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Wright-Patterson AFB, OH

An Analysis of F-105 Combat Losses in SEA (Out-Country) (Unclassified Title)

Jerry D. O'Brien
Jay M. Meiselman, 2d Lt, USAF

TECHNICAL REPORT AFFDL-TR-67-118
September 1967

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Air Force Flight Dynamics Laboratory
Research and Technology Division
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio

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FOREWORD

This report was prepared by the Structures Division of the Air Force Flight Dynamics Laboratory (AFFDL), Research and Technology Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. This work was performed under Project 1368, "Structural Design Concepts," Task 136814, "Aircraft Vulnerability." Lt Jay M. Meiselman (FDTS) was the project engineer.

This report contains data which has been extracted from the Weapons Systems Evaluation Group (WSEG) Compendium of Aircraft Combat Losses and Damages in Southeast Asia from 1 February 1965 to 31 January 1966 (U), Volume I: Losses, dated July 1966. The subject report is classified SECRET, Group 3, No Foreign Dissemination.

This report was submitted by the authors July 1967.

This technical report has been reviewed and is approved.



FREDERICK C. KRUG, Colonel
Chief, Structures Division

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UNCLASSIFIED ABSTRACT

This report contains an analysis of F-105 aircraft losses based on the Weapons Systems Evaluation Group (WSEG) Compendium of Aircraft Losses for the time period of 1 February 1965 to 31 January 1966. The analysis is performed for the purpose of providing an insight into areas such as threat, cause of aircraft loss, and time from initial damage to loss. (In addition to security requirements which must be met, this abstract is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of the Air Force Flight Dynamics Laboratory (FDTS), Wright-Patterson Air Force Base, Ohio 45433.)

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SECTION I

INTRODUCTION

(U) A two-volume compendium containing the damage and losses data was published by the Weapons Systems Evaluation Group (WSEG) to provide a source of information identifying combat data which would be useful for R&D purposes. The information was compiled for the period of 1 February 1965 to 31 January 1966 and was published without being analyzed. The information for the Air Force aircraft losses is limited to North Vietnam and Laos. A case history for each aircraft loss incident is contained in the compendium in the form of an Aircraft Combat Loss Report.

(U) The authors attempt to analyze the WSEG data in order to provide an insight into areas such as threat, cause of loss, and time from damage to loss. Due to many unknowns, an effort was made to estimate a most reasonable answer to many of the parameters presented. This estimate was arrived at by looking back to known information such as enemy defenses and reported location of fire. The results hopefully will lead to less vulnerable aircraft in the future and point out areas where possible fixes are needed on present aircraft by providing an insight into the most vulnerable areas and subsystems, thus allowing a judicious choice for the ABCS of survivability ("A" denoting add protection or armor vulnerable components; "B" being bury vulnerable components behind less vulnerable components; "C" representing concentration of vulnerable components to provide a smaller presented area; and "S" being separate redundant critical vulnerable items so that damage to one will not result in highly probable damage to the other).

(U) Although this report deals solely with the F-105, the analysis methods should be applicable to all aircraft.

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SECTION II

COMPILATION

(U) This report attempts to make a correlation of the WSEG compendium data for the F-105. The tables are presented as compilations of the information contained in the WSEG reports. There are 62 aircraft listed in the tables, but four of these aircraft were lost to causes other than enemy defenses and are not included in the analysis. The last two tables summarize the data on aircraft lost due to flight control and fire damage, respectively. It is obvious from examination of these tables that much data is lacking. In various figures, this lacking data is presented as "UNK" or unknowns. The handling of the unknowns will be dealt with in Section III of this report.

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SECTION III

(U) THE THREAT

(S) From Table I it is seen that the F-105 is used on a variety of missions. Among these are flak suppression, armed reconnaissance (recce), strike, and close air support. As such, the F-105 is exposed to a hostile environment for which it was not designed. The environment exposes the F-105 to defenses which include small arms, automatic weapons such as 12.7 mm and 14.5 mm; medium antiaircraft such as 23 mm, 37 mm, and 57 mm; heavy antiaircraft artillery such as 85 mm and 100 mm; and SAM's. (See Section IV for an explanation of the letters used in the Type Kill column of Table I.)

(C) Figure 1 shows the number of aircraft lost as a function of projectile type. The figure contains a large number of the previously mentioned unknowns. Since the lost aircraft are not recovered, it is difficult to determine the exact killing projectile. In Figure 2, an attempt is made to decrease the number of reported kills due to unknown projectiles by making an estimate of projectile type. This estimate is arrived at from an analysis of enemy defenses in the target area. The analysis involves looking at the enemy defenses that the lost aircraft encountered. For example, if the killing projectile was unknown but the defenses were listed as 37 mm and 57 mm, then the kill is placed in the 37-57 mm category in Figure 2.

(S) Finally we have the number of aircraft lost as a function of altitude and projectile size in Figure 3. The most noticeable trends are the appearance of SAM hits at altitudes over 3000 feet and the disappearance of projectiles of less than 37 mm at 3000 feet. The properties of both weapons predict this occurrence.

(S) One should keep in mind the fact that North Vietnam antiaircraft defenses are such that heavy and medium antiaircraft batteries are reinforced by many small-arms-firing infantrymen and machine gunners. Thus, many of the unknown kills were relegated to the 37-57 mm category, but the aircraft loss could possibly have been caused by weapons in the category of 14.5 mm or less.

SECTION IV

(U) CAUSE OF LOSS

(C) In the field of aircraft vulnerability, aircraft losses due to battle damage are classed in the categories of KK, K, A, and B kills. These are defined as:

- KK -- Instantaneous
- K -- Loss within 5 seconds
- A -- Loss within 5 minutes
- B -- Loss within 30 minutes

Figure 4 shows the number of aircraft lost in each category.

(S) An examination of the location of hits on the F-105 could possibly give a clue as to the most vulnerable areas. Figure 5 shows the number of losses occurring as a function of hit location on the aircraft. It is known (Reference 2) that almost all aircraft are hit on low-level attack missions and that the hits occur on the underside and sides of the aircraft. Examination of Figure 5 indicates that most of the hits causing losses are located between Stations 300 and 777. Station 300 is just aft of the crew station. Station 494 is the start of the engine section, and 777 is the aft end of the aircraft. These stations are for the F-105F but are representative of all F-105 series aircraft. An estimate was used to lower the number of unknowns shown in the Location of Hits column in Table I. The location was estimated in many cases by the observation of damage, i. e., when a fire was reported coming from the tail section it was assumed that the aircraft was hit in the tail section even though the exact location was not reported. It was not possible to account for 21 of the lost aircraft even with this method. Figure 5 has these estimates taken into account. The damage locations have been presented on a view of the F-105 in Figure 6.

(U) An examination of Figures 7a and 7b shows that many critical components of the aircraft are located in the area between Stations 300 and 777. These components are:

- a. Engine and compressors
- b. Fuel tanks
- c. Fuel lines and pumps
- d. Stabilizer control actuator
- e. Hydraulic lines.

It can also be seen that most of these components are on the underside of the aircraft and, thus, are not masked by less vulnerable or less critical components. Figure 8 gives an indication of the density of hydraulic, fuel, and air lines through the bomb bay.

(C) A possible correlation between cause of loss and hits in a certain location would be to examine the failure mode of the lost aircraft. Figure 9 shows the

percentage of aircraft lost experiencing various failure modes. From Figure 9, it is noted that flight control failure and fire occur in most of lost aircraft. Figure 7a shows that all the fuel tanks and fuel lines are between Stations 300 and 777 along with a heat or ignition source (engine). The stabilizer actuator is also in this area along with hydraulic lines and the engine-driven hydraulic pumps. A hit in any of these items could lead to a loss with a reported fire. Both the aircraft fuel and hydraulic fluid are highly flammable and even if the projectile does not perform the ignition function the engine can.

(S) It is interesting to note on Table I that 50% of the losses on which information was available had fires, 32.8% had no fires, and 17.2% were unknown losses.

(S) Figure 10 is a representation of the time that the aircraft remains flyable after the aircraft is hit and fire is observed. Since most of the kills are Category A, the pilot does have some time to try to control the fire or to eject.

(S) The data in Figure 9 also shows that 34.5% of the lost aircraft experienced flight control failure. Since an aircraft can have both fire and flight control failure, the flight control failure due to hydraulic line penetration can lead to a fire or a fire can cause failure of the flight control system through degradation of the hydraulic fluid or seals. Thus, it is often difficult to determine the prime cause of loss. Furthermore, loss of the engine and the associated hydraulic pump power supply driven by the engine can cause loss of flight control before the ram-air turbine, an emergency pump power supply, can be activated. Figure 11 shows the kill category for flight control failure.

(C) Another consideration from an intelligence standpoint is the attacking sequence of the aircraft when damage was received. Figure 12 shows the formation position, if known, of the aircraft when hit. A possible reason for the decrease in losses to following aircraft, as indicated in Figure 12, could be that the defenders are protecting themselves from explosions from the ordnance delivered by the first aircraft. This is particularly true in a flak suppression mission (Reference 3).

(S) A brief analysis is performed on pilot survivability according to type of aircraft kill. Survivability is defined as getting out of the aircraft alive regardless of whether the pilot was captured or returned to his unit. This analysis is based on the data from Table I (Type Kill column) and Table II (Pilot Status column). The results of this analysis are shown in Figure 13. Note that 65% of A kill and 83.3% of B kill pilots survive, indicating the natural conclusion that the longer the aircraft remains under control, the greater the chances of crew survival.

(S) The following table gives the pilot status for aircraft lost as a function of altitude.

<u>Altitude</u>	<u>Number of Aircraft Lost</u>	<u>Pilot Survives</u>	<u>Pilot Recovered</u>	<u>KIA or MIA</u>
0 to 1000 ft	10	5	3	5
1000 to 3000 ft	7	6	5	1
3000 to 6000 ft	12	10	8	2
greater than 6000 ft	5	2	2	3
unknown	24	9	7	15

(U) The pilot status is shown as a percentage of total losses at altitude bands in Figure 14.

SECTION V**(U) RESULTS**

(U) The objective of this analysis was to determine those factors which contributed to the losses of the F-105 aircraft when subjected to the combat environment encountered in Southeast Asia. Although detailed information was lacking in many of the combat losses reports contained in the WSEG Compendium, it was possible to obtain a general indication of those items which eventually lead to the loss of the aircraft.

(S) Based on the known information and various estimates, the analysis shows that most aircraft losses were due to subsystem failure or fire rather than primary structural failure. Furthermore, other studies under Air Force Project 5105 have indicated that this is the case for all SEA combat fighter/bomber aircraft.

(C) It should be noted that there are many items of information missing in the reported data. It is realized that it is difficult to obtain information from an unrecovered aircraft. However, there are many gaps in the data due to unsatisfactory reporting procedures. Efforts are currently under way to attempt to improve the reporting procedures.

SECTION VI**(U) CONCLUSIONS**

(C) As a result of the this analysis, it can be concluded that more detailed information is needed. In many cases, information such as cause of loss or damaging projectile cannot be recovered. However, much of the data needed to achieve a higher degree of confidence in portions of the analysis should be available but is not reported.

(S) The primary cause of F-105 loss in SEA (Out-Country) during the period studied was due to damage from medium antiaircraft (37-57 mm) weapons with the failure mechanism being fire and subsystem loss, primarily the flight control system. Fires were reported in 50% of the losses. Flight control failure was reported in 34.5% of the losses. Fifty percent of the losses were attributed to ground fire in the 37-57 mm range.

REFERENCES

1. Compendium of Aircraft Combat Losses and Damages in Southeast Asia (Out-Country), 1 February 1965 to 31 January 1966, Volume I: Losses (U), Weapons Systems Evaluation Group, Arlington, Virginia, July 1966 (Secret Report).
2. AFSE Letter dated 18 Nov 1966, Subject: Vulnerability, U.S. Aircraft (U), with 1 Attachment, Preliminary Analysis and Evaluation of the Weapons Systems Evaluation Group's Compendium of Aircraft Losses and Damages in SEA (Out-Country Missions) From 1 February 1965 to 31 January 1966, (U).
3. Flak Suppression Report (U), Air Force Presentation to President's Scientific Advisory Committee, Secret Report (NOFORN), not dated.

