

**TRANSACTIONS OF SOCIETY OF ACTUARIES  
1971 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 are included for comparison and to indicate trends.

The Committee has been successful in obtaining data for Canadian Military Aviation and for the United States Air Force by duty assignment. This information has not been available in recent years.

The experience on United States Military Aviation reflects diminishing activity in Southeast Asia.

More detailed analyses of certain classes of intercompany experience, which have been awaiting the accumulation of sufficient data, are presented in this report.

**UNITED STATES CIVIL AIR CARRIER FLEET**

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. 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. The experience of Commercial Operators is very limited because of the small number of aircraft; and the number of flying hours and the number of fatal accidents are not available.

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 as "airlines," "airways," and "carrier" and may provide scheduled passenger service on a limited basis (e.g., commuter or feeder airlines). Nevertheless, data regarding their activities are included under "Air Taxi" in the "General Aviation" section of this 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 di-

vided into two groups—passenger/cargo and all cargo. A recent issue of the monthly Civil Aeronautics Board publication *Air Carrier Traffic Statistics* listed 35 such passenger/cargo air carriers (including 4 intra-Alaska, 2 intra-Hawaii, and 3 helicopter carriers) and 3 such all-cargo air 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, and other crew members in domestic and international flying. The lives exposed as “All Pilots and Copilots” 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 passenger fatality rates which are subject to marked fluctuation from year to year. However, such rates, when taken in four-year periods, have declined since 1959, as indicated in Table 1.

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 average fewer hours monthly because they have ground duties before and after flights.

Helicopter airlines designated as “Certificated Route Air Carriers” are excluded from the experience for passengers and first pilots in Table 1. During the twelve years 1960–71 there were 5 fatal accidents on helicopter airlines, resulting in a passenger death rate of 0.026 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 the conduct of nonscheduled operations, which may include passengers.

The first-pilot fatality rates for all-cargo carriers are shown in Table 2 for recent four-year periods, together with the rates for Supplemental Carriers. First-pilot fatality rates for scheduled services of all-cargo carriers were less favorable than the rates for nonscheduled services. However, the volume of experience has been small.

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                   |   |  |   |                                       |
| 1959-62.....                          | .0015 (23)  | .0017 (22)   | .0012 (30)                                | .0014 (25)                            |
| 1963-66.....                          | .0006 (18)  | .0012 (16)   | .0007 (22)                                | .0005 (14)                            |
| 1967-70.....                          | .0006 (18)  | .0009 (16)   | .0005 (23)                                | .0003 (18)                            |
| 1971§.....                            | .0006 (3)   | .0006 (3)  | .0002 (3)                                 | .0002 (3)                             |
| 1959-71§.....                         | .0008 (62)  | .0012 (57)   | .0007 (78)                                | .0005 (60)                            |
| International Operations              |   |  |   |                                       |
| 1959-62.....                          | .0006 (3)   | .0014 (3)  | .0009 (3)                                 | .0012 (3)                             |
| 1963-66.....                          | .0013 (4)   | .0019 (4)  | .0015 (6)                                 | .0020 (6)                             |
| 1967-70.....                          | .0002 (3)   | .0003 (1)  | .0004 (2)                                 | .0004 (3)                             |
| 1971§.....                            | .0000 (0)   | .0000 (0)  | .0000 (0)                                 | .0000 (0)                             |
| 1959-71§.....                         | .0006 (10)  | .0010 (8)  | .0008 (11)                                | .0009 (12)                            |
| Domestic and International Operations |   |  |   |                                       |
| 1959-62.....                          | .0014 (26)  | .0017 (25)   | .0011 (33)                                | .0014 (28)                            |
| 1963-66.....                          | .0007 (22)  | .0013 (20)   | .0008 (28)                                | .0007 (20)                            |
| 1967-70.....                          | .0005 (21)  | .0008 (17)   | .0005 (25)                                | .0003 (21)                            |
| 1971§.....                            | .0005 (3)   | .0006 (3)  | .0002 (3)                                 | .0002 (3)                             |
| 1959-71§.....                         | .0008 (72)  | .0011 (65)   | .0007 (89)                                | .0006 (72)                            |

\* 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.

§ 1971 figures are preliminary.

*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 15 such air carriers listed in the 1970 edition of the *FAA Statistical Handbook*.

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

| Years    | All-Cargo<br>(All Operations) | Supplemental<br>(All Operations) |
|----------|-------------------------------|----------------------------------|
| 1959-62  | .0052 (4)                     | .0066 (6)                        |
| 1963-66  | .0074 (5)                     | .0049 (5)                        |
| 1967-70  | .0046 (3)                     | .0025 (3)                        |
| 1971†    | .0081 (1)                     | .0000 (0)                        |
| 1959-71† | .0058 (13)                    | .0042 (14)                       |

\* Number of fatalities shown in parentheses.

† 1971 figures are preliminary.

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 of Supplemental Air Carriers since 1959, based on 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 boundary lines may require. From *World Air Transport Statistics*, a publication of the International Air Transport Association, the Committee has summarized the experience of the Association's members. In 1970 these members carried 89 per cent of the world's scheduled airline traffic (excluding the U.S.S.R. and the People's Republic of China). Some com-

panies operated only within the borders of a particular country, some only on an international basis, and some on both bases of varying proportions.

By making reasonable assumptions regarding average speed, passenger fatality rates per 1,000 scheduled passenger hours were derived and are shown in Table 3. The 1970 issue of *World Air Transport Statistics* lists 91 IATA members in countries other than the United States and 11 United States members who operate scheduled passenger flights in fixed-wing aircraft. The safety record of the scheduled services of the airlines

TABLE 3  
SCHEDULED AIR CARRIERS OF  
UNITED STATES AND OTHER COUNTRIES  
PASSENGER 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 |                                |
| 1959-62 . . . . .  | .0036                                  | .0014         | .0014                          |
| 1963-66 . . . . .  | .0026                                  | .0008         | .0007                          |
| 1967-70* . . . . . | .0017                                  | .0002         | .0005                          |
| 1970* . . . . .    | .0010                                  | .0000         | .0000                          |
| 1959-70* . . . . . | .0024                                  | .0007         | .0008                          |

\* IATA figures are preliminary.

of other countries has been improving but continues to be less favorable than that of United States scheduled air carriers.

For 1970, 52 per cent of the scheduled passenger hours reported to IATA were flown by the United States members. These air carriers accounted for 89 per cent of the scheduled passenger hours flown by all United States Certificated Route Air Carriers in 1970. 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 flying includes all domestic civil flying except that performed by the United States Civil Air Carrier Fleet. The annual flying time of planes in general aviation totals more than five times the flying

time of air carriers in their domestic flights. The number of hours flown by each aircraft in general aviation and the primary use of each aircraft are obtained at the time of FAA annual inspection of aircraft.

In 1970 a more refined method for reporting aircraft hours was used by the FAA. A new category for kind of flying is "Rental," for which the actual uses of the aircraft by the pilot are unknown. In Table 4 the Rental

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

| Years | Estimated Hours (000)  | Aviation Deaths | Rate | Estimated Hours (000) | Aviation Deaths | Rate |
|-------|------------------------|-----------------|------|-----------------------|-----------------|------|
|       | Pleasure               |                 |      | Instruction           |                 |      |
| 1968  | 5,532                  | 360             | .065 | 6,494                 | 61              | .009 |
| 1969  | 5,999                  | 326             | .054 | 7,023                 | 54              | .008 |
| 1970* | 9,163                  | 323             | .035 | 4,524                 | 52              | .011 |
|       | Business and Corporate |                 |      | Air Taxi              |                 |      |
| 1968  | 6,976                  | 85              | .012 | 1,999                 | 39              | .020 |
| 1969  | 7,064                  | 77              | .011 | 2,238                 | 26              | .012 |
| 1970* | 7,204                  | 81              | .011 | 2,311                 | 32              | .014 |
|       | Aerial Application     |                 |      |                       |                 |      |
| 1968  | 1,282                  | 38              | .030 |                       |                 |      |
| 1969  | 1,478                  | 32              | .022 |                       |                 |      |
| 1970* | 1,396                  | 40              | .029 |                       |                 |      |

\* 1970 figures are preliminary. See text for comments regarding change in method of reporting aircraft hours.

hours are included with "Pleasure," on the assumption that most pilots renting aircraft do so for pleasure purposes. Under the system used in 1969 and prior years, it is believed that most Rental hours were classified under "Instruction" because the owner's primary use of his aircraft was usually for instruction. Because of this change, the pilot aviation death rate for Pleasure flying in 1970 is much lower than for previous years, although it remains the highest among the categories in general aviation shown in Table 4. However, it is probable that the tendency of individuals to underreport hours for Pleasure flying and to overreport hours for other

types of flying still causes a distortion of the pilot aviation death rates, particularly in the "Pleasure" category where the rates still appear to be overstated.

