

**TRANSACTIONS OF SOCIETY OF ACTUARIES
1981 REPORTS**

**REPORT OF THE COMMITTEE ON AVIATION
AND HAZARDOUS SPORTS**

I. AVIATION STATISTICS

This section of the report covers statistics obtained from United States and Canadian governmental sources, both civilian and military, supplemented by publications of the aviation industry. The emphasis in the report is primarily on new data that have become available during the past two years. Data for earlier periods are included for comparison and to indicate trends.

Fatality experience of both the United States and IATA member scheduled passenger airlines has improved from the 1971-75 to the 1976-80 period as well as from the 1979 to the 1980 period.

UNITED STATES CIVIL AVIATION

United States civil aviation can be divided into four major types: Certificated Route Air Carriers, Charter Air Carriers, Commercial Operators, and General Aviation. In earlier reports, the first three types were classified singly as the United States Civil Air Carrier Fleet. Definitions as to what constitutes a particular aviation type or activity are formulated either by the Civil Aeronautics Board or the Federal Aviation Administration.

Pilots engaged in air carrier flying may not, under government regulations, fly more than 100 hours per month or more than 1,000 hours per year in domestic operations. Pilots of international operations are generally limited to either 100 hours per month or 300 hours every 90 days, depending upon the size of the flight crew. The Certificated Route Air Carrier pilots, in particular, under a union-negotiated contractual obligation, are allowed to fly only a maximum of 700-800 hours per year, but actually average 600-700 hours. Other air carriers, with no such obligation, generally require pilots to fly the maximum annual number of regulation hours.

Certificated Route Air Carriers (Passenger/Cargo)

Certificated Route Air Carriers are air carriers holding certificates of public convenience and necessity (issued by the Civil Aeronautics Board) authorizing them to conduct scheduled air transportation over specified

routes as well as a limited amount of nonscheduled operations. They are divided into two groups—passenger/cargo and all-cargo. The December 1980 issue of the monthly Civil Aeronautics Board publication *Air Carrier Traffic Statistics* lists 60 passenger/cargo air carriers and 3 all-cargo air carriers.

As defined by the Civil Aeronautics Board, "domestic" operations are, in general, within and between the 50 states of the United States, including intra-Alaska and intra-Hawaii operations. "International" (technically "international and territorial") operations are, in general, outside the territory of the United States, including operations between the United States and foreign countries and the United States and its territories or possessions.

Table 1 shows the recent aviation fatality rates of United States Cer-

TABLE 1
UNITED STATES CERTIFICATED ROUTE AIR CARRIER
(PASSENGER/CARGO) AVIATION DEATH RATES*

Years	Passenger Rate per 1,000 Scheduled Passenger Hours†	First-Pilot Rate per 1,000 Scheduled Airplane Hours‡	All Pilot and Copilot Rate per 1,000 Life Years‡	Other Crew Member Rate per 1,000 Life Years‡
Domestic Operations				
1971-75 .....	.0005 (17)	.0006 (14)	.2271 (15)	.1571 (13)
1976-80 .....	.0001 (10)	.0002 (5)§	.0846 (7)	.0876 (3)
1979 .....	.0005 (3)§	.0003 (2)§	.1459 (3)§	.2128 (1)
1980 .....	.0000 (1)§	.0002 (1)§	.0708 (1)§	.0000 (0)§
1971-80 .....	.0003 (27)	.0004 (19)	.1526 (22)	.1190 (16)
International Operations				
1971-75 .....	.0009 (5)§	.0011 (4)§	.6678 (4)	.9590 (4)
1976-80 .....	.0002 (2)§	.0003 (1)§	.2240 (1)§	.6874 (3)
1979 .....	.0005 (1)§	.0015 (1)§	1.1655 (1)§	1.4711 (1)
1980 .....	.0000 (0)§	.0000 (0)§	.0000 (0)§	.0000 (0)§
1971-80 .....	.0005 (7)	.0007 (5)§	.4783 (5)	.8338 (7)
Domestic and International Operations				
1971-75 .....	.0005 (22)	.0006 (18)	.2674 (19)	.2731 (17)
1976-80 .....	.0002 (12)	.0002 (6)	.0936 (8)	.1525 (6)
1979 .....	.0005 (4)§	.0004 (3)§	.2059 (4)	.3460 (2)
1980 .....	.0000 (1)§	.0001 (1)§	.0670 (1)§	.0000 (0)§
1971-80 .....	.0003 (34)	.0004 (24)	.1779 (27)	.2082 (23)

* Number of fatal accidents shown in parentheses.

† Based on scheduled operations only; experience of helicopter carriers is excluded.

‡ Based on all operations, scheduled and nonscheduled; experience of helicopter carriers is excluded.

§ Based on 5 or fewer deaths.

tificated Route Air Carriers for passengers, first pilots, all pilots and co-pilots, and other crew members in domestic and international flying. Lives exposed as "All Pilot and Copilot" and "Other Crew Members" include persons who may do less than the normal amount of flying because of supervisory duties or other reasons. Helicopter airlines that are also certificated route carriers are excluded from the experience in Table 1. The last flight of such airlines took place early in 1979 and they were not resumed in 1980.

Certificated Route Air Carriers (All-Cargo)

Carriers in this class hold temporary certificates of public convenience and necessity (issued by the Civil Aeronautics Board) authorizing the operation of scheduled air freight express and mail transportation over specified routes as well as nonscheduled flights that may include passengers.

The first pilot fatality rates for all-cargo carriers are shown in Table 2. Earlier reports had shown that there had been pilot fatalities. However, a reexamination of the earlier data now shows that there have been no pilot fatalities in the period 1971-80.

Charter Air Carriers

Charter Air Carriers form a class of carriers holding temporary certificates of public convenience and necessity (issued by the Civil Aeronautics Board) authorizing them to operate passenger/cargo charter services supplementing the scheduled services of the Certificated Route Air Carriers. In addition, they may operate scheduled flights including the transportation of individually ticketed passengers and individually weigh-billed cargo, on a limited temporary basis, as authorized by the Civil Aeronautics

TABLE 2
ALL-CARGO CARRIERS AND CHARTER CARRIERS
FIRST-PILOT AVIATION DEATH RATES
PER 1,000 AIRPLANE HOURS*

Years	All-Cargo (All Operations)	Charter (Revenue Operations)
1971-75 .....	.0000 (0)	.0017 (2)
1976-80 .....	.0000 (0)	.0012 (1)
1979 .....	.0000 (0)	.0063 (1)
1980 .....	.0000 (0)	.0000 (0)
1971-80 .....	.0000 (0)	.0015 (3)

* Number of fatalities shown in parentheses.

