

**DOCKET NO.: SA-517**  
**EXHIBIT NO. 2U**

**NATIONAL TRANSPORTATION SAFETY BOARD**  
**WASHINGTON, D.C.**

**CAPTAIN PAUL WOODBURN WITNESS PRESENTATION**  
**(23 Pages)**

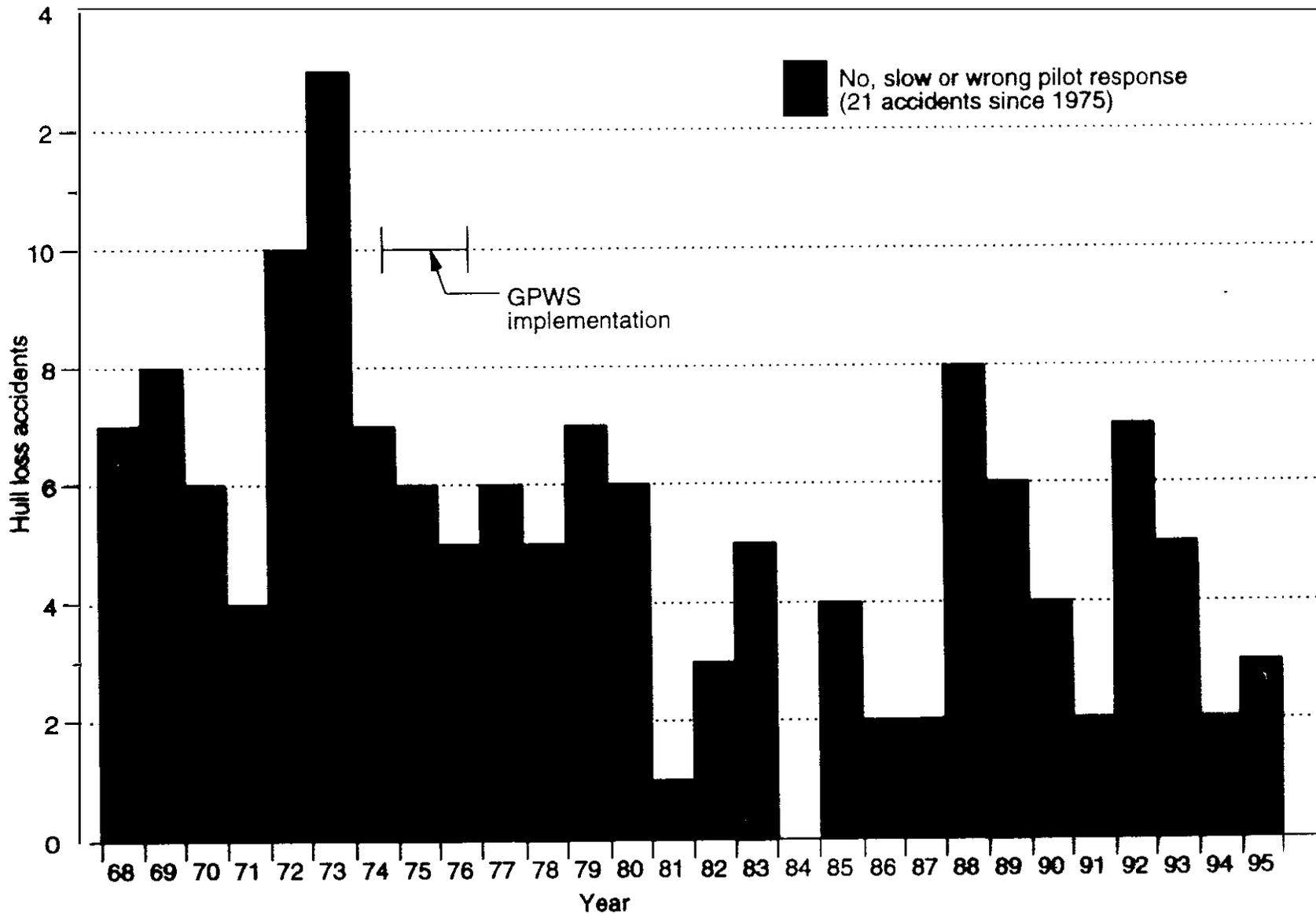
# CFIT DEFINITION

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**" WHEN AN AIRCRAFT IS INADVERTENTLY  
FLOWN INTO THE TERRAIN OR WATER "**