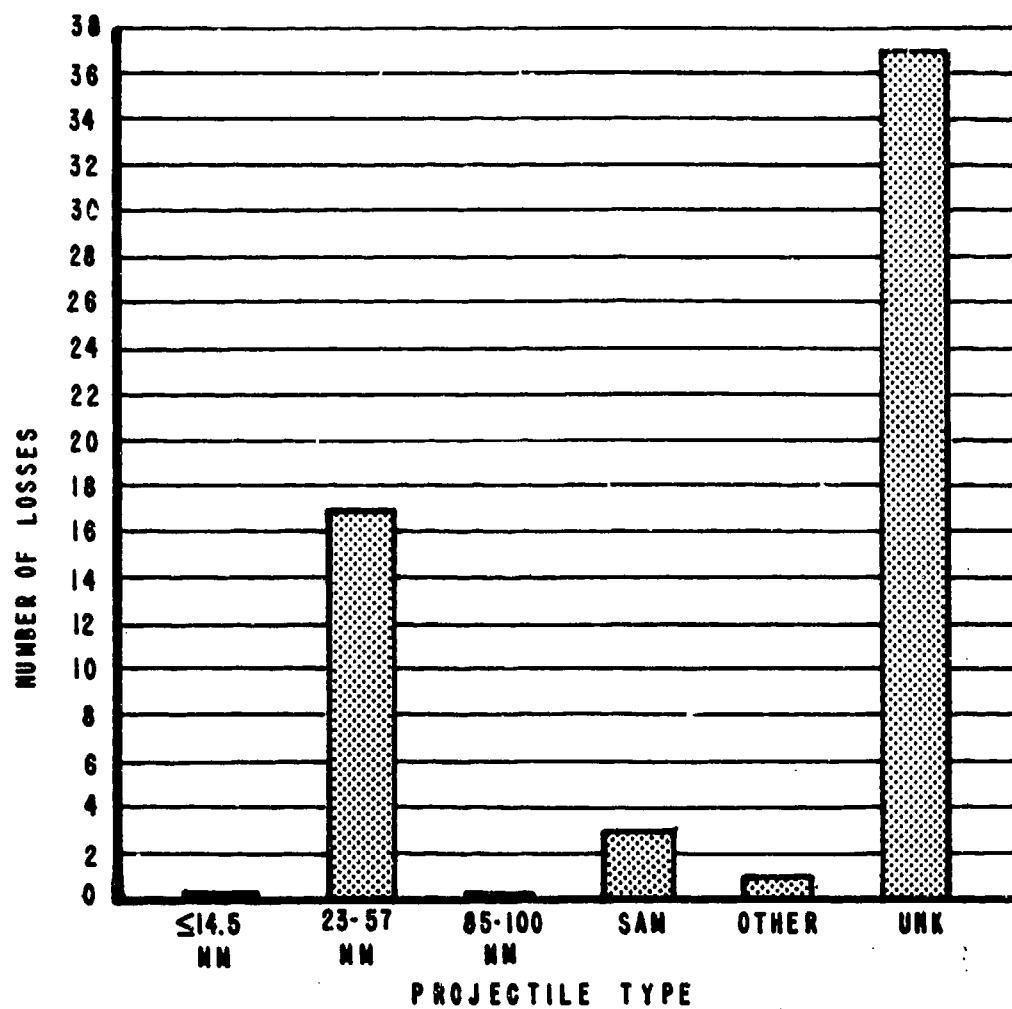


Figure 1. Losses From Known Projectile Type

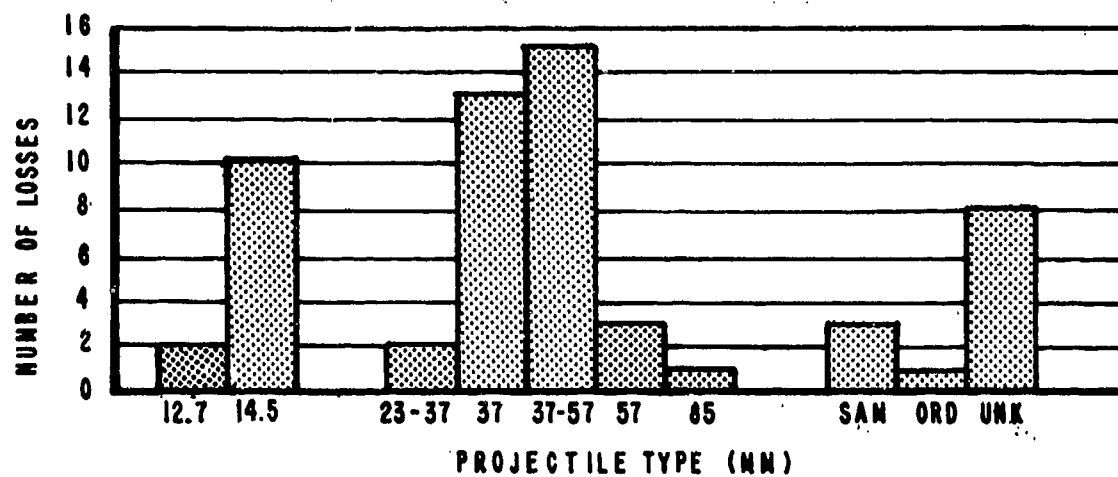


Figure 2. Projectile Type Based on Area Defenses

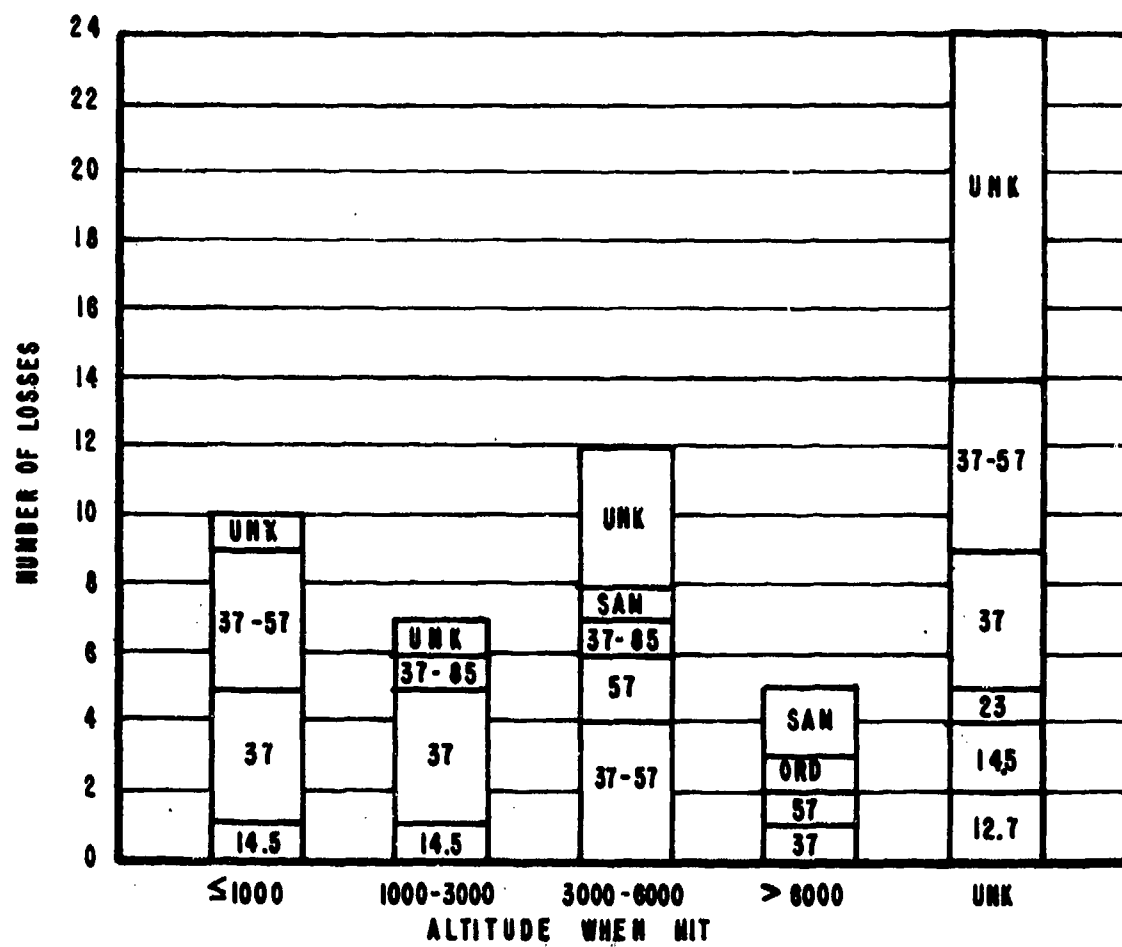
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Figure 3. Losses as a Function of Altitude and Projectile

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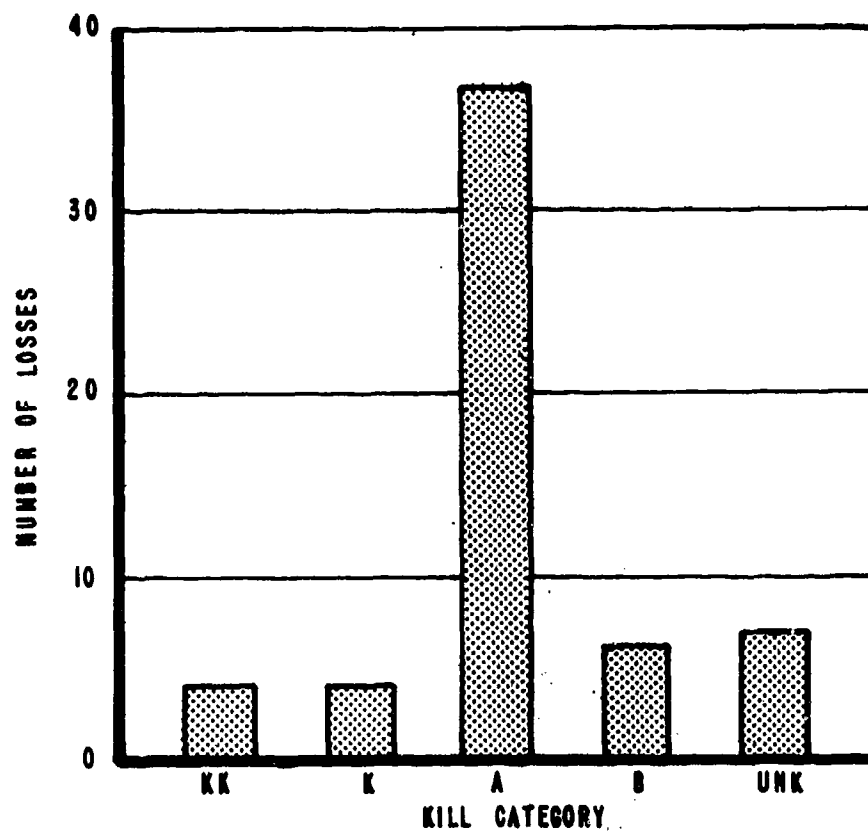


Figure 4. Total Aircraft Losses Versus Category of Kill

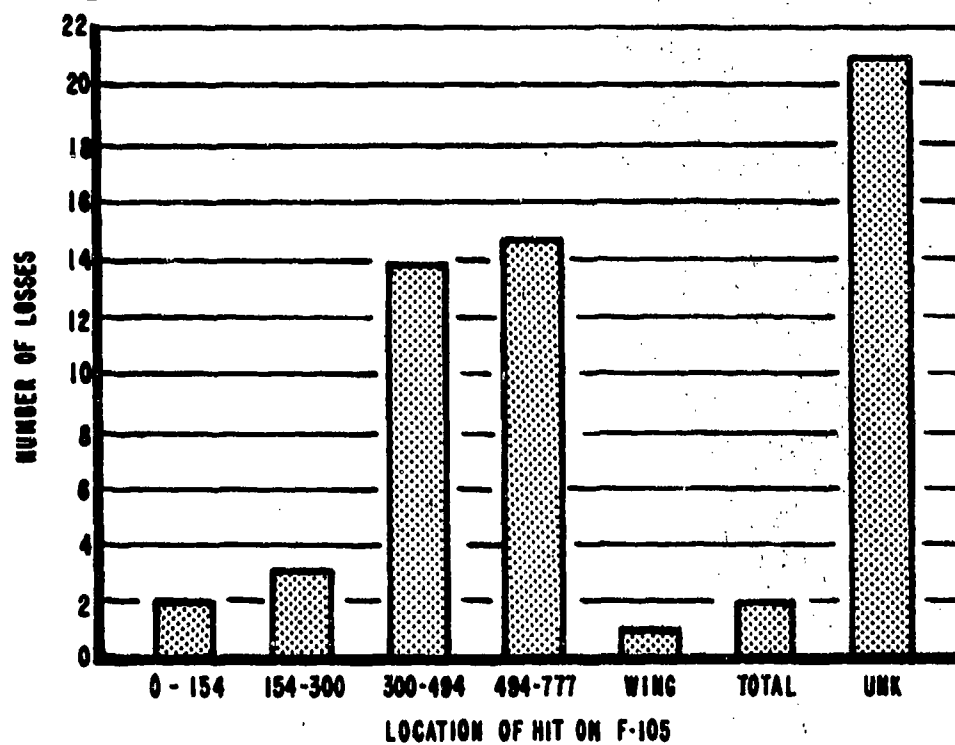


Figure 5. Number of Aircraft Losses as a Function of Location of Hit

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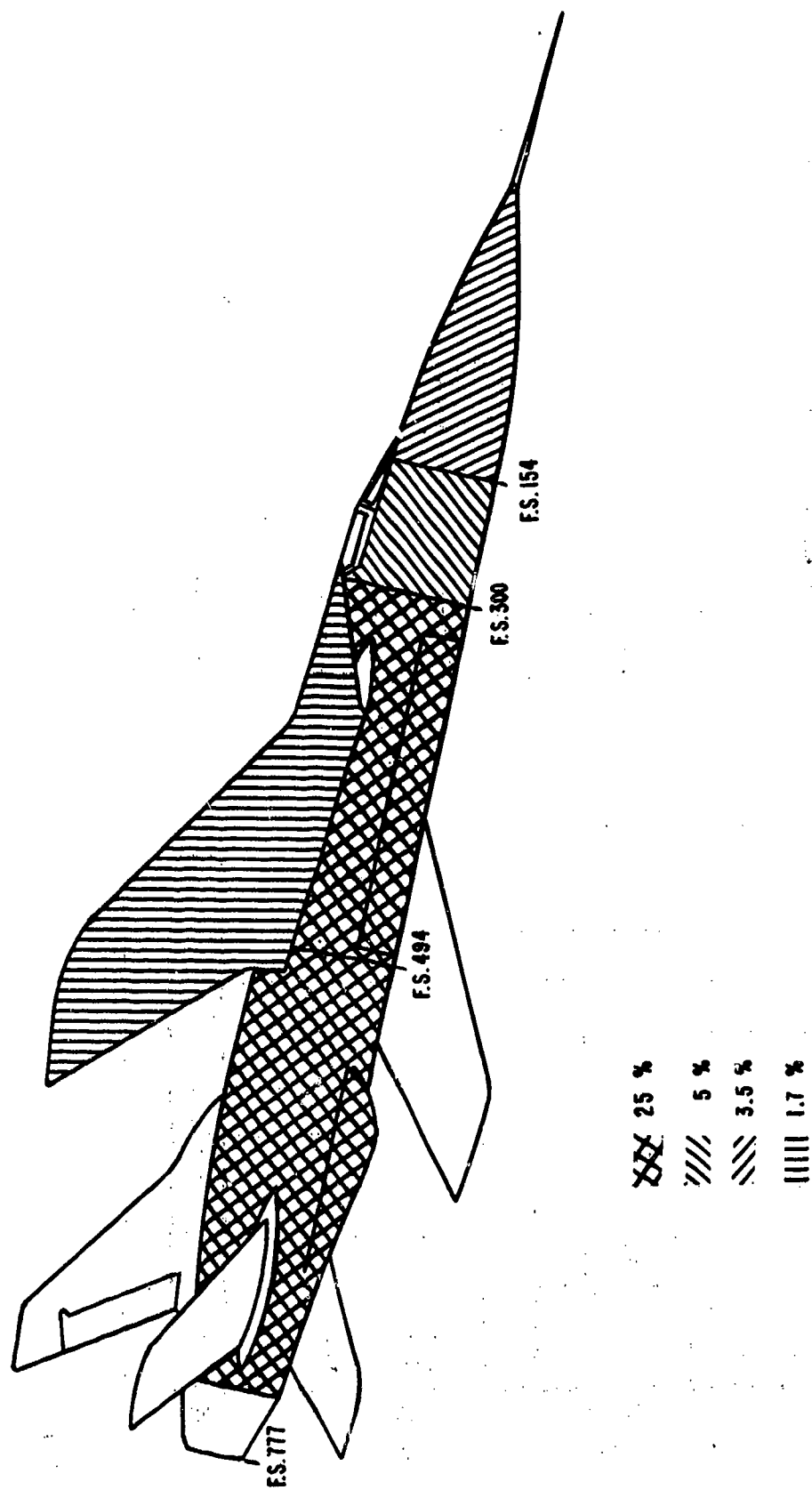


