The Aviation System Is Complex

~800 airlines

200 languages

1,350+ major airports

150,000+ flight crew

200 countries

240,000+ maintenance personnel

Over 21,000 airplanes (Western built)
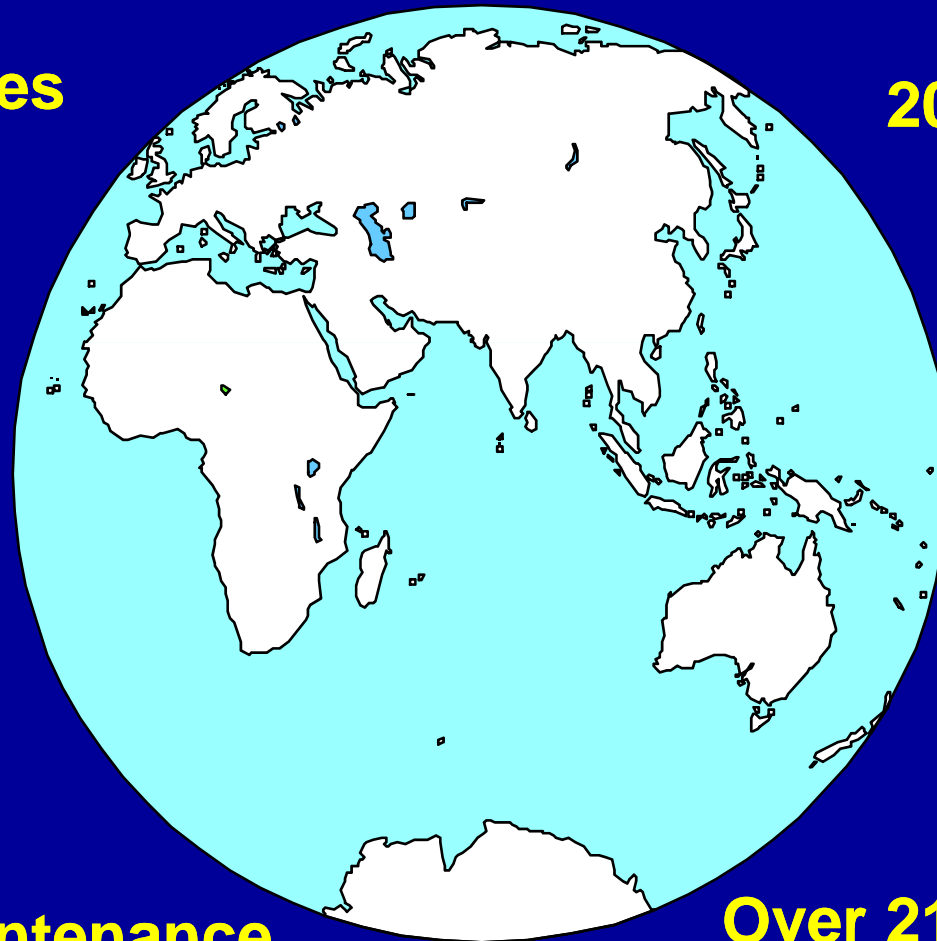
Safety Responsibilities Are Shared

Safe Airplane + Safe Operation + Safe Infrastructure = Safe Air Travel

Manufacturers

- **Safe airplane design**
- **Safety-enhancing technology development**
- **Flight and maintenance operations, recommendations, documents, training, and support**
- **Maintenance planning**
- **Safety-related analysis**
- **Safety initiatives**

Operators

- **Operations policy and procedures**
- **Airplane/pilot publications**
- **Approved maintenance program**
- **Maintenance, policy, and procedures**
- **Maintenance publications**
- **Safety program**
- **Training**

