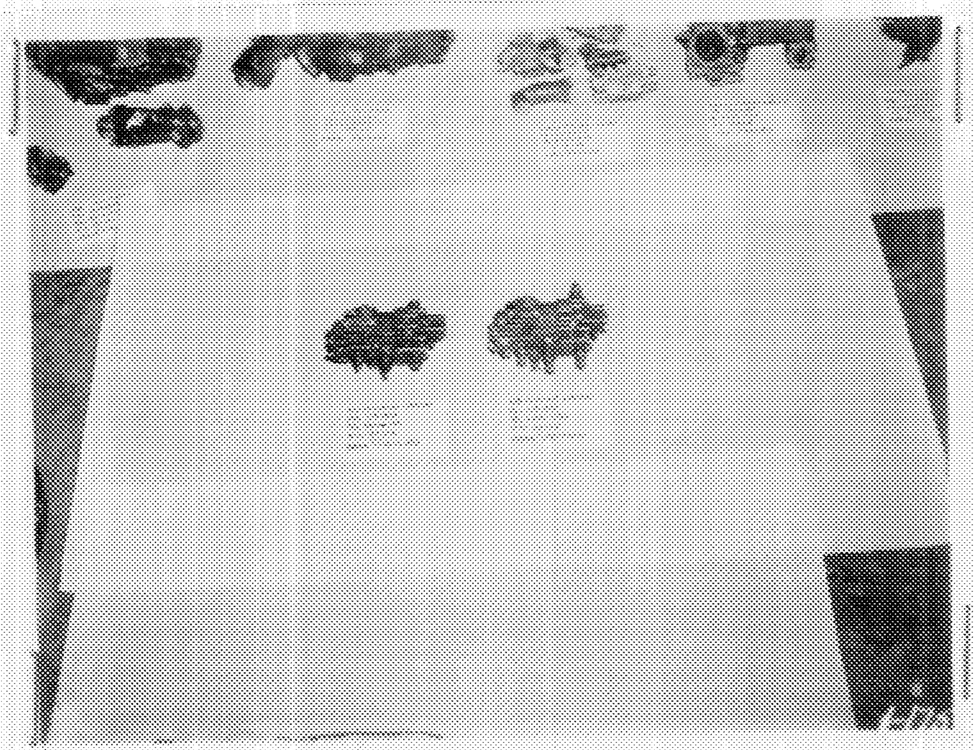

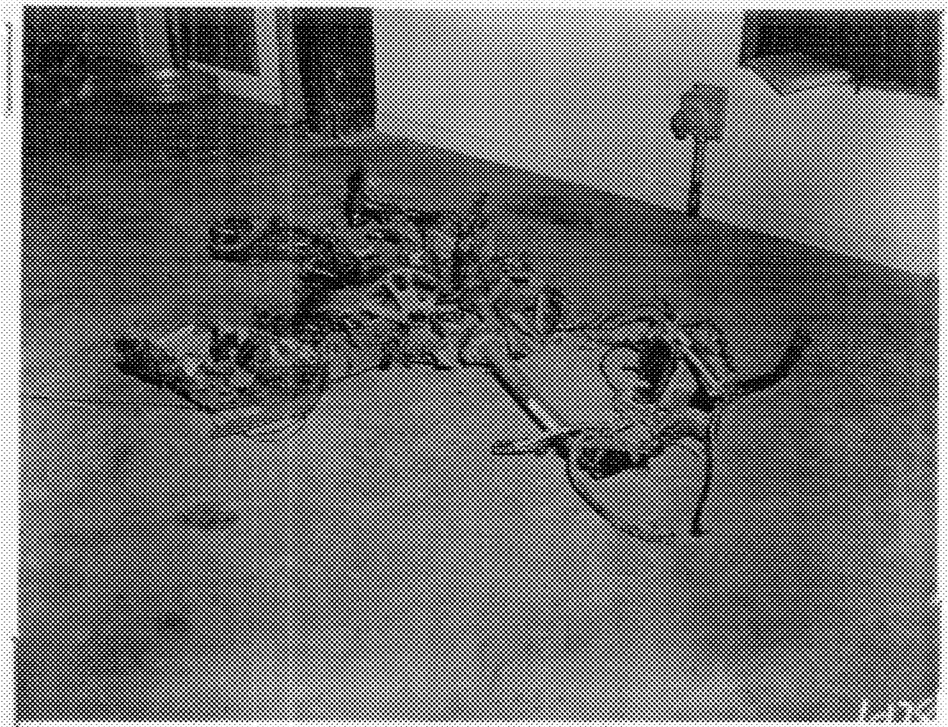

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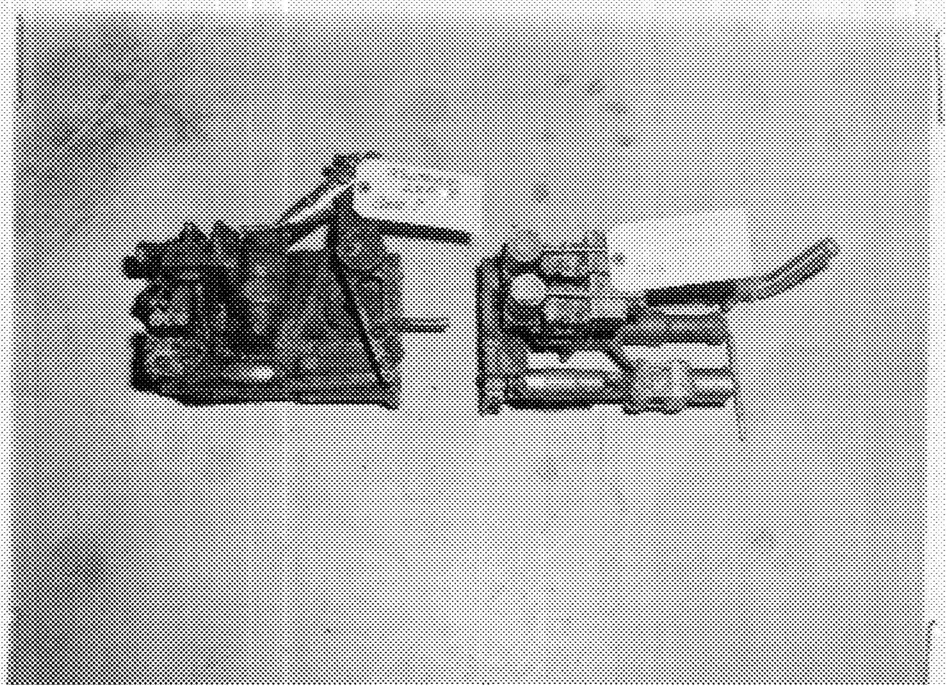

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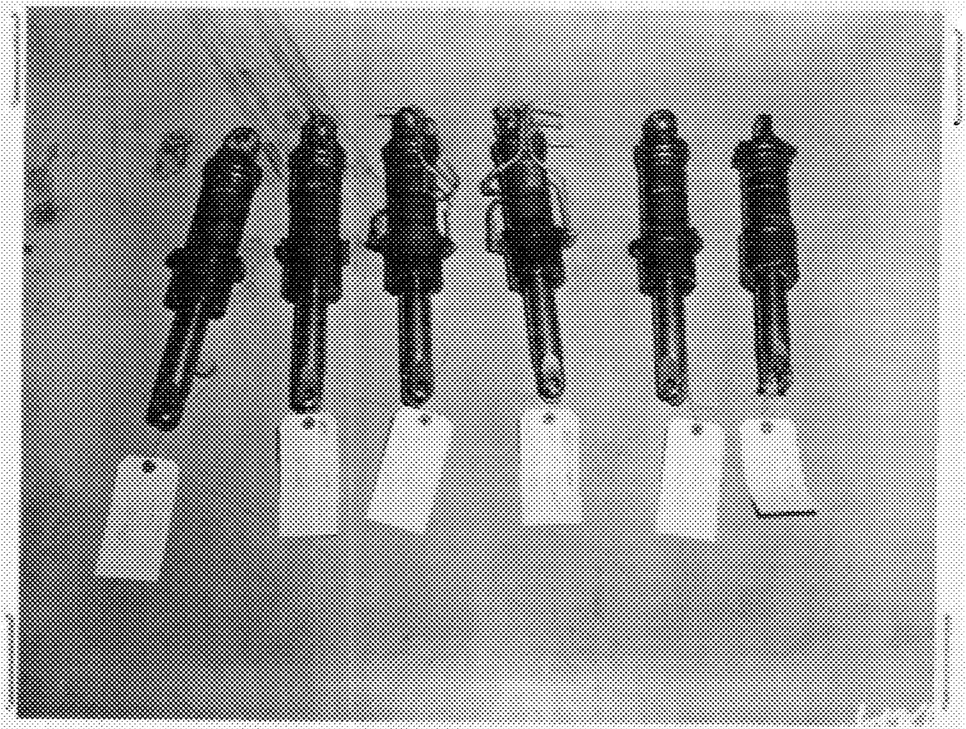

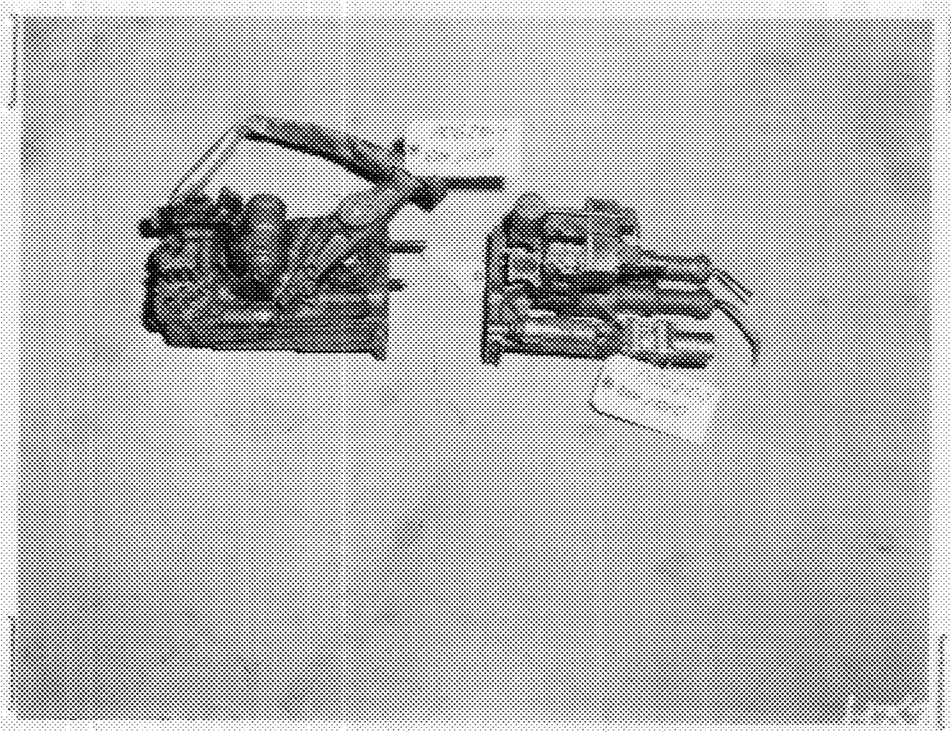

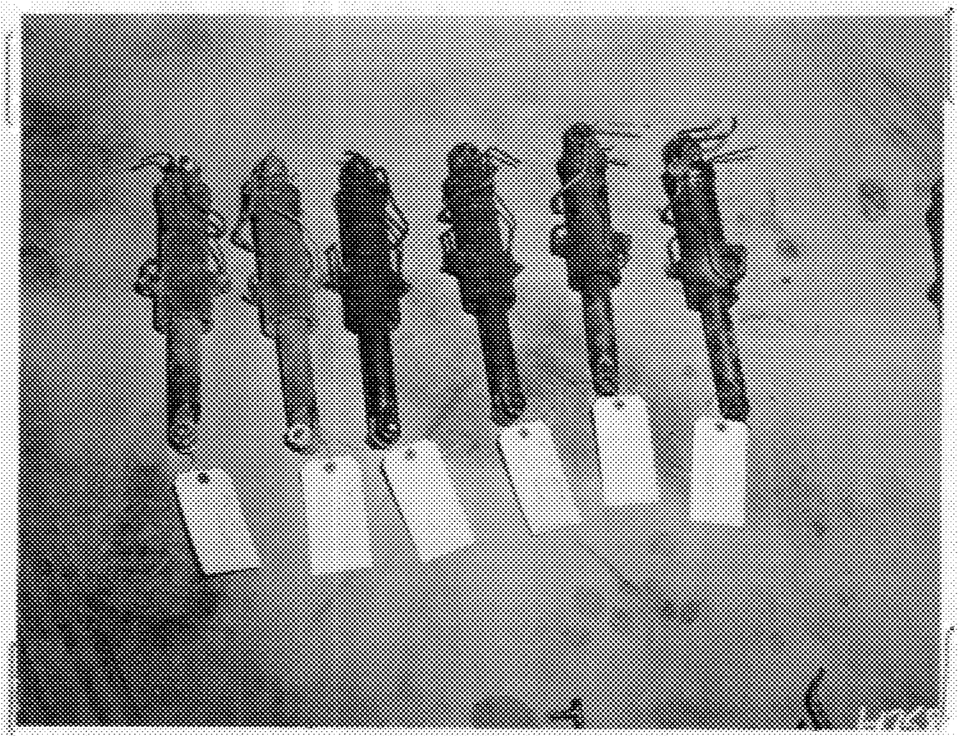

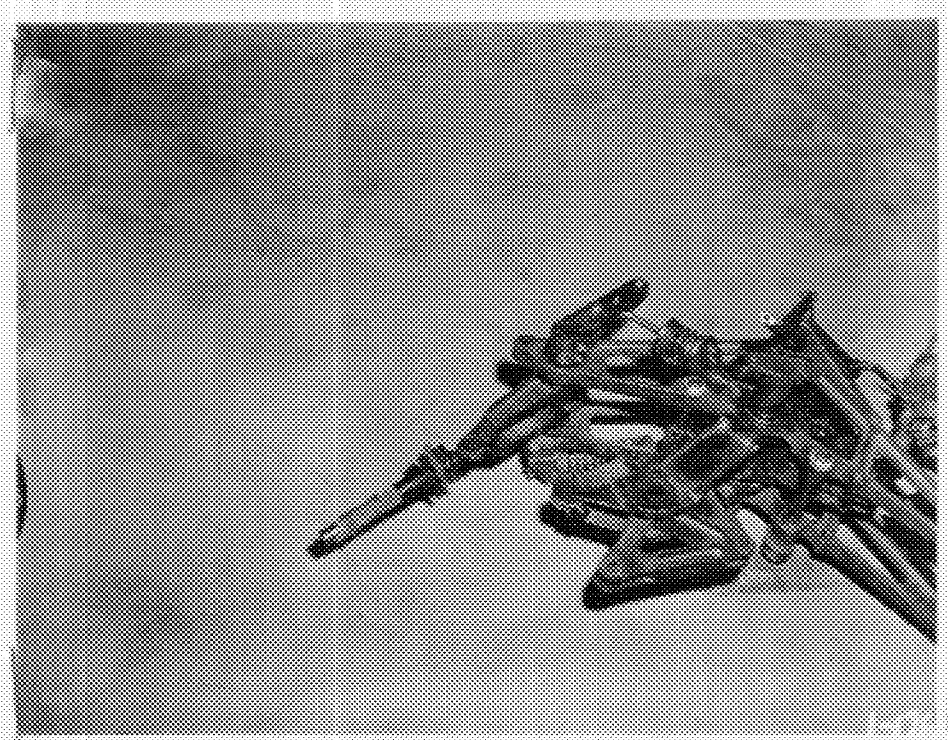

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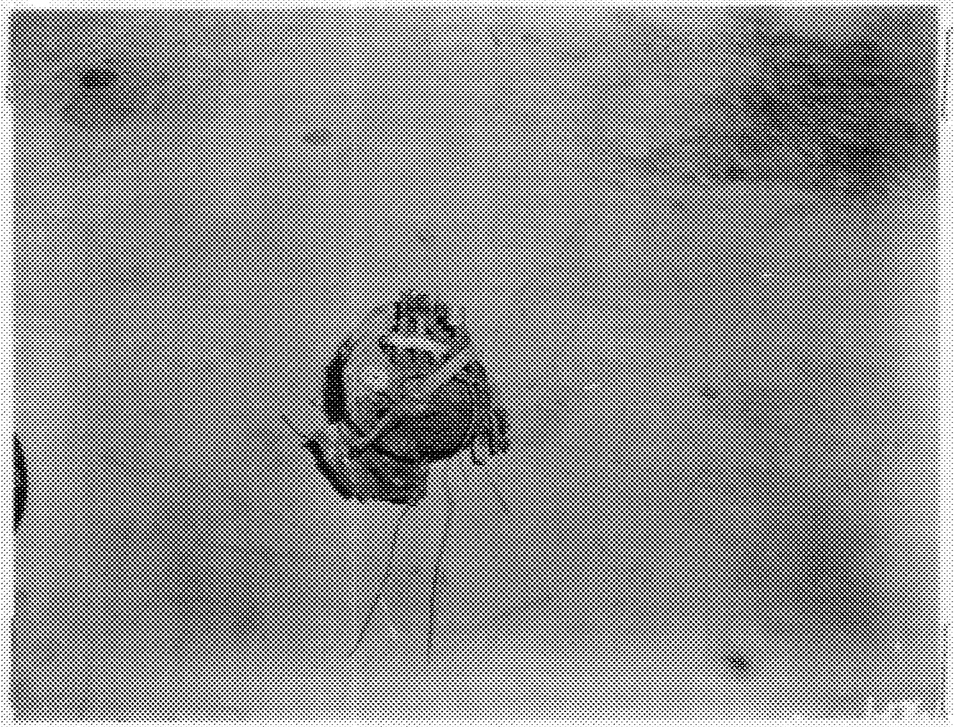

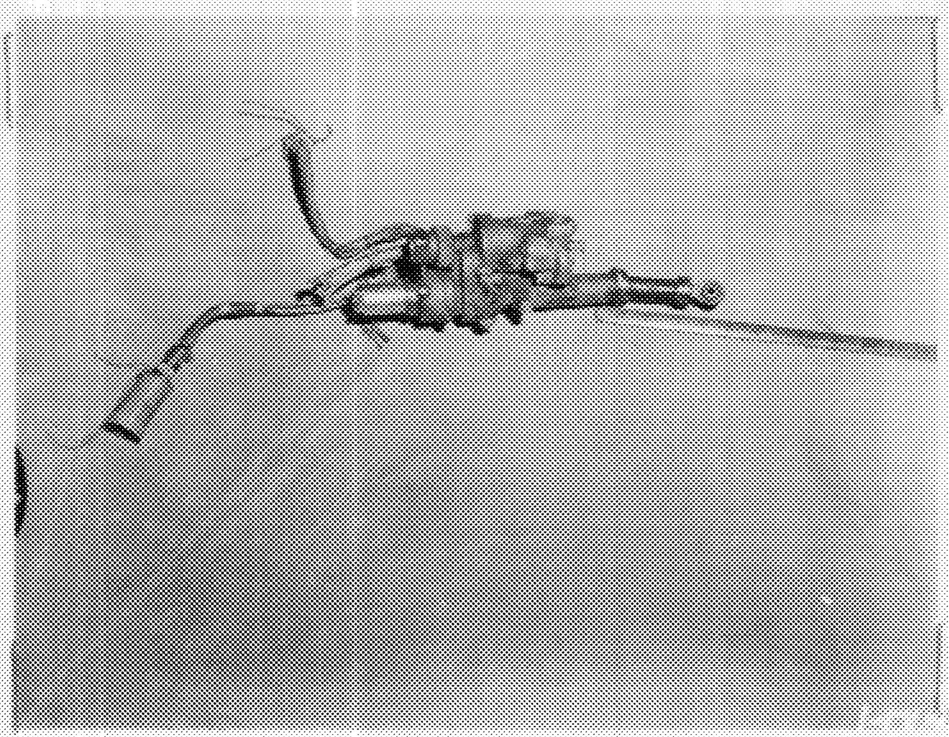

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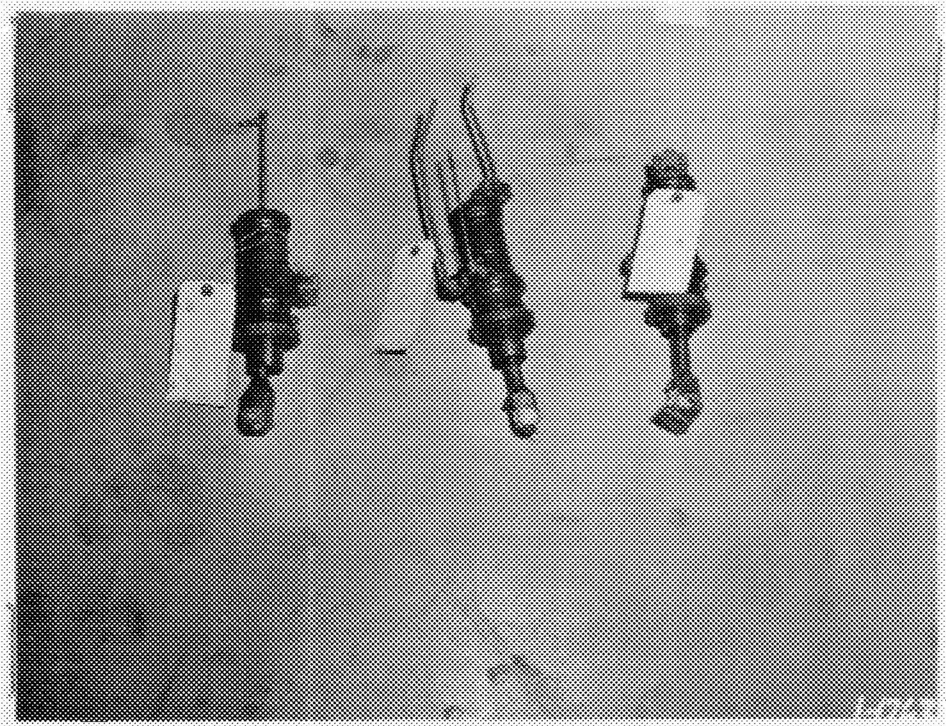

