

**TRANSACTIONS OF SOCIETY OF ACTUARIES  
1968 REPORTS**

**REPORT OF THE COMMITTEE ON AVIATION  
AVIATION STATISTICS**

**T**HIS report presents primarily new data which have become available during the past year. Data for earlier periods have been included for comparison and to indicate trends.

Only aviation deaths are used in determining death rates. The effects on death rates of fatalities due to enemy or hostile action against United States military forces are shown separately where data are available.

The Committee has encountered some problems in the collection and interpretation of data on Military Aviation, for reasons related to present hostilities and, for Canada, to changes in procedures by which the authorities assemble data. However, for the first time the experience of the United States Navy and Marine Corps is shown both including and excluding deaths due to hostile action.

**SCHEDULED AIRLINES**

*United States Airlines*

As in previous years' reports, the information in this section relates only to passenger/cargo air carriers as listed in the *FAA Statistical Handbook of Aviation*. These are air carriers holding certificates of public convenience and necessity issued by the Civil Aeronautics Board, authorizing them to perform scheduled air transportation of passengers and property over specified routes and a limited amount of nonscheduled or charter operations.

Some companies not listed as passenger/cargo air carriers may use such terms as "airlines," "airways," and "carrier" and may provide some scheduled passenger service on a limited basis. Nevertheless, data regarding their activities are included under the "Supplemental Airlines" or "General Aviation Flying" sections of this report.

"Domestic" operations are in general within the territory 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 United States points separated by foreign territory or major expanses of international waters. Operations between the United States mainland and Alaska, Hawaii, Puerto Rico, or other outlying areas of the United States are included in "International" operations, as are those parts of international flights which are over "domestic" territory.

Table 1 shows the recent aviation fatality rates in United States scheduled airlines for passengers, pilots, and other crew members. "All Pilots" and "Other Crew Members" include persons who may do less than the normal amount of flying on account of having some supervisory duties or for other reasons.

The small number of fatal accidents and the relatively large number of passenger fatalities in some accidents result in fatality rates which are subject to marked fluctuation from year to year. Despite this, in domestic

TABLE 1  
UNITED STATES SCHEDULED AIRLINES AVIATION DEATH RATES  
(Number of Fatal Accidents in Parentheses)

	1956-59	1960-63	1964-67	1967*	1968 (Est.)
Passenger Death Rate per 1,000 Scheduled Passenger Hours†					
Domestic.....	.0010 (20)	.0012 (18)	.0008 (22)	.0010 (7)	.0009 (6)
International.....	.0011 (4)	.0008 (3)	.0007 (3)	.0000 (0)	.0008 (2)
Total.....	.0010 (24)	.0011 (21)	.0008 (25)	.0008 (7)	.0009 (8)
First-Pilot Death Rate per 1,000 Scheduled Airplane Hours†					
Domestic.....	.0011 (14)	.0014 (17)	.0013 (19)	.0015 (6)	.0013 (6)
International.....	.0012 (3)	.0011 (2)	.0013 (3)	.0000 (0)	.0011 (1)
Total.....	.0011 (17)	.0014 (19)	.0013 (22)	.0012 (6)	.0013 (7)
Death Rate of All Pilots and Copilots per Life Year of Exposure‡					
Domestic.....	.0009 (21)	.0010 (25)	.0006 (22)	.0008 (7)	.0008 (8)
International.....	.0008 (3)	.0009 (3)	.0008 (4)	.0000 (0)	.0015 (2)
Total.....	.0009 (24)	.0010 (28)	.0007 (26)	.0007 (7)	.0009 (10)
Death Rate of Other Crew Members per Life Year of Exposure‡					
Domestic.....	.0010 (18)	.0011 (19)	.0005 (17)	.0006 (7)	.0003 (6)
International.....	.0015 (3)	.0014 (3)	.0011 (4)	.0000 (0)	.0017 (3)
Total.....	.0011 (21)	.0012 (22)	.0006 (21)	.0005 (7)	.0005 (9)

\* Preliminary.

† Helicopter experience excluded beginning in 1957.

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

flying, death rates resulting from experiences over successive four-year periods from 1956 are fairly constant. The passenger death rate for the entire period 1956-68 is 0.0010 per 1,000 scheduled passenger hours. Also in domestic flying, the death rate for first pilots for the period 1956-68 is 0.0013 per 1,000 scheduled airplane hours.

In scheduled international flying of United States scheduled airlines, the death rates for the entire period 1956-68 are 0.0008 per 1,000 scheduled passenger hours for passengers and 0.0012 per 1,000 scheduled airplane hours for first pilots. In 1968 in this type of flying there were two fatal accidents, causing the deaths of 47 passengers, 1 first pilot, 1 copilot, and 8 other crew members. In addition one fatal accident on a nonscheduled flight took the lives of 1 first pilot, 1 copilot, and 1 other crew member.

Pilots engaged in scheduled 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 limited either to 100 hours per month or 300 hours every 90 days. In actual practice, pilots average less hours monthly because they have ground duties before and after flights.

Helicopters flew approximately 169,000,000 passenger miles in scheduled passenger service during the ten years 1959-68. In this period four fatal accidents have produced a passenger death rate of 0.029 per 1,000 scheduled passenger hours. Two of the fatal accidents occurred in 1968, taking the lives of 38 passengers, 2 first pilots, 2 copilots, and 2 other crew members. The other two fatal accidents were referred to in the 1964 report.

#### *Airlines 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 crossing international boundary lines may require. From *World Air Transport Statistics*, a publication of the International Air Transport Association, the Committee has summarized the experience of most of the Association's members. Some companies operate only within the border of a particular country, some only on an international basis, and some, in varying proportions, on both bases.

