NATIONAL AVIATION OPERATIONS MONITORING SERVICE
(NAOMS)

Presentation to FAA, Washington, DC
April 9, 2003

Purpose

- **A number of databases attempt to capture safety-related information concerning National Airspace System, e.g.**
  - NTSB Accident/Incident Database
  - FAA Data System (NAIMS)
  - Aviation Safety Reporting System (ASRS)
- **A number of databases attempt to capture safety-related information concerning specific parts of the NAS, e.g.**
  - FOQA
  - PDARS
  - ASAP
- **No existing database addresses the health and safety of the NAS as a whole in a quantitatively defensible fashion.**

Goal

To create a new national capability that will quantitatively:

1. Track aviation safety trends
2. Monitor the impacts of technological and procedural changes to the aviation system
3. Contribute to the development of a data-driven basis for safety decisions.

Gov't and Industry Groups Briefed

- FAA
- HAI
- GAMA
- AOPA
- ALPA
- CAST
- NATCA
- NATA
- Boeing
- NBAA
- SWAPA
- ASRS Advisory Subcommittee

NAOMS field study briefing 3/1/00, D.C., 75 attendees

NAOMS Team

NASA Managers

- **Linda Connell** — **AvSP, Level 3**
- **Mary Connors** — **AvSP, Level 3**

Battelle Support Service Contract to NASA

- **Loren Rosenthal** — **Battelle Manager**
- **Robert Dodd** — **Principal Investigator**
- **Jon Krosnick** — **Survey Methodologist**
- **Joan Cwi** — **Survey Application**
- **T. Ferryman** — **Statistician**
- **Mike Silver** — **Survey Methodologist**
- **Mike Jobanek** — **Aviation Safety Analyst**

Agenda

- 9:00-9:15 - NAOMS Introduction
  Mary Connors
- 9:15-9:35 - Concepts and Rationale
  Loren Rosenthal
- 9:35-10:00 - Protocol Development and Description
  Jon Krosnick
- 10:00-10:20 - Data Collection
  Joan Cwi
- 10:20-10:30 Break
- 10:30-12:00 - Air Carrier Survey Results
  Bob Dodd
- 12:00-1:00 - Lunch
- 1:00 - 1:30 - General Aviation Survey
  Mary Connors
- 1:30-2:15 - Future Plans
  - General Survey Perspectives
  Jon Krosnick
  - Perspectives on NAOMS
  Linda Connell
- 2:15-2:25 - Break
- 2:25-2:50 - Outreach and Community Information
  Linda Connell
- 2:50-3:15 - Summary and Wrap-up
  Mary Connors and Irv Statler
- 3:15-5:00 - Discussion
  AvSSP Program Office, NAOMS Team
- Adjourn

CONCEPTS and RATIONALE

Loren Rosenthal

The Unmet Data Need

- **Reliable, stable numbers with system-wide scope**
  - To inform policy decisions
  - And, investment decisions
- **Providing better and more rapid feedback on system change**
  - Technological and procedural
- **Facilitating a truly data-driven basis for safety decisions**
  - An escape from the accident *du jour* policy-making syndrome

After examining various possibilities, it was decided that a survey approach could best meet the unmet requirements

Features of the Survey Method

- Human-centered
- Quantitative
- Flexible (versatile, topical)
- Comprehensive
- Well developed methodology
- Statistically accurate
- Stable

Users of Survey Research

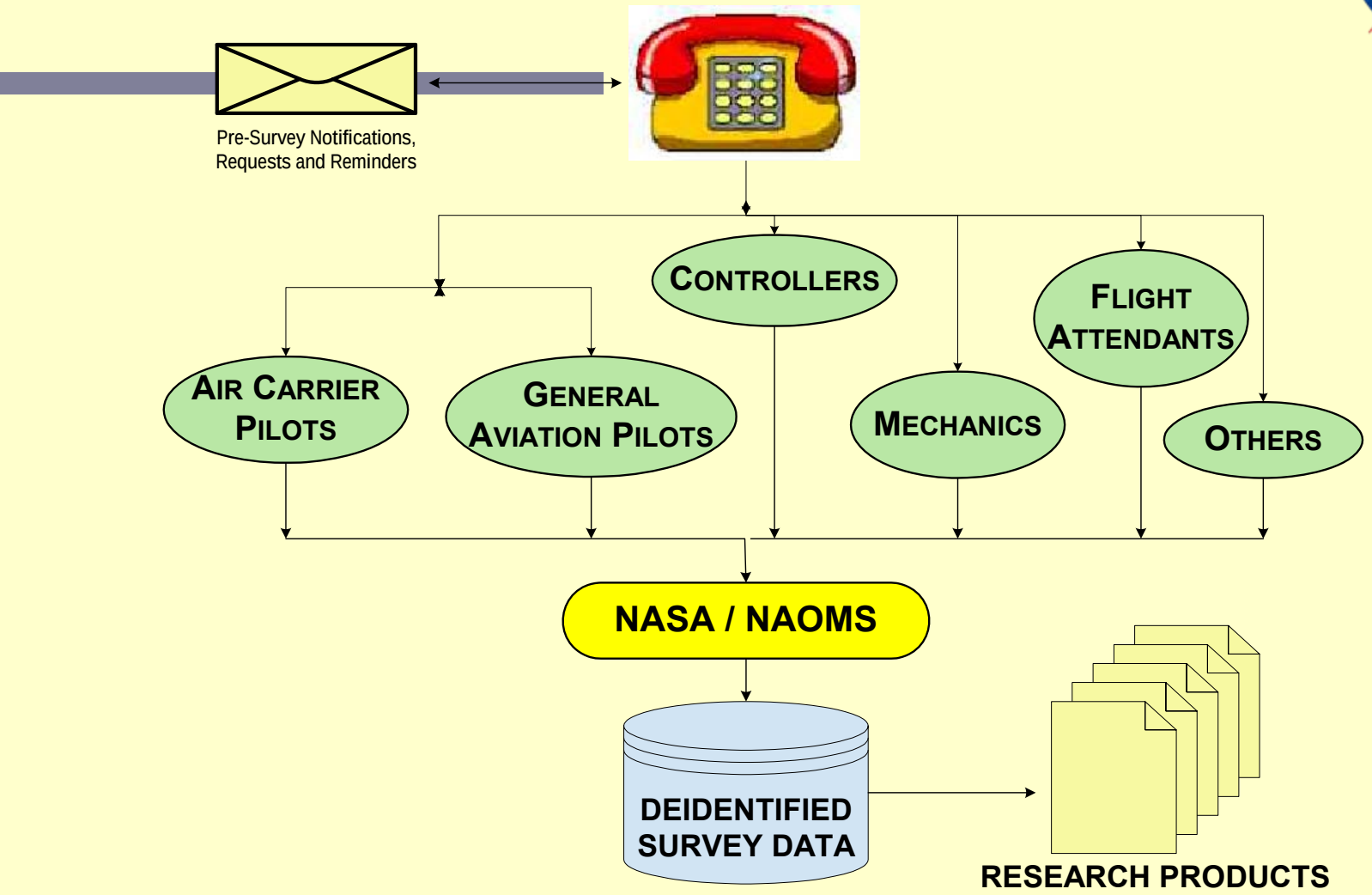
The advantages of the survey method have been demonstrated by its wide use in:

- Federal, State, and Local Government
- Academia
- Federal and State Courts
- Consumer Research

NAOMS Survey Approach

- **Regularly survey pilots, controllers, mechanics, flight attendants and others who operate the national aviation system (NAS)**
  - View the national aviation system through their eyes
  - Includes all types of operations (air carrier, regional, corporate, general aviation)
- **Collect data on respondents events (as operationally experienced)**
- **Guarantee confidentiality of data**
- **Normalize for risk exposure (hours, legs, etc.)**
- **Achieve scientific integrity by using well crafted survey instruments and statistical analysis methods**

NAOMS PROCESS



NAOMS Outputs

- **Safety Event Rates and Trends**
- **Quantitative Analyses of Safety Issues**

NAOMS EVENT RATE ESTIMATES

Preliminary Estimates for Internal Use Only

Equipment Problems Question		Risk Exposure Factor	Estimated Event Frequency per Million Exposure Units (COV)* SMA	MED	LRG	WDB
ER1	Diversion Due to Equipment Problem	Hours	2,197.5 (17.16%)	783.8 (6.8%)	496.7 (12.4%)	577.3 (6.9%)
ER2	Hazmat Spill, Fire, or Fumes	Legs		67.4 (32.9%)	53.4 (104.3%)	334.0 (25.2%)
ER3	Cargo Shift	Legs	262.1 (17.54%)	115.2 (29.7%)	2,159.6 (13.9%)	2,674.9 (9.8%)
ER4A	Uncommanded Movement of Elevators	Hours	578.7 (27.50%)	243.7 (15.2%)	115.5 (50.9%)	137.0 (17.8%)
ER4B	Uncommanded Movement of Rudder	Hours	219.8 (39.66%)	81.5 (19.7%)	46.3 (35.8%)	61.2 (29.3%)
ER4C	Uncommanded Movement of Ailerons	Hours	262.0 (53.84%)	103.3 (19.8%)	23.6 (55.2%)	67.6 (27.5%)
ER4D	Uncommanded Movement of Spoilers	Hours	65.2 (45.30%)	97.8 (24.6%)	72.5 (59.5%)	82.3 (24.7%)
ER4E	Uncommanded Movement of Speedbrakes	Hours	78.8 (54.34%)	54.0 (34.5%)	27.4 (18.0%)	37.6 (54.8%)
ER4F	Uncommanded Movement of Trimtabs	Hours	217.2 (43.90%)	53.6 (23.4%)	15.2 (75.2%)	19.9 (49.7%)
ER4G	Uncommanded Movement of Flaps	Hours	216.5 (37.63%)	44.6 (24.9%)	64.5 (34.7%)	50.1 (23.9%)
ER4H	Uncommanded Movement of Slats	Hours	12.2 (285.23%)	42.0 (26.6%)	53.5 (35.1%)	61.1 (29.1%)
ER4I	Uncommanded Movement of Other	Hours	475.8 (32.84%)	178.4 (12.7%)	193.6 (21.6%)	161.2 (12.3%)
ER5A	Fire, Smoke, or Fumes; Engine or Nacelle	Hours	177.8 (54.42%)	70.8 (24.1%)	65.0 (61.5%)	64.8 (28.5%)
ER5B	Fire, Smoke, or Fumes; Flight Deck	Hours	140.5 (18.84%)	50.7 (22.8%)	63.3 (29.6%)	66.1 (19.6%)
ER5C	Fire, Smoke, or Fumes; Cargo Hold	Hours		24.8 (37.8%)	30.2 (70.6%)	47.5 (28.6%)
ER5D	Fire, Smoke, or Fumes; Galley	Hours	116.9 (51.47%)	328.2 (9.8%)	199.7 (44.3%)	266.3 (10.2%)
ER5E	Fire, Smoke, or Fumes; Elsewhere in Pax Compart't	Hours	136.6 (44.9%)	231.5 (11.0%)	157.4 (17.5%)	230.1 (12.5%)
ER5F	Fire, Smoke, or Fumes; Elsewhere	Hours	92.9 (49.4%)	185.1 (13.2%)	86.4 (40.2%)	114.5 (18.8%)
ER6	Precautionary Engine Shutdown	Hours	570.3 (35.08%)	94.2 (17.2%)	50.9 (45.8%)	119.0 (36.9%)
ER7	Total Engine Failure	Hours	187.8 (90.02%)	24.8 (33.6%)	2.9 (120.1%)	43.1 (36.8%)

Protocol Development and Description

Jon Krosnick

Surveys Can Measure:

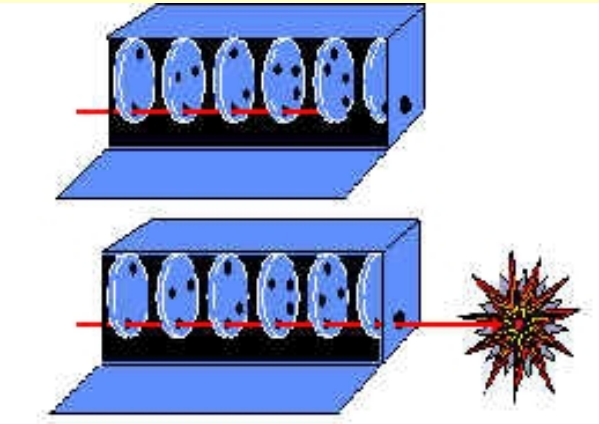
- Attitudes
- Preferences
- Beliefs about the state of the world
- Predictions about the future
- Past behavioral experiences or events

NAOMS will focus on the measurement of events

NAOMS
Design Decisions

- What events to address?
- What order of questions?
- How long of a recall period?
- What mode?

Types of Events



Accidents

↑

Proximal Causal Events

↑

Distal Causal Events

↑

Static Contribution Factors

Mid-air collision

Incorrect altitude

Altitude clearance misunderstood by pilot

Microphone, earphones, radios, pilot's hearing, noise, etc

Building Lists of Events

- **Consultation with Industry/Gov't Safety Group, e.g.**
  - CAST
  - FAA
  - ASRS Analysts
  - Workshops
- **Review of Aviation Databases, e.g.,**
  - ASRS
  - NTSB
  - NAIMS
  - BTS
- **Decision: Sample Events at Distal or Proximal Levels of Event Chain**
- **Focus Groups with Active Professional Participants**

Question Ordering

Question Ordering Relates to Memory Organization:

- Records of experiences are organized systematically and thematically in memory
- Asking questions in clusters that match a person's memory organization improves measurement precision
- Various hypotheses about how pilots might organize their memories discussed, but no hard data.

Memory Organizations

- **Severity**
- **Causes**
- **Phase of Flight**

Identifying Memory Organization

- **Experiments**
- **Participants: Air carrier pilots**
- **Various tasks**
  - Order of Recall
  - Labeling of Clusters
  - Sorting of Events into Categories
- **Decision: A "hybrid" organization emerged: mostly causes with some phases**

Recall Period

Recall Period - The optimal time between event occurrence and survey

- Needs to maximize recall and balance survey logistics
- Memories fade over time
- Participants should not be asked to recall things from too far in the past
- Literature Review: A literature review resulted in data that we felt to be insufficient for our purposes
- Our own study of pilots' recall of mundane flight events: 7 days maximum
- We needed to determine how long more serious events can be remembered

Recall Period: Validity Analysis

- Association of hours flown with number of events witnessed
- Association of days in the recall period with number of events witnessed
- Strongest relationships for one month and two months
- Decision: Keep recall period less than four months (60 days chosen as recall period)

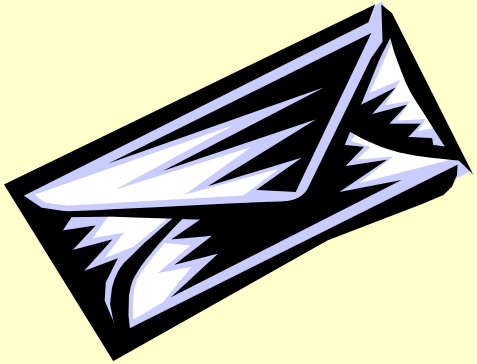
Data Collection Modes

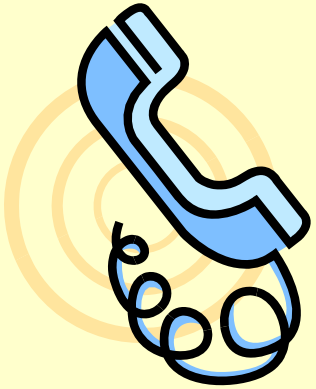
- **Mailed, Self-Administered (SAQ)**
- **Telephone (CATI)**
- **In-Person**

Each mode has positive and negative aspects related to a variety of considerations

Test Findings:

- **Response Rate**
  - Mail 73%
  - Telephone 81%
- **Completion Rate**
  (% missing responses)
  - Mail 4.8%
  - Telephone 0.0%
- **Confidence Rating**
  - Mail 80%
  - Telephone 91%





In-Person Interviewing Terminated Early d/t Time and Cost Investment

Mode: Selection and Validation

- **Validation results:**
  - More hours flown should be associated with more events witnessed
  - More days in the recall period should be associated with more events witnessed
  - Stronger relationships indicate more accurate reporting
- **Mode selection:**
  - 30% stronger relationships for telephone than mail
- **Decision: Perform telephone interviewing (Computer Assisted Telephone Interview - CATI)**

Summary of Design Conclusions

- Address as many safety events identified during preliminary investigations as practical
- Order questions to match hybrid clustering
- Use 60-day recall period to maximize documentation of rare events
- Use telephone interviewing to maximize measurement accuracy

Data Collection

Joan Cwi

Sample Design

- **Sample source**
  - Airmen Certification Directory (N = 670,000)
  - Available online at FAA Oklahoma City
- **Samples are drawn among U.S.-based pilots**
  - Air Carrier (N = 55,000) currently available
- **Sample drawn on quarterly basis**
  - Sampling without replacement for 12 rolling months

Locating Pilots

- **Addresses updated, telephone numbers obtained**
  - National Change of Address
  - Telematch
  - Other sources, such as Directory Assistance, Web sites
- **Location results**
  - 80% of AC pilots

Interviewing Process

- Sending Advance Letter
- Screening for Eligibility
- Conducting the Interview

Sending Advance Letter

- **Sent to pilots about a week before calling**
- **On NASA letterhead/envelopes**
- **Explains**
  - purpose of study
  - what participation means
  - confidentiality
  - who will call
  - etc.

