

Aviation Insurance

Casualty Actuarial Society 2019 Annual Meeting

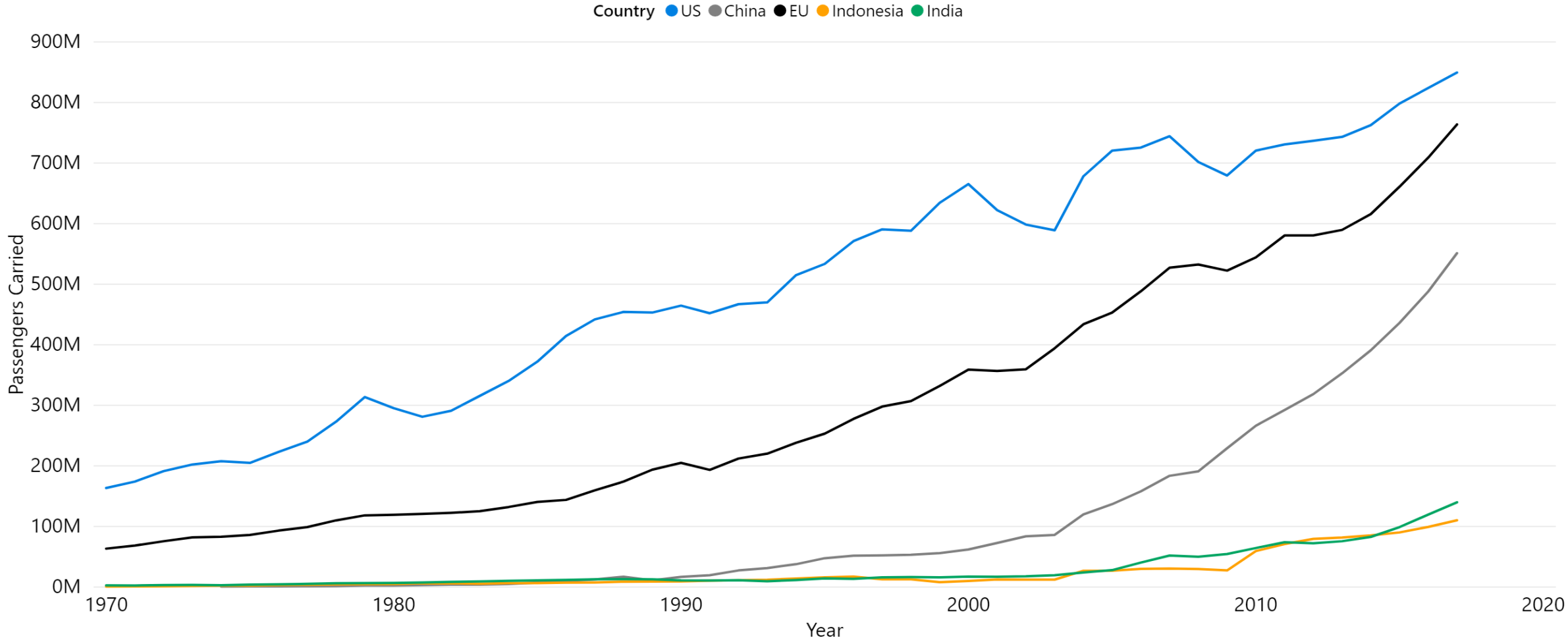
Carl X. Ashenbrenner, FCAS, MAAA

NOVEMBER , 2019



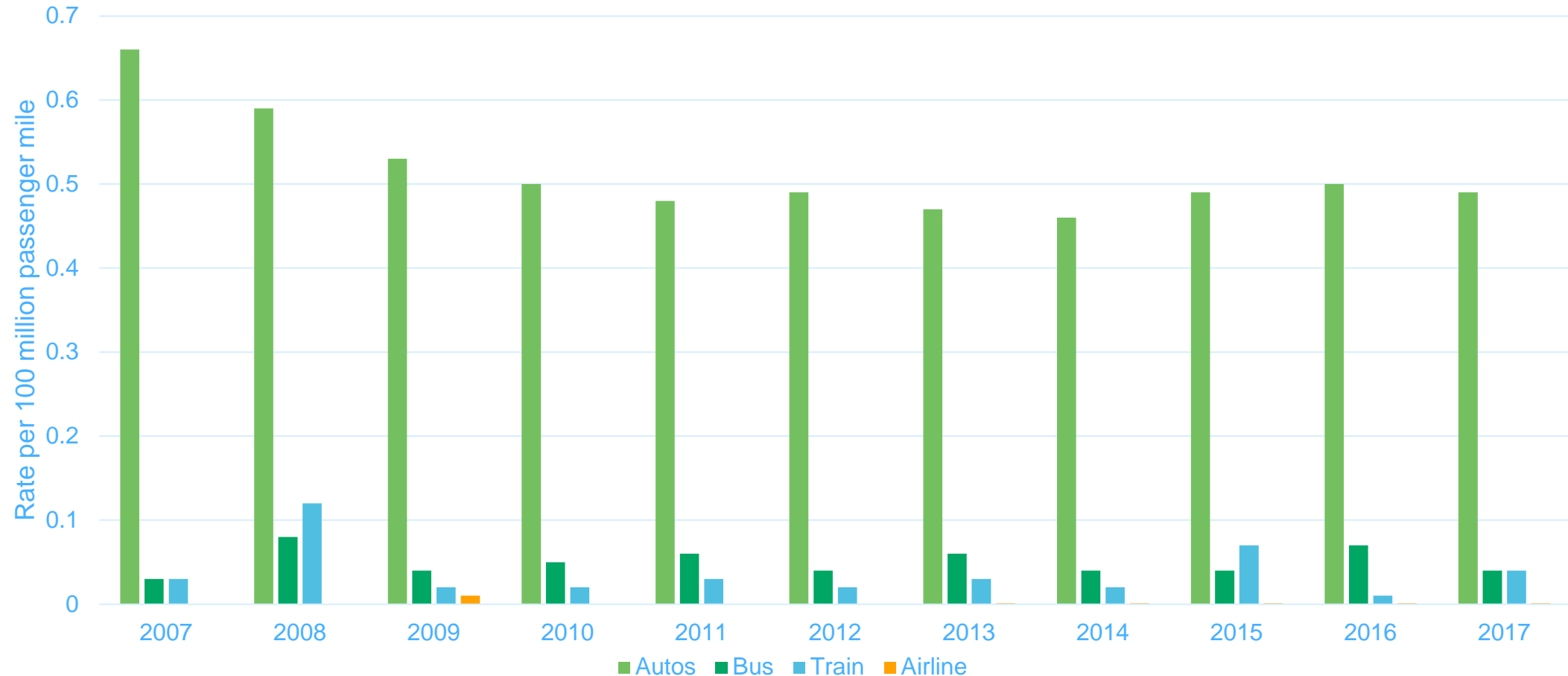
Aviation Industry Statistics

Air Transport Passengers Carried by Country from 1970-2017



