



Airline Safety After Deregulation: A Retrospective Look

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Overview

- What did deregulation change that might affect safety?
- What were the specific safety concerns?
- What happened?
- What safety challenges do we face now?

Assessing deregulation and safety

Choosing the right safety metric

Recognizing the heterogeneity of the airline industry

“Risk profile” of travel

Deregulation Changes with Potential Safety Impacts

- Freedom to start new service
- Flexibility in the fares
- Freedom to stop service
- New airlines in interstate scheduled service

Deregulation: Freedom to Start New Service

- Certificated airlines could not enter a market without CAB approval
 - Terms “certificated,” “trunk and local service,” and “legacy” carriers are used interchangeably.
- CAB approval was rarely given if there was already a carrier serving that market.
- Possible safety issues:
 - Could airlines expanding rapidly or moving into new regions maintain their level of safety?
 - Would more airlines serving more places stretch the capabilities of FAA inspectors?

Deregulation: Flexibility to set fares

- CAB set fares based loosely on average cost.
- Deregulation gave airlines flexibility (eventually complete freedom) to set their own fares.
- Possible safety issue:
 - Would lower fares lead airlines to cut corners on safety?
 - Certificated carriers had long argued that they provided more than the minimum required level of safety.
 - Recall that this industry has a marginal cost much lower than their average cost.
 - Competition might cause airlines to reduce fares to unprofitable levels (destructive competition).

Trunk and Local Service Safety



EASTERN AIRLINES A300B4-201 N227EA

Domestic Scheduled Service

Trunk and Local Service

Measure	1970-1978	1979-1985
Passenger fatalities per one million enplanements	0.42	0.30
Fatal accidents per one million aircraft departures	0.46	0.22

The historic trend of improving safety continued after deregulation.
No evidence that route expansion or fare competition affected safety.

Deregulation: Freedom to Stop Service

- Airlines had been forced to maintain unprofitable service, particularly in small communities.
- If they withdrew, it was expected that commuter carriers would replace the certificated carriers.
- Possible safety issue:
 - Commuter carriers were believed to be markedly less safe than the certificated carriers they would be replacing.
 - Would the safety of small community service be reduced?

