

**TRANSACTIONS OF SOCIETY OF ACTUARIES
1965 REPORTS**

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

THIS report presents primarily new data which have become available during the past year. Data for earlier periods have been included for comparison or to indicate trends. Only aviation deaths are used in determining death rates. The 1960 report of the Committee includes an index, pages 68-70, covering the most recent information not shown in this report.

With the exception of the effect of increased military activity on fatalities in the armed services, aviation fatality rates for the period covered in this report do not differ markedly from those reported last year. The effects of fatalities due to enemy action are shown separately where data are available.

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.

It should be noted that 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.

Table 1 shows the recent aviation fatality rates in United States scheduled airlines for passengers, pilots, and other crew members. The

death rates for "Passengers" and "First Pilots" arise only from scheduled operations, while the death rates for "All Pilots" and for "Other Crew Members" are from all operations, both scheduled and nonscheduled. "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 flying, death rates resulting from experiences over successive four-year periods from 1953 are fairly constant. The passenger death rate for the

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

	1953-56	1957-60	1961-64	1964*	1965 (Est.)
Passenger Death Rate per 1,000 Scheduled Passenger Hours†					
Domestic . . . . .	.0012 (19)	.0013 (22)	.0008 (18)	.0007 (6)	.0011 (6)
International . . . . .	.0001 (3)	.0011 (6)	.0014 (3)	.0028 (2)	.0005 (1)
Total . . . . .	.0010 (22)	.0013 (28)	.0009 (21)	.0011 (8)	.0010 (7)
First-Pilot Death Rate per 1,000 Scheduled Airplane Hours†					
Domestic . . . . .	.0013 (14)	.0015 (20)	.0012 (15)	.0016 (5)	.0012 (4)
International . . . . .	.0000 (0)	.0016 (4)	.0011 (2)	.0021 (1)	.0019 (1)
Total . . . . .	.0011 (14)	.0015 (24)	.0012 (17)	.0016 (6)	.0013 (5)
Death Rate of All Pilots and Copilots per Life Year of Exposure					
Domestic . . . . .	.0010 (17)	.0012 (29)	.0008 (22)	.0008 (6)	.0005 (5)
International . . . . .	.0001 (1)	.0011 (4)	.0011 (4)	.0018 (2)	.0011 (1)
Total . . . . .	.0009 (18)	.0012 (33)	.0008 (26)	.0009 (8)	.0006 (6)
Death Rate of Other Crew Members per Life Year of Exposure					
Domestic . . . . .	.0011 (17)	.0012 (22)	.0008 (16)	.0003 (4)	.0007 (3)
International . . . . .	.0001 (1)	.0019 (4)	.0018 (4)	.0030 (2)	.0021 (1)
Total . . . . .	.0008 (18)	.0013 (26)	.0009 (20)	.0008 (6)	.0010 (4)

* Preliminary.

† Helicopter experience excluded, beginning in 1957.

entire period 1953-65 is 0.0011 per 1,000 scheduled passenger hours. Also in domestic flying, the death rate for first pilots for the period 1953-65 is 0.0013 per 1,000 scheduled airplane hours.

In international flying of United States scheduled airlines, in 1965 there was one fatal accident in which 21 passengers, 1 pilot, 1 copilot, and 7 other crew members lost their lives. The death rates in international flying for the entire period 1953-65 are 0.0009 per 1,000 scheduled passenger hours for passengers and 0.0010 per 1,000 scheduled airplane hours for first pilots.

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.

During the nine years 1957-65, helicopters flew a total of approximately 92,000,000 passenger miles in scheduled passenger service. In this period, two fatal accidents—referred to in previous reports—have produced a passenger death rate of 0.013 per 1,000 scheduled passenger hours.

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. Nearly 80 per cent of the scheduled passenger miles 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.

At least since 1951, the experience of United States scheduled airlines has been much better than that of airlines of other countries. Only in 1959 was the safety record of other countries' airlines' scheduled services comparable to that of United States 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	
1953-56.....	.0043	.0012	.0010
1957-60.....	.0028	.0011	.0013
1961-64.....	.0035	.0010	.0009
1964*.....	.0018	.0009	.0011

* 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 1964 there were five such carriers. In recent years, about 30 per cent of their services have been on a scheduled basis, varying from 19 per cent in 1962 to almost 42 per cent in 1964.

In the nine years 1956-64 the first-pilot fatality rate for scheduled all-cargo services was 0.009 per 1,000 airplane hours, based on 6 deaths. It has been estimated that in the five years 1960-64 the first-pilot fatality rate for combined scheduled and nonscheduled services of the all-cargo carriers was 0.005 per 1,000 airplane hours, based on 5 deaths.

SUPPLEMENTAL AIRLINES

These airlines are a class of air carriers holding temporary certificates of public convenience and necessity, authorizing them to perform pas-

senger 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. On December 31, 1964 there were 13 such airlines.