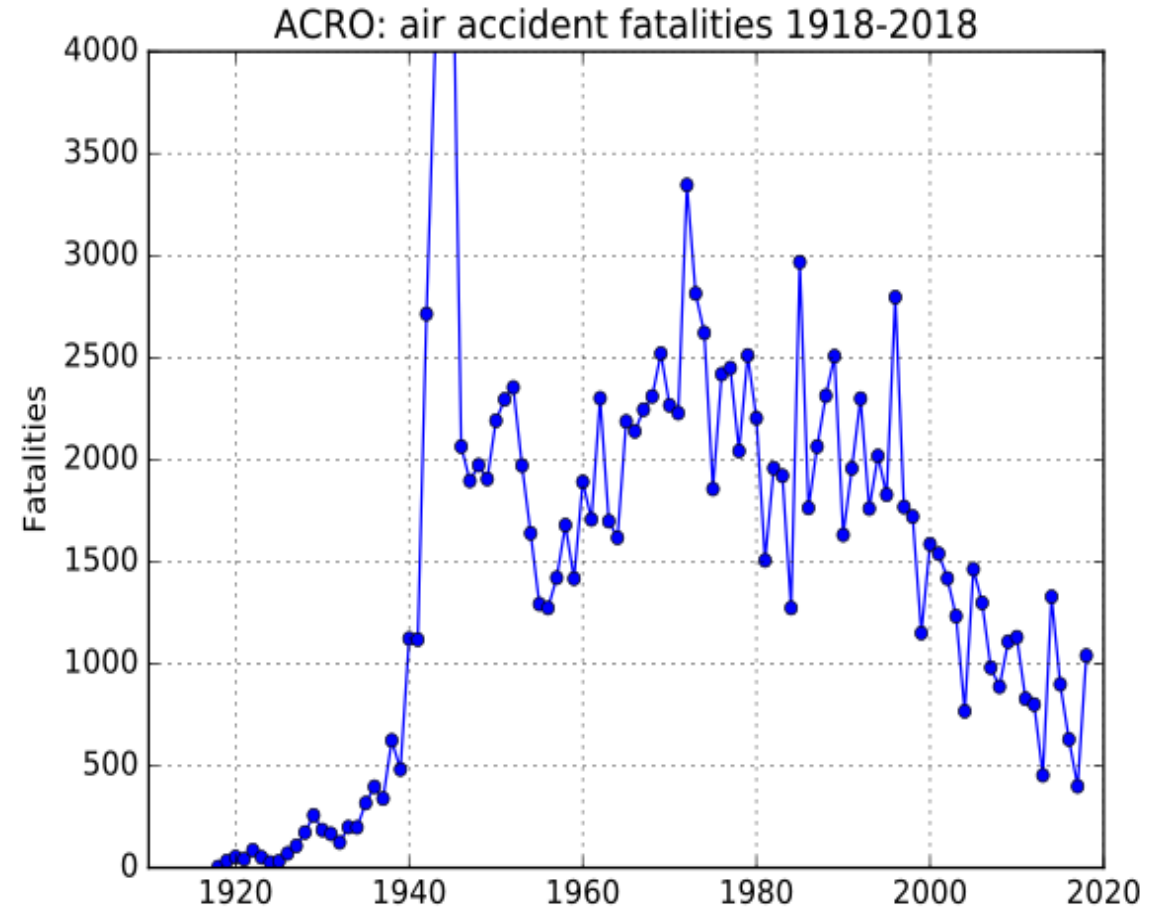
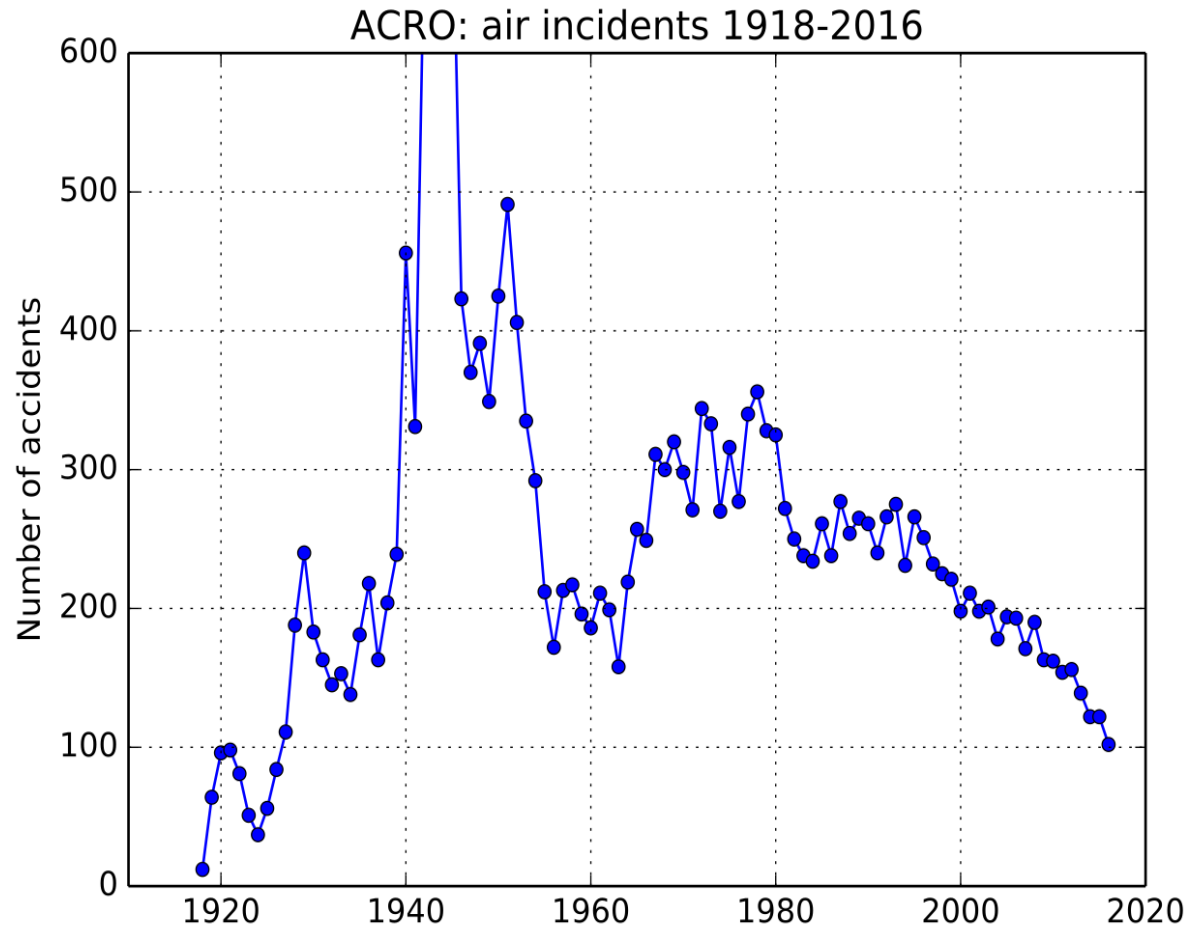
Data from The World Bank

Passenger Death Rates by Transportation Mode (US)



Source: National Safety Council

Airline Safety



Source: <http://www.baaa-acro.com/statistics/death-rate-per-year>

Aviation Insurance

Covered Risks and Exposures

- Major/ Regional /Cargo Airlines
 - American Airlines
 - FedEx
- Major Manufacturers (Products)
 - Boeing
 - Rolls Royce (engines)
- General Aviation
 - Charter
 - Corporate Fleets
 - Fractional Ownership
 - FBOs (Fixed based operators)
 - Minor products

Why Separate Market for Aviation?