Commuter Airline Safety

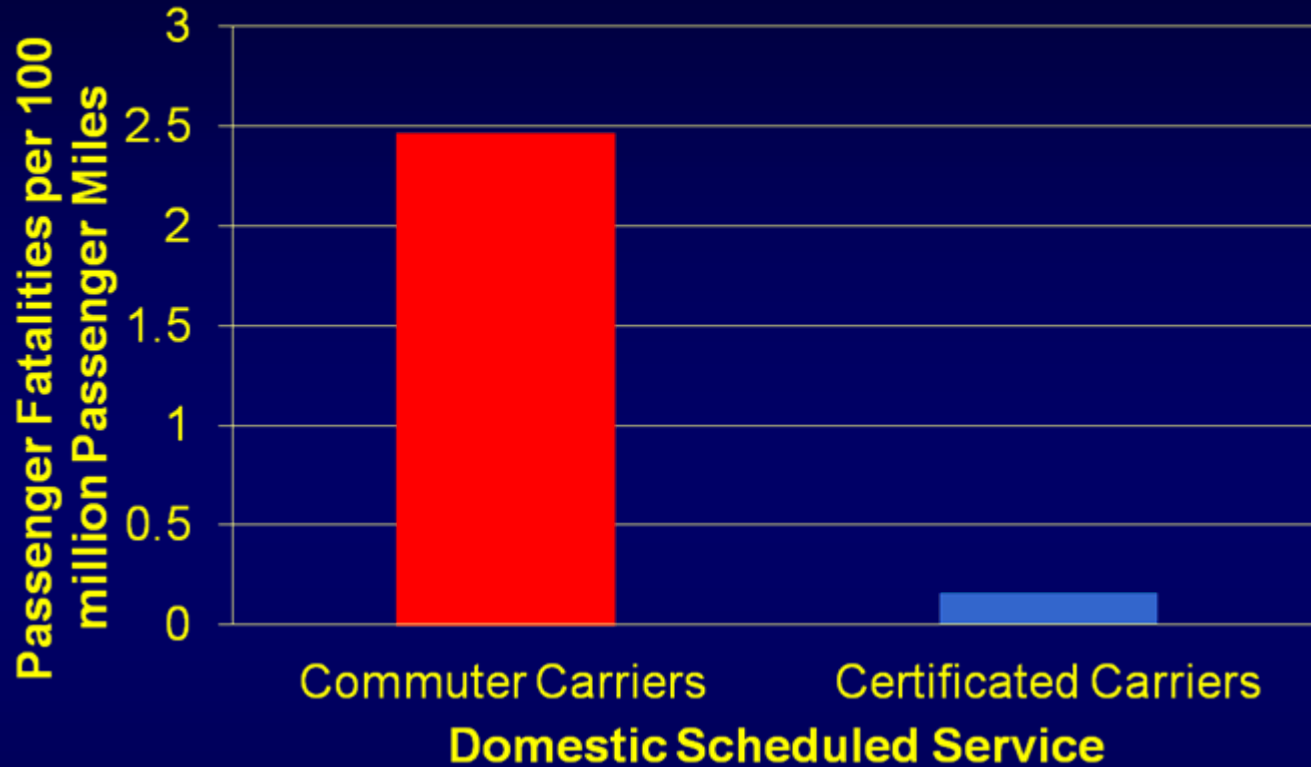


Langhorne Bond, FAA Administrator, at the First Commuter Air Carrier Safety Symposium in 1980, “no matter how you cook or juggle the statistics on commuter accidents, they add up to a safety record that is unacceptable ... and we are not comparing apples and oranges here ... we’re comparing one apple to another and yours doesn’t look so good.”

Many small communities (elected representatives) opposed deregulation because service by certificated airlines was regarded as a mark of status for a community.

Some seized on degraded small community safety as a way to roll back deregulation.

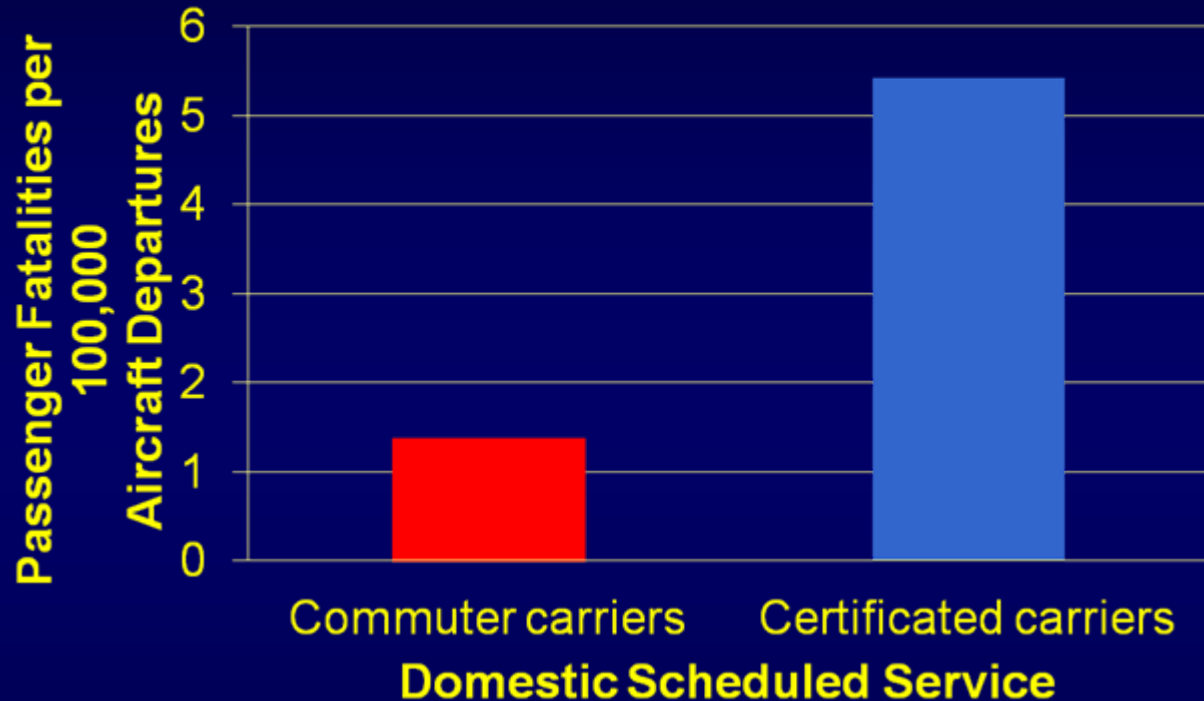
Commuter and Certificated Carrier Safety, 1977-78



This was the most common aviation safety measure in the late 1970s.