The figures shown in Table 3 include experience in operations under contracts with the military authorities. Fatality rates are derived from mileage reports supplied to the Civil Aeronautics Board, assuming an average speed of 200 miles per hour for years prior to 1960, increasing gradually to 233 miles per hour in 1965. In the years 1960 and 1961 there

TABLE 3
SUPPLEMENTAL CARRIERS OPERATING AIRCRAFT OF
MORE THAN 12,500 POUNDS GROSS WEIGHT
(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
1957-60.....	94 (3)	.003	5	.006
1961-64.....	153 (3)	.005	4	.004
1964.....	2 (1)	.000	1	.004
1965 (est.).....	0 (0)	.000	1	.004

were accidents causing a relatively large number of passenger deaths, but since 1961 there have been only three fatal accidents which took the lives of 3 first pilots and 2 passengers in total. During the eight-year period 1957-64, 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.

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 about four times the flying time of public carriers in their domestic flights. The number of hours flown in general aviation is estimated from surveys, made at intervals, of aircraft use.

Pilot death rates per 1,000 airplane hours are shown in Table 4 for five different classes of flying. Death rates referred to in this section are death rates per 1,000 airplane hours unless specifically stated otherwise. 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.

Pleasure flying accounts for approximately one-fourth of the total general aviation flying time but for one-half of the pilot fatalities. During 1960-63 the death rate of pilots in pleasure flying was the highest among the five categories in general aviation shown in Table 4. There is reason to believe that these high fatality rates for pleasure flying are substantially accurate.

The business category, which makes up more than two-fifths of total

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		
1960.....	3,172	157	.049	1,828	48	.026
1961.....	3,398	180	.053	1,796	38	.021
1962.....	3,489	173	.050	2,385	19	.008
1963.....	3,626	224	.062	2,417	25	.010
1960-63....	13,685	734	.054	8,426	130	.015
	Business			Commercial (Excluding Aerial Application) and Miscellaneous		
1960.....	5,699	83	.015	1,476	51	.035
1961.....	5,699	78	.014	1,779	43	.024
1962.....	5,431	92	.017	2,102	31	.015
1963.....	5,740	93	.016	2,208	31	.014
1960-63....	22,569	346	.015	7,565	156	.021
	Aerial Application					
1960.....	889	32	.036			
1961.....	855	38	.044			
1962.....	949	39	.041			
1963.....	964	30	.031			
1960-63....	3,657	139	.038			

* FAA estimate based on 1962 survey of aircraft used in general aviation.

general aviation flying, accounts for one-fifth of the pilot fatalities and has a relatively low pilot death rate. All flying in connection with business (other than commercial aviation) or government activities, whether by professional or nonprofessional pilots, is included in this category.

No new data on "corporate flying" have become available, and those interested in that subdivision of business flying are referred to the 1964 report.

Flight training of civilians also presents a favorable record. The pilot death rate for the years 1960-63 was 0.015 per 1,000 plane 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 about one-seventh of the total in general aviation. Single-engine planes are used almost exclusively for this purpose.

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 less than one-fifth 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 for these pilots, as a class, and for passengers using these methods of transportation are not available. The experience in aerial application and that of other forms of commercial flying are shown separately in the table.

The pilot fatality rates in aerial application have been higher than in other commercial activities, being estimated at 0.038 per 1,000 airplane hours for the years 1960-63. Aerial application includes any form of flying in which chemicals are distributed from aircraft upon the land below, the usual form being crop-dusting. During 1962 the average annual flying time was about 220 hours per year, but it 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.

In 1963 helicopters engaged in general aviation flying accounted for 387,000 flight hours with 12 deaths, a fatality rate of 0.031 per 1,000 aircraft hours.

In "General Aviation Flying" of all types in 1963, there were among pilots 455 fatalities and 270 serious injuries (among crop-dusting pilots 30 deaths and 47 serious injuries; among helicopter pilots, 12 deaths and 15 serious injuries). Briefly, serious injuries are those which require hospitalization of more than 48 hours or are fractures (except simple fractures of fingers, toes, or nose), or lacerations which cause severe hemorrhages; nerve, muscle, or tendon damage; injuries to any internal organs; or second- and third-degree burns.

CANADIAN CIVIL FLYING

Passenger and 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 5.

Pilot aviation fatality rates per 1,000 hours in domestic and international operations of Canadian nonscheduled airlines have been estimated

TABLE 5
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
1953-56.....	0.0043 (5)	0.0033 (3)
1957-60.....	.0003 (1)	.0008 (1)
1961-64.....	.0024 (3)	.0015 (2)
1953-64.....	.0021 (9)	.0017 (6)
1962-65 (est.)..	0.0031 (5)	0.0031 (4)

TABLE 6
NONSCHEDULED VERSUS SCHEDULED FIRST-PILOT
FATALITY RATES PER 1,000 AIRPLANE HOURS
(Number of Fatal Accidents in Parentheses)

Years	Nonscheduled	Scheduled
1957-60.....	0.0195 (29)	0.0008 (1)
1961-64.....	.0177 (24)	.0015 (2)
1957-64.....	0.0187 (53)	0.0012 (3)

from figures furnished by the Canadian Department of Transport and the Dominion Bureau of Statistics and are shown in Table 6, compared with corresponding fatality rates in scheduled flying (domestic and international).