Death rates referred to in this section are expressed per 1,000 airplane hours. One of the many factors affecting pilot death rates is the number of hours flown in a year, and death rates per life year of exposure may be markedly lower than death rates per 1,000 aircraft hours. However, such rates cannot be reliably estimated on the basis of the material from which this information has been taken.

The experience under flight training of civilians includes the death of the instructor or the student, whichever was acting as pilot when the accident occurred. The hours of instructional flying in 1970 represented 17 per cent of the total in general aviation. 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 rate in 1970 reflects the reduced number of aircraft hours due to the change in reporting method mentioned above.

The "Business" and "Corporate" categories, which accounted for 28 per cent of total general aviation flying in 1970, are composed of non-professional 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 personnel or cargo in furtherance of the company's business (Corporate). The subdivision of experience for these categories in 1970 showed pilot aviation death rates per 1,000 aircraft hours of 0.016 for Business flying (73 deaths) and 0.003 for Corporate flying (8 deaths).

Air Taxi flying accounted for 9 per cent of the total general aviation hours in 1970. 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 1970 there were 9 pilot deaths in scheduled flying (5 passenger and 4 cargo) and 23 in nonscheduled flying (19 passenger and 4 cargo). The number of flying hours is not available for these categories separately.

The pilot fatality rates in Aerial Application, which accounted for 5 per cent of general aviation flying in 1970, have been higher than those in other commercial activities. During 1965-70 there were 441,000 hours flown for such purposes by rotorcraft (helicopter), with 10 deaths, a fatality rate of 0.022 per 1,000 airplane hours. This compares with 6,820,000 hours flown by other planes in aerial application during the same period, with 217 deaths and a fatality rate of 0.032 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.

In addition to the total of 528 deaths recorded in all the categories shown in Table 4, there were 70 other pilot deaths during 1970. Of this number, 10 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 which consists primarily of practice flying; and 45 deaths were classified as "miscellaneous," which included 9 accidents in testing (including testing of homemade aircraft), 7 in ferrying, 3 in hunting, and 4 in demonstration. The remaining 22 fatal accidents referred to as "miscellaneous" include airshow participation, towing gliders, search and rescue, and unauthorized or unknown uses.

The 598 pilot deaths during 1970 in general aviation as reported by the National Transportation Safety Board included 561 in small fixed-wing aircraft (12,500 pounds or less), 13 in large fixed-wing aircraft (over 12,500 pounds), 16 in rotorcraft, and 8 in gliders or other aircraft. Among the 652 pilots involved in fatal accidents (which resulted in the 598 pilot deaths previously mentioned) were 54 holding student certificates, 296 with private certificates, 241 with commercial certificates, 40 with airline transport certificates, and 10 with no certificate; the remaining 11 pilots are listed as unknown or unreported.

#### 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 Statistics, Canada, are shown in Table 5.

Comparable first-pilot aviation fatality rates for Canadian nonscheduled airlines have been estimated from the same sources and are shown in Table 6, 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 7.

Canadian scheduled airlines comprise air carriers that serve designated points in accordance with a definite service schedule. Nonscheduled air-



TABLE 5  
CANADIAN SCHEDULED AIRLINES  
AVIATION FATALITY RATES\*

| Years                | Passenger<br>Fatality Rate<br>per 1,000<br>Passenger Hours | First-Pilot<br>Fatality Rate<br>per 1,000<br>Airplane Hours |
|----------------------|--|---|
| 1959-62 .....        | .0004 (2)  | .0008 (1)   |
| 1963-66 .....        | .0033 (4)  | .0029 (4)   |
| 1967-70 .....        | .0010 (2)  | .0011 (2)   |
| 1959-70 .....        | .0015 (8)  | .0015 (7)   |
| 1968-71 (est.) ..... | .0009 (2)  | .0010 (2)   |

\* Number of fatal accidents shown in parentheses.

TABLE 6  
CANADIAN NONSCHEDULED VERSUS  
SCHEDULED AIRLINES  
FIRST-PILOT FATALITY RATES PER  
1,000 AIRPLANE HOURS\*

| Years         | Nonscheduled | Scheduled |
|---------------|--------------|-----------|
| 1963-66 ..... | .0191 (33)   | .0029 (4) |
| 1967-70 ..... | .0152 (44)   | .0011 (2) |
| 1963-70 ..... | .0166 (77)   | .0018 (6) |

\* Number of fatal accidents shown in parentheses.

TABLE 7  
CANADIAN NONSCHEDULED FLYING—  
DOMESTIC OPERATIONS  
PASSENGER FATALITY RATES PER  
1,000 PASSENGER HOURS\*

| Years         | Fatality Rate |
|---------------|---------------|
| 1963-66 ..... | .0182 (31)    |
| 1967-70 ..... | .0149 (52)    |
| 1963-70 ..... | .0161 (83)    |

\* Number of fatal accidents shown in parentheses.

lines 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 8, separately, for the periods 1963-66 and 1967-70, on the basis of 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 8  
CANADIAN CIVIL PILOTS, BY CLASS OF LICENSE  
1963-70 AVIATION FATALITY RATES

| Class of License                       | Years     | Life Years<br>of Exposure | Aviation<br>Fatalities | Rate per<br>1,000<br>Life Years<br>of Exposure |
|--|-----------|---------------------------|------------------------|--|
| Airline transport . . . . .            | { 1963-66 | 5,839                     | 13                     | 2.2  |
|  | { 1967-70 | 9,290                     | 17                     | 1.8  |
| Senior commercial . . . . .            | { 1963-66 | 1,508                     | 6                      | 4.0  |
|  | { 1967-70 | 2,317                     | 13                     | 5.6  |
| Commercial . . . . .                   | { 1963-66 | 10,825                    | 54                     | 5.0  |
|  | { 1967-70 | 18,111                    | 93                     | 5.1  |
| Private (excluding students) . . . . . | { 1963-66 | 65,548                    | 103                    | 1.6  |
|  | { 1967-70 | 88,583                    | 117                    | 1.3  |
| Glider . . . . .                       | 1967-70   | 4,744                     | 4                      | 0.8  |

The 1967-70 fatality rates for airline transport and private pilots are slightly lower than the corresponding rates of the 1963-66 period. The fatality rate for commercial pilots has been about the same during the recent four-year period as that for the earlier period, while the rate for senior commercial pilots has been somewhat higher.

#### UNITED STATES MILITARY

##### *General*

Whenever possible, aviation fatality rates are shown both including and excluding deaths due to hostile action, provided that the necessary information is available.

Aviation fatality rates by duty assignment for Air Force pilots on active duty, which last appeared in the *1967 Reports*, are included for 1970.

In the past, aviation fatality statistics for pilots and crew members of the Military Air Command were furnished to the Committee on a fiscal-year basis, but hereafter they will appear on a calendar-year basis.

The tables in this report are now consistent in showing outside of brackets those fatality rates which include deaths due to hostile action, and within brackets those rates which exclude such deaths. It has not been possible to obtain this consistency in past reports.

The experience of Navy and Marine Corps Reserve pilots is almost entirely that of the Active Reserve rather than the Inactive Reserve.

TABLE 9  
 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<br>RATED PILOTS |           | AIR FORCE NONPILOT<br>RATED OFFICERS |             | NAVY AND MARINE<br>CORPS PILOTS† |            |
|------------------|---------------------------|-----------|--------------------------------------|-------------|----------------------------------|------------|
|                  | 1967-70                   | 1970      | 1967-70                              | 1970        | 1967-70                          | 1970       |
| Under 25.....    | 5.3 [3.4]                 | 6.2 [3.6] | 0.6‡ [0.6]‡                          | 0.0‡ [0.0]‡ | 14.4 [9.3]                       | 9.4 [7.3]  |
| 25-29.....       | 7.4 [4.3]                 | 9.7 [6.9] | 1.7 [1.1]                            | 0.6‡ [0.6]‡ | 13.1 [9.1]                       | 11.2 [8.9] |
| 30-34.....       | 4.8 [2.9]                 | 3.1 [2.1] | 1.7 [1.0]                            | 1.4 [0.9]‡  | 10.1 [6.8]                       | 4.8 [2.8]  |
| 35-39.....       | 3.7 [2.3]                 | 3.4 [2.6] | 1.3 [0.6]                            | 0.7‡ [0.4]‡ | 5.2 [3.5]                        | 2.5 [2.5]  |
| 40 and over..... | 1.8 [1.1]                 | 1.2 [0.9] | 1.5 [1.1]‡                           | 0.0‡ [0.0]‡ | 1.9 [1.5]                        | 2.4 [1.9]  |
| All.....         | 4.3 [2.6]                 | 4.7 [3.1] | 1.5 [0.9]                            | 0.7 [0.5]   | 9.1 [6.1]                        | 6.9 [5.4]  |

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

† A small proportion of total deaths for each period were not identified by age.