By making reasonable assumptions regarding average speed, the passenger fatality rates per 1,000 scheduled passenger hours were derived for United States airlines reporting to I.A.T.A. and for the member airlines of all other countries combined. The fatality rates are compared in

Table 2. Almost 50 per cent of the total scheduled passenger hours were flown by United States airlines. Approximately 80 per cent of the scheduled passenger hours flown by United States scheduled airlines were accumulated by airlines which report to the I.A.T.A. The combined international and domestic scheduled experience of all United States scheduled airlines is also included in Table 2 for comparison. The passenger fatality rates presented in Table 2 relate to scheduled services only, excluding United States helicopter services.

The safety record of other countries' airlines' scheduled services has been improving but continues to be less favorable than that of United States scheduled airlines.

TABLE 2  
SCHEDULED AIRLINES OF  
UNITED STATES AND OTHER COUNTRIES  
PASSENGER AVIATION DEATH RATES  
PER 1,000 PASSENGER HOURS

PERIOD	MEMBERS REPORTING TO I.A.T.A.		ALL UNITED STATES AIRLINES
	Countries Other than the United States	United States	
1956-59 . . . . .	.0031	.0009	.0010
1960-63 . . . . .	.0040	.0013	.0011
1964-67 . . . . .	.0019	.0007	.0008
1967* . . . . .	.0010	.0005	.0008

\* Preliminary.

*All-Cargo Carriers*

These are a class of air carriers holding temporary certificates of public convenience and necessity, issued by the Civil Aeronautics Board, authorizing the performance of scheduled air flight express and mail transportation over specified routes as well as the conduct of nonscheduled operations which may include passengers.

In the twelve years 1956-67 the first-pilot fatality rate for scheduled all-cargo services was 0.010 per 1,000 airplane hours, based on 8 deaths. In the four-year period 1956-59, the first-pilot fatality rate was 0.005 per 1,000 airplane hours, based on 2 first-pilot deaths; in 1960-63 the rate was 0.010, based on 2 first-pilot deaths; in 1964-67 the rate was 0.016, based on 4 first-pilot deaths. In combined scheduled and nonscheduled services of the all-cargo carriers there were 6 first-pilot deaths in the four years 1964-67, producing a death rate of 0.008 per 1,000 airplane hours.

## SUPPLEMENTAL AIRLINES

These airlines are a class of air carriers holding temporary certificates of public convenience and necessity, authorizing them to perform passenger and cargo charter services supplementing the scheduled service of the certificated route air carriers. In addition, they can perform on a limited or temporary basis, as authorized by the Civil Aeronautics Board, scheduled operations including the transportation of individually ticketed passengers.

The figures shown in Table 3 include experience in operations under contracts with military authorities. During the eight-year period 1960-67, the passenger death rate was 0.004 per 1,000 passenger hours, and the death rate among first pilots was 0.005 per 1,000 airplane hours.

TABLE 3  
SUPPLEMENTAL AIR CARRIERS—AVIATION DEATH RATES  
(Number of Fatal Accidents in Parentheses)

PERIOD	PASSENGER		FIRST PILOT	
	Aviation Deaths	Rate per 1,000 Passenger Hours	Aviation Deaths	Rate per 1,000 Airplane Hours
1960-63.....	244 (4)	.008	6	.007
1964-67.....	80 (2)	.001	5	.004
1967 (est.).....	0	.000	1	.003
1968 (est.).....	1 (1)	.000	0	.000

## GENERAL AVIATION FLYING

General aviation flying includes all domestic civil flying except that performed by the public carriers (passenger/cargo carriers, all-cargo carriers, and supplemental airlines). The annual flying time of planes in general aviation totals more than five times the flying time of public carriers in their domestic flights. The number of hours flown in general aviation is estimated by the FAA from sampling surveys (most recent one in 1962) of aircraft use, supplemented by FAA estimated breakdowns of general information obtained at the time of FAA annual inspection of aircraft.

Pilot death rates per 1,000 airplane hours are shown in Table 4 for five classes of flying. Death rates referred to in this section are death rates per 1,000 airplane hours. It is not practical to determine death rates per life year of exposure from the material from which this information has been derived. Such death rates may be markedly lower than death rates per 1,000 airplane hours, depending on the number of hours a pilot flies each

year. Of course, this is only one of many factors affecting pilot death rates.

Certain "other" noncommercial and miscellaneous types of flying, such as test, demonstration, and ferry, are not included in Table 4 because the number of flying hours is not available. There were 47 fatalities in these types of flying during 1966.

Pleasure flying accounts for approximately 20 per cent of the total general aviation flying time in the most recent year but for somewhat more than one-half of the pilot fatalities. During 1963-66 the death rate of pilots in pleasure flying was the highest among the five categories in general aviation shown in Table 4.

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

Period	Hours* (000)	Aviation Deaths	Rate	Hours* (000)	Aviation Deaths	Rate
	Pleasure			Instruction		
1963 .....	3,626	224	.062	2,417	25	.010
1964 .....	3,777	222	.059	2,675	18	.007
1965 .....	4,016	260	.065	3,346	29	.009
1966 .....	4,540	293	.065	5,674	34	.006
1963-66..	15,959	999	.063	14,112	106	.008
	Business and Corporate			Commercial† (Excluding Aerial Application)		
1963 .....	5,740	93	.016	2,208	31	.014
1964 .....	5,823	93	.016	2,313	41	.018
1965 .....	5,857	77	.013	2,332	33	.014
1966 .....	7,057	70	.010	2,516	41	.016
1963-66..	24,477	333	.014	9,369	146	.016
	Aerial Application					
1963 .....	964	30	.031			
1964 .....	992	43	.043			
1965 .....	1,016	34	.033			
1966 .....	1,039	40	.038			
1963-66..	4,011	147	.037			

\* FAA estimate based on 1962 survey of aircraft used in general aviation supplemented by information obtained on FAA annual inspection of such aircraft.

† Includes air taxi (see Table 5).