Screening for Eligibility

- **Attempt to screen all pilots by telephone**
- **AC screener**
  - Determines pilot has flow in last 60 days as air carrier pilot

Conducting the Interview

- Conduct screening and interviewing using computer-assisted telephone interviewing (CATI)
- Interviewer administers questionnaire from telephone center
- Questionnaire pre-programmed into computer so data entered immediately--no additional data entry
- CATI has most error checks built into the programs--requires little editing
- 10% of each interviewer's work is validated

Air Carrier Interviewing Effort

- **Yearly interviewing effort**
  - Sample size (N = 14,300)
  - Screening (N = 10,700)
  - Interview (N = 8,000)
  - Interview length averages 18 minutes
- **Non- completes**
  - No locates (N = 18%)
  - Not eligible (N = 19%)
- **Progress to date (1.5 years)**
  - 11,800 completed interviews

Air Carrier Survey Overview

Linda Connell

Air Carrier Questionnaire Structure*

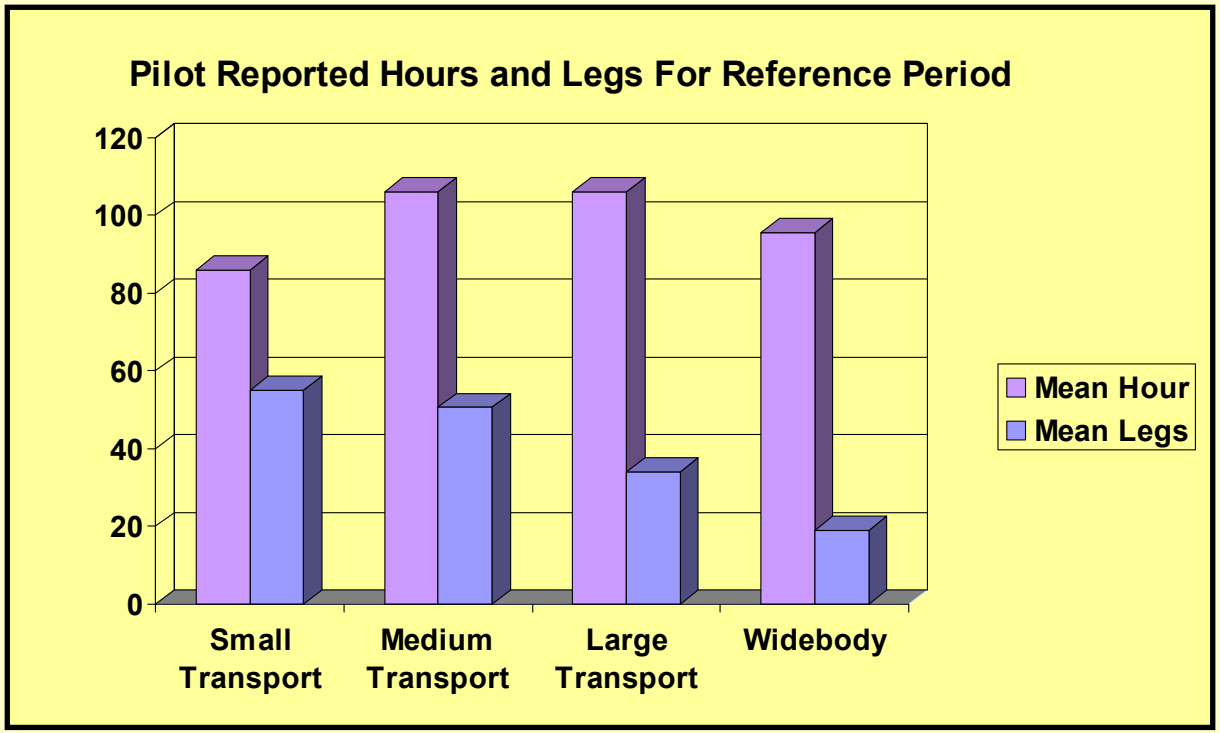
- **Section A: Descriptive Demographic Information**
  - Information suitable for exposure determination: Lifetime hours flown, hours and legs flown last 60 days, aircraft make/model, type flights, crew position and more
- **Section B: Safety Related Events**
  - Consistent data set over time
- **Section C: Focus Questions**
  - Specific topics driven by government/industry high-priority needs
- **Section D: Questionnaire Feedback**

*** Data collection started April, 2001; over 11,800 completed interviews to date**

Air Carrier Results
Section A - Demographics

Respondent Flight Experience	Mean Value
Total Life-Time Flight Hours	10,094 hours
Last 60 Days Flight Hours	97.8 hours
Last 60 Days Departures	37 Departures

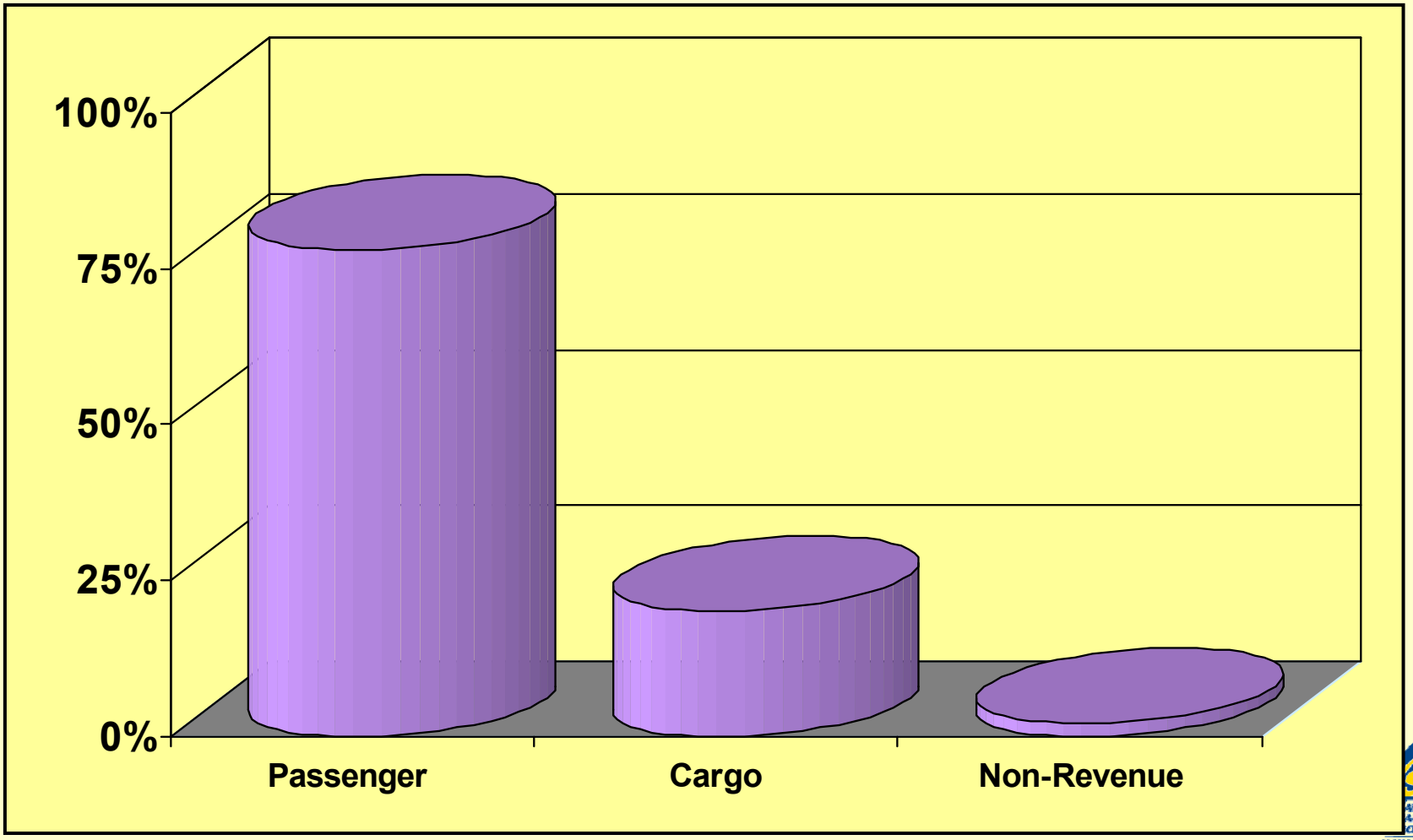
Hours and Legs by Aircraft Size



Aircraft Size	Mean Hours Per Leg
Small Transport	1.5
Medium Transport	2.1
Large Transport	3.1
Widebody	4.9

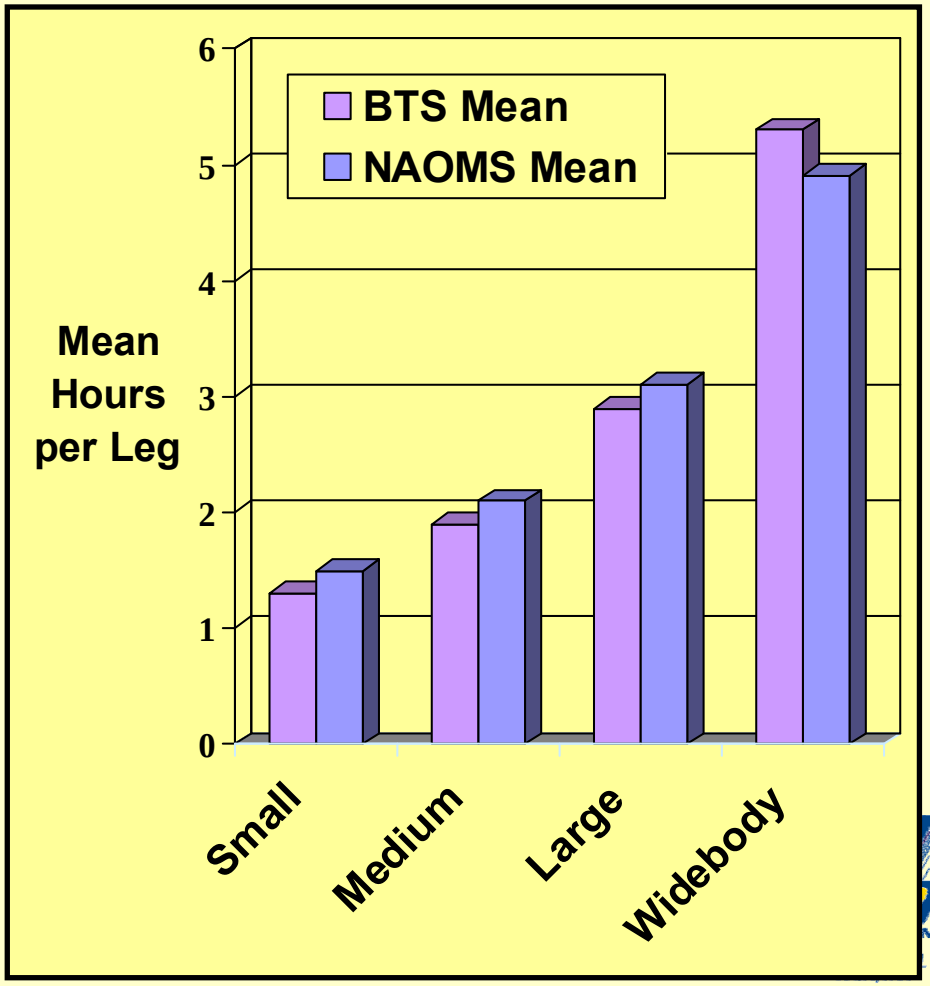
- Small Transport < 100 k lbs GTOW
- Medium Transport ≥ 100 k lbs and < 200 k lbs GTOW
- Large Transport > 200 k lbs GTOW with single aisle
- Widebody > 300k lbs GTOW with two aisles

Type of Flight

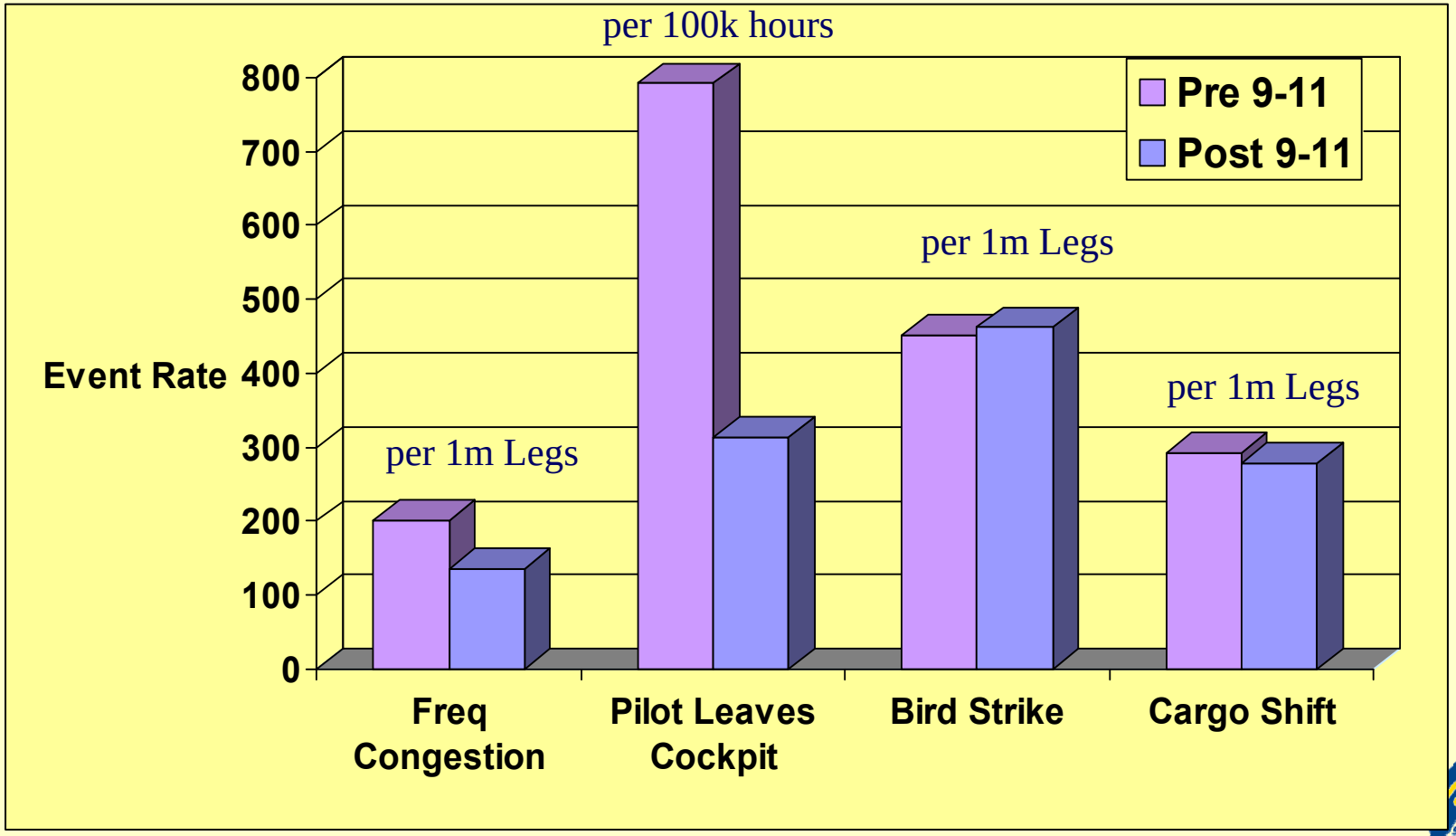


NAOMS Flight Time per Leg Estimates Compared to BTS Census Data

Aircraft Category	Estimate Source	Mean Hours Per Leg
Small Transport	NAOMS	1.5
	BTS	1.3
Medium Transport	NAOMS	2.1
	BTS	1.9
Large Transport	NAOMS	3.1
	BTS	2.9
Widebody	NAOMS	4.9
	BTS	5.3



Pre and Post 9-11
Evaluation of Sample Events



Section B: Safety Related Events

- Equipment Problems
- Turbulence
- Weather Events While Airborne
- Passenger Related Events
- Airborne Conflicts
- Ground Operations
- Aircraft Handling Events
- Altitude Deviations
- Air Traffic Control Interactions

Example
Air Carrier Results

Robert Dodd

Equipment-Related Events

This section addresses aircraft related equipment failures such as equipment-related diversions, engine problems, uncommanded movements etc.

