The Flight Crew's Solution

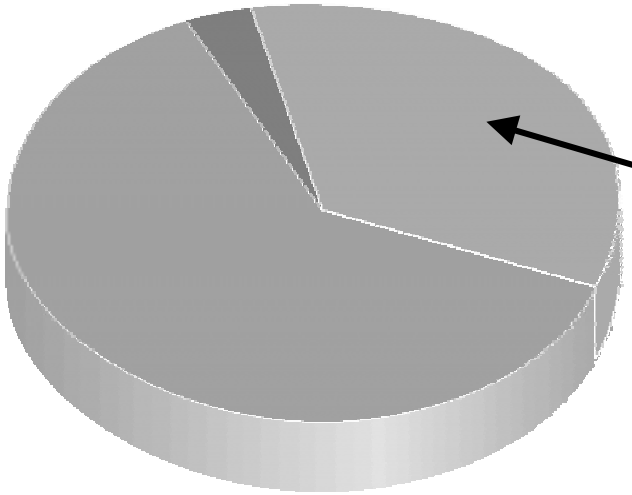
to an

Age-Old Safety Problem

Presentation before the
Royal Aeronautical Society
Human Factors Group

NASA's Aviation Safety Reporting System 1983-1990

Total Incidents: 104,880

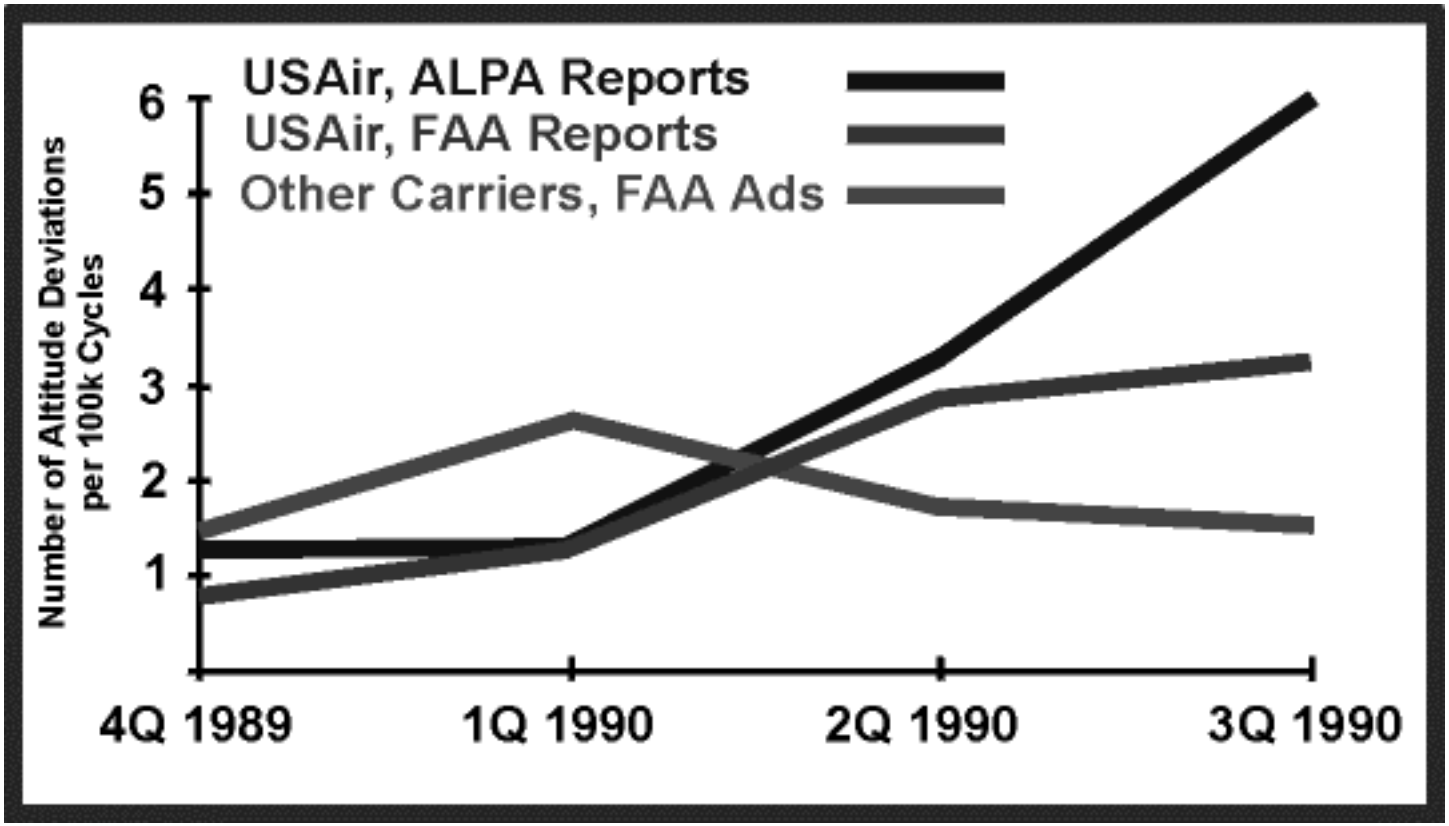


Altitude Deviations: 39,704

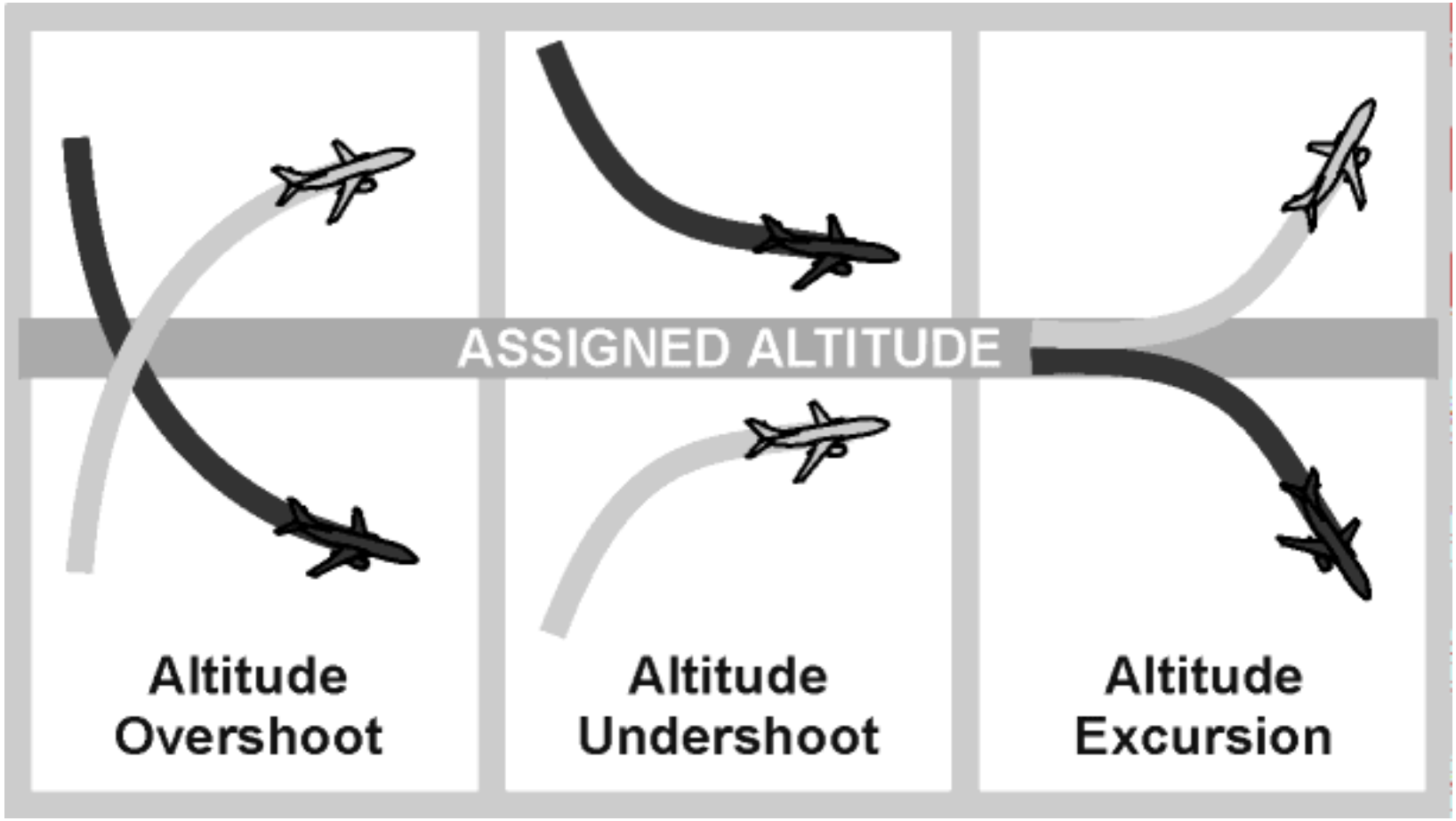
Altitude Deviations *caused by flight crews:* 33,992

That's 32.4% of the total NASA ASRS Incidents

Altitude Deviation Rates for USAir and Other Carriers



US Airways Altitude Awareness Program



Major Reasons for Altitude Deviation

- Hearback Error
- Improperly set altitude alerter
- Crew distractions
- Flightdeck automation malfunction
- Improper altimeter settings
- Poor crew discipline and procedures
- ATC operational errors

