

**TRANSACTIONS OF SOCIETY OF ACTUARIES
1975 REPORTS**

REPORT OF THE COMMITTEE ON AVIATION
AND HAZARDOUS SPORTS

I. AVIATION STATISTICS

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

The reporting methods used for United States General Aviation once again have produced death rates per 1,000 flying hours that, when translated to life years of exposure, would appear to be considerably higher than the governmental figures for Canadian civil aviation and the intercompany figures. We can only assume that this represents an underreporting of exposure, particularly for private pilots.

The fatality rates for Canadian military pilots are considerably higher than for United States military pilots. This reflects the greater number of flying hours flown by Canadian military pilots.

Intercompany aviation data, which are now being compiled on a biennial basis, are shown this year. These data are limited to 1967 and subsequent issues and are therefore smaller in volume than the data reported two years ago, which covered 1959 and subsequent issues. The small volume of military data also reflects the caution exercised by individual companies in issuing policies to military flying personnel during the Vietnam conflict.

UNITED STATES CIVIL AIR CARRIER FLEET

United States civil aviation is divided into two categories: Civil Air Carrier Fleet and General Aviation. The United States Civil Air Carrier Fleet is made up largely of Certificated Route Air Carriers (passenger/cargo and all-cargo), which are the major airlines in the United States. The balance of the United States Civil Air Carrier Fleet, as defined in the *FAA Statistical Handbook of Aviation*, is comprised of Supplemental Carriers and Commercial Operators. Supplemental Carriers are discussed later in this section. Commercial Operators are not included in this report, since the small number of aircraft involved makes the experience difficult to analyze. Commercial Operators include all carriers operating at least one aircraft weighing over 12,500 pounds that

are not classified as Certificated Route Air Carriers or Supplemental Carriers.

Some companies not classified as part of the United States Civil Air Carrier Fleet, because they operate only aircraft weighing 12,500 pounds or less, may use such terms "airlines," "airways," and "carrier" and may provide scheduled passenger service on a limited basis (e.g., commuter or feeder airlines). Such aircraft are included under General Aviation, and data regarding their activities are not included in this section of the report.

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 perform scheduled air transportation over specified routes and a limited amount of nonscheduled operations. They are divided into two groups—passenger/cargo and all-cargo. A recent issue of the monthly Civil Aeronautics Board publication *Air Carrier Traffic Statistics* listed 32 such passenger/cargo air carriers (including 3 intra-Alaska, 2 intra-Hawaii, and 3 helicopter carriers) and 3 such all-cargo carriers.

"Domestic" operations are, in general, within and between the fifty 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 Certificated Route Air Carriers (passenger/cargo) for passengers, first pilots, all pilots and copilots, and other crew members in domestic and international flying. The lives exposed as "All Pilot and Copilot" and "Other Crew Member" include persons who may do less than the normal amount of flying because of supervisory duties or other reasons.

The small number of fatal accidents and the relatively large number of passenger fatalities in some accidents result in passenger fatality rates which are subject to marked fluctuations from year to year. However, such rates have shown a trend of improvement over the years.

Pilots engaged in air carrier flying may not, under government regulations, fly more than 100 hours per month or 1,000 hours per year in domestic operations. Pilots in international operations are generally limited to either 100 hours per month or 300 hours every 90 days, depending on the size of the flight crew. In actual practice, pilots aver-

age 600-700 hours per year because they have ground duties before and after flights.

Another type of carrier, for which statistics are not available, is the Intra-state Air Carrier. Such carriers must obey the general safety rules and regulations for carrying passengers as set by the Civil Aeronautics Board. However, the responsibility for regulating, licensing, and collecting flight and fatality statistics for each Intra-state Air Carrier

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 Life Year‡	Other Crew Member Rate per Life Year‡
Domestic Operations				
1963-66 .....	.0006 (18)	.0012 (16)	.0007 (22)	.0005 (14)
1967-70 .....	.0006 (18)	.0009 (16)	.0005 (23)	.0003 (18)
1971-74 .....	.0005 (15)	.0006 (12)	.0002 (13)	.0002 (12)
1975§ .....	.0004 (2)	.0004 (2)	.0002 (2)	.0001 (1)
1963-75§ .....	.0005 (53)	.0008 (46)	.0004 (60)	.0003 (45)
International Operations				
1963-66 .....	.0013 (4)	.0019 (4)	.0015 (6)	.0020 (6)
1967-70 .....	.0002 (3)	.0003 (1)	.0004 (2)	.0004 (3)
1971-74 .....	.0011 (5)	.0014 (4)	.0008 (4)	.0012 (4)
1975§ .....	.0000 (0)	.0000 (0)	.0000 (0)	.0000 (0)
1963-75§ .....	.0008 (12)	.0010 (9)	.0008 (12)	.0010 (13)
Domestic and International Operations				
1963-66 .....	.0007 (22)	.0013 (20)	.0008 (28)	.0007 (20)
1967-70 .....	.0005 (21)	.0008 (17)	.0005 (25)	.0003 (21)
1971-74 .....	.0006 (20)	.0007 (16)	.0003 (17)	.0003 (16)
1975§ .....	.0003 (2)	.0004 (2)	.0002 (2)	.0001 (1)
1963-75§ .....	.0006 (65)	.0008 (55)	.0005 (72)	.0004 (58)

* Number of fatal accidents shown in parentheses.

