The following is the complete official USAF Mishap [Safety Board] Report regarding the 18 January 1982 Thunderbird Diamond accident occurring at what was then called the Indian Springs Air Force Auxiliary Field in Indian Springs, Nevada. This report was requested under the FOIA program and was received redacted IAW AFR 91-204. It should be noted that at the time of this incident AFR 127-4 was in effect. This PDF's text and image quality matches that of the paper copy received. The FOIA requestor was informed that it was complete, and the best copy available. The Board identified the cause of the accident by typing (CAUSE) next to one of the findings on the last page of the report.

The Accident Investigation Board Report, a summary of which was printed in an Aviation Week and Space Technology magazine issue dated 17 May 1982, is publically releasable without redaction under AFI 51-503. Unfortunately, this AIB report was destroyed as prescribed by AF instruction after 25 years when the Air Force deemed this report not historically significant (AFI 51-503, Chapter 10.4.1.6 & AFMAN 37-139). A recent FOIA request for this report resulted in a "no record exists" response from the USAF.

It should be noted that public controversy exists regarding possible undue influence and adherence to USAF process in the production of these reports. USAF regulations and other legal jeopardy limit what some knowledgeable people can discuss. Others who may be free to discuss the matter feel this incident is best left as currently documented, not wanting to blemish the historical prestige of the USAF ADS.

Although the AFI 51-503 AIB report no longer appears to be available through official channels, someone with a complete personal copy could bring it forward for public and historical access. In light of all of the above, scrutiny of unofficial sources might become the only source for all the details and circumstances that led to the unfortunate loss of life and materiel during this historic incident.

(filled in)

USAF MISHAP REPORT

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

1. DATE OF OCCURRENCE (Day, Month and Year)	2. VEHICLE(s) OR MATERIEL INVOLVED (Model designation and aerial no. if applicable)	3. FOR GROUND ACCIDENTS ONLY (Base Code and Report Serial No.)
18 January 1982	T-38A (1) 68-8156 (3) 68-8176 (2) 68-8184 (4) 68-8175	82-1-18-1

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.
Indian Springs Air Force Auxiliary Field Indian Springs, Nevada	0953 PST	☒ DAY ☐ NIGHT ☐ DAWN ☐ DUSK

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

MAJOR COMMAND	SUBCOMD OR AF	AIR DIVISION	WING	GROUP	SQ OR UNIT	NAME & BASE CODE
TAC	TFWC		57FWW		ADS	Nellis AFB, NV NJOT

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

9. ORGANIZATION AND BASE SUBMITTING REPORT *(Do not abbreviate)*

57th Fighter Weapons Wing, Nellis Air Force Base, Nevada 89191

10. LIST OF PERSONNEL DIRECTLY INVOLVED
(See AFR 127-2 for specific instructions)

LAST NAME, FIRST NAME, MIDDLE INITIAL	GRADE	SSAN	ASSIGNED DUTY	AERO RATING	DEGREE INJURY [1] (Use Abbr)	DAYS LOST ON T1 ONLY
Lowry, Norman L. III	Major		Cmdr/Ldr	Sr Plt	F	
Mays, William T.	Capt		Left Wing	Sr Plt	F	
Peterson, Joseph N. III	Capt		Right Wing	Sr Plt	F	
Melancon, Mark E.	Capt		Slot	Sr Plt	F	

[1] *(Enter applicable letter(s) in DEGREE INJURY column. None-N; Temporary Total-TT; Permanent Partial-PP; Permanent Total-PT; Fatal-F; Missing-M)*

11. FACTUAL SUMMARY OF CIRCUMSTANCES. GIVE A DETAILED HISTORY OF FLIGHT OR CHRONOLOGICAL ORDER OF FACTS AND CIRCUMSTANCES LEADING TO THE MISHAP. THE RESULTS OF INVESTIGATION WILL BE CONTAINED IN THE "ANALYSIS PART" OF THE REPORT. ANALYSIS OF AND CONCLUSIONS DRAWN FROM ORAL OR WRITTEN STATEMENTS OBTAINED ONLY IN THE INTEREST OF MISHAP PREVENTION WILL NOT BE INCLUDED IN THIS SUMMARY.

The flight was briefed and flown as a Thunderbird aerial demonstration training mission at Indian Springs Air Force Auxiliary Field, Nevada, their normal training site. The flight had been airborne for approximately twenty minutes and had accomplished four routine maneuvers in prebriefed sequence before initiating a line abreast loop maneuver. During the final portion of the maneuver, all four aircraft hit the ground and were destroyed. All four aircrew members were fatalities.

12. AUTHENTICATION

CERTIFICATION BY (Title)	TYPED NAME AND GRADE	SIGNATURE	DATE
Board President	GERALD D. LARSON Brigadier General, USAF	[redacted]	4 MAR 1982

AF FORM 711 AUG 75 PREVIOUS EDITION IS OBSOLETE.

(filled in)

(When filled in)

AIRCRAFT FLIGHT MISHAP REPORT

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

1. MISHAP CLASS	2. ACFT MDS & SERIAL NO.	3. DATE	4. UNIT CONTROL NO.	5. ACFT ASSIGNMENT/STATUS CODE
☒ A ☐ B ☐ C ☒ DEST	T38-A 68-8156	18 Jan 82	USAFADS/1-A-1	57FWW, NELLIS AFB, NV

PILOT(S) INVOLVED (FLIGHT CREW)[1]

6. OPERATOR AT CONTROLS

A. LAST NAME, INITIALS	B. COMPONENT	D. NATIONALITY	E. AGE
LOWRY, NORMAN L., III	REGULAR AIR FORCE	U.S.	37

C. POSITION IN AIRCRAFT AT TIME OF MISHAP: X FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING
TAC, TFWC, 57FWW, USAFADS	

7. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	D. NATIONALITY	E. AGE

C. POSITION IN AIRCRAFT AT TIME OF MISHAP: ☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

8. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	D. NATIONALITY	E. AGE

C. POSITION IN AIRCRAFT AT TIME OF MISHAP: ☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

9. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	D. NATIONALITY	E. AGE

C. POSITION IN AIRCRAFT AT TIME OF MISHAP: ☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

10. CLEARANCE

FROM NELLIS AIR FORCE BASE, NEVADA TO NELLIS AIR FORCE BASE, NEVADA

☐ VFR ☒ IFR ☒ LOCAL ☐ PT TO PT ☐ DIRECT ☐ AIRWAYS ☐ NO CLEARANCE ☐ NA

11. DURATION OF FLIGHT		12. TYPE OF MISSION	13. ALTITUDE/ELEVATION
HOURS	TENTHS		
0	3	5-5 AERIAL DEMONSTRATION TRAINING	3123 FEET

14. PHASE OF OPERATION	15. TYPE OF MISHAP
ACROBATICS	COLLISION WITH GROUND

16. METEOROLOGICAL CONDITIONS: ☒ VMC ☐ SIMULATED IMC ☐ TRANSITION ☐ IMC ☐ ON TOP ☐ VFR IN IMC CONDITIONS

17. AIRFIELD DATA APPLICABLE TO TAKEOFF AND LANDING MISHAPS OCCURRING WITHIN 2 MILES OF AIRFIELD

A. FIELD ELEVATION (Feet)	B. COMPOSITION OF RUNWAY	C. LENGTH OF RUNWAY (Feet)	D. RUNWAY HEADING	E. DISTANCE OF TOUCHDOWN FROM RUNWAY (Feet)	F. SURFACE CONDITION	OTHER (Specify)
	☐ ASPHALT ☐ CONCRETE ☐ OTHER (Specify)				☐ DRY ☐ WET	

G. LENGTH OF OVERRUN	H. COMPOSITION OF OVERRUN (Specify)	I. BARRIER TYPE	I. BARRIER USED	I. BARRIER LOCATION
			☐ YES ☐ NO	

J. CONDITIONS AFFECTING OCCURENCE *(For example, type of instrument or lighting approach used, obstructions, barrier, airspeed, gross weight, forced landing)*

[1] *If more than four pilots are involved (Flight Crew) report same information required on additional sheet for each.*

AF FORM SEP 79 711b PREVIOUS EDITION IS OBSOLETE. *(When filled in)*

(When filled in)

AIRCRAFT FLIGHT MISHAP REPORT

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

1. MISHAP CLASS	2. ACFT MDS & SERIAL NO.	3. DATE	4. UNIT CONTROL NO.	5. ACFT ASSIGNMENT/STATUS CODE
☒ A ☐ B ☐ C ☒ DEST	T38-A 68-8184	18 Jan 82	USAFADS/1-A-1	57FWW, NELLIS AFB, NV

PILOT(S) INVOLVED (FLIGHT CREW)[1]

6. OPERATOR AT CONTROLS

A. LAST NAME, INITIALS	B. COMPONENT
MAYS, WILLIAM T.	REGULAR AIR FORCE

C. POSITION IN AIRCRAFT AT TIME OF MISHAP	D. NATIONALITY	E. AGE
X FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT	U.S.	32

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING
TAC, TFWC, 57FWW, USAFADS	

7. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT

C. POSITION IN AIRCRAFT AT TIME OF MISHAP	D. NATIONALITY	E. AGE
☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT		

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

8. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT

C. POSITION IN AIRCRAFT AT TIME OF MISHAP	D. NATIONALITY	E. AGE
☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT		

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

9. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT

C. POSITION IN AIRCRAFT AT TIME OF MISHAP	D. NATIONALITY	E. AGE
☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT		

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

10. CLEARANCE

FROM					TO					
NELLIS AIR FORCE BASE, NEVADA	☐ VFR	X IFR	X LOCAL	☐ PT TO PT	NELLIS AIR FORCE BASE, NEVADA	☐ DIRECT	☐ AIRWAYS	☐ NO CLEARANCE	☐ NA

11. DURATION OF FLIGHT		12. TYPE OF MISSION	13. ALTITUDE/ELEVATION
HOURS	TENTHS		
0	3	5-5 AERIAL DEMONSTRATION TRAINING	3123 FEET

14. PHASE OF OPERATION	15. TYPE OF MISHAP
ACROBATICS	COLLISION WITH GROUND

16. METEOROLOGICAL CONDITIONS ☒ VMC ☐ SIMULATED IMC ☐ TRANSITION ☐ IMC ☐ ON TOP ☐ VFR IN IMC CONDITIONS

17. AIRFIELD DATA APPLICABLE TO TAKEOFF AND LANDING MISHAPS OCCURRING WITHIN 2 MILES OF AIRFIELD

A. FIELD ELEVATION *(Feet)*	B. COMPOSITION OF RUNWAY			
	☐ ASPHALT ☐ CONCRETE ☐ OTHER *(Specify)*			
C. LENGTH OF RUNWAY *(Feet)*	D. RUNWAY HEADING	E. DISTANCE OF TOUCHDOWN FROM RUNWAY *(Feet)*	F. SURFACE CONDITION ☐ DRY ☐ WET	OTHER *(Specify)*

G. LENGTH OF OVERRUN	H. COMPOSITION OF OVERRUN *(Specify)*	I. BARRIER		
		TYPE	USED ☐ YES ☐ NO	LOCATION

J. CONDITIONS AFFECTING OCCURENCE *(For example, type of instrument or lighting approach used, obstructions, barrier, airspeed, gross weight, forced landing)*

[1] *If more than four pilots are involved (Flight Crew) report same information required on additional sheet for each.*

AF FORM SEP 79 711b PREVIOUS EDITION IS OBSOLETE. *(When filled in)*

When filled in

AIRCRAFT FLIGHT MISHAP REPORT

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

1. MISHAP CLASS	2. ACFT MDS & SERIAL NO.	3. DATE	4. UNIT CONTROL NO.	5. ACFT ASSIGNMENT/STATUS CODE
[X] A [ ] B [ ] C [X] DEST	T38-A 68-8176	18 Jan 82	USAFADS/1-A-1	57FWW, NELLIS AFB, NV

PILOT(S) INVOLVED (FLIGHT CREW)[1]

6. OPERATOR AT CONTROLS

A. LAST NAME, INITIALS	B. COMPONENT	D. NATIONALITY	E. AGE
PETERSON, JOSEPH N., III	REGULAR AIR FORCE	U.S.	32

C. POSITION IN AIRCRAFT AT TIME OF MISHAP: [X] FRONT SEAT [ ] LEFT SEAT [ ] REAR SEAT [ ] RIGHT SEAT [ ] JUMP SEAT

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING
TAC, TFWC, 57FWW, USAFADS	

7. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	D. NATIONALITY	E. AGE

C. POSITION IN AIRCRAFT AT TIME OF MISHAP: [ ] FRONT SEAT [ ] LEFT SEAT [ ] REAR SEAT [ ] RIGHT SEAT [ ] JUMP SEAT

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

8. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	D. NATIONALITY	E. AGE

C. POSITION IN AIRCRAFT AT TIME OF MISHAP: [ ] FRONT SEAT [ ] LEFT SEAT [ ] REAR SEAT [ ] RIGHT SEAT [ ] JUMP SEAT

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

9. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	D. NATIONALITY	E. AGE

C. POSITION IN AIRCRAFT AT TIME OF MISHAP: [ ] FRONT SEAT [ ] LEFT SEAT [ ] REAR SEAT [ ] RIGHT SEAT [ ] JUMP SEAT

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

10. CLEARANCE

FROM NELLIS AIR FORCE BASE, NEVADA TO NELLIS AIR FORCE BASE, NEVADA

[ ] VFR [X] IFR [X] LOCAL [ ] PT TO PT [ ] DIRECT [ ] AIRWAYS [ ] NO CLEARANCE [ ] NA

11. DURATION OF FLIGHT		12. TYPE OF MISSION	13. ALTITUDE/ELEVATION
HOURS	TENTHS		
0	3	5-5 AERIAL DEMONSTRATION TRAINING	3123 FEET

14. PHASE OF OPERATION	15. TYPE OF MISHAP
ACROBATICS	COLLISION WITH GROUND

16. METEOROLOGICAL CONDITIONS: [X] VMC [ ] SIMULATED IMC [ ] TRANSITION [ ] IMC [ ] ON TOP [ ] VFR IN IMC CONDITIONS

17. AIRFIELD DATA APPLICABLE TO TAKEOFF AND LANDING MISHAPS OCCURRING WITHIN 2 MILES OF AIRFIELD

A. FIELD ELEVATION *(Feet)*	B. COMPOSITION OF RUNWAY	C. LENGTH OF RUNWAY *(Feet)*	D. RUNWAY HEADING	E. DISTANCE OF TOUCHDOWN FROM RUNWAY *(Feet)*	F. SURFACE CONDITION	OTHER *(Specify)*
	[ ] ASPHALT [ ] CONCRETE [ ] OTHER *(Specify)*				[ ] DRY [ ] WET	

G. LENGTH OF OVERRUN	H. COMPOSITION OF OVERRUN *(Specify)*	I. BARRIER		
		TYPE	USED [ ] YES [ ] NO	LOCATION

J. CONDITIONS AFFECTING OCCURENCE *(For example, type of instrument or lighting approach used, obstructions, barrier, airspeed, gross weight, forced landing)*

[1] *If more than four pilots are involved (Flight Crew) report same information required on additional sheet for each.*

AF FORM SEP 79 711b PREVIOUS EDITION IS OBSOLETE. *(When filled in)*

When filled in)

AIRCRAFT FLIGHT MISHAP REPORT

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

1. MISHAP CLASS	2. ACFT MDS & SERIAL NO.	3. DATE	4. UNIT CONTROL NO.	5. ACFT ASSIGNMENT/STATUS CODE
☒ A ☐ B ☐ C ☒ DEST	T38-A 68-8175	18 Jan 82	USAFADS/1-A-1	57FWW, NELLIS AFB, NV

PILOT(S) INVOLVED (FLIGHT CREW)[1]

6. OPERATOR AT CONTROLS

A. LAST NAME, INITIALS	B. COMPONENT	C. POSITION IN AIRCRAFT AT TIME OF MISHAP	D. NATIONALITY	E. AGE
MELANCON, MARK E.	REGULAR AIR FORCE	X FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT	U.S.	31

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING
TAC, TFWC, 57FWW, USAFADS	

7. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	C. POSITION IN AIRCRAFT AT TIME OF MISHAP	D. NATIONALITY	E. AGE
		☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT		

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

8. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	C. POSITION IN AIRCRAFT AT TIME OF MISHAP	D. NATIONALITY	E. AGE
		☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT		

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

9. OTHER PILOT

A. LAST NAME, INITIALS	B. COMPONENT	C. POSITION IN AIRCRAFT AT TIME OF MISHAP	D. NATIONALITY	E. AGE
		☐ FRONT SEAT ☐ LEFT SEAT ☐ REAR SEAT ☐ RIGHT SEAT ☐ JUMP SEAT		

F. MAJCOM, NAF, DIV, WG, SQ ASSIGNED	G. MAJCOM, NAF, DIV, WG, SQ ATTACHED FOR FLYING

10. CLEARANCE

FROM NELLIS AIR FORCE BASE, NEVADA TO NELLIS AIR FORCE BASE, NEVADA

☐ VFR X IFR X LOCAL ☐ PT TO PT ☐ DIRECT ☐ AIRWAYS ☐ NO CLEARANCE ☐ NA

11. DURATION OF FLIGHT		12. TYPE OF MISSION	13. ALTITUDE/ELEVATION
HOURS	TENTHS		
0	3	5-5 AERIAL DEMONSTRATION TRAINING	3123 FEET

14. PHASE OF OPERATION	15. TYPE OF MISHAP
ACROBATICS	COLLISION WITH GROUND

16. METEOROLOGICAL CONDITIONS ☒ VMC ☐ SIMULATED IMC ☐ TRANSITION ☐ IMC ☐ ON TOP ☐ VFR IN IMC CONDITIONS

17. AIRFIELD DATA APPLICABLE TO TAKEOFF AND LANDING MISHAPS OCCURRING WITHIN 2 MILES OF AIRFIELD

A. FIELD ELEVATION *(Feet)*	B. COMPOSITION OF RUNWAY			
	☐ ASPHALT ☐ CONCRETE ☐ OTHER *(Specify)*			
C. LENGTH OF RUNWAY *(Feet)*	D. RUNWAY HEADING	E. DISTANCE OF TOUCHDOWN FROM RUNWAY *(Feet)*	F. SURFACE CONDITION ☐ DRY ☐ WET	OTHER *(Specify)*

G. LENGTH OF OVERRUN	H. COMPOSITION OF OVERRUN *(Specify)*	I. BARRIER		
		TYPE	USED ☐ YES ☐ NO	LOCATION

J. CONDITIONS AFFECTING OCCURENCE *(For example, type of instrument or lighting approach used, obstructions, barrier, airspeed, gross weight, forced landing)*

[1] *If more than four pilots are involved (Flight Crew) report same information required on additional sheet for each.*

AF FORM SEP 79 711b PREVIOUS EDITION IS OBSOLETE.

When filled in)

filled in)

AIRCRAFT MAINTENANCE AND MATERIEL REPORT

1. AIRCRAFT SERIAL NUMBER	2. MISSION DESIGN AND SERIES (MDS)
68-8156	T-38A-NO-75

3. HISTORICAL DATA

AIRCRAFT		DEFICIENT PART COMPONENT OR ACCESSORY							
AIR FORCE ACCEPTANCE DATE	19 Jun 69	NOUN	N/A						
TOTAL FLIGHT HOURS	4980.8	PART NUMBER							
LAST OVERHAUL DATE	N/A	T.O. REFERENCE							
OVERHAULING ACTIVITY (Name & Loc)	N/A	FIGURE							
HOURS SINCE OVERHAUL	N/A	INDEX							
HOURS SINCE LAST SCHEDULED INSP.	146.9	WORK UNIT CODE							
DATE OF LAST SCHEDULED INSPECTION	20 Aug 81	TDR REQUESTED		YES		NO		YES		NO
TYPE OF LAST SCHEDULED INSPECTION	16 PR	MDR SUBMITTED		YES		NO		YES		NO
DATE ASGNED PRESENT ORGN.	28 Feb 74	MDR NUMBER							
ORGN. TRANSFERRED FROM	3575 PTW	MIP NUMBER							

Vance AFB, OK

ENGINE
(Complete a Column for each Engine)

INSTALLED POSITION	#1	#2		
ENGINE MODEL AND SERIES	J85-GE-5H	J85-GE-5H		
ENGINE SERIAL NUMBER	GE 232-807	GE 231-869		
TOTAL ENGINE HOURS	3431.2	5355.9		
NUMBER OF MAJOR OVERHAULS	1	2		
HRS SINCE LAST MAJOR OVERHAUL	1506.2	1669.5		
DATE OF LAST OVERHAUL	13 Jun 74	24 May 74		
OVERHAUL ACTIVITY	Teledyne Neosho	Teledyne Neosho		
DATE LAST INSTALLED	5 Mar 81	15 Dec 81		
HOURS SINCE LAST INSTALLED	272.3	21.6		
DATE OF LAST SCHEDULED INSPECTION	4 Mar 81	10 Jul 81		
TYPE OF LAST SCHEDULED INSPECTION	HPO	PE		
FUEL (Type & Octane Rating)	JP-4	JP-4		
TDR REQUESTED	On Site	On Site		

4. N/A — SOAP SAMPLES
(Engine, CSD, Gearbox or APU failure of which occurred or was suspected)

ITEM AND SERIAL NUMBER

HOURS SINCE O/H	HOURS SINCE OIL CHANGE	FE	CR	AG	AL	CU	SN	MG	TI			HOURS SINCE O/H	HOURS SINCE OIL CHANGE	FE	CR	AG	AL	CU	SN	MG	TI		

5. DAMAGED AIRCRAFT
(Furnish complete damage information under Tab "L". See AF Form 711h)

DAMAGE TO AIRCRAFT	MANHOURS TO REPAIR	COST (ESTIMATE)
[XX] DESTROYED OR DAMAGED BEYOND ECONOMICAL REPAIR [ ] SUBSTANTIAL [ ] MINOR [ ] LESS THAN MINOR OR NONE	N/A	$1,307,002 ~~N/A~~

6. N/A — FIRE DATA
(To be completed when fire or chemical explosion occurs, not resulting from ground impact. Indicate: P - Probable or K - Known, in squares) (see Item M)

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		BLEED AIR SYSTEM		PNEUMATIC SYSTEM		OTHER (Specify)		ELECTRICAL INSULATION		LUBRICATING OIL	
HYDRAULIC SYSTEM		OTHER (Specify)		PROPULSION SYSTEM				EXPLOSIVES		OTHER (Specify)	
PNEUMATIC SYSTEM		UNKOWN		BLEED AIR		UNKNOWN		FUEL		UNKNOWN	

7. LOCATION OF INITIAL FIRE

	KNOWN	PROBABLE		KNOWN	PROBABLE		KNOWN	PROBABLE
BAGGAGE COMPARTMENT			AFT OF FIREWALL			WHEEL WELL		
BOMB BAY			FORWARD OF FIREWALL			CARGO-PASSENGER COMPARTMT.		
COCKPIT OR CREW QUARTERS			ROCKET POD			OTHER (Specify)		
ENGINE SECTION			TIRE, WHEEL OR BRAKE			UNKNOWN [ ]		

8. MISCELLANEOUS CHEMICAL EXPLOSION DATA

	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 & BEFORE GRD IMPACT.			OTHER SIGNIFICANT DATA (Specify)		
EXPLOSION OCCURRED SUBSEQUENT TO GROUND IMPACT.			UNKNOWN OR NOT AVAILABLE		

filled in)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—623-319/599 3-1

(filled in)

AIRCRAFT MAINTENANCE AND MATERIEL REPORT

1. AIRCRAFT SERIAL NUMBER	2. MISSION DESIGN AND SERIES (MDS)
68-8184	T-38A-NO-75

3. HISTORICAL DATA

AIRCRAFT		DEFICIENT PART COMPONENT OR ACCESSORY							
AIR FORCE ACCEPTANCE DATE	17 Sep 69	NOUN	N/A						
TOTAL FLIGHT HOURS	4927.8	PART NUMBER							
LAST OVERHAUL DATE	N/A	T.O. REFERENCE							
OVERHAULING ACTIVITY (Name & Loc)	N/A	FIGURE							
HOURS SINCE OVERHAUL	N/A	INDEX							
HOURS SINCE LAST SCHEDULED INSP.	119.8	WORK UNIT CODE							
DATE OF LAST SCHEDULED INSPECTION	5 Jul 81	TDR REQUESTED		YES		NO		YES		NO
TYPE OF LAST SCHEDULED INSPECTION	16 PE	MDR SUBMITTED		YES		NO		YES		NO
DATE ASGNED PRESENT ORGN.	14 Mar 74	MDR NUMBER							
ORGN. TRANSFERRED FROM	14th FTW	MIP NUMBER							
	Columbus AFB, MS								

ENGINE (Complete a Column for each Engine)

INSTALLED POSITION	#1	#2		
ENGINE MODEL AND SERIES	J85-GE-5H	J85-GE-5H		
ENGINE SERIAL NUMBER	GE 231-874	GE 232-218		
TOTAL ENGINE HOURS	5897.8	5418.6		
NUMBER OF MAJOR OVERHAULS	3	2		
HRS SINCE LAST MAJOR OVERHAUL	826.2	752.8		
DATE OF LAST OVERHAUL	10 Jun 77	13 Jan 77		
OVERHAUL ACTIVITY	Teledyne Neosho	Teledyne Neosho		
DATE LAST INSTALLED	20 Nov 81	20 Nov 81		
HOURS SINCE LAST INSTALLED	23.9	23.9		
DATE OF LAST SCHEDULED INSPECTION	28 Sep 81	5 Nov 81		
TYPE OF LAST SCHEDULED INSPECTION	PE	PE		
FUEL (Type & Octane Rating)	JP-4	JP-4		
TDR REQUESTED	On Site	On Site		

4. N/A — SOAP SAMPLES (Engine, CSD, Gearbox or APU failure of which occurred or was suspected)

ITEM AND SERIAL NUMBER

HOURS SINCE O/H	HOURS SINCE OIL CHANGE	FE	CR	AG	AL	CU	SN	MG	TI			HOURS SINCE O/H	HOURS SINCE OIL CHANGE	FE	CR	AG	AL	CU	SN	MG	TI		

5. N/A — DAMAGED AIRCRAFT (Furnish complete damage information under Tab "L". See AF Form 711h)

DAMAGE TO AIRCRAFT	MANHOURS TO REPAIR	COST (ESTIMATE)
[XX] DESTROYED OR DAMAGED BEYOND ECONOMICAL REPAIR [ ] SUBSTANTIAL [ ] MINOR [ ] LESS THAN MINOR OR NONE	N/A	$1,397,002

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

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		BLEED AIR SYSTEM		PNEUMATIC SYSTEM		OTHER (Specify)		ELECTRICAL INSULATION		LUBRICATING OIL	
HYDRAULIC SYSTEM		OTHER (Specify)		PROPULSION SYSTEM				EXPLOSIVES		OTHER (Specify)	
PNEUMATIC SYSTEM		UNKOWN		BLEED AIR		UNKNOWN		FUEL		UNKNOWN	

7. LOCATION OF INITIAL FIRE

	KNOWN	PROBABLE		KNOWN	PROBABLE		KNOWN	PROBABLE
BAGGAGE COMPARTMENT			AFT OF FIREWALL			WHEEL WELL		
BOMB BAY			FORWARD OF FIREWALL			CARGO-PASSENGER COMPARTMT.		
COCKPIT OR CREW QUARTERS			ROCKET POD			OTHER (Specify)		
ENGINE SECTION			TIRE, WHEEL OR BRAKE			UNKNOWN [ ]		

8. MISCELLANEOUS CHEMICAL EXPLOSION DATA

	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 & BEFORE GRD IMPACT.			OTHER SIGNIFICANT DATA (Specify)		
EXPLOSION OCCURRED SUBSEQUENT TO GROUND IMPACT.			UNKNOWN OR NOT AVAILABLE		

(filled in)

(filled in)

AIRCRAFT MAINTENANCE AND MATERIEL REPORT

1. AIRCRAFT SERIAL NUMBER	2. MISSION DESIGN AND SERIES (MDS)
68-8176	T-38A-NO-75

3. HISTORICAL DATA

AIRCRAFT		DEFICIENT PART COMPONENT OR ACCESSORY							
AIR FORCE ACCEPTANCE DATE	18 Aug 69	NOUN	N/A						
TOTAL FLIGHT HOURS	5078.9	PART NUMBER							
LAST OVERHAUL DATE	N/A	T.O. REFERENCE							
OVERHAULING ACTIVITY (Name & Loc)	N/A	FIGURE							
HOURS SINCE OVERHAUL	N/A	INDEX							
HOURS SINCE LAST SCHEDULED INSP.	15.5	WORK UNIT CODE							
DATE OF LAST SCHEDULED INSPECTION	17 Dec 81	TDR REQUESTED		YES		NO		YES		NO
TYPE OF LAST SCHEDULED INSPECTION	17 PE	MDR SUBMITTED		YES		NO		YES		NO
DATE ASGNED PRESENT ORGN.	25 Feb 74	MDR NUMBER							
ORGN. TRANSFERRED FROM	64th FTW Reese AFB, TX	MIP NUMBER							

ENGINE
(Complete a Column for each Engine)

INSTALLED POSITION	#1	#2		
ENGINE MODEL AND SERIES	J85-GE-5L	J85-GE-5H		
ENGINE SERIAL NUMBER	GE 230-895	GE 231-862		
TOTAL ENGINE HOURS	5888.8	5915.9		
NUMBER OF MAJOR OVERHAULS	2	3		
HRS SINCE LAST MAJOR OVERHAUL	2379.8	1823.9		
DATE OF LAST OVERHAUL	29 May 71	5 May 74		
OVERHAUL ACTIVITY	Geaso/Strother	Teledyne Neosho		
DATE LAST INSTALLED	17 Dec 81	28 Dec 81		
HOURS SINCE LAST INSTALLED	16.2	15.5		
DATE OF LAST SCHEDULED INSPECTION	24 Jul 81	18 Sep 80		
TYPE OF LAST SCHEDULED INSPECTION	PE	PE		
FUEL (Type & Octane Rating)	JP-4	JP-4		
TDR REQUESTED	On Site	On Site		

4. N/A — SOAP SAMPLES
(Engine, CSD, Gearbox or APU failure of which occurred or was suspected)

ITEM AND SERIAL NUMBER

HOURS SINCE O/H	HOURS SINCE OIL CHANGE	FE	CR	AG	AL	CU	SN	MG	TI			HOURS SINCE O/H	HOURS SINCE OIL CHANGE	FE	CR	AG	AL	CU	SN	MG	TI		

5. N/A — DAMAGED AIRCRAFT
(Furnish complete damage information under Tab "L". See AF Form 711h)

DAMAGE TO AIRCRAFT	MANHOURS TO REPAIR	COST (ESTIMATE)
[XX] DESTROYED OR DAMAGED BEYOND ECONOMICAL REPAIR [ ] SUBSTANTIAL [ ] MINOR [ ] LESS THAN MINOR OR NONE	N/A	$1,307,002 ~~N/A~~

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

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		BLEED AIR SYSTEM		PNEUMATIC SYSTEM		OTHER (Specify)		ELECTRICAL INSULATION		LUBRICATING OIL	
HYDRAULIC SYSTEM		OTHER (Specify)		PROPULSION SYSTEM				EXPLOSIVES		OTHER (Specify)	
PNEUMATIC SYSTEM		UNKOWN		BLEED AIR		UNKNOWN		FUEL		UNKNOWN	

7. LOCATION OF INITIAL FIRE

	KNOWN	PROBABLE		KNOWN	PROBABLE		KNOWN	PROBABLE
BAGGAGE COMPARTMENT			AFT OF FIREWALL			WHEEL WELL		
BOMB BAY			FORWARD OF FIREWALL			CARGO-PASSENGER COMPARTMT.		
COCKPIT OR CREW QUARTERS			ROCKET POD			OTHER (Specify)		
ENGINE SECTION			TIRE, WHEEL OR BRAKE			UNKNOWN [ ]		

8. MISCELLANEOUS CHEMICAL EXPLOSION DATA

	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 & BEFORE GRD IMPACT.			OTHER SIGNIFICANT DATA (Specify)		
EXPLOSION OCCURRED SUBSEQUENT TO GROUND IMPACT.			UNKNOWN OR NOT AVAILABLE		

(filled in)

(When filled in)

AIRCRAFT MAINTENANCE AND MATERIEL REPORT

1. AIRCRAFT SERIAL NUMBER	2. MISSION DESIGN AND SERIES (MDS)
68-8175	T-38A-NO-75

3. HISTORICAL DATA

AIRCRAFT		DEFICIENT PART COMPONENT OR ACCESSORY							
AIR FORCE ACCEPTANCE DATE	27 Aug 69	NOUN	N/A						
TOTAL FLIGHT HOURS	5136.5	PART NUMBER							
LAST OVERHAUL DATE	N/A	T.O. REFERENCE							
OVERHAULING ACTIVITY (Name & Loc)	N/A	FIGURE							
HOURS SINCE OVERHAUL	N/A	INDEX							
HOURS SINCE LAST SCHEDULED INSP.	16.3	WORK UNIT CODE							
DATE OF LAST SCHEDULED INSPECTION	16 Dec 81	TDR REQUESTED		YES		NO		YES		NO
TYPE OF LAST SCHEDULED INSPECTION	17 PE	MDR SUBMITTED		YES		NO		YES		NO
DATE ASGNED PRESENT ORGN.	16 Feb 74	MDR NUMBER							
ORGN. TRANSFERRED FROM	38th FTW	MIP NUMBER							

Laredo AFB, TX ENGINE
(Complete a Column for each Engine)

INSTALLED POSITION	#1	#2		
ENGINE MODEL AND SERIES	J85-GE-5A	J85-GE-5H		
ENGINE SERIAL NUMBER	GE 231-606	GE 231-093		
TOTAL ENGINE HOURS	5535.4	6174.0		
NUMBER OF MAJOR OVERHAULS	2	2		
HRS SINCE LAST MAJOR OVERHAUL	1553.4	1211.1		
DATE OF LAST OVERHAUL	16 May 74	21 Jun 74		
OVERHAUL ACTIVITY	Teledyne Neosho	Teledyne Neosho		
DATE LAST INSTALLED	15 Oct 81	4 Dec 81		
HOURS SINCE LAST INSTALLED	69.4	25.3		
DATE OF LAST SCHEDULED INSPECTION	23 Jun 80	26 Jul 81		
TYPE OF LAST SCHEDULED INSPECTION	HPO	HPO		
FUEL (Type & Octane Rating)	JP-4	JP-4		
TDR REQUESTED	On Site	On Site		

4. N/A — SOAP SAMPLES
(Engine, CSD, Gearbox or APU failure of which occurred or was suspected)

ITEM AND SERIAL NUMBER	HOURS SINCE O/H	HOURS SINCE OIL CHANGE	FE	CR	AG	AL	CU	SN	MG	TI			ITEM AND SERIAL NUMBER	HOURS SINCE O/H	HOURS SINCE OIL CHANGE	FE	CR	AG	AL	CU	SN	MG	TI		

5. N/A — DAMAGED AIRCRAFT
(Furnish complete damage information under Tab "L". See AF Form 711h)

DAMAGE TO AIRCRAFT	MANHOURS TO REPAIR	COST (ESTIMATE)
[XX] DESTROYED OR DAMAGED BEYOND ECONOMICAL REPAIR [ ] SUBSTANTIAL [ ] MINOR [ ] LESS THAN MINOR OR NONE	N/A	$1,307,002

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

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		BLEED AIR SYSTEM		PNEUMATIC SYSTEM		OTHER (Specify)		ELECTRICAL INSULATION		LUBRICATING OIL	
HYDRAULIC SYSTEM		OTHER (Specify)		PROPULSION SYSTEM				EXPLOSIVES		OTHER (Specify)	
PNEUMATIC SYSTEM		UNKOWN		BLEED AIR		UNKNOWN		FUEL		UNKNOWN	

7. LOCATION OF INITIAL FIRE

	KNOWN	PROBABLE		KNOWN	PROBABLE		KNOWN	PROBABLE
BAGGAGE COMPARTMENT			AFT OF FIREWALL			WHEEL WELL		
BOMB BAY			FORWARD OF FIREWALL			CARGO-PASSENGER COMPARTMT.		
COCKPIT OR CREW QUARTERS			ROCKET POD			OTHER (Specify)		
ENGINE SECTION			TIRE, WHEEL OR BRAKE			UNKNOWN [ ]		

8. MISCELLANEOUS CHEMICAL EXPLOSION DATA

	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 & BEFORE GRD IMPACT.			OTHER SIGNIFICANT DATA (Specify)		
EXPLOSION OCCURRED SUBSEQUENT TO GROUND IMPACT.			UNKNOWN OR NOT AVAILABLE		