‡ Based on 5 or fewer deaths.

All references to the term "Inactive Reserve" in prior reports have been changed to "Active Reserve" in the current report; the rates are not affected.

*Age*

Table 9 shows aviation fatality rates by age group for Air Force pilots and nonpilot rated officers and for Navy and Marine Corps aviators on active duty. Navy and Marine Corps pilot fatality rates excluding deaths due to hostile action averaged over a four-year time period appear in this report for the first time.

The fatality rates for Air Force rated pilots during the four-year time period 1967-70, both including and excluding deaths due to hostile action, were essentially the same as those for 1966-69. The fatality rates in 1970

returned to the 1968 level after being markedly lower in 1969. On the other hand, fatality rates for Air Force nonpilot rated officers remained at the low levels of 1969. As indicated in the table, the age-group rates shown for the single year 1970 were, with one exception, based on 5 or fewer deaths.

Fatality rates for Navy and Marine Corps pilots, including deaths due to hostile action, have been successively lower each year since 1967, with the exception of a rise in the year 1969 for the age group 40 and over. Nevertheless, the trend of average fatality rates covering a four-year time period has continued upward through 1967-70 for all age groups under

TABLE 10  
UNITED STATES AIR FORCE FLYERS, BY RANK  
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE  
DEATHS DUE TO HOSTILE ACTION INCLUDED\*

| RANK                          | RATED PILOTS |             | NONPILOT RATED OFFICERS |             |
|-------------------------------|--------------|-------------|-------------------------|-------------|
|                               | 1967-70      | 1970        | 1967-70                 | 1970        |
| 2d Lieutenant . . . . .       | 3.7 [3.5]    | 7.3 [7.3]   | 0.0† [0.0]†             | 0.0† [0.0]† |
| 1st Lieutenant . . . . .      | 7.3 [4.1]    | 7.2 [3.9]   | 1.5 [1.2]               | 0.0† [0.0]† |
| Captain . . . . .             | 6.3 [3.6]    | 6.9 [4.2]   | 1.8 [1.2]               | 0.4† [0.4]† |
| Major . . . . .               | 4.1 [2.6]    | 4.1 [3.1]   | 1.3 [0.6]               | 1.3 [0.8]†  |
| Lieutenant Colonel . . . . .  | 1.9 [1.2]    | 2.0 [1.5]   | 0.9† [0.7]†             | 0.6† [0.6]† |
| General and Colonel . . . . . | 0.9 [0.7]    | 1.0† [1.0]† | 0.0† [0.0]†             | 0.0† [0.0]† |
| All . . . . .                 | 4.3 [2.6]    | 4.7 [3.1]   | 1.5 [0.9]               | 0.7 [0.5]   |

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

† Based on 5 or fewer deaths.

the domination of the high fatality rates for 1967. The sole exception is for age group 35-39, where a decrease is now noted. If deaths due to hostile action are excluded, fatality rates for 1970 are generally lower than for 1969, except at ages 35-39. In comparing the rates on the two bases for 1970, it may be noted that 35-39 is the only age group where there were no deaths due to hostile action.

#### *Pilots and Other Rated Officers—by Rank*

Aviation fatality rates according to rank are shown in Table 10 for Air Force pilots and other rated officers. Table 11 shows similar rates for Navy and Marine Corps aviators and shows, for the first time in this report, rates which exclude deaths due to hostile action averaged over a four-year time period.

Fatality rates for Air Force rated pilots, both including and excluding deaths due to hostile action, were markedly higher in 1970 than in 1969 for all ranks and are more similar to those of 1967 and 1968. The fatality rates averaged over the four-year time period 1967-70 compared with the rates for 1966-69 were moderately higher for Second Lieutenants and Majors, moderately lower for First Lieutenants and Captains, and essentially the same for Lieutenant Colonels and higher ranks. The 1967-70

TABLE 11  
 UNITED STATES NAVY AND MARINE CORPS PILOTS, BY RANK  
 AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE  
 DEATHS DUE TO HOSTILE ACTION INCLUDED\*

| RANK †                  |                           | 1967-70       | 1970          |
|-------------------------|---------------------------|---------------|---------------|
| Navy                    | Marine Corps              |               |               |
| Ensign and Warrant      | 2d Lieutenant and Warrant | 16.2 [10.2]   | 0.0 ‡ [0.0] ‡ |
| Lieutenant Junior Grade | 1st Lieutenant            | 16.6 [10.5]   | 14.0 [9.3]    |
| Lieutenant              | Captain                   | 10.7 [7.5]    | 7.3 [7.1]     |
| Lieutenant Commander    | Major                     | 7.5 [5.4]     | 4.9 [3.8]     |
| Commander               | Lieutenant Colonel        | 3.0 [1.9]     | 3.1 [2.6]     |
| Admiral and Captain     | General and Colonel       | 0.3 ‡ [0.3] ‡ | 0.0 ‡ [0.0] ‡ |
| All.....                |                           | 9.1 [6.1]     | 6.9 [5.4]     |

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

† A small proportion of total deaths for each period were not identified by rank.

‡ Based on 5 or fewer deaths.

rates for nonpilot rated officers were about the same as the 1966-69 rates, with those for First Lieutenants and Captains being lower in 1967-70 and those for Majors and Lieutenant Colonels generally slightly higher.

Average fatality rates which include deaths due to hostile action for all ranks of Navy and Marine Corps pilots except the highest continued an upward trend during 1967-70. Except for Commanders in the Navy and Lieutenant Colonels in the Marine Corps, rates which include deaths due to hostile action decreased in 1970 from the corresponding rates in 1969. There was a substantial decrease in the fatality rates for Ensigns and Second Lieutenants, but the rates were based on 5 or fewer deaths.

*Duty Assignment*

The 1970 aviation fatality rates among Air Force pilots, according to duty assignment, are shown in Table 12. Comparable rates for the years

1963, 1964, and 1965 are also shown because data for the intervening years 1966-69 have not been available.

The assignment of Observation pilot did not appear in earlier reports, and the fatality rate, including deaths due to hostile action, is notably high. If deaths due to hostile action are excluded, the 1970 fatality rate for this assignment lies between those of Cargo pilots and Fighter pilots. Observation pilots are assigned primarily as Forward Air Controllers who

TABLE 12  
UNITED STATES AIR FORCE PILOTS, BY DUTY ASSIGNMENT  
AVIATION FATALITY RATES PER 1,000 LIFE YEARS OF EXPOSURE  
DEATHS DUE TO HOSTILE ACTION INCLUDED\*

| Duty Assignment            | 1963 | 1964 | 1965        | 1970        |
|----------------------------|------|------|-------------|-------------|
| Pilot, helicopter          | 2.8  | 0.0  | 4.1† [2.7]† | 8.2 [3.7]†  |
| Pilot, search-rescue       | 4.5  | 8.5‡ | 0.0‡ [0.0]‡ | 0.0‡ [0.0]‡ |
| Pilot, tanker              | 2.6  | 0.0‡ | 2.0 [2.0]   | 0.0‡ [0.0]‡ |
| Pilot, bomber              | 3.5  | 2.4  | 3.1 [2.4]   | 1.2‡ [0.6]‡ |
| Pilot, reconnaissance      | 8.9  | 2.3‡ | 7.6 [4.3]†  | 3.3‡ [2.6]† |
| Pilot, trainer             |      |      |             | 3.8 [3.8]   |
| Pilot, cargo               |      | 2.1  | 7.4 [5.6]   | 5.8 [4.8]   |
| Pilot, transport           | 2.6  | ‡    | ‡           |             |
| Pilot, troop carrier       | 1.6  | ‡    | ‡           |             |
| Pilot, observation         |      |      |             | 24.3 [5.6]  |
| Pilot, fighter             | 13.9 | 10.3 | 8.4 [5.1]   | 12.1 [8.0]  |
| Pilot, fighter-interceptor | 10.1 | §    | §           |             |
| Pilot, fighter-bomber      | 18.6 | §    | §           |             |
| All                        | 3.0  | 2.4  | 4.4 [3.2]   | 6.5 [4.3]   |

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

† Based on 5 or fewer deaths.

‡ Included in "Pilot, cargo" in 1964 and 1965.