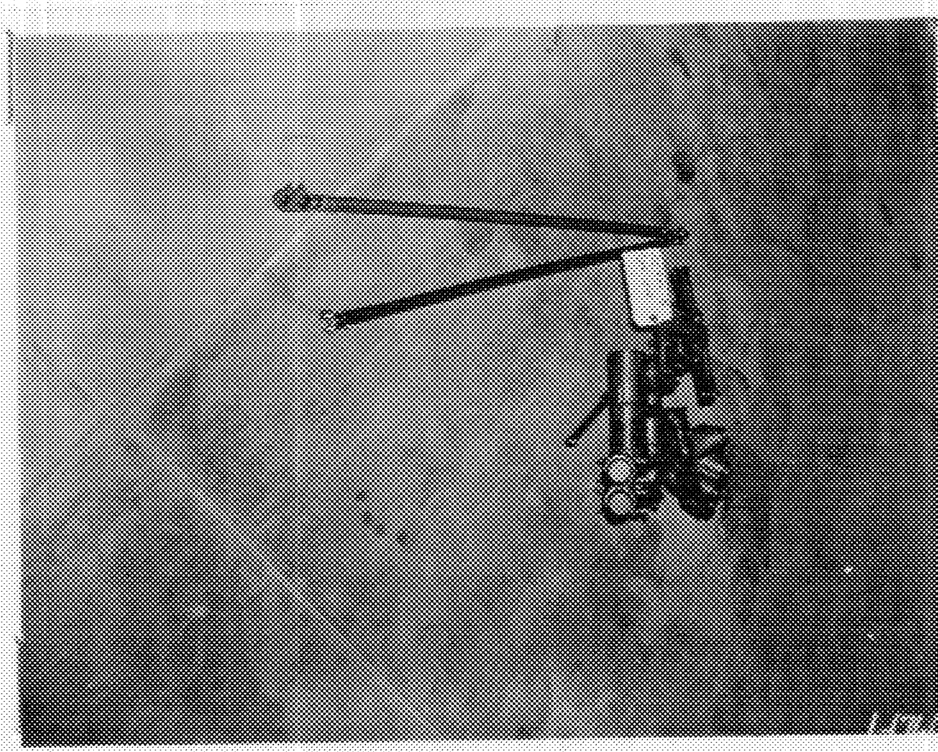

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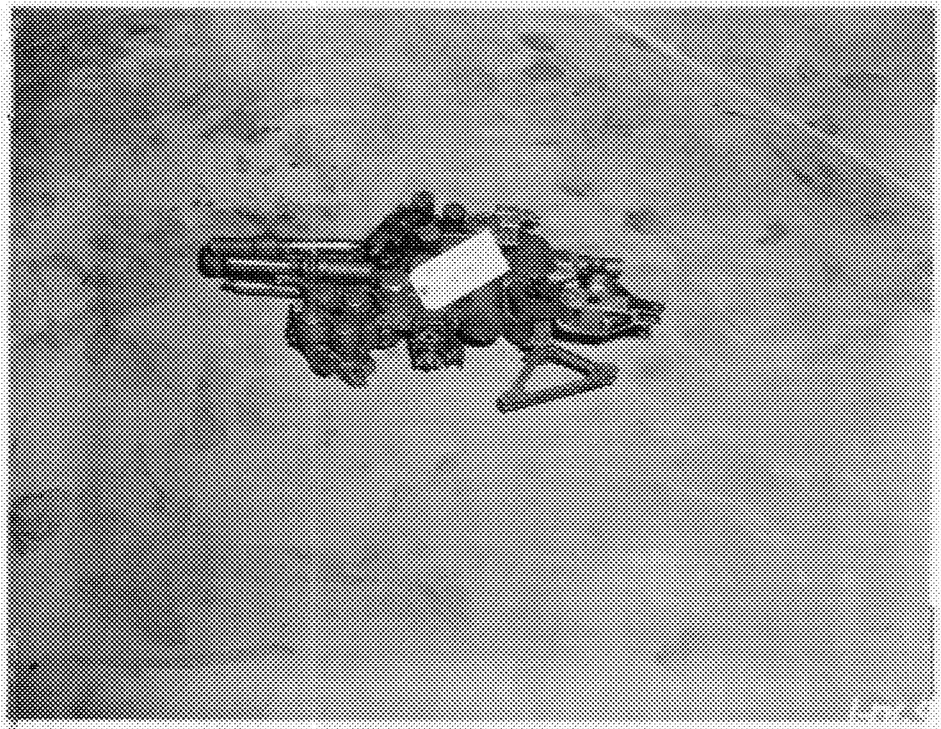

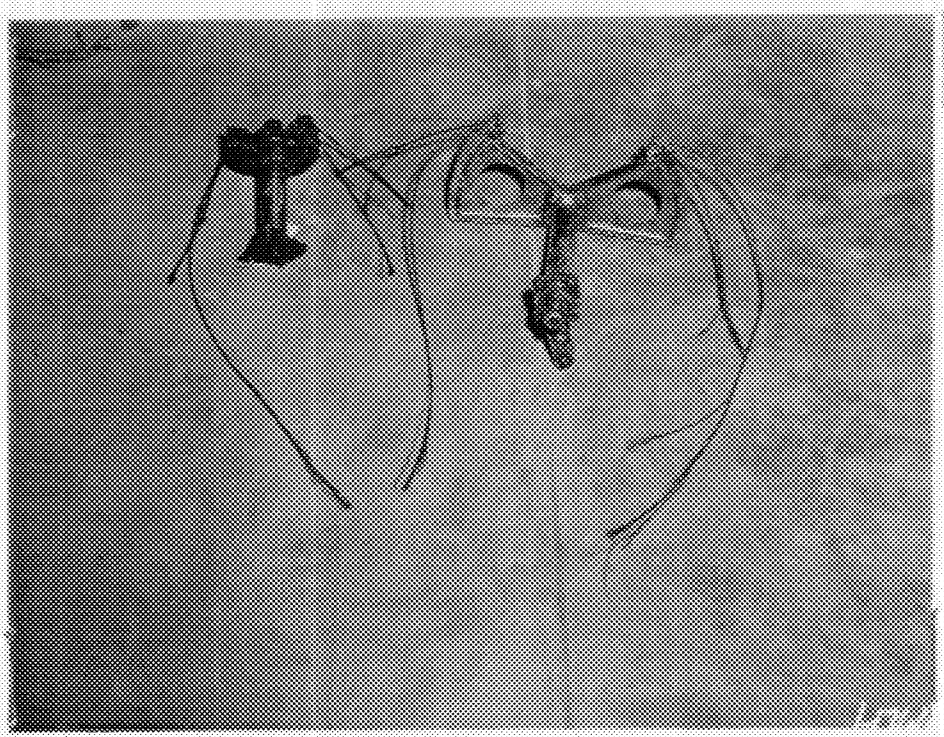

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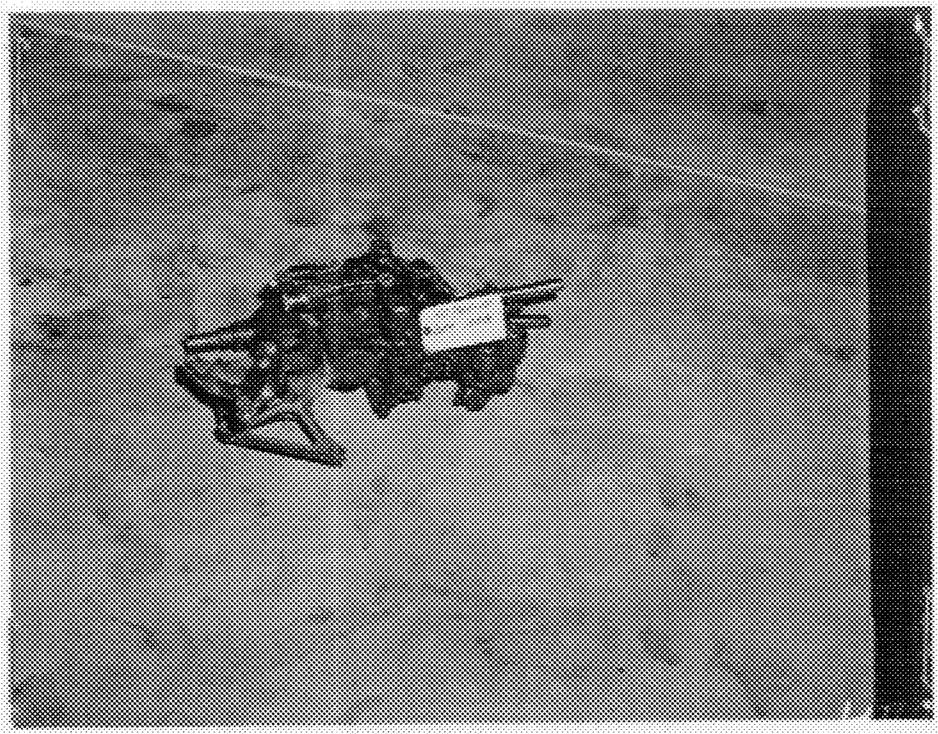

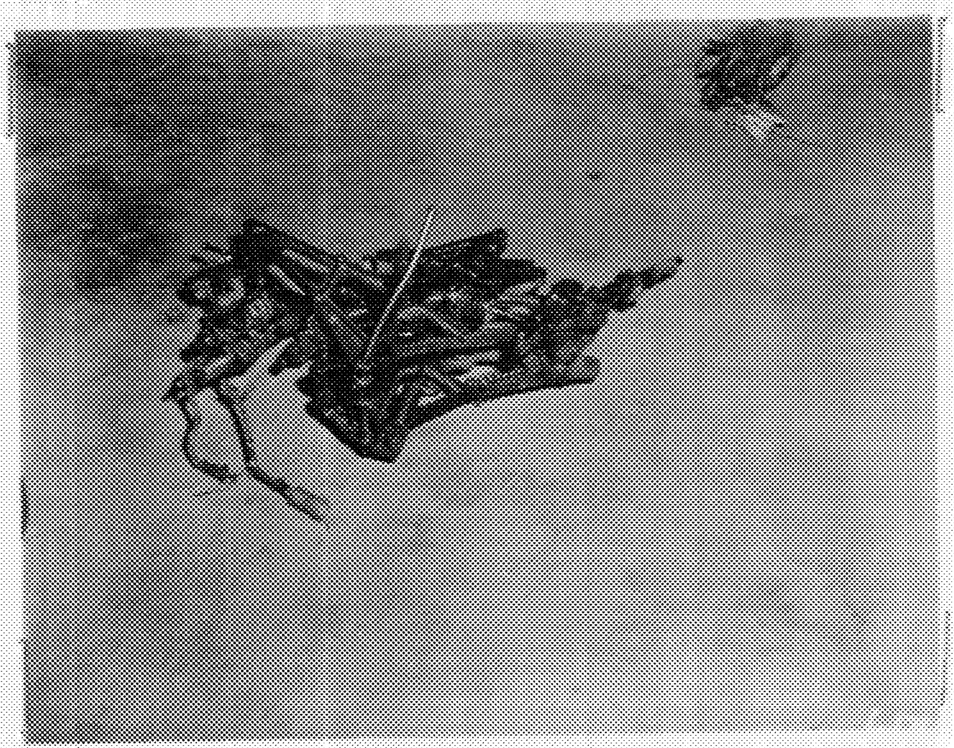

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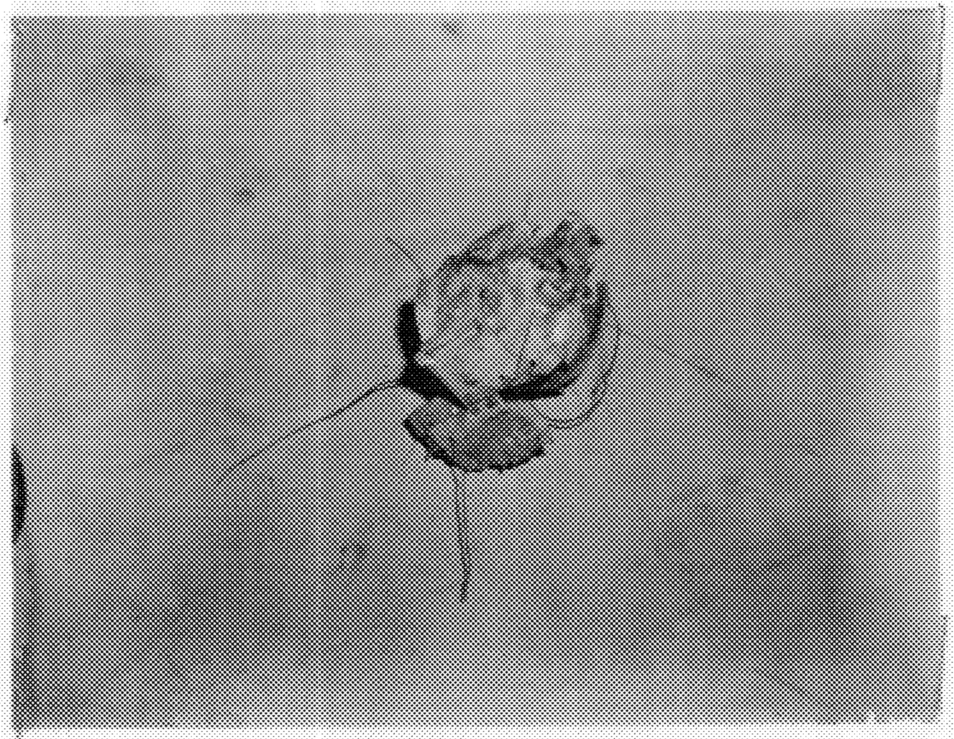

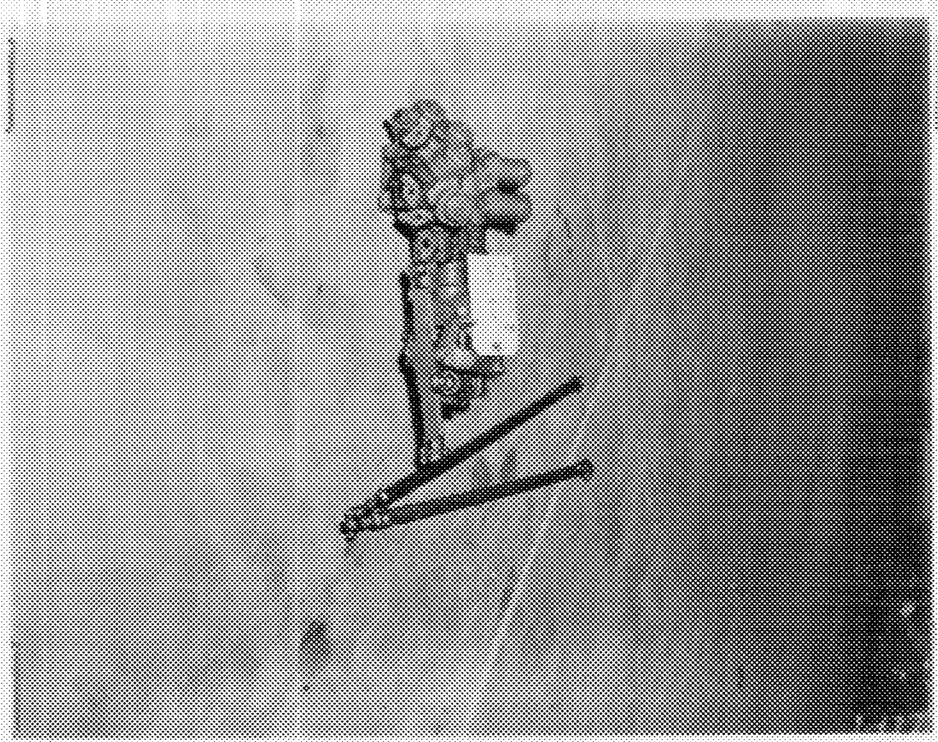

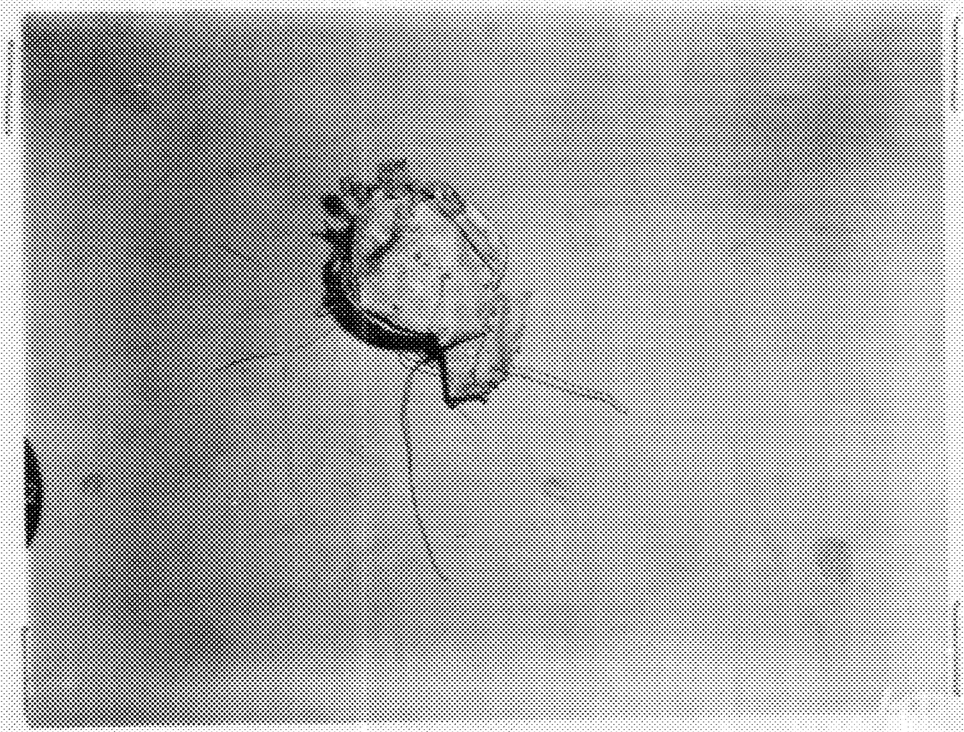

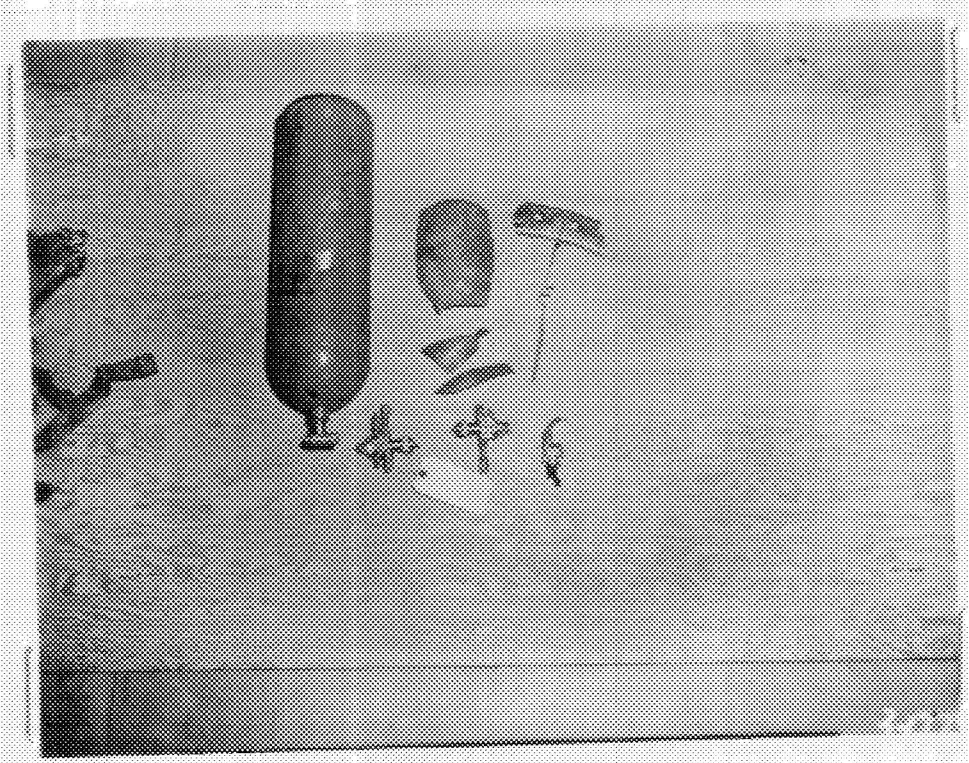

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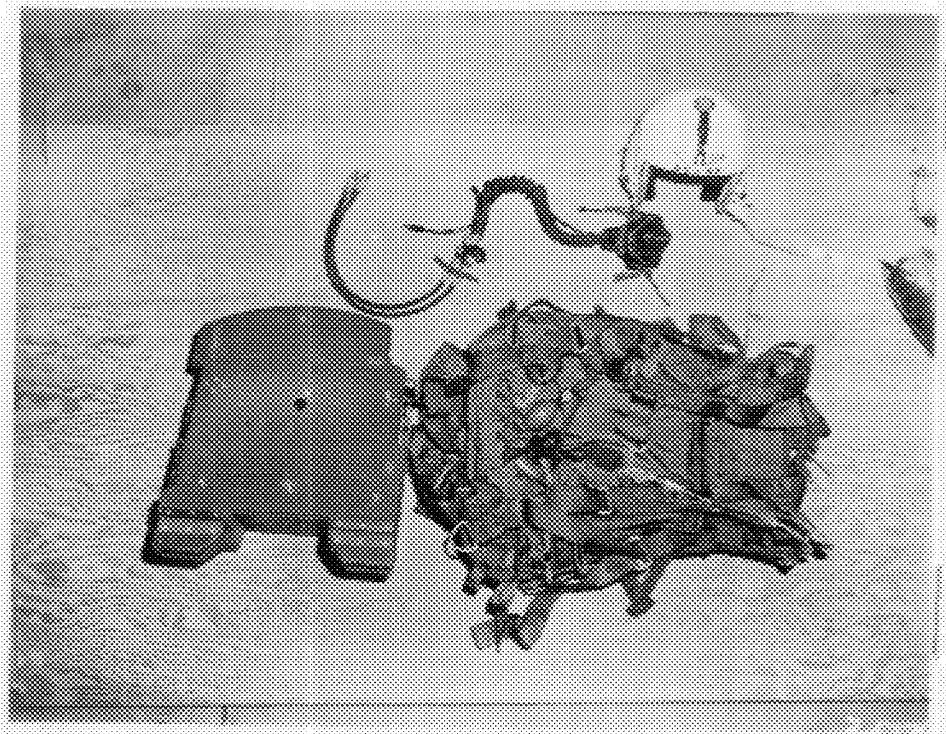