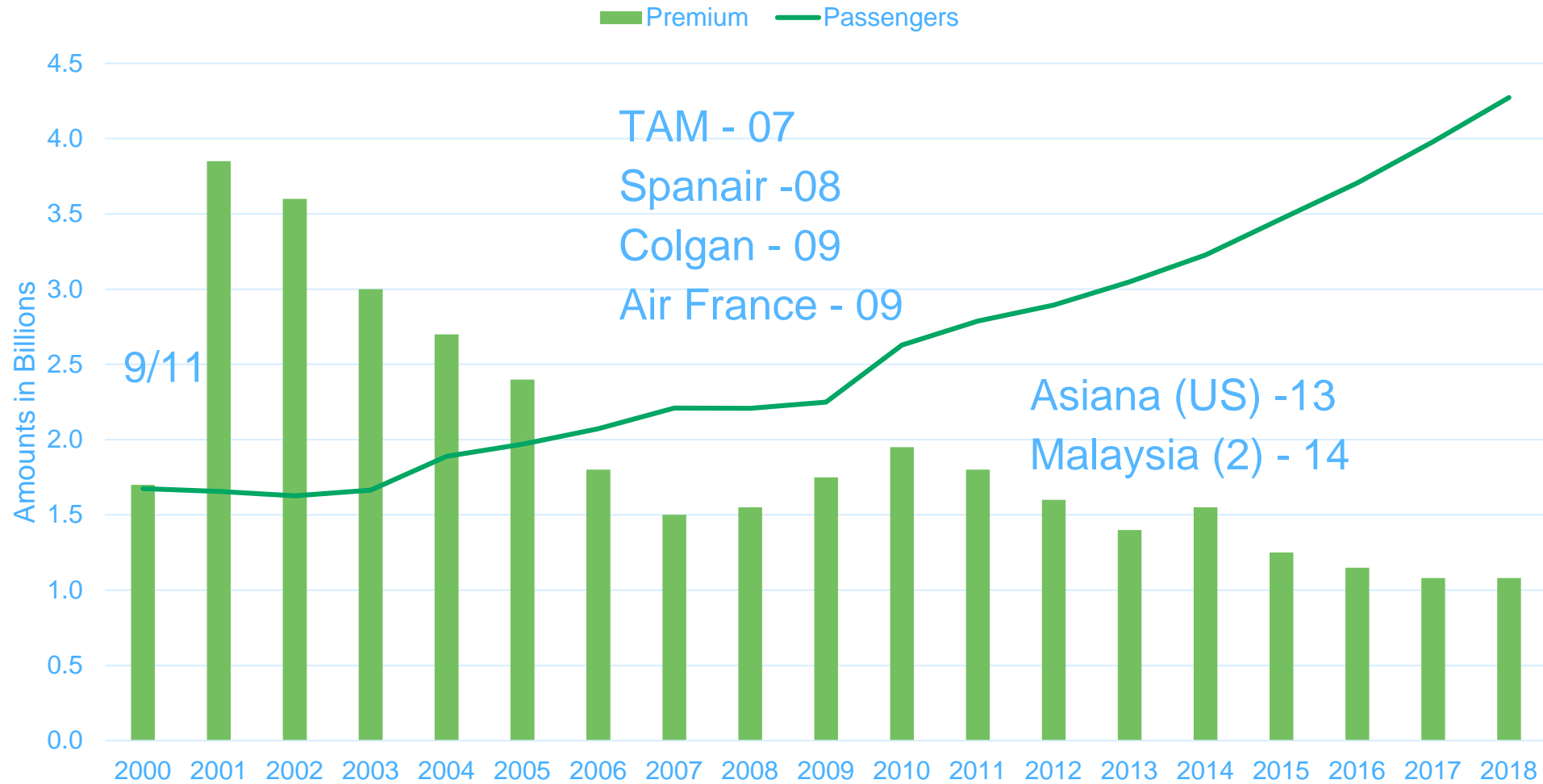
- General liability (GL) reinsurance policies historically excluded aviation risks
 - Primary GL excluded aviation risks
- Need for Specialization
 - Specialized policy, underwriting and claims handling
 - Separate laws (state, country, international treaties)
 - Spread of risk
 - Large policy limits (\$2B+)
 - Vertical placement

Primary \$1B limit								Excess \$1.5B Xs \$1B							
Ins1	Ins2	Ins3	Ins4	Ins5	Ins6	Ins7	Ins8	XS1	XS2	XS3	XS4	XS5	XS6	XS7	XS8

Aviation Insurance Underwriting Cycle - Why?

