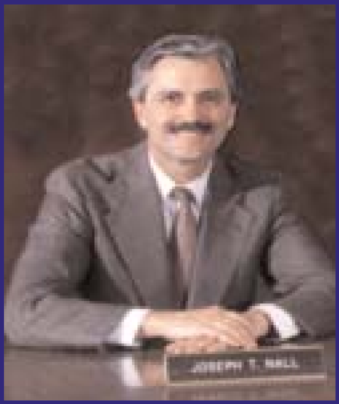
2004 NALL REPORT

Accident Trends and Factors for 2003

AOPA AIR SAFETY FOUNDATION



Dedication

The Joseph T. Nall Report is the AOPA Air Safety Foundation's annual review of general aviation aircraft accidents that occurred during the previous year. The report is dedicated to the memory of Joe Nall, an NTSB Board member who died as a passenger in an airplane accident in Caracas, Venezuela, in 1989.

Final vs. Preliminary Statistics

This report is based on NTSB reports of accidents involving fixed-wing general aviation aircraft weighing 12,500 pounds or less. To provide the pilot community with the most current safety information, ASF gathered NTSB data on 2003 accidents throughout 2004. By February 2005, the NTSB had finalized 83.9 percent of the year 2003 reports. The remaining 16.1 percent contained preliminary data.

Prior year comparisons suggest that this mix of preliminary and final data will not significantly change the conclusions presented here when all final reports are analyzed.

As a supplement to the information contained in this report, ASF now offers its accident database online. You may search the database by selecting specific criteria. To view the database, visit www.aopa.org/asf/ntsb/.

The AOPA Air Safety Foundation gratefully acknowledges the technical support and assistance of:

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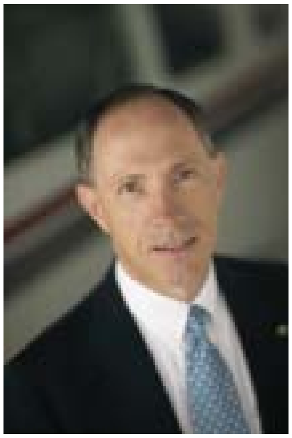
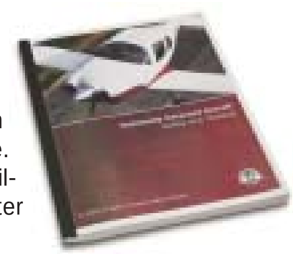


Bruce Landsberg
Executive Director,
AOPA Air Safety Foundation

The numbers continue to speak. Over the last decade, total and fatal General Aviation (GA) accidents have each decreased about 25%, a significant achievement. Pilots have always believed in safety, and I believe there is an even stronger GA safety culture now than in past decades. It's not just GA; as a country we are more attuned to managing risk everywhere, in new automobiles, household products and of course, in new aircraft.

The AOPA Air Safety Foundation (ASF) just published a special report on technically advanced aircraft (TAA) that reviews the benefits and a few of the challenges of the second century of flight. While the technology is exciting, the report found that the basics haven't changed. Both new and older pilots can take comfort in that.



For the senior aviator, the TAA report confirmed that all the hard-learned lessons still apply, even while new challenges abound. For new pilots, it means that those hard-learned lessons, for which someone else paid dearly, are available without danger or expense. The ASF accident database upon which this report is built is available to all pilots in the new AOPA Online Safety Center www.aopa.org/safetycenter.

All the details are in the summary that follows, but the top trouble spots remain: too many takeoff and landing accidents due to poor skill, and too many fatal maneuvering flight accidents due to lack of either skill or judgment. Weather accidents, particularly pilots attempting to maintain VFR into instrument meteorological conditions, still occupy a significant portion of the fatalities. Time after time, post-accident analysis shows that had the pilot diverted to an alternate or changed course even a few minutes earlier, it would have made a huge difference.

This report, which helps ASF and the industry decide where to invest safety resources each year, is the result of efforts by many people. We acknowledge the excellent support from FAA and NTSB in gathering data and the special funding we have received from the Emil Buehler Trust in sponsoring database activities.

Finally, the AOPA pilot community, through its individual donations, makes this annual effort possible. Thank you!

Let's make the coming year even safer!

Bruce Landsberg

Safe Pilots. Safe Skies.

Overview of 2003 Accident Trends and Factors

The AOPA Air Safety Foundation's Nall Report is the nation's foremost annual review of GA accident rates and trends. Over the past 15 years, it has become an invaluable tool for identifying critical safety issues. It covers fixed-wing aircraft with a gross weight of 12,500 pounds or less. These account for some 90 percent of all GA aircraft. The report is based on NTSB accident investigations conducted during the previous calendar year. Thus, this report surveys accidents that occurred in 2003.

The number of GA accidents is relatively low, and overall, GA accidents and fatalities continue to decline (see appendix for an overview of GA vs. airline safety). The data in this report can help members of the media, the public, and the aviation community better understand the factors involved in those accidents that do occur.

Accident Analysis

The ASF Nall Report presents GA accident data broken out by type of aircraft, category of mishap, and other factors. This allows armchair analysts of all stripes—pilots, reporters, and other interested readers—to explore specific aspects of GA safety. For instance, pilots can learn more about the accident profile of the particular type of aircraft they fly, or of the particular kind of flying they do.

Accident Statistics

	1999	2000	2001	2002	2003
Total Fixed-Wing GA Accidents	1,679	1,593	1,494	1,476	1,513
Fatal Fixed-Wing GA Accidents	305	300	296	312	311
Total Fixed-Wing GA Fatalities	552	521	526	518	555
Estimated GA Flight Hours	29.2M	27.8M	25.4M	25.5M	25.7M

Fig. 1

Figure 1 presents GA accident numbers and fleet flight time for the last five years. In 2003, total accidents for aircraft covered in this report rose 2.5 percent over the preceding year (1513 vs. 1476), and the estimated number of flight hours increased .8 percent (25.7 million vs. 25.5 million the preceding year).

Fatal accidents declined by one (to 311 from 312), but because more passengers were flying aboard aircraft involved in fatal accidents, the total number of fatalities rose 7.1 percent (to 555 from 518 the year before). Fatality statistics include deaths to those outside of the aircraft, although there was only one in 2003, an individual who walked into a spinning propeller.

Accident Trends

Because the number of hours flown annually changes, the figure for total accidents does not provide a full picture of safety trends. An "accident rate" helps compensate for this variation. Aviation accident rates are typically calculated using the number of accidents per 100,000 hours of flight time, as estimated by the FAA. Figure 2 *(above, right)* depicts the NTSB-estimated overall GA accident rate for each of the last 10 years. It shows a downward trend in both total accidents and fatal accidents. The overall accident rate for 2003 was 6.77 per 100,000 hours, and for fatal accidents only, 1.37 per 100,000 hours.

U.S. General Aviation Accidents
per 100,000 Flight Hours 1994-2003

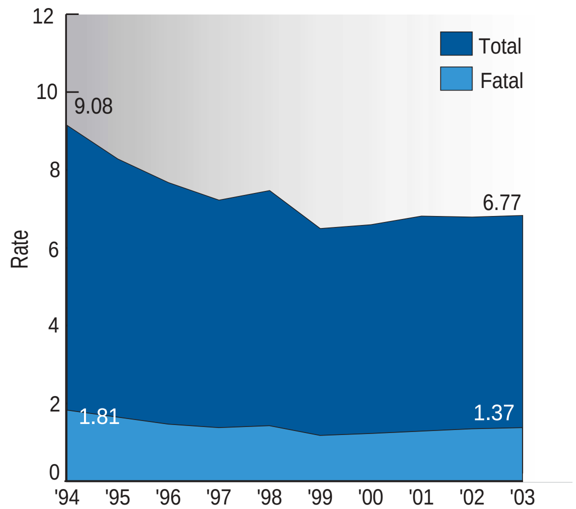


Fig. 2

Over this 10-year period, the rate of total GA accidents fell more than 25 percent (6.77 compared to 9.08 per 100,000 hours). The rate of fatal GA accidents also declined about 25 percent in the same period, from 1.81 to 1.37 per 100,000 hours.

Accident Causes

The causes of aircraft accidents can be divided into three groups:

- ***Pilot-related*** – accidents that arise from the improper action or inaction of the pilot.
- ***Mechanical/Maintenance*** – accidents that arise from failure of a mechanical component or errors in maintenance.
- ***Other/Unknown*** – includes causes such as pilot incapacitation as well as accidents whose cause could not be determined.

Figure 3 *(below)* charts 2003 GA accidents and fatal accidents by cause.

General Aviation Accidents 2003

MAJOR CAUSE	All Accidents	Fatal Accidents
Pilot	1147 (75.8%)	236 (75.9%)
Mechanical/ Maintenance	225 (14.9%)	23 (7.4%)
Other/Unknown	141 (9.3%)	52 (16.7%)
TOTAL	**1513**	**311**

Fig. 3

Like most well-designed mechanical equipment, an airplane is generally more reliable than its operator. Thus, the great majority of GA accidents are pilot-related. Last year, pilots were responsible for three-quarters of all accidents (75.8 percent) and a virtually equal rate of fatal mishaps (75.9 percent). This percentage has remained relatively constant for the last several decades. Mechanical/maintenance accidents accounted for 14.9 percent of all accidents, but only half that proportion (7.4 percent) of fatal accidents. Fewer than one in 10 accidents (9.3 percent) were from causes classified as other/unknown. These accounted for 16.7 percent of all fatal mishaps.

Accident Category

Within the three broad causes described above, accidents can be classified by category. For the ASF Nall Report, the category is determined by the phase of flight in which the accident occurred (for example, landing or maneuvering), or by primary precipitating factor, such as fuel management or weather.

Pilot-Related Accidents

1147 total/ 236 fatal

Accidents Causes - Pilot Related

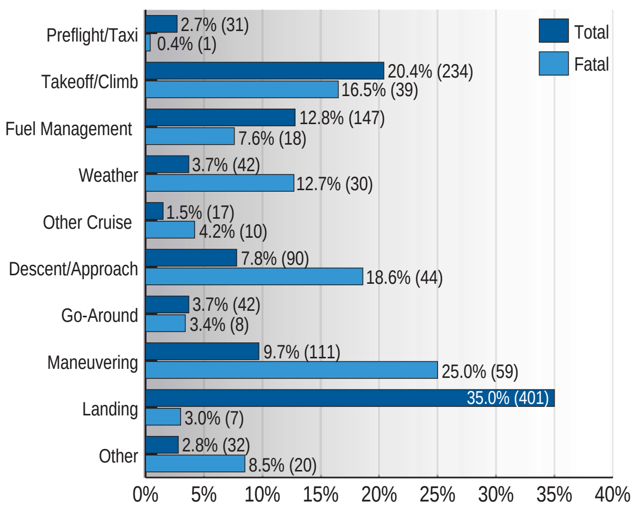


Fig. 4

Figure 4 *(above)* breaks down pilot-related accidents for 2003 by category. While total pilot-related accidents declined 1.9 percent (to 1147 from 1169), fatal pilot-related accidents rose 7.3 percent (to 236 from 220). Note that most accidents occurred during landing, accounting for more than one out of three mishaps (35 percent). This is understandable, because landing is a phase of flight in which the aircraft intentionally comes in contact with the ground. A relatively high level of pilot skill is required to prevent any number of mishaps, such as contacting the runway with too much force, or losing control of the aircraft and allowing it to leave the runway. Yet landing accidents are also the least lethal, accounting for only three percent of all fatal pilot-related accidents. When landing, an aircraft is moving relatively slowly, and the open space of an airport minimizes the chance of collision with obstructions that could exacerbate the severity of an accident.