Flight training of civilians presents a favorable record. The pilot death rate for the years 1963-66 was 0.008 per 1,000 airplane hours. Included are the deaths of the instructor or the student, whoever was acting as pilot when the accident occurred. The hours of instructional flying now represent over 25 per cent of the total in general aviation. Practice flying when not under the supervision of an instructor, either in the air or from the ground, is included in pleasure flying.

The "Business and Corporate" category, which accounts for about 35 per cent of total general aviation flying, is 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 for the transportation of

TABLE 5  
AIR TAXI  
PILOT AVIATION DEATH RATES  
PER 1,000 AIRPLANE HOURS

Period	Hours (000)	Aviation Deaths	Rate
1964.....	1,659	22	.013
1965.....	1,802	18	.010
1966.....	1,744	24	.014
1964-66...	5,205	64	.012

personnel or cargo in furtherance of the company's business (Corporate). The number of flying hours is not available for these two categories separately for the year 1966. See the 1967 report for a breakdown between "Business" and "Corporate" flying for the years 1964-65.

Commercial flying—which includes the transportation of passengers and cargo for hire, survey and patrol activities, aerial application, miscellaneous flying (such as search and rescue work) and Civil Air Patrol—accounts for over 15 per cent of the total hours in general aviation. Included in this subdivision are pilots who fly scheduled passenger routes for air taxi and other commercial operators. Death rates per 1,000 airplane hours for pilots flying air taxis are shown in Table 5 for the years 1964-66. This group includes scheduled and nonscheduled taxi flying and charter flying not done by scheduled airlines and supplemental airlines.

The pilot fatality rates in aerial application have been higher than those in other commercial activities, being estimated at 0.037 per 1,000 airplane hours for the years 1963-66. These figures include 159,000 hours flown during 1963-66 for such purposes by rotocraft (helicopter) with 3 deaths, a

fatality rate of 0.019 per 1,000 airplane hours. This compares with 3,850,000 hours flown by other planes during the same period with 144 deaths and a fatality rate of 0.037 per 1,000 airplane hours. Aerial application includes any form of flying in which chemicals are distributed from aircraft upon the land below, the usual form being crop-dusting. Fire control is not included in this category. The average annual flying time is believed to vary considerably among pilots who have a local business confined to a single growing season and those who move from area to area with the season.

CANADIAN CIVIL FLYING

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 the Canadian Department of Transport and the Dominion Bureau of Statistics are shown in Table 6.

TABLE 6  
CANADIAN SCHEDULED AIRLINES  
AVIATION FATALITY RATES  
(Number of Fatal Accidents in Parentheses)

Years	Passenger Fatality Rate per 1,000 Passenger Hours	First-Pilot Fatality Rate per 1,000 Airplane Hours
1956-59.....	.0025 (4)	.0027 (3)
1960-63.....	.0025 (3)	.0015 (2)
1964-67.....	.0014 (3)	.0020 (3)
1956-67.....	.0020 (10)	.0020 (8)
1965-68 (est.).....	.0012 (3)	.0018 (3)

Comparable first-pilot aviation fatality rates for Canadian non-scheduled airlines have been estimated from the same sources and are shown in Table 7, compared with corresponding fatality rates in scheduled flying (domestic and international).

Data from similar sources have been used to estimate the passenger aviation fatality rates per 1,000 passenger hours in domestic nonscheduled operations of Canadian carriers which are shown in Table 8.

Canadian scheduled airlines comprise air carriers which serve designated points in accordance with a definite service schedule. Non-scheduled airlines are those which 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 9, separately, for the periods 1960-63 and 1964-67, 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 7  
CANADIAN NONSCHEDULED VERSUS  
SCHEDULED AIRLINES  
FIRST-PILOT FATALITY RATES PER  
1,000 AIRPLANE HOURS  
(Number of Fatal Accidents in Parentheses)

Years	Nonscheduled	Scheduled
1960-63 . . . . .	.0159 (21)	.0015 (2)
1964-67 . . . . .	.0186 (39)	.0020 (3)
1960-67 . . . . .	.0176 (60)	.0017 (5)

TABLE 8  
CANADIAN NONSCHEDULED FLYING—  
DOMESTIC OPERATIONS  
AVIATION FATALITY RATES  
(Number of Fatal Accidents in Parentheses)

Years	Passenger Fatality Rate per 1,000 Passenger Hours
1960-63 . . . . .	.0106 (19)
1964-67 . . . . .	.0189 (40)
1960-67 . . . . .	.0150 (59)

The 1964-67 fatality rates for airline transport, senior commercial and private pilots have not changed significantly from those of the 1960-63 period. The fatality rate for commercial pilots, however, has been somewhat higher in the more recent period.

Excluded from the experience in Table 9 were persons holding glider licenses only, of whom there have been a steadily increasing number—712 in 1964, 793 in 1965, 870 in 1966, and 971 in 1967, with one fatality in each of the years 1964 and 1965 and two fatalities in 1967.

UNITED STATES MILITARY

*General*

The aviation fatality rates for 1967 of all three services are shown both including and excluding deaths due to hostile action. Heretofore, this separation of the rates was not available for the Navy and Marine Corps.

Certain data underlying the Army fatality rates were received by the Committee on a fiscal-year rather than calendar-year basis and have been adjusted to the latter basis for this report. If official data for 1967 become available on a calendar-year basis, future reports will be adjusted.

TABLE 9  
CANADIAN CIVIL PILOTS BY CLASS OF LICENSE  
1960-67 AVIATION FATALITY RATES

Class of License	Period	Life Years of Exposure	Aviation Fatalities	Rate per 1,000 Life Years of Exposure
Airline transport . . . . .	{ 1960-63	5,164	9	1.7
	{ 1964-67	6,449	13	2.0
Senior commercial . . . . .	{ 1960-63	1,604	8	5.0
	{ 1964-67	1,624	8	4.9
Commercial . . . . .	{ 1960-63	9,114	34	3.7
	{ 1964-67	12,522	73	5.8
Private (excluding students) . . . .	{ 1960-63	58,432	90*	1.5
	{ 1964-67	68,980	118	1.7

\* Includes 3 missing and presumed dead for years 1960-63.