- Relatively easy to enter aviation market as a follow
 - Lead insurer provides loss adjusting and expertise
 - Policy language negotiated between brokers and major players
 - Subscription markets
- Short term memories
 - All major events are unique and “won’t happen again”
- Excess capital in market
 - Assumed little to no correlation to property cat risks

Airline Passengers to Airline Premium



A Brief History of Aviation Insurance

- 1688 – Lloyd’s begins in a coffee house to insure shipping industry
- 1903 – Wright brothers first flight
- 1914 – World War I; airplanes first used for military purposes
- 1924 – British Aviation Insurance Group formed
- 1929 – Associated Aviation Underwriters formed
- 1939 – WWII; first jet aircrafts used in military
- 1996 – Lloyd’s formation of Equitas
- 2001 – September 11th
- 2019 – “Lloyd’s of London calls time on drink and drugs” – BBC; April 8, 2019
 - “On-site bar will become a coffee shop”
- July 24, 2019 Flightradar24 records over 225,000 flights in one day

Legal Discussion

Aviation Civil Litigation

- Jurisdiction – what law applies?
 - State vs. Federal (US Event)
 - Other country
- Liability – Airline/Product/Airport
- Damages

Actuarial Considerations

Reserving for Attritional Claims

- Description
 - Defined as claims under some large dollar value (i.e \$100 Million Market Loss)
 - More predictable than major events, can use loss history to predict future losses
 - Separate losses by line (airlines, products, etc) and by hull or liability
- Methodology
 - Traditional Actuarial triangles and methods
 - Incurred and paid LDF, BF and pure premium methods
- Issues
 - Hull losses can have substantial salvage/subrogation (LDF less than unity)
 - Changing net retentions and policy limits
 - Implementation of trends - frequency (safety), severity and exposure

Aviation Multi-Party Major Events

- Hangar Collapse at Dulles (who's to blame?)



Aviation Multi-Party Major Events – Air France Flight 447

- Flight recorders not found until two years after accident
- 228 passengers and crew; 33 different nationalities
- Products include: Airbus 330; GE Engines; Pitot tubes (Thales)
- Flying through 50K foot mesoscale convective system (thunderstorm)



Actuarial Considerations

- Reserving for Major Events
 - Exclude major events as these claims develop differently than attritional claims
 - Claims are “event driven” – no need to reserve for crashes that didn’t happen
 - Reserve amounts shift between airlines and manufacturers; legal rulings can significantly change total liability
 - Salvage and Subrogation can be substantial
 - Liable parties may enter into sharing agreements to minimize legal costs and preserve on-going relationships

Increasing Severities

- **Jury awards \$116M for 3 National Air Cargo pilots' families (Cook County)**
 - two 12-ton M-ATVs and three 18 ton Cougars loaded on plane
 - Insufficient straps to tie down and overloaded
 - <https://www.youtube.com/watch?v=7sUWC2jfjql>
- **\$100M settlement in helicopter crash (burn victim - Colorado)**
 - believed to be the highest pre-trial settlement in U.S. history at \$100 million.
- **Boeing Loses Bid to Toss \$2.2M Decompression Injury Award**
 - “claims that she suffered post-traumatic stress disorder after the decompression and emergency landing of a 757 jetliner”
- **Jury Awards \$148M to Dancer Paralyzed in O'Hare Shelter Collapse – settled for \$115M**
 - “The payout will be covered by the city's insurance and not taxpayers.”