US Airways Altitude Awareness Program

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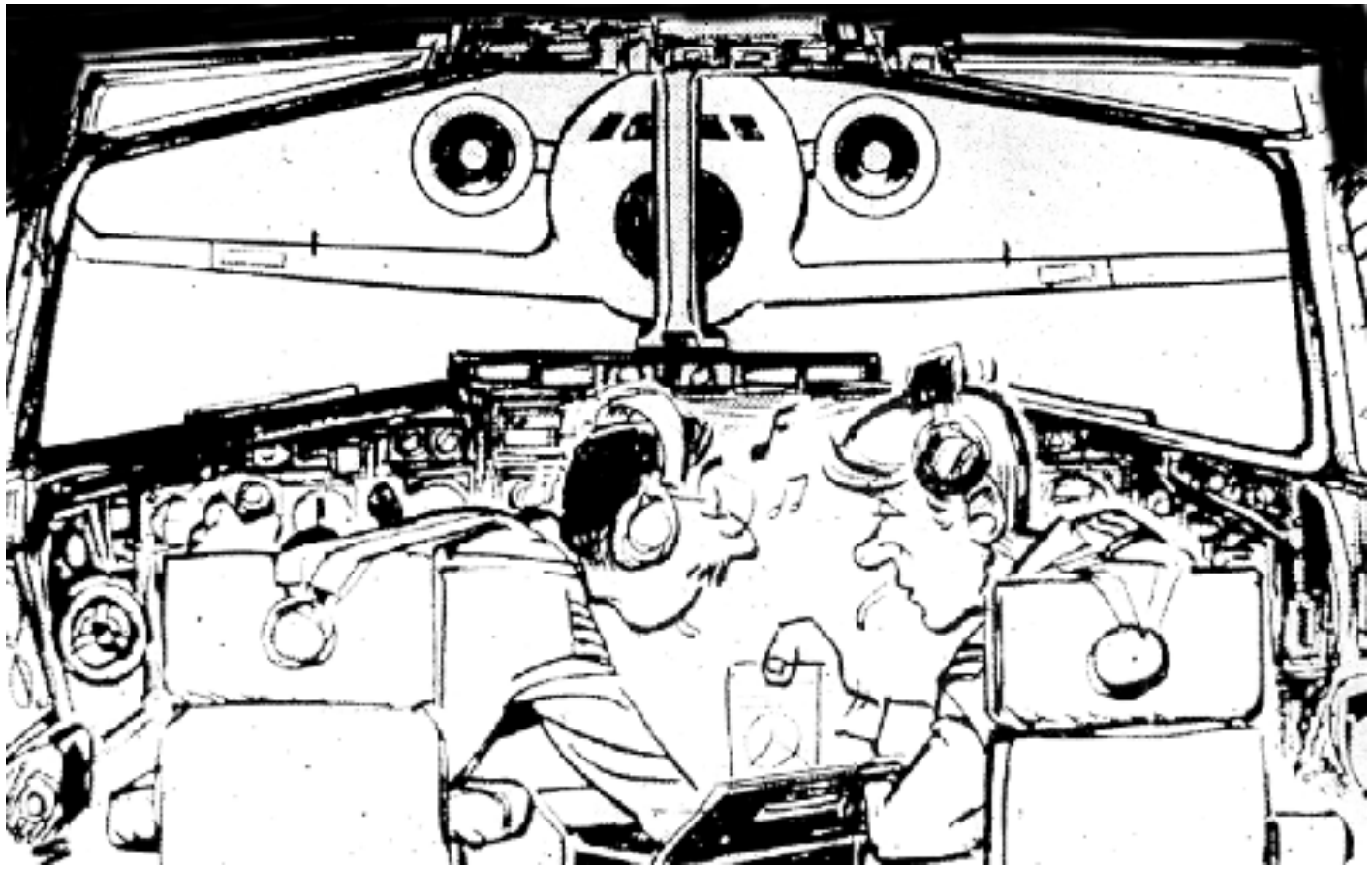
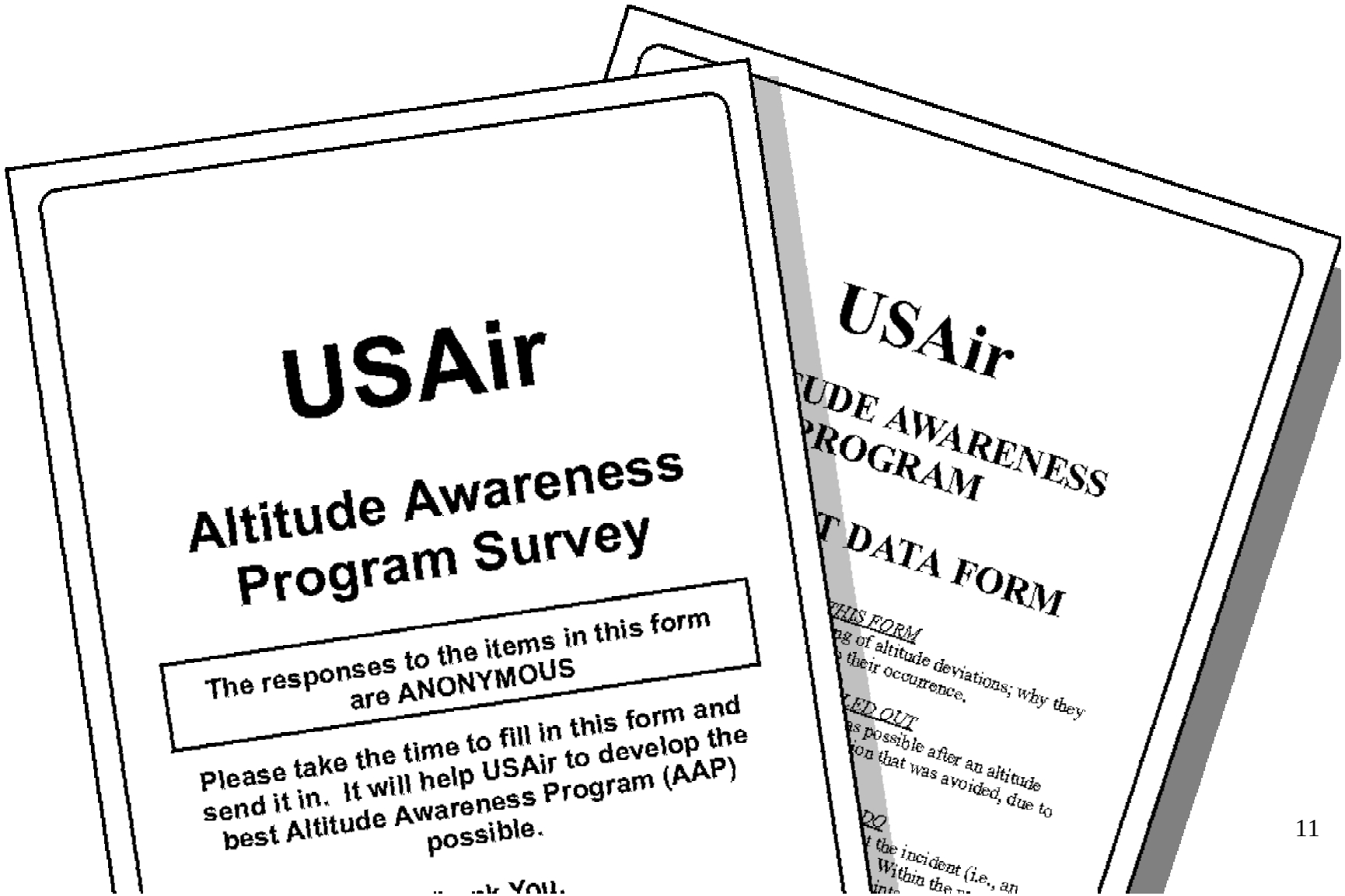


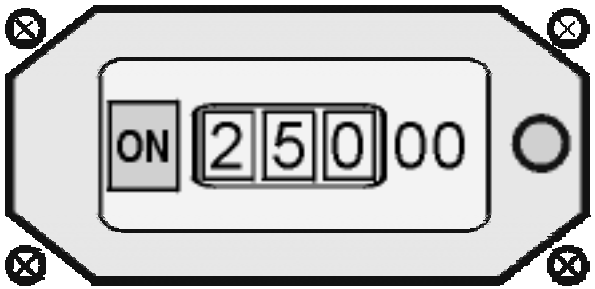
8780 pilot-caused Altitude Deviations in 1990

HUMAN FACTORS RESEARCH

US Airways Altitude Awareness Program



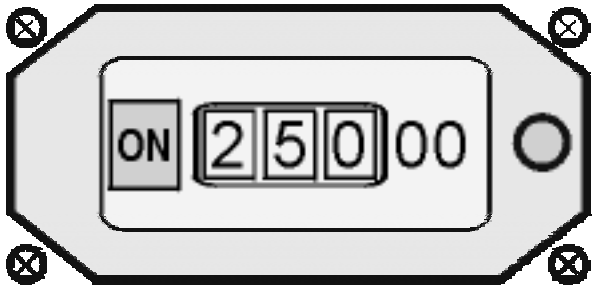
Watch Your ALTITUDE



The cockpit crew should all agree;
If not, verify with ATC!

Altitude Awareness begins in the cockpit.

Change your attitude -- Watch Your ALTITUDE



Altitude Awareness begins in the cockpit.