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—623-319/599 3-1

PERSONAL DATA-PRIVACY ACT OF 1974

PREPARED 82 JAN 23 — FNDS MASTER RECORDS LIST(PA) — AS OF 82 JAN 22 — PCN N352007

LOWRY NORMAN L III — MAJ — SSAN: — PILOT — BIRTH-DATE: [redacted] — BASE NAME: NELLIS AFB NV

```
****** MDSH DECISION DATA *****
 ST=FET:
 CITY/STATE:      USAF ADS
 ZIP-CODE:                4115
 CMD-OF-ASGN:                OT=TAC
 FLY-ORGN:                   0057
 SQDN-ID: B              CREW-ID: 1
 MDSH-INSTALLATION-CODE:  RKMF
 NONRATED-DUTY-CONTROL:
 SPECIAL-CATEGORY-ID:        NONE
-----INST/QUAL/SIMU-CHK DATA-----
 INSTRUMENT-RATING:          1=YES
 INST CURR/DUE:   111111/
 QUAL CURR/DUE:   111111/
 SIMU CURR/DUE:   111111/
 POI-INDEX/DATE:      C1Y/811231
** AERO MEDICAL DECISION DATA **
 PHYSICAL-STAT/LAST:  A/810108
 PHYS-AVAIL-CODE/DATE: A/810108
 PHYSIOL-TNG-DATE:        810714
*** AIRCRAFT ASSIGNMENT DATA ***
 ACFT-ASSIGNMENT-CODE:       2A
 ACFT-INSTALLATION-CODE:  RKMF
 ACFT-SERVICE-CATEGORY:      A
 CMD-OF-ACFT:                OT=TAC
 DT-PRI-ACFT-1ST-FLOWN:   810707

**** AVIATION ASSIGNMENT DATA *****
 OFFICER SERV DATE:          670328
 AVIATION SERV DATE:         670504
 RPT/PPI-DATE:          6/
 DUTY AFSC:                  A011157
 FAC-CODE:                      3
--CURR-ASC:  2A          DATE: 790504
--PRIOR-ASC:  1A         DATE: 740601
 AERO-DELFM-TERM-DATE:       850503
 MED-SERVICE-CATEGORY:          A
 CATEGORICAL-FLYING-WAIVER:
 DATE-DEPARTED-LST-DTY-STN:  780503
 DATE-ARR-STA:               760530
 EFF-DATE-OF-DUTY:           810908
 PAS:                   NJOTFD07
 RCD-STAT:                      10
 SHORT-TOUR-INDCTR:
 PROJ-DEPART-DATE:
 PROJ-PAS:
 PROJ-DAFSC:
 PROJ-DUTY-LOCATION:
 PROJ-ARR-DATE:
 DATE OF SEPARATION:         888888
--AERO RATING                RTG-DATE-ORIG--
    CURR:        SR PLT      680504
    ADDL:          NONE

***** 60-1 ACCOMPLISHMENTS **A/A**
* 1ST LINE = 1ST HALF TY TOTALS *
* 2ND LINE = 2ND HALF TY TOTALS *
* PRO-RATA CREDITS NOT INCLUDED *
--------- FP AND TP HRS ----------
TOTAL DAY-INST NITE-INST NITE-VFR
 102.4     7.5      0.0      0.0
  17.9     0.3      0.0      0.0
---------- COPILOT HRS ----------
TOTAL DAY-INST NITE-INST NITE-VFR
   1.7     0.0      0.0      0.0
   0.0     0.0      0.0      0.0
APPROACHES-PENETRATIONS-LANDINGS
PREC NONPREC  SIM  WEA  TOT  NITE
  20     16     5    4  134     0
   2      0     1    0   19     0
-- NAV/OBS/FS          HRS     EVENTS
 DAY-HRS      NITE-HRS    NAV-LEGS
     0.0           0.0           0
     0.0           0.0           0
-------- PRO RATA CODES ---------
 PILOT          NAV/OBS/FS
 1ST:  2ND:     1ST:  2ND:
 60-1 REQUIREMENTS:    EXCUSED
 PCDS-PVN-REF-MO/DATE:  /811112
 LOCAL-USE:                730607

***** FLIGHT-PAY-HOURS *****
---AUG-------SEP-------OCT-
   4.0        13.8       27.0
---NOV-------DEC-------JAN-
  30.4        14.4       17.9
***** FLIGHT-PAY-MPO *******
CREW: YES**PAY-EXCUSAL: YES
 MPO-REASON/DATE:  P/750101
 PAY-STOP-DATE:      920327

******** ACIA-DATA ********
 PRE-ACIA-OFDA:              085
 OFDA-CONTROL-MONTH:
 OFDA-TO-DATE:               177
    OFDA-GATE-12:            144
    OFDA-GATE-18:
 OFDA-CONTROL-DAY:

 DATE-LAST-OFDA-FLT   820116
 DATE-PREV-OFDA-FLT   820115

***** PCS-ACIA-CONTROL ****
 OPS-FLY-PCS-CONTROL:
```

* AUTHORIZED AIRCRAFT *

ACFT NR	M/D/S	SEQ NR	TYPE DUTY	SIMLR IND	JET/RCP IND	NON-STD CODE	DATE-LAST LNDG/FLT	** TOTAL HOURS	INSTR HOURS	FP/NAV/ OBS	CP/EWO HOURS	EP/WSO HOURS	NAV/BMB HOURS
PRI	T03A	0	1=PLT		1=JET		820116	114.7	0.0	113.0	1.7	0.0	0.0
2ND	MISSION	2	1=PLT		1=JET	Z=NONSTD		2919.6	536.2	2383.1	0.3	0.0	0.0

* CAREER TOTAL HOURS *

PILOT	1ST-PLT	I/PLT	CO-PLT	CMD-PLT	EVAL-PLT	OTHER	TOTAL-PF	STUD	CIV	OTH-US-MIL	FGN-MIL	TOTAL
TO-DATE:	2549.6	536.2	4.6	0.0	0.0	0.0	3090.6	235.9	0.0	0.0	0.0	3326.5

NONRATED	TOTAL
TO-DATE:	0.0

COMBAT FLYING HOURS

	PILOT	NAV/OB/FS	NON-RATED
COMBAT:	531.5	0.0	0.0
COMBAT SUPPORT:	0.0	0.0	0.0

GRAND TOTAL 3,326.5

NBP8R01 R0349

PERSONAL DATA-PRIVACY ACT OF 1974

PREPARED 82 JAN 23 — FMDS MASTER RECORDS LIST(PA) — AS OF 82 JAN 22 — PCN N352007

MAYS WILLIAM T — CPT — SSAN: — PILOT — BIRTH-DATE: [redacted] — BASE NAME: NELLIS AFB NV

****** HOSP DECISION DATA ******
STREET:
CITY/STATE: USAF-ADS
ZIP-CODE: 4115
END-OF-DAY: OT=TAC
FLY-URGNT: 0057
SQDN-ID: B CREW-ID:
HOSP-INSTALLATION-CODE: RKMF
NONRATED-DUTY-CONTROL:
SPECIAL-CATEGORY-ID: NONE
----INST/DUAL/SIMU-CHK DATA----
INSTRUMENT-RATING: 1=YES
INST CURR/DUE: 111111/
QUAL CURR/DUE: 111111/
SIMU CURR/DUE: 111111/
POI-INDEX/DATE: CIY/810101
-- AERO MEDICAL DECISION DATA --
PHYSICAL-STAT/LAST: A/810402
PHYS-AVAIL-CODE/DATE: A/811127
PHYSIOL-TRG-DATE: 810327
--- AIRCRAFT ASSIGNMENT DATA ---
ACFT-ASSIGNMENT-CODE: ZA
ACFT-INSTALLATION-CODE: RKMF
ACFT-SERVICE-CATEGORY: A
CMD-OF-ACFT: OT=TAC
DT-PRI-ACFT-1ST-FLOWN: 801208

**** AVIATION ASSIGNMENT DATA *****
OFFICER SERV DATE: 711218
AVIATION SERV DATE: 720403
RPT/PPI-DATE: 1/
DUTY AFSC: 011157
FAC-CODE: I
--CURR-ASC: 1A DATE: 740601
--PROJ-ASC: DATE:
AERO-RATED-TERM-DATE: 840402
USR-SERVICE-CATEGORY: A
CATEGORICAL-FLYING-WAIVER:
DATE-DEPARTED-LST-DTY-STN: 801021
DATE-ANX-STA: 801022
EFF-DATE-OF-DUTY: 801024
P&S: NJOTF007
RCD-STAT: 10
SHORT-TOUR-INDCTR:
PROJ-DEPART-DATE:
PROJ-MPSC:
PROJ-DPSC:
PROJ-DUTY-LOCATION:
PROJ-ARR-DATE:
DATE OF SEPARATION: 868888
--AERO RATING
CURR: SR PLT RTG-DATE: 730228 ORIG--
ADD: NONE

***** 60-1 ACCOMPLISHMENTS *****
* 1ST LINE = 1ST HALF TY TOTALS *
* 2ND LINE = 2ND HALF TY TOTALS *
* PRO-RATA CREDITS NOT INCLUDED *
---------- FP AND IP HRS ----------
TOTAL DAY-INST NITE-INST NITE-VFR
123.6 7.7 0.0 0.0
14.5 0.0 0.0 0.0
---------- COPILOT HRS ----------
TOTAL DAY-INST NITE-INST NITE-VFR
9.7 0.0 0.0 0.0
0.0 0.0 0.0 0.0
APPROACHES-PENETRATIONS-LANDINGS
PREC NONPREC SIM WEA TOT NITE
12 12 0 6 104 0
0 0 0 0 16 0
-- NAV/OBS/FS HRS -- EVENTS
DAY-HRS NITE-HRS NAV-LEGS
0.0 0.0 0
0.0 0.0 0
---------- PRO RATA CODES ----------
PILOT NAV/OBS/FS
1ST: 2ND: 1ST: 2ND:
ANVI REQUIREMENTS: PILOT
RCDS-RVW-REF-MO/DATE: /810804
LOCAL-USE:

**** FLIGHT-PAY-HOURS *****
---AUG---SEP---OCT-
31.9 10.5 22.8
---NOV---DEC---JAN-
20.4 10.3 14.5
***** FLIGHT-PAY-MPO *****
CREW: YES**PAY-EXCUSAL: YES
MPO-REASON/DATE: P/750101
PAY-STOP-DATE: 940217

******** ACIA-DATA ********
PRE-ACIA-OFDA: 026
OFDA-CONTROL-MONTH:
OFDA-TO-DATE: 310
OFDA-GATE-12:
OFDA-GATE-18:
OFDA-CONTROL-DAY:
DATE-LAST-OFDA-FLT 820110
DATE-PREV-OFDA-FLT 820105

***** PCS-ACIA-CONTROL ****
OPS-FLY-PCS-CONTROL:

* AUTHORIZED AIRCRAFT *

ACFT IN	M/D/S	SFD	TYPE DUTY	SIMLR IND	JET/RCP IND	NON-STD CODE	DATE-LAST LNDG/FLT	** TOTAL HOURS	INSTR HOURS	FP/NAV/ OBS	CP/EWO HOURS	EP/WSO HOURS	NAV/BMB HOURS
PRI	T038A	0	1=PLT		1=JET		820116	287.4	0.0	273.8	13.6	0.0	0.0
2ND	MISSION	2	1=PLT		1=JET	Z=NONSTD		1485.0	630.6	854.4	0.0	0.0	0.0
3TH	F37AT51	6	1=PLT		1=JET	6=SIMUL							

* CAREER TOTAL HOURS *

PILOT	1ST-PLT	I/PLT	CO-PLT	CRU-PLT	EVAL-PLT	OTHER	TOTAL-AF	STUD	CIV	OTH-US-MIL	FGN-MIL	TOTAL
TO-DATE:	1128.2	630.6	13.6	0.0	0.0	1.4	1773.8	201.9	0.0	0.0	0.0	1975.7

NONRATED	TOTAL
TO-DATE:	0.0

COMBAT FLYING HOURS

	PILOT	NAV/OBS/FS	NON-RATED
COMBAT:	0.0	0.0	0.0
COMBAT SUPPORT:	0.0	0.0	0.0

GRAND TOTAL 1975.7

G-2

PERSONAL DATA-PRIVACY ACT OF 1974

PREPARED 82 JAN 23 — FIDS MASTER RECORDS LIST(MA) — AS OF 82 JAN 22 — PCN N352007

PETERSON JOSEPH N III — CPT — SSAN: — PILOT — BIRTH-DATE: [redacted] — BASE NAME: NELLIS AFB, NV.

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****** HOSP DECISION DATA ******
 STREET:
 CITY/STATE:     USAF ADS
 ZIP-CODE:              4115
 CND-OF-ACFT:          CT=TAC
 FLY-OPSN:              0057
 SQDN-ID:  B      CREW-ID:
 HOSP-INSTALLATION-CODE:   RKMF
 NONRATED-DUTY-CONTROL:
 SPECIAL-CATEGORY-ID:       NONE
-----INST/QUAL/SIMU-CHK DATA-----
 INSTRUMENT-RATING:         1=YES
 INST CURR/DUE:    111111/
 QUAL CURR/DUE:    111111/
 SIMU CURR/DUE:    111111/
 PCI-INDEX/DATE:        C1Y/800101
-- AFRO MEDICAL DECISION DATA --
 PHYSICAL-STAT/LAST:    A/810930
 PHYS-AVAIL-CODE/DATE:  A/810930
 PHYSIOL-TNG-DATE:          800425
--- AIRCRAFT ASSIGNMENT DATA --
 ACFT-ASSIGNMENT-CODE:          ZA
 ACFT-INSTALLATION-CODE:   RKMF
 ACFT-SERVICE-CATEGORY:         A
 CND-OF-ACFT:          CT=TAC
 DT-PRI-ACFT-1ST-FLOWN:  721206

**** AVIATION ASSIGNMENT DATA *****
 OFFICER-SERV-DATE:             710627
 AVIATION-SERV-DATE:            711206
 RPI/RPI-DATE                      1/
 DUTY-AFSC:                     011152
 FAC-CODE:                          1
--COMB-ASC:  1A          DATE: 740601
--FSIM-ASC:              DATE:
 AFRC-DROPP-TER**-DATE:         831205
 HHH-SERVICE-CATEGORY:              A
 CATEGORICAL-FLYING-WAIVER:
 DATE-DEPARTED-LST-DTY-STN:     791010
 DATE-ARR-STA:                  791018
 EFF-DATE-OF-DUTY:              810101
 PAS:                           NJ0FD07
 RCD-ST&T:                          10
 SHORT-TOUR-INDCTR:
 PROJ-DEPART-DATE:
 PROJ-RPS:
 PROJ-DAFSC:
 PROJ-DUTY-LOCATION:
 PROJ-ARR-DATE:
 DATE OF SEPARATION:            888888
--AFRO RATING          RTG-DATE-ORIG--
   CURR:        SR PLT         721027
   ADDL:          NONE

***** 60-1 ACCOMPLISHMENTS *****
* 1ST LINE = 1ST HALF TY TOTALS *
* 2ND LINE = 2ND HALF TY TOTALS *
* PRO-RATA CREDITS NOT INCLUDED *
--------- FP AND IP HRS ---------
TOTAL DAY-INST NITE-INST NITE-VFR
178.1    9.9      0.0      0.0
 15.8    0.0      0.0      0.0
---------- COPILOT HRS ----------
TOTAL DAY-INST NITE-INST NITE-VFR
  4.1    0.0      0.0      0.0
  0.0    0.0      0.0      0.0
APPROACHES-PENETRATIONS-LANDINGS
PREC NONPREC  SIM  HEA  TOT  NITE
  20      14    4    6  166     0
   0       0    0    0   15     0
-- NAV/OBS/FS      HRS      EVENTS
DAY-HRS       NITE-HRS    NAV-LEGS
    0.0           0.0           0
    0.0           0.0           0
-------- PRO RATA CODES ---------
PILOT          NAV/OBS/FS
1ST:    2ND:    1ST:    2ND:
60-1 REQUIREMENTS:      EXCUSED
RCDS-RVW-REF-MO/DATE:    /810916
LOCAL-USE:          791019

**** FLIGHT-PAY-HOURS ******
---AUG-------SEP-------OCT-
  47.1      28.3      29.3
---NOV-------DEC-------JAN-
  28.2       9.0      15.8
***** FLIGHT-PAY-MPO ******
CREW: YES**PAY-EXCUSAL: YES
 MPO-REASON/DATE:  P/7=0101
 PAY-STOP-DATE:      960826

******** ACIA-DATA ********
 PRE-ACIA-OFDA:             030
 OFDA-CONTROL-MONTH:
 OFDA-TO-DATE:              122
   OFDA-GATE-12:
   OFDA-GATE-18:
 OFDA-CONTROL-DAY:

 DATE-LAST-OFDA-FLT  820116
 DATE-PREV-OFDA-FLT  820115

***** PCS-ACIA-CONTROL ****
 OPS-FLY-PCS-CONTROL:
```

* AUTHORIZED AIRCRAFT *

ACFT SP	M/D/S	SEQ NR	TYPE DUTY	SIMLR IND	JET/RCP IND	NON-STD CODE	DATE-LAST LNDG/FLT
PRI	1038A	0	1=PLT		1=JET		820116
2ND MISSION		2	1=PLT		1=JET	Z=NONSTD	
9TH F37A151		9	1=PLT		1=JET	C=SIMUL	

**	TOTAL HOURS	INSTR HOURS	FP/NAV/ OBS	CP/ENG HOURS	EP/WSO HOURS	NAV/BMB HOURS
**	2696.4	1608.3	1045.1	43.0	0.0	0.0
	306.6	35.2	271.4	0.0	0.0	0.0

* CAREER TOTAL HOURS *

	1ST-PLT	I/PLT	CO-PLT	CMD-PLT	EVAL-PLT	OTHER	TOTAL-AF	STUD	CIV	OTH-US-MIL	FGN-MIL	TOTAL
PILOT TO-DATE:	1316.5	1643.5	43.0	0.0	0.0	0.6	3003.6	202.1	0.0	0.0	0.0	3205.7

NONRATED	TOTAL
TO-DATE:	0.0

COMBAT FLYING HOURS	PILOT	NAV/OBS/FS	NON-RATED
COMBAT:	0.0	0.0	0.0
COMBAT SUPPORT:	0.0	0.0	0.0

GRAND TOTAL 3,205.7

NBPEBU: 80343

PERSONAL DATA-PRIVACY ACT OF 1974

PREPARED 82 JAN 23 — FMDS MASTER RECORDS LIST(PA) — AS OF 82 JAN 22 — PCN N352007

MELANCON MARK E — OPT — SSA: — PILOT BIRTH-DATE: [redacted] — BASE NAME: NELLIS AFB, NV.

****** HUSM DECISION DATA *****
STREET:
CITY/STATE: USAF/ADS
ZIP-CODE: 4115
CMD-OF-ASGN: OT=TAC
FLY-SRGN: 0057
SQDN-ID: B CREW-ID:
HOSM-INSTALLATION-CODE: RKNF
NONRATED-DUTY-CONTROL:
SPECIAL-CATEGORY-ID: NONE
---INST/QUAL/SIMU-CHK DATA----
INSTRUMENT-RATING: 1=YES
INST CURR/DUE: 111111/
QUAL CURR/DUE: 811023/820630
SIMU CURR/DUE: 111111/
POI-INDEX/DATE: CIY/811231
** AERO MEDICAL DECISION DATA **
PHYSICAL-STAT/LAST: A/811102
PHYS-AVAIL-CODE/DATE: A/811102
PHYSIOL-TNG-DATE: 810312
--- AIRCRAFT ASSIGNMENT DATA --
ACFT-ASSIGNMENT-CODE: Z4
ACFT-INSTALLATION-CODE: RKNF
ACFT-SERVICE-CATEGORY: A
CMD-OF-ACFT: OT=TAC
DT-PRI-ACFT-1ST-FLOWN: P11013

**** AVIATION ASSIGNMENT DATA *****
OFFICER SERV DATE: 720611
AVIATION SERV DATE: 720924
RPI/RPT-DATE 1/
DUTY AFSC: 01115Z
FAC-CODE: 1
--CURR-ASC: 1A DATE: 740601
--PRIOR-ASC: DATE:
AERO-ORDER-TERM-DATE: 840923
MER-SERVICE-CATEGORY: A
CATEGORICAL-FLYING-WAIVER:
DATE-DEPARTED-LST-DTY-STN: 810927
DATE-ARR-STA: 811009
FFF-DATE-OF-DUTY: 811009
PAS: NJOTFD07
RCO STAT: 10
SHORT-TOUR-INDCTR:
PROJ-DEPART-DATE:
PROJ-RAS:
PROJ-DAFSC:
PROJ-DUTY-LOCATION:
PROJ-ARR-DATE:
DATE OF SEPARATION: 888888
--AERO RATING RTG-DATE-ORIG--
CURR: SR PLT 730921
ADDL: NONE

***** 60-1 ACCOMPLISHMENTS ******
* 1ST LINE = 1ST HALF TY TOTALS *
* 2ND LINE = 2ND HALF TY TOTALS *
* PRO-RATA CREDITS NOT INCLUDED *
--------- FP AND TP HRS ---------
TOTAL DAY-INST NITE-INST NITE-VFR
90.5 12.6 0.4 0.0
12.7 0.0 0.0 0.0
--------- COPILOT HRS ---------
TOTAL DAY-INST NITE-INST NITE-VFR
3.7 0.0 0.0 0.0
0.0 0.0 0.0 0.0
APPROACHES-PENETRATIONS-LANDINGS
PREC NONPREC SIM HEA TOT NITE
27 18 12 4 125 0
0 0 0 0 14 0
-- NAV/OBS/FS HRS EVENTS
DAY-HRS NITE-HRS NAV-LEGS
0.0 0.0 0
0.0 0.0 0
--------- PRO RATA CODES ---------
PILOT NAV/OBS/FS
1ST: 2ND: 1ST: 2ND:
60-1 REQUIREMENTS: EXCUSED
RCUS-RVW-REF-MO/DATE: /811015
LOCAL-USE: 811015

**** FLIGHT-PAY-HOURS *****
---AUG-------SEP-------OCT-
3.9 7.2 11.4
---NOV-------DEC-------JAN-
27.1 10.7 12.7
***** FLIGHT-PAY-MPD ******
CREW: YES**PAY-EXCUSAL: YES
MPD-REASON/DATE: P/7E0101
PAY-STOP-DATE: 970611

******** ACIA-DATA ********
PRE-ACIA-OFDA: 021
OFDA-CONTROL-MONTH:
OFDA-TO-DATE: 119
OFDA-GATE-12:
OFDA-GATE-18:
OFDA-CONTROL-DAY:
DATE-LAST-OFDA-FLT 820116
DATE-PREV-OFDA-FLT 820115

***** PCS-ACIA-CONTROL ****
OPS-FLY-PCS-CONTROL:

* AUTHORIZED AIRCRAFT *

ACFT MR	M/D/S	SEQ NR	TYPE DUTY	SIMLR IND	JET/RCP I=D	NON-STD CODE	DATE-LAST LNDG/FLT	** TOTAL HOURS	INSTR HOURS	FP/NAV/ OBS	CP/EWO HOURS	EP/WSO HOURS	NAV/BMB HOURS
PRI	T38A	0	1=PLT		1=JET		820116	51.2	0.0	58.2	3.7	0.0	0.0
2ND	MISSION	2	1=PLT		1=JET	Z=NONSTD		1561.7	688.5	873.2	0.0	0.0	0.0
9TH	F37AT51	9	1=PLT		1=JET	6=SIMUL	811023						

* CAREER TOTAL HOURS *

PILOT	1ST-PLT	I/PLT	CO-PLT	CMD-PLT	EVAL-PLT	OTHER	TOTAL-AF	STUD	CIV	OTH-US-MIL	FGN-MIL	TOTAL
TO-DATE:	931.4	699.2	4.6	0.0	0.0	0.0	1635.2	222.8	0.0	0.0	0.0	1858.0

NONRATED	TOTAL
TO-DATE:	0.0

COMBAT FLYING HOURS

	PILOT	NAV/OBS/FS	NON-RATED
COMBAT:	0.0	0.0	0.0
COMBAT SUPPORT:	0.0	0.0	0.0

GRAND TOTAL 1,858.0

G-4

AFTO FORM 781 SERIES

A review of aircraft 781 series records revealed nothing significant regarding mishap aircraft.

[redacted]
DAREL M. RAY, Lt Col, USAF
Board Maintenance Officer

4175

AEROSPACE FUELS LABORATORY TEST REPORT

ITEM TO BE TESTED: JP-4	
TEST LABORATORY AND LOCATION: Aerospace Fuels Laboratory, Mukilteo, WA	SPECIFICATION NUMBER: MIL-T-5624
SAMPLE NUMBER: 82-F-194	DATE SAMPLE RECEIVED: 29 JAN 82
DATE SAMPLE TESTED:	
CONTRACTOR:	CONTRACT NUMBER:
MANUFACTURER:	PURCHASE ORDER NO AND/OR NATIONAL STOCK NUMBER:
SUBMITTED BY: Base Fuels; Nellis AFB, NV	SAMPLE MARKED: Main fuel control Plot 2430; 82-565

TEST RESULTS

IR Scan: Normal JP-4 scan
FSII appears to be within acceptable concentration

GC Scan: Normal JP-3 scan
Normal boiling point range except low-boiling components absent.
No extraneous high-boiling components.

REMARKS

Reference telecon with Chief Dodby on 1 FEB 82.

REVIEWED BY (Signature, date and organization symbol)	APPROVED BY (Signature, date and organization symbol)
	[redacted] CHARLES P. LeSUEUR, Chemist, SFQLD 1 FEB 82

SA-ALC FORM JAN 76 216

AEROSPACE FUELS LABORATORY TEST REPORT

ITEM TO BE TESTED: JP-4

TEST LABORATORY AND LOCATION: Aerospace Fuels Laboratory, Mukilteo, WA

[redacted] NUMBER: MIL-T-5624

SAMPLE NUMBER	DATE SAMPLE RECEIVED	DATE SAMPLE TESTED
82-F-195	29 JAN 82	

CONTRACTOR	CONTRACT NUMBER

MANUFACTURER	PURCHASE ORDER NO AND/OR NATIONAL STOCK NUMBER

SUBMITTED BY	SAMPLE MARKED
Base Fuels, Nellis AFB, NV	Crashed aircraft; Main fuel Control Plot 3765; 82-566

TEST RESULTS

IR SCAN: Normal JP-4 scan
FSII appears to be within acceptable concentration

GC Scan: Normal JP-4 scan
Normal boiling point range except low-boili ng components absent.
No extravious high boiling components.

REMARKS

Reference telecon with Chief Dodby on 1 FEB 82.

REVIEWED BY (Signature, date and organization symbol)	APPROVED BY (Signature, date and organization symbol)
	[redacted] CHARLES P. LeSUEUR, Chemist, SFQLD 1 FEB 82

SA-ALC FORM JAN 76 216

4175

AEROSPACE FUELS LABORATORY TEST REPORT

ITEM TO BE TESTED: JP-4

TEST LABORATORY AND LOCATION: Aerospace Fuels Laboratory, Mukilteo, WA

SPECIFICATION NUMBER: MIL-[redacted]-5624

SAMPLE NUMBER	DATE SAMPLE RECEIVED	DATE SAMPLE TESTED
82-F-196	29 JAN 82	

CONTRACTOR	CONTRACT NUMBER

MANUFACTURER	PURCHASE ORDER NO AND/OR NATIONAL STOCK NUMBER

SUBMITTED BY	SAMPLE MARKED
Base Fuels; Nellis AFB, NV	Crash aircraft; Main fuel control Plot 3640; 82-567

TEST RESULTS

IR Scan: Normal JP-4 scan
FSII appears to be within acceptable concentration.

GCScan: Normal JP-4 scan
Normal boiling point range exeept bow-boiling components absent.
No extraneous high-boiling components.

REMARKS

Reference telecon with Chief Dodby on 1 FEB 82.

REVIEWED BY (Signature, date and organization symbol)	APPROVED BY (Signature, date and organization symbol)
	[redacted] CHARLES P. LeSUEUR, Chemist, SFQLD 1 FEB 82

SA-ALC FORM JAN 76 216

AEROSPACE FUELS LABORATORY TEST REPORT

ITEM TO BE TESTED: JP-4

TEST LABORATORY AND LOCATION: Aerospace Fuels Laboratory, Mukilteo, WA [redacted]

SPECIFICATION NUMBER: [redacted]

SAMPLE NUMBER	DATE SAMPLE RECEIVED	DATE SAMPLE ~~XXXXX~~
82-F-197	29 JAN 82	

CONTRACTOR	CONTRACT NUMBER

MANUFACTURER	PURCHASE ORDER NO AND/OR NATIONAL STOCK NUMBER

SUBMITTED BY	SAMPLE MARKED
Base Fuels; Nellis AFB, NV	Main fuel control Crash aircraft; Plot 2430,6852; 82-568

TEST RESULTS

IR Scan: Normal JP-4 scan
FSII appears to be within acceptable concentration

GC Scan: Normal JP-4 scan
Normal biling point range except low-boiling components absent
No extraneous high-boiling components

REMARKS

Reference telecon with Chief Dodby on 1 FEB 82.

REVIEWED BY (Signature, date and organization symbol)	APPROVED BY (Signature, date and organization symbol)
	[redacted] CHARLES P. LeSUEUR, Chemist, SFQLD 1FEB 82

SA-ALC FORM JAN 76 216

BASE FUELS SAMPLING AND TESTING RECORD

SAMPLING RECORD						LABORATORY TEST RESULTS																	
						SEDIMENT								FILTRATION TIME		CONDUCTIVITY		DEMIN. WATER					
NUMBER	SAMPLE SIZE	TYPE PRODUCT	SAMPLE SOURCE	INITIALS OF SAMPLER	DATE TAKEN	MG/GAL OR P.A.G.	COLOR	WATER AEL PPM OR VISUAL	FSII %	SUL-FIDES	FIBER COUNT	API	HEAVY HYDRO-CARBONS	MIN-UTES	IN/HG	S / P / M	TEM-PERA-TURE	SOLIDS PPM	pH	A.B.O. ODOR	REMARKS (See Reverse)		
A	B	C	D	E	F 82	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V		
0337	4085	JP4	731-1223	WB	18 JAN	A	AL2	0													✓	3	
0338	4085	JP4	731-1227	WB	18 JAN	A	AL2	0													✓	13	
0339	4085	JP4	731-1233	WB	18 JAN	A	AL2	0													✓	6	

AFTO FORM JUN 77 150 PREVIOUS EDITION IS OBSOLETE.

ROUTINE

PT A 00263 07 204024

(2.) DO 9-3 RF

RTTUZYUW RUVKAA3220 0372041-UUUU--RUNJBMA.
ZNR UUUUU
P 061900Z FEB 82
FM DIR MAT MGT KELLY AFB TX/MMSRP
TO RUNJCMA/57FWW NELLIS AFB NV/THUNDERBIRD SIR
INFO RUMJABA/HQ AFISC NORTON AFB CA/SER
RUNAFLC/HQ AFLC WPAFB OH/AA/IGY/LOA
BT
UNCLAS
SUBJ: CATEGORY I REPORT IAW T.O. 00-35D-54, YOUR SIR 060215Z FEB 82.
3.ACN: 57FWW CAT I 82-01
5.NSN: 1680000080940
6.NOM: TRIM ACTUATOR
8.P/N: 6-73905-3
9.SER, LOT, BATCH NO: TAG NUR3369 SER F0627
10.DEF ITEM WORKS ON/WITH A. END ITEM:N/A B. NHA:NEXT HIGHER
ASSEMBLY:N/A (C) NSN:N/A
20.WUC:14261
THIS IS AN INTERIM REPLY TO ACKNOWLEDGE RECEIPT OF YOUR REPORT
DURING NON-NORMAL DUTY HOURS. DETERMINATION ON CLASSIFICATION OF
CATEGORY I REPORT AND DISPOSITION INSTRUCTIONS WILL BE FORTHCOMING
08 FEB 82. REPORTED FAILURE ASSIGNED SAN ANTONIO ALC MIP
PAGE 2 RUVKAA3220 UNCLAS
NUMBER SASOR 82-0115.
ST
#3220
NNNN

ROUTINE

PT A 00047 RCC 005643

RTTUZYUW RUVKAAA4614 0410032-UUUU--RUWJBMA.
ZNR UUUUU
R 091905Z FEB 82
FM DIR MAT MGT KELLY AFB TX//MMSR//
TO RUWJBMA/57FWW NELLIS AFB NV//THUNDERBIRD SIB//
ZEN/DIR MAT MGT KELLY AFB TX//MMIR//
INFO RUWJABA/HQ AFISC NORTON AFB CA//SER//
RUVAFLC/HQ AFLC WPAFB OH//QA/IGY/LOA//
RUWTMAA/HQ ATC RANDOLPH AFB TX//LGM/IGF//
RUCIPBA/HQ TAC LANGLEY AFB VA//LGM/SE//
RUWTEKA/HQ SAC OFFUTT AFB NE//LGMS//
RUVAAHA/ASD WPAFB OH//SE//
RUWTPGA/12 AF BERGSTROM AFB//LGM/SE//
RUEAHQA/USAF WASHINGTON DC//IGF//
RUEOAWA/AFSC ANDREWS AFB MD//IGF//
AF-ACXJRF
BT
UNCLAS
SUBJ: COMBINED CAT I MATERIEL DEFICIENCY/ACFT MISHAP REPORT.
REF: A. YOUR 57FWW/THUNDERBIRD SIB 060217Z FEB 82 MSG.
B. YOUR 57FWW/THUNDERBIRD SIB 060216Z FEB 82 MSG.
C. YOUR 57FWW/THUNDERBIRD SIB 060215Z FEB 82 MSG.
PAGE 2 RUVKAAA4614 UNCLAS
THIS MSG IN THREE PARTS.
PART ONE FOR 57FWW NELLIS AFB NV/THUNDERBIRD SIB.
YOUR 060217Z FEB 82, 060216Z FEB 82 AND 060215Z FEB 82 CAT I 57FWW 82-03, CAT I 57FWW 82-02 AND CAT I 57FWW 82-01 (ACFT MISHAP CLASS A) REPORTED FAILURE OF TRIM ACTUATORS, NSN 1680-00-006-0040, P/N 6-73905-3, WUC 14261, T-38A, S/N F0627, TAG NO. 4175, TAG NO. 4515, TAG NO. 3360. MIP SASDB 82-0117, SASDB 82-0116 AND SASDB 82-0115 ASSIGNED FOR INTERIM REPLY PURPOSE. SUBJ CAT II'S ARE BEING FORWARDED TO THE APPROPRIATE ITEM MANAGER FOR INVESTIGATION/EVALUATION.
PART TWO FOR DIR MAT MGT/MMIR.
REQ YOU ESTABLISH MIP'S TO INVESTIGATE THE REPORTED DEFICIENCY. SINCE ACTUATORS WERE HAND CARRIED TO SA-ALC/MMSR/MMIR ON 3 FEB 82, REQUEST YOU PROVIDE MIP NUMBERS ASSIGNED AND LAB ANALYSIS REPORT TO 57FWW/THUNDERBIRD SIB WITH INFO COPIES TO ADDRESSEES AND THIS OFFICE.
PART THREE FOR ALL.
POINT OF CONTACT IS MR. R. HAYNIE, SA-ALC/MMIRCA, AUTOVON 945-4765 OR MR. C. GARCIA/SA-ALC/MMSRB, AUTOVON 945-7378.
BT
#4614
NNNN

ROUTINE

UNCLASSIFIED

01 PP EEEE 122207 Feb 94

DIR MAT MGT KELLY AFB TX//MM//
57FWW NELLIS AFB NV//SEF//
INFO HQ AFISC NORTON AFB CA//SER/SEF//
HQ TAC LANGLEY AFB VA//SE/DO/LG//
AFHSC BROOKS AFB TX//SGPA//
HQ AFSC ANDREWS AFB MD//IGF/DOCP//
HQ AFLC WPAFB OH//QA/IGY/LOA//
ASD WPAFB OH//SE//
ACCT AF-ACXJRF
UNCLAS E F T O

FOR THUNDERBIRD MISHAP INVESTIGATION BOARD.
SUBJ: LABORATORY REPORT, PITCH TRIM ACTUATORS THUNDERBIRD MISHAP.
1. THE FOLLOWING REPORT CONCLUDES THE INVESTIGATION OF SUBJECT ACTUATORS. ANY SUBSEQUENT CONCLUSIONS OR SCENARIOS DEVELOPED FROM INFORMATION INCLUDED HEREIN AS TO THE CONDITION OF THESE ACTUATORS WOULD BE CONSIDERED OUT OF CONTEXT.
2. ACTUATORS TAGGED NO. 1151, 3380, 4175 AND 4515 WERE RECEIVED, X-RAYED AND EXAMINED. COMPONENTS NO. 2201, 2239 AND 2291 WERE

FRANK MUEGGE, MMIRCC, 56277,YC

FOUND TO BE PART OF ACTUATOR TAGGED NO. 1151 AND EXAMINED WITH THAT ACTUATOR. THE FOLLOWING ARE THE RESULTS OF THE EXAMINATION.

3. ACTUATOR NO. 1151. ACTUATOR COMPONENTS WERE EXAMINED FOR EVIDENCE OF PRE-IMPACT FAILURE. CAPACITOR (NO. 2291) HAD FIRE DAMAGE SUFFICIENT TO MELT SOLDERED CONNECTIONS WITH NO EVIDENCE OF FAILURE. CIRCUIT BOARD (NO. 2201) HAD FIRE DAMAGE AND WAS BADLY CHARRED; ONE DIODE WAS IN PLACE, ONE DIODE HAD ONLY ONE END REMAINING WITH SIGNS OF MECHANICAL DAMAGE. CIRCUIT BOARD DID NOT HAVE PROVISION FOR CAPACITOR TIE-DOWN. ALL SOLDERED JOINTS WERE MELTED. THERE WERE NO SIGNS OF ELECTRICAL ARCING OR OTHER EVIDENCE OF COMPONENT FAILURE. MOTOR (NO. 2239) WAS INTACT WITH THE EXCEPTION OF BRAKE ENGAGEMENT PINS THAT FAILED IN BENDING AS A RESULT OF IMPACT TO THE BRAKE ASSEMBLY. THERE WAS NO EVIDENCE FOUND TO INDICATE MECHANICAL MALFUNCTION OF THE ACTUATOR.

4. ACTUATOR NO. 3380. ACTUATOR CASE WAS VIRTUALLY INTACT, WITH LITTLE FIRE OR HEAT DAMAGE. ALL COMPONENTS WERE EXAMINED FOR EVIDENCE OF PRE-IMPACT FAILURE. ELECTRICAL COMPONENTS WERE EXAMINED FOR CONDITION AND SERVICEABILITY. BOTH DIODES ON THE CIRCUIT BOARD WERE INTACT AND IN PLACE AND ELECTRICALLY OPERATIONAL. CAPACITOR WAS PHYSICALLY DAMAGED BUT WAS ELECTRICALLY OPERATIONAL.

FRANK MUEGGE, MMIRCC, 56277,YC

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THERE WERE NO PROVISIONS FOR CAPACITOR TIE-DOWN. ALL SOLDERED JOINTS WERE SOUND EXCEPT FOR A CAPACITOR LEAD THAT HAD BEEN CRACKED. ALL JOINTS WERE FOUND TO BE ELECTRICALLY SOUND. MOTOR WAS VIRTUALLY INTACT EXCEPT FOR PHYSICAL DAMAGE TO THE BRAKE. BRAKE ENGAGEMENT PINS WERE SHEARED AND THE MOTOR SHAFT WAS BROKEN AT THE BRAKE ROTOR. THERE WAS NO EVIDENCE FOUND TO INDICATE MECHANICAL MALFUNCTION OF THE ACTUATOR.

5. ACTUATOR NO. 4175. ACTUATOR CASE WAS REMOVED AND ELECTRICAL AND MECHANICAL COMPONENTS WERE EXAMINED FOR ANY EVIDENCE OF PRE-IMPACT FAILURE. CIRCUIT BOARD WAS INSPECTED AND FOUND TO BE CRACKED BY EXTERNAL FORCE. CAPACITON LEADS WERE FOUND SEPARATED FROM THE SOLDERED JOINTS ON THE BOARD; ONE SEPARATED COMPLETELY, ONE BROKE AWAY FROM THE SOLDER BUT WAS STILL IN PLACE. ONE OF THE TWO DIODES WAS INTACT AND IN PLACE; THE OTHER DIODE WAS BROKEN WITH LEADS SHOWING EVIDENCE OF MECHANICAL DAMAGE. CERAMIC FRAGMENTS OF DIODE FOUND IN THE CASE WERE NOT TYPICAL OF SERVICE INDUCED FAILURE AND WERE TYPICAL OF IMPACT DAMAGE. THE REMAINING ELECTRICAL COMPONENTS INCLUDING THE MOTOR BRAKE, WERE CHECKED FOR SERVICEABILITY. THE CAPACITOR, DIODE AND MOTOR BRAKE WERE FOUND TO BE OPERATIONAL. THE BRAKE AND DIODE WERE RE-TESTED IN A COLD CHAMBER AT 9 FAHRENHEIT

FRANK MUEGGE, MMIRCC, 56277,YC

04 RR EEE

AND WERE FOUND OPERATIONAL. ACTUATOR MOTOR COULD NOT BE FULLY CHECKED DUE TO IMPACT DAMAGE. ONE LEAD OF THE MOTOR, TRACED TO THE AREA OF IMPACT DAMAGE, DID NOT HAVE ELECTRICAL CONTINUITY. IN THAT THIS ACTUATOR DID NOT HAVE PROVISIONS FOR CAPACITOR TIE DOWN, ALL SOLDERED LEADS TO THE CAPACITOR WERE EXAMINED FOR EVIDENCE OF FATIGUE FAILURE THAT COULD POSSIBLY BE INDUCED BY VIBRATION OF THE CAPACITOR. CONVENTIONAL AND ELECTRON MICROSCOPE EXAMINATION FOUND NO EVIDENCE OF ANY FATIGUE FAILURE. SOLDERED CONNECTIONS WERE INVESTIGATED FOR SOUNDNESS AT IMPACT. SOLDERED SURFACES, UNDER MAGNIFICATION, WERE FOUND TO BE GRAINY IN TEXTURE AND OF GRAY COLOR WITH VARYING DEGREES OF BRIGHTNESS. THERE WERE NO SIGNS OF ELECTRICAL ARCING. THERE WAS NO EVIDENCE OF MECHANICAL MALFUNCTION THAT WOULD PRECLUDE OPERATION OF THE ACTUATOR. IT IS NOTED THAT TWO OF THE THREE REQUIRED BRAKE ENGAGEMENT PINS HAD FAILED PRIOR TO IMPACT. THIS IS EVIDENCED BY BURNISH MARKS ON THE BRAKE STATOR SHOWING SHIFTING MOVEMENT OF THE STATOR. THE SHIFTING MOVEMENT WAS CENTERED ABOUT THE REMAINING PIN. IN THAT ONE PIN REMAINED, THERE WAS NO DEGRADATION OF THE BRAKE OPERATION. THERE WERE NO OTHER SIGNS OF MECHANICAL FAILURE.

6. ACTUATOR NO. 4515. ACTUATOR COMPONENTS WERE EXAMINED FOR

FRANK MUEGGE, MMIRCC, 56277, YC

UNCLASSIFIED

OS OS RR EEEE

EVIDENCE OF PRE-IMPACT FAILURE. CIRCUIT BOARD COMPONENTS WERE EXAMINED. BOTH DIODES WERE INTACT AND OPERATIONAL. CAPACITOR WAS ALSO FOUND TO BE OPERATIONAL. WIRES A-22 AND C-22 WERE BROKEN AT THE BOARD AND WERE EXAMINED BY MICROSCOPE TO DETERMINE CONDITION AT IMPACT. WIRE ENDS WERE FOUND CLEAN, WITHOUT CORROSION OR ELECTRICAL ARCING. IT IS CONCLUDED THAT WIRES WERE INTACT AT IMPACT AND WERE BROKEN FROM EXTERNAL FORCES. IT IS NOTED THAT ON THIS BOARD ONLY, THE CAPACITOR WAS TIED TO THE BOARD WITH BLACK LACING. CIRCUIT BOARD ITSELF WAS BENT WITH HEAT DISCOLORATION AT POINT OF CONTACT WITH THE ACTUATOR CASE. ALL CONNECTIONS, WITH THE EXCEPTION OF THOSE MENTIONED ABOVE, WERE FOUND TO BE ELECTRICALLY AND MECHANICALLY SOUND. NO ELECTRICAL ARCING WAS FOUND. MOTOR BRAKE WAS DISASSEMBLED AND BRAKE PAD WAS FOUND TO BE SIGNIFICANTLY CLEANER THAN THOSE FOUND ON THE OTHER ACTUATORS. BRAKE WAS OPERATIONAL. MOTOR ITSELF WAS INTACT. THERE WAS NO EVIDENCE FOUND OF MECHANICAL MALFUNCTION OF THE ACTUATOR.

7. CONCLUSION: THERE IS NO EVIDENCE OF MECHANICAL OR ELECTRICAL FAILURE OR ANY CONDITION THAT WOULD PRECLUDE NORMAL OPERATION OF EXHIBIT ACTUATORS PRIOR TO AIRCRAFT IMPACT. POINT OF CONTACT IS FRANK MUEGGE, SA-ALC/MMIRCC/AUTOVON 945-6277.

MMIRCC MMIRC MMIR MM MM

12 Dec 82 12 Dec 82 12 Dec 82

FRANK MUEGGE, MMIRCC, 56277

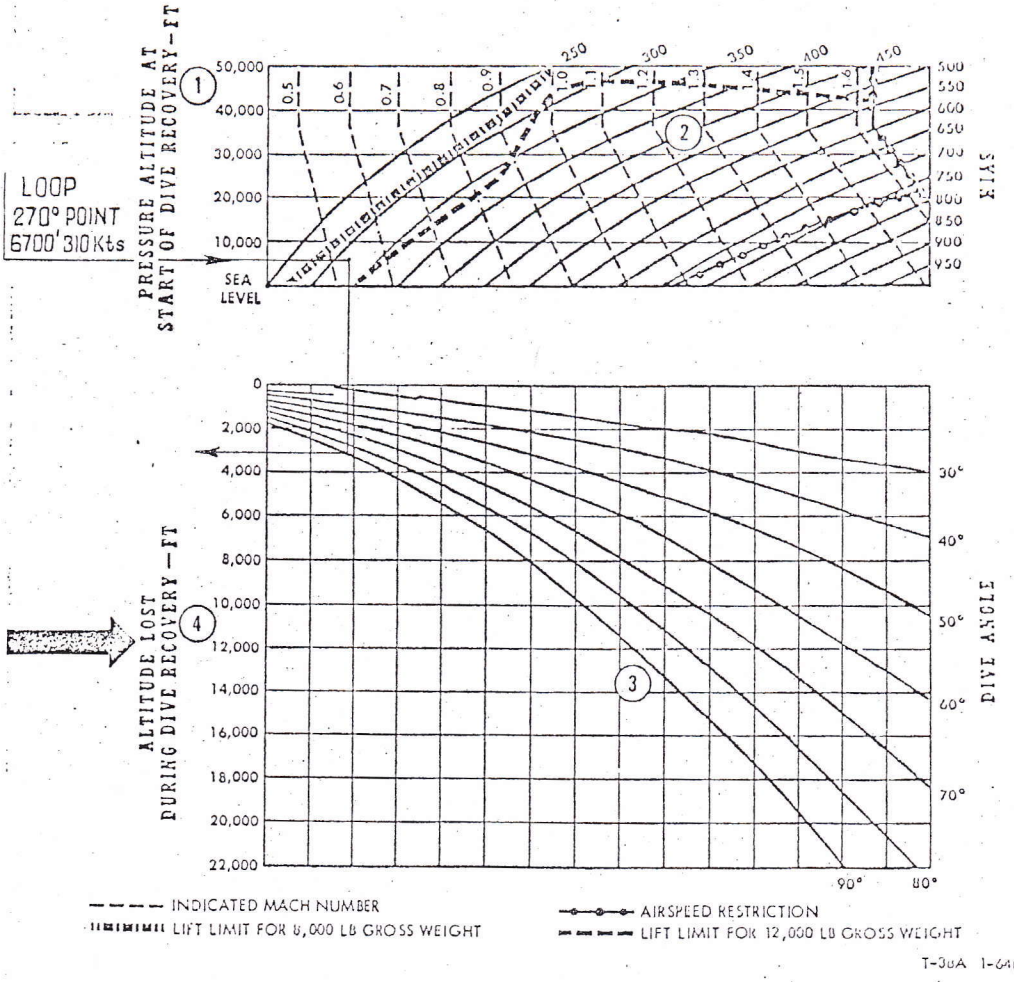
INDEX TO TAB J

ALTITUDE LOST DURING DIVE RECOVERY

CONSTANT 4.0 G ACCELERATION

DATE: 15 JANUARY 1965
DATA BASIS: FLIGHT TEST

- SUBSONIC LIFT LIMIT IS DETERMINED BY BUFFET.
- SUPERSONIC LIFT LIMIT IS DETERMINED BY HORIZONTAL TAIL DEFLECTION LIMIT.
- THE DASHED LINES (LIFT LIMITS) ON THE LEFT OF THE CHART SHOW THE AIRSPEED AT WHICH THE AIRCRAFT WILL ENTER AN ACCELERATED STALL AT THE G'S INDICATED.



T-38A 1-6A(3) F

Figure 6-6. (Sheet 2)

AIRCRAFT MISHAP INVESTIGATION
THUNDERBIRD AIRCRAFT
#1 - S/N 68-8156
#2 - S/N 68-8184
#3 - S/N 68-8176
#4 - S/N 68-8175
18 January 1982
PERFORMANCE EVALUATION

1. INTRODUCTION

The mishap occurred during a USAF Thunderbird formation training mission. The specific maneuver was a four-ship, line abreast loop. All four aircraft impacted the ground during the final portion of the maneuver. Review of the videotape (VTR) of the mishap revealed that formation integrity was maintained throughout the loop maneuver; consequently, the performance analysis will deal exclusively with the flight path of the lead aircraft.

2. METHODOLOGY

a. General. All available sources of data were considered in attempting to correlate and corroborate flight conditions. These sources included flight data recorders, audio recordings, eyewitness testimony, videotapes, instrument readings, flight control positions, computer simulations, and investigative flights.

b. Flight Data Recorders.

(1) VGH Recorder. A velocity-Gs-height (VGH) recorder was installed in the lead aircraft. The tape was processed and interpreted by Oklahoma City ALC/MMDAC following the mishap. The last series of recorded maneuvers on the VGH bear no resemblance to the scheduled flight profile. There was no VGH data.

(2) MXU-553 Recorder. The three remaining aircraft were equipped with the MXU-553 recorder. However, due to a tape shortage, no recording cartridges were installed in any of the recorders.

(3) MSR strain recorders were installed on all four aircraft. Recorders are located in a highly vulnerable area on the bottom of the aircraft. All aircraft were heavily damaged in this area, and none of the MSR cartridges were recovered.

c. Audio Recorders. A PRC-66 portable, battery powered UHF radio is used to record Thunderbird transmissions directly onto the videotape during practice mission and airshows. On the mishap day, a freshly charged battery was installed in the PRC-66. The radio was later discovered to be non-functional at recording time. No spare battery was immediately available, and therefore, the pilot's radio conversation was neither monitored, nor recorded by the VTR specialist.

d. Witness statements and interviews provide no additional data or insight into the mishap cause.

e. Instruments. On the #4 aircraft (S/N 68-8175), the rear cockpit attitude indicator (ADI) showed impact marks at 5 and 35 degrees dive. The front cockpit standby attitude indicator had impact marks at 5 and 15 degrees dive. The front cockpit airspeed indicator had a pointer impact mark at 380 KIAS. All other useful flight instruments lacked impact marks. Other aircraft exhibited no impact marks on instruments.

f. FLight Controls. Lead aircraft's stabilator angle was 7 degrees trailing edge up at impact.

g. Videotape.

(1) It quickly became apparent that the videotape would provide the most meaningful aircraft performance data on the mishap maneuver. The mishap was recorded on 3/4-inch videotape using a Sony DXC-1640 Portable MF Trinicon color camera with an F1.4, 11-70 mm macro/zoom lens and auto-iris exposure control. The hand held camera was manually zoomed at various points in the maneuver so that neither the camera lens' F-stop nor the focal length are precisely known at any point.

(2) Videotape analyses were performed by two separate agencies. The lower portions of the loop (entry and exit) were analyzed using terrain features comparison techniques. Focal length prediction techniques produced highly erroneous results when attempting to calculate actual "over-the-top" conditions from the VTR. Consequently, this process was terminated early in the investigation.

(3) The entry/exit analysis was accomplished by first transcribing the video to a one-inch tape format, thus allowing the tape to be manipulated using recording studio quality equipment with less distortion and greater sophistication. Photographs were made of the TV screen at select time intervals. One second increments were used during the maneuver entry and one-half second increments during the exit portion. These photos were then used for distance and angle measurements.

(4) The geometric relationship between aircraft position and visible terrain features were established assuming segments of the loop occur in a purely vertical plane. Since the aircraft impacted at a slight angle to the runway and displaced from show center, two separate vertical planes were used for the analysis. Distance to the vertical plane will be distance to the maneuver centerline for the entry and distance to impact for the exit. Distance to the vertical plane and distance to the terrain feature are used to scale aircraft altitude to terrain elevation (see Figure 1). Aircraft ground position is determined by a similar lateral scaling method. This technique was used to determine altitude and airspeed.

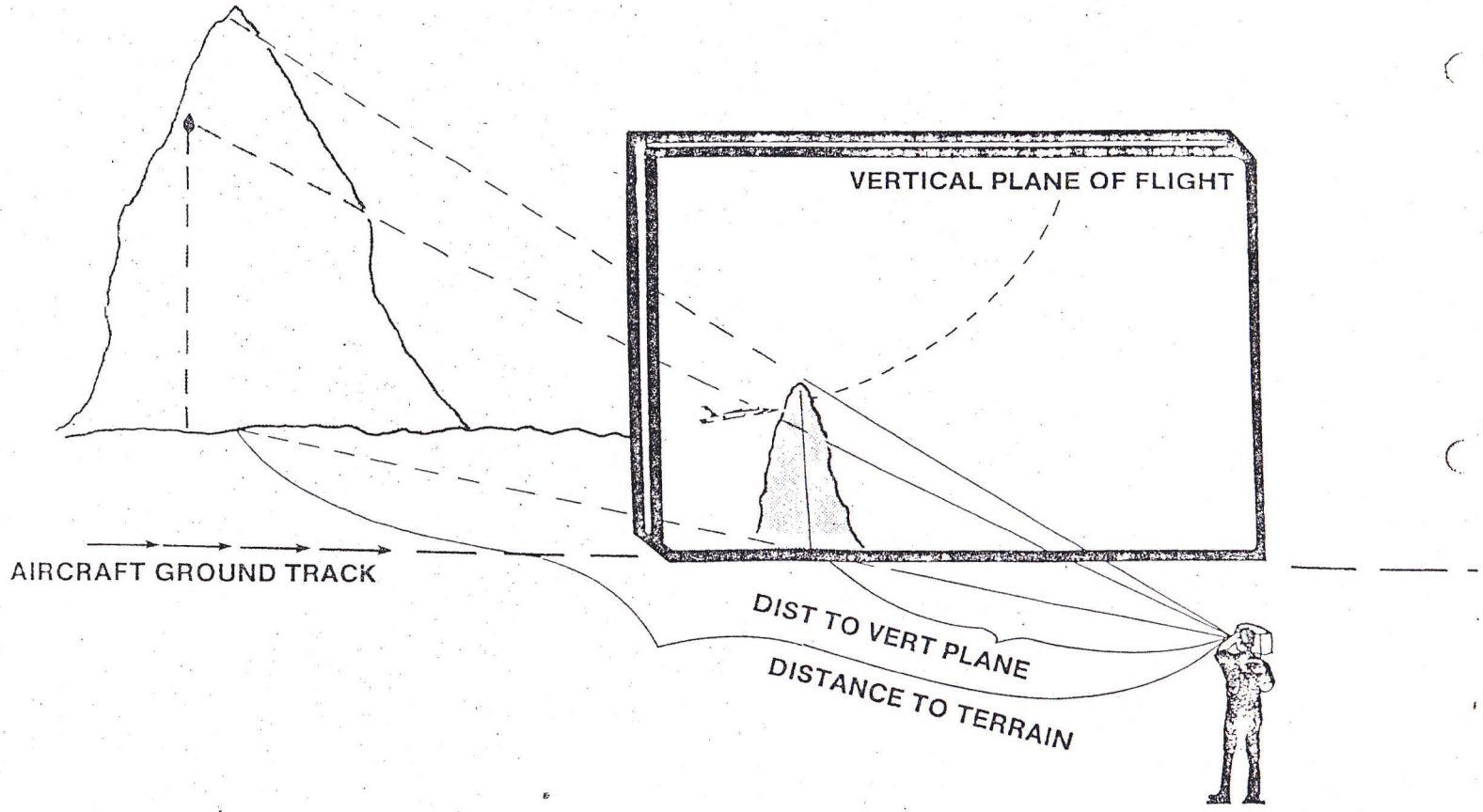
(5) It was found that small errors in altitude caused a significant error in flight path angles and large errors in G load computation. Consequently, it was decided to measure the apparent flight path angle directly from the photographs by using the smoke trail and the horizontal. The apparent flight path angle was first corrected for elevation and azimuth errors before being used to calculate Gs.

(6) The mishap Board then requested that 12 loop and roll maneuvers from each of four practice tapes be analyzed for trends. Ridley Mission Control Center at Edwards AFB, California, was contacted to coordinate a computer linked effort to quickly analyze large quantities of data. A slightly different geometric methodology was developed and utilized. An Arvin-Echo RDG-2 Image Maker and a Quantex DS-30 Digital Video Processor were linked with a Tektronics computer terminal. An interface program was written to allow this data to be processed into performance parameters. The results of this program can be found in Atch 1. Data has been smoothed and integrated into the analysis.

h. Flight Computer Simulation. Initial flight conditions were those derived from the videotape analysis. Elapsed times at the 090, 180, and 270 degree positions of the loop were also taken from the VTR. The three-degree-of-freedom program was manipulated to match the provided parameters.

i. Investigative Flights. Several sorties were flown in a T-38A to study the dynamcis of the loop maneuver. Entry airspeed and Gs were varied to determine the effects on loop parameters. The parametric study proved valuable in comparing calculated performance values with actual flight data.

FIG 1 GEOMETRIC RELATIONSHIP BETWEEN
THE AIRCRAFT AND TERRAIN



3. ANALYSIS.

a. Entry Flight Conditions.

(1) The initial methodology involved obtaining space positioning data (altitude and position over the ground), then calculating the remainder of the performance values (airspeed, flight path angles, and Gs). However, flight path angles proved very sensitive to altitude errors, and therefore, pitch rate (used to calculate Gs) become grossly inaccurate. Consequently, flight path angles were measured directly from the smoke trail on the photographs and corrected for elevation and azimuth errors.

(2) The normal loop entry takes approximately four seconds to establish pull-up Gs. Since the terrain was visible for only three seconds after the start of the loop, subsequent, terrain-less frames were studied to determine peak Gs at entry. Although the terrain-less frames would be subjected to indeterminate camera tilt, it is observed that camera tilt was neglible in the frames which include terrain image; therefore, the tilt should not be appreciable in the last few frames. Changes in flight path angle (γ) divided by time, result in flight path angle rate ($\dot{\gamma}$). Gs can then be calculated using the equation:

$$g = G + \cos \gamma$$

$$= \frac{(\text{pitch rate})\ (\text{velocity})}{(57.3^{0}/\text{radian})(32.2\ \text{ft/sec}^2)} + \cos \gamma$$

Where: g = Total Gs
G = Centrifugal Gs
cos γ = Gravitational Component

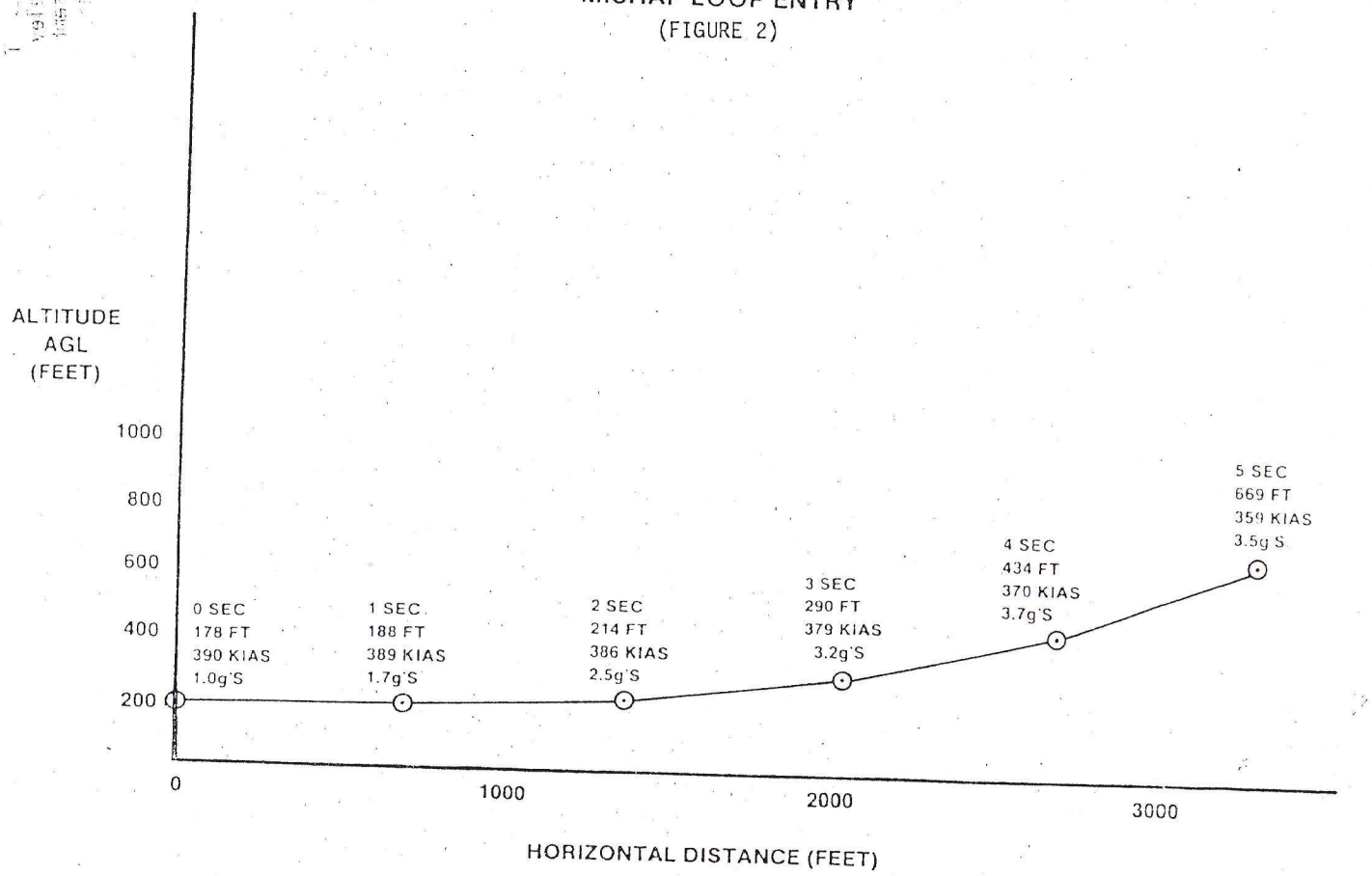
The data shows a pull-up to the 3.5 to 3.8 G range in four seconds time. The resulant entry data is summarized on Table 1 and shown on Figure 2.

MISHAP LOOP ENTRY CONDITIONS

Time From Pull-Up (Seconds)	Alt AGL (Feet)	Est Vel (KIAS)	Flt Path Angle (Degrees)	Gs
0	178	390	0	1.0
1	188	389	1	1.7
2	214	386	4	2.5
3	290	379	9	3.2
4	434	370	16	3.7
5	669	359	26	3.5

TABLE I

MISHAP LOOP ENTRY
(FIGURE 2)



b. Exit Flight Conditions

(1) The methodology used is similar to the entry analysis. The results of this analysis are shown on Table 2 Figure 3.

MISHAP LOOP EXIT CONDITIONS

Time From Pull-Up (Seconds)	Alt AGL (Feet)	VEL (KIAS)	Flt Oath Angle (Degrees)	Gs
41.6	479	426	32.3	6.3
42.1	281	424	25.6	7.2
42.6	114	422	17.3	7.1
43.1	27	419	9.0	7.0
43.3	6	417	5.4	7.0
43.4	0	416	3.3	7.0

TABLE II

(2) At time 43.3 seconds, the video image is suitable for measuring pitch angle ($+4.2^{0}$), as well as flight path angle (-5.4^{0}). The included angle is angle of attack ($+9.6^{0}$). This angle of attack at 417 KIAS results in a 6.50 G load condition.

(3) The stabilator angle at impact was discovered to be 7 degrees trailing edge up. For a center of gravity of 20 percent mean aerodynamic chord and at Mach .65, this equates to an 8.1 G load,

(4) The horizontal distance from the +43.3 time to impact is 87.5 feet. At a ground speed of 417 KIAS (736 ft/sec), this distance is traversed in 0.119 seconds. The flight path angle at time +43.3 is -5.4 degrees and is increasing at 18.00 degrees per second. Therefore, ground impact angle is -3.3 degrees. Also, the time required to change the flight path angle is from -3.3 to 0.0 degrees is 0.20 seconds. This would require an addtional ten feet of altitude.

c. "Over-the-Top" Flight Conditions. Simulation was modified slightly to reflect (1) data gathered during the observation flights, (2) the lower airspeed and lower Gs at entry, (3) the higher Gs predicted during the exit, and (4) a greater horizontal distance between pull-up and impact.

4. CONCLUSIONS.

a. The computed flight conditions for the mishap loop are as follows:

(1) Entry (0.0 degrees).

(a) Time: 0.0 seconds

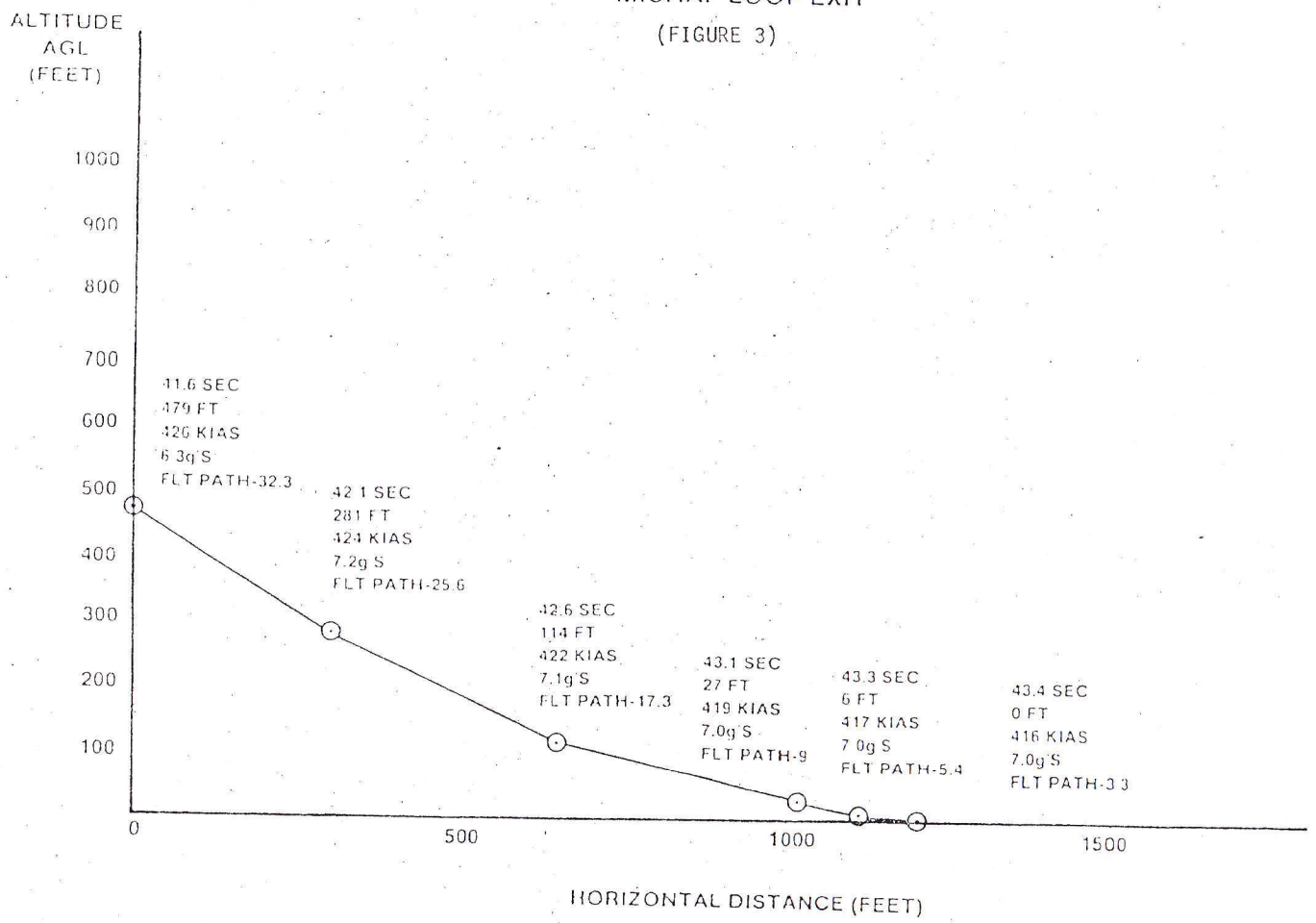
(b) Altitude: 3286 feet MSL; 178 feet AGL.

(c) Airspeed: 390 KIAS.

(d) Entry Gs: 3.7 in four seconds.

(e) Remarks: Airspeed and Gs are below target values, but are not abnormally low.

MISHAP LOOP EXIT
(FIGURE 3)



(2) 090 Degrees.

(a) Time: 11.7 seconds.

(b) Altitude: 6500 feet MSL: 3392 feet AGL.

(c) Airspeed: 290 KIAS.

(d) Gs: 2.5.

(3) 180 Degrees.

(a) Time: 24.0 seconds.

(b) Altitude: 9750 feet MSL; 6642 feet AGL.

(c) Airspeed: 140 KIAS.

(d) Gs: 0.5.

(e) Remarks: Loop appears normal up to this point. Videotape review shows no abnormalities in either lead's or wingmen's flight path. Smoke trail appears smooth. The low airspeed might have resulted in power not being reduced.

(4) 220 Degrees. Gs less than normal at this point. This would result in the 270 degree point being reached in the same time, but at a higher than normal velocity and lower than normal altitude.

(5) 270 Degrees.

(a) Time: 34.8 seconds.

(b) Altitude: 6700 feet MSL; 3592 feet AGL.

(c) Airspeed: 310 KIAS.

(d) Gs: 2.6.

(e) Remarks: Although the Gs are slightly higher than normal for the 270 degree point, the airspeed is much greater, and the pilot should be commanding more Gs to successfully recover the aircraft. The maximum G available is 4.2 Gs.

(6) 334 Degrees.

(a) Time: 42.1 seconds.

(b) Altitude: 3389 feet MSL; 281 feet AGL.

(c) Airspeed: 424 KIAS.

(d) Gs: 7.2.

(e) Remarks: G available is 7.8. High G loading is maintained until impact.

(7) 357 Degrees.

(a) Time: 43.4 seconds.

(b) Altitude: 3108 feet MSL; 0 feet AGL.

(c) Airspeed: 416 KIAS.

(d) G's: 7.0.

(e) Remarks: Ground impact. G available is 7.5.

b. Recovery Altitudes.

(1) If an application of stick force sufficient to achieve an average of about 4 G's had been made at the 270 degree flight path angle, successful recovery could be achieved.

(2) If a maximum performance recovery was attempted (C_L max = 0.775), then successful recovery could be achieved as late as 800 feet AGL, the 315 degree flight path angle point (approximately 7.7 G's).

c. Summary. The first 180 degrees of the loop appeared normal. At approximately the 220 degree point, lower than normal G load is attained. Consequently, the 270 degree point is reached at a lower than normal altitude and higher than normal airspeed. From the 270 degree to the 310 degree point, the G's are slightly higher than normal, but still less than required for recovery. From the 334 degree point to impact, 7.0 to 7.2 G's were maintained. This was still insufficient for successful recovery. An additional ten feet of altitude was required for lead aircraft to clear the terrain with the established turn rate.

DENNIS M. KONO
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I certify that this report is a true copy of that submitted to the Board by Dennis M. Kono, Performance Analyst.

[redacted]

RONALD F. SCHLOEMER, Lt Colonel, USAF
Investigating Officer

MISHAP LOOP DATA FROM EDWARDS AFB

18 FEB 82

MISHAP LOOP DATA FROM EDWARDS AFB

18 February 1982

ENTRY:	FRAME #	Time (Sec)	X	Z	Alt AGL (Feet)
	140	-9.3	-11031.6	486.1	509.0
	150	-9.0	-10840.8	474.0	496.9
	160	-8.7	-10595.6	460.8	483.7
	180	-8.0	-10371.9	446.6	469.5
	190	-7.7	-10371.9	447.1	470.0
	200	-7.3	- 9916.3	419.0	441.9
	210	-7.0	- 4569.8	-152.5	-129.6
	220	-6.7	- 9433.9	391.3	414.2
	230	-6.3	- 9069.1	347.3	370.2
	240	-6.0	- 8803.4	331.6	354.5
	250	-5.7	- 8509.0	312.5	335.4
	260	-5.3	- 8330.9	300.2	323.1
	270	-5.0	- 8025.4	280.3	303.2
	280	-4.7	- 7722.4	260.6	283.5
	290	-4.3	- 7431.9	242.7	265.6
	300	-4.0	- 7384.1	271.0	293.9
	310	-3.7	- 7118.7	259.3	282.2
	320	-3.3	- 6684.8	226.4	249.3
	330	-3.0	- 6521.5	219.0	241.9
	340	-2.7	- 6185.0	240.2	263.1
	350	-2.3	- 6034.9	222.2	245.1
	360	-2.0	- 5606.7	202.4	225.3
	370	-1.7	- 5376.9	191.5	214.4
	380	-1.3	- 5298.5	151.4	174.3
	390	-1.0	- 5060.8	136.3	159.2
	400	-0.7	- 4963.1	183.2	206.1
	410	-0.3	- 4727.4	179.6	202.5
	420	0.0	- 4578.1	140.9	163.8
	430	0.3	- 4191.6	173.6	196.5
	440	0.7	- 3744.1	183.7	206.6
	450	1.0	- 3429.9	166.8	189.7
	460	1.3	- 3286.0	255.3	278.2
	470	1.7	- 3030.1	229.5	252.4

EXIT:	FRAME #	Time (Sec)	X	Y	Z	Alt AGL (Ft)	Vel (KIAS)
	100		-336	2145	686	709	
	101		-111	2137	647	670	
	102		-575	2131	617	640	
	103		-539	2125	599	622	
	104		-498	2117	560	583	
	105		-459	2110	530	553	
	106		-421	2104	498	521	
	107		-407	2101	470	493	
		41.6					425.9
	108		-367	2094	443	466	
	109		-329	2088	414	437	
	110		-279	2079	377	400	
	111		-214	2067	361	384	
	112		-177	2061	344	367	
	113		-135	2053	315	338	
	114		- 93	2046	296	319	
	115	42.1	- 46	2038	281	304	424.0
	116		0	2030	255	278	
	117		48	2021	236	259	423.6
	118		76	2016	192	215	
	119		119	2008	168	191	
	120		148	1997	140	163	
	121		208	1993	134	157	
	122		214	1992	122	145	
		42.6					421.9
	123		270	1982	106	129	
	124		314	1975	87	110	
	125		375	1963	73	96	
	126		406	1958	54	77	
	127		468	1948	43	66	
	128		524	1937	29	52	419.1
	129		572	1929	17	40	
	130	43.1	617	1921	3.7	26.6	418.6
	131		661	1913	-3.4	19.5	418
	132	43.3	714	1904	-16.5	6.4	417
		43.4					416

AIRCRAFT MISHAP INVESTIGATION
THUNDERBIRD AIRCRAFT
18 January 1982
AIRFRAME/FLIGHT CONTROLS/SYSTEMS REPORT

1. GENERAL.

The accident involving four USAF Thunderbird T-38 aircraft occurred on 18 January 1982 at Indian Springs Air Force Auxiliary Field approximately 45 miles north of Nellis AFB, NV. The mission was a practice session for the forthcoming 1982 show season. The four aircraft had completed several maneuvers prior to starting a line abreast loop. The loop progressed near to completion when all four aircraft impacted the ground at high speed at a shallow angle. All four aircraft were destroyed and the crewmembers were fatally injured. The flight leader was in aircraft #1 and the slot man was in aircraft #4. In the line abreast formation, the aircraft were arranged as follows: (left to right as viewed from behind) 4 - 2 - 1 - 3. The ground impact marks show the aircraft to have been in the following relative positions at the time of impact:

Aircraft #3: 43 feet to the right and 86 feet behind #1.

Aircraft #2: 47 feet to the left and 38 feet behind #1.

Aircraft #4: 105 feet to the left and 114 feet behind #2; 152 feet to the left and 152 feet behind #1.

There was no evidence of inflight structural failure or mid-air collision. The aircraft hit on relatively flat desert land that had a moderate covering of brush that was of the same size and shape of tumbleweed. The wreckage of each aircraft was basically distributed in a long, narrow, fan-shaped pattern. Since the four aircraft were in close formation, there was considerable overlapping of the wreckage pattern and intermingling of wreckage. The combined wreckage pattern of all four aircraft covered an area approximately 700 feet wide and 3100 feet long. Aircraft identification from serial number to tail is as follows:

Aircraft #1 - T38-A S/N 68-8156

Aircraft #2 - T38-A S/N 68-8184

Aircraft #3 - T38-A S/N 68-8176

Aircraft #4 - T38-A S/N 68-8175

2. PREFACE.

The intent of the "Impact" and "Structural Breakup and Wreckage Distribution" paragraphs (paras 1 and 2 for each aircraft) in this section is only to provide a brief and approximate description of the accident site, impact conditions, sequence of events, and location of sections and components of each aircraft. Specific damage to the individual section/components will be discussed later in this report.

a. Unless otherwise stated, all items of discussion related to aircraft #1 have been positively identified to that aircraft by direct matching of fracture surfaces, as well as paint patterns, fire and soot patterns, and consistency of item location within the wreckage distribution pattern. Items related to aircraft #2, #3, and #4 have been identified by at least two of the above mentioned methods and/or by elimination, up to the aft fuselage (boatail) separation point. Components of the boatail assemblies of aircraft #2, #3, and #4 were identified primarily by location in the wreckage pattern.

b. Observations of the ground impact marks/scars described in this report were made on the fourth day after occurrence of the accident. The marks and scars were not as sharp and distinct as initially found due to the effects of light, rain, sleet, and snowfall during the first two days after the mishap and prior to arrival of the team members undersigning this report.

c. Distance measurements given for each aircraft are measured from the initial impact point for that particular aircraft and are totally independent of measurements from any other aircraft unless otherwise stated.