Governments

- **Aviation law**
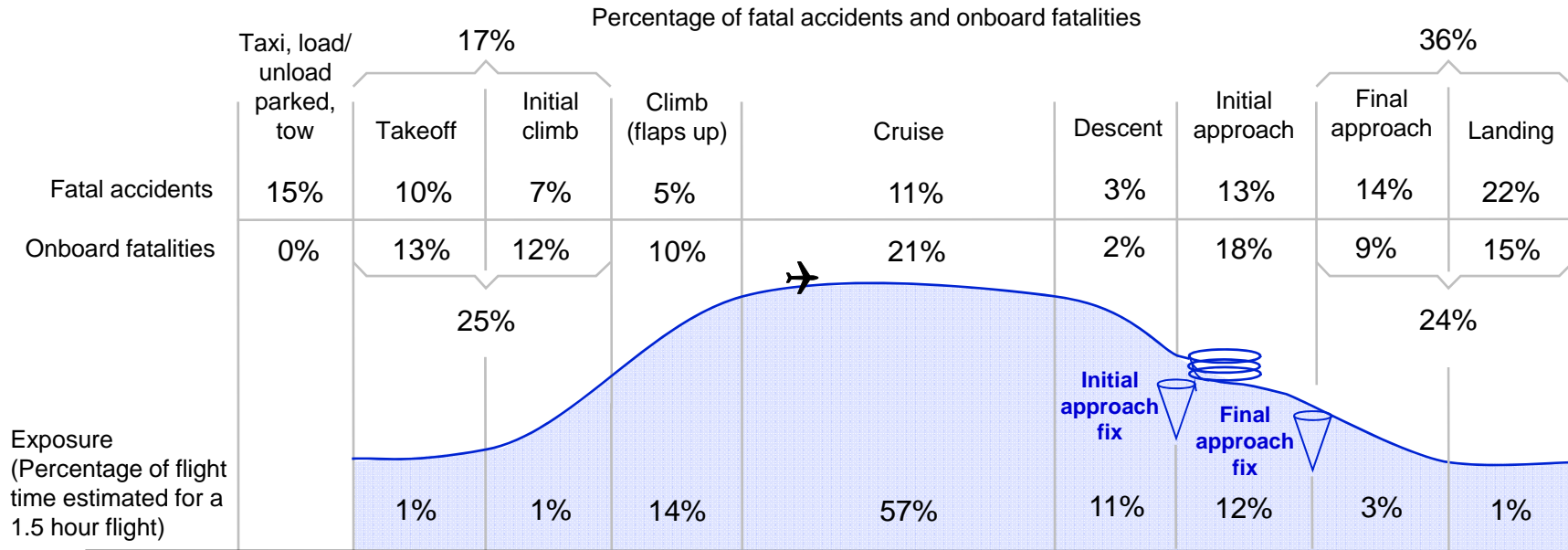- **Operations specification**
- **Rules and regulations**
- **Inspectors policy, procedures, and training**
- **Airline policy and procedures requirements**
- **Safety, health, environmental law, and regulations**
- **Navigation facilities/operations**
- **Airport facilities**
- **Departure en route, arrival, approach policy, and procedures**
- **Air traffic control services**
- **Safety-related analysis**
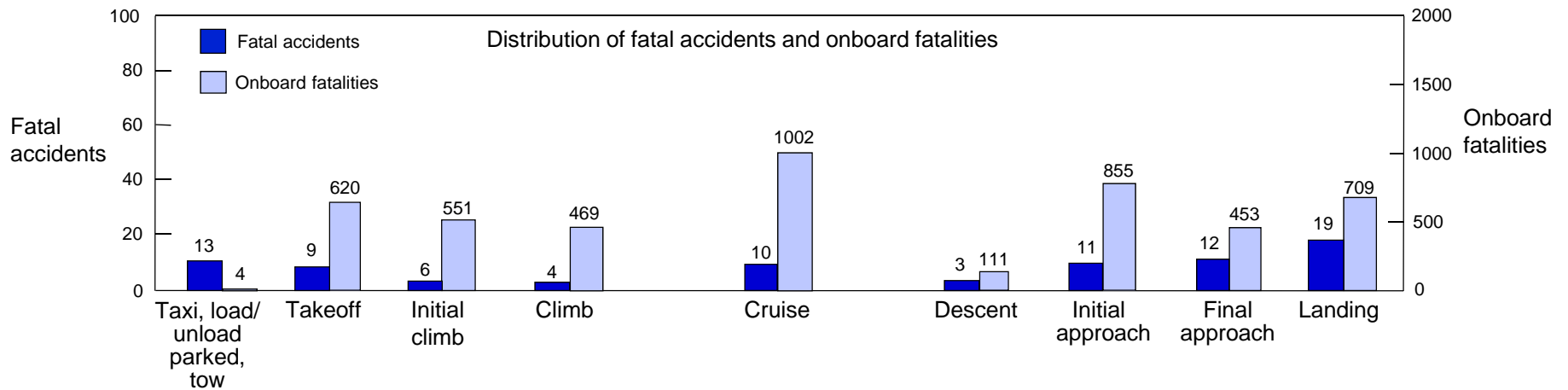
Aviation Safety:
Some Perspective