US Airways' Altitude Awareness Procedures

- **Pilot not flying communicates with ATC**
- **Pilot not flying sets the altitude alerter/mode control panel**
- **Pilot not flying announces new altitude**
  - **Flying pilot points at and repeats new altitude**
- **Pilot flying makes 1000 feet-to-go callout**

US Airways Altitude Awareness Program

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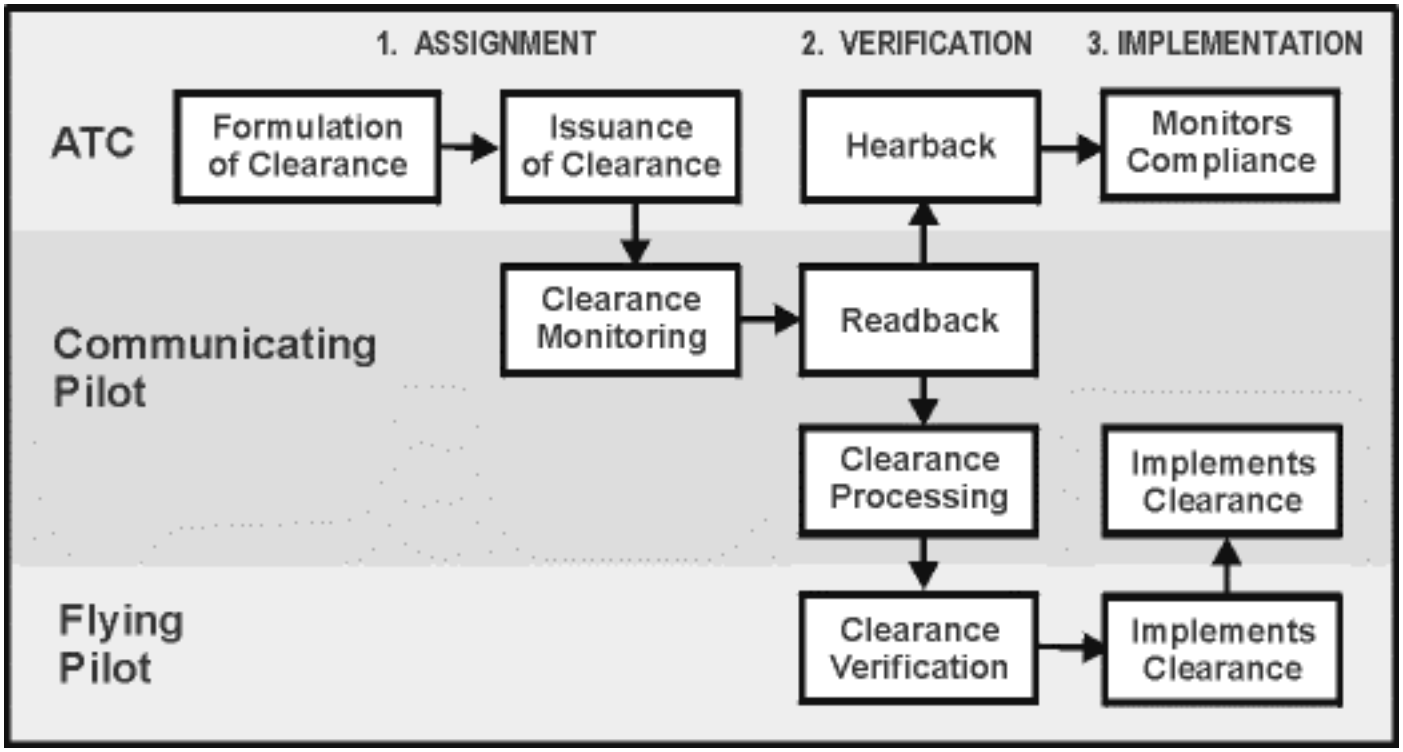
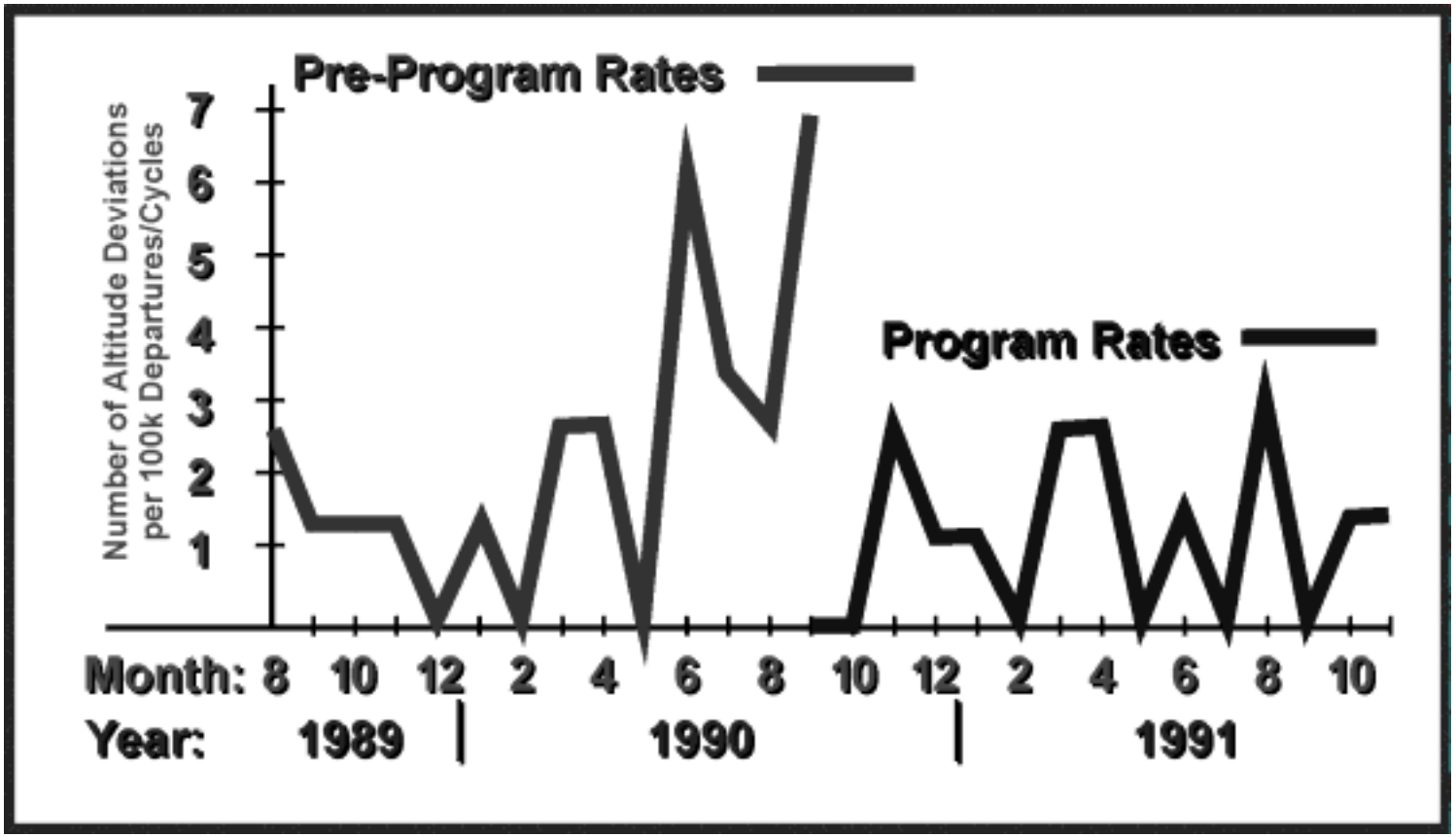
Altitude Clearance Processing Task Flow