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

‡ Based on all operations, scheduled and nonscheduled, including helicopter operations.

§ 1975 figures are preliminary.

rests, on an individual basis, with the respective state, which has sole jurisdiction. Not all states have such carriers, and, of those that do, not all states collect statistics.

Helicopter airlines designated as "Certificated Route Air Carriers" are excluded from the experience for passengers and first pilots in Table 1. During the thirteen years 1963-75, there were 4 fatal accidents on helicopter airlines, resulting in a passenger death rate of 0.021 per 1,000 scheduled passenger hours.

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 performance of scheduled air freight express and mail transportation over specified routes as well as nonscheduled operations which may include passengers.

The first-pilot fatality rates for all-cargo carriers, together with the rates for Supplemental Carriers, are shown in Table 2.

Supplemental Carriers

These airlines form a class of carriers holding temporary certificates of public convenience and necessity (issued by the Civil Aeronautics Board) authorizing them to perform passenger and cargo charter services supplementing the scheduled service of the Certificated Route Air Carriers. In addition, they may perform on a limited or temporary basis, as authorized by the Civil Aeronautics Board, scheduled operations including the transportation of individually ticketed passengers and individually waybilled cargo. There were 9 such air carriers listed in a recent edition of the *Air Carrier Traffic Statistics*.

The figures shown in Table 2 include experience in operations under contracts with military authorities. There has been a decline in first-pilot fatality rates over the years, on the basis of limited experience.

AIR CARRIERS OF COUNTRIES OTHER THAN THE UNITED STATES

The general conditions and aviation technology peculiar to any country influence the hazards of flying in that country. Each country has its own aviation regulations and methods of enforcement. These may be different for domestic and international operations, the latter being affected by such compromises as the crossing of international boundaries.

World Air Transport Statistics, a publication of the International Air Transport Association (IATA), reports on the operations of the Association's members. In 1974 the 112 members carried 86 per cent of the

world's scheduled airline traffic (excluding the U.S.S.R. and the People's Republic of China). It should be noted in making comparisons between the current and prior years that Northwest Airlines, which accounts for about 5 per cent of the world's scheduled airline traffic, has not been a member since 1973. Some companies operated only within the borders of a particular country and some only on an international basis, while others operated on both bases but in varying proportions.

Table 3 gives passenger fatality rates per 1,000 scheduled passenger hours based on the experience of 10 members in the United States and

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

Years	All-Cargo (All Operations)	Supplemental (All Operations)
1963-66.....	.0074 (5)	.0049 (5)
1967-70.....	.0045 (3)	.0025 (3)
1971-74.....	.0039 (2)	.0021 (2)
1975†.....	.0077 (1)	.0000 (0)
1963-75†.....	.0055 (11)	.0029 (10)

* Number of fatalities shown in parentheses.

† 1975 figures are preliminary.

TABLE 3
SCHEDULED AIR CARRIERS OF
UNITED STATES AND OTHER COUNTRIES
(PASSENGER/CARGO) AVIATION 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	
1963-66.....	.0026	.0008	.0007
1967-70.....	.0017	.0002	.0005
1971-74.....	.0011	.0005	.0006
1974†.....	.0010	.0011	.0010
1963-74†..	.0016	.0005	.0006

* Experience of helicopter air carriers is excluded.

† IATA figures are preliminary.

98 members in other countries (four IATA members do not operate scheduled passenger flights in fixed-wing aircraft). The safety record of airlines in countries other than the United States has shown improvement but continues to be less favorable than that of the United States scheduled airlines.

For 1974, 47 per cent of the scheduled passenger hours reported to IATA were flown by the United States members, and these members accounted for 89 per cent of the scheduled passenger hours flown by all United States Certificated Route Air Carriers. The combined international and domestic scheduled experience of all United States Certificated Route Air Carriers (passenger/cargo) is included in Table 3 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 annual flying time in General Aviation is more than five times that of the United States Civil Air Carrier Fleet's domestic flights. In January of each year, General Aviation aircraft owners receive a registration form from the FAA. Certain statistical information is requested, including the number of hours flown and the primary use of each aircraft. These statistics are then adjusted for "nonreporting" aircraft, which account for about 25 per cent of total estimated flying hours.

Death rates are expressed per 1,000 airplane 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 4, such data cannot be estimated reliably from the information supplied by the National Transportation Safety Board. Some distortion in death rates may occur because the methods used for assigning deaths are not totally consistent with those used for assigning airplane hours to a kind of flying.

Pleasure flying accounts for about 34 per cent of the time pilots spend 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 in pleasure flying and overreport hours for other types of flying (causing an understatement of death rates in these other categories). In Table 4 "Rental" hours are included with "Pleasure," on the assumption that most pilots renting planes do so for pleasure purposes. In past Society reports (for flying done before 1970), most rental hours were probably included under "Instruction." Caution should therefore be taken in analyzing long-term trends.