Worldwide:

- An airplane is landing approximately every two seconds somewhere in the world

- More than 3 million people fly each day

- In 2011, Over 1.6 billion people flew on over 29 million flights

Fatal Accidents and Onboard Fatalities by Phase of Flight
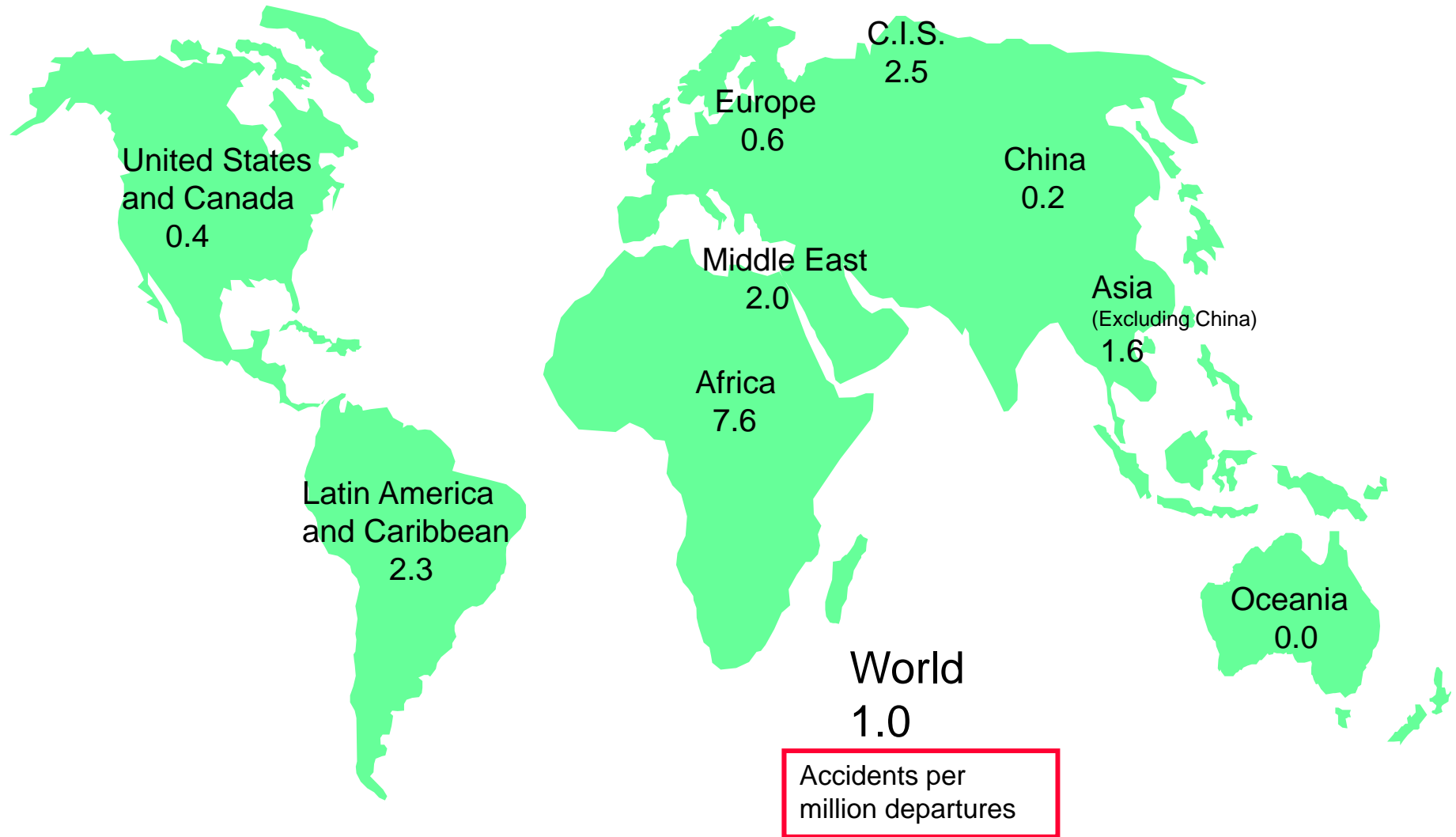## Worldwide Commercial Jet Fleet – 2001 Through 2010