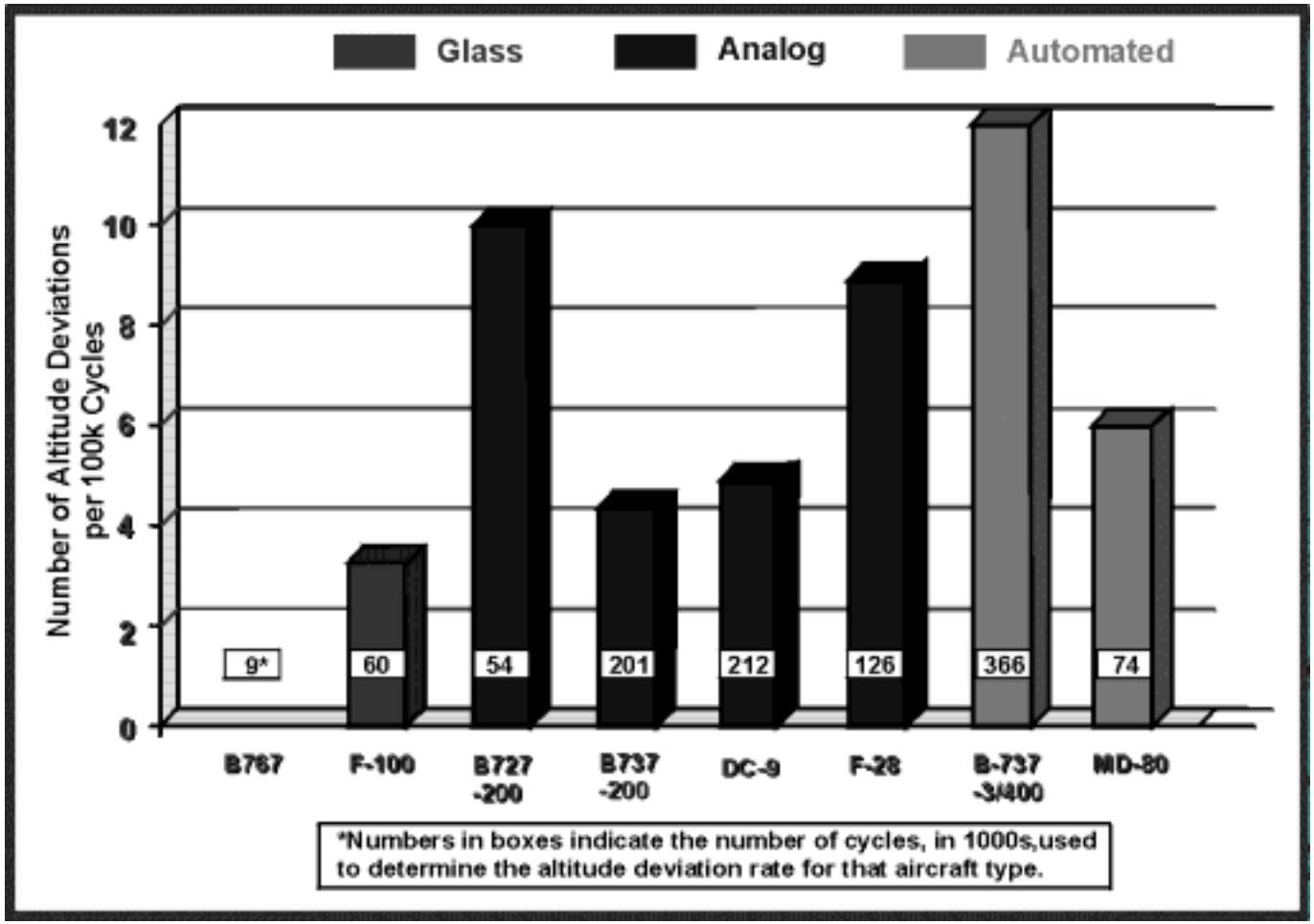


ALTITUDE DEVIATI0N STUDY RESULTS

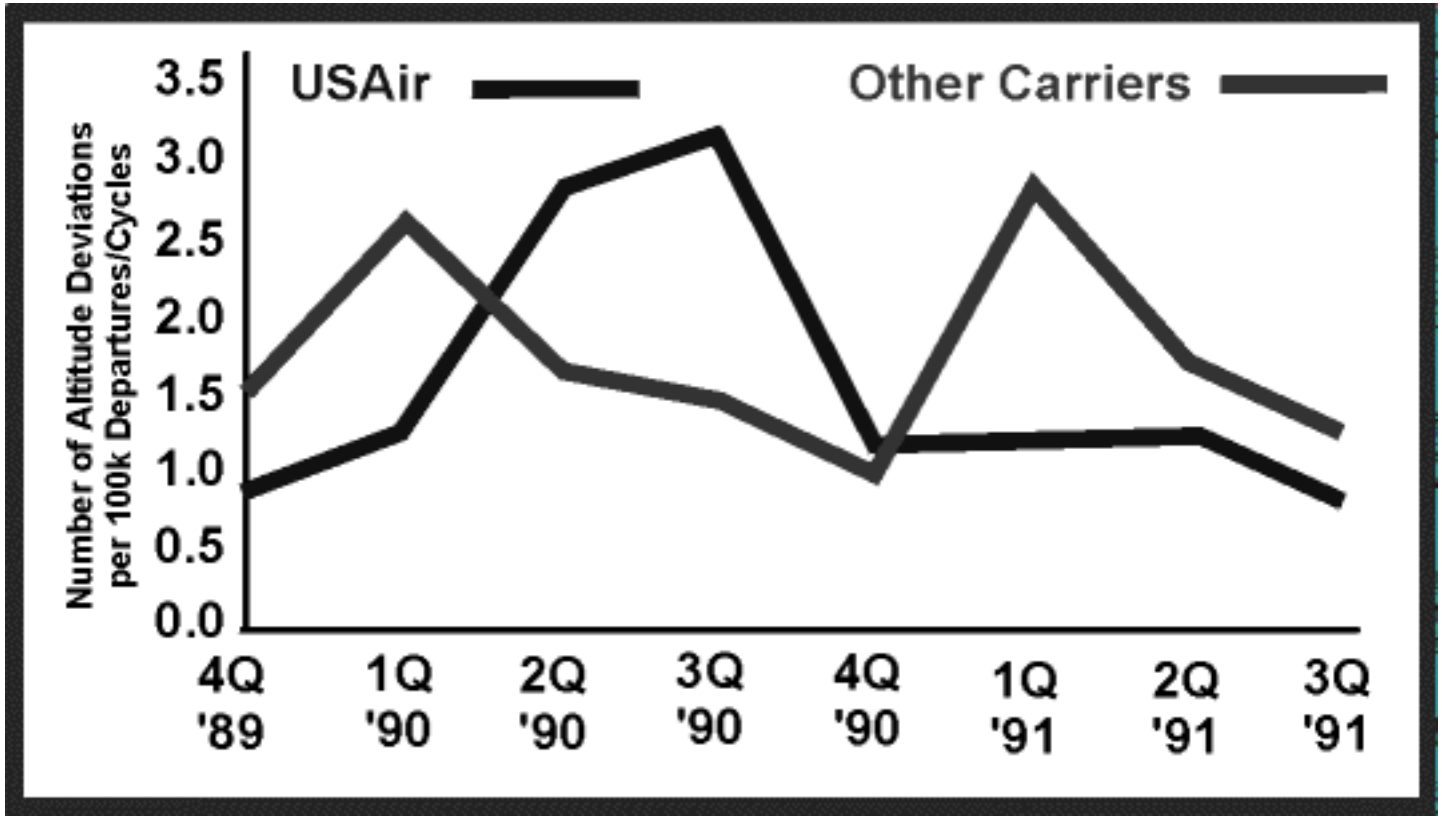
USAir Monthly Altitude Deviation Rates



Pilot Reported Altitude Deviation Rates by Aircraft Type



Altitude Deviation Rates for USAir and Other Part 121 Carriers



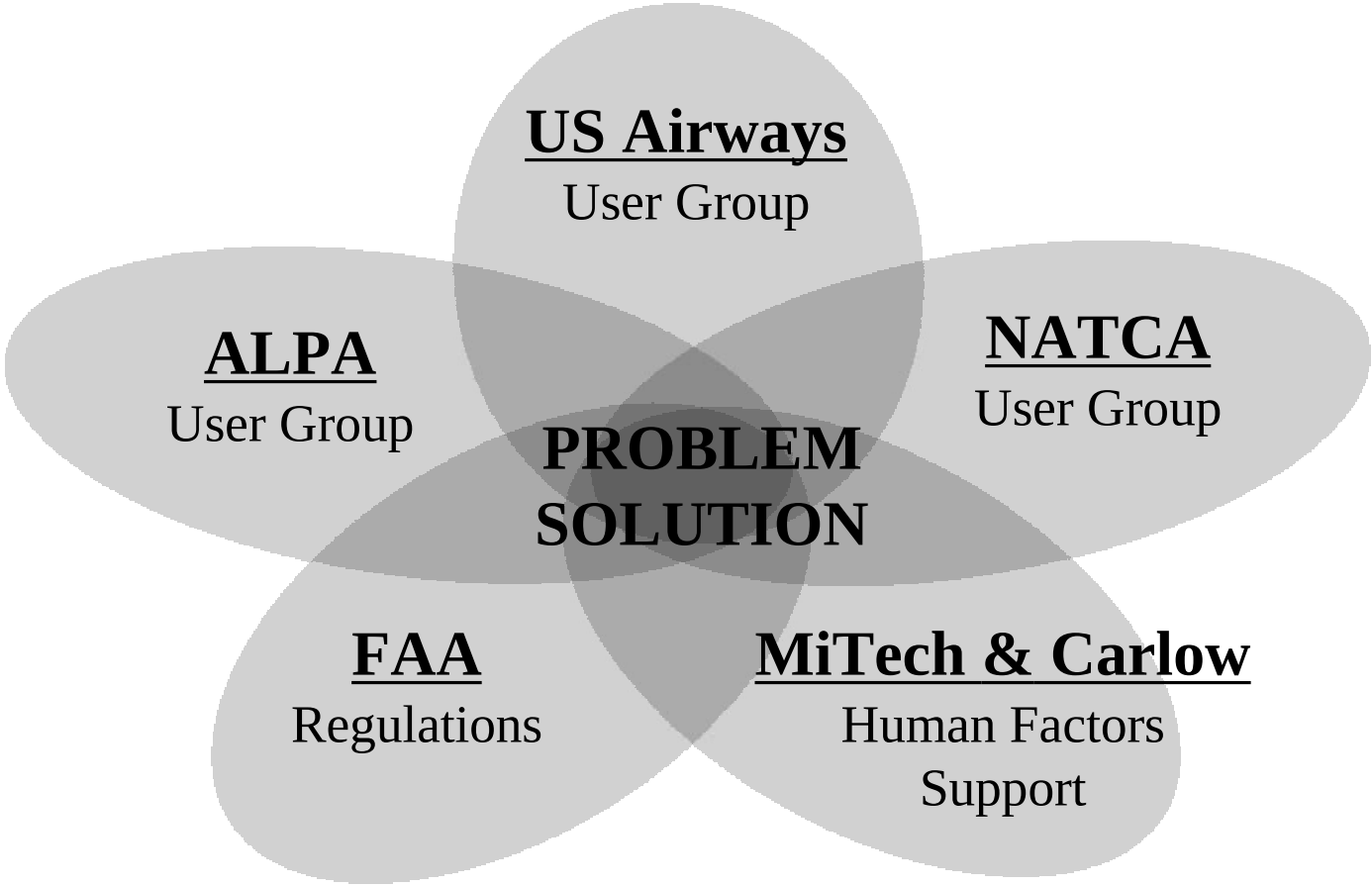
Selected Reaction to Altitude Awareness Study

	PILOTS **Did altitude awareness procedures increase awareness?**	*Controllers* **Should other facilities participate in altitude study?**
Yes	**465**	**39**
No	**20**	**6**
Don't know/ no opinion	**7**	**3**
Totals	**492**	**48**

Conclusions of the Altitude Awareness Study

- **USAir's altitude deviation rate was significantly lowered**
- **Useful data was collected from pilots and controllers**
- **Limited immunity in exchange for incident information is an effective approach to safety problem resolution**
- **Diverse groups can work together for a common good**