Three pilot-related accident categories account for a disproportionate number of fatal accidents: weather, maneuvering flight, and descent/approach. Accidents involving weather often result in loss of control. This category accounted for just 3.7 percent of all accidents but 12.7 percent of all fatal accidents. Likewise, fewer than one out of 10 (9.7 percent) of all accidents in 2003 occurred during maneuvering flight, but they accounted for 25.0 percent of all fatal accidents. In 2003, descent/approach mishaps represented 7.8 percent of all accidents but 18.6 percent of all fatal crashes. These accidents are often high speed or stall/spin impacts with the ground prior to reaching the airport.

Type of Operation

General aviation encompasses a vast range of aerial activities, from recreational and personal flying to commercial operations. So in addition to cause and category, classifying accidents by the operation in which they occur, as in Figure 5 *(below)*, helps identify important safety issues.

Type of Operation

TYPE OF OPERATION	Percent of Flying (2002)	Percent of Total Accidents (2003)	Percent of Fatal Accidents (2003)
Personal	50.1%	71.1%	75.9%
Instructional	18.8%	13.8%	8.4%
Aerial Application	5.0%	4.6%	1.6%
Business	14.4%	2.8%	4.5%
Positioning	*	1.6%	1.3%
Ferry	*	0.7%	0.0%
Other Work Use	1.2%	1.6%	1.9%
Aerial Observation	3.5%	0.5%	1.3%
Exec./Corporate	5.4%	0.2%	0.3%
Other/Unknown	1.6%	3.1%	4.8%

*Included in Other/Unknown

Fig. 5

The three types of operations making up the bulk of GA flying are personal flight, such as visiting friends or family, traveling to a vacation home, or for recreation (50.1 percent); instructional flight (18.8 percent); and business flight (14.4 percent).

Personal flights accounted for more than seven out of 10 accidents in 2003 (71.1 percent) and more than three-quarters (75.9 percent) of all fatal accidents. This ranks personal flying behind the safety records of most other operations.

By contrast, learning to fly is among aviation's safest activities. While it accounted for about one in five (18.8 percent) of all flight hours, it resulted in only 13.8 percent of all accidents and 8.4 percent of fatal accidents in 2003.

Business flying—that is, flights made in furtherance of the pilot's own livelihood—comprised 14.4 percent of GA operations in 2002, but accounted for only 2.8 percent of all accidents, and 4.5 percent of all fatal accidents. (The primary distinction between business and executive/corporate flying is that executive/corporate pilots are hired solely to fly. For business pilots, flying is secondary to their primary business or occupational function.)

Emergency Phase of Flight

Identifying when an accident actually begins can help uncover important safety issues. Typically, one mistake or failure—a precipitating event—leads to another in a cascading series of malfunctions and mistakes that culminates in an accident. This is called the accident chain. In its investigations, the NTSB tries to determine in which phase of flight the precipitating event occurred. This is termed the emergency phase. Figure 6 charts 2003's pilot-related accidents by the phase of flight in which the accident chain began. There is some overlap in the terms used to describe the phase in which the emergency began and the accident category, but the two are not always the same. For example, fuel exhaustion during cruise would be categorized as a fuel management accident, but the emergency phase of flight would be listed as cruise. An accident caused by descending below the minimum descent altitude on an instrument approach would be categorized as descent/approach for both the accident category and the emergency phase of flight.

Emergency Phase of Flight

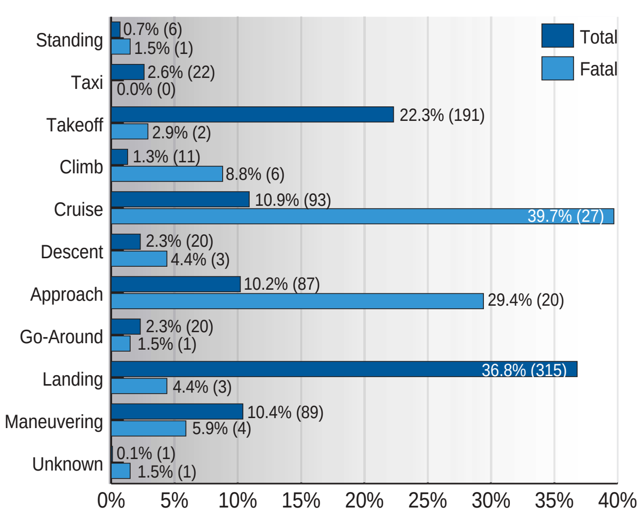


Fig. 6

Accidents and Aircraft Class

Fixed-wing GA aircraft fall into three broad classes: single-engine fixed-gear (SEF), single-engine retractable-gear (SER), and multiengine (ME) aircraft. As pilots transition from fixed to retractable landing gear, then to multiengine aircraft, instrumentation and systems generally become more complex. Additionally, the aircraft's performance capability increases. It is often assumed that more complex and higher performance aircraft are flown by pilots with more experience, but there is no data to support or contradict this idea. What is known is that each class of aircraft has a distinct accident profile. The types of accidents an aircraft is most likely to have, and the probability that a given type of accident will end in a fatality, change from class to class.

Accident/Fatality Rate by Class

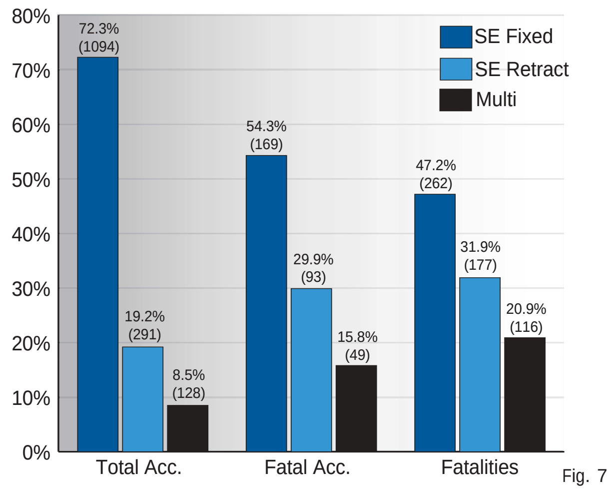


Fig. 7

Figure 7 *(above)* displays a breakdown of total and fatal accidents by aircraft class. Comparing accident rates among aircraft class by this chart alone is not possible, given the difference in the number of aircraft in each class and the hours they fly. (See page 17 for details of the GA fleet.) However, the chart indicates that the more complex and capable the aircraft, the greater the chance of a fatality in the event of an accident.

In 2003, SEF aircraft accounted for 72.3 percent of all accidents and 54.3 percent of all fatal accidents. SEF aircraft comprise the great majority of the GA fleet.

SER aircraft accounted for about one out of five accidents (19.2 percent) and almost one out of three (29.9 percent) fatal accidents.

ME aircraft accounted for 8.5 percent of all accidents and 15.8 percent of fatal accidents. On average, ME aircraft accidents claimed more lives per crash than did fatal accidents in either SEF or SER aircraft. ME aircraft probably spend proportionally more flight time in challenging weather conditions than do either SEF or SER aircraft, and accidents in such conditions are more likely to result in fatalities. Moreover, ME aircraft have higher stall speeds than single-engine aircraft, which makes any contact with the ground, even a normal landing, potentially more hazardous. Also, ME aircraft often have more passenger seats, which may account for the higher proportion of fatalities in ME aircraft accidents.

Lethality Index

This section examines the probability that pilot-related accidents in various categories will result in a fatality. We call this a lethality index. Figure 8 *(below)* presents the lethality index for all pilot-related accidents by accident category.

Lethality Index - All

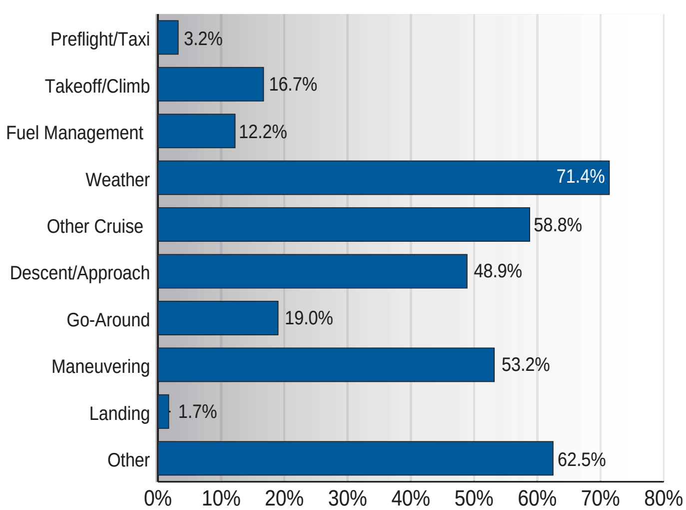


Fig. 8

Accidents attributed to weather had the highest lethality index in 2003. More than seven out of 10 (71.4 percent) ended in mortality. "Other cruise" accidents ended in fatality almost six out of 10 times (58.8 percent). Maneuvering accidents also tended to be lethal, with more than half (53.2 percent) resulting in a fatality in 2003.

Note the high lethality index of the "other" category: "Other" includes accidents for which no cause could be found. This often means no one survived to explain what happened, so the lethality index for this category is, of course, high.

