Project no: ASA6-CT-2006-044549

Project acronym: EPATS

Project title: European Personal Air Transportation System STUDY

Instrument: Specific Support Action

Thematic Priority: Integrating and Strengthening the European Research Area

Deliverable reference number and title:

# D1.1 Report on European Business & Personal Aviation Database and Findings

Organization name of lead contractor for this deliverable: **Institute of Aviation**

| Date of report preparation: June 15, 2007 | Date of report issue: December 12, 2007 |
|---|---|
| Deliverable:<br>**D1.1 Report on European Business & Personal Aviation Database and Findings** | Version/Status: **V 1**<br>(draft: a,b,c; final: 0,1,2,3) |

| Approval Status (date, signature) | | | |
|---|---|---|---|
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| Project coordinator name:<br>Krzysztof PIWEK | Start date of project: Jan 1, 2007 |
|---|---|
| Project coordinator organization name:<br>INSTITUTE of AVIATION | Duration: 18 month |

| Project funded by the European Commission within the Sixth Framework Programme (2002-2006) | | |
|---|---|---|
| **Dissemination** | | |
| **PU** | Public | **X** |
| **PP** | Restricted to other programme participants (including the Commission Services) | |
| **RE** | Restricted to a group specified by the consortium (including the Commission Services) | |
| **CO** | Confidential, only for members of the consortium (including the Commission Services) | |

## *Table of contents:*

# 1. INTRODUCTION

**The EPATS (European Personal Air Transportation System)** focuses on the future Highly Customer Oriented and Time, and Cost Efficient Air Transport System. It fills niche between Surface and Scheduled Air Transport. Future mobility cannot be satisfied only through investments in hub and spoke, or rail - and highway systems.
This future EPATS system will provide a wide choice of transportation mode - and the wider use of small aircraft, served by small airports, to create access to more communities in less time.
**The goal of the EPATS proposal is to demonstrate the needs and potential of small aircraft business development and to propose recommendations for the introduction of this new European Air Transportation System in the context of the European Research Areas.**

**The EPATS study** will address the following issues:

– The potential new market for personal aviation up to 2020.
– The potential impact of this new way of transport on the European ATM, and airport infrastructures, as well as the environmental, safety and security issues involved.
– The EPATS general specification and R&D Roadmap

The adjective „personal" means that some area of the European Air Transportation System is tailored to the personal needs, preference and resources of the population and is adapted to serve European & National Intercity low-density passenger flow, which cannot be profitably served by current Regional Airline neither by High Speed Train.
EPATS is mainly an Air Service to European Small Communities

Most of the European regional air traffic still consists of turbo-propellers, with a 30-70 seating capacity. Typical examples of this type of aircraft are: Saab 340 (33-seater), ATR 42 (48-seater), Fokker 50 (50-seater) and ATR 72 (68-seater). Although they are mainly used for short-haul journeys, they cannot operate on a number of small local airports and be profitably used on the most of interregional routes where density of passenger flow is below 20 passengers per day.

EPATS provides alternatives to long distance car trips and air travel – more frequent flights of small aircraft take off and land at small airports.

**The studies will be carried out by a Consortium supported by representative experts of the EPATS stakeholder community and namely:**

- Institute of Aviation – Poland (the Coordinator)
- Eurocontrol - Europe
- M3Systems - France
- National Aerospace Laboratory – Netherlands
- Polskie Zakłady Lotnicze sp. z o.o. w Mielcu – Poland
- Rzeszów University of Technology - Poland

- WSK PZL Rzeszów S.A – Poland
- Budapest University of Technology & Economics – Hungary
- Windrose Air JetCharter GmbH – Germany
- Ad Cuenta B.V - Netherlands

The deliverables of these studies will be rapports containing a joint vision of the personal air transportation system in Europe to 2020 and proposals for developing this new small aircraft business at a European level.

## Deliverables list

| Del. No | Deliverable name |
|---|---|
| D1.1 | Report on European Business & Personal Aviation Data Base and findings. |
| D2.1 | Potential transfer of passenger demand to personal aviation by 2020 and needs of further R&D works. |
| D2.2 | Experts seminar |
| D3.1 | EPATS ATM General requirements & related issues to be solved. |
| D3.2 | EPATS Airports General requirements, safety and environmental aspects & related issues to be solved. |
| D4.1 | EPATS aircraft missions specification |
| D4.2 | Operating Costs Analysis Report |
| D4.3 | Fuel consumption and transportation energy effectiveness Analysis Report |
| D5.1 | EPATS Research and Development Program |
| D5.2 | EPATS Roadmap |
| D5.3 | Joint meeting with SESAR |
| D5.4 | Joint meeting with CESAR |
| D5.5 | Workshop |
| D5.6 | Berlin Airshow Conference |
| D5.7 | EPATS presentation CD Rom |
| D6.1 | Management reports of kick-off, mid-term progress, and final |
| D6.2 | Project Management Plan |
| D6.3 | EPATS website, and flimsy |
| D6.4 | Financial statements (end year, final) |

This document is the execution of EPATS STUDY Project deliverable D1.1 “Report on European Business & Personal Aviation Data Base and findings”.

This document includes 3 Reports:

1. Report on European Business & Personal Aviation Data Base and findings which is a leader document and include the 2 following attachments:
2. Report on Task 1.1 Aircraft Database.
3. Report on Task 1.2 Airports and Facilities Database.

The Report 1 deal with EU-USA General Aviation comparison and safety and at the same time is an overview of current situation of General Aviation in Europe.

The Report 2 on Task 1.1 Aircraft Database presents the results of bringing together the key characteristics of current personal aircraft, including price and Direct Operational Cost and shows how a list of reference aircraft was selected.

The Report 3 on Task 1.2 Airports facilities and Database presents an overview of all European landing facilities and distributions of their main characteristics.

The Report 1 - D1.1 Report (Version 1) was reviewed after discussion on EPATS Project Management Committee Meeting no 2 (NLR, Amsterdam, 10 Sept, 2007).

# 2. EUROPEAN AND U.S. AMERICAN PERSONAL TRAVEL GENERAL AVIATION COMPARISON

General Aviation is defined as all aviation other than scheduled airlines and military aviation.

GA aircraft are used in a variety of way: for travel, instructional, medical, aerial works, air tours and others. Each of the General Aviation segments has its own specific characteristics, but some problems, like safe access to infrastructure and airspace or environmental constrains are common to all General Aviation.

In this paper we will only concentrate on personal travel use of GA. As in USA GA aircraft can be a useful mean of personal transportation, particularly for people living in remote regions and individuals requiring fast point to point transportation mode. In Europe more than 2000 communities could rely on general aviation for their air transportation needs. By contrast, scheduled airlines serve at most 450 airports.

The structure of data given below is based on the FAA's General Aviation Air Taxi Activity and Avionics (GAATA) Survey which provides the best overview of US GA. This survey categorizes the airplanes as:

- Pistons,
- Turboprops,
- Jets.

And the uses of GA airplanes for travel purpose as follows:

- Personal flying (flying for personal reasons, without a paid, non professional crew),
- Business (flying for business reasons, individual use without a paid, professional crew),
- Corporate (flying for business reasons with a paid, professional crew – includes fractional ownership),
- Air taxi (on demand operated under FAR Part 135).

In EU there is no common and comprehensive categorization of General Aviation aircraft and their uses.
In USA nearly two-thirds of the hours flown by general aviation are for travel purposes (including business and commercial purposes). In Europe this figure is not known, but we suppose it is much smaller.

## 2.1 GENERAL TRANSPORTATION DATA

In order to situate the role and position of General Aviation in the sector of personal transportation the following general transportation data for EU and USA is presented.

**Geographical and population data**

| | EU-25 | USA |
|---|---|---|
| Surface [km$^2$ ] | 3 929 416 | 9 629 100 |
| Population [million inhabitants] | 453 684 700 | 278 058 900 |
| Maximum extent [km] | 4500 | 5000 |
| GDP per capita in PPS* [Euro] | 22 280 | 33 770 |

* Purchasing Power Standards

**Transport infrastructure (2000)** [1, 2]

| | EU-25 | USA |
|---|---|---|
| Road network [1000 km] | 4300 | 6370 |
| Motorway [1000 km] | 51,8 | 89,2 |
| Railway [1000 km] | 155,8 | 315 |
| Airports open to public | 2250 | 5314 |
| Motorization [cars/1000 persons] | 479 | 480 |
| Total number of civil aircraft | 65 000 | 215 000 |
| Airliners | 3881 | 4129 |

**Passenger transport structure (2000)** [2, 3] **[billion pkm]**

| | EU-25 | USA |
|---|---|---|
| Cars | 3736 | 6464 |
| Bus/ coach | 410 | 259 |
| Railway | 304 | 24 |
| Tram-metro | 46 | 24 |
| Air (domestic/ intra EU) | 284 | 854 |

**Number of airports** [3]

| | | EU-25 | USA |
|---|---|---|---|
| **1.** | **Total landing facilities** | **n/r** | **19 306** |
| 1.1 | Airports open to public | 2250 | 5314 |
| 1.1.1 | Public owned | n/r | 4160 |
| 1.1.2 | Private owned | n/r | 1154 |
| 1.2 | Airports close to public | n/r | 13 992 |
| **2.** | **Airports important to national (intra EU) transportation** | **n/r** | **3489 (NPIAS Airports)[4]** |
| 2.1 | Existing | n/r | 3364 |
| 2.1.1 | Primary | 450 | 422 |
| 2.1.1.1 | Large-Hub | 43 (main pas. Airports) | 31 |
| 2.1.1.2 | Medium-Hub | | 37 |
| 2.1.1.3 | Small-Hub | n/r | 74 |
| 2.1.1.4 | Non-Hub | n/r | 280 |
| 2.1.2 | Commercial service | n/r | 124 |
| 2.1.3 | Reliever | n/r | 260 |
| 2.1.4 | General Aviation | n/r | 2558 |
| 2.2 | Proposed | n/r | 125 |
| 2.2.1 | Primary | n/r | 0 |
| 2.2.2 | Commercial service | n/r | 5 |
| 2.2.3 | Reliever | n/r | 9 |
| 2.2.4 | General Aviation | n/r | 111 |

n/r - non reported

[1] only EU-15
[2] source: Eurostat
[3] Statistics for most EU data are not available
[4] NPIAS – US National Plan of Integrated Airports Systems

**Civil aviation aircraft fleet**

| | | EU-25 | USA |
|---|---|---|---|
| **1.** | **Air Carrier Aircraft** | | |
| 1.1 | Passenger | 3667 | 8666 |
| 1.2 | Cargo | 344 | 1065 |
| **2.** | **General Aviation** | **36100**[5] | **214 000** |
| 2.1 | Pistons | n/r | 166 700 |
| 2.1.1 | Single Engine | n/r | 146 000 |
| 2.1.2 | Multi Engine | n/r | 20 700 |
| 2.2 | Turbine | 971[6] | 13 200 |
| 2.2.1 | Turboprops | n/r | 5700 |
| 2.2.2 | Turbojets | n/r | 7500 |
| 2.3 | Rotorcraft | n/r | 7000 |
| 2.4 | Experimental | n/r | 20400 |
| 2.5 | Other | n/r | 6700 |

n/r - non reported

***GENERAL AVIATION AIRCRAFT SHIPMENTS IN 2006***

According to General Aviation Statistical Databook 2006

2006 Number of units

| Aircraft type | Worldwide | USA | Europe |
|---|---|---|---|
| Pistons | 2750 | 2287 | 438* |
| Turboprops | 407 | 256 | 151 |
| Jets | 885 | 603 | 71 |
| **Total** | **4042** | **3146** | **660** |

* Diamond airplanes

Except Jets all GA aircraft are built on the basis of FAR-23 or equivalent requirements. The most of light jets – with takeoff weight less than 8550 kg (19000 lbs), which correspond to the maximum weight of personal jet are also built on the FAR-23 basis, the another according to FAR-25 requirements, and have a much more weight. All European GA jets (Dassault Falcon) have a takeoff weight more than 18000 kg and therefore are not classified as personal jet.

The only reported European manufacturer of piston aircraft is the Austrian Diamond Aircraft Industry, which have subsidiary and manufacturing facility in Ontario Canada from where occur shipments.

***PRODUCTION BY EUROPEAN MANUFACTURERS IN 2006 Y***

| Manufacturers | Pistons | Turboprops | Jets |
|---|---|---|---|
| Airbus | - | - | 10 |
| Dassault Falcon | - | - | 61 |
| Piaggio | - | 19 | - |
| Pilatus | - | 90 | - |

[5] General Aviation Statistical Databook 2006 GAMA (data from 1996)

[6] Business/Corporate/Executive aircraft (851) and Special purpose/ Ambulance (120)

| Manufacturers | Pistons | Turboprops | Jets |
|---|---|---|---|
| Socata EADS | - | 42 | - |
| Diamond Aircraft | 438 | - | - |
| **Total Europe** | **438** | **151** | **71** |

### *USA AND EUROPEAN GA PERSONAL AIRCRAFT SHIPMENTS BY TYPE IN 2006*

2006 Number of units

| Aircraft type | USA | Europe |
|---|---|---|
| Pistons | 2287 | - |
| Turboprops | 256 | 151 |
| Jets* | 300 | 0 |
| **Total** | **2843** | **151** |

*Only jets with takeoff weight less 19000 lb

### *GA AIRCRAFT EXPORTS BY TYPE IN 2006*

| Aircraft type | USA | Europe |
|---|---|---|
| Pistons | 555 | n/r |
| Turboprops | 74 | n/r |
| Jets | 252 | n/r |
| **Total** | **881** | **n/r** |

n/r – non reported
A large part of US GA aircraft are exported to Europe.

GA aircraft production in the EU and US is incomparable. The differences in shipments are widening constantly and small aircraft EU import is growing and concerns mostly second hand airplanes. The production of piston aircraft in the EU is practically stopped and the production of advanced small personal aircraft is beyond time horizon if no news activities are undertaken. Only in the class of turboprop aircraft, the EU manufactures significant part of world volume (37%). The US does 62%.