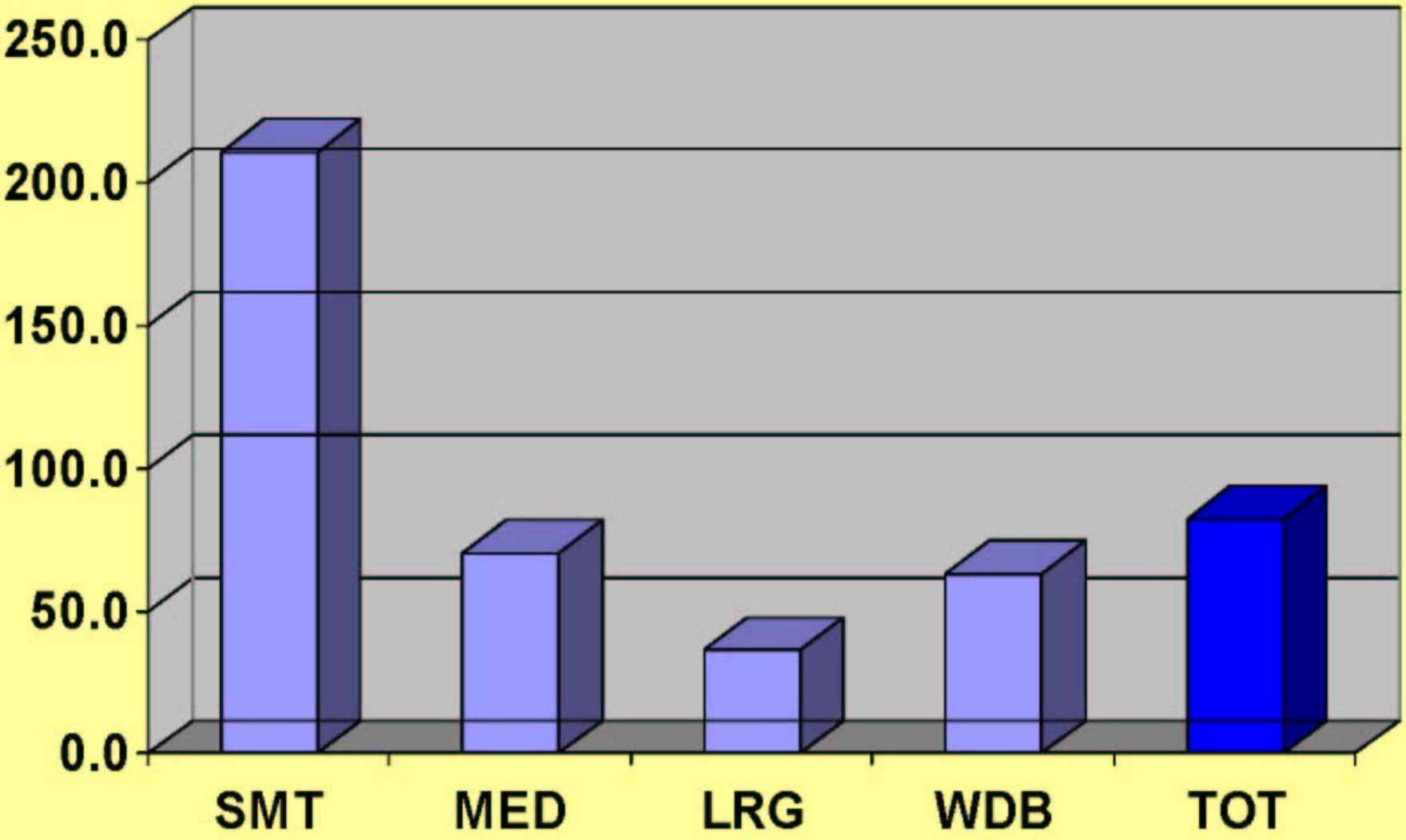
Estimated Air Carrier Event Rates

Diversion Due to Equipment Problem

Question: **Equipment Problems (ER1)**

Exposure Factor: **Events per 100k Hours**

Rate estimates based on all data collected through October, 2002.



Turbulence Events

Questions address weather-related, clear-air, and wake turbulence.

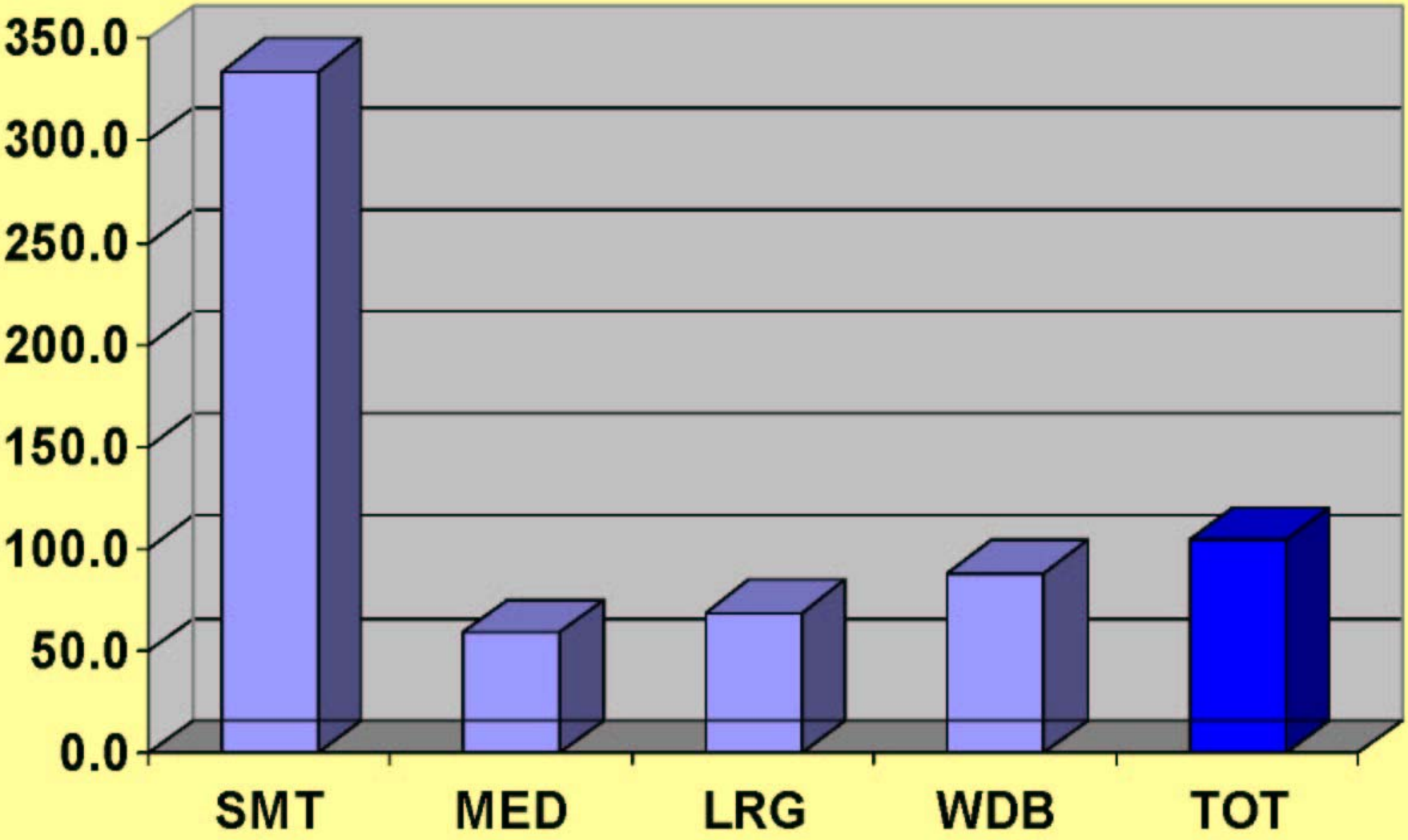
Estimated Air Carrier Event Rates

Severe Turbulence Encounter

Question: Turbulence Encounters (TU1)

Exposure Factor: Events per 100k Hours

Rate estimates based on all data collected through October, 2002.



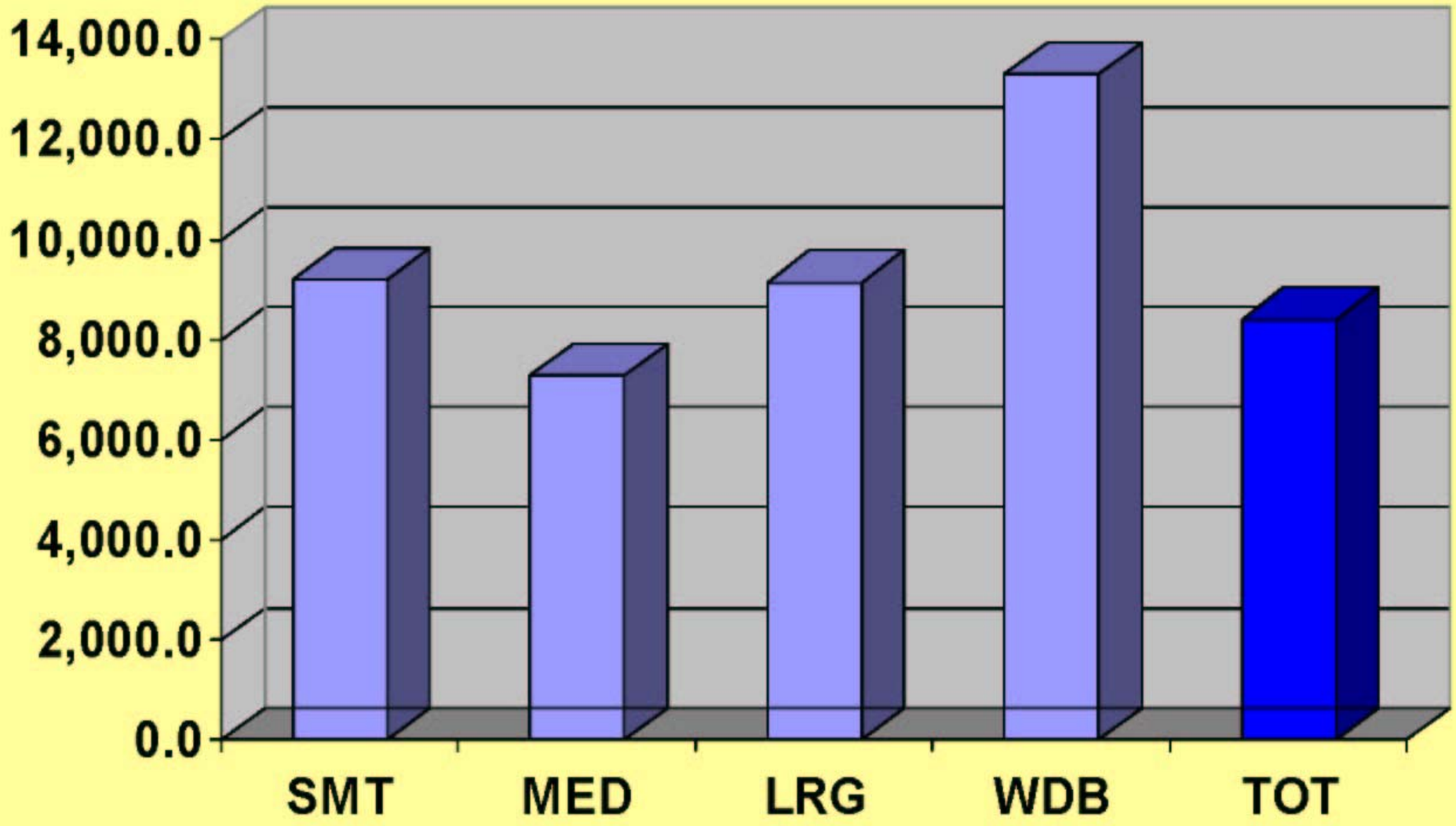
Estimated Air Carrier Event Rates

Windshear or Microburst Encounter; >15 Knot Airspeed Chg

Question: Weather-Related Events (WE5)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



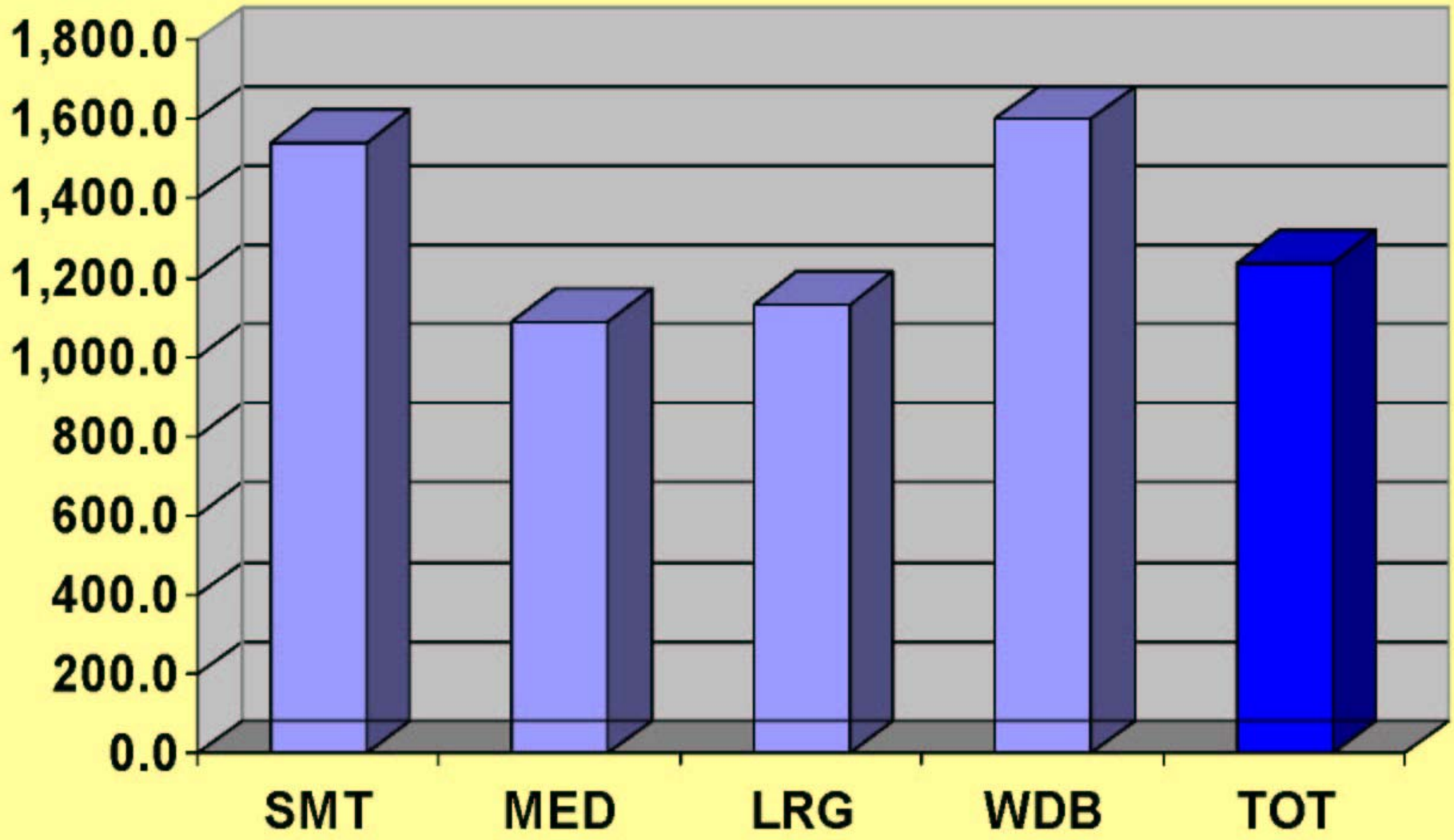
Estimated Air Carrier Event Rates

Windshear or Microburst Encounter; Windshear Maneuver

Question: Weather-Related Events (WE6)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



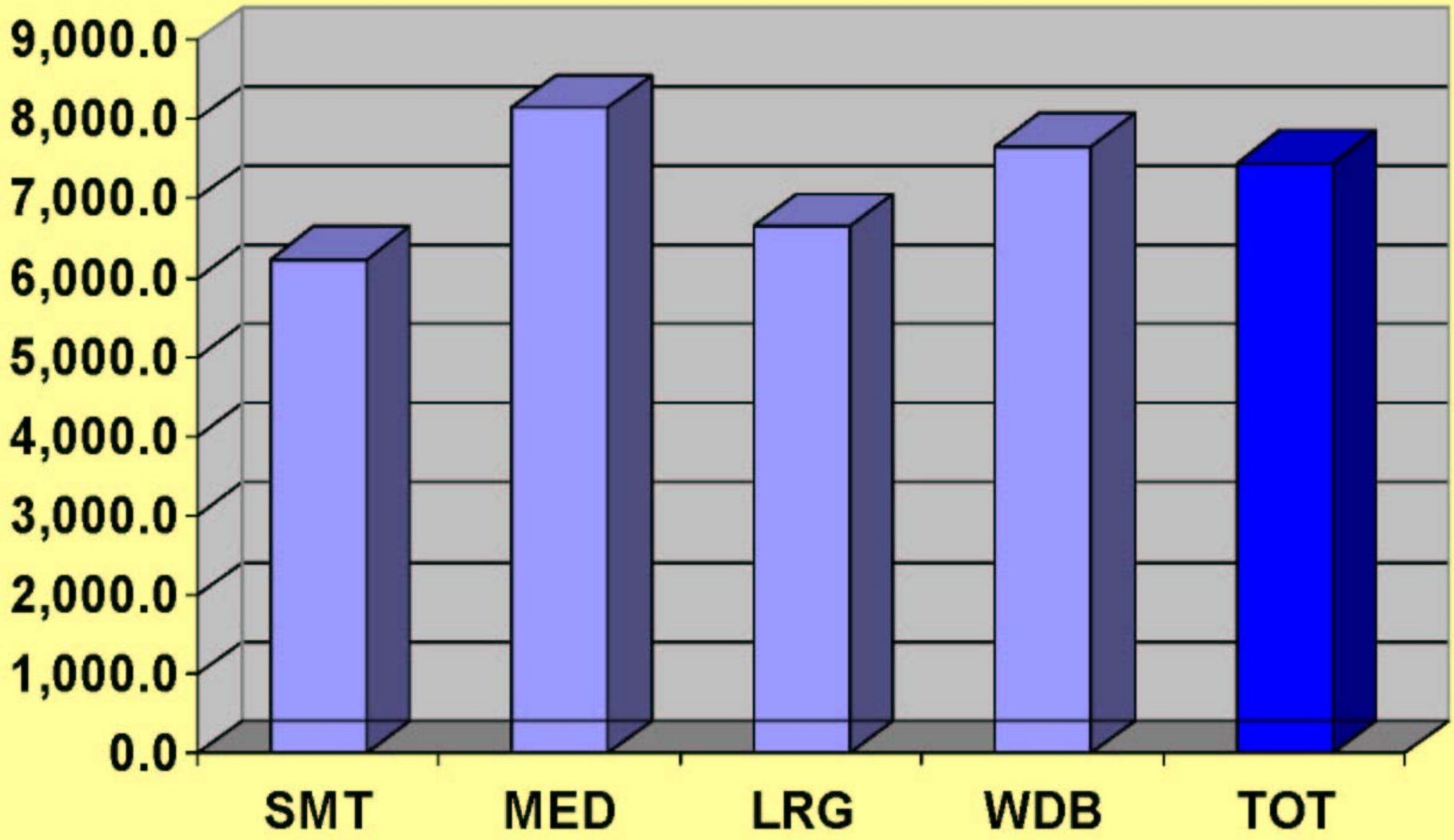
Estimated Air Carrier Event Rates

Wake Turbulence Encounter

Question: Turbulence Encounters (TU2)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



Weather-Related Events

Questions focus on weather related events and issues. Topics include, but are not limited to, airframe icing, wind shear, weather diversions and other factors.

