mfc1

FLIGHT SAFETY FOUNDATION

independent • impartial • international

Circling Accident Case Study:

Air China 129, Busan Korea

ALAR Workshop

Bali, Indonesia

Slide 1

mfc1 mfc7549, 12/3/2010

FLIGHT SAFETY FOUNDATION
independent • impartial • international

Circling Traps

- Air China Flight 129 CFIT accident
- April 15 2002
- B767-200
- Busan Korea
- 129 killed out of 166 passengers and crew
- First fatal accident on Air China in 47 years

FLIGHT SAFETY FOUNDATION

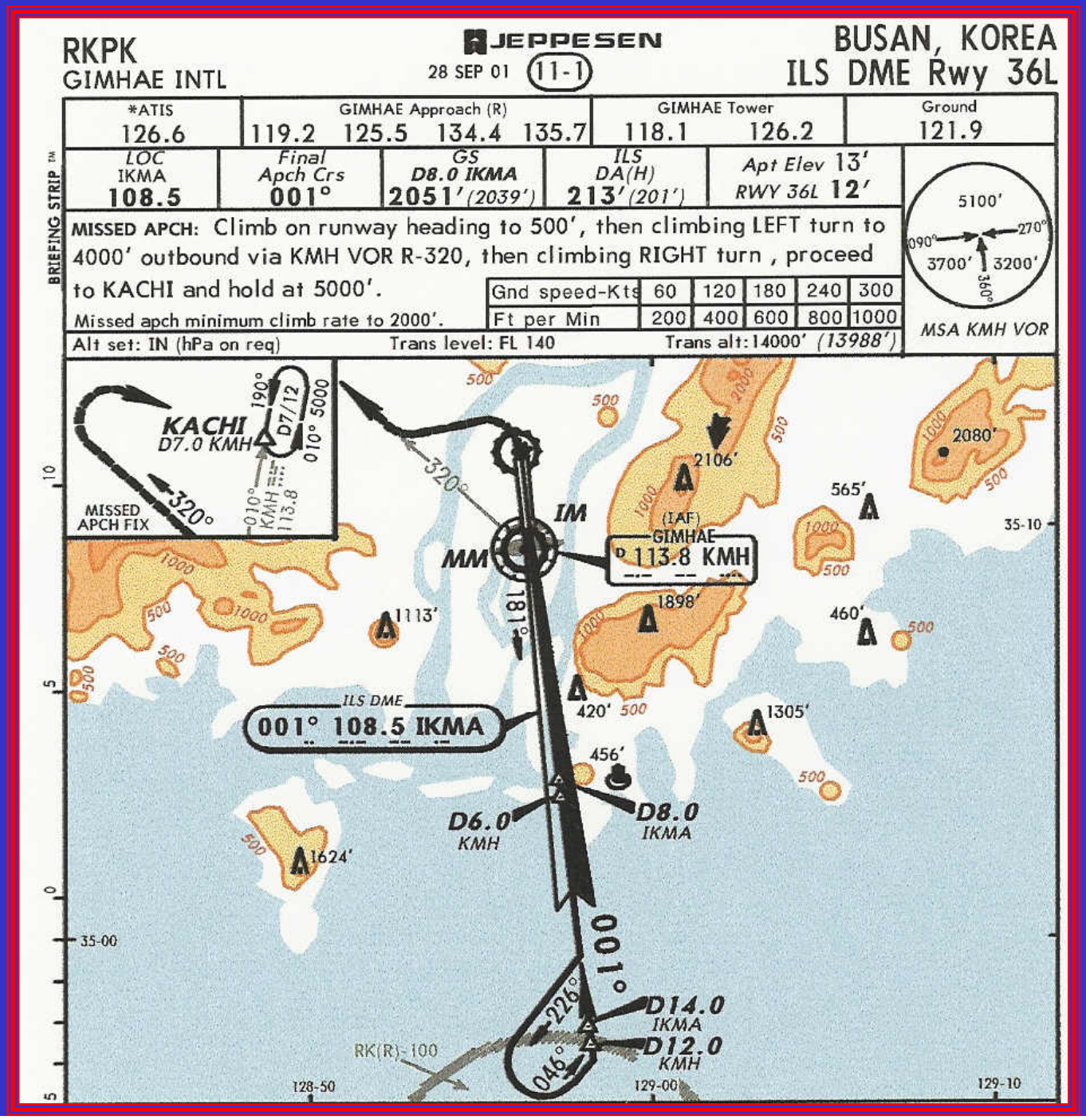
independent • impartial • international

Busan Summary

- Crew initially briefed for an ILS 36L approach
- On arrival they received the following ATIS: *500 scattered, 1000 broken, 2500 overcast, rain, mist, visibility 4000 meters, wind 200 14 knots gusting to 20 knots*
- Captain elected to conduct a CAT C circling approach to R/W 18R, 10,500 feet long
- CAT C minimums 700 feet and 3200 meters