§ Included in "Pilot, fighter" in 1964 and 1965.

are called on to fly over enemy positions directing high-level attacking planes to the proper location.

The 1970 experience presented in this table excludes pilots who are not assigned to a specific flying duty but fly chiefly to maintain proficiency.

### Hours of Flying

On the average in 1970, Navy pilots flew 181 hours, while Active Naval Reserve pilots flew 117 hours. Last year these averages were available only in combination with Marine Corps pilots. During 1970 Marine Corps pilots flew an average of 128 hours, a markedly lower number than the average of 203 hours in 1969, while Active Marine Reserve pilots flew an average of 112 hours, or about the same as in the previous year.

During 1969 and 1970 Army pilots flew an average of 149 and 115 aircraft hours, respectively, in fixed-wing aircraft, while the averages were 257 and 217 aircraft hours, respectively, in rotary-wing aircraft. These data have not been previously available.

The average number of aircraft hours for Air Force pilots is not available. During 1970 the average annual flying time for Air National Guard pilots was 120 hours, compared with 123 hours in 1969.

*Military Air Command (MAC)*

There have been no passenger fatalities on military carriers in MAC during the four-year period 1967-70. There were 3 passenger fatalities on commercial carriers in MAC during this same period.

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

|                      | 1963-66 | 1967-70   | 1970        |
|----------------------|---------|-----------|-------------|
| <b>Pilots:</b>       |         |           |             |
| Transport units..... | 2.1     | 0.6 [0.6] | 0.7† [0.7]† |
| Other units.....     | 1.2     | 2.5 [1.2] | 5.3 [0.9]†  |
| All.....             | 1.8     | 1.4 [0.8] | 2.0 [0.8]†  |
| <b>Crew members:</b> |         |           |             |
| Transport units..... | 2.8     | 0.9 [0.9] | 0.7† [0.7]† |
| Other units.....     | 2.9     | 3.3 [1.9] | 3.3 [0.7]†  |
| All.....             | 2.8     | 1.8 [1.3] | 1.8 [0.7]†  |

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

† Based on 5 or fewer deaths.

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

*United States Army*

Complete Army data for the four-year period 1967-70 are not available.

Recent information has revealed that pilot fatality rates for 1969 did not include a certain number of deaths that were incorrectly classified as crew-member fatalities. Accordingly, Tables 14 and 15 include adjusted fatality rates for 1969 as well as the rates for 1970. Fatality rates from the latest available four-year period, 1964-67, are also shown.

The fatality rates for crew members shown in Table 14 increased slight-

ly in 1970 over the corresponding rates in 1969. The reverse was true for rated pilots. Crew-member fatality rates remained at higher levels than the corresponding pilot fatality rates. Fatality rates that include deaths due to hostile action for both crew members and rated pilots in 1969 and 1970 were more than double the corresponding rates that exclude deaths due to hostile action.

Fatality rates among Army rated pilots per 1,000 aircraft hours in rotary-wing and fixed-wing aircraft are compared in Table 15. Fatality

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

|                        | 1964-67    | 1967-70      | 1969        | 1970        |
|------------------------|------------|--------------|-------------|-------------|
| Rated pilots . . . . . | 15.7 [9.8] | N.A. [N.A.]† | 18.1 [8.6]  | 15.4 [7.6]  |
| Crew members . . . . . | 16.8 [8.8] | N.A. [N.A.]  | 27.6 [11.5] | 30.0 [12.4] |

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

† N.A. = Not available.

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

|                                 | 1964-67       | 1967-70      | 1969          | 1970          |
|---------------------------------|---------------|--------------|---------------|---------------|
| Fixed-wing aircraft . . . . .   | .0275 [.0221] | N.A. [N.A.]† | .0234 [.0147] | .0316 [.0283] |
| Rotary-wing aircraft . . . . .  | .0694 [.0398] | N.A. [N.A.]  | .0727 [.0338] | .0723 [.0335] |
| All types of aircraft . . . . . | .0567 [.0344] | N.A. [N.A.]  | .0647 [.0307] | .0659 [.0327] |

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

† N.A. = Not available.

rates in 1970 for pilots of fixed-wing aircraft have increased over the corresponding rates in 1969, but the rates for rotary-wing aircraft pilots have remained about the same. Rates for pilots of rotary-wing aircraft continue to be higher than the corresponding rates for pilots of fixed-wing aircraft.

#### *Student Pilots*

Table 16 presents aviation fatality rates among student pilots in the military services. Except for Navy and Marine Corps students in the



basic course, where a very small increase occurred, all services in 1970 registered lower fatality rates as compared with the previous year. The rate for students in the Navy and Marine Corps advanced course during 1970 was more than 50 per cent lower than the relatively high rate experienced in 1969 and a little less than the relatively low rate experienced in 1968. Navy and Marine Corps student pilots in the advanced course

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

|   | 1963-66 | 1967-70 | 1970 |
|---|---------|---------|------|
| Air Force*.....                             | 2.9     | 2.2     | 2.6  |
| Navy and Marine Corps*<br>Basic course..... | 2.0     | 3.9     | 3.3  |
| Advanced course.....                        | 7.5     | 11.2    | 7.2  |
| Army.....                                   | 1.9     | 4.0     | 3.9  |

\* Commissioned officers only.

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

|              | 1963-66 | 1967-70 | 1970 |
|--------------|---------|---------|------|
| Pilots.....  | 2.2*    | 2.9     | 0.0* |
| Crewmen..... | 0.7*    | 0.9     | 0.0* |

\* Based on 5 or fewer deaths.

continued to show higher annual and four-year average fatality rates than those for other student pilots.

*Coast Guard*

The aviation fatality rates among Coast Guard personnel on flight orders are shown in Table 17. During 1970 there were no aviation fatalities. There have been no fatalities among student pilots or observers during the last fourteen years.

*Navy and Marine Corps Reservists*

Table 18 shows the aviation fatality rates for Navy and Marine Corps active reserve pilots on drill pay status. Rates during 1970 and the four-year period 1967-70 were lower than the corresponding rates during 1969 and the four-year period 1966-69, respectively.

*Air National Guard*

The aviation fatality rates among Air National Guard pilots not federally activated were 1.7 per 1,000 life years of exposure during 1970 and 2.0 for the four-year period 1967-70. The corresponding rates in last year's report were 2.2 and 2.1, respectively.

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

|                       | 1963-66 | 1967-70 | 1970 |
|-----------------------|---------|---------|------|
| Ages under 30.....    | 4.4     | 3.3     | 2.0* |
| Ages 30 and over..... | 2.5     | 2.0     | 1.4* |
| All ages.....         | 2.8     | 2.3     | 1.6  |

\* Based on 5 or fewer deaths.

*Army National Guard and Army Reserves*

During 1970 there were no aviation fatalities in the Army National Guard or the Army Reserves.

*Air Force Flight Surgeons and Nurses*

The aviation fatality rate among flight surgeons was 2.5 per 1,000 life years in the four-year period 1967-70. All fatalities occurred during 1968, and none were due to hostile action.

There have been no fatalities among flight nurses during the last nine years.

*Graduates of Academies—Assignment to Aviation*

In 1970 the Air Force accepted 1.5 per cent of the military academy graduates and none of the naval academy graduates for flight training.

Of the commissioned Air Force Academy graduates in 1970, 99.8 per cent were placed in the Air Force, and 0.1 per cent received assignment in the Marine Corps, 0.1 per cent in the Army, and none in the Navy.

CANADIAN FORCES

Data on Canadian military aviation are available for the first time since the *1967 Reports*. The figures for 1969-70 shown in Table 19 present

TABLE 19  
CANADIAN FORCES  
1969-70 AVIATION FATALITY RATES  
PER 1,000 FLYING HOURS OF EXPOSURE

|   | Pilots | Crew Members |
|---|--------|--------------|
| Age group:  |        |              |
| Under 25.....                                     | .0372  | .0000*       |
| 25-29.....  | .0100* | .0054*       |
| 30-34.....  | .0092* | .0000*       |
| 35-39.....  | .0092* | .0028*       |
| 40 and over.....                                  | .0036* | .0039*       |
| All.....  | .0129  | .0028*       |
| Rank:   |        |              |
| Lieutenant and others of lower rank.....          | .0312  | .0011*       |
| Captain.....                                      | .0104  | .0061*       |
| Major.....  | .0000* | .0000*       |
| Lieutenant Colonel and others of higher rank..... | .0000* | .0000*       |
| All.....  | .0129  | .0028*       |
| Functional classification:                        |        |              |
| Fighter.....                                      | .0547  | .0644*       |
| Training.....                                     | .0209  | .0000*       |
| Transport.....                                    | .0000* | .0000*       |
| Maritime.....                                     | .0000* | .0000*       |
| Helicopter.....                                   | .0228* | .0258*       |
| Others.....                                       | .0000* | .0000*       |
| All.....  | .0129  | .0028*       |

\* Based on 5 or fewer deaths.