Board. There were 10 such air carriers listed in the December 1980 issue of *Air Carrier Traffic Statistics*.

The figures shown in Table 2 include experience in operations under contracts with the military.

Commercial Operators

A *Commercial Operator* is a person who, for compensation or hire, engages in air commerce of persons or property other than as an air carrier or air taxi. Formerly, Commercial Operators were called Intrastate Air Carriers.

Commercial Operators of large aircraft are those operating aircraft of more than 12,500 pounds of maximum certificated takeoff weight. Statistics for this class have been available since 1975 and are shown in Table 3. In 1978, one accident with 127 passenger fatalities resulted in the very high death rate for that year and for the five-year period of 1976-80. The experience for all other years, however, has been favorable.

Because of the recent deregulation of the airlines, the distinction among the various types of air carriers is becoming blurred. Future reports may reflect this by different classifications of airlines.

AIR CARRIERS OF COUNTRIES OTHER THAN THE UNITED STATES

The general conditions and aviation technology unique to any country influence the hazards of flying in that country. Each country has its own aviation regulations and methods of enforcement. These regulations may differ for domestic and international operations, the latter being affected by international agreements relating to the crossing of international boundaries.

TABLE 3
COMMERCIAL OPERATIONS OF LARGE AIRCRAFT
PASSENGER AND CREW MEMBER DEATH RATE
PER 1,000 AIRPLANE HOURS*

Years	Passenger Rate (All Operations)	Crew Member Rate (All Operations)
1976 .....	.0000 (0)	.0178 (3)
1977 .....	.0000 (0)	.0162 (3)
1978 .....	.4612 (127)	.0290 (8)
1979 .....	.0000 (0)	.0000 (0)
1980 .....	.0000 (0)	.0000 (0)
1976-80 .....	.1635 (127)	.0180 (14)

* Number of fatalities shown in parentheses.

World Air Transport Statistics, a publication of the International Air Transport Association (IATA), reports on the operations of association members. IATA member airlines numbered 102 on June 1, 1980. These 102 airlines carried 70 percent of the world's scheduled air traffic (excluding the U.S.S.R. and the People's Republic of China). United States membership has been declining in recent years and stands at 5 passenger/cargo and 1 all-cargo air carrier members in 1980.

Table 4 gives passenger fatality rates per 1,000 scheduled passenger hours. The safety record of airlines in countries other than the United States has shown a little improvement but continues to be less favorable than that of the United States scheduled airlines.

For 1980, 34 percent of the scheduled passenger hours reported to IATA were flown by the United States members. This is a decline from 40 percent in 1979. United States members also accounted for 52 percent of the scheduled airline passenger hours flown by all United States certificated route air carriers in 1980. This is a decline from 69 percent in 1979. The combined international and domestic scheduled experience of all United States Certificated Route Air Carriers (passenger/cargo) is included in Table 4 for comparison.

UNITED STATES GENERAL AVIATION

General aviation includes all domestic civil flying except that performed by the United States Civil Air Carrier Fleet. The flying time in general aviation during 1980 was almost seven times that of the United States Civil Air Carrier Fleet's domestic flights. Prior to 1977, the FAA collected

TABLE 4
SCHEDULED AIR CARRIERS (PASSENGER/CARGO) OF
UNITED STATES AND OTHER COUNTRIES
PASSENGER DEATH RATES
PER 1,000 SCHEDULED PASSENGER HOURS*

YEARS	MEMBERS REPORTING TO IATA		ALL UNITED STATES AIR CARRIERS
	Countries Other than the United States	United States	
1971-75 .....	.0010 (1,890)	.0005 (821)	.0005 (1,064)
1976-80 .....	.0007 (2,159)	.0002 (364)	.0002 (438)
1979 .....	.0009 (617)	.0007 (258)	.0005 (318)
1980 .....	.0008 (548)	.0000 (0)	.0000 (11)
1971-80 .....	.0008 (4,049)	.0003 (1,185)	.0003 (1,502)

* Experience of helicopter air carriers is excluded. Number of fatalities shown in parentheses.

statistics on general aviation by sending a registration form to all general aviation aircraft owners each January requesting information such as the number of hours flown and the primary use of each aircraft. The data were compiled and adjusted for "nonreporting" aircraft, which accounted for about 25 percent of the total estimated flying hours. Beginning in 1977, a sample of approximately 14 percent of all registered General Aviation aircraft was selected as a basis for determining hours flown by all aircraft according to primary use.

Death rates are expressed per 1,000 aircraft hours. Although it might be useful to relate deaths to the average hours flown in a year by pilots in each category of General Aviation shown in Table 5, such data cannot be estimated reliably from information supplied by the National Transportation Safety Board. Some distortion in death rates by type of flying may occur because the methods used for assigning deaths are not entirely consistent with those used for assigning aircraft hours. Both rotary- and fixed-wing aircraft are included.

The category of General Aviation flying that is not included in this report because there were not sufficient data is industrial flying. In 1980, it accounted for 2.6 percent of all flying hours.

In the five-year period 1976-80 pleasure flying accounted for about 24 percent of pilots' flying time in general aviation. Death rates in this category are probably overstated because there is a tendency for pilots to understate the amount of time they spend pleasure flying and overreport the amount of time they spend on other types of flying. In Table 5, rental hours are included with "Pleasure" hours on the assumption that most pilots renting planes do so for pleasure purposes. In 1980, rental hours accounted for 10 percent of all General Aviation flying hours.