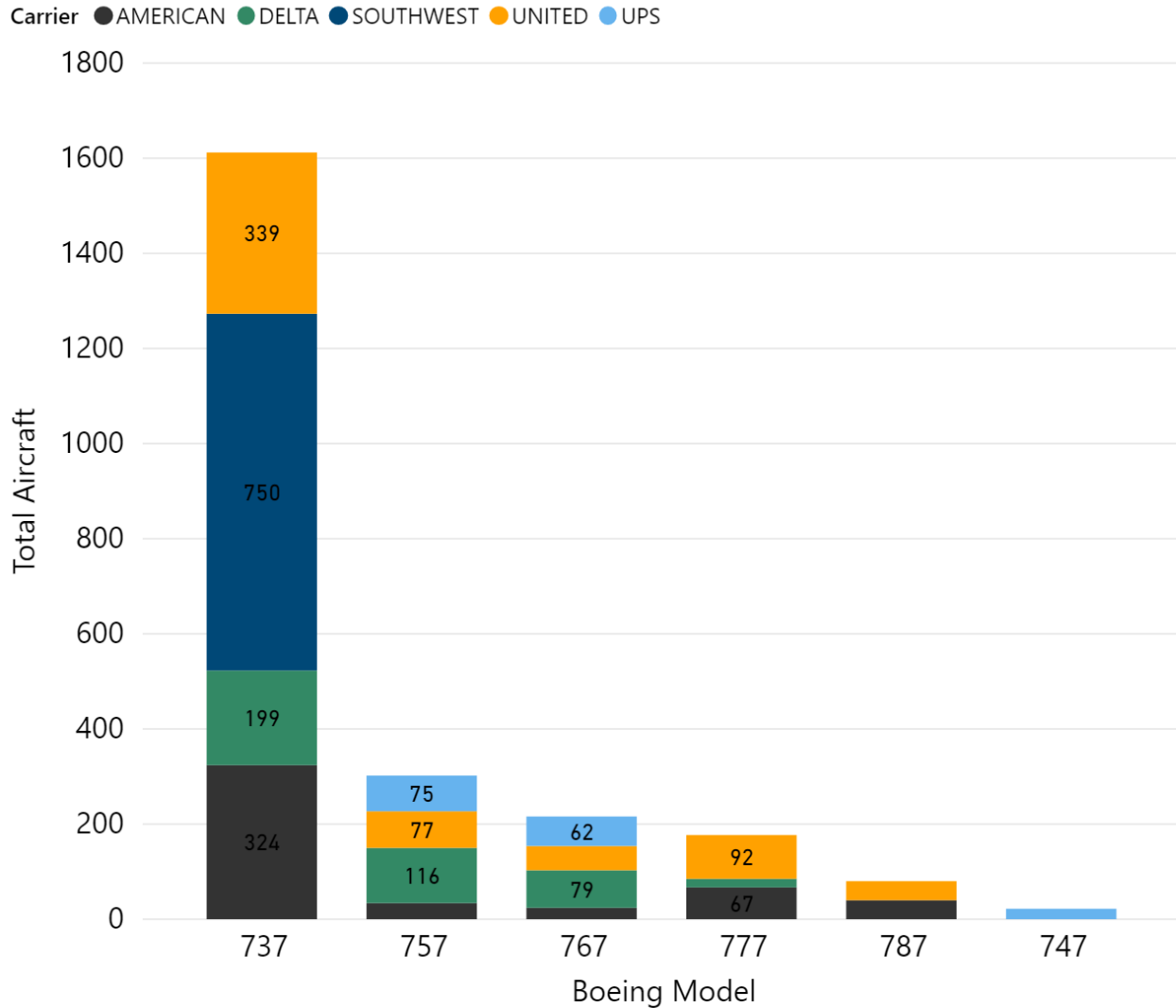
Example of Major Event Development Between Insureds

	Development Period					
	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72-Ult</u>
Total Market Loss	100	100	100	100	100	100
Total Market Loss - Split by Segment						
Airline Reported Losses	100	100	75	75	75	50
Products Reported Losses	0	0	25	25	25	50
Total Reported Losses	100	100	100	100	100	100
Company 1 writes 15% Airline and 5% Products						
Airline Reported Losses	15	15	11.25	11.25	11.25	7.5
Products Reported Losses	0	0	1.25	1.25	1.25	2.5
Total Reported Losses	15	15	12.5	12.5	12.5	10
Age - to - Age LDF	1.000	0.833	1.000	1.000	0.800	1.000
Cumulative LDF	0.667	0.667	0.800	0.800	0.800	1.000
Company 2 writes 5% Airline and 15% Products						
Airline Reported Losses	5	5	3.75	3.75	3.75	2.5
Products Reported Losses	0	0	3.75	3.75	3.75	7.5
Total Reported Losses	5	5	7.5	7.5	7.5	10
Age - to - Age LDF	1.000	1.500	1.000	1.000	1.333	1.000
Cumulative LDF	2.000	2.000	1.333	1.333	1.333	1.000