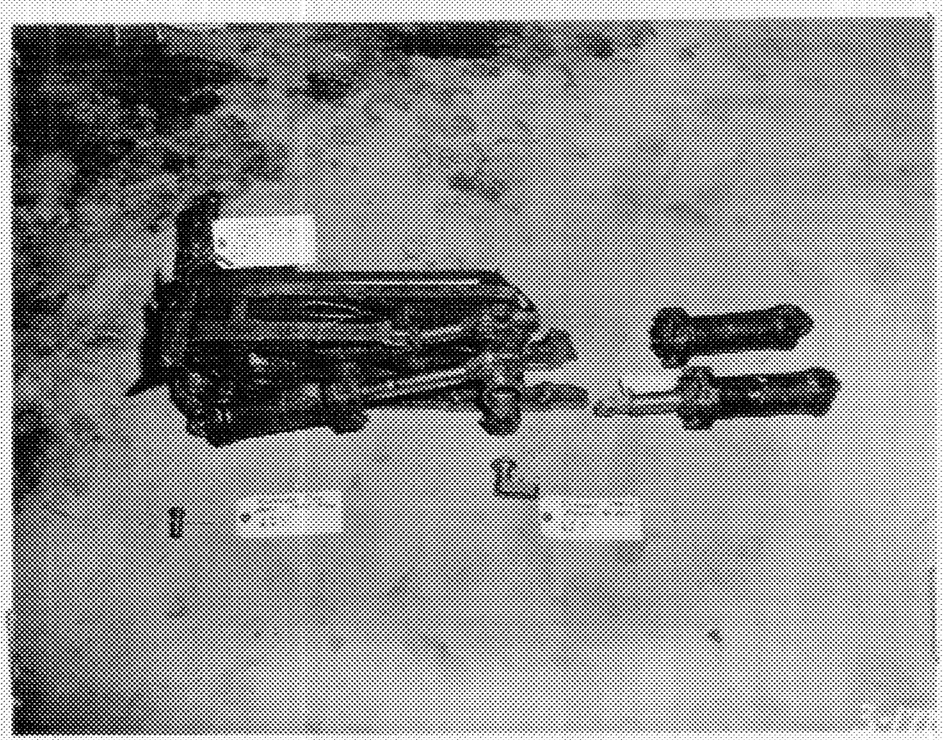

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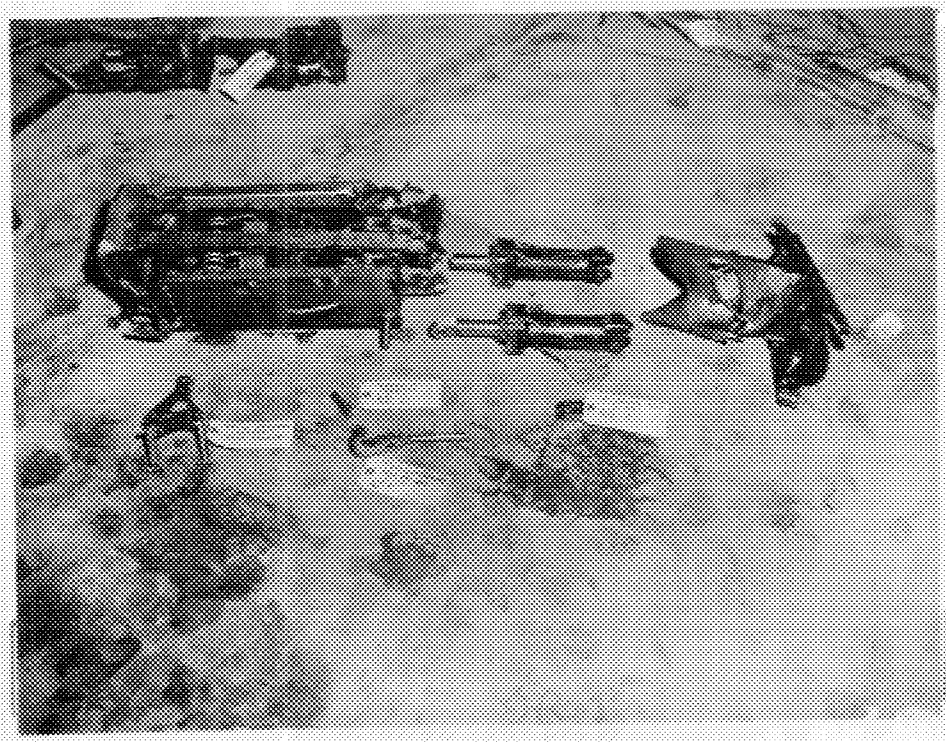

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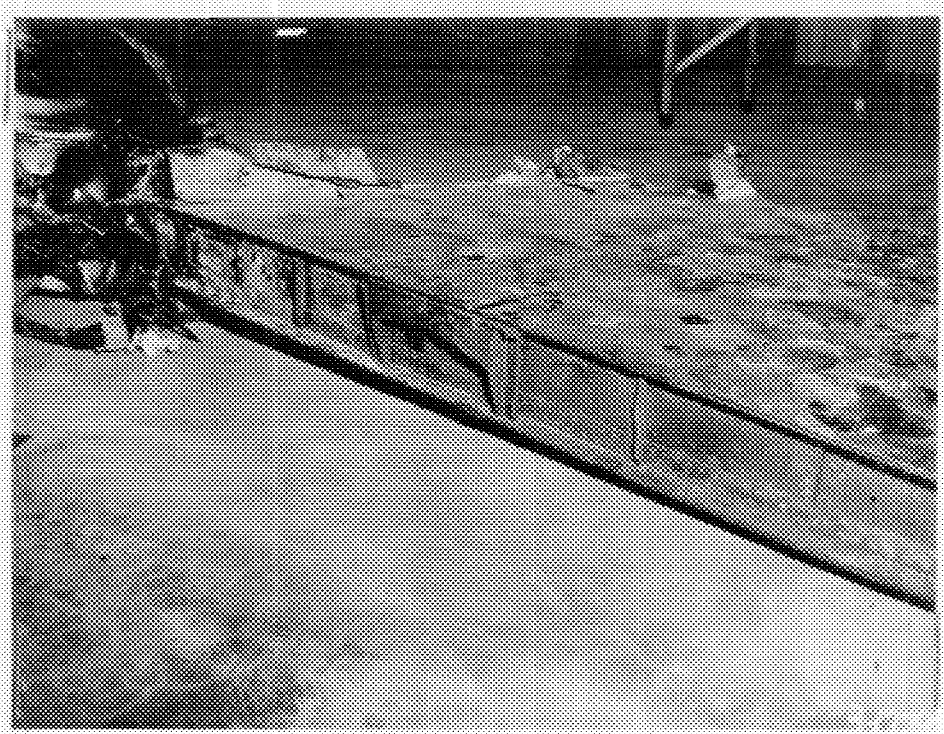

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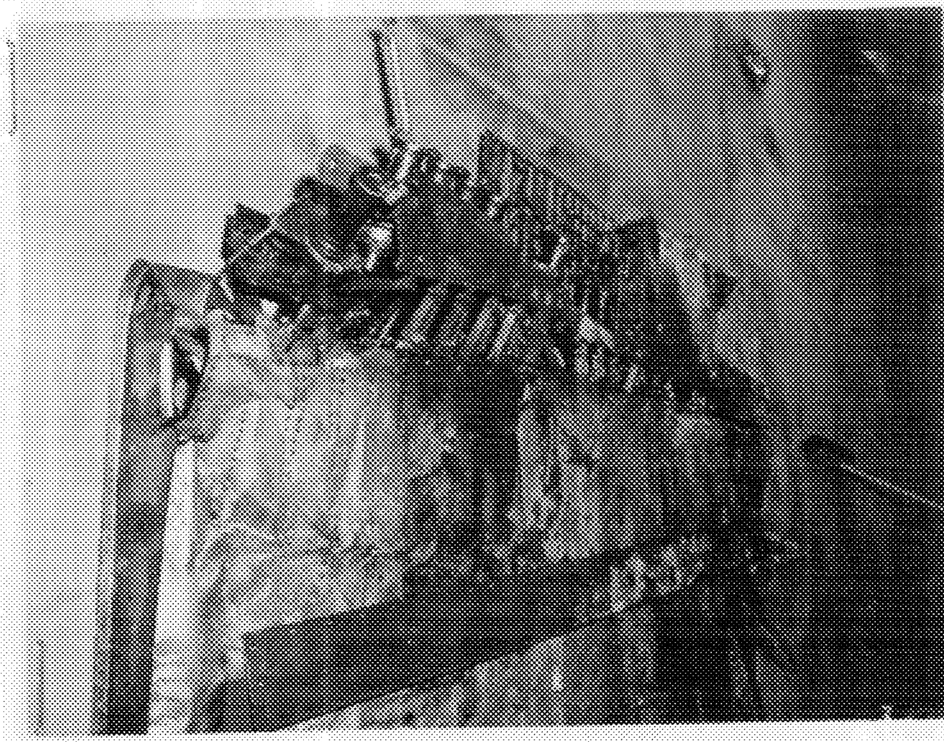

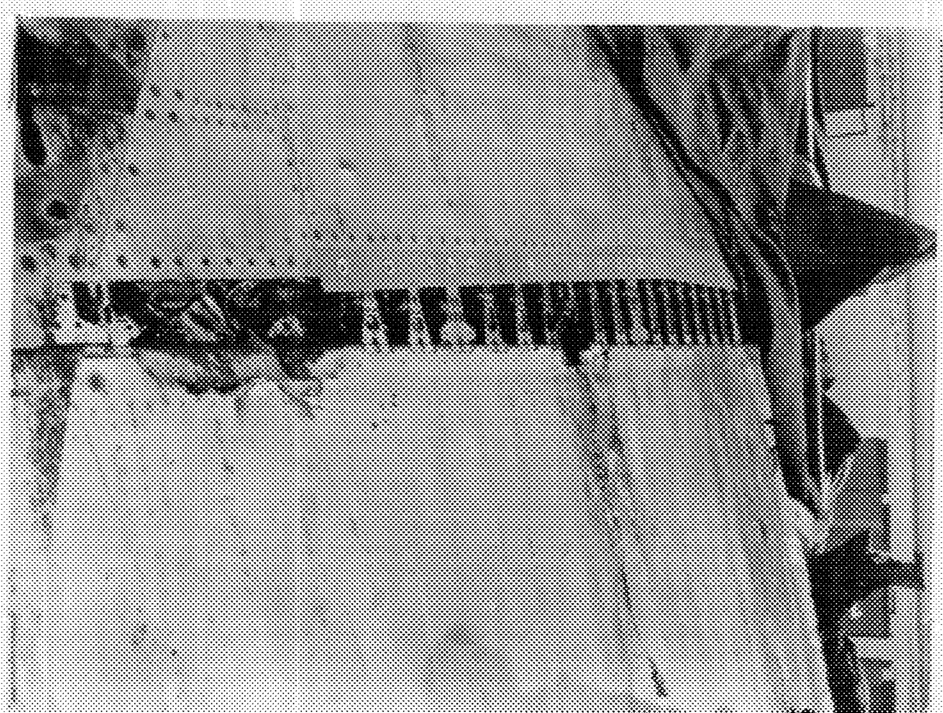

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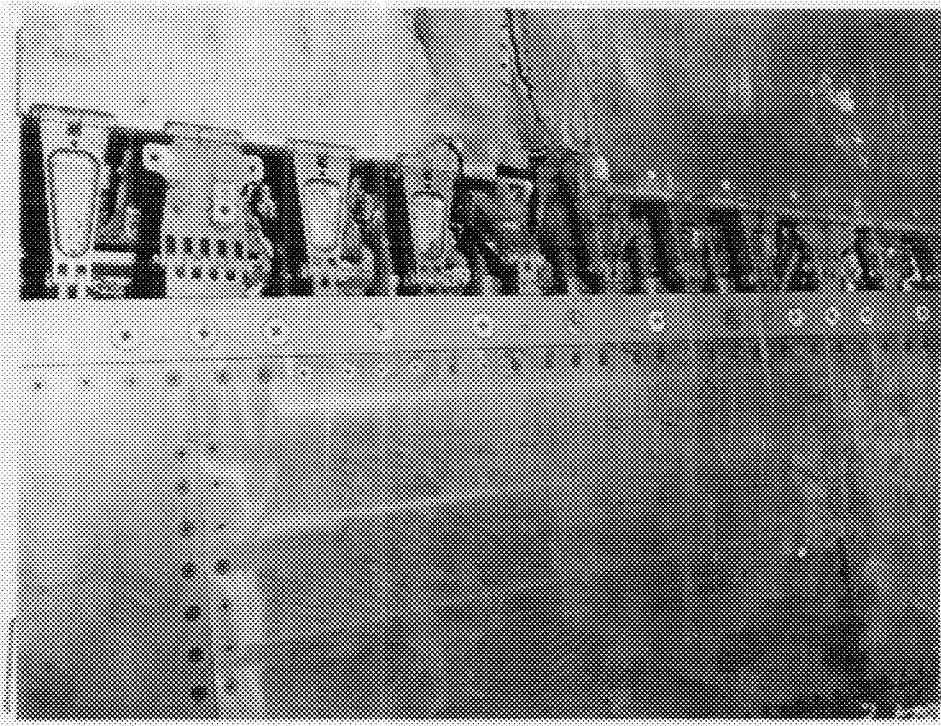

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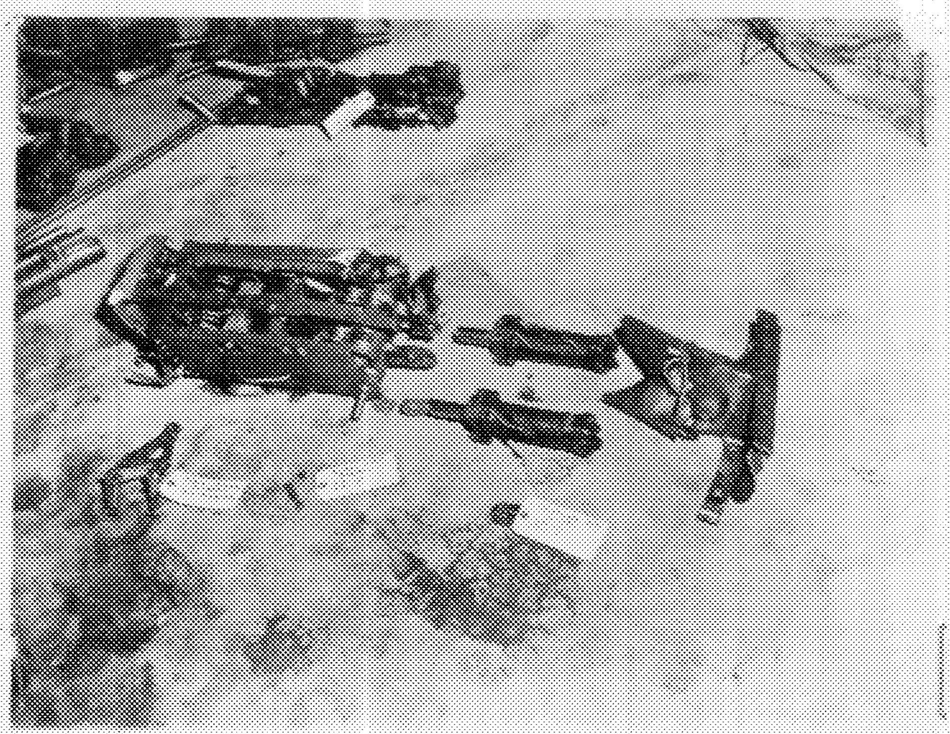