Instructional flying in the 1976-80 period represents about 15 percent of the total hours flown in General Aviation. The experience under flight

TABLE 5
GENERAL AVIATION FLYING BY KIND
PILOT AVIATION DEATH RATES PER 1,000 AIRCRAFT HOURS*

Years	Pleasure	Instruction	Business	Corporate	Aerial Application	Air Taxi
1971-75	.035 (1,860)	.010 (236)	.013 (351)	.005 (70)	.017 (150)	.012 (160)
1976-80	.029 (1,865)	.008 (220)	.007 (273)	.003 (77)	.010 (106)	.011 (222)
1979	.026 (362)	.006 (37)	.006 (52)	.003 (14)	.007 (16)	.009 (43)
1980	.027 (340)	.007 (38)	.007 (58)	.003 (16)	.012 (24)	.011 (38)
1971-80	.032 (3,725)	.009 (456)	.010 (624)	.004 (147)	.013 (256)	.011 (382)

* Number of fatalities shown in parentheses.

training of civilians includes the death of either the instructor or the student, depending upon who was acting as pilot when the accident occurred. Practice flying not under the supervision of an instructor, either in the air or on the ground, is not included in the "Instruction" category.

The "Business" and "Corporate" categories accounted for approximately 31 percent of the total General Aviation hours. Business flying is done by nonprofessional pilots flying for business reasons. Corporate flying is done by professional pilots receiving direct salary or compensation for piloting aircraft (not for public hire) operated by a corporation or business firm for the transportation of personnel or cargo in furtherance of the company's business.

Air-taxi flying accounted for approximately 11 percent of the total General Aviation hours. This type of flying includes scheduled and nonscheduled passenger and cargo flying by professional pilots (other than corporate) that is not done by the United States Civil Air Carrier Fleet. Scheduled air-taxi flying comprises the commuter air carriers, third-level airlines, and the feeder airlines. Table 5 includes both scheduled and nonscheduled air-taxi flying. Scheduled air-taxi (commuter air carrier) experience is shown in Table 6 and is available only from 1975 and later. Passenger and crew member fatality rates in 1980 were about the same as those in 1975. The crew member fatality rate for cargo operations increased in 1979 and 1980 to reach the 1975 level.

Aerial application, which accounted for approximately 6 percent of General Aviation flying, consists primarily of crop dusting. Other activities include spraying to control insects, reseeding forests, and fertilizing. Fire control is not included in this category. Pilot fatality rates have been

TABLE 6
 COMMUTER AIR CARRIER FLYING
 (SCHEDULED AIR TAXI)
 AVIATION DEATH RATES PER 1,000 AIRPLANE HOURS*

YEARS	PASSENGER OPERATIONS		CARGO OPERATIONS
	Passenger Rate	Crew Member Rate	Crew Member Rate
1976 .....	.0254 (19)	.0080 (6)	.0184 (4)
1977 .....	.0230 (20)	.0081 (7)	.0146 (4)
1978 .....	.0325 (33)	.0089 (9)	.0146 (4)
1979 .....	.0445 (49)	.0091 (10)	.0372 (6)
1980 .....	.0112 (13)	.0043 (5)	.0388 (4)
1976-80 .....	.0274 (134)	.0076 (37)	.0214 (22)

* Number of fatalities shown in parentheses.

higher than those in other commercial activities but in the years after 1975 have shown some improvement.

CANADIAN CIVIL FLYING

Canadian scheduled airlines comprise air carriers that serve designated points in accordance with a definite service schedule. Nonscheduled airlines are those that follow a route pattern with some degree of regularity or operate from a designated base to serve a defined area or on charter of an entire aircraft.

Passenger and first-pilot aviation fatality rates per 1,000 hours in domestic and international operations of Canadian scheduled airlines derived from figures furnished by Transport Canada and by Statistics Canada are shown in Table 7. Comparable passenger and first-pilot aviation fatality rates for Canadian nonscheduled airlines have been estimated from the same sources and are also shown in Table 7. For scheduled airlines, rates shown in Table 7 generally compare very favorably with the corresponding rates from the United States in Table 1.

The fatality rates among Canadian civil pilots, by class of license, are shown in Table 8 separately, for the periods 1971-75 and 1976-80, based on figures furnished by Transport Canada. It should be noted that many pilots holding licenses may be inactive and that pilots holding airline transport licenses are not necessarily flying for scheduled airlines, since they may engage in other types of flying.

TABLE 7
CANADIAN AIRLINES
AVIATION FATALITY RATES

Years	Passenger Rate per 1,000 Passenger Hours*	First Pilot Rate per 1,000 Airplane Hours†
Scheduled Airlines		
1971-75 .....	.0000 (0) (0)	.0000 (0)
1976-80 .....	.0002 (3) (55)	.0007 (2)
1971-80 .....	.0001 (3) (55)	.0004 (2)
Nonscheduled Airlines		
1971-75 .....	.0169 (109) (166)	.0176 (83)
1976-80 .....	.0114 (79) (166)	.0093 (56)
1971-80 .....	.0136 (188) (332)	.0130 (139)

* Number of fatal accidents and passenger fatalities shown in parenthesis.

† Number of fatal accidents shown in parenthesis.

UNITED STATES MILITARY

General

As in the previous report, deaths due to hostile action are omitted. Experience will continue to be grouped in five-year intervals.

In the aggregate, Air Force experience for 1979 and 1980 is less favorable than that reported for both 1977 and 1978. Experience reported for the Navy and Marine Corps for 1979 and 1980 is slightly more favorable than the 1978 experience. The 1979 and 1980 experience for the Army generally is slightly more favorable than that reported for 1977 and 1978.

All United States military aviation statistics in this report are shown on a calendar-year basis.

Age and Rank

Table 9 shows aviation fatality rates by age group, while Table 10 presents aviation fatality rates by rank for Air Force pilots and nonpilot rated officers and for Navy and Marine Corps pilots on active duty. This experience includes pilots who flew chiefly to maintain proficiency as well as those with full-time flying duties. Nonpilot rated officers in the Air Force are those with duties other than as a pilot (e.g., navigators and observers).

The fatality rates for Air Force pilots were higher in 1979 than in 1980, while the rates for Air Force nonpilot rated officers were higher in 1980 than in 1979, both in the aggregate and for most age and rank categories. Rates for most categories of rank and age group, including the "All" categories, were higher in the 1976-80 period than in 1971-75 for Air Force pilots and nonpilots.