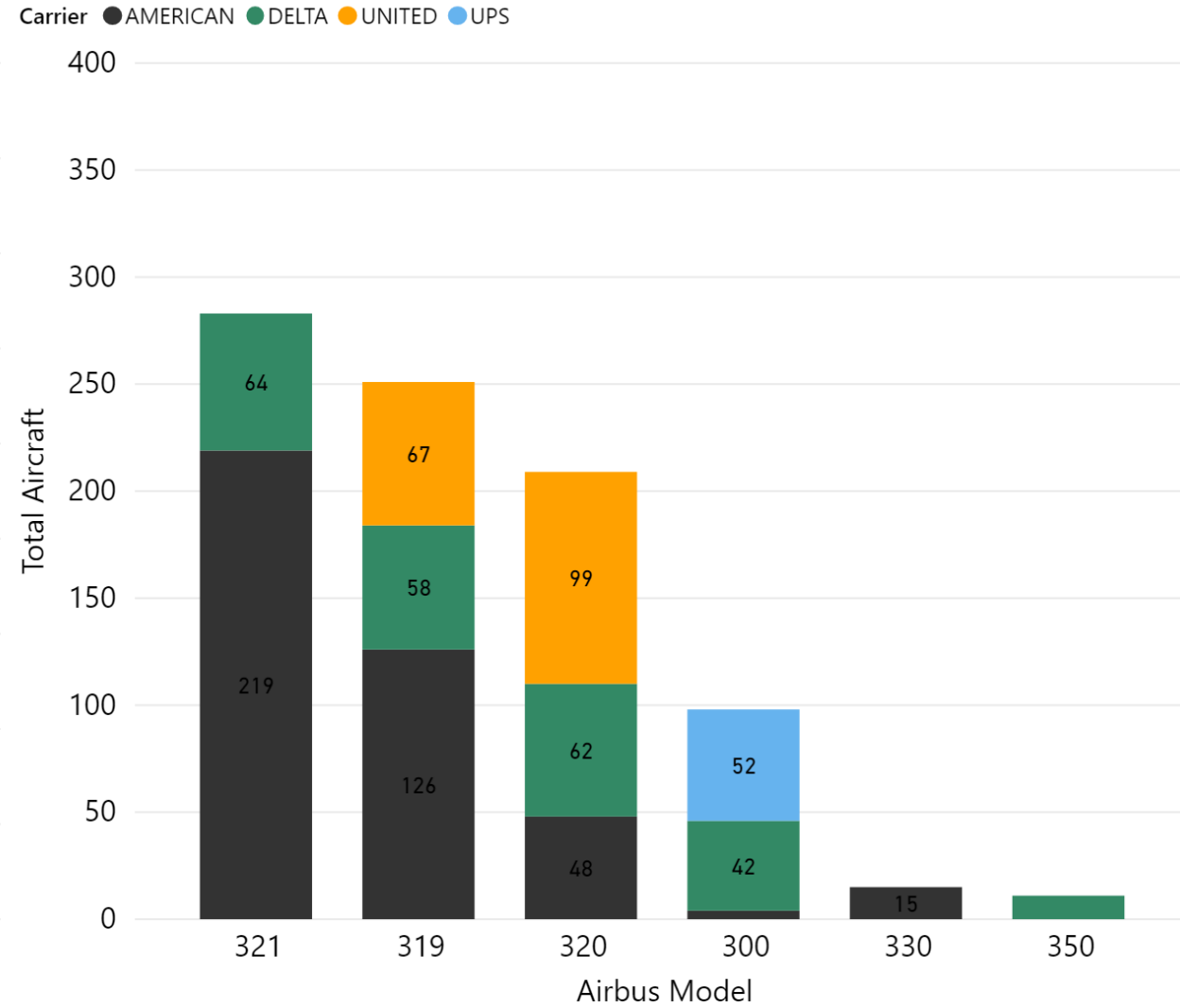
Boeing 737 Max



Boeing Aircraft in Operation by Carrier



Airbus Aircraft in Operation by Carrier



Data from The Bureau of Transportation Statistics

Beginning of 737 Max

- “During spring of 2011, American Airlines was ready to place an order for hundreds of new, fuel-efficient jets from Airbus”
- “Boeing ditched idea of developing new passenger plane... Instead it decided to update its workhorse 737”
- “The timeline was extremely compressed,” the engineer said. “It was go, go, go.”
- “Limit changes to hopefully avert a requirement that pilots spend time training in a flight simulator before flying the Max.”
- “The push for automation was a philosophical shift for Boeing, which for decades wanted to keep pilots in control of the planes as much as possible. Airbus, by comparison, tended to embrace technology, putting computers in control. Pilots who preferred the American manufacturer even had a saying: “If it’s not Boeing, I’m not going.””