But the average jet flight was six times longer than the average commuter flight, so does this metric really reflect differences in risk?

Commuter and Certificated Carrier Safety, 1977-78



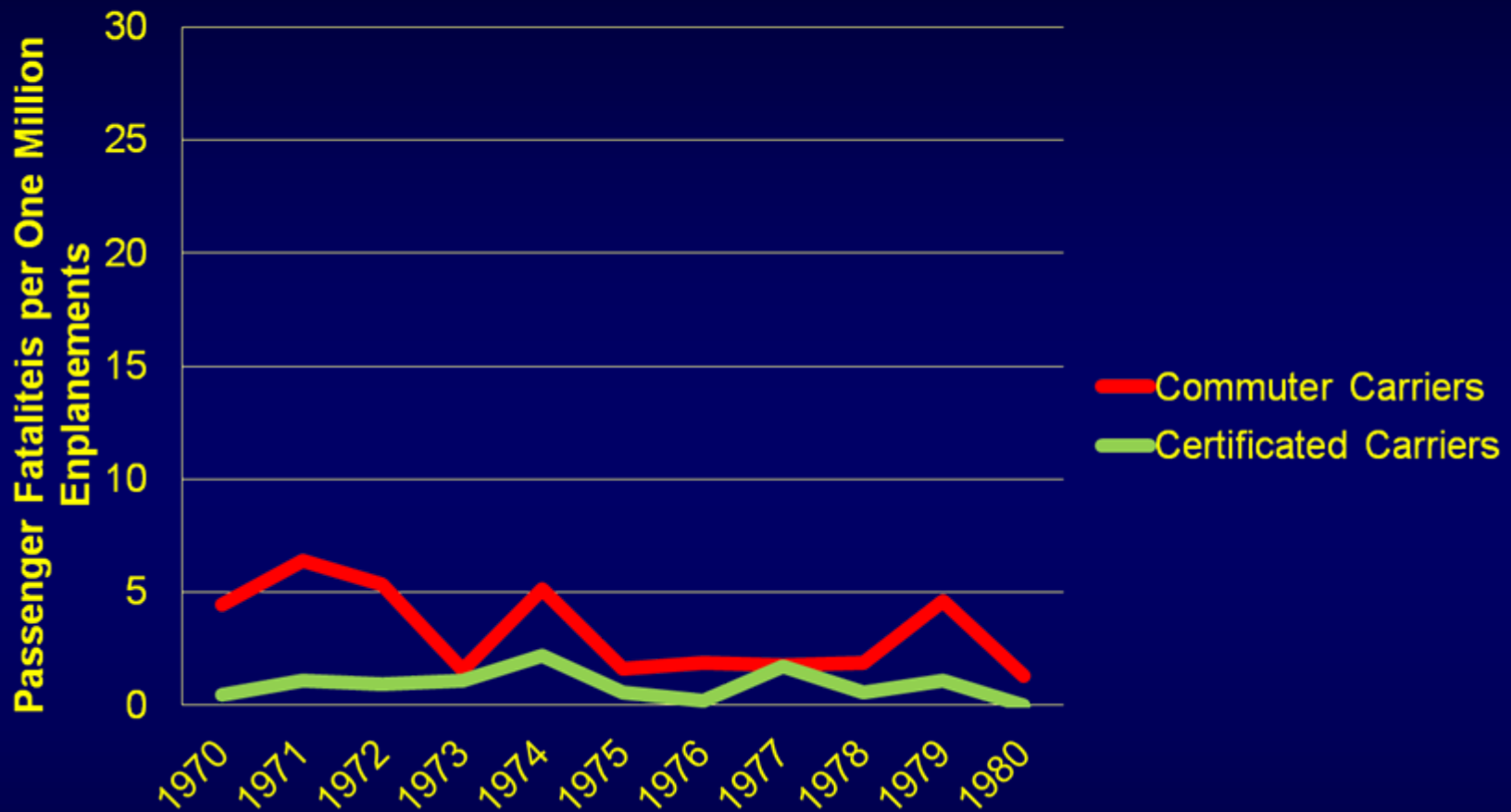
But the average commuter plane was much smaller than the average jet, so this isn't a useful metric for comparing segments with different aircraft sizes.