TABLE 8
CANADIAN CIVIL PILOTS BY CLASS OF LICENSE
1971-80 AVIATION FATALITY RATES

Class of License	Period	Life Years of Exposure	Aviation Fatalities	Rate per 1,000 Life Years of Exposure
Air transport	{1971-75	16,522	32	1.9
	{1976-80	22,054	38	1.7
Senior commercial	{1971-75	4,144	14	3.4
	{1976-80	5,088	15	2.9
Commercial	{1971-75	28,382	93	3.3
	{1976-80	39,093	113	2.9
Private (excluding students) . . .	{1971-75	141,522	160	1.1
	{1976-80	117,333	170	1.4
Glider	{1971-75	7,014	5	0.7
	{1976-80	14,980	5	0.3

Navy and Marine Corps fatality rates for 1979 and 1980 improved slightly over 1978 rates, both in the aggregate and for most age and rank categories.

Duty Assignment

Aviation fatality rates among Air Force pilots with full-time flying duties and all Navy and Marine Corps pilots are shown according to duty assignment in Table 11.

In contrast to the exposures underlying Tables 9 and 10, Air Force pilots who were not assigned to a specific flying duty but who flew chiefly to maintain proficiency were excluded from the experience in Table 11. In 1979 the fatality rate for utility aircraft pilots was very high; in 1978 and 1980 the rate was very low. The rate for observation aircraft pilots de-

TABLE 9
UNITED STATES AIR FORCE, NAVY, AND MARINE CORPS FLYERS, BY AGE
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE
DEATHS DUE TO HOSTILE ACTION EXCLUDED

Age Group	1971-75	1976-80	1979	1980
Air Force Pilots				
Under 25	1.6	2.1	0.0*	0.9*
25-29	2.0	2.4	3.3	2.8
30-34	2.3	2.6	4.1	2.2
35-39	1.2	2.7	4.2	3.8
40 and over	1.0	1.8	3.3	0.9
All	1.7	2.4	3.6	2.5
Air Force Nonpilot Rated Officers				
Under 25	0.7*	2.6	0.0*	6.0*
25-29	1.4	2.1	2.3	0.8*
30-34	0.7	2.3	2.8	4.0
35-39	1.1	1.8	2.4	2.3*
40 and over	1.6	2.2*	1.5*	4.4*
All	1.1	2.2	2.3*	2.9
Navy and Marine Corps Pilots				
Under 25	4.5	0.9*	2.2*	0.0*
25-29	4.2	4.7	4.4	4.1
30-34	2.5	3.7	3.8	4.6
35-39	1.9	2.1	1.7*	3.0
40 and over	0.9	0.4	0.7*	1.5*
All	2.8†	2.9†	2.9†	3.3†

* Based on 5 or fewer deaths.

† A small portion of total Navy and Marine Corps pilots and pilot deaths was not identified by age.

creased during 1979 but increased sharply during 1980, although there were 5 or fewer deaths in both years.

For the Navy and Marine Corps, all pilots are included, since no exclusions of pilots flying chiefly to maintain proficiency was possible. The aggregate rate was lower in 1979 than in 1978. However, it increased in 1980 but to a lower level than in 1978.

Hours of Flying

Average hours of flying are based on the combined flying time of pilots who flew chiefly to maintain proficiency and those with full-time flying duties.

TABLE 10

UNITED STATES AIR FORCE, NAVY, AND MARINE CORPS FLYERS, BY RANK
 AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE
 DEATHS DUE TO HOSTILE ACTION EXCLUDED

Rank (Pay Grade)*	1971-75	1976-80	1979	1980
Air Force Pilots				
2d Lieutenant (O-1)	3.7	1.0 [†]	3.6 [†]	0.0 [†]
1st Lieutenant (O-2)	1.7	2.6	4.6	2.1 [†]
Captain (O-3)	2.1	2.5	3.8	2.5
Major (O-4)	1.7	2.8	3.0	3.8
Lieutenant Colonel (O-5)	1.0	1.7	1.9 [†]	2.2 [†]
General and Colonel (O-6 and up)	0.4	1.6 [†]	4.9 [†]	0.0 [†]
All	1.7	2.4	3.6	2.5
Air Force Nonpilot Rated Officers				
2d Lieutenant (O-1)	0.3 [†]	2.2	3.0 [†]	4.1 [†]
1st Lieutenant (O-2)	1.6	3.0	10.8	1.1 [†]
Captain (O-3)	1.2	2.0	0.5 [†]	2.8
Major (O-4)	1.1	1.8	1.1 [†]	2.2 [†]
Lieutenant Colonel (O-5)	2.1	1.4 [†]	0.0 [†]	6.6 [†]
General and Colonel (O-6 and up)	0.0 [†]	0.0 [†]	0.0 [†]	0.0 [†]
All	1.3	2.2	2.3	2.9
Navy and Marine Corps Pilots				
Ensign (O-1)	1.5 [†]	0.9 [†]	0.0 [†]	0.0 [†]
Lieutenant Junior Grade (O-2)	5.1	5.1	5.3	3.9
Lieutenant (O-3)	3.9	3.7	3.3	3.9
Lieutenant Commander (O-4)	1.9	2.9	2.3	4.4
Commander (O-5)	1.0	0.9	2.2 [†]	1.7 [†]
Admiral and Captain (O-6 and up)	0.1 [†]	0.0 [†]	0.0 [†]	0.0 [†]
All	2.8 [‡]	2.9 [‡]	2.9 [‡]	3.3 [‡]

* Ranks shown under "Navy and Marine Corps Pilots" are for Navy; equivalent Marine Corps ranks are similar to Air Force pilot ranks.

† Based on 5 or fewer deaths.

‡ A small portion of total Navy and Marine Corps pilots and pilot deaths was not identified by rank.

Navy pilots flew an average of 147 hours in 1979 and an average of 109 hours in 1980. These averages are similar to previous years except for 1976. Marine Corps pilots flew an average of 142 and 104 hours in 1979 and 1980, respectively, which was consistent with the 1977 and 1978 averages. Naval Reserve pilots flew an average of 107 hours in 1979 and 87 hours in 1980, slightly less than the averages for 1977 and 1978. The average number of flying hours for Marine Corps Reserve pilots was unavailable for 1979 and 1980.