Canadian scheduled airlines comprise air carriers which serve designated points in accordance with a definite service schedule. Nonscheduled 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 7, separately, for the periods 1957-60 and 1961-64, 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.

With the exception of pilots holding senior commercial licenses, the trend of aviation mortality by class of license has been generally downward during the past 10 years. Based on a relatively small exposure, the fatality rate for pilots with senior commercial licenses has remained fairly constant in recent years.

TABLE 7
CANADIAN CIVIL PILOTS BY CLASS OF LICENSE
1957-64 AVIATION FATALITY RATES

Class of License	Period	Life Years of Exposure	Aviation Fatalities	Rate per 1,000 Life Years of Exposure
Airline transport	{ 1957-60	4,281	12	2.8
	{ 1961-64	5,333	7	1.3
Senior commercial	{ 1957-60	1,649	8*	4.9
	{ 1961-64	1,540	9	5.8
Commercial	{ 1957-60	9,669	49*	5.1
	{ 1961-64	9,291	39	4.2
Private (excluding students) .	{ 1957-60	37,811	65†	1.7
	{ 1961-64	61,848	89‡	1.4

* Includes 1 missing and presumed dead.

† Includes 2 missing and presumed dead for years 1957-60 and 1 death as glider pilot in each of the years 1958 and 1959.

‡ Includes 3 missing and presumed dead for years 1961-64.

Excluded from the experience in Table 7 were persons holding glider licenses only, of whom there have been a steadily increasing number—534 in 1962, 616 in 1963, and 712 in 1964, with 1 fatality reported in each of the years 1963 and 1964.

UNITED STATES MILITARY

General

The Air Force and Navy and Marine Corps aviation fatality rates shown in this section include deaths due to enemy action. Data excluding deaths from enemy action are not available. Army aviation fatality rates for 1964 are shown both including and excluding deaths due to enemy action.

Age and Rank

Table 8 shows the 1964 and 1961-64 aviation fatality rates by age group for Air Force pilots and nonpilot rated officers and for Navy and Marine Corps aviators on active duty.

The aviation fatality rates of Air Force rated pilots averaged over the four-year period 1961-64 are about the same as those for the period 1960-63 in last year's report. The 1964 rates are higher than those for 1963 at ages under 30 and lower at ages 30 and over.

The aviation fatality rates for Air Force nonpilot rated officers aged 25-34 were about the same in 1964 as in 1963, but at the younger and older ages there have been noticeable increases.

TABLE 8
UNITED STATES AIR FORCE, NAVY, AND MARINE CORPS FLYERS
AVIATION FATALITY RATES PER 1,000 LIFE YEARS, BY AGE
DEATHS DUE TO ENEMY ACTION INCLUDED

AGE GROUP	AIR FORCE RATED PILOTS		AIR FORCE NONPILOT RATED OFFICERS		NAVY AND MARINE CORPS PILOTS	
	1961-64	1964	1961-64	1964	1961-64	1964
Under 25	2.1	3.3	1.7	5.8	9.6	11.0
25-29	4.7	5.2	2.5	1.5	8.7	8.9
30-34	4.2	3.4	2.7	2.6	4.7	5.1
35 and over	1.5	1.0	1.7	2.8	2.2	1.7
All	2.9	2.4	2.2	2.5	5.3	5.5

The aviation fatality rates of Navy and Marine pilots increased somewhat in 1964 at ages under 25 and at the age group 30-34, as compared with 1963, but decreased at the other ages. Navy and Marine Corps pilot fatality rates are higher than those of Air Force pilots, but the differences decrease with increasing age.

Pilots and Other Rated Officers—by Rank

Aviation fatality rates for Air Force pilots and other rated officers, according to rank, are shown in Table 9. The fatality rate of first lieutenants, which showed a marked reduction last year, has returned to about the average for 1961-64. The aviation fatality rates for nonpilot rated officers were higher in 1964 than in 1963 at all ranks except captain, although based on few deaths at the higher ranks. There have been no deaths among second lieutenants since 1961.