d. The flight controls and systems descriptions are based on positive correlation of physical evidence wherever possible. The summary, listed at the end, is subject to the restrictions of the main text and is not intended to imply contradictory information to the main text.

3. INDIVIDUAL AIRCRAFT IMPACT AND WRECKAGE DISTRIBUTION.

a. Aircraft #1 - 68-8156.

(1) Impact. Analysis of the ground impact scars, cuts on brush, and paint smears on ground surface rocks indicates the aircraft impacted tail first in a slightly nose high, near wing level attitude. The aircraft was traveling at a high rate of speed and the descent angle was very shallow; probably less than 5 degrees. The impact scar was approximately four inches deep at the deepest point and was basically shaped like an elongated T-38 fuselage of approximately 60 feet in length. At a distance of 57 feet from initial impact, there was a gouge of 8 to 10 inches in depth and 4 to 5 feet in length. The gouge was at the proper angle and distance from the centerline of the fuselage ground scar to correspond with the RH (right hand) horizontal stabilizer. Trapped within the gouge was a piece of horizontal stabilizer skin approximately 8 x 16 inches in size along with several smaller pieces of stabilizer skin. It is concluded that the gouge was made by the RH horizontal stabilizer of the #1 aircraft. Approximately 8 feet beyond the above described gouge was a similar sized and shaped gouge except the second gouge started at a point in the impact scar that corresponded with the approximate centerline of the aircraft (rather than at the LH (left hand) edge of the fuselage scar). The gouge extended outboard (left) and aft with the same approximate angle and dimensions as the gouge made by the RH horizontal stabilizer. Excavation of the gouge produced 6 to 8 small metal fragments (3/4 x 2 inches to 3/4 x 1½ inches) and several chips of paint which are consistent with materials and paint used on the horizontal stabilizer; however, those materials are also used in many applications throughout the aircraft. Accordingly, due to the small size of the fragments and lack of distinguishing paint scheme, etc., a positive determination of the source of the gouge cannot be determined; however, it was probably made by the LH horizontal stabilizer of the #1 aircraft.

(2) Structural Breakup and Wreckage Distribution. After initial impact the #1 aircraft may have gone airborne from approximately the 500-foot point to the 1000-foot point; however, if the aircraft did become airborne, it was barely clear of the ground. For practical purposes of this discussion, it can be said that the #1 aircraft remained in ground contact after the initial impact. The ground track for the #1 aircraft was straight for approximately the first 1200 feet after which it began a gradual drift to the left of an extended centerline from the initial impact scar. At approximately 1950 feet, the ground track of #1 crossed the ground track of #2, which at that time was drifting to its right. (Ref. description for #2 aircraft "Structural Breakup and Wreckage Distribution.") The major portion of the aircraft structure continued on the left drift and began to breakup until depositing the farthest major structure assembly (front and rear cockpit section) 2270 feet down the ground track and 110 feet left of the extended centerline from the #1 aircraft impact point. Major structural assemblies and significant parts/components were distributed along the ground track as follows:

(a) LH horizontal stabilizer torque and spar, minus control surface, 450 feet down track and 45 feet left of ground track.

(b) RH horizontal stab torque tube and spar, minus control surface, 775 feet down track and 70 feet right of ground track.

(c) Aft fuselage section (boatail), minus horizontal stab and actuators, 1375 feet down track and 45 feet right of ground track.

(d) LH wing assembly, 1400 feet down track and 45 feet left of track.

(e) RH wing assembly, 2010 feet down and on track.

(f) Center fuselage section with vertical stab, minus front and rear cockpit section, 2060 feet down and on track.

(g) Front and rear cockpit section, 2200 feet down and on track.

b. Aircraft #2 - 68-8184.

(1) Impact. Analysis of the visible ground impact scars, cuts on brush, and paint smears on ground surface rocks indicates the #2 aircraft struck the ground at a high rate of speed, tail first, and in a slightly nose high attitude. Cuts on brush around the impact scar indicate the angle of descent was approximately the same as for the #1 aircraft or very slightly higher (estimated 5 to 7 degrees). The impact scar, like that of the #1 aircraft, was in the shape of an elongated T-38 fuselage of approximately 50 feet in length. The main impact scar did not contain any other significant or unusual marks.

(2) Structural Breakup and Wreckage Distribution. It appears the aircraft became airborne again somewhere between 70 and 100 feet from initial impact as evidenced by the height of brush cut by the aircraft wings. It could not be positively determined where the aircraft made its second ground contact; however, from initial impact it continued on a straight course for approximately 1800 feet where it began to drift to the right. At the 2000-foot point, the #2 aircraft crossed the ground track of the #1 aircraft, which was at the time drifting left. (Ref. description for #1 aircraft "Structural Breakup and Wreckage Distribution.") From that point, the main fuselage and wing continued down the track (while continuing to drift right) to the final resting point of the last major structural section (complete wing assembly). Major structural assemblies and significant components were distributed along the ground track as follows:

(a) Complete LH and RH horizontal stabilizer torque tube assembly, with most of the LH and part of the RH control surface attached, 1000 feet down and 20 feet left of the ground track (extended centerline).

(b) Aft fuselage assembly (boatail) structure minus the torque tubes, control surfaces, actuators, operating mechanism, etc., 1500 feet down and 75 feet left of ground track/centerline.

(c) Center fuselage, wing and front and rear cockpit section separated, at 2000 to 2100 feet and each section came to rest as follows:

1 Center fuselage assembly, including vertical stabilizer, from just aft of the wing to the boatail separation point, 2200 feet down and 75 feet left of the main wreckage track.

2 Front and rear cockpit section, 2400 feet down and 120 feet right of the extended centerline from initial impact.

3 Complete wing assembly, 2500 feet down and 225 feet right of the extended centerline.

c. Aircraft #3 - 68-8176.

(1) Impact. Examination of the impact evidence, such as ground scars, broken/cut brush and paint smears on rocks indicates the #3 aircraft impacted at a high rate of speed and in a nearly level attitude (estimated 0 to 2 degrees nose high). The aircraft probably hit tail first and definitely had a higher descent rate than either aircraft #1 or #2 as judged from the somewhat deeper impact scar. Another indicator of more severe impact is the earlier appearance of "heavy" structural items along the ground track, such as broken pieces of the wing lower skin and the bottom 8 inches of the vertical fin attachment stub, which was found only 39 feet from initial impact. It is estimated that the angle of descent was between 6 and 8 degrees. As with the #1 and #2 aircraft, the impact scar was in the basic shape of a T-38 fuselage, except this scar does not show the elongation as seen with #1 and #2. There were no other significant or unusual marks or scars noted at the initial impact point.

(2) Structural Breakup and Wreckage Distribution. Aircraft #3 sustained major structural damage during the initial impact, as previously mentioned. There is abundant evidence to support this conclusion, such as wing lower skin pieces, vertical stabilizer attach stub parts, large section of nose structure (i.e., forward electronics bay access doors, canopy and windshield acrylic panel pieces) within the first 300 feet of ground travel. In addition, it is evident by the burn pattern on the ground that #3 had almost instantaneous and severe rupture of the fuel bladders. The ground track of #3 was an almost perfectly straight line from impact to final resting place of the farthest major structural part (RH wing with part of fuselage attached), which traveled approximately 1700 feet from the point of impact. Major structural assemblies and other significant components were distributed along the ground track as follows:

(a) Rudder, 750 feet down and 200 feet left of ground track.

(b) LH and RH horizontal torque tube assembly with most of the LH and part of the RH control surfaces attached, 925 feet down and 40 feet left of ground track.

(c) Vertical stabilizer, with part of the center fuselage attached, 1000 feet down and 50 feet left of ground track.

(d) RH half of center fuselage assembly, 1025 feet down and 170 feet right of ground track.

(e) Aft fuselage assembly (boatail), 1030 feet down and 75 feet right of ground track.

(f) LH wing, 1350 feet down and 45 feet right of ground track.

(g) LH half of center fuselage assembly, 1425 feet down and 50 feet right of ground track.

(h) Outer section of LH wing, with aileron centering mechanism, 1500 feet down and 150 feet right of ground track.

(i) Front and rear cockpit section, 1680 feet down and centered on ground track.

(j) RH wing assembly with small section of RH air intake duct, 1700 feet down and 8 feet right of ground track.

c. Aircraft #4 - 68-8175.

(1) Impact. Analysis of visible ground impact scars, cuts on brush, and paint scrapes on surface of rocks indicates that #4 impacted the ground at a high rate of speed and in a nose low attitude. The impact scar differs significantly from the other three scars in that it is deeper (estimated 6 to 8 inches in some areas), particularly at the aft end where the boatail

impacted. One's first impression when looking at the deep impact marks made by the boatail is that it was the first part of the aircraft to strike the ground. Careful examination and consideration of all the evidence, however, reveals that such is not the case. The indications of high aircraft velocity and undamaged brush in the flight path adjacent to the boatail impact point imply that the aircraft hit nose first. The nose of the aircraft would act as a pivot point causing an energy transfer toward the tail of the aircraft and would result in downward acceleration of the tail; hence, the apparent high angle of descent exhibited by the brush and impact scar. It is estimated that the #4 aircraft was around 3 degrees nose low and the actual angle of descent (immediately prior to nose impact) is estimated to have been approximately 10 degrees. There were no other significant or unusual marks or scars noted at the impact point.

(2) Structural Breakup and Wreckage Distribution. The aircraft received severe structural damage at initial impact as evidenced by the early appearance of "heavy" and/or large structural components deposited along the ground track. These types of components include such things as pieces of the wing lower skin, the bottom 8 inches of the vertical stabilizer attachment stub, electronics bay access doors, windshield/canopy acrylic panel pieces, and other similar items. The #4 aircraft, like #3, also shows a burn pattern that is consistent with immediate rupture of the fuel bladders. The main aircraft structure became airborne again at approximately 150 feet from initial impact as it "topped" a slight rise in the ground surface. The point of next ground contact is uncertain; however, the main aircraft structure continued in a straight line to approximately the 1000-foot point, at which time the front and rear cockpit sections separated from the remainder of the aircraft. The two sections took divergent paths from an extended centerline of the initial impact scar. The center fuselage section and wing(s) diverged to the right of the extended centerline at an angle of approximately 5 degrees, while the front and rear cockpit sections diverged to the left of the centerline at an angle of approximately 5 degrees. Major assemblies and significant items were distributed along the ground track/extended centerline as follows:

(a) Aft fuselage section (boatail), 1060 feet down and 100 feet left of ground track.

(b) LH horizontal stabilizer torque tube and spar, minus all control surfaces, 1280 feet down and 25 feet right of the extended centerline.

(c) RH horizontal stabilizer torque tube and spar, minus all control surfaces, 1285 feet down and 155 feet right of the extended centerline.

(d) Center fuselage section from aft edge of wing back to the boatail disconnect point, including the vertical stabilizer, 1295 feet down and 28 feet right of the extended centerline.

(e) LH wing assembly, 1370 down and 70 feet right of the extended centerline.

(f) RH wing assembly, 1435 feet down and 40 feet right of the extended centerline.

(g) Front and rear cockpit section, 1860 feet down and 45 feet left of the extended centerline.

4. ROLL AXIS.

All aileron hydraulic actuators were found installed in the wing cavities. A positive correlation of the wings to the aircraft number was made for the #1, #3, and #4 aircraft by matching fracture surfaces of the LH (left hand) and RH (right hand) wing segments to the fuselage sections. Aircraft #2 wing (whole) was identified, through the presence of the steel dorsal longeron on the broken/burned center fuselage section attached to the #2 wing. The operating mechanisms and centering mechanisms of aircraft #1, #2, and #4

remained with the wing segments. The LH wing of #3 separated between the aileron actuator and operating mechanism. The #3 LH operating and centering mechanism was found separately and matched to the LH #3 wing by fracture surfaces. Continuity from the aileron actuator to the centering mechanism was established in each case and a positive match of each aileron hydraulic actuator to aircraft number was established. Major parts were identified as follows:

ITEM	TAG NUMBER
#1 LH wing	1210
#1 RH wing	2500
#1 Main fuselage section w/vertical tail (marked #1)	2520
#2 Complete wing (steel dorsal match)	3780
#3 RH wing	3530
#3 LH wing	3380
#3 LH centering and operating mechanism	3480
#3 Vertical tail (marked #3)	3250
#3 RH fuselage section	3210
#3 LH fuselage section	3460
#3 Foward fuselage section	3520
#4 LH wing	2350
#4 RH wing	4380
#4 Main fuselage section w/vertical tail (marked #4)	4330
#4 Foward fuselage section	4530

a. Aircraft #1. The major portions of both wings were found with the aileron actuators and the associated operating mechanism. Everything in the RH wing was intact. In the LH wing the aileron centering mechanism was attached but its mounting support was broken. Examination of the fracture surfaces showed that failure was from overload. The servo valves for both aileron actuators were checked for lap leakage. The lap leakage was within the specified T.O. limits. Servo valve operation was free and smooth. The spools would fall freely under their own weight when held in the vertical position. All aileron control valve filters were clean and in good condition. The LH filters were unmodified. The pressure relief valves were tested and functional operation was good. The results are tabulated later in the report. Aileron position at impact was not determined. Marks in the aileron cylinder were light and initial impact marks could not be differentiated from those occurring during the ensuing breakup. Recovered parts are identified as follows:

LH Aileron Actuator
P/N 2-43160-507
S/N R6240
Servo Valve P/N 6U60007-3 S/N 635C

RH Aileron Actuator
P/N 2-43160-508
S/N R6344
Servo Valve P/N 6U6007-4 S/N 858C

Aileron Trim Actuator - Recovered but not identified to aircraft. See section under trim.

Aileron Operating Mechanism
LH 2-74152-1
RH 2-74152-2

Centering Mechanism Support - 2 ea
P/N 2-74190-1

b. Aircraft #2. The basic wing structure on this aircraft was found with the aileron actuator and associated operating mechanism intact in their respective areas with the exception of the LH aileron centering mechanism. It was attached but its mounting support was broken. Examination of the fracture surfaces showed that failure was from overload. The servo valves for both aileron actuators were checked for lap leakage. The lap leakage was within the specified T.O. limits. Servo valve operation was free and smooth. The spools would fall freely under their own weight when held in the vertical position. All aileron control valve filters were clean and in good condition. The pressure relief valves were tested and functional operation was good. The results are tabulated later in the report. Impact marks found in the LH aileron outboard cylinder were judged to have been made at initial impact. These marks correlated to a .5 degree to 2 degrees TE (trailing edge) up position at the time of impact. Other marks in the cylinders occurred during the ensuing breakup. Recovered parts are identified as follows:

LH Aileron Actuator
P/N 2-43160-507
S/N R6375
Servo Valve P/N 6U6007-3 S/N 698C

RH Aileron Actuator
P/N 2-43160-508
S/N R6382
Servo Valve P/N 6U6007-4 S/N 735C

Aileron Trim Actuator - Recovered but not identified to aircraft. See section under trim.

Aileron Operating Mechanism
LH 2-74152-1
RH 2-74152-2

Centering Mechanism Support
P/N 2-74190-1

c. Aircraft #3. The RH wing of the aircraft was found with the actuator, operating and centering mechanism installed. The LH wing with actuator was found separated from the LH operating and centering mechanism. Both mechanisms were found broken where the stop adjustment bolt passes through the servo input arm. Continuity of the LH mechanism was established by matching fracture surfaces. The RH aileron centering mechanism was attached but the mounting supports were broken. Examination of these fracture surfaces showed that failure was from overload. The servo valves for both aileron actuators were checked for lap leakage. The lap leakage was within the specified T.O. limits. Servo valve operation was free and smooth. The spools would fall freely under their own weight when held in a vertical position. The aileron control valve filters were clean and in good condition. The pressure relief valves were tested and functional operation was good. The results are tabulated later in the report. Impact marks found in the LH inboard cylinder were judged to have been made at the initial impact and correlate to a 2.5 degree TE down position at the time of impact. Numerous other marks were judged to be secondary impact marks. Recovered parts are identified as follows:

LH Aileron Actuator
P/N 2-43160-507
S/N R6356
Servo Valve P/N 6U6007-3 S/N 690C

RH Aileron Actuator
P/N 2-43160-508
S/N R6376
Servo Valve P/N 6U6007-4 S/N 727C

Aileron Trim Actuator - Recovered but not identified to aircraft. See section under trim.

Aileron Operating Mechanism
LH 2-74152-1
RH 2-74152-2

Centering Mechanism Support - 2 ea
P/N 2-74190-1

d. Aircraft #4. The major portions of both wings were found with the aileron actuators and the associated mechanism. Everything in the RH wing was intact. In the LH wing, the aileron centering mechanism was attached but its mounting support was broken. Examination of the fracture surfaces show that failure was from overload. The spools in both servo valves were bound up and lap leakage checks could not be made. The aileron control valve filters were clean and in good condition. All filters were unmodified. The relief valves were tested and functional operation was good. The results are tabulated later in this report. Impact marks found in the LH outboard cylinder were judged to have been made at the initial impact. These marks correlate to a 2.5 degrees TE up position at the time of impact. Numerous other marks were judged to be secondary impact marks. Recovered parts are identified as follows:

LH Aileron Actuator
P/N 2-43160-507
S/N R6275
Servo Valve P/N 6U6007-3 S/N 708C

RH Aileron Actuator
P/N 2-43160-508
S/N R5827
Servo Valve P/N 6U6007-4 S/N F255C

Aileron Trim Actuator - Recovered but not identified to aircraft. See section under trim.

Aileron Operating Mechanism
LH 2-74152-1
RH 2-74152-2

Centering Mechanism Support - 2 ea
P/N 2-74190-1

Aileron Trim - Component pieces of four aileron trim actuators were recovered separated from the aircraft. A correlation could not be made to match the aileron trim actuators to the aircraft by fracture surfaces, since the matching mechanisms of the under cockpit area were also destroyed and separated from the aircraft.

Measurements made from radiographic film of the recovered trim actuators follow:

TAG NUMBER	MEASUREMENT
1164	.5 degrees left aileron down
2330	shaft missing - not readable
2510	.2 degrees left aileron up
4211	.5 degrees left aileron down

5. YAW AXIS.

a. Correlation of Parts. Hydraulic components of the rudder control system of the #1, #2, and #4 aircraft were found attached to the aft fuselage section and identifiable to the aircraft through the vertical tail. The #3 rudder components were correlated to the #3 vertical tail by exclusion, since the other aircraft retained their components. Component parts were matched as follows:

ITEM	TAG NUMBER
#1 Aft fuselage section w/tail	2520
#2 Aft fuselage section w/tail	2550
#3 Vertical tail	3250
#3 RH fuselage section	3210
#3 LH fuselage section	3460
#3 Rudder	4180
#3 Rudder force producer	3347
#4 Aft fuselage section w/tail	4330

b. Continuity. Continuity of the rudder system from the force producer to the servo valves was established by matching of fracture surfaces for each aircraft. The mechanical linkage from the force producer to the servo valves remained with the #1, #2, and #4 aircraft. The force producer, left and right aft fuselage section, vertical tail, and rudder were found separated on the #3 aircraft. Continuity of the #3 rudder mechanical linkages was established by matching fracture surfaces of the broken linkages contained in the separate pieces of structure. All fractures in each of the aircraft linkages from the force producer to the servo valves were determined to have resulted from overload failure. Examination of the broken cable ends attached in each aircraft showed evidence of tensile overload failure. No evidence of inflight disconnect or foreign object restriction was found in any of the rudder operating mechanisms or linkages.

(1) Aircraft #1. Both rudder actuators and the SAS (electro hydraulic servo) actuator were with the vertical tail assembly. The rudder actuators were broken out at the end cap attachment point. LH (left hand) servo input crank was still attached to broken input arm. RH (right hand) servo input crank was missing. Examination of fracture surfaces found they failed in overload. The SAS actuator was attached at both ends. The servo valves were free and smooth in operation. Control valve filters were examined. No visible contamination present. Pressure relief valves were tested. The RH relief valve did not meet the prescribed cracking/reseat pressures. The cracking pressure was 1800 PSI. The relief valve was retested and cracking occurred at 3450 PSI and reseat was at 3100 PSI. The cause of the low initial cracking pressure is not known. Impact marks found in the rudder cylinder barrels indicate a rudder position of approximately 2.5 degrees right rudder at the time of impact. There were no impact marks in the SAS actuator barrel. Recovered parts were identified as follows:

LH Rudder Actuator
P/N 2-43330-507
S/N 943
Servo Valve P/N 6U6009-1 S/N M31

RH Rudder Actuator
P/N 2-43330-508
S/N B-587
Servo Valve P/N 36400-2 S/N 2328

Electro Hydraulic Servo Valve (SAS)
P/N 3-43260-505
S/N R902

(2) Aircraft #2. Both rudder actuators and the SAS actuator were found with the vertical tail assembly. The LH rod end attach point was broken out. The linkage to the servo input crank of both actuators was still attached. The RH actuator was attached at both ends. The SAS was separated at its forward attach point. Examination of fracture surfaces determined that failure resulted from overload. The servo valves were free and smooth in operation. Control valve filters were examined. No visible contamination was present. Both relief valves were tested and functional operation was good. Impact marks on the RH cylinder barrel indicate a rudder position of approximately 2.5 degrees right rudder at impact. There were no impact marks in the SAS actuator barrel. Rudder parts recovered were identified as follows:

LH Rudder Actuator
P/N and S/N name plate missing
Servo Valve P/N 6U6009-1 S/N D2466

RH Rudder Actuator
P/N 2-43330-512
S/N 3141
Servo Valve P/N 6U6009-2 S/N 635C

Electro Hydraulic Servo Valve (SAS)
P/N 3-43260-505
S/N R2862

(3) Aircraft #3. Both rudder actuators and the SAS actuator were recovered. Only the LH rudder actuator, attached by rod end, was still in the vertical tail assembly. The SAS actuator and RH rudder actuator were completely separated from the vertical tail assembly. The servo valves were free and smooth in operation. Control valve filters were examined. No visible contamination was present. Both pressure relief valves were tested and functional operation was good. Impact marks found in RH cylinder barrel indicate a rudder position at impact of 1.5 degrees left rudder. There were no impact marks in the SAS actuator barrel. Recovered parts were identified as follows:

LH Rudder Actuator
P/N 3-43260-505
S/N P493

RH Rudder Actuator
P/N and S/N name plate missing
Servo Valve P/N 6U6009-2 S/N B21

Electro Hydraulic Servo Valve (SAS)
P/N 3-43260-505
S/N P493

(4) Aircraft #4. Both rudder actuators and the SAS actuator were found in the vertical intact. Rudder control input linkage was attached. The servo valves were free and smooth in operation. Control valve filters were examined. No visible contamination was present. Both pressure relief valves were tested and functional operation was good. Impact marks on the RH actuator cylinder barrel indicate 4.5 degrees right rudder at impact. Records show that the aircraft was rigged with 8/32 inch left rudder. This amount of rudder would be out of the SAS authority range and indicates a rudder input. The measured aircraft heading at impact was within one degree of the other three aircraft. There were no impact marks in the SAS actuator barrel. Recovered parts were identified as follows:

LH Rudder Actuator
P/N 2-43330-509
S/N R1685
Servo Valve P/N 6U6009-1 S/N V66

RH Rudder Actuator
P/N 2-43330-508
S/N R30
Servo Valve P/N 6U6009-2 S/N A87

Electro Hydraulic Servo Valve (SAS)
P/N 3-43260-505
S/N R2442

6. PITCH AXIS.

a. Correlation of Parts. The horizontal stab hydraulic actuators, torque tubes, outboard bearing housing support, and mating boatail structure were severely damaged during breakup and post impact fire. The hydraulic actuators of the #1 aircraft were identified by matching the fracture surfaces of the end caps to the mating pieces on the LH (left hand) and RH (right hand) torque tube segments. The LH and RH torque tube segments separated through the taper pins and were matched to each other by mating fracture surfaces. This assembly was then matched to the #1 aft fuselage section (containing the #1 vertical tail) through a segment of the burned boatail structure on the LH side. The match of the #1 aircraft components did not require any reliance on location in the wreckage scatter pattern. The #2, #3, and #4 aircraft hydraulic actuators were matched to their respective torque tubes by matching fracture surfaces. The identifying of these assemblies to the #2, #3, and #4 aircraft relies on their position in the wreckage pattern and, therefore, is considered tentative. Parts were identified as follows:

ITEM	TAG NUMBER
#1 LH hydraulic actuator	3260
#1 LH actuator end cap	1105
#1 RH hydraulic actuator	3670
#1 LH torque tube	2090
#1 RH torque tube	3180
#1 LH bearing support structure	1103
#1 Main fuselage w/vertical (marked #1)	2520
#2 LH hydraulic actuator	4490
#2 LH actuator rod end	2370
#2 RH hydraulic actuator	2400
#2 Whole torque tube	2260
#3 LH hydraulic actuator	4480
#3 LH actuator rod end	2410
#3 RH hydraulic actuator	3230
#3 Whole torque tube	3205
#4 LH hydraulic actuator	1190
#4 LH actuator end cap	4245
#4 RH hydraulic actuator	4450
#4 LH torque tube	4320
#4 RH torque tube	1200

(1) Aircraft #1. Both horizontal stabilizer control actuators were separated from the aircraft. The LH actuator rod end was still attached to a piece of the end cap structure. The end cap separated at the end cap bearing and also at the point where the end cap screws into the actuator housing. The RH actuator separated at the rod end attach point and at the end cap bearing. Examination of the fracture surfaces found that failure was from overload. The servo valve input cranks were broken off. The LH servo valve operation was free and smooth. The spool would fall freely under its own weight when held in a vertical position. Valve lap leakage was checked and was within the specified T.O. limits. The RH servo valve was binding and could not be checked for lap leakage. The pressure relief valves from the two horizontal stabilizer hydraulic manifolds were tested and functional operation was good. The results are tabulated later in the report. The horizontal stabilizer system filters were examined. There was no visible contamination present. Impact marks on both the LH forward and RH forward cylinder barrels correlate to 7 degrees or 11 degrees TE (trailing edge) up stabilizer position at impact, depending on which edge of the piston made the marks. Recovered parts were identified as follows:

LH Horizontal Stabilizer Actuator
P/N name plate missing
S/N name plate missing (3260)
Servo Plate P/N 66500-301X S/N 334

RH Horizontal Stabilizer Actuator
P/N name plate missing
Servo Valve P/N name plate missing

Pitch Trim Actuator - Recovered but not identified to particular aircraft. See section on pitch trim.

L/H Manifold

R/H Manifold

(2) Aircraft #2. Both horizontal stabilizer control actuators were separated from the aircraft. The RH actuator rod end and a short piece of the piston rod were broken off. The rod end had also separated from its attach point. The end cap separated at the end cap attach bearing. The RH actuator was attached to a piece of structure. The end cap was still attached to the torque tube control horn. It had separated at the point where the end cap screws into the actuator housing. Examination of the fracture surfaces found that failure was from overload. The servo valve input cranks were broken off. The servo valve operation was free and smooth. Spools would fall freely under their own weight when held in a vertical position. Valve lap leakage was checked and was within the specified T.O. limits for both servo valves. Only six of the eight horizontal stabilizer manifolds were found and could not be matched to this aircraft. The pressure relief valves for those recovered were tested and the results are tabulated later in this report. The hydraulic system filters were examined for contamination. There was no visible contamination present. Heavy impact marks in the LH forward cylinder barrel and light marks in the LH aft cylinder barrel correlate to 11 degrees and 10.8 degrees TE up position of the horizontal stabilizer at the time of impact. Recovered parts were identified as follows:

LH Horizontal Stabilizer Actuator
P/N 4-43200-50
S/N B795
Servo Plate P/N 66500-301X S/N 1402

RH Horizontal Stabilizer Actuator
P/N and S/N name plate missing
Servo Valve P/N 6U6019-2 S/N B324L

Pitch Trim Actuator - Recovered but not identified to a particular aircraft. See section on pitch trim.

(3) Aircraft #3. Both horizontal stabilizer actuators were separated from the aircraft. The LH rod end and a section of the piston rod had separated from the actuator. The end cap had separated at the end cap bearing. The RH rod end had separated from its attach point and the end cap had separated at the point where the end cap screws into the actuator housing with the end cap still attached to the torque tube horn. Examination of the fracture surfaces found the failures to be from overload. The servo input cranks were broken off. The LH servo valve operation was smooth and free. The spool would fall under its own weight when held vertically. Valve lap leakage was checked and was within the specified T.O. limits. The RH servo valve was binding and could not be checked for lap leakage. Only six of eight stabilizer manifolds were found and four of these could not be identified to a particular aircraft. The pressure relief valves for those recovered were tested and the results are tabulated later in this report. Impact marks found in three of four cylinder barrels correlate to 7.3 degrees and 7.6 degrees TE up position at the time of impact. Recovered parts were identified as follows:

LH Horizontal Stabilizer Actuator
P/N and S/N name plate missing
Servo Valve P/N 6U6019-1X S/N E124G

RH Horizontal Stabilizer Actuator
P/N and S/N name plate missing
Servo Valve P/N 6U6019-2 S/N C157HCL

Pitch Trim Actuator - Recovered but not identified to a specific aircraft. See section on pitch trim.

(4) Aircraft #4. Both horizontal stabilizer actuators were separated from the aircraft. The LH rod end had separated from its attach point and the end cap had separated at its bearing and at the point where it screws into the actuator housing. The RH rod end had separated at its attach point and the end cap had separated at the point where it screws into the actuator housing. The right hand end cap was still attached to the torque tube horn. The LH servo spool was binding. The RH servo was free and smooth. The spool would fall under its own weight with the servo held in a vertical position. Valve lap leakage was checked and the lap leakage was within the specified T.O. limits. Only six of the eight stabilizer manifolds were found. Four of these manifolds could not be identified to a specific aircraft. The pressure relief valves for those recovered were tested and the results tabulated later in this report. Impact marks found in the RH forward cylinder barrel correlate to 10.5 degrees or 6.4 degrees TE up position of the horizontal stabilizer at the time of impact depending on which edge of the piston made the marks. Recovered parts were identified as follows:

LH Horizontal Stabilizer Actuator
P/N and S/N name plate missing
Servo Valve P/N 6U6019-1 S/N A808

RH Horizontal Stabilizer Actuator
P/N and S/N name plate missing
Servo Valve P/N 6U6019-2 S/N C172HL

Pitch Trim Actuator - Recovered but not identified to a specific aircraft. See section on pitch trim.

b. Horizontal Trim. Four pitch trim actuators, P/N 6-73905-3, were found in a severely damaged condition, separated from the aircraft. A match of the pitch trim actuators to the aircraft could not be made by fracture surfaces. The horizontal tail operating mechanisms (mixer) (birdcage), which contains the pitch trim actuator, were separated and completely destroyed with pieces intermixed during aircraft breakup. Measurements made from radiographic film (x-ray) of the pitch trim actuators are listed below:

TAG #	Y(1)	TRIM(2)(-1° rig)	TRIM(3)(-2° rig)	SERIAL NO.	P/N
1151	2.45	.8° (TE up)	.2° (TE down)	Plate Missing	6-73905-3
3360	2.75	1.4° (TE up)	.4° (TE up)	F0627	6-73905-3
4175	1.75	0°	1.0° (TE down)	Plate Missing	6-73905-3
4XXX	2.05	.3° (TE up)	.7° (TE down)	Plate Missing	6-73905-3

(1) Y is defined in NOR 78-138, page II-7, and was measured directly from the x-ray.

(2) These angles assume the aircraft was rigged as per T.O. 11-38A-102, figure 4-3, page 4-4 (1.00 degree full nose down trim).

(3) These angles assume that the aircraft was rigged to a 2-degree full nose down setting. Measurements of full nose down trim settings taken from the remaining (three) Thunderbird aircraft available at Nellis AFB, NV were as follows:

ACFT S/N	TRIM SETTING	REF. DISTANCE	ACTUATOR P/N
64-13168	2.27° (TE down)	10.85"	6-73905-3
68-8137	2.06° (TE down)	10.75"	6-73905-1
68-8106	1.96° (TE down)	10.70"	6-73905-3