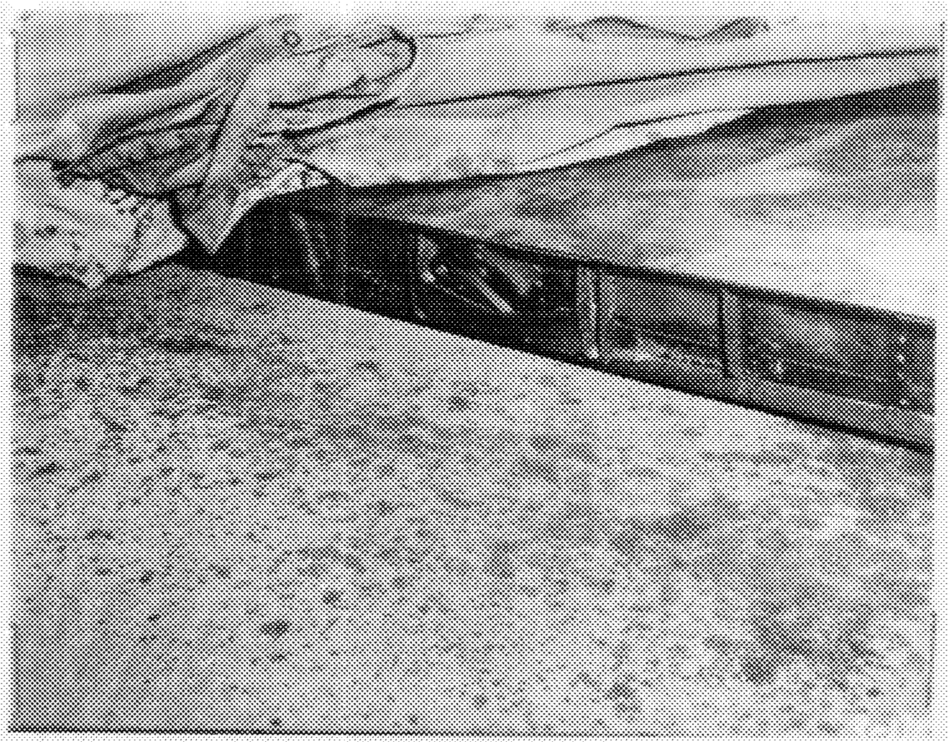

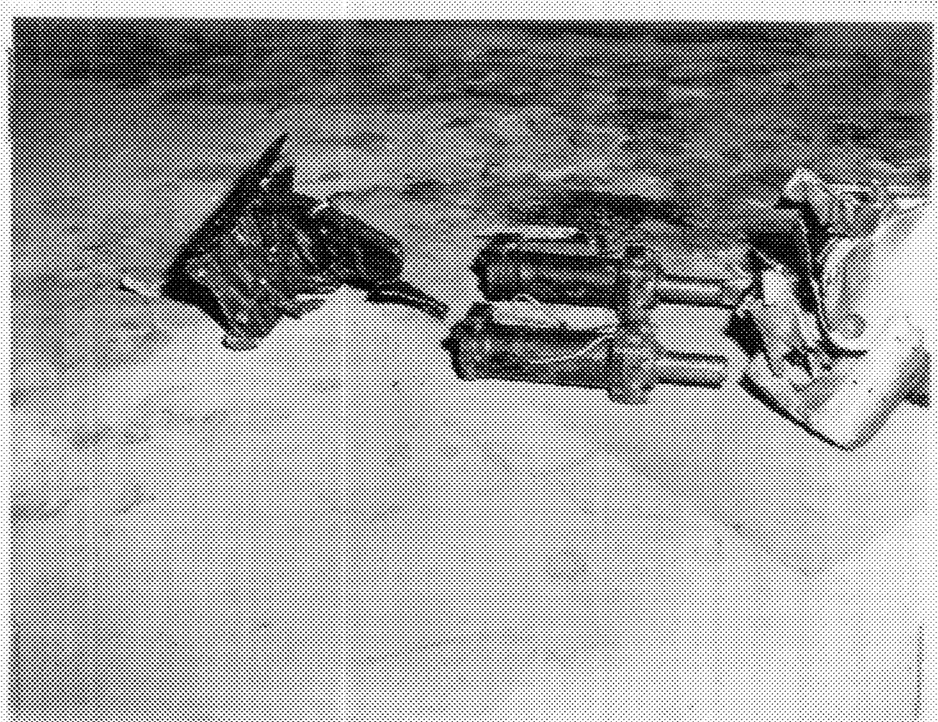

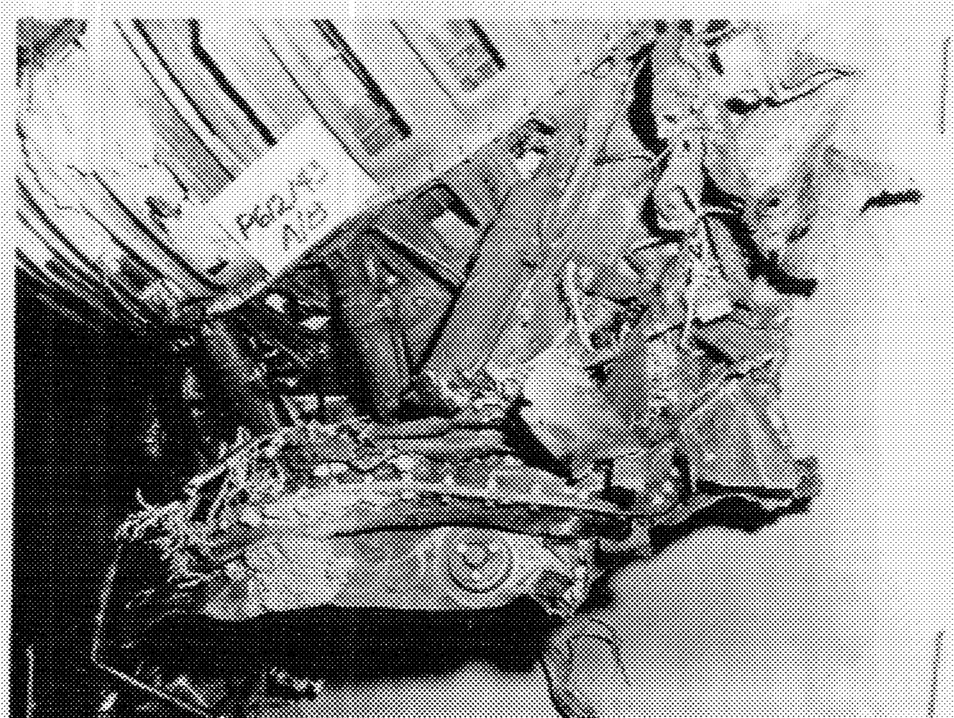

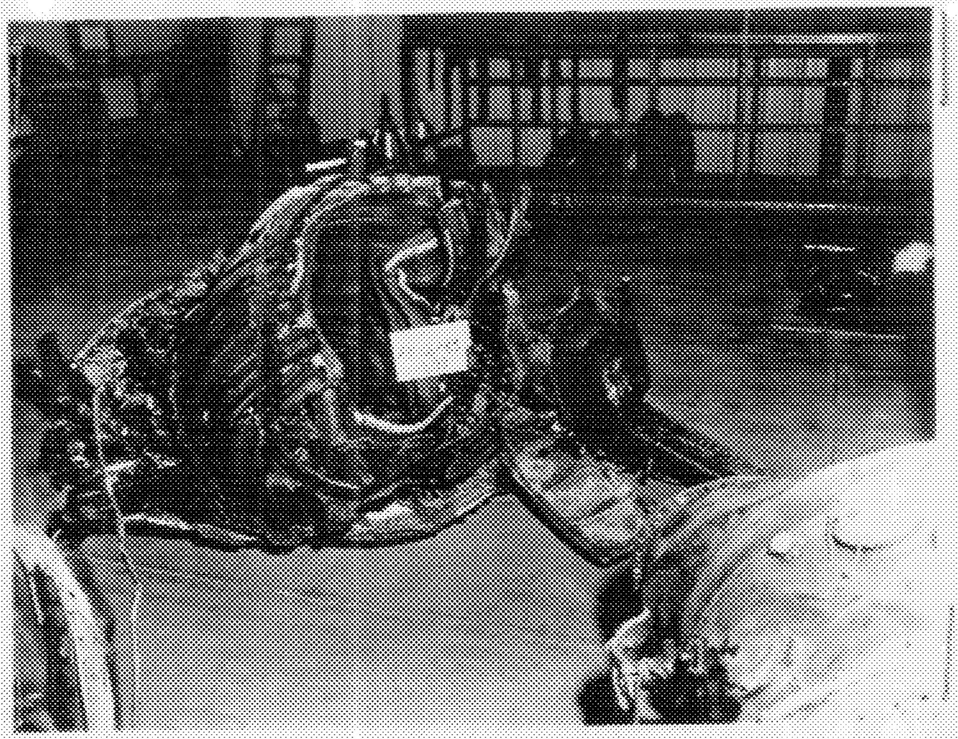

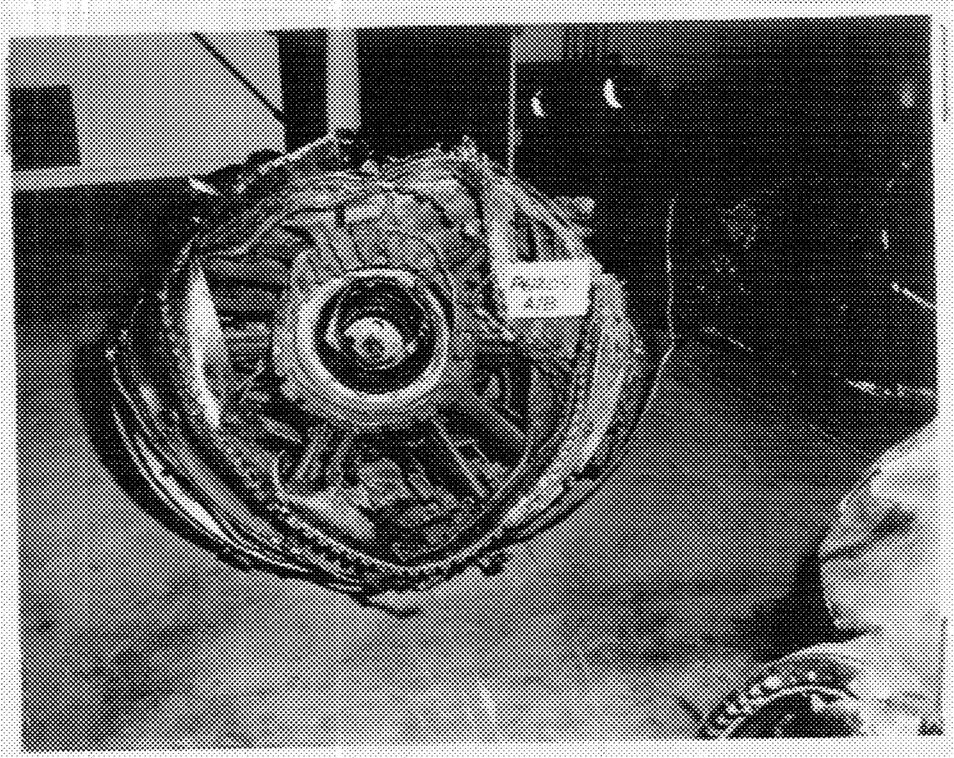

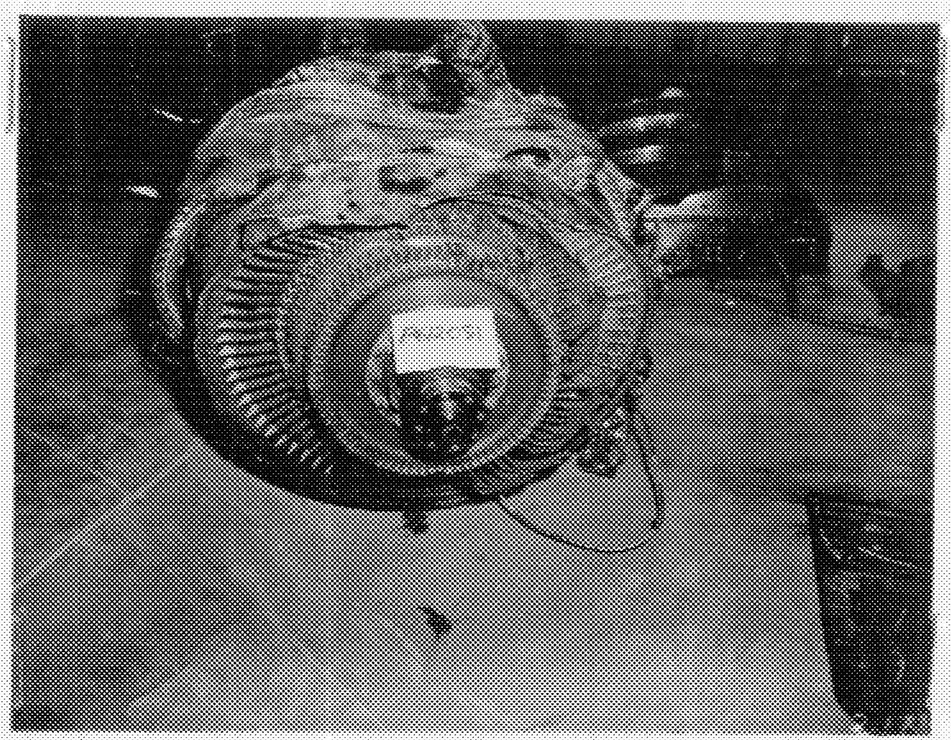

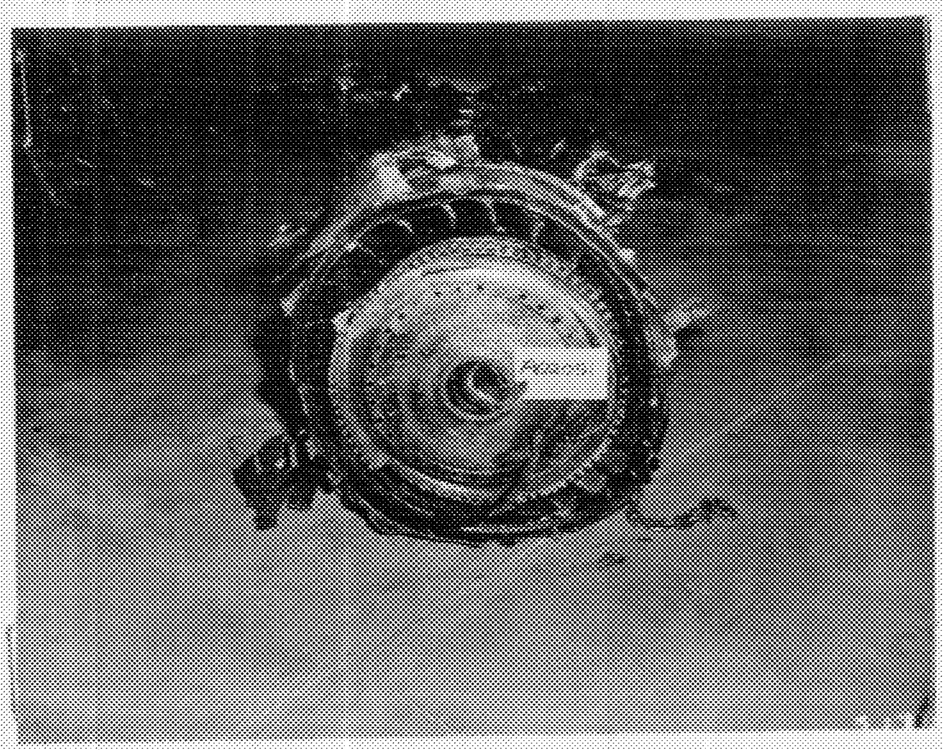

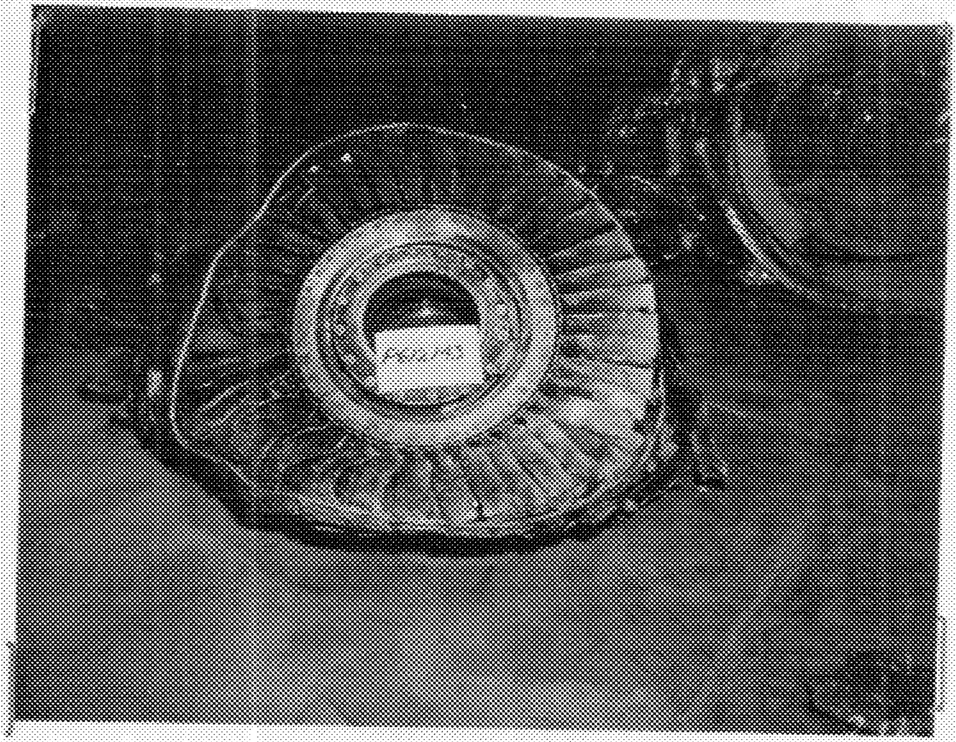

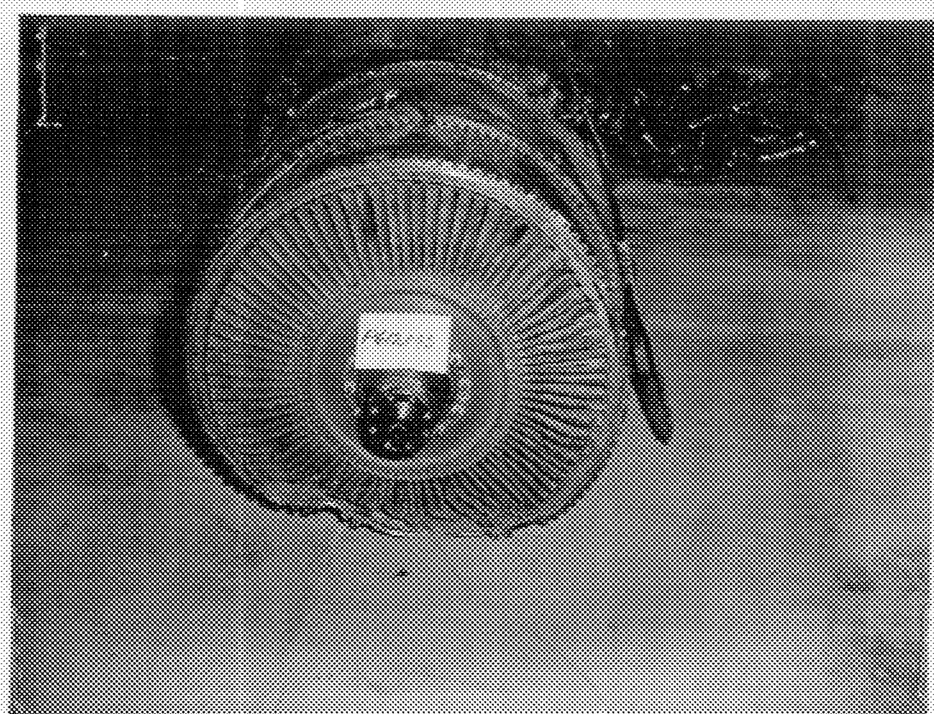

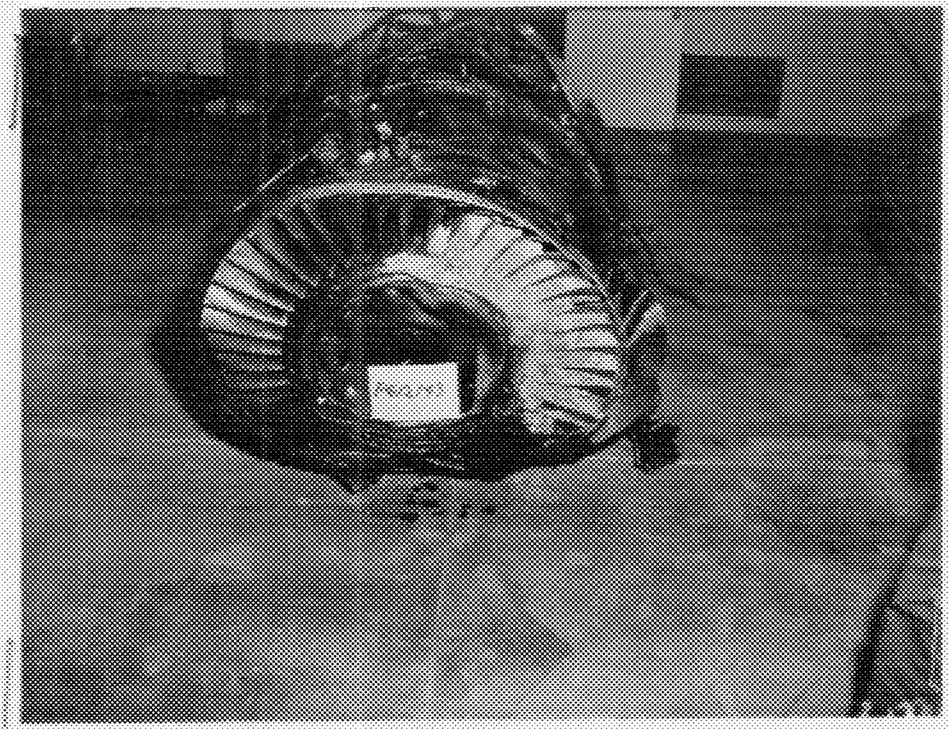

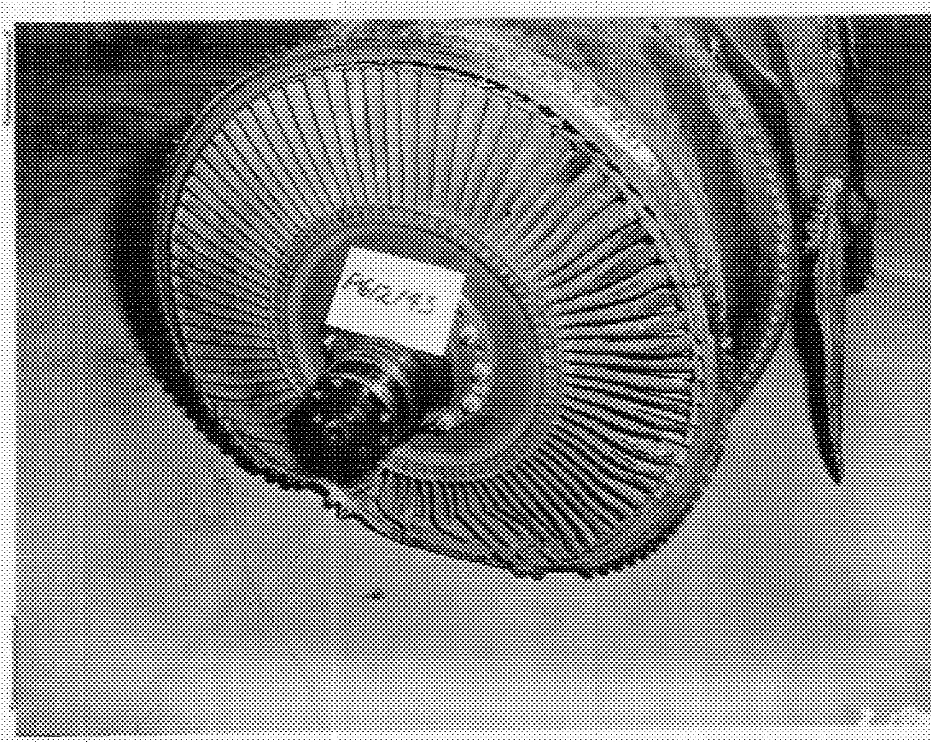

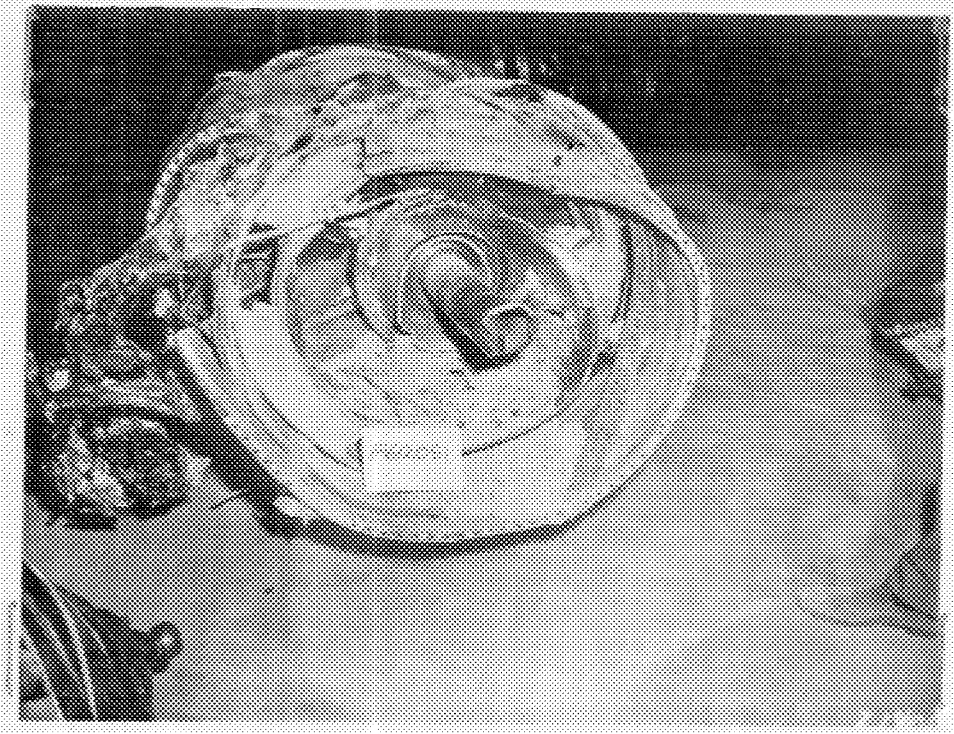

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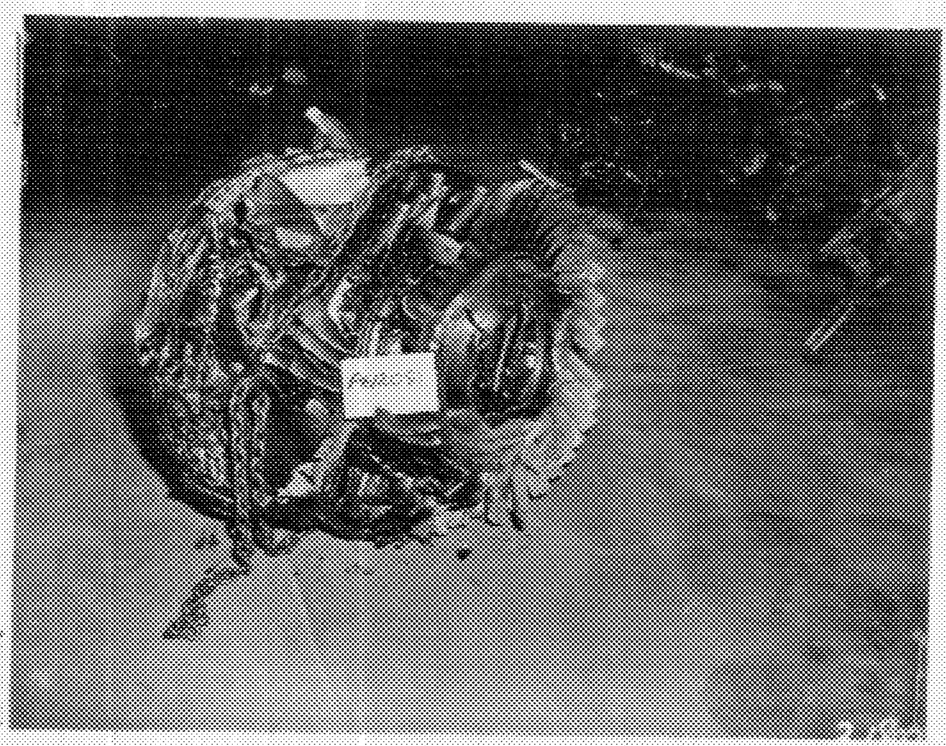