Figure 6. Representation of Hit Location on Lost F-105 Aircraft

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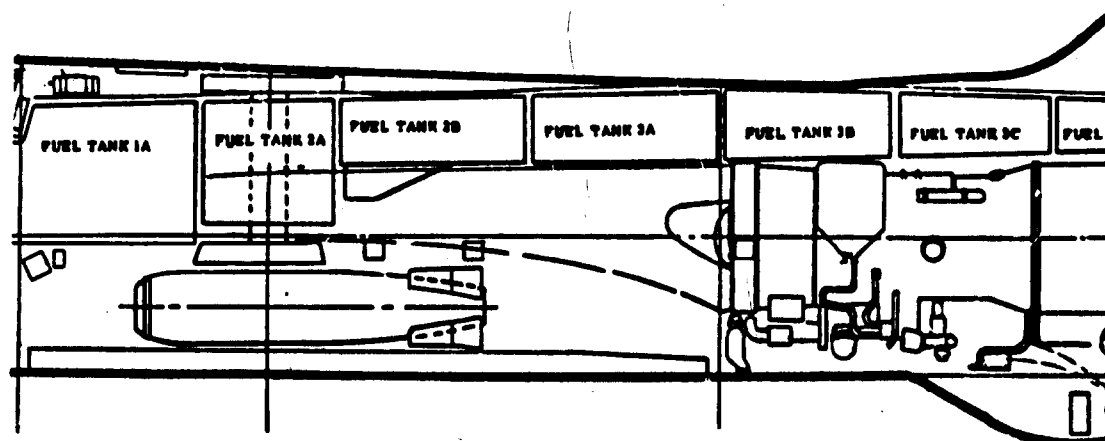


Figure 7a. F-105 Inboard

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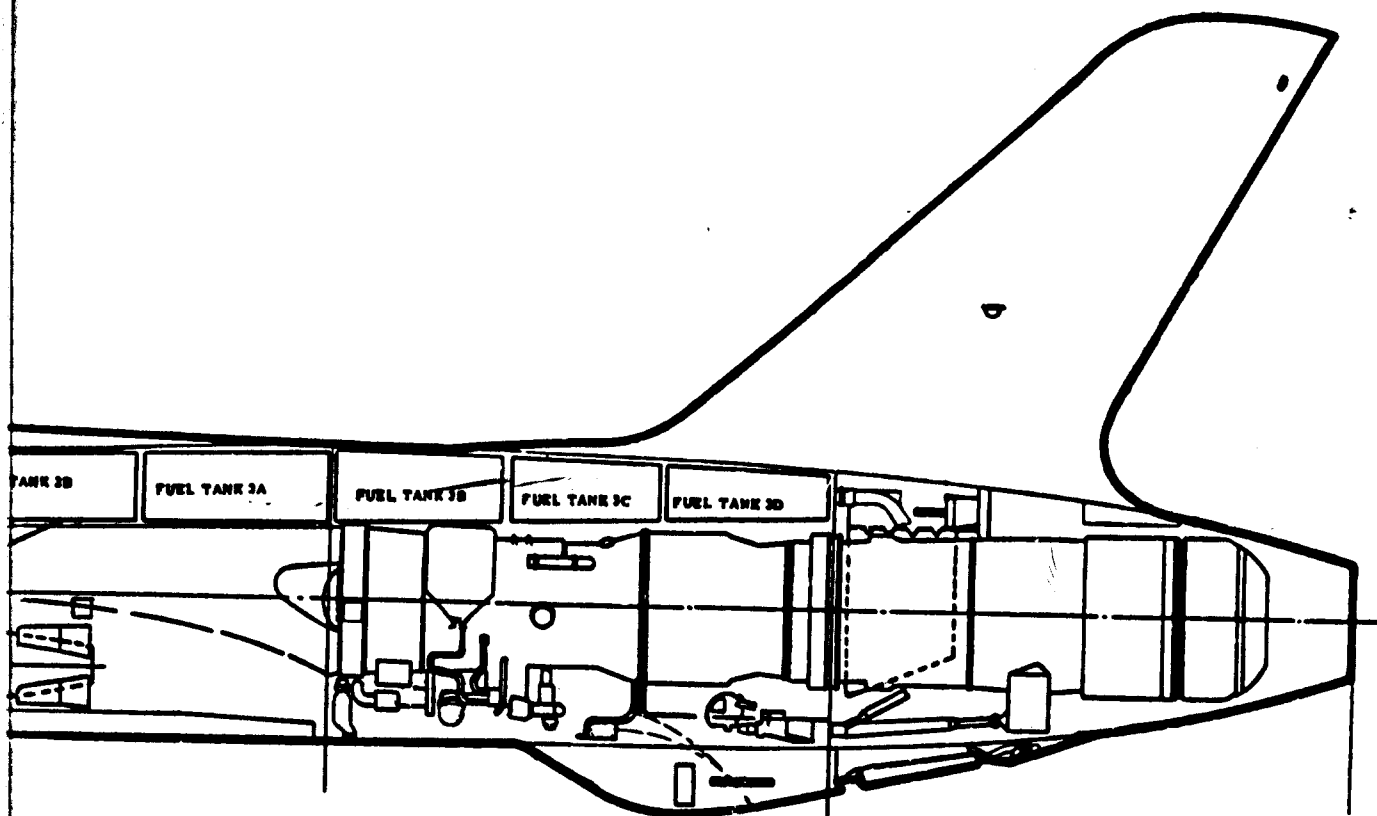


Figure 7a. F-105 Inboard Profile

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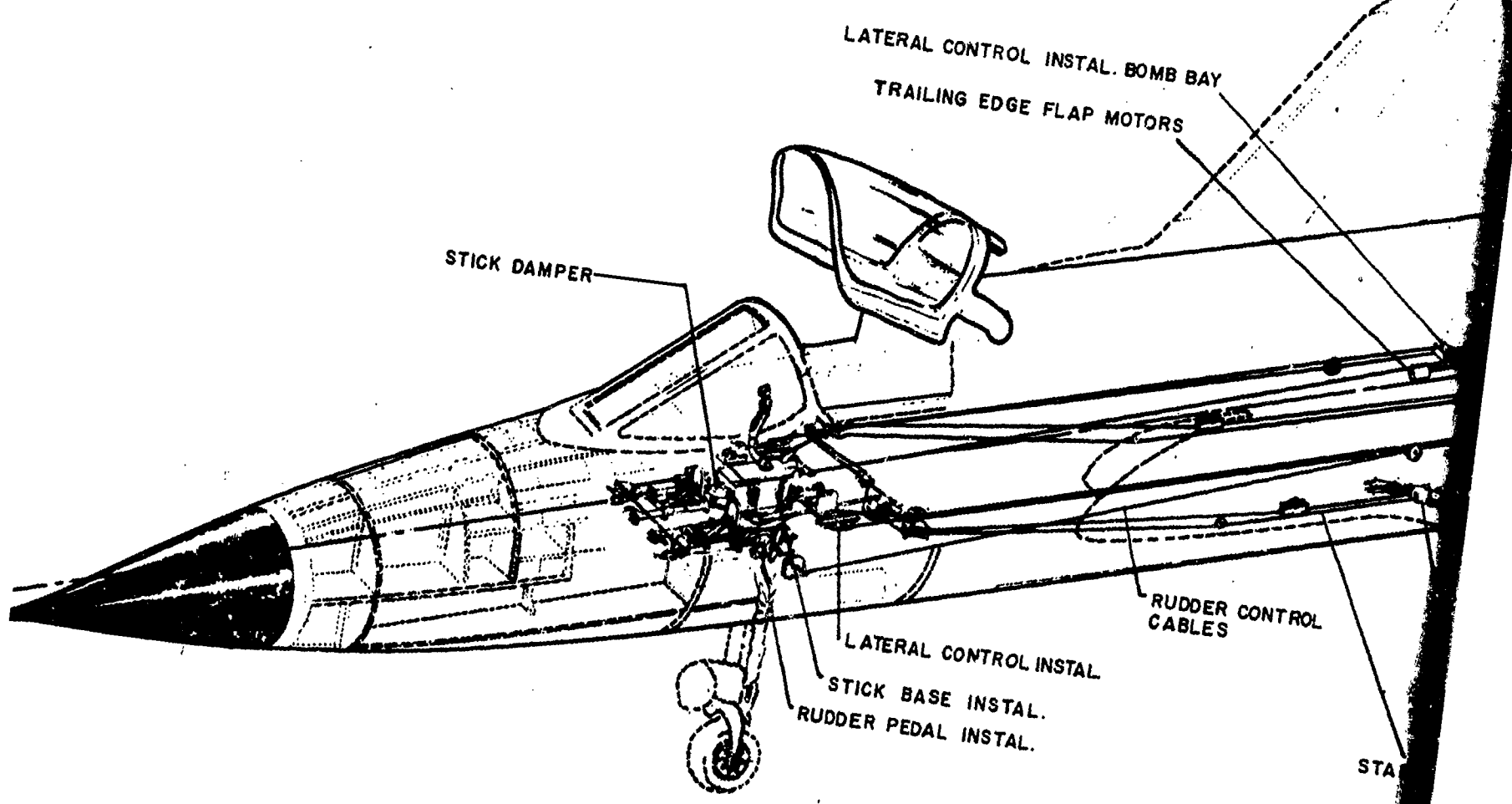
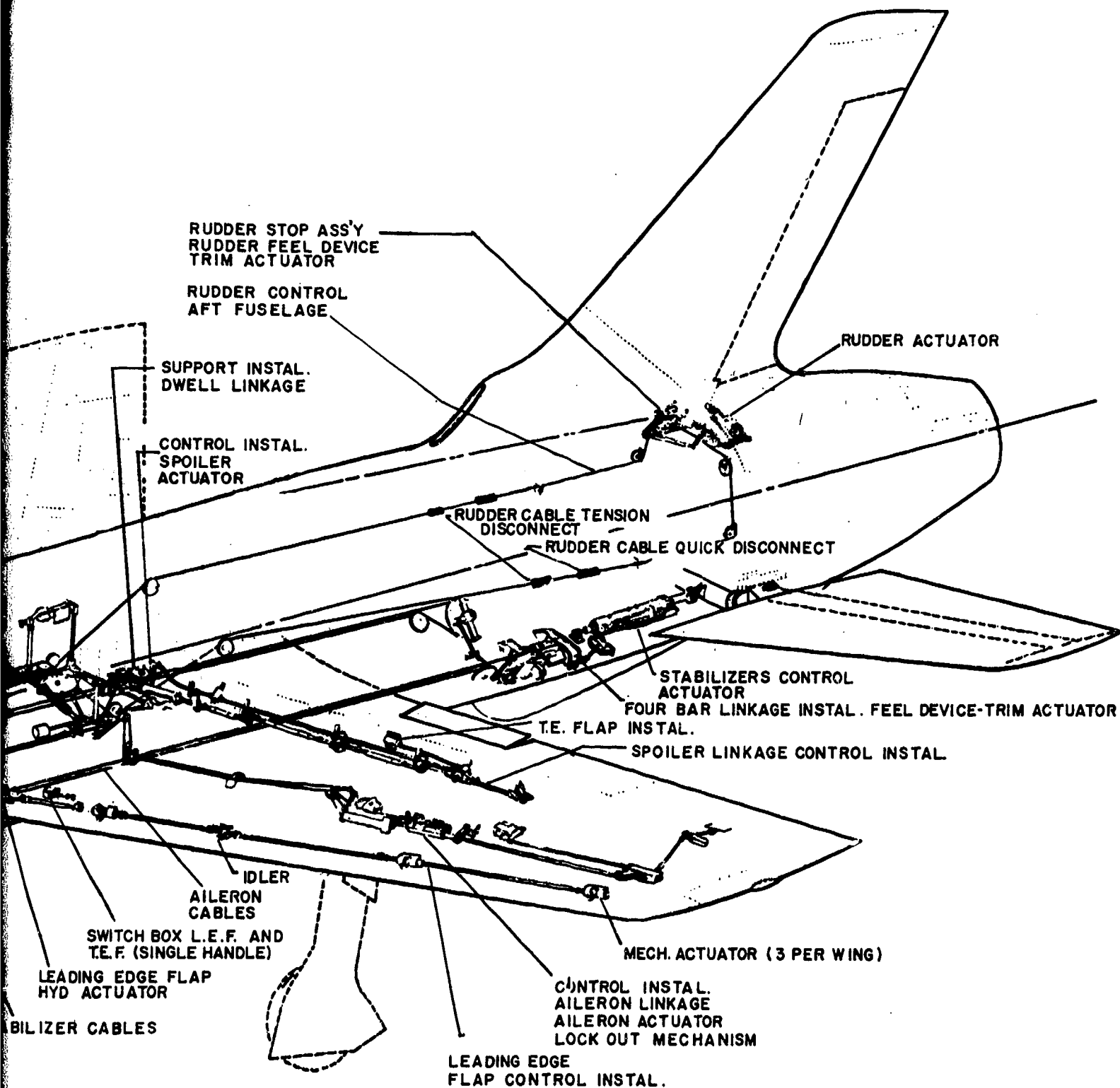