*Age*

Table 10 shows aviation fatality rates by age group for Air Force pilots and nonpilot rated officers and for Navy and Marine aviators on active duty, for calendar year 1967 as well as the four-year period 1964-67.

The aviation fatality rates of Air Force rated pilots for 1967 are marked by an unusually low rate at ages under 25. Nevertheless, the four-year average rates at ages under 25 continue to show an upward trend, influenced by the higher rates during 1965 and 1966. Age groups 25-29 and 30-34 show a rising trend in the averaged rates. For the younger of the two age groups the rise is related to a high rate in 1965 followed by decreasing rates, but for age group 30-34 the annual rates are successively higher. The fatality rates for nonpilot rated officers are generally higher than those in last year's report, being lower only at ages under 25 for the year 1967.

The Navy and Marine Corps aviation fatality rates for 1967 are distinctly higher than those for 1966. The 1967 rates are also higher than the fatality rates for Air Force pilots, although this was not the case during 1965 and 1966.

*Pilots and Other Rated Officers—by Rank*

Aviation fatality rates according to rank are shown in Table 11 for Air Force pilots and other rated officers and in Table 12 for Navy and Marine Corps aviators on active duty.

TABLE 10  
UNITED STATES AIR FORCE, NAVY, AND MARINE CORPS FLYERS  
AVIATION FATALITY RATES PER 1,000 LIFE YEARS, BY AGE  
DEATHS DUE TO HOSTILE ACTION INCLUDED\*

AGE GROUP	AIR FORCE RATED PILOTS		AIR FORCE NONPILOT RATED OFFICERS		NAVY AND MARINE CORPS PILOTS	
	1964-67	1967	1964-67	1967	1964-67	1967
Under 25.....	6.6	2.6 [2.2]†	4.5	1.2† [1.2]†	7.9	13.6 [9.2]
25-29.....	7.3	6.8 [2.7]	2.3	3.2 [1.9]	8.6	11.7 [8.9]
30-34.....	5.4	7.2 [3.5]	2.3	2.7 [1.3]	6.2	12.2 [9.3]
35-39.....	4.4	4.9 [3.2]	1.7	2.0 [0.6]†	4.3	7.7 [4.9]
40 and over....	1.4	2.1 [1.1]	1.3	1.1† [1.1]†	0.9	1.3 [1.0]†
All.....	4.0	4.5 [2.4]	2.2	2.4 [1.3]	5.5	8.8 [6.5]

\* Rates in brackets exclude deaths due to hostile action.

† Based on 5 or fewer deaths.

TABLE 11  
UNITED STATES AIR FORCE ON ACTIVE DUTY, BY RANK  
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE  
DEATHS DUE TO HOSTILE ACTION INCLUDED\*

RANK	RATED PILOTS		NONPILOT RATED OFFICERS	
	1964-67	1967	1964-67	1967
2d Lieutenant.....	6.2	0.0† [0.0]†	0.7†	0.0† [0.0]†
1st Lieutenant.....	8.5	7.8 [3.4]	3.2	2.6† [2.0]†
Captain.....	6.0	6.8 [3.0]	2.3	3.2 [1.6]
Major.....	2.9	5.0 [3.1]	1.8	1.9 [1.0]†
Lieutenant Colonel.....	1.1	1.9 [1.2]	0.8†	0.0† [0.0]†
General and Colonel.....	0.7	0.9† [0.7]†	2.4†	0.0† [0.0]†
All.....	4.0	4.5 [2.4]	2.2	2.4 [1.3]

\* Rates in brackets exclude deaths due to hostile action.

† Based on 5 or fewer deaths.

The changes in the 1967 aviation fatality rates among such Air Force officers as compared to those in 1966 do not appear to be significant when fluctuations due to small numbers of deaths are taken into account and deaths due to hostile action are eliminated. The lower fatality rate at the younger ages, noted above, is also noted among pilots with the rank of Lieutenant.

Aviation fatality rates for Navy and Marine Corps pilots by rank for 1967 show an increase over those in 1966. Fatality rates excluding deaths due to hostile action are now available.

TABLE 12

UNITED STATES NAVY AND MARINE CORPS AVIATORS ON ACTIVE DUTY, BY RANK  
 AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE  
 DEATHS DUE TO HOSTILE ACTION INCLUDED\*

RANK		1964-67	1967
Navy	Marine Corps		
Ensign and Warrant	2d Lieutenant and Warrant	5.0	1.8 [1.3]
Lieutenant Junior Grade	1st Lieutenant	11.1	9.9 [6.9]
Lieutenant	Captain	7.0	14.0 [9.7]
Lieutenant Commander	Major	4.0	8.8 [6.8]
Commander	Lieutenant Colonel	2.1	1.7 [1.1]†
Admiral and Captain	General and Colonel	0.3†	0.0† [0.0]†
All.....	.....	5.4	8.4 [6.0]

\* Rates in brackets exclude deaths due to hostile action.

† Based on 5 or fewer deaths.

*Duty Assignment*

Aviation fatality rates by duty assignment, which did not appear in last year's report because they appeared to be incomplete, are again omitted for the same reason.

*Hours of Flying*

The average number of hours flown by Navy and Marine Corps pilots decreased to 163 in 1967.

Pilots in the Inactive Naval Reserves flew an average of 108 hours in 1967, which is a decrease from the average flown during each of the last four years.

The average number of aircraft hours for Army pilots—in fixed-wing and rotary-wing craft combined—decreased from 319 hours in 1966 to 285 hours in 1967. The average for the five-year period 1963-67 was 251 hours.

The average number of aircraft hours for Air Force pilots is not available for 1967.