Instructional flying represents about 17 per cent of the total hours flown in General Aviation. The experience under flight training of civil-

ians includes the death of the instructor or the student, whoever was acting as pilot when the accident occurred. Practice flying not under the supervision of an instructor, either in the air or from the ground, is not included in the Instruction category. The higher pilot aviation death rates after 1969 reflect the reduced number of airplane hours due to the change in reporting method mentioned above for Rental aircraft.

The "Business" and "Corporate" categories, which account for approximately 28 per cent of total General Aviation, are composed of nonprofessional pilots flying for business reasons (Business) and professional pilots receiving direct salary or compensation for piloting planes operated (not for public hire) by a corporation or business firm

TABLE 4
GENERAL AVIATION FLYING BY KIND
PILOT AVIATION DEATH RATES PER 1,000 AIRPLANE HOURS

Years	Estimated Hours (000)	Aviation Deaths	Rate	Estimated Hours (000)	Aviation Deaths	Rate
	Pleasure			Instruction		
1971.....	9,359	349	.037	4,309	55	.013
1972.....	9,988	357	.036	4,427	48	.011
1973*.....	10,140	381	.038	5,052	44	.009
1971-73*	29,487	1,087	.037	13,788	147	.011
	Business			Corporate		
1971.....	4,503	73	.016	2,638	7	.003
1972.....	4,549	86	.019	2,690	12	.004
1973*.....	5,451	67	.012	3,106	23	.007
1971-73*	14,503	226	.016	8,434	42	.005
	Aerial Application			Air Taxi		
1971.....	1,398	38	.027	2,042	27	.013
1972.....	1,616	29	.018	2,329	37	.016
1973*.....	1,847	30	.016	2,802	38	.014
1971-73*	4,861	97	.020	7,173	102	.014

* 1973 figures are preliminary.

for the transportation of personnel or cargo in furtherance of the company's business (Corporate).

Air Taxi flying accounts for approximately 9 per cent 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. In 1973 there were 33 pilot deaths in small fixed-wing aircraft (12,500 pounds or less), of which 19 deaths were in passenger flights and 14 were in cargo flights. There were 2 pilot deaths in large fixed-wing aircraft. In rotorcraft there were 3 pilot deaths in passenger flights and none in cargo flights.

The pilot fatality rates in Aerial Application, which accounts for approximately 6 per cent of General Aviation flying, have been higher than those in other commercial activities. The subdivision of experience by type of aircraft in 1968-73 showed pilot aviation fatality rates per 1,000 airplane hours of 0.021 for rotorcraft (13 deaths) and 0.024 for fixed-wing aircraft (196 deaths). Aerial Application consists primarily of crop dusting, although there are a variety of other agricultural activities included (most of them involving chemicals). Fire control is not included in this category. The average annual flying time for pilots having a local business confined to a single growing season is believed to be considerably less than that of pilots who either work more than one season or move from area to area.

In addition to the 583 deaths recorded in all the categories shown in Table 4, there were 93 other pilot deaths during 1973. Of this number, 24 deaths occurred in aircraft being used for commercial purposes other than those shown in Table 4, such as power and pipeline patrol, fire control, survey, advertising, and photography; 15 deaths were classified as "noncommercial—other," a category that consists primarily of practice flying; and 54 deaths were classified as "miscellaneous." Miscellaneous accidents included 13 accidents in testing (including testing of homemade aircraft), 9 in ferrying, 2 in hunting, and 4 in demonstration, with the remaining 26 accidents in activities such as air-show participation, towing gliders, search and rescue, and unauthorized or unknown uses.

Of the 676 pilot deaths during 1973 in General Aviation, 638 were in small fixed-wing aircraft (12,500 pounds or less), 14 in large fixed-wing aircraft (over 12,500 pounds), 17 in rotorcraft, and 7 in gliders or other aircraft. There were 728 pilots involved in these fatal accidents, of which 52 held student certificates, 346 held private certificates, 260

held commercial certificates, 54 held airline transport certificates, 13 held no certificates, and 3 were listed as unknown.

CANADIAN CIVIL FLYING

Passenger and first-pilot aviation fatality rates per 1,000 hours in domestic and international operations of Canadian scheduled airlines

TABLE 5
CANADIAN AIRLINES
AVIATION FATALITY RATES*

Years	Passenger Rate per 1,000 Passenger Hours	First-Pilot Rate per 1,000 Airplane Hours
Scheduled Airlines		
1963-66. ....	.0033 (4)	.0029 (4)
1967-70. ....	.0010 (4)	.0011 (3)
1971-74. ....	.0000 (0)	.0000 (0)
1963-74. ....	.0010 (8)	.0011 (7)
1972-75 (est.) ....	.0000 (0)	.0000 (0)
Nonscheduled Airlines		
1967-70. ....	.0149 (64)	.0157 (47)
1971-74. ....	.0169 (82)	.0167 (60)
1967-74. ....	.0160 (146)	.0162 (107)

* Number of fatal accidents shown in parentheses.

derived from figures furnished by the Canadian Department of Transport and by Statistics Canada are shown in Table 5. 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 5.

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.

The fatality rates among Canadian civil pilots, by class of license,

are shown in Table 6, separately, for the periods 1967-70 and 1971-74, based on figures furnished by the Canadian Department of Transport. It should be noted that pilots holding airline transport licenses are not necessarily flying for scheduled airlines, since they may engage in other types of flying.