Figure 7b. Primary Hydraulic System

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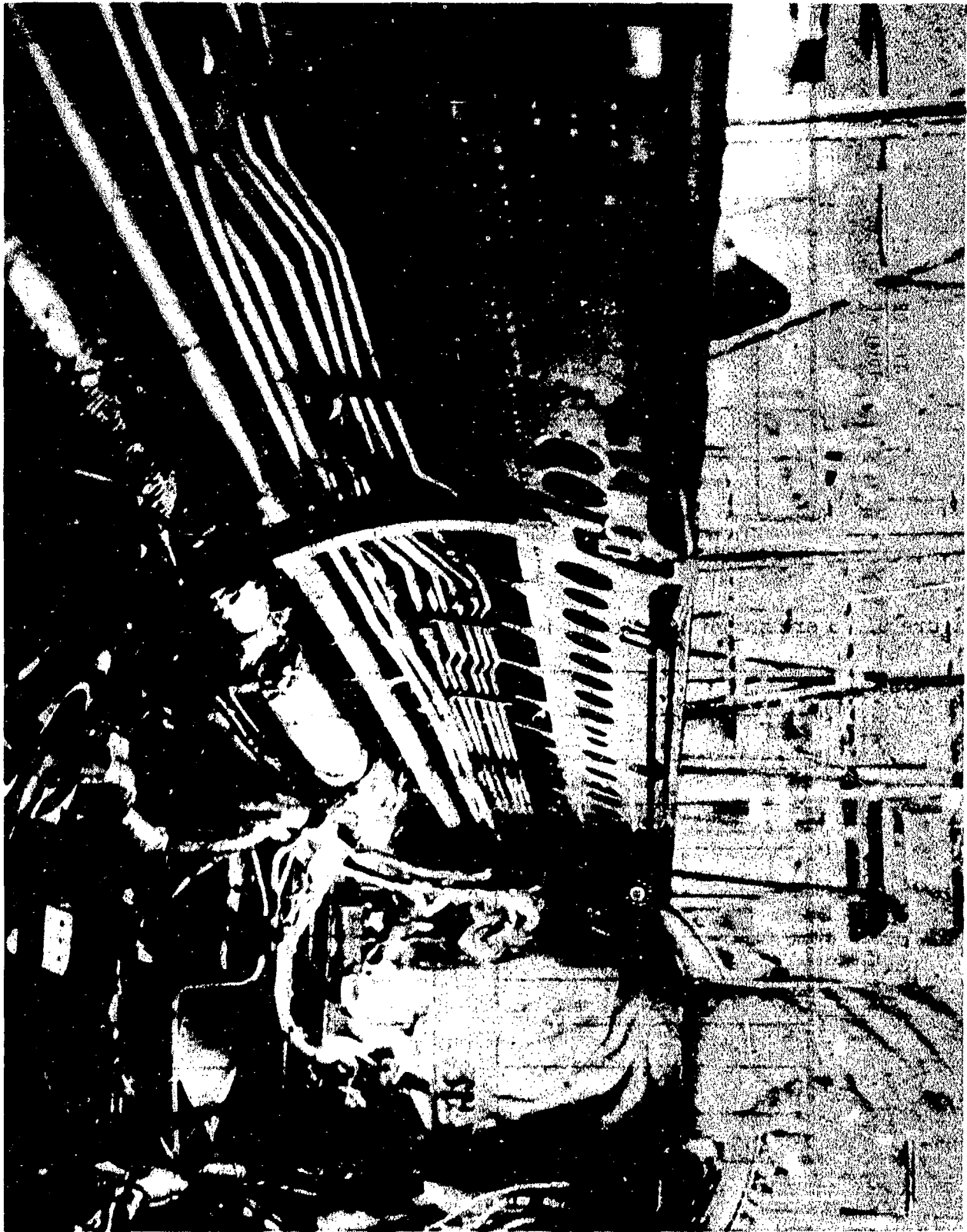


Figure 8. F-105 Bomb Bay

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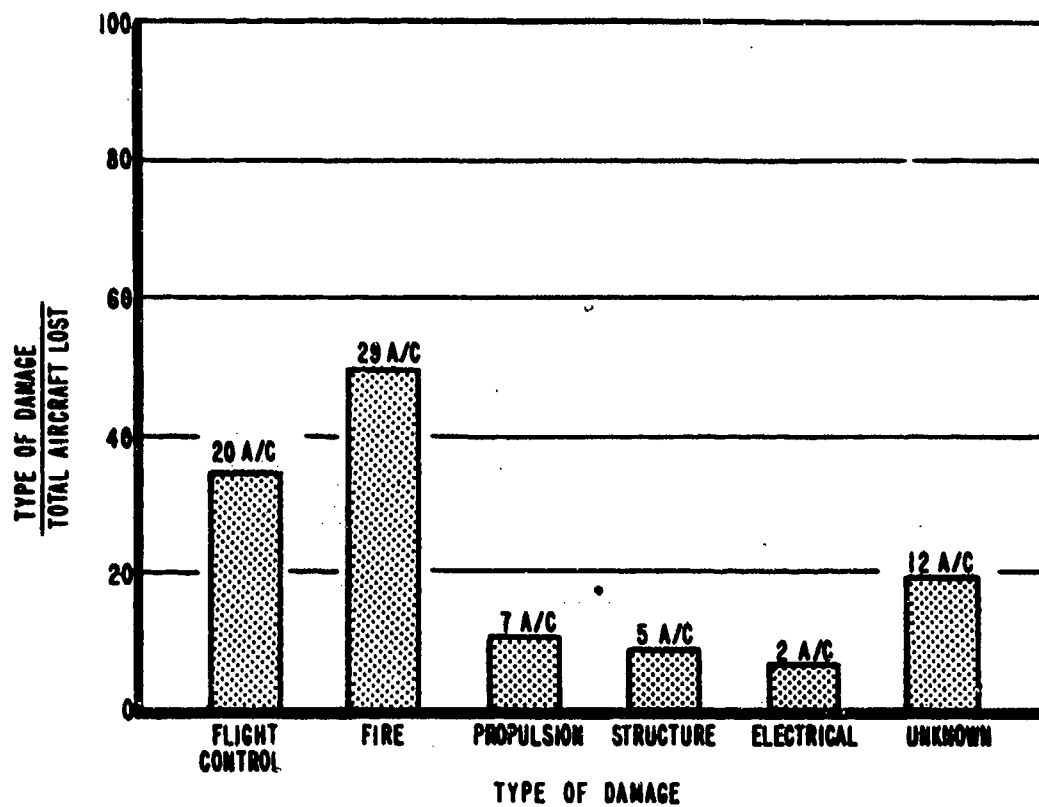


Figure 9. Percentage of Aircraft Lost Experiencing Various Types of Damage

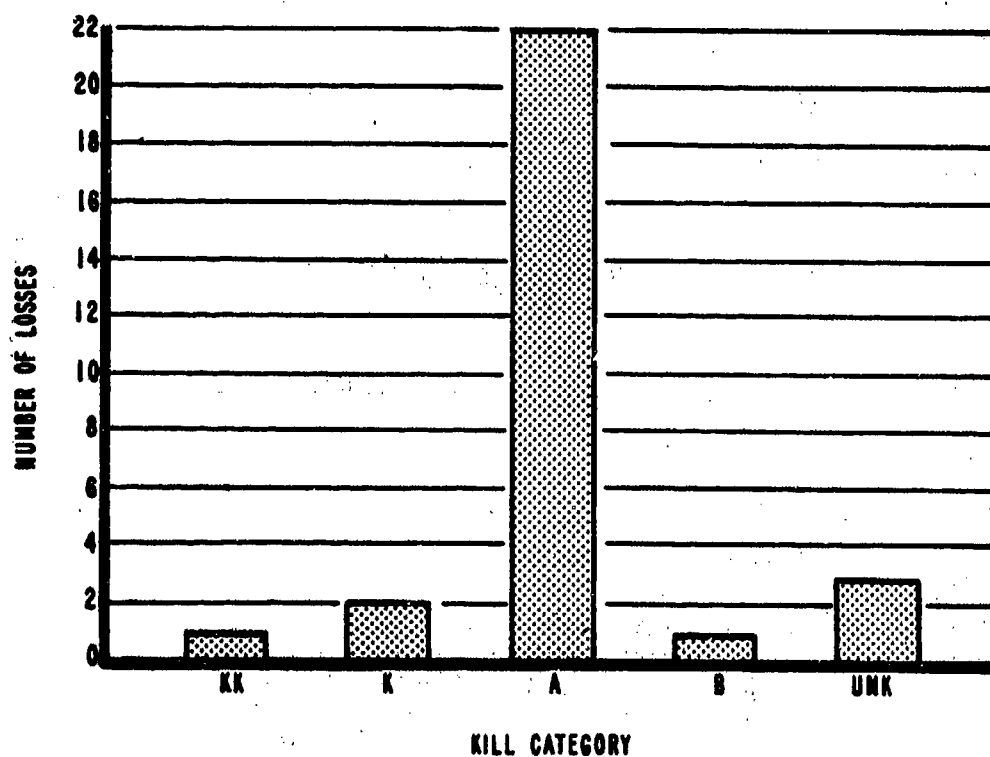


Figure 10. Category of Kill as a Result of Fire

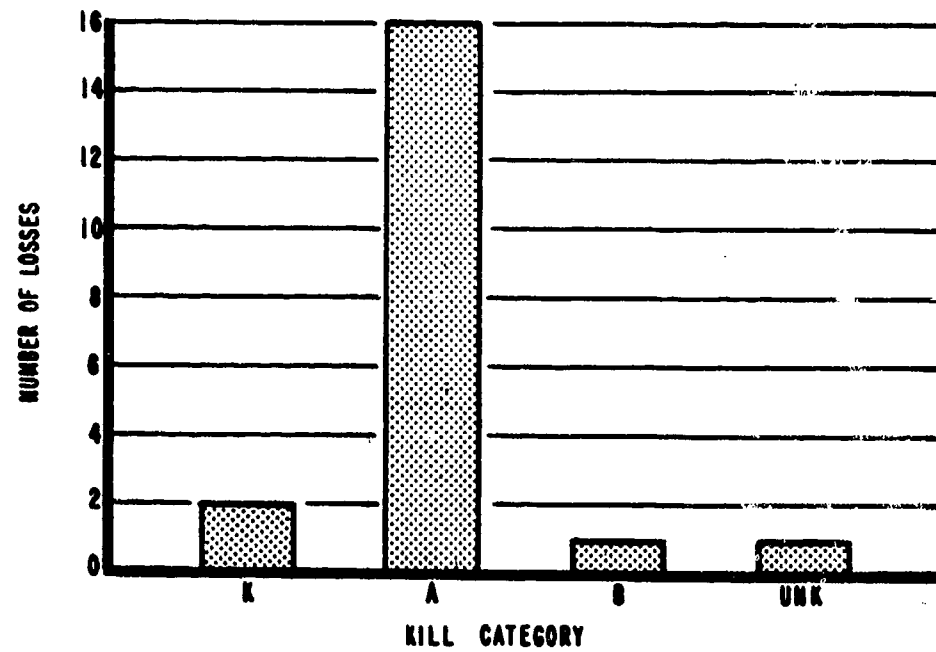
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Figure 11. Category of Kill as a Result of Flight Control Failure