## 2.2 GENERAL AVIATION FLEET

***GENERAL AVIATION FLEET BY TYPE AND USE 1N 2006***

Number of aircraft

| Aircraft Type | | Total Active | Personal | Business | Corporate | Air taxi | Commuter | Other |
|---|---|---|---|---|---|---|---|---|
| Pistons: | USA | **167 608** | **121 295** | **21 371** | **2 012** | **2 651** | n/r | **20 279** |
| Single Eng | | 148 101 | 112 105 | 15 780 | 719 | 1 169 | n/r | |
| Multi Eng | | 19 412 | 9 166 | 5 591 | 1 293 | 1 465 | n/r | |
| | EU | n/r | n/r | **400**[7] | | | n/r | n/r |
| | | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| | | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| Turboprops | USA | **7 942** | **1 300** | **1 868** | **2 372** | **1 256** | **N/R** | **1 146** |
| Single Eng | | 2 595 | 567 | 715 | 222 | 444 | n/r | |
| Multi Eng | | 5 307 | 743 | 1 153 | 2 150 | 812 | n/r | |
| | EU | n/r | n/r | **650**[8] | | | n/r | n/r |
| | | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| | | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| Jets | USA | **9 823** | **720** | **834** | **5 508** | **2 015** | n/r | **735** |
| Twin jets | | 9 097 | 649 | 806 | 5 004 | 1 939 | n/r | |
| Others | | 727 | 71 | 28 | 505 | 87 | n/r | |
| | EU | n/r | n/r | **950**[8] | | | n/r | n/r |
| | | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| | | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| **Total** | **USA** | **185 373** | **123 315** | **24 073** | **9 892** | **5 922** | **22 160** | |
| | **EU** | **36 100**[6] | **20 000**[8] | **2 000**[9] | | | n/r | n/r |

n/r – non reported

Source: General Aviation Statistical Databook 2006

The European operators with the largest fleets of business aircraft are summarized below:

| Company | Country | # of Aircraft | Primary Fleet Operations in Europe |
|---|---|---|---|
| NetJets | Portugal* | 91 | Fractional Shares Operator; Card Programme Operator |
| Grupo Gestair | Spain | 31 | Charter, Fleet management |
| Jetalliance Flugbetriebs | Austria | 28 | Charter, Fleet management |
| London Executive Aviation | United Kingdom | 22 | Charter, Fleet management |
| TAG Aviation | United Kingdom, Switzerland | 20 | Charter, Fleet management |
| Zimex Aviation | Switzerland | 20 | Charter |
| Aero Services Executive | France | 16 | Charter, Fleet management |
| DaimlerChrysler Aviation | Germany | 14 | Corporate, Charter, Fleet Mgmt. |
| 17 Operators | | 10-13 | All Charter and Fleet Mgmt. |
| 639 Operators | | 1-9 | Various |

** NetJets entire fleet is registered in Portugal, but there aircraft operate throughout Europe with no set base*

*Source: PRISME-Fleet and ALG analysis*

[7] Approximate figures

[8] Approximate figure of recreational piston aircraft from EC „General Aviation in the European Community“ 2007

[9] Approximate figure from Eurocontrol „Getting to the point: Business Aviation in Europe”

## *GENERAL AVIATION FLEET ANNUAL FLIGHT HOURS BY TYPE AND USE*

In Thousand Hours

| Aircraft Type | | Total Active | Personal | Business | Corporate | Air taxi | Commuter | Other |
|---|---|---|---|---|---|---|---|---|
| Pistons | USA | 16 434 | 7 538 | 2 460 | 394 | 934 | | 5 108* |
| | EU | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| Turboprops | USA | 2 106 | 198 | 298 | 597 | 529 | | 485 |
| | EU | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| Jets | USA | 3 771 | 239 | 306 | 1 844 | 922 | | 421 |
| | EU | n/r | n/r | n/r | n/r | n/r | n/r | n/r |
| Total | USA | **22 311** | **7 975** | **3 064** | **2 835** | **2 385** | | **6 014** |
| | EU | **6 000**[10] | n/r | n/r | n/r | n/r | n/r | n/r |

n/r - non reported Source: General Aviation Statistical Databook 2006

* include 3 152 instructional hours

## *SUMMARY OF GENERAL AVIATION OPERATIONS STATISTICS IN 2005 Y (IN THOUSANDS)*

| | **USA** | **EU** |
|---|---|---|
| GA IFR Aircraft Handled at Air Route Traffic Control Centers | 8 368 | n.a. |
| G.A. Instrument Operations at FAA & Contract Facilities | 17 986 | n.a. |
| **Total Aircraft Contacts at FSS** | | n.a. |
| | | |
| **GA Total Airport Operations at FAA Control Towers** | **20 727** | **n.a.** |
| – Itinerant Operations at FAA Control Towers | 12 449 | n.a. |
| – Local Operations at FAA Control Towers | 8 278 | n.a. |
| | | |
| **GA Total Airport Operations at Control Towers** | **13 375** | **n.a.** |
| – Itinerant Operations at Control Towers | 6 835 | n.a. |
| – Local Operations at Control Towers | 6 540 | n.a. |
| **GA Total Airport Operations at FAA & Contract Control Towers** | **34 102** | **n.a.** |

n.a. - not available Source: FAA Air Traffic Activity

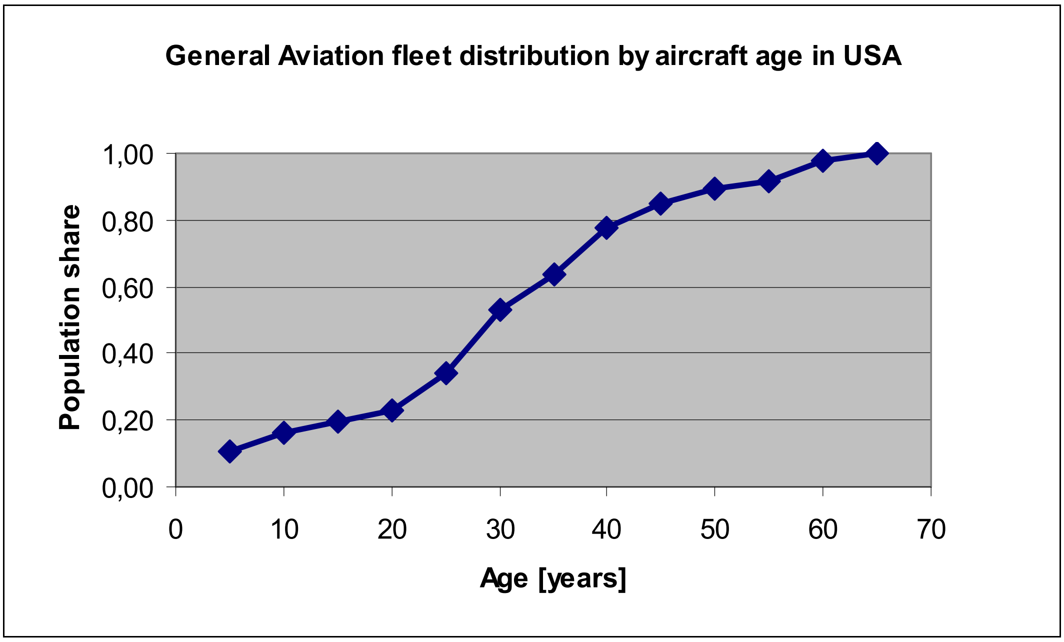
Facilities includes Control Towers , TRACONs, CERAPs and RAPCONs

According to Eurocontrol "Getting to the point: Business Aviation in Europe" figure 45. Total IFR Business Aviation per State, the total 2005 Business Movements/Day in Europe amount to 1722 movements per day.

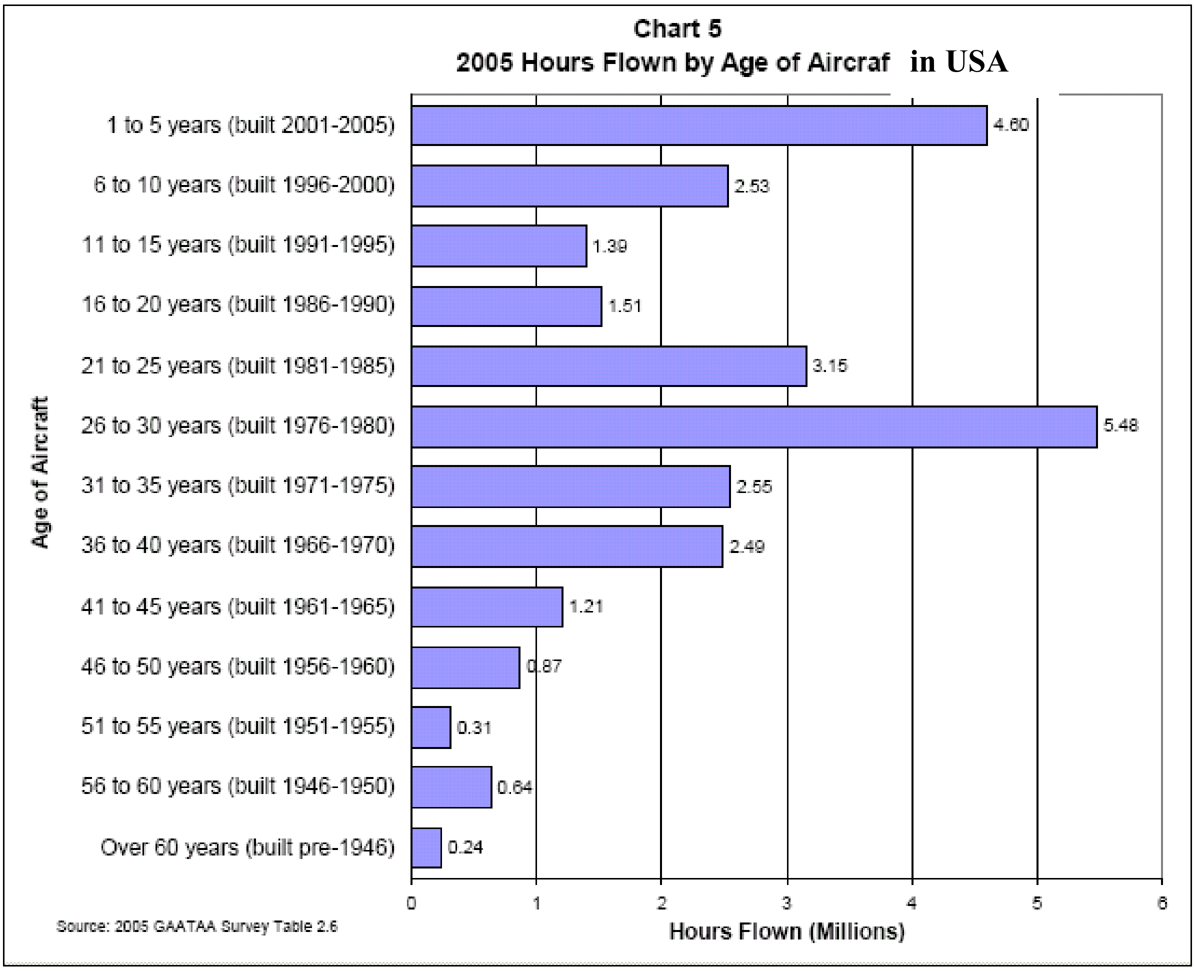
[10] GA Databook 2006 (concerns 1997)

**GA POPULATION SIZE, ACTIVE AIRCRAFT, TOTAL FLIGHT HOURS, AND AVERAGE FLIGHT HOURS BY AGE OF AIRCRAFT IN USA**

| Old years | | Population size | Number active | Percent active | Total hours flown | Average hours | Active pop increasingly | Population share |
|---|---|---|---|---|---|---|---|---|
| from | to | | | | | | | |
| 1 | 5 | 24 911 | 23 249 | 93,3 | 4 703 824 | 202,3 | 23 249 | 0,106 |
| 6 | 10 | 14 150 | 12 014 | 84,9 | 2 266 298 | 188,6 | 35 263 | 0,161 |
| 11 | 15 | 9 547 | 7 575 | 79,3 | 1 389 384 | 183,4 | 42 838 | 0,195 |
| 16 | 20 | 9 366 | 7 413 | 79,2 | 1 387 240 | 187,1 | 50 251 | 0,229 |
| 21 | 25 | 28 206 | 23 935 | 84,9 | 4 320 987 | 180,5 | 74 186 | 0,338 |
| 26 | 30 | 55 302 | 42 547 | 76,9 | 5 663 771 | 133,1 | 116 733 | 0,532 |
| 31 | 35 | 29 352 | 23 330 | 79,5 | 2 403 810 | 103,0 | 140 063 | 0,638 |
| 36 | 40 | 37 923 | 30 545 | 80,5 | 2 865 942 | 93,8 | 170 608 | 0,778 |
| 41 | 45 | 20 088 | 15 323 | 76,3 | 1 198 575 | 78,2 | 185 931 | 0,847 |
| 46 | 50 | 14 580 | 9 794 | 67,2 | 656 739 | 67,1 | 195 725 | 0,892 |
| 51 | 55 | 8 323 | 5 216 | 62,7 | 335 445 | 64,3 | 200 941 | 0,916 |
| 56 | 60 | 24 243 | 13 114 | 54,1 | 658 630 | 50,2 | 214 055 | 0,976 |
| 61 | 65 | 11 768 | 5 371 | 45,6 | 275 250 | 51,2 | 219 426 | 1 |
| | | | | | | | | |
| | | 287 758 | 219 426 | 76,3 | 28 125 896 | 128,2 | | |




For Europe data are not reported, but we can assume the distribution by aircraft age similar to USA




We suppose, that the maximum hours flown is in the age interval: 26 to 30 years because of the lower operational costs due to smaller amortization rate.
The graph shows, that only 22% of the whole population of GA aircraft is younger than 20 years (which is generally assumed as depreciation time), and 20% more then 40 years old. The image indicates one of the most important reasons behind relatively high level of GA fatal accident rate (1,2 per 100 000 flight hours).