Single-Engine Fixed-Gear Aircraft

857 total/ 133 fatal

Overview

Accident Causes

Single-Engine Fixed-Gear (SEF)

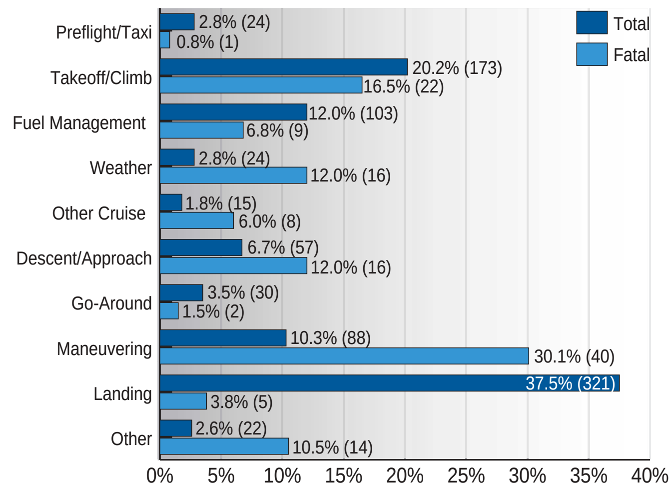


Fig. 9

For SEF aircraft, overall and fatal accidents were up slightly in 2003 over the previous year. Figure 9 charts pilot-related SEF aircraft accidents for 2003. The four leading fatality categories together accounted for 70.6 percent of all fatal mishaps in this class. These numbers are very similar to the previous year's accident data.

Maneuvering: 30.1 percent (40)
Takeoff and Climb: 16.5 percent (22)
Weather: 12 percent (16)
Descent/Approach: 12 percent (16)

Fatal Accident Factors

Maneuvering Accidents

Single-Engine Fixed-Gear (SEF)

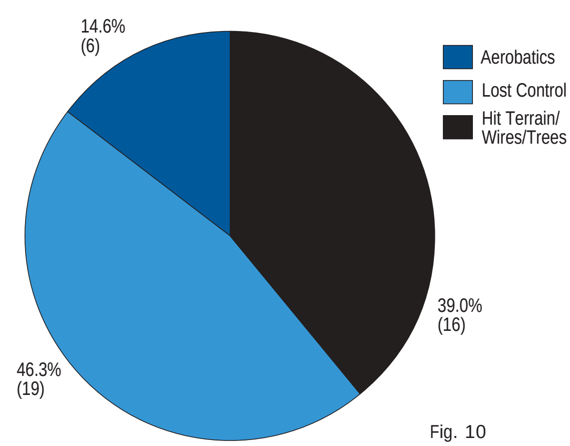


Fig. 10

Though only about one in 10 SEF aircraft accidents occurred during maneuvering flight, this category accounted for almost one-third of all fatal accidents in 2003. Figure 10 *(opposite page)* shows how these maneuvering accidents occurred. Loss of control was the most common cause (46.3 percent) followed by hitting terrain, wires, or other obstacles (39.0 percent). Accidents occurring during aerobatic flight accounted for 14.6 percent of the fatal maneuvering crashes.

Weather-Related Accident Causes

Single-Engine Fixed-Gear (SEF)

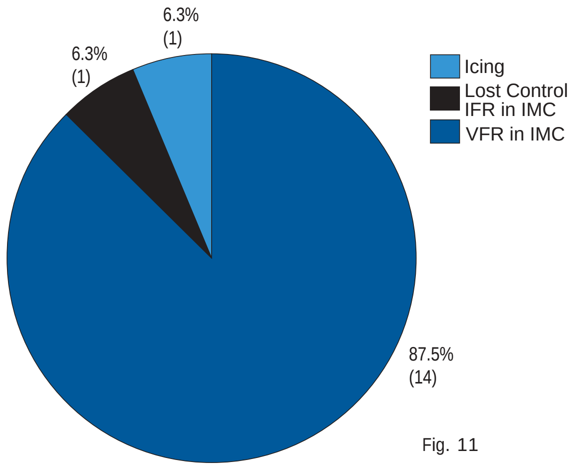


Fig. 11

Overall, only 2.8 percent of SEF aircraft accidents were attributable to weather, but weather was involved in 12 percent of the fatal accidents in this aircraft class. Figure 11 breaks down these weather-related accidents by their cause.

The overwhelming majority resulted from continued VFR into IMC; quite simply, a pilot flying by reference to outside visual cues flew into low visibility conditions and lost control of the aircraft or hit terrain. VFR into IMC accounted for 87.5 percent of all fatal weather accidents in SEF aircraft. Most of these accidents could have been avoided had the pilot reversed course at the first recognition of IMC, or not departed at all.

Lethality Index

Single-Engine Fixed-Gear (SEF)

Fig. 12

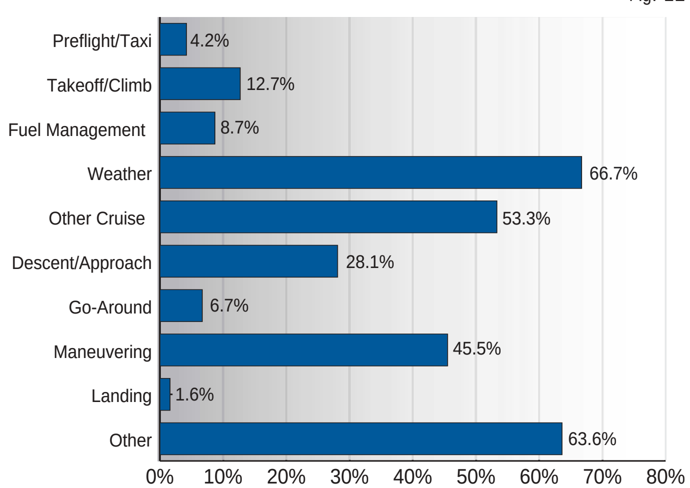


Figure 12 *(bottom, left)* depicts the lethality index by accident category for SEF aircraft. It closely resembles the chart of the lethality index for all three classes of aircraft (Figure 8) because SEF aircraft comprise the majority of the GA fleet.

Flight Training

173 total/ 17 fatal

The time spent learning to fly is when skills, habits, and attitudes that have a direct impact on safety are acquired. That makes accident trends for this type of operation of particular interest to the GA community.

Proportion of Accidents - Flight Training

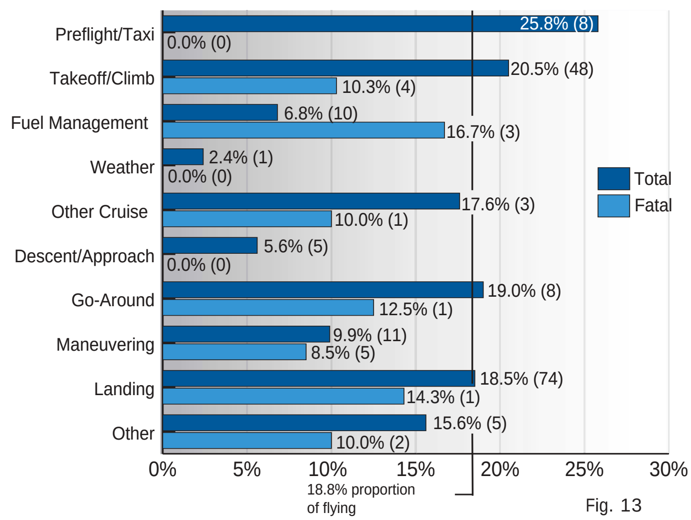


Fig. 13

The number of accidents that occurred during flight training increased 9.5 percent in 2003 (from 158 to 173). Pilot-related accidents during training rose from 14.8 percent of all such accidents in 2002 to 15.1 percent in 2003. In the same period, fatal pilot-related training accidents declined from 8.2 percent to 7.2 percent of all such fatal mishaps. Figure 13 *(above)* shows the proportion of all accidents and fatal accidents by category for instructional flights.

Overall, the figures speak well for the safety records of both instructors and student pilots. Their share of accidents in almost all categories was below the proportion of flying represented by instructional flight. Some noteworthy points about 2003 instructional accidents:

• The number of accidents that occurred in takeoff/climb increased 65.5 percent in 2003 (29 to 48). However, the percentage of fatal takeoff/climb accidents attributed to flight instruction actually declined from the previous year's level (10.3 percent in 2003 vs. 11.4 percent in 2002).

• A relatively high number of instructional accidents occurred during preflight and taxi (8). This is a phase of flight in which instructors cannot afford to be complacent, and students must practice vigilance.

• Landing accidents, while remaining the number one category of training mishaps, declined 5.1 percent in 2003 (from 78 to 74), and resulted in only one fatal accident.

• Weather is rarely a factor in instructional accidents. Due to the close oversight and control exercised by instructors, students are typically kept out of adverse weather.

• There were 10 instructional accidents attributed to improper fuel management in 2003, an increase of one over the previous year. Of those, two (20 percent) were fatal. Such accidents are avoidable simply by assuring an adequate supply of fuel is onboard, and switching tanks as appropriate in flight.

A rising trend of instructional flight accidents is always a concern to the ASF. In response to the increase in 2003, the ASF published a special report about instructional flight accidents, which is available online at http://www.aopa.org/asf/publications/topics/instructional.pdf.

Fortunately, preliminary data shows that instructional accidents in 2004 returned to their historic levels, indicating that the 2003 increase was an anomaly.

Single-Engine Retractable-Gear Aircraft

195 total/ 66 fatal

Overview

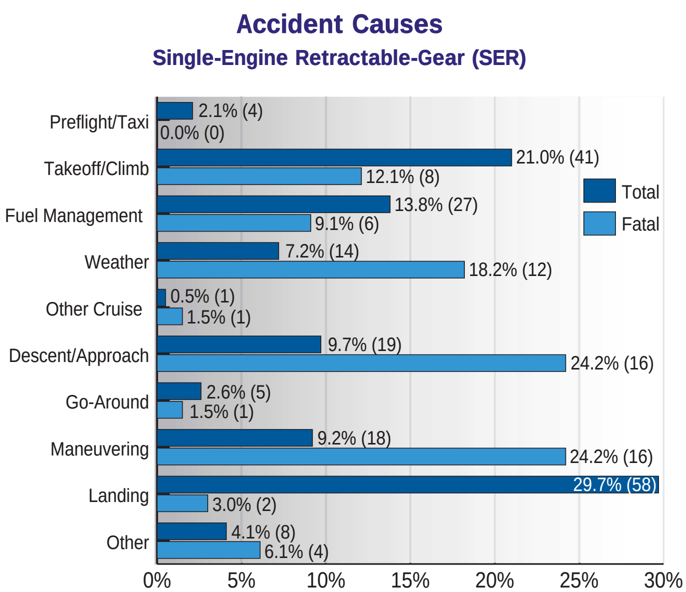


Fig. 14

Accidents in SER aircraft increased 12.1 percent in 2003 (from 174 to 195), while fatal accidents increased 13.8 percent (from 58 to 66). Figure 14 *(above)* charts the data on all pilot-related accidents and fatal accidents in this aircraft class. The four leading categories of fatal accidents in 2003 were:

Maneuvering: 24.2 percent (16)
Descent/Approach: 24.2 percent (16)
Weather: 18.2 percent (12)
Takeoff/Climb: 12.1 percent (8)

This list is similar to the 2002 rankings, except that "takeoff/climb" has moved up to replace "other cruise" in the number four spot. These four categories accounted for 78.7 percent of all fatal pilot-related accidents in their class in 2003.