# CONTROLLED FLIGHT INTO TERRAIN

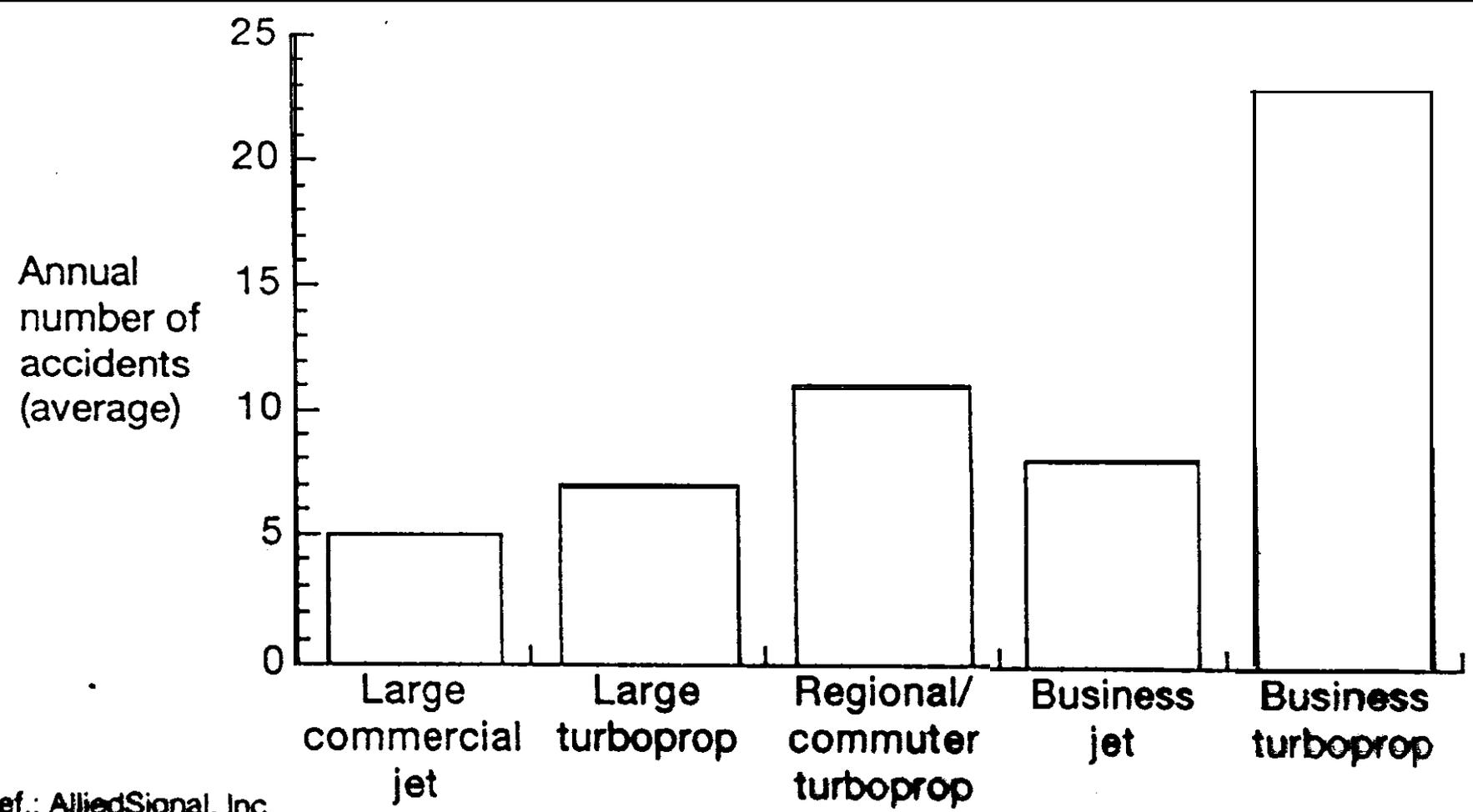
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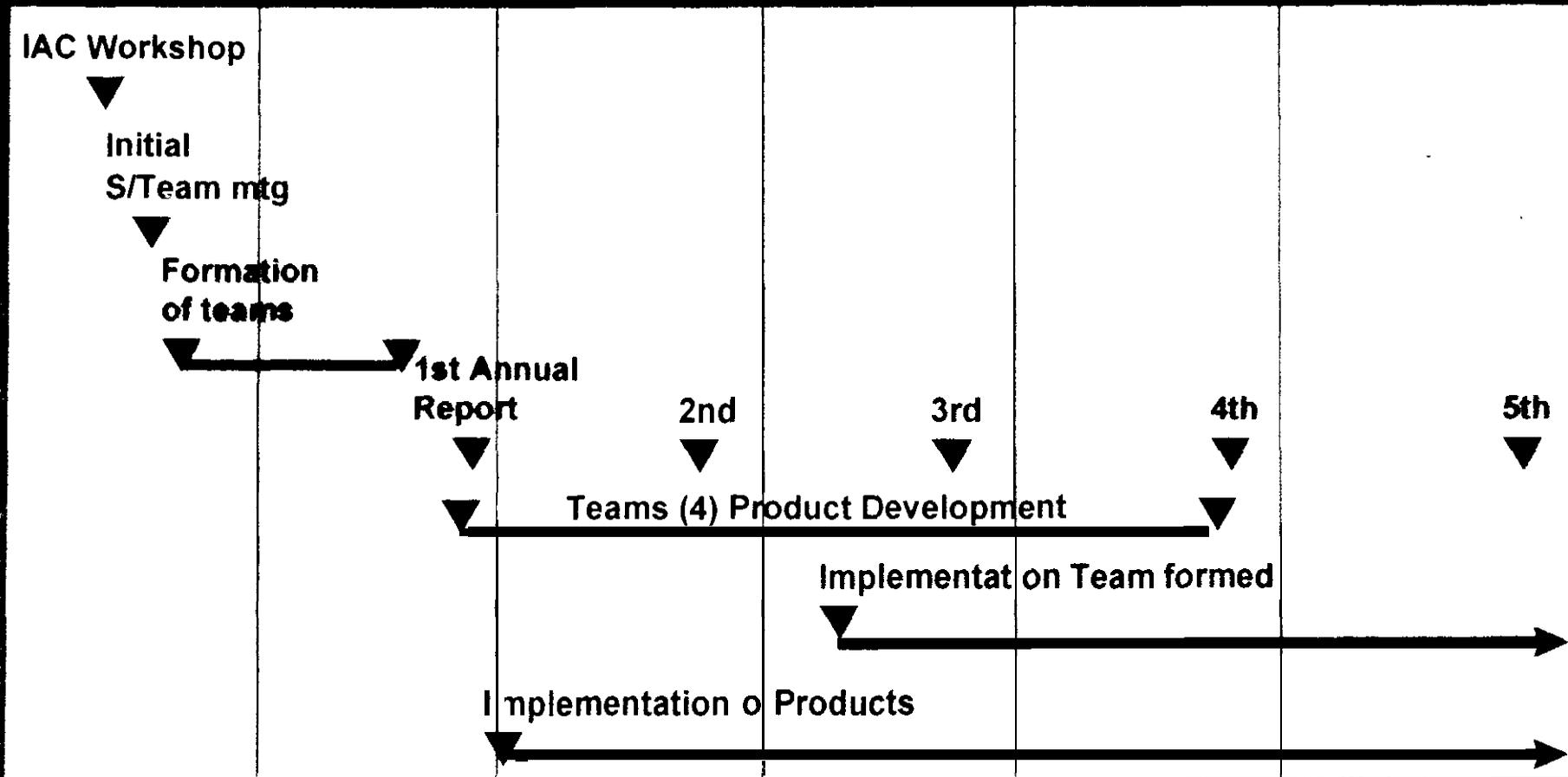
# Average Annual CFIT Accidents

Worldwide—1983–1992



Ref.: AlliedSignal, Inc.