Duty Assignment

The 1964, 1963, and 1959-62 aviation fatality rates among Air Force pilots, according to duty assignment, are given in Table 10. The 1964 data are not available in the same subdivisions as formerly. Fatality rates for years prior to 1964 are the same as in last year's report except that it now appears that the 3.9 rate for the years 1959-62 shown in last year's

TABLE 9
UNITED STATES AIR FORCE ON ACTIVE DUTY, BY RANK
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE
DEATHS DUE TO ENEMY ACTION INCLUDED

RANK	RATED PILOTS		NONPILOT RATED OFFICERS	
	1961-64	1964	1961-64	1964
2nd Lieutenant.....	3.9	3.0*	0.5*	0.0*
1st Lieutenant.....	6.0	5.6	2.9	2.6
Captain.....	3.6	3.7	2.3	2.5
Major.....	1.4	1.1	2.3	3.8
Lieutenant Colonel.....	1.0	0.1*	1.3	3.0*
General and Colonel.....	0.5	0.9*	1.6*	4.6*
All.....	2.9	2.4	2.2	2.5

* Based on 5 or fewer deaths.

TABLE 10
UNITED STATES AIR FORCE PILOTS ON ACTIVE DUTY
BY DUTY ASSIGNMENT
AVIATION FATALITY RATES
PER 1,000 LIFE YEARS OF EXPOSURE
DEATHS DUE TO ENEMY ACTION INCLUDED

Duty Assignment	1959-62	1963	1964
Pilot, helicopter.....	1.5*	2.8	0.0*
Pilot, search-rescue.....	0.0*	4.5	8.5*
Pilot, transport.....	2.5	2.6	2.1
Pilot, troop carrier.....	3.0	1.6	1.2*
Pilot, fighter		13.9	
Pilot, fighter-interceptor.....	8.7	10.1	10.3
Pilot, fighter-bomber.....		18.6	
Pilot, bomber.....	3.9	3.5	2.4
Pilot, reconnaissance.....	6.8	8.9	2.3*
Pilot, tanker.....	2.1	2.6	0.0*
All.....	2.9	3.0	2.4

* Based on 5 or fewer deaths.

report as applicable to pilot, fighter-bombers and pilot, bomber applies only to pilots of bombers, and that pilots of fighter-bombers should have been included with pilots of other fighter planes.

Officers on Flying Status—by Age Group and Duty Assignment

The 1964 distribution of Air Force officers on flying status, by duty assignment and age, is shown in Table 11. Several of the duty assignments shown last year are not available for the current report.

TABLE 11
UNITED STATES AIR FORCE
1964 DISTRIBUTION OF OFFICERS BY DUTY ASSIGNMENT AND AGE

DUTY ASSIGNMENT	AGE				
	Under 25	25-29	30-34	35-39	40 and Over
Pilot, helicopter.....	2.9%	40.3%	40.2%	8.0%	8.6%
Pilot, search-rescue.....	14.4	12.7	38.2	18.6	16.1
Pilot, fighter*.....	2.6	25.2	41.3	16.2	14.7
Pilot, bomber.....	2.4	17.5	29.4	14.0	36.7
Pilot, reconnaissance....	0.0	22.0	36.1	19.7	22.2
Pilot, tanker.....	2.7	22.5	38.0	11.9	24.9
All other.....	2.9	12.3	22.3	15.2	47.3
All.....	2.7%	16.5%	28.0%	15.0%	37.8%

* Includes pilots of regular fighters, fighter-interceptors, and fighter-bombers.

Hours of Flying

The number of aircraft hours per pilot on flying status in the Air Force was about 146 hours per year in 1964. During the period 1960-63 the average number ranged from 120 to 125. The average number of flight hours per pilot has been estimated at about double the number of aircraft hours per pilot.

Navy and Marine Corps pilots flew an average of 232 hours in 1964. This compares with a high of 279 hours in 1962 and a low of 234 hours in 1963 during the five-year period 1959-63.

The upward trend, since 1961, in the average number of flight hours per year for pilots in the Inactive Naval Reserves has been marked by an increase to 121 hours in 1964 from 88 hours in 1963.

The average number of aircraft hours for Army pilots—in fixed-wing and rotary-wing craft combined—was 192 in 1964. The corresponding average for 1961-64 was 202 hours.

Military Air Transport Service

During 1964 there were 74 passenger fatalities (resulting from one accident) on military carriers in MATS, as compared with none in 1963 and 1962. The passenger fatality rate for the four-year period 1961-64 was 1.48 per 100,000,000 passenger miles.

Aviation fatality rates among pilots and crew members of MATS are shown in Table 12.

United States Army

Table 13 shows aviation fatality rates among Army rated pilots and crew members. The 1964 rates are shown on two bases—including and excluding deaths due to enemy action. Part of the increase in the 1964 rates excluding enemy action may be attributable to increased activity not involving direct enemy action.