TABLE 6
CANADIAN CIVIL PILOTS BY CLASS OF LICENSE
1967-74 AVIATION FATALITY RATES

Class of License	Period	Life Years of Exposure	Aviation Fatalities	Rate per 1,000 Life Years of Exposure
Airline transport	1967-70	9,290	17	1.8
	1971-74	12,657	29	2.3
Senior commercial	1967-70	2,317	13	5.6
	1971-74	3,229	11	3.4
Commercial	1967-70	18,111	93	5.1
	1971-74	21,667	69	3.2
Private (excluding students)	1967-70	88,583	117	1.3
	1971-74	109,536	117	1.1
Glider	1967-70	4,744	4	0.8
	1971-74	5,166	4	0.8

UNITED STATES MILITARY

General

Where the necessary information is available, aviation fatality rates are shown both including and excluding deaths due to hostile action. As in the previous report, fatality rates which include deaths due to hostile action are shown without brackets, and fatality rates which exclude such deaths are shown within brackets.

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

In aggregate, the 1974 experience is at least as favorable as that reported for 1973 and as such represents a substantial drop in fatality rates since the height of the Vietnam conflict. The Air Force experience is quite similar to that in 1973, while the other services generally had experience better than that reported for 1973.

Age and Rank

Table 7 shows aviation fatality rates by age group, and Table 8 shows 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 (in contrast to nonrated) officers in the Air Force are those who have flying duties other than as a pilot.

The overall fatality rates for both Air Force pilots and nonpilot rated officers for 1974 were very similar to the 1973 rates.

TABLE 7
 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 INCLUDED*

Age Group	1967-70	1971-74	1974
Air Force Pilots			
Under 25.....	5.3 [3.4]	2.3 [1.9]	2.7 [2.7]
25-29.....	7.4 [4.3]	2.9 [1.9]	1.3 [1.2]
30-34.....	4.8 [2.9]	4.8 [2.7]	4.4 [1.1]
35-39.....	3.7 [2.3]	2.4 [1.4]	4.6 [1.5]
40 and over.....	1.8 [1.1]	2.0 [1.1]	2.0 [0.3]†
All.....	4.3 [2.6]	2.8 [1.7]	2.6 [1.2]
Air Force Nonpilot Rated Officers			
Under 25.....	0.6† [0.6]†	0.9† [0.9]†	0.0† [0.0]†
25-29.....	1.7 [1.1]	2.1 [1.5]	2.0 [1.4]†
30-34.....	1.7 [1.0]	1.8 [0.8]	2.1† [0.4]†
35-39.....	1.3 [0.6]	1.5 [1.2]	1.9† [1.5]†
40 and over.....	1.5 [1.1]	3.0 [1.4]	4.1† [0.0]†
All.....	1.5 [0.9]	1.8 [1.2]	1.9 [0.9]
Navy and Marine Corps Pilots			
Under 25.....	14.4 [9.3]	5.3 [5.3]	4.8† [4.8]†
25-29.....	13.1 [9.1]	4.4 [4.3]	3.5 [3.5]
30-34.....	10.1 [6.8]	3.1 [3.1]	1.2† [1.2]†
35-39.....	5.5 [3.7]	2.0 [2.0]	1.8† [1.8]†
40 and over.....	2.3 [1.7]	0.5 [0.5]	0.0† [0.0]†
All.....	9.0 [6.1]‡	3.2 [3.0]‡	2.5 [2.5]

* Rates in brackets exclude deaths due to hostile action.

† Based on 5 or fewer deaths.

‡ A small portion of total Navy and Marine Corps pilot deaths were not identified by age.

The 1974 fatality rates for Navy and Marine Corps pilots showed a decrease from the 1973 experience, both in aggregate and for most age groups. This decrease in fatality rates for Navy and Marine Corps pilots is a continuation of a decline which began in the mid- to late 1960's.