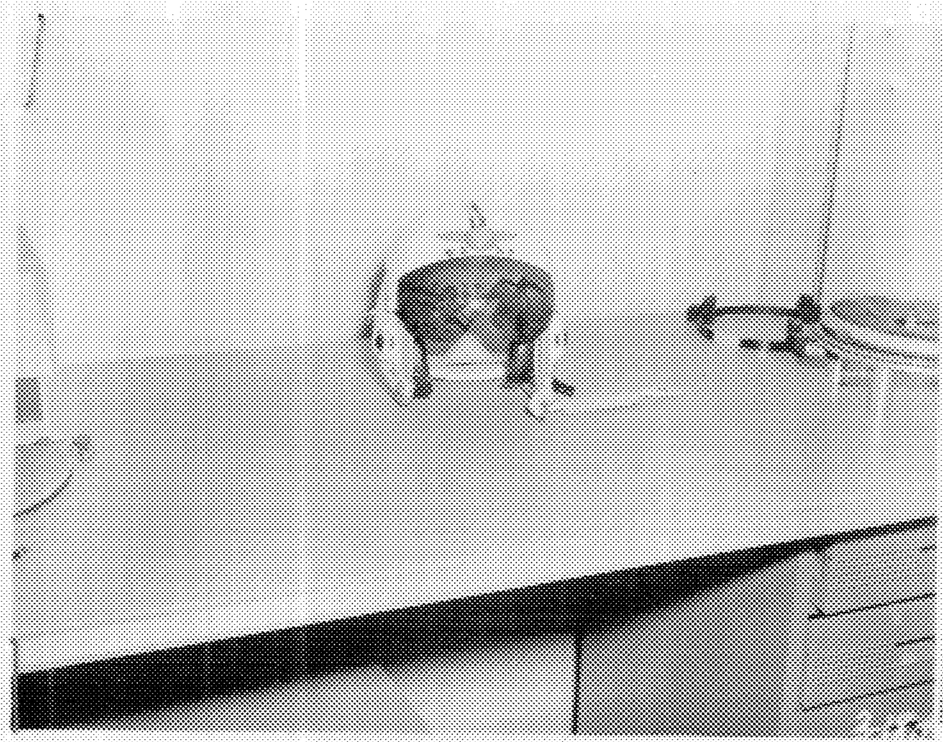

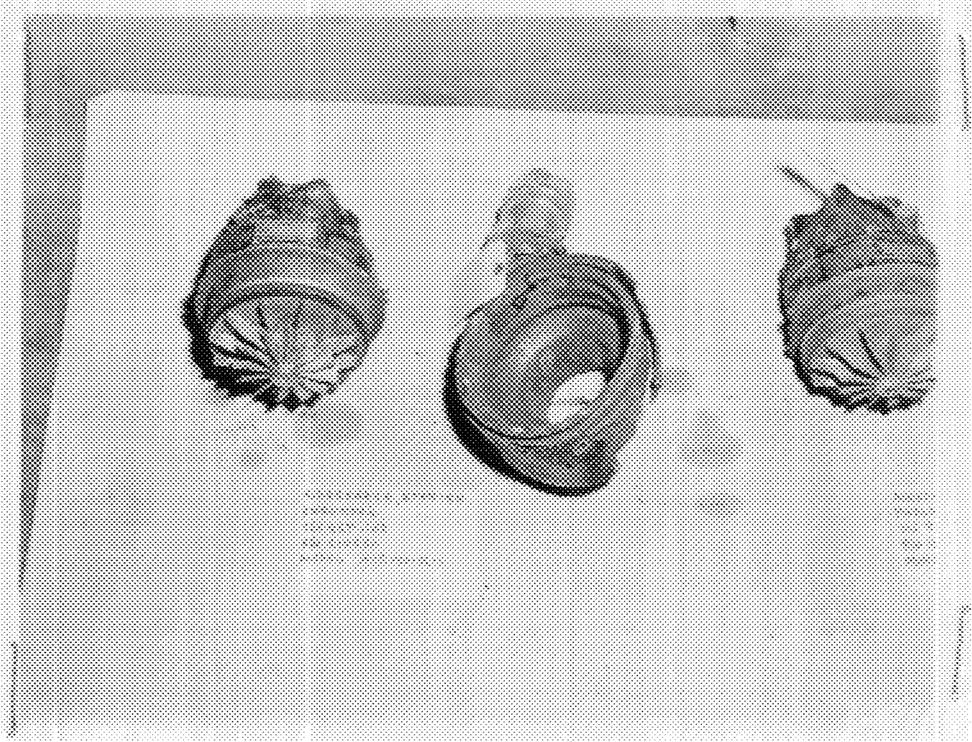

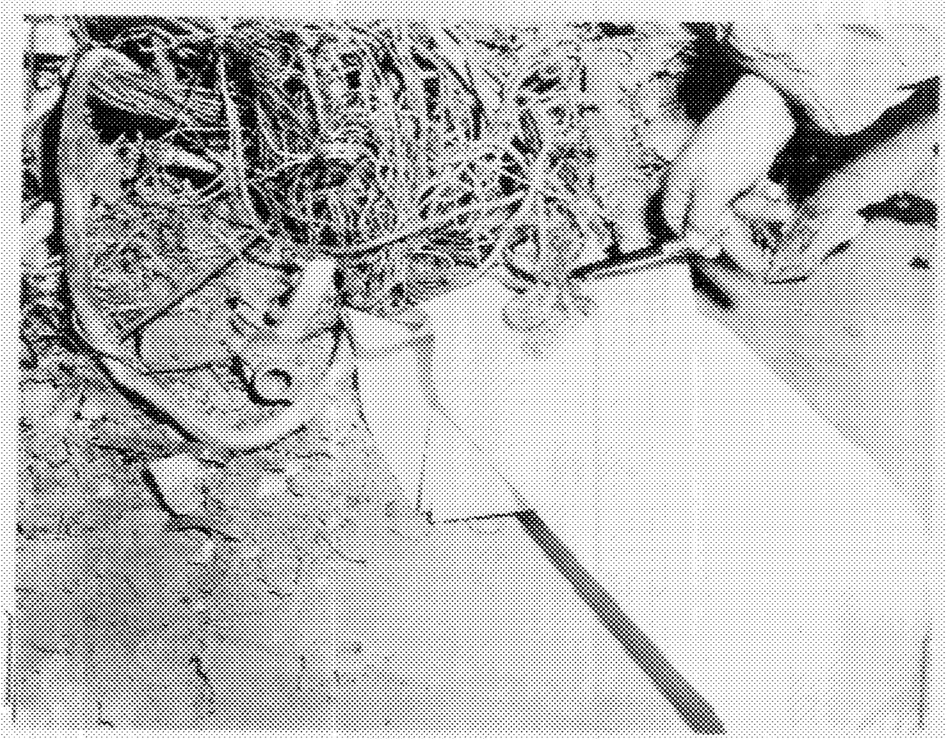

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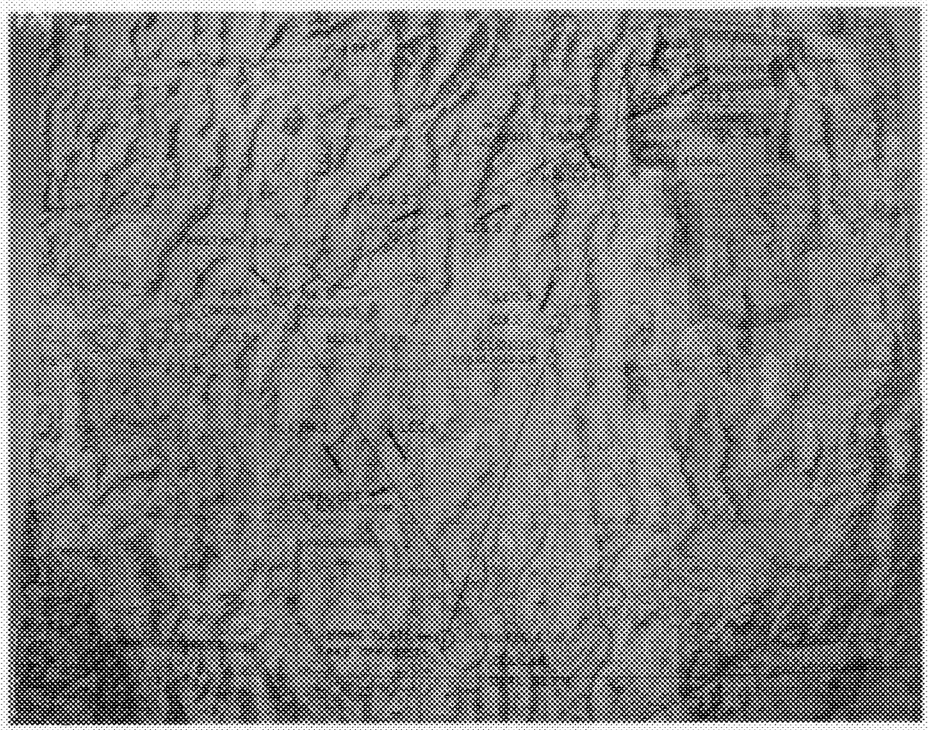

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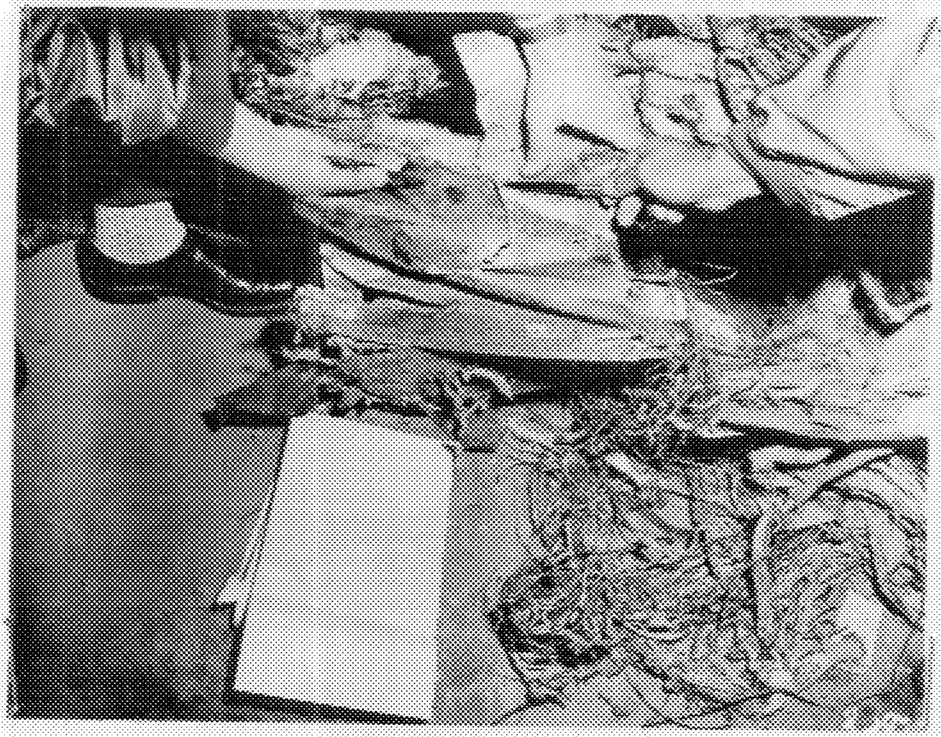

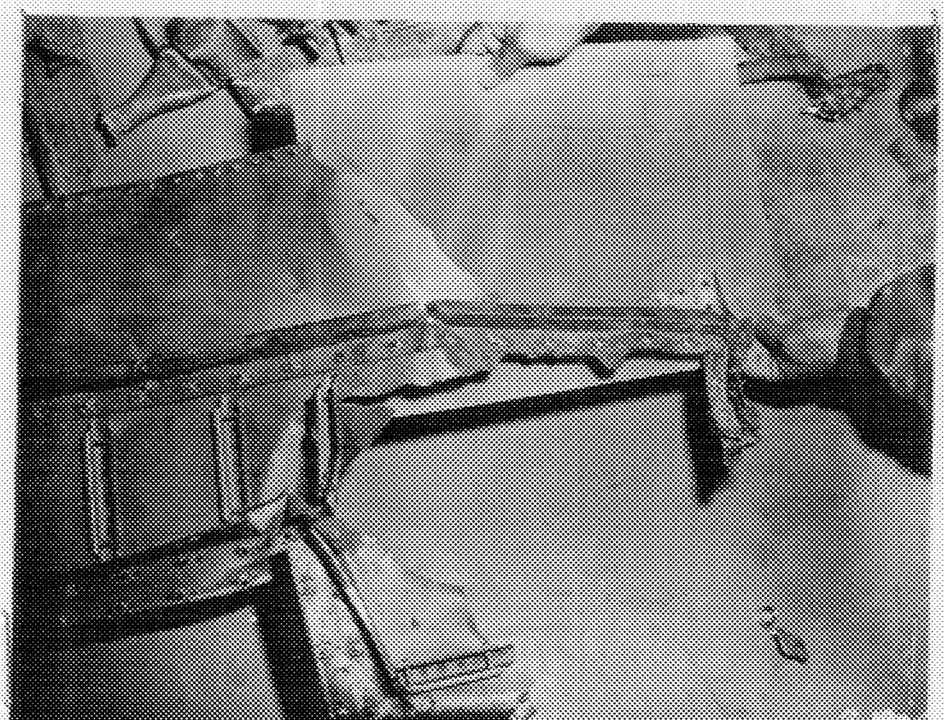

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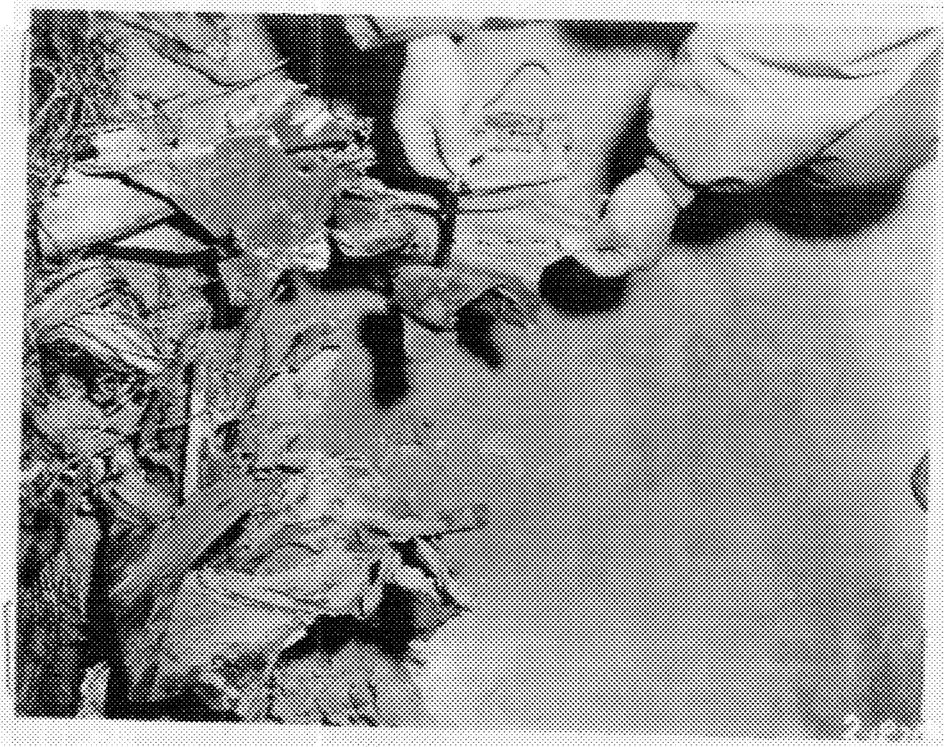

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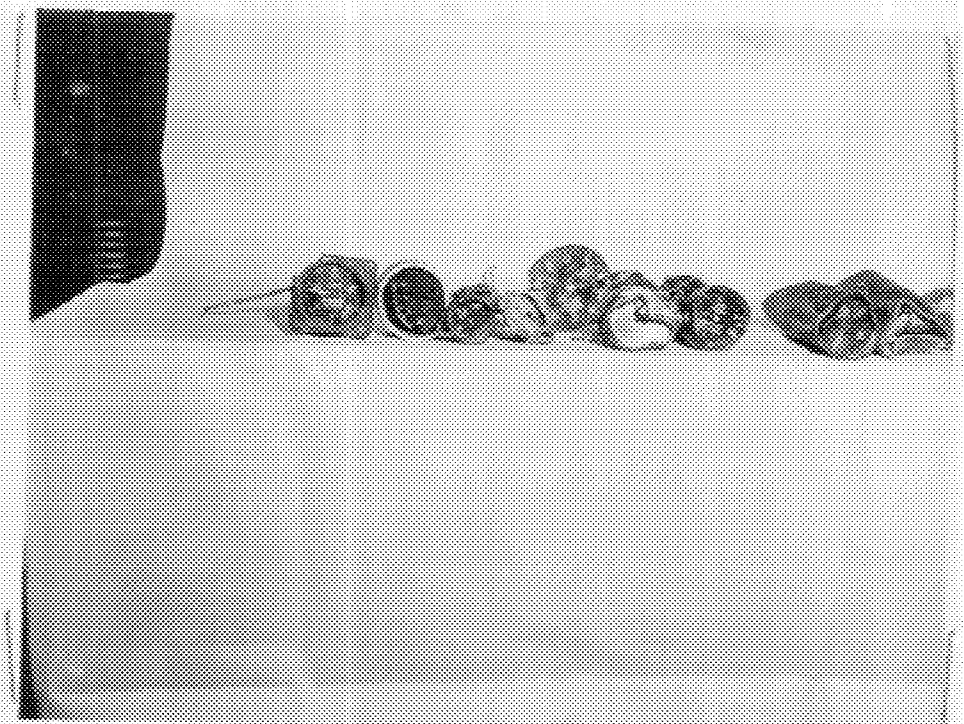