TABLE II
 UNITED STATES AIR FORCE, NAVY, AND MARINE CORPS PILOTS,
 BY DUTY ASSIGNMENT
 AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE
 DEATHS DUE TO HOSTILE ACTION EXCLUDED

Duty Assignment	1971-75	1976-80	1979	1980
Air Force Pilots*				
Search rescue	0.0 [†]	0.0 [†]	0.0 [†]	0.0 [†]
Helicopter	2.5	1.9 [†]	4.1 [†]	2.1 [†]
Tanker	0.3 [†]	1.3	1.1 [†]	0.0 [†]
Bomber	2.4	0.7 [†]	0.0 [†]	0.0 [†]
Reconnaissance	1.7	2.9	4.3 [†]	3.0 [†]
Trainer	1.3	0.8	0.7 [†]	0.5 [†]
Cargo	1.8	1.4	0.6 [†]	3.0
Observation	4.7	5.9	3.7 [†]	10.5 [‡]
Fighter	5.2	4.9	8.7	4.2
Utility	4.9	5.5	24.5	4.0 [†]
Liaison	166.7 [†]	0.0 [‡]	0.0 [†]	0.0 [†]
All	2.2	2.4	3.6	2.5
Navy and Marine Corps Pilots				
Navy carrier-based jet	5.1	4.5	5.7	5.0
Marine fighter/attack jet	4.8	5.2	5.5	6.9
Navy carrier-based prop	3.0	2.3	0.0 [†]	3.3 [‡]
Marine fighter/attack/OBS prop§	4.6 [‡]	1.3 [†]	0.0 [†]	0.0 [†]
Navy patrol/transport	0.6	1.2	0.0 [†]	0.8 [†]
Marine patrol/transport	1.6 [†]	0.0 [†]	0.0 [†]	0.0 [†]
Navy helicopter	1.9	1.8	0.0 [†]	2.5 [‡]
Marine helicopter	3.0	4.1	2.7 [†]	3.1
All	3.0 [‡]	2.9 [‡]	2.9 [‡]	3.3 [‡]

* In this table, Air Force pilots who were not assigned to a specific flying duty but flew chiefly to maintain proficiency were excluded from the exposure. Similar Navy and Marine Corps pilots were included.

† Based on 5 or fewer deaths.

‡ A small portion of total Navy and Marine Corps pilots and pilot deaths was not identified by duty assignment.

§ OBS prop = observation/counterinsurgency propeller.

For 1979 and 1980, all nonstudent Army pilots who were qualified to fly fixed-wing aircraft were also qualified to fly rotary-wing aircraft. These pilots flew an average of 94 hours in 1979 and an average of 89 hours in 1980 in fixed-wing aircraft. The averages are significantly greater than the 1977 and 1978 averages. Nonstudent Army pilots who were qualified to fly rotary-wing aircraft flew an average of 80 and 81 hours, respectively, for 1979 and 1980. These averages include a small percentage of pilots who were qualified to fly both fixed-wing and rotary-wing aircraft. For both types of aircraft combined, nonstudent Army pilots flew an average of 92 hours in 1979 and 93 hours in 1980.

The average number of aircraft hours for Air Force pilots was 242 and 235 hours for 1979 and 1980, respectively. The average annual flying time for Air National Guard pilots on flying status was 130 hours for both 1979 and 1980. Army Reserve pilots and Army National Guard pilots flew an average of 61 and 67 hours in 1979, and 61 and 70 hours in 1980, respectively.

Military Air Command (MAC)

Aviation fatality rates among pilots and crew members of MAC, a branch of the Air Force, are shown in Table 12. The experience during 1977 and 1979 was much more favorable than in 1978 but only a little more favorable than in 1980. There were no fatalities among pilots or crew members in 1979. The experience of MAC pilots was also included in Tables 9-11.

TABLE 12
MILITARY AIR COMMAND (MAC)
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE
DEATHS DUE TO HOSTILE ACTION EXCLUDED

	1971-75	1976-80	1979	1980
Pilots:				
Transport units	0.9	1.1	0.0*	0.0*
Other units	1.2	0.4*	0.0*	0.0*
All	1.0	0.8	0.0*	0.5*
Crew members:				
Transport units	1.3	1.4	0.0*	0.0*
Other units	0.7	0.9	0.0*	0.9*
All	1.1	1.2	0.0*	0.8*

*Based on 5 or fewer deaths.

United States Army

Table 13 includes data for all flying operations among nonstudent Army pilots and crew members. Both fixed-wing and rotary-wing aircraft pilot fatality rates were lower during the five-year period 1976–80 than during 1971–75.

Student Pilots

Table 14 presents aviation fatality rates for student pilots in the military services. None of the rates in 1979 and 1980 were based on more than 5 deaths. Because of the small number of deaths each year, there is a wide fluctuation in rates from year to year.

TABLE 13
UNITED STATES ARMY—ALL FLYING OPERATIONS
DEATHS DUE TO HOSTILE ACTION EXCLUDED

	1971-75	1976-80	1979	1980
	Aviation Fatality Rates per 1,000 Life Years of Exposure			
Pilots	2.0	1.0	0.5	1.2
Crew members	6.4	1.4	0.5*	1.2*
	Pilot Fatality Rates per 1,000 Aircraft Hours			
Fixed-wing aircraft .....	.0299	.0183	.0129*	.0066*
Rotary-wing aircraft .....	.0178	.0132	.0039*	.0136
All types of aircraft .....	.0197	.0140	.0051	.0127

* Based on 5 or fewer deaths.

TABLE 14
UNITED STATES AIR FORCE, NAVY, AND MARINE CORPS,
AND ARMY STUDENT PILOTS
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE

	1971-75	1976-80	1979	1980
Air Force*	1.6	1.4	0.0†	2.5‡
Navy and Marine Corps:*				
Basic course	1.3	2.7	2.3†	4.8†
Advanced course	3.1	2.5	2.4†	3.4†
Army	2.3‡	1.0†	0.8†	0.0†

* Commissioned officers only.