If the time of utilization was limited to 20 years (for increasing safety it should go towards this direction) and substituted scrapped aircraft with the new ones (in number to keep the current level of aircraft fleet only), there should be more than 80% of current fleet aircraft delivered, what in case of Europe means around 25 000 aircraft.

## 2.3 EUROCONTROL AND FAA BUSINESS FLEET FORECAST SCENARIO 2006-2015

Total Business fleet

| Aircraft type | | USA[11] | EU[12] |
|---|---|---|---|
| Pistons | 2006 | 25 127 | n/r |
| | 2015 | 25 845 | 300 |
| Turboprops | 2006 | 5 540 | n/r |
| | 2015 | 6 920 | 650 |
| Jets | 2006 | 7 334 | n/r |
| | 2015 | 13 264 | 2 060 |
| **Total** | **2006** | **38 001** | |
| | **2015** | **46 029** | **3 010** |

n/r - non reported

In the light of this forecast, the existing between the EU and the US gap in business aviation will constantly widen. Considering the fact that the forecasted business aircraft fleet enlargement in Europe is not accompanied by the adequate manufacture strategies, it will most probably be done by import. The realization attempt of such forecast does not satisfy the Europeans, who look for a tool of their business development and catching up with the US in business aviation. This may also be a disadvantage for European GA industry, which, despite great difficulties may attempt to keep up with the American partner. This idea is supported by the aircraft like TB-850, Piaggio Avanti II and Pilatus PC-12j and attempt to start manufacture of small, modern jet Grob-Spn by German Grob.

## 2.4 PILOTS BY CERTIFICATE AND RATING

Active Pilots and Non-Pilot Certificates Held in 2006 y

| | USA | EU |
|---|---|---|
| **Pilot–Total**<br>**Instrument rated** | **597 109**<br>**309 333** | n.a. |
| Student | 84 865 | n.a. |
| Recreational Airplane (only) | 239 | n.a. |
| Sport (only) | 939 | n.a. |
| Airplane | | n.a. |
| - Private | 219 233 | n.a. |
| - Commercial | 117 610 | n.a. |
| - Airline Transport | 141 935 | n.a. |
| Rotorcraft (only) | 10 690 | n.a. |
| Glider (only ) | 21 597 | n.a. |
| **Flight Instructor** | | **n.a.** |
| **Certificates** | **91 343** | **n.a.** |

[11] GA Statistical Databook 2006
[12] Eurocontrol "Getting to the Point: Business Aviation in Europe" Fig. 32

Pilot training is a "sine qua non" condition of the aviation development and especially personal aviation. Number of students and pilots stimulates demand for new aircraft. The American government program "General Aviation Propulsion Program" estimated a model of demand for aircraft basing on number of student pilots, average domestic product per capita and aircraft price.
This very simple model is shown below:

$$\text{Aircraft Quantity} = 0{,}6433 \times 10^{-4} \times (\text{price/income})^{-3{,}2702} \times (\text{New Pilots})^{1{,}9503}$$
$$\text{New Pilots} = 13855{,}8 + 0{,}29694 * \text{New Student Pilots}$$

Lack of information about flight training and long-term development programs for this activity is an important defect in aviation development forecasting.

## 2.5 AERONAUTICAL FACILITIES

FAA Air Route Facilities and Services (2005)

| | VOR VORTAC | Non Directional Beacon | Air Route Traffic Cont. Ctr. | Air Traffic Cont. Towers | Flight Service Stations | Int'l Flight Service Stations | Instrument Landing Systems | Airport Surveillance Radar |
|---|---|---|---|---|---|---|---|---|
| USA | 1111 | 1613 | 24 | 698 | 80 | 3 | 1490 | 226 |
| EU | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |

Sources: FAA

## 2.6 GENERAL AVIATION AIRPORT STATISTICS

US Airports Ranked by number of General Aviation Operations 2006

| Rank 2006 | Rank 2005 | Facility | Name | Itinerant Operations | Local Operations | Total GA Operations | GA as % of Total | Total Operations |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | DVT | Phoenix Deer Valley, AZ | 150,111 | 251,107 | 401,218 | 98.7% | 406,507 |
| 2 | 1 | VNY | Van Nuys, CA | 266,524 | 111,502 | 378,026 | 95.7% | 394,915 |
| 3 | 4 | LGB | Long Beach, CA | 148,508 | 184,028 | 332,536 | 90.0% | 369,412 |
| 4 | 5 | SFB | Sanford-Orlando, FL | 129,714 | 178,080 | 307,794 | 96.5% | 318,860 |
| 5 | 10 | SEE | Gillespie Field, CA | 112,133 | 165,905 | 278,038 | 99.9% | 278,388 |
| 6 | 16 | DAB | Daytona Beach, FL | 210,325 | 62,191 | 272,516 | 96.5% | 282,368 |
| 7 | 17 | DWH | David Wayne Hooks Mem. Airport | 99,374 | 167,723 | 267,097 | 98.1% | 272,276 |
| 8 | 12 | CHD | Chandler Municipal Airport | 82,292 | 182,806 | 265,098 | 98.5% | 269,072 |
| 9 | 6 | APA | Centennial Airport, CO | 130,332 | 134,461 | 264,793 | 82.8% | 319,799 |
| 10 | 8 | IWA | Williams Gateway Airport, AZ | 85,618 | 174,702 | 260,320 | 92.7% | 280,774 |
| 11 | 9 | SNA | John Wayne-Orange County, CA | 133,431 | 113,352 | 246,783 | 68.0% | 362,796 |
| 12 | 7 | FFZ | Falcon Field, AZ | 115,610 | 123,728 | 239,338 | 96.1% | 249,081 |
| 13 | 3 | RVS | Richard Lloyd Jones, OK | 107,237 | 124,386 | 231,623 | 98.6% | 234,924 |
| 14 | 13 | PRC | Ernes A. Love Field, AZ | 78,819 | 149,252 | 228,071 | 97.3% | 234,358 |
| 15 | 11 | MYF | Montgomery Field Airport, CA | 122,732 | 104,965 | 227,697 | 97.9% | 232,698 |
| 16 | 14 | BFI | Boeing Field, King County Airport, WA | 134,117 | 91,278 | 225,395 | 75.2% | 299,793 |
| 17 | 32 | TMB | Kendall-Tamiami Executive Airport, FL | 103,005 | 101,859 | 204,864 | 98.4% | 208,090 |
| 18 | 15 | HIO | Portland-Hillsboro Airpor, OR | 65,008 | 137,421 | 202,429 | 95.7% | 211,493 |
| 19 | 38 | RYN | Ryan Field Airport, AZ | 60,775 | 138,329 | 199,104 | 98.3% | 202,570 |
| 20 | 23 | VGT | North Las Vegas Airport, NV | 82,286 | 113,815 | 196,101 | 85.7% | 228,785 |
| 21 | 18 | MMU | Morristown Municipal Airport, NJ | 128,769 | 64,188 | 192,957 | 93.4% | 206,701 |
| 22 | 26 | PDK | Dekalb-Peachtree Airport, GA | 138,219 | 49,794 | 188,013 | 90.4% | 207,982 |
| 23 | 25 | PTK | Oakland County Int'l Airport, MI | 89,059 | 97,559 | 186,618 | 91.7% | 203,528 |
| 24 | 29 | FXE | Fort Lauderdale Executive Airport, FL | 147,766 | 37,656 | 185,422 | 91.7% | 202,264 |
| 25 | 19 | TIX | Space Coast Regional Airport, FL | 63,557 | 120,410 | 183,967 | 99.0% | 185,870 |
| 26 | 20 | SDL | Scottsdale Airport, AZ | 120,366 | 63,166 | 183,532 | 93.5% | 196,298 |
| 27 | 22 | CRQ | McClellan-Palomar Airport, CA | 125,723 | 53,073 | 178,796 | 90.0% | 198,590 |
| 28 | 24 | FRG | Republic Airport, NY | 95,176 | 81,579 | 176,755 | 92.7% | 190,723 |
| 29 | 31 | PIE | St. Petersburg-Clearwater Int'l Airport, FL | 96,731 | 76,753 | 173,484 | 85.1% | 203,961 |
| 30 | 34 | LVK | Livermore Municipal Airport, CA | 72,567 | 100,695 | 173,262 | 99.0% | 174,926 |
| 31 | 27 | PAO | Palo Alto Airport, CA | 67,718 | 103,486 | 171,204 | 99.0% | 172,851 |
| 32 | 30 | MRI | Merril Field Airport, AK | 69,856 | 99,773 | 169,629 | 90.3% | 187,798 |
| 33 | 28 | CNO | Chino Airport, CA | 66,647 | 101,159 | 167,806 | 99.6% | 168,422 |
| 34 | 36 | BJC | Jeffco Airport, CO | 78,366 | 87,855 | 166,221 | 96.5% | 172,253 |
| 35 | 56 | HWO | North Perry Airport, FL | 57,580 | 106,549 | 164,129 | 99.8% | 164,378 |
| 36 | 21 | RHV | Reid-Hillview Airport, CA | 57,759 | 105,825 | 163,584 | 99.3% | 164,737 |
| 37 | 35 | TUS | Tucson International Airport | 66,998 | 92,664 | 159,662 | 59.0% | 270,473 |
| 38 | 37 | GFK | Grand Forks Int'l, ND | 12,780 | 144,915 | 157,695 | 68.7% | 229,470 |
| 39 | 131 | PVU | Provo Municipal Airport, UT | 59,671 | 97,197 | 156,868 | 98.2% | 159,793 |
| 40 | 50 | TOA | Zamperini Field, CA | 80,031 | 74,018 | 154,049 | 99.5% | 154,751 |
| 41 | 43 | MLB | Melbourne International Airport, FL | 83,403 | 70,115 | 153,518 | 96.6% | 158,867 |
| 42 | 55 | RNM | Ramona Airport, CA | 39,449 | 113,771 | 153,220 | 98.8% | 155,120 |
| 43 | 60 | ISP | Long Island Mac Arthus Airport, NY | 76,872 | 74,872 | 151,744 | 80.1% | 189,390 |
| 44 | 45 | ISM | Kissimmee Gateway Airport, FL | 80,323 | 70,124 | 150,447 | 98.1% | 153,297 |
| 45 | 49 | ORL | Executive Airport Orlando, FL | 94,688 | 55,132 | 149,820 | 91.5% | 163,811 |
| 46 | 63 | GEU | Glendale Municipal, AZ | 46,560 | 102,811 | 149,371 | 99.1% | 150,772 |
| 47 | 57 | OMN | Ormond Beach Municipal Airport, FL | 80,612 | 65,834 | 146,446 | 99.0% | 147,889 |
| 48 | 42 | CPS | St. Louis Downtown Airport, IL | 61,481 | 84,735 | 146,216 | 94.0% | 155,545 |
| 49 | 41 | CMA | Camarillo Airport, CA | 81,266 | 64,902 | 146,168 | 97.6% | 149,825 |
| 50 | 46 | BED | Laurence G Hanscom Field, MA | 86,303 | 59,223 | 145,526 | 84.4% | 172,470 |

General Aviation operations is defined by the FAA based on traffic operations counted in Air Traffic Activity Data System (ATADS). Source: FAA

Source: General Statistical Databook 2006

European Airports with the most business departures (2005 compared to 2004)

| Rank | Previous Rank | ICAO Code | Airport | 2005 Business Deps/Day | 2004 Business Deps/Day | Business Growth | % Business | Busiest Business Day |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | LFPB | PARIS LE BOURGET | 65.6 | 64.9 | 1.0% | 87% | 115 |
| 2 | 2 | LSGG | GENEVE COINTRIN | 40.9 | 38.7 | 5.7% | 20% | 123 |
| 3 | 3 | LIRA | ROMA CIAMPINO | 36.1 | 32.3 | 11.8% | 39% | 72 |
| 4 | 4 | LIML | MILANO LINATE | 35.8 | 32.1 | 11.6% | 21% | 83 |
| 5 | 5 | EGGW | LONDON/LUTON | 31.0 | 27.7 | 11.8% | 22% | 68 |
| 6 | 7 | LFMN | NICE | 26.9 | 23.3 | 15.6% | 15% | 107 |
| 7 | 6 | LSZH | ZURICH | 26.7 | 26.8 | -0.7% | 7.6% | 66 |
| 8 | 8 | EGLF | FARNBOROUGH CIV | 20.8 | 19.2 | 8.6% | 87% | 44 |
| 9 | 12 | LOWW | WIEN SCHWECHAT | 20.3 | 17.6 | 15.5% | 5.9% | 48 |
| 10 | 9 | EDDM | MUENCHEN 2 | 20.2 | 18.8 | 7.4% | 3.7% | 48 |
| 11 | 11 | LETO | MADRID TORREJON | 20.1 | 17.8 | 12.8% | 69% | 43 |
| 12 | 10 | EDDS | STUTTGART | 17.7 | 17.9 | -0.6% | 8.8% | 38 |
| 13 | 13 | LFMD | CANNES MANDELIEU | 16.1 | 15.1 | 7.0% | 87% | 46 |
| 14 | 14 | EDDK | KOELN-BONN | 13.9 | 14.2 | -2.6% | 6.6% | 30 |
| 15 | 18 | LEBL | BARCELONA | 13.8 | 12.1 | 14.4% | 3.3% | 49 |
| 16 | 15 | LEPA | PALMA DE MALLORCA | 13.5 | 12.9 | 5.0% | 5.4% | 34 |
| 17 | 20 | EBBR | BRUSSELS NATIONAL | 13.1 | 11.1 | 18.6% | 3.9% | 41 |
| 18 | 17 | EDDL | DUESSELDORF | 13.0 | 12.3 | 5.2% | 4.7% | 31 |
| 19 | 16 | EDDI | TEMPELHOF-BERLIN | 12.8 | 12.8 | -0.0% | 35% | 42 |
| 20 | 22 | EHAM | SCHIPHOL AMSTERDAM | 12.5 | 11.0 | 14.0% | 2.2% | 34 |
| 21 | 31 | EGLC | LONDON/CITY | 12.5 | 8.9 | 40.1% | 13% | 32 |
| 22 | 19 | EDDF | FRANKFURT MAIN | 12.0 | 12.1 | -0.3% | 1.7% | 41 |
| 23 | 24 | EGKB | BIGGIN HILL | 11.6 | 10.0 | 15.2% | 86% | 28 |
| 24 | 25 | LIEO | OLBIA COSTA SMERALDA | 11.2 | 9.6 | 16.5% | 30% | 69 |
| 25 | 23 | ENGM | OSLO/GARDERMOEN | 11.1 | 11.0 | 1.5% | 4.0% | 24 |