Fatal Accident Factors

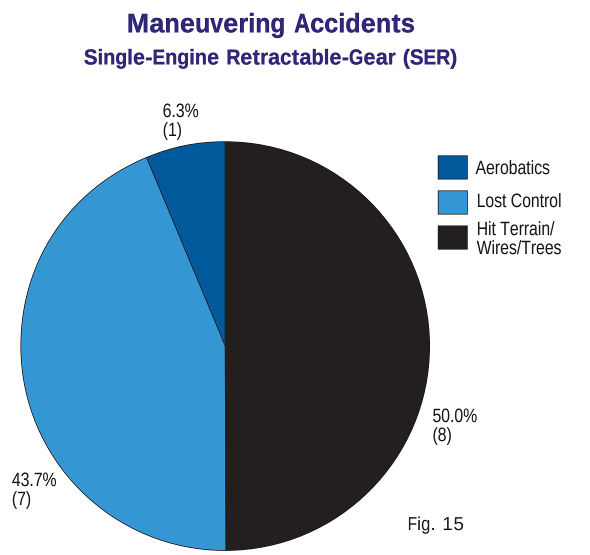


Fig. 15

Similar to the accident experience with SEF aircraft, maneuvering flight in SER aircraft accounted for about one in 10 pilot-related accidents (9.2 percent) and about one in four fatal accidents (24.2 percent) in 2003. However, the number of fatal maneuvering accidents in SER aircraft showed an increase (45.5 percent). Figure 15 *(above)* shows how these maneuvering accidents happened. Half (50.0 percent) resulted from hitting terrain, wires, or other obstructions. The remainder were due to loss of control while maneuvering (43.7 percent) and aerobatic flight (6.3 percent).

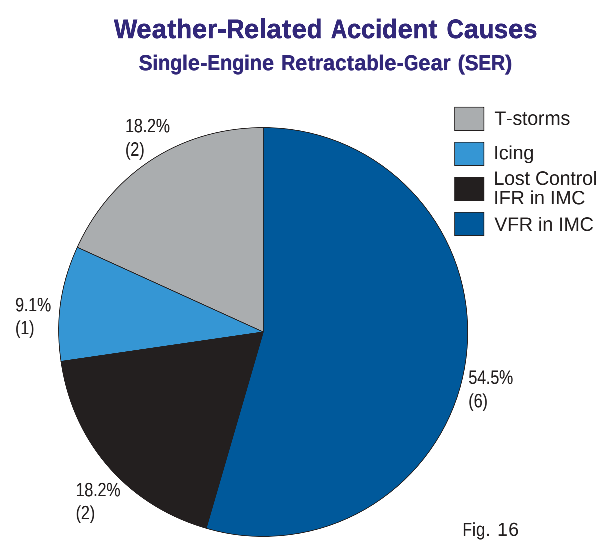


Fig. 16

SER aircraft are capable machines, but data on weather-related accidents confirms pilots sometimes put the aircraft in conditions beyond the capabilities of the pilot or the airplane. Figure 16 *(bottom, left)* shows the factors behind weather-related accidents in these aircraft. In 2003, more than half (54.5 percent) resulted from VFR into IMC. But a significant number occurred when pilots lost control of the aircraft, either in thunderstorms (18.2 percent) or when legally operating in IMC (18.2 percent). There was one fatal accident attributed to icing (9.1 percent).

Lethality Index
Single-Engine Retractable-Gear (SER)

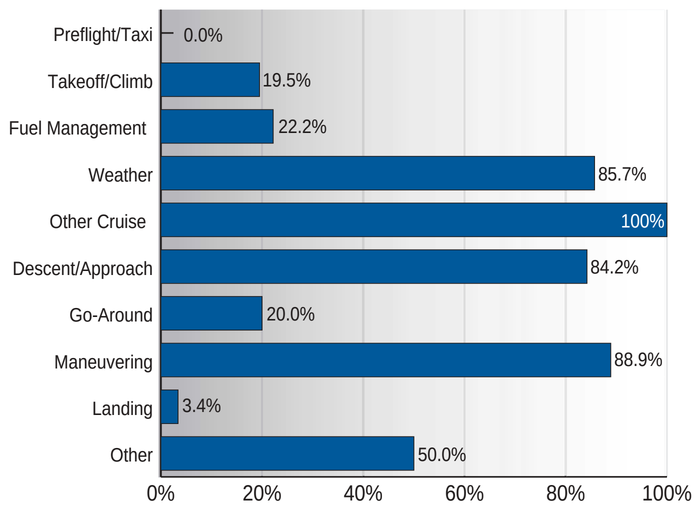


Fig. 17

Figure 17 *(above)* presents the lethality index for accidents in SER aircraft. As the ratio of fatal to nonfatal accidents indicates, in 2003 the probability of mortality was high for mishaps attributable to weather (85.7 percent), during other phases of cruise (100 percent), while maneuvering (88.9 percent), and in the descent/approach phase (84.2 percent). Keep in mind when analyzing the lethality index that small numbers of accidents are involved, which can skew results. For example, "other cruise" had a lethality index of 100 percent, but there was only one SER aircraft accident in that category.

Multiengine Aircraft

95 total/ 37 fatal

Overview

Powerplant redundancy gives multiengine (ME) aircraft a potential safety edge in the event of engine failure, but these aircraft are also more challenging to operate. Loss of an engine during takeoff or climb can be more dangerous in an ME aircraft than in a single-engine (SE) aircraft. Indeed, the debate over whether an ME or SE is a safer aircraft has gone on for years. Although last year's accident data bolstered the argument for the safety superiority of ME, the real answer has much more to do with pilot skill and proficiency, especially in handling engine failure emergencies during takeoff or climb.

Accident Causes
Multiengine (ME)

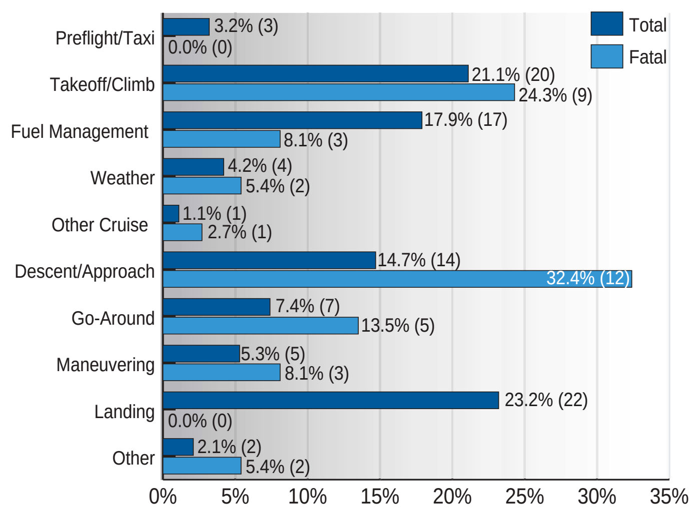


Fig. 18

Accidents in ME aircraft declined 3.1 percent in 2003 (from 98 to 95), while fatal accidents decreased 5.1 percent (from 39 to 37). Figure 18 *(above)* charts the data on all pilot-related accidents and fatal accidents in this aircraft class. The leading categories of fatal ME aircraft accidents in 2003 were:

Descent/Approach: 32.4 percent (12)
Takeoff/Climb: 24.3 percent (9)
Go-Around: 13.5 percent (5)
Fuel Management: 8.1 percent (3)
Maneuvering: 8.1 percent (3)

These five categories accounted for 86.4 percent of all fatal ME aircraft accidents. Noteworthy in its absence is weather involvement, the third most common category of fatal accidents in ME aircraft in 2002. On the negative side, accidents during go-around increased significantly in number and lethality. Go-arounds were responsible for 13.5 percent of all fatal ME aircraft accidents in 2003, versus only 2.6 percent of fatal crashes the preceding year. And the probability of a go-around accident ending in a fatality rose to 71.4 percent in 2003 from 12.5 percent in 2002.

Fatal Accident Factors

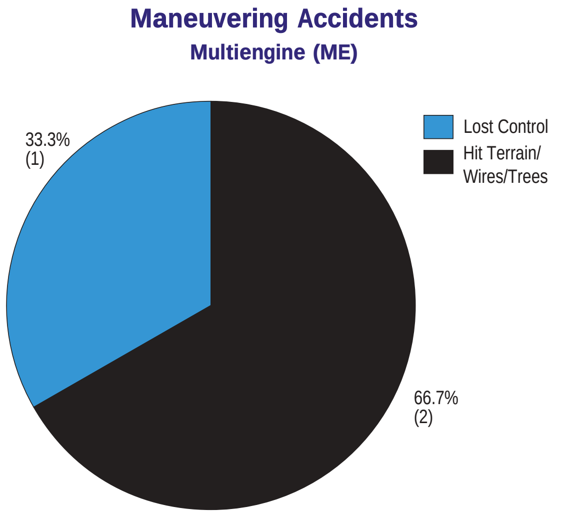


Fig. 19

Figure 19 *(above)* shows ME aircraft maneuvering accidents by their cause. Note how the maneuvering accident profile differs from that of single-engine aircraft, either fixed-gear or retractable. Two-thirds of fatal ME aircraft maneuvering accidents in 2003 resulted from striking terrain, wires, or trees, and one-third from loss of control. Overall, maneuvering accidents in class had a 60 percent probability of ending in fatality, a figure falling between the maneuvering fatality rates for fixed-gear (45.5 percent) and retractable-gear (88.9 percent) singles.

There were only two fatal ME aircraft accidents attributed to weather in 2003. One resulted from the pilot losing control of the aircraft while flying IFR in IMC, and the other resulted from an encounter with a thunderstorm.

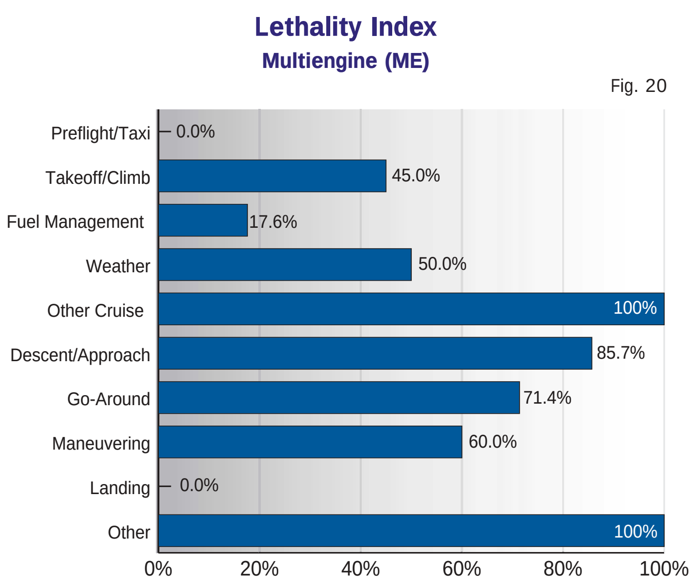


Fig. 20

Figure 20 *(below, left)* provides a lethality index for all accident categories in ME aircraft in 2003. Accidents during takeoff and climb in ME aircraft were more likely to end in a fatal crash than in single-engine aircraft. One factor in this difference is likely the higher stall speed of ME aircraft. Takeoff accidents, and those that begin in climb, may involve higher velocities and their attendant consequences. Also, in a conventional ME aircraft in climb configuration, a power loss in one engine will create asymmetrical thrust forces that can overwhelm an unprepared pilot. Of the four weather-related accidents recorded, two ended in fatalities, giving the category a 50 percent lethality index. Only one accident occurred in "other cruise," and it was fatal, accounting for the category's lethality index of 100 percent.