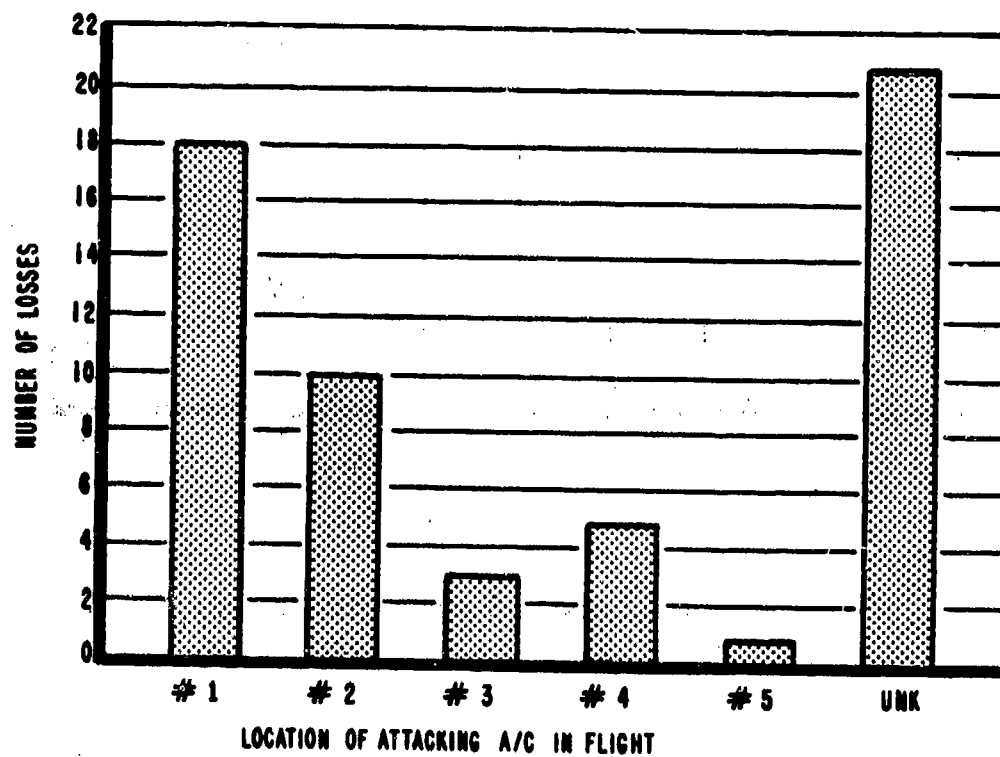


Figure 12. Losses as a Function of Attack Sequence

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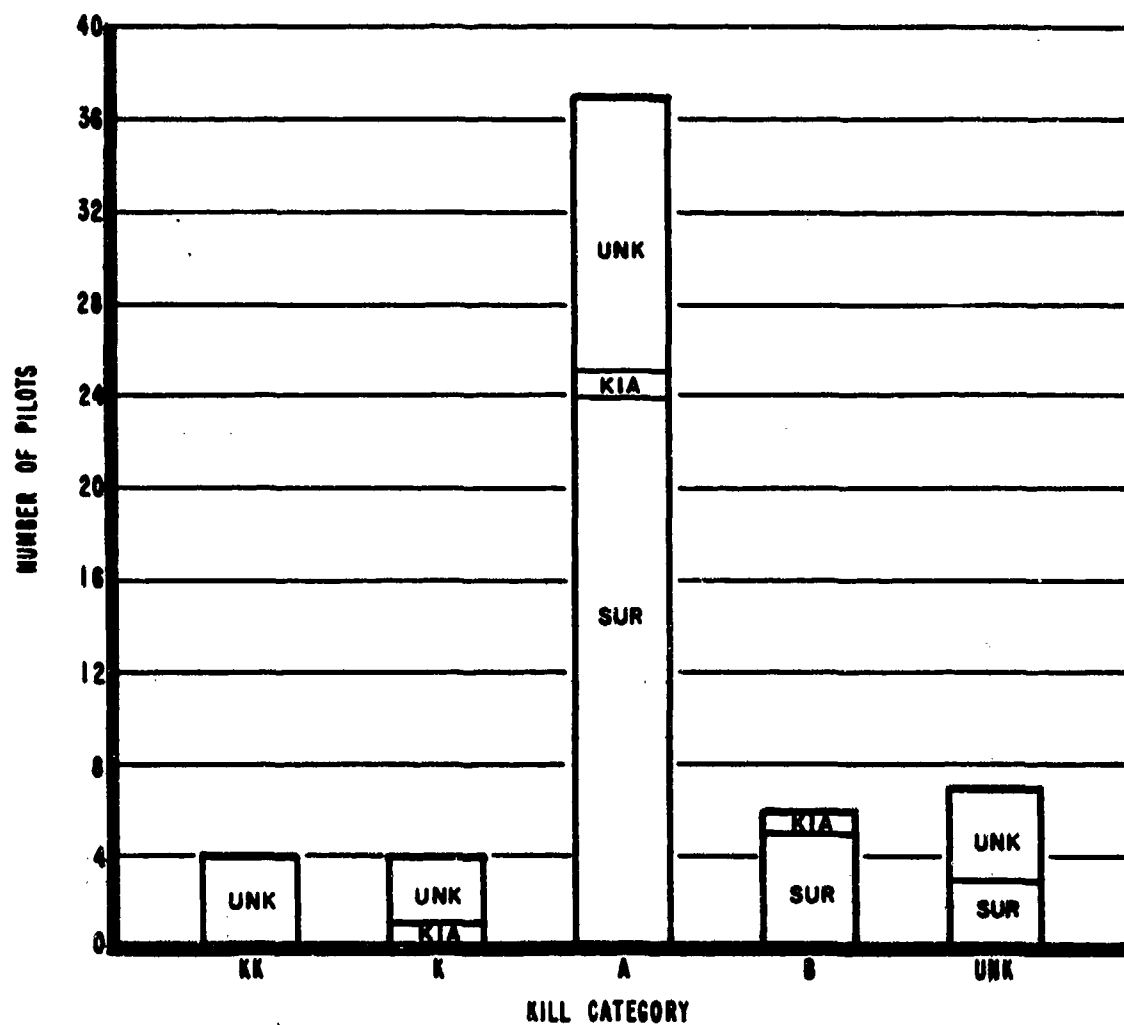
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Figure 13. Pilot Status Versus Kill Category

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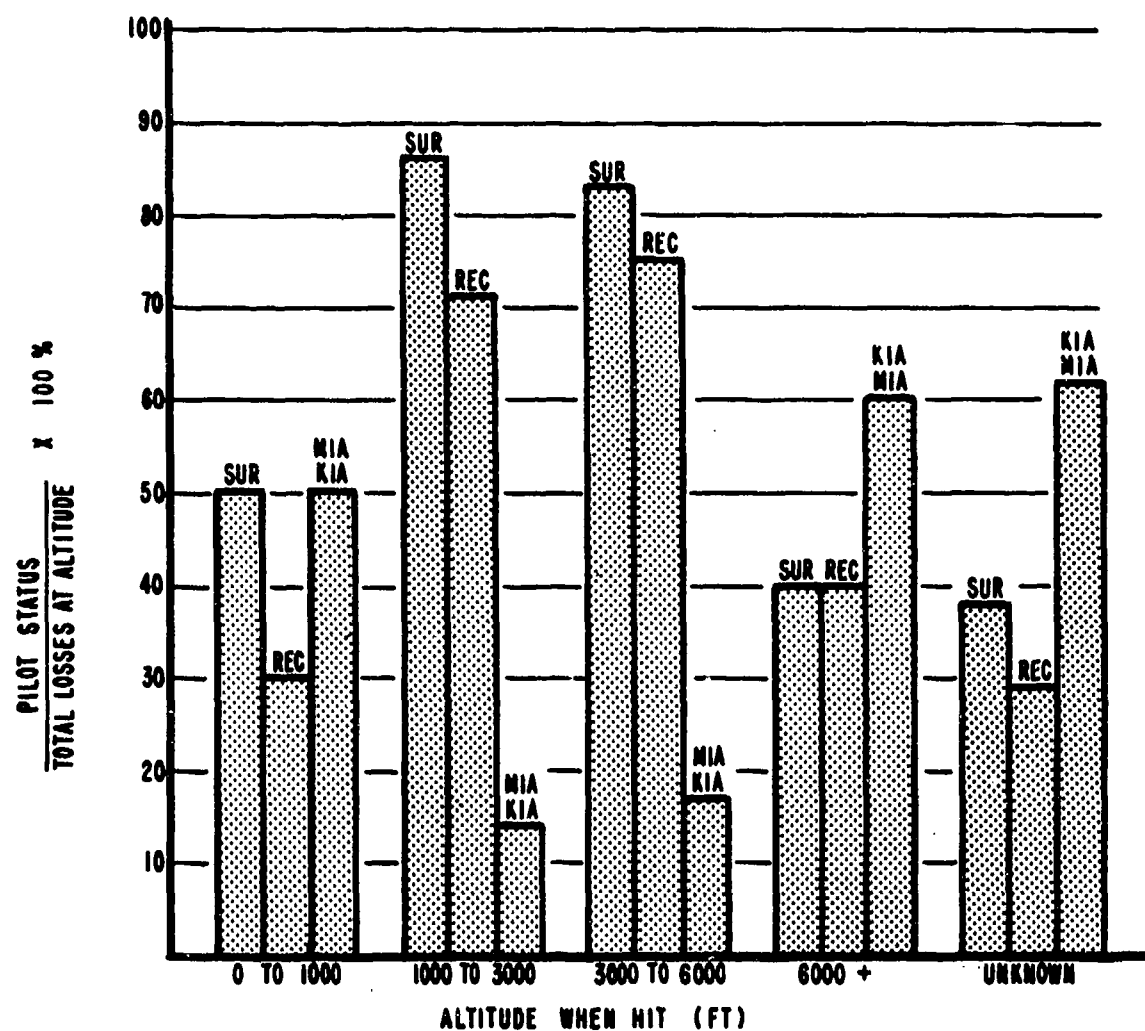


Figure 14. Pilot Status as a Function of Altitude

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INCIDENT	SORTIE TYPE	SORTIE LOCATION	TARGET TYPE	WEATHER	ENEMY DEFENSE	WEAPONS OF AIRCRAFT	NO. OF AIRCRAFT IN MISSION	STAGE WHEN HIT
1	FLAK SUPPRESSION	ROLLING THUNDER 5	MUNITIONS STORAGE	20% CLOUD, 10 MI. VISIBILITY	37 OR 57 MM	8-750	24 (LEAD OF 4)	ATTACK
2	STRIKE	—	MUNITIONS STORAGE	20% CLOUD, 10 MI. VISIBILITY	GROUND FIRE (HEAVY)	8-750	24	ATTACK
3	FLAK SUPPRESSION	—	AMMUNITION STORAGE	CLEAR WITH HAZE	AUTO WEAPONS, 37 MM	2-CBU	4	ATTACK
4	FLAK SUPPRESSION	—	AA BOATS OFF SHORE	CLEAR	14.5 MM (MODERATE)	BOMBS, ROCKETS	4 (LEAD MAN)	ATTACK
5	STRIKE	THANH HOA	RAILROAD WITH HIWAY BRIDGE	CLEAR 5 MI. VIS., HAZE 0-1200 FT	GROUND FIRE	750 LB BOMBS	48	ATTACK
6	STRIKE	THANH HOA	RAILROAD WITH HIWAY BRIDGE	—	MIG CANNON	—	48 (FLIGHT LEAD)	ORBIT PRIOR TO ATTACK
7	STRIKE	THANH HOA	RAILROAD WITH HIWAY BRIDGE	SCATTERED HAZE	MIGS	—	48	ORBIT PRIOR TO ATTACK
8	ARMED RECCE.	—	TRUCKS	—	37 MM	—	4 (THIS MAN #4)	PULLOUT FROM STRAFING PASS
*9	ARMED RECCE.	—	—	—	—	—	4	—
10	STRIKE	THANH HOA	BRIDGE	40% CLOUD, 25 MI VISIBILITY	AUTO WEAPONS, 37 & 57 MM	8-750	42	ATTACK
11	ARMED RECCE	STEEL TIGER	FLAK POSITION	SCATT. TO BROKEN TO OVERCAST	GROUND FIRE (HEAVY)	ROCKET POD, M61 CANNON	2 (THIS MAN #2)	—
12	RECCE	ROUTE 7 FROM VINH TO LAOS	TARGETS OF OPPORTUNITY	SCATTERED TO BROKEN CLOUDS	14.5, 37 MM HEAVY AUTO, SM. ARMS	ROCKET PODS, 20 MM	4 (THIS MAN #4)	ROAD RECCE
13	STRIKE BARREL ROLL	—	ROAD	SCATTERED TO BROKEN OVERCAST. 10 MI. VISIBILITY	GROUND FIRE, LIGHT AA, AUTO. WEAPONS	8-750, M61 CANNON	4 (LEAD MAN)	ATTACK
14	ROAD RECCE	ROUTES A, B, & C	BRIDGE, ROADS	50% CLOUD, 15 MI. VISIBILITY	AUTO. WEAPONS (LIGHT)	ROCKETS	12	—
15	STRIKE	THAN HOA	BRIDGE	15-16,000 FT CLOUD LAYER	GROUND FIRE	8-750	4	ATTACK
16	RESCAP FOR A4C	LAOS	—	—	GROUND FIRE (HEAVY)	—	—	ORDINANCE DELIVERY PASS
17	ARMED RECCE	—	WOODEN BRIDGE	70% CLOUD, 10 MI. VISIBILITY	GROUND FIRE (HEAVY)	—	— (LEAD MAN)	ATTACK
18	STRIKE	BON XOM LOM	ARMY BARRAKS	11,000 FT, BROKEN	37, 57, & 85 MM AUTO. WEAPONS	8-750	4 (LEAD MAN)	ATTACK
19	ARMED RECCE	ROLLING THUNDER 19 C	CONCRETE BRIDGE	4500 FT, OVERCAST	AUTO WEAPONS (HEAVY)	8-750	4	ATTACK

* NOT USED IN ANALYSIS

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TABLE I
WSEG DATA SUMMARY

NO. OF AFT	NO. OF AIRCRAFT IN MISSION	STAGE WHEN HIT	BASIC MANEUVER	STARTING ALTITUDE	ALTITUDE WHEN HIT	VELOCITY WHEN HIT	PROJECTILE TYPE	DIRECT OR FRAGMENT	LOCATION OF HIT	RESULT DAM
0	24 (LEAD OF 4)	ATTACK	PULLOUT AFTER BOMBING	—	—	—	37 OR 57 MM	—	TAIL	HYDRAULIC FLIGHT C
0	24	ATTACK	—	—	—	—	—	—		AC GENERATOR LOST
0	4	ATTACK	LEVEL FLIGHT	10,000	20 FT	500 KIAS	37 MM	DIRECT	NOSE, LT. WING ENG COMP ELEC. SYS.	ELECTRIC
0	4 (LEAD MAN)	ATTACK	—	—	—	—	—	—	AFT SECTION	FIRE IN INTAKES
	48	ATTACK	BOMB RUN	—	—	—	—	—	—	FIRE IN SECTION
	48 (FLIGHT LEAD)	ORBIT PRIOR TO ATTACK	ORBITING	—	—	—	CANNON FIRE MIG	—	—	DAMAGED CANNON
	48	ORBIT PRIOR TO ATTACK	ORBITING	—	—	—	CANNON FIRE MIG 23 & 37 MM	DIRECT	LT. SIDE FROM SP. BK. TO CANOPY	LOST A/C CONTROL
	4 (THIS MAN #4)	PULLOUT FROM STRAFIN PASS	STRAFIN PASS	—	—	420 KTS	—	—	—	FIRE AND CONTROL
	4	—	ROCKET ATTACK	6000	—	305 KTS	—	—	(HIT HILL IN DIVE)	—
0	42	ATTACK	DIVE BOMB ATTACK	13-14,000	4500 FT	—	—	—	RIGHT WING ROOT	STABILITY AUGMENT
POD, NON	2 (THIS MAN #2)	—	—	—	—	—	—	—	?	?
PODS,	4 (THIS MAN #4)	ROAD RECCE	ROAD RECCE	3000	3000	450	37 MM	DIRECT	FUEL CONT. OR MAIN FUEL LINE	ENGINE FLAMED
NON	4 (LEAD MAN)	ATTACK	DIVE BOMB DELIVERY	—	3000 AGL	—	—	—	?	FIRE
	12	—	—	—	1000 AGL	—	—	—	ELECTRONICS IN FUSELAGE BOTM.	FIRE
	4	ATTACK	DIVE BOMB ATTACK	18,000	—	—	—	—	—	FIRE TAIL
	—	ORDINANCE DELIVERY PASS	ORDINANCE DELIVERY PASS	—	4000	—	—	—	—	LOSS OF TANK & P
	— (LEAD MAN)	ATTACK	EVASIVE CLIMB AFTER PASS	—	4000	—	GROUND FIRE	—	AFT SECTION	FIRE
0	4 (LEAD MAN)	ATTACK	DIVE BOMB PASS	7000 AGL	4000 AGL	500	—	—	—	—
0	4	ATTACK	DIVE BOMB RUN, BOMBS DID NOT RELEASE	4500 MSL 1500 PULLOUT	—	300 KTS	AUTO WEAPON FIRE	—	—	FIRE ON COMING TAIL