Sources: Eurocontrol. Getting to the Point: Business Aviation in Europe

GA Ranked Airport Operations comparison

| Rank | Total GA operations/day | | Itinerant/business operations/day | |
|---|---|---|---|---|
| | USA | EU | USA | EU |
| 1 | 1084 | nr | 768 | 131 |
| 25 | 518 | nr | 252 | 22 |

## 2.7 CONCLUSIONS of EU – US GA RELATIONS

1. The comparison tables above do not support the position, that the existing between the EU and the US gap in General Aviation development is caused by differences in area, wealth nor surface transport infrastructure. The position was true when Europe was partitioned and there was not any sign of common market and European sky.
   The Fleet and volume of passenger-kilometer done by General Aviation of the USA is nearly 5 times greater than the one of Europe, when the global national income of the EU prevails over the GDP of the USA, the distances separating outlaying regions are similar, and the land transport infrastructure comparable.
   The reasons behind the US General Aviation uncompetitive position should be found in conditions created in the US by the administrations and involvement of society and local public government for the benefit of local and personal air transport.
2. One of the major obstacles in conducting effective study on general aviation is the lack of adequate statistical information. Deep knowledge about current state is the fundament of development planning. The knowledge is gained from statistical surveys, highly valued by the FAA. It is confirmed by many research programs and especially

continuously undertaken: „General Aviation and Air Taxi Activity and Avionics (GAATAA) Surveys", which were used for the comparison tables. The information collected in this survey helps to understand more about general aviation activities, assess the impact of general aviation activities on the National Airspace System, and determine the need for increased traffic facilities and services. Federal, state and local governments; general aviation associations; and private industry and individuals use the summary data for safety analyses, planning, forecasting, and research and development. For example, more accurate information on hours flown and aircraft activity lead to more accurate safety measures, which in turn impacts general aviation insurance rates.

3. As regards to safety, the partial data available gives only some indication as to the main causes of fatal accidents. There are no European wide comprehensive statistics on safety of General Aviation Aircraft
4. In the same condition of Air Traffic Management and Control the number of General Aviation operations at GA airports is much bigger in USA than in EU, compare 768 itinerant operations per day for the first ranked airport in USA with 131 business operations per day for the first ranked airport in Europe (comparing the total operations – itinerant and locale- the difference will be else bigger). That means, that at the current level of ATM- ATC there is a large reserve of GA airports capacity in Europe.
5. Our knowledge of current state in Europe as it is clearly visible at the tables is poor. Up to date comprehensive data describing the General Aviation sector in Europe is not available. Most of the existing data concern almost exclusively commercial air transport sector and usually refer to airlines and airports. Even if some statistics for GA on the Country level are available from different sources, it is hard to compare them because they are prepared on different criteria basis and using different terms definitions. For example, because of the lack of common definition, Eurocontrol define business aviation via a list of aircraft types. SESAR (Deliverable D1) define General Aviation as all aircraft except those of airlines, business aviation and state-owned aircraft, when Eurostat "Draft Glossary version 6 on air transport statistics" in GA operations - commercial includes Air Taxi and others renumbered operations , and in GA operations – non-commercial includes State Flight, Business flying and other.
6. Creation of a comprehensive European Business & Personal Aviation Data Base is indispensable for research & development planning. As in USA appropriate statistical surveys on EU level should be done.

# 3. CALCULATED DOC AND CURRENT PRICE OF AIR-TAXI SERVICES

Aircraft References

| Aircraft | Pax seats | Vcr. [km/h] | SFC [l/s.km] | DOC* [E/s.km] | Price** [E/h] | Price** [E/s.km] | Source |
|---|---|---|---|---|---|---|---|
| Cirrus SR-22 | 3 | 343 | 0,025 | 0,105 | 446 | 0,43 | 1 |
| Piper Saratoga II | 5 | 343 | 0,045 | 0,082 | | | |
| Diamond DA-42 | 3 | 335 | 0,050 | 0,186 | | | |
| Piper Seneca V | 5 | 300 | 0,033 | 0,146 | 500 | 0,41 | 2 |
| Epic Dynasty | 5 | 630 | 0,055 | 0,150 | | | |
| Pilatus PC-12 | 9 | 500 | 0,036 | 0,126 | | 0,70 | 10 |
| Piaggio Avanti II | 7 | 737 | 0,054 | 0,253 | 5640 | 1,09<br>0,53 | 3<br>10 |
| King-Air 350 | 15 | 578 | 0,036 | 0,238 | 6737 | 0,77<br>0,85 | 3<br>10 |
| King-Air B200 | 7 | 422 | | | 600 | 0,2<br>0,90 | 9<br>10 |
| +Jetstream 32 EP | 19 | 491 | 0,020<br>0,060 | 0,205<br>0,17 | 5428<br>1218 | 0,58<br>0,17 | 3<br>6 |
| Diamond D-jet | 3 | 583 | 0,150 | 0,417 | | | |
| Eclipse | 5 | 685 | 0,083 | 0,277 | 1200<br>(372) | 0,35<br>(0,11) | 4<br>6 |
| Embraer Phenom 300 | | 833 | | | | | |
| Citation Mustang | 4 | 630 | 0,147 | 0,478 | (574) | (0,23) | 5 |
| Evation EV20 Vanta | 8 | | 0,041 | 0,117 | | | |
| Grob Spn | 8 | 754 | 0,062 | 0,282 | | | |
| Citation Encore | 9 | 793 | 0,105 | 0,289 | 10000 | 1,40 | 3 |
| **Skypoland – Polish Air-Taxi services Provider** | | | | | | | |
| Cessna 3108 – twin pis | 5 | 300 | | | 650 | 0,43 | 7 |
| Cessna 182T | 5 | 250 | | | 400 | 0,32 | 7 |
| Cessna 172 Skyhawk | 3 | 200 | | | 300 | 0,5 | 7 |
| **US Market Analyses**: http://www.rti.org/pubs/SATS_Market-Business_Analyses.pdf | | | | | | | |
| US Air-Taxi – average | | | | | | 0,70 | 8 |

* DOC per seat.km calculated

** Air-Taxi Providers price in Euro per hour and per seat.km – see sources

Sources:

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10. Operating Cost http://planequest.com/operationcosts/default.asp

# 4. TOTAL AND FATAL ACCIDENTS RATE BY AIRCRAFT TYPE AND OPERATORS

Unlike the United States, in European Union there are no statistical compilation and review of General Aviation accidents involving EU registered GA aircraft.
Such data are needed to inform general aviation users and to provide detailed information to support future government, industry, and private research efforts and safety improvement initiatives.
Because statistical data on General Aviation safety in Europe are not reported, we can get some indication about the level of accident rate of European GA by comparing with US American level of total and fatal accidents in General aviation, assuming the aircraft fleet structure is comparable and the operational conditions similar.
In US the National Transportation Safety Board (NTSB) is charged by the US Congress to investigate every civil aviation accident in the United States, as well as significant accidents in other modes of transportation.
General Aviation operate under Parts 135 (scheduled and on-demand) for Commuter and Air-Taxi aircraft and under the part 91 for personal, business and corporate aircraft uses.

Scheduled.Part.135 : A scheduled passenger carrying operation that flies to smaller airports that do not provide the services required to support Part 121 operations. Includes commercial air carriers flying smaller jet and turboprop aircraft commonly referred to as commuter airlines.
On-Demand.Part.135 : Any operation for compensation or hire for which the departure location, departure time, and arrival location are negotiated with the customer. Customers can arrange to charter an entire aircraft or book a single seat on an Air-Taxi. Also includes medical evacuation flights when a patient is on board.
For GA investigation the Safety Board drew on several resources in compiling data for General Aviation Accidents Review. Accident data, for example, were extracted from the Safety Board's Aviation Accident/Incident Database. Activity data were extracted from the *General Aviation and Air Taxi Activity Survey* (*GAATA Survey*) and from *U.S. Civil Airmen Statistics.*

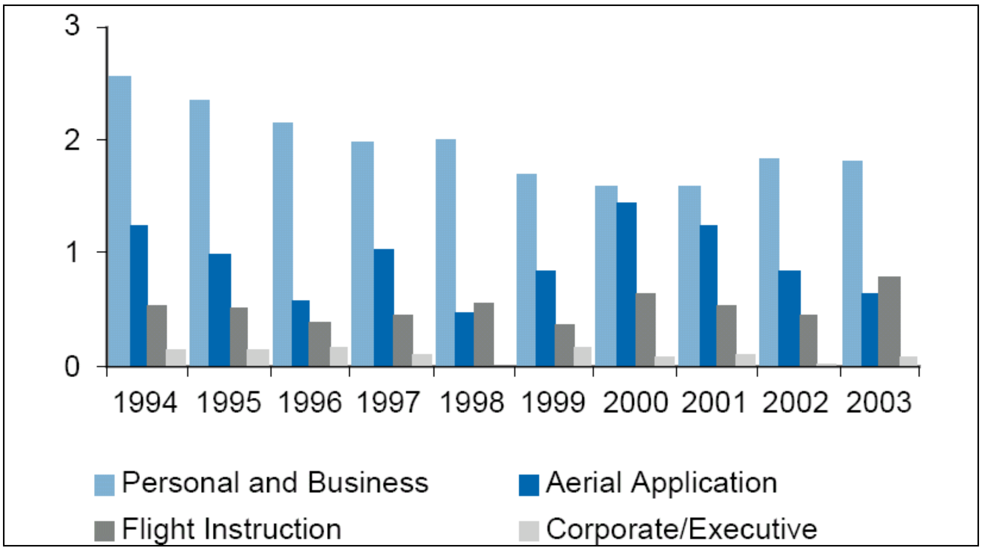
From the safety point of view General Aviation is described as any civil aircraft operation that is *not* covered under 14 *Code of Federal Regulations* (CFR) Parts 121, 129, and 135, commonly referred to as commercial air carrier operations, that means that not include commuter and Air-Taxi operations but include General Aviation operating under Part 91 using a wide range of aircraft, including airplanes, rotorcraft, gliders, balloons and blimps, and registered experimental or amateur-built aircraft.
Using AS American sources of data, for a just interpretation of accidents data for EPATS safety evaluation purposes it is necessary to take into account both the Part 135 accidents data for commuter and Air-Taxi and Part 91 for personal, business and corporate aircraft.

## 4.1 PART 91 ACCIDENT RATE BY TYPE OF OPERATION

General aviation includes a wide range of operations, each with unique aircraft types, flight profiles, and operating procedures. This diversity is evident in the accident record. However, the flight data collected in the *GAATA Survey* allow for only a coarse representation of the many types of general aviation operations. For some types of operations, such as public aircraft flights, 15 no activity data are available.
The data presented here include four operational categories selected because they are representative of general aviation and have activity information available. The categories selected as typical of general aviation activity include personal/business flying, 16 corporate

flying, aerial application, and instructional flights. Personal flying makes up the largest portion of general aviation

In 8 out of the 10 years, personal and business flying had the highest average accident rate, followed by aerial application. The lowest accident rate was for corporate/executive transportation, which for the 10-year period ranked lowest overall each year.