Pilot-Related Accident Factors

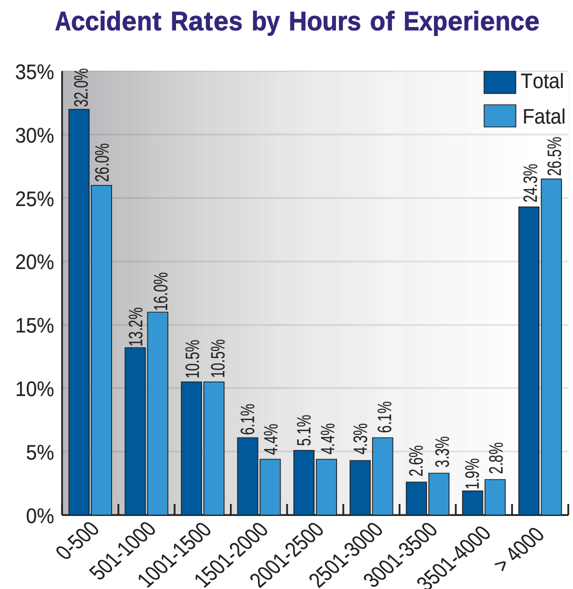


Fig. 21

Which pilots are having accidents? Total flight time and time in a particular aircraft play key roles in the answer. Figure 21 *(above)* shows the correlation between accidents and experience. The more experienced the pilot, the less likely he or she is to become an accident statistic. However, in general, the lethality of accidents appears to rise with experience. This may be because more experienced pilots are likely to fly in challenging conditions that other pilots might avoid. Accidents in such conditions, for example, adverse weather or at night, are more likely to result in fatality.

Time in Type

Figure 22 *(opposite, top)* shows the correlation between accidents and pilot experience in type. The more familiar a pilot is with an aircraft type, the less likely he or she is to have an accident in it. More than 40 percent of 2003 accidents involved pilots with fewer than 100 hours of experience in type. Total accident rates fall sharply after the first 100 hours of flight, yet over the next 200 hours, while the total accident rate declines, the percentage of fatal accidents rises dramatically.

Accident Rates by Time in Type

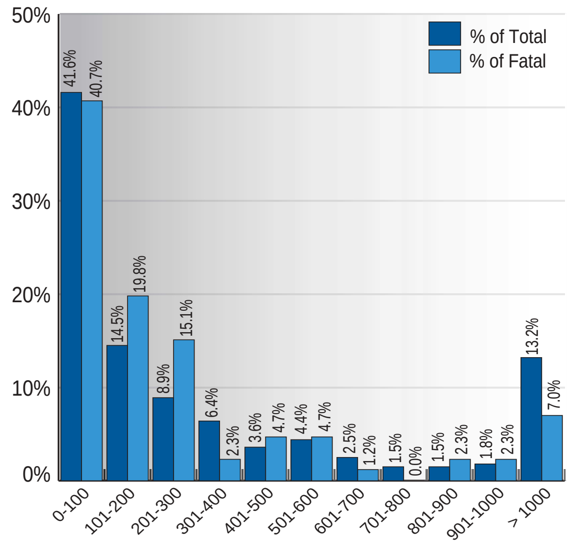


Fig. 22

One interpretation is that after 100 hours, some pilots may become overconfident and expose themselves to conditions that they do not yet have the experience to handle safely.

Certificate Level

Accident Rates by Certificate Level

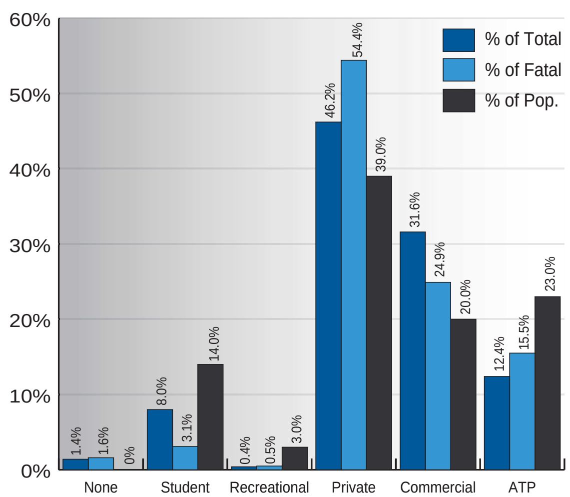


Fig. 23

Accident rates are also linked to pilot certificate level. Figure 23 *(above)* compares these rates. Other than recreational pilots, who represent just three percent of certificated pilots, student pilots and ATPs (Airline Transport Pilots) have the lowest accident rates. Conversely, private and commercial pilots have an outsize percentage of accidents in relation to their proportion of the pilot population. But while ATPs have the lowest accident rates of these four groups, an accident involving an ATP certificate holder is more likely to be fatal than is an accident involving a student, private, or commercial pilot.

Different Ways to Explain GA Safety

There are several ways to express GA safety statistics, some of which may be more useful than others in helping understand the state of GA safety.

Accidents per 100 pilots is calculated by dividing the number of active pilots, currently 625,011, into the number of accidents (1513 total and 311 fatal) and multiplying by 100. There were 0.24 total accidents and 0.05 fatal accidents per 100 pilots in 2003.

In other words, one out of every 413 active pilots had an accident in 2003, and one out of every 2,009 active pilots was involved in a fatal accident.

Number of flight hours per accident is another expression of the state of GA safety that some pilots have found particularly helpful in encouraging reluctant spouses to fly. Using the NTSB estimate of hours flown in 2003, one accident occurred on average every 17,052 hours. By the same measurement, a fatal accident occurred every 82,958 flight hours. By any calculation, the average pilot could fly many, many lifetimes without having an accident of any sort, let alone a much more rare fatal mishap.

Personal Flying

819 total/ 184 fatal

Personal flying represents about half of all GA flying. But as Figure 24 shows, pilots conducting personal flights have more than their share of accidents, both fatal and nonfatal.

Proportion of Accidents - Personal Flying

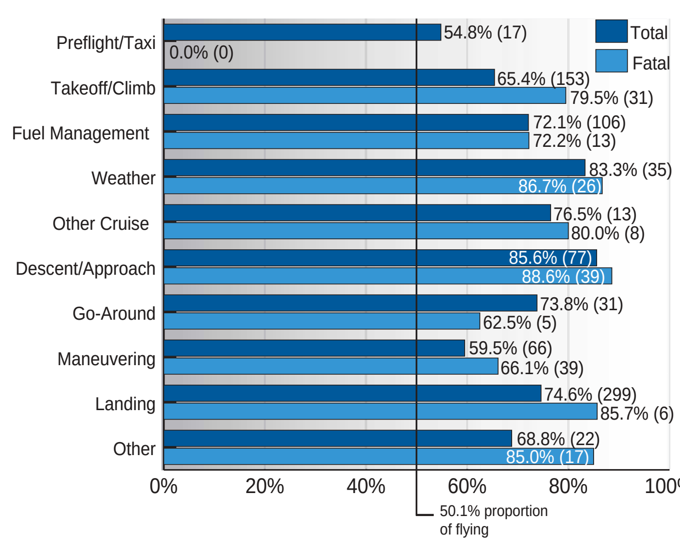


Fig. 24

In 2003, personal flying accounted for 71.4 percent of all pilot-related accidents, and more than three-quarters (78.0 percent) of all fatal pilot-related accidents. And in almost all categories within personal flying, the percentage of fatal accidents was higher than the percentage of total accidents. Simply put, pilots engaged in personal flying are more likely to have an accident, and their accidents are more likely to end in a fatality than are pilots engaged in any other common type of operation. For example, personal flying was the type of operation that accounted for more than 80 percent of all weather-related accidents, and an even higher percentage (86.7) of those that claimed a life. Similarly, personal flying accounted for 85.6 percent of all descent/approach accidents, and 88.6 percent of fatal accidents. Three-quarters (74.6 percent) of all landing accidents, and more than 85 percent of resulting fatal crashes, occurred during this operation.

Business Flying

31 total/ 10 fatal

GA is a vital component of the business community and the nation's economy. Many pilots rely on their aircraft for business transportation, and owner-flown business use accounted for 14.4 percent of all GA operations in 2002.

Proportion of Accidents - Business Flying

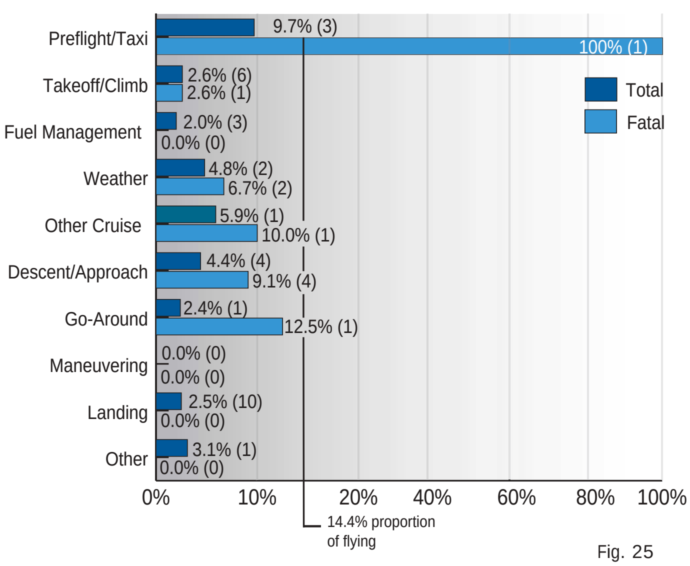


Fig. 25

When compared to 2002 data, 2003 fatal pilot-related business accidents decreased by 41.2 percent. Figure 25 *(above)* shows the proportion of accidents by category that occurred during business flying. In all categories, pilots flying on business had lower accident rates than did pilots as a whole, although there was one unique twist to 2003 business flying statistics: its largest share of accidents occurred before takeoff, with almost 10 percent of mishaps occurring during preflight or taxi. Only one of those accidents was fatal, however. The second highest category of business flying accident, "other cruise," represented only 5.9 percent of all such mishaps. Business flyers were also responsible for only 2.4 percent of all accidents during go-around. But these go-around mishaps had a relatively high probability of ending in fatality, accounting for 12.5 percent of all such fatal crashes.