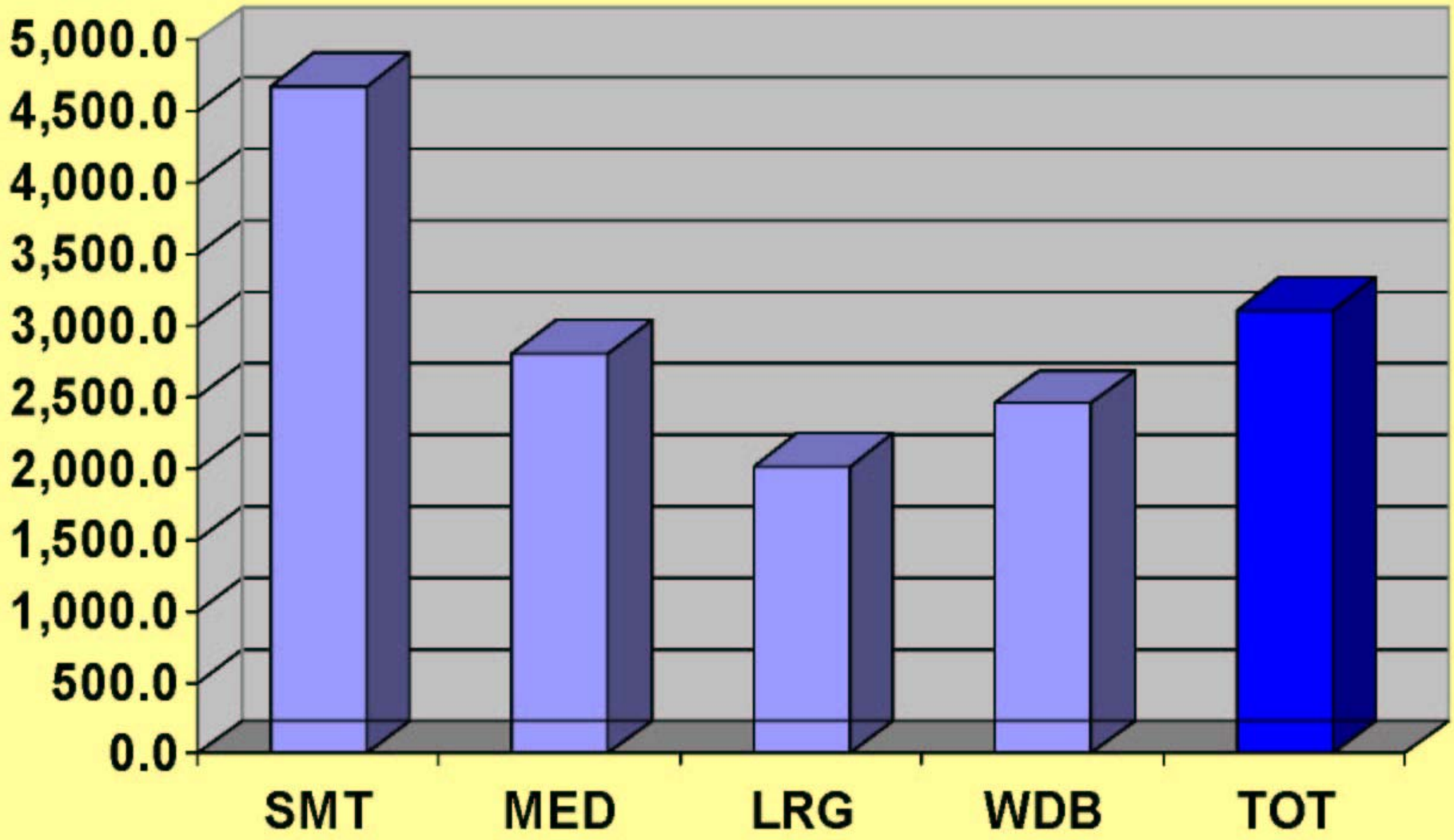
Estimated Air Carrier Event Rates

Diverted to Alternate Airfield because of Wx

Question: Weather-Related Events (WE3)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



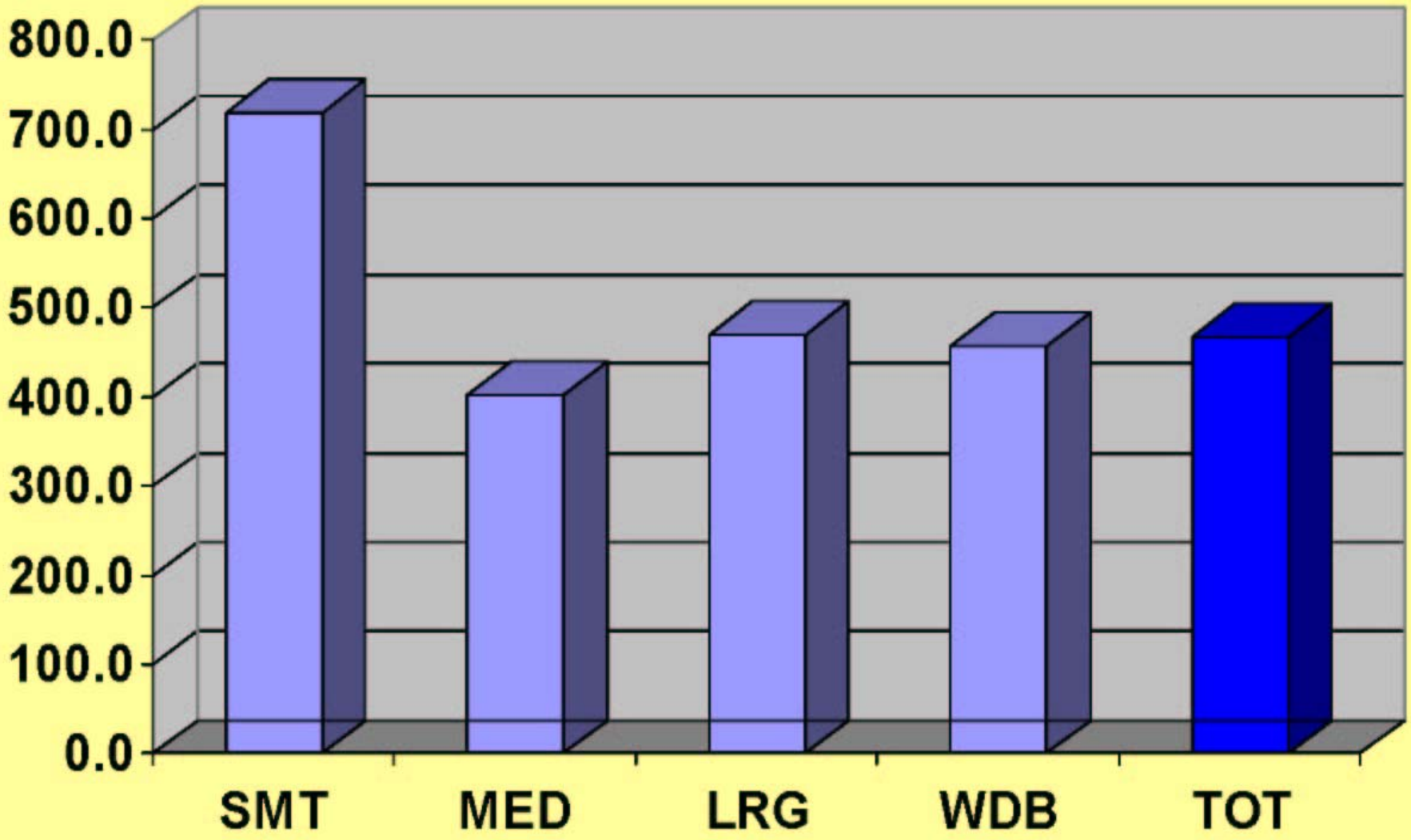
Estimated Air Carrier Event Rates

Lacked Good Wx Info while Airborne

Question: Weather-Related Events (WE1)

Exposure Factor: Events per 100k Hours

Rate estimates based on all data collected through October, 2002.



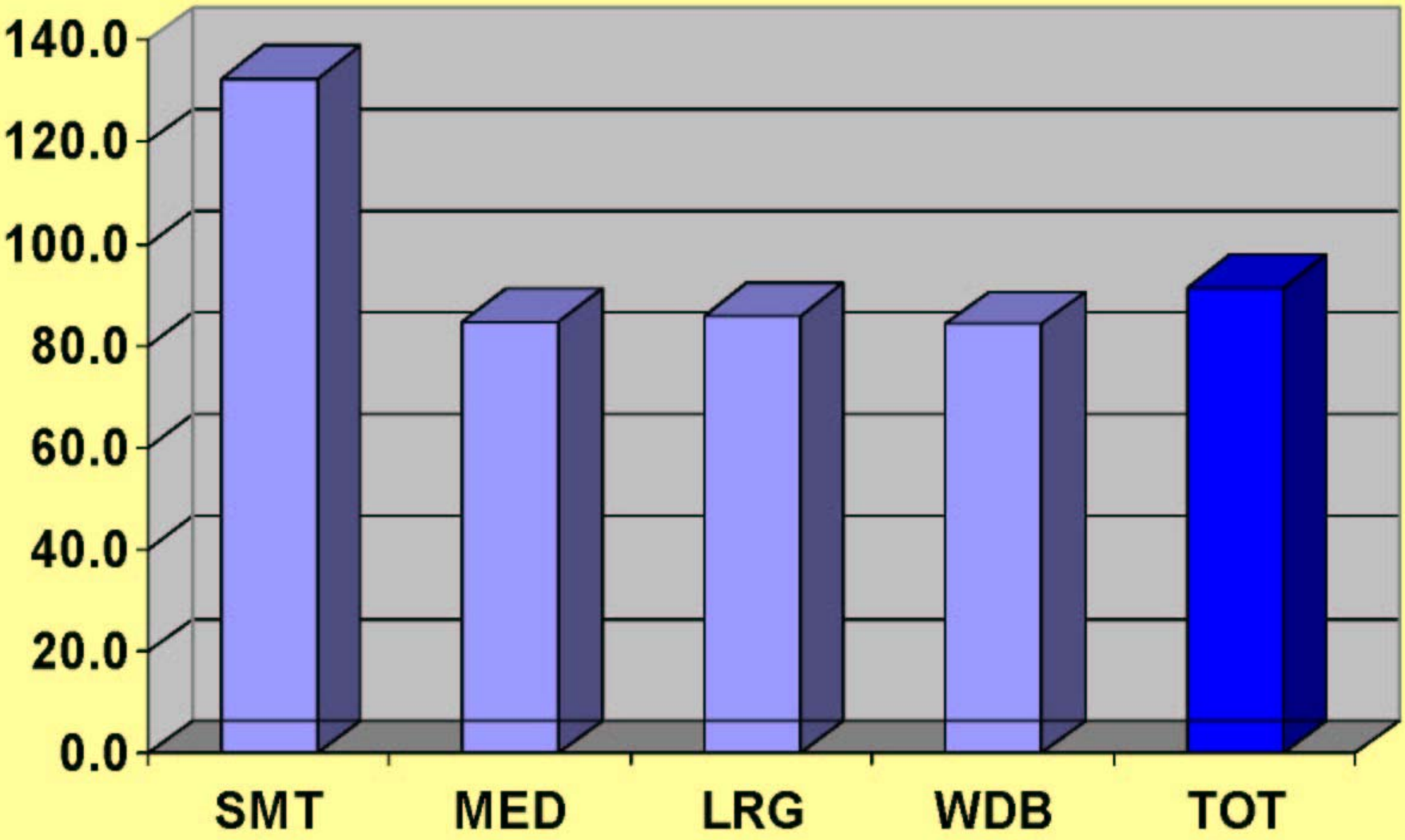
Estimated Air Carrier Event Rates

ATC Denied Request to Circumvent Wx

Question: Weather-Related Events (WE2)

Exposure Factor: Events per 100k Hours

Rate estimates based on all data collected through October, 2002.



Passenger-Related Events

These questions focus on passenger emergencies and disruptions.

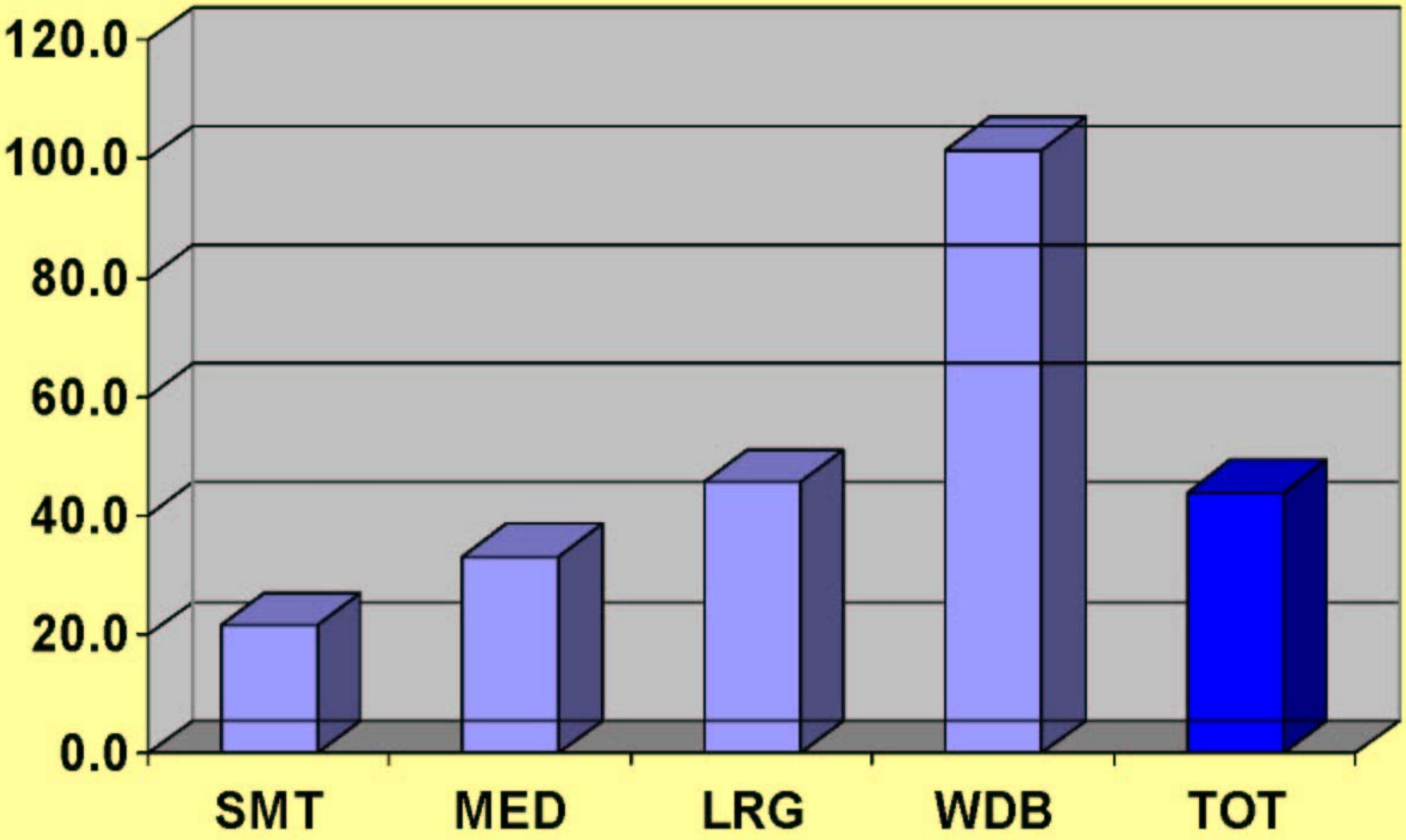
Estimated Air Carrier Event Rates

Pilot Left Cockpit to Deal with Pax Disturbance

Question: Passenger-Related Events (CP3)

Exposure Factor: Events per 100k Hours

Rate estimates based on all data collected through October, 2002.