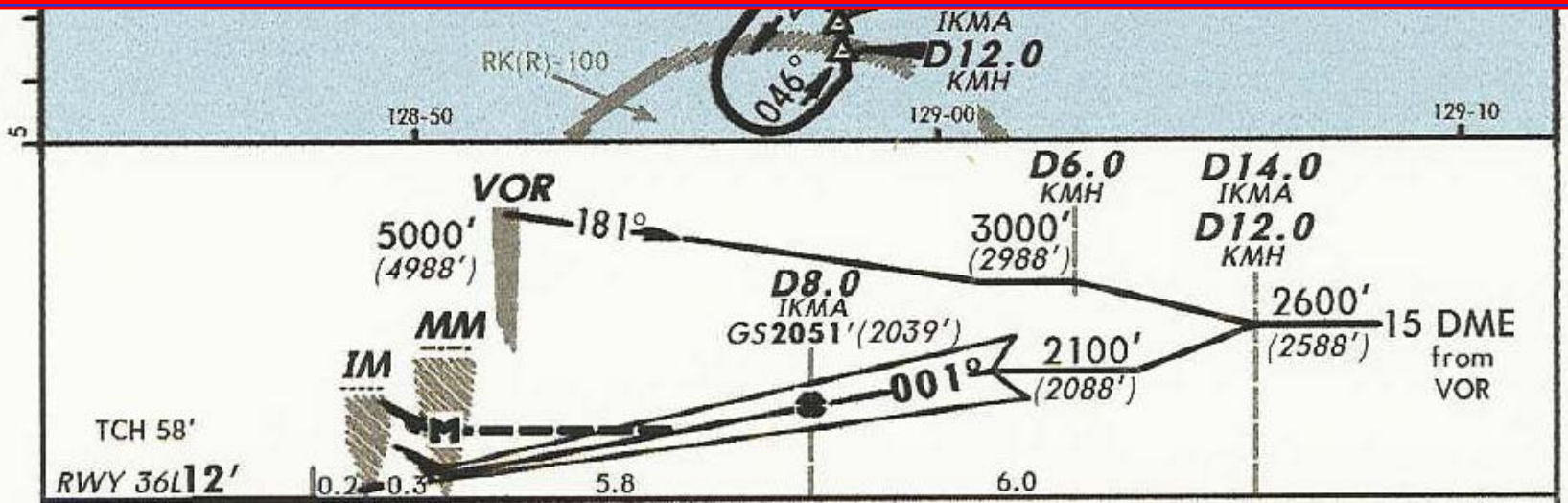
FLIGHT SAFETY FOUNDATION

independent • impartial • international



FLIGHT SAFETY FOUNDATION

independent • impartial • international



Gnd speed-Kts		70	90	100	120	140	160
GS	3.00°	377	484	538	646	753	861
MAP at MM or FAF to MAP	5.8	4:58	3:52	3:29	2:54	2:29	2:10

ALSF-II
PAPI

500'

4000'
via LT
KMH
113.8
R-320

STRAIGHT-IN LANDING RWY36L **CEILING REQUIRED**

CIRCLE-TO-LAND
Not Authorized
East of Rwy 18R-36L

ILS
DA(H) 213' (201')

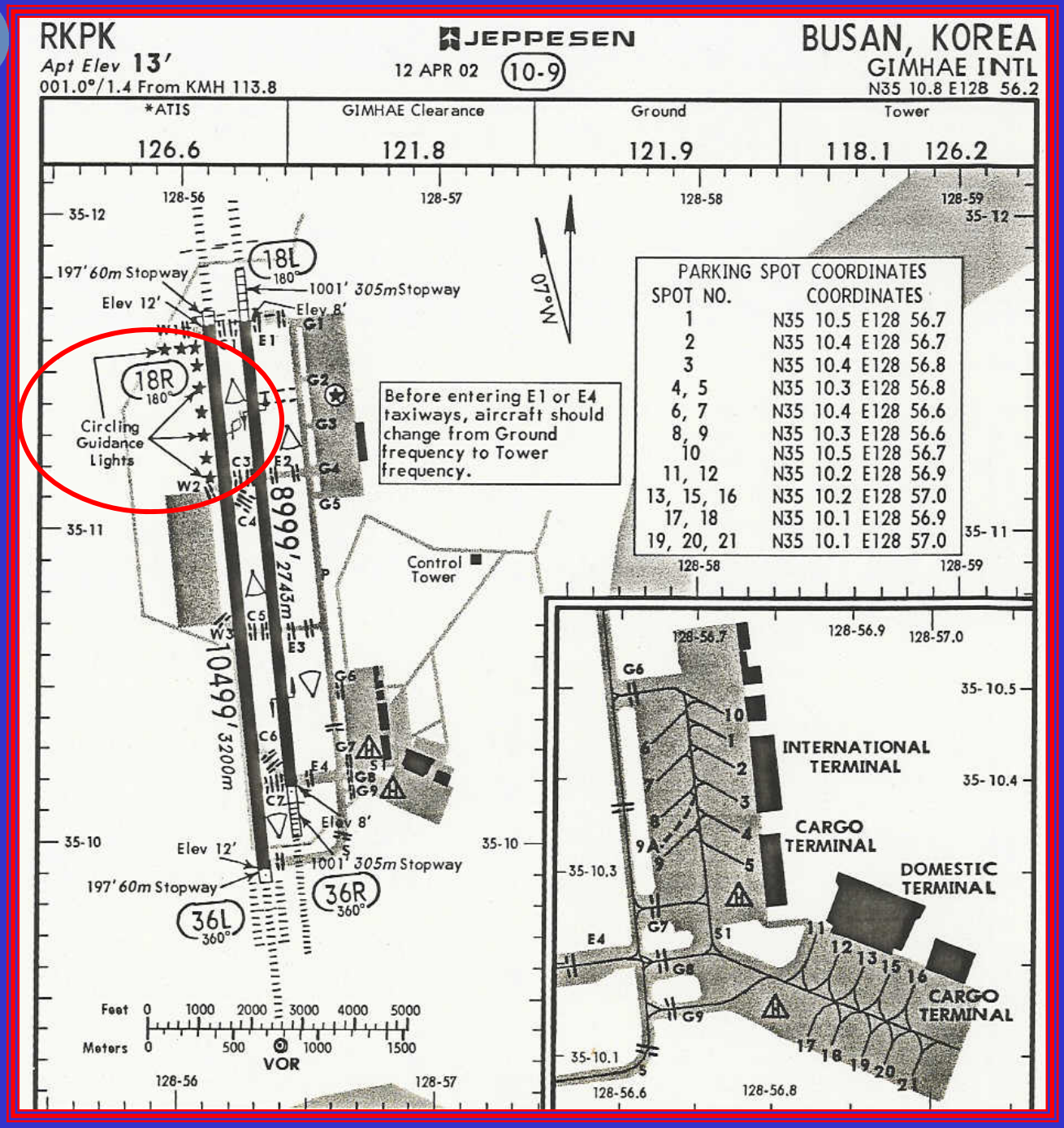
LOC (GS out)