# CFIT REVIEW



# Worldwide and U. S. Airline Fatalities

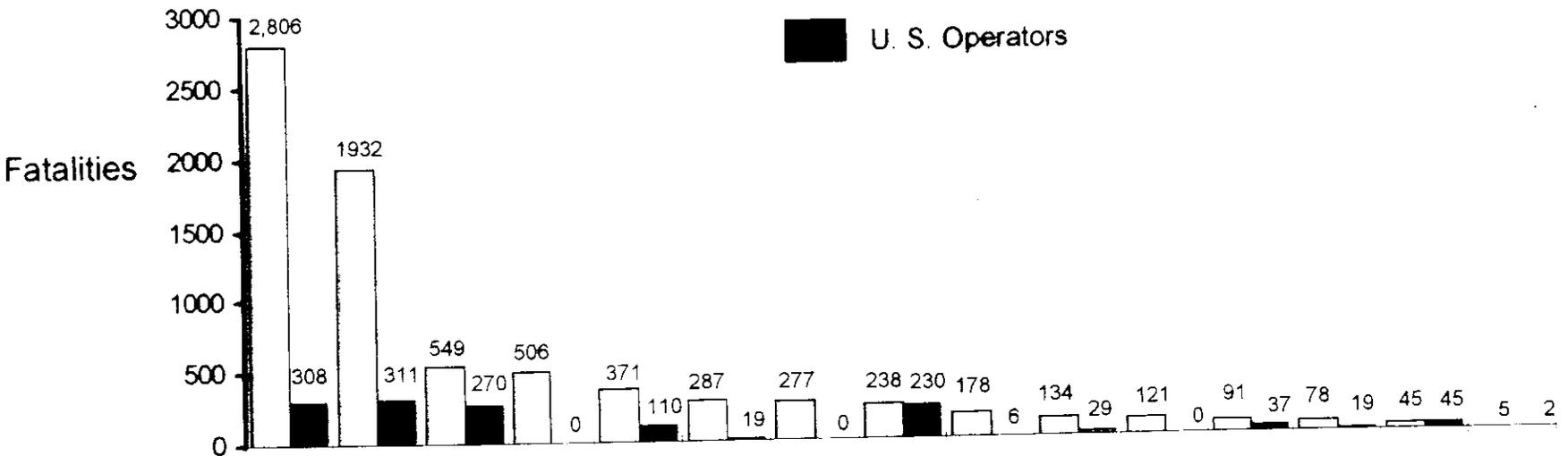
## Classified by Type of Accident – 1988 through 1997

5

Total fatalities - 7,618

Worldwide

U. S. Operators



	CFIT	Loss of control in flight	Sabotage	Mid-air collision	In-flight fire	Other/unk	Hijack	Fuel tank explosion	Landing	Ice/snow	Fuel exhaustion	Wind-shear	Takeoff config.	Runway Incursion	RTO
Worldwide number of fatal accidents (136 total)	36	31	4	2	2	18	6	2	12	4	7	2	4	4	2
U.S. Operators (33 total)	3	8	1	0	1	8	0	1	1	2	0	1	2	4	1

CFIT = Controlled Flight Into Terrain  
RTO = Refused Takeoff

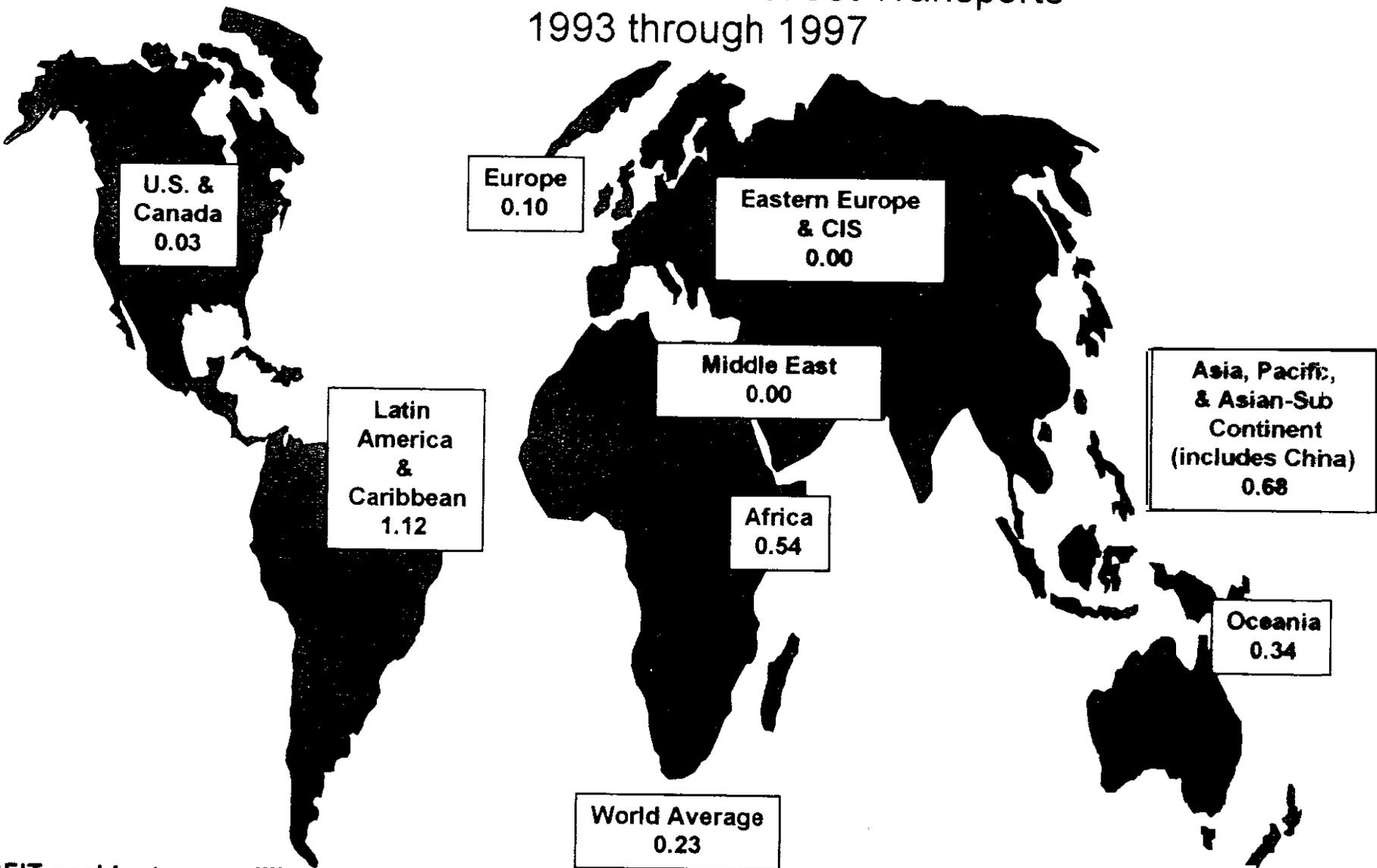
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# CFIT Accident Rates\* by Region Where Accident Occurred