† Based on 5 or fewer deaths.

‡ Based on data excluding 1974, for which year data are not available.

Coast Guard

Table 15 displays the aviation fatality rates per 1,000 life years of exposure for Coast Guard personnel on flight orders. Most of these rates are based on 5 or fewer deaths, causing extreme fluctuations in rates from year to year. There have been no aviation fatalities for Coast Guard student pilots for the last twenty-four years.

Active Reserves and National Guard

Table 16 shows the aviation fatality rates for Army pilots and for Navy and Marine Corps pilots in the active reserves and for Air and Army National Guard pilots. Such pilots are not on full-time active duty but generally fly on weekend and/or short-term (usually two weeks) training duty. Rates for the five-year period 1976-80 are generally similar to the corresponding rates for the five-year period 1971-75. The rates for 1979 and 1980 were generally based on 5 or fewer deaths.

TABLE 15
UNITED STATES COAST GUARD
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE

	1971-75	1976-80	1979	1980
Aviator	1.75	1.21*	5.56*	0.00*
Observer	0.00*	8.89*	19.23*	0.00*
Crewman	0.61	0.42*	1.67*	0.00*

* Based on 5 or fewer deaths.

TABLE 16
PILOTS IN THE ACTIVE RESERVES AND NATIONAL GUARD
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE

	1971-75	1976-80	1979	1980
Navy and Marine Corps Reserves:				
Ages under 30	0.7*	0.0*†	0.0*	0.0*
Ages 30 and over	0.8	0.9†	1.0*	1.1*
All ages	0.8	0.9†	0.9*	1.0*
Army Reserves	1.3	0.3*	1.7*	0.0*
Air National Guard	2.0	2.5‡	§	2.3
Army National Guard	0.8	0.6	0.7*	0.2*

* Based on 5 or fewer deaths.

† Based on data excluding 1977, for which year data are not available.

‡ Based on data excluding 1979, for which year data are not available.

§ Not available.

Air Force Flight Surgeons and Nurses

During the five-year period 1976-80, the aviation fatality rate per 1,000 life years of exposure for flight surgeons was 0.5. This rate is based on 5 or fewer deaths. There have been no fatalities among Air Force flight nurses in the last nineteen years.

CANADIAN MILITARY

Aviation fatality rates among Canadian regular military forces, excluding reserves, are shown in Table 17 by age, rank, and functional classification.

The average number of flying hours for all pilots combined has remained

TABLE 17

CANADIAN REGULAR FORCES
1971-80 AVIATION FATALITY RATES
PER 1,000 LIFE YEARS OF EXPOSURE*

	1971-75		1976-80†		1971-80‡	
	Pilots	Crew	Pilots	Crew	Pilots	Crew
Age group:						
Under 25	7.6 (6)	1.9 (1)	2.8 (3)	2.5 (1)	4.8 (9)	2.2 (2)
25-29	3.5 (9)	1.0 (2)	7.5 (10)	2.9 (3)	4.9 (19)	1.6 (5)
30-34	3.3 (7)	3.4 (7)	6.3 (10)	3.1 (5)	4.6 (17)	3.3 (12)
35-39	1.2 (2)	1.8 (4)	2.9 (4)	0.7 (1)	2.0 (6)	1.4 (5)
40 and over	0.0 (0)	0.5 (1)	2.0 (3)	2.5 (4)	0.9 (3)	1.5 (5)
All	2.7 (24)	1.7 (15)	4.4 (30)	2.3 (14)	3.4 (54)	2.0 (29)
Rank:						
Lieutenant and lower rank	4.9 (5)	2.5 (13)	2.0 (3)	2.8 (11)	5.2 (8)	2.6 (24)
Captain	3.0 (17)	0.7 (2)	7.1 (25)	1.3 (2)	4.6 (42)	0.9 (4)
Major	1.1 (2)	0.0 (0)	1.5 (2)	0.0 (0)	1.3 (4)	0.0 (0)
Lieutenant Colonel and higher rank	0.0 (0)	0.0 (0)	0.0 (0)	9.4 (1)	0.0 (0)	4.3 (1)
All	2.7 (24)	1.7 (15)	4.4 (30)	2.3 (14)	3.4 (54)	2.0 (29)
Functional classifications:‡						
Fighter	1.8 (4)	1.3 (1)	8.9 (14)	1.9 (1)	4.7 (18)	1.5 (2)
Training	1.4 (6)	0.0 (0)	1.7 (6)	0.0 (0)	1.5 (12)	0.0 (0)
Transport	1.6 (4)	1.3 (5)	1.2 (2)	2.7 (8)	1.4 (6)	1.9 (13)
Maritime	3.7 (4)	1.3 (4)	4.0 (3)	1.1 (2)	3.8 (7)	1.2 (6)
Helicopter	2.3 (4)	3.2 (4)	1.6 (3)	1.9 (3)	1.9 (7)	2.5 (7)
Others	1.2 (2)	0.8 (1)	6.2 (2)	0.0 (0)	2.0 (4)	0.7 (1)
All	1.7 (24)	1.4 (15)	3.1 (30)	1.8 (14)	2.3 (54)	1.5 (29)

* Number of fatalities shown in parentheses.

† Based on data excluding 1979, for which year data are not available.

‡ The fatality rates by functional classification are understated because some pilots and crew members fly more than one type of aircraft. The extent of understatements in total can be determined by comparing the fatality rates of the "All" categories.

steady over the ten-year period at approximately 295 hours per year and shows little variation by age group. Crew members average about 340 hours per year. There is some variation by functional classification, but this cannot be accurately determined because of duplicate counting in different functions. Pilots and crew members flying more than one type of aircraft are counted in each function in which flying is done.

The extent of overstatement by type of aircraft is unknown. The unadjusted average annual flying time for pilots and crew in the transport and maritime categories is considerably higher than for those in the categories of fighter, training, and helicopter. The former group averages 350 hours per year and the latter approximately 135 hours per year.

The functional classification "Others" is composed largely of pilots who ferry planes to air bases and test new planes, both accepted and experimental models. It also includes a small number of pilots whose primary assignment is on the ground but who occasionally fly to maintain proficiency.