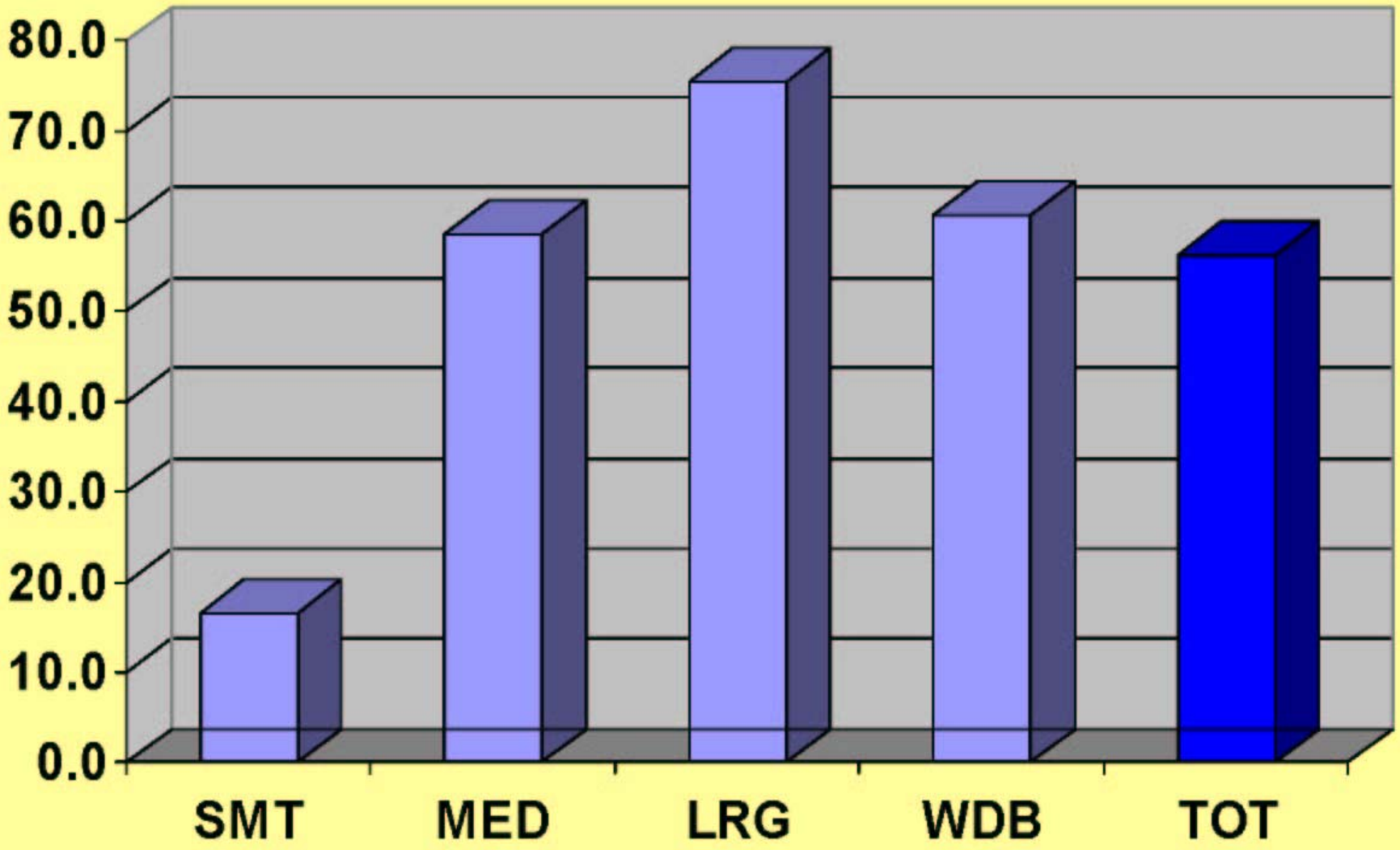
Estimated Air Carrier Event Rates

Expedited Lndg or Diversion due to Pax Medical Emergency

Question: Passenger-Related Events (CP1)

Exposure Factor: Events per 100k Hours

Rate estimates based on all data collected through October, 2002.



Airborne Conflicts

Airborne conflicts involve issues such as near mid-air collisions, evasive actions to avoid collisions and bird strikes.

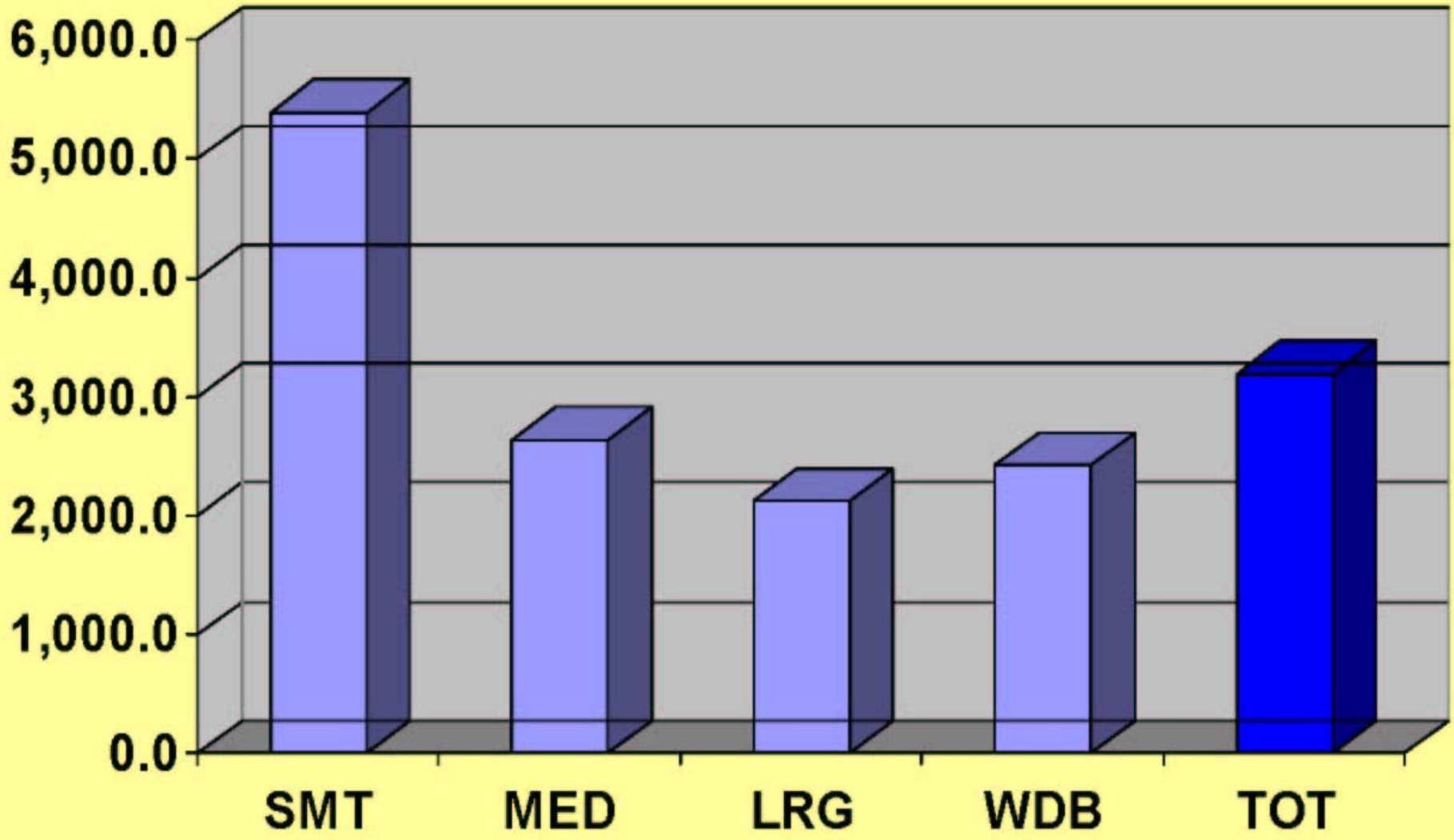
Estimated Air Carrier Event Rates

Evasive Action; >500 ft Separation

Question: Airborne Conflicts (AC2)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



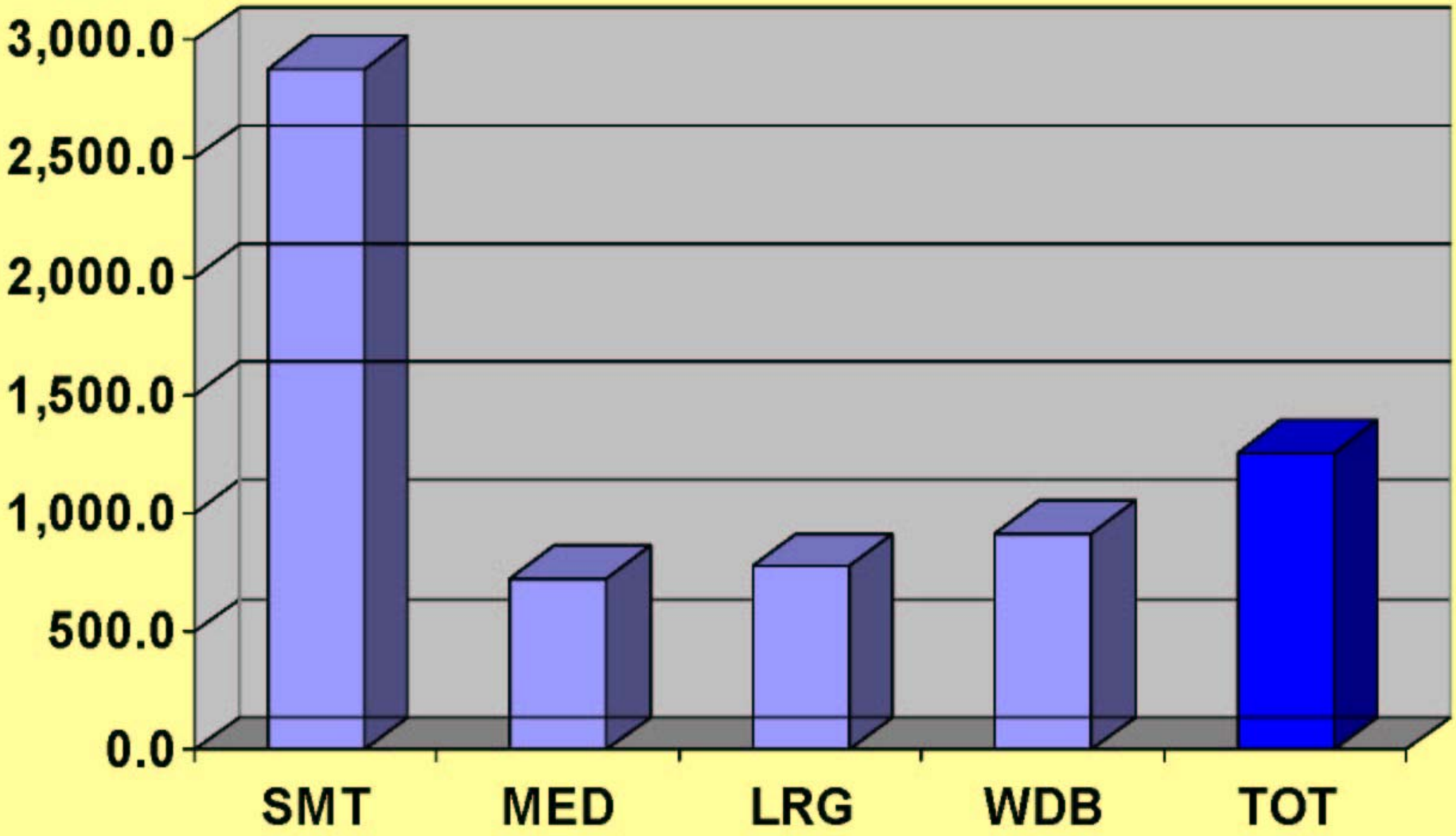
Estimated Air Carrier Event Rates

<500 ft Separation

Question: **Airborne Conflicts (AC3)**

Exposure Factor: **Events per 1 million Legs**

Rate estimates based on all data collected through October, 2002.



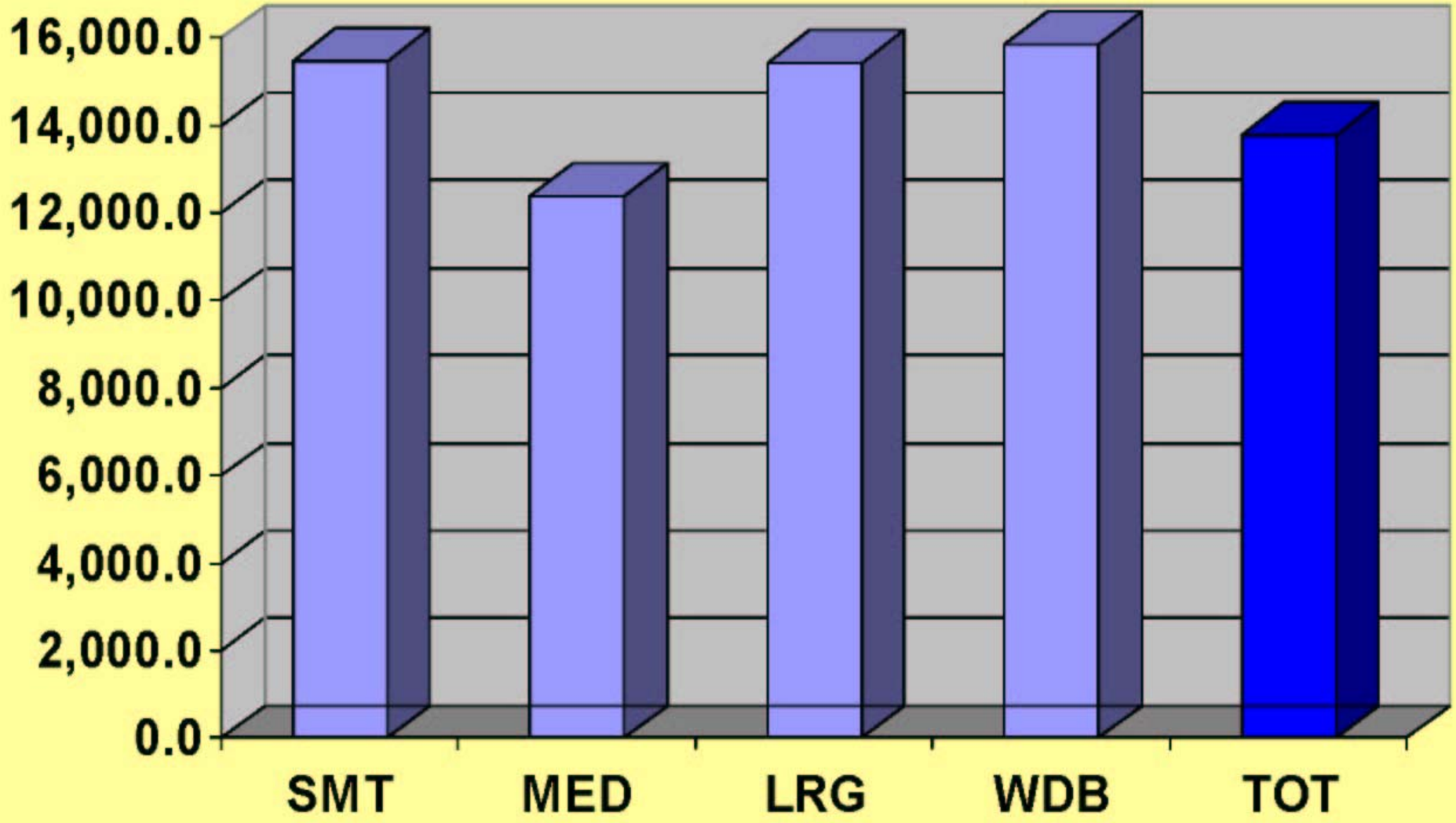
Estimated Air Carrier Event Rates

Lost Sight of Visually Separated Acft

Question: Aircraft Handling Events (AH3)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



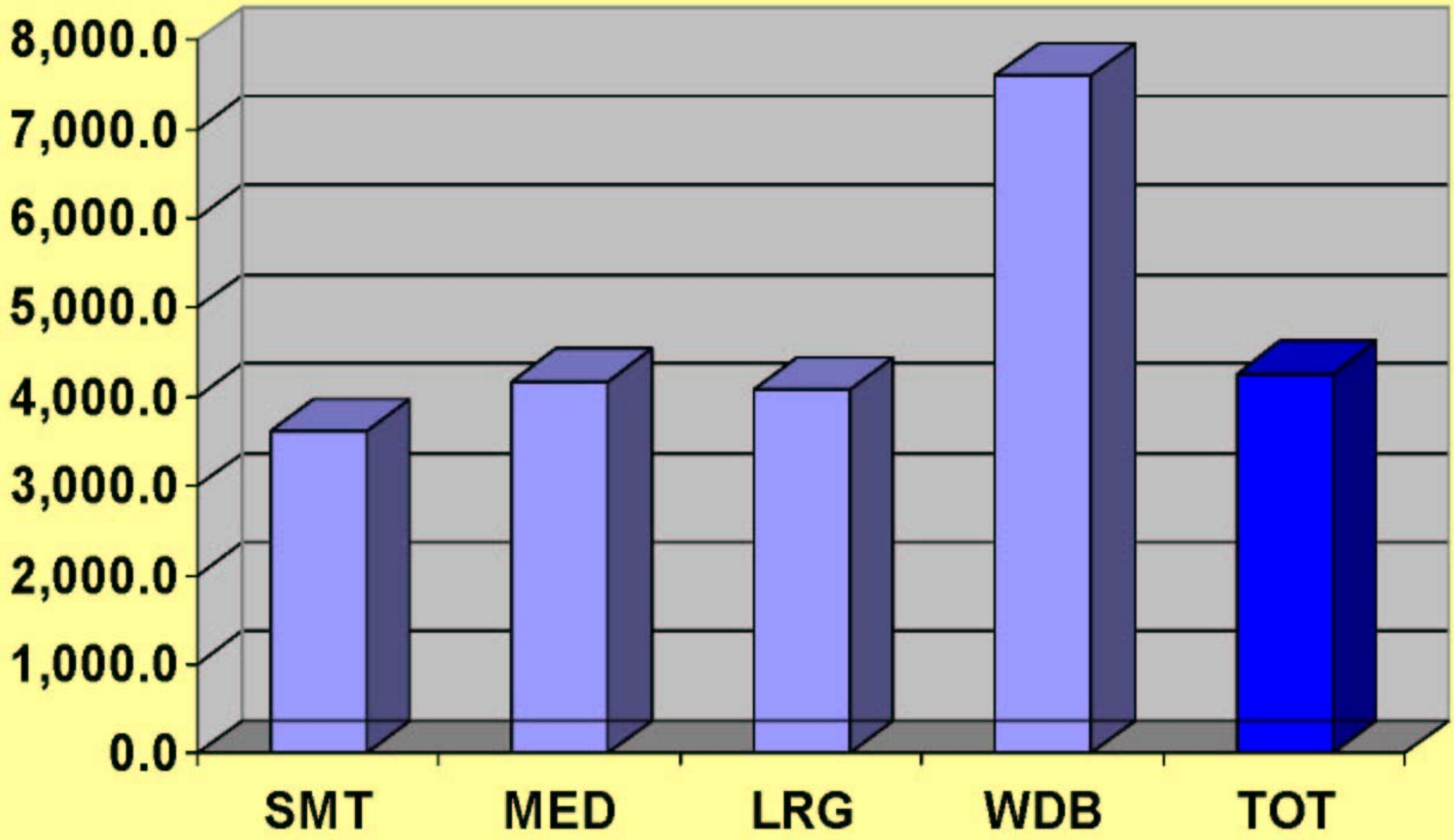
Estimated Air Carrier Event Rates

Bird Strike

Question: **Airborne Conflicts (AC1)**

Exposure Factor: **Events per 1 million Legs**

Rate estimates based on all data collected through October, 2002.