MARY

COVER	STARTING ALTITUDE	ALTITUDE WHEN HIT	VELOCITY WHEN HIT	PROJECTILE TYPE	DIRECT OR FRAGMENT	LOCATION OF HIT	RESULTANT DAMAGE	TYPE KILL
AFTER SC	—	—	—	37 OR 57 MM	—	TAIL	HYDRAULIC PRESS. FLIGHT CONTROL	B
	—	—	—	—	—		AC GENERATOR, LOST NAV. AIDS	B
FLIGHT	10,000	20 FT	500 KIAS	37 MM	DIRECT	NOSE, LT. WING ENG. COMP ELEC. SYS.	ELECTRICAL	A
	—	—	—	—	—	AFT SECTION	FIRE IN FUSELAGE, & INTAKES, COMP STALL	—
RUN	—	—	—	—	—	—	FIRE IN AFT SECTION	—
ING	—	—	—	CANNON FIRE MIG	—	—	DAMAGED BY CANNON FIRE	B
ING	—	—	—	CANNON FIRE MIG 23 & 37 MM	DIRECT	LT. SIDE FROM SP. BK. TO CANOPY	LOST ALL CONTROL	—
ING	—	—	420 KTS	—	—	—	FIRE AND CONTROL LOSS	A
T K	6000	—	305 KTS	—	—	(HIT HILL IN DIVE)	—	—
BOMB K	13-14,000	4500 FT	—	—	—	RIGHT WING ROOT	STABILITY AUGMENTATION	A
	—	—	—	—	—	?	?	KK
ECCE	3000	3000	450	37MM	DIRECT	FUEL CONT. OR MAIN FUEL LINE	ENGINE FLAMEOUT	A
BOMB ERY	—	3000 AGL	—	—	—	?	FIRE	A
	—	1000 AGL	—	—	—	ELECTRONICS IN FUSELAGE BOTM.	FIRE	B
BOMB K	18,000	—	—	—	—	—	FIRE IN TAIL	A
ANCE RY PASS	—	4000	—	—	—	—	LOSS OF RT. WING TANK & PYLON	B
IE CLIMB PASS	—	4000	—	GROUND FIRE	—	AFT SECTION	FIRE	A
BOMB	7000 AGL	4000 AGL	500	—	—	—	—	A
BOMB RUN, DID NOT SE	4500 MSL 1500 PULLOUT	—	300 KTS	AUTO WEAPON FIRE	—	—	FIRE OBSERVED COMING FROM TAIL	A

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TABLE I

INCIDENT	SORTIE TYPE	SORTIE LOCATION	TARGET TYPE	WEATHER	ENEMY DEFENSE	WEAPONS OF AIRCRAFT	NO. OF AIRCRAFT IN MISSION	STAGE WHEN HIT
20	ARMED RECCE	ROLLING THUNDER 21C	BRIDGE	20,000 FT, THIN OVERCAST	57 MM (HEAVY)	6-750, 2 LAU3A PODS	4 (THIS MAN #2)	ATTACK
21	—	—	RESCAP FOR DOWNED NAVY CREW	3000 FT, OVERCAST	37MM (LIGHT)	20 MM	4 (LEAD MAN)	RESCAP
22	ARMED RECCE	—	BARRACKS AREA	—	37, 57 MM AUTO WEAPONS (INTENSE)	—	0	APPROACH TO TARGET
23	STRIKE	—	CAN DOI BKS.	CLEAR, 10 MI VISIBILITY	37-57 MM? AUTO WEAP (HEAVY)	—	15	ATTACK
24	—	HANOI	SAM SITE #7	CLEAR, UNLIMITED VISIBILITY	37MM & AUTO WEAP. (INTENSE)	—	12 (THIS MAN #2)	AFTER WEAPON RELEASE
25	—	?	SAM SITE #7	CLEAR, UNLIMITED VISIBILITY	GROUND FIRE (HEAVY)	—	12	AFTER NAPALM RELEASE
*26	—	?	SAM SITE #6	—	GROUND FIRE (VERY HEAVY)	—	11	OVER TARGET
*27	—	?	SAM SITE #6	—	GROUND FIRE (VERY HEAVY)	—	11	—
28	ARMED RECCE	ROLLING THUNDER 25-C4	BRIDGE	10,000 OVERCAST, 5 MI VISIBILITY	37, 57, 85, & 100 MM AUTO WEAP	2-3000	5	PRIOR TO BOMB RELEASE
29	ARMED RECCE	ROLLING THUNDER 25-C5	BARGES	80% CLOUD COVER AT 20,000 FT	12.7 MM AUTO WEAPONS (HEAVY)	38-2.75" ROCKETS	? (THIS MAN #1)	ATTACK
30	STRIKE	ROLLING THUNDER 25-A-3	BRIDGES	90% CLOUD COVER AT 25,000 FT	37MM (LIGHT)	2-3000	4 (THIS MAN #4)	ATTACK
31	ARMED RECCE	ROLLING THUNDER 28-C-6	RADAR SITE	CLEAR, 15 MI VISIBILITY	37MM (LIGHT)	—	4	ATTACK
32	ARMED RECCE	ROLLING THUNDER 28-C-5	—	—	—	—	—	ATTACK
33	ARMED RECCE	ROLLING THUNDER 29-C-2	BARRACKS AREA	SCATTERED CLOUDS 7000'	AUTO WEAPONS & SM. ARMS (LT)	20 MM SHAKE BOMBS	4	ATTACK
34	ARMED RECCE	ROLLING THUNDER 29-C-4	YEN BAY ARSENAL	2000' BROKEN TO OVERCAST, 10 MI. VISIBILITY	20MM, 37MM (HEAVY)	6-750	4 (THIS MAN #4)	ATTACK
35	ARMED RECCE	LEFT HOOK ALERT	BRIDGE	CLEAR, 10 MI. VISIBILITY	37MM, 57 MM (MODERATE)	NAPALM	2	ATTACK
36	ARMED RECCE	ROLLING THUNDER 29-C-7	BRIDGE	SCATTERED TO BROKEN, GOOD VISIBILITY	37 MM OR 57MM (LIGHT)	6-750 2 LAU	4	ATTACK

*NOT USED IN ANALYSIS

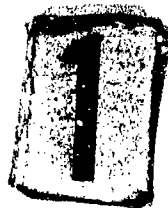
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TABLE I (Cont'd)

STAGE WHEN HIT	BASIC MANEUVER	STARTING ALTITUDE	ALTITUDE WHEN HIT	VELOCITY WHEN HIT	PROJECTILE TYPE	DIRECT OR FRAGMENT	LOCATION OF HIT	RESULTANT DAMAGE	TYPE KILL
ATTACK	DIVE BOMB	17,000	5000	450	AUTO WEAPON FIRE	DIRECT	AFT OF COCKPIT	FIRE FROM WING ROOT	A
ESCAP	TURNING, GOING INTO ORBIT	3000 AGL	3000 AGL	350-400 KTS	37 MM	DIRECT	ACCESSORY SECTION	FIRE, LOST STABILIZER CONTROL	A
APPROACH TO TARGET	LEFT BREAK TO AVOID FLAK	—	800	500	AUTO WEAPON FIRE	—	—	ENGINE POWER LOSS - FLIGHT CONTROL FAILURE	A
ATTACK	NAPALM RUN	100 AGL	100 AGL	500 KTS	—	—	—	FIRE LT. WING RT-PART OF LEFT WING MISSING	A
AFTER WEAPON RELEASE	EVADING AA FIRE	—	—	—	—	—	—	POSSIBLE FLIGHT CONTROL FAILURE	A
AFTER NAPALM RELEASE	LOW-LEVEL NAPALM DELIV.	—	50 AGL	—	—	—	—	BURNING FROM FWD. OF INTAKES	A
OVER TARGET	—	—	—	—	—	—	FLAK HIT NOSE SECTION	—	A
—	—	—	—	—	—	—	MID AIR COLLISION	—	—
PRIOR TO BOMB RELEASE	DIVE RECOVERY AT REL. POINT	10,000	5000	450	37 OR 57 MM	FRAGMENTS	BETWEEN RIGHT WING & FUSELAGE	FIRE AT HIT LOC., FLT. CONT. LOSS	A
ATTACK	ROCKET PASS	—	—	—	—	—	—	FIRE OBSERVED AT AFT. SECT., FLIGHT CONTS & HYD.	A
ATTACK	DURING DIVE RUN OR AFTER PULL-UP	16,000	—	450	37 MM	—	ENGINE INTAKE	—	B
ATTACK	START OF PULL-UP FROM STRAFING PASS	—	—	—	—	—	—	FUEL INLET PRESS., FUEL PUMP, LIGHTS ON STAB. AUGMENT.	A
ATTACK	PULL-UP FROM ATTACK	—	6-7000	500	—	—	—	FIRE	A
ATTACK	WEAPONS DELIVERY PASS	—	—	—	—	—	—	FIRE IN TAIL PIPE, HIS GUN EXPLODED	A
ATTACK	LOW-LEVEL HIGH SPEED ATTACK	50-100	50-100	550 KTS	20 OR 37 MM	—	—	FIRE IN BATTERY COMP., ELECT. & FLIGHT CONTROLS	A
ATTACK	DIVE HIT AT NAPALM DROP PT.	8000	3000	450	37 MM	DIRECT	FUSELAGE - BOMB BAY TO AFT SECT	FLIGHT CONTROL	A
ATTACK	DIVE BOMB RUN	10,000	—	500-530	37 OR 57 MM	DIRECT (ASSUMED)	—	NO FIRE, POSSIBLY FLIGHT CONTROL	K

INCIDENT	SORTIE TYPE	SORTIE LOCATION	TARGET TYPE	WEATHER	ENEMY DEFENSE	WEAPONS OF AIRCRAFT	NO. OF AIRCRAFT IN MISSION	STAGE WHEN HIT
37	ARMED RECCE	ROLLING THUNDER 30-C-4	RADIO COMMUNICATIONS SITE	70% CLOUD COVER AT 13,000'	37,57MM AUTO WEAPONS (HEAVY)	—	4 (THIS MAN #2)	ATTACK
38	STRIKE	IRON HAND	SAM SITE	CLEAR, 20 MI VISIBILITY	37MM, 57MM (MEDIUM)	—	2 (LEAD MAN)	—
39	STRIKE	IRON HAND	SAM SITE	CLEAR, 15 MI VISIBILITY	SMALL ARMS OR 37 MM	NAPALM AND 20 MM	2 (LEAD MAN)	RUN-IN TO TARGET
40	ARMED RECCE	ROLLING THUNDER 32-C-1	BARRACKS BUILDING	CLEAR, UNLIMITED VISIBILITY	37MM (MODERATE)	2 PODS OF 2.75" ROCKETS	4 (THIS MAN #2)	ATTACK
41	ARMED RECCE	ROLLING THUNDER 32-C-4	BRIDGE	—	—	—	3 (THIS MAN #2)	ATTACK
42	ARMED RECCE	DONG BAI NVN	BRIDGE	CLOUD BASE 6000', 7MI. VISIBILITY, 80% CLOUD COVER	GROUND FIRE (HEAVY)	—	4	ATTACK
43	ARMED RECCE	STEEL TIGER 311	MILITARY BUILDINGS	CEILING UNLIMITED, 15 MI. VIS.	AUTO WEAPONS 57 MM (MEDIUM)	—	2 (LEAD MAN)	ATTACK
44	ARMED RECCE	ROLLING THUNDER 33-C-7	NINH BINH HIWAY BRIDGE	20,000' CEILING 7 MI. VISIBILITY	SAM'S	NONE	2	ORBITING DIRECTING ST
45	ROLLING THUNDER	—	LANG MET HIWAY BRIDGE	—	GROUND FIRE (HEAVY)	—	4	—
46	STRIKE	—	LANG MET HIWAY BRIDGE	BROKEN LAYER AT 3000', RAIN, THUNDERSTORMS, SHOWERS	37MM, 57MM, 85 MM	6 - 750	3 (LEAD MAN)	ATTACK
47	—	—	BRIDGE	—	—	—	4 (LEAD)	BDA RUN AFT ATTACK
48	ARMED RECCE	ROLLING THUNDER 36-C-D	BARRACKS & STORAGE AREA	7000' OVERCAST, 10 MI. VISIBILITY	20 GUNS OF 37-57 VARIETY	8 - 750 GP BOMBS	4 (LEAD)	ATTACK
49	ARMED RECCE	ROLLING THUNDER 36-C-1	BARRACKS & STORAGE AREA	7000' OVERCAST 10 MI. VISIBILITY	20 GUNS OF 37-57 VARIETY	8 - 750 GP BOMBS	4 (THIS MAN #2)	RESCAP
50	ARMED RECCE	ROLLING THUNDER 37-C-1	SAM SITE	2000' SCATTERED, 5 MI. VISIBILITY IN HAZE	37,57MM AUTO WEAPONS (HEAVY)	CBU'S AND SHAKEYE BOMBS	4 (LEAD)	ATTACK
*51	ARMED RECCE	—	BRIDGE	12,000' OVERCAST 7 MI. VISIBILITY	—	6 BOMBS	4 (THIS MAN #4)	ATTACK
52	(AIRBORNE IRON HAND)		TARGETS OF OPPORTUNITY	1500-2500 FT OVERCAST 2 MI. VISIBILITY	SAM'S (3)	750 LB BOMBS	4 (LEAD)	APPROACH TARGET ARE
53	ARMED RECCE	ROLLING THUNDER 40	RO/	CLOUDS BROKEN AT 3000 FT, 7 MI VISIBILITY IN RAIN	SAM'S (2)	2.75" ROCKETS	— (THIS MAN #4)	OUT BOARD FROM TARG

*NOT USED IN ANALYSIS



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TABLE I (Cont'd)