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

rates by age, rank, and functional classification. Rank classifications differ from those in prior reports, and fatality rates are based upon flying hours rather than upon life years of exposure.

Fatality rates were highest for pilots under age 25, for Lieutenants and others of lower rank, and for those flying fighter aircraft.

## INTERCOMPANY EXPERIENCE

The form of submission of data was simplified three years ago and changed to permit greater flexibility in selecting classifications to be studied. Consequently, this year's intercompany aviation study contains four new tables. Although the data in some of these tables are scanty, it is felt that enough pertinent information is displayed to justify their inclusion.

The issue years contributing data to an experience year have changed from time to time, and this is indicated in the footnotes to the tables. Again, twenty companies submitted data to this study, so that hopefully the downward trend in the number of contributing companies has come to a halt.

*Civilian Aviation*

Tables 20-23 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. Exposure in the "With Aviation Extra Premium" category is terminated when the extra premium is discontinued. If discontinuance is due to 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 this, and consequently the experience for such policies includes only a portion of such cases.

The material in Table 20 compares the experience of 1957-62, 1963-67, and 1968-70, each period being shown separately for cases with aviation extra premium and for cases without aviation extra premium. For scheduled airline pilots accepted with aviation extra premium, the 1968-70 fatality rates were higher than the other two periods, whereas the 1968-70 fatality rates for scheduled airline pilots accepted without aviation extra premium were lower than the experience for the other two periods. However, it should be noted that in each case fewer than 5 deaths were involved in the 1968-70 experience. For other commercial pilots flying for hire, the "Others" category continued its downward trend in fatality rates only for those issued with an aviation extra premium. Private pilots with fewer than 100 hours flown in the twelve months preceding issue represent the major class by years of exposure. The fatality rate for private pilots with aviation extra premium was greater than the fatality

TABLE 20  
INTERCOMPANY EXPERIENCE ON PILOTS IN CIVILIAN  
AVIATION—BY POLICIES\*

| STATUS AT ISSUE AND<br>HOURS FLOWN IN 12 MONTHS<br>PRECEDING ISSUE | YEARS    | WITH AVIATION<br>EXTRA PREMIUM† |                                  |                      | WITHOUT AVIATION<br>EXTRA PREMIUM‡ |                                  |                      |
|--|----------|---------------------------------|----------------------------------|----------------------|------------------------------------|----------------------------------|----------------------|
|  |          | Years<br>of<br>Exposure         | Avia-<br>tion<br>Fata-<br>lities | Rate<br>per<br>1,000 | Years<br>of<br>Exposure            | Avia-<br>tion<br>Fata-<br>lities | Rate<br>per<br>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                  |
|  | {1968-70 | 499                             | 3                                | 6.0§                 | 7,366                              | 4                                | 0.5§                 |
| Other commercial pilots<br>flying for hire:                        |          |                                 |                                  |                      |                                    |                                  |                      |
| Instructing (at least<br>half-time).....                           | {1957-62 | 5,250                           | 19                               | 3.6                  |                                    |                                  |                      |
|  | {1963-67 | 3,964                           | 11                               | 2.8                  |                                    |                                  |                      |
|  | {1968-70 | 2,798                           | 9                                | 3.2                  | 54                                 | 0                                | §                    |
| 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                  |
|  | {1968-70 | 6,863                           | 29                               | 4.2                  | 4,018                              | 8                                | 2.0                  |
| 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                            | 111                              | 1.1                  |
|  | {1968-70 | 9,988                           | 16                               | 1.6                  | 56,146                             | 35                               | 0.6                  |
| 100-199 hours.....   | {1957-62 | 23,097                          | 63                               | 2.7                  | 6,821                              | 11                               | 1.6                  |
|  | {1963-67 | 11,973                          | 20                               | 1.7                  | 24,917                             | 67                               | 2.7                  |
|  | {1968-70 | 4,903                           | 12                               | 2.4                  | 21,534                             | 34                               | 1.6                  |
| 200-299 hours.....   | {1957-62 | 8,123                           | 34                               | 4.2                  | 905                                | 1                                | §                    |
|  | {1963-67 | 4,976                           | 17                               | 3.4                  | 2,815                              | 9                                | 3.2                  |
|  | {1968-70 | 1,992                           | 16                               | 8.0                  | 2,260                              | 9                                | 4.0                  |
| 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§                 |
|  | {1968-70 | 2,025                           | 15                               | 7.4                  | 994                                | 1                                | §                    |
| Hours not stated....   | {1957-62 | 3,388                           | 5                                | 1.5§                 | 1,318                              | 1                                | §                    |
|  | {1963-67 | 1,246                           | 4                                | 3.2§                 | 2,312                              | 0                                | §                    |
|  | {1968-70 | 212                             | 0                                | §                    | 1,259                              | 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 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; 1968-70 data include issues of 1959 and later years only.

‡ 1957-67 data include issues of 1955 and later years; 1968-70 data include issues of 1959 and later years only.

§ Based on 5 or fewer deaths.

¶ 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).

rate for private pilots without aviation extra premium in all the hourly and period breakdowns, with the exception of the 1963-67 experience of the 100-199 hours group. For private pilots accepted with aviation extra premium, there was a marked increase in the fatality rates of the 1968-70 experience over the other two periods for both the 200-299 hours group and the 300 or more hours group.

Table 21 shows the experience during the years 1954-70, inclusive, among pilots with aviation extra premium flying for pleasure or personal business only and not for hire, (a) by type of flying certificate and (b) by attained age, analyzed in each case according to the number of hours flown in the twelve months preceding issue. Among pilots with fewer than 100 hours flown in the year prior to issue, the experience was more favorable for those 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 tended to be slightly more favorable for holders of commercial or transport certificates. By attained ages, the mortality was more favorable for the pilots at ages 35 and over with fewer than 100 hours in the year prior to issue, but more favorable for the younger pilots with 100 or more hours.

Tables 22 and 23 are similar in format to Table 21 but cover only the 1968-70 experience on 1959 and subsequent issues. Table 22 contains the results of the experience issued with an aviation extra premium, while Table 23 contains the results of the experience issued without an aviation extra premium. Even though the exposure is still quite sparse, it is evident that the experience issued without an aviation extra premium exhibited distinctly lower fatality rates than the experience issued with an aviation extra premium.

The Committee also tabulated the 1968-70 experience on 1959 and subsequent issues for pilots of other than scheduled airlines and for hired pilots of corporate planes. On policies issued with an aviation extra premium, the former showed a fatality rate of 5.7 per 1,000, based on 1,935 life years of exposure and 11 aviation fatalities, while corporate pilots exhibited a fatality rate of 3.2 per 1,000, based on 1,554 life years of exposure and 5 aviation fatalities; corporate pilots issued without an aviation extra premium had a fatality rate of 2.4 per 1,000, based on 6 deaths and 2,517 life years of exposure.

Student pilots with an aviation extra premium showed a rate of 1.0 per 1,000 in 1970, based on 10,903 life years of exposure and 11 aviation

TABLE 21  
 INTERCOMPANY EXPERIENCE ON PILOTS FLYING FOR  
 PLEASURE OR PERSONAL BUSINESS\*  
 WITH AVIATION EXTRA PREMIUM†  
 (1954-70 Experience on 1946 and Subsequent Issues‡—by Policies)

| HOURS FLOWN IN<br>12 MONTHS<br>PRECEDING ISSUE | BY TYPE OF FLYING CERTIFICATE—ALL AGES            |                        |                   |  |                        |                   |
|--|---|------------------------|-------------------|--|------------------------|-------------------|
|  | Commercial or Transport                           |                        |                   | Private (with 100<br>or More Solo Hours) |                        |                   |
|  | Years of<br>Exposure                              | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure                     | Aviation<br>Fatalities | Rate per<br>1,000 |
| Less than 100 hours...                         | 18,097  | 34                     | 1.9               | 86,414                                   | 86                     | 1.0               |
| 100-199 hours.....                             | 9,248   | 21                     | 2.3               | 36,420                                   | 83                     | 2.3               |
| 200-299 hours.....                             | 6,370   | 23                     | 3.6               | 11,496                                   | 51                     | 4.4               |
| 300 or more hours.....                         | 6,882   | 21                     | 3.1               | 8,937                                    | 41                     | 4.6               |
| Hours not stated.....                          | 925   | 3                      | 3.2§              | 4,575                                    | 9                      | 2.0               |
| Total.....                                     | 41,522  | 102                    | 2.5               | 147,842                                  | 210                    | 1.8               |
|  | BY ATTAINED AGES—ALL TYPES OF FLYING CERTIFICATES |                        |                   |  |                        |                   |
|  | Attained Ages<br>under 35                         |                        |                   | Attained Ages<br>35 and Over             |                        |                   |
|  | Years of<br>Exposure                              | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure                     | Aviation<br>Fatalities | Rate per<br>1,000 |
| Less than 100 hours...                         | 38,588  | 54                     | 1.4               | 64,653                                   | 65                     | 1.0               |
| 100-199 hours.....                             | 15,323  | 30                     | 2.0               | 29,798                                   | 72                     | 2.4               |
| 200-299 hours.....                             | 3,563   | 8                      | 2.2               | 13,119                                   | 64                     | 4.9               |
| 300 or more hours.....                         | 3,351   | 11                     | 3.3               | 12,286                                   | 51                     | 4.2               |
| Hours not stated.....                          | 1,565   | 1                      | §                 | 3,915                                    | 11                     | 2.8               |
| Total.....                                     | 62,390  | 104                    | 1.7               | 123,771                                  | 263                    | 2.1               |