INTERCOMPANY EXPERIENCE

This year's report and the data contained in Tables 18-20 were based on the 1979-80 calendar-year experience for issues of 1967 and subsequent calendar years. Additionally, each of the tables shows the experience between 1971-74 and 1975-78 for issues of 1967 and subsequent years for comparison purposes over the three periods.

All experience is by number of policies, and the insured is classified according to status at the time of application of insurance. Policies with an aviation exclusion clause are not included. Exposure for policies with aviation extra premium is terminated when the extra premium is discontinued. For those policies with civilian flying hazards and where there is still an aviation hazard after discontinuance of the extra premium, companies were encouraged to transfer the exposure to the "Without Aviation Extra Premium" category. Not all companies were able to do this, and consequently the experience for that category includes only a portion of such cases.

In analyzing the data, it should be kept in mind that the criteria by which the lives are classified are determined largely by the facts at time of issue. The older the issue, the greater the chance that the classification does not properly reflect current flying activity. The data used were submitted by ten companies, as compared with fourteen companies contributing to the study two years ago. No company with a large exposure withdrew.

Most classifications have very few deaths, so that any analysis of trends should be made with caution.

Civilian Aviation

Table 18 covers the experience for various classifications of pilots for policies issued with and without aviation extra premiums. The "Scheduled Airline" classification includes United States certificated route air carriers

TABLE 18
INTERCOMPANY EXPERIENCE ON PILOTS IN CIVILIAN
AVIATION—BY POLICIES*

(1971-74, 1975-78, and 1979-80 Experience on 1967 and Subsequent Issues)

STATUS AT ISSUE	YEARS	WITH AVIATION EXTRA PREMIUM			WITHOUT AVIATION EXTRA PREMIUM			
		Years of Exposure	Aviation Fatali- ties	Rate per 1,000	Years of Exposure	Aviation Fatali- ties	Rate per 1,000	
Scheduled airline pilots	{ 1971-74	625	1	1.6	1,842	6	3.3	
	{ 1975-78	570	2	3.5	7,790	6	0.8	
	{ 1979-80	204	1	4.9	3,423	1	0.3	
Other commercial pilots flying for hire:								
	Instructing (at least half-time)	{ 1971-74	3,664	10	2.7	231	1	4.3
	{ 1975-78	4,312	16	3.7	506	0	0.0	
	{ 1979-80	1,977	0	0.0	307	0	0.0	
Corporate	{ 1971-74	1,881	2	1.1	3,064	1	0.3	
	{ 1975-78	2,470	7	2.8	4,447	5	1.1	
	{ 1979-80	1,136	4	3.5	2,108	2	0.9	
Charter and other airlines	{ 1971-74	2,765	10	3.6	521	1	1.9	
	{ 1975-78	3,021	12	4.0	854	1	1.2	
	{ 1979-80	1,402	6	4.3	468	1	2.1	
Others†	{ 1971-74	2,446	6	2.6	623	1	1.6	
	{ 1975-78	3,174	12	3.8	838	0	0.0	
	{ 1979-80	3,020	13	4.3	1,542	3	1.9	
Private pilots	{ 1971-74	22,275	24	1.1	85,101	87	1.0	
	{ 1975-78	26,757	25	0.9	106,122	98	0.9	
	{ 1979-80	11,899	7	0.5	54,148	47	0.9	
Student pilots	{ 1971-74	35,129	21	0.6	4,717	9	1.9	
	{ 1975-78	39,055	14	0.4	8,450	0	0.0	
	{ 1979-80	18,100	6	0.3	5,531	3	0.5	
Total	{ 1971-74	68,785	74	1.1	96,099	106	1.1	
	{ 1975-78	79,359	88	1.1	129,007	110	0.9	
	{ 1979-80	36,369	31	0.9	67,527	57	0.8	

* Exposure in "With Aviation Extra Premium" category is terminated upon discontinuance of extra premium. Exposure in "Without Aviation Extra Premium" category consists of pilots active at time of issue and rated standard or reduced to standard through liberalization of underwriting rules.

† Includes exposure of companies unable to subdivide data.

TABLE 19

INTERCOMPANY EXPERIENCE ON PILOTS FLYING FOR PLEASURE
OR PERSONAL BUSINESS—BY POLICIES*
(1971-74, 1975-78, and 1979-80 Experience on 1967 and Subsequent Issues)

STATUS AT ISSUE	YEARS	WITH AVIATION EXTRA PREMIUM			WITHOUT AVIATION EXTRA PREMIUM		
		Years of Exposure	Aviation Fatali- ties	Rate per 1,000	Years of Exposure	Aviation Fatali- ties	Rate per 1,000
By hours flown:†							
Under 100	{ 1971-74	11,966	8	0.7	55,081	37	0.7
	{ 1975-78	14,706	7	0.5	68,685	38	0.6
	{ 1979-80	6,422	3	0.5	34,775	24	0.7
100-199	{ 1971-74	5,429	5	0.9	24,138	42	1.7
	{ 1975-78	6,149	5	0.8	28,802	54	1.9
	{ 1979-80	2,842	1	0.4	14,519	17	1.2
200-299	{ 1971-74	2,309	3	1.3	2,745	2	0.7
	{ 1975-78	2,521	6	2.4	3,597	4	1.1
	{ 1979-80	1,053	1	0.9	1,740	5	2.6
300 or more	{ 1971-74	2,187	6	2.7	1,350	2	1.5
	{ 1975-78	2,810	5	1.8	2,434	1	0.4
	{ 1979-80	1,268	2	1.6	1,541	0	0.0
By type of flying certificate:							
Commercial or transport	{ 1971-74	5,982	6	1.0	17,239	20	1.2
	{ 1975-78	7,103	8	1.1	22,432	13	0.6
	{ 1979-80	3,221	2	0.6	11,789	11	0.9
Private	{ 1971-74	16,293	18	1.1	67,862	67	1.0
	{ 1975-78	19,654	17	0.9	83,690	85	1.0
	{ 1979-80	8,678	5	0.6	42,359	36	0.8
By attained age:							
Under 35	{ 1971-74	14,069	11	0.8	19,134	18	0.9
	{ 1975-78	16,929	8	0.5	19,577	10	0.5
	{ 1979-80	7,102	2	0.3	8,126	12	1.5
35-49	{ 1971-74	6,198	12	1.9	50,507	49	1.0
	{ 1975-78	6,856	11	1.6	60,573	56	0.9
	{ 1979-80	3,169	2	0.6	29,617	22	0.7
50 and over	{ 1971-74	2,008	1	0.5	15,460	20	1.3
	{ 1975-78	2,972	6	2.0	25,972	32	1.2
	{ 1979-80	1,628	3	1.8	16,405	13	0.8
Total	{ 1971-74	22,275	24	1.1	85,101	87	1.0
	{ 1975-78	26,757	25	0.9	106,122	98	0.9
	{ 1979-80	11,899	7	0.6	54,148	47	0.9