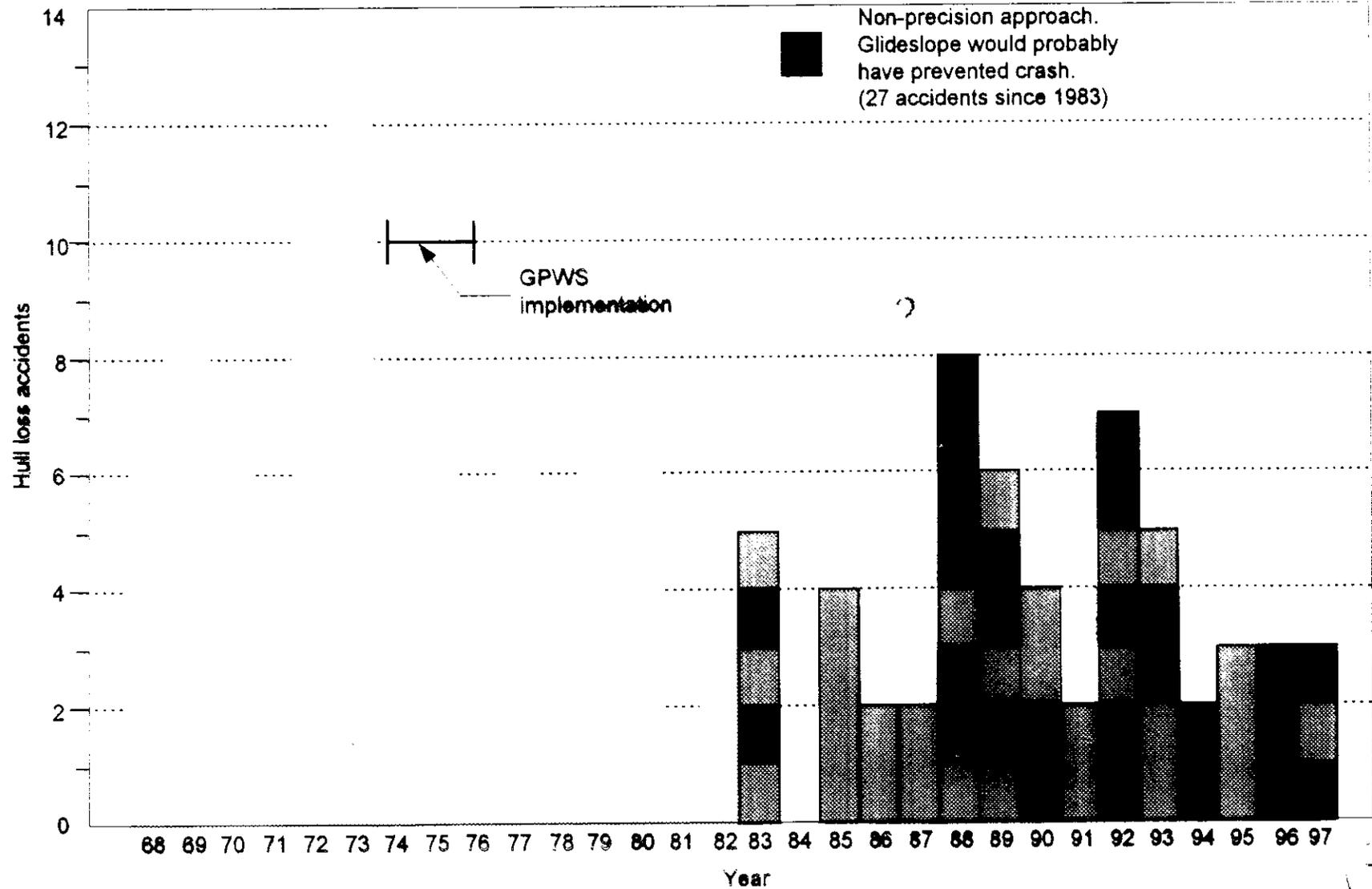
Western-Built Commercial Jet Transports  
1993 through 1997