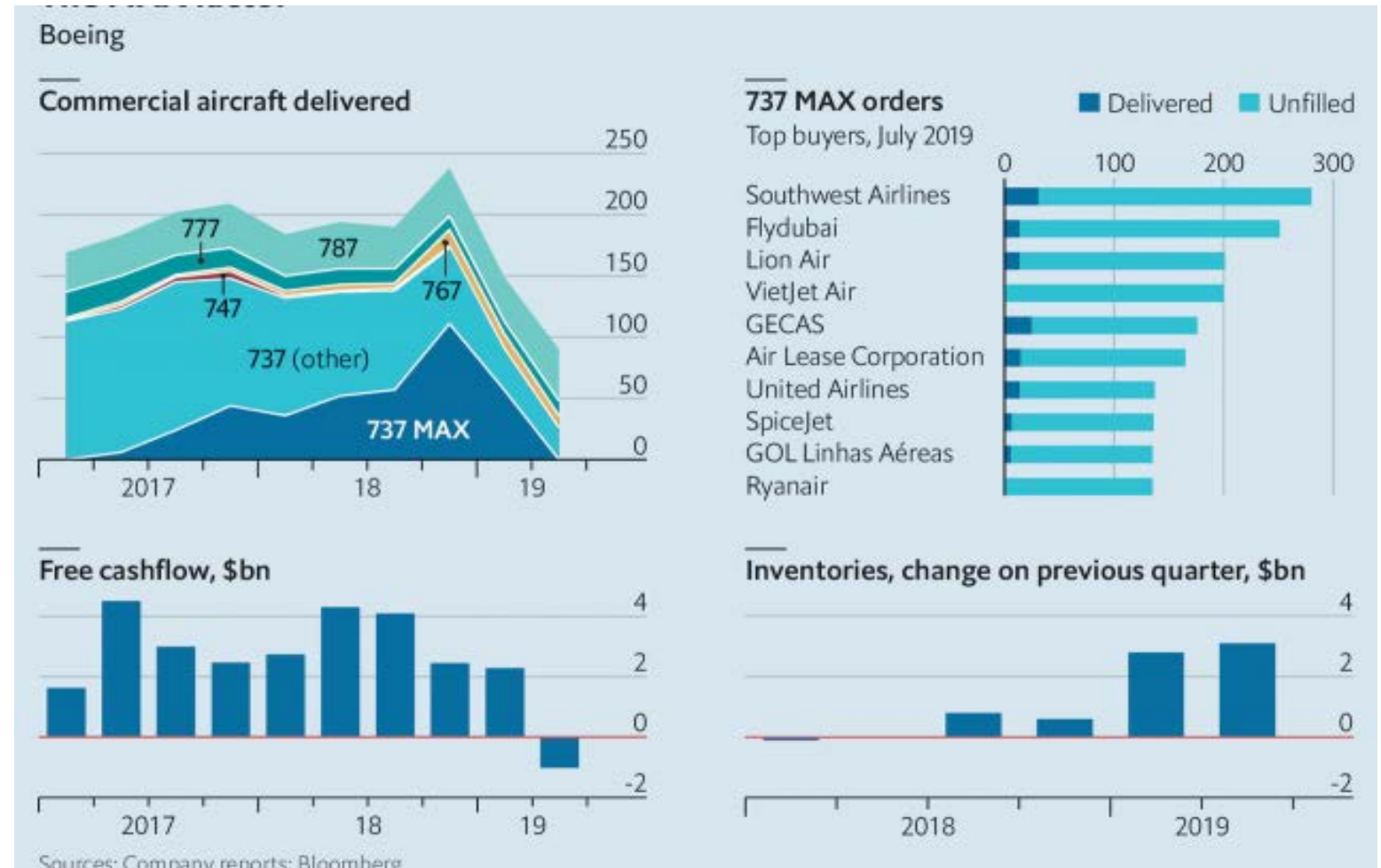
Source: NY Times “Boeing was ‘Go,Go,Go’ to Beat Airbus With the 737 Max” 03/23/19

Grounding of 737 Max

- Lion Air Flight 610 crashes killing 189; October 29, 2018
- Ethiopian Airlines Flight 302 crashes killing 157; March 10, 2019
- During March 2019 all countries ground 737 Max planes

Impact of 737 Max Grounding

- 5,000 737 Max orders since 2011 and 390 delivered
- Southwest – cancelled thousands of flights- \$175M hit in 2Q
- American Airlines scrapped 115 flights a day - \$350M hit in 2019
- Boeing stock lost 25% of value



Source: The Economist “Boeing’s troubles cost the aerospace industry \$4B a quarter” August, 2, 2019

Insurance Impact of 737 Max

- “Boeing ... set aside \$4.9B for compensation for angry airlines..” - The Economist
- Boeing says charges tied to 737 Max Grounding to reach \$8 Billion” – NY Times
- Reinsurance broker Willis Re said in its report on April 1 reinsurance renewals that the grounding claim "could potentially be the largest ever non-war claim the market has incurred" and that it could "erode three to four years' worth of reinsurers' global excess of loss premium" in aerospace. – S&P Global Market Intelligence
- Boeing’s product liability limit = \$2.5B – S&P Global Market Intelligence
 - \$500M sublimit for grounding liability – S&P Global Market Intelligence
- Claims from Lion Air and Ethiopian Air crashes
- Grounding claims from Airlines
- Boeing sued by more than 400 pilots in class action over 737 Max...



Thank you

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