Mechanical/Maintenance Accidents

225 total/ 23 fatal

Mechanical/maintenance accidents are caused by a mechanical failure that adversely affects the performance of the aircraft. Though pilots are responsible for assuring their aircraft is airworthy, when an equipment failure precipitates an accident, it is considered a mechanical/maintenance accident, rather than a pilot-related accident.

Accident Causes - Mechanical/Maintenance

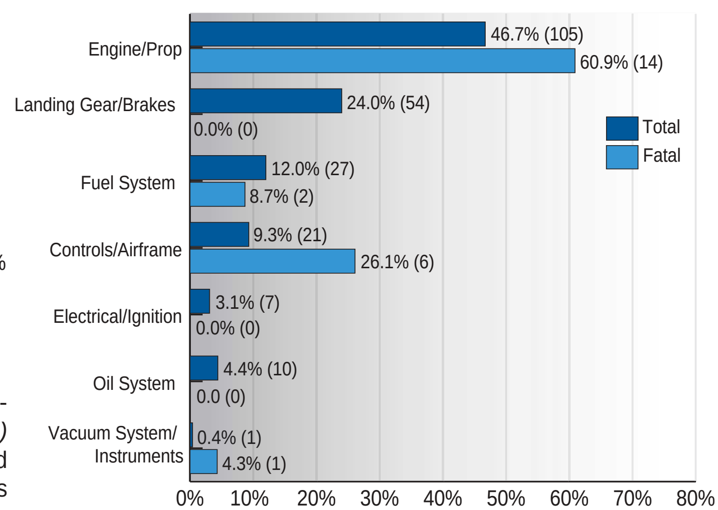


Fig. 26

Figure 26 *(above)* breaks down mechanical/maintenance accidents by the mechanical system involved. In 2003, engine/propeller malfunctions accounted for 46.7 percent of all mechanical/maintenance accidents and 60.9 percent of all such fatal mishaps. Malfunctions involving controls or the airframe caused about one in 10 such accidents (9.3 percent) and more than one-quarter of fatal mechanical/maintenance mishaps (26.1 percent). Accidents involving failures of vacuum systems or instruments are rare, but can lead to loss of aircraft control when the failure occurs in IMC. In 2003 there was one such accident, and it was fatal.

Accident Trend - Mechanical/Maintenance

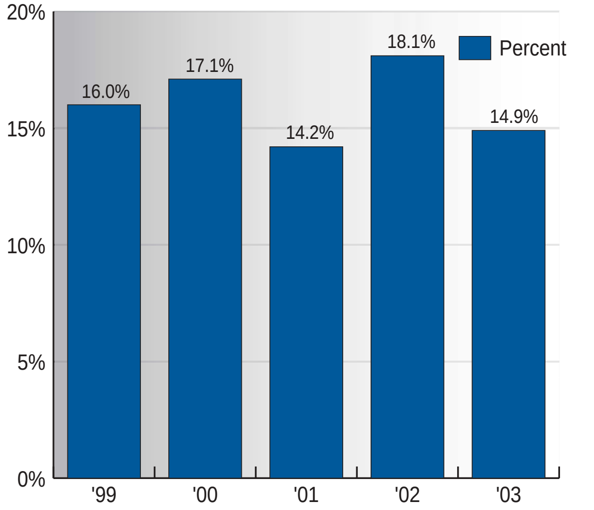


Fig. 27

Over the past five years, mechanical/maintenance accidents accounted for an average of 16.1 percent of all accidents (Figure 27). 2003's figure of 14.9 percent is 1.2 percent below this average. It is also the second lowest percentage achieved during this five-year time span. Pilots contribute to these low accident rates by keeping their aircraft well maintained and by conducting rigorous preflight inspections.

Night and Weather

Night and adverse weather can create challenging conditions, primarily due to reduced visibility. But accidents are more likely to occur during the day than at night (6.5 vs. 4.8 accidents per 100,000 hours), and also more likely to occur in visual rather than IMC (7.5 vs. 6.7 accidents per 100,000 hours).

Accidents - Day vs. Night

CONDITIONS	Percent Fatal	Accident Rate/ 100,000 hours	Fatal Acc. Rate/ 100,000 hours
Day	14.0%	6.5	0.9
Night	36.1%	4.8	1.7
VMC	17.7%	7.5	1.3
IMC	64.1%	6.7	4.3
Day VMC	11.7%	6.6	0.8
Night VMC	19.6%	4.6	0.9
Day IMC	63.6%	4.2	2.7
Night IMC	50.0%	6.0	3.0

Fig. 28

Figure 28 *(above)* presents 2003 accidents sorted by flight conditions and day vs. night. Accidents at night and in IMC tended to be more severe than those occurring in daylight and VMC. Only 14.0 percent of daytime accidents resulted in fatalities. More than one-third (36.1 percent) of all night accidents were fatal. And though only 17.7 percent of accidents in VMC were fatal, in IMC, almost two-thirds (64.1 percent) claimed a life.

Day VMC accidents had the lowest fatal accident rate of any light/flight condition, with little more than one in 10 (11.7 percent) resulting in fatality. Day IMC had the highest, with 63.6 percent ending in death. At night, one in five accidents in VMC conditions was fatal (19.6 percent), while half of night IMC accidents (50.0 percent) resulted in mortality.

Accident Trend - Weather

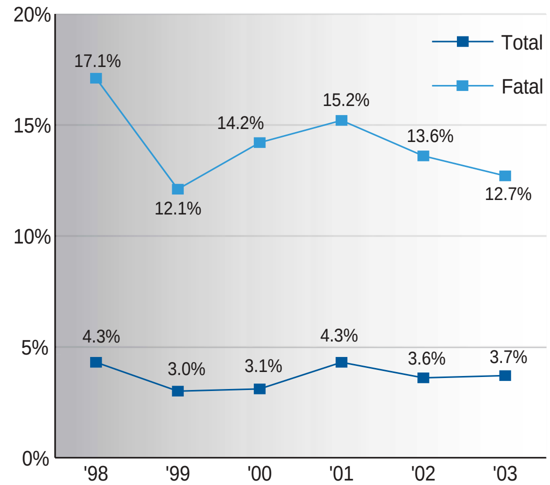


Fig. 29

Figure 29 *(above)* charts the six-year trend of weather-related accidents. In 2003, weather was the primary factor in 3.7 percent of all accidents (the same as the average for the six-year period). These accounted for 12.7 percent of all fatal crashes. Weather's overall share of accidents has held steady over the last six years. But the proportion of fatal weather-related accidents has followed a downward trend.

Special Emphasis Topic Fuel Management

Fuel management accidents continue to plague GA, even though most pilots don't believe that this type of accident could ever happen to them. In the last 10 years, improper fuel management of all types has caused an average of 13.7 percent of all pilot-related accidents and 6.4 percent of fatal pilot-related accidents. Expressed another way, over three accidents per week are the result of improper fuel management.

Fuel management accidents include fuel exhaustion, when the airplane just runs out of gas; fuel starvation, meaning fuel remains on board but is prevented from reaching the engine, such as a failure to switch tanks at the right time; and fuel contamination, when the pilot does not ensure that water or other contaminants have been drained from the fuel tanks prior to flight.

On average, fuel exhaustion causes over 50 percent of all fuel management accidents. Fuel exhaustion happens for numerous reasons, including not refueling before taking off, improper preflight planning, improper in-flight monitoring, or failure to divert from the planned course to refuel. While FAA regulations mandate a minimum fuel reserve for all operations, ASF has gone one step further by advocating that pilots should never land with less than one hour of fuel left in their tanks. The best way to prevent a fuel exhaustion accident is to plan ahead, monitor in-flight progress, and land early if you need to. GPS units have proven to be a wonderful aid when it comes to monitoring in-flight progress. Many have built-in fuel monitoring, and almost all provide pilots with the aircraft's groundspeed, which can help pilots determine the time left to get to their destination.

GPS isn't the only new technology valuable in preventing fuel exhaustion accidents. When Cessna resumed production of new aircraft in the mid 1990s, they added low-fuel warning lights in all their aircraft. Since then, no fuel exhaustion accidents in newer Cessna aircraft have been reported.

Fuel starvation is the second most common cause of fuel management accidents. Over the last 10 years, fuel starvation was the cause of nearly one-third of all fuel management accidents. Considering there is still fuel on board, it is hard to believe that this number is so high.

In airplanes without a "both" position on the fuel selector handle, decide before departure on a schedule for switching between fuel tanks. Not only will this help keep you from running one tank dry, it will also help keep the airplane balanced. A good example would be to fly on one tank for one hour, then switch to the other tank for two hours. Then, switch back to the first tank. Also, don't wait until short final to switch tanks. Perform this operation during descent to the airport, so that if there is a problem during the transition, there is time and altitude to deal with the problem.

The final type of fuel management accident stems from fuel contamination. Water in the fuel supply, leaky fuel cap seals, deteriorating bladder tanks, and even being fueled with the wrong type of fuel can cause fuel contamination. The best ways to prevent fuel contamination include maintaining your aircraft properly and conducting a thorough preflight prior to each flight. When refueling, make a point to be at the aircraft when it is being fueled. Mis-fueling of an aircraft is rare, but can happen. Make sure the right grade and type fuel is going into the aircraft.

Fuel management accidents are the most preventable in aviation. Trying to stretch the range of the aircraft is like trying to stretch a piece of concrete. It is impossible to do without breaking the object in question, and shouldn't even be tried.

Homebuilt Aircraft

132 total/ 35 fatal

With increasing sophistication and ease of construction, homebuilt aircraft represent a fast-growing segment of the GA fleet. While total pilot-related accidents in homebuilt aircraft increased 12.8 percent in 2003 (132 from 117), fatal accidents declined by 2.8 percent (36 to 35). The leading categories of fatal pilot-related homebuilt accidents were:

Maneuvering: 37.1 percent (13)
Fuel Management: 17.1 percent (6)
Takeoff/Climb: 11.4 percent (4)
Weather: 11.4 percent (4)

Together, these accident categories accounted for 77.0 percent of all pilot-related fatal mishaps in homebuilt aircraft.