It was not possible to determine the full nose down trim rig points of the mishap aircraft since the components necessary to accomplish this measurement were destroyed by ground impact. Based on the measurements obtained from the remaining aircraft, it is unlikely that the mishap aircraft were rigged to the T.O. limit (1.00 degree full down trim), but rather were approximately 2 degrees full nose down trim. A comparison of the stabilizer position data determined through barrel impact marks with the trim actuator data shows that an aircraft rigged to 2 degrees full nose down trim would require 9 to 12 pounds greater stick force to achieve the mishap stabilizer positions than an aircraft rigged to one degree full nose down trim.

c. Mechanical Linkages. The horizontal tail operating mechanisms of each aircraft were completely destroyed and intermixed during the aircraft breakup. This condition eliminated the possibility of a physical reconstruction of the horizontal control system mechanical linkages. Barrel impact marks were found in all 8 aircraft pitch hydraulic actuators between 7 and 11 degrees TE up. These marks establish that the system was functioning with the mechanical control linkages continuous from the stick to the servo valves. No evidence of foreign object restriction or binding was found in any of the component pieces examined.

d. Supplemental Data. A teardown analysis of the four pitch trim actuators will be provided as a supplement to this report.

7. HYDRAULIC SYSTEM.

a. Hydraulic Pumps and Relief Valves. All eight hydraulic pumps were recovered. The pumps were still installed in aircraft #1. The #2 accessory drive was adjacent the #2 aft fuselage section with the pumps installed. Serial numbers were obtained from aircraft records; however, only one hydraulic pump (from #1 aircraft) had a name plate and the serial number matched the aircraft record. The pumps in #1 aircraft were subjected to fire. Burnt hydraulic fluid had seized the piston and block assembly. Disassembly determined that at the time of the fire, the pumps were not turning. The remaining six pumps could be turned by hand. There was no internal damage to any of the pumps. Since rotational power from both the accessory drive gearboxes was available (see the electrical section), the hydraulic pumps were capable of producing hydraulic pressure. Recovered parts were identified and recorded by serial number as follows:

SYSTEM	PUMP SERIAL NUMBER
#1 - S/N 68-8156	
Utility	B4947
Flight Control	A53170
#2 - S/N 68-8184	
Utility	B4450
Flight Control	A5870
#3 - S/N 68-8176	
Utility	B4959
Flight Control	34429
#4 - S/N 69-8175	
Utility	A4117
Flight Control	A52724

All relief valves were removed from their respective components and functionally tested. Cracking/reseat pressures were recorded as follows:

#1 Aircraft

LH aileron (flight control)	3500/3400
LH aileron (utility)	3400/3100
RH aileron (flight control)	3300/3100
RH aileron (utility)	3300/3200
LH horizontal stabilizer (utility)	3525/2750
RH horizontal stabilizer (flight control)	3500/3125
LH rudder	3300/3100
RH rudder	1800/1000*

*NOTE: This relief valve was retested and the cracking/reseat pressures were 3450/3100.

#2 Aircraft

LH aileron (flight control)	3300/3200
LH aileron (utility)	3500/3100
RH aileron (flight control)	3500/3100
RH aileron (utility)	3500/3400
LH horizontal stabilizer (utility)	See Below
RH horizontal stabilizer (flight control)	See Below
LH rudder	3400/3200
RH rudder	3300/3150

#3 Aircraft

LH aileron (flight control)	3300/3200
LH aileron (utility)	3300/3100
RH aileron (flight control)	3400/3000
RH aileron (utility)	3300/3200
LH horizontal stabilizer (utility)	See Below
RH horizontal stabilizer (flight control)	See Below
LH rudder	3400/3100
RH rudder	3400/3100

#4 Aircraft

LH aileron (flight control)	3400/3300
LH aileron (utility)	3500/3100
RH aileron (flight control)	3400/3300
RH aileron (utility)	3300/3100
LH horizontal stabilizer (utility)	See Below
RH horizontal stabilizer (flight control)	See Below
LH rudder	3300/2800
RH rudder	3200/2800

*NOTE: Test results for horizontal stabilizer pressure relief valves which could not be identified to specific aircraft are listed below. Two manifold assemblies, which contain the relief valves, were not found.

LOCATION # FROM WRECKAGE PLOT	S/N	CRACKING/RE-SEAT PRESSURE
4250	17018	3400/2800
3183	18291	3400/3100
2250	16973	3450/3100
4231	17108	3525/2650

b. Hydraulic System Filters. The filters for #1 aircraft horizontal stabilizer control system and the hydraulic system filters for #2 aircraft were recovered. Various other filters were also recovered but could not be identifield to a specific aircraft. All recovered filters were examined. There was no visible contamination present in any of the filters.

8. ELECTRICAL POWER.

Both accessory drive gearboxes were found installed in the #1 fuselage with both AC generators and hydraulic pumps attached. Both AC generators were removed and disassembled. Light rotational scoring was found on both AC generator armatures and fields. The aft fuel boost pump was also found in the #1 fuselage.

Examination of the aft boost pump showed light rotational scoring on the armature. These facts collectively establish that AC electrical power was available to the #1 aircraft at impact. Recovered parts were identified as follows:

ITEM	P/N	S/N
RH AC Generator	904J026-5	1313
LH AC Generator	904J026-5	405
RH Gearbox	3-51100-1	Plate Missing
LH Gearbox	3-51100-1	Plate Missing

Component pieces of the remaining seven boost pumps were found separately. All showed signs of light rotational scoring. Although these pumps could not be matched to the aircraft from which they separated, the boost pumps collectively establish that AC electrical power was also available to aircraft #2, #3, and #4.

9. FLAP SYSTEM.

All eight flap actuators were recovered and found with their respective crank arms attached. All actuators separated from the motor end. The actuators fractured at several points from their respective aircraft. Examination of fracture surfaces on the actuators showed overload failure. Due to heavy structural damage to the underside of the aircraft, the actuators could not be correlated to a specific aircraft. Measurements taken from crank arm position on all flap actuators showed all flaps to be in the full up position. Recovered actuators were identified as follows:

ITEM	P/N	S/N	TAG NUMBER
Flap Motor (RH)	3-74210-404	Plate Missing	2490
" (RH)	"	"	2590
" (RH)	"	"	3515
" (RH)	3-74210-404	"	4410
" (LH)	3-74210-401	"	2580
" (LH)	"	"	3560
" (LH)	"	"	3570
Flap Motor (LH)	3-74210-401	Plate Missing	4550

10. LANDING GEAR.

The condition and position of the nose gear on all aircraft could not be determined. All nose gear assemblies had separated from their respective aircraft. The condition and position of the main landing gear by individual aircraft follows.

a. Aircraft #1. The right and left main landing gears remained attached to their respective mounting points. The RH (right hand) torque cylinder was found attached to the wing by the rod end but had separated in the wing cavity. The LH (left hand) MLG (main landing gear) strut, trunion, and torque cylinder were attached. The main gear doors and door locks were destroyed, and their position at impact could not be determined. The left and right gear strut locking rollers had some distortion, indicating the gear was forced out of the uplock hooks during impact or aircraft breakup. These components collectively establish that the main gears were up and locked at impact.

b. Aircraft #2. The complete wing of the #2 aircraft was found inverted with both main landing gears and strut doors attached. The left gear was still in the up and locked position. There was no damage to the landing gear and strut doors, particularly the leading edges of the doors. Although the RH gear was found slightly out of wing cavity, a deep mark was found in the right gear uplock roller indicating that the right gear had been forced out of the locked position. The inboard landing gear doors were missing. The forward locks were in the locked position with one of the door rollers in its grasp. These components collectively establish that the main gears were up and locked at the time of impact.

c. Aircraft #3. Both the LH and RH landing gear struts were broken/ shattered with the wheels/brakes completely separated from the aircraft. The upper end of the strut assemblies were still attached to the wing. The RH gear door actuator was closed and the torque cylinder fully extended indicating that the gear was retracted at impact. The uplock hooks show distortion indicating the landing gear was forced from the uplocks by impact or aircraft breakup.

d. Aircraft #4. The RH landing gear was found attached to the wing and complete, except for the tire and torque cylinder. The LH strut was broken off near the wing with the wheel, torque cylinder, uplock and lower strut missing. Examination of uplock rollers and hooks shows distortion indicating that the gear was forced from the uplocks by impact or aircraft breakup.

The recovered components collectively establish that the main landing gear on all four aircraft were up and locked at impact.

11. SPEEDBRAKES.

Pieces of speedbrake surfaces were found in all impact zones. Seven of eight speedbrake actuators were recovered from the accident site. The actuators were disassembled and all showed impact marks in the retracted position, indicating the surfaces were in the closed position. Actuators could not be correlated to any specific aircraft. Recovered parts were identified as follows:

ITEM	P/N	S/N	TAG NUMBER
Speedbrake Actuator	2-43100-1	Plate Missing	3155
"	"	"	3270
"	"	"	3340
"	"	"	1214
"	"	"	2220
"	"	"	4255
Speedbrake Actuator	2-43100-1	Plate Missing	4167

12. FUEL SYSTEM.

The fuel system in all aircraft were destroyed by impact and post impact fire. All fuel shut-off valves and cross feed valves were recovered. All fuel shut-off valves were found in the open position and the fuel cross feed valves were in the closed position. Portions of all fuel boost pumps were recovered. Boost pumps were disassembled and examined. Rotational scoring found on the end caps or the armature indicated that all pumps were operating at the time of impact. The fuel strainers that remained intact reveal no evidence of contamination. No evidence was found to indicate an inflight failure of the fuel systems. Recovered parts were identified as follows:

ITEM	P/N	S/N	TAG NUMBER
Boost Pump, bottom missing	4-52914-1	1000187	2190
Boost Pump, whole	"	Ser Plate Missing	1215
" , whole, aft	"	"	1240
" , bottom missing	"	"	1250
" , top missing	"	"	2520
" , bottom missing	"	"	3610
" , bottom missing	"	"	4187
" , top only	"	"	4310
Boost Pump, body only	4-52914-1	"	4571
Cross Feed Valve	3-52905-503	"	2160
Shut-off Valve	"	"	3081
"	"	"	3081
"	"	"	2520
"	"	"	2520
Cross Feed Valve	"	"	2520
"	"	"	4430
Shut-Off Valve	"	"	1130
"	"	"	1240
"	"	"	1240
Cross Feed Valve	"	"	1240
Shut-Off Valve	"	"	2160
"	"	"	3082
Shut-Off Valve	3-52905-503	Ser Plate Missing	3082

13. THROTTLE SYSTEM.

The #1 aircraft aft quadrant was found still attached to the aft section containing the vertical (Tag #2520). The aft throttle quadrant had partially melted in place from the post impact fire. The RH teleflex cable was continuous from the melted quadrant end to a separation approximately ¼ inch above the upper mount. The LH teleflex cable separated at the aft quadrant arm. Examination of the fracture surfaces showed evidence of overload. Both throttle cables were encased by the molten aft quadrant metal and terminated approximately 5 feet forward. Examination of the cable ends showed tensile overload failure. This data collectively shows that both throttle mechanisms and linkages were connected at impact. No evidence of disconnect or foreign object restriction was found.

The aft throttle quadrant of the #2 aircraft was found attached to structure containing the accessory drive gearboxes (Tag #2540). Both the LH (left hand) and RH (right hand) teleflex cables had separated between the quadrant and upper mounts. Approximately one foot of teleflex and fixed end remained attached to the intact aft throttle quadrant. A short piece of control cable remained with the LH quadrant. Examination of the LH and RH teleflex ends and the LH control cable showed evidence of tensile overload failure. These components collectively establish that the #2 throttles were connected at impact. No evidence of disconnect or foreign object restriction was found.

A 12-inch piece of the LH teleflex cable of the #3 aircraft was found attached by the upper mount and separated between the quadrant and upper mount. The aft quadrant, RH teleflex, and control cables were not recovered. Continuity of the #3 aircraft throttle system could not be established.

A section of the #4 aircraft aft fuselage section, containing the vertical (Tag #4330), was found with an 8-inch piece of the LH teleflex housing connected to the upper mount. The aft quadrant, RH teleflex, and control cables were not recovered. Continuity of the #4 aircraft throttle system could not be established.

14. SUMMARY.

a. Impact marks were found in the hydraulic flight control actuators which correspond to the following positions:

AIRCRAFT	#1	#2	#3	#4
Aileron Actuators (LH)	No Marks	0.5^{o}-2^{o} Up	2.5^{o} Down	2.5^{o} Up
Rudder Actuators	2.5^{o} Right	2.5^{o} Right	1.5^{o} Left	4.5^{o} Right
Stab Actuators (TE)	7, 11 Up	10.8, 11 Up	7.3, 7.6 Up	6.4, 10.5 Up

b. Pitch trim actuators were not correlated to aircraft nor could rig be determined. Positions for the actuators were measured as follows:

TAG #	1151	3360	4175	4XXX
-1^{o} Rig	0.8^{o} TE Up	1.4^{o} TE Up	0^{o}	0.3^{o} TE UP
-2^{o} Rig	0.2^{o} TE Down	0.4^{o} TE Up	1.0^{o} TE Down	0.7^{o} TE Down

c. Aileron trim actuators were not correlated to aircraft but had position as follows:

TAG #	1164	2330	2510	4211
Reading	0.5^{o} LH Down	Shaft Missing	0.2^{o} LH Up	0.5^{o} LH Down

d. No marks were found in the four SAS actuators to determine rudder trim.

e. Flap actuators were not correlated to aircraft but all eight were full up.

f. Seven of eight speedbrake actuators were recovered but not correlated to aircraft. All seven were in the closed position.

g. All fuel boost pumps, shutoff valves, and cross feed valves were recovered. Only the aft #1 boost pump was correlated to aircraft. All boost pumps were running, all shutoff valves were open. All cross feed valves were closed. Throttle continuity was verified on #1 and #2 aircraft.

h. AC electrical power was available to all aircraft, since all boost pumps were running.

i. All main landing gears were correlated to aircraft. All main landing gears were determined to be up and locked at impact. Nose landing gears were not correlated to aircraft or positions determined.

j. All eight hydraulic pumps were recovered and correlation was made on the #1 and #2 aircraft pumps. All eight hydraulic pumps were functional at impact, all relief valves were recovered except for two speedbrake manifolds and two horizontal stab manifolds. Correlation was made on all aileron relief valves and the #1 horizontal stab manifolds. No speedbrake manifolds were correlated. All recovered relief valves functioned within the operational ranges. No evidence of contamination was found in any of the recovered filters.

k. No evidence was found in any of the aircraft flight control mechanisms or linkages to indicate inflight disconnect or foreign object restriction.

l. A separate teardown analysis of the pitch trim actuators will be provided.

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AIRCRAFT MISHAP INVESTIGATION
THUNDERBIRD AIRCRAFT
#1 - 68-8156
#2 - 68-8184
#3 - 68-8176
#4 - 68-8175
18 January 1982
ENGINE ANALYSIS REPORT

At the crash site, engines from the four aircraft were found scattered over a wide area. All afterburners and main fuel controls (MFCs) had separated from the main engines. All engines had sustained considerable external damage. Because of the number of aircraft involved and the way the engines were scattered around, it was not possible to positively identify the parts to a particular aircraft or engine position. It was necessary to use the engine records to identify an individual afterburner, MFCs, and engine to each aircraft engine position. We covered all engines, afterburners, and MFCs. They were moved to Nellis AFB for investigation.

1. SUMMARY OF FINDINGS.

#1 Aircraft - Both engines were operating properly. They were running between 77% and 85% RPM at the time of impact.

#2 Aircraft - Both engines were operating properly. They were operating between 82% and 90% at impact.

#3 Aircraft - The engines were operating normally. They were running between 86% and 95% at impact.

#4 Aircraft - The engines were functioning properly. They were operating between 82% and 90% at impact.

There was no evidence of a mechanical failure in any of the engines. There was nothing found which could have prevented the engines from operating at any selected engine speed.

2. EXAMINATION OF INDIVIDUAL ENGINES.

a. Aircraft #1 - 68-8156.

(1) Number 1 Engine - S/N 232-802: The engine had one bleed valve open and one closed. Removal and inspection of the open valve showed it to be damaged by impact and that the valve had opened after hitting the ground. The other valve had considerable dirt packed behind the gates. This indicates the engine was turning sufficiently to pull in this dirt. The gates are fully closed at 69% RPM. The top half of the compressor case was removed. The compressor rotor had considerable dirt throughout. Several foreign objects were found between the stages. Pieces of the airframe were found between stages 3 and 4 and between stages 4 and 5. A portion of a spring was found between stages 4 and 5. The presence of this material indicates the engine was operating at the time the airframe began coming apart. All the first, second and third stage blades had leading edge tip curl. This indicates the engine was operating at moderate to high RPM at impact. The turbine rotor sustained only light damage. This is not unusual, since the turbine case was still intact and there was little impact damage to the aft end of the engine. The engine had Detroit Diesel fuel nozzles. Disassembly of the main fuel control and inspection of the 3-D cam indicated the engine was running 77% to 85% at first impact. There was no indication of a mechanical failure prior to impact.

(2) Number 2 Engine - S/N 231-869: Both bleed valves were closed. When removed, both had considerable dirt packed behind the gates. The top half of the compressor case was removed. Dirt was found throughout. Airframe metal was found between stages 2 and 3, stages 4 and 5, and stages 7 and 8. This indicates the engine was running at impact. All the stage one turbine blades had been destroyed on impact. About a third of the stage 2 blades were gone.

All the remaining ones were bent. The engine had Detroit Diesel fuel nozzles. The fuel control was disassembled. The 3-D cam indicated it was operating 77% to 85% RPM at impact. There was no evidence of a mechanical failure prior to impact.

b. Aircraft #2 - 68-8184.

(1) Number 1 Engine - S/N 231-874: The engine compressor case had ripped off at impact. All the compressor blades were bent in the opposite direction to rotation. This indicates the engine was operating at moderate to high RPM. The turbine case was removed. The leading edges of the first stage blades were bent forward. This also indicates a moderate to high speed at impact. The engine had Delevan fuel nozzles with an "L" on the end cap. This indicates TCTO 2J-J85-925 had been complied with and the proper locking assemblies were installed. The main fuel control 3-D cam indicated the engine was operating from 82% to 90% RPM at impact. There was no evidence of a mechanical failure prior to impact.

(2) Number 2 Engine - S/N 232-218: A small amount of dirt was found behind the bleed valves, indicating the engine was turning when it struck the ground. The first two stages of the compressor rotor were missing. The stage 3 blades were bent opposite to the direction, indicating a moderate to high RPM. The turbine case and all turbine blades had separated from the engine during impact. The engine had Detroit Diesel fuel nozzles. We were not able to positively identify the main fuel control that was on this engine. (See section on unidentified fuel controls.) However, because of its location at the site, it appears control B was on this engine. It had a 3-D cam reading from 82% to 90% RPM. There was no evidence of a mechanical failure prior to impact.

c. Aircraft #3 - 68-8176.

(1) Number 1 Engine - S/N 230-895: The bleed valves were missing from this engine. The top half of the compressor case was removed. The tips of all blades were bent opposite to the direction of rotation. The first stages blade's leading edges were jagged from ingestion of foreign material. Both of these indicated the engine was rotating at moderate to high RPM at impact. During removal of the compressor case, a piece of the aircraft inlet duct fell out. The piece was badly chewed up. This also indicated the engine was rotating at impact. The combustor and turbine had separated from the main engine. The turbine case was gone. The stage one blades were all missing. The stage 2 blades had their leading edge tips bent opposite to the direction of rotation. This again indicates a moderate to high RPM at impact. The engine had Detroit Diesel fuel nozzles. The main fuel control 3-D cam indicated it was operating from 87% to 95% at impact. There was no evidence of a mechanical failure prior to impact.

(2) Number 2 Engine - S/N 231-682: The bleed valves were missing. The compressor was full of dirt. The stage one blade leading edges were jagged from ingestion of foreign material. The jagged shapes indicate a moderate to high RPM at impact. The stage 2 blades were bent opposite to the direction of rotation. This also indicates a moderate RPM. A piece of cloth was found between stages 3 and 4 blades. The engine had to be rotating to ingest the cloth. All the turbine stage one blades had leading edge tip curl, and the stage 2 blade tips were all bent in the opposite direction to rotation. These factors indicate a moderate to high engine speed. The engine had Detroit Diesel fuel nozzles. The main fuel control could not be positively identified. From its location at the impact site, it appears control C was on this engine. Control C has a 3-D cam reading from 86% to 94%. There was no indication of any mechanical failure prior to impact.

d. Aircraft #4 - 68-8175.

(1) Number 1 Engine - S/N 231-606: The bleed valves were missing. The top half of the compressor case was removed. The first stage blade's leading edges were jagged from the ingestion of foreign material while rotating.

There was also leading edge tip curl opposite to the direction of rotation. These two factors indicate a moderate to high engine speed. The compressor case had stator segments laying over completely on their side and subject to considerable rubbing. This indicates the engine was still rotating after impact, since that is when the stator segments would have been layed over. The turbine and combustor were completely separated from the engine during impact. The compressor drive shaft had sheared during impact. The engine had Delevan fuel nozzles without an "L" on the end caps. The nozzles were disassembled and found to have the proper locking assemblies. The nozzles were either overhauled prior to December 1980 or the "L" had not been put on the cap after rework. The main fuel control could not be positively identified. From its location at the crash site, it appears that fuel control A was on this engine. Control A had a 3-D cam reading from 82% to 90%. There was no evidence of a mechanical failure prior to impact.

(2) Number 2 Engine - S/N 231-093: There were no bleed valves left on the engine. The compressor case top half was removed and considerable foreign material was found inside. There were two pieces of aircraft metal lodged between second stage blades. There was an airframe bolt and nut lodged in the third stage blades. There were pieces of aircraft metal lodged between stages 3 and 4 and stages 4 and 5. The presence of aircraft material in the compressor indicates it was turning at impact. The first stage compressor blades had leading edge tip curl and jagged leading edges. Both of these are caused by the ingestion of foreign material, while the compressor was rotating at moderate or high speed. The turbine had separated from the engine at impact. This engine also had the Delevan fuel nozzles without an "L" on the end caps. Disassembly showed they had the proper locking assemblies. The nozzles had either been overhauled prior to December 1980 or the "L" had not been put on the end caps after changing the locking assemblies. The main fuel control from the engine could not be positively identified. However, fuel control D was located near the engine. The 3-D cam from fuel control D read from 82% to 90%. There was no indication of a mechanical failure prior to impact.

3. UNIDENTIFIED MAIN FUEL CONTROLS.

It was not possible to positively identify four main fuel controls to a particular engine. Three of the controls had their data plate torn off during the crash. The only method of identification is the case serial number. Unfortunately, the records on case serial numbers are incomplete. Therefore, the positive link between case and control may never be found. The fourth MFC had a serial number that was not recorded in the records of any of the engines:

MFC S/N 27815 - The control was coded A. Its 3-D cam indicated an engine speed of 82% to 90%.

Case S/N 6978 - The control was coded B. Its 3-D cam indicated an engine speed of 82% to 90%.

Case S/N 6852 - The control was coded C. Its 3-D cam indicated an engine speed of 86% to 94%.

Case S/n 383 - The control was coded D. Its 3-D cam indicated an engine speed of 82% to 90%.

All the controls indicated engine speeds from 82% to 94%. This shows considerable consistency between the engines. Not being able to positively put a control or a particular engine, or matching the wrong control, with an engine would not alter our findings.

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AIRCRAFT MISHAP INVESTIGATION
THUNDERBIRD AIRCRAFT
#1 - S/N 68-8156
18 January 1982
INSTRUMENT REPORT

1. INTRODUCTION/SUMMARY OF FINDINGS.

The following is the anlysis, findings and recommendations derived from the investigation of T-38 S/N 68-8156 involved in a major accident at Indian Springs AFAF, NV, on 18 January 1982. Several methods were utilized in an attempt to reconstruct instrument readings at time of impact or loss of electrical signal. Instruments employing synchro repeaters, such as oil and hydraulic pressure, tend to remain at the point where electrical signal was lost unless the pointer is displaced, such as being struck by a foreign object or subjected to a rotating force. Tachometer, airspeed indicators, and some EGT gauges return to zero or ambient condition upon loss of signal or input pressures unless captured by impact. These variables were taken into consideration during the analysis of the recovered instruments. During the course of this investigation, no indication of an instrument malfunction was noted. All instruments appeared to be operating normally up to point of impact.

2. INVESTIGATION AND ANALYSIS.

a. Flight Instruments.

(1) Both attitude indicators (ADI) were recovered. Front cockpit indicator received minor impact damage. When recovered, indicator read 40 degrees left wing down and 58 degrees climb. Internal examination revealed an impact mark on the sphere caused by the miniature airplane at 55 degrees climb. There was an impact mark on the yoke drive gear at 60 degrees left wing down. The OFF flag was in view. Rear cockpit indicator had very minor impact damage. When recovered, it was reading 5 degrees left wing down and zero degrees pitch. Internal examination did not reveal any impact marks. It appears the front cockpit indicator had changed in pitch and roll during breakup.

(2) Attitude Indicator (Standby). Front cockpit indicator received major frontal impact damage. When recovered, the indicator was reading 40 degrees left wing down and 45 degrees dive. Internal examination revealed impact marks correlating to these readings. No other impact marks could be found. Rear cockpit indicator received very minor impact damage. When recovered, it was reading 30 degrees left wing down and 25 degrees dive. There were no impact marks.

(3) Altimeter (AAV-19). Front cockpit indicator received very minor impact damage. When recovered, the indicator was reading 2550 feet and was set at 29.90. The STBY flag was in view. There were no impact marks on the altitude counter, dial face or baro counter. This indicator was found in good enough condition to perform a functional test. The results were that the indicator read 50 feet higher than the actual altitude from minus 1000 to plus 60,000 feet. Rear cockpit indicator received very minor impact damage. When recovered, it was reading 3050 feet. The baro was set at 30.10 in. hg. The STBY flag was in view. There were no impact marks on the dial face, baro counter or altitude counter.

(4) G-Meter. Front cockpit indicator received very minor impact damage. When recovered, it was reading plus 10 and minus 5 Gs. Internal examination revealed the mechanism to be at the upper and lower limit stops. Rear cockpit indicator, when recovered, was reading plus 10 and minus 1.5 Gs. Internal examination verified the mechanism to be at the above readings. There were no pointer impact marks on the dial face of either indicator.

(5) Horizontal Situation Indicator (HSI). Front cockpit indicator received major impact damage. The only portion recovered was the case and compass card. A reading could not be determined. Rear cockpit indicator received minor impact damage. The readings were as follows:

Range Counter - 121 miles and flag in view
Course Counter - 284 degrees
Course Arrow - 284 degrees
Bearing Pointer - 155 degrees
Heading Marker - 260 degrees

(6) Airspeed Indicator. Front cockpit indicator received very minor impact damage. The pointer was at zero. There were no pointer impact marks on the dial face. Internal examination revealed the mechanism had returned to zero. The maximum allowable was at 775 knots. The airspeed marker was at 525 knots. Rear cockpit indicator received minor impact damage. The pointer was at zero. Internal examination revealed the mechanism had returned to zero. There were no pointer impact marks on the dial face.

(7) Vertical Velocity Indicator. Front cockpit indicator received minor impact damage. When recovered, the pointer was reading 900 FPM down. There were no pointer impact marks on the dial face. Internal examination revealed the bellows to be distorted, which displaced the pointer from zero. Rear cockpit indicator received minor impact damage. When recovered, pointer was reading 3500 FPM up. There were no pointer impact marks on the dial face. Internal examination revealed the bellows was ruptured driving the pointer from zero.

(8) Pitch trim indicator received minor impact damage. This indicator is constructed with the pointer connected directly to the shaft of a synchro repeater. The pointer was off the scale. There were no pointer impact marks on the dial face. A reading could not be determined.

b. Engine Instruments.

(1) Nozzle Position Indicator. Front Cockpit - Both indicators were recovered and received very minor impact damage. The pointers on both were off scale or at the ambient position. This is normal upon loss of electrical signal. There were no pointer impact marks on the dial face. Rear Cockpit - Both indicators were recovered and received very minor impact damage. There were no pointer impact marks on the dial face. The pointers had returned to the ambient position.

(2) Tachometer. Both indicators from the front and rear cockpits were recovered. All four indicators had received very minor impact damage. The pointer and internal mechanism had returned to zero. There were no pointer impact marks on the dial faces.

(3) Oil Pressure Indicator. Front Cockpit - Both indicators were recovered and had received minor impact damage. There were no impact marks on the dial faces. The pointer was not captured and was free to move. When recovered, the left indicator was reading 85 PSI. Rear Cockpit - Both indicators were recovered and received minor impact damage. When recovered, the left indicator was reading 5 PSI and the right was reading 2 PSI. There were no pointer impact marks on the dial face and the pointers were not captured.

(4) Fuel Quantity Indicator. Front Cockpit - This indicator is constructed such that it will retain its position upon loss of electrical signal. Both indicators were recovered and were reading 1200 lbs. Rear Cockpit - This indicator is constructed with the pointer connected directly to a synchro repeater. Both indicators had received minor impact damage. There were no pointer impact marks on the dial faces. When recovered, the left indicator was reading 700 lbs. and the right was off scale below zero. The pointers were not captured.

(5) Fuel Flow Indicator. This indicator is constructed with the pointer connected directly to the shaft of a synchro repeater. Front Cockpit - Both indicators were recovered and had received minor impact damage. There were no pointer impact marks on the dial faces. When recovered, both indicators were reading 2200 PPH. The pointers were not captured. Rear Cockpit - The left indicator was reading 300 PPH when recovered. There were no pointer impact marks on the dial face. The pointer was not captured and was free to move. Right indicator was reading 1500 PPH when recovered. There were pointer marks at 2000, 1800, and 1500 PPH. The pointer was free to move.

(6) Temperature Indicator. Front Cockpit - The left indicator received minor impact damage. The pointer and internal mechanism is spring loaded to return to its ambient position upon loss of electrical signal. When recovered, this indicator had returned to the ambient position. There were no pointer impact marks on the dial face. The right indicator is constructed such that it will retain its position upon loss of electrical signal. This indicator had received major impact damage. When recovered, it was reading 600 degrees. Rear Cockpit - This indicator is constructed with the pointer connected to a synchro repeater. When recovered, the left indicator was reading 450 degrees and the right was reading 550 degrees. There were no pointer impact marks on the dial face. The pointers were free to move.

c. Miscellaneous Instruments.

(1) Hydraulic Pressure Indicator. This indicator is constructed with the pointer connected directly to the shaft of a synchro repeater. Front Cockpit - Both indicators were recovered and had received minor impact damage. There were no pointer impact marks on the dial faces. The utility indicator was reading 3000 PSI and the flight control indicator was reading 2400 PSI. Rear Cockpit - Both indicators were recovered and had received minor impact damage. There were no pointer impact marks on the dial faces. The utility indicator was reading 3000 PSI and the flight control indicator was reading 2400 PSI.

(2) Liquid Oxygen Indicator. Front Cockpit - This indicator is a synchro repeater type, and it had received minor impact damage. The pointer was not captured and there were no pointer impact marks on the dial face. When recovered, the pointer was off the scale. A reading could not be determined. Rear Cockpit - This indicator is designed such that it will retain its position upon loss of electrical input. This indicator received minor impact damage. When recovered, it was reading 4.5 liters.

(3) Flaps Indicator. This indicator is designed with a meter movement mechanism. It will return to the 12 o'clock or ambient position upon loss of electrical input. Both indicators from the front and rear cockpits were recovered. They had all returned to the ambient position. There were no pointer impact marks on the dial faces.

(4) Oxygen Supply Pressure Gauge. Front Cockpit - This indicator will return to zero position upon loss of input pressure. When recovered, it was at the zero position. There were no pointer impact marks on the dial face.

d. Light Bulbs. The light bulbs were analyzed to determine if illuminated at time of impact. The bulb analysis follows:

Front Cockpit -

Master Caution Light	-	Not Illuminated
Eng Fire (L/R)	-	" "
L/R Generator	-	" "
L/R Fuel Pressure	-	" "
Utility Hyd	-	" "
Flight Hyd	-	" "
Engine Anti-Ice	-	" "
Oxygen	-	" "
Fuel Low	-	" "
XMR Rect Out	-	" "

Rear Cockpit -

Master Caution Light - Not Illuminated