TABLE 8
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 INCLUDED*

Rank (Pay Grade)†	1967-70	1971-74	1974
Air Force Pilots			
2d Lieutenant (O-1)	3.7 [3.5]	3.6 [3.6]	5.6‡ [5.6]‡
1st Lieutenant (O-2)	7.3 [4.1]	3.0 [2.0]	1.2 [1.2]
Captain (O-3)	6.3 [3.6]	3.4 [2.1]	2.5 [1.5]
Major (O-4)	4.1 [2.6]	3.2 [1.9]	4.1 [1.1]
Lieutenant Colonel (O-5)	1.7 [1.2]	1.7 [1.0]	1.8 [0.5]‡
General and Colonel (O-6 and up)	0.9 [0.7]	1.8 [0.5]	3.7 [0.0]‡
All	4.3 [2.6]	2.8 [1.7]	2.6 [1.2]
Air Force Nonpilot Rated Officers			
2d Lieutenant (O-1)	0.0‡ [0.0]‡	0.4‡ [0.4]‡	3.1‡ [3.1]‡
1st Lieutenant (O-2)	1.5 [1.2]	2.0 [1.6]	0.4‡ [0.4]‡
Captain (O-3)	1.8 [1.2]	2.1 [1.4]	1.7 [0.8]‡
Major (O-4)	1.3 [0.6]	2.1 [1.3]	3.3 [1.8]
Lieutenant Colonel (O-5)	0.9‡ [0.7]‡	0.7‡ [0.3]‡	0.0‡ [0.0]‡
General and Colonel (O-6 and up)	0.0‡ [0.0]‡	10.5‡ [0.0]‡	55.6‡ [0.0]‡
All	1.5 [0.9]	1.8 [1.2]	1.9 [0.9]
Navy and Marine Corps Pilots			
2d Lieutenant (O-1)	16.6 [10.5]	2.2‡ [2.2]‡	0.0‡ [0.0]‡
1st Lieutenant (O-2)	16.5 [10.5]	5.4 [5.3]	4.6 [4.6]
Captain (O-3)	10.7 [7.5]	4.4 [4.2]	3.7 [3.7]
Major (O-4)	7.5 [5.4]	2.3 [2.2]	1.5‡ [1.5]‡
Lieutenant Colonel (O-5)	3.0 [1.9]	1.1 [0.9]	0.3‡ [0.3]‡
General and Colonel (O-6 and up)	0.3‡ [0.3]‡	0.0‡ [0.0]‡	0.0‡ [0.0]‡
All	9.0 [6.1]§	3.2 [3.0]§	2.5 [2.5]

* Rates in brackets exclude deaths due to hostile action.

† Ranks shown are for Army, Air Force, and Marine Corps; equivalent Navy ranks apply to Navy experience.

‡ Based on 5 or fewer deaths.

§ A small portion of total Navy and Marine Corps pilot deaths were not identified by rank.

Duty Assignment

Aviation fatality rates among Air Force pilots with full-time flying duties are shown in Table 9 according to duty assignment. In this table pilots who were not assigned to a specific flying duty but flew chiefly to maintain proficiency are excluded from the experience. As was re-

TABLE 9
 UNITED STATES AIR FORCE PILOTS,
 BY DUTY ASSIGNMENT
 AVIATION FATALITY RATES
 PER 1,000 LIFE YEARS OF EXPOSURE

Duty Assignment*	1971-74	1974
Including Deaths due to Hostile Action		
Pilot, search rescue	1.7†	0.0†
Pilot, helicopter	4.1	0.0†
Pilot, tanker	0.2†	0.4†
Pilot, bomber	2.8	1.4†
Pilot, reconnaissance	3.8	3.5†
Pilot, trainer	1.1	1.7
Pilot, cargo	2.2	1.6
Pilot, observation	11.9	8.5†
Pilot, fighter	10.5	12.9
Pilot, utility	5.1	0.0†
Pilot, fighter bomber	8.8†	8.8†
All	3.4	3.6
Excluding Deaths due to Hostile Action		
Pilot, search rescue	0.0†	0.0†
Pilot, helicopter	1.2†	0.0†
Pilot, tanker	0.2†	0.4†
Pilot, bomber	2.4	1.0†
Pilot, reconnaissance	1.9	0.9†
Pilot, trainer	1.1	1.7
Pilot, cargo	1.7	1.0†
Pilot, observation	4.6	1.7†
Pilot, fighter	5.5	3.5
Pilot, utility	5.1	0.0†
Pilot, fighter bomber	8.8†	8.8†
All	2.1	1.6

* In this table pilots who were not assigned to a specific flying duty but flew chiefly to maintain proficiency are excluded from the exposure.

† Based on 5 or fewer deaths.

flected in Tables 7 and 8, the fatality rates in aggregate are very similar between 1973 and 1974. A new duty assignment, pilot of a fighter bomber, was added this year.

Hours of Flying

Average hours of flying are based on the flying time of pilots who fly chiefly to maintain proficiency, as well as those with full-time flying duties.

In 1974 Navy pilots flew an average of 82 hours, and Active Naval Reserve pilots flew an average of 61 hours. These figures represent substantial reductions from the averages of 193 hours for Navy pilots and 193 hours for Active Naval Reserve pilots reported in 1973. For Marine Corps pilots and Active Marine Corps Reserve pilots the 1974 figures are 175 and 188 hours, respectively. The flying hours for Active Marine Corps Reserve pilots showed a marked increase over the corresponding number for 1973.

During 1974 Army pilots flew an average of 27 hours in fixed-wing aircraft, which was slightly lower than the average number of hours flown in 1973. The average number of hours flown in rotary-wing aircraft was 68, a reduction of over 25 per cent from the figure recorded for 1973. The average numbers of flying hours by type of aircraft can be misinterpreted unless it is understood how these numbers were derived. The total number of flying hours flown by Army pilots was divided into two categories: those flown in fixed-wing aircraft and those flown in rotary-wing aircraft. However, in reporting mean strengths, the Army divides its pilots into three categories: those qualified to fly only fixed-wing aircraft, those qualified to fly only rotary-wing aircraft, and those qualified to fly both. The average flying hours mentioned above are derived by dividing the number of flying hours flown in a particular type of craft by the number of aviators qualified to fly that aircraft (i.e., single-qualified only plus dual-qualified pilots). Since the number of Army pilots who are dual-qualified is large, especially in relation to the number of those qualified only for fixed-wing aircraft, the above averages can be used only to represent the number of hours flown in each type of aircraft by those qualified to fly that type, not the number flown by those pilots actually assigned to fly that type of aircraft only. The portion of hours flown by dual-qualified pilots in each type of aircraft is not available. Taking all types of aircraft combined, Army pilots flew an average of 75 hours during 1974. This average number of flying hours represents a continuation of a downward trend experienced over the last four years. The average

numbers of flying hours for Army pilots during 1973, 1972, 1971, and 1971-74 are 101, 103, 163, and 115, respectively.