Pilot-Related Accident Rates - Homebuilt

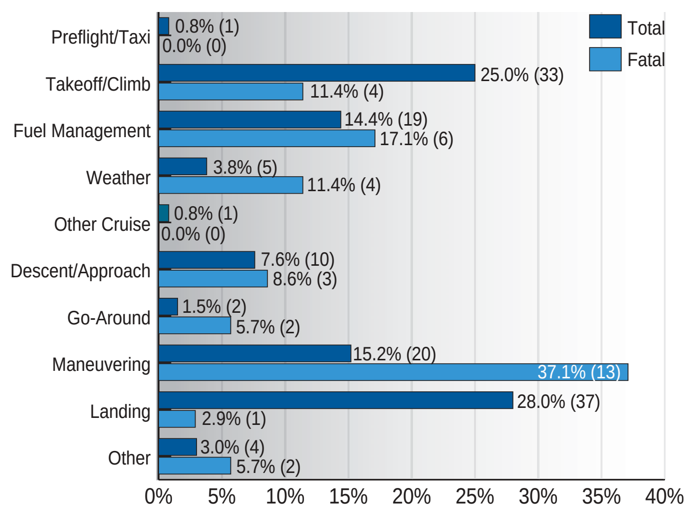


Fig. 30

Figure 30 *(below, left)* charts the factors involved in pilot-related accidents in homebuilt aircraft in 2003. It indicates homebuilt and certificated aircraft have similar types and rates of accidents. The one area where the picture was very different is in fuel management accidents. The rate for this category was higher for homebuilt aircraft than either factory-built SEF or SER aircraft, and the mishaps were much more likely to be fatal. (Virtually all homebuilt aircraft are single-engine aircraft.) Almost one in three fuel management homebuilt aircraft accidents claimed a life (31.6 percent). The likelihood of a fuel management accident ending in a fatality in a factory-built SEF or SER aircraft was 8.7 percent and 22.2 percent respectively.

Maneuvering also accounted for a greater proportion of accidents, both fatal and nonfatal, in homebuilt aircraft than in factory-built single-engine aircraft in 2003. On the positive side, accidents in homebuilt aircraft during descent and approach had a significantly lower likelihood of ending in a fatality than those in factory-built aircraft.

Proportion of Accidents - Homebuilt

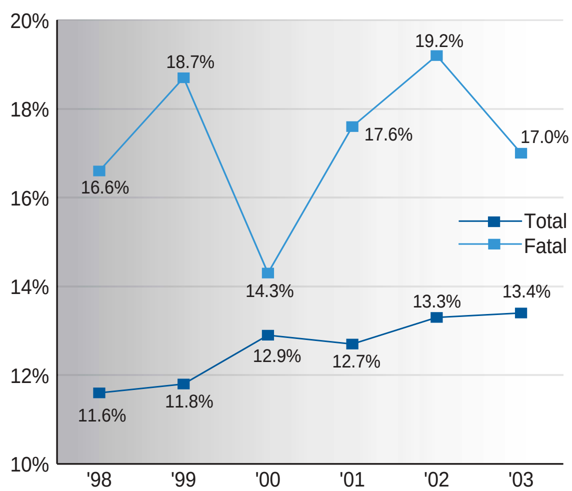


Fig. 31

Figure 31 *(above)* tracks the ratio of pilot-related accidents in homebuilt aircraft to overall GA accidents over the last five years. The percentage of accidents in which homebuilt aircraft are involved is growing steadily (from 11.8 percent in 1999 to 13.4 percent in 2003), but so is the number of homebuilt aircraft in the GA fleet. (There were 20,528 experimental aircraft, the great majority of them homebuilt aircraft, registered with the FAA in 1999, and an estimated 21,936 in 2002, a 6.9 percent increase.) Accidents in homebuilt aircraft are more likely to end in a fatality, but this increased probability has fluctuated widely, from a low of 14.3 percent in 2000 to a high of 19.2 percent in 2002.

The homebuilt arena encompasses a wide variety of aircraft and pilot experience levels. Initially, homebuilding mainly attracted pilots seeking an inexpensive way to acquire a simple, reliable airplane. But with the growing sophistication of design, construction techniques, and equipment, today's homebuilt fleet includes some of the most sophisticated and highest performing GA aircraft available. One consideration for pilots contemplating the homebuilt route is that the FAA sets different construction standards for homebuilt than for factory-built aircraft.

Other Accident Factors

Midair Collisions

11 total/ 7 fatal

Midair collisions increased in 2003, up 22.2 percent (from nine to 11) overall, and by 40 percent (from 5 to 7) for fatal accidents. Overall fatalities increased from nine to 23 (a 155.6 percent increase). Most midair collisions occur in daylight and in good VFR conditions, usually at low altitudes and near airports. A few minutes of enhanced concentration and focus on the part of all pilots could reduce the number of these accidents. Over 80 percent of midair collisions that occurred during "normal" flight operations (this excludes formation flight) took place within 10 miles of an airport. Fully 78 percent of midair collisions that occurred in the traffic pattern took place at nontowered airports.

An AOPA Air Safety Foundation study rebutted the popular image of midair collisions occurring head-on or at an acute angle. The study found the vast majority (82.0 percent) resulted from a faster aircraft overtaking and hitting a slower moving aircraft. Only five percent were from a head-on angle. Over the past three years ASF has made a major effort to educate pilots on collision avoidance strategies. These initiatives included special emphasis programs in high-density traffic areas with high potential for midair collisions.

Fuel Management

147 total/ 18 fatal

As noted in the special emphasis area, fuel management accidents consist of fuel exhaustion, fuel starvation, and fuel contamination. In 2003, 90 (nine fatal) accidents were a result of fuel exhaustion. Although easily preventable, 41 total and five fatal accidents were caused by fuel starvation in 2003. Fuel contamination resulted in 16 total and four fatal accidents in 2003.

Ground Injuries: Off-Airport

8 total/ 1 fatal

Fear of airplanes falling out of the sky and causing death or injury to those on the ground is a common concern of nonpilot airport neighbors, and is often cited as a reason to restrict or close GA airports. Statistics show this concern is far more fiction than fact. In 2003 only one person on the ground died outside of the airport environment (off airport) as a result of a GA accident.

Alcohol and Drugs

7 total/ 7 fatal

Drug and alcohol misuse continues to rank low as an accident factor. Historically, drug or alcohol use has been cited as a cause or factor in about 1.1 percent of all accidents.

Prescription or OTC drugs, rather than alcohol, have been the predominant abused substances in these crashes. As a class, these mishaps have a high probability of ending in a fatality. In 2003 seven accidents were attributed to drugs or alcohol, and all were fatal. Four pilots were found to be impaired by either over-the-counter (OTC) or prescription medications. Two were impaired by alcohol, and one by an illegal substance. Many pilots believe that it is safe to fly if they have recently taken an OTC or prescription medication. Depending on the drug, this may not be the case. A list of drugs commonly approved by the FAA is available to AOPA members on the AOPA Web site (www.aopa.org). Also, the AOPA Medical Certification Department offers free counseling to AOPA members on a wide variety of medical issues related to flying.

Pilot Incapacitation

5 total/ 5 fatal

Pilot incapacitation happens very rarely. Five such accidents occurred in 2003. Two resulted from heart attacks, one from carbon monoxide poisoning, one from G-LOC (G-induced loss of consciousness), and the cause of one was unknown. In only one of these accidents was a passenger aboard. Although the odds of a pilot becoming incapacitated on any one flight are one in several million, nonpilots concerned about the possibility can take special instruction that prepares them to take control of an aircraft and land safely. ASF now offers its Pinch Hitter® course on DVD to help flying companions feel more comfortable in aircraft. For more information, or to order the DVD, visit the AOPA Online Safety Center (www.aopa.org/safety-center).

Propeller Strike Injuries

5 total/ 2 fatal

Propeller strike injuries usually result from either an attempt to hand prop-start an airplane, or an individual in the ramp area inadvertently coming into contact with a moving propeller. The number of fatalities from propeller strikes is very low, averaging two per year. Five propeller strike accidents occurred in 2003; two of those were fatal. Additionally, although not a prop strike, one ground handler was struck by a wing and injured.

Summary

Between 1999 and 2002, the number of GA accidents declined more than 12 percent. In 2003, the number of accidents increased slightly, but so did the estimated number of hours of operation. Thus, the total GA accident rate per 100,000 flight hours for 2003 was only 0.2 more than 2002. Both figures represent historic lows for GA. However, the Air Safety Foundation believes improvements in GA safety can still be achieved. Here are additional highlights of GA accident trends:

• The accident rates for GA aircraft in 2003 were 6.71 per 100,000 hours, and 1.36 fatal accidents per 100,000 hours.

• In 2003, pilot-related causes were responsible for three-quarters of all accidents (75.8 percent) and a virtually equal rate of fatal mishaps (75.9 percent). Total pilot-related accidents declined 1.9 percent (to 1,147 from 1,169; fatal pilot-related accidents rose 6.8 percent (to 236 from 220).

• Pilot-related accidents during flight instruction increased from 14.8 percent of all accidents in 2002 to 15.1 percent in 2003, while fatal pilot-related accidents during training declined from 8.2 percent to 7.2 percent of all fatal accidents.

• More than one out of three (35.0 percent) pilot-related accidents in 2003 occurred during landing, but they were seldom fatal; fewer than one out of 11 resulted in a fatality.

• Accidents during personal flying accounted for more than three-quarters (75.9 percent) of all fatal accidents in 2003, and more than seven out of 10 of all accidents (71.1 percent). Personal flying accounted for about half of 2002 GA activity (50.1 percent).

• Maneuvering flight was the category with the largest number of pilot-related fatal accidents, accounting for one out of four such crashes (25.0 percent). Maneuvering flight was also the number one fatal accident category for single-engine fixed-gear aircraft, responsible for almost one-third (30.1 percent) of all such mishaps. For single-engine retractable-gear aircraft, maneuvering tied with descent/approach accidents for most fatal crashes, accounting for 24.2 percent of all accidents that ended in death.

• The fuel management accident rate for homebuilt aircraft was higher than for factory-built single-engine aircraft. Additionally, almost one in three such accidents (31.6 percent) in homebuilt aircraft was fatal.

• On a per-hour basis, accidents were more than twice as likely to occur during the day than at night in 2003. But only 14.0 percent of daytime accidents resulted in fatalities. At night, more than one in three (36.1 percent) was fatal.

• In 2003, accident rates in VMC were more than 270 percent higher than accident rates in IMC (7.5 accidents per 100,000 hours in VMC vs. 2.8 in IMC). However, those occurring in IMC were much more likely to end in a fatality (64.1 percent in IMC vs. 17.7 percent in VMC).

ONLINE SAFETY CENTER
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Additional information about the topics covered in this report, as well as many others, can be found online in the AOPA Online Safety Center. Visit www.aopa.org/safetycenter today to learn more.

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Maneuvering

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Maneuvering Flight – Hazardous to Your Health? Safety Advisor
(http://www.aopa.org/asf/publications/sa20.pdf)

Stall/Spin: Entry Point for Crash and Burn? Special Report
(http://www.aopa.org/asf/publications/topics/stall_spin.pdf)

Weather

Single-Pilot IFR Online Course
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SkySpotter® Online Course
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Lights-Out: A New Collision Avoidance Challenge Safety Advisor
(http://www.aopa.org/asf/publications/sa21.pdf)

Terrain Avoidance Plan Safety Brief
(http://www.aopa.org/asf/publications/tap.pdf)

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Instructional Safety

Flight Instruction Safety Special Report
(http://www.aopa.org/asf/publications/topics/instructional.pdf)

Propeller Strikes

Propeller Safety Safety Advisor
(http://www.aopa.org/asf/publications/sa06.pdf)

Appendix

GA Safety vs. Airlines

GA accident rates have always been higher than airline accident rates. People often ask about the reasons for this disparity. There are several:

• Variety of missions – GA pilots conduct a wider range of operations. Some operations, for example, aerial application (crop-dusting in common parlance) and banner towing, have inherent mission-related risks.

• Variability of pilot certificate and experience levels – All airline flights are crewed by at least one ATP (Airline Transport Pilot), the most demanding rating. GA is the training ground for most pilots, and while the GA community has its share of ATPs, the community also includes many new and low time pilots, and a great variety of experience in between.

• More limited cockpit resources and flight support – GA operations are predominantly conducted by a single pilot, and the pilot typically handles all aspects of the flight, from flight planning to piloting. Air carrier operations require at least two pilots. Likewise, airlines have dispatchers, mechanics, loadmasters, and others to assist with operations.

• Greater variety of facilities – GA operations are conducted at about 5,000 public-use and 8,000 private-use airports, while airlines are confined to only about 700 of the larger, public-use airports. Many GA-only airports lack the precision approaches, long runways, approach lighting systems, and the advanced services of airline-served airports. (There are also another 6,000 GA-only landing areas that are not technically airports, such as heliports and seaplane bases.)

• More takeoffs and landings – During takeoffs and landings aircraft are close to the ground and in a more vulnerable configuration than in other phases of flight. On a per hour basis, GA conducts many more takeoffs and landings than either air carriers or the military.

• Less weather-tolerant aircraft – Most GA aircraft cannot fly over or around weather the way an airliner can, and they often do not have the systems to avoid or cope with hazardous weather conditions, such as ice.

What Is General Aviation?

Although GA is typically characterized by recreational flying, it encompasses much more. Besides providing personal, business, and freight transportation, GA supports diverse activities such as law enforcement, forest fire fighting, air ambulance, logging, fish and wildlife spotting, and other vital services.

What Does General Aviation Fly?

General aviation aircraft are as varied as their pilots and the types of operations flown. The following aircraft categories and classes are included in each year's Nall Report:

- Piston single-engine
- Piston multiengine
- Turboprop single-engine
- Turboprop multiengine
- Experimental
- Homebuilt

The following aircraft categories and classes are not included in each year's Nall Report:

- Turbojets
- FAR Part 121 airline operations
- FAR Part 135 charter operations
- Military operations
- Aircraft weighing more than 12,500 pounds
- Helicopters
- Gliders
- Balloons

The number of GA aircraft, sorted by category and class, registered in 2001 (the most recent year statistics are available from the FAA) to air taxi operators and GA is shown below:

	Air Taxi	General Aviation
Piston single-engine	569	144,465
Piston multiengine	855	17,426
Turboprop single-engine	95	820
Turboprop multiengine	645	5,036
Turbojet	716	7,071
Helicopter	819	5,964
Experimental	253	20,168
Total	**3,952**	**200,950**

Fig. 32

Figure 32 displays the composition of the powered GA fleet, divided by aircraft class and by the type of operation. The aircraft covered in this report comprise 90.6 percent of the GA fleet, if one totals homebuilt aircraft, all singles, and all piston aircraft.

Interpreting Aviation Accident Statistics: What is the accident rate?

Meaningful comparisons are based on equal exposure to risk. However, this alone does not determine total risk. Experience, proficiency, equipment, and flight conditions all have a safety impact. To compare different airplanes, pilots, types of operations, etc., we must first "level the playing field" in terms of exposure to risk. The most common way to do this is to compare accidents per 100,000 flight hours. GA flight hours are estimated using data from an annual aircraft activity survey conducted by the FAA. Whether this survey accurately reports the total hours has been debated for years, but even with likely inaccuracies, the relationships between accident categories will remain constant. For instance, landing accidents will still account for the lion's share of minor injury mishaps, while weather and maneuvering flight will still claim the most lives.

Accident investigators and safety researchers determine the probability that a given accident was the result of a particular cause or sequence of events. This report shows the percentage of accidents attributed to a particular accident category and the percentage of accident sequences that began in a particular phase of flight. Thus we can identify and concentrate on accidents that carry the greatest risk.

NTSB Definitions

Accident/Incident (NTSB Part 830)

The following definitions of terms used in this report have been extracted from NTSB Part 830 of the Federal Aviation Regulations. It is included in most commercially available FAR/AIM digests and should be referenced for detailed information.

Aircraft Accident

An occurrence incidental to flight in which, "as a result of the operation of an aircraft, any person (occupant or nonoccupant) receives fatal or serious injury or any aircraft receives substantial damage."

• **A fatal injury** is one that results in death within 30 days of the accident.

• **A serious injury** is one that:

(1) Requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received.

(2) Results in a fracture of any bone (except simple fractures of fingers, toes, or nose).

(3) Involves lacerations that cause severe hemorrhages, nerve, muscle, or tendon damage.

(4) Involves injury to any internal organ. Or

(5) Involves second- or third-degree burns, or any burns affecting more than five percent of body surface.

• **A minor injury** is one that does not qualify as fatal or serious.

• **Destroyed** means that an aircraft was demolished beyond economical repair, i.e., substantially damaged to the extent that it would be impracticable to rebuild it and return it to an airworthy condition. (This may not coincide with the definition of "total loss" for insurance purposes. Because of the variability of insurance limits carried and such additional factors as time on engines and propellers, and aircraft condition before an accident, an aircraft may be "totaled" even though it is not considered "destroyed" for NTSB accident-reporting purposes.)

• **Substantial damage** for accident reporting purposes does not necessarily correlate with "substantial" in terms of financial loss. Contrary to popular misconception, there is no dollar value that defines "substantial" damage. Because of the high cost of many repairs, large sums may be spent to repair damage resulting from incidents that do not meet the NTSB definition of substantial damage.

(1) Except as provided below, substantial damage means damage or structural failure that adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected part.

(2) Engine failure, damage limited to an engine, bent fairings or cowling, dented skin, small puncture holes in the skin or fabric, ground damage to rotor or propeller blades, damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wing tips are not considered "substantial damage."

• **Minor damage** is any damage that does not qualify as substantial, such as that in item (2) under substantial damage.

Type of Flying

The purpose for which an aircraft is being operated at the time of an accident:

On-Demand Air Taxi — Revenue flights, conducted by commercial air carriers operating under FAR Part 135, that are not operated in regular scheduled service, such as charter flights, and all non-revenue flights incident to such flights.

Personal — Flying by individuals in their own or rented aircraft for pleasure or personal transportation not in furtherance of their occupation or company business. This category includes practice flying (for the purpose of increasing or maintaining proficiency) not performed under supervision of an accredited instructor and not part of an approved flight training program.

Business — The use of aircraft by pilots (not receiving direct salary or compensation for piloting) in connection with their occupation or in the furtherance of a private business.

Instruction — Flying accomplished in supervised training under the direction of an accredited instructor.

Executive/Corporate — The use of aircraft owned or leased, and operated by a corporate or business firm for the transportation of personnel or cargo in furtherance of the corporation's or firm's business, and which are flown by professional pilots receiving a direct salary or compensation for piloting.

Aerial Observation — The operation of an aircraft for the purpose of pipeline/power line patrol, land and animal surveys, etc. This does not include traffic observation (electronic newsgathering) or sightseeing.

Other Work Use — The operation of an aircraft for the purpose of aerial photography, banner/glider towing, parachuting, demonstration or test flying, racing, aerobatics, etc.

Public Use — Any operation of an aircraft by any federal, state, or local entity.

Ferry — A non-revenue flight for the purpose of (1) returning an aircraft to base, (2) delivering an aircraft from one location to another, or (3) moving an aircraft to and from a maintenance base. Ferry flights, under certain terms, may be conducted under terms of a special flight permit.

Positioning — Positioning of the aircraft without the purpose of revenue.

Other — Any flight that does not meet the criteria of any of the above.

Unknown — A flight whose purpose is not known.

Phase of Flight

The phase of the flight or operation is the particular phase of flight in which the first occurrence or circumstance occurred:

Standing — From the time the first person boards the aircraft for the purpose of flight until the aircraft taxies under its own power. Also, from the time the aircraft comes to its final deplaning location until all persons deplane. Includes preflight, starting engine, parked-engine operating, parked-engine not operating, and idling rotors.

Taxi — From the time the aircraft first taxies under its own power until power is applied for takeoff. Also, when the aircraft completes its landing ground run until it parks at the spot of engine shutoff. Includes rotorcraft aerial taxi. Includes taxi to takeoff and taxi from landing.

Takeoff — From the time the power is applied for takeoff up to and including the first airborne power reduction, or until reaching VFR traffic pattern altitude, whichever occurs first. Includes ground run, initial climb, and rejected takeoff.

Climb — From the time of initial power reduction (or reaching VFR traffic pattern altitude) until the aircraft levels off at its cruise altitude. Also includes en route climbs.

Cruise — From the time of level off at cruise altitude to the beginning of the descent.

Descent — From the beginning of the descent from cruise altitude to the IAF, FAF, outer marker, or VFR pattern entry, whichever occurs first. Also includes en route descents, emergency descent, auto-rotation descent, and uncontrolled descent.

Approach — From the time the descent ends (IAF, FAF, outer marker, or VFR pattern entry) until the aircraft reaches the MAP (IMC) or the runway threshold (VMC). Includes missed approach (IMC) and go-around (VMC).

Landing — From either the MAP (IMC) or the runway threshold (VMC) through touchdown or after touchdown off an airport, until the aircraft completes its ground run. Includes rotorcraft run-on, power-on, and auto-rotation landings. Also includes aborted landing where touchdown has occurred and landing is rejected.

Maneuvering — Includes the following: aerobatics, low pass, buzzing, pull-up, aerial application maneuver, turn to reverse direction (box-canyon-type maneuver), or engine failure after takeoff and pilot tries to return to runway.

Other — Any phase that does not meet the criteria of any of the above. Examples are practice single-engine air work, basic air work, external load operations, etc.

Unknown — The phase of flight could not be determined.

Aviation in itself is not inherently dangerous. But to an even greater degree than the sea, it is terribly unforgiving of any carelessness, incapacity or neglect.

Captain A. G. Lamplugh
British Aviation Insurance Group, London
Circa early 1930's

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