Percentage of fatal accidents and onboard fatalities

	Taxi, load/ unload parked, tow	Takeoff	Initial climb	Climb (flaps up)	Cruise	Descent	Initial approach	Final approach	Landing
		17%						36%	
Fatal accidents	15%	10%	7%	5%	11%	3%	13%	14%	22%
Onboard fatalities	0%	13%	12%	10%	21%	2%	18%	9%	15%
		25%						24%	
Exposure (Percentage of flight time estimated for a 1.5 hour flight)		1%	1%	14%	57%	11%	12%	3%	1%

Initial approach fix

Final approach fix

Percentages may not sum to 100% due to numerical rounding.

Distribution of fatal accidents and onboard fatalities

- Fatal accidents
- Onboard fatalities

Fatal accidents / Onboard fatalities

Phase	Fatal accidents	Onboard fatalities
Taxi, load/ unload parked, tow	13	4
Takeoff	9	620
Initial climb	6	551
Climb	4	469
Cruise	10	1002
Descent	3	111
Initial approach	11	855
Final approach	12	453
Landing	19	709

BOEING

Regional Perspective
Accident Rates Vary by Region of the World

Western-built transport <u>hull loss</u> accidents, by <u>airline domicile</u>, 2001 through 2010

C.I.S.
2.5

Europe
0.6

China
0.2

United States
and Canada
0.4

Middle East
2.0

Asia
(Excluding China)
1.6

Africa
7.6

Latin America
and Caribbean
2.3

Oceania
0.0

World
1.0

Accidents per
million departures

Possible Reasons for Regional Accident Rate Differences

- **Infrastructure**
  - **Air traffic control**
  - **Navigation aids**
  - **Airport equipment**
  - **Weather services**

- **Airline operations**
  - **Procedures**
  - **Training**
  - **Maintenance**
  - **Dispatch**

- **Regulatory oversight**
  - **Aviation law**
  - **Regulation**
  - **Personnel qualifications**
  - **Resource constraints**

2008 Libya

Most Frequent Causal Factors - Worldwide

- Poor Professional Judgement/airmanship   74%
- Omission of action/inappropriate action   72%
- Failure in CRM (Crosscheck/Coordinate)   63%
- Lack of Positional awareness in air   51%
- Lack of awareness of circumstances in flight   47%
- Flight handling difficulties   45%
- Slow/delayed crew action   45%
- "Press-on-itis"   42%
- Deliberate non-adherence to procedures   40%
- Slow and/or low on approach   36%
- Incorrect or inadequate ATC instruction/advice/service   33%
- Fast and/or high on approach   30%

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Slow/de

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**ALL ADDRESSED BY
THE ALAR TOOLKIT**

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Source: Flight Safety Foundation Approach-and-Landing Accident Reduction (ALAR) Task Force