* Exposure in "With Aviation Extra Premium" category is terminated upon discontinuance of extra premium. Exposure in "Without Aviation Extra Premium" category consists of pilots active at time of issue and rated standard or reduced to standard through liberalization of underwriting rules.

† Omits data where hours are not stated.

TABLE 20

INTERCOMPANY EXPERIENCE ON MILITARY PILOTS BY BRANCH OF SERVICE
AND FLYING DUTIES—WITH AVIATION EXTRA PREMIUM*
(1971-74, 1975-78, and 1979-80 Experience on 1967 and Subsequent Issues—by Policies)

STATUS AT ISSUE AND ATTAINED INSURANCE AGE	YEARS	OPERATIONAL			ADMINISTRATIVE		
		Years of Exposure	Aviation Fatali- ties	Rate per 1,000	Years of Exposure	Aviation Fatali- ties	Rate per 1,000
U.S. Air Force:							
Under 35	{ 1971-74	5,228	8	1.5	486	2	4.1
	{ 1975-78	3,546	3	0.8	469	0	0.0
	{ 1979-80	2,409	2	0.8	120	0	0.0
35 and over	{ 1971-74	3,369	5	1.5	1,726	3	1.7
	{ 1975-78	2,957	3	1.0	1,180	1	0.8
	{ 1979-80	4,486	7	1.6	489	0	0.0
Total	{ 1971-74	8,597	13	1.5	2,212	5	2.3
	{ 1975-78	6,503	6	0.9	1,649	1	0.6
	{ 1979-80	6,895	9	1.3	609	0	0.0
U.S. Army:							
Under 35	{ 1971-74	3,830	11	2.9	2,436	2	0.8
	{ 1975-78	3,367	6	1.8	1,810	0	0.0
	{ 1979-80	2,076	0	0.0	471	1	2.1
35 and over	{ 1971-74	783	1	1.3	1,172	2	1.7
	{ 1975-78	1,208	4	3.3	1,351	1	0.7
	{ 1979-80	1,546	0	0.0	763	0	0.0
Total	{ 1971-74	4,613	12	2.6	3,608	4	1.1
	{ 1975-78	4,575	10	2.2	3,161	1	0.3
	{ 1979-80	3,622	0	0.0	1,234	1	0.8
U.S. Navy	{ 1971-74	2,337	3	1.3	1,128	0	0.0
	{ 1975-78	1,788	2	1.1	846	1	1.2
	{ 1979-80	2,345	7	3.0	345	1	2.9
U.S. Marine Corps	{ 1971-74	737	0	0.0	380	0	0.0
	{ 1975-78	758	3	4.0	344	1	2.9
	{ 1979-80	519	3	5.8	131	1	7.6
U.S. Air Force, Army, Navy, and Marine Corps Reserves	{ 1971-74	.....	.....	.....	926	2	2.2
	{ 1975-78	.....	.....	.....	656	1	1.5
	{ 1979-80	.....	.....	.....	280	1	3.6
U.S. Air National Guard	{ 1971-74	.....	.....	.....	877	2	2.3
	{ 1975-78	.....	.....	.....	1,185	0	0.0
	{ 1979-80	.....	.....	.....	392	0	0.0
Total	{ 1971-74	16,284	28	1.7	9,131	13	1.4
	{ 1975-78	13,624	21	1.5	7,841	5	0.6
	{ 1979-80	13,381	19	1.4	2,991	4	1.3

* Exposure is terminated on discontinuance of extra premium.

and corresponding major Canadian airlines. The "Corporate" classification covers hired pilots flying company-owned planes. The "Charter and other airlines" classification comprises the supplemental air carriers and intrastate and foreign airlines, as well as air-taxi and charter operations. The "Others" classification includes corporate and charter pilots insured by companies unable to subdivide their data, as well as specialty pilots in such occupations as aerial application, pipeline survey, advertising, and photography. Pilots with either student or private certificates are defined as (1) private pilots (if they have 100 or more solo hours of pleasure or personal business flying) or (2) student pilots (if they have less than 100 solo hours of flying).

The 1979-80 experience in the "With Aviation Extra Premium" category was poorer than that for both earlier periods in all classifications with exceptions of private, student, and instructor pilots. Private and student pilots continue to show better experience than the other pilots. The aggregate rates show very little fluctuation.

Classifications under the "Without Aviation Extra Premium" category continue to show a better experience generally than under the other category.

Table 19 covers the experience for various categories of private pilots (from Table 18) for policies issued with and without aviation extra premiums. Subdivisions by hours flown, type of flying certificate, and attained age are shown. The exposure for issues without aviation extra premium includes an unknown proportion of lives who have discontinued their flying activities. The total experience under "With Aviation Extra Premium" shows an almost steady improvement from the earliest to the latest period.

Experience in the "Without Aviation Extra Premium" category showed a generally stable trend for the "Under 100," "Private," "35-49," and "Total" classifications. Exposures and fatalities continue to exceed those under "With Aviation Extra Premium."

Military Aviation

Table 20 shows aviation fatality rates for military aviation pilots with policies issued only with an aviation extra premium separately for operational and administrative pilots. Administrative pilots are defined as those flying 40-150 hours annually, whereas operational pilots are defined as those flying over 150 hours annually. Within the "Operational" category, the greatest and most significant improvements in 1979-80 over 1975-78 occurred for the United States Army.