\* 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; for exposure years 1968-70, issues of only 1959 and later years are included.

§ Based on 5 or fewer deaths.

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

TABLE 22  
 INTERCOMPANY EXPERIENCE ON PILOTS FLYING FOR  
 PLEASURE OR PERSONAL BUSINESS\*  
 WITH AVIATION EXTRA PREMIUM†  
 (1968-70 Experience on 1959 and Subsequent Issues—by Policies)

| HOURS FLOWN IN<br>12 MONTHS<br>PRECEDING ISSUE | BY TYPE OF FLYING CERTIFICATE—ALL AGES |                        |                   |  |                        |                   |
|--|--|------------------------|-------------------|--|------------------------|-------------------|
|  | Commercial or Transport                |                        |                   | Private (with 100<br>or More Solo Hours) |                        |                   |
|  | Years of<br>Exposure                   | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure                     | Aviation<br>Fatalities | Rate per<br>1,000 |
| Less than 100 hours.....                       | 1,519                                  | 3                      | 2.0‡              | 8,469                                    | 13                     | 1.5               |
| 100-199 hours.....                             | 1,212                                  | 2                      | 1.7‡              | 3,691                                    | 10                     | 2.7               |
| 200-299 hours.....                             | 717                                    | 6                      | 8.4               | 1,275                                    | 10                     | 7.8               |
| 300 or more hours.....                         | 954                                    | 6                      | 6.3               | 1,071                                    | 9                      | 8.4               |
| Hours not stated.....                          | 28                                     | 0                      | ‡                 | 184                                      | 0                      | ‡                 |
| Total.....                                     | 4,430                                  | 17                     | 3.8               | 14,690                                   | 42                     | 2.9               |
|  | BY ATTAINED AGES                       |                        |                   |  |                        |                   |
|  | Under 35                               |                        |                   |  |                        |                   |
|  | Years of<br>Exposure                   | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure                     | Aviation<br>Fatalities | Rate per<br>1,000 |
| Less than 100 hours.....                       | 719                                    | 2                      | 2.8‡              | 4,321                                    | 6                      | 1.4               |
| 100-199 hours.....                             | 640                                    | 0                      | ‡                 | 1,898                                    | 6                      | 3.2               |
| 200-299 hours.....                             | 255                                    | 1                      | ‡                 | 297                                      | 0                      | ‡                 |
| 300 or more hours.....                         | 351                                    | 2                      | 5.7‡              | 220                                      | 2                      | 9.1‡              |
| Hours not stated.....                          | 14                                     | 0                      | ‡                 | 64                                       | 0                      | ‡                 |
| Total.....                                     | 1,979                                  | 5                      | 2.5‡              | 6,800                                    | 14                     | 2.1               |
|  | 35 and Over                            |                        |                   |  |                        |                   |
|  | Years of<br>Exposure                   | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure                     | Aviation<br>Fatalities | Rate per<br>1,000 |
| Less than 100 hours.....                       | 800                                    | 1                      | ‡                 | 4,148                                    | 7                      | 1.7               |
| 100-199 hours.....                             | 572                                    | 2                      | 3.5‡              | 1,793                                    | 4                      | 2.2‡              |
| 200-299 hours.....                             | 462                                    | 5                      | 10.8‡             | 978                                      | 10                     | 10.2              |
| 300 or more hours.....                         | 603                                    | 4                      | 6.6‡              | 851                                      | 7                      | 8.2               |
| Hours not stated.....                          | 14                                     | 0                      | ‡                 | 120                                      | 0                      | ‡                 |
| Total.....                                     | 2,451                                  | 12                     | 4.9               | 7,890                                    | 28                     | 3.5               |

\* 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.

‡ Based on 5 or fewer deaths.



**TABLE 23**  
**INTERCOMPANY EXPERIENCE ON PILOTS FLYING FOR**  
**PLEASURE OR PERSONAL BUSINESS\***  
**WITHOUT AVIATION EXTRA PREMIUM**  
(1968-70 Experience on 1959 and Subsequent Issues—by Policies)

| HOURS FLOWN IN<br>12 MONTHS<br>PRECEDING ISSUE | BY TYPE OF FLYING CERTIFICATE—ALL AGES |                        |                   |  |                        |                   |
|--|--|------------------------|-------------------|--|------------------------|-------------------|
|  | Commercial or Transport                |                        |                   | Private (with 100<br>or More Solo Hours) |                        |                   |
|  | Years of<br>Exposure                   | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure                     | Aviation<br>Fatalities | Rate per<br>1,000 |
| Less than 100 hours...                         | 11,817                                 | 5                      | 0.4†              | 44,329                                   | 30                     | 0.7               |
| 100-199 hours.....                             | 4,217                                  | 5                      | 1.2†              | 17,317                                   | 31                     | 1.8               |
| 200-299 hours.....                             | 692                                    | 1                      | †                 | 1,568                                    | 8                      | 5.1               |
| 300 or more hours.....                         | 592                                    | 1                      | †                 | 402                                      | 0                      | †                 |
| Hours not stated.....                          | 274                                    | 0                      | †                 | 985                                      | 0                      | †                 |
| Total.....                                     | 17,592                                 | 12                     | 0.7               | 64,601                                   | 69                     | 1.1               |
|  | BY ATTAINED AGES                       |                        |                   |  |                        |                   |
|  | Under 35                               |                        |                   |  |                        |                   |
|  | Years of<br>Exposure                   | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure                     | Aviation<br>Fatalities | Rate per<br>1,000 |
| Less than 100 hours...                         | 1,241                                  | 1                      | †                 | 7,527                                    | 2                      | 0.3†              |
| 100-199 hours.....                             | 611                                    | 0                      | †                 | 3,010                                    | 6                      | 2.0               |
| 300-299 hours.....                             | 158                                    | 0                      | †                 | 254                                      | 0                      | †                 |
| 300 or more hours.....                         | 177                                    | 0                      | †                 | 81                                       | 0                      | †                 |
| Hours not stated.....                          | 19                                     | 0                      | †                 | 151                                      | 0                      | †                 |
| Total.....                                     | 2,206                                  | 1                      | †                 | 11,023                                   | 8                      | 0.7               |
|  | 35 and Over                            |                        |                   |  |                        |                   |
|  | Years of<br>Exposure                   | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure                     | Aviation<br>Fatalities | Rate per<br>1,000 |
| Less than 100 hours...                         | 10,576                                 | 4                      | 0.4†              | 36,802                                   | 28                     | 0.8               |
| 100-199 hours.....                             | 3,606                                  | 5                      | 1.4†              | 14,307                                   | 25                     | 1.7               |
| 200-299 hours.....                             | 534                                    | 1                      | †                 | 1,314                                    | 8                      | 6.1               |
| 300 or more hours.....                         | 415                                    | 1                      | †                 | 321                                      | 0                      | †                 |
| Hours not stated.....                          | 255                                    | 0                      | †                 | 834                                      | 0                      | †                 |
| Total.....                                     | 15,386                                 | 11                     | 0.7               | 53,578                                   | 61                     | 1.1               |

\* 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.

† Based on 5 or fewer deaths.

fatalities. In the 1968-70 period student pilots had a fatality rate of 1.3 per 1,000, based on 30,083 life years of exposure and 39 aviation fatalities. There were 11 war deaths in 1968-70 among all pilots coded for civilian aviation at issue.