TABLE 12
MILITARY AIR TRANSPORT SERVICE
AVIATION FATALITY RATES
PER 1,000 LIFE YEARS OF EXPOSURE
DEATHS DUE TO ENEMY ACTION INCLUDED

	7/1/57- 6/30/61	7/1/61- 6/30/65	7/1/64- 6/30/65
Pilots:			
Transport units.....	2.5	2.3	3.3
Other units.....	1.6	1.6	0.0
All.....	2.0	2.1	2.4
Crew members:			
Transport units.....	2.9	2.9	4.2
Other units.....	4.8	1.9	0.0
All.....	3.5	2.7	3.3

TABLE 13
UNITED STATES ARMY—ALL FLYING OPERATIONS
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE
DEATHS DUE TO ENEMY ACTION EXCLUDED

	1957-60	1961-64*	1964
Rated pilots.....	4.8	4.1	5.2 (7.8)†
Crew members.....	6.5	8.2	11.9 (20.8)†

* 1963 data exclude all fatalities occurring in Viet-Nam, enemy action and others. 1964 data exclude only deaths due to enemy action.

† 1964 aviation fatality rates in parentheses include deaths due to enemy action.

Fatality rates among Army rated pilots per 1,000 aircraft hours in rotary-wing and fixed-wing aircraft are compared in Table 14.

In 1964, as in 1963 and 1962, the fatality rate, excluding fatalities due to enemy action, per 1,000 aircraft hours for pilots of fixed-wing aircraft was higher than that for pilots of rotary-wing aircraft. However, if deaths due to enemy action are included, the 1964 helicopter pilot fatality rate was higher than the corresponding rate for fixed-wing aircraft pilots.

TABLE 14
 UNITED STATES ARMY—ROTARY- VERSUS FIXED-WING AIRCRAFT
 PILOT FATALITY RATES PER 1,000 AIRCRAFT HOURS
 DEATHS DUE TO ENEMY ACTION EXCLUDED

	1957-60	1961-64*	1964
Fixed-wing aircraft.....	.0180	.0210	.0296 (.0346)†
Rotary-wing aircraft.....	.0250	.0197	.0246 (.0466)†
All types of aircraft.....	.0207	.0204	.0272 (.0405)†

* 1963 data exclude all fatalities occurring in Viet-Nam, enemy action and others. 1964 data exclude only deaths due to enemy action.

† 1964 aviation fatality rates in parentheses include deaths due to enemy action.

TABLE 15
 UNITED STATES AIR FORCE, NAVY AND MARINE CORPS,
 AND ARMY STUDENT PILOTS
 AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE

	1957-60	1961-64	1964
Air Force*.....	N.A.	3.1†	2.8†
Navy and Marine Corps:			
Basic course.....	3.2	2.8	1.8†
Advanced course.....	9.7	8.7	10.5
Army.....	2.0	1.5	2.0†

* Officers only.

† Preliminary.

‡ Based on 5 or fewer deaths.

N.A. = Not available.

Student Pilots

Table 15 shows aviation fatality rates among student pilots in the military services. Air Force records separating primary and basic courses are no longer maintained. The Navy and Marine Corps rates are based on both officers and cadets, whereas the Air Force rates are based on officers only. The Air Force cadet program was phased out in 1962.

Because of the low numbers of deaths involved, there has been consider-

able fluctuation in the fatality rates for individual years. However, the fatality rates averaged over four-year periods have exhibited a trend which is generally downward.

Coast Guard

Table 16 shows aviation fatality rates among Coast Guard personnel on flight orders. The rates for 1964 were the result of two aviation accidents. There were no pilot fatalities reported in 1963 or 1962. There have

TABLE 16
UNITED STATES COAST GUARD PERSONNEL
ON FLIGHT ORDERS
AVIATION FATALITY RATES PER 1,000 LIFE
YEARS OF EXPOSURE

	1957-60	1961-64	1964
Pilots.....	3.4*	4.1	8.5*
Crewmen.....	0.7*	1.1	2.9*

* Based on 5 or fewer deaths.

TABLE 17
UNITED STATES NAVY AND MARINE CORPS INACTIVE
RESERVISTS ON DRILL PAY STATUS
AVIATION FATALITY RATES BY AGE PER 1,000 LIFE
YEARS OF EXPOSURE

	1957-60	1961-64	1964
Ages under 30.....	2.5	3.6	4.7*
Ages 30 and over.....	1.7	2.0	2.2
All ages.....	1.9	2.4	2.6

* Based on 5 or fewer deaths.

been no fatalities among Coast Guard student pilots or observers during the past eight years. There were no fatalities due to enemy action in the period covered by this report.

Inactive Reservists

The fatality rates for Navy and Marine Corps inactive reservists on drill-pay status are shown in Table 17.

Air National Guard

The aviation fatality rates among Air National Guard pilots not federally activated were 6.5 per 1,000 life years of exposure during 1964 and

4.9 for the period 1961-64. The rates for 1963 and 1960-63 were 4.4 and 3.6, respectively. The 1963 rate is based on new data supplied by the Air Force. It was reported as 4.3 in last year's report.

Army National Guard

For Army National Guard flyers, there was one aviation fatality reported during each of the calendar years 1963 and 1964 among rated pilots and none among student pilots or crew members.