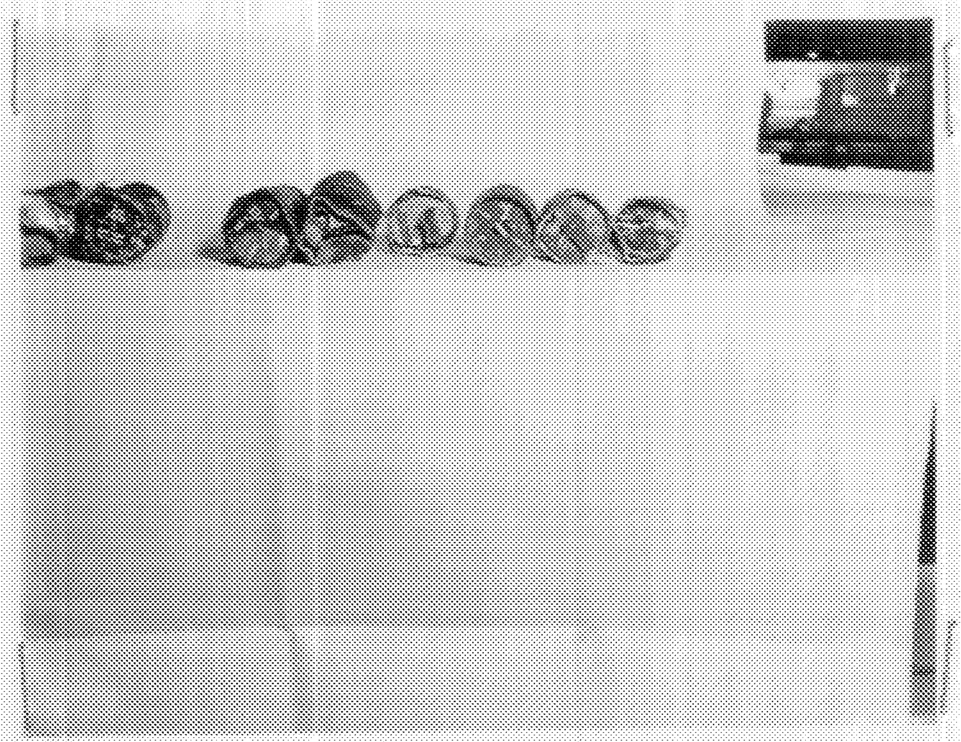

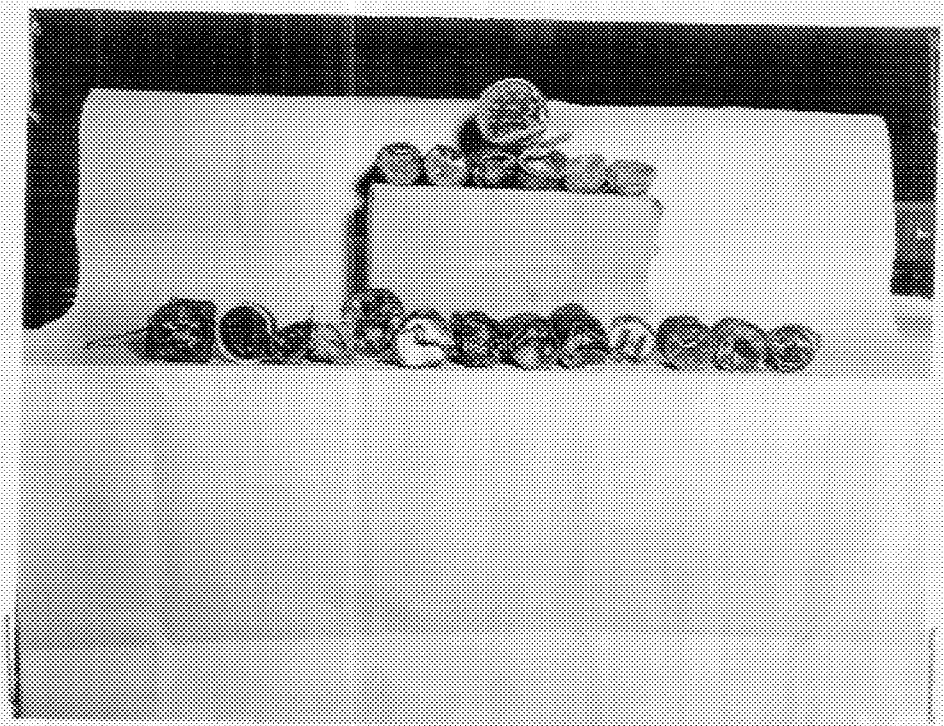

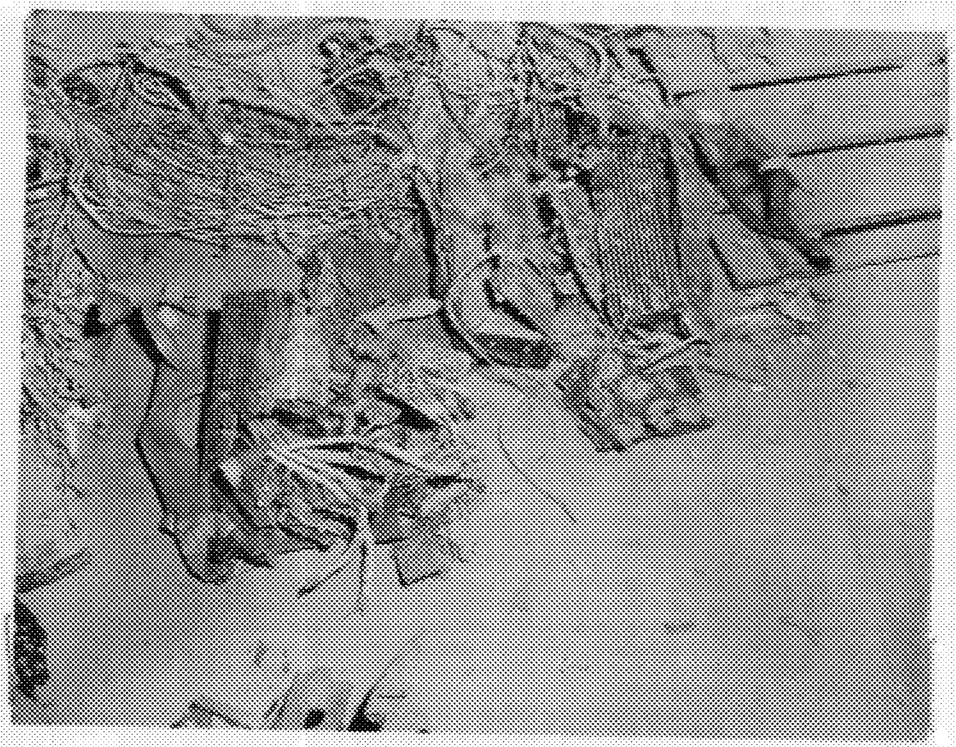

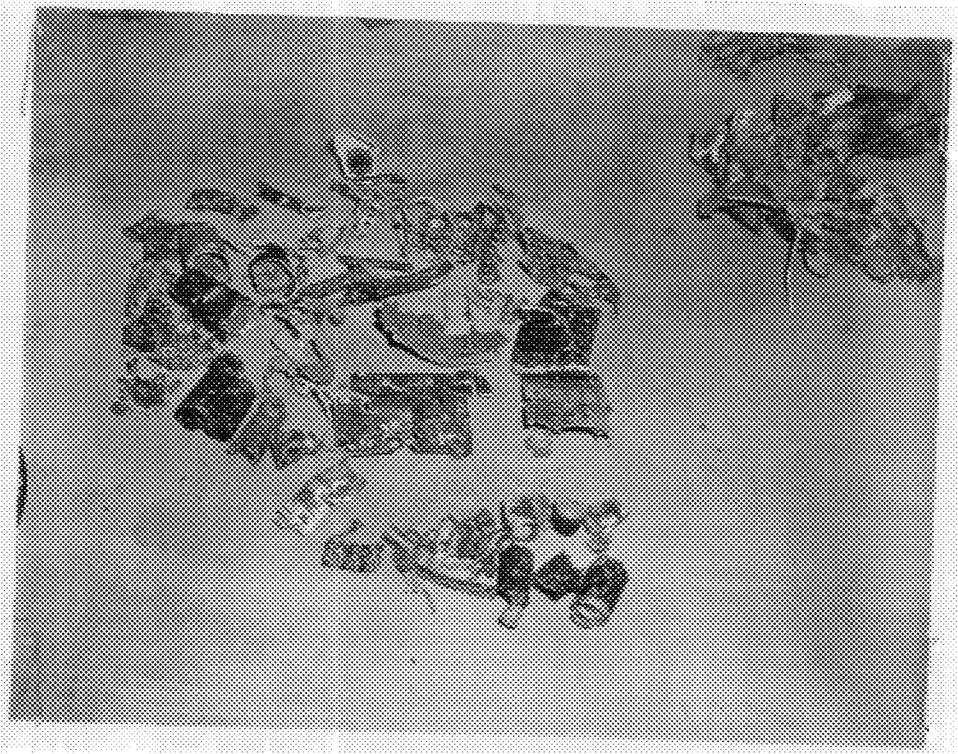

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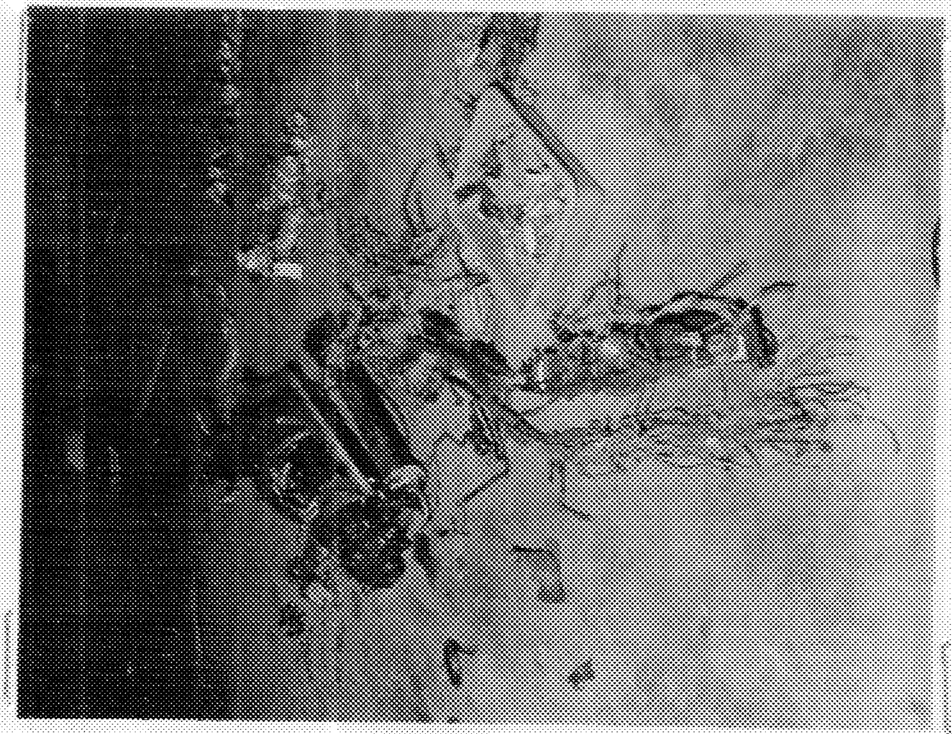

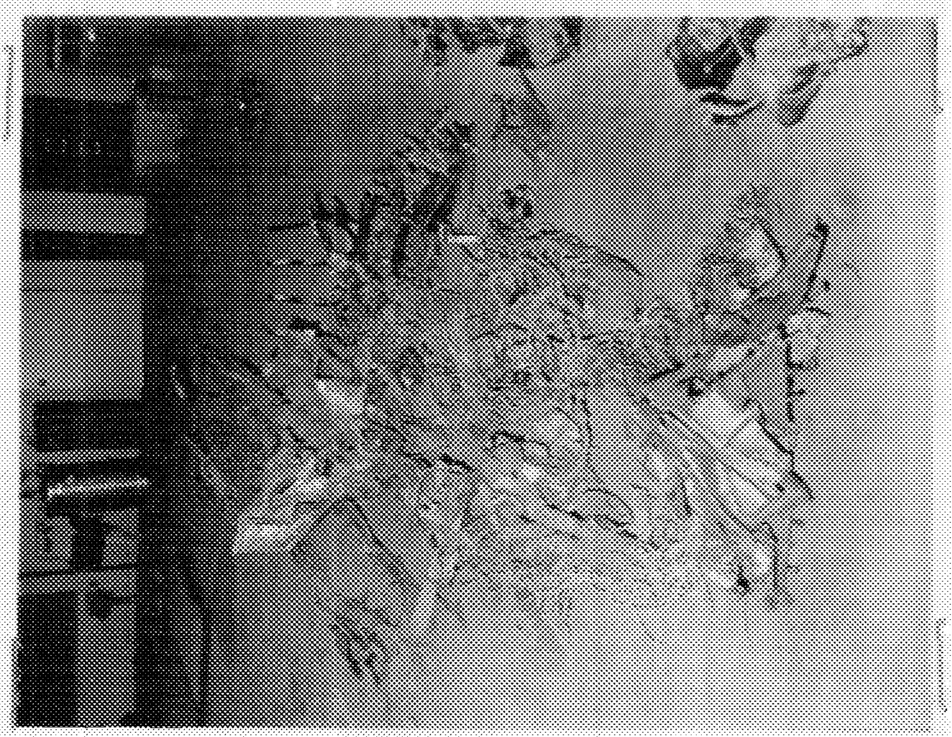

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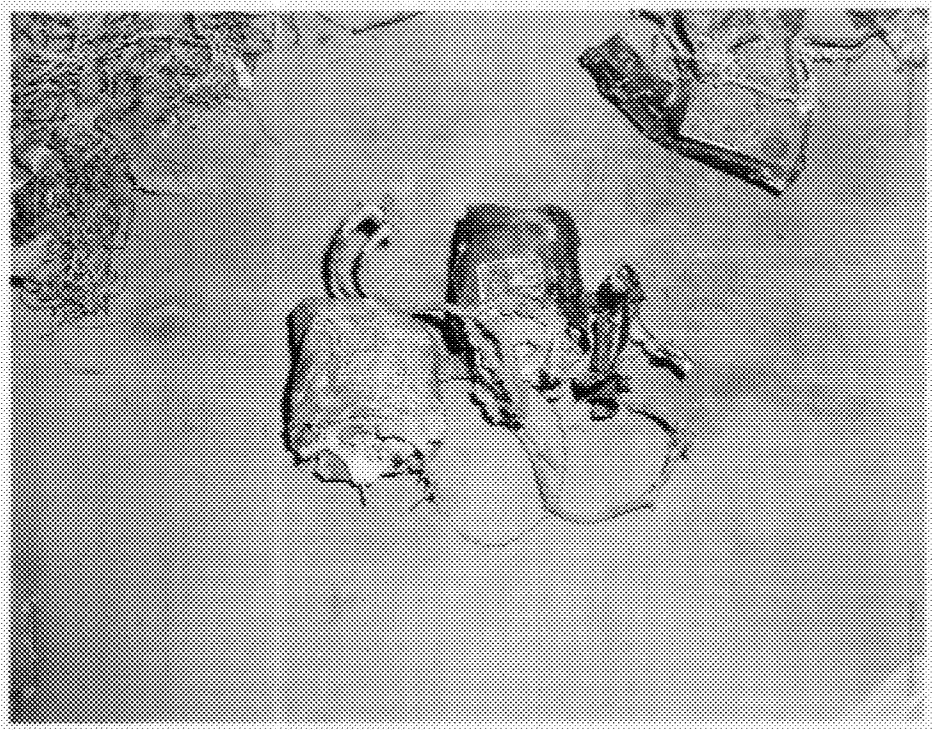

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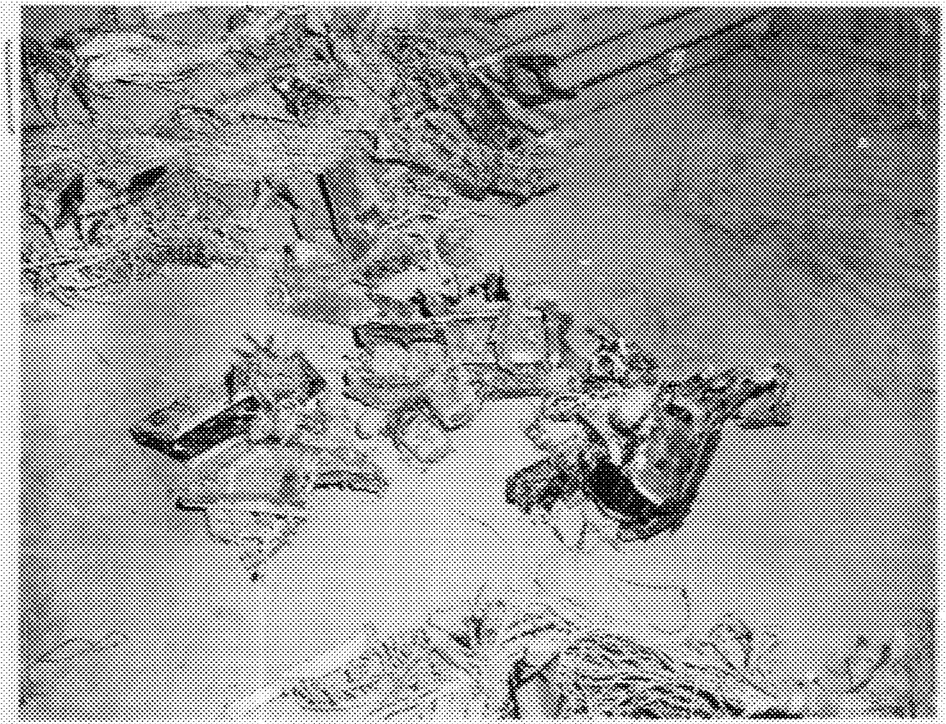