NO. OF CRAFT	NO. OF AIRCRAFT IN MISSION	STAGE WHEN HIT	BASIC MANEUVER	STARTING ALTITUDE	ALTITUDE WHEN HIT	VELOCITY WHEN HIT	PROJECTILE TYPE	DIRECT OR FRAGMENT	LOCATION OF HIT	
	4 (THIS MAN #2)	ATTACK	PULL-UP AFTER RELEASE	—	6000	500 KTS	—	—	TAIL SECTION	ELI FLI
	2 (LEAD MAN)	—	—	—	MINIMUM ALTITUDE	—	—	—	—	EN AF
LM AND	2 (LEAD MAN)	RUN-IN TO TARGET	LOW-LEVEL RUN	150 FT	150 FT	510 KTS	SMALL ARMS OR 37 MM	DIRECT	BOMB BAY	FIR EN
NO OF ROCKETS	4 (THIS MAN #2)	ATTACK	PULL-OUT ON ROCKET PASS	8000	500 AGL	—	—	—	—	EXI AF
	3 (THIS MAN #2)	ATTACK	ROCKET PASS	7-8000	—	350 KTS	—	—	—	MAI WHI
	4	ATTACK	DIVE BOMB DELIVERY	7000	—	—	—	—	—	AF ON
	2 (LEAD MAN)	ATTACK	ROCKET PASS CLIMB-OUT	—	4500	500 KTS	57 MM	—	—	FI
	2	ORBITING DIRECTING STRIKE	ORBITING AS MISSION COORD.	—	18,000	—	SAM	?	—	
	4	—	—	—	—	—	—	—	—	
750	3 (LEAD MAN)	ATTACK	DEPARTING AREA AFTER BOMB DROP	1500	1500	480	—	—	—	FIR OF FLI
	4 (LEAD)	BDA RUN AFTER ATTACK	TURN TO RIGHT ON BDA RUN	—	2000 AGL	—	—	—	REAR PART OF AIRCRAFT	HYD FLI
NO GP	4 (LEAD)	ATTACK	PULL-UP AFTER PASS ON TARGET	—	—	—	37-57 MM	—	—	
NO GP	4 (THIS MAN #2)	RESCAP	—	—	—	—	—	—	UNKNOWN	
AND YE	4 (LEAD)	ATTACK	LOW-LEVEL HIGH-SPEED OBU DELIVERY	400 AGL	400 AGL	550	AUTO WEAPONS	DIRECT	—	FIR FUS BOT
NO	4 (THIS MAN #4)	ATTACK	DIVE BOMB RUN	11,000 MSL	—	—	—	—	HIT MOUNTAIN	HIT
BOMBS	4 (LEAD)	APPROACH TO TARGET AREA	APPROACH	8500	8500	450 K (EAS)	SAM (SA-2)	FRAGMENTS	SAM DETONATED 20 FT UNDER AIRCRAFT	BUR A/C TO
ROCKETS	— (THIS MAN #4)	OUT BOARD FROM TARGET	—	—	4000	400	(PILOT SAID IT WAS A SAM)	—	—	FIR DIS



STARTING ALTITUDE	ALTITUDE WHEN HIT	VELOCITY WHEN HIT	PROJECTILE TYPE	DIRECT OR FRAGMENT	LOCATION OF HIT	RESULTANT DAMAGE	TYPE KILL
—	6000	500 KTS	—	—	TAIL SECTION	ELECTRICAL ENG. FLIGHT CONTROL	A
—	MINIMUM ALTITUDE	—	—	—	—	ENGINE AFFECTED	A
150 FT	150 FT	510 KTS	SMALL ARMS OR 37 MM	DIRECT	BOMB BAY	FIRE IN BOMB BAY ENGINE	A
8000	500 AGL	—	—	—	—	EXPLOSION IN AFT SECTION	A
7 - 8000	—	350 KTS	—	—	—	MAY HAVE HIT TREES WHEN TURNING	KK
7000	—	—	—	—	—	AFT SECTION ON FIRE	A
—	4500	500 KTS	57 MM	—	—	FIRE	A
—	18,000	—	SAM	?	—	—	KK
—	—	—	—	—	—	—	—
1500	1500	480	—	—	—	FIRE LEFT SIDE OF AIRCRAFT FLIGHT CONTROLS	K
—	2000 AGL	—	—	—	REAR PART OF AIRCRAFT	HYDRAULIC SYS. & FLIGHT CONTROL	A
—	—	—	37-57 MM	—	—	—	A
—	—	—	—	—	UNKNOWN	UNKNOWN	—
400 AGL	400 AGL	550	AUTO WEAPONS	DIRECT	—	FIRE ON FUSELAGE BOTTOM	A
11,000 MSL	—	—	—	—	HIT MOUNTAIN	HIT MOUNTAIN	
6500	6500	450 K (EAS)	SAM (SA-2)	FRAGMENTS	SAM DETONATED 20 FT UNDER AIRCRAFT	BURST IN FLAMES A/C SHREDDED TO PIECES	KK
—	4000	400	(PILOT SAID IT WAS A SAM)	—	—	FIRE, AIRCRAFT DISINTEGRATED	K

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TABLE I (Co

INCIDENT	SORTIE TYPE	SORTIE LOCATION	TARGET TYPE	WEATHER	ENEMY DEFENSE	WEAPONS OF AIRCRAFT	NO. OF AIRCRAFT IN MISSION	STAGE WHEN HIT	BAS MANI
54	—	—	—	—	—	—	— (LEAD)	ATTACK	CLINE POSIT ROCKE
55		ROLLING THUNDER	BARRACKS	2000' OVERCAST, 3 MI. VISIBILITY IN HAZE	—	—	— (THIS MAN #2)	ATTACK	HIGH STRAF
56		ROLLING THUNDER	RR BRIDGE	3000-5000 FT SCATTERED, 10 MI. VISIBILITY	57 TO 85 MM (HEAVY & ACCURATE)	3000 LB BOMB	4 (THIS MAN #3)	ATTACK	POP-U ORDIN DELIV
57		ROLLING THUNDER	POWER PLANT	OVERCAST AT 2500 FT, 7 MI VISIBILITY IN HAZE	37 MM AUTO WEAPONS (LIGHT)	—	? (LEAD)	TARGET APPROACH	—
58	—	VU CHUA, NVN	RR BRIDGE	1000 FT OVERCAST	37 MM OR 57 MM	6-750	4 (THIS MAN #3)	LETDOWN TO TARGET	LEFT BANK DOWN
59		(ROLLING THUNDER)	BRIDGE	—	37 & 57 MM (MODERATE)	6-750	4 (THIS MAN #2)	ATTACK	PULLO BOMB
60	BARREL ROLL	(LAOS)	BRIDGE	CLEAR WITH LIGHT HAZE, 7 MI VISIBILITY	AUTO WEAPONS (LIGHT)	8-750	4 (THIS MAN #3)	ATTACK	PULL FROM BOMB
61	CLOSE AIR SUPPORT	—	AUTO WEAPONS POSITIONS & TRENCHES	HEAVY CUMULUS SCATTERED BASE, 8-9000 FT	GROUND FIRE	20MM	5 (THIS MAN #5)	ATTACK	STRAF
62	ARMED RECCE	ROLLING THUNDER 48-C-4	ROUTE 51A & WATERWAY BARGES	LOW SCATTERED AT 1200-1600 FT SOLID AT 2000 FT	37 OR 14.5 MM	ROCKETS 20 MM	4 (THIS MAN #2)	RECCE	LOW- ARME

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TABLE I (Cont'd)

AGE N HIT	BASIC MANEUVER	STARTING ALTITUDE	ALTITUDE WHEN HIT	VELOCITY WHEN HIT	PROJECTILE TYPE	DIRECT OR FRAGMENT	LOCATION OF HIT	RESULTANT DAMAGE	TYPE KILL
ACK	CLIMB TO POSITION FOR ROCKET PASS	—	5000	—	—	—	—	FUEL COMING OUT OF A/C, FIRE FLIGHT CONTROLS	A
ACK	HIGH ANGLE STRAFE PASS	7000 AGL	—	—	—	—	—	FLIGHT CONTROLS	A
ACK	POP-UP FOR ORDINANCE DELIVERY	—	8-9000 FT	515	37 MM	DIRECT	—	—	K
RET ROACH	—	—	2500	450	37 MM	—	—	FIRE (TRAILING AIRCRAFT)	—
DOWN TO RET	LEFT TURN & BANK TO LET- DOWN ON TARGET	—	4000	350 KTS	—	— (PILOT FELT THUMP)	—	FIRE, LOST FLIGHT CONTROLS	A
ACK	PULLOUT AFTER BOMB RELEASE	—	7-8000 FT	450	57 MM	DIRECT	TAIL HOOK AREA	FIRE, UTILITY & HYDRAULIC SYS, FLIGHT CONTROLS	A
ACK	PULLOUT FROM OWN BOMB RUN	—	4500	500	A/C OWN BOMB (PREMATURE)	—	—	FIRE	A
ACK	STRAFE PASS	—	—	—	—	—	—	—	—
RECCE	LOW-LEVEL ARMED RECCE	—	—	—	—	—	—	—	PROB A

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TABLE II
DATA SOURCES

INCIDENT	DATE	TAIL NUMBER	ORGANIZATION	PILOT STATUS	USAF COMMAND POST RECORDS	COACT	MISHAP REPORT	ESCAPE AND EVASION REPORT	WINGMAN INTERVIEWED	WINGMAN STATEMENT	PILOT INTERVIEWED	PILOT STATEMENT	FORM 484	SEARCH AND RESCUE REPORT
1	2 MAR 65	62-4260	18 TFW	RECOVERED	X	X		X						X
2	2 MAR 65	62-4325	18 TFW	RECOVERED	X	X								X
3	2 MAR 65	61-4214	18 TFW	RECOVERED	X						X	X		X
4	22 MAR 65	62-4233	18 TFW	RECOVERED	X	X								X
5	4 APR 65	62-4217	18 TFW	DETAINED	X	X				X			X	
6	4 APR 65	59-1754	355 TFW	KIA	X	X				X				
7	4 APR 65	59-1764	18 TFW	MIA	X	X				X			X	
8	5 APR 65	59-1742	355 TFW	RECOVERED	X	X						X		
9	17 APR 65	61-0171	23 TFW	KIA	X									
10	7 MAY 65	59-1718	355 TFW	RECOVERED	X	X								X
11	9 MAY 65	62-4408	23 TFW	MIA	X					X			X	
12	9 MAY 65	62-4222	18 TFW	RECOVERED	X				X			X		X
13	18 MAY 65	59-1731	983 TFS	DETAINED	X	X				X			X	
14	23 MAY 65	61-0054	355 TFW	RECOVERED	X	X						X		X
15	31 MAY 65	62-4381	35 TFS	DETAINED	X					X			X	
16	5 JUN 65	61-0135	23 TFW	RECOVERED	X									
17	8 JUNE 65	62-0280	355 TFW	RECOVERED	X	X						X		X
18	14 JUN 65	62-4220	18 TFW	DETAINED	X	X			X				X	X
19	23 JUN 65	62-4319	355 TFW	RECOVERED	X							X		X
20	7 JUL 65	62-4232	18 TFW	MIA	X					X			X	X
21	24 JUL 65	62-4373	6441 TFW	RECOVERED	X			X						
22	27 JUL 65	62-4407	18 TFW	RECOVERED	X							X		X
23	27 JUL 65	62-4252	18 TFW	MIA	X	X				X			X	
24	27 JUL 65	62-4257	23 TFW	MIA	X					X			X	
25	27 JUL 65	61-0113	23 TFW	DETAINED	X					X			X	
26	27 JUL 65	61-0177	355 TFW	KIA	X									
27	27 JUL 65	61-4298	355 TFW	KIA	X									
28	2 AUG 65	62-4249	18 TFW	DETAINED	X				X	X			X	X
29	3 AUG 65	61-0088	355 TFW	KIA	X	X								X
30	10 AUG 65	61-184	18 TFW	RECOVERED	X	X			X					
31	11 AUG 65	61-0172	563 TFS	RECOVERED	X	X						X		

X NOT USED IN ANALYSIS

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TABLE II (Cont'd).

INCIDENT	DATE	TAIL NUMBER	ORGANIZATION	PILOT STATUS	USAF COMMAND POST RECORDS	COACT	MISHAP REPORT	ESCAPE AND EVASION REPORT	WINCHMAN INTERVIEWED	WINCHMAN STATEMENT	PILOT INTERVIEWED	PILOT STATEMENT	FORM 484	SEARCH AND RESCUE REPORT
32	23 AUG 65	62-4235	6441 TFW	RECOVERED	X		X					X		X
33	28 AUG 65	63-8282	18 TFW	MIA	X	X				X			X	X
34	29 AUG 65	61-0193	18 TFW	DETAINED	X	X				X			X	X
35	31 AUG 65	61-0185	18 TFW	RECOVERED	X	X	X				X	X		X
36	2 SEP 65	62-4389	6441 TFW	MIA	X	X			X				X	X
37	6 SEP 65	62-4337	18 TFW	RECOVERED	X	X	X					X		X
38	16 SEP 65	61-0189	18 TFW	MIA	X	X	X			X			X	
39	16 SEP 65	61-0217	18 TFW	MIA	X	X	X		X	X			X	
40	17 SEP 65	62-4247	18 TFW	MIA	X	X	X			X			X	X
41	20 SEP 65	62-4328	18 TFW	MIA	X	X	X			X			X	
42	20 SEP 65	60-0082	334 TFS	MIA	X		X			X			X	X
43	21 SEP 65	61-0200	562 TFS	RECOVERED	X	X	X					X		X
44	30 SEP 65	60-0117	334 TFS	MIA	X		X			X			X	
45	5 OCT 65	62-4285	6441 TFW	MIA	X		X			X			X	
46	5 OCT 65	62-4376	6441 TFW	MIA	X		X		X				X	
47	13 OCT 65	61-0180	562 TFS	RECOVERED	X		X	X				X		X
48	15 OCT 65	62-4333	6441 TFW	MIA	X		X			X			X	X
49	15 OCT 65	62-4305	6441 TFW	MIA	X		X			X			X	X
50	22 OCT 65	62-4350	6441 TFW	MIA	X	X	X		X				X	
51	3 NOV 65	61-0163	23 TFW	MIA	X		X			X			X	
52	5 NOV 65	62-4342	355 TFW	MIA	X	X	X			X			X	X
53	16 NOV 65	62-4332	6234 TFW	KIA	X	X	X							
54	18 NOV 65	61-062	6234 TFW	RECOVERED	X		X							X
55	28 NOV 65	62-4285	355 TFW	MIA	X					X			X	X
56	1 DEC 65	61-0182	355 TFW	MIA	X	X	X			X			X	
57	15 DEC 65	62-4363	355 TFW	RECOVERED	X	X	X							X
58	20 DEC 65	61-0090	355 TFW	RECOVERED	X		X					X		X
59	21 DEC 65	59-1823	6234 TFW	RECOVERED	X		X				X	X		X
60	11 JAN 66	59-1736	355 TFW	RECOVERED	X	X	X					X		X
61	16 JAN 66	59-1719	355 TFW	MIA	X		X					X	X	X
62	31 JAN 66	61-0210	6234 TFW	MIA	X	X	X			X			X	X

* NOT USED IN ANALYSIS

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TABLE III
FLIGHT CONTROL FAILURES