Operator Safety Culture Is Major Factor in Risk Reduction

- **Safer operators have:**

  – Safety emphasis from senior management

  – Strong procedural development programs

  – Strong standardization programs

  – Training based on accident/incident data - emphasis on accident related operational topics

  – Safety programs reporting to senior management

Operators with poorer records are missing one or more of these safety culture issues

Operator Safety Culture Is Major Factor in Accident Prevention

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- O **→ALAR Toolkit Emphasis**

  missing one or more of these safety culture issues

Challenges in This Region

- **Operational –**
  - **Varied Terrain**
  - **Obstructions to Visibility (Haze/smoke/weather)**
  - **Many airports with no precision approach aids**
  - **Turbulent areas**

- **Training –**
  - **Many pilots and controllers to train**
  - **Rapid expansion**
  - **Smaller operator issues**

Major Accidents
Indonesia
2000 – 2011

Date	Operator	Aircraft	Location	Phase	Fatal
26 Mar 01	Merpati	F27	Surabaya, Indonesia	Landing	3
15 Jun 01	Manunggal Air	Transall C160	Jayapura, Indonesia	Landing	1
14 Jan 02	Lion Air	B737-200	Pekanbaru, Indonesia	Takeoff	0
16 Jan 02	Garuda	B737-300	Jakarta, Indonesia	Descent	1
25 May 02	Trigana Air Service	DHC-6	Nr. Nabire, Indonesia	Cruise	6
3 Sep 02	Trigana Air Service	DHC-6	Silimo, Indonesia	Landing	0
27 Mar 03	Air Regional	DHC-6	Mulia, Indonesia	Climb	4
28 Apr 03	Air Regional	DHC-6	Gunung Mulia, Indonesia	Landing	0
30 Nov 04	Lion Air	MD-82	Solo City, Indonesia	Landing	31
5 Sept 05	Mandala Airlines	B-737-200	Medan-Polonia,Indonesia	Takeoff	104
12 April 05	GT Air	DHC-6	Indonesia	Enroute	17
3 October 06	Mandala Airlines	B-737	Tarakan, Indonesia	Landing	0
5 June 06	Merpati Nusantara	CASA 212	Bandanaira, Indonesia	Landing	0
17 Nov 06	Trigana Air Service	DHC-6	Puncak Jaya, Inodnesia	Enroute	12
1 Jan 07	Adam Air	B-737	Sulawsui, Indonesia	Enroute	102
21 Feb 07	Adam Air	B-737	Surabaya, Indonesia	Landing	0

Major Accidents
Indonesia
2000 – 2011 (page 2 of 2)

Date	Operator	Aircraft	Location	Phase	Fatal
7 March 07	Garuda	B-737	Yogyakarta, Indonesia	Landing	22
6 March 08	Manunggal Air	Transal C-160	Wamena, Indonesia	Landing	0
6 Nov 08	Express Air	Dornier 328	Fak Fak, Indonesia	Approach	0
9 March 09	Lion Air	B-737	Jakarta, Indonesia	Landing	0
9 April 09	Avistar Mandiri	BAE-146	Wamena, Indonesia	Approach	6
29 June 09	Aviastar Mandiri	DHC-6	Wamena, Indonesia	Enroute	3
2 Aug 09	Merpati Nusantara	DHC-6	Oksibil, Indonesia	Enroute	15
13 April 10	Merpati Airlines	B-737	Rendani, Indonesia	Landing	0
12 Feb 11	Sabang Air Charter	CASA 212	Bintan, Indonesia	Enroute	5
7 May 11	Merpadi Nusantara	MA-60	Kaimana, Indonesia	Approach	25
29 Sept 11	Nusantara Buana	CASA 212	Medan, Indonesia	Enroute	18

Challenges and Opportunities

- Approach & Landing accidents have both led to the majority of major accidents worldwide - and in your region

- The ALAR toolkit is an effective resource for addressing both the CFIT and Approach & Landing accident risks

- There are challenges to the successful implementation of the toolkit, but dedication and effort can overcome those challenges