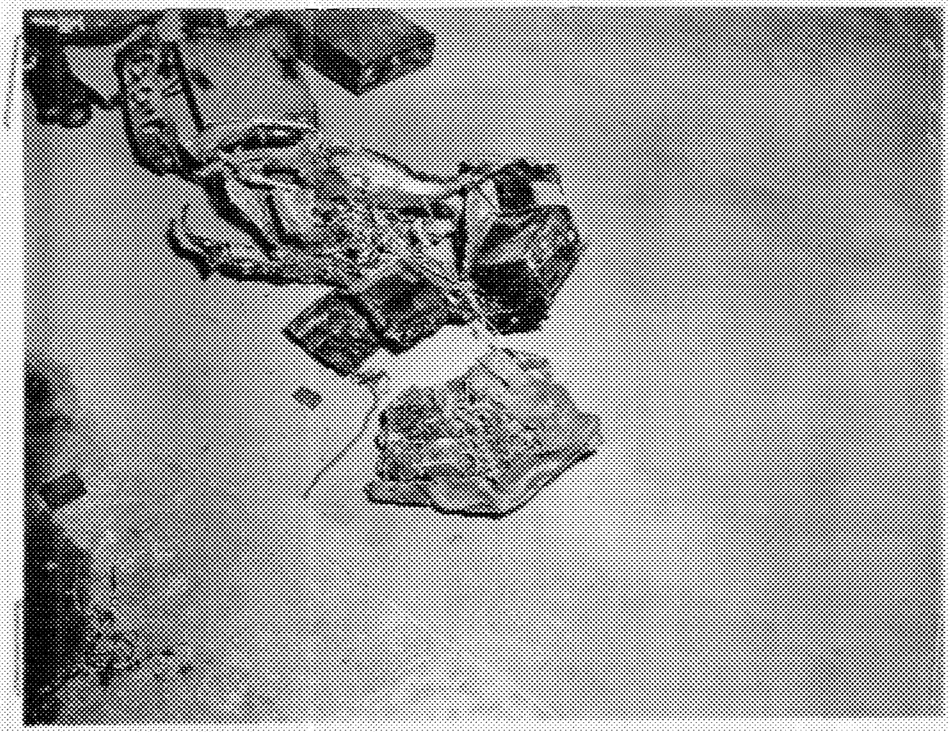

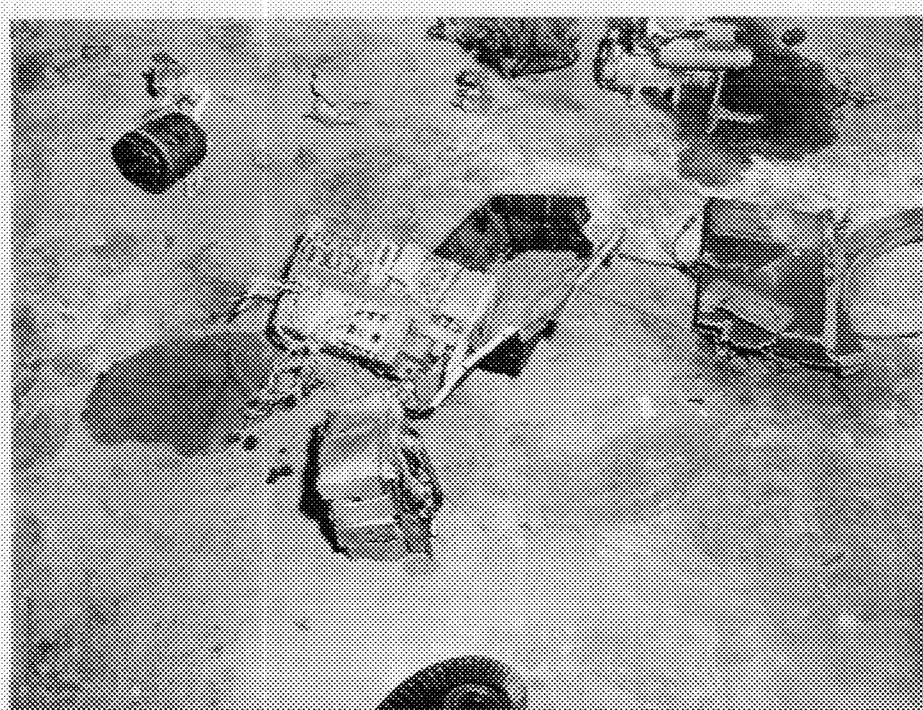

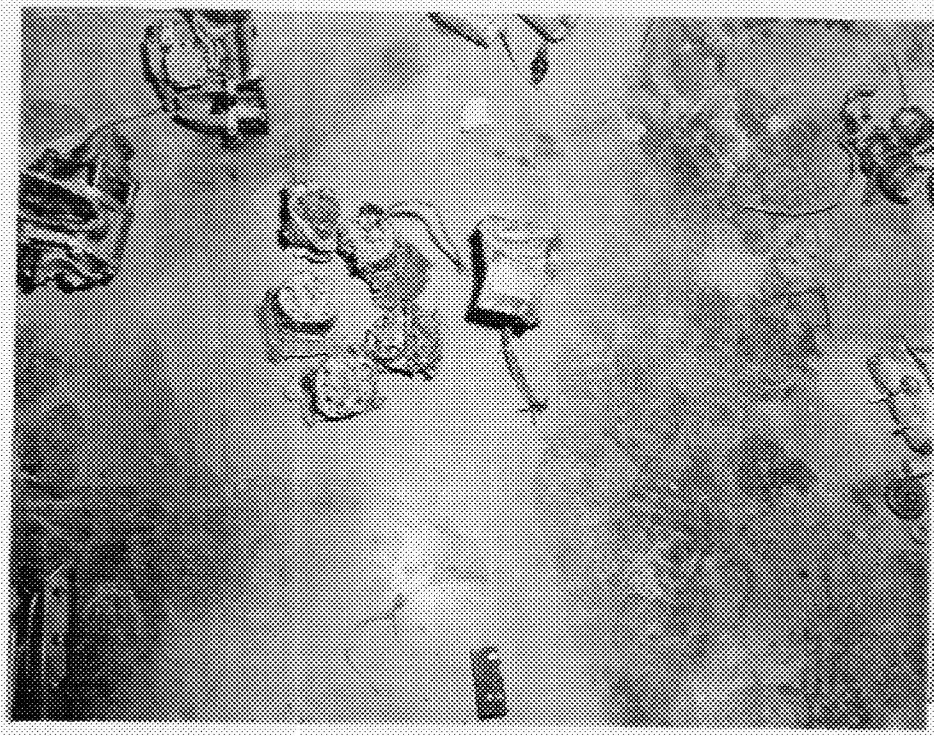

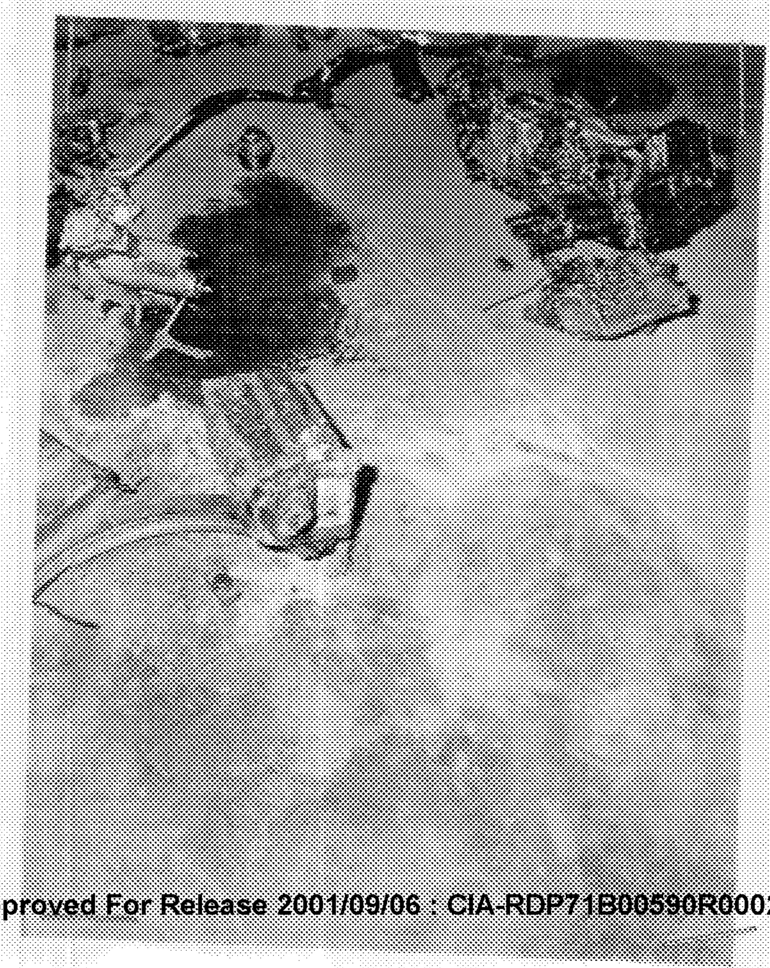

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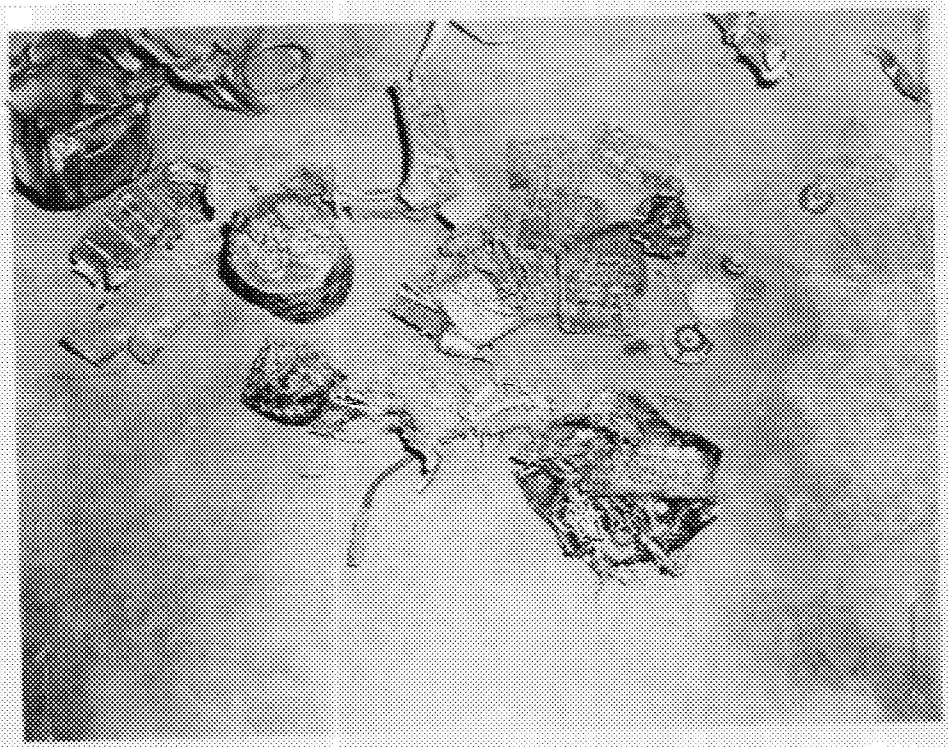

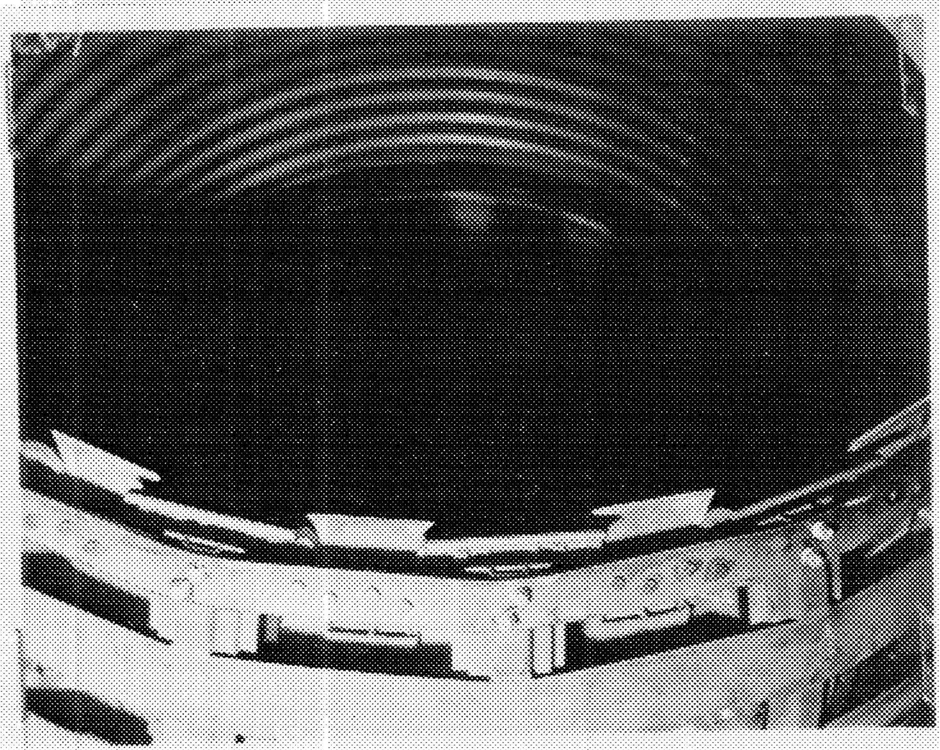

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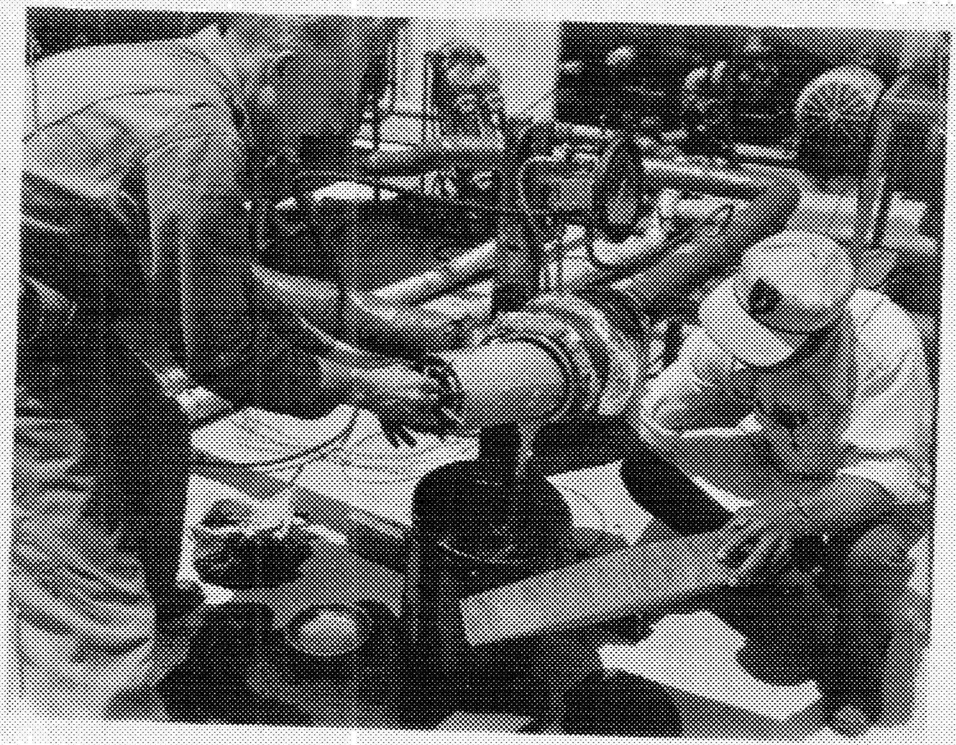

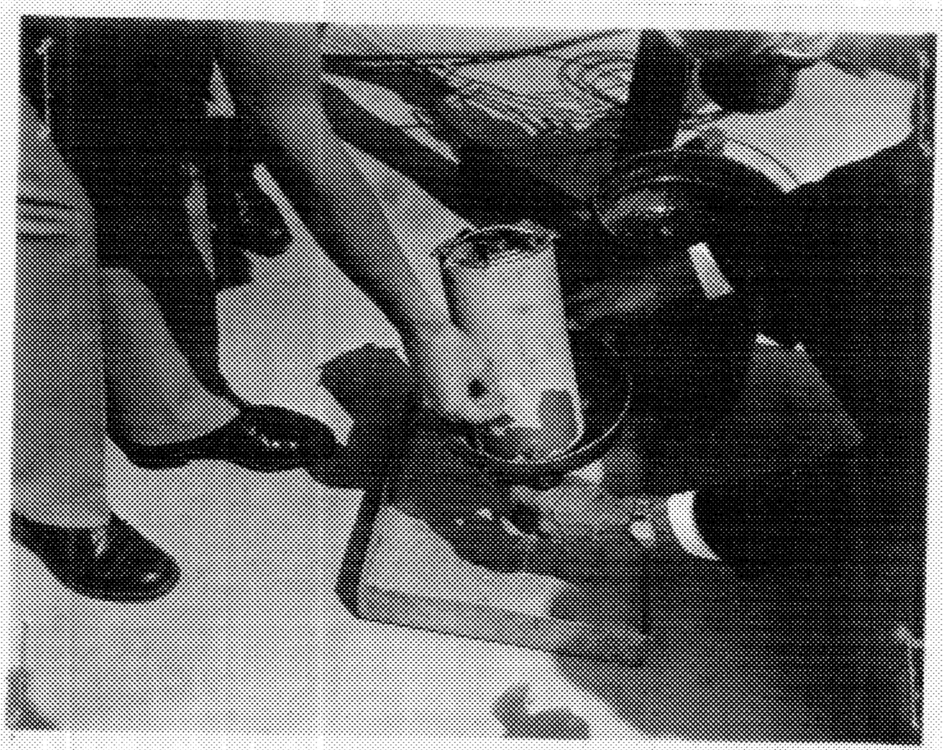

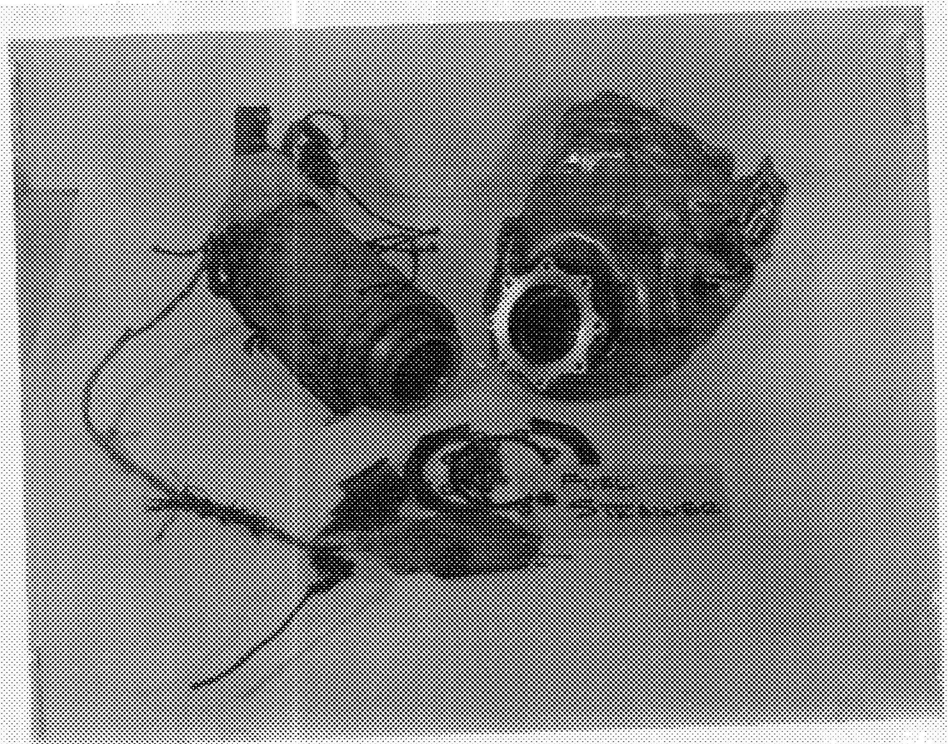

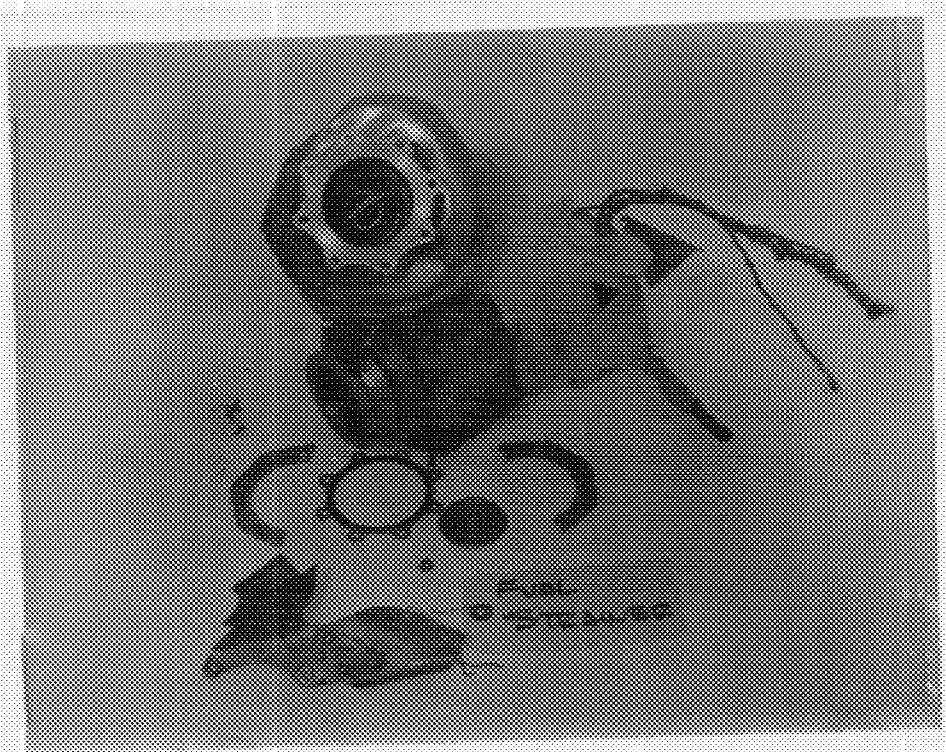

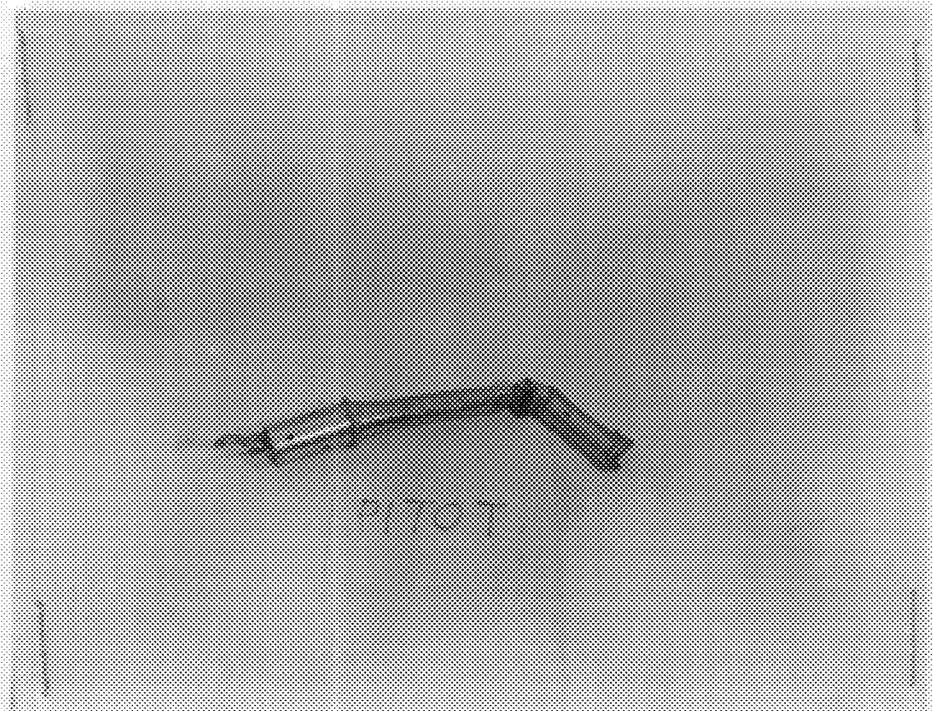

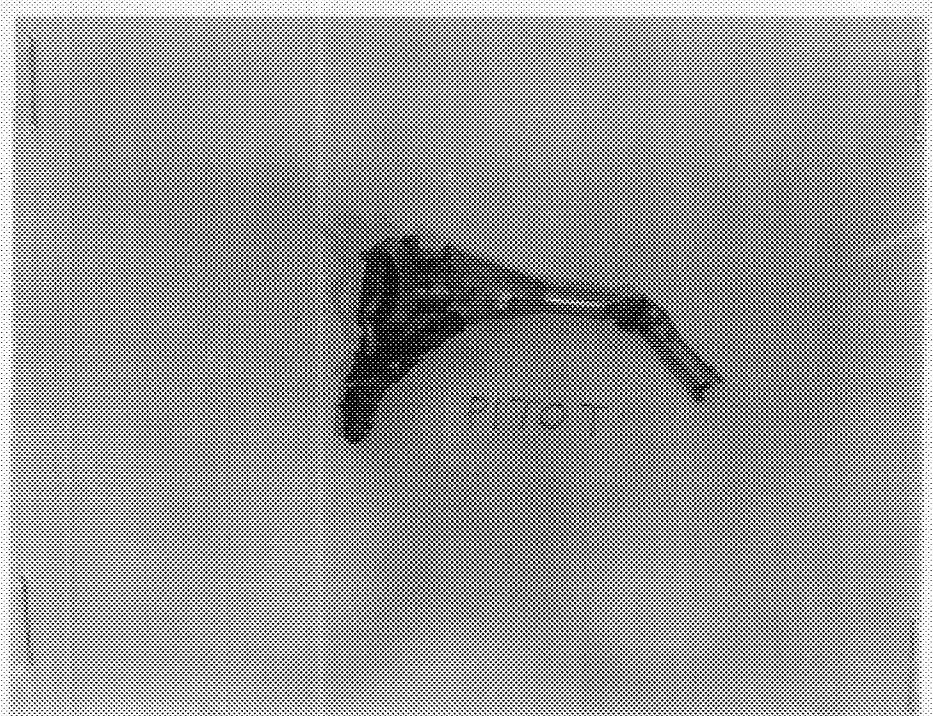

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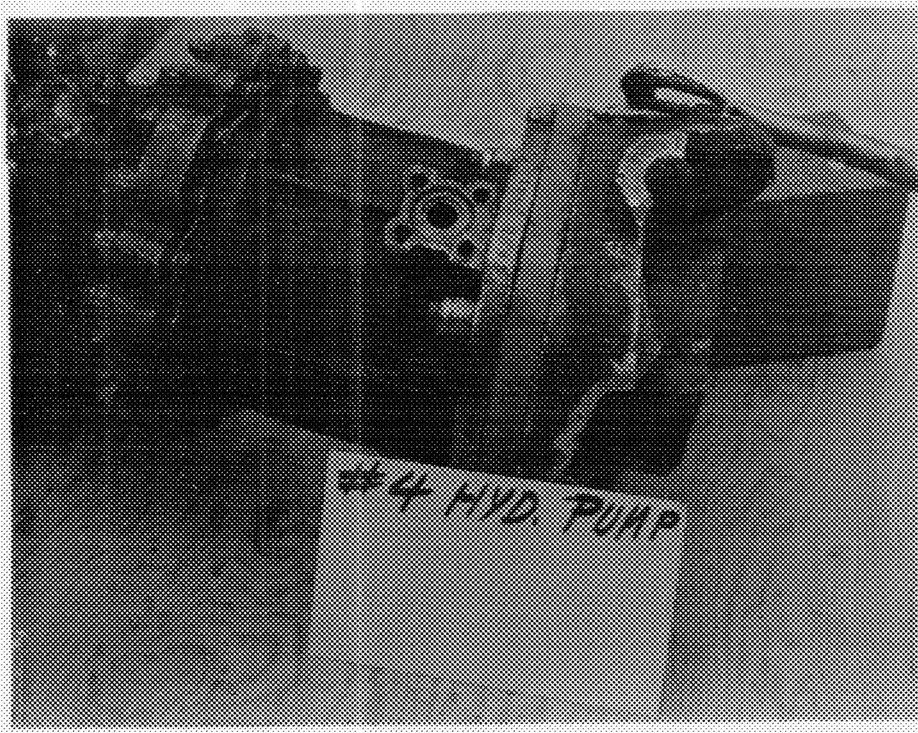