Air Force Flight Surgeons and Nurses

During the period 1961-64 the aviation fatality rate among flight surgeons was 0.9 per 1,000 life years. The corresponding rate for 1960-63 was 2.1, and for 1959-62 it was 2.4. There have been no fatalities among flight nurses during the last three years. The death of a flight nurse in 1961, not previously reported, amends the comment in last year's report.

Graduates of Academies—Assignment to Aviation

In 1964, 2.0 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.

Of the commissioned Air Force Academy graduates, 99.6 per cent were placed in the Air Force and the remaining 0.4 per cent in the Marine Corps.

ROYAL CANADIAN AIR FORCE

Table 18 shows the 1959-64 aviation fatality rates for pilots and crew members of the R.C.A.F. The aviation fatality rate for pilots on active duty decreased to 3.5 per 1,000 life years from 4.2 in 1958-63 and 5.1 in 1957-62. The aviation fatality rates for other crew members decreased to 1.2 per 1,000 life years from 1.6 in 1958-63 and 1.9 in 1957-62.

The fatality rates by rank follow, in general, patterns similar to those shown in last year's report for both pilots and other crew members.

The R.C.A.F. Auxiliary (i.e., reserve personnel who undergo weekly training in organized squadrons) has had no pilot fatalities during the seven years ending 1964.

A comparison of the 1959-64 aviation fatality rates for pilots by function with those of the periods 1958-63 and 1957-62 shows that the rates have decreased slightly in each category. The aviation fatality rate among radio navigators in the Fighter Command was 4.3 per 1,000 life years for 1959-64 as compared with 5.6 for the period 1958-63 and 6.5 for the period 1957-62.

In reviewing the results shown in Table 18, it should be kept in mind

that the bulk of the R.C.A.F. pilot experience was concentrated in the "Fighter" and "Training" categories and that the aviation fatality rates for the "Transport" and "Maritime" categories were based on relatively small exposures. Likewise, the movement from ground crew to air crew, and the transfers from one functional formation to another, continue.

During the period 1959-64 the aviation fatality rates were 0.0286 per 1,000 flying hours for R.C.A.F. pilots flying jet aircraft and 0.0046 for pilots flying other aircraft. For crew members, the corresponding rates were 0.0161 and 0.0018, respectively.

The average number of flight hours per pilot during 1964 was 297 for R.C.A.F. Regular pilots and 137 for R.C.A.F. Auxiliary pilots. This figure

TABLE 18
ROYAL CANADIAN AIR FORCE
1959-64 AVIATION FATALITY RATES
PER 1,000 LIFE YEARS OF EXPOSURE

	REGULAR	
	Pilot	Other Crew
Age group:		
Under 25.....	5.3	1.0*
25-29.....	6.4	1.8
30-34.....	3.2	1.0*
35-39.....	2.5	0.9*
40 and over.....	0.4*	0.8*
All.....	3.5	1.2
Rank:		
Flight cadet and pilot officer.....	0.0*	0.0*
Flying officer.....	7.5	1.9
Flight lieutenant.....	2.3	0.8*
Squadron leader.....	0.5*	0.0*
Wing commander and higher ranks.....	2.2*	2.8*
All.....	3.5	1.2
By function:		
Fighter.....	5.9	4.3
Training.....	2.9	0.4*
Transport.....	0.8*	0.0*
Maritime.....	0.6*	0.0*
Others.....	3.1	0.0*
All.....	3.5	1.2

* Based on 5 or fewer deaths.

NOTE.—The function classified as "Others" is composed largely of pilots whose primary assignment is on the ground but who occasionally fly to maintain proficiency. It also includes pilots of the Air Material Command who ferry planes to air bases and test new planes, both accepted and experimental models.

has been fairly constant in recent years for Regular pilots but has been decreasing for Auxiliary pilots from 169 hours in 1962 and 158 hours in 1963.

The 1964 distribution of R.C.A.F. pilots and crew members by duty assignment and age is given in Table 19. Compared with the 1963 distribution, there has been relatively little change for most categories.

TABLE 19
ROYAL CANADIAN AIR FORCE
1964 DISTRIBUTION BY AGE AND DUTY ASSIGNMENT

FUNCTION	PILOT AGE					OTHER AIR CREW AGE				
	Under 25	25-29	30-34	35-39	40 and Over	Under 25	25-29	30-34	35-39	40 and Over
By Age Group for Each Duty Assignment										
Fighter.....	11%	20%	22%	15%	32%	11%	37%	26%	10%	16%
Training.....	48	23	10	6	13	45	14	20	11	10
Transport.....	6	14	20	18	42	27	23	23	15	12
Maritime.....	16	12	18	14	40	43	31	15	7	4
Others.....	.....	11	17	14	58	1	10	29	23	37
By Duty Assignment for Each Age Group										
Fighter.....	15%	32%	39%	36%	30%	8%	33%	27%	20%	29%
Training.....	74	42	21	16	14	33	12	20	21	18
Transport.....	4	12	17	22	20	13	12	16	19	13
Maritime.....	7	6	10	11	12	46	39	23	19	11
Others.....	.....	8	13	15	24	.....	4	14	21	29
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

INTERCOMPANY EXPERIENCE

Contributions submitted for the 1963 and 1964 experiences were limited to issues of 1953 and later, and this is indicated in the footnotes to the tables.