**Fatal accident Rate by Type of operation, 1994-2003 per 100 000 Flight Hours**

**Table 10. Accidents, Fatalities, and Rates, 1987 through 2006, U.S. General Aviation**

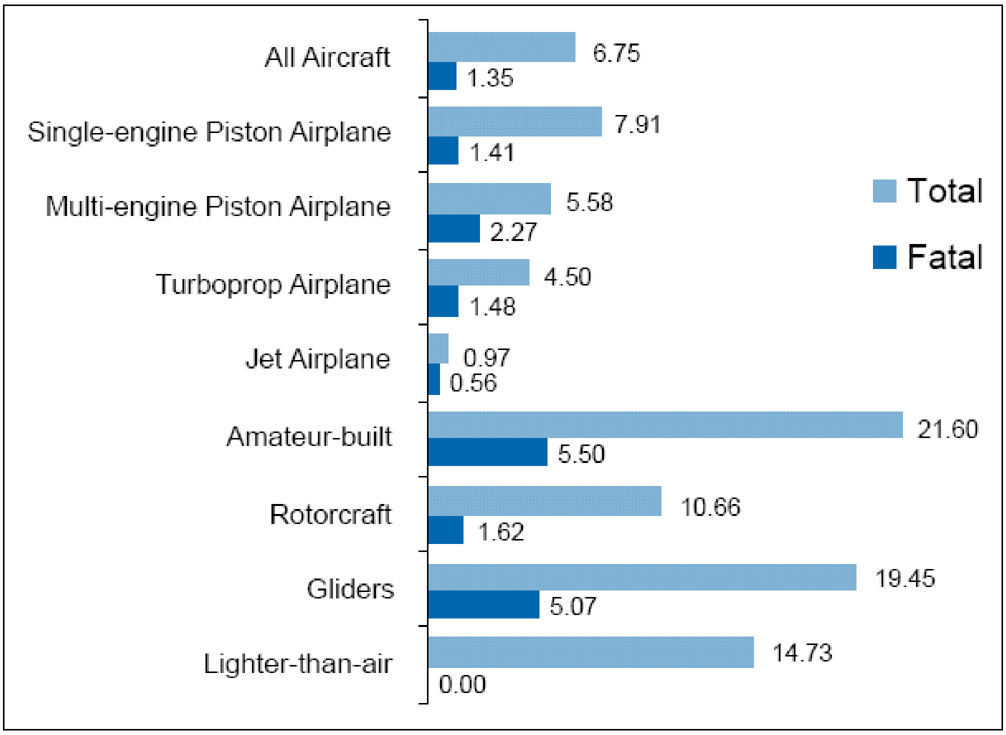
| | Accidents | | Fatalities | | | Accidents per 100,000 Flight Hours | |
|---|---|---|---|---|---|---|---|
| Year | All | Fatal | Total | Aboard | Flight Hours | All | Fatal |
| 1987 | 2,494 | 446 | 837 | 822 | 26,972,000 | 9.18 | 1.63 |
| 1988 | 2,388 | 460 | 797 | 792 | 27,446,000 | 8.65 | 1.66 |
| 1989 | 2,242 | 432 | 769 | 766 | 27,920,000 | 7.97 | 1.52 |
| 1990 | 2,242 | 444 | 770 | 765 | 28,510,000 | 7.85 | 1.55 |
| 1991 | 2,197 | 439 | 800 | 786 | 27,678,000 | 7.91 | 1.57 |
| 1992 | 2,111 | 451 | 867 | 865 | 24,780,000 | 8.51 | 1.82 |
| 1993 | 2,064 | 401 | 744 | 740 | 22,796,000 | 9.03 | 1.74 |
| 1994 | 2,021 | 404 | 730 | 723 | 22,235,000 | 9.08 | 1.81 |
| 1995 | 2,056 | 413 | 735 | 728 | 24,906,000 | 8.21 | 1.63 |
| 1996 | 1,908 | 361 | 636 | 619 | 24,881,000 | 7.65 | 1.45 |
| 1997 | 1,844 | 350 | 631 | 625 | 25,591,000 | 7.19 | 1.36 |
| 1998 | 1,905 | 365 | 625 | 619 | 25,518,000 | 7.44 | 1.41 |
| 1999 | 1,905 | 340 | 619 | 615 | 29,246,000 | 6.50 | 1.16 |
| 2000 | 1,837 | 345 | 596 | 585 | 27,838,000 | 6.57 | 1.21 |
| 2001 | 1,727 | 325 | 562 | 558 | 25,431,000 | 6.78 | 1.27 |
| 2002 | 1,715 | 345 | 581 | 575 | 25,545,000 | 6.69 | 1.33 |
| 2003 | 1,740 | 352 | 633 | 630 | 25,998,000 | 6.68 | 1.34 |
| 2004 | 1,619 | 314 | 559 | 559 | 24,888,000 | 6.49 | 1.26 |
| 2005 | 1,669 | 321 | 563 | 558 | 23,168,000 | 7.20 | 1.38 |
| 2006 | 1,515 | 303 | 698 | 538 | 22,800,000 | 6.64 | 1.32 |

## Aircraft Type

The following graphs summarize the total number of general aviation accidents and fatal accidents occurring in 2003 by aircraft type. Most notable is the large number of accidents involving single-engine piston airplanes, which accounted for 74% of all accident aircraft and 66% of all fatal accident aircraft.

In 2003, the per-aircraft accident rate for all aircraft types was 6.75 accidents and 1.35 fatal accidents per 100,000 hours flown.

Among fixed-wing powered aircraft, the rate for single-engine piston airplanes was 7.91 accidents and 1.41 fatal accidents per 100,000 hours flown. Amateur-built aircraft23 had the highest accident rate with 21.60 accidents and 5.50 fatal accidents per 100,000 flight hours. Rotorcraft had the second-highest rate among powered aircraft, with 10.60 accidents and 1.62 fatal accidents per 100,000 hours flown. However, glider operations had the second-highest accident rate overall, with 19.45.




**Accident Rate per Aircraft Type, 2003 per 100 000 Flight Hours**

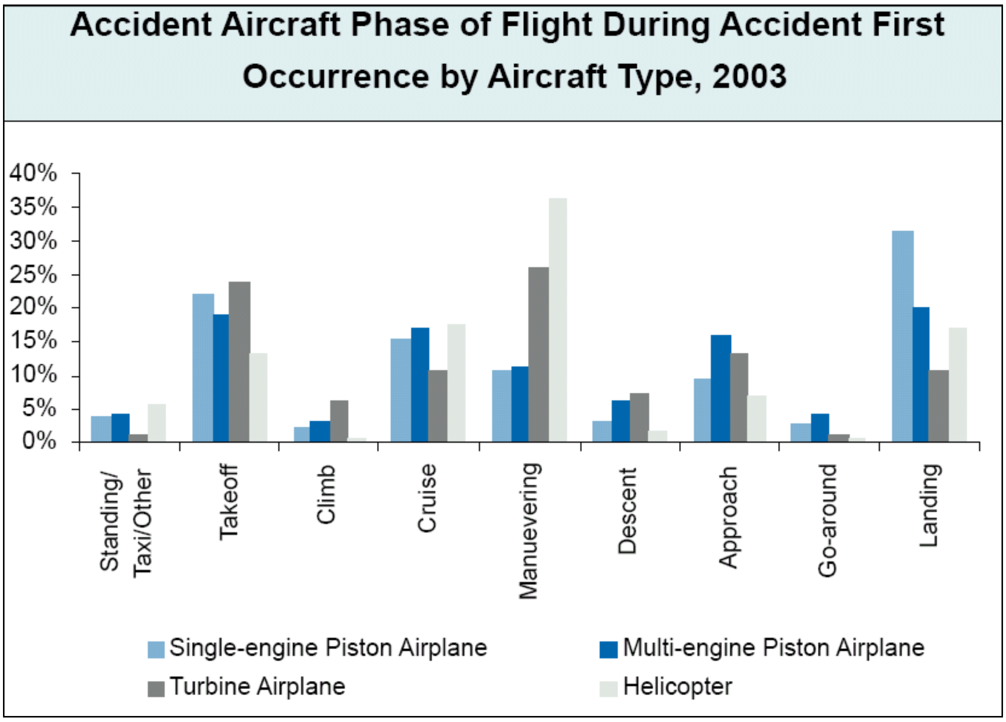
## Purpose of Flight

The type of operation or purpose of flight can be defined as the reason a flight is initiated. Activity data by purpose of flight are derived from the *GAATA Survey*, which includes 14 purpose/use categories. Two of these categories, air taxis and air tours, are covered under 14 CFR Part 135 and are therefore not included in this review. The remaining 12 include the previously mentioned categories of "personal," "business," "instructional," "corporate," and "aerial application," which together accounted for 90% of all general aviation operations during 2003. The remaining 10% are included in more specific categories, such as "external load" and "medical use." A limitation of the *GAATA* activity data is that those categories provide only a coarse representation of the range of possible flight operations. For example, "personal flying" includes but does not distinguish between travel, recreation, or proficiency flying.

At the same time, the differences between similar categories like "personal" and "business flying" are not easily identified. Accordingly, the purpose-of-flight information presented in this review is limited to the combined categories of personal and business flying, as well as corporate, instructional, and aerial application flights. According to the *GAATA Survey*, most general aviation operations are conducted for personal and/or business purposes. Of the estimated 26 million general aviation hours flown in 2003, more than half— 14.6 million— were conducted for personal or business reason

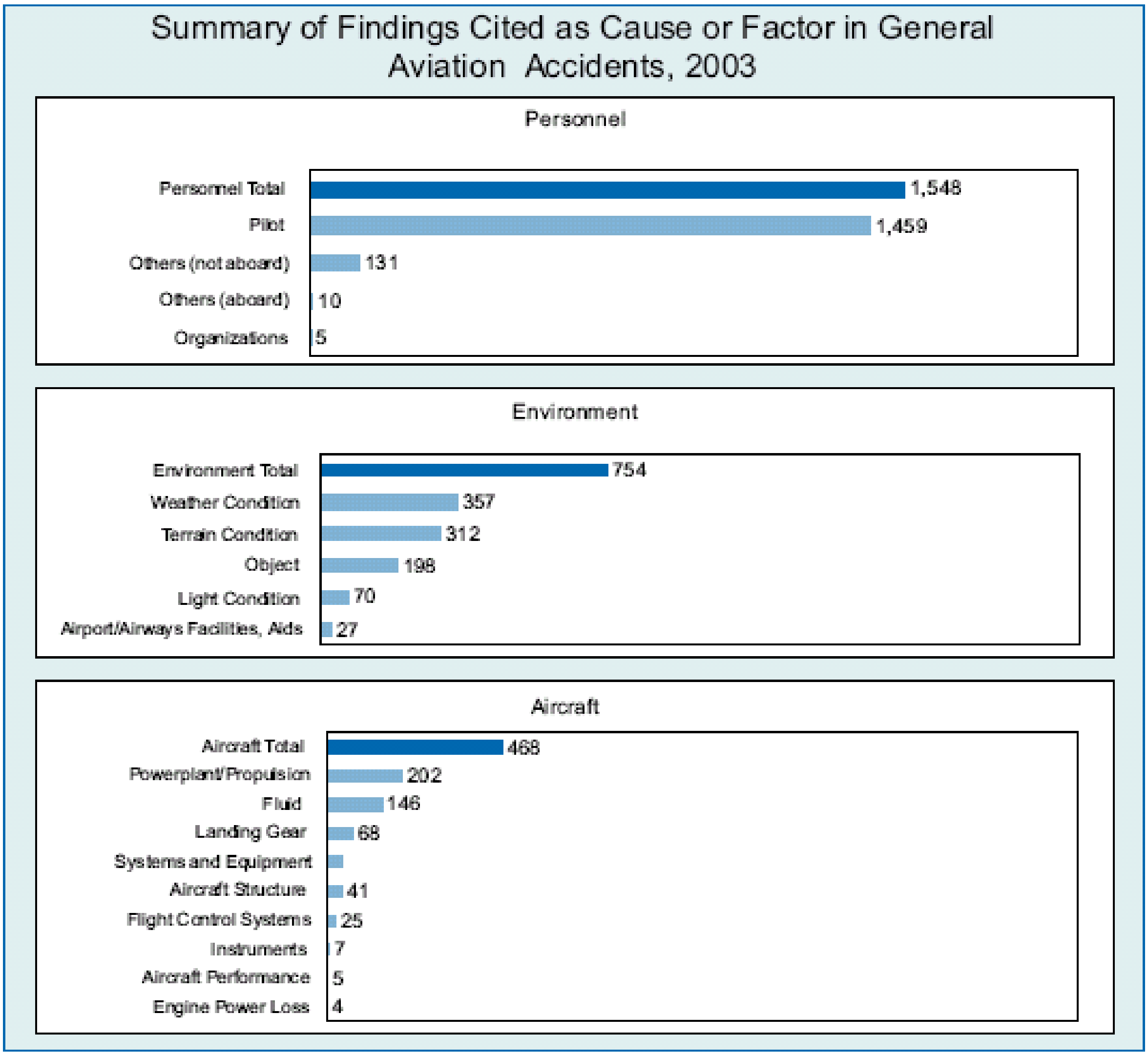
## Accident Occurrences for 2003

Safety Board accident reports document the circumstances of an accident as "accident occurrences" and the "sequence of events." Occurrence data can be defined as *what* happened during the accident.




**Most Prevalent Causes/Factors for 2003**

In addition to coding accident occurrences, the Safety Board makes a determination of probable cause. The objective of the probable cause statement is to define the cause and effect relationships in the accident sequence. The probable cause could be described as *why* the accident happened. In determining probable cause, the Board considers the facts, conditions, and circumstances of the event. Within each accident occurrence, any information that helps explain why that event happened is identified as a "finding" and may be further designated as either a "cause" or "factor." The term "factor" is used to describe situations or circumstances that contributed to the accident cause.



(1,677 accidents with findings in 2003)

## Aviation Accident/Incident Database

In USA an accident-based relational database is currently available to the public at http://www.ntsb.gov/ntsb/query.asp#query_start. It contains records of about 40,000 accidents and incidents that occurred between 1982 and the present. Each record may contain more than 650 fields of data concerning the aircraft, event, engines, injuries, sequence of accident events, and other topics. Individual data files are also available for download at ftp://www.ntsb.gov/ av data, including one complete data set for each year beginning with 1982. The data files are in Microsoft Access (.mdb) format and are updated monthly. This download site also provides weekly updates and complete documentation.