### *Military Aviation*

Table 24 shows, for the companies that have contributed to the experience on military aviation, the aviation fatality rates separately for the years 1957-62 and 1963-70 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 status at the time of application for insurance. Exposure was terminated when the extra premium was discontinued.

Fatalities due to enemy action represented about 31 per cent of the aviation fatalities in the period 1963-70. These deaths were excluded in the figures and rates shown in brackets in Tables 24-28. The differences between the rates that include and those that 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 1963-70 fatality rates excluding deaths due to enemy action, shown in Table 24 for United States Air Force and Army pilots combined, were higher at ages under 25 and lower at older ages than those for 1957-62. For both periods the fatality rates decreased as the age increased. The combined experience for United States Air Force and Army pilots included not only the data contributed separately for each service but also data for which the particular branch of service was not given.

The 1963-70 fatality rates for United States Air Force and Army crew members, when deaths due to enemy action are excluded, were higher at ages under 25 and lower at higher ages than those for 1957-62. In the 1963-70 period, aviation fatality rates decreased as the attained age increased, but there seems to be no definite pattern to the 1957-62 experience. Although the crew-member data are based on the combined experience of both Air Force and Army personnel, the Army experience is very limited.

The 1963-70 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 were excluded. However, the aggregate fatality rate continued to be significantly higher than the rate for Air Force and Army pilots.

Table 25 shows the experience during the years 1968-70 among pilots

TABLE 24

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†

(1957-62 Experience on 1946 and Subsequent Issues—by Policies;  
1963-67 Experience on 1953 and Subsequent Issues—by Policies;  
1968-70 Experience on 1959 and Subsequent Issues—by Policies)

| STATUS AT ISSUE AND<br>ATTAINED INSURANCE AGE                    | YEARS OF EXPOSURE |         | AVIATION<br>FATALITIES |           | RATE PER 1,000 |            |
|--|-------------------|---------|------------------------|-----------|----------------|------------|
|  | 1957-62           | 1963-70 | 1957-62                | 1963-70   | 1957-62        | 1963-70    |
| U.S. Air Force pilots:‡§   |                   |         |                        |           |                |            |
| Under 25.....  | 2,476             | 853     | 9                      | 3 [2]     | 3.6            | 3.5 [2.3]  |
| 25-29.....   | 19,419            | 11,003  | 72                     | 55 [32]   | 3.7            | 5.0 [2.9]  |
| 30-34.....   | 28,275            | 31,142  | 85                     | 104 [73]  | 3.0            | 3.3 [2.3]  |
| 35 and over.....   | 103,513           | 84,252  | 218                    | 144 [106] | 2.1            | 1.7 [1.3]  |
| Total.....   | 153,683           | 127,250 | 384                    | 306 [213] | 2.5            | 2.4 [1.7]  |
| U.S. Army pilots:‡§  |                   |         |                        |           |                |            |
| Under 25.....  | 225               | 799     | 1                      | 19 [7]    |                | 23.8 [8.8] |
| 25-29.....   | 2,180             | 3,149   | 3                      | 19 [13]   | 1.4            | 6.6 [4.1]  |
| 30-34.....   | 3,664             | 6,157   | 19                     | 30 [7]    | 5.2            | 4.9 [1.1]  |
| 35 and over.....   | 17,678            | 8,487   | 19                     | 24 [17]   | 1.1            | 2.8 [2.0]  |
| Total.....   | 23,747            | 18,592  | 42                     | 92 [44]   | 1.8            | 4.9 [2.4]  |
| U.S. Air Force and Army<br>pilots:‡                              |                   |         |                        |           |                |            |
| Under 25.....  | 3,082             | 1,655   | 11                     | 22 [9]    | 3.6            | 13.3 [5.4] |
| 25-29.....   | 24,393            | 14,254  | 82                     | 74 [45]   | 3.4            | 5.2 [3.2]  |
| 30-34.....   | 36,972            | 38,044  | 120                    | 134 [80]  | 3.2            | 3.5 [2.1]  |
| 35 and over.....   | 152,691           | 96,297  | 304                    | 174 [129] | 2.0            | 1.8 [1.3]  |
| Total.....   | 217,138           | 150,250 | 517                    | 404 [263] | 2.4            | 2.7 [1.8]  |
| U.S. Air Force and Army<br>crew members:‡                        |                   |         |                        |           |                |            |
| Under 25.....  | 9,079             | 3,741   | 17                     | 11 [10]   | 1.9            | 2.9 [2.7]  |
| 25-29.....   | 22,873            | 19,548  | 55                     | 59 [42]   | 2.4            | 3.0 [2.1]  |
| 30-34.....   | 14,184            | 31,739  | 32                     | 62 [44]   | 2.3            | 2.0 [1.4]  |
| 35 and over.....   | 31,043            | 32,663  | 52                     | 42 [31]   | 1.7            | 1.3 [0.9]  |
| Total.....   | 77,179            | 87,691  | 156                    | 174 [127] | 2.0            | 2.0 [1.4]  |
| U.S. Navy and Marine<br>pilots:‡                                 |                   |         |                        |           |                |            |
| Under 25.....  | 1,847             | 988     | 24                     | 8 [8]     | 13.0           | 8.1 [8.1]  |
| 25-29.....   | 11,768            | 7,787   | 115                    | 43 [30]   | 9.8            | 5.5 [3.9]  |
| 30-34.....   | 18,861            | 14,266  | 90                     | 87 [63]   | 4.8            | 6.1 [4.4]  |
| 35 and over.....   | 61,848            | 33,526  | 172                    | 107 [73]  | 2.8            | 3.2 [2.2]  |
| Total.....   | 94,324            | 56,567  | 401                    | 245 [174] | 4.3            | 4.3 [3.1]  |
| U.S. Air Force, Army,<br>Navy, and Marine<br>Reserve pilots..... | 10,323            | 10,562  | 18                     | 21 [21]   | 1.7            | 2.0 [2.0]  |
| U.S. Air National Guard<br>pilots.....                           | 3,565             | 5,312   | 12                     | 3 [2]     | 3.4            | 0.6 [0.4]  |

\* Exposure is terminated on discontinuance of extra premium.

† Figures in brackets exclude deaths from enemy action.

‡ 1968-70 experience excludes pilots and crew members flying 40-150 hours in the 12 months preceding issue.

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

|| Based on 5 or fewer deaths.

TABLE 25

INTERCOMPANY EXPERIENCE ON PILOTS IN MILITARY AVIATION—WITH  
 AVIATION EXTRA PREMIUM\*—FATALITIES IN COMBAT MISSIONS IN-  
 CLUDED WHETHER OR NOT RESULTING FROM ENEMY ACTION†  
 (1968-70 Experience on 1959 and Subsequent Issues—by Policies)

| STATUS AT ISSUE AND<br>CLASSIFICATION BY<br>BRANCH OF SERVICE<br>AND FLYING DUTIES | ATTAINED AGES<br>UNDER 35 |                        |                   | ATTAINED AGES<br>35 AND OVER |                        |                   |
|--|---------------------------|------------------------|-------------------|------------------------------|------------------------|-------------------|
|  | Years of<br>Exposure      | Aviation<br>Fatalities | Rate per<br>1,000 | Years of<br>Exposure         | Aviation<br>Fatalities | Rate per<br>1,000 |
| Pilots, operational:   |                           |                        |                   |                              |                        |                   |
| U.S. Air Force:  |                           |                        |                   |                              |                        |                   |
| MAC . . . . .  | 1,686                     | 2 [1]                  | 1.2 [0.6]‡        | 2,158                        | 6 [3]                  | 2.8 [1.4]‡        |
| All others . . . . .   | 5,859                     | 19 [7]                 | 3.2 [1.2]         | 11,446                       | 27 [14]                | 2.4 [1.2]         |
| U.S. Army:   |                           |                        |                   |                              |                        |                   |
| Helicopter . . . . .   | 1,274                     | 12 [5]                 | 9.4 [3.9]‡        | 910                          | 2 [2]                  | 2.2 [2.2]‡        |
| All plane types . . . . .  | 2,751                     | 21 [6]                 | 7.6 [2.2]         | 2,583                        | 10 [8]                 | 3.9 [3.1]         |
| U.S. Navy:   |                           |                        |                   |                              |                        |                   |
| Carrier based  |                           |                        |                   |                              |                        |                   |
| fighter . . . . .  | 252                       | 5 [2]                  | 19.8 [7.9]‡       | 329                          | 2 [2]                  | 6.1 [6.1]‡        |
| All carrier based  |                           |                        |                   |                              |                        |                   |
| types . . . . .  | 1,402                     | 13 [7]                 | 9.3 [5.0]         | 1,243                        | 4 [3]                  | 3.2 [2.4]‡        |
| U.S. Navy and Ma-  |                           |                        |                   |                              |                        |                   |
| rines:   |                           |                        |                   |                              |                        |                   |
| All noncarrier   |                           |                        |                   |                              |                        |                   |
| based types . . . . .  | 3,917                     | 21 [10]                | 5.4 [2.6]         | 5,686                        | 12 [8]                 | 2.1 [1.4]         |
| Pilots, administrative   |                           |                        |                   |                              |                        |                   |
| (all plane types):   |                           |                        |                   |                              |                        |                   |
| U.S. Air Force . . . . .   | 702                       | 3 [3]                  | 4.3 [4.3]‡        | 5,410                        | 12 [10]                | 2.2 [1.8]         |
| U.S. Army . . . . .  | 978                       | 8 [3]                  | 8.2 [3.1]‡        | 1,790                        | 4 [1]                  | 2.2 [0.6]‡        |
| U.S. Navy and Ma-  |                           |                        |                   |                              |                        |                   |
| rines . . . . .  | 723                       | 4 [4]                  | 5.5 [5.5]‡        | 2,660                        | 5 [5]                  | 1.9 [1.9]‡        |
| All branches . . . . .   | 2,403                     | 15 [10]                | 6.2 [4.2]         | 9,860                        | 21 [16]                | 2.1 [1.6]         |