\*CFIT accidents per million departures

10

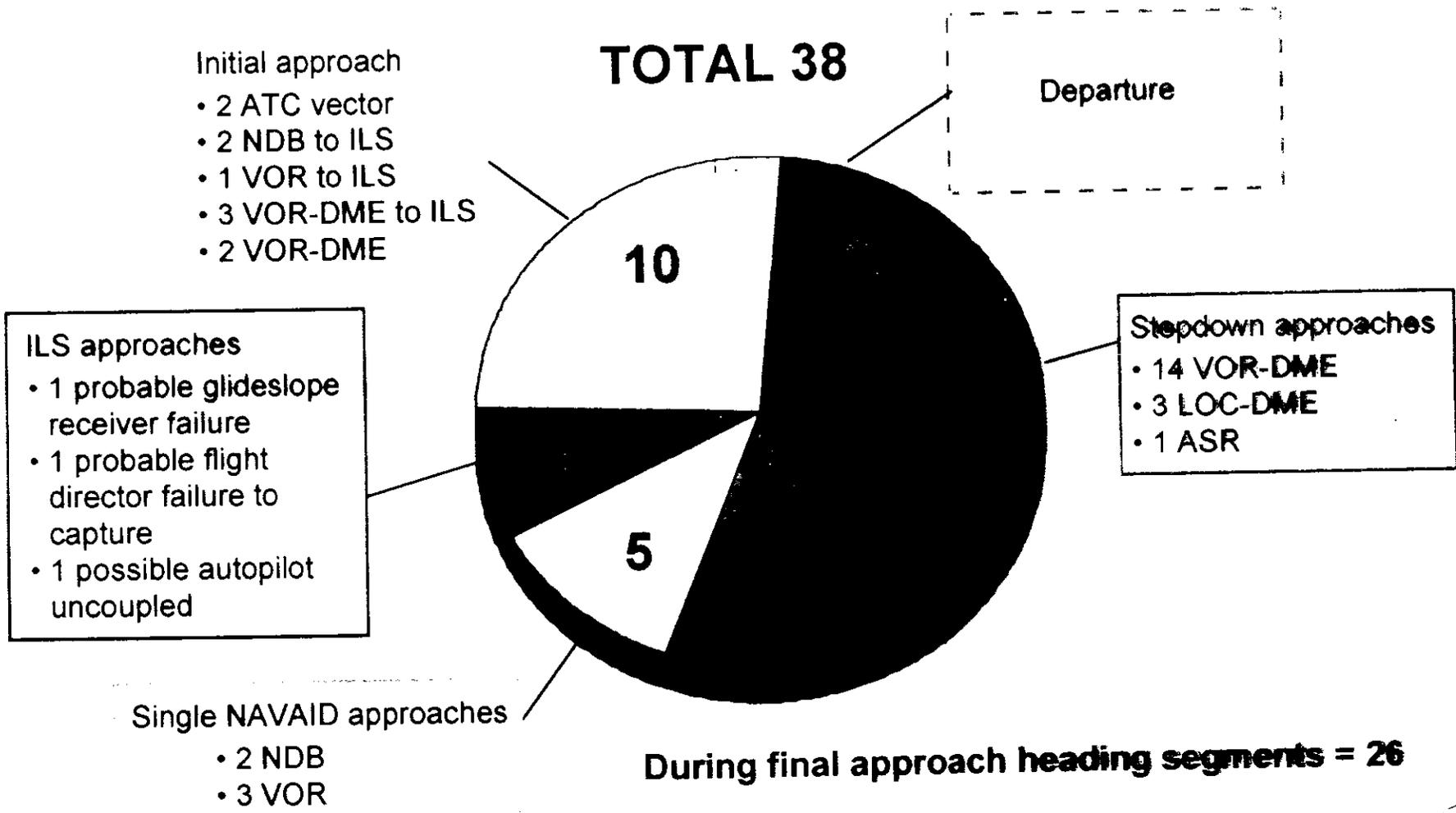
# Controlled Flight Into Terrain



# CFIT Accidents by Type of Instrument Procedure

Commercial Jet Aircraft – July 1988 to December 31, 1997

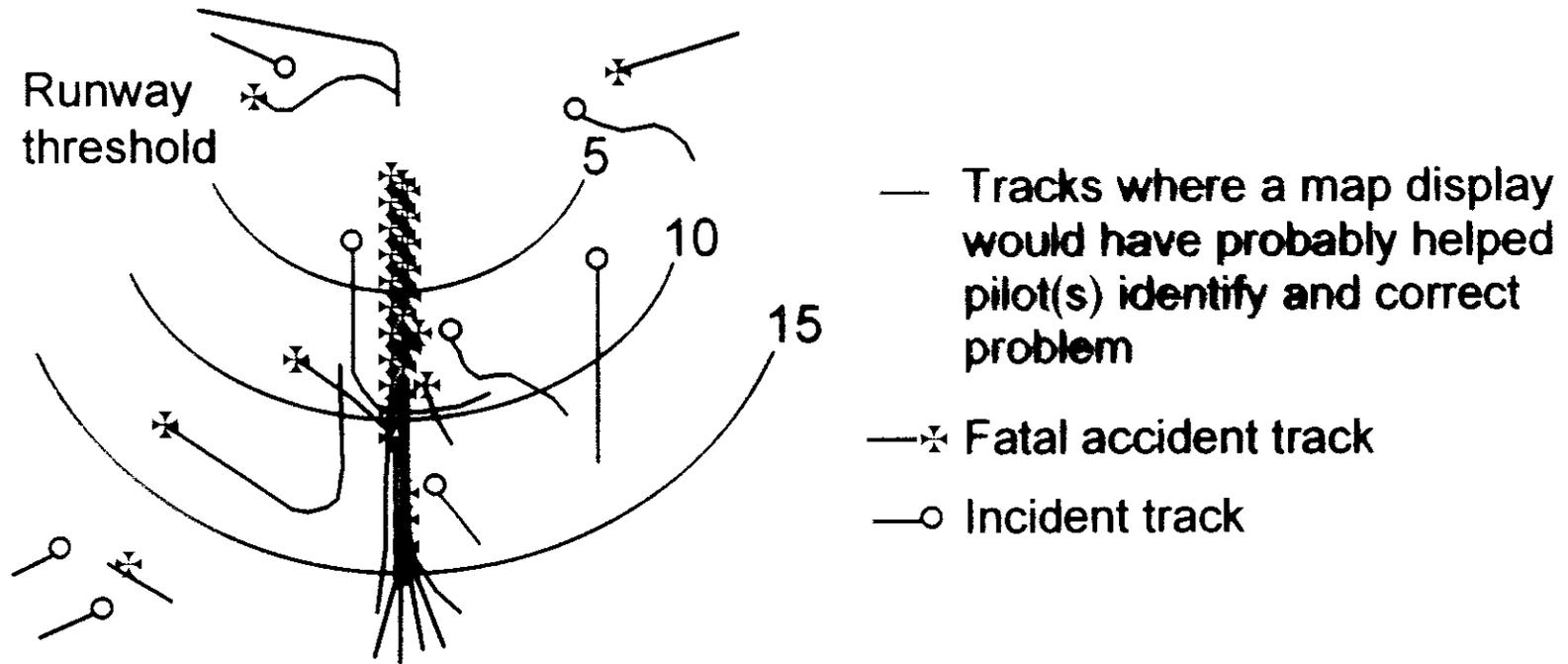
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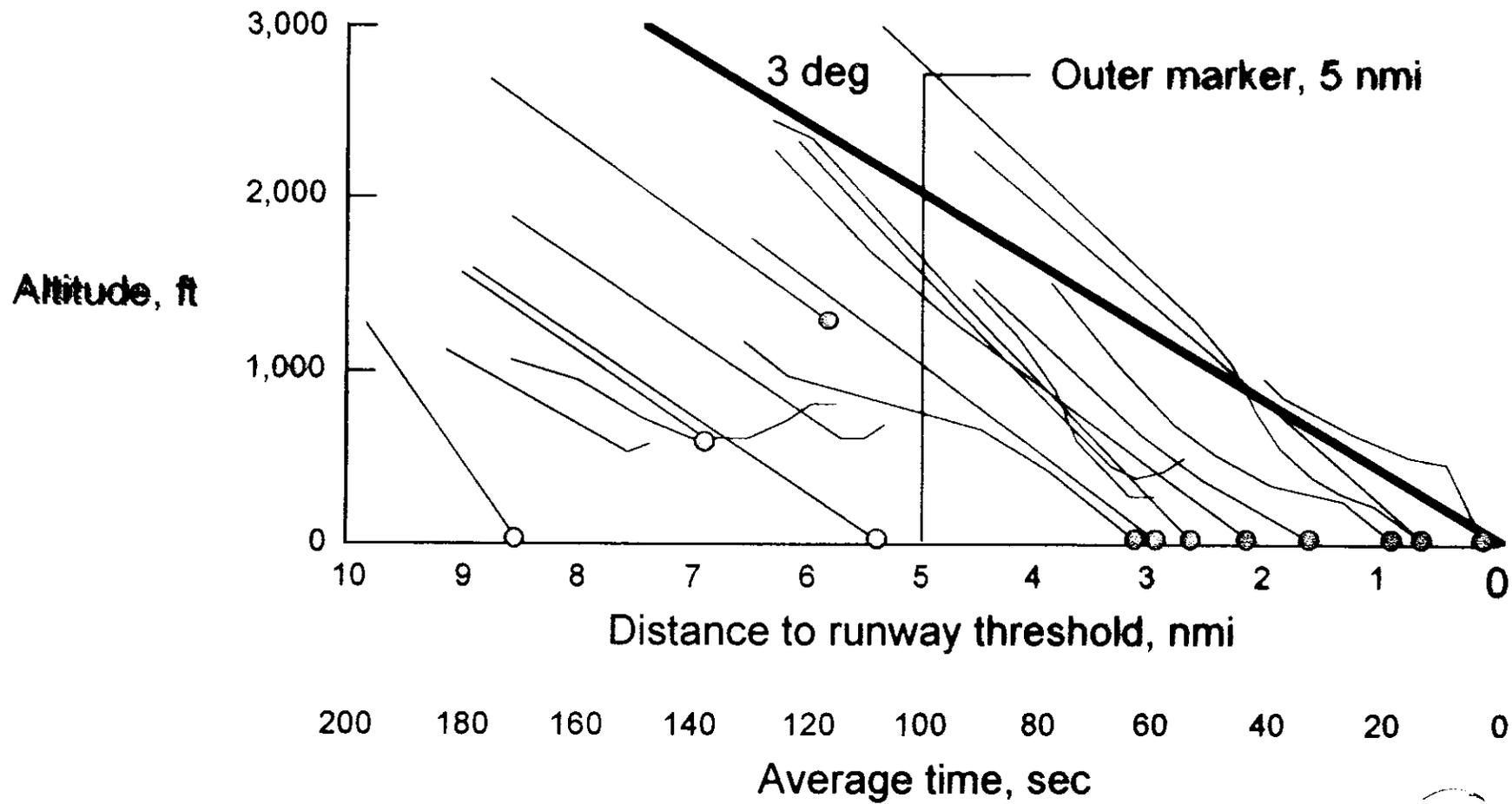
# Map Location of CFIT Accidents/Incidents

## From Runway Threshold, 40 Accidents/Incidents



**5-Year Period, 1986 to 1990**

# Vertical Profile of Some Recent CFIT Accidents/Incidents



# Overall Goals

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- Reduce CFIT accident rate by 50% in 5 years (1998)
- Limit worldwide accident rate to no more than twice the rate in the lowest geographic region

# INDUSTRY PARTICIPATION

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- **FSF - OPERATORS  
MANUFACTURERS  
REGULATORY AUTHORITIES  
TRAINING ORGANISATIONS**
  
