

GAO

Briefing Report to the Ranking Minority  
Member, Subcommittee on Military  
Procurement, Committee on National  
Security, House of Representatives

---

February 1996

# MILITARY AIRCRAFT SAFETY

## Significant Improvements Since 1975







United States  
General Accounting Office  
Washington, D.C. 20548

National Security and  
International Affairs Division

B-270647

February 1, 1996

The Honorable Ike Skelton  
Ranking Minority Member  
Subcommittee on Military Procurement  
Committee on National Security  
House of Representatives

Dear Mr. Skelton:

In May 1995, you noted that a number of military aircraft accidents had occurred over a period of a few weeks, resulting in the death of more than a dozen crew members and passengers. You requested that we conduct a review of military aircraft accidents. Our objectives were to identify (1) historical trends in aircraft accidents involving deaths or extensive aircraft damage (Class A flight mishaps), (2) investigations performed to determine the causes, and (3) examples of actions taken to reduce the number of aviation accidents. We also analyzed investigation summaries to identify the primary factors contributing to mishaps and reviewed studies which addressed the relationship of operating tempo to aviation safety. As agreed, we did not address your concern about alleged mishandling of mishap investigations in the Air Force because the Department of Defense (DOD) Inspector General was already examining those allegations. This report reflects the information in our briefing to you on January 22, 1996.

---

## Background

A measure of aviation safety within DOD is the mishap rate—number of Class A flight mishaps per 100,000 flying hours. DOD defines a Class A flight mishap as one involving a DOD aircraft with an intent to fly, that resulted in damages totaling \$1 million or more, a destroyed aircraft, a fatality, or a permanent total disability. DOD requires that Class A mishaps be investigated so that causes can be identified and corrective actions taken to prevent future occurrences.

Service safety centers<sup>1</sup> play a key role in maintaining aviation mishap statistics, establishing safety policies, disseminating safety information, reviewing mishap investigation reports, tracking recommendations, and performing safety studies. In addition, the safety centers analyze trends to identify potential safety hazards.

---

<sup>1</sup>These centers are the Naval Safety Center, Norfolk, Virginia; Air Force Safety Agency, Kirtland Air Force Base, New Mexico; and the Army Safety Center, Fort Rucker, Alabama. In addition to its involvement in Navy safety, the Naval Safety Center also monitors investigations of Marine Corps aviation mishaps.

---

## Results in Brief

DOD aviation safety has improved significantly over the last 21 years. Between fiscal years 1975 and 1995 for example, the annual number of Class A mishaps decreased from 309 to 76, while the number of fatalities decreased from 285 to 85. During this period, Class A mishaps per 100,000 flying hours, referred to as the mishap rate, also decreased from about 4.3 to 1.5. The value of Class A losses remained fairly constant over the last 6 years, ranging from a high of about \$1.6 billion in fiscal year 1993 to a low of \$1.2 billion in fiscal year 1994.

Although DOD requires that the services report and investigate Class A aviation mishaps, service requirements differ as to who convenes the investigation board and who participates as voting members. For example, until recently only the Army required safety center investigators as voting board members. Past GAO and Air Force studies have questioned the independence of the investigators because of their organizational ties to the mishap command. The Air Force has recently directed changes to enhance the independence of its investigations.

Each of the services have taken steps to reduce aviation mishaps, such as tracking mishap investigation recommendations and disseminating safety information in manuals, newsletters, videos, and messages. Recent safety initiatives include risk management and human factor studies. The Army, for example, is developing a series of profiles for predicting whether an aviation training mission is low, medium, or high risk. A subsequent system will provide guidance for assessing operational risks and reducing them to acceptable levels.

In fiscal years 1994 and 1995, human error was reported as a contributing cause in 73 percent of the Class A flight mishaps. However, in a 1994 report,<sup>2</sup> examining its historical flight mishap data, the Air Force found no direct correlation between operating tempo and safety mishaps. In 1995, the Air Force Blue Ribbon panel reported some evidence connecting pace of operations to aviation safety. Service statisticians, however, told us that the relatively low incidence of Class A flight mishaps makes it difficult to draw inferences and identify statistical correlations of variables with mishap rates.

---

## Agency Comments

In commenting orally on a draft of this report, officials from the Office of the Secretary of Defense, Air Force, Army, and Navy generally concurred

---

<sup>2</sup>Safety Challenge: Identifying and Addressing Recent Trends in USAF Flight Mishaps, Office of the Chief of Safety, Headquarters, United States Air Force, September 1994.

---

with the findings. The Air Force provided documentation showing that the recommendations of the Blue Ribbon Panel were being implemented. Other recommended technical changes were incorporated throughout the report as deemed appropriate.

---

## Scope and Methodology

We obtained and analyzed annual statistics, beginning in 1975, on the number of Class A flight mishaps, fatalities, destroyed aircraft, and dollar losses. We compared the services' data, validated mishap rates, and documented trends. We also analyzed mishap investigation summaries to document causes contributing to flight mishaps.

We reviewed agency instructions and procedures regarding flight mishap investigations, interviewed safety officials, and reviewed final reports. We observed an Air Force safety investigation, discussed the investigation with board members, and attended the outbrief at the major command. We did not observe the board's deliberations. We interviewed National Transportation Safety Board officials and reviewed their investigation procedures to provide some comparison with DOD's safety investigations. We reviewed studies dealing with the independence of investigations and the possible relationship of operating factors to aircraft accident rates. We also identified service initiatives to reduce aviation accidents.

We conducted our work from June 1995 to January 1996 in accordance with generally accepted government auditing standards.

---

As arranged with your staff, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from its issue date. At that time, we will send copies to other interested congressional committees and Members of Congress, and the Secretaries of Defense, the Army, the Navy, and the Air Force. We will also make copies available to other interested parties on request.

---

The major contributors to this report are identified in appendix I. If you or your staff have any questions concerning this report, please contact me on (202) 512-5140.

Sincerely yours,

A handwritten signature in black ink that reads "Mark E. Gebicke". The signature is written in a cursive style with a large, prominent "M" and "G".

Mark E. Gebicke  
Director, Military Operations and Capabilities

---

---

---

# Contents

---

<b>Letter</b>		1
<b>Briefing Section I</b>		8
<b>Background</b>	Criteria for Classes of Flight Mishaps	8
<b>Briefing Section II</b>		10
<b>Aircraft Mishap</b>	Decrease in Number of Class A Flight Mishaps (Fiscal Years 1975-95)	10
<b>Trends</b>	Decrease in DOD Class A Mishap Rate (Fiscal Years 1975-95)	11
	Decrease in Service Class A Flight Mishap Rates (Fiscal Years 1975-95)	12
	Decrease in Class A Flight Mishap Fatalities (Fiscal Years 1975-95)	13
	Decrease in DOD Rate of Class A Fatalities (Fiscal Years 1975-95)	14
	Decrease in Number of Destroyed Aircraft (Fiscal Years 1975-95)	15
	Decrease in Rate of Destroyed Aircraft (Fiscal Years 1975-95)	16
	Value of Class A Flight Mishap Losses (Fiscal Years 1990-95)	17
<b>Briefing Section III</b>		18
<b>Mishap Investigations</b>	Each Service Has Own Mishap Investigation Requirements	18
	Concerns About Independence of Investigators	20
<b>Briefing Section IV</b>		22
<b>Actions Taken by</b>	Actions Taken by Services to Reduce Mishaps	22
<b>Services to Reduce</b>		
<b>Mishaps</b>		
<b>Briefing Section V</b>		24
<b>Major Mishap Causes</b>	Human Error Was Contributing Factor in High Percentage of Flight Mishaps	24
	Correlation Between Operating Tempo and Mishaps Is Inconclusive	26
<b>Appendix I</b>		28
<b>Major Contributors to</b>		
<b>This Report</b>		

---

## Abbreviations

DOD Department of Defense



---

---

# Background

---

## GAO Criteria for Classes of Flight Mishaps

---

- Criteria for Class A flight mishaps include fatality or permanent total disability, destroyed aircraft, or damage of \$1 million or more
  - Criteria for other classes based primarily on dollar value and severity of injury
-

---

**Briefing Section I**  
**Background**

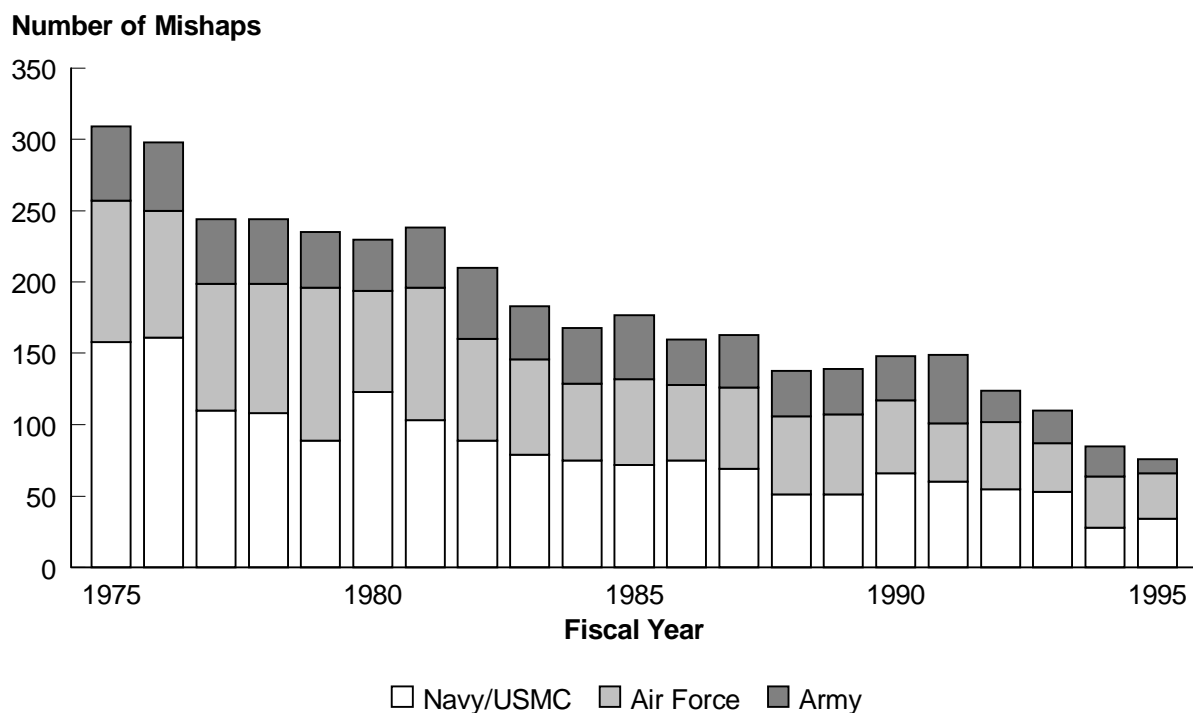
---

Flight mishaps involve any reportable damage to an aircraft that is preparing to fly, in flight, or completing a landing. Flight mishaps are classified by DOD according to the severity of resulting injury or property damage. Class A mishaps involve damage of \$1 million or more, a destroyed aircraft, or a fatality or permanent total disability. The remaining classes of mishaps are distinguished primarily by their loss value and severity of injury: Class B accidents involve damage of \$200,000 to less than \$1 million, permanent partial disability, or inpatient hospitalization of five or more people; Class C accidents involve damage of \$10,000 to less than \$200,000, or a lost-time injury; and Class D accidents involve damage of less than \$10,000.

Our review focused on Class A flight mishaps only.

# Aircraft Mishap Trends

## GAO Decrease in Number of Class A Flight Mishaps (Fiscal Years 1975-95)

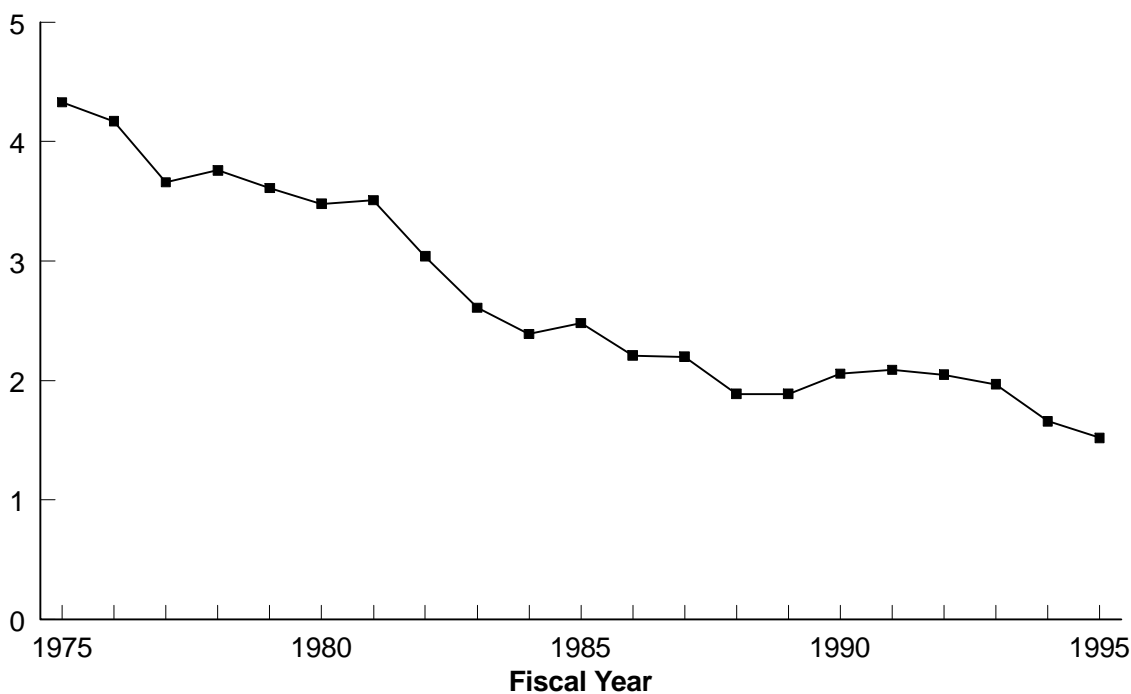


Between fiscal years 1975 and 1995, military aircraft were involved in 3,828 Class A mishaps, which resulted in 3,810 fatalities and 3,483 destroyed aircraft.

The annual number of DOD Class A flight mishaps decreased from 309 in fiscal year 1975 to 76 in fiscal year 1995. The Navy/Marine Corps reduced the number from 158 to 34, the Air Force from 99 to 32, and the Army from 52 to 10.

## GAO Decrease in DOD Class A Flight Mishap Rate (Fiscal Years 1975-95)

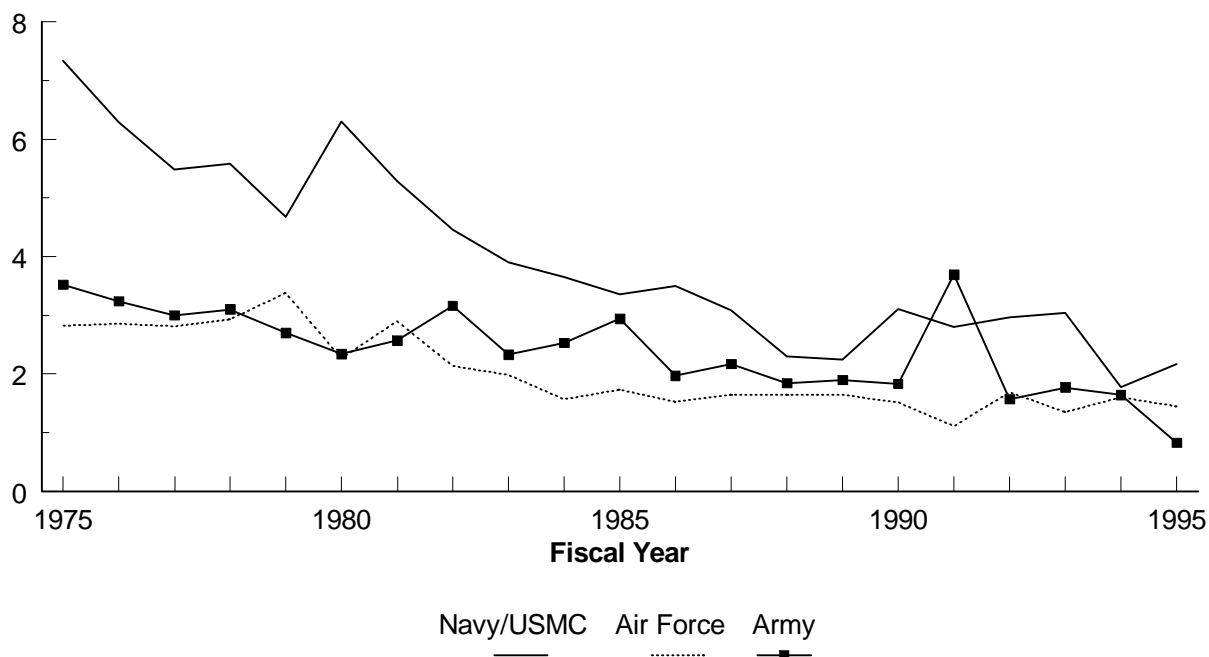
Mishaps per 100,000 Flying Hours



DOD's Class A mishap rate, calculated as the number of accidents per 100,000 flying hours, declined from about 4.3 in fiscal year 1975 to 1.5 in fiscal year 1995.

## GAO Decrease in Service Class A Flight Mishap Rates (Fiscal Years 1975-95)

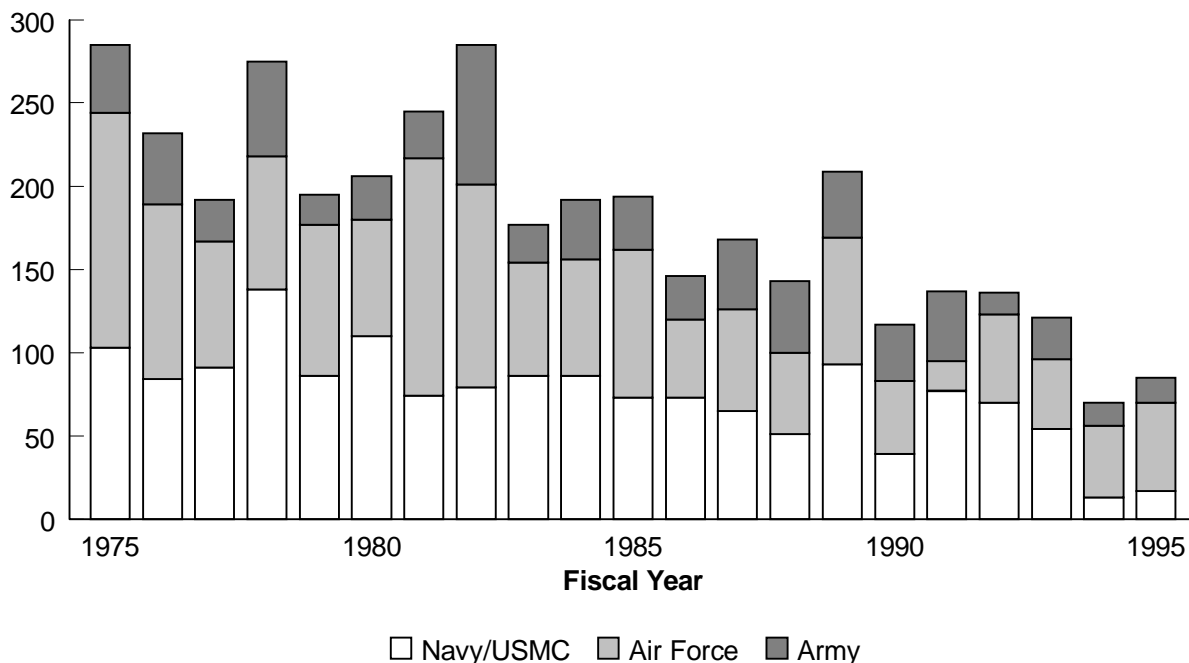
Mishaps Per 100,00 Flying Hours



As with the number of mishaps, each of the services has also experienced an overall downward trend in its mishap rate since fiscal year 1975. In particular, the Navy/Marine Corps mishap rate dropped significantly from 7.3 mishaps per 100,000 flying hours in fiscal year 1975 to 2.2 in fiscal year 1995. Air Force rates were reduced from about 2.8 to 1.5 during that period. Army aviation experienced its best year in fiscal year 1995 with a Class A mishap rate of 0.8—a reduction from 3.5 in fiscal year 1975.

## GAO Decrease in Class A Flight Mishap Fatalities (Fiscal Years 1975-95)

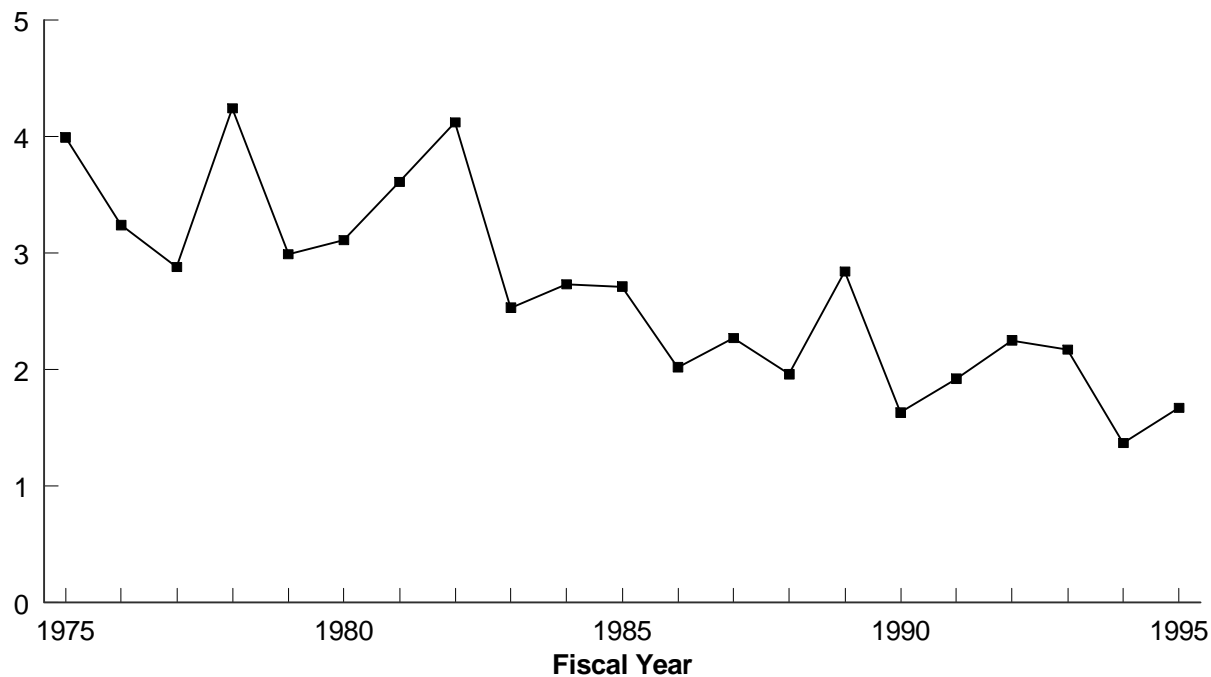
Number of Fatalities



The annual number of aviation fatalities has dropped significantly since fiscal year 1975, when DOD reported 285, including 141 in the Air Force, 103 in the Navy/Marine Corps, and 41 in the Army. In fiscal year 1995, fatalities had fallen to 85, including 53 in the Air Force, 17 in the Navy/Marine Corps, and 15 in the Army.

## GAO Decrease in DOD Rate of Class A Fatalities (Fiscal Years 1975-95)

Fatalities per 100,000 Flying Hours

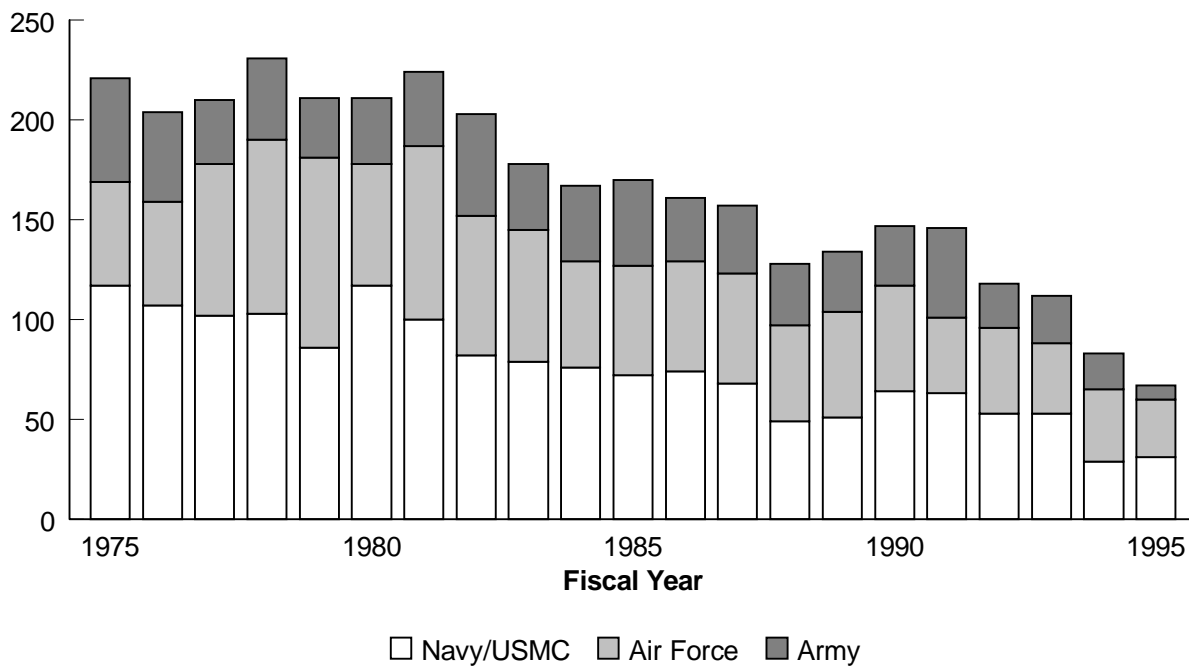


The number of DOD aviation fatalities per 100,000 flying hours fell from about 4 in fiscal year 1975 to 1.7 in fiscal year 1995.



# GAO Decrease in Number of Destroyed Aircraft (Fiscal Years 1975-95)

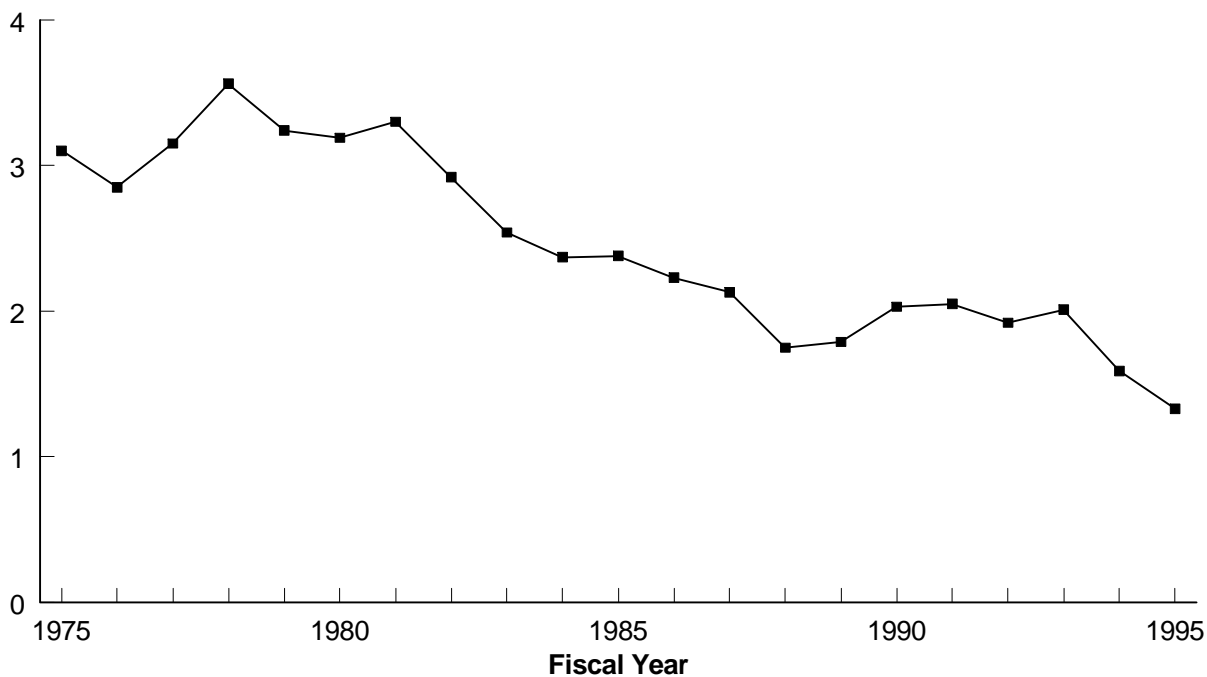
Number of Destroyed Aircraft



The number of destroyed aircraft resulting from flight mishaps fell significantly between fiscal years 1975 and 1995. In fiscal year 1975, 221 were destroyed, including 117 Navy/Marine Corps, 52 Air Force, and 52 Army. The number of destroyed aircraft fell to 67 in fiscal year 1995, when the Navy/Marine Corps reported 31, the Air Force 29, and the Army 7.

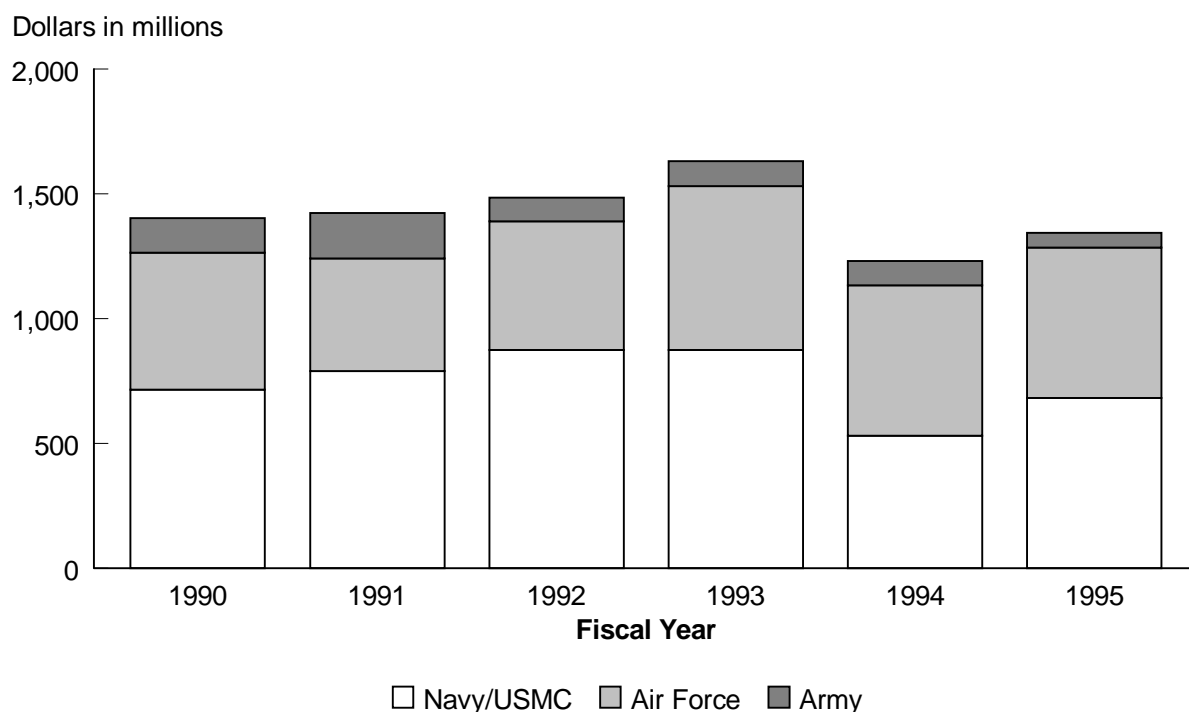
## GAO Decrease in Rate of Destroyed Aircraft (Fiscal Years 1975-95)

Destroyed Aircraft per 100,000 Flying Hours



Since fiscal year 1975, the annual rate of destroyed aircraft per 100,000 flying hours was reduced from 3.1 to 1.3.

## GAO Value of Class A Flight Mishap Losses (Fiscal Years 1990-95)



Since fiscal year 1975, the services report the cost of Class A flight mishaps at about \$21 billion. The value of Class A losses has been fairly constant over the last 6 years, ranging from a high of approximately \$1.6 billion in fiscal year 1993 to a low of \$1.2 billion in fiscal year 1994. Even given that fiscal years 1994 and 1995 had generally low mishap rates, the value of Class A losses still exceeded \$2.5 billion during that time, totaling about \$1.2 billion in fiscal year 1994 and \$1.3 billion in fiscal year 1995.

# Mishap Investigations

---

## GAO Each Service Has Own Mishap Investigation Requirements

---

- Army - Safety center provides voting board president and recorder.
  - Navy - Standing mishap board from command having custody of aircraft. Safety center provides non-voting member.
  - Air Force - Prior to Oct. 1995, board convened by numbered AF having custody of aircraft . No voting board member from safety agency.
-

DOD requires investigations of all Class A flight mishaps in order to determine the causes and reduce future risks of property damage, injuries, or deaths. However, each service has established its own requirements regarding how the investigations are performed and reported.

The Army assigns at least two safety investigators from its safety center to each Class A mishap investigation—the board president and recorder. Other members of the investigation team are assigned from the command having the mishap, other Army commands or DOD agencies, or private industry. The investigating team is responsible for finding the cause(s) and preparing the final report. Command review and approval occur after preparation of the draft investigation report.

The Navy requires that aircraft reporting custodians appoint and maintain standing aircraft mishap boards to investigate Class A flight mishaps. According to Naval Safety Center data, in about 75 percent of the Class A mishap investigations, a professional investigator from the center is sent to assist the board. The Safety Center representative is not a voting member of the board. However, the Commander of the Naval Safety Center does not see this as a problem since he is the final endorser of the report. In addition, although not required by regulation, the Commander also receives an independent briefing from his representative on the board's tentative findings and conclusions. Each endorser up the chain of command must comment on the report in turn, presenting evidence, if appropriate, for suggested changes. Endorsements become part of the report and are available for review as the report goes up the chain. Following its final endorsement, the Safety Center tracks recommended corrective action to completion.

Prior to October 1995, the responsible Air Force major command routinely delegated the responsibility for convening the investigative board to the numbered Air Force that was the custodian of the mishap aircraft. The board president, as well as other members, were normally selected from units within the numbered Air Force. The Air Force Safety Agency generally did not provide a voting member to participate in the investigation. Following the investigation, the board briefed its findings to the major command prior to finalization of the report. In October 1995, the Air Force implemented several changes to its investigation procedures as a result of recommendations made by a Blue Ribbon Panel appointed by the Air Force Chief of Staff.

---

## GAO Concerns About Independence of Investigators

---

- GAO's 1994 report
    - Navy investigators lack independence
  - AF Blue Ribbon Panel's report
    - Undue command influence on board
    - Lack of experienced investigators
    - Too much pressure regarding time
    - Process credibility depends on independence of the board
-

A recurring issue of concern has been the independence of accident investigators. Our 1994 report<sup>1</sup> noted the Navy investigators' lack of independence because of the investigators' organizational ties to the mishap command. The Navy has not taken action on that finding. A Blue Ribbon Panel convened by the Air Force to address aviation safety stated in its 1995 report that mishap investigation boards should be more independent of the convening authority.<sup>2</sup> As a result of the panel's recommendations, the Secretary of the Air Force (1) directed that the major command not delegate the convening authority for Class A investigations, (2) mandated safety courses for key board members, (3) directed that an Air Force safety center representative be a voting member on all Class A flight mishap investigations, and (4) clarified that only the voting members of the board can change the final report.

---

<sup>1</sup>Military Training Deaths: Need to Ensure That Safety Lessons Are Learned and Implemented (GAO/NSIAD-94-82, May 5, 1994).

<sup>2</sup>The Blue Ribbon Panel on Aviation Safety, Department of the Air Force (Sept. 5, 1995).

# Actions Taken by Services to Reduce Mishaps

---

## GAO Actions Taken by Services to Reduce Flight Mishaps

---

- Track recommendations
- Disseminate safety information
- Undertake special initiatives

---

Service safety centers track the implementation of recommendations stemming from mishap investigations. Within the Air Force, the Safety Agency maintains a centralized database of open recommendations and solicits status reports semi-annually. Major operational commanders track and report their disposition of open recommendations for inclusion in the safety center database. In the Army, the responsibility for tracking the status of open recommendations rests with the Safety Center in coordination with the major commands. The Army Safety Center conducts



quarterly reviews of open recommendations and documents the actions taken on each recommendation. The Navy places responsibility for ensuring that recommendations are implemented with safety center analysts, who monitor the recommendations associated with one or more aircraft models. In addition to tracking recommendations, the services disseminate a variety of information aimed at reducing flight mishaps. This information includes changes to manuals and procedures, safety newsletters, videos of specific mishaps that identify the causes, and safety messages.

The services also undertake special initiatives aimed at reducing mishap rates. Earlier this year, for example, the Air Force convened a panel to review aviation safety. This panel was appointed on June 23, 1995, following a spate of aircraft mishaps during the early part of fiscal year 1995, the highly publicized allegations that Air Force mishap investigations lacked quality and objectivity, and your request that GAO undertake this review. While the panel found that the long-term trends of reduced mishap rates reflected favorably on the general soundness of the Air Force's safety program, the panel made a number of recommendations aimed at improving investigation objectivity and reducing human errors as a causal factor.

Additionally, the Army undertook a study to determine the causes for an increase in OH-58 helicopter mishaps. The Army determined that a disproportionate number of accidents had taken place at night and involved human error. The Army then developed a series of profiles for predicting whether a mission was low, medium, or high risk. From this, the Army began using a system to assess the risk prior to each OH-58 night mission, as well as guidance for reducing the risk to acceptable levels. The Army attributes the subsequent downward trend in OH-58 accidents to this initiative. Army officials informed us that they plan to expand the use of this risk management system to include other aircraft. The Air Force and Navy are also developing risk assessment programs.

Operational commanders have also ordered flight operations to cease for a specific time period so that personnel can focus on safety issues. Additionally, the services have undertaken a number of studies looking at cause-and-effect relationships and their impact on mishap rates. An example of an ongoing study concerns two types of Air Force mishaps, those involving air traffic control operations and those involving rescue helicopters. Both kinds of mishaps have experienced notable increases during the past 2 years.

# Major Mishap Causes

---

**GAO Human Error Was Contributing Factor  
in High Percentage of Flight Mishaps**

---

- During fiscal years 1994-95, human error was a factor in
  - 71 percent of Air Force mishaps
  - 76 percent of Army mishaps
  - 74 percent of Navy/USMC mishaps

---

**Briefing Section V**  
**Major Mishap Causes**

---

In their efforts to reduce aviation mishaps, the services focus on the contributing causes that can be grouped by human error, material, and environmental. On the basis of data reported by the services and our own analyses, human error contributed to 73 percent of the Class A flight mishaps in fiscal years 1994 and 1995. Human error, as a contributing factor, ranged from a high of 76 percent in Army mishaps to approximately 71 percent in Air Force mishaps. The Naval Safety Center provided data showing that human error was a causal factor in 80 percent of Navy and Marine Corps Class A flight mishaps for fiscal years 1990 through 1994.

---

GAO Correlation Between Operating Tempo  
and Mishaps Is Inconclusive

---

- 1994 Air Force report
    - No direct correlation
  - 1995 Blue Ribbon Panel's report
    - Operating tempo presents safety risks
    - Recommended AF review safety impact of reduced experience levels
  - Statisticians say limited number of mishaps make correlation difficult
-

While service studies have addressed the relationship of operating tempo to aviation mishaps, direct correlation has been inconclusive. For example, in 1994 the Secretary of Defense requested the Air Force examine the relationship between operating tempo and other readiness indicators and flight mishap rates. The Air Force's final report issued in September 1994, provided no direct correlation between operating tempo and safety mishaps.

In a September 1995 report, the Blue Ribbon Panel noted that "the current 'Operations Tempo' in the Air Force presents an obvious operational safety risk." The report pointed to many factors contributing to this assessment such as organizational change, reduced maintenance and leadership manning within squadrons, and extended duty days of both flying and maintenance personnel. The panel believed that the Air Force should take actions to reduce stress on aircrew and maintenance personnel and recommended that the Air Force review the safety impact of reduced manning and aircraft numbers without corresponding changes in operational requirements.

Service statisticians, however, told us that the relatively low incidence of Class A flight mishaps make drawing inferences and statistical correlations of variables with mishap rates difficult.

# Major Contributors to This Report

---

**National Security and  
International Affairs  
Division, Washington,  
D.C.**

Sharon A. Cekala, Associate Director  
William E. Beusse, Assistant Director

---

**Norfolk Regional  
Office**

Hugh Brady, Evaluator-in-Charge  
Sharon Reid, Evaluator  
Harry E. Taylor, Jr., Evaluator

---

### Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are \$2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. VISA and MasterCard credit cards are accepted, also. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

#### Orders by mail:

U.S. General Accounting Office  
P.O. Box 6015  
Gaithersburg, MD 20884-6015

#### or visit:

Room 1100  
700 4th St. NW (corner of 4th and G Sts. NW)  
U.S. General Accounting Office  
Washington, DC

Orders may also be placed by calling (202) 512-6000 or by using fax number (301) 258-4066, or TDD (301) 413-0006.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

For information on how to access GAO reports on the INTERNET, send an e-mail message with "info" in the body to:

[info@www.gao.gov](mailto:info@www.gao.gov)

---

**United States  
General Accounting Office  
Washington, D.C. 20548-0001**

**Bulk Rate  
Postage & Fees Paid  
GAO  
Permit No. G100**

**Official Business  
Penalty for Private Use \$300**

**Address Correction Requested**

---