INCIDENT	DESCRIPTION OF HIT OR DAMAGE WHICH RESULTED IN LOSS OF FLIGHT CONTROL SYS.	HYDRAULIC PRESSURE LOST ON			FINAL MANEUVER	FIRE	TYPE KILL
		P ₁	P ₂	UTILITY			
1	A/C HIT IN TAIL SECTION AND VERTICAL STABILIZER NEAR FUSELAGE.	AFTER CLIMB-OUT	FLUCTUATED AT FIRST, WENT OUT	5 MIN AFTER RAM AIR EXTENDED	A/C ROLLED TO RIGHT. UNABLE TO STOP WITH RUDDER	NO	B
7	HIT BY CANNON FIRE ON LEFT SIDE OF A/C FROM SPEED BRAKE TO APPROXIMATELY 5 FT REAR OF CANOPY.	—	—	—	PILOT LOST ALL CONTROL EXCEPT RUDDER	NO	—
8	PILOT FELT THREE THUMPS AT PULLOUT. OVERHEAT AND FIRE WARNING.	—	—	—	LOST CONTROL AFTER WARNING LIGHTS CAME ON, A/C NOSED OVER	YES	A
10	RIGHT WING ROOT. PILOT THOUGHT STABILITY AUGMENTATION "KICKED-OFF"	GRADUALLY DECAYED TO ZERO	WENT OUT FEW MINUTES AFTER P ₁	—	WAS TURNING TO LEFT WHEN P ₂ WENT TO ZERO	NO	A
21	A/C RECEIVED DIRECT HIT IN THE ACCESSORY SECTION.	—	—	—	DURING LEVEL-OFF AFTER A CLIMBING TURN, PILOT LOST CONTROL OF STABILIZER	NO	A
22	PILOT DID NOT FEEL HIT. FIRE WARNING LIGHT CAME ON, FIRE CAME LATER	—	—	—	MUFFLED EXPLOSION FOLLOWED BY LOSS OF CONTROL, THEN FLAMEOUT	YES	A
24	A/C STREAMED WHITE SMOKE FROM AFT SECTION	—	—	—	POSSIBLE FLIGHT CONTROL FAILURE EVIDENCED BY PORPOISING	NO	A
28	A/C HIT ON RIGHT SIDE WHERE FLIGHT CONTROLS ARE.	—	—	—	BALLISTIC TYPE TRAJECTORY	NO	A
29	FLAMES WERE SEEN COMING FROM A/C REAR	LOST	—	LOST	—	YES	A
31	PILOT FELT HITS. FUEL PUMP AND STABILITY AUGMENTATION LIGHTS CAME ON	—	—	—	—	NO	A

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TABLE III (Cont'd)

INCIDENT	DESCRIPTION OF HIT OR DAMAGE WHICH RESULTED IN LOSS OF FLIGHT CONTROL SYS.	HYDRAULIC PRESSURE LOST ON			FINAL MANEUVER	FIRE	TYPE KILL
		P ₁	P ₂	UTILITY			
34	A/C OBSERVED TO BE ON FIRE. FIRE COMING FROM BATTERY COMPARTMENT AREA. AS FIRE GOT WORSE, A/C STARTED PITCHING AND YAWING.				FIRE MAY HAVE CAUSED FLIGHT CONTROL LOSS	YES	A
35	AFTER HIT, ALL LIGHTS ON EXCEPT FIREWARNING. RUDDER CONTROLS SEVERED				BEST CONTROL WAS PITCH. CONTROLS DETERIORATED.	NO	A
36	OBSERVER NOTICED FLAK BEHIND A/C FOLLOWED BY STREAMING WHITE VAPOR. NO FLIGHT CONTROL DATA.					NO	K
37	MASTER CAUTION AND RUDDER TRAVEL LIGHTS CAME ON. AFTER HITS LOST BOTH BOOST PUMPS AND AC GENERATOR.	LOST			CONTROL STICK WOULD NOT MOVE LEFT OF CENTER IN ROLL AXIS, ENGINE SURGED	NO	A
46	FIRE ON LEFT SIDE OF A/C. A/C PITCHED DOWN.				FIRE MAY HAVE CAUSED FLIGHT CONTROL LOSS.	YES	K
47	A/C HIT IN REAR. FUEL FLOW INDICATOR SPINNING RAPIDLY AND HYDRAULIC SYSTEM FAILING.				NOSE OF A/C DROPPED. BACK PRESSURE RAISED IT, BUT NOT THE SECOND TIME IT HAPPENED	NO	A
54	FUEL AND FIRE COMING OUT OF A/C LOWER LEFT FUSELAGE.				LOST FLIGHT CONTROLS	YES	A
55	PILOT FELT HIT	FAILED			PILOT USED RAM AIR AND STATED THAT IT HELPED, THEN TRANSMITTED THAT HE HAD TO EJECT	NO	A
58	A/C HIT; COCKPIT FILLED WITH SMOKE, FLIGHT CONTROLS THEN LOST.					?	A
59	PILOT FELT EXPLOSION AND NOTED THAT P ₂ AND UTILITY SYSTEMS WERE OUT. EXTERNAL FIRE FED BY STREAMING HYDRAULIC FLUID.	LOST ABOUT 1 1/2 MIN LATER			STICK FROZE FROM LOSS OF HYDRAULIC FLUID.	YES	A

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TABLE IV

FIRE

INCIDENT	RESULTANT DAMAGE	LOCATION OF HIT	PROJECTILE TYPE	TYPE KILL
4	FIRE IN FUSELAGE AND ENGINE INTAKES, COMPRESSOR STALL.	AFT SECTION	—	—
5	FIRE IN AFT SECTION	—	—	—
8	FIRE AND CONTROL LOSS	—	—	A
13	FIRE	?	—	A
14	FIRE	ELECTRONICS IN FUS. BOTTOM	—	B
15	FIRE IN TAIL	—	—	A
17	FIRE	AFT SECTION	GROUND FIRE	A
19	FIRE OBSERVED COMING FROM TAIL	—	AUTO WEAPON FIRE	A
20	FIRE FROM WING ROOT	AFT OF COCKPIT	AUTO WEAPON FIRE	A
21	FIRE, LOST STABILIZER CONTROL	ACCESSORY SECTION	37 MM	A
23	FIRE LEFT WING ROOT; PIECES FROM A/C, PART OF LEFT WING MISSING	—	—	A
25	BURNING FROM FORWARD OF INTAKES	—	—	A
28	FIRE AT HIT LOCATION, FLIGHT CONTROL LOSS	BETWEEN RIGHT WING AND FUSELAGE	37 OR 57 MM	A
29	FIRE OBSERVED AT AFT SECTION, FLIGHT CONTROLS AND HYDRAULICS.	—	—	A
32	FIRE	—	—	A
33	FIRE IN TAIL PIPE, HIS GUN EXPLOADED	—	—	A
34	FIRE FWD OF COCKPIT IN BATTERY COMPARTMENT, ELECTRIC AND FLIGHT CONTROLS	—	20 OR 37 MM	A
39	FIRE IN BOMB BAY ENGINE	BOMB BAY	SMALL ARMS OR 37 MM	A
42	AFT SECTION ON FIRE	—	—	A
43	FIRE	—	57 MM	A

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TABLE IV (Cont'd)

INCIDENT	RESULTANT DAMAGE	LOCAT+ON OF HIT	PROJECTILE TYPE	TYPE KILL
46	FIRE, LEFT SIDE OF AIRCRAFT FLIGHT CONTROLS	—	—	K
50	FIRE ON BOTTOM OF FUSELAGE	—	AUTO WEAPON	A
52	BURST INTO FLAMES, AIRCRAFT SHREDDED	DETONATED 20 FT UNDER AIRCRAFT BOTTOM	SAM	K K
53	FIRE, AIRCRAFT DISINTEGRATED	—	— (SAM)	K
54	FIRE, LOST FLIGHT CONTROL	—	—	A
57	FIRE (TRAILING)	—	37 MM	—
58	FIRE, LOST FLIGHT CONTROL	—	—	A
59	FIRE, LOST UTILITY HYDRAULIC SYSTEM. LOST FLIGHT CONTROL	TAIL HOOK AREA	57 MM	A
60	FIRE	—	OWN BOMB	A

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(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Air Force Flight Dynamics Laboratory Wright-Patterson Air Force Base, Ohio 45433		2a. REPORT SECURITY CLASSIFICATION SECRET	
		2b. GROUP 3 NOFORN	
3. REPORT TITLE An Analysis of F-105 Combat Losses in SEA (Out-Country) (U)			
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)			
5. AUTHOR(S) (Last name, first name, initial) O'Brien, J. D. Meiselman, Jay M., 2d Lt, USAF			
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c. Task 136814		9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
d.			
10. AVAILABILITY/LIMITATION NOTICES In addition to security requirements which apply to this document and must be met, each transmittal outside the agencies of the U. S. Government must have prior approval of the Air Force Flight Dynamics Laboratory (FDTS), Wright-Patterson Air Force Base, Ohio 45433.			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY Air Force Flight Dynamics Laboratory Wright-Patterson Air Force Base, Ohio 45433.	
13. ABSTRACT (UNCLASSIFIED) This report contains an analysis of F-105 aircraft losses based on the Weapons Systems Evaluation Group (WSEG) Compendium of Aircraft Losses for the time period of 1 February 1965 to 31 January 1966. The analysis is performed for the purpose of providing an insight into areas such as threat, causes of aircraft loss, and time from initial damage to loss. (In addition to security requirements which must be met, this abstract is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of the Air Force Flight Dynamics Laboratory (FDTS), Wright-Patterson Air Force Base, Ohio 45433.)			

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
AIRCRAFT VULNERABILITY F-105 AIRCRAFT LOSS ANALYSIS SUBSYSTEM VULNERABILITY SEA COMBAT ENVIRONMENT						

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 88TH AIR BASE WING (AFMC)
WRIGHT-PATTERSON AIR FORCE BASE OHIO

MEMORANDUM FOR DTIC-RS

14 JUN 2002

ATTN: Kelly Akers
Defense Technology Information Center
8725 John J. Kingman Rd, Suite 0944
Ft Belvoir VA 22060-6218

FROM: 88 CG/SCCMF
4375 5th Street Rm 150
WPAFB OH 45433-7802

SUBJECT: Change of Classification and Distribution Statement for Document Number's AD-C016-682 and AD-385-882

1. The attached 16 April 2001 letter from W. Howard Plunkett requests classification review of subject technical reports and change of distribution requirements from "Limited Distribution" to "Approved for Public Release; Distribution Unlimited."
2. The requestor handcarried this request to the FOIA office, therefore it was treated as a FOIA request. Subsequently, it was reviewed by the Subject Matter Expert, Don Voyls, 46 OGM/OL-AC. His analysis states that the documents appear to be fully releasable. Capt Stephanie Masoni, his Security Manager, attached a memo indicating that she concurs to full release of the reports.
3. Please take the appropriate action to make subject technical reports available for public dissemination. The requester has been notified of this action. Point of contact at 88 CG/SCCMF is Lynn Kane at DSN 674-8189.

Sincerely,

SHEREE M. COON
Freedom of Information Act Manager
Management Services Branch
Information Management Division

Attachments:

1. AFMC Form 559, 6 June 2002
2. 46 OG/OGM/OL-AC Memo, 6 Jun 2002
3. Don Voyls Memo, 5 Jun 2002
4. Initial Request Letter, 16 Apr 2001
5. AD 385-882
6. AD C016 682
7. 88CG/SCCMF Ltr to Requestor, 14 Jun 02



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 46TH TEST WING (AFMC)
EGLIN AIR FORCE BASE, FLORIDA

6 June 2002

MEMORANDUM FOR 46 OG/OGM/OL-AC (Mr. Richard E. Colclough)

FROM: CAPT STEPHANIE MASONI (Unit Security Manager)

SUBJECT: Classification and Limited Distribution Requirement Review for Freedom of Information Act (FOIA) Case #010421LK, W. Howard Plunkett.

I have reviewed the two documents in support of the attached FOIA request, and concur with Mr. Donald Voyls(memo attached); both documents are fully releasable to the public.

Stephanie C Masoni

Stephanie C. Masoni, Capt, USAF
46 OG/OGM/OL-AC
Security Manager

Attachment

Memo dated 5 June 02 (Mr. Voyls)

MEMO TO: 46TH OG/OGM/OL-AC

SUBJECT: Freedom of Information Act (FOIA) Case #010421LK, W. Howard Plunkett

I have reviewed the two documents in support of the attached FOIA request iaw the guidelines provided. Based on the instructions and directions provided (DoD Regulation 5400.7, Chapter 3 and DoD Directive 5230.25) I could not find any exemptions for withholding these documents from public disclosure. Therefore the documents appear to be Fully Releasable.

Review of AFFDL-TR-67-118, An Analysis of F-105 Combat Losses in SEA resulted in the following findings. The report was declassified 22 August 1990. The F-105 has been out of the USAF inventory for some time and I do not know of any other country operating that aircraft. The report draws general trends on F-105 combat losses. Some limited identification on the cause of loss based on hit location is provided on page 4 but in my opinion is common knowledge. In conclusion the author states that more detailed data was needed to increase the confidence of the analysis.

Review of AFFDL-TR-77-115, A Comparative Analysis of USAF Fixed Wing Aircraft Losses in Southeast Asia Combat, AD-C016682 resulted in the following findings. The report was declassified 31 December 1988. The aircraft covered in this report with the exception of the B-52 and C/AC-130 are no longer in the USAF inventory. To my knowledge the German Air Force still flies the F-4. The report provides statistics on aircraft and crew losses relative to a variety of situations such as altitude, location, threat category, date, etc for all the aircraft except the B-52 and AC-130. Statistics on losses due to general causes (fuel fire, engine failure, flight controls) were provided. Data on the B-52, page 51, and AC-130, page 56, were limited to reasons for crash with no threat stated. Comparative analyses on the F-4 vs. F-105, one engine vs. two, and effectiveness of vulnerability reduction features were included. Though I personally have some small reservation on releasing the F-4 portion of this report to the public, I could not find any justification in the directives to withhold it.

According to the FOIA office, a memo from the classification officer stating that the reports are properly classified and marked is needed. Also, to aid in filling out form DD Form 2086 block 2, I spent 2 hours on Coordination/Approval/Denial and 11 hours on the review.

Let me know if you have any questions.

Don Voyls, 5 June 2002