- **ICAO**
- **IATA**
- **IFALPA / ALPA / ATA**
- **ATC AUTHORITIES**

# CFIT

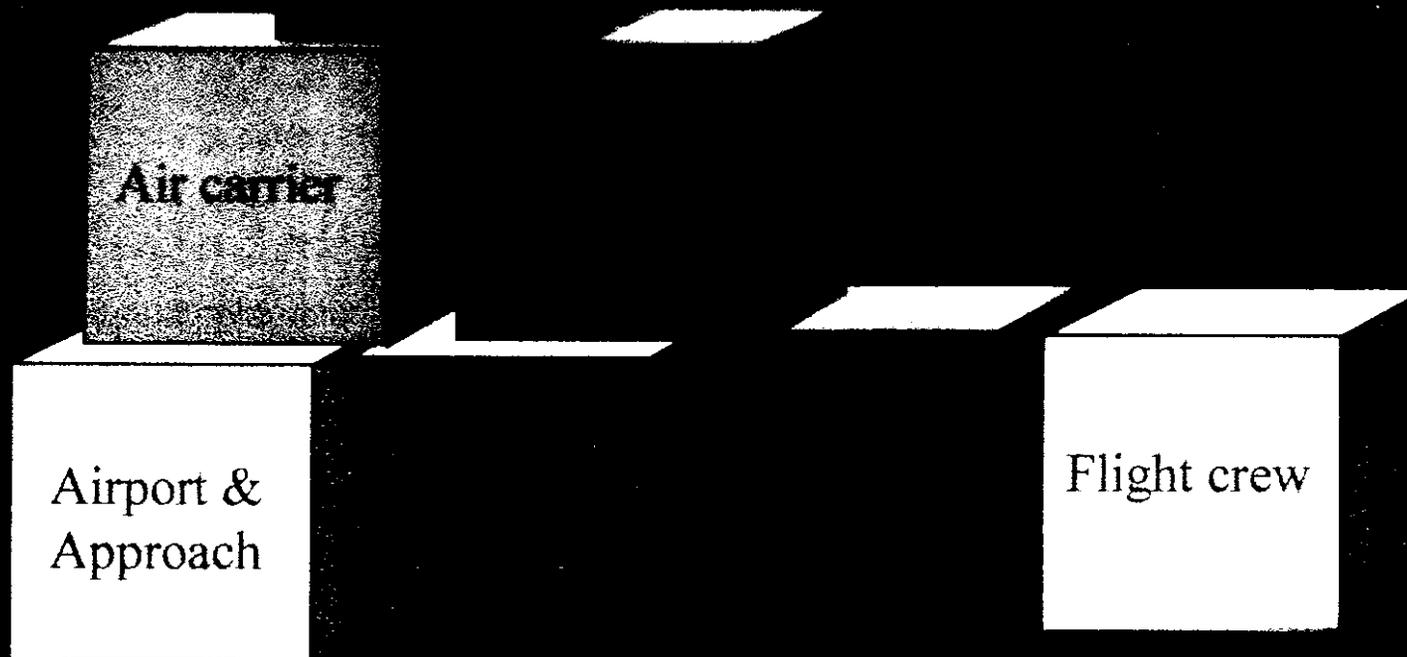
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Recap:-

- **Inadvertent flight into terrain/water**
- **Causes greatest fatalities**
- **Non-precision approach risk greats**
- **Breakdown of crew coordination and monitoring**

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# *Accident Taxonomy*



(41)

(4)

# ICAO Annex 6, Amendment No. 1

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**All turbine engine airplanes of MCTM in excess of 5,700 kg or authorized to carry more than nine passengers shall be equipped with a GPWS after January 1, 1999.**

# ICAO Annex 6, Amendment No. 2

## GPWS Warning Functions

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After January 1, 1999, a GPWS shall provide, as a minimum, warnings of the following circumstances

- 1) excessive descent rate;
- 2) excessive terrain closure rate;
- 3) excessive altitude loss after takeoff or go-around
- 4) unsafe terrain clearance while not in the landing configuration;
  - a) gear not locked down;
  - b) flaps not in a landing position; and
- 5) excessive descent below the instrument glide path

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# **ICAO Annex 6, Amendment No. 3**

## **ICAO Annex 6, Part I, Chapter II**

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- **Required contents of the operations manual**
  - **Instructions and training requirement for the avoidance of CFIT**
  - **Company policy on the use of the GPWS**

# Future ICAO Action

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- **Amendments to ICAO documents may be required in the following area:**
  - **Licensing and training** **Annex 1**
  - **charting** **Annex 4**
  - **Operation of aircraft** **Annex 6**
  - **Instrument approach procedure design** **PANS-OPS**
  - **Air traffic services** **PANS-RAC**
  
- **Publish manual on CFIT avoidance**

# Summary

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- **Train to ensure proper pilot response**
- **Update early ground proximity warning system installations**
- **Encourage development of enhanced GPWS**
- **Provide precision glideslope guidance (GPS RNAV-RNP)**
- **Eliminate step-down non-precision approaches**
- **Encourage expansion of approach radar coverage with MSAW**
- **Foster equipping of smaller transports**

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# **KOREAN AIRLINES 747-300, GUAM 6 August 1997**

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## **APPLICABLE RECOMMENDATIONS FROM CFIT EDUCATION AND TRAINING AID.**

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- . CHART SUPPLY AND PRESENTATION.**
  
- . APPROACH AND DEPARTURE BRIEFINGS.**
  
- . ALLOCATION OF FLIGHT CREW DUTIES  
(USE OF MONITORED APPROACH PROCEDURES).**
  
- . NON PRECISION APPROACH PROCEDURES,  
INCLUDING DESIGN.**

20 -

# KOREAN AIRLINES 747-300, GUAM 6 August 1997

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# KOREAN AIRLINES 747-300, GUAM 6 August 1997

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## APPLICABLE RECOMMENDATIONS FROM CFIT EDUCATION AND TRAINING AID (continued).