### *Military Air Command*

There were no passenger fatalities on military carriers in MAC in 1967. The passenger fatality rate for the four-year period 1964-67 was 3.91 per 100,000,000 passenger miles.

Aviation fatality rates among pilots and crew members of MAC are shown in Table 13.

### *United States Army*

Aviation fatality rates among Army rated pilots and crew members are shown in Table 14. The fatality rates of rated pilots in 1967 are signifi-

TABLE 13  
MILITARY AIR COMMAND  
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE  
DEATHS DUE TO HOSTILE ACTION INCLUDED\*

	7/1/60- 6/30/64	7/1/64- 6/30/68	7/1/67- 6/30/68
Pilots:			
Transport units.....	2.1	2.0	1.2† [1.2]†
Other units.....	1.6	0.5†	1.1† [0.6]†
All.....	1.9	1.4	1.2† [0.9]†
Crew members:			
Transport units.....	2.6	2.2	1.5 [1.5]
Other units.....	3.1	1.1	1.3† [0.4]†
All.....	2.8	2.0	1.5 [1.2]

\* Rates in brackets exclude deaths due to hostile action.

† Based on 5 or fewer deaths.

TABLE 14  
UNITED STATES ARMY—ALL FLYING OPERATIONS  
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE  
DEATHS DUE TO HOSTILE ACTION EXCLUDED\*

	1960-63	1964-67	1967
Rated pilots.....	3.7	9.8 [15.7]	21.1 [30.6]
Crew members....	5.5	6.5 [N.A.]	4.2 [N.A.]

\* Aviation fatality rates in brackets include deaths due to hostile action.

N.A. = Not available.

cantly above the rates for prior years, especially for rotary-wing craft.

Fatality rates among Army rated pilots per 1,000 aircraft hours in rotary-wing and fixed-wing aircraft are compared in Table 15. The fatality rate per 1,000 aircraft hours for pilots of rotary-wing aircraft continues to exceed that for pilots of fixed-wing aircraft.

*Student Pilots*

Table 16 shows aviation fatality rates among student pilots in the military services. The Navy and Marine Corps rates are based on both officers and cadets, whereas the Air Force rates are based on officers only.

The 1967 fatality rates for Army student pilots and Air Force student pilots show no significant change and for Navy and Marine Corps student pilots in basic and advanced courses were higher than the corresponding 1966 rates.

TABLE 15  
 UNITED STATES ARMY—ROTARY- VERSUS FIXED-WING AIRCRAFT  
 PILOT FATALITY RATES PER 1,000 AIRCRAFT HOURS  
 DEATHS DUE TO HOSTILE ACTION EXCLUDED\*

	1960-63†	1964-67	1967
Fixed-wing aircraft . . . . .	.0178	.0227 [.0282]	.0380 [.0466]
Rotary-wing aircraft . . . . .	.0173	.0431 [.0752]	.0808 [.1250]
All types of aircraft . . . . .	.0176	.0367 [.0604]	.0712 [.1073]

\* Aviation fatality rates in brackets include deaths due to hostile action.  
 † 1963 data exclude all fatalities occurring in Vietnam, hostile action and others.

TABLE 16  
 UNITED STATES AIR FORCE, NAVY AND MARINE  
 CORPS, AND ARMY STUDENT PILOTS  
 AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE

	1960-63	1964-67	1967
Air Force* . . . . .	N.A.	2.4	1.7
Navy and Marine Corps:			
Basic course . . . . .	3.2	2.6	6.5
Advanced course . . . . .	10.8	9.6	17.5
Army . . . . .	1.2†	2.5	3.0

\* Officers only.  
 † Based on 5 or fewer deaths.  
 N.A. = Not available.

*Coast Guard*

The aviation fatality rates among Coast Guard personnel on flight orders are shown in Table 17. There were 4 aviation fatalities among pilots and 6 among crewmen in 1967. There have been no fatalities among student pilots or observers during the past eleven years.

*Inactive Reservists*

Table 18 shows the aviation fatality rates for Navy and Marine Corps inactive reservists on drill-pay status.

TABLE 17  
UNITED STATES COAST GUARD PERSONNEL  
ON FLIGHT ORDERS  
AVIATION FATALITY RATES PER 1,000  
LIFE YEARS OF EXPOSURE

	1960-63	1964-67	1967
Pilots.....	1.9*	4.0	7.1*
Crewmen.....	0.4*	1.6	4.0

\* Based on 5 or fewer deaths.

TABLE 18  
UNITED STATES NAVY AND MARINE CORPS INACTIVE  
RESERVISTS ON DRILL-PAY STATUS  
AVIATION FATALITY RATES BY AGE PER  
1,000 LIFE YEARS OF EXPOSURE

	1960-63	1964-67	1967
Ages under 30.....	2.6	5.5	10.5*
Ages 30 and over.....	2.1	2.6	2.1
All ages.....	2.2	3.0	3.3

\* Based on 5 or fewer deaths.

*Air National Guard*

The aviation fatality rates among Air National Guard pilots not federally activated were 2.3 per 1,000 life years of exposure during 1967 and 4.2 for the four-year period 1964-67.

*Army National Guard and Army Reserves*

There were 2 aviation deaths among pilots and none among crew members in the Army National Guard during 1967. The 2 deaths involved

rotary-wing aircraft. The number of aviation deaths of student pilots was not available.

The number of aviation deaths of members in the Army Reserves was also not available.

#### *Air Force Flight Surgeons and Nurses*

The aviation fatality rate among flight surgeons was 0.4 per 1,000 life years for the four-year period 1964-67. There have been no fatalities among flight nurses during the past six years.

#### *Graduates of Academies—Assignment to Aviation*

In 1968 1.0 per cent of the military academy graduates and 0.2 per cent of the naval academy graduates were accepted for flight training by the Air Force.

All commissioned Air Force Academy graduates were placed in the Air Force.