Eng Fire (L/R) - " "

3. FINDINGS.

During the course of this investigation, no indication of an instrument malfunction was noted. All instruments appeared to be operating normally up to the point of impact.

4. RECOMMENDATIONS. None.

[redacted]
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AIRCRAFT MISHAP INVESTIGATION
THUNDERBIRD AIRCRAFT
#2 - S/N 68-8184
18 January 1982
INSTRUMENT REPORT

1. INTRODUCTION/SUMMARY OF FINDINGS.

The following is the analysis, findings and recommendations derived from the investigation of T-38 S/N 68-8184 involved in a major accident at Indian Springs AFAF, NV, on 18 January 1982. Several methods were utilized in an attempt to reconstruct instrument readings at time of impact or loss of electrical signal. Instruments employing synchro repeaters, such as oil and hydraulic pressure, tend to remain at the point where electrical signal was lost unless the pointer is displaced, such as being struck by a foreign object or subjected to a rotating force. Tachometer, airspeed indicators, and some EGT gauges return to zero or ambient condition upon loss of signal or input pressure, unless captured by impact. These variables were taken into consideration during the analysis of the recovered instruments. During the course of this investigation, no indication of instrument malfunction was noted. All instruments appeared to be operating normally up to point of impact.

2. INVESTIGATION AND ANLYSIS.

a. Flight Instruments.

(1) Attitude Indicator (ADI). Front cockpit indicator was not recovered. Rear cockpit indicator received minor impact and major post fire damage. The sphere was severely melted. By reconstructing the remaining portion of the sphere and yoke assembly, a reading of 10 degrees dive and zero pitch was determined.

(2) Attitude Indicator (Standby). Front cockpit indicator received major impact damage. When recovered, it was reading 88 degrees right wing down and 34 degrees dive. Internal examination revealed the sphere had impact marks at 35 degrees dive and zero, 34, and 88 degrees right wing down. Rear cockpit indicator received minor impact and major post fire damage. The sphere was melted from heat. The yoke assembly was captured at 20 degrees left wing down. The sphere was at 10 degrees dive. No impact marks could be found.

(3) Altimeter (AAU-19) Front cockpit indicator received major impact damage. The pointer was torn loose from its shaft. There were no pointer impact marks on the dial face. The altitude counter was captured at 2900 feet. It could not be determined if the counter had rotated. The baro was set at 29.81 in. hg. The baro set knob was broken off. When this happened, the baro setting could have changed. The STBY flag was in view. Rear cockpit indicator received major post fire damage and minor impact damage. The STBY flag was in view. When recovered, indicator was reading 83,550 feet. Internal examination revealed the 100-foot drum and pointer were captured at 550 feet. The 10,000- and 1000-foot drums were torn loose and free to rotate. No impact marks could be determined. The baro was set at 30.14 in. hg.

(4) G-Meter. Front cockpit indicator received major impact damage. When recovered, indicator was reading plus 6.5 and minus 4 Gs. The plus pointer was loose and free to move. Internal examination revealed the plus mechanism was at the upper limit stop of 10 Gs. There were no pointer impact marks on the dial face. Rear cockpit indicator received major fire and minor impact damage. When recovered, it was reading plus 5 and minus 4. Internal examination revealed the plus and minus mechanism had separated, allowing the pointers to be free to move. There were no pointer impact marks on the dial face.

(5) Horizontal Situation Indicator (HSI). Front cockpit indicator received major impact damage. Recovered the case and some internal mechanism parts. A reading could not be determined. Rear cockpit indicator received major fire and minor impact damage. The readings were as follows:

Course Counter - 75 degrees
Course Arrow - 65 degrees
Bearing Pointer - 87 degrees
Heading Marker - 120 degrees
Range Counter - 58 miles and flag in view
Compass Card - 87 degrees

(6) Airspeed Indicator. Front cockpit indicator received minor external impact damage. Pointer was reading 110 knots. There were no pointer impact marks on the dial face. Internal examination revealed the pointer sector gear had separated from the bellows mechanisms. This allowed the pointer to move freely. Rear cockpit indicator received major fire and minor impact damage. The airspeed pointer was torn from its shaft. There were no pointer impact marks on the dial face. The internal bellows were ruptured from heat. A reading could not be determined.

(7) Vertical Velocity Indicator (VVI). Front cockpit indicator received minor external impact damage. When recovered, it was reading 300 FPM up. The pointer was free to move. There were no pointer impact marks on the dial face. Internal examination revealed the mechanism had separated, which allowed the pointer to move freely. Rear cockpit indicator received major fire and minor impact damage. When recovered, the pointer was at 6000 FPM. The dial face had heavy smoke damage. There was a mark at zero indicating the pointer was at zero during the smoke damage. Internal examination revealed the bellows had ruptured driving the point to the 6000 FPM reading.

(8) Pitch Trim Indicator. This indicator is constructed with the pointer connected directly to the shaft of a synchro repeater. This indicator received minor impact damage. The pointer was off the scale. There were no pointer impact marks on the dial face. A reading could not be determined.

b. Engine Instruments.

(1) Nozzle Position Indicator. This indicator is designed with a meter movement mechanism. It will return to the 12 o'clock or ambient position upon loss of electrical signal. Front Cockpit - Both indicators were recovered and had received minor impact damage. The pointer on both indicators had returned to the ambient position. There were no pointer impact marks on the dial faces. Rear Cockpit - Both indicators had received major fire and minor impact damage. The dial face, pointer and meter movement were destroyed by heat. A reading could not be obtained.

(2) Tachometer. Front Cockpit - Both indicators had received minor impact damage. The pointer and internal mechanism had returned to zero. There were no pointer impact marks on the dial faces.

(3) Oil Pressure Indicator. Front Cockpit - The left indicator had received minor impact damage. The pointer was at 82 PSI and free to move. There were no pointer impact marks on the dial face. The right indicator had received major impact damage. The pointer was reading 92 PSI and free to move. There were no pointer impact marks on the dial face. Rear Cockpit - This indicator is a synchro repeater type indicator. Both indicators had received major fire and minor impact damage. The dial face and pointer were missing. A reading could not be obtained.

(4) Fuel Quantity Indicator. Front Cockpit - This indicator is designed such that it will retain its position upon loss of electrical signal. Both indicators had received major impact damage. The left indicator was reading 1180 lbs. and the right was reading 1200 lbs. Rear Cockpit - This indicator is a synchro repeater type. Both indicators had received major fire and minor impact damage. The dial face and pointer were destroyed on both indicators. A reading could not be obtained.

(5) Temperature Indicator. Front Cockpit - This indicator is designed such that it will return to low end or ambient position upon loss of electrical signal. The left indicator had received minor impact damage. The pointer and internal mechanism had returned to the ambient position. The right indicator had received major impact damage. The pointer and dial face were missing. The internal mechanism had returned to the low end stop. Rear cockpit indicators received major heat and minor impact damage. The dial faces and pointers were destroyed by heat. This is a synchro repeater type indicator. A reading could not be obtained.

(6) Fuel Flow Indicator. This is a synchro repeater type indicator. Front Cockpit - Both indicators were recovered and had received major impact damage. The left indicator pointer was off scale below zero. There were no pointer impact marks on the dial face. The right indicator pointer was off scale. There were pointer impact marks at 3650 and 2500 PPH. The pointer was free on both indicators. Rear Cockpit - Both indicators had received major fire and light impact damage. The dial faces and pointers were destroyed by heat. A reading could not be obtained.

c. Miscellaneous Instruments.

(1) Liquid Oxygen Indicator. This indicator will retain its indication upon loss of electrical signal. This indicator had received major fire and minor impact damage. The dial face and pointer were missing. The internal mechanism was at 4 liters.

(2) Hydraulic Gauges. Front Cockpit - The utility gauge was missing. The flight control gauge received minor impact damage. When recovered, it was reading 1800 PSI. There were no pointer impact marks on the dial face. This is a synchro repeater type indicator. The pointer was free to move.

(3) Cabin pressure altimeter received minor impact damage. The pointer was at zero. There were no pointer impact marks on the dial face. Internal mechanism was intact.

d. Light Bulbs. The tele-lite panel, master caution and engine fire lights were not recovered or had they been destroyed.

3. FINDINGS.

During the course of this investigation, no indication of an instrument malfunction was noted. All instruments appeared to be operating normally up to the point of impact.

4. RECOMMENDATIONS. None.

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AIRCRAFT MISHAP INVESTIGATION
THUNDERBIRD AIRCRAFT
#3 - S/N 68-8176
18 January 1982
INSTRUMENT REPORT

1. INTRODUCTION/SUMMARY OF FINDINGS.

The following is the analysis, findings and recommendations derived from the investigation of T-38 S/N 68-8176 involved in a major accident at Indian Springs AFAF, NV, on 18 January 1982. Several methods were utilized in an attempt to reconstruct instrument readings at time of impact or loss of electrical signal. Instruments employing synchro repeaters, such as oil and hydraulic pressure, tend to remain at the point where electrical signal was lost unless the pointer is displaced, such as being struck by a foreign object or subjected to a rotating force. Tachometer, airspeed indicators, and some EGT gauges return to zero or ambient condition upon loss of signal or input pressures unless captured by impact. These variables were taken into consideration during the analysis of the recovered instruments. During the course of this investigation, no indication of instrument malfunction was noted. All instruments appeared to be operating normally up to point of impact.

2. INVESTIGATION AND ANALYSIS.

a. Flight Instruments.

(1) Altitude Indicator (ADI). Front cockpit indicator received major fire and impact damage. The sphere was melted from heat. When recovered, the indicator was reading 60 degrees left wing below the horizon and 90 degrees dive. The presentation was an inverted aircraft. The yoke assembly was not captured. Due to the heat damage, no other readings could be obtained. Rear cockpit indicator received major frontal impact damage. A portion of the sphere was missing. When recovered, the reading was 90 degrees right wing down and 30 degrees climb. There were impact marks on the yoke assembly drive gear at 5 and 30 degrees right wing down. It appears this indicator had changed in roll during breakup.

(2) Attitude Indicator (Standby). Front cockpit indicator received major fire and minor impact damage. The sphere was melted and portions missing. The yoke assembly was captured at 45 degrees dive. No impact marks could be found. Rear cockpit received minor impact damage. When recovered, indicator was reading 25 degrees left wing down and 30 degrees dive. There were no impact marks. The OFF flag was in view.

(3) Altimeter (AAU-19). Front cockpit indicator received major impact damage. When recovered, it was reading 5000 feet. The baro was set at 29.87. The STBY flag was in view. There was a pointer impact mark on the dial face at 150 feet. There were impact marks on the 1000- and 10,000-foot drums. These marks were caused by the edge of the cut out on the dial face. When these marks were aligned, a reading of 3150 feet was read. The internal bellows were ruptured, which would drive the altitude counter and pointer up scale. Rear cockpit indicator received major rear impact damage. When recovered, indicator was reading 3700 feet. The baro was set at 30.22 in. hg. The STBY flag was in view. There were no impact marks on the dial face, altitude counter or baro counter. The altitude counter and pointer had separated from the drive gear; this allows them to rotate freely.

(4) G-Meter. Front cockpit indicator received major fire and impact damage. When recovered, reading was plus 4 and minus 1. Fire had damaged the dial face to the point where no impact mark could be determined. The minus pointer was loose on its shaft. Rear cockpit indicator was not recovered.

(5) Horizontal Situation Indicator (HSI). Front cockpit indicator received major impact damage. The compass card and internal mechanism were missing. The range counter was reading 38 miles and the flag was in view. The course counter was set at 267 degrees. No other reading could be obtained. Rear cockpit indicator received minor impact damage. The readings were as follows:

Course Counter - 255 degrees
Range Counter - 38 miles and flag in view
Course Arrow - 255 degrees
Compass Card - 87 degrees
Bearing Pointer - 142 degrees
Heading Marker - 292 degrees

(6) Airspeed Indicator. Front cockpit indicator received major impact damage. The pointer was missing. There were no pointer impact marks on the dial face. The internal mechanism had separated. A reading could not be obtained. Rear cockpit indicator was not recovered.

(7) Vertical Velocity Indicator. Front cockpit indicator received minor impact damage. When recovered, indicator was reading zero. The internal mechanism was intact. There were no pointer impact marks on the dial face. Pointer is spring loaded to return to zero upon loss of input source. Rear cockpit indicator received minor impact damage. When recovered, pointer was at 3000 FPM up. There was a pointer impact mark at zero. Internal examination revealed the pointer sector gear had separated from the bellows assembly. This allowed the pointer to move freely.

(8) Pitch trim indicator was destroyed by fire. A reading could not be determined.

b. Engine Instruments.

(1) Nozzle Position Indicator. This indicator is designed with a meter movement mechanism. It will return to the 12 o'clock or ambient position upon loss of electrical signal. Front cockpit indicator received minor impact damage. The pointer had returned to the ambient position on both indicators. There were no pointer impact marks. Rear cockpit indicators received minor impact damage. The pointer had returned to the ambient position. There were no pointer impact marks on the dial face.

(2) Tachometer. Front Cockpit - Both indicators had received minor impact damage. The left indicator pointer was captured by broken dial glass at 70 percent RPM. The right indicator pointer had returned to zero. There were no pointer impact marks on the dial faces. Rear Cockpit - Both indicators had received minor impact damage. The pointers and internal mechanism had returned to zero. There were no pointer impact marks on the dial faces.

(3) Oil Pressure Indicator. Front Cockpit - The left indicator received major impact damage. The pointer was found loose between the glass and dial face. There were no pointer impact marks on the dial face. Right indicator received minor impact damage. When recovered, the pointer was reading 5 PSI; however, it was not captured and was free to rotate. There were no pointer impact marks on the dial face. Rear Cockpit - The left indicator received minor impact and heat damage. When recovered, it was reading 68 PSI. The synchro was frozen due to heat. There were no pointer impact marks on the dial face. Right indicator received minor impact damage and was reading 38 PSI. The pointer was not captured and was free to rotate.

(4) Fuel Quantity Indicator. Front Cockpit - This indicator is designed such that it will retain its position upon loss of electrical signal. Both indicators received minor impact damage. The left indicator was reading 1100 lbs. and the right was reading 1300 lbs. Rear Cockpit - This indicator is a synchro repeater type. The left indicator received minor impact damage. The pointer was reading 910 lbs. and free to rotate. Right indicator received major impact damage. The glass was broken and had captured the pointer at 1000 lbs. There were no pointer impact marks on either dial face.

(5) Temperature Indicator. Front Cockpit (Left) - This indicator will return to zero upon loss of electrical signal and had done so. The OFF flag was in view. (Right) This indicator will retain its position upon loss of electrical signal. The pointer and dial face were missing. The OFF flag was in view. Internal examination revealed the mechanism to be 95 angular degrees from the low end mechanical stop. When this angular degree was measured on a good dial face, a reading of 520 degrees was determined. Rear Cockpit - This is a synchro repeater type. Both indicators had received minor impact damage. The left indicator was reading 650 degrees and the right was reading 730 degrees. The pointer was free to rotate and there were impact marks on the dial faces.

(6) Fuel Flow Indicator. This is a synchro repeater type indicator. Front Cockpit - Both indicators had received major impact damage. When recovered, the left indicator was reading 2300 PPH and the right 1800 PPH. There were no pointer impact marks on the dial faces, and the pointers were free to move. Rear Cockpit - Both indicators had received minor impact damage. The left indicator was reading 2450 PPH when recovered. The right indicator was reading 2650 when recovered. There was a point impact mark at 1800 PPH. The pointers were free to move on both indicators.

c. Miscellaneous Instruments.

(1) Hydraulic Gauge. This is a synchro repeater type indicator. Front Cockpit gauges were not recovered. Rear Cockpit - Both gauges received minor impact damage. There were no pointer impact marks on the dial faces. The utility gauge was reading 3200 PSI and the flight control gauge was reading 2800 PSI.

(2) Liquid oxygen indicator will retain its position upon loss of electrical signal. When recovered, it was reading 5 liters.

d. Light Bulbs. The bulbs were analyzed to determine if illuminated at time of impact. The analysis follows:

Front Cockpit -

Master Caution - Not Illuminated
Engine Fire - Missing

Rear Cockpit -

Master Caution - Missing
Eng Fire (L/R) - Not Illuminated

3. FINDINGS.

During the course of this investigation, no indication of an instrument malfunction was noted. All instruments appeared to be operating normally up to point of impact.

4. RECOMMENDATIONS. None.

[redacted]
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AIRCRAFT MISHAP INVESTIGATION
THUNDERBIRD AIRCRAFT
#4 - S/N 68-8175
18 January 1982
INSTRUMENT REPORT

1. INTRODUCTION/SUMMARY OF FINDINGS.

The following is the analysis, findings and recommendation derived from the investigation of T-38 S/N 68-8175 involved in a major accident at Indian Springs AFAF, NV, on 18 January 1982. Several methods were utilized in an attempt to reconstruct instrument readings at time of impact or loss of electrical signal. Instruments employing synchro repeaters, such as oil and hydraulic pressure, tend to remain at the point where electrical signal was lost unless the pointer is displaced, such as being struck by a foreign object or subjected to a rotating force. Tachometer, airspeed indicators, and some EGT gauges return to zero or ambient condition upon loss of signal or input pressures unless captured by impact. These variables were taken into consideration during the analysis of the recovered instruments. During the course of this investigation, no indication of instrument malfunction was noted. All instruments appeared to be operating normally up to point of impact.

2. INVESTIGATION AND ANALYSIS.

a. Flight Instruments.

(1) Attitude Indicator (ADI). Front cockpit indicator received major impact damage. The only portion recovered was the case and portions of the internal mechanism. A reading could not be obtained. Rear cockpit indicator received major impact damage. The sphere was the only portion recovered. There were impact marks at 5 and 35 degrees dive. A bank angle could not be determined.

(2) Attitude Indicator (Standby). Front cockpit indicator received major impact damage. The sphere was captured at 30 degrees left wing down and 15 degrees dive. There were impact marks on the sphere at 5 and 15 degrees dive. There were impact marks on the sphere and yoke assembly at 45 degrees left wing down. It appears the indicator changed in pitch and roll during breakup. Rear cockpit indicator received minor impact damage. When recovered, indicator was reading 4 degrees dive and 62 degrees left wing down. There were no impact marks on the sphere or gear assembly.

(3) Altimeter (AAU-19). Rear cockpit indicator received major impact damage. The pointer was missing. The altitude counter was reading 6400 feet. The baro counter was set at 30.10 in. hg. and the STBY flag was in view. There were no pointer impact marks on the dial face. There were impact marks on the altitude counter at 4800 and 6400 feet. Internal examination revealed the altitude counter had separated from the main drive gear. This would allow the counter drums to be free to rotate. Front cockpit indicator received minor impact damage. The STBY flag was in view. The indicator was reading 3160 feet and the baro was set at 30.04 in. hg. There were no pointer impact marks on the dial face or altitude counter. Internal examination revealed the mechanism to be intact.

(4) G-Meter. Rear cockpit indicator received minor impact damage. When recovered, it was reading plus 8.7 and minus 5 Gs. There were no pointer impact marks on the dial face. Internal mechanism was intact. Front cockpit indicator received major impact damage. When recovered, it was reading plus 4.5 and minus 4.5 Gs. There were no marks on the dial face and the mechanism was intact.

(5) Horizontal Situation Indicator (HSI). Front cockpit indicator received major impact damage. The readings were as follows:

Range Counter - 48 miles and flag missing
Course Counter - 270 degrees
Compass Card - 90 degrees
Heading Marker - 120 degrees
Course Arrow - missing
Bearing Pointer - missing

Rear cockpit indicator was not recovered.

(6) Airspeed Indicator. Front cockpit indicator received major impact damage. The airspeed pointer was missing. There was a pointer impact mark at 380 knots. No other readings could be determined. Rear cockpit indicator received major impact damage. When recovered, the airspeed pointer was at 400 knots. There were no pointer impact marks on the dial face. Internal examination revealed the pointer sector gear was torn loose at its pivots, which let the pointer move.

(7) Vertical Velocity Indicator. Front cockpit indicator received minor impact damage. When recovered, it was reading 5700 FPM down. There were no pointer impact marks on the dial face. Internal examination revealed the pointer sector gear had sheared, which allows the point to be free to move. Rear cockpit indicator received minor impact damage. When recovered, it was reading 5000 FPM up. Internal mechanism had separated, allowing pointer to move. There were no pointer impact marks on the dial face.

(8) Pitch trim indicator was destroyed by fire to the point a reading could not be obtained.

b. Engine Instruments.

(1) Nozzle Position Indicator. This indicator is designed with a meter movement mechanism. It will return to the 12 o'clock or ambient position upon loss of electrical signal. Both indicators from the front and rear cockpits were recovered. All four had received minor impact damage. They had returned to their ambient position. There were no pointer impact marks on the dial faces.

(2) Tachometer. Front Cockpit - The right indicator received major impact and fire damage. The dial face and pointer were missing. The internal mechanism had returned to zero. The left indicator was missing. Rear Cockpit - The left indicator received minor impact damage and was reading zero when recovered. There were pointer impact marks at 50, 40 and zero percent. The internal mechanism had returned to zero. The right indicator received minor impact damage. There were no pointer impact marks on the dial face. The pointer and internal mechanism had returned to zero.

(3) Oil Pressure Indicator. Front Cockpit - The right indicator received major impact damage. The pointer was missing. There were no pointer impact marks on the dial face. A reading could not be determined. The left indicator received major impact damage. When recovered, the pointer was off scale below zero. There were no pointer marks on the dial face. The pointer was free to rotate. Rear Cockpit - The right indicator received major impact damage. The pointer was missing. There were no pointer impact marks on the dial face. The left indicator received major impact damage. When recovered, this indicator was reading 57 PSI. There were no pointer impact marks on the dial face. The pointer was free to rotate.

(4) Fuel Quantity Indicator. Front Cockpit - This indicator is constructed such that it will retain its position upon loss of electrical signal. Both indicators had received major impact damage. The left indicator pointer was missing and there were no pointer impact marks on the dial face. The right indicator was reading 1125 lbs. Rear Cockpit - This is a synchro repeater type indicator. Both indicators received minor impact damage. The left indicator pointer was off scale below zero. There were no pointer impact marks on the dial face. The right indicator was reading 800 lbs. when recovered. There was a pointer impact mark at 200 lbs. The pointer was free to move.

(5) Fuel Flow Indicator. This indicator is constructed with the pointer connected directly to the shaft of a synchro repeater. Front Cockpit - The left indicator received major impact damage. The pointer was at 2500 PPH when recovered. There were no pointer impact marks on the dial face and pointer was free to move. The right indicator received major impact damage. The pointer was missing and there were no impact marks on the dial face. Rear Cockpit - The left indicator received major impact damage. When recovered, the pointer was below zero, off scale. There were pointer impact marks at 3300, 2600, and 1900 PPH. The pointer was free to rotate. The right indicator received major impact damage. When recovered, indicator was reading 1500 PPH. There were pointer impact marks at 3500 and 2400 PPH. The pointer was free to rotate.

(6) Temperature Indicator. Front Cockpit - The indicator will return to the lower limit stop or ambient position upon loss of electrical signal. Both indicators had received major impact damage. The dial face was missing on both indicators. The point and internal mechanism had returned to the ambient position. Rear Cockpit - Both indicators received minor impact damage. There were no pointer impact marks on either dial face. The pointers were free to rotate. When recovered, the left indicator was reading 755 degrees and the right was reading 780 degrees.

c. Miscellaneous Instruments.

(1) Hydraulic Gauge. This indicator is a synchro repeater type. Frong Cockpit - Both indicators received minor impact damage. The pointer was free to rotate and there were no marks on the dial faces. When recovered, the utility indicator was reading 3100 PSI and the flight control indicator was reading 3200 PSI. Rear Cockpit - The flight control indicator received minor impact damage. When recovered, it was reading 3250 PSI. The pointer was free to rotate and there were no pointer impact marks on the dial face. The utility gauge was not recovered.

(2) Liquid Oxygen Indicator. Front cockpit indicator received major fire and impact damage. The dial face and a portion of the pointer were missing. The remaining portion of the pointer was at 3 liters. The internal mechanism was at 3 liters. This indicator will retain its position upon loss of electrical signal.

d. Light Bulbs. Light bulbs recovered were analyzed to determine if illuminated at time of impact. The front cockpit master caution and engine fire lights were missing or destroyed. The rear cockpit master caution and right engine fire lights were missing. The rear cockpit left engine fire light was not illuminated.

3. FINDINGS.

During the course of this investigation, no indication of an instrument malfunction was noted. All instruments appeared to be operating normally up to the point of impact.

4. RECOMMENDATIONS. None.

[redacted]
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SUBJECT: Egress Report, T-38As, Serial Numbers (1) 68-8156, (2) 68-8184, (3) 68-8176 and (4) 68-8175, Major Thunderbird Aircraft Flight Mishap, Indian Springs AFAF, Nevada, 18 January 1982

TO: Brig Gen Gerald D. Larson, President, Mishap Investigation Board

As egress specialists assigned to the Egress Systems Unit, SA-ALC/MMIRCB, Kelly AFB, Texas, we have evaluated the egress systems of the following T-38A aircraft: (1) 68-8156, (2) 68-8184, (3) 68-8176 and (4) 68-8175.

1. DESCRIPTION.

The T-38 egress system consists of two independently functioning ejection seats. Each seat requires a dual motion to initiate the ejection. First, the leg braces are raised to the full up position, exposing and cocking the triggers, arming the system and locking the inertia reel. (The leg braces are interconnected and are not independent of each other). Second, leg braces are then released and the trigger or triggers squeezed to initiate the ejection sequence. The canopy is jettisoned immediately. Three-tenths of a second later, the rocket catapult is ignited and the man/seat mass moves up the rails at a rate of forty-five (45) feet per second. The rocket catapult nozzle automatically adjusts to corresponding seat height in order to align rocket thrust to seat/man center of gravity. This adjustment retards tumbling during ejection. Nineteen hundreths of a second later, the drogue gun deploys the drogue chute to stabilize the ejection seat. The drogue gun fires a two (2) pound projectile to the left side of the ejection seat. The drogue chute not only stabilizes the seat, but also assists seat/man separation by retarding the velocity of the ejection seat. Sixty-five hundreths of a second after the rocket catapult is ignited, the lap belt is ballistically opened and the rotary actuator is activated. The open lap belt frees the occupant from the seat and the rotary actuator reels up the seat/man separator straps, pushing the occupant from the seat. As the seat falls away, the gold key attached to the lap belt arms the model 1100 parachute actuator release, with twenty-five hundreths of a second delay, which pulls the pins and releases the pull down vent line (PDVL) parachute. The PDVL allows for more rapid inflation of the parachute and eliminates the need for a zero delay lanyard. With the BA-25 parachute, the system is safe and effective at zero altitude and fifty knots. When the BA-22 parachute is used, the zero delay lanyard must be connected in order to retain the 50-knot system capability. If the zero delay lanyard is not connected, the egress system reverts back to a zero altitude, one hundred twenty-knot system, due to the longer time delay of the F-1B timer and longer parachute inflation time.

2. MISHAP DESCRIPTION.

The flight was flown as a Thunderbird aerial demonstration training mission at Indian Springs Air Force Auxiliary Field, Nevada. During the final portion of the four-ship line abreast loop maneuver, all four T-38A aircraft impacted ground and were destroyed. The following report lists aircraft in order of position number during flight.

3. AIRCRAFT NUMBER 1, 68-8156.

a. Aft Cockpit Observations: Aft canopy was located approximately 290 yards from aircraft initial impact. Canopy frame was distorted, but intact. Canopy glass was still intact with minor cracking noted. Examination of canopy attach plates revealed minor scoring at each end. This indicates canopy attach plate was forcibly withdrawn from canopy latch hinge disconnect assembly and not released as would occur during an ejection. Inspection of canopy roller housings revealed impact scars on forward and aft roller housings. The direction of impact was forward on aft roller housings and

aft on forward roller housings. Opposite impact marks combined with no canopy glass breakage would be indicative of a slight canopy buckling at or prior to canopy release. Canopy thruster was recovered unfired. Severe structural damage to cockpit floor was noted. Both canopy latch hinge disconnect assemblies and their linkages had been sheared away during post impact aircraft breakup. The right aircraft canopy lock hook had an impact mark on its inner radius, which indicated it was in the locked position at initial impact. The right forward most canopy lock hook had sustained impact marks on both the left and right sides. This indicated lateral movement by either the canopy or airframe as the canopy departed. Both right canopy lock hooks were in the unlocked position. Both left canopy lock hooks were in the unlocked position but had sustained impact marks, which were indicative of canopy lock hook/ canopy roller binding at canopy separation from aircraft. Examination of ballistics, ballistic circuitry, and one-way valves installed in aircraft cockpit area revealed proper installation.

b. Forward Cockpit Observations: Forward canopy was located approximately 250 yards from aircraft initial impact point. Forward canopy bow was broken away and located adjacent to cockpit area. Canopy gasket was missing and located entangled in horizontal stabilator (stab). Examination of right canopy attach plate revealed minor scoring at forward and aft end of plate. This is indicative of canopy departing aircraft prior to full release by canopy latch hinge disconnect assembly. Inspection of right rear canopy roller revealed impact marks which indicated canopy lock hooks in locked position at initial impact. Mid-canopy roller housing sustained a severe impact mark on inner side. Severe impact marks were also noted forward of mid-roller. It is considered likely that horizonal stab contacted canopy during post impact aircraft breakup with sufficient force to dislodge and entangle seal. The left canopy attach plate sustained minor scoring on aft side. This is indicative of canopy being locked in place at initial aircraft impact with the ground. Examination of left aircraft canopy roller revealed impact marks, which indicated canopy lock hooks in locked position at initial aircraft impact. Left mid- and forward canopy rollers and housings were unmarked. The aircraft floor had been completely torn away. Canopy thruster was recovered unfired. Examination of right canopy latch hinge disconnect assembly revealed it was in locked position. Impact marks were noted on forward edge of housing where canopy attach plate is seated. This indicates a forced withdrawal of canopy attach plate, as canopy latch hinge disconnect assembly was releasing. The left latch hinge disconnect assembly had sheared away as a result of aircraft breakup forces. Three canopy lock hooks on right side of aircraft were examined. The forward two hooks had severe impact marks, indicating hooks were in locked position at aircraft initial impact. The three left canopy lock hooks contained impact marks, which indicated they were in locked position at aircraft initial impact. All forward cockpit ballistics, one-way valves and ballistic circuitry were examined and found to be properly installed.