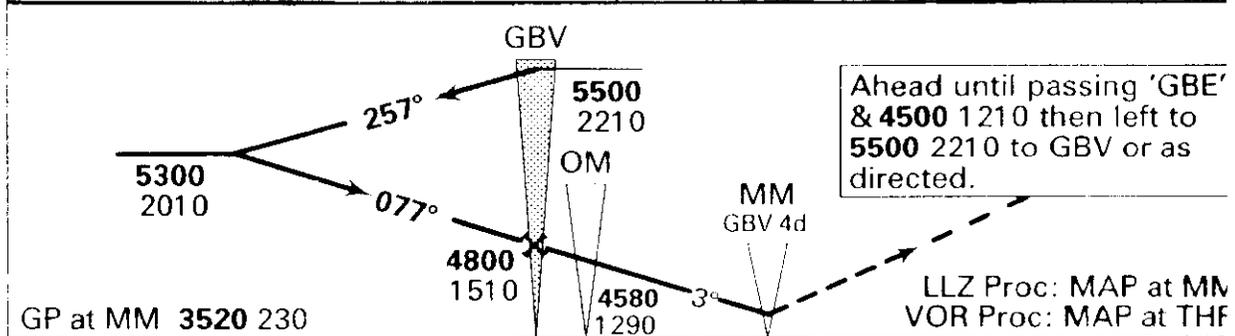
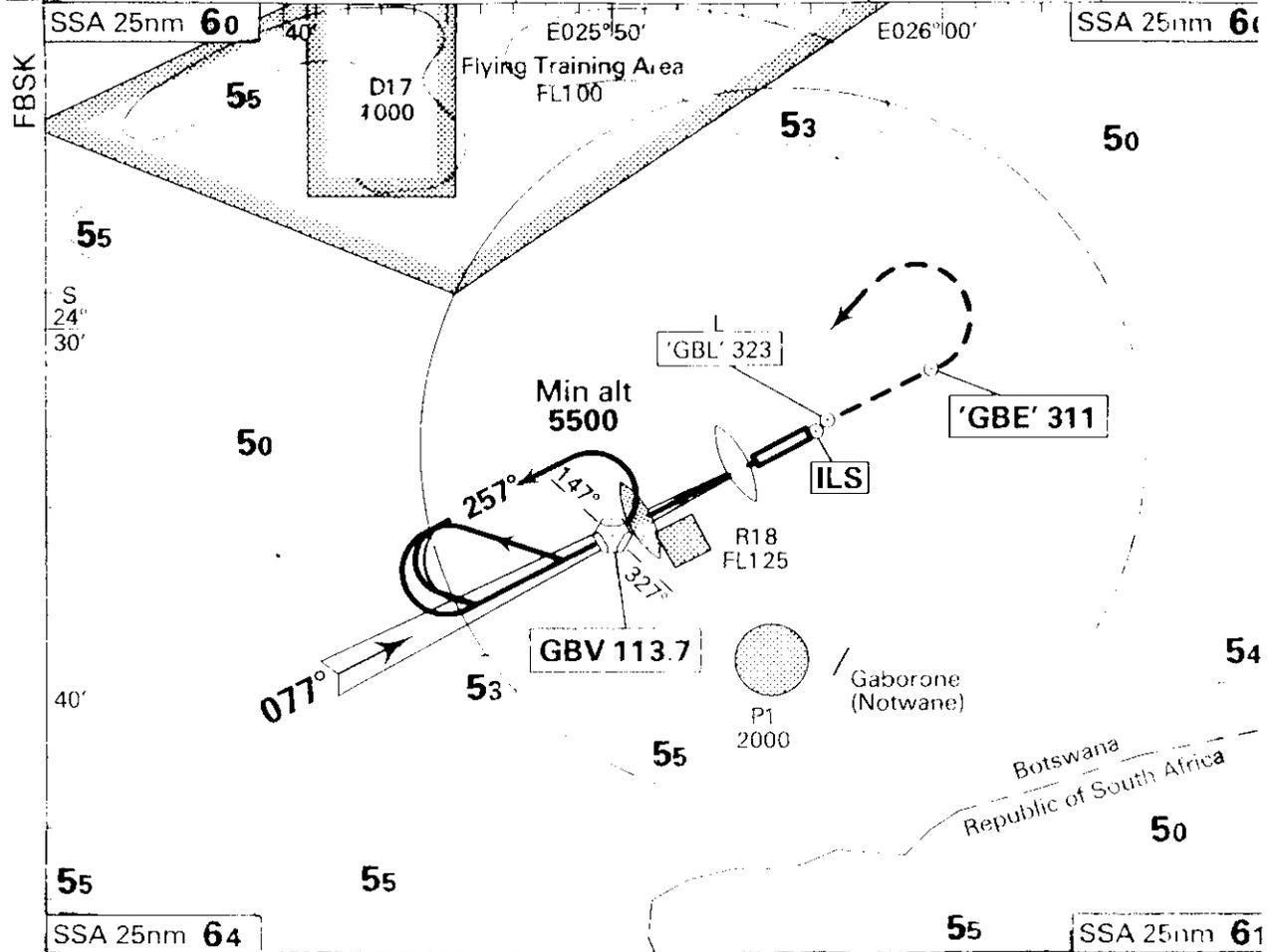
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- . ALTITUDE AWARENESS.
  
- . RADIO ALTIMETRY AND
  
- . MEASUREMENT AND EVALUATION  
OF SYSTEM PERFORMANCE
  
- . MINIMUM SAFE ALTITUDE  
WARNING SYSTEM (MSAW)

Elev **3299**  
 OCH: ILS A135, B146, C156, D167  
 LLZ 408, VOR 611

(SIR SERETSE KHAMA INTL) **GABORON**  
**GBI 109.3 ILS or VOR C**

**GABORONE Approach** 128.2 128.8  
**KHAMA Tower** 118.3  
**Ground** 121.9  
**M1**  
 22 MAY 95



GP at MM 3520 230  
 THR Elev 3292/115hPa  
 GP at THR 51  
 Var 14°W

Abm GBV	T.Lev ATC		OM
	kt	fpm	
1:30	200	1060	THR
1:30	180	950	
1:30	160	850	1:28
1:30	140	740	1:40
1:30	120	640	1:57
1:30	100	530	2:20
1:30	80	420	2:55

- When approaching GBV from sectors 1 or 2, use phraseology 'Request procedure turn approach'. Start proc. turn right 30sec, after GBV.
- LLZ or VOR Procedure: ROD from GBV computes at 3.1° angle of descent.
- All joining traffic from SE sector should enter the CTR on GBV 160R or greater and establish on final R/W 08 over GBV.
- Flying below 2000agl over Gaborone City prohibited.

GBV VOR/DME		
GBV	4800	1510
1d	4470	1180
2d	4140	850
3d	3810	520

BRITISH AIRWAYS AERAD

Rev: Note 3

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