#### ROYAL CANADIAN AIR FORCE

No data regarding aviation fatality rates among members of the Royal Canadian Air Force, more recent than that published in the 1967 report, have become available.

#### INTERCOMPANY EXPERIENCE

Contributions submitted for the experience of 1963-67 were limited to issues of 1953 and later, and this is indicated in the footnotes to the tables.

#### *Civilian Aviation*

Tables 19 and 20 show the aviation fatality rates experienced in recent years among civilian pilots on policies issued since January 1, 1946, by the twenty-nine companies contributing part or all their data on civilian aviation risks. The experience is by numbers of policies, and the classification of the insured is according to status at the time of application for insurance. Exposure in the "With Aviation Extra Premium" category is terminated when the extra premium is discontinued. If discontinuance is due to a liberalization of underwriting practices, companies have been encouraged to transfer the exposure to the "Without Aviation Extra Premium" classification. Not all companies have been able to do so, and consequently the experience for such policies shown in Table 19 includes only a portion of such cases. Moreover, without an extra premium there is no opportunity to terminate the exposure of pilots who materially reduce or eliminate their flying hours.

The material in Table 19 compares the experience of 1957-62 and that of 1963-67, each period being shown separately, for cases with aviation



extra premium and without aviation extra premium. For scheduled airline pilots the aviation fatality rates for 1963-67 are higher than the corresponding rates for 1957-62 and higher than the rates for 1963-66 reported last year. However, for such pilots accepted with extra premium, the number of deaths is too small to indicate a significant change. Private pilots with fewer than 100 hours flown in the twelve months preceding issue

TABLE 19  
INTERCOMPANY EXPERIENCE ON PILOTS IN CIVILIAN  
AVIATION—BY POLICIES\*

STATUS AT ISSUE AND HOURS FLOWN IN 12 MONTHS PRECEDING ISSUE	PERIOD	WITH AVIATION EXTRA PREMIUM†			WITHOUT AVIATION EXTRA PREMIUM (1955 AND SUBSEQUENT ISSUES)		
		Years of Exposure	Avia- tion Fatali- ties	Rate per 1,000	Years of Exposure	Avia- tion Fatali- ties	Rate per 1,000
Scheduled airline pilots . . .	{1957-62	8,029	24	3.0	21,233	33	1.6
	{1963-67	1,851	6	3.2	21,063	38	1.8
Other commercial pilots flying for hire: Instructing (at least half-time) . . . . .	{1957-62	5,250	19	3.6	.....	.....	.....
	{1963-67	3,964	11	2.8	.....	.....	.....
Others . . . . .	{1957-62	13,700	79	5.8	3,160	8	2.5
	{1963-67	11,186	60	5.4	6,249	10	1.6
Private pilots:‡ Less than 100 hours . . .	{1957-62	53,842	57	1.1	49,615	50	1.0
	{1963-67	27,865	36	1.3	101,213	110	1.1
100-199 hours . . . . .	{1957-62	23,097	63	2.7	6,821	11	1.6
	{1963-67	11,973	20	1.7	24,917	65	2.6
200-299 hours . . . . .	{1957-62	8,123	34	4.2	905	1	.....
	{1963-67	4,976	17	3.4	2,815	9	3.2
300 or more hours . . . .	{1957-62	7,297	27	3.7	850	1	.....
	{1963-67	5,171	13	2.5	1,808	2	1.1§
Hours not stated . . . .	{1957-62	3,388	5	1.5§	1,318	1	.....
	{1963-67	1,246	4	3.2§	2,312	0	.....

\* Exposure in "With Aviation Extra Premium" category is terminated on discontinuance of extra premium. Exposure in "Without Aviation Extra Premium" category is for pilots apparently active at time of issue who were issued standard (without aviation rider) or reduced to standard because of a liberalization in companies' underwriting rules.

† 1957-62 data include issues of 1946 and later years; 1963-67 data include issues of 1953 and later years only.

‡ Pilots flying only for pleasure or personal business (not flying for hire). Includes pilots having commercial or transport certificate and pilots having private certificate and 100 or more solo hours (or solo hours not stated).

§ Based on 5 or fewer deaths.

represent the major class by years of exposure. The aviation fatality rates for these pilots are at about the same level for issues with and without aviation extra premium. In contrast, for private pilots with 100-199 hours flown in the year preceding issue, the 1963-67 rate of 2.6 per 1,000 for issues without aviation extra premiums is approximately 60 per cent higher than both the corresponding 1957-62 rate and the 1963-67 rate for

TABLE 20  
 INTERCOMPANY EXPERIENCE ON PILOTS FLYING FOR  
 PLEASURE OR PERSONAL BUSINESS\*  
 WITH AVIATION EXTRA PREMIUM†  
 (1954-67 Experience on 1946 and Subsequent Issues‡—by Policies)

HOURS FLOWN IN 12 MONTHS PRECEDING ISSUE	BY TYPE OF FLYING CERTIFICATE—ALL AGES					
	Commercial or Transport			Private (with 100 or More Solo Hours)		
	Years of Exposure	Aviation Fatalities	Rate per 1,000	Years of Exposure	Aviation Fatalities	Rate per 1,000
Less than 100 hours...	16,578	31	1.9	77,945	74	0.9
100-199 hours.....	8,036	19	2.4	32,729	73	2.2
200-299 hours.....	5,653	17	3.0	10,221	41	4.0
300 or more hours....	5,928	15	2.5	7,866	32	4.1
Hours not stated.....	897	3	3.3§	4,391	9	2.0
Total.....	37,092	85	2.3	133,152	229	1.7
	BY ATTAINED AGES—ALL TYPES OF FLYING CERTIFICATES					
	Attained Ages under 35			Attained Ages 35 and Over		
	Years of Exposure	Aviation Fatalities	Rate per 1,000	Years of Exposure	Aviation Fatalities	Rate per 1,000
Less than 100 hours...	33,548	47	1.4	59,709	57	1.0
100-199 hours.....	12,785	24	1.9	27,433	66	2.4
200-299 hours.....	3,011	7	2.3	11,679	49	4.2
300 or more hours....	2,780	7	2.5	10,832	40	3.7
Hours not stated.....	1,487	1	.....	3,781	11	2.9
Total.....	53,611	86	1.6	113,434	223	2.0

\* Excludes pilots flying for hire. Includes pilots having commercial or transport certificate and pilots having private certificate and 100 or more solo hours (or solo hours not stated), flying only for pleasure or personal business.