Flight Phase	Percent of		
	Flight Time	Accidents	Fatalities
Taxi, Load, Parked	0	6	0
Takeoff	1	12	6
Initial Climb	1	5	13
Climb	14	9	24
Cruise	57	6	6
Descent	11	5	16
Initial Approach	12	5	14
Final Approach	3	8	19
Landing	1	46	3

Risk profile of air travel – the main difference between a long flight and a short flight is the time spent in cruise, which is the safest portion of the flight.

Safety metrics based on passenger miles aren't useful for comparisons across segments with different average flight lengths.

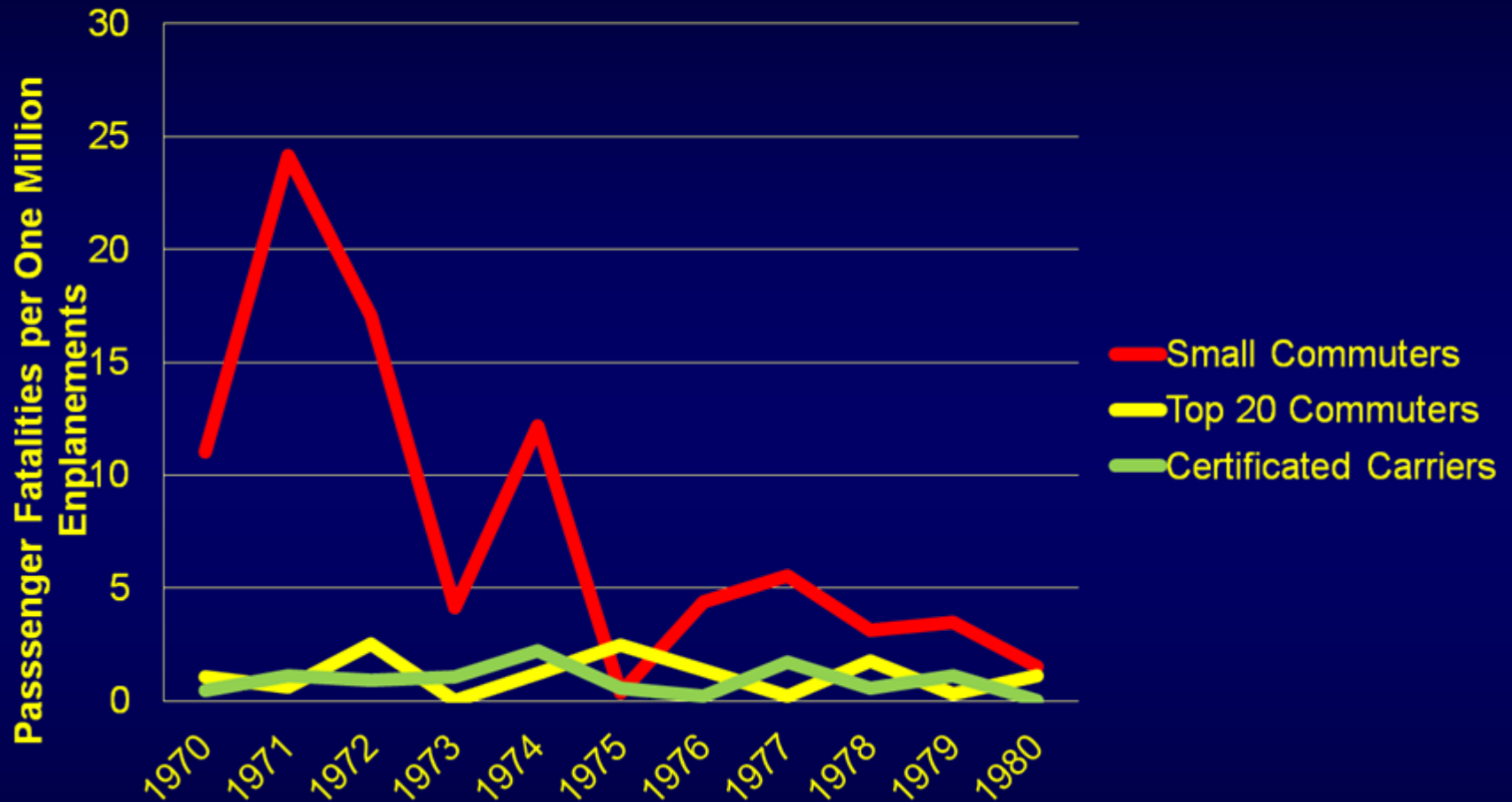
Commuter and Certificated Carrier Safety, 1970-1980



A better metric to compare the risk faced by a passenger in segments with different characteristics

Commuter industry was very heterogeneous.