c. Aft Ejection Seat Observations: The aircraft ejection seat was in aircraft cockpit with seat safety pin installed. Lap belt was connected through shoulder harness, negative G strap, and seat/man separator strap. This action taken due to aircraft seat being unoccupied. Ejection seat was damaged during removal due to cockpit distortion. Rocket catapult was recovered unfired with nozzle section broken away. Damage to nozzle section was result of aircraft skidding on ground after aircraft initial impact. Examination of right leg brace revealed M-120, M-27 and M-26 initiators unfired. Examination revealed drive connecting link disconnected from drive pin. This indicated a lateral movement of the right leg brace as a result of post impact aircraft breakup forces. Examination of left leg brace revealed M-27 and M-26 initiators unfired. Drogue gun was also found to be unfired. Examination of ejection seat handgrips revealed impact marks on forward section, indicating handgrips were down at initial impact.

d. Forward Ejection Seat Observations: The forward ejection seat was located in the forward cockpit. Drogue gun had fired deploying drogue chute. Drogue chute was entangled around aircraft fuselage. Ejection seat damaged during removal due to distortion of cockpit. Examination of ejection seat revealed leg braces up with ejection handgrips exposed. Forward bucket and seat pan had been broken away as a result of post impact aircraft breakup forces. Right leg brace sustained a severe impact gouge in the forward lower section. This gouge is considered the result of contact with adjacent aircraft components which broke loose due to post impact aircraft breakup forces. The direction and magnitude of force required to make gouge is considered sufficient to raise right leg brace. Removal of right leg brace cover revealed M-120, M-27 and M-26 initiator had fired. Inspection of right leg brace arm revealed impact mark at top section, which corresponded with leg brace being down at aircraft initial impact. It was also noted that drive connecting link had disconnected from drive pin. This indicates lateral movement of right leg brace during aircraft breakup. Ejection seat handgrip sustained impact mark in the handgrip retention slot, indicating handgrip was down when impact was made. Material transfer left by handgrip uplock assembly indicates handgrip was forced upward as a result of aircraft breakup forces. Examination of left leg brace revealed M-27 and M-26 initiator had fired. Inspection of left leg brace arm revealed strong impact mark which corresponded with leg brace being down at initial impact. Further inspection revealed locking support arm had sheared at lower end. Locking support arm and locking pawl were in stowed position. This also indicates left leg brace arm was down at initial impact. Distortion of airframe and ejection seat is considered sufficient to withdraw sear pins firing M-27 and M-120 initiators. Inspection of rocket catapult revealed bottom portion had broken away bending tube backward. This is considered a result of aircraft skidding along ground after initial impact. Rocket catapult had ballistically fired as a result of activation by the M-26 initiator. This was determined by the presence of ballistic gas residue at the inlet port of the rocket catapult, as well as burn residue at the other end. Although the rocket catapult fired, it did not eject the seat. The catapult section and rocket nozzle had previously broken away. Therefore at ignition, there was no catapult to impart instantaneous force to the seat. As the rocket motor ignited, there was no nozzle present; whereby the majority of thrust was lost. And lastly, the force imparted by the rocket motor was insufficient to dislodge the bent rocket tube. The rotary actuator had been activated by the M-120 initiator and had partially retracted. The lap belt had been ballistically separated by the M-120 initiator the aircrew was thrown approximately 30 feet away. This action occurred at or just prior to the fuselage coming to rest.

e. Personal Equipment Observation: Aircrew's helmet was recovered. Examination of helmet revealed material traces just left of centerline, above and through edge of helmet. Leather edge cover gouged with material trace present. Helmet had separated from aircrew's head. Scratch was noted on top section, left of centerline, with trace of blue paint imbedded. Indentation noted on forward left side of helmet just above visor cover and on right forward side just above visor cover. Section of tinted visor recovered. Bayonet clip on right side of oxygen mask was connected, while left side was disconnected. Oxygen hose was pulled out of mask. Chin strap was disconnected. Helmet damage and loss by aircrew considered result of violent breakup of aircraft after impact. Zero delay lanyard was connected and deployed personal parachute as aircrew exited aircraft. Personal parachute was entangled in cockpit wreckage. Suspension lines failed in tension. Aircrew was located approximately 30 feet from final resting place of fuselage and adjacent to survival kit ruck sack. Life raft had inflated. Sections of fractured survival kit container located nearby. Aircrew gloves were located. Examination of gloves revealed traces of black. No yellow traces were noted. This finding is considered significant, indicating aircrew had hands on aircraft controls and not on yellow ejection seat handgrips at aircraft initial impact.

4. AIRCRAFT NUMBER 2, 68-8184.

a. Aft Cockpit Observations: Canopy located approximately 245 yards from aircraft initial impact point. Canopy frame was intact. Canopy seal was attached. Large section of canopy glass had broken out, but was located adjacent to canopy. Examination of canopy attach plates revealed both were scored. This indicates forced withdrawal from latch hinge disconnect assemblies. Left forward canopy roller housing sustained severe impact mark on aft side. Severe impact mark also noted aft of right forward roller housing. This indicates canopy did not separate as a result of ejection. Aft cockpit was totally destroyed during post impact aircraft breakup. Extended part of canopy thruster had sheared away. Canopy thruster was unfired. Extended canopy thruster considered result of aircraft breakup forces. All one-way valves and ballistic circuitry recovered were properly installed. All airframe mounted ballistics were recovered and were properly installed.

b. Forward Cockpit Observations: Forward canopy was located approximately 260 yards from aircraft initial impact point. Aft canopy bow had broken at mid-section. Forward canopy bow had broken away. Canopy seal was still attached to major canopy section. Inspection of right canopy attach plate revealed slight impact mark on forward edge. This indicates forced withdrawal of canopy attach plate prior to full release by latch hinge disconnect assembly. Right canopy attach plate was unmarked. Examination of aft canopy roller housing on right canopy rail revealed distortion on inner side. This indicates movement of canopy to the left or cockpit rail to the right as canopy departed aircraft. Inspection of left forward and left aft roller housings revealed impact marks on aft edge of housings. This indicates canopy was forced aft at initial aircraft impact. Examination of right canopy latch hinge disconnect assembly revealed canopy attach plate missing but disconnect assembly in locked position. Further inspection revealed tension rod distorted and latch disconnect hook free to rotate. Slight score noted on edge of latch disconnect hook which indicated forced removal of canopy attach plate as latch hinge disconnect assembly was releasing. Left latch hinge disconnect assembly and linkage sheared away during subsequent aircraft breakup after initial impact. Left side canopy lock hooks showed no impact marks. Minor scoring on canopy lock hook housings may indicate canopy was forced to the right at or prior to canopy separation from the aircraft. Three canopy latch hooks on right side were in unlocked position with no impact marks noted. Forward cockpit underwent severe structural damage following initial impact. Entire cockpit floor had been torn away. Canopy thruster had fully extended. Examination of inlet port revealed ballistic gas residue from fired external canopy jettison initiator. Initiator sear pin pulled as result of airframe distortion during breakup. All forward cockpit ballistics, ballistic circuitry, and one-way valves were properly installed.

c. Aft Ejection Seat Observations: Aft ejection seat was located approximately 25 yards from final resting place of aircraft cockpit section. Seat departed aircraft as a result of complete aft cockpit breakup. Headrest casting had broken away from seat back. Drogue gun was recovered unfired. Ejection seat safety pin was still installed in right leg brace, and leg brace was in down position. Examination of right leg brace revealed M-120 lap belt initiator had sear pin removed and was fired. The lap belt initiator lanyard was pulled when seat was thrown clear of aircraft. The M-27 and M-26 initiators were recovered unfired. Rocket catapult had broken away and was recovered unfired. Left leg brace was in up position with trigger exposed. The M-27 and M-26 initiators were recovered unfired. Since right leg brace was down and left leg brace was up, aircraft breakup forces are considered to to have sufficient force to fracture interconnecting linkages and raise left leg brace. Lap belt had ballistically separated as a result of M-120 initiator action. Washer was installed in gold key aperture. This action required since aft seat was unoccupied. Both ejection seat handgrips sustained impact marks, which were consistent with handgrips being in down and locked position

at aircraft initial impact. Examination of seat mounted ballistics, ballistic circuitry, and one-way valves indicated proper installation.

d. Forward Ejection Seat Observations: Forward ejection seat was located in forward cockpit. Aircrew was recovered adjacent to cockpit. Ejection seat pan and forward seat bucket had broken away. Both ejection seat leg braces were up, ejection handgrips raised, and triggers exposed. Rocket catapult had broken away from ejection seat. Rocket catapult was recovered unfired with catapult end cap broken away. Ballistic hose to rocket catapult had broken apart during aircraft breakup. Seat height adjustment actuator had broken away. Ejection seat was removed from aircraft. Examination of right leg brace revealed M-120 lap belt initiator sear pin removed and initiator fired. Lap belt had ballistically separated. Gold key was installed and zero delay lanyard connected. Sear pin pulled from M-27 initiator and both M-27 and M-26 initiators fired. Examination of left leg brace revealed M-26 and M-27 initiator had also fired. Examination of right and left leg brace arms revealed impact marks at top ends, which are consistent with leg braces being in down position at initial impact. Several gouges on left leg brace arm indicate secondary impacts were sustained as leg brace was coming up. Ejection handgrip had impact marks, indicating handgrip was down at initial impact. Bottom front section of left leg brace had impact marks indicating a force in upward direction. Impact marks are consistent with leg braces being forced up as a result of post impact aircraft breakup forces. Ballistics were fired as a result of these forces. All ballistics, ballistic circuitry and one-way valves were properly installed on forward ejection seat.

e. Personal Equipment Observations: Aircrew personal parachute had deployed and was entangled in the forward cockpit. Life raft was partially inflated and entangled in cockpit debris. Fragments of survival kit container were scattered. Survival kit ruck sack was badly damaged scattering contents around local area. Aircrew helmet was recoverd. Left side bayonet clip was attached with clip release pin bent slightly aft. Right bayonet clip disconnected. Rubber oxygen mask missing. Visor cover and tinted visor broken away. Chin strap was disconnected. Black marks noted near right chin strap and on back of helmet. Traces of smoke damage noted on back of helmet. Chips and scratches with traces of blue paint imbedded noted on back side of helmet. Helmet crack, propagating from left forward corner up and then aft, was noted. Helmet was located approximately 20 yards from crewmember and down path of destruction. Aircrew gloves were recovered. Traces of dark material were noted in palm area of both gloves. No traces of yellow were noted. This is considered significant. Black traces on gloves indicate aircrew hands were on aircraft controls at initial impact. The lack of yellow residue indicates aircrew hands were not on ejection seat handgrips.

5. AIRCRAFT NUMBER 3, 68-8176.

a. Aft Cockpit Observations: Aft canopy located approximately 240 yards from aircraft initial impact point. Examination of canopy revealed it impacted ground once before coming to rest some five feet away. Canopy frame was intact but broken at mid-point of both bows. This type of break is consistent with damage being done at canopy ground impact. Canopy glass was scattered in the immediate area. Canopy seal attached. Inspection revealed canopy attach plates had broken away. This indicates canopy separated as a result of impact forces and not by aircrew initiation. Right side latch hinge disconnect assembly was in locked position with sheared canopy attach plate still connected. This confirms canopy was removed as a result of post impact aircraft breakup forces. Examination of canopy rollers failed to reveal any out-of-round rollers or traces of material transfer on the rollers. This means canopy lock hooks had rotated to the unlocked position and is a strong indication canopy lock hook linkage had broken at initial

impact. Aft cockpit area was totally destroyed during post impact aircraft breakup. Left and right forward canopy lock hooks were recovered from wreckage. Both were in unlocked position with no abnormal scoring noted. Aft canopy latch hinge disconnect assembly had linkages sheared away. Assemblies were in unlocked position and badly damaged by fire. Aft cockpit ballistics, ballistic circuitry and one-way valves recovered revealed proper installation.

b. Forward Cockpit Observation: A portion of forward canopy side rail and bow was located. Examination of canopy rollers revealed they were slightly scarred. Section of canopy rail and aft bow were located approximately 40 yards further down the path of destruction. Examination revealed canopy rollers slightly scarred. Impact marks on canopy roller housing indicated canopy movement to the right prior to canopy separation. Canopy seal was attached to canopy parts. Forward cockpit underwent severe structural breakup. Aircrew was recovered entangled with cockpit debris. Right forward airframe mounted canopy rail was examined. First and second canopy lock hooks were missing. Second canopy lock hook housing sustained severe impact mark, which indicated canopy removed forcefully. Third lock hook in open position. Scoring noted on interior of hook tip. Severe impact mark noted on outside of hook housing. This further substantiates a forced removal of the canopy. The left forward airframe mounted canopy rail was located in the fuselage wreckage. First canopy lock hook was in locked position. Score noted on inside tip of hook. Second canopy lock hook in locked position. Minor score noted on inside tip of hook. Third canopy lock hook was in unlocked position. Canopy lock hooks being locked and unlocked indicates canopy lock hook linkages broke during post impact aircraft breakup. Scoring noted on inside tip of canopy lock hook indicates forced removal of canopy. Both canopy latch hinge disconnect assemblies had been broken away. Canopy thruster was unfired, but partially extended, as a result of breakup forces. All front cockpit mounted one-way valves, ballistics, and ballistic circuitry recovered were properly installed.

c. Aft Ejection Seat Observations: The aft ejection seat was located approximately 40 yards from the cockpit. Ballistic gas residue trail formed an arc to ejection seat. Both leg braces raised. Rocket catapult had catapult end cap broken away. Catapult had ballistically ignited and was located attached to ejection seat. Examination of right leg brace revealed ejection seat safety pin had been forcibly withdrawn from hole. Leg brace side cover was removed revealing M-120, M-27, and M-26 initiators had fired. Inspection of left leg brace revealed all initiators unfired. Drogue gun had fired deploying drogue chute. Drogue chute located near ejection seat. Lap belt, shoulder harness, negative G strap, and seat/man separator strap had burned away. Lap belt link and latch were connected with washer installed in gold key aperture. This indicates initiators were fired as a result of aircraft breakup forces encountered after restraint straps burned. Washer was installed in gold key aperture since rear seat was unoccupied. Examination of seat mounted ballistics, ballistic circuitry and one-way valves revealed proper installation.

d. Forward Ejection Seat Observations: Ejection seat underwent severe structural breakup and was located with cockpit wreckage. Entire seat bucket assembly had broken away. Seat pan was located near cockpit wreckage with calfguard in stowed position. This indicates seat did not move up ejection seat guide rail sufficiently to pull calfguard down. Left leg brace was recovered sheared away but laying adjacent to ejection seat back. Right leg brace was recovered 30 yards away with all initiators expended. Inspection of left leg brace revealed all initiators unfired. Both ejection seat handgrips sustained impact marks, which are consistent with handgrips being down at aircraft initial impact. Both leg brace arms sustained impact marks, which would indicate leg braces were down at aircraft initial impact. Rocket catapult was located approximately 100 feet away with catapult end cap broken away and unfired. Lap belt buckle and link were connected with

gold key installed. Zero delay lanyard was attached to parachute D ring. Post impact fire melted lap belt, shoulder harness loops, negative G strap and seat/man separator strap. It was noted that inertia reel strap failed at stitching. Drogue gun had fired, deploying drogue chute. Drogue chute was entangled in wreckage and melted. This indicates leg brace ballistics were activated as a result of ejection seat breakup forces which occurred after aircraft post impact fire. Personal leads quick disconnect had not separated. This indicates seat did not move up the ejection seat guide rails sufficiently to separate the personal leads quick disconnect.

e. Personal Equipment Observations: Aircrew's helmet was located with both bayonet clips installed. Left bayonet bracket bent outward. Visor cover and tinted visor broken away. Traces of black residue noted on left side of helmet near bayonet housing. Right side bayonet clip housing cracked. Right side (earcup section) of helmet fractured with paint chipped away. Nape strap was connected. Examination of chin strap revealed snap had pulled out. Oxygen mask screws had pulled through on left side. Aircrew personal parachute was deployed in cockpit and melted in post impact fire. Pilot chute was entangled in ejection seat drogue chute. Both were melted. The CRU-60 oxygen regulator was located near cockpit wreckage. Survival kit container underwent severe structural breakup with pieces scattered throughout path of destruction. Survival kit contents were scattered. Examination of aircrew flying gloves revealed traces of black; no traces of yellow were noted. This is considered significant, since it indicates aircrew had hands on aircraft controls and not on ejection seat handgrips.

6. AIRCRAFT NUMBER 4, 68-8175.

a. Aft Cockpit Observations: Aft canopy was located approximately 250 yards from aircraft initial impact point. Right side canopy attach plate sheared away. Left side canopy attach plate showed no impact scars. Right forward canopy roller housing had severe distortion to inside right indicating airframe movement to right prior to canopy departure. Impact mark noted on aft inside of left forward canopy roller housing, indicating airframe movement to left prior to canopy departure. Canopy bow broken at mid-point. This indicated airframe distortion at initial impact was sufficient to spread canopy and leave impact marks. Canopy gasket was attached. The aft cockpit was totally destroyed as a result of post impact aircraft breakup forces and subsequent fire. Right side cockpit latch hinge disconnect assembly was located in partial locked position with canopy linkage sheared. Canopy attach plate was located nearby. With linkage sheared, latch hinge disconnect assembly is a free operating mechanism. Therefore, it is considered highly probable canopy attach plate fell out of latch hinge disconnect assembly as cockpit area came to rest. Aft canopy thruster was located in extended position. This is considered to be the result of post impact fire. Aft canopy latch hinge disconnect assemblies had broken away during post impact aircraft breakup. Those aft cockpit ballistics and one-way valves recovered are considered to be properly installed.

b. Forward Cockpit Observations: Left canopy rail was attached to airframe, which was located in cockpit wreckage. Left canopy attach plate still connected to latch hinge disconnect assembly. Right section forward canopy was located approximately 20 yards away. Canopy rollers show no scoring. This indicates canopy lock hook linkage had sheared on left side. The forward cockpit area was totally destroyed by post impact aircraft breakup forces and subsequent fire.

c. Aft Ejection Seat Observations: Aft ejection seat was located in cockpit wreckage and was totally destroyed by post impact aircraft breakup forces and subsequent fire. Lower ejection seat ballistics and one-way valves recovered were properly installed.

d. Forward Ejection Seat Observations: Forward ejection seat was badly damaged as a result of post impact aircraft breakup forces and subsequent fire. Examination of both leg braces revealed initiators unfired. Rocket catapult was recovered in wreckage. Rocket catapult had shoulder harness, lap belt, and oxygen hose tightly wound around upper end. Rocket catapult had fired as a result of post impact fire. Examination of lap belt revealed gold key and lap belt link had separated. Inspection of buckle handle revealed severe impact marks. It is considered highly probable that handle impacted airframe hardware, while being wound around catapult, with sufficient force to rotate handle and release gold key and link. Examination of ejection seat handgrips revealed impact marks, indicating handles down at initial impact. Inspection of leg brace arms revealed impact marks, which indicated leg braces were down at initial impact.

e. Personal Equipment Observations: Aircrew helmet was recovered with both bayonet clips connected. Right side clip release bent down. Tops of bayonet brackets bent inward. Cracks were noted on upper left side through top middle of helmet. Second crack noted around back to midpoint level. Trace of black residue noted at midpoint through back of helmet. Visor cover and tinted visor missing. Hole noted in right side of helmet. Chin strap was attached. Crack noted on right side of helmet. Parachute fly away disc was located thirty feet and to the right of aircraft initial impact point. Small shreds of personal parachute located throughout path of destruction. This indicates aircraft underwent severe structural deformation at initial impact. Section of parachute remained in cockpit area. Fragments of survival kit container located approximately 60 feet from cockpit. Ruck sack and components scattered throughout path of destruction. Inspection of aircrew flying gloves revealed traces of black residue. No yellow traces were noted. This indicates aircrew had hands on aircraft controls at initial impact. Lack of yellow traces on gloves is strong evidence that aircrew did not have hands on ejection seat handgrips at initial impact.

7. SUMMARY.

It should be noted egress and life support equipment was virtually untouched prior to the arrival of these egress specialists. Of particular appreciation is the professional manner in which explosive ordnance disposal personnel safetied live ballistics without destroying valuable evidence at the scene. All eight aircraft canopies were on their respective aircraft prior to initial impact. All eight canopies departed their respective aircraft as a result of post impact aircraft breakup forces. The scatter pattern of egress and life support components along the four paths of destruction is consistent with those components being removed as a result of post impact aircraft breakup forces. All aft ejection seats were unoccupied. All four forward aircrew occupied ejection seats were located in respective aircraft cockpit sections. There is no evidence to indicate any aircrew attempted to initiate ejection, either before or after aircraft impact. If a decision to eject was considered, it did not progress to the point of grabbing the ejection seat handgrips. Maintenance of the egress system is not considered a factor in any of the aircraft involved in the mishap. It is the opinion of the undersigned egress specialists, based on the foregoing observations, that the ejection seats, ballistics, and ballistic circuitry were operational and, if used within the parameters for which they were designed, would have functioned as advertised.

[redacted]

CHARLES S. GOODMAN
Egress Specialist
SA-ALC/MMIRCB
Kelly AFB, TX

[redacted]

JESUS MARTINEZ
Egress Specialist
SA-ALC/MMIRCB
Kelly AFB, TX

INDEX TO TAB K

LOCAL VFR FLIGHT CLEARANCE - DAILY FLIGHT ORDER - FLIGHTS ORIGINATING AND TERMINATING AT UNIT BASE

PRIVACY ACT STATEMENT. AUTH: 10USC8012, EO9397. PRINCIPAL PURPOSE(S): ACTS AS A LOCAL FLIGHT CLEARANCE AND SET OF WRITTEN FLIGHT ORDERS. ROUTINE USES: THIS FORM VERIFIES THAT THE AIRCRAFT COMMANDER HAS CHECKED THE CRITICAL ITEMS AND FORMS NECESSARY TO FLY. IT ALSO ACTS AS A HISTORICAL DOCUMENT TO SUPPLY VARIOUS FACTS ABOUT THE FLIGHT. WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION: DISCLOSURE IS MANDATORY. NONDISCLOSURE OF SSAN WOULD MEAN NONVERIFICATION OF CREWMEMBER FLYING AIRCRAFT SINCE NO OTHER IDENTIFICATION NUMBER OTHER THAN SSAN IS GIVEN TO AIR FORCE PERSONNEL. THE CREWMEMBER WOULD NOT BE ALLOWED TO FLY IF HE DID NOT DISCLOSE HIS SSAN.

BASE	UNIT ISSUING ORDER	ORDER NUMBER	SIGNATURE, GRADE, TITLE OF AUTHENTICATING OFFICIAL	PAGE	DATE
NELLIS AFB, NV	USAF ADS		FOR COMPLETED OF FLYING DAY JOSEPH N. PETERSON III, CAPT, OPS OFFICER	1 OF 2	18 Jan 82

2 COMPLETE BEFORE FLIGHT															3 COMPLETE AFTER FLIGHT		
CALL SIGN FLT POS FLT LDR(**) DEP LDR(+) A	CREW POS B	LAST NAME-INITIALS (*) FP IN CMD C	GRADE D	SSAN E	MSN PEID F	ACFT TYPE/MOD G	ACFT NR. H	HRS FUEL I	ETD J	ETE K	CIF L	WX M	DD FORM 365F N	NOTAMS O	A/C CMDR OR FLIGHT LEAD AND DEP FLT LEAD P	ATD Q	ATE R	REMARKS S
TB-5 **	FP	COOKE, B.	CPT		S-5 / D	T38	168	1.5	0855	1.0	C	✓	NA	C		0855	.9	HIWAY 1, INS, LEE/R65&INS (TSX)
																		0900-0945
TB-6 +	FP	JONES, S.	MAJ		S-5 / D	T38	137	1.5	0855	1.0	J	✓	NA	J		L	L	REMAIN SOUTH OF BLACK ROCK
																		AVOID 65A 26 3250 114 155 155 132
																		4.7 6.2
TB-1 **	FP	LOWRY, N.	MAJ		S-5 / D	T38	156	1.5	0940	1.0	L	✓	NA	L				HIWAY 1, INS, LEE/R65&INS (TSX)
																		0945-1030
TB-2	FP	MAYS, W.	CPT		S-5 / D	T38	184	1.5	0940	1.0	M	✓	NA	m				REMAIN SOUTH OF BLACK ROCK
																		AVOID 65A
TB-3 +	FP	PETERSON, J.	CPT		S-5 / D	T38	176	1.5	0940	1.0	P	✓	NA	P				2.6 3250 114 155 155 RD 132 RW 4.7 6.2
																		TB-1THRU4 GROUND IMPACTED AT
3-4	FP	MELANCON, M.	CPT		S-5 / D	T38	175	1.5	0940	1.0	M	✓	NA	m				APPROXIMATELY 1000HRS PST

CREW MEMBERS LISTED ABOVE WILL PROCEED IN AIRCRAFT INDICATED AND UPON COMPLETION OF FLIGHT WILL RETURN TO PROPER STATIONS.

VARIATIONS IN ITINERARY ARE AUTHORIZED.

PERSONNEL ARE SUBJECT TO THE PROVISIONS OF THE UNIFORM CODE OF MILITARY JUSTICE WHILE PERFORMING THIS DUTY.

NAFB FORM JAN 79 175 PREVIOUS EDITION IS OBSOLETE

K-1

DEPARTMENT OF THE AIR FORCE
25TH WEATHER SQUADRON (MAC)
BERGSTROM AIR FORCE BASE, TX 78743

REPLY TO ATTN OF: Det 16, 25WS/CC
Nellis AFB, NV 89191

18 January 1982

SUBJECT: Weather Input for 18 Jan 82 T-38 Mishap (Thunderbirds)

TO: 57FWW/SEF

1. No official weather observation is available for Indian Springs. However, observations are available from Point B, Range 63. Observations for that location were:

Time	Sky	Vis	Temp/DP (^{O}F)
1755Z	120SCT E 180 Bkn 250 Bkn	20	47/23
1828Z	120SCT E 180 Bkn 250 Bkn	20	47/23

WND	ALSG
Calm	E29.87 Ins
0803	E29.84 Ins

2. No radar detectable weather was reported or observed in the mishap area.

3. There were no indications of low level turbulence in the mishap area.

[redacted]
LARRY W. JOBES, Lt Colonel, USAF
Commander

Kenny's

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

Show (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
06 JAN 81	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT/NO.	SERIAL NO.	TO	PILOT
	68-8156		

REMARKS

MOST AFT CG
FROM CHART E
WT 8900
mom 3121
CG 21%

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	8180	2896.4
2	OIL (2.35 Gal.)	18	9.0
		26	3.0
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	INDEX OR MOM/
B	1	200			200	38.0

COMPUTER PLATE NO. (If used)
CHART E & MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
TOTAL WEIGHT REMOVED		−	−
TOTAL WEIGHT ADDED		+	+
NET DIFFERENCE (Ref. 11)			

4	OPERATING WEIGHT	8424	294.64
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD		
	AFT		
	EXTERNAL		
	ROCKETS		
7	FUEL — BUILT IN (534 Gal.)	3471	121.09
	BOMB BAY (Gal.)		
	EXTERNAL (Gal.)		
	4C 44 CAC	357	12.25
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION (Uncorrected)	12249	428.58
11	CORRECTIONS (If required)		
12	TAKEOFF CONDITION (Corrected)	12249	428.58
13	TAKEOFF C. G. IN % M. A. C. OR IN.	349.2	20.1%
14	LESS EXPENDABLES — JATO OR RATO		
	BOMBS		
	AMMUNITION		
	FUEL −463	3010	164.55
	4C −44	354	12.35
15	ESTIMATED LANDING CONDITION	8585	311.12
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	350.2	20.6%

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C. OR IN.)
[1] PERMISSIBLE C. G. TAKEOFF	14%	25%
[1] PERMISSIBLE C. G. LANDING	14%	25%

[1] Enter constant used.
[2] Enter values from current applicable T. O.
[3] Applicable to gross weight (Ref. 12).
[4] Applicable to gross weight (Ref. 15).

COMPUTED BY (Signature) [redacted]
WEIGHT AND BALANCE AUTHORITY (Signature) [redacted]
PILOT (Signature)

DD FORM 1 SEPT 54 365F

L-1-1

10—67910-4

WEIGHT AND BALANCE CLEARANCE FORM F

FCF

TACTICAL

(USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
06 JAN 81	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8156		

REMARKS

MOST AFT CG
FROM CHART E
WT 9225
MOM 3244
CG 22 %

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
1	BASIC AIRCRAFT (*From Chart C*)	31 80	2 27 6 4
2	OIL (2.35 Gal.)	1 2	9 0
		2 C	3 0
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	[1] INDEX OR MOM/
B	1	200			200	3 3 0

COMPUTER PLATE NO. (*If used*)
CHART E & MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

REF	ITEM			WEIGHT	[1] INDEX OR MOM/
4	OPERATING WEIGHT			8424	2946 4
5	AMMUNITION — COMPT.	ROUNDS	CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD				
	AFT				
	EXTERNAL				
	ROCKETS				
7	FUEL — BUILT IN (583 Gal.)			3790	1326 5
	BOMB BAY (Gal.)				
	EXTERNAL (Gal.)				
8	WATER INJ. FLUID (Gal.)				
9	JATO OR RATO				
10	TAKEOFF CONDITION (*Uncorrected*)			12214	4272 4
11	CORRECTIONS (*If required*)				
12	TAKEOFF CONDITION (*Corrected*)			12214	4272 4
13	TAKEOFF C. G. IN % M. A. C. OR IN.			349.8	20.1 %
14	LESS EXPENDABLES — JATO OR RATO				
	BOMBS				
	AMMUNITION				
	FUEL -463			3010	1045 5
15	ESTIMATED LANDING CONDITION			9204	3227 4
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.			350.6	21 %

CORRECTIONS (*Ref. 11*)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (*Ref. 11*)		

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C.)
[1] PERMISSIBLE C. G. TAKEOFF	14 %	25 %
[1] PERMISSIBLE C. G. LANDING	14 %	25 %

[1] *Enter constant used.*
[2] *Enter values from current applicable T. O.*
[3] *Applicable to gross weight (Ref. 12).*
[4] *Applicable to gross weight (Ref. 15).*

COMPUTED BY (*Signature*) [redacted]

WEIGHT AND BALANCE AUTHORITY (*Signature*) [redacted]

PILOT (*Signature*)

DD FORM 1 SEPT 54 365F

16—67910 4

SHOW

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

PILOT/OBSERVER (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
06 JAN 81	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT NO.	SERIAL NO.	TO	PILOT
	63-8156		

REMARKS

MOST ACFT CG FROM CHART F

GT 12450
MOM. 4343
CG 1490

COMPUTER PLATE NO. (If used)

CHART F/MATH

REF	ITEM	WEIGHT	INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	31820	288764
2	OIL (7.25 Gal.)	196	90
	10 LTR - LUY	26	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	INDEX OR MOM/
A	1	200			200	360
B	1	200			200	500

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	INDEX OR MOM/
TOTAL WEIGHT REMOVED		−	−
TOTAL WEIGHT ADDED		+	+
NET DIFFERENCE (Ref. 11)			

4	OPERATING WEIGHT			86244	299664
5	AMMUNITION	COMPT.	ROUNDS	CALIBER	
6	BOMBS, ROCKETS, ETC.	FORWARD			
		AFT			
		EXTERNAL			
		ROCKETS			
7	FUEL	BUILT IN (534 Gal.)			34711 / 121094
		BOMB BAY (Gal.)			
		EXTERNAL (Gal.)			
		510 414 GAL			3544 / 12285
8	WATER INJ. FLUID (Gal.)				
9	JATO OR RATO				
10	TAKEOFF CONDITION (Uncorrected)			124499	433588
11	CORRECTIONS (If required)				
12	TAKEOFF CONDITION (Corrected)			124499	433588
13	TAKEOFF C. G. IN % M. A. C. OR IN.			342.2	18.4%
14	LESS EXPENDABLES — JATO OR RATO				
	BOMBS				
	AMMUNITION				
	FUEL	− 163		2010	104555
		− 44		354	12285
15	ESTIMATED LANDING CONDITION			90855	316178
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.			342.0	12.2%

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C. or IN.)
[1] PERMISSIBLE C. G. TAKEOFF	14 %	25 (or IN.) %
[1] PERMISSIBLE C. G. LANDING	14 %	25 (or IN.) %

[1] Enter constant used.
[2] Enter values from current applicable T. O.
[3] Applicable to gross weight (Ref. 12).
[4] Applicable to gross weight (Ref. 15).

COMPUTED BY (Signature) [redacted]

WEIGHT AND BALANCE AUTHORITY (Signature) [redacted]

PILOT (Signature)

DD FORM 1 SEPT 54 365F

16—67910-4

X-Country
Pilot/Observer

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

(USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
06 JAN 81	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8156		

REMARKS

most AFT CG
From CHART E
WT 9400
mom 3279
CG 19%

COMPUTER PLATE NO. (*If used*)

CHART E & MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

REF	ITEM					WEIGHT	INDEX OR MOM/ [1]
1	BASIC AIRCRAFT (*From Chart C*)					8172	28964
2	OIL (2.35 Gal.)					12	70
	10 LTR - Lox					20	30
3	DISTRIBUTION OF LOAD						
	COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.		
	B	1	200			200	380
	B	1	200			200	500
4	OPERATING WEIGHT					8624	29964
5	AMMUNITION: COMPT. / ROUNDS / CALIBER						
6	BOMBS, ROCKETS, ETC.: FORWARD						
	AFT						
	EXTERNAL						
	ROCKETS						
7	FUEL: BUILT IN (583 Gal.)					3790	13265
	BOMB BAY (Gal.)						
	EXTERNAL (Gal.)						
8	WATER INJ. FLUID (Gal.)						
9	JATO OR RATO						
10	TAKEOFF CONDITION (*Uncorrected*)					12414	43229
11	CORRECTIONS (*If required*)						
12	TAKEOFF CONDITION (*Corrected*)					12414	43229
13	TAKEOFF C. G. IN % M. A. C. OR IN.					348.2	18.2%
14	LESS EXPENDABLES: JATO OR RATO						
	BOMBS						
	AMMUNITION						
	FUEL -463					3010	10455
15	ESTIMATED LANDING CONDITION					9404	32774
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.					347.5	18.7%

CORRECTIONS (*Ref. 11*)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	CHANGES (+ or −) [1] INDEX OR MOM/
TOTAL WEIGHT REMOVED		−	−
TOTAL WEIGHT ADDED		+	+
NET DIFFERENCE (*Ref. 11*)			

LIMITATIONS

[2] GROSS WT. TAKEOFF (lb.)		[3] GROSS WT. LANDING (lb.)	
13,500		13,500	
[2] PERMISSIBLE C. G. TAKEOFF	FROM 14%	TO (% M. A. C.) 23.8%	
[4] PERMISSIBLE C. G. LANDING	FROM 14%	TO (% M. A. C.) 23.8%	

[1] Enter constant used.
[2] Enter values from current applicable T. O.
[3] Applicable to gross weight (Ref. 12).
[4] Applicable to gross weight (Ref. 15).

COMPUTED BY (*Signature*) [redacted]

WEIGHT AND BALANCE AUTHORITY (*Signature*) [redacted]

PILOT (*Signature*)

DD FORM 1 SEPT 54 365F

10—67910-4

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

USE REVERSE FOR TRANSPORT MISSIONS)

SHOW

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 JAN 81	T-38A		NEW ORLEANS NAS

MISSION/TRIP/FLIGHT NO.	SERIAL NO.	TO	PILOT
	65-8184		

REMARKS

MOST AFT CG FROM CHART E

WT 8975
MOM 3147
CG 2170