† Exposure is terminated on discontinuance of extra premium.

‡ For exposure years 1963-67 issues of only 1953 and later years are included.

§ Based on 5 or fewer deaths.

|| Excludes experience of those companies which were unable to subdivide experience by age.

pilots charged aviation extra premiums. Private pilots with 200–299 hours flown in the year preceding issue and who are charged an extra premium had an aviation fatality rate of 3.4 per 1,000 during the period 1963–67, almost double the rate for 1963–66 reported last year.

Table 20 shows the experience during the period 1954–67, inclusive, among pilots flying only for pleasure or personal business, but not for hire, (a) by type of flying certificate and (b) by attained age, in each case according to the hours flown in the twelve months preceding issue. Among the pilots with fewer than 100 hours flown in the year prior to issue, the experience has been distinctly more favorable for those pilots with private certificates than for those with commercial or transport certificates. For pilots with 100 or more hours in the twelve months prior to issue, the experience has been at about the same level or more favorable for holders of commercial or transport certificates. By attained ages, the mortality has been more favorable at ages 35 and over for the pilots with fewer than 100 hours in the year prior to issue and more favorable at ages under 35 for pilots with 100 or more hours.

#### *Military Aviation*

Table 21 shows, for the twenty-six companies which have contributed to the experience on military aviation, the aviation fatality rates separately for the years 1957–62 and 1963–67 among military aviation personnel on policies issued with an aviation extra premium. The experience is by number of policies, and the classification of the insured is according to his status at the time of application for insurance. Exposure was terminated when the extra premium was discontinued.

Fatalities due to enemy action now represent about 28 per cent of the aviation fatalities in the period 1963–67. These deaths are included in the figures in the “Aviation Fatalities” columns of Tables 21–23 and are also shown separately in parentheses. Fatality rates excluding deaths due to enemy action are shown in brackets. The differences between the rates which include and those which exclude deaths due to enemy action are, of course, not a proper measure of the fatality rates from enemy action, inasmuch as the exposures include a portion of the period prior to our extensive involvement in the Vietnam conflict.

The 1963–67 fatality rates excluding deaths due to enemy action shown in Table 21 for the combined United States Air Force and Army pilots are higher at ages under 25 and lower at older ages than those for 1957–62. The combined experience for United States Air Force and Army pilots includes not only the data contributed separately for each service but also data for which the particular branch of service was not given.

TABLE 21

INTERCOMPANY EXPERIENCE ON PILOTS AND CREW MEMBERS IN  
MILITARY AVIATION—WITH AVIATION EXTRA PREMIUM\*  
FATALITIES IN COMBAT MISSIONS INCLUDING WHETHER  
OR NOT RESULTING FROM ENEMY ACTION†

(1957-62 Experience on 1946 and Subsequent Issues—by Policies;  
1963-67 Experience on 1953 and Subsequent Issues—by Policies)

STATUS AT ISSUE AND ATTAINED INSURANCE AGE	YEARS OF EXPOSURE		AVIATION FATALITIES		RATE PER 1,000		
	1957-62	1963-67	1957-62	1963-67	1957-62	1963-67	
U.S. Air Force pilots:‡							
Under 25.....	2,476	675	9	3 (1)	3.6	4.4§	[3.0]§
25-29.....	19,419	8,633	72	43 (16)	3.7	5.0	[3.1]
30-34.....	28,275	26,145	85	93 (25)	3.0	3.6	[2.6]
35 and over.....	103,513	70,648	218	109 (21)	2.1	1.5	[1.2]
Total.....	153,683	106,101	384	248 (63)	2.5	2.3	[1.7]
U.S. Army pilots:‡							
Under 25.....	225	371	1	9 (4)	.....	24.3	[13.5]§
25-29.....	2,180	2,273	3	15 (5)	1.4§	6.6	[4.4]
30-34.....	3,664	4,710	19	23 (17)	5.2	4.9	[1.3]
35 and over.....	17,678	5,904	19	14 (5)	1.1	2.4	[1.5]
Total.....	23,747	13,258	42	61 (31)	1.8	4.6	[2.3]
U.S. Air Force and Army pilots:							
Under 25.....	3,082	1,049	11	12 (5)	3.6	11.4	[6.7]
25-29.....	24,393	11,008	82	57 (21)	3.4	5.2	[3.3]
30-34.....	36,972	31,600	120	116 (42)	3.2	3.7	[2.3]
35 and over.....	152,691	80,110	304	129 (26)	2.0	1.6	[1.3]
Total.....	217,138	123,767	517	314 (94)	2.4	2.5	[1.8]
U.S. Air Force and Army crew mem- bers:							
Under 25.....	9,079	3,367	17	11 (1)	1.9	3.3	[3.0]
25-29.....	22,873	15,867	55	43 (13)	2.4	2.7	[1.9]
30-34.....	14,184	24,603	32	50 (14)	2.3	2.0	[1.5]
35 and over.....	31,043	23,533	52	28 (8)	1.7	1.2	[0.8]
Total.....	77,179	67,370	156	132 (36)	2.0	2.0	[1.4]
U.S. Navy and Marine pilots:							
Under 25.....	1,847	817	24	8	13.0	9.8	
25-29.....	11,768	6,117	115	28 (4)	9.8	4.6	[3.9]
30-34.....	18,861	11,676	90	74 (20)	4.8	6.3	[4.6]
35 and over.....	61,848	29,145	172	95 (31)	2.8	3.3	[2.2]
Total.....	94,324	47,755	401	205 (55)	4.3	4.3	[3.1]
U.S. Air Force, Army, and Navy Reserve pilots.....	10,323	8,003	18	14	1.7	1.7	
U.S. Air National Guard pilots.....	3,565	3,811	12	3 (1)	3.4	0.8§	[0.5]§

\* Exposure is terminated on discontinuance of extra premium.