The average number of aircraft hours for Air Force pilots is not available. In 1974 the average annual flying time for Air National Guard pilots on flying status was 107 hours, which was less than in 1973.

Military Air Command (MAC)

Aviation fatality rates in 1974 among pilots and crew members of MAC, a branch of the Air Force, are shown in Table 10. Decreases

TABLE 10
MILITARY AIR COMMAND (MAC)
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE
DEATHS DUE TO HOSTILE ACTION INCLUDED*

	1967-70	1971-74	1974
Pilots:			
Transport units.....	0.6 [0.6]	1.0 [0.9]	0.9† [0.9]†
Other units.....	2.5 [1.2]	2.4 [1.4]	1.2† [1.2]†
All.....	1.4 [0.8]	1.5 [1.1]	1.0† [1.0]†
Crew members:			
Transport units.....	0.9 [0.9]	0.7 [0.6]	0.9† [0.9]†
Other units.....	3.3 [1.9]	1.8 [0.9]	1.6† [1.6]†
All.....	1.8 [1.3]	1.1 [0.7]	1.1 [1.1]

* Rates in brackets exclude deaths due to hostile action.

† Based on 5 or fewer deaths.

from 1973 rates were recorded in all but one of the categories. The decrease was larger for pilots than for crew members; however, the number of fatalities in each case was small. The experience of MAC pilots is also included in Tables 7-9. There were no hostile deaths reported in 1974 among Military Air Command pilots or crew members.

United States Army

Table 11 includes data for Army pilots and crew members for all flying operations. All 1974 rates have shown a sizable decrease over those of 1973. As was true in 1973, no hostile deaths were recorded in 1974. This is in contrast to the four-year period 1967-70, when virtually half of all aviation fatalities were due to hostile action. Both hostile and nonhostile fatality rates have decreased substantially from the rates recorded at the height of the Vietnam conflict.

Student Pilots

Table 12 presents aviation fatality rates for student pilots in the military services. Each of the 1974 rates shown increased over those of 1973. However, only the rate for Air Force student pilots was based on more than 5 deaths.

TABLE 11
UNITED STATES ARMY—ALL FLYING OPERATIONS
DEATHS DUE TO HOSTILE ACTIONS INCLUDED*

	1971-74	1974
Aviation Fatality Rates per 1,000 Life Years of Exposure		
Pilots	4.0 [2.2]	0.2† [0.2]†
Crew members	14.8 [7.0]	1.0 [1.0]
Pilot Fatality Rates per 1,000 Aircraft Hours		
Fixed-wing aircraft . . . . .	.0341 [.0304]	.0063† [.0063]†
Rotary-wing aircraft . . . . .	.0347 [.0167]	.0019† [.0019]†
All types of aircraft . . . . .	.0346 [.0188]	.0025† [.0025]†

* Rates in brackets exclude deaths due to hostile action.

† Based on 5 or fewer deaths.

TABLE 12
UNITED STATES AIR FORCE, NAVY AND MARINE CORPS,
AND ARMY STUDENT PILOTS
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE

	1967-70	1971-74	1974
Air Force*	2.2	1.7	3.4
Navy and Marine Corps:*			
Basic course	3.9	1.5	1.6†
Advanced course	11.2	4.2	5.0†
Army	4.2	1.5‡	N.A.§

* Commissioned officers only.

† Based on 5 or fewer deaths.

‡ Calendar years 1971-73.

§ N.A. = Not available.

Coast Guard

During the four-year period 1971-74 the aviation fatality rates per 1,000 life years of exposure for Coast Guard personnel on flight orders were 1.1 for pilots and 0.7 for crew members. There have been no aviation fatalities for Coast Guard student pilots and observers for the last eighteen years.

Active Reserves and National Guard

Table 13 shows the aviation fatality rates for Army, Navy, and Marine Corps pilots in the active reserves and for Air and Army

TABLE 13
PILOTS IN THE ACTIVE RESERVES AND NATIONAL GUARD
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE

	1967-70	1971-74	1974
Navy and Marine Corps Reserves:			
Ages under 30.....	3.3	0.8*	0.0*
Ages 30 and over.....	2.0	0.9	1.1*
All ages.....	2.3	0.9	0.9*
Army Reserves.....	N.A.†	1.4	0.9*
Air National Guard.....	2.0	2.1	2.1
Army National Guard.....	0.7	1.1	0.0*

* Based on 5 or fewer deaths.

† N.A. = Not available.

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. With the exception of the Air National Guard aviation fatality rate, each rate in 1974 was based on 5 or fewer deaths.