Small Commuter, Top 20 Commuter, and Certificated Carrier Safety, 1970-1980



Top 20 commuters carried over half of all commuter passengers.
Most of the commuter replacement service was by a Top 20 Commuter.

Commuter Safety Regulations were Tightened in 1978

- Culmination of an effort that FAA started in the early 1970s unrelated to deregulation
- Tightened:
 - Requirements for maintenance
 - Training programs for crew members
 - Pilot qualification requirements
 - Minimum equipment lists
 - Flight continuation rules

Commuter carrier passenger fatality rates

Industry Segment	Passenger fatalities per one million enplanements		
	1970-1978	1979-1985	1986-1988
Total Industry	2.65	1.27	0.38
Top Twenty Carriers	0.69	0.67	0.12
Rest of the Top Fifty	3.27	1.21	0.33
Rest of the Industry	13.32	4.08	4.67

The top 20 carriers were already doing the things required by the revised regulations.

By the mid to late 1980s, equipment was improving among the larger commuters.

Principal Causes of Commuter Accidents

Fatalities per one million enplanements, 1979-1988

	Top 20	Rest of Top 50	Rest of Industry
Equipment Failure	0.06	0.30	0.93
Environment	0.08	0.02	0.98
Pilot Error	0.05	0.14	0.93
Other Aircraft	0.04	0.26	0.52
Other	0.18	0.12	0.83
Total	0.41	0.84	4.19

No single reason why the top 20 carriers were safer, they had fewer of all types of accidents.

Deregulation: New Interstate Airlines

- CAB had permitted virtually no entry into scheduled interstate service
- Deregulation permitted entry by:
 - Former intrastate carriers (Southwest)
 - Former charter carriers (World)
 - Completely new airlines (People Express)
- Would these new carriers operate as safely as the “certificated” carriers?

New Entrant Safety



Domestic Scheduled Service

Measure	Former Intrastate and Charters		New Entrants
	1970-1978	1979-1985	1979-1985
Passenger fatalities per one million enplanements	12.47	0.01	1.12
Fatal accidents per one million aircraft departures	5.89	0.50	1.49

Post-deregulation fatal accidents were by World, Midwest Express, and Air Florida

Losing the distinction through mergers

- Legacy/New Entrant Combinations
 - American – Air California, Reno Air
 - Continental – People Express, New York Air
 - US Airways – PSA, America West
- New Entrant Combinations
 - Southwest – Muse Air, Morris Air, AirTran
 - Alaska Airlines – Jet America
- Still a “Legacy”
 - Delta – Northwest (Republic), Western
- Still a “New Entrant”
 - Jet Blue, Virgin America

The Airline Deregulation and Safety Experience

- Safety had been improving before deregulation and continued to improve after deregulation
 - No evidence that deregulation slowed the process
- While commuters overall were less safe than certificated carriers, the commuters who replaced the withdrawing carriers had a similar safety record.
 - No evidence that commuter substitution degraded safety
- Impact of new entrants (including former charter carriers and former intrastate carriers) difficult to assess because of small numbers, but no large effect.