† Figures in parentheses indicate fatalities from enemy action included. Rates in brackets exclude deaths from enemy action.

‡ Excludes experience of those companies which were unable to subdivide experience between Air Force and Army.

§ Based on 5 or fewer deaths.

The 1963-67 fatality rates for United States Air Force and Army crew members are higher at ages under 25 and lower at older ages than those for 1957-62, when deaths due to enemy action are excluded. Although the crew-member data are based on the combined experience of both Air Force and Army personnel, the Army experience is very limited, amounting to about 1 per cent of the exposure in the years 1964-67 and including one fatality.

TABLE 22  
INTERCOMPANY EXPERIENCE ON PILOTS IN MILITARY AVIATION  
WITH AVIATION EXTRA PREMIUM\*  
FATALITIES IN COMBAT MISSIONS INCLUDED WHETHER  
OR NOT RESULTING FROM ENEMY ACTION†  
(Experience on 1953 and Subsequent Issues—by Policies)

HOURS FLOWN IN 12 MONTHS PRECEDING ISSUE AND ATTAINED INSURANCE AGE	YEARS OF EXPOSURE		AVIATION FATALITIES		RATE PER 1,000	
	1957-62	1963-67	1957-62	1963-67	1957-62	1963-67
U.S. Air Force and Army						
40-150 hours:						
Ages 30-34.....	7,298	6,393	24	25 (5)	3.3	3.9 [3.1]
Ages 35 and over..	36,074	30,668	62	30 (6)	1.7	1.0 [0.8]
Total.....	43,372	37,061	86	55 (11)	2.0	1.5 [1.2]
Over 150 hours:						
Ages 30-34.....	22,349	24,247	76	89 (34)	3.4	3.7 [2.3]
Ages 35 and over..	46,429	46,723	121	94 (18)	2.6	2.0 [1.6]
Total.....	68,778	70,970	197	183 (52)	2.9	2.6 [1.8]
U.S. Navy and Marines						
40-150 hours:						
Ages 30-34.....	4,184	2,839	19	18 (6)	4.5	6.3 [4.2]
Ages 35 and over..	13,836	12,266	33	34 (9)	2.4	2.8 [2.0]
Total.....	18,020	15,105	52	52 (15)	2.9	3.4 [2.4]
Over 150 hours:						
Ages 30-34.....	10,112	8,472	45	54 (14)	4.5	6.4 [4.7]
Ages 35 and over..	16,904	15,978	55	58 (20)	3.3	3.6 [2.4]
Total.....	27,016	24,450	100	112 (34)	3.7	4.6 [3.2]

\* Exposure is terminated on discontinuance of extra premium.

† Figures in parentheses indicate fatalities from enemy action included. Rates in brackets exclude deaths from enemy action.

The 1963-67 fatality rates for United States Navy and Marine Corps pilots were lower than the 1957-62 rates at all ages, when deaths due to enemy action are excluded. However, the aggregate rate continues to be significantly higher than the rate for Air Force and Army pilots combined.

Table 22 shows a further subdivision of the experience on pilots in military aviation at attained ages 30 and over according to the number of

TABLE 23  
 INTERCOMPANY EXPERIENCE ON PILOTS IN MILITARY AVIATION  
 WITH AVIATION EXTRA PREMIUM\*  
 FATALITIES IN COMBAT MISSIONS INCLUDED WHETHER  
 OR NOT RESULTING FROM ENEMY ACTION†  
 (1963-67 Experience on 1953 and Subsequent Issues—by Policies)

Status at Issue and Attained Insurance Age	Years of Exposure	Aviation Fatalities	Rates per 1,000
U.S. Air Force pilots:‡			
Ages 35-39.....	22,870	62 (16)	2.7 [2.0]
Ages 40 and over.....	47,778	47 (5)	1.0 [0.9]
Ages 35 and over.....	70,648	109 (21)	1.5 [1.2]
U.S. Army pilots:‡			
Ages 35-39.....	3,497	10 (5)	2.9 [1.4]§
Ages 40 and over.....	2,407	4	1.7§
Ages 35 and over.....	5,904	14 (5)	2.4 [1.5]
U.S. Navy and Marine pilots:			
Ages 35-39.....	11,350	68 (23)	6.0 [4.0]
Ages 40 and over.....	17,795	27 (8)	1.5 [1.1]
Ages 35 and over.....	29,145	95 (31)	3.3 [2.2]

\* Exposure is terminated on discontinuance of extra premium.

† Figures in parentheses indicate fatalities from enemy action included. Rates in brackets exclude deaths from enemy action.

‡ Excludes experience of those companies which were unable to subdivide experience between Air Force and Army.

§ Based on 5 or fewer deaths.

hours flown in the twelve months preceding issue. The table shows that for ages 35 and over aviation fatality rates are higher for pilots who flew more than 150 hours during the year preceding issue than for pilots who flew not more than 150 hours; aviation fatality rates have continued to be lower for those at attained ages 35 and over than for those at ages 30-34.

Beginning with the experience of 1963, the contributing companies have been asked to show separately their experience on issues of 1953 and later for pilots in military aviation at attained ages 35-39, as well as at ages 35 and over. A summary of the data is shown in Table 23. This table indicates

that for United States Air Force and United States Navy and Marine Corps pilots the aviation fatality rates at attained ages 40 and over are significantly lower than those at ages 35–39. The limited data for United States Army pilots are inconclusive.