\* Exposure terminated on discontinuance of extra premium.

† Figures in brackets exclude deaths from enemy action.

‡ Based on 5 or fewer deaths.

in military aviation with aviation extra premiums by branch of service and flying duties and further subdivided into attained ages under 35 and attained ages 35 and over. The relatively favorable fatality rates for United States Army helicopter pilots for all ages combined presumably reflected cautious underwriting at time of issue.

Table 26 presents the experience during the years 1968-70 of crew members in military aviation with an aviation extra premium by branch

TABLE 26  
 INTERCOMPANY EXPERIENCE ON CREW MEMBERS IN MILITARY AVIATION—  
 WITH AVIATION EXTRA PREMIUM\*—FATALITIES IN COMBAT MISSIONS  
 INCLUDED WHETHER OR NOT RESULTING FROM ENEMY ACTION†  
 (1968-70 Experience on 1959 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 crew members:                 |                   |                     |                |
| MAC.....                                     | 3,141             | 7 [7]               | 2.2 [2.2]      |
| All others: all plane types.....             | 16,195            | 33 [25]             | 2.0 [1.5]      |
| Under 25.....                                | 300               | 0 [0]               | 4.6 ‡          |
| 25-29.....                                   | 3,019             | 14 [10]             | 4.6 [3.3]      |
| 30-34.....                                   | 5,724             | 9 [6]               | 1.6 [1.0]      |
| 35-39.....                                   | 4,557             | 5 [4]               | 1.1 [0.9] ‡    |
| 40 and over.....                             | 2,595             | 5 [5]               | 1.9 [1.9] ‡    |
| Bombers.....                                 | 2,748             | 8 [6]               | 2.9 [2.2]      |
| U.S. Army crew members.....                  | 337               | 1 [1]               | ‡              |
| U.S. Navy and Marine Corps crew members..... | 2,626             | 6 [3]               | 2.3 [1.1] ‡    |

\* Exposure terminated on discontinuance of extra premium.

† Figures in brackets exclude deaths from enemy action.

‡ Based on 5 or fewer deaths.

of service. The data for the United States Air Force is divided into those for MAC crew members and those for all other crew members, the latter being further subdivided by age for all plane types combined. The experience of bomber crew members is also shown.

Table 27 shows a further subdivision of the experience on pilots in military aviation at attained ages 30 and over according to the number of hours flown in the twelve months preceding issue. The table shows that, for ages 35 and over, aviation fatality rates were higher for pilots who flew more than 150 hours during the year preceding issue than for pilots who flew not more than 150 hours; at attained ages 30-34, the reverse

TABLE 27

INTERCOMPANY EXPERIENCE ON PILOTS IN MILITARY AVIATION  
WITH AVIATION EXTRA PREMIUM\*  
FATALITIES IN COMBAT MISSIONS INCLUDED WHETHER  
OR NOT RESULTING FROM ENEMY ACTION†  
(1957-67 Experience on 1953 and Subsequent Issues—by Policies;  
1968-70 Experience on 1959 and Subsequent Issues—by Policies)

| HOURS FLOWN IN<br>12 MONTHS PRECEDING<br>ISSUE AND ATTAINED<br>INSURANCE AGE | YEARS OF EXPOSURE |         | AVIATION<br>FATALITIES |           | RATE PER 1,000 |           |
|--|-------------------|---------|------------------------|-----------|----------------|-----------|
|  | 1957-62           | 1963-70 | 1957-62                | 1963-70   | 1957-62        | 1963-70   |
| U.S. Air Force and Army  |                   |         |                        |           |                |           |
| 40-150 hours:  |                   |         |                        |           |                |           |
| Ages 30-34†  | 7,298             | 7,941   | 24                     | 35 [25]   | 3.3            | 4.4 [3.1] |
| Ages 35 and over   | 36,074            | 37,868  | 62                     | 45 [34]   | 1.7            | 1.2 [0.9] |
| Total  | 43,372            | 45,809  | 86                     | 80 [59]   | 2.0            | 1.7 [1.3] |
| Over 150 hours:  |                   |         |                        |           |                |           |
| Ages 30-34   | 22,349            | 30,691  | 76                     | 107 [61]  | 3.4            | 3.5 [2.0] |
| Ages 35 and over   | 46,429            | 62,910  | 121                    | 135 [99]  | 2.6            | 2.1 [1.6] |
| Total  | 68,778            | 93,601  | 197                    | 242 [160] | 2.9            | 2.6 [1.7] |
| U.S. Navy and Marines  |                   |         |                        |           |                |           |
| 40-150 hours:  |                   |         |                        |           |                |           |
| Ages 30-34†  | 4,184             | 3,432   | 19                     | 22 [16]   | 4.5            | 6.4 [4.7] |
| Ages 35 and over   | 13,836            | 14,926  | 33                     | 39 [30]   | 2.4            | 2.6 [2.0] |
| Total  | 18,020            | 18,358  | 52                     | 61 [46]   | 2.9            | 3.3 [2.5] |
| Over 150 hours:  |                   |         |                        |           |                |           |
| Ages 30-34   | 10,112            | 11,062  | 45                     | 65 [47]   | 4.5            | 5.9 [4.2] |
| Ages 35 and over   | 16,904            | 20,359  | 55                     | 73 [50]   | 3.3            | 3.6 [2.5] |
| Total  | 27,016            | 31,421  | 100                    | 138 [97]  | 3.7            | 4.4 [3.1] |

\* Exposure is terminated on discontinuance of extra premium.

† Figures in brackets exclude deaths from enemy action.

‡ A small part of the data includes ages under 30.

was true for the 1963-70 experience. Aviation fatality rates continued to be lower at attained ages 35 and over than for those at ages 30-34.

Beginning with the experience of 1963, the contributing companies were asked to show separately their experience 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 28. This table indicates that in each branch of service the fatality rate at attained ages 40 and over was less than the fatality rate at attained ages 35-39.

TABLE 28  
 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;  
 1968-70 Experience on 1959 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:‡§                   |                   |                     |                |
| Ages 35-39.....                            | 30,941            | 87 [57]             | 2.8 [1.8]      |
| Ages 40 and over.....                      | 53,311            | 55 [48]             | 1.0 [0.9]      |
| Ages 35 and over.....                      | 84,252            | 142 [105]           | 1.7 [1.2]      |
| U.S. Army pilots:‡§                        |                   |                     |                |
| Ages 35-39.....                            | 5,248             | 17 [10]             | 3.2 [1.9]      |
| Ages 40 and over.....                      | 3,239             | 5 [5]               | 1.5 [1.5]      |
| Ages 35 and over.....                      | 8,487             | 22 [15]             | 2.6 [1.8]      |
| U.S. Navy and Marine pilots:‡              |                   |                     |                |
| Ages 35-39.....                            | 13,995            | 80 [55]             | 5.7 [3.9]      |
| Ages 40 and over.....                      | 19,531            | 30 [21]             | 1.5 [1.1]      |
| Ages 35 and over.....                      | 33,526            | 110 [76]            | 3.3 [2.3]      |

\* Exposure is terminated on discontinuance of extra premiums.

† Figures in brackets exclude deaths from enemy action.

‡ 1968-70 experience excludes pilots flying 40-150 hours in the 12 months preceding issue.

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

|| Based on 5 or fewer deaths.