Ground Operations

This section asks questions relating to aircraft departures from paved surfaces, near collisions with other vehicles on the ground, intrusion into occupied runways, rejected takeoffs, and more.

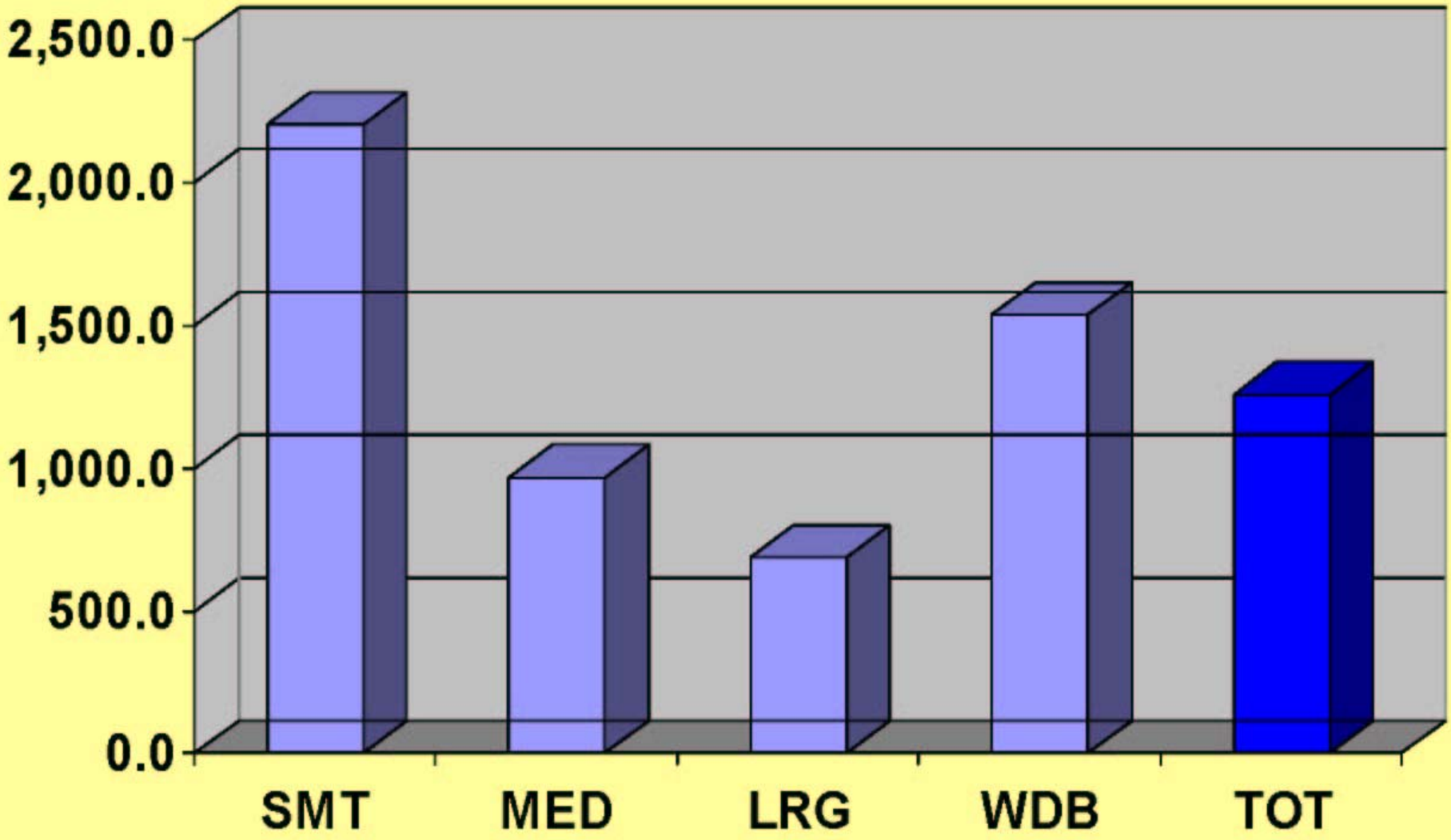
Estimated Air Carrier Event Rates

Rejected Takeoff

Question: Ground Events (GE4)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



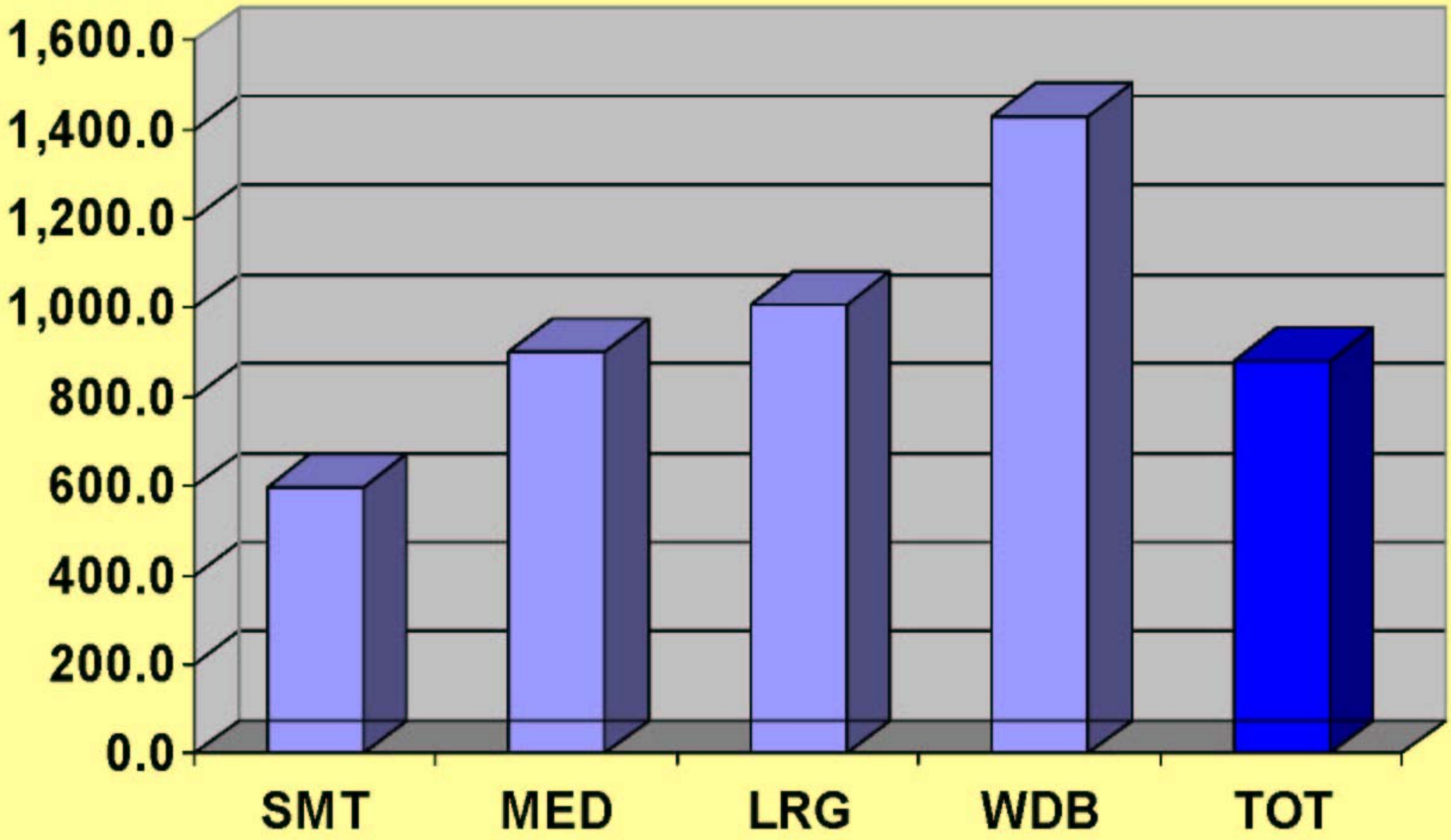
Estimated Air Carrier Event Rates

Ground Conflict with Vehicle

Question: Ground Events (GE2)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



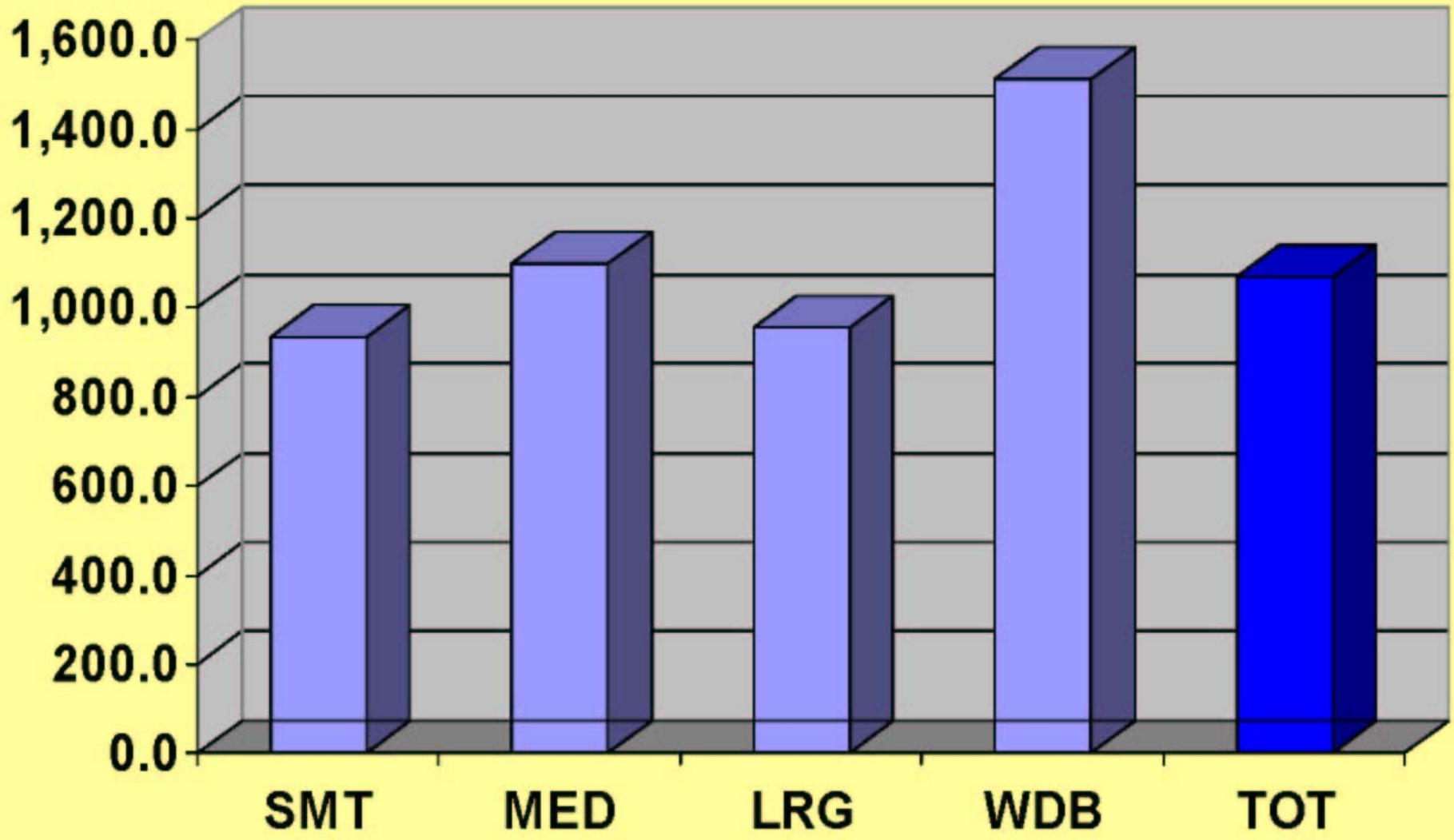
Estimated Air Carrier Event Rates

Landing Skid

Question: **Ground Events (GE3)**

Exposure Factor: **Events per 1 million Legs**

Rate estimates based on all data collected through October, 2002.



Spatial Deviations

Questions relate to altitude overshoots, inadvertent altitude deviations, and descents below minimum safe altitude (MSA), track deviations, and airspace incursions/excursions.

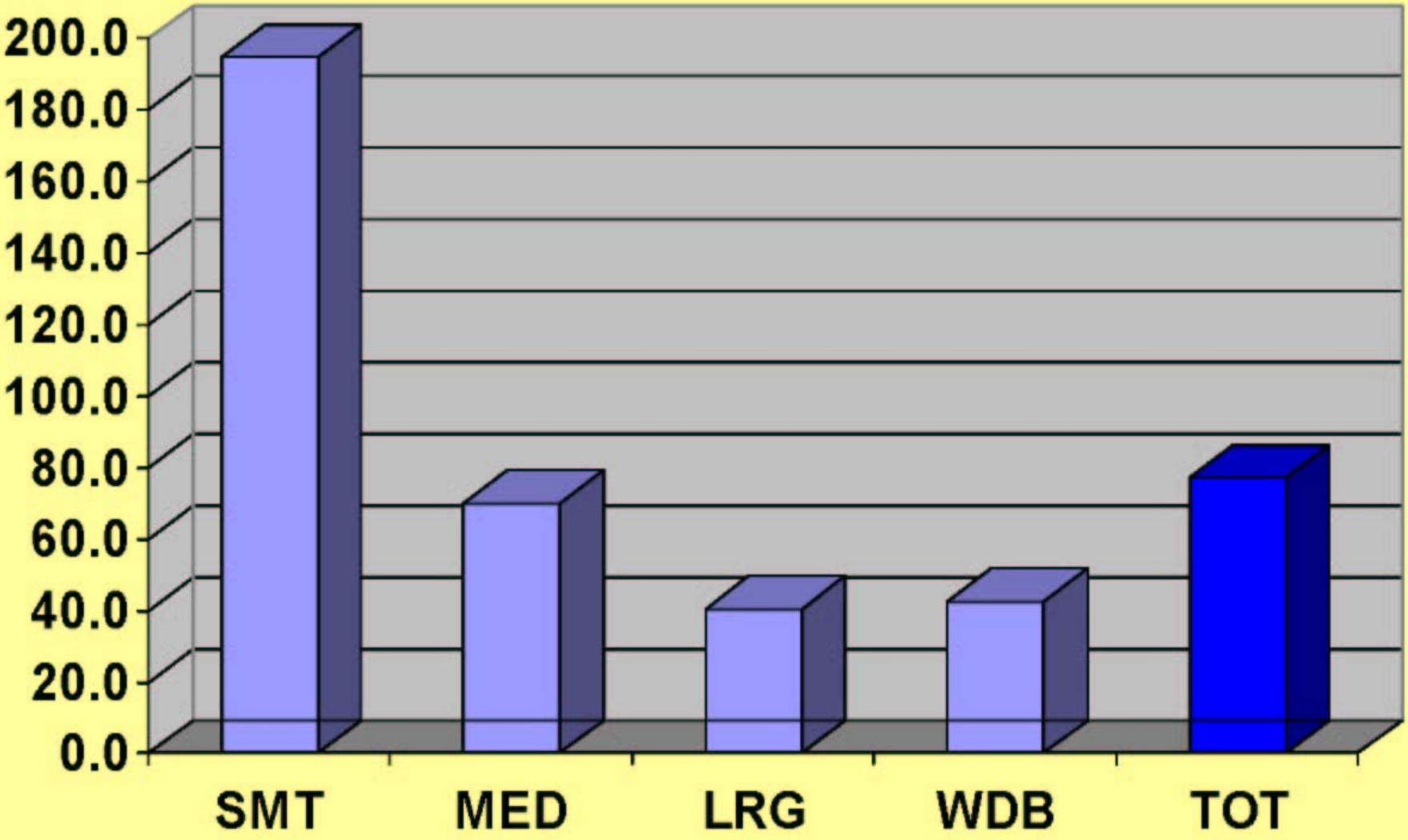
Estimated Air Carrier Event Rates

Altitude Deviation; >300 ft

Question: **Altitude Deviations (AD1)**

Exposure Factor: **Events per 100k Hours**

Rate estimates based on all data collected through October, 2002.



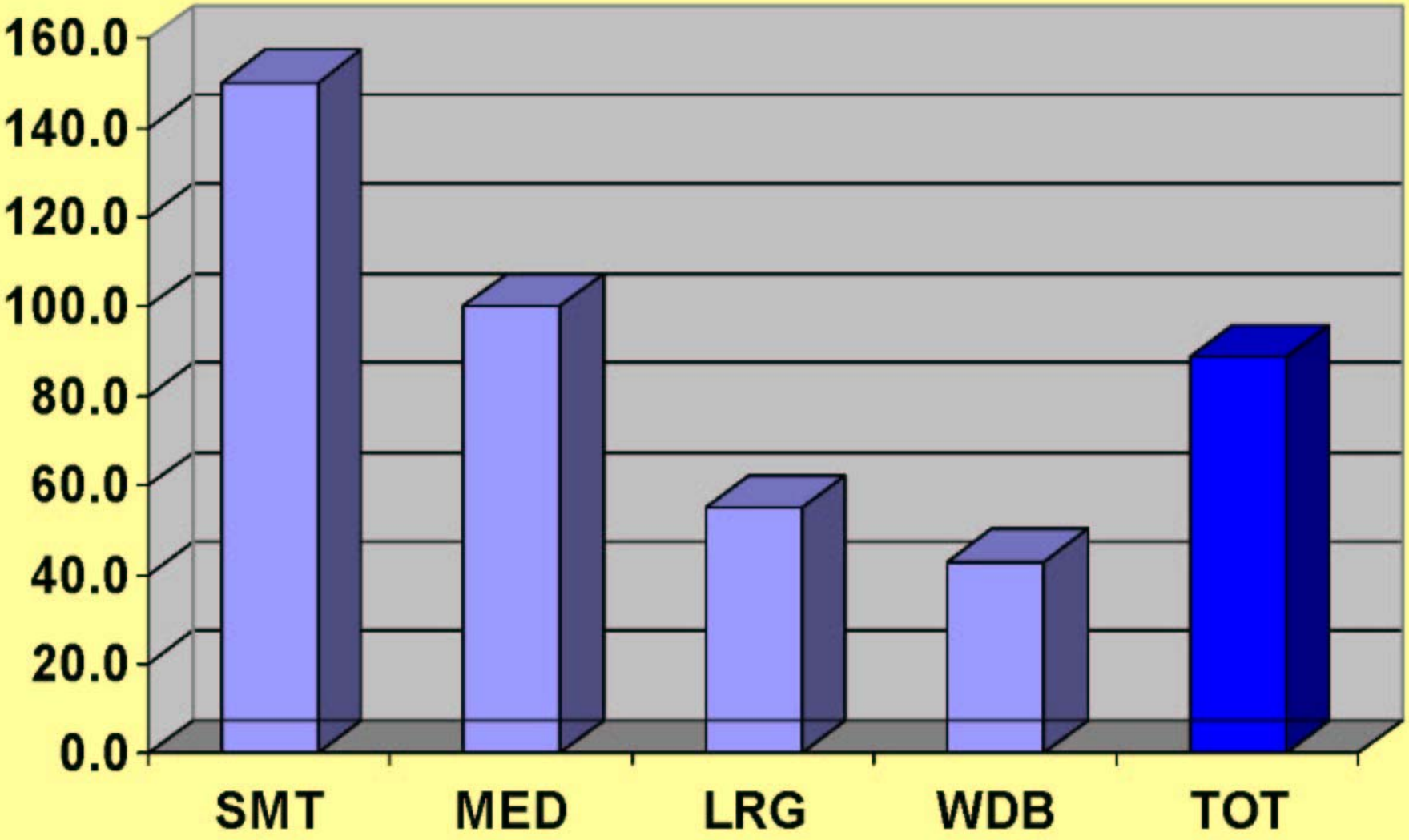
Estimated Air Carrier Event Rates

Track Deviation

Question: **Aircraft Handling Events (AH6)**

Exposure Factor: **Events per 100k Hours**

Rate estimates based on all data collected through October, 2002.



Pilot Interactions with ATC

These questions are related to frequency congestion, rushed (high or fast) approaches and other ATC related issues.

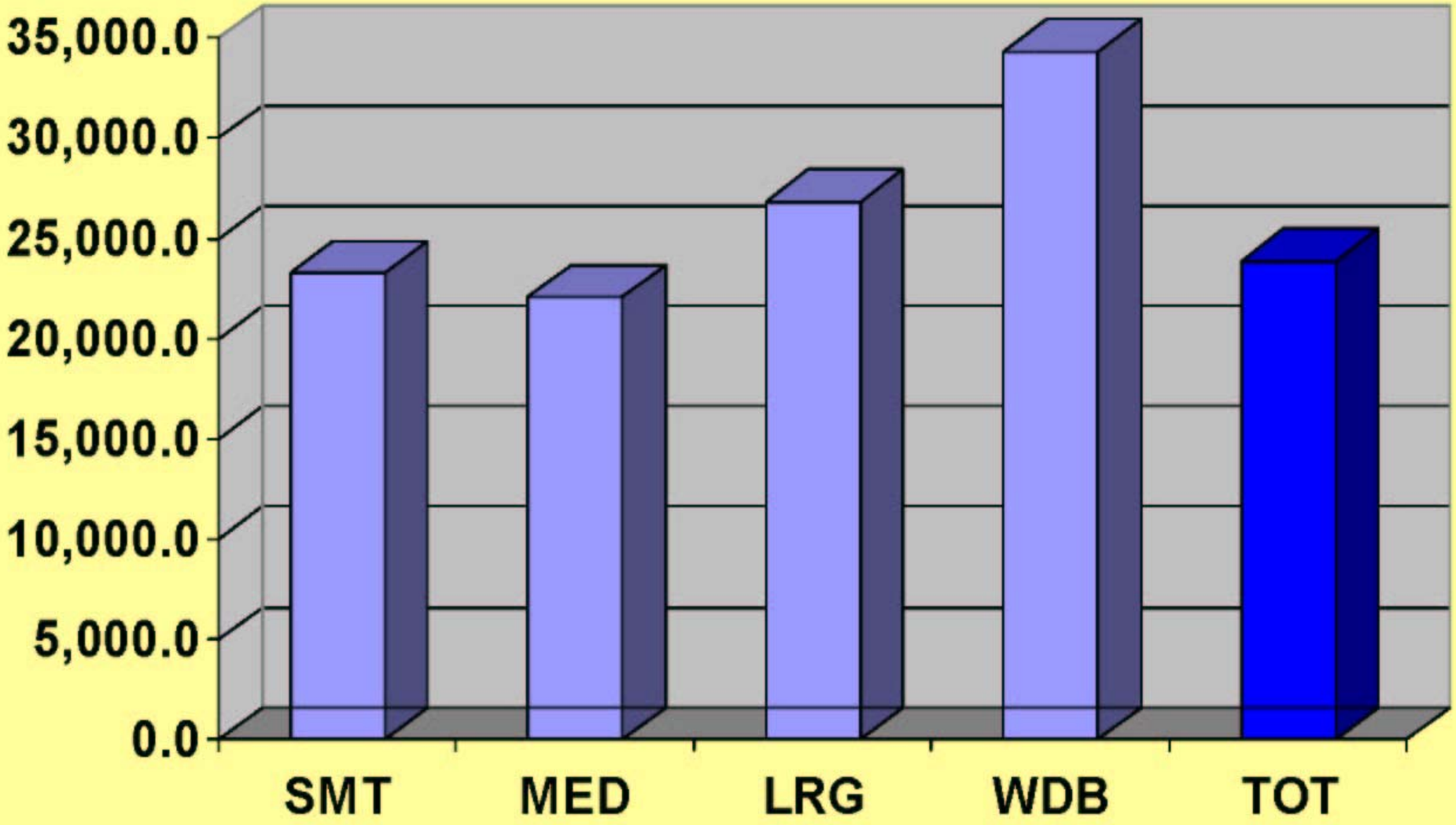
Estimated Air Carrier Event Rates

Unable Time-Critical Com with ATC

Question: ATC-Interaction Events (AT1)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



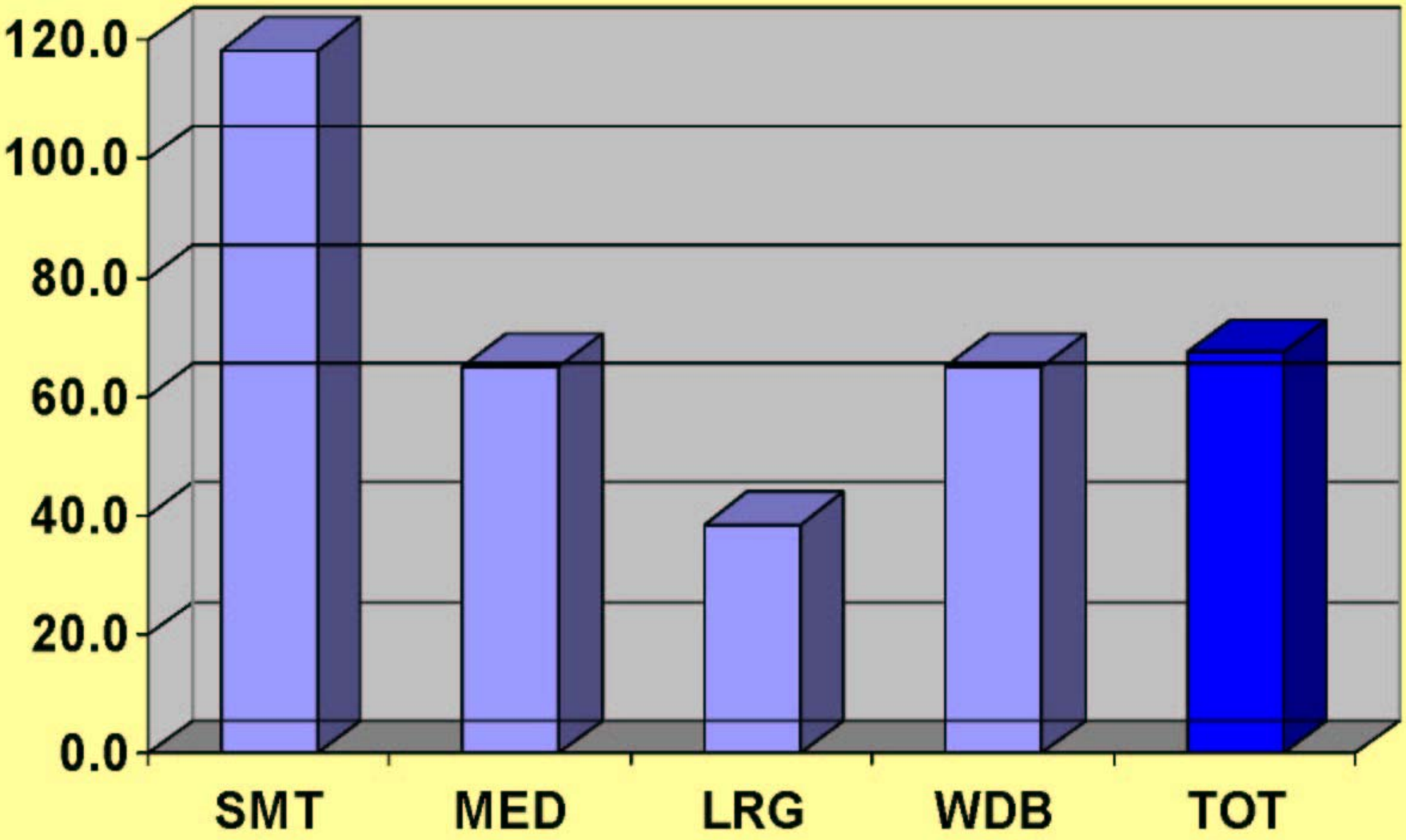
Estimated Air Carrier Event Rates

Accepted Clearance; Could Not Comply

Question: Aircraft Handling Events (AH2)

Exposure Factor: Events per 100k Hours

Rate estimates based on all data collected through October, 2002.



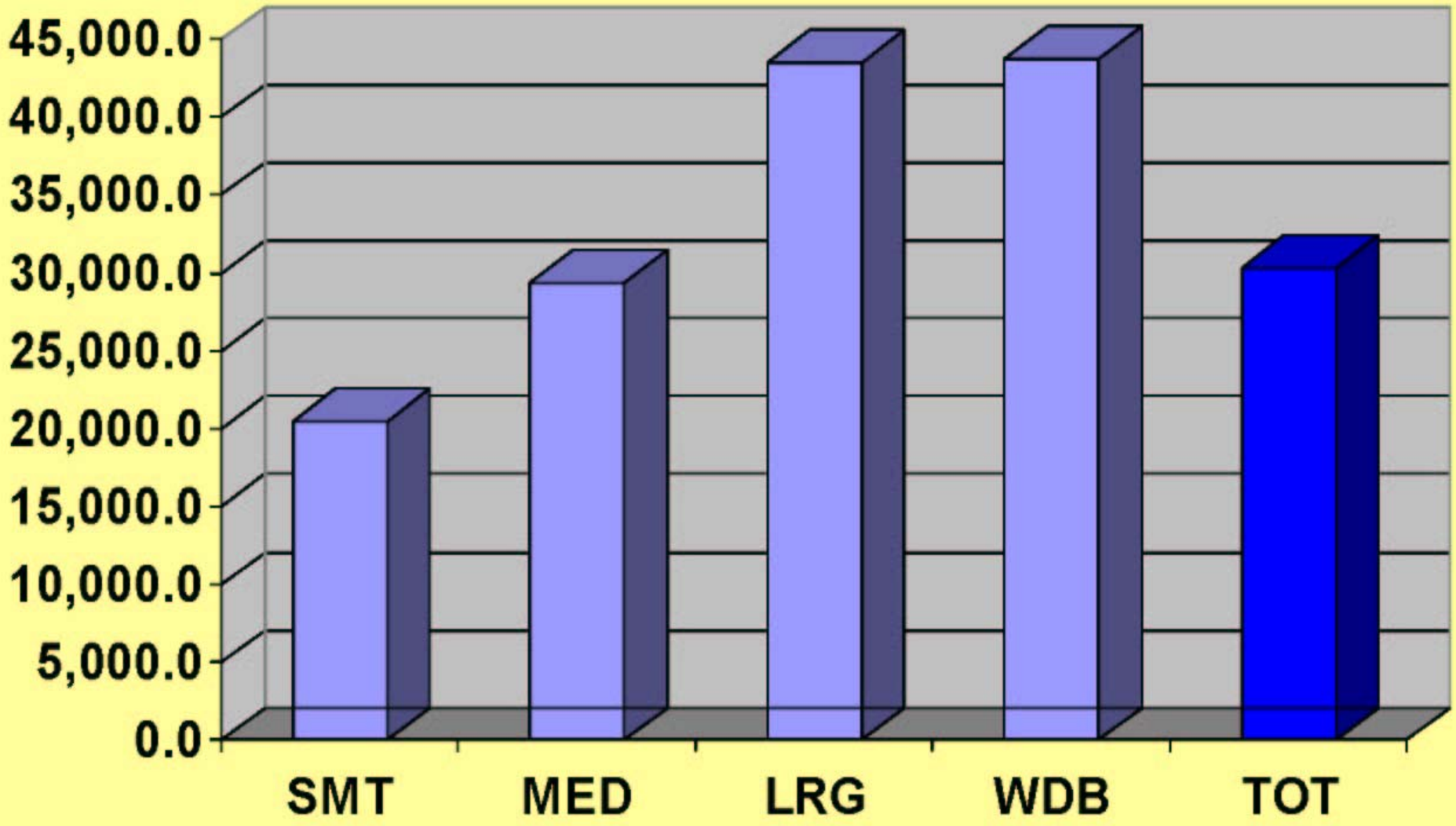
Estimated Air Carrier Event Rates

Rushed Approach Due to ATC

Question: ATC-Interaction Events (AT2)

Exposure Factor: Events per 1 million Legs

Rate estimates based on all data collected through October, 2002.



Aircraft Handling

Miscellaneous questions relating to aircraft management and handling practices, and other matters.