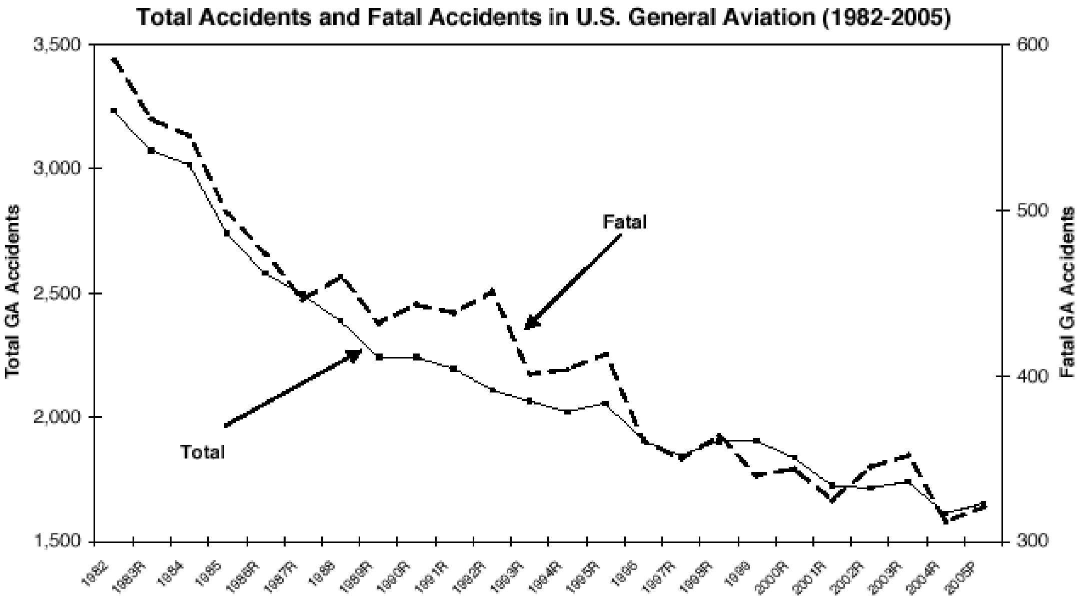
## 2003 US General aviation accident Summary

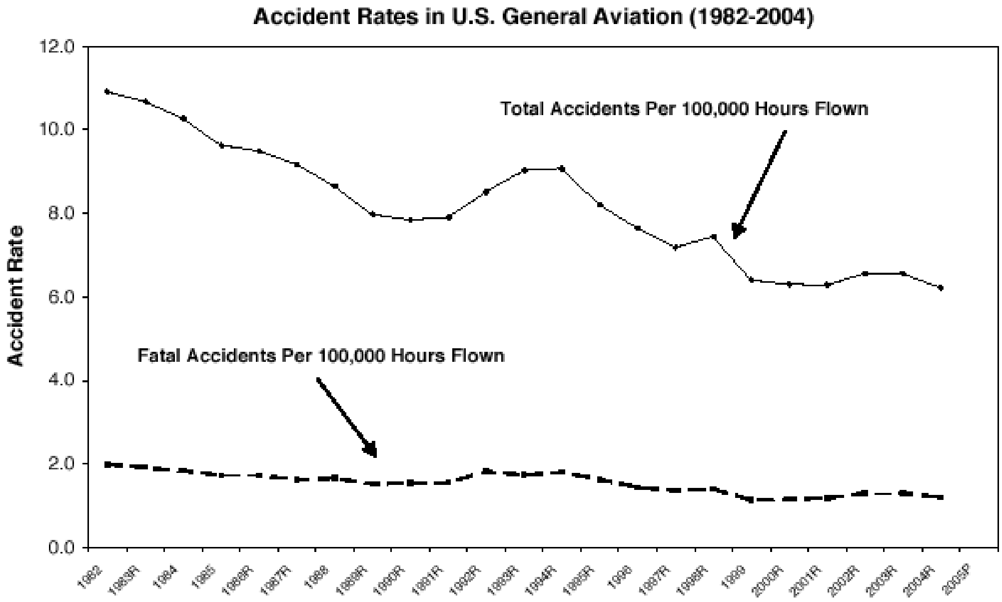
### 2003 General Aviation Accident Statistics

| | |
|---|---|
| **General Aviation Accidents** | |
| Total Accidents | 1,739 |
| Fatal Accidents | 352 |
| Accident Aircraft | 1,758 |
| **General Aviation Accident Injuries** | |
| Fatal | 632 |
| Serious | 324 |
| Minor | 523 |
| Persons involved in accidents with no injuries | 1,697 |
| **General Aviation Accident Rate** | |
| General Aviation Hours Flown[a] | 25,998,000 |
| All Accidents[b] | 6.67/100,000 hours |
| Fatal Accidents[b] | 1.34/100,000 hours |
| Accidents per Active Pilots | 2.78/1,000 active pilots |
| Fatal Accidents per Active Pilots | 0.56/1,000 active pilots |

[a] Federal Aviation Administration, *General Aviation and Air Taxi Survey, 2003.*
[b] Excludes events involving suicide, sabotage, and stolen/unauthorized use

Source: Annual Review of Aircraft Accident Data. US General Aviation, Calender Year 2003 National Transportation Safety Board.






Sources: General Aviation Statistical Databook 2005

The 2003 rate of 1.34 fatal accidents per 100,000 flight hours was only slightly higher than the 2002 fatal accident rate of 1.33 per 100,000 hours.

## 4.2 PART 135 ACCIDENTS

Part 135 applies to commercial air carriers that operate commuter flights (scheduled Part 135), charters and air taxis (on-demand Part 135), and cargo flights (which can be either scheduled or on-demand).

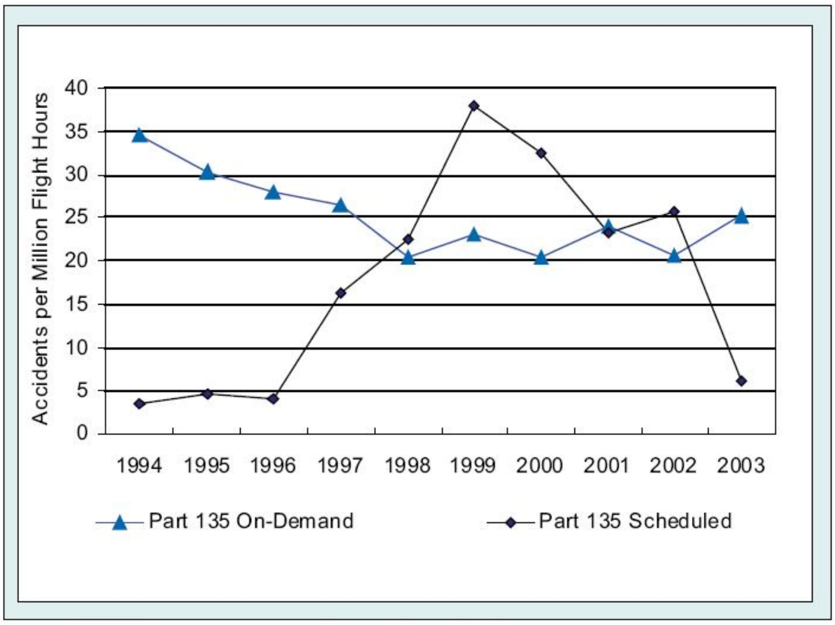



Figure 12: Part 135 Accident Rates, 1994-2003

In general, Part 135 accident rates were substantially higher than Part 121 accident rates in the same years.
The FAA uses the *GAATA Survey* to estimate on-demand Part 135 flight hours.

Although the fleet of on-demand Part 135 aircraft comprises both fixed-wing airplanes and helicopters, the FAA's revised flight-hour estimate does not distinguish between the two types of aircraft. The FAA bases its estimate of flight hours associated with airplanes and helicopters on the proportion of airplanes and helicopters in the charter and air taxi fleet as indicated in the *GAATA Survey*.

Table 19: On-Demand Part 135 Accidents, Fatal Accidents, and Accident Rates for 2003

| | Accidents | Fatal Accidents | Flight Hours | Accidents per million Flight Hours | Fatal Accidents per million Flight Hours |
|---|---|---|---|---|---|
| Airplane | 47 | 8 | 2,072,108 | 22.7 | 3.9 |
| Helicopter | 27 | 10 | 794,900 | 34.0 | 12.6 |
| Overall | 74 | 18 | 2,927,000 | 25.3 | 6.1 |

**Table 9. Accidents, Fatalities, and Rates, 1987 through 2006, for U.S. Air Carriers Operating Under 14 CFR 135, On-Demand Operations**

| | Accidents | | Fatalities | | | Accidents per 100,000 Flight Hours | |
|---|---|---|---|---|---|---|---|
| Year | All | Fatal | Total | Aboard | Flight Hours | All | Fatal |
| 1987 | 96 | 30 | 65 | 63 | 2,657,000 | 3.61 | 1.13 |
| 1988 | 102 | 28 | 59 | 55 | 2,632,000 | 3.88 | 1.06 |
| 1989 | 110 | 25 | 83 | 81 | 3,020,000 | 3.64 | 0.83 |
| 1990 | 107 | 29 | 51 | 49 | 2,249,000 | 4.76 | 1.29 |
| 1991 | 88 | 28 | 78 | 74 | 2,241,000 | 3.93 | 1.25 |
| 1992 | 76 | 24 | 68 | 65 | 2,844,000 | 2.67 | 0.84 |
| 1993 | 69 | 19 | 42 | 42 | 2,324,000 | 2.97 | 0.82 |
| 1994 | 85 | 26 | 63 | 62 | 2,465,000 | 3.45 | 1.05 |
| 1995 | 75 | 24 | 52 | 52 | 2,486,000 | 3.02 | 0.97 |
| 1996 | 90 | 29 | 63 | 63 | 3,220,000 | 2.80 | 0.90 |
| 1997 | 82 | 15 | 39 | 39 | 3,098,000 | 2.65 | 0.48 |
| 1998 | 77 | 17 | 45 | 41 | 3,802,000 | 2.03 | 0.45 |
| 1999 | 74 | 12 | 38 | 38 | 3,204,000 | 2.31 | 0.37 |
| 2000 | 80 | 22 | 71 | 68 | 3,930,000 | 2.04 | 0.56 |
| 2001 | 72 | 18 | 60 | 59 | 2,997,000 | 2.40 | 0.60 |
| 2002 | 60 | 18 | 35 | 35 | 2,911,000 | 2.06 | 0.62 |
| 2003 | 73 | 18 | 42 | 40 | 2,927,000 | 2.49 | 0.61 |
| 2004 | 66 | 23 | 64 | 63 | 3,238,000 | 2.04 | 0.71 |
| 2005 | 66 | 11 | 18 | 16 | 3,815,000 | 1.73 | 0.29 |
| 2006 | 54 | 10 | 16 | 16 | 3,600,000 | 1.50 | 0.28 |

Table 32: On-Demand Part 135 Airplane Accidents, Top Causes/Factors, 1999-2003

| | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| **Personnel** | | | | | |
| Pilot | 75.0% | 80.0% | 84.3% | 80.5% | 80.0% |
| Others (aboard) | 1.8% | | | | |
| Others (not aboard) | 21.4% | 23.3% | 15.7% | 24.4% | 15.6% |
| **Aircraft** | | | | | |
| Powerplant/propulsion | 12.5% | 18.3% | 11.8% | 4.9% | 6.7% |
| Flight control systems | 1.8% | | 2.0% | | 2.2% |
| Aircraft structure | 5.4% | 3.3% | 7.8% | | 4.4% |
| Landing gear | 1.8% | 5.0% | 9.8% | 7.3% | 8.9% |
| Systems and equipment | 1.8% | 8.3% | 2.0% | 2.4% | 4.4% |
| **Environment** | | | | | |
| Weather condition | 23.2% | 36.7% | 39.2% | 31.7% | 26.7% |
| Terrain condition | 25.0% | 31.7% | 19.6% | 19.5% | 28.9% |
| Light condition | 7.1% | 15.0% | 15.7% | 14.6% | 15.6% |
| Object | 7.1% | 8.3% | 11.8% | 4.9% | 6.7% |
| Airport/airways facilities, aids | 7.1% | 11.7% | 3.9% | 4.9% | |

## Scheduled Part 135 Accidents

Scheduled Part 135 operations represent a small segment of scheduled air carrier operations, accounting for less than 2% of total air carrier flight hours in 2003. Two accidents occurred in 2003, one in Alaska and one in the Bahamas, resulting in two fatalities, one serious injury, and six minor injuries.

Because both the number of scheduled Part 135 accidents and the number of people involved in those accidents is small each year, accident and injury data vary over the years (figure 16). Although the relatively few scheduled Part 135 accidents every year make stable patterns in the data difficult to discern, the number of scheduled Part 135 accidents and injuries declined overall from 1994 through 2003.

**Table 8. Accidents, Fatalities, and Rates, 1987 through 2006, for U.S. Air Carriers Operating Under 14 CFR 135, Scheduled Service**

| | Accidents | | Fatalities | | | | | Accidents per 100,000 Flight Hours | | Accidents per 1,000,000 Miles Flown | | Accidents per 100,000 Departures | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | All | Fatal | Total | Aboard | Flight Hours | Miles Flown | Departures | All | Fatal | All | Fatal | All | Fatal |
| 1987 | 33 | 10 | 59 | 57 | 1,946,349 | 350,879,000 | 2,809,918 | 1.695 | 0.514 | 0.0940 | 0.0285 | 1.174 | 0.356 |
| 1988 | 18 | 2 | 21 | 21 | 2,092,689 | 380,237,000 | 2,909,005 | 0.860 | 0.096 | 0.0473 | 0.0053 | 0.619 | 0.069 |
| 1989 | 19 | 5 | 31 | 31 | 2,240,555 | 393,619,000 | 2,818,520 | 0.848 | 0.223 | 0.0483 | 0.0127 | 0.674 | 0.177 |
| 1990 | 15 | 3 | 6 | 4 | 2,341,760 | 450,133,000 | 3,160,089 | 0.641 | 0.128 | 0.0333 | 0.0067 | 0.475 | 0.095 |
| 1991 | 23 | 8 | 99 | 77 | 2,291,581 | 433,900,000 | 2,820,440 | 1.004 | 0.349 | 0.0530 | 0.0184 | 0.815 | 0.284 |
| 1992* | 23 | 7 | 21 | 21 | 2,335,349 | 507,985,000 | 3,114,932 | 0.942 | 0.300 | 0.0433 | 0.0138 | 0.706 | 0.225 |
| 1993 | 16 | 4 | 24 | 23 | 2,638,347 | 554,549,000 | 3,601,902 | 0.606 | 0.152 | 0.0289 | 0.0072 | 0.444 | 0.111 |
| 1994 | 10 | 3 | 25 | 25 | 2,784,129 | 594,134,000 | 3,581,189 | 0.359 | 0.108 | 0.0168 | 0.0050 | 0.279 | 0.084 |
| 1995 | 12 | 2 | 9 | 9 | 2,627,866 | 550,377,000 | 3,220,262 | 0.457 | 0.076 | 0.0218 | 0.0036 | 0.373 | 0.062 |
| 1996 | 11 | 1 | 14 | 12 | 2,756,755 | 590,727,000 | 3,515,040 | 0.399 | 0.036 | 0.0186 | 0.0017 | 0.313 | 0.028 |
| 1997 | 16 | 5 | 46 | 46 | 982,764 | 246,029,000 | 1,394,096 | 1.628 | 0.509 | 0.0650 | 0.0203 | 1.148 | 0.359 |
| 1998 | 8 | 0 | 0 | 0 | 353,670 | 50,773,000 | 707,071 | 2.262 | - | 0.1576 | - | 1.131 | - |
| 1999 | 13 | 5 | 12 | 12 | 342,731 | 52,403,000 | 672,278 | 3.793 | 1.459 | 0.2481 | 0.0954 | 1.934 | 0.744 |
| 2000 | 12 | 1 | 5 | 5 | 369,535 | 44,943,000 | 603,659 | 3.247 | 0.271 | 0.2670 | 0.0223 | 1.988 | 0.166 |
| 2001 | 7 | 2 | 13 | 13 | 300,432 | 43,099,000 | 558,052 | 2.330 | 0.666 | 0.1624 | 0.0464 | 1.254 | 0.358 |
| 2002 | 7 | 0 | 0 | 0 | 273,559 | 41,633,000 | 513,452 | 2.559 | - | 0.1681 | - | 1.363 | - |
| 2003 | 2 | 1 | 2 | 2 | 319,206 | 47,404,000 | 572,260 | 0.627 | 0.313 | 0.0422 | 0.0211 | 0.349 | 0.175 |
| 2004 | 4 | 0 | 0 | 0 | 302,218 | 46,809,000 | 538,077 | 1.324 | - | 0.0855 | - | 0.743 | - |
| 2005 | 6 | 0 | 0 | 0 | 295,034 | 45,721,000 | 527,267 | 2.034 | - | 0.1312 | - | 1.138 | - |
| 2006 | 3 | 1 | 2 | 2 | 280,000 | 44,900,000 | 500,875 | 1.071 | 0.357 | 0.0668 | 0.0223 | 0.599 | 0.200 |

According to IBAC International Business Aviation Council

**Number of Turbine Aircraft, flight hours, departures in 2002**

The Breiling Report contains data covering a five year period for the global population and the distribution of aircraft by region. A summary of the aircraft population in 2002, the last year covered by the report, is as follows:

| 2002 Global Business Aircraft Population | Population | Flight hours | Departures |
|---|---|---|---|
| Business Jets | 12,581 | 4766230 | 3486300 |
| Turbo Props | 9,995 | 4187280 | 2667057 |
| All Turbine Business A/C | 22,576 | 8953510 | 6153357 |

Business aircraft in North America represent 72% of the global fleet. South and Central America have approximately 10% and Europe 10% of the world's fleet. Other regions account for the remaining 8% of the fleet.