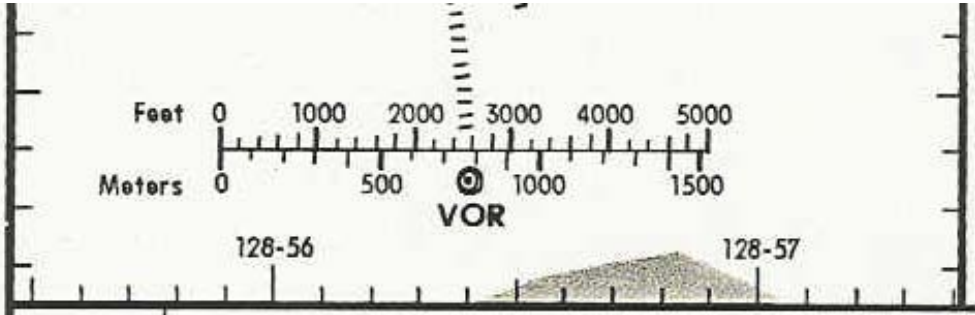
	FULL	TDZ/CL out CEIL-VIS	ALS out		Max Kts	MDA(H)	CEIL-VIS
A				When glide slope unusable, use LOC DME Rwy 36L procedure (11-2)	90	700' (687')	700'- 1600m
B					120		
C	200'- RVR 550m VIS 800m	200'- 800m	200'- 1200m		140	700' (687')	700'- 3200m
D					165	1100' (1087')	1100'- 4800m

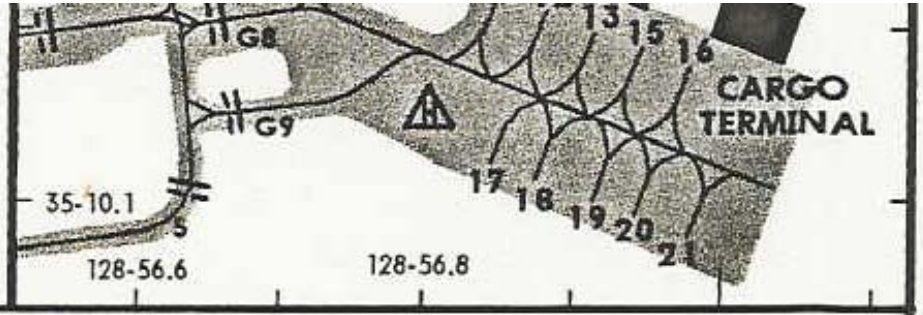
CHANGES: Location and airport names.

FLIGHT SAFETY FOUNDATION

independent • impartial • international





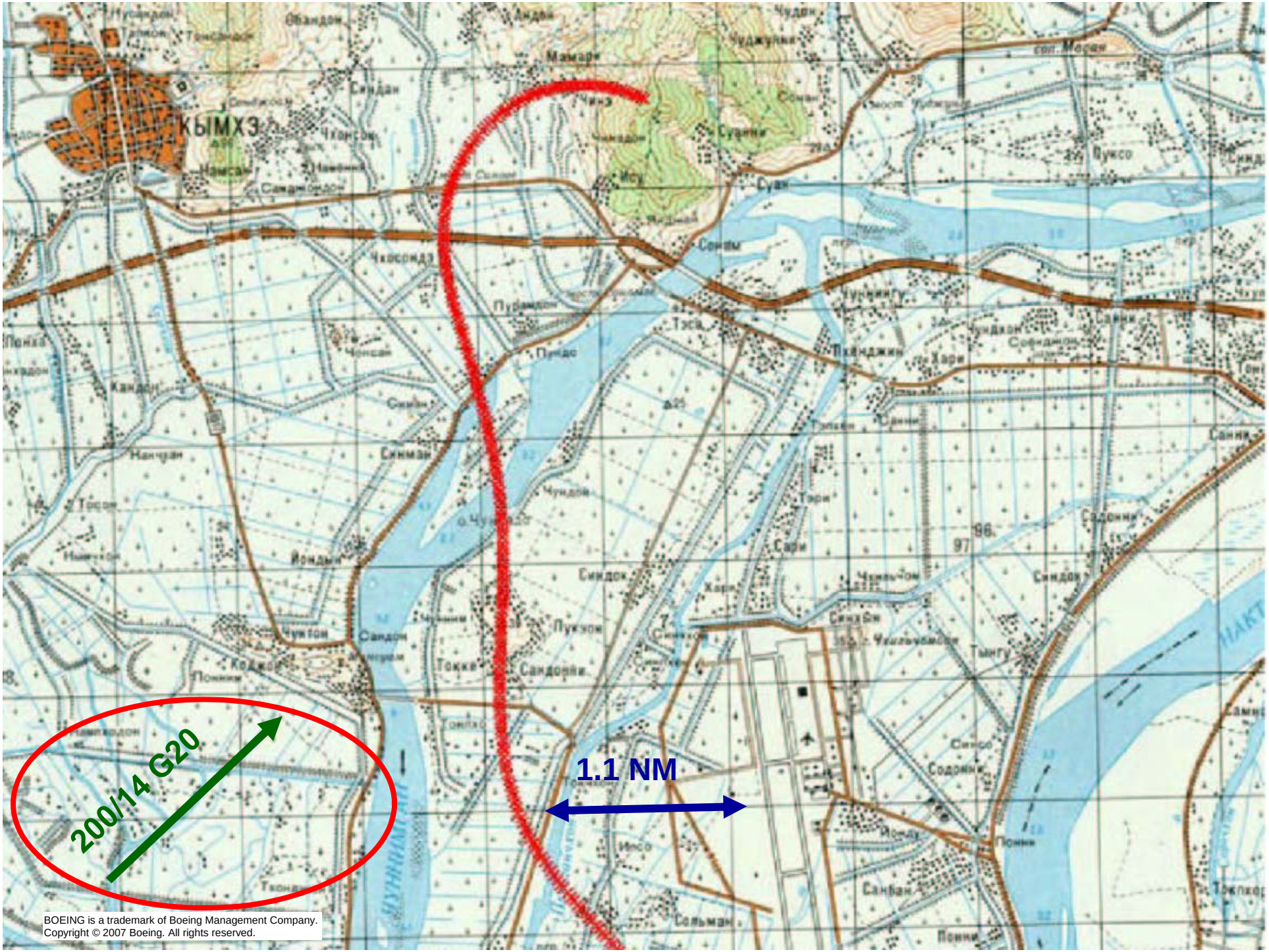


RWY	ADDITIONAL RUNWAY INFORMATION	USABLE LENGTHS — LANDING BEYOND — Threshold	Glide Slope	TAKE-OFF	WIDTH
18L	HIRL 197' *(60m)* SALS PAPI (angle 3.0°)				148' *45m*
36R	HIRL 197' *(60m)* ALSF-I PAPI (angle 3.0°) RVR		7894' *2406m*		
18R ❶	HIRL 98' *(30m)* CL SALS REIL PAPI (angle 3.0°) ❷				197' *60m*
36L	HIRL 98' *(30m)* CL ALSF-II TDZ PAPI-L (angle 3.0°) RVR		9478' *2889m*		

❶ Grooved.
❷ Circling guidance lights.

	TAKE-OFF Rwy 18L/R	TAKE-OFF Rwy 36L/R
1 Eng	200'- *1600m*	500'- *1600m*
2 & 3 Eng	200'- *800m*	500'- *800m*
4 Eng	100'- *400m*	

	FOR FILING AS ALTERNATE Precision	Non-Precision
A	600'-*3200m*	800'-*3200m*
B		
C		
D		1100'-*4800m*



FLIGHT SAFETY FOUNDATION

independent • impartial • international

PANS-OPS

APPROACH PROCEDURES

CIRCLING, GENERAL

CIRCLING APPROACH ICAO DEFINITION

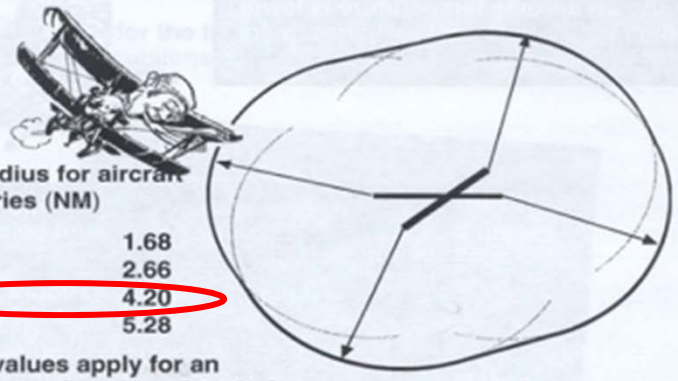
An extension of an instrument approach procedure which provides for visual circling of the aerodrome prior to landing.

The circling area is determined by drawing arcs, centred on each runway threshold and joining those arcs with tangential lines. The radius of the arcs is related to:

- Aircraft category — Specified on page B-1
- Speed

Aircraft category	MAX speed (kt IAS)
A	100
B	135
C	180
D	205

- Wind — 25 kt throughout the turn
- Bank angle — 20° or 3°/s whichever requires less bank

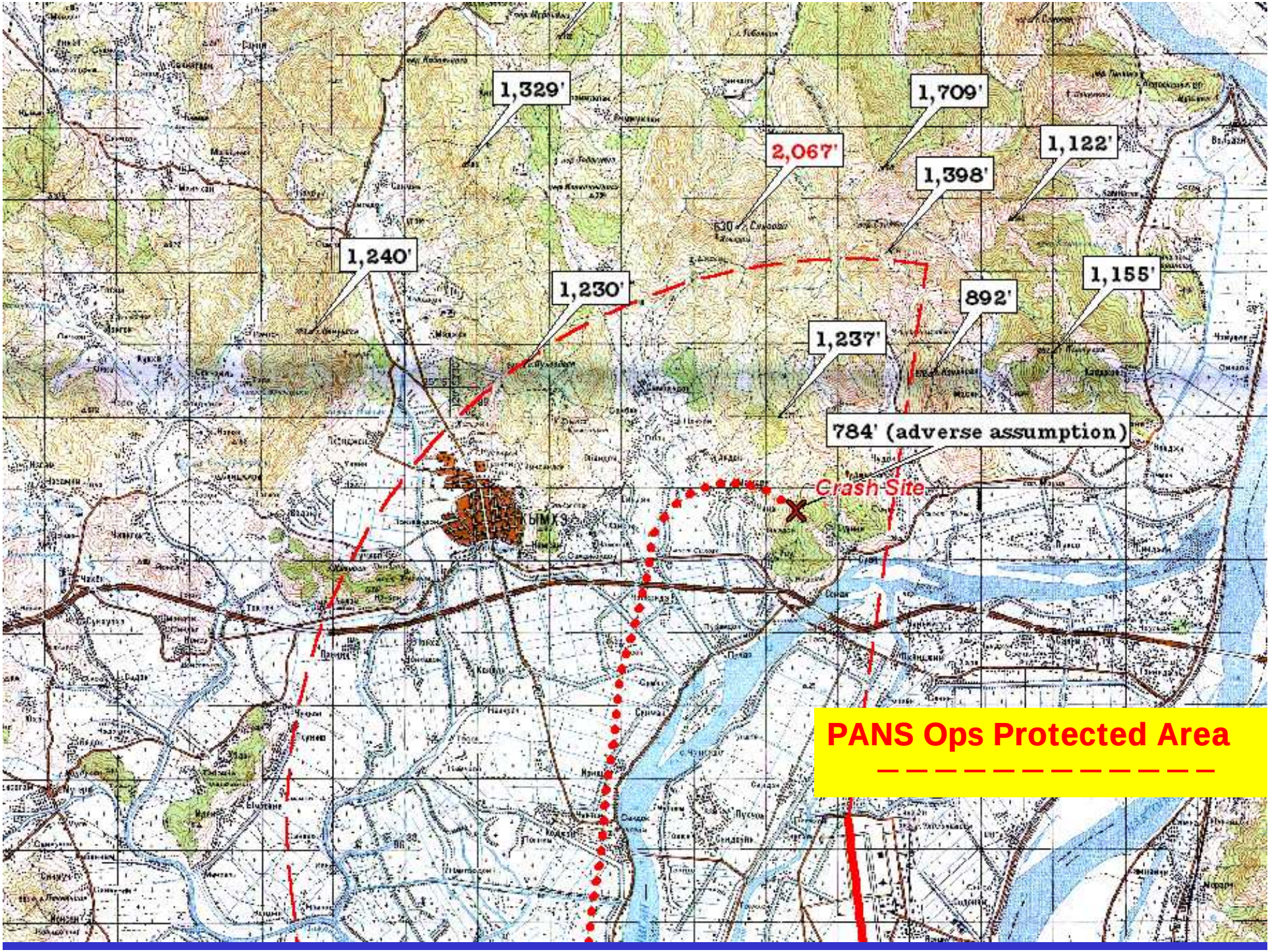


Area radius for aircraft categories (NM)

A	1.68
B	2.66
C	4.20
D	5.28

These values apply for an aerodrome elevation of 2 000 ft.

J-1


1,329'
1,709'
2,067'
1,122'
1,398'
1,240'
1,230'
1,155'
892'
1,237'
784' (adverse assumption)
Crash Site
PANS Ops Protected Area

FLIGHT SAFETY FOUNDATION
independent • impartial • international

TERPS

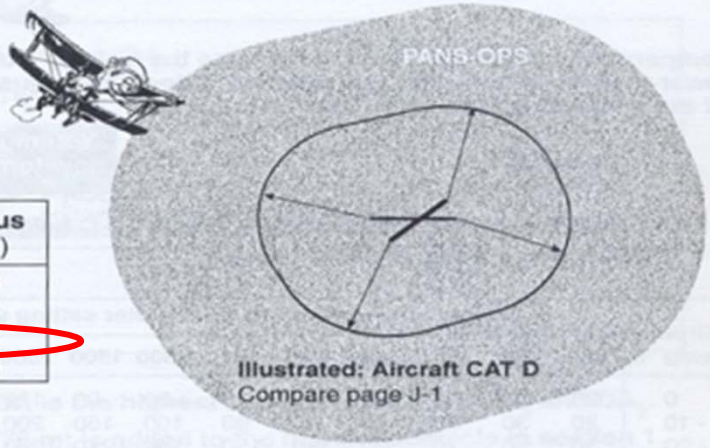
APPROACH PROCEDURES
CIRCLING APPROACH AREA

CIRCLING APPROACH AREA
FAA DEFINITION

The area in which aircraft circle to land under visual conditions after completing an instrument approach.

The circling area is determined by drawing arcs, centred on each runway threshold and joining those arcs with tangential lines.

The radius of the arcs varies with the aircraft category (specified on page L-2):

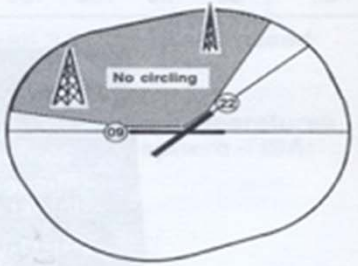


Illustrated: Aircraft CAT D
Compare page J-1

Aircraft category	Radius (NM)
A	1.3
B	1.5
C	1.7
D	2.3

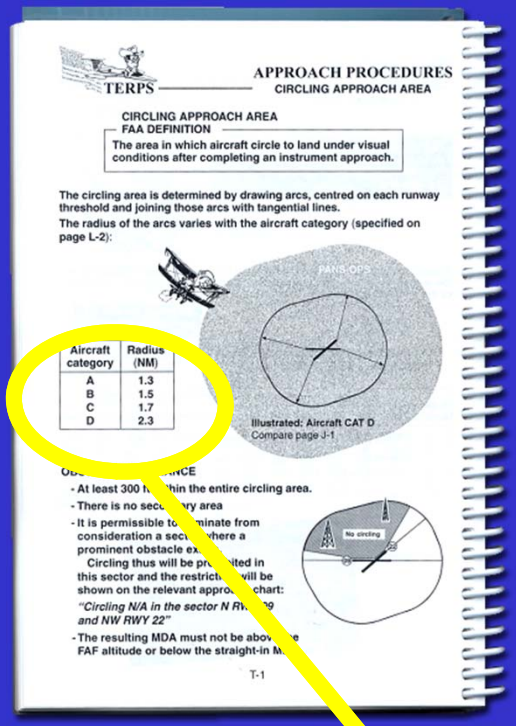
OBSTACLE CLEARANCE

- At least 300 ft within the entire circling area.
- There is no secondary area
- It is permissible to eliminate from consideration a sector where a prominent obstacle exists.
  Circling thus will be prohibited in this sector and the restriction will be shown on the relevant approach chart:
  "Circling N/A in the sector N RWY 09 and NW RWY 22"
- The resulting MDA must not be above the FAF altitude or below the straight-in MDA.



T-1

FLIGHT SAFETY FOUNDATION
independent • impartial • international


TERPS
APPROACH PROCEDURES
CIRCLING APPROACH AREA

CIRCLING APPROACH AREA
FAA DEFINITION
The area in which aircraft circle to land under visual conditions after completing an instrument approach.

The circling area is determined by drawing arcs, centred on each runway threshold and joining those arcs with tangential lines.
The radius of the arcs varies with the aircraft category (specified on page L-2):

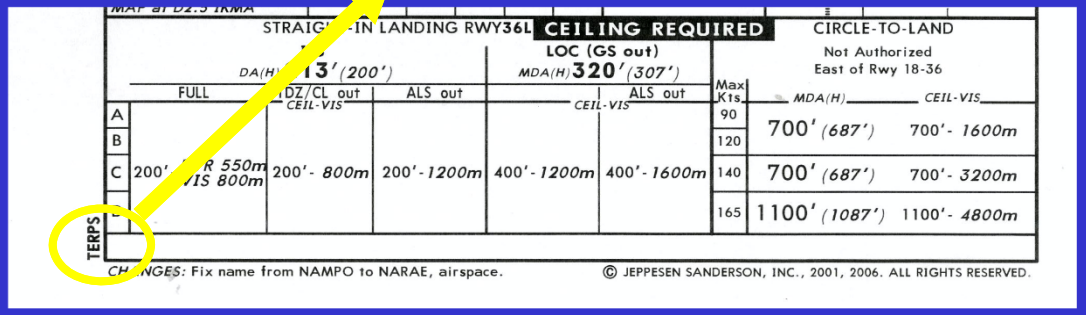
Aircraft category	Radius (NM)
A	1.3
B	1.5
C	1.7
D	2.3

Illustrated: Aircraft CAT D
Compare page J-1

- At least 300 ft within the entire circling area.
- There is no sector area
- It is permissible to eliminate from consideration a sector where a prominent obstacle ex
  Circling thus will be prohibited in this sector and the restriction will be shown on the relevant approach chart:
  "Circling N/A in the sector N RWY 09 and NW RWY 22"
- The resulting MDA must not be above the FAF altitude or below the straight-in M

T-1

TERPS Cat "C" 1.7 nm

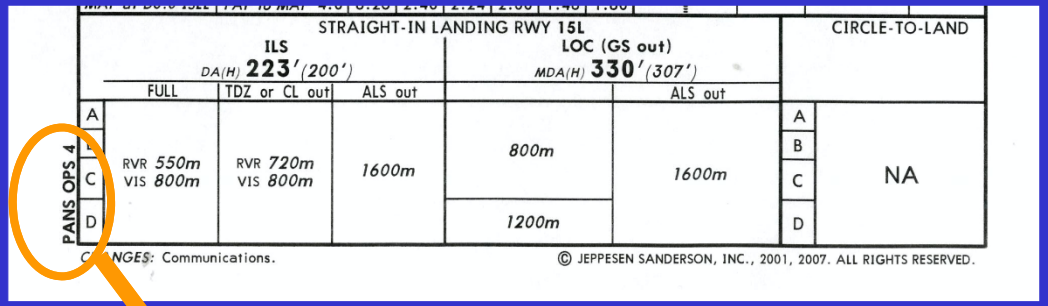

MAP at D2.5 IRMA

STRAIGHT-IN LANDING RWY36L **CEILING REQUIRED**

	ILS DA(H) 213′(200′) FULL	ILS DA(H) 213′(200′) TDZ/CL out CEIL-VIS	ILS DA(H) 213′(200′) ALS out CEIL-VIS	LOC (GS out) MDA(H) 320′(307′) CEIL-VIS	LOC (GS out) MDA(H) 320′(307′) ALS out CEIL-VIS	Max Kts.	CIRCLE-TO-LAND Not Authorized East of Rwy 18-36 MDA(H)	CEIL-VIS
A						90	700′(687′)	700′- 1600m
B						120		
C	200′ R 550m VIS 800m	200′- 800m	200′-1200m	400′-1200m	400′-1600m	140	700′(687′)	700′- 3200m
D						165	1100′(1087′)	1100′- 4800m

TERPS

CHANGES: Fix name from NAMPO to NARAE, airspace.

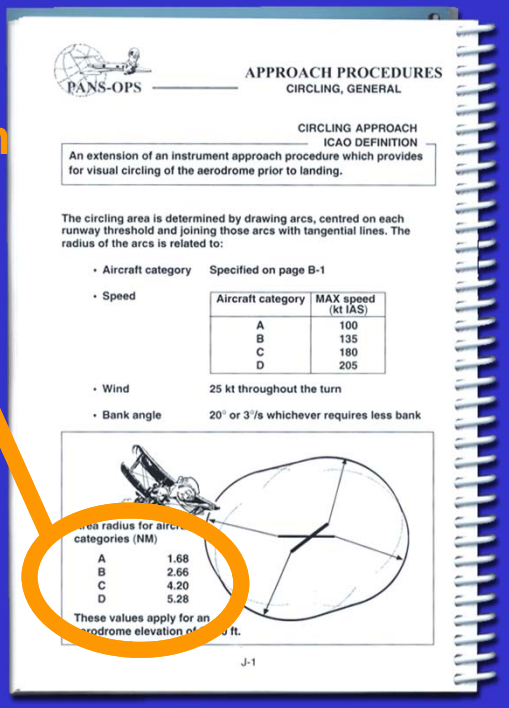

STRAIGHT-IN LANDING RWY 15L

	ILS DA(H) 223′(200′) FULL	ILS DA(H) 223′(200′) TDZ or CL out	ILS DA(H) 223′(200′) ALS out	LOC (GS out) MDA(H) 330′(307′)	LOC (GS out) MDA(H) 330′(307′) ALS out	CIRCLE-TO-LAND
A						A
B						B
C	RVR 550m VIS 800m	RVR 720m VIS 800m	1600m	800m	1600m	C NA
D				1200m		D

PANS OPS 4

CHANGES: Communications.

PANS OPS "C" 4.20 nm


PANS-OPS
APPROACH PROCEDURES
CIRCLING, GENERAL

CIRCLING APPROACH
ICAO DEFINITION
An extension of an instrument approach procedure which provides for visual circling of the aerodrome prior to landing.

The circling area is determined by drawing arcs, centred on each runway threshold and joining those arcs with tangential lines. The radius of the arcs is related to:

- Aircraft category — Specified on page B-1
- Speed

Aircraft category	MAX speed (kt IAS)
A	100
B	135
C	180
D	205

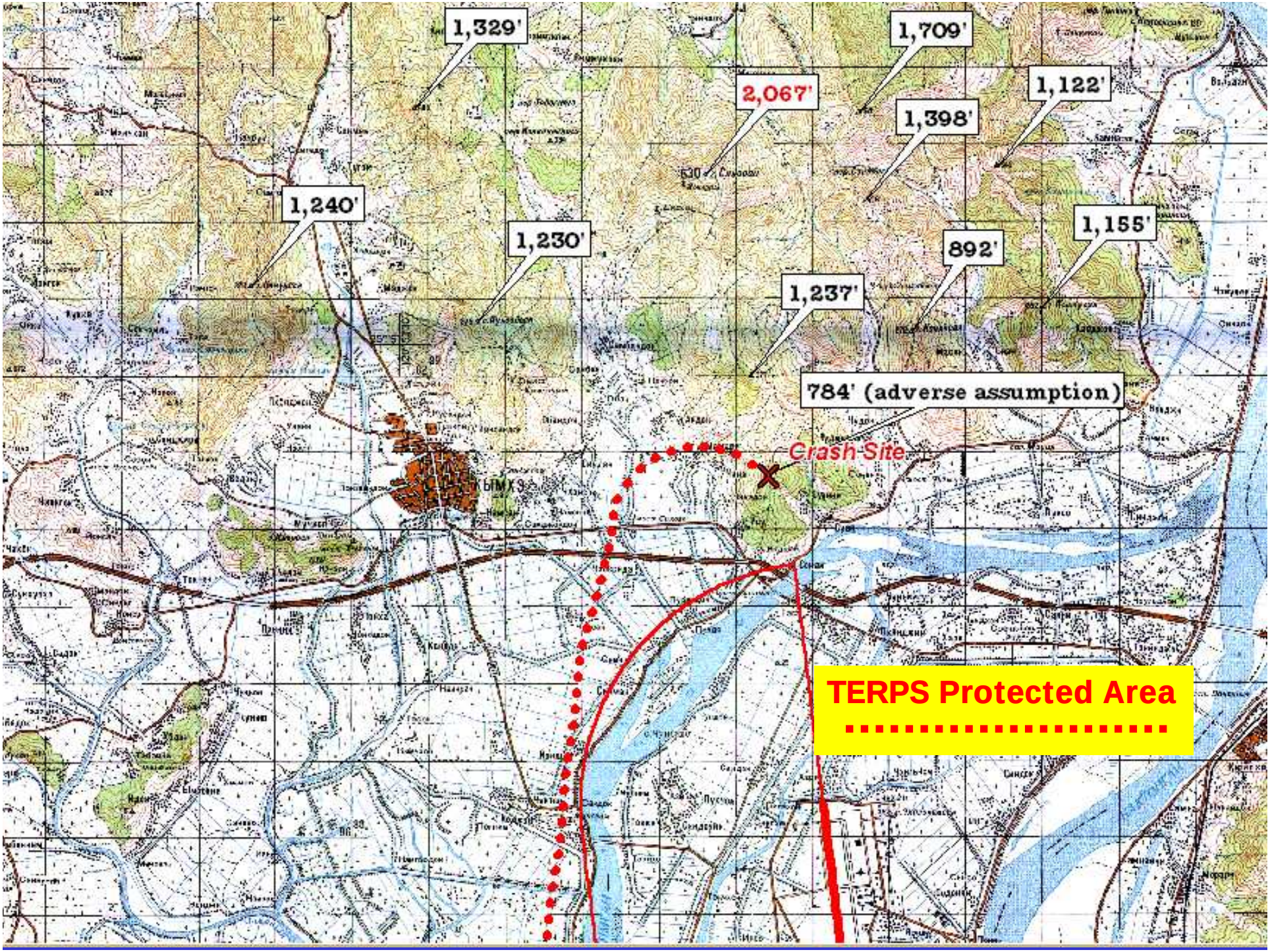
- Wind — 25 kt throughout the turn
- Bank angle — 20° or 3°/s whichever requires less bank

ea radius for aircr categories (NM)

A	1.68
B	2.66
C	4.20
D	5.28

These values apply for an rodrome elevation of ft.

J-1


1,329'
1,709'
2,067'
1,122'
1,398'
1,240'
1,230'
1,155'
892'
1,237'
784' (adverse assumption)
Crash Site
TERPS Protected Area

FLIGHT SAFETY FOUNDATION
independent • impartial • international