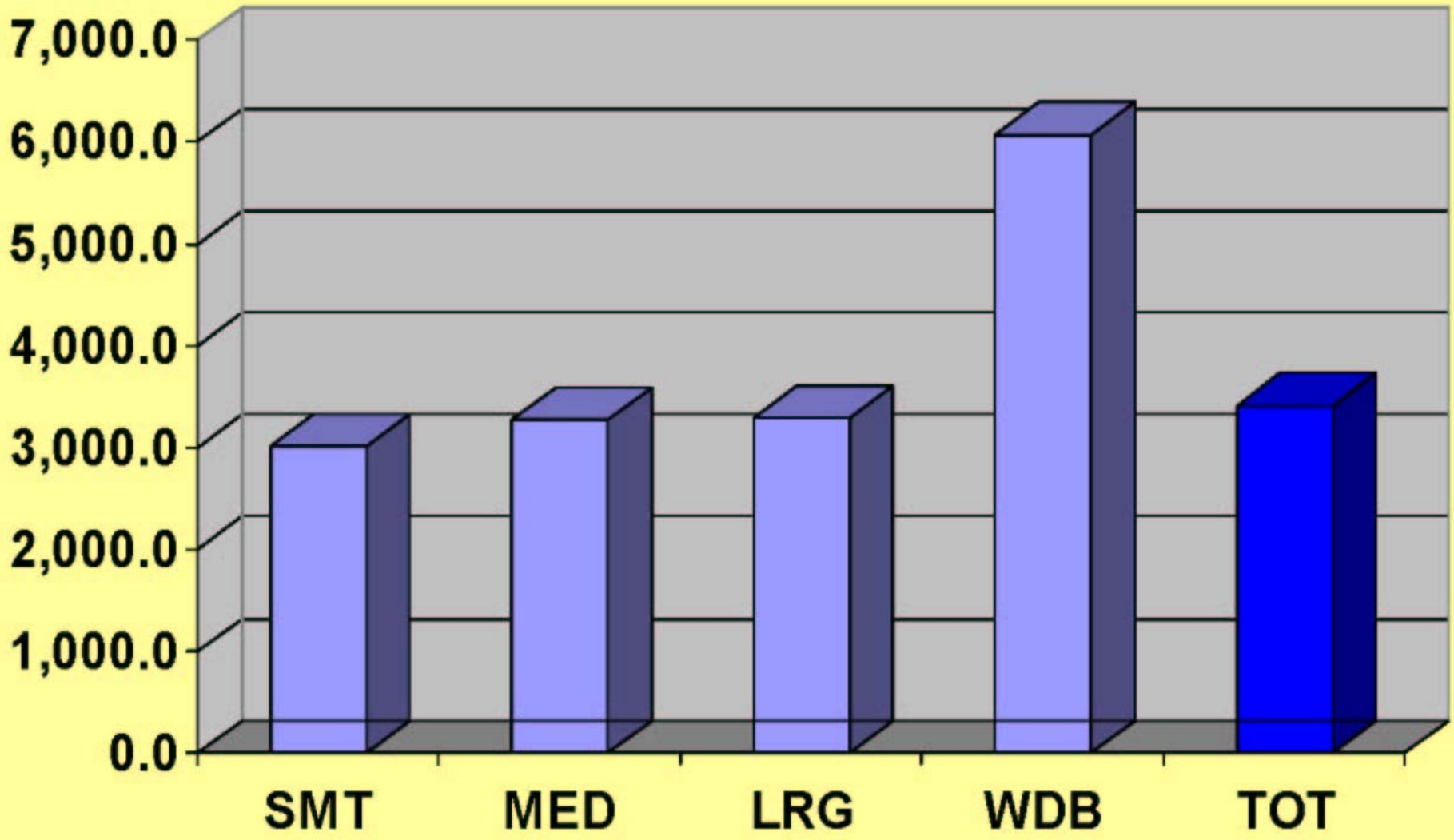
Estimated Air Carrier Event Rates

Used Reserve Fuel

Question: **Aircraft Handling Events (AH1)**

Exposure Factor: **Events per 1 million Legs**

Rate estimates based on all data collected through October, 2002.



In-Close Approach Change Results

Section C: Special Topic – In-Close Approach Changes

- **Dynamics of approach clearance changes requested by ATC within ten-miles of a destination airport**
- **Sixteen questions relating to:**
  - Pilot execution of requested changes
  - Consequences
- **Questions focus on number of in-close approach change (ICAC) events**
- **Followed by additional questions concerning the last ICAC experienced by pilot**

Number of In-close Approach Changes Requested by ATC of NAOMS Response Pilots

	Approaches Flown	Percentage of Approaches Flown
Total Approaches Flown	296,165	100.00
Total Number of ICAC Requested by ATC	17,943	6.0
Total Number Accepted by Pilots	16,802	5.7
Total Number of ICAC Approaches with Issues	1,083	0.4

NAOMS Estimates of Marginal Probabilities Associated with IN-CLOSE APPROACH CHANGES

Given that an ICAC request was Received . . .

there is a 95% probability that the ICAC request was Accepted.

Given that the ICAC request was Accepted . . .

there is a 6% probability that the ICAC resulted in one or more Undesirable Events.

Given that the ICAC resulted in one or more Undesirable Events . . .

there is a 74% probability that the events included an Unstable Approach.

there is a 59% probability that the events included a Long or Fast Landing.

there is a 27% probability that the events included a Go-Around.

there is a 14% probability that the events included a Wake Turbulence Encounter.

there is a 6% probability that the events included a Ground Conflict.

there is a 4% probability that the events included an Airborne Conflict.

there is a 4% probability that the events included an Out-of-Limit Landing.

there is a 1% probability that the events included a Landing without Clearance.

there is a 0% probability that the events included a Wrong Runway Landing.

there is a 46% probability that the events included an Other Undersirable Event.

NAOMS Estimates of Marginal Probabilities Associated with IN-CLOSE APPROACH CHANGES

Given that an ICAC request was Received and Accepted . . .

there is a 72% probability that the receiving aircraft was Equipped with an FMS.

there is a 61% probability that the receiving aircraft was Equipped with a Multi-Route Capable FMS

Given that the receiving aircraft was Equipped with a Multi-Route Capable FMS . . .

there is a 34% probability that Frequency Changes are made through the Multi-Route FMS.

there is a 41% probability that the FLC attempted to Reprogram the Multi-Route FMS.

there is a 38% probability that the Multi-Route FMS Facilitated ICAC compliance.

Given that the FLC attempted to Reprogram the Multi-Route FMS . . .

there is a 12% probability that the Inputs did Not Load Properly into the Multi-Route FMS.

there is a 9% probability that Other Multi-Route FMS Programming Difficulties were encountered.

there is a 90% probability that it was Possible to Complete programming of the Multi-Route FMS.

Given that it was Possible to Complete programming of the Multi-Route FMS . . .

there is a 81% probability that the Multi-Route FMS programming was Cross-Checked.

NAOMS Estimates of Marginal Probabilities Associated with IN-CLOSE APPROACH CHANGES

Given that an ICAC request was Received and Accepted . . .

there is a 24% probability that the FLC Changed the ATC Frequency.

there is a 59% probability that the FLC Changed the NavAid Frequency in response to the ICAC.

there is a 52% probability that the FLC Revised the Approach Briefing.

there is a 20% probability that the FLC Changed the Aircraft Configuration.

there is a 36% probability that the FLC Disconnected 1 or more Automatics.

Given that the FLC Changed the NavAid Frequency in response to the ICAC . . .

there is a 73% probability that the FLC Confirmed the new NavAid Identity.

Given that an ICAC request was Received and Accepted . . .

there is a 47% probability that a Reason for the ICAC was given by ATC.

NAOMS Estimates of Marginal Probabilities Associated with IN-CLOSE APPROACH CHANGES

Given that a Reason for the ICAC was given by ATC . . .

there is a 85% probability that ATC cited Traffic flow and separation.

there is a 11% probability that ATC cited desire to assign runway Favored by Air Carrier.

there is a 8% probability that ATC cited Change in Active Runway.

there is a 7% probability that ATC cited Wake Turbulence avoidance.

there is a 4% probability that ATC cited Weather or Wind factors.

there is a 1% probability that ATC cited Noise Abatement factors.

there is a 0% probability that ATC cited ATC Equipment Problems.

there is a 10% probability that ATC cited Other factors.

Given that an ICAC request was Received and Accepted . . .

there is a 30% probability that the ICAC Reduced the Quality of FLC Coordination.

there is a 27% probability that the ICAC Compromised Traffic Watch.

there is a 18% probability that the ICAC Reduced FLC Situational Awareness.

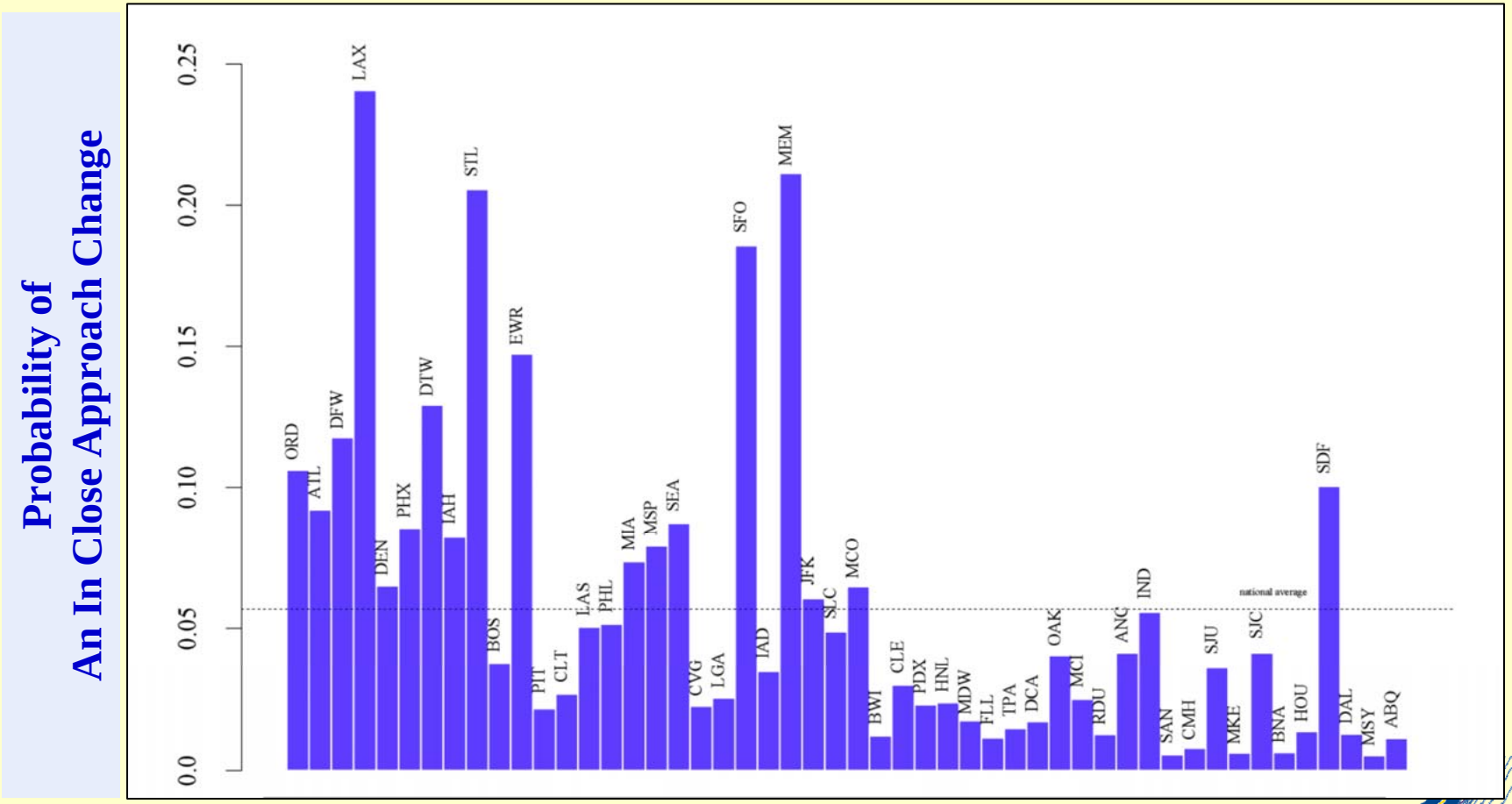
there is a 4% probability that the ICAC Compromised Safety In some Other Way.

Issues Associated with In-Close Approach Changes

Type of ICAC Problem	Number Reported	Percentage of Itemized Problems
Unstablilized Approach	631	3.76
Long/Fast Landing	561	3.52
Wake Turbulence	213	1.27
Missed Approach	211	1.26
Ground Conflict	52	0.31
Airborne Conflict	50	0.30
Out of Limit Winds	33	0.20
Landing without Clearance	7	0.04
Other	479	2.85

ok

In-Close Approach Change Probability for the 50 Busiest US Airport



Highest Number of Airport Operations ⟷ **Lowest Number of Airport Operations**

General Aviation Survey

Mary Connors

General Aviation Interviewing Effort

- **Yearly interviewing effort**
  - Sample size (N = ~23,800)
  - Screening (N = ~15,000)
  - Interview (N = 8,000)
  - Interview length averages 27 minutes
- **Progress to date (13 weeks)**
  - 2,000 completed interviews

General Aviation Interviewing

- Too early to predict final outcomes
- Initial location efforts seem to indicate that when compared with air carrier pilots, GA pilots difficult to locate
- Once located, it takes more effort to get a completed interview
- Although refusal rate is not high yet, it is higher than AC rate after same period of time

General Aviation Questionnaire Structure*

- **Section A: Descriptive Demographic Information**

  Information suitable for exposure determination

- **Section B: Safety Related Events**

  Consistent data set over time

- **Section C: Focus Questions**

  Specific topics driven by government/industry high-priority needs

- **Section D: Questionnaire Feedback**

*** Data collection started August, 2002; over 2,000 completed interviews to date; analysis based on 1,425 interviews**

Flight Time Summary of Respondents

	Lifetime Hours: Mean	Last 60 Days Hours: Mean
Helicopter	7,023	54
Fixed Wing	2,763	29

*** Preliminary analyses involved 40 helicopter and 1,375 fixed-wing GA pilots.**

Distribution of Flight Activity

	Helicopter *	Fixed Wing *
Flight Instructor	6.9 %	13.5 %
Student	1.3 %	5.5 %
Corporate Pilot	1.8 %	15.4 %
Personal Business	2.1 %	12.3 %
Public Use	13.4 %	3.0 %
Revenue Passengers	38.3 %	8.9 %
Cargo Transport	4.9 %	4.1 %
Air Medical	14.0 %	1.5 %
Recreational	1.8 %	32.2%

* Categories are not mutually exclusive

Event Indications for General Aviation

- **Preliminary data analysis begun**
- **Data volume still too low for detailed analysis**
- **But, certain events suggest a higher level of occurrence than anticipated**
  - Inadvertently entering airspace without clearance
  - Attitude Indicator Failures, some under IMC

Earmarked Congressional Funds

- **500 helicopter and 500 corporate pilots surveyed with earmarked congressional funds**
  - Interviews just completed
  - Preliminary analyses just begun
- **The broader GA survey confirms**
  - Both helicopter pilots and corporate pilots are infrequently captured in the randomly-selected general aviation survey
  - These groups would require further focused investigation if further information is desired in the near term.

GENERAL PERSPECTIVES ON LONG-TERM SURVEY RESEARCH

Jon Krosnick

Survey Benefits

- Surveys have been used to shape national policy for many decades
- This use is extensive in areas such as public health policy and economics
- Aviation safety is a natural topic for survey data collection
- Survey methods are mature and well understood

Examples of Continuing Surveys

- Survey of Income and Program Participation (Census Bureau) 1984 -
- Consumer Expenditure Surveys (Census Bureau) 1968 -
- Annual Housing Surveys (Census Bureau) 1973 -
- Survey of Consumer Attitudes (NSF) 1953 –
- Health and Nutrition Examination Surveys (NCHS) 1959 -
- National Health Interview Surveys (NCHS) 1970 -
- American National Election Studies (NSF) 1948 -
- Panel Study of Income Dynamics (NSF) 1968 –
- National Longitudinal Surveys (BLS) 1964 -
- Behavioral Risk Factor Surveillance System (CDC) 1984 –
- Monitoring the Future (NIDA) 1975 -

Features of These Studies

- Federally-funded via contracts or grants
- Long-term tracking studies
- Large constituencies use the data
- Important policy decisions are based on the data
- Conducted by the most prestigious survey research firms in the nation

Features of These Studies (cont'd)

- Design done by collaborative teams of investigators
- Principal Investigators remain stable over time
- Planning Boards make decisions – rotating membership
- Advisory Oversight Boards oversee the entire project and make suggestions about planning board membership and project direction.
- Methodological experts serve on advisory boards

Features of These Studies (cont'd)

- Questionnaires have core items that remain constant from wave to wave
- Topical questions are rotated into and out of the questionnaire to reflect current interests
- Press releases and press conferences mark the release of new data (e.g., once a year)
- Publications by the project staff summarize a simple set of core trend findings
- Information is released to the public
- Information forms basis for follow-on studies

OUTREACH AND COMMUNITY INFORMATION

Linda Connell

The plan for NAOMS called for the full inclusion of air carriers pilots, general aviation pilots, air traffic controllers, mechanics/technicians, and flight attendants by the end of FY 04

Products

- **OUTPUTS**
  - Summarized aviation operational experience data
  - Statistically reliable estimates of incident rates
  - Identification/tracking of safety trends
  - Near real-time feedback on impacts of new technology and procedures
  - Support for data-driven safety agendas

- **PRODUCT CONSUMERS**
  - Decision makers (government and industry)
  - Safety professionals and research organizations

Briefing Plans

- **December 02 - AvSSP Program Office**
- **February 03 - NAOMS Working Group Kickoff**
- **February 03 – Report to ATAC Subcommittee (?), Code R/HQ (?)**
- **March 03 – Report to AvSSP Bi-Annual (?)**
- **Proposed Follow On:**
  - FAA - Office of System Safety, Flt. Standards, System Capacity, Other - March, 03
  - CAST - March, 03
  - Alphabet Groups, airlines, other - As can be arranged, March through June, 03

Permanent service possibilities will be explored in conjunction with briefing activities.

NAOMS Working Group

- **Industry and government group**

  (Individuals recruited from all major industry groups; independent from employer; selected for their individual/team skills)

- **Non-Disclosure/Confidentiality Agreement**

  (Based on pre-decisional exemption from public information requirements)

- **Ames Associates Program - Industry Participants**

  (No government compensation; no intellectual property rights covered by Workmen's Compensation [by ARC])

- **Purpose**
  - Ensure that results are validly interpreted
  - Gain consensus on content, level, and timing of information release
  - Build community support for NAOMS
  - Meet four times/year