Amateur-Built Aircraft
Safety Record

Brian Poole

Office of Accident Investigation
Federal Aviation Administration
What is an Amateur-Built Aircraft?
Airworthiness Certificate Types

Standard
- Normal
- Utility
- Acrobatic
- Transport

Special
- Experimental
- Restricted
- Limited
- Provisional
- Special Flight
- Primary Category
Experimental Aircraft

Experimental certificates are issued for the following purposes:

- Operating Amateur-Built Aircraft
- Exhibition
- Air Racing
- Research and Development
- Crew Training of Applicant’s Flight Crew
- Showing Compliance with Regulations
- Market Surveys
“An Aircraft, the major portion of which has been fabricated and assembled by person(s) who undertook the construction project solely for their own education or recreation.”
Advisory Circular No: 20-27D

“Certification and Operation of Amateur-Built Aircraft” 6/22/1990--Provides guidance concerning the building, certification, and operation of amateur-built aircraft.
Other Related Advisory Circulars


AC No:  103-7  The Ultralight Vehicle (1/30/1984)
Ultralight Vehicle

- Used for manned operation in air by single occupant
- Used for recreation or sport purposes
- Does not have airworthiness certificate
- Unpowered - Less than 155 pounds
- Powered
  - weighs less than 254 pounds
  - fuel capacity less than or equal to 5 U.S. gallons
  - calibrated airspeed not greater than 55 knots at full power at level flight
  - power-off stall speed not greater than 24 knots
Light Sport Aircraft Proposal

- Maximum of 2 occupants
- 1,232 pounds (560Kg) maximum certified takeoff weight
- 39-knot stall speed using lift enhancing devices and 44-knot stall speed without such devices
- 115 knot maximum operating speed
- Single non-turbine powered engine
- Fixed landing gear
How many Amateur-Built Aircraft are out there?
Total Certificated Amateur-Built Aircraft
As of January 1, 1995-2004

Year

Total Aircraft


0 5,000 10,000 15,000 20,000 25,000 30,000
Amateur-Built Aircraft Certificated by Year
1995-2003
Annual New U.S. Manufactured General Aviation Unit Shipments
1973-2002

Total Factory Shipments

Year


Total Aircraft

0

5000

10000

15000

20000
Annual New U.S. Manufactured General Aviation Unit Billings (Millions) 1973-2002

**Factory Net Billings (millions)**

**Year**

**Total Factory Billings**
How Much Flying Do Amateur-Built Aircraft Do?
Amateur-Built Aircraft Average Hours Flown Per Year 1993-2001

Source: General Aviation & Air Taxi Survey
WHAT IS AN AIRCRAFT ACCIDENT?
Aircraft Accident:

- An Occurrence Associated With the Operation of an Aircraft Which Takes Place Between the Time Any Person Boards the Aircraft With the Intention of Flight and Until Such Time as All Such Persons Have Disembarked, and in Which Any Person Suffers Death or Serious Injury, or in Which the Aircraft Receives Substantial Damage
An Injury Which (1) Requires Hospitalization for More Than 48 Hours, Commencing Within 7 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) Causes Severe Hemorrhages, Nerve, Muscle or Tendon Damage; (4) Involves Any Internal Organ; or (5) Involves Second or Third Degree Burns or Any Burns Affecting More Than 5 Percent of the Body Surface
Substantial Damage:

- Damage or Failure Which Adversely Affects the Structural Strength, Performance, or Flight Characteristics of the Aircraft, and Which Would Normally Require Major Repair or Replacement of the Affected Component. Engine Failure or Damage Limited to an Engine Cowling, Dented Skin, Small Punctured Holes in the Skin Fabric, Ground Damage to Rotor or Propeller Blades, and Damage to Landing Gear, Wheels, Tires, Flaps, Engine Accessories, Brakes, or Wingtips are not Considered “Substantial Damage”
Other Definitions

- Fatal Accident--Aircraft accident in which a fatality occurs
- Fatality--An occurrence where death results within 30 days of the accident
- Incident--An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operations
General Aviation Accidents
1930-2002

Number of Accidents

Year
General Aviation Fatal Accidents
1930-2002

Year

Number of Accidents


0 100 200 300 400 500 600 700 800 900 1000
General Aviation Accident Rates by Purpose of Flight
1983-2001
Amateur-Built Aircraft Accidents 1983-2003

Number of Accidents vs. Year


Number of Accidents: 0 50 100 150 200 250

Graph showing the number of Amateur-Built Aircraft Accidents from 1983 to 2003.
Amateur-Built Aircraft
Fatal Accidents
1983-2003

Number of Accidents

Year

Amateur-Built Aircraft Fatalities 1983-2003

Number of Accidents

Year

Amateur-Built & General Aviation Accident Rates 1993-2001

- Amateur-Built
- General Aviation

![Graph showing the accident rates per 100,000 hours for Amateur-Built and General Aviation from 1993 to 2001. The graph indicates a decreasing trend in both categories over the years.]
Amateur-Built & General Aviation Fatal Accident Rates 1993-2001

Year

Amateur-Built

General Aviation

Accidents Per 100,000 Hours

Amateur-Built & General Aviation Fatal Accident Rates
## Amateur-Built Aircraft Accidents 1999-2003

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
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<tr>
<td>Accidents</td>
<td>219</td>
<td>228</td>
<td>208</td>
<td>214</td>
<td>187</td>
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<tr>
<td>Fatal Accidents</td>
<td>61</td>
<td>49</td>
<td>54</td>
<td>63</td>
<td>47</td>
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<td>Fatalities</td>
<td>79</td>
<td>72</td>
<td>71</td>
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Source: NTSB
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<tr>
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<td>13</td>
<td>3</td>
<td>13</td>
<td>16</td>
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<td>Fatalities</td>
<td>1</td>
<td>8</td>
<td>3</td>
<td>6</td>
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Source: NTSB
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<tr>
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<th>General Aviation</th>
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<tbody>
<tr>
<td>Active Aircraft</td>
<td>21,531</td>
<td>220,000</td>
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<tr>
<td>Flight Hours (000)</td>
<td>799</td>
<td>26,220</td>
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<tr>
<td>Accidents</td>
<td>205</td>
<td>1721</td>
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<td>Accident Rate per 100,000 Aircraft Hours</td>
<td>25.66</td>
<td>6.56</td>
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<tr>
<td>Fatal Accidents</td>
<td>53</td>
<td>321</td>
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<tr>
<td>Fatal Accident Rate per 100,000 Aircraft Hours</td>
<td>6.63</td>
<td>1.22</td>
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## Amateur-Built Aircraft Accidents
### Top 10 States 1993-2002

<table>
<thead>
<tr>
<th>State</th>
<th>Accidents</th>
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<tbody>
<tr>
<td>California</td>
<td>221</td>
</tr>
<tr>
<td>Florida</td>
<td>185</td>
</tr>
<tr>
<td>Texas</td>
<td>134</td>
</tr>
<tr>
<td>Washington</td>
<td>78</td>
</tr>
<tr>
<td>Oregon</td>
<td>73</td>
</tr>
<tr>
<td>Arizona</td>
<td>71</td>
</tr>
<tr>
<td>Michigan</td>
<td>68</td>
</tr>
<tr>
<td>Colorado</td>
<td>67</td>
</tr>
<tr>
<td>Ohio</td>
<td>56</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>55</td>
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</table>
# Amateur-Built Aircraft Accidents

## Ten Most Common Aircraft Involved 1992-2001

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Number of Accidents</th>
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<tbody>
<tr>
<td>KITFOX</td>
<td>90</td>
</tr>
<tr>
<td>RV-6</td>
<td>81</td>
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<tr>
<td>PITTS</td>
<td>68</td>
</tr>
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<td>LANCAIR</td>
<td>55</td>
</tr>
<tr>
<td>RV-4</td>
<td>48</td>
</tr>
<tr>
<td>GLASAIR</td>
<td>48</td>
</tr>
<tr>
<td>AVID FLYER</td>
<td>45</td>
</tr>
<tr>
<td>KR-2</td>
<td>41</td>
</tr>
<tr>
<td>LONG-EZ</td>
<td>40</td>
</tr>
<tr>
<td>VARI-EZ</td>
<td>39</td>
</tr>
<tr>
<td>ROTORWAY EXEX 90</td>
<td>37</td>
</tr>
</tbody>
</table>
Amateur-Built Aircraft Accidents by Month 1993-2002
Amateur-Built Aircraft Accidents
Type of Flight Plan
1993-2002

Type of Flight Plan

- NONE: 95%
- IFR: 1%
- VFR: 2%
- OTHER: 2%

Percent of Accidents
Amateur-Built Aircraft Accidents
Condition of Light and Type of Weather
1993-2002

Condition of Light

- Daylight: 96%
- Night: 1%
- Dawn/Dusk: 2%
- VMC: 98%
- IMC: 1.2%

Percent of Accidents
Amateur-Built Aircraft Accidents

Pilot Age

1992-2001

Pilot Age

15-19: 0.1
20-29: 3.3
30-39: 12.3
40-49: 26.4
50-59: 26.7
60 or older: 21.6

Percent of Accidents
Amateur-Built Aircraft Accidents
Pilot Total Time
1993-2002

Pilot Total Time (Hours)

- 1-99
- 100-499
- 500-999
- 1000-4999
- 5000 or more

Percent of Accidents

0 10 20 30 40 50 60 70 80 90 100

- 5
- 28.4
- 17.3
- 32.9
- 16
Amateur-Built Aircraft Accidents
Initial Phase of Accident
1992-2001

- Unknown: 1
- Taxi: 1.5
- Takeoff: 26.5
- Standing: 0.3
- Other: 0.2
- Maneuvering: 17
- Landing: 16.1
- Hover: 0.8
- Descent: 2.8
- Cruise: 16.4
- Climb: 4.4
- Approach: 12.9
Amateur-Built Aircraft Accidents
Breakdown of Broad Cause
1992-2001

Aircraft - 846
  Propulsion System and Controls - 84
  Flight Control System - 420
  Airframe - 86
  Landing Gear - 57
  Systems/ Equipment/ Instruments - 18

Environment - 130
  Weather - 42
  Light Conditions - 0
  Object (Trees, Wires, Etc.) - 6
  Airport/ Airways Facilities, Aids - 4
  Terrain/ Runway Condition - 72

Personnel - 2341
  Pilot - 1917
  Others (Aboard) - 5
  Others (Not Aboard) - 196
Characteristics of Amateur-Built Aircraft Accidents

- 20% occur during the first two flights
- Daylight - VFR
- No flight plan
- Summertime - good weather
- Older pilots
- Less experienced pilots
- 50% lack of familiarization with aircraft
“25 to 50 percent of new homebuilt's suffer from reduced power or engine stoppage during their first 10 flight hours.”

*Source: Sport Aviation--January 2003*