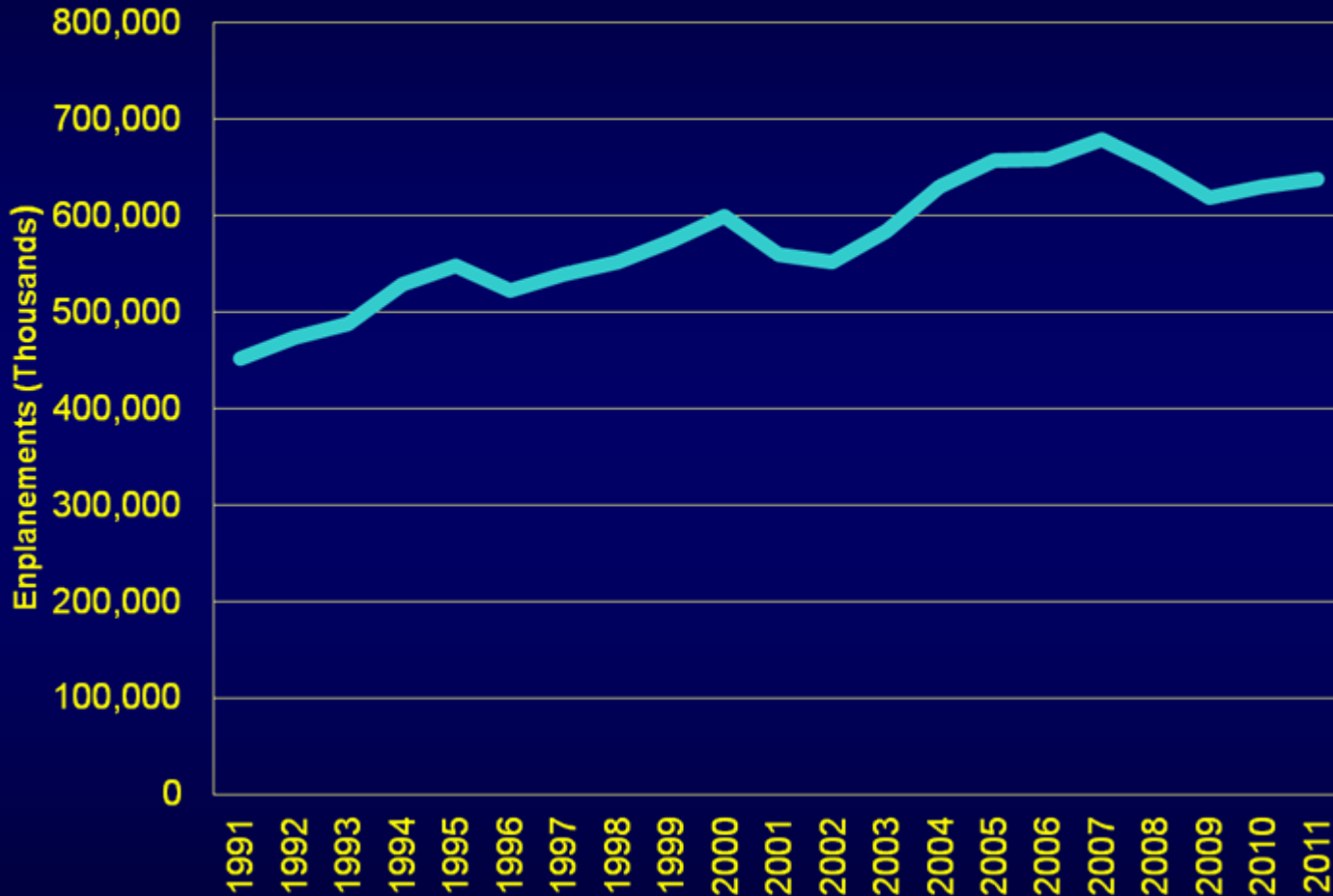
Not so fast ...

- What about the “Margin of Safety?”
- Argument presented at the 1987 conference:
 - “Stock” of safety had been built up by exceeding requirements in the past
 - Stock was being depleted as carriers went to minimum safety standards
 - Hub and spoke systems stressed a weakened ATC system (post-PATCO)
 - Rapid expansion reduces experience in pilots and mechanics
 - FAA inspectors overtaxed by new certifications
 - Deregulation’s adverse effect on safety was still to come