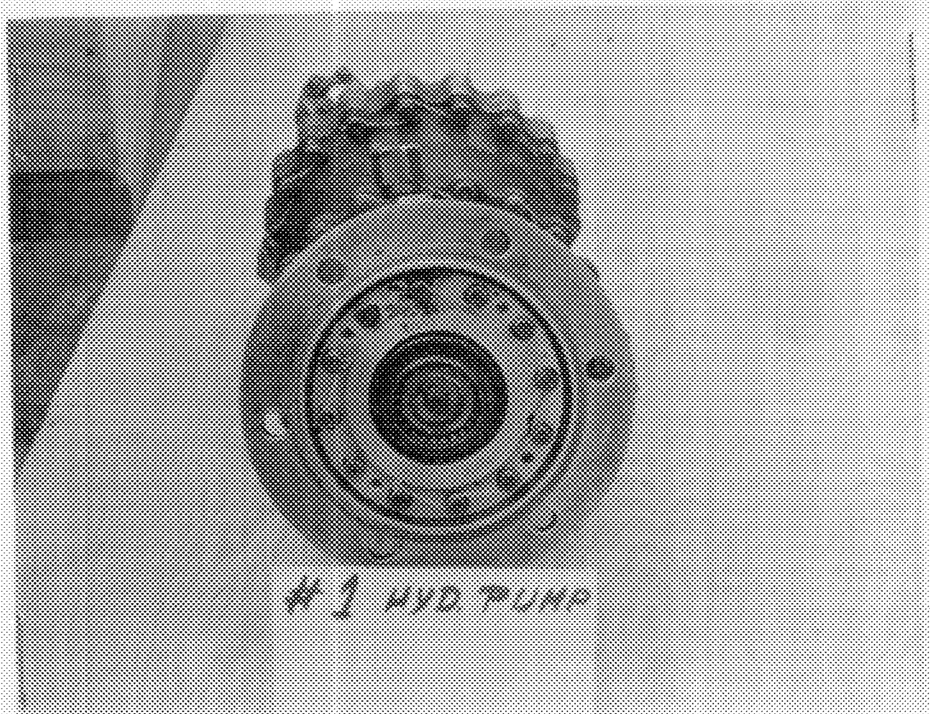

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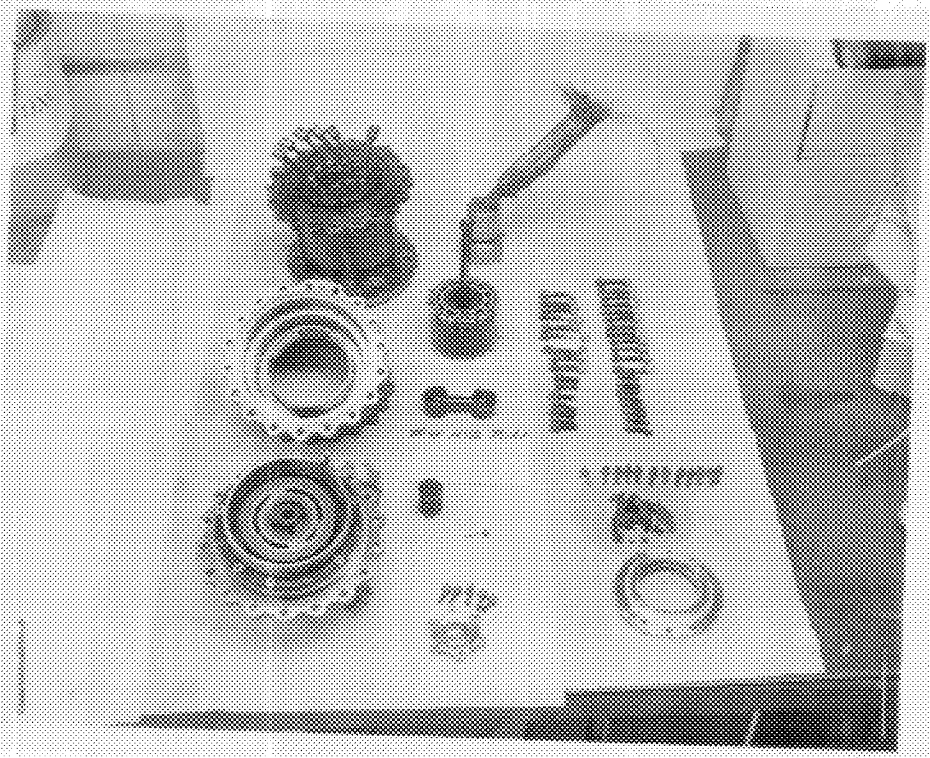

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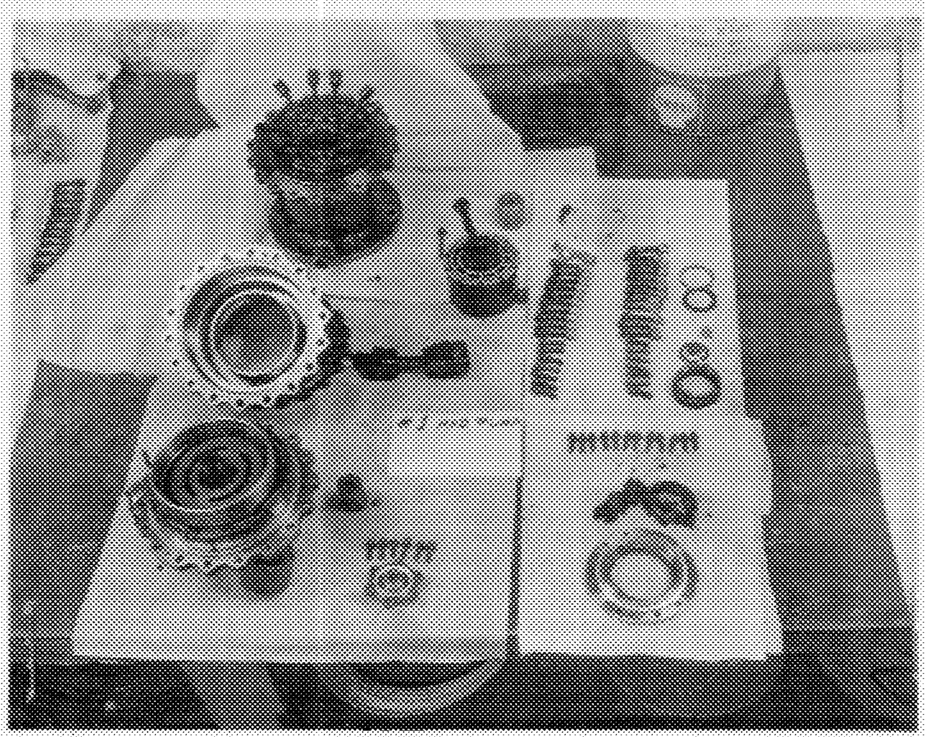

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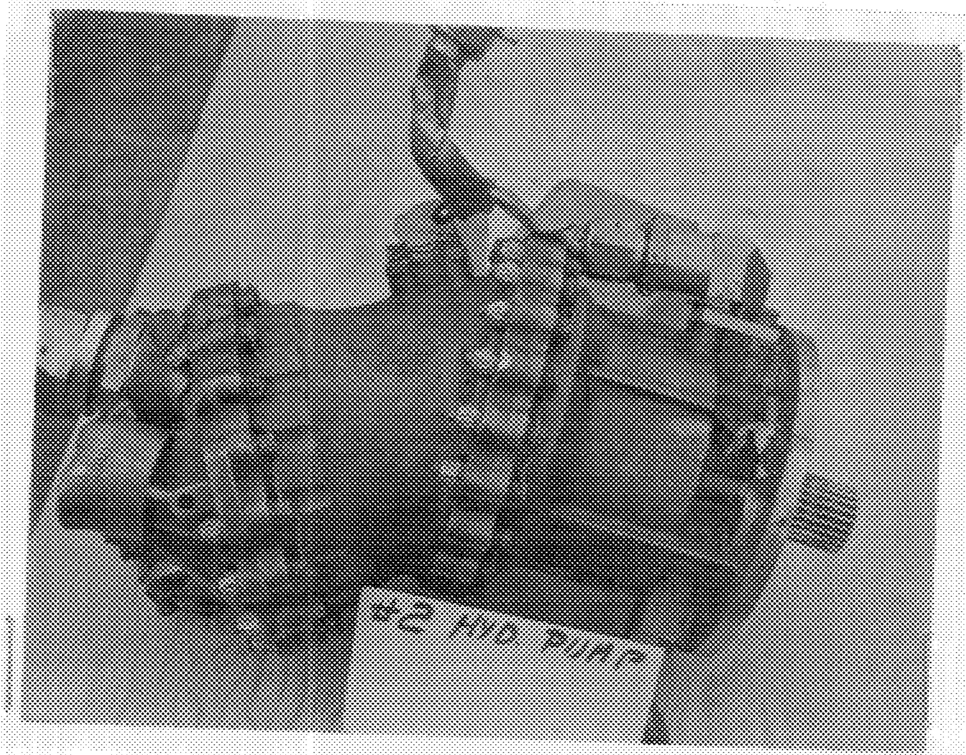

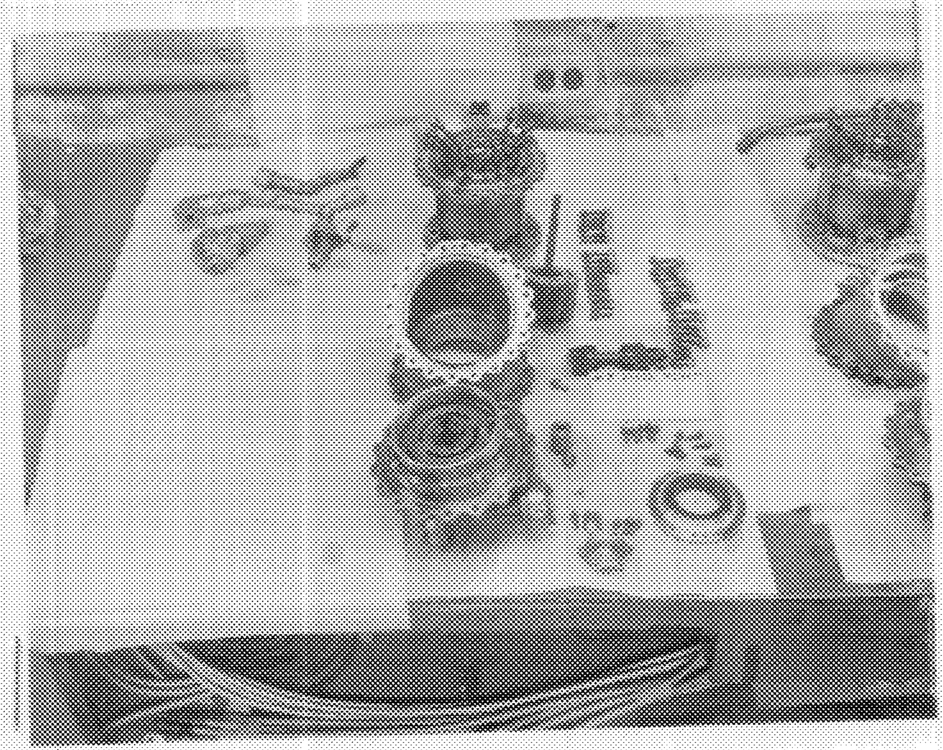

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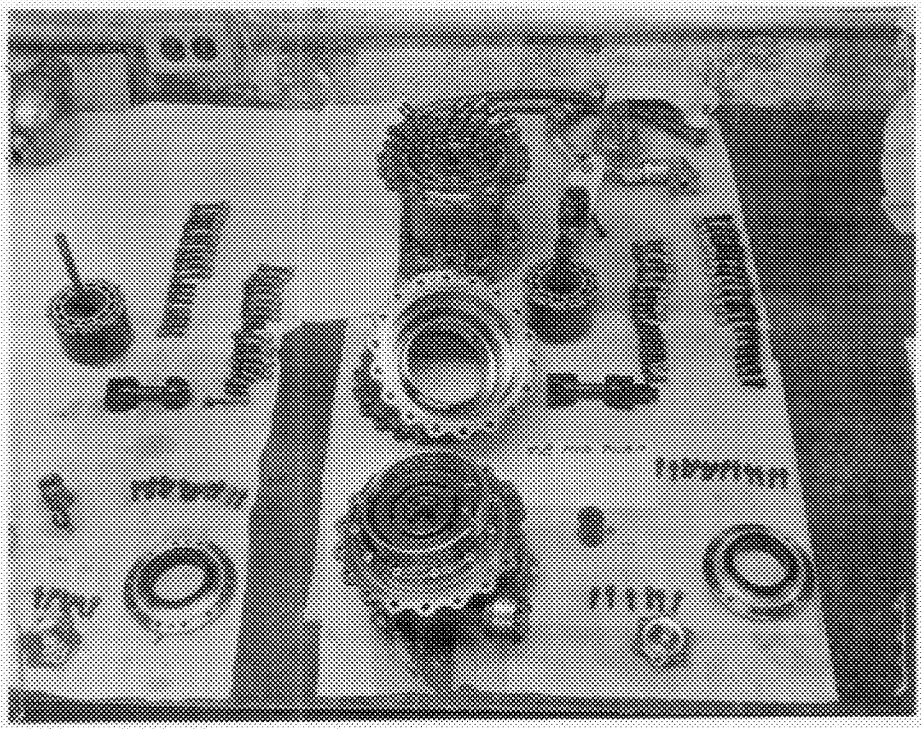

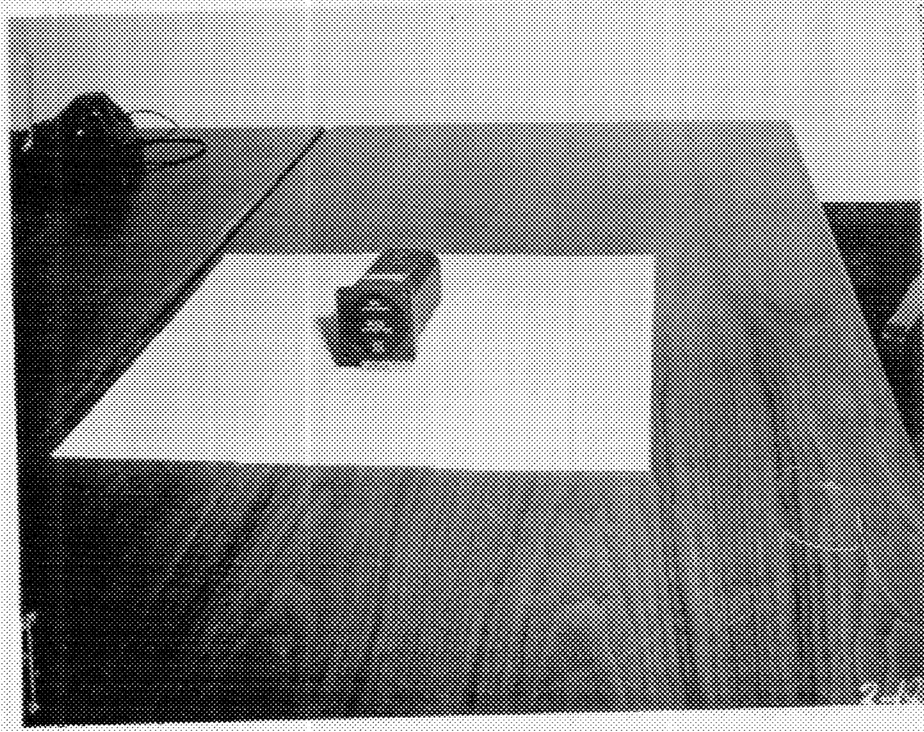

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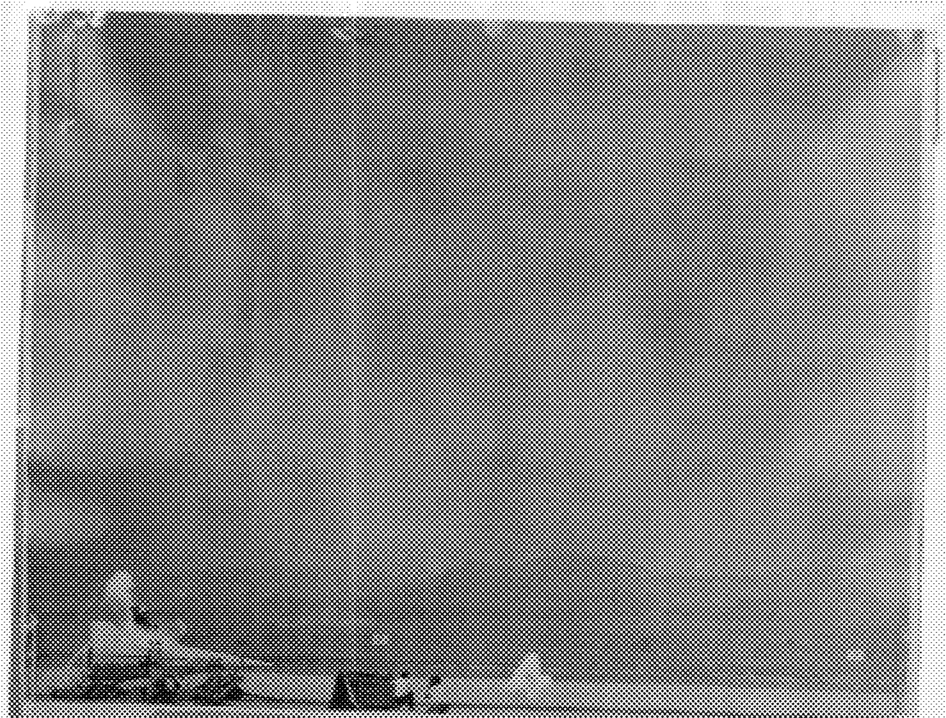

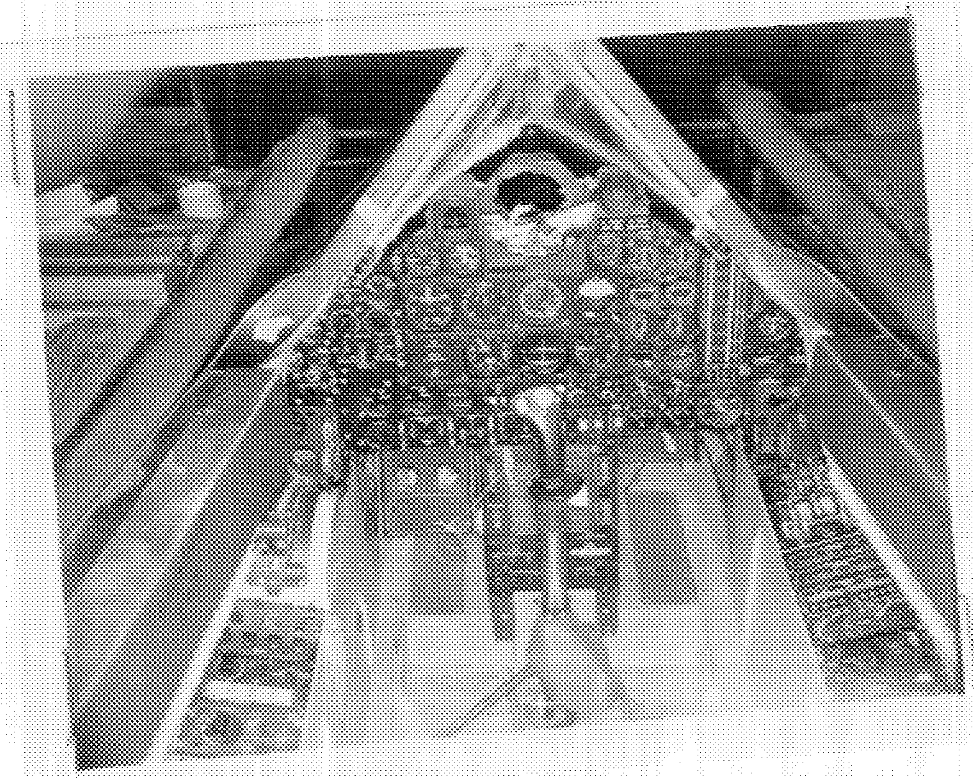

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