For the past two years contributing companies have been asked to show separately their military experience for ages 35-39. However, the publication of this subdivision of the data continues to be deferred until more data have been accumulated.

Civilian Aviation

Tables 20 and 21 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 of 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 20 includes only a portion of such cases.

The experience in Table 20 covers the years 1957-64 inclusive and is shown separately for cases with aviation extra premium and without

TABLE 20
INTERCOMPANY EXPERIENCE ON PILOTS IN CIVILIAN AVIATION*
(1957-64 Experience--by Policies)

STATUS AT ISSUE AND HOURS FLOWN IN 12 MONTHS PRECEDING ISSUE	WITH AVIATION EXTRA PREMIUM (1946 AND SUBSEQUENT ISSUES) †			WITHOUT AVIATION EXTRA PREMIUM (1955 AND SUBSEQUENT ISSUES)		
	Years of Exposure	Avia- tion Fa- talities	Rate per 1,000	Years of Exposure	Avia- tion Fa- talities	Rate per 1,000
Scheduled airline pilots....	8,797	24	2.7	29,697	46	1.5
Other commercial pilots fly- ing for hire:						
Instructing (at least half- time).....	6,630	24	3.6			
Others.....	17,945	92	5.1	5,186	13	2.5
Total.....	24,575	116	4.7	5,186	13	2.5
Private pilots:‡						
Less than 100 hours....	65,492	80	1.2	84,084	94	1.1
100-199 hours.....	27,903	70	2.5	14,194	30	2.1
200-299 hours.....	10,070	38	3.8	1,701	3	1.8§
300 or more hours.....	9,256	31	3.3	1,448	1	
Hours not stated.....	3,917	8	2.0	2,075	1	
Total.....	116,638	227	1.9	103,502	129	1.2

* 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.

† For exposure years 1963 and 1964, issues of only 1953 and later years are included.

‡ 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.

aviation extra premium. The experience in the "Without Aviation Extra Premium" classifications remains more favorable than that in the "With Aviation Extra Premium" classifications. The experience in the "With Aviation Extra Premium" classifications is somewhat more favorable than the 1957-63 experience shown in last year's report. Note that even for scheduled airline pilots accepted without aviation extra premium, the aviation fatality rate during the 1957-64 period was 1.5 per 1,000 based on 46 deaths, while among other commercial pilots accepted without aviation

TABLE 21
 INTERCOMPANY EXPERIENCE ON PILOTS FLYING FOR
 PLEASURE OR PERSONAL BUSINESS*
 WITH AVIATION EXTRA PREMIUM†
 (1954-64 Experience on 1946 and Subsequent Issues‡—by Policies)

HOURS FLOWN IN 12 MONTHS PRECEDING ISSUE	COMMERCIAL OR TRANSPORT CERTIFICATE			PRIVATE CERTIFICATE (WITH 100 OR MORE SOLO HOURS)		
	Years of Exposure	Avia- tion Fa- talities	Rate per 1,000	Years of Exposure	Avia- tion Fa- talities	Rate per 1,000
Less than 100 hours	14,002	27	1.9	64,306	65	1.0
100-199 hours	6,567	14	2.1	27,031	65	2.4
200-299 hours	3,657	11	3.0	8,188	34	4.2
300 or more hours	4,530	12	2.6	6,052	26	4.3
Hours not stated	810	3	3.7§	3,761	8	2.1
Total	29,566	67	2.3	109,338	198	1.8
	ATTAINED AGES UNDER 35||			ATTAINED AGES 35 AND OVER||		
	Years of Exposure	Avia- tion Fa- talities	Rate per 1,000	Years of Exposure	Avia- tion Fa- talities	Rate per 1,000
Less than 100 hours	28,337	44	1.6	48,705	47	1.0
100-199 hours	10,385	19	1.8	22,666	58	2.6
200-299 hours	2,502	7	2.8	9,159	36	3.9
300 or more hours	2,213	5	2.3§	8,187	33	4.0
Hours not stated	1,310	1	.....	3,241	10	3.1
Total	44,747	76	1.7	91,958	184	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 and 1964, 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.

extra premium it was 2.5 per 1,000 based on 13 deaths. Private pilots flying 100-199 hours and accepted without aviation extra premium experienced a fatality rate of 2.1 per 1,000 based on 30 deaths, which is less favorable than the fatality rate of 1.8 per 1,000 based on 18 deaths published last year for the period 1957-63.