Regional Jets – The Next Step

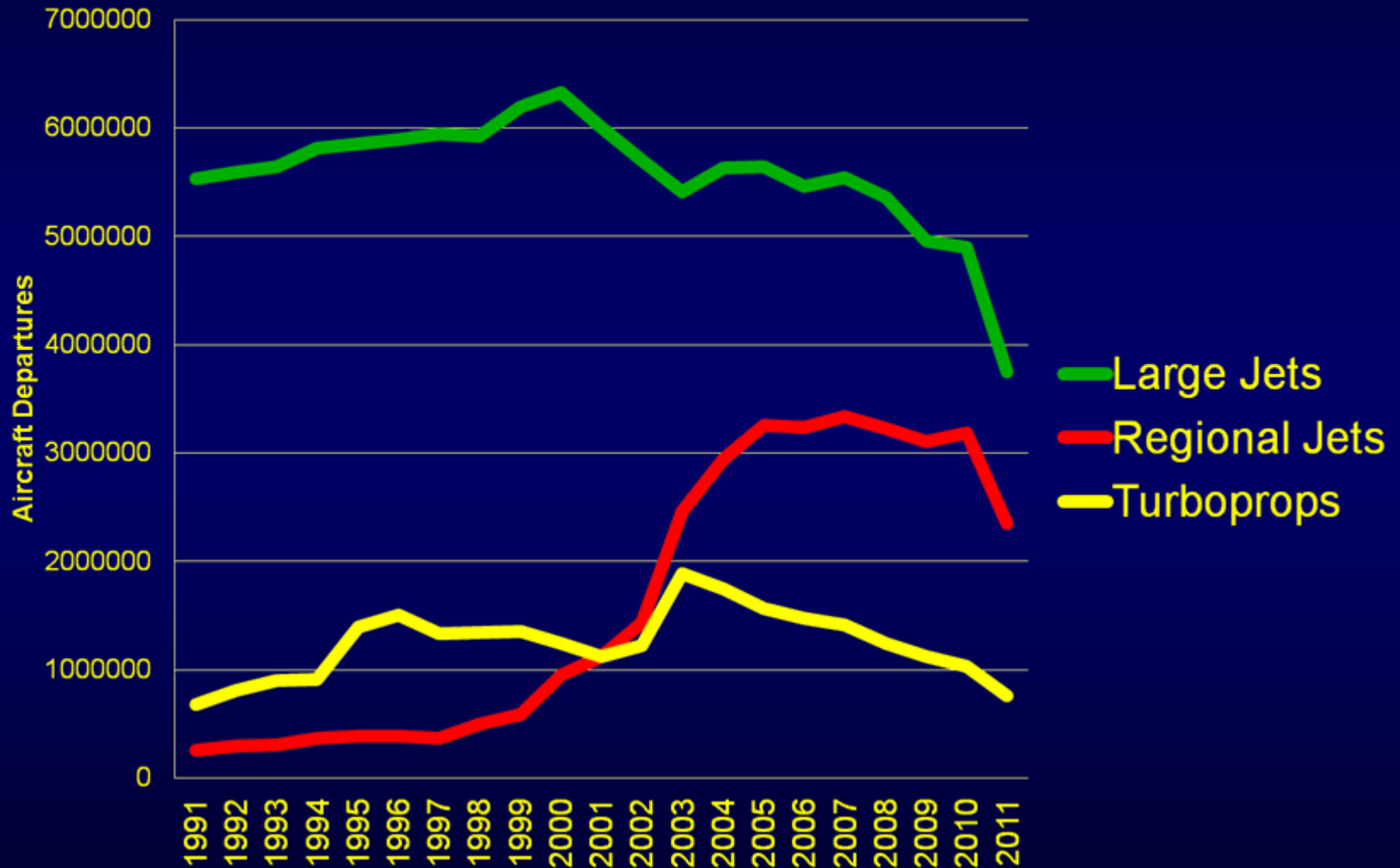


Domestic Scheduled Enplanements 1991-2011



Enplanements have been growing, with fluctuations because of economic conditions. But such aggregate numbers hide an important transition in service provision.

Scheduled Passenger Aircraft Departures by Aircraft Type, 1991-2011



Regional Jets – Filling the Gap

- Regional jets replace turboprops
 - Greater passenger acceptance
 - Greater local political acceptance
 - Aging turboprops taken out of service
- Regional jets replace mainline jets
 - Serve thinner markets
 - Maintain frequencies with falling traffic
 - Contract with regional carriers or separate affiliates
 - Aging “large” jets taken out of service
- Safety concerns with regional jets
 - Short Term – less experienced pilots
 - Long Term – durability of aircraft

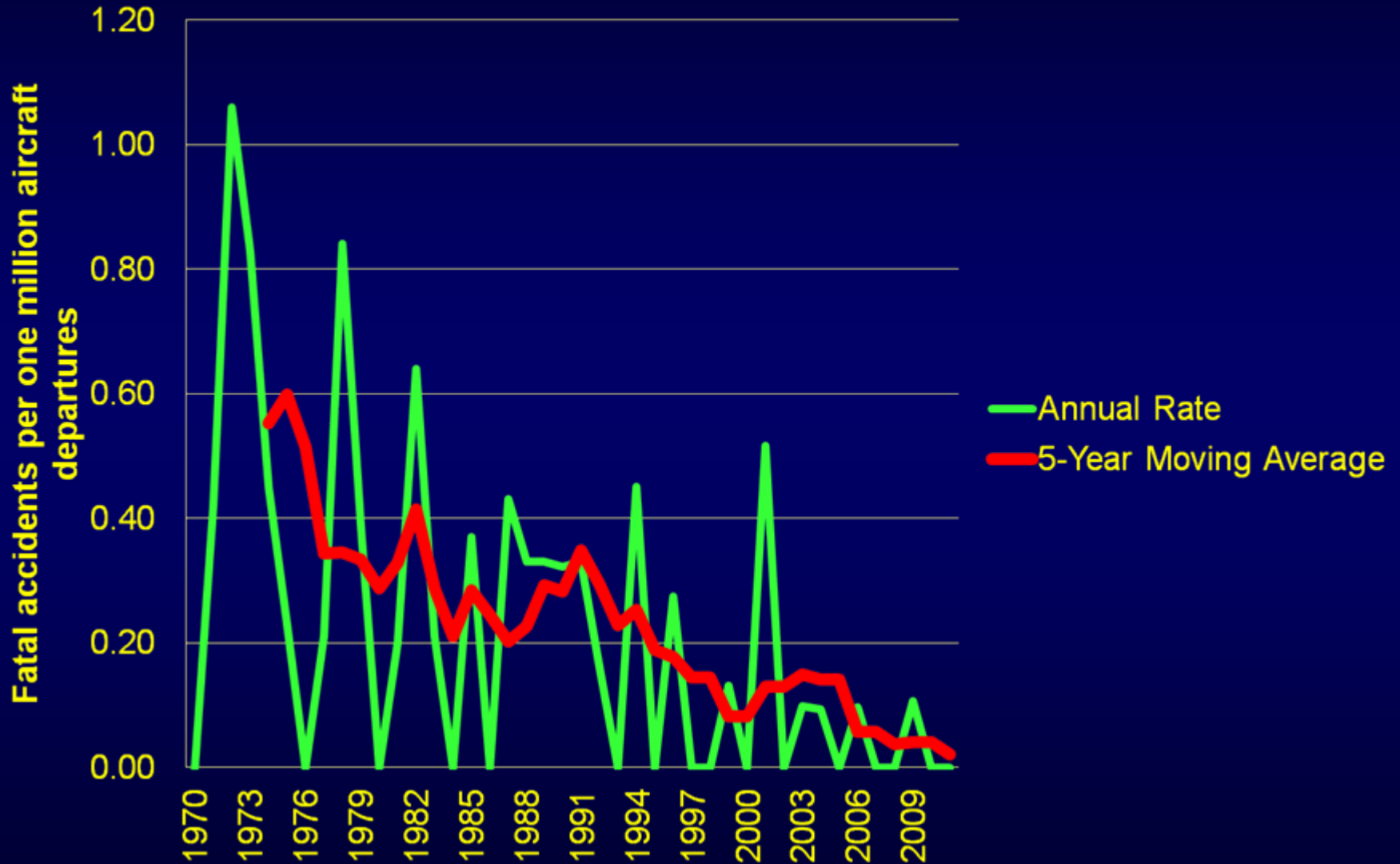
More Recent Trends and Emerging Concerns



What about the Margin of Safety?

- President's Commission on Aviation Safety
 - Initiated just prior to the 1987 conference
 - Created by Senator Byrd (W.Va.)
 - Found nothing to support the margin of safety argument
- But its report was issued in April 1988
- What has happened since?

Fatal Accident Rate, Domestic Scheduled Service, 1970-2011



What have we learned

- Safety improvement in the has been broad based
 - Rates of all types of accidents have declined
 - All segments of commercial aviation have improved
- Improved equipment and better pilot training seem to have been the key improvements
 - TCAS, Ground Proximity, ATM, Navigation, Weather
 - Fewer engine and avionics failures, better automation
 - Crew Resource Management training

What else have we learned?

- Rapid change stresses the entire system
 - Growth → Pilots “moving up” faster → less experience in the “left seat”
 - Merger → Differences in operating procedures
- The safety system seems pretty robust
 - It usually takes a string of failures to have an accident
 - A stressed system may result in more failures
 - More failures may just mean going further down the string more often rather than more accidents
- US system is still heterogeneous
 - Small commuters and air taxis still more dangerous
 - Aviation worldwide is extremely heterogeneous

Some Emerging Concerns

- Criminalization of aviation accidents (and operations)
 - Voluntary providing and sharing of safety information has been critical to improving safety
 - Lawsuits can impede this sharing
 - A potentially promising area is analyzing incidents that could have resulted in an accident but didn't
- Safety efforts driven by anecdote rather than analysis
- How does the increasing use of composites affect our ability to monitor structural integrity?
- Can our “system” sensibly address complex issues like human fatigue?
- Do we understand the downside of better automation?