Air Force Flight Surgeons and Nurses

During the four-year period 1971-74 the fatality rate for Air Force flight surgeons was 0.3 per 1,000 life years of exposure, as it was for 1970-73. There have been no fatalities among Air Force flight nurses in the last thirteen years.

Graduates of Academies—Assignment to Aviation

Of those graduates of the military service academies in 1974 who were accepted for flight training by the Air Force, 98.6 per cent

were from the Air Force Academy, 1.4 per cent were from the Military Academy, and none were from the other academies.

Of the commissioned Air Force Academy graduates in 1974, all received their assignments in the Air Force.

CANADIAN MILITARY

Aviation fatality rates among Canadian regular military forces, excluding reserves, for the period 1969-74 are shown in Table 14 by age, rank, and functional classification. The average number of flying hours for all pilots combined has remained steady over the six-year period at approximately 300 hours per year and shows little variation by age group. Crew members average around 350 hours per year. The average annual flying time for transport and maritime pilots and crew is con-

TABLE 14
CANADIAN REGULAR FORCES
1969-74 AVIATION FATALITY RATES
PER 1,000 LIFE YEARS OF EXPOSURE

	Pilots	Crew
Age group:		
Under 25.....	11.1	2.3*
25-29.....	4.2	1.6*
30-34.....	3.8	3.2
35-39.....	2.0*	2.2
40 and over.....	0.8*	1.0*
All.....	3.8	2.0
Rank:		
Lieutenant and lower rank.....	8.3	2.6
Captain.....	4.0	1.5
Major.....	1.0*	*
Lieutenant Colonel and higher rank.....	*	*
All.....	3.8	2.0
Functional classification:†		
Fighter.....	4.2	4.0*
Training.....	2.2	*
Transport.....	1.7	1.6
Maritime.....	2.5*	1.0*
Helicopter.....	3.2	4.0*
Others.....	1.0*	0.6*
All.....	2.4	1.6

* Based on 5 or fewer deaths.

† The fatality rates by functional classification are understated because some pilots and crew members fly more than one type of aircraft. The extent of understatement by type of aircraft cannot be measured.

siderably higher than those in the categories of fighter, training, and helicopter. The former average 350 hours per year, the latter less than 200 hours per year. The functional classification "Others" is composed largely of pilots who ferry plans 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

For this year's study, each of the tables is based on the 1971-74 experience for 1967 and subsequent issues. The data being accumulated for 1967 and subsequent issues is still relatively scanty as compared with that in the previous study (*1973 Reports*), which was based on 1968-72 experience for 1959 and subsequent issues. This reflects individual company selection of aviation risks during the Vietnam period. 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 twenty companies, as compared with nineteen companies contributing to the study of two years ago. The results in general are similar to those of the previous study. The number of deaths by enemy action was virtually eliminated by the change in issue years and exposure period.

Civilian Aviation

Tables 15 and 16 show the fatality rates experienced in recent years among civilian pilots. The experience is by number of policies, and the classification of the insured is according to status at the time of application for insurance. Policies issued with an aviation clause are not included. Exposure in the "With Aviation Extra Premium" category is terminated when the extra premium is discontinued. For those policies where there is still an aviation hazard after discontinuance of the extra premium, companies have been encouraged to transfer the exposure to the "Without Aviation Extra Premium" classification. Not all companies have been able to do this, and consequently the experience for that classification includes only a portion of such cases.

Table 15, which corresponds to Table 14 of the *1973 Reports*, covers the experience for various categories of pilots for policies issued with and without aviation extra premium. The "Scheduled airline" category is

defined by the coding instructions as United States Certificated Route Air Carriers and corresponding major Canadian airlines. The "Corporate" category is defined as hired pilots flying company-owned planes. "Charter and other airlines" includes the supplemental air carriers and intrastate and foreign airlines, as well as air-taxi and charter operations. The "Others" category includes corporate and charter pilots insured by companies unable to subdivide data, as well as specialty pilots in such

TABLE 15
INTERCOMPANY EXPERIENCE ON PILOTS IN CIVILIAN
AVIATION—BY POLICIES*
(1971-74 Experience on 1967 and Subsequent Issues)

STATUS AT ISSUE	WITH AVIATION EXTRA PREMIUM			WITHOUT AVIATION EXTRA PREMIUM		
	Years of Exposure	Aviation Fatalities	Rate per 1,000	Years of Exposure	Aviation Fatalities	Rate per 1,000
Scheduled airline pilots	625	1		1,842	6	0.8
Other commercial pilots flying for hire:						
Instructing (at least half-time)	3,664	10	2.7	231	1	.....
Corporate	1,881	2	1.1	3,064	1	.....
Charter and other airlines	2,765	10	3.6	521	1	.....
Others†	2,446	6	2.6	623	1	.....
Private pilots	22,275	24	1.1	85,101	87	1.0
Student pilots	35,129	21	0.6	4,717	9	1.9

* 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.

† Includes exposure of companies unable to subdivide data.

occupations as aerial application, pipeline survey, advertising, and photography. Private pilots are defined by the coding instruction as those with 100 or more solo hours of flying for pleasure or personal business only, and student pilots are defined as those with less than 100 solo hours.

For both private pilots and student pilots there was some improvement in the "With Aviation Extra Premium" fatality rates per 1,000 as compared with the previous study (private pilots: 1.1 versus 2.1; student pilots: 0.6 versus 1.1). There was 1 war death among the 21 deaths of student pilots. The rate of 1.9 per 1,000 for student pilots

without aviation extra premium is misleading, since 7 of the 9 fatalities are policies on the same life.

Table 16 corresponds to Table 15 in the *1973 Reports* and shows, both with and without aviation extra premium, the experience for private pilots, subdivided by hours flown, type of flying certificate, and attained age. The exposure for issues without aviation extra premium

TABLE 16
 INTERCOMPANY EXPERIENCE ON PILOTS FLYING FOR
 PLEASURE OR PERSONAL BUSINESS—BY POLICIES*
 (1971-74 Experience on 1967 and Subsequent Issues)

	WITH AVIATION EXTRA PREMIUM			WITHOUT AVIATION EXTRA PREMIUM		
	Years of Exposure	Aviation Fatalities	Rate per 1,000	Years of Exposure	Aviation Fatalities	Rate per 1,000
By hours flown:†						
Under 100.....	11,966	8	0.7	55,081	37	0.7
100-199.....	5,429	5	0.9	24,138	42	1.7
200-299.....	2,309	3	1.3	2,745	2	0.7
300 or more.....	2,187	6	2.7	1,350	2	1.5
By type of flying certificate:						
Commercial or transport.....	5,982	6	1.0	17,239	20	1.2
Private.....	16,293	18	1.1	67,862	67	1.0
By attained age:						
Under 35.....	14,069	11	0.8	19,134	18	0.9
35-49.....	6,198	12	1.9	50,507	49	1.0
50 and over.....	2,008	1	.....	15,460	20	1.3
Total.....	22,275	24	1.1	85,101	87	1.0

* 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.

† Hours flown in 12 months preceding issue. Excludes experience of companies unable to subdivide data.

includes an unknown proportion of lives who have discontinued their flying activities. However, a comparison of Table 16 with Table 15 in the *1973 Reports*, which includes a larger proportion of older issues, does not show any significant difference in the "Without Aviation Extra Premium" fatality rates for the two studies. For the "With Aviation Extra Premium" category, not only was the fatality rate for all classifications combined less than that in the *1973 Reports* (1.1 versus 2.1), but the rate for each individual classification was also less.

Military Aviation

Table 17 displays the aviation fatality rates for the years 1971-74 among military aviation pilots on policies issued with an aviation extra premium. The experience is by number of policies, and the classification of the insured is determined by his status at the time of application for insurance. Exposure was terminated when the extra premium was discontinued. There were relatively few military aviation exposures and deaths included in the study, making it difficult to draw any meaningful conclusions. The ratio of military aviation exposures to civilian aviation exposures dropped to about one-half of what it was in the prior study. There were not sufficient data to show the experience by type of aircraft; however, most of the Army experience was on helicopter

TABLE 17
INTERCOMPANY EXPERIENCE ON MILITARY PILOTS BY BRANCH OF SERVICE
AND FLYING DUTIES — WITH AVIATION EXTRA PREMIUM*
(1971-74 Experience on 1967 and Subsequent Issues — by Policies)

STATUS AT ISSUE AND ATTAINED INSURANCE AGE	OPERATIONAL			ADMINISTRATIVE		
	Years of Exposure	Aviation Fatalities†	Rate per 1,000	Years of Exposure	Aviation Fatalities†	Rate per 1,000
U.S. Air Force:						
Under 35	5,228	9 [8]	1.7 [1.5]	486	3 [2]	6.2 [4.1]
35 and over	3,369	5	1.5	1,726	3	1.7
Total	8,597	14 [13]	1.6 [1.5]	2,212	6 [5]	2.7 [2.3]
U.S. Army:						
Under 35	3,830	12 [11]	3.1 [2.9]	2,436	3 [2]	1.2 [0.8]
35 and over	783	1	.....	1,172	2	1.7
Total	4,613	13 [12]	2.8 [2.6]	3,608	5 [4]	1.4 [1.1]
U. S. Navy	2,337	3	1.3	1,128	1 [0]	.....
U.S. Marine Corps:	737	0	.....	380	0	.....
U.S. Air Force, Army, Navy, and Marine Corps Reserve				926	2	2.2
U.S. Air National Guard				877	2	2.3

* Exposure is terminated on discontinuance of extra premium.

† Figures in brackets exclude deaths from enemy action but do not exclude other fatalities in combat missions.

flying. It is expected that for subsequent reports more significant data will have been accumulated.

Administrative pilots are defined by the coding instructions as those flying only 40–150 hours annually; operational pilots are defined as those flying over 150 hours annually. The experience for Reserve and Air National Guard pilots is included under the “Administrative” column heading, since the annual hours flown are usually less than 150. There were only 5 deaths (Operational and Administrative combined) due to enemy action, and these are excluded in the figures and rates shown in brackets. There were only 5 deaths on military crew members (operational) for all branches of service. The fatality rate for these crew members was 0.5 per 1,000.