REF	ITEM	WEIGHT	INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	8749	2919.3
2	OIL 8.35 (Gal.)	18	9.0
	10 LTRS - LOX	26	3.0
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO	CREW WEIGHT	BAGGAGE	CARGO AND MISC.		
B	1	200			200	3.8

COMPUTER PLATE NO. (If used)

CHART E MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	INDEX OR MOM/

TOTAL WEIGHT REMOVED	−	−	
TOTAL WEIGHT ADDED	+	+	
NET DIFFERENCE (Ref. 11)			

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (C. M. A. C.)
[2] PERMISSIBLE C. G. TAKEOFF	14%	25%
[2] PERMISSIBLE C. G. LANDING	14%	25%

[1] Enter constant used.
[2] Enter values from current applicable T. O.
[3] Applicable to gross weight (Ref. 13).
[4] Applicable to gross weight (Ref. 15).

		WEIGHT	INDEX OR MOM/
4	OPERATING WEIGHT	84933	296.93
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD		
	AFT		
	EXTERNAL		
	ROCKETS		
7	FUEL — BUILT IN (534 Gal.)	34771	121.09
	BOMB BAY (Gal.)		
	EXTERNAL (Gal.)		
	S10 49 CAL	3544	12.85
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION (Uncorrected)	123188	430.87
11	CORRECTIONS (If required)		
12	TAKEOFF CONDITION (Corrected)	123188	430.87
13	TAKEOFF C. G. IN % M. A. C. OR IN.	349.7	20.09%
14	LESS EXPENDABLES — JATO OR RATO		
	BOMBS		
	AMMUNITION		
	FUEL −463	30104	10.45
	S10 − 49	3544	12.85
15	ESTIMATED LANDING CONDITION	89541	313.47
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	350.0	20.49%

COMPUTED BY (Signature) [redacted]

WEIGHT AND BALANCE AUTHORIZED (Signature) [redacted]

PILOT (Signature)

DD FORM 1 SEPT 54 365F

L-2-1

16—67010-4

WEIGHT AND BALANCE CLEARANCE FORM F

FCF

TACTICAL

(USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 JAN 81	T-38A		NELLIS AFB NV
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
	62-2181		

REMARKS

MOST AFT CG
FROM CHART E

WT. 9275
MOM. 3253
CG. 21.9%

COMPUTER PLATE NO. (If used)

CHART E & MAP 17

REF	ITEM	WEIGHT	¹INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	8249	2919.3
2	OIL (2.35 Gal.)	18	9.0
	10 LTR. LOX	26	3.0
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	¹INDEX OR MOM/
B	1	200			200	3.8.0

			WEIGHT	¹INDEX OR MOM/
4	OPERATING WEIGHT		8493	296.93
5	AMMUNITION	COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC.	FORWARD		
		AFT		
		EXTERNAL		
		ROCKETS		
7	FUEL	BUILT IN (583 Gal.)	3790	1326.5
		BOMB BAY (Gal.)		
		EXTERNAL (Gal.)		
8	WATER INJ. FLUID (Gal.)			
9	JATO OR RATO			
10	TAKEOFF CONDITION (Uncorrected)		12283	429.58
11	CORRECTIONS (If required)			
12	TAKEOFF CONDITION (Corrected)		12283	429.58
13	TAKEOFF C. G. IN % M. A. C. OR IN.		349.7	20.0%
14	LESS EXPENDABLES: JATO OR RATO			
	BOMBS			
	AMMUNITION			
	FUEL -463		3010	104.55
15	ESTIMATED LANDING CONDITION		9273	325.03
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.		350.5	20.9%

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	¹INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (Ref. 11)		

LIMITATIONS

¹GROSS WT. TAKEOFF (lb.)	¹GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C.)
¹PERMISSIBLE C. G. TAKEOFF	14.90	25.90
⁴PERMISSIBLE C. G. LANDING	14.90	25.90

¹ Enter constant used.
² Enter values from current applicable T. O.
³ Applicable to gross weight (Ref. 12).
⁴ Applicable to gross weight (Ref. 15).

COMPUTED BY (Signature) [redacted]

WEIGHT AND BALANCE AUTHORITY (Signature) [redacted]

PILOT (Signature)

DD FORM 1 SEPT 54 365F

L-2-2

10—07910-4

SHOW

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

PILOT/OBSERVER (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 JAN 81	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8124		

REMARKS

MOST AFT CG
FROM CHART E

WT 9175
MOM 3200
CG 1470

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	32494	2914 93
2	OIL (2.35 Gal.)	18	90
	10 LTC - LOX	26	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.		
B	1	200			2003	3800
B	1	200			2000	5000

COMPUTER PLATE NO. (If used)
CHART E MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

4	OPERATING WEIGHT	26493	301493
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD		
	AFT		
	EXTERNAL		
	ROCKETS		
7	FUEL — BUILT IN (5341 Gal.)	34711	121099
	BOMB BAY (Gal.)		
	EXTERNAL (Gal.)		
	S/O 49 CAL	3574	12855
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION (Uncorrected)	125128	435837
11	CORRECTIONS (If required)		
12	TAKEOFF CONDITION (Corrected)	125128	435837
13	TAKEOFF C. G. IN % M. A. C. OR IN.	348.1	18.2 %
14	LESS EXPENDABLES — JATO OR RATO		
	BOMBS		
	AMMUNITION		
	FUEL -463	30100	104555
	S/O -49	3574	12855
15	ESTIMATED LANDING CONDITION	91554	318477
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	347.9	18.0 %

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (Ref. 11)		

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C. or IN.)
[1] PERMISSIBLE C. G. TAKEOFF	14 %	25 %
[1] PERMISSIBLE C. G. LANDING	14 %	25 %

[1] Enter constant used.
[2] Enter values from current applicable T. O.
[3] Applicable to gross weight (Ref. 12).
[4] Applicable to gross weight (Ref. 15).

COMPUTED BY (Signature) [redacted]

WEIGHT AND BALANCE AUTHORITY (Signature) [redacted]

PILOT (Signature)

DD FORM 1 SEPT 54 365F

10—67910-4

X-COUNTRY

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

PILOT/OBSERVER (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 JAN 81	T-37A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8184		

REMARKS

MOST AFT CG FROM CHART E

WT 9475
MOM 3305
CG. 1490

REF	ITEM	WEIGHT	INDEX OR MOM/1000
1	BASIC AIRCRAFT (From Chart C)	8249	2919.3
2	OIL (2.35 Gal.)	18	9.3
	10 CTR - 6.5 X	26	3.0
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	INDEX OR MOM/1000
B	1	200			200	33.0
B	1	200			200	50.0

COMPUTER PLATE NO. (If used)

CHART F 1 MITH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	CHANGES (+ or −) INDEX OR MOM/1000

TOTAL WEIGHT REMOVED	−	−	
TOTAL WEIGHT ADDED	+	+	
NET DIFFERENCE (Ref. 11)			

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C. or IN.)
[1] PERMISSIBLE C. G. TAKEOFF	14%	25%
[1] PERMISSIBLE C. G. LANDING	14%	25%

[1] Enter constant used.
[1] Enter values from current applicable T. O.
[2] Applicable to gross weight (Ref. 12).
[3] Applicable to gross weight (Ref. 15).

4	OPERATING WEIGHT	8643	301.3
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD		
	AFT		
	EXTERNAL		
	ROCKETS		
7	FUEL — BUILT IN (5383 Gal.)	3790	132.65
	BOMB BAY (Gal.)		
	EXTERNAL (Gal.)		
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION (Uncorrected)	12483	434.58
11	CORRECTIONS (If required)		
12	TAKEOFF CONDITION (Corrected)	12483	434.58
13	TAKEOFF C. G. IN % M. A. C. OR IN.	342.1	18.3%
14	LESS EXPENDABLES — JATO OR RATO		
	BOMBS		
	AMMUNITION		
	FUEL −463	3010	104.35
15	ESTIMATED LANDING CONDITION	9473	330.05
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	342.3	18.5%

COMPUTED BY (Signature) [redacted]

WEIGHT AND BALANCE AUTHORITY (Signature) [redacted]

PILOT (Signature) [redacted]

DD FORM 1 SEPT 54 365F

L-2-4

16—67013-4

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

SHOAL (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 JAN 81	T-39A		
MISSION/TRIP/FLIGHT NO.	**SERIAL NO.**	**TO**	**PILOT**
	61-8176		

REMARKS

MOST AFT CG FROM CHART F

GT 9025

MOM 3150

CG 20.7%

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	8306	29333
2	OIL (7.5 Gal.)	18	2
	1 EA LAV LAV	26	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	[1] INDEX OR MOM/
3	1	200			200	380

COMPUTER PLATE NO. (If used)

CHART F/MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

		WEIGHT	[1] INDEX OR MOM/
4	OPERATING WEIGHT	8550	27833
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD		
	AFT		
	EXTERNAL		
	ROCKETS		
7	FUEL — BUILT IN (534 Gal.)	3471	12109
	BOMB BAY (Gal.)		
	EXTERNAL (Gal.)		
	5/0 44 CAL	354	1235
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION (Uncorrected)	12375	432207
11	CORRECTIONS (If required)		
12	TAKEOFF CONDITION (Corrected)	12375	432207
13	TAKEOFF C. G. IN % M. A. C. OR IN.	349.5	19.6%
14	LESS EXPENDABLES — JATO OR RATO		
	BOMBS		
	AMMUNITION		
	FUEL − 443	3012	10455
	5/0 − 44	354	1235
15	ESTIMATED LANDING CONDITION	9011	31487
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	349.4	19.7%

CORRECTIONS (Ref. 11)			
COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (Ref. 11)		

LIMITATIONS		
[3] GROSS WT. TAKEOFF (lb.) 13,500	[3] GROSS WT. LANDING (lb.) 13,500	
[2] PERMISSIBLE C. G. TAKEOFF	FROM 14.0	TO (% M. A. C. or IN.) 23.2
[4] PERMISSIBLE C. G. LANDING	FROM 14.0	TO (% M. A. C. or IN.) 23.2

[1] Enter constant used.
[2] Enter values from current applicable T. O.
[3] Applicable to gross weight (Ref. 12).
[4] Applicable to gross weight (Ref. 15).

COMPUTED BY (Signature) [redacted]

WEIGHT AND BALANCE AUTHORITY (Signature) [redacted]

PILOT (Signature)

DD FORM 1 SEPT 54 365F

L-3-1

16—67910-4

WEIGHT AND BALANCE CLEARANCE FORM F

FCF

TACTICAL

(USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 JAN 81	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8176		

REMARKS

MOST AFT C.G.
FROM CHART E.

WT 9350
MOM 3279
C.G. 21.9%

COMPUTER PLATE NO. *(If used)*

CHART E/MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
1	BASIC AIRCRAFT *(From Chart C)*	25660	2933[3]
2	OIL (23.5 Gal.)	18	9[0]
	1C CTR tk	2C	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	INDEX OR MOM/
B	1	200			200	320

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
4	OPERATING WEIGHT	25850	29833
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD / AFT / EXTERNAL / ROCKETS		
7	FUEL — BUILT IN (5393 Gal.)	3790	13265
	FUEL — BOMB BAY (Gal.)		
	FUEL — EXTERNAL (Gal.)		
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION *(Uncorrected)*	12340	43098
11	CORRECTIONS *(If required)*		
12	TAKEOFF CONDITION *(Corrected)*	12340	43098
13	TAKEOFF C. G. IN % M. A. C. OR IN.	349.2	19.5%
14	LESS EXPENDABLES — JATO OR RATO		
	LESS EXPENDABLES — BOMBS		
	LESS EXPENDABLES — AMMUNITION		
	LESS EXPENDABLES — FUEL -4613	3010	10455
15	ESTIMATED LANDING CONDITION	23730	32643
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	349.2	20.1%

CORRECTIONS *(Ref. 11)*

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE *(Ref. 11)*		

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C. or IN.)
[2] PERMISSIBLE C. G. TAKEOFF	14%	23%
[4] PERMISSIBLE C. G. LANDING	14%	23%

[1] *Enter constant used.*
[2] *Enter values from current applicable T. O.*
[3] *Applicable to gross weight (Ref. 12).*
[4] *Applicable to gross weight (Ref. 15).*

COMPUTED BY *(Signature)* [redacted]

WEIGHT AND BALANCE AUTHORITY *(Signature)* [redacted]

PILOT *(Signature)*

DD FORM 1 SEPT 54 365F

18- 07010 4

X-COUNTRY

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

PILOT/OBSERVER (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 JAN 81	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8176		

REMARKS

MOST ART IS FROM CHART E

WT 9550
MOM 3303
CG 18%

REF	ITEM	WEIGHT	[1] INDEX OR MOM.
1	BASIC AIRCRAFT (From Chart C)	8306	29333
2	OIL 235 (Gal.)	18	90
	10 LTR LOX	26	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.		
B	1	200			200	380
B	1	200			200	500

COMPUTER PLATE NO. (If used)
CHART E & MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/

TOTAL WEIGHT REMOVED	−	−	
TOTAL WEIGHT ADDED	+	+	
NET DIFFERENCE (Ref. 11)			

LIMITATIONS

[2] GROSS WT. TAKEOFF (lb.)	[3] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C.)
[3] PERMISSIBLE C. G. TAKEOFF	14%	25%
[4] PERMISSIBLE C. G. LANDING	14%	25%

[1] Enter constant used.
[2] Enter values from current applicable T. O.
[3] Applicable to gross weight (Ref. 12).
[4] Applicable to gross weight (Ref. 15).

4	OPERATING WEIGHT			8750	30333
5	AMMUNITION — COMPT. / ROUNDS / CALIBER				
6	BOMBS, ROCKETS, ETC. — FORWARD				
	AFT				
	EXTERNAL				
	ROCKETS				
7	FUEL — BUILT IN (593 Gal.)			3790	13265
	BOMB BAY (Gal.)				
	EXTERNAL (Gal.)				
8	WATER INJ. FLUID (Gal.)				
9	JATO OR RATO				
10	TAKEOFF CONDITION (Uncorrected)			12540	43598
11	CORRECTIONS (If required)				
12	TAKEOFF CONDITION (Corrected)			12540	43598
13	TAKEOFF C. G. IN % M. A. C. OR IN.			347.6	17.7%
14	LESS EXPENDABLES — JATO OR RATO				
	BOMBS				
	AMMUNITION				
	FUEL −463			3010	10455
15	ESTIMATED LANDING CONDITION			9530	33143
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.			347.7	17.8%

COMPUTED BY (Signature) [redacted]

WEIGHT AND BALANCE AUTHORITY (Signature) [redacted]

PILOT (Signature)

DD FORM 1 SEPT 54 365F

16—67913-4

SHOW

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

PILOT/OBSERVER (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 JAN 81	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8176		

REMARKS

MOST AFT CG
FROM CHART E
WT 9225
MOM. 3209
CC 1870

COMPUTER PLATE NO. (If used)

CHART E/MATH

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	8306	2933
2	OIL (2.35 Gal.)	18	90
	10 LTRS. -LOX	26	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	INDEX OR MOM/
B	1	200			200	380
B	1	200			200	500

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (*Ref. 11*)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
TOTAL WEIGHT REMOVED		−	−
TOTAL WEIGHT ADDED		+	+
NET DIFFERENCE (*Ref. 11*)			

LIMITATIONS

[2] GROSS WT. TAKEOFF (lb.)	[3] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO
[4] PERMISSIBLE C. G. TAKEOFF	14%	25% (% M. A. C. or IN.)
[4] PERMISSIBLE C. G. LANDING	14%	25% (% M. A. C. or IN.)

4	OPERATING WEIGHT	8750	30333
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD		
	AFT		
	EXTERNAL		
	ROCKETS		
7	FUEL — BUILT IN (534 Gal.)	3471	12109
	BOMB BAY (Gal.)		
	EXTERNAL (Gal.)		
	S/O 49 GAL	3549	12855
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION (*Uncorrected*)	12575	43727
11	CORRECTIONS (*If required*)		
12	TAKEOFF CONDITION (*Corrected*)	12575	43727
13	TAKEOFF C. G. IN % M. A. C. OR IN.	347.7	17.8%
14	LESS EXPENDABLES — JATO OR RATO		
	BOMBS		
	AMMUNITION		
	FUEL − 463	3010	10455
	− 49	3549	12855
15	ESTIMATED LANDING CONDITION	9211	31987
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	347.2	17.4%

COMPUTED BY (*Signature*) [redacted]

WEIGHT AND BALANCE AUTHORITY (*Signature*) [redacted]

PILOT (*Signature*)

[1] *Enter constant used.*
[2] *Enter values from current applicable T. O.*
[3] *Applicable to gross weight (Ref. 12).*
[4] *Applicable to gross weight (Ref. 15).*

DD FORM 1 SEPT 54 365F

16-67011-1

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

FCF

(USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 DEC 81	F-15A		NELLIS AFB NV
MISSION/TRIP/FLIGHT NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-0175		

REMARKS

MOST AFT CG
FROM CHART E
WT 9250
MOM 3244
CG 21%

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
1	BASIC AIRCRAFT (*From Chart C*)	8224	2907
2	OIL (2.35 Gal.)	18	90
	10 LTD LOX	26	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.		
A	1	200			200	380

COMPUTER PLATE NO. (*If used*)

CHART E & MATH

REF	ITEM													
4	OPERATING WEIGHT						8	4	6	3		2	9	5	9	7
5	AMMUNITION — COMPT. / ROUNDS / CALIBER															
6	BOMBS, ROCKETS, ETC. — FORWARD															
	AFT															
	EXTERNAL															
	ROCKETS															
7	FUEL — BUILT IN (583 Gal.)						3	7	9	0		1	3	2	6	5
	BOMB BAY (Gal.)															
	EXTERNAL (Gal.)															
8	WATER INJ. FLUID (Gal.)															
9	JATO OR RATO															
10	TAKEOFF CONDITION (*Uncorrected*)						1	2	2	5	8	4	2	8	6	2
11	CORRECTIONS (*If required*)															
12	TAKEOFF CONDITION (*Corrected*)						1	2	2	5	8	4	2	8	6	2
13	TAKEOFF C. G. IN % M. A. C. OR IN.						350.0					20.4%				
14	LESS EXPENDABLES — JATO OR RATO															
	BOMBS															
	AMMUNITION															
	FUEL −463						3	0	1	0		1	1	4	5	5
15	ESTIMATED LANDING CONDITION						9	2	4	8		3	2	4	0	7
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.						350.4					20.8%				

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (*Ref. 11*)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (*Ref. 11*)		

LIMITATIONS

[2] GROSS WT. TAKEOFF (*lb.*)	[2] GROSS WT. LANDING (*lb.*)
13,500	13,500

	FROM	TO (% M. A. C. or IN.)
[3] PERMISSIBLE C. G. TAKEOFF	14%	25%
[3] PERMISSIBLE C. G. LANDING	14%	25%

[1] *Enter constant used.*
[2] *Enter values from current applicable T. O.*
[3] *Applicable to gross weight (Ref. 12).*
[4] *Applicable to gross weight (Ref. 15).*

COMPUTED BY (*Signature*)

WEIGHT AND BALANCE AUTHORITY (*Signature*)

PILOT (*Signature*)

DD FORM 1 SEPT 54 365F

16—67910-4

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL

(USE REVERSE FOR TRANSPORT MISSIONS)

SHOW

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 DEC 81	T-38A		NELLIS AFB NV
MISSION/TRIP/FLIGHT NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8175		

REMARKS

MOST AFT CG
FROM CHART E

WT 7850
MOM 3128
CG 249.0

COMPUTER PLATE NO. (If used)

CHART E & MATH

REF	ITEM	WEIGHT	¹INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	8234	2907
2	OIL (2.35 Gal.)	18	90
	10 LTA LOX	26	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	¹INDEX OR MOM/
B	1	200			200	380

4	OPERATING WEIGHT	8468	29597
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD		
	AFT		
	EXTERNAL		
	ROCKETS		
7	FUEL — BUILT IN (534 Gal.)	3471	12109
	BOMB BAY (Gal.)		
	EXTERNAL (Gal.)		
	S/O 49 CAL	354	1285
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION (Uncorrected)	12293	42991
11	CORRECTIONS (If required)		
12	TAKEOFF CONDITION (Corrected)	12293	42991
13	TAKEOFF C. G. IN % M. A. C. OR IN.	349.7	20.0 %
14	LESS EXPENDABLES — JATO OR RATO		
	BOMBS		
	AMMUNITION		
	FUEL -463	3010	10455
	S/O -49	354	1285
15	ESTIMATED LANDING CONDITION	8929	31251
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	350.0	20.4 %

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	¹INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (Ref. 11)		

LIMITATIONS

¹GROSS WT. TAKEOFF (lb.)	¹GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C. or IN.)
¹PERMISSIBLE C. G. TAKEOFF	14 %	25 %
¹PERMISSIBLE C. G. LANDING	14 %	25 %

¹ Enter constant used.
² Enter values from current applicable T. O.
³ Applicable to gross weight (Ref. 12).
⁴ Applicable to gross weight (Ref. 15).

COMPUTED BY (Signature)

WEIGHT AND BALANCE AUTHORITY (Signature)

PILOT (Signature)

DD FORM 1 SEPT 54 365F

16—67910 4

SHOW PILOT/OBSERVER

WEIGHT AND BALANCE CLEARANCE FORM F

TACTICAL (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 DEC 90	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8175		

REMARKS

MOST AFT CG FROM CHART E

WT MOM C/G

COMPUTER PLATE NO. (If used)

CHART E & MATH

REF	ITEM	WEIGHT	[1] INDEX OR MOM/
1	BASIC AIRCRAFT (From Chart C)	32240	2960.7
2	OIL (2.35 Gal.)	12	9.6
	10 LTRS - LCL	36	2.0
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	[1] INDEX OR MOM/
6	1	200			200	3.8.0
8	1	200			200	5.0.0

4	OPERATING WEIGHT				8668	3009.7
5	AMMUNITION	COMPT.	ROUNDS	CALIBER		
6	BOMBS, ROCKETS, ETC.	FORWARD				
		AFT				
		EXTERNAL				
		ROCKETS				
7	FUEL	BUILT IN (534 Gal.)			3471	1210.9
		BOMB BAY (Gal.)				
		EXTERNAL (Gal.)				
		SIO 49 CAL.			354	12.3.5
8		WATER INJ. FLUID (Gal.)				
9		JATO OR RATO				
10		TAKEOFF CONDITION (Uncorrected)			12493	43491
11		CORRECTIONS (If required)				
12		TAKEOFF CONDITION (Corrected)			12493	43491
13		TAKEOFF C. G. IN % M. A. C. OR IN.			348.1	18.3%
14	LESS EXPENDABLES	JATO OR RATO				
		BOMBS				
		AMMUNITION				
		FUEL -46.3			3010	1045.5
		-49			354	12.8.5
15		ESTIMATED LANDING CONDITION			9129	3172.1
16		ESTIMATED LANDING C. G. IN % M. A. C. OR IN.			347.8	17.9%

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (Ref. 11)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	[1] INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (Ref. 11)		

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C. or IN.)
[1] PERMISSIBLE C. G. TAKEOFF	14%	25%
[1] PERMISSIBLE C. G. LANDING	14%	25%

[1] Enter constant used.
[2] Enter values from current applicable T. O.
[3] Applicable to gross weight (Ref. 12).
[4] Applicable to gross weight (Ref. 15).

COMPUTED BY (Signature) [redacted]

WEIGHT AND BALANCE AUTHORITY (Signature) [redacted]

PILOT (Signature)

DD FORM 1 SEPT 54 365F

16—67910-4

WEIGHT AND BALANCE CLEARANCE FORM F

X-COUNTRY
TACTICAL
PILOT / OBSERVER (USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRCRAFT TYPE	FROM	HOME STATION
05 DEC 84	T-38A		NELLIS AFB, NV
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
	68-8175		

REMARKS

MOST AFT CG
FROM CHART F

WT 9450
MOM 3296
CG 1970

REF	ITEM	WEIGHT	INDEX OR MOM/
1	BASIC AIRCRAFT (*From Chart C*)	8224	290971
2	OIL (2.35 Gal.)	18	70
	10 LTRS - LOX	26	30
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	INDEX OR MOM/
B	1	200			200	390
B	1	200			200	510

COMPUTER PLATE NO. (*If used*)
CHART C & MATH

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

		WEIGHT	INDEX OR MOM/
4	OPERATING WEIGHT	8668	300977
5	AMMUNITION — COMPT. / ROUNDS / CALIBER		
6	BOMBS, ROCKETS, ETC. — FORWARD		
	AFT		
	EXTERNAL		
	ROCKETS		
7	FUEL — BUILT IN (583 Gal.)	3790	132655
	BOMB BAY (Gal.)		
	EXTERNAL (Gal.)		
8	WATER INJ. FLUID (Gal.)		
9	JATO OR RATO		
10	TAKEOFF CONDITION (*Uncorrected*)	12458	433662
11	CORRECTIONS (*If required*)		
12	TAKEOFF CONDITION (*Corrected*)	12458	433612
13	TAKEOFF C. G. IN % M. A. C. OR IN.	348.0	18.39%
14	LESS EXPENDABLES — JATO OR RATO		
	BOMBS		
	AMMUNITION		
	FUEL -463	3010	10455
15	ESTIMATED LANDING CONDITION	9448	312907
16	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	348.2	18.49%

CORRECTIONS (*Ref. 11*)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	INDEX OR MOM/
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+
	NET DIFFERENCE (*Ref. 11*)		

LIMITATIONS

[1] GROSS WT. TAKEOFF (lb.)	[1] GROSS WT. LANDING (lb.)
13,500	13,500

	FROM	TO (% M. A. C. or IN.)
[1] PERMISSIBLE C. G. TAKEOFF	14%	25%
[1] PERMISSIBLE C. G. LANDING	14%	25%

[1] *Enter constant used.*
[2] *Enter values from current applicable T. O.*
[3] *Applicable to gross weight (Ref. 12).*
[4] *Applicable to gross weight (Ref. 15).*

COMPUTED BY (*Signature*) [redacted]
WEIGHT AND BALANCE AUTHORITY (*Signature*) [redacted]
PILOT (*Signature*)

DD FORM 1 SEPT 54 365F

10—67910 4

CERTIFICATE OF DAMAGE

T-38A aircraft S/N #68-8156, S/N #68-8184, S/N #68-8176, and S/N #68-8175 have been destroyed. Total cost of aircraft and installed equipment has been extracted from Technical Order 00-25-30.

AIRFRAME		$ 508,000	
ENGINES		173,000	
ELECTRONICS		33,000	
ORDNANCE		3,000	
OTHER		39,000	
	SUB TOTAL	$ 756,000	
THUNDERBIRD MOD		3,000	(Kit T)
		40,000	(Kit A)
	SUB TOTAL	$ 799,000	
FOUR AIRCRAFT		x 4	
	TOTAL	$3,196,000	

[redacted]
DAREL M. RAY, Lt Col, USAF
Maintenance Officer
Thunderbird Mishap Investigation Board

Mat. Cost (4 destroyed acft) $5,228,008
Inv Cost (4 fatalities) 1,320,000
Total $6,548,008

3/23/82

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS TACTICAL AIR COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA 23665

SPECIAL ORDER

A-364 1 Febuary 1982

The following personnel, organization indicated, are appointed members of the investigation board to investigate DOD Class A Mishap of T-38's aircraft, SN 68-8156, SN 68-8184, SN 68-8176, and SN 68-8175, 57FWW (TAC), Nellis Air Force Base, Nevada. Each board member will assist in the investigation and preparation of the formal report. Duties imposed on the board members take precedence until the investigation is completed and the report submitted IAW AFR 127-4. Individuals not assigned to this headquarters are appointed with the concurrence of the commander concerned per telecon between TAC/CC and CINCSAC.

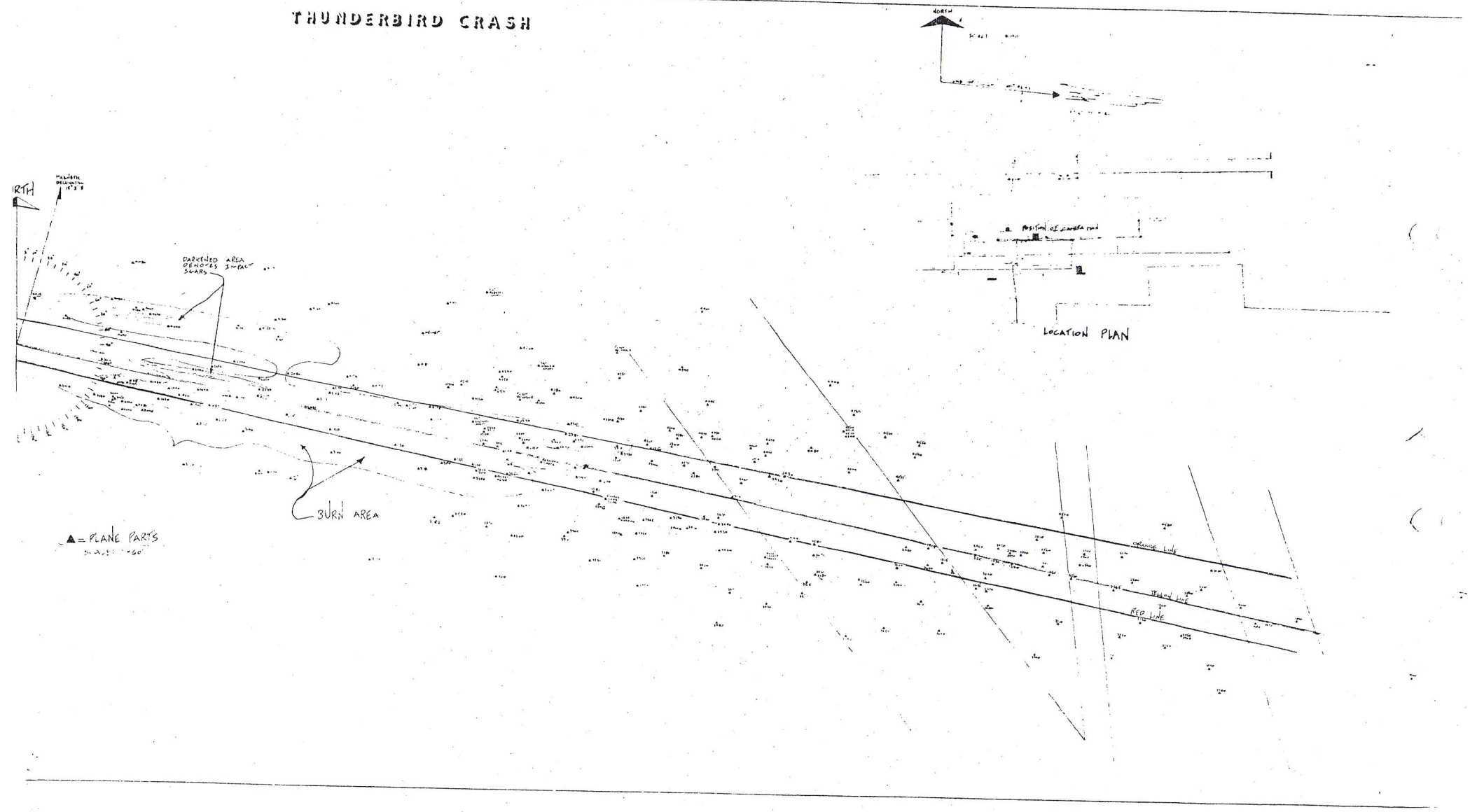
BRIG GEN GERALD D. LARSON, 45AD/CC (SAC), PEASE AFB NH,
Board President
LT COL RONALD F. SCHLOEMER, 479TTW (TAC), HOLLOMAN AFB NM,
Investigating Officer
LT COL DAREL M. RAY, 479TTW (TAC), HOLLOMAN AFB NM,
Maintenance Officer
LT COL LEROY P. GROSS, USAF HOSP, (TAC), LANGLEY AFB VA,
Medical Officer
MAJ GAIL L. SCARBROUGH, 388TFW (TAC), HILL AFB UT,
Pilot Member
CAPT DENNIS E. KENT, 425TFTS (TAC), WILLIAMS AFB AZ,
Life Support Member (non-voting)
CAPT PATRICIA L.C. PRIEST, 57AGS (TAC), NELLIS AFB NV,
Recorder (non-voting)

FOR THE COMMANDER

ROBERT L. JOHNSTON, Colonel, USAF
Director of Administration

DISTRIBUTION:
1 - DAAO
1 - HO
1 - TAC/SE
25 - 57FWW/SE
2 - Individual (ea)

THUNDERBIRD CRASH



PLOT INDEX

NUMBER	DESCRIPTION
1010	Horizontal stab skin, RH, in deep gouge at initial impact zone
1015	Deep gouge
1020	LH outboard boatail segment, with access plate for stab actuator bolt
1030	Air start access door
1040	Dorsal cover, blue
1050	Gouge with buried wing skin segment
1060	Aft section of RH stab (honeycomb)
1070	Control rod, stab servo input
1080	Landing gear alternate release control
1090	LH main landing gear strut door
1100	Vertical fin lower stub with attach bolt
1103	LH boatail segment adjacent tube support
1105	End capt of stab actuator
1110	Gouge in ground
1120	Outboard control quadrant, horizontal stab
1125	RH torque tube support
1130	Fuel shut-off valve
1135	Hydraulic filter
1140	Speed brake
1150	Fueselage segment, RH
1151	Horizontal trim actuator
1160	Part of seat pack
1164	Aileron trim actuator, segment with screw
1165	Cover plate from horizontal trim actuator
1170	RH half of #3 (Peterson) front canopy
1180	LH rail of #3 front ejection seat
1190	Horizontal stab actuator, LH, #4 aircraft
1200	RH half of Horizontal torque tube, #4 aircraft
1205	Sleeve from horizontal stab actuator
1210	LH wing with gear, wheel, tire, #1 A/C, matches 2520 cen wing section fracture, with aileron actuator, mech, cen damaged, wing tip missing
1214	Speed brake actuator

NUMBER	DESCRIPTION
1215	Fuel boost pump
1220	Engine fuel control
1230	Nose landing gear
1240	Fuel boost pump, aft, with shut-off valve (open), crossfeed valve (closed), and segment of aft tank floor
1241	Rudder pedal center post
1250	Fuel boost pump
1260	Front windshield bow, with compass
1270	A/B fuel control
1280	Main fuel control with case broken
1290	Compressor disc (engine)
2010	Initial impact zone 24 ft. x 6 ft. and 4 in. deep
2020	Piece of wing skin 18 in. x 6 in.
2030	Top of MXU recorder
2040	RH NAV/COM door
2050	Seat pin
2060	Rudder travel limiter
2070	Fwd boatail piece
2080	Horizontal stab outboard bearing housing
2090	LH torque tube and spar (burned), #1
2100	Fwd section of boatail
2110	Quadrant, P/N 2-73318
2120	Section of boatail, 18 in. x 6 in.
2130	Section of boatail with fire warning loop
2135	Horizontal tail cam
2137	RH torque tube support structure
2140	LH strut door
2150	Rudder pedals
2160	Cross feed valve
2170	Component of stab actuator
2180	Tape mounting plate of MXU recorder
2190	Fuel boost pump, bottom missing, P/N 4-52914-1, S/N 1000187
2195	Outboard control quadrant, horizontal stab

NUMBER	DESCRIPTION
2200	LH flap
2201	P.C. Board from 1151 horizontal trim actuator
2210	Canopy frame
2220	Speed brake actuator
2230	Hydraulic filters, horizontal stab
2235	LH torque tube bearing support
2239	Motor/Break from 1151 horizontal trim actuator
2240	RH wing tip
2250	Slab relief manifold
2260	Horizontal tail assembly, #2 aircraft, complete torque tube, 20% RH surface, 50% LH surface
2270	RH flap
2275	Piece of Horizontal trim actuator, missing shaft
2280	Piece of RH surface trailing edge
2290	LH inboard flap hinge
2291	Capacitor from 1151 horizontal trim actuator
2300	RH MLG strut door
2310	Slab filters
2320	Relief valve
2330	Aileron trim actuator missing shaft
2340	Slab actuator servo input arm
2350	LH wing, #4 aircraft, wing tip missing, gear installed, strut broken, aileron operating mechanism intact, aileron attached
2360	Horizontal mixer control quadrant - interconnect
2370	Rod end, piston, slab actuator, #2 matches 4490 LH actuator
2380	A/B fuel control
2390	Input bellcrank - mixer
2400	Slab actuator, RH, #2 aircraft
2410	Piston rod end-slab, matches LH #3 actuator fracture surface
2420	Boatail assembly with filters and relief manifold
2430	Maint fuel control
2440	Engine outer casing
2450	VGH tape from #1 aircraft
2460	MLG torque actuators
2470	Hydraulic pump and piece of engine casing
2480	Nose gear
2490	RH flap with actuator attached

NUMBER	DESCRIPTION
2500	RH wing, #1, fracture matches 2520, with aileron actuator and mechanism intact, wing tip attached, RH gear installed, missing cen wing section
2510	Aileron trim actuator
2520	Main fuselage of #1 aircraft, vertical tail attached, rudder surface attached, boatail missing, gearboxes with pumps and generators burned in place, aft fuel boost pump burned in place, wing center section attached. Fuselage fwd of 15% spar attach missing. Rudder force producer SAS actuator and both rudder actuators broken/burned in place. Fuel control in left engine only. Aircraft laying on left side missing both wing sides. Fuselage burned over vertical and exterior aft from dorsal rupture.
2530	Engine A/B
2540	Accessory drive gearboxes of #2 aircraft with both hydraulic pumps and LH generator attached
2550	Main fuselage section of #2 aircraft from F.S. 460 aft to boatail separation point, including vertical tail, rudder, both rudder actuators, SAS actuator, force producer and main line filters; burned and crushed internally
2560	Engine A/B
2565	Generator housing, P/N 904J206XC, S/N MM 2834, showing rotational scoring
2570	Fuselage section of #1 aircraft from fwd cockpit instrument panel to aft cockpit seat rail, all control mechanisms below the cockpits destroyed. Fwd cockpit floor missing to the front canted bulkhead. Rear cockpit intact.
2580	LH flap actuator
2590	RH flap
2600	Engine ven actuator
2610	Main fuel control, S/N 6978
2620	ARC 164 radio, S/N L300081, set at chanel 4, 260.1, 80F, squelch off
2920	Engine
3010	Vertical fin lower beam tip in initial impact zone
3020	Pieces of speed brake, fuel floor and access panels
3030	Piece of wing skin and a flight control cable disconnect
3040	Piece of MLG door
3050	Piece of canopy glass
3060	Part of access panel and hydraulic tubing
3070	LH speed brake fragment
3080	Fuel cell floor, control cable, and fair leads
3081	Fuel valves
3082	Fuel valves

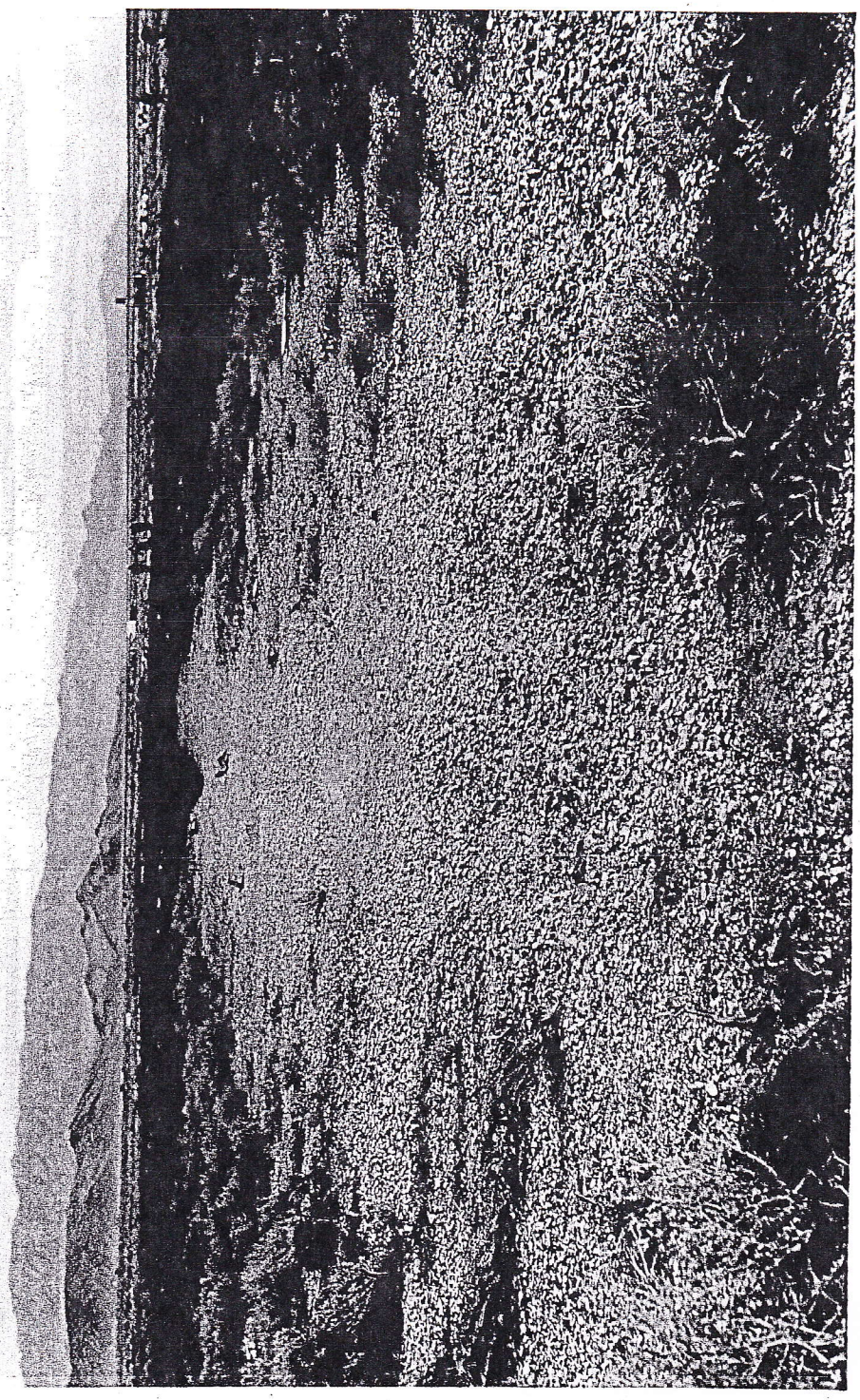
NUMBER	DESCRIPTION
3090	Segment of wing skin
3100	Segment of wing and control cable
3110	Segment of wing and engine gearbox
3120	Part of seat drogue chute cover
3130	LH COM/NAV door
3140	Part of helmet marked "PETE" (#3)
3150	LH horizontal stab honeycomb segment
3155	Speed brake actuator
3160	Ejection seat rocket motor
3165	Torque tube bearing support, fracture surface matches 2137
3170	Rear canopy marked "BAXTER" (#3)
3180	RH torque tube and beam, fracture surfaces match 2090 LH torque tube (#1 aircraft)
3190	Left wing tip
3200	Front canopy, #1 aircraft
3205	LH Horizontal stab with both torque tubes attached and RH beam. #3 aircraft stab.
3206	Main line Hydraulic filter
3210	RH aft fuselage section marked 68-8176 (#3 aircraft)
3220	Boatail section missing slab
3230	Horizontal stab actuator, RH, matches 3205 stab (#3 aircraft)
3240	Nose gear door actuator
3250	Vertical stab, marked #3, separated completely from fuselage, rudder missing
3260	Horizontal stab actuator, LH, matches 1105 end of cap and 2090 torque tube of #1 aircraft
3270	Speed brake actuator
3280	Bungee, spring missing, burned
3290	Pulley with structure and P/N 2-73268 arm attached
3300	Flap-stab interconnect cam-mixer
3310	Bungee with springs
3320	Piece of honeycomb, 18 in. x 18 in. triangle outer edge of #3 boundary
3330	MXU recorder and pice of fuselage with flags on side
3340	Speedbrake actuator (closed)
3347	#3 force producer mechanism

NUMBER	DESCRIPTION
3350	Lower tension regulator - horizontal
3360	Horizontal trim actuator, P/N 6-73905-3, S/N F0627, model AL1020M4
3370	LH flap
3380	LH wing, #3 aircraft, 44% spar fitting fracture matches 3520, with MLG, aileron piece, cen mech missing (matches 3480), actuator intact
3390	Main line filters
3400	LH aileron surface
3410	LH flap
3420	Fuel control
3430	Aft fuselage section, #1 boatail
3439	Horizontal stab end seal ring
3440	Engine actuator
3450	LH flap
3460	Top LH main fuselage at boatail separation, #3 aircraft
3470	Engine A/B
3480	LH aileron operating mechanism matches #3 (3380) wing
3490	Horizontal tail feel spring
3500	Helmet chin strap (Peterson) #3
3510	Hydraulic pump
3515	RH flap motor with interconnect
3520	Fwd fuselage section of #3 aircraft
3530	RH wing, matches (3480) wing of #3 aircraft, gear installed broke at strut, with aileron actuator, mechanism damaged separated outboard of cen spring
3540	Ejection seat
3550	Nose gear
3560	Flap motor, LH, w/crank, less rod
3570	LH flap motor, w/crank, less rod
3580	Sas actuator
3590	Engine A/B
3600	Throttle quadrant
3610	Fuel boost pump, bottom missing

NUMBER	DESCRIPTION
3620	Engine A/B with partical spray bar
3630	Main landing gear strut less tire
3640	Fuel control
3650	Piece of steel dorsal longeron F.S. 388 to end, #2 aircraft
3660	A/B fuel control
3670	Slab actuator, RH, fracture matches 3180 RH torque tube of #1 aircraft
3680	Engine A/B, S/N G005257
3690	LH MLG strut
3700	Engine S/N 231-682
3710	Engine
3720	Seal
3730	Engine 231869
3735	Altimeter
3740	Engine 230885
3745	Main fuel control
3750	A/B fuel control
3760	#2 front cockpit less instrument panel and aft instrument panel
3765	Main fuel control
3770	RH flap
3780	#2 wing assy including both MLG, aileron surfaces, actuators and piece of steel dorsal longeron
3790	Engine S/N 232802
4010	Initial impact zone of #4 aircraft
4020	Red/white/blue piece of surface, 24 in x 14 in.
4030	Dorsal cover - P/N 2-11855-411 inside
4040	Lower leading edge of boatail
4050	Dorsal cover
4060	Lower fwd skin of LH stab
4070	RH wing tip
4080	Upper fwd skin LH stab
4090	Outboard leading tip of RH stab
4100	Flap rod end
4110	Piece of LH inlet duct
4120	Pitot nose assy w/attach structure

NUMBER	DESCRIPTION
4125	Boatail section, RH 20 in x 6 in x 3 in
4130	RH com/nav door
4140	Flap rod end
4150	Casio wrist watch
4160	P/N 2-73882-1
4167	Speedbrake actuator
4170	Com/nav door
4175	Pitch Trim Actuator
4180	Complete rudder assy, #3 aircraft
4187	Fuel boost pump, top and bottom missing
4190	Aft canopy, #2 aircraft
4200	RH flap inboard hinge and horizontal stab inboard bearing support
4210	Input arm - horizontal stab mech
4211	Aileron trim actuator with screw jack
4220	#1 aft canopy
4230	IGV actuator
4240	Input crank arm - stab
4250	Slab actuator relief valve
4255	Speedbrake actuator
4260	Upper half of boatail, #4
4270	Aft canopy, S/N 083, marked Sgt Weaver one side, Dresher 2nd side
4280	IGV actuator
4290	Nose gear housing with actuator
4300	LH fuselage section from hydraulic reservoir fwd 48 in.
4310	Fuel boost pump, top only
4320	LH torque tube with spar, matches #4 aircraft
4330	#4 vertical tail assy including rudder, both actuators, and upper right half of aft fus fwd to force producer
4340	Air speed indicator
4350	Upper LH fuselage section of #4 aircraft to boatail disconnect from F.S. 445
4360	A/B nozzle actuator
4370	RH canopy rack with half of canopy mechanism, fwd cock, and 2nd lock 30 in aft
4380	RH wing, #4 with aileron actuator, mechanism, cen mech (functional) tip missing, MLG gear installed with wheel/tire missing, cen lower wing skin attached.

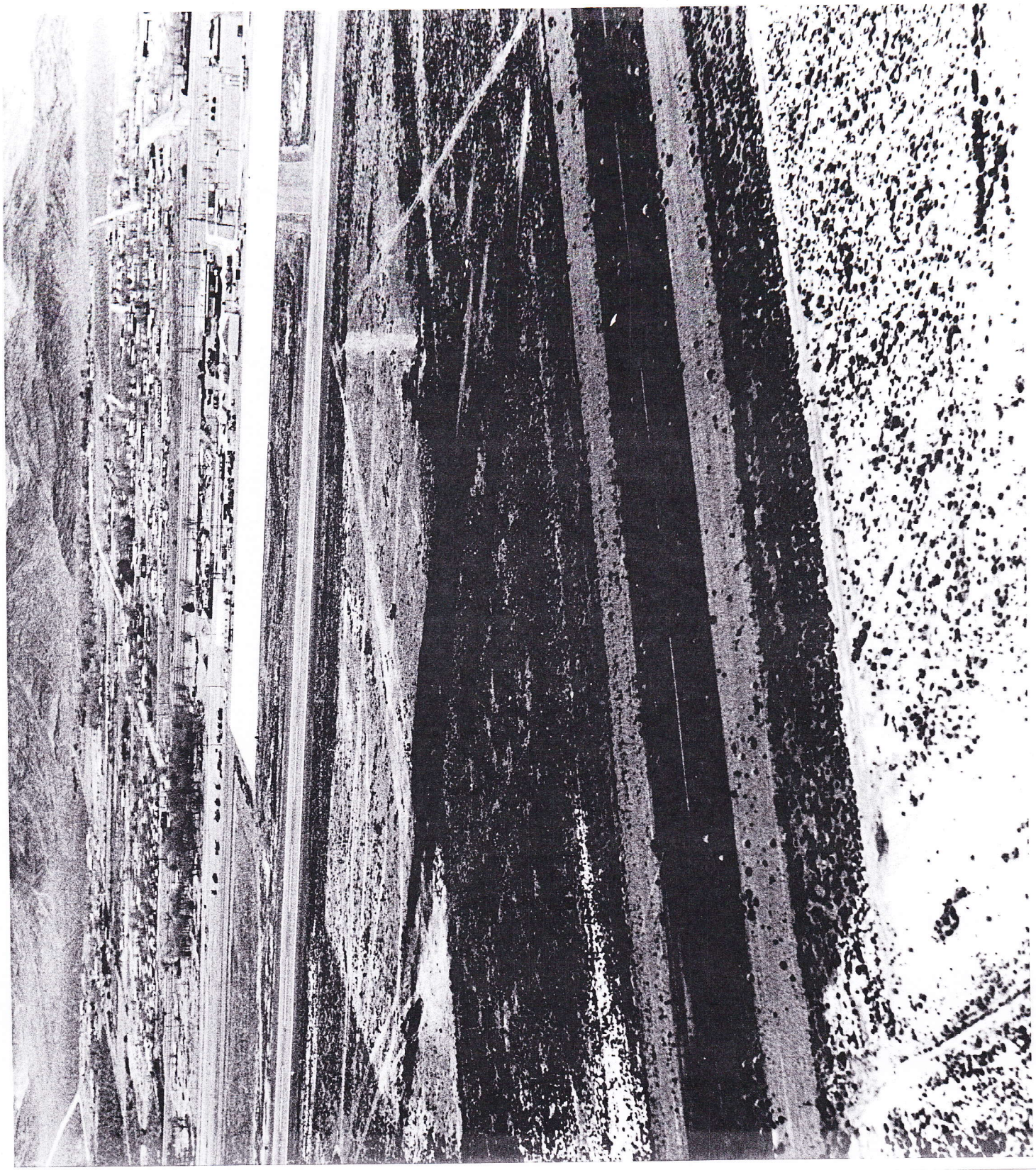
NUMBER	DESCRIPTION
4390	A/B fuel control, S/N 534
4400	Rudder actuator
4410	Flap actuator, RH
4420	Engine A/B
4430	Fuel cross feed valve, closed
4440	Stab actuator sleeve
4450	RH stab actuator, matches #4 aircraft
4460	Engine A/B
4470	IGV actuator
4480	LH stab actuator, matches 3205 LH stab horizontal piece of #3 aircraft
4490	Slab actuator, LH matches #2 (2260) torque tube
4500	#4 RH canopy frame
4510	Instrument panel
4515	Pitch trim actuator, 4XXX
4520	Altimeter
4530	Cockpit section of #4 aircraft including aft cockpit 68-8175 (#4) written on ejection seat, severely burned
4535	Hydraulic pump
4540	Main fuel control, S/N 4176
4550	Flap actuator, LH
4555	Hydraulic pump
4560	Main fuel control, S/N 283
4570	Engine compressor section, S/N 231073
4571	Fuel boost pump, top and bottom missing
4580	Engine compressor section
4900	Engine compressor



DEEPEST IMPACT CRATER (#4 AIRCRAFT)

SIDEVIEW OF BORN PATTERN (LOOKING SOUTH)

AERIAL VIEW OF CRASH SITE (LOOKING EAST)



III. FINDINGS.

Finding 1. After four routine formation practice maneuvers, the flight leader initiated a line abreast loop.

Finding 2. Entry parameters were met, and no significant deviations were noted during the first half of the loop.

Finding 3. For an undetermined reason, the leader did not achieve sufficient turn radius during the last half of the maneuver. (CAUSE)

(a) Most probable cause was a malfunctioning pitch trim system which inhibited normal nose rotation and focused the pilot's attention.

(b) A foreign object may have lodged in the flight control mechanism to inhibit or preclude sufficient nose rotation.

Finding 4. As a result, all four aircraft impacted the ground and were destroyed.

Finding 5. There were no ejection attempts and all four pilots were fatally injured.

[redacted]

[redacted]