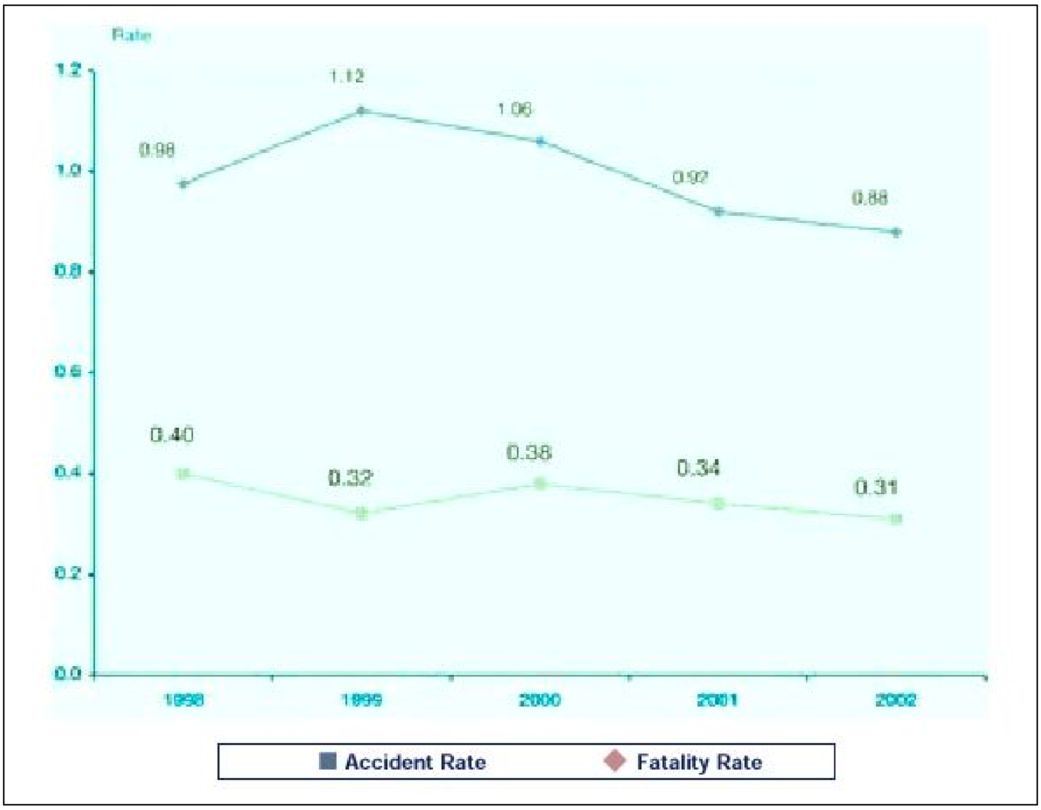
## 4.3 ACCIDENT RATE BY AIRCRAFT TYPE

| Accident Rate per 100,000 hours by Aircraft Type | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | | **5 Year Total** | |
| | Acc Rate | Fatal Rate | Acc Rate | Fatal Rate | Acc Rate | Fatal Rate | Acc Rate | Fatal Rate | Acc Rate | Fatal Rate | **Acc Rate** | **Fatal Rate** |
| Business Jets | 0.55 | 0.16 | 0.62 | 0.18 | 0.43 | 0.17 | 0.58 | 0.20 | 0.50 | 0.10 | **0.53** | **0.16** |
| Turbo props | 1.40 | 0.62 | 1.62 | 0.46 | 1.72 | 0.61 | 1.29 | 0.49 | 1.31 | 0.55 | **1.47** | **0.53** |
| All Bus A/C | 0.98 | 0.40 | 1.12 | 0.32 | 1.06 | 0.38 | 0.92 | 0.34 | 0.88 | 0.31 | **0.99** | **0.35** |

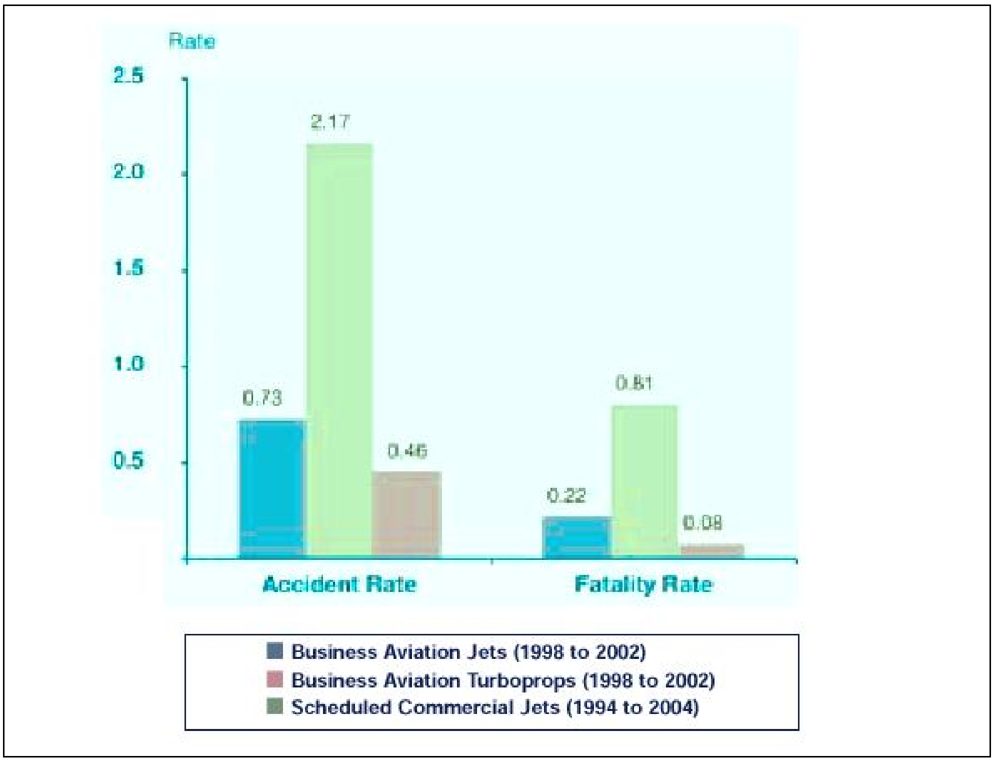
## 4.4 ACCIDENT RATE BY OPERATOR TYPE

| **Global Accident Rates by Operational Category** *(Extrapolated)* *(per 100,000 flight hours)* | | | | | |
|---|---|---|---|---|---|
| Operator Type | Hours of Operation (5 yrs) | Total Accidents | Fatal Accidents | Total Accident Rate | Fatal Accident Rate |
| Commercial (Air Taxi) | 9,248,590 | 230 | 77 | 2.48 | 0.83 |
| Corporate | 15,673,494 | 49 | 15 | 0.31 | 0.09 |
| Owner-operated | 16,000,878 | 109 | 45 | 0.68 | 0.28 |
| All Business Aircraft | 40,922,963 | 405 | 143 | 0.98 | 0.34 |

| **Business Aircraft Accident Rates by Operator Type** *(Extrapolated)* *(per 100,000 departures)* | | | | | |
|---|---|---|---|---|---|
| Operator Type | Departures (5 yrs) | Total Accidents | Fatal Accidents | Total Accident Rate | Fatal Accident Rate |
| Commercial (Air Taxi) | 6,337,396 | 230 | 77 | 3.62 | 1.21 |
| Corporate | 10,739,923 | 49 | 15 | 0.45 | 0.13 |
| Owner-operated | 10,964,256 | 109 | 45 | 0.99 | 0.41 |
| All Business Aircraft | 28,041,576 | 405 | 143 | 1.44 | 0.50 |




Global Business Aviation Accident Rates per 100 000 Hours Flown




Source: IBAC Business Aviation Safety Brief, issue 2
http://www.ibac.org/Library/ElectF/saft/safetybriefissue2.pdf

Global Accident Rates per 100 000 Departures

Since business aviation is typically short-range, say 500km (see section 15), it is illuminating to compare accident rates with that of motorway and rail travel, which at that distance could be viable alternatives. In Europe, rates are variable, but on average motorway travel suffers 7.5 fatalities per billion passenger kilometres travelled 19 and the rate for rail travellers is around 0.9 fatalities per billion passenger kilometres.

Making a low assumption of four passengers per aircraft and using the median business jet flight length of 600km, the 0.22 fatality rate for business aviation jet departures worldwide approximates to one fatality per billion passenger kilometres travelled. Without knowing how much European safety rates are better than world averages, this appears to suggest the business jet is safer than taking the car, and of the same order as travelling by train. Even with a higher world fatality rate, shorter distances (say 330km, from Figure 30) travelled and assuming around eight passengers per trip, turboprops have a fatality rate of perhaps six per billion passenger kilometre, similar to that of motorway travel.

The accident rate data demonstrates that corporate aviation has an excellent safety record over the years measured. The corporate jet accident rate of 0.08 accidents per 100,000 departures compares favourably with the scheduled airline rate of 0.112 for hull loss and/or fatal accidents per 100,000 departures of jet aircraft over 60,000 lbs and 0.241 for non-scheduled and all other operations of jet aircraft over 60,000 lbs (*Source: Boeing – Statistical Summary of Commercial Jet Airplane Accidents, Worldwide Operations 1959-2002*). The rate for scheduled operations of jet aircraft as published by ICAO has shown a steady decrease year over year with the fatal accident rate of scheduled jet airline operations in 2002 being 0.081. The data in this Brief demonstrates that there is room for improvement in the commercial business aviation sector.

## 4.5 PASSENGER TRANSPORT RISKS BY MODE AND THEIR COMPARISON

According to European Transport Safety Council

| Road (Total) | | 0.95 |
|---|---|---|
| Motorcycle/moped | 13.8 | |
| Foot | 6.4 | |
| Cycle | 5.4 | |
| Car | 0.7 | |
| Bus and coach | 0.07 | |
| Ferry | | 0.25 |
| Air (civil aviation) | | 0.035 |
| Rail | | 0.035 |

**Table 1: Deaths per 100 million person kilometres**

| Road (Total) | | 28 |
|---|---|---|
| Motorcycle/moped | 440 | |
| Cycle | 75 | |
| Foot | 25 | |
| Car | 25 | |
| Bus and coach | 2 | |
| Air (civil aviation) | | 16 |
| Ferry | | 8 |
| Rail | | 2 |

**Table 2: Deaths per 100 million person travel hours**

Source: „Transport safety performance in the EU a statistical overview, 2003 European Transport Safety Council.

Tables 1 and 2 show the death risk for different travel modes of transport in the EU for the period 2001/2002.

Air transport fatality statistics refer mainly to scheduled flights, because air travel fatalities on unscheduled (charter) flights are only partially reported by international air transport organisations. A similar practice exists for GA aircraft fatalities – they are not registered in EU, they are recorded only in USA.

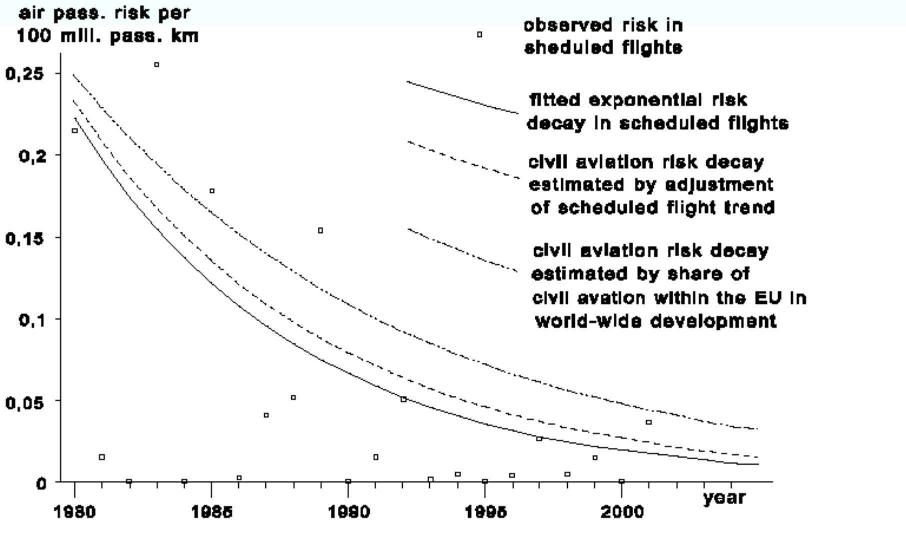



**Fig. 16 Estimated risk trends for scheduled flights and civil aviation within the EU**

Source: „Transport safety performance in the EU a statistical overview, 2003 European Transport Safety Council.