Table 21 shows the experience during the period 1954-64 inclusive, among commercial, transport, and private pilots flying 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 private pilots flying less than 100 hours per year, the experience has been distinctly more favorable for pilots with private certificates than for pilots with commercial or transport certificates and more favorable at attained ages 35 and over than at attained ages under 35. On the other hand, among private pilots flying 100 or more hours per year, the experience has been more favorable for pilots with commercial or transport certificates and also at attained ages under 35 as compared with attained ages 35 and over.

Military Aviation

Table 22 shows, for the twenty-six companies which contributed their experience on military aviation, the aviation fatality rates during the years 1957-64 inclusive among military aviation personnel on policies issued since January 1, 1946, with an aviation extra premium. The experience is by number of policies, and the classification of the insured is according to status at the time of application for insurance. Exposure was terminated when the extra premium was discontinued.

The 1963-64 fatalities due to enemy action, although few, have reached a level to be recognized in Tables 22 and 23. The figures in the "Aviation Fatalities" column include deaths due to enemy action; the number of such deaths is shown in parentheses. Fatality rates excluding deaths due to enemy action are shown in brackets and are quite similar to those for the period 1957-63 shown last year. 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 cover years back to 1957.

Inasmuch as some of the contributing companies were not able to subdivide their data according to branch of service, 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. Although the crew-member data report the combined experience of both Air Force and Army, the Army

TABLE 22

INTERCOMPANY EXPERIENCE ON PILOTS AND CREW MEMBERS IN
MILITARY AVIATION—WITH AVIATION EXTRA PREMIUM*
FATALITIES IN COMBAT MISSIONS INCLUDED WHETHER
OR NOT RESULTING FROM ENEMY ACTION†
(1957-64 Experience on 1946 and Subsequent Issues‡—by Policies)

Status at Issue and Attained Insurance Age	Years of Exposure	Aviation Fatalities	Rate per 1,000
U.S. Air Force pilots:§			
Under 25.....	2,737	10	3.7
25-29.....	23,590	89 (3)	3.8 [3.6]
30-34.....	39,221	117 (2)	3.0 [2.9]
35 and over.....	131,695	244	1.9
Total.....	197,243	460 (5)	2.3 [2.3]
U.S. Army pilots:§			
Under 25.....	298	3	.....
25-29.....	2,992	7	2.3
30-34.....	5,383	20 (1)	3.7 [3.5]
35 and over.....	19,363	23	1.2
Total.....	28,036	53 (1)	1.9 [1.9]
U.S. Air Force and Army pilots:			
Under 25.....	3,417	14	4.1
25-29.....	29,443	102 (3)	3.5 [3.4]
30-34.....	50,029	153 (3)	3.1 [3.0]
35 and over.....	184,047	334	1.8
Total.....	266,936	603 (6)	2.3 [2.2]
U.S. Air Force and Army crew members:			
Under 25.....	10,953	25 (1)	2.3 [2.2]
25-29.....	29,892	71 (2)	2.4 [2.3]
30-34.....	23,168	47 (1)	2.0 [2.0]
35 and over.....	39,507	60	1.5
Total.....	103,520	203 (4)	2.0 [1.9]
U.S. Navy and Marine pilots:			
Under 25.....	2,124	27	12.7
25-29.....	14,448	125	8.7
30-34.....	23,769	113	4.8
35 and over.....	73,190	197	2.7
Total.....	113,531	462	4.1
U.S. Air Force, Army, and Navy Reserve pilots.....	13,384	23	1.7
U.S. Air National Guard pilots	4,948	12	2.4

* 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.

‡ For exposure years 1963 and 1964, issues of only 1953 and later years are included.

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

portion is very small, amounting in 1964 to less than 1 per cent of the exposure and no fatalities.

United States Navy and Marine pilots at ages under 30 have experienced in recent years significantly higher aviation fatality rates than United States Air Force and Army pilots at these ages.

Table 23 shows a further subdivision of the experience on pilots in

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†
(1957-64 Experience on 1953 and Subsequent Issues—by Policies)

HOURS FLOWN IN 12 MONTHS PRECEDING ISSUE	U.S. AIR FORCE AND ARMY			U.S. NAVY AND MARINES		
	Years of Exposure	Avia- tion Fa- talities	Rate per 1,000	Years of Exposure	Avia- tion Fa- talities	Rate per 1,000
40-150 hours:						
Ages 30-34	10,016	32	3.2	5,377	26	4.8
Ages 35 and over	48,974	66	1.3	18,862	43	2.3
Total	58,990	98	1.7	24,239	69	2.8
Over 150 hours:						
Ages 30-34	32,232	100 (1)	3.1 [3.1]	13,654	65	4.8
Ages 35 and over	63,798	148	2.3	22,868	69	3.0
Total	96,030	248 (1)	2.6 [2.6]	36,522	134	3.7

* 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.

military aviation at attained ages 30 and over according to the number of annual flying hours reported at time of issue—for issues of 1953 and later years only. 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; fatality rates have continued to be lower for those at attained ages 35 and over than for those at ages 30-34.