A Team Approach

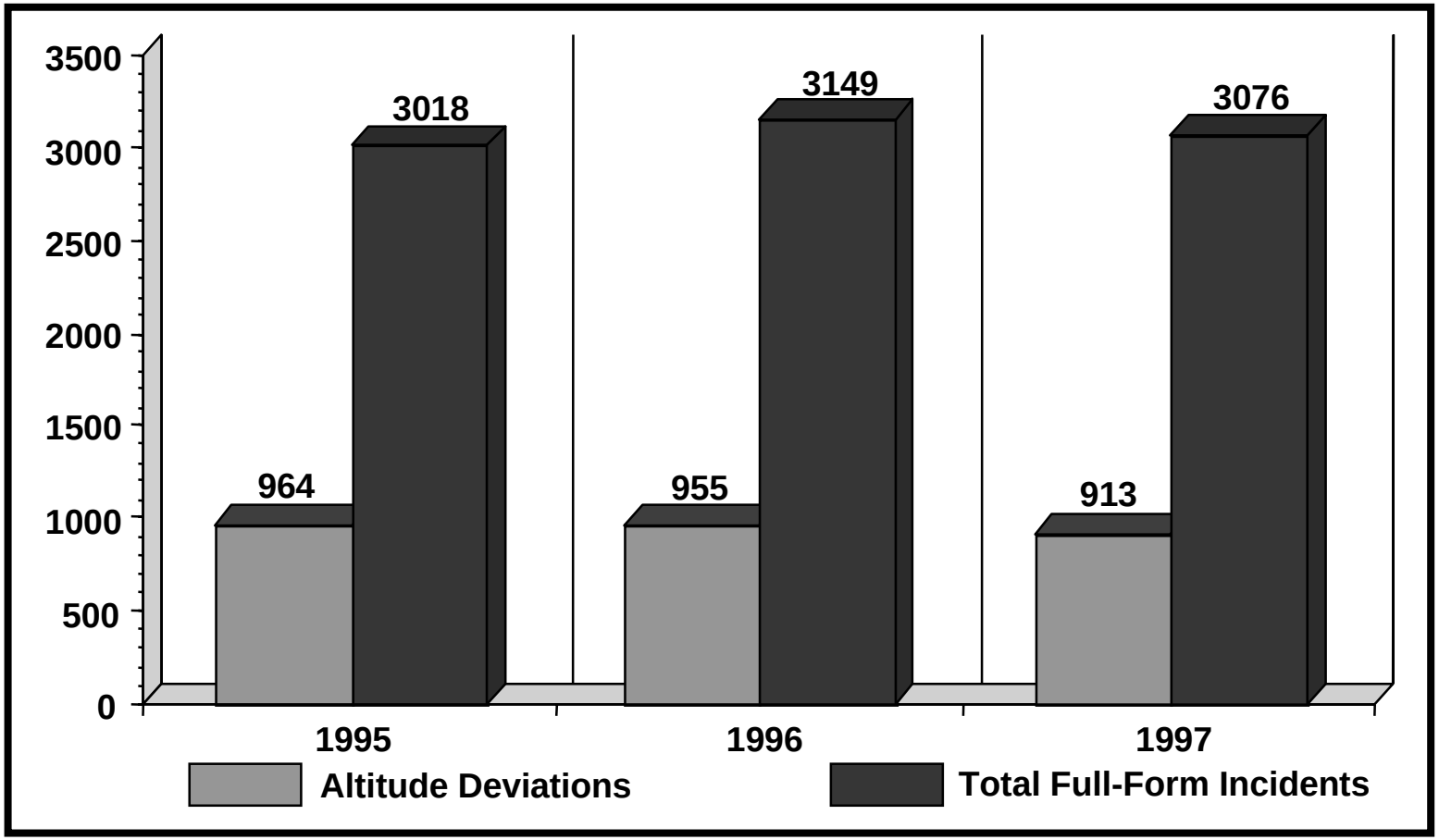


NASA Analysis of Altitude Deviation Data

1995 through 1997

NASA Aviation Safety Reporting System Data:

Comparison of Full-form Incidents vs. Altitude Deviation Incidents

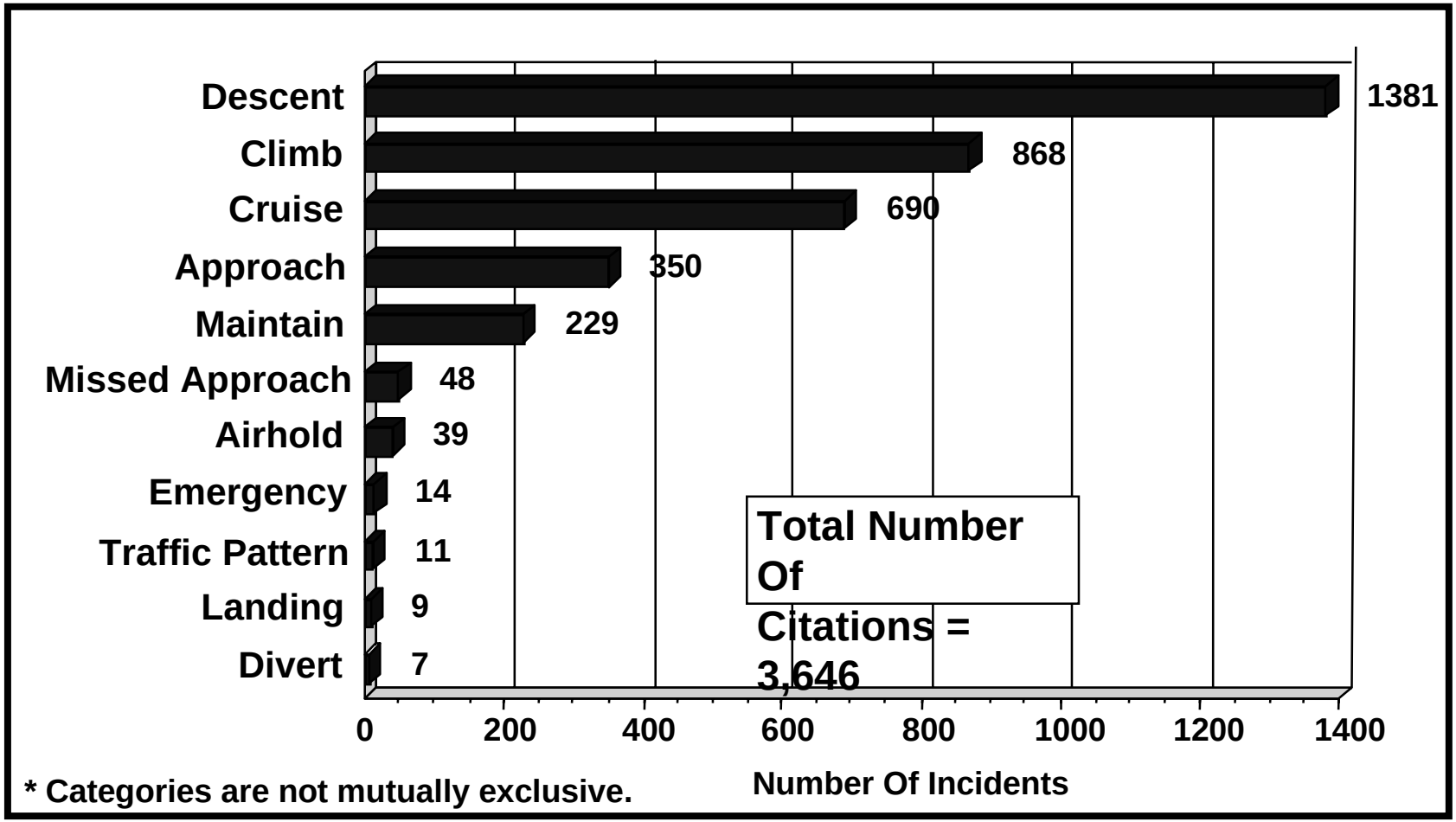


US Airways Altitude Awareness Program

NASA Aviation Safety Reporting System Data:

Altitude Deviation Incidents - Phase of Flight*

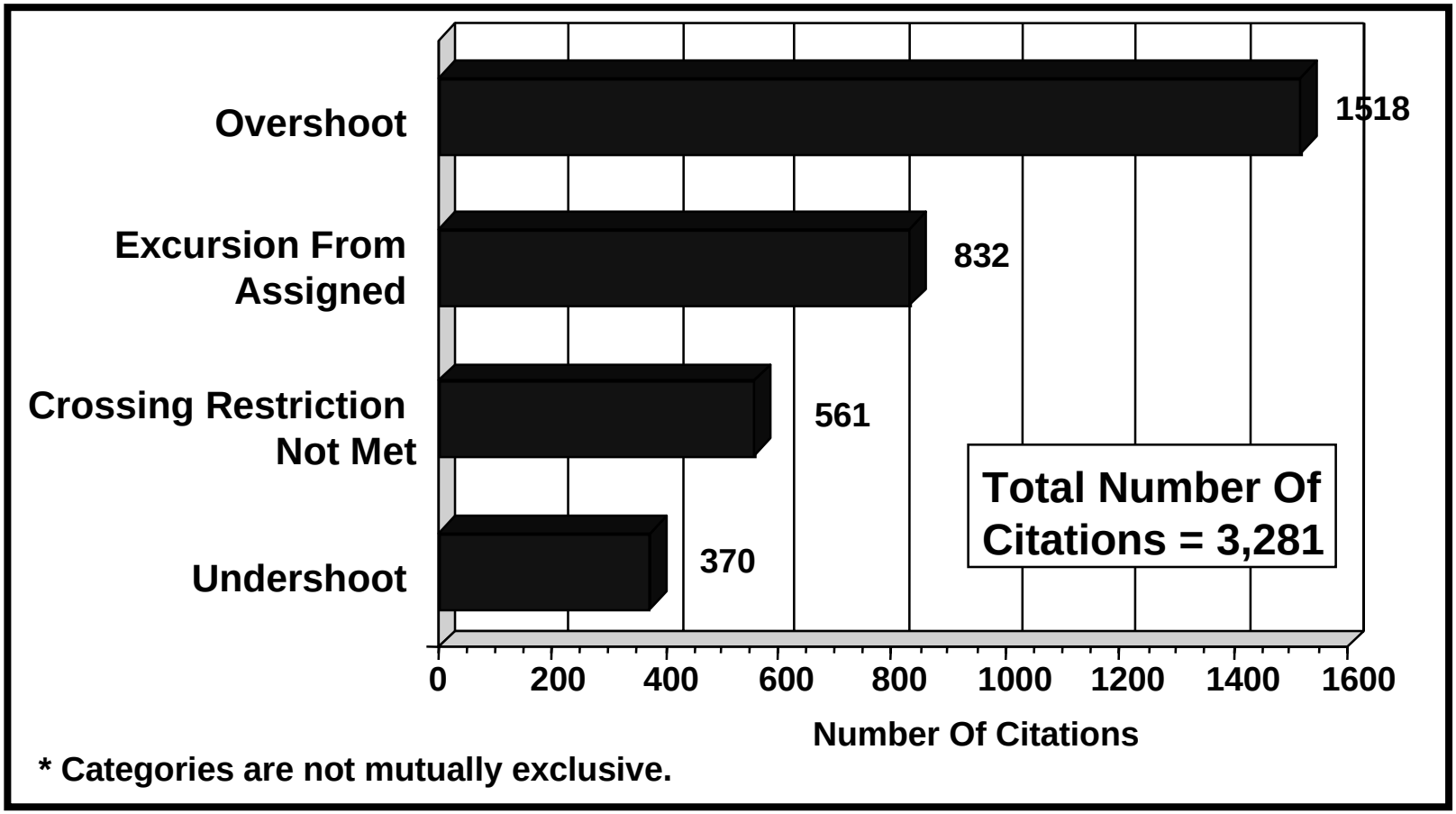
January 1995 - December 1997



NASA Aviation Safety Reporting System Data:

Altitude Deviation Incidents - Deviation Breakdown*

January 1995 - December 1997

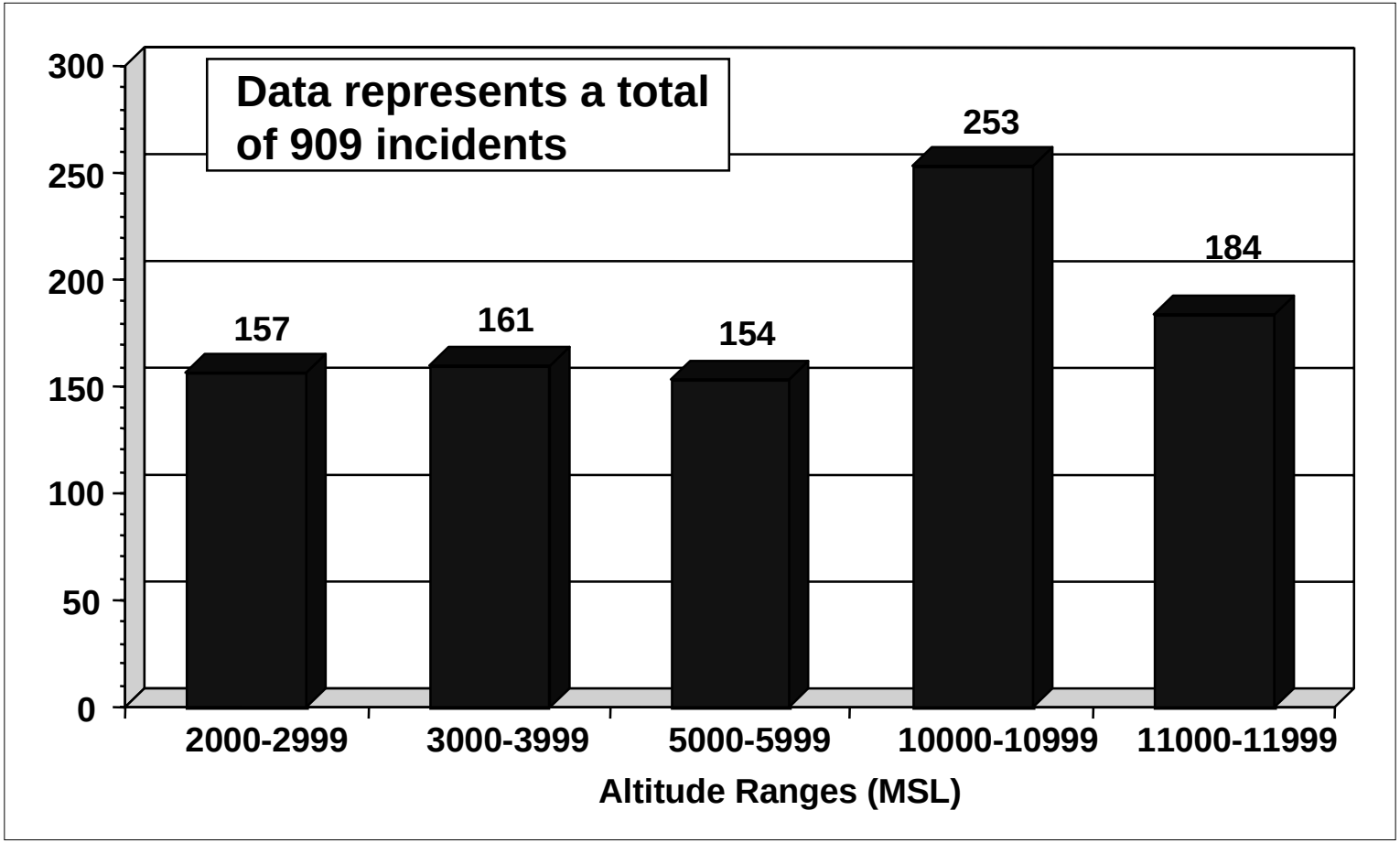


* Categories are not mutually exclusive.

NASA Aviation Safety Reporting System Data:

Altitude Deviation Incidents - Top Five Altitudes

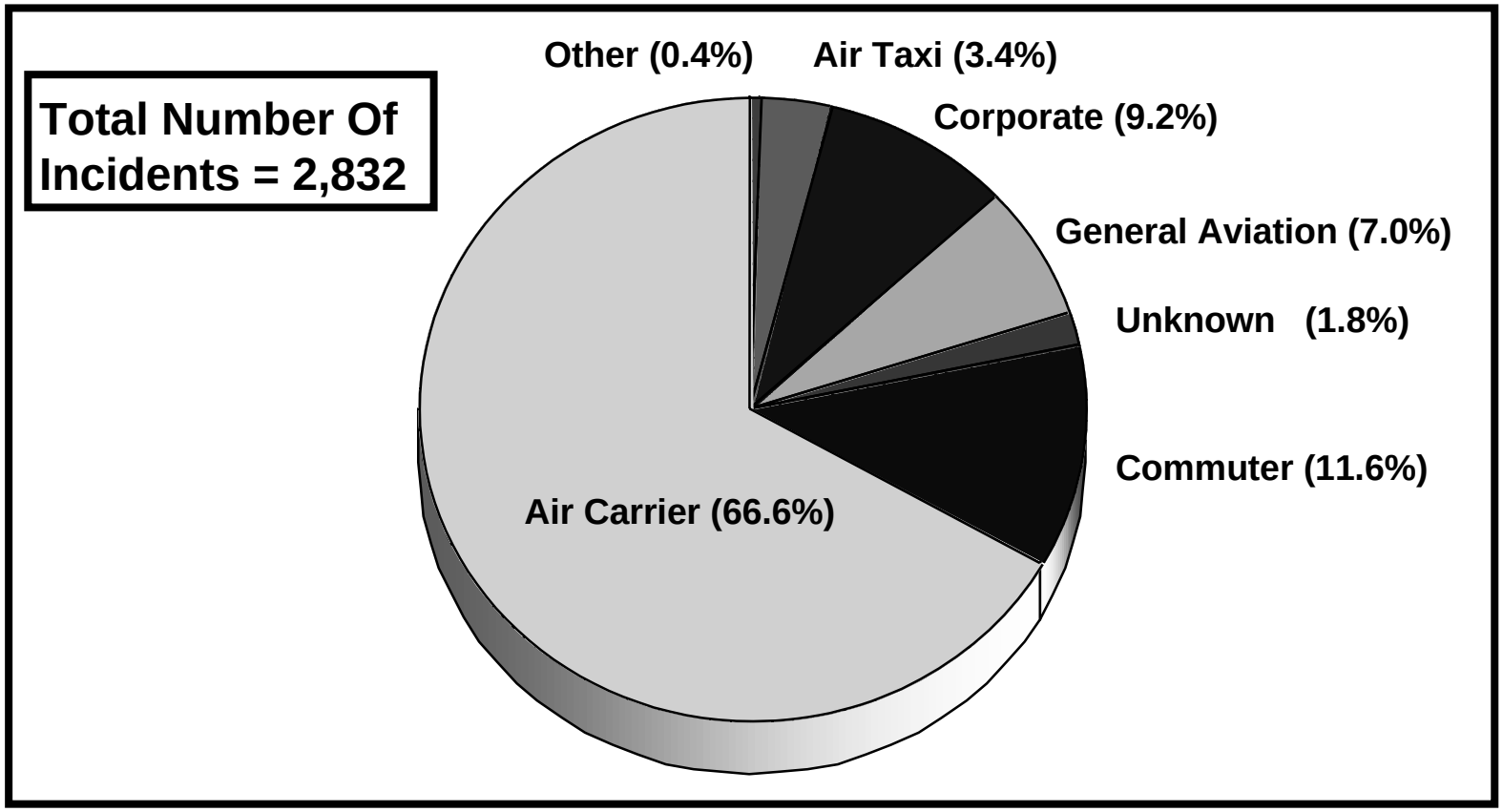
January 1995 - December 1997



NASA Aviation Safety Reporting System Data:

Altitude Deviation Incidents - Primary Operator

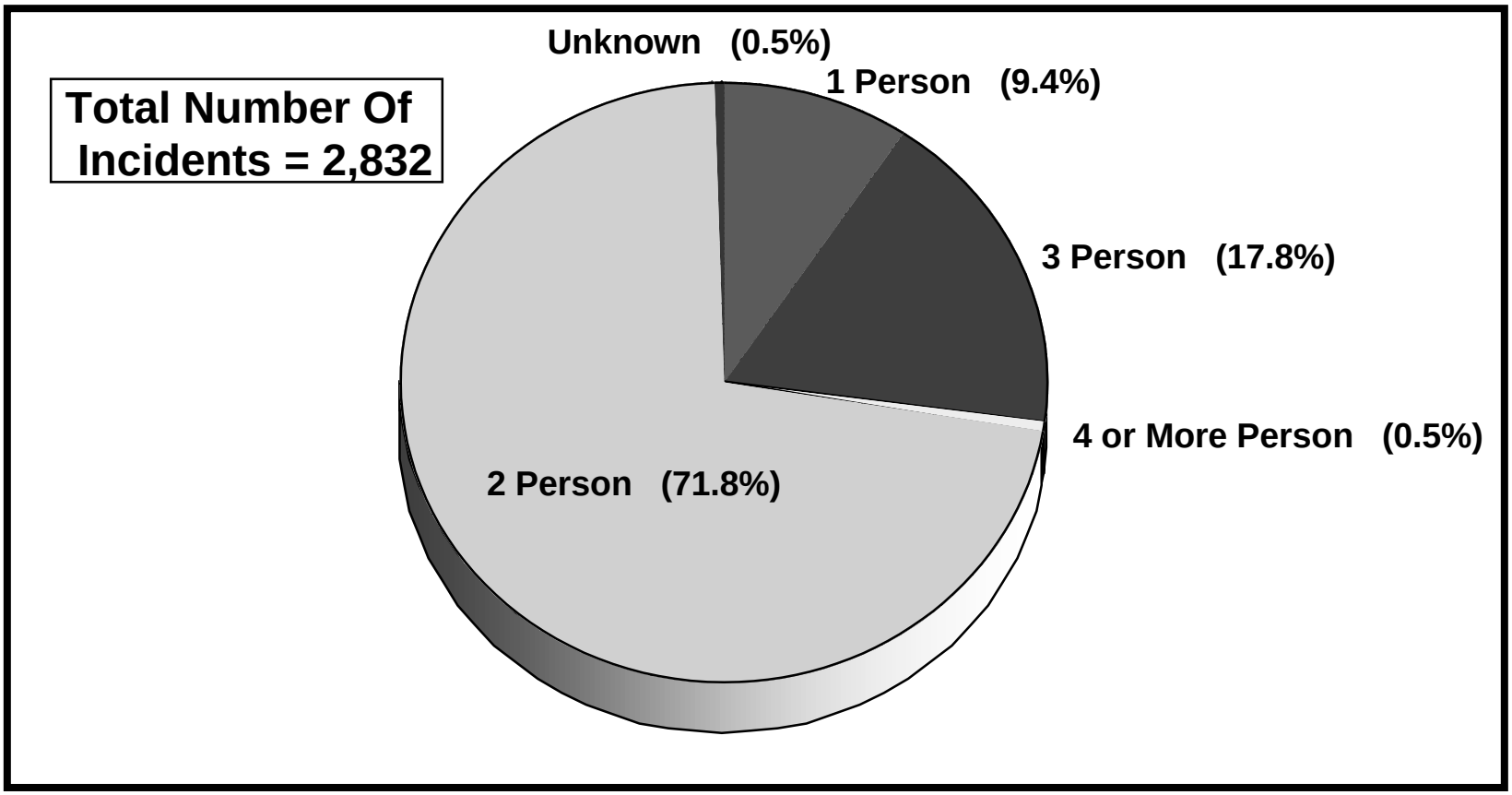
January 1995 - December 1997



NASA Aviation Safety Reporting System Data:

Altitude Deviation Incidents - Primary Crew Size

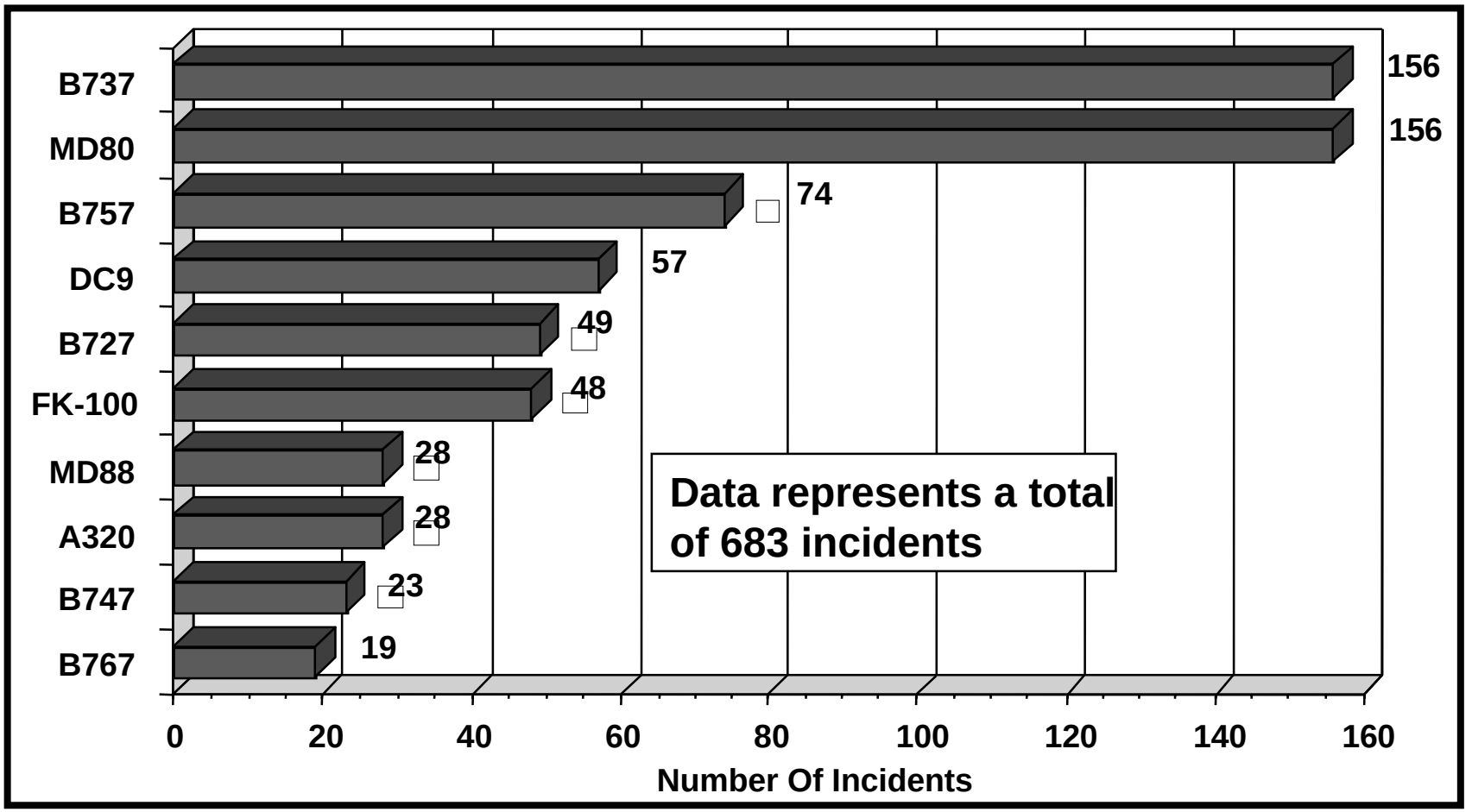
January 1995 - December 1997



NASA Aviation Safety Reporting System Data:

Altitude Deviation Incidents - Top Ten Part 121 Type Aircraft

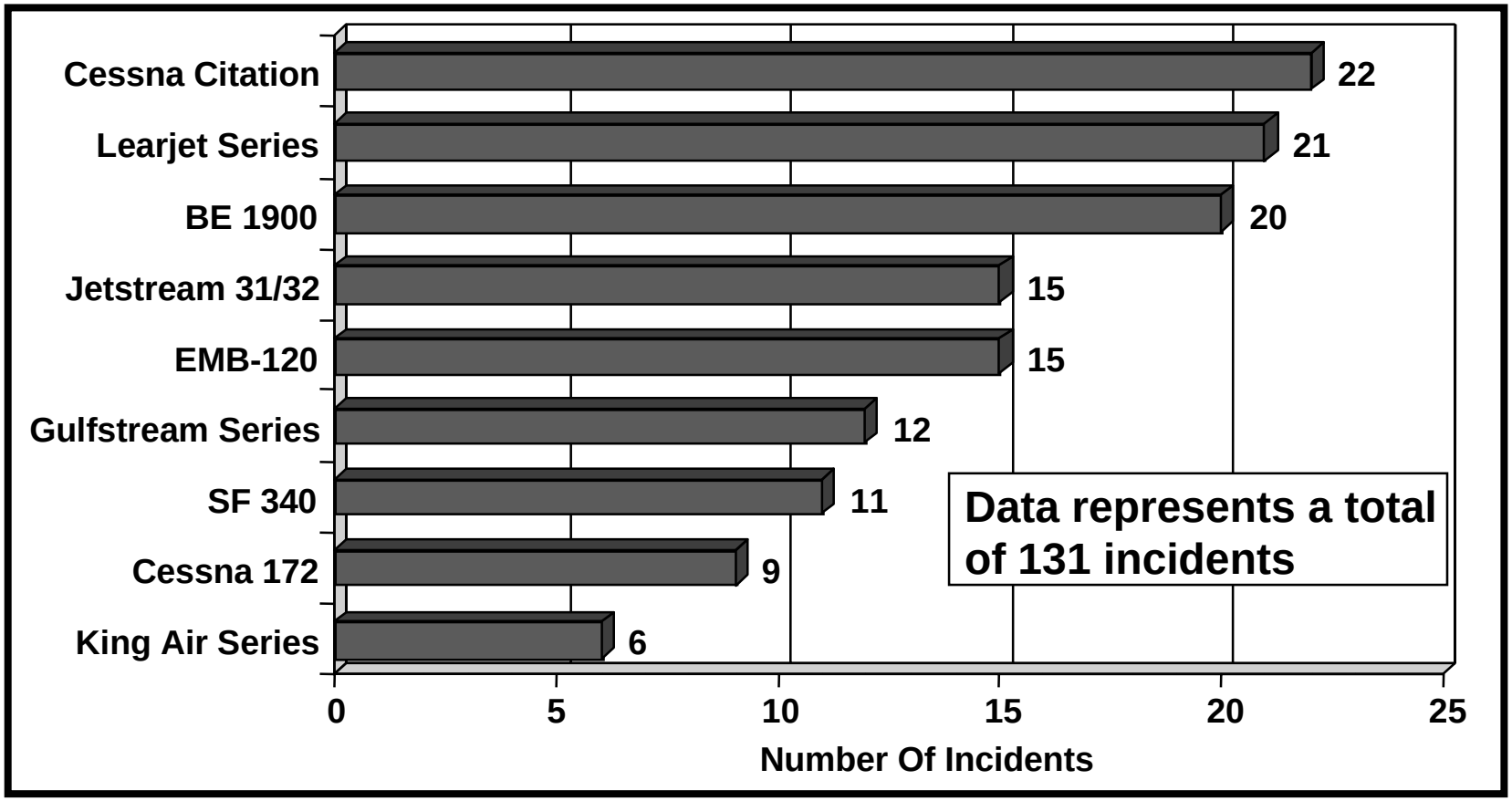
January 1995 - December 1997



NASA Aviation Safety Reporting System Data:

Altitude Deviation Incidents - Top Ten Part 135/91 Type Aircraft

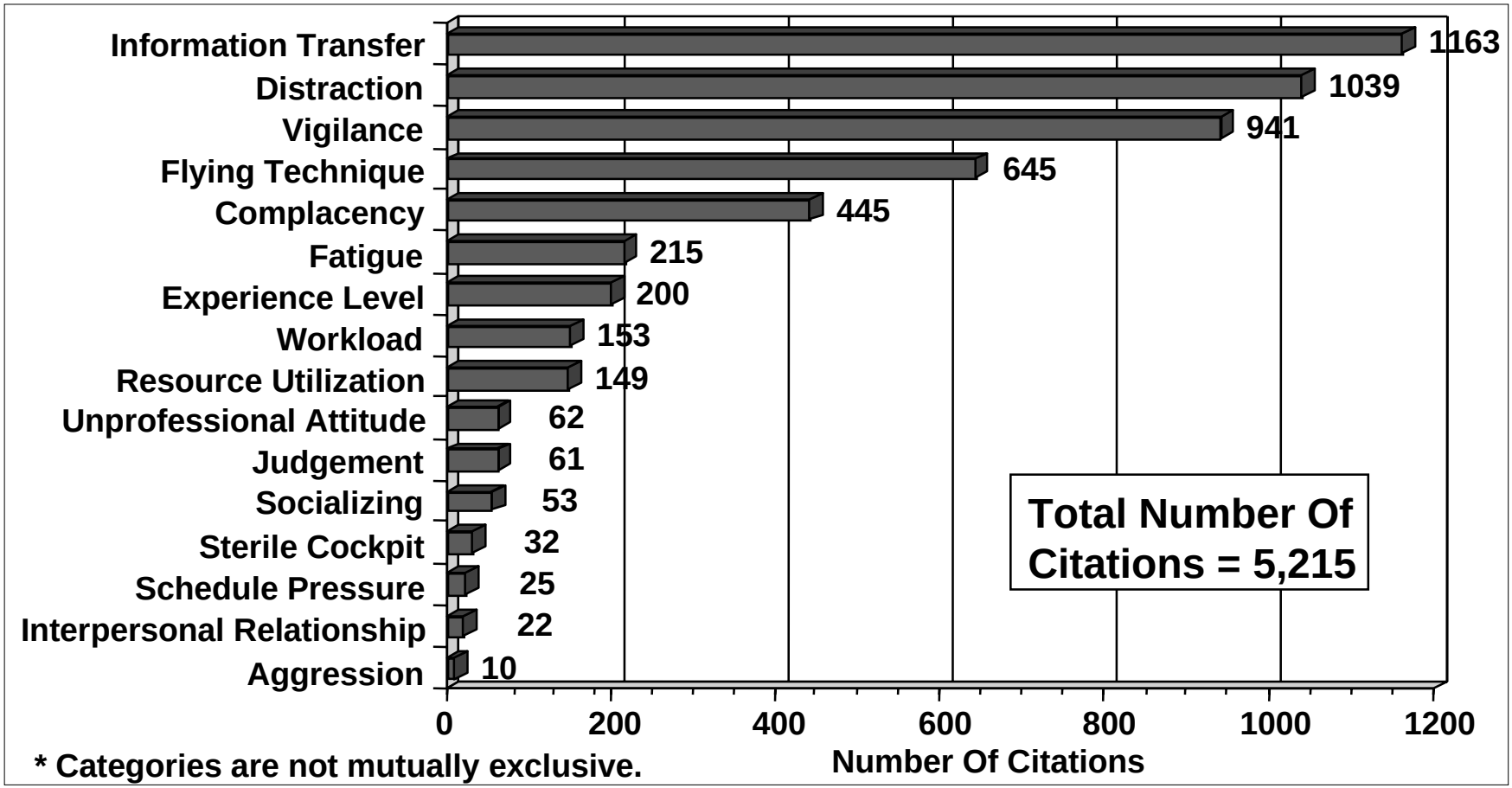
January 1995 - December 1997



NASA Aviation Safety Reporting System Data:

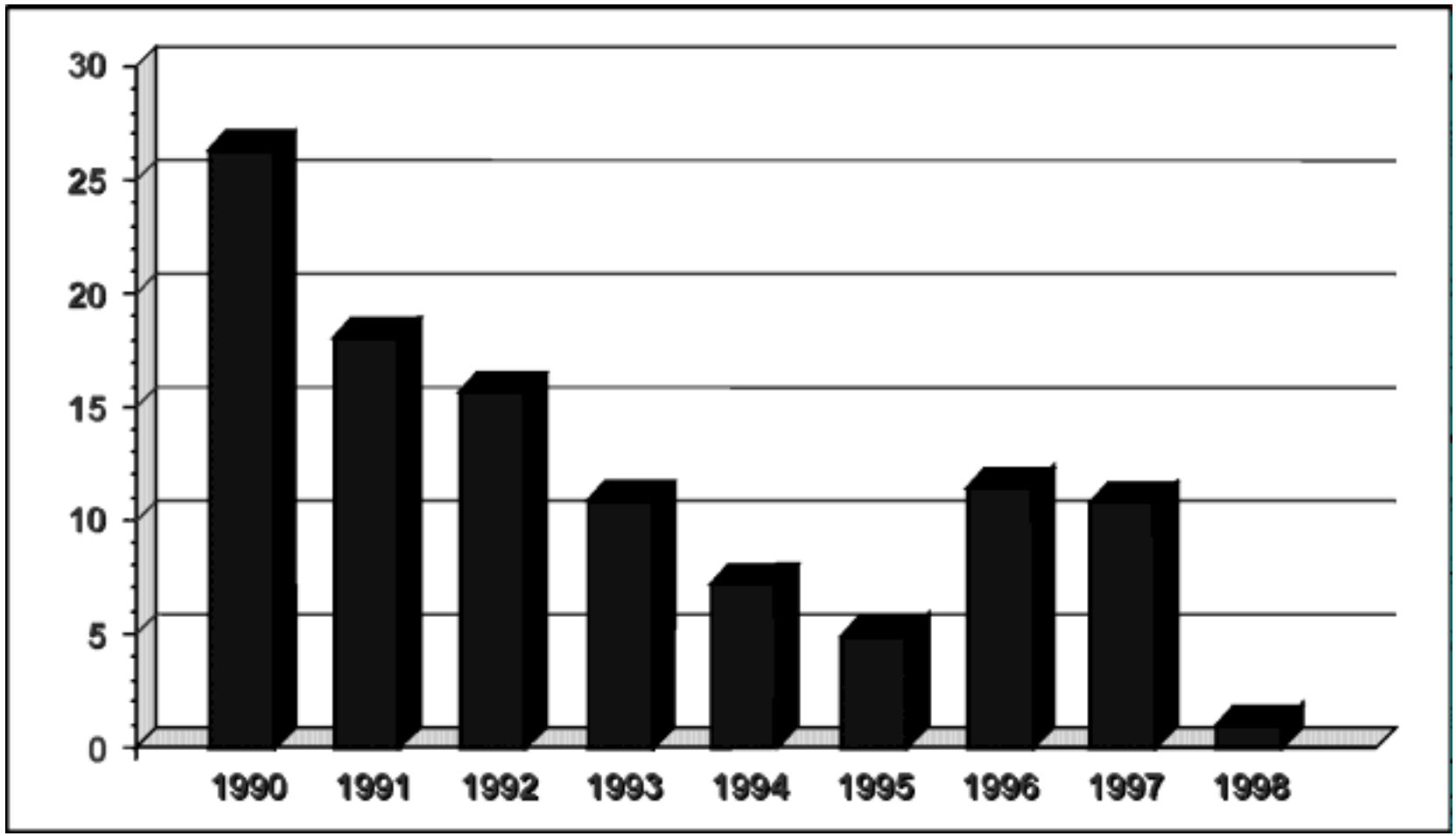
Altitude Deviation Incidents - Human Factors*

January 1995 - December 1997



USAir Altitude Deviations 1990 - 1998

Source: ASY 100



US Airways Altitude Awareness Program