## 4.6 CONCLUSIONS of GA SAFETY

1. There are no European wide comprehensive statistics on safety of General Aviation Aircraft without which research efforts is problematical and safety improvement is hard to measure.
2. Air transport fatality statistics refer mainly to scheduled flights, because air travel fatalities on unscheduled (charter) and General Aviation flights are only surveyed and reported by FAA and partially reported by international air transport organisations.
3. On the basis of US American General Aviation Safety data operating both under Parts 91 and 135 of the American Code and analysis of above mentioned sources we can say, that Personal Aircraft Transportation System have an accident rate factor lower than Road Transportation Mode and have the potential to be near the Part 121 air carriers safety level. Apart improving design safety this potential involve mainly new technology aiming to facilitate flying and new training systems.
4. As in US, an European Transportation Safety Board (ETSB) responsible for maintaining European database on civil aviation accidents, including General Aviation should be appointed. The Safety Board's Accident/Incident database should be the official repository of aviation accident data and causal factors. (The existing European Transport Safety Council do not involve surveys and is not a repository of civil aviation accident data).

# 5. CURRENT STATE OF SATS

This discussion of current state of SATS is mainly based on sources: 1,2,3

The **Small Aircraft Transportation System** (**SATS**) is a joint research project between the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA), along with local airports and aviation authorities. It is designed to facilitate transportation between small General Aviation airports using small aircraft as an alternative to traditional airline travel.

In the United States, the current National Airspace System of hub-and- spoke operations has served its purpose well, but it is beginning to reach a capacity plateau. Because of increasing demand on the system and with only modest potential gains in the number of flights, the system could reach gridlock within the next 10–15 years.

The Small Aircraft Transportation System (SATS) is conceived as a safe travel alternative, freeing people and products from existing transportation system delays, by creating access to more communities in less time. The vision for SATS is bold. NASA has begun a research initiative to prove the SATS concept will work. This initiative covers a five-year period from FY 2001 through FY 2005, with funding of $69 million.

NASA plans to conduct flight research and demonstrations of new technologies at a variety of airports, including Danville, Virginia.

Throughout US history, saturation of existing transportation systems helped drives the search for the next system innovations. Looking forward 25 years, beyond saturation of the National highway and skyway systems (gridlock and hublock), the Nation faces new challenges in creating transportation-driven economic growth and wealth.

The SATS system concept targets the stimulation of latent markets of consumers who make transportation choices based mostly on time considerations. The latent market for transportation is defined as trips not taken (for reasons of time, cost, convenience, comfort, or other factors), trips not imagined (because consumers have never been able to experience the service or product), and trips not possible (in the absence of enabling vehicles and infrastructure).

The SATS concept of operations uses small aircraft for business and personal transportation, for on-demand, point-to-point travel between smaller regional, reliever, general aviation and other landing facilities, including heliports. The SATS architecture contemplates near-all-weather access to any landing facilities in the U.S. SATS would leverage Internet communications technologies for travel planning and scheduling, which would also minimize user uncertainty regarding destination services. It would operate within the National Airspace System, initially about 5,400 existing public-use-landing facilities (scheduled air carriers serve only about 660 of these facilities). A total of over 18,000 landing facilities serve a vast number of communities in the U.S; ultimately, essentially all of these facilities could employ SATS operating capabilities.

The SATS proof-of-concept effort will culminate in a joint NASA/FAA/industry demonstration of these operational capabilities. The results will establish the basis for future decisions by local, state, and federal policy makers regarding SATS and air transportation.

Several new, small, efficient aircraft are being developed by Honda, Cessna, Diamond, Eclipse, Sa .re, Cirrus, Lancair, Adam Aircraft, and others to provide point-to-point service and make

use of small airports, many without control towers that lie outside air traf control (ATC) radar coverage.

Affordable, small jet aircraft based on NASA technology are on computer drawing boards today. Illustrated above is the Eclipse 500 Jet, a six-place, twin-turbofan aircraft expected to cost less than most used turboprops. Its all-glass cockpit and computer industry-derived avionics and operating systems will make the most of a future small aircraft transportation system.

The past 7 years of investment by NASA in Advanced General Aviation Transport Experiments (AGATE) and General Aviation Propulsion (GAP) technologies have led to the emergence of a new generation of small aircraft. In addition, a new industrial business strategy is emerging to create innovations in delivering transportation services to the marketplace. The aircraft will incorporate state-of-the-art advancements in avionics, airframes, engines, and advanced pilot training technologies. However, these new aircraft will make the SATS vision for transportation available to the general public only if new concepts for airspace architecture and operations can be developed.

The Federal Aviation Administration (FAA) and industry partners joined NASA in showcasing forward-looking aviation technologies at „SATS 2005: A Transformation of Air Travel". NASA Administrator Michael Griffin and FAA Administrator Marion Blakey were in attendance and helped kick off the demonstration at the Danville Regional Airport.

For small planes to fly safely and reliably into more than 3,400 community airports in all kinds of weather, they need crucial new technologies and operating capabilities since many of these small airfields do not have control towers or radar. The demonstration by NASA, FAA and state research groups - known as SATSlabs, used six airplanes equipped with advanced cockpit technologies and displays to demonstrate how small planes can fly safely and efficiently into these local and regional airports. The event was considered a great success in showcasing new aviation technologies.

The Small Aircraft Transportation System (SATS) government/private sector five year project came to an end with SATS 2005, a demonstration/exhibit/conference event at the Danville Regional Airport in Danville, VA from June 5th to June 7th. The success of the project, led by NASA's Dr. Bruce Holmes, was evident in the technologies displayed, which were developed by company members of six regional SATSlabs organized by NCAM (National Consortium for Aviation Mobility). The highlight demo was the High Volume Operation landing of several small aircraft in about the same time it would take to land one under current procedures. Aircraft on exhibit were from Adam Aircraft (A500), Cessna (CJ1), Cirrus Design (several SR22s), Diamond Aircraft, and The Lancair Company.

In addition to the new aircraft and cockpit navigational devices on exhibit, there were impressive business software displays, such as RTI International's MCATS (Monte Carlo Air Taxi Simulator) for analyzing feasibility of an air taxi service, refining an existing operation, or creating an air taxi network. Another is Virginia Tech's Transportation Systems Analysis Model (TSAM) to predict future numbers of small aircraft travelers in the U.S. It uses county level socio-economic data to forecast numbers of intercity trips by car, airlines, and small planes.

With the five year project end is also its government funding. It will now be largely up to the private sector to continue the technological development, and work with the government (FAA, etc.) to bring more automated small aircraft traffic into the existing national air system. An example of a private group already forming to pick up where the Southeast SATSlab leaves off is CASA (Consortium for Aviation System Advancement). It will interface with private companies, government, and others to pursue technology funding opportunities. Also, since it is Florida based, it will encourage air taxi and charter operators to use Florida as their test-bed and initial operating area.

## CONCLUSION of SATS

SATS is a concept that proposes a technological solution to a number of critical transportation and economic development problems. It is certainly not a cure-all since it will not likely prevent the gridlock forecasted for the hub and spoke system. The demand for conventional air transport services will continue to grow as the economy grows and the result will be a system saturated to the point where the needs of many travellers are no longer met. SATS is also not a panacea for every small community that lacks adequate air service. SATS is not a promise to provide air service as an entitlement. It does, however, offer a much better means for providing access to reliable and efficient air transport than the current system, within which air carriers focus on large markets and within which government subsidies seem to waste scarce resources subsidizing services that fail to meet most travellers' needs. SATS can reduce the need for substantial infrastructure investment and reduce the demand threshold for attracting reliable air transport services. In the end, SATS promises to be a paradigm shift that will make air transport an even more useful tool for business and leisure.

Source:

1. Optimizing airspace system capacity through a small aircraft transportation system: an analysis of economic and operational considerations. Scott E. Tarry and Brent D. Bowen Omaha, Nebraska
2. http://www.nasa.gov/centers/langley/news/factsheets/SATS.html
3. http://www.nasa.gov/vision/earth/improvingflight/sats_danville.html

# 6. SUMMARISED CONCLUSIONS & RECOMMENDATIONS

1. The comparison tables above do not support the position, that the existing between the EU and the US gap in General Aviation development is caused by differences in area, wealth nor surface transport infrastructure. The position was true when Europe was partitioned and there was not any sign of common market and European sky.
   The Fleet and volume of passenger-kilometer done by General Aviation of the USA is nearly 5 times greater than the one of Europe, when the global national income of the EU prevails over the GDP of the USA, the distances separating outlaying regions are similar, and the land transport infrastructure comparable.

2. The reasons behind the US General Aviation uncompetitive position should be found in conditions created in the US by the administrations and involvement of society and local public government for the benefit of local and personal air transport.

3. One of the major obstacles in conducting effective study on general aviation is the lack of adequate statistical information. Deep knowledge about current state is the fundament of development planning. The knowledge is gained from statistical surveys, highly valued by the FAA. It is confirmed by many research programs and especially continuously undertaken: „General Aviation and Air Taxi Activity and Avionics (GAATAA) Surveys", which were used for the comparison tables. The information collected in this survey helps to understand more about general aviation activities, assess the impact of general aviation activities on the National Airspace System, and determine the need for increased traffic facilities and services. Federal, state and local governments; general aviation associations; and private industry and individuals use the summary data for safety analyses, planning, forecasting, and research and development. For example, more accurate information on hours flown and aircraft activity lead to more accurate safety measures, which in turn impacts general aviation insurance rates.

4. As regards to safety, the partial data available gives only some indication as to the main causes of fatal accidents. There are no European wide comprehensive statistics on safety of General Aviation Aircraft .

5. In the same condition of Air Traffic Management and Control the number of General Aviation operations at GA airports is much bigger in USA than in EU, compare 768 itinerant operations per day for the first ranked airport in USA with 131 business operations per day for the first ranked airport in Europe (comparing the total operations – itinerant and locale- the difference will be else bigger). That means, that at the current level of ATM- ATC there is a large reserve of GA airports capacity in Europe.

6. Our knowledge of current state in Europe as it is clearly visible at the tables is poor. Up to date comprehensive data describing the General Aviation sector in Europe is not available. Most of the existing data concern almost exclusively commercial air transport sector and usually refer to airlines and airports. Even if some statistics for GA on the Country level are available from different sources, it is hard to compare them because they are prepared on different criteria basis and using different terms definitions. For example, because of the lack of common definition, Eurocontrol define business aviation via a list of aircraft types. SESAR (Deliverable D1) define General Aviation as all aircraft except those of airlines, business aviation and state-owned aircraft, when

Eurostat "Draft Glossary version 6 on air transport statistics" in GA operations - commercial includes Air Taxi and others renumbered operations , and in GA operations – non-commercial includes State Flight, Business flying and other.

7. Creation of a comprehensive European Business & Personal Aviation Data Base is indispensable for research & development planning. As in USA appropriate statistical surveys on EU level should be done.

8. There are no European wide comprehensive statistics on safety of General Aviation Aircraft without which research efforts is problematical and safety improvement is hard to measure.

9. Air transport fatality statistics refer mainly to scheduled flights, because air travel fatalities on unscheduled (charter) and General Aviation flights are only surveyed and reported by FAA and partially reported by international air transport organisations

10. On the basis of US American General Aviation Safety data operating both under Parts 91 and 135 of the American Code and analysis of above mentioned sources we can say, that Personal Aircraft Transportation System have an accident rate factor lower than Road Transportation Mode and have the potential to be near the Part 121 air carriers safety level. Apart improving design safety this potential involve mainly new technology aiming to facilitate flying and new training systems.

11. As in US, an European Transportation Safety Board (ETSB) responsible for maintaining European database on civil aviation accidents, including General Aviation should be appointed. The Safety Board's Accident/Incident database should be the official repository of aviation accident data and causal factors. (The existing European Transport Safety Council do not involve surveys and is not a repository of civil aviation accident data).

12. There is no systematically collection of information about General Aviation in EU and the existing sources are not sure. The lack of data make analysis and valuation not enough reliable. There is a need of systematically GA information gathering and creating a complex and reliable database affordable for all the European aviation community.

13. For desirable development of the EPATS, a similar to the US "National Plan of integrated Airports Systems" (NPIAS) and "Airport Improvement Program" (AIP) European plan and program should be prepared and implemented.

The summarised conclusions also are based on the following important papers defining European General Aviation:

1. General Aviation in the European Community – Commission Staff Discussion Paper – Brussels, 1.02.2007
2. Consultations on General Aviation in the European Community – Update and summary of contributions – Brussels, 21.05.2007
3. European Civil Aviation Conference – Final Report of the ECAC General Aviation Task Force – Paris , 6 December 2007

# 7. ATTACHMENTS

## 7.1 TASK 1.1 AIRCRAFT DATABASE

Technical report:
Title: **Aircraft Data Base**
Document Number: EPATS T1.1-AcftBase-V0
Organization name of lead contractor for this report: **Institute of Aviation**
Date of report issue: 20 Sept, 2007.

## 7.2 TASK 1.2 AIRPORTS AND FACILITIES DATABASE

Technical report:
Title: **Airports and Facilities Data Base**
Document Number: EPATS T1.2-ArptsDB -V0
Organization name of lead contractor for this report: **Rzeszow University of Technology**
Date of report issue: 20 Sept, 2007

***Document Change Log:***

| Version | Author /Organization | Date of Release | Description of the release | Modifications (sections affected and relevant information) |
|---|---|---|---|---|
| 0a | A. Baron/IoA | 30 VIII 07 | European Business & Personal Aviation Database and Findings Report - draft | Initial proposal |
| 1 | A. Baron/IoA | 12 XII 07 | European Business & Personal Aviation Database and Findings Report | Official document (reviewed after PMC No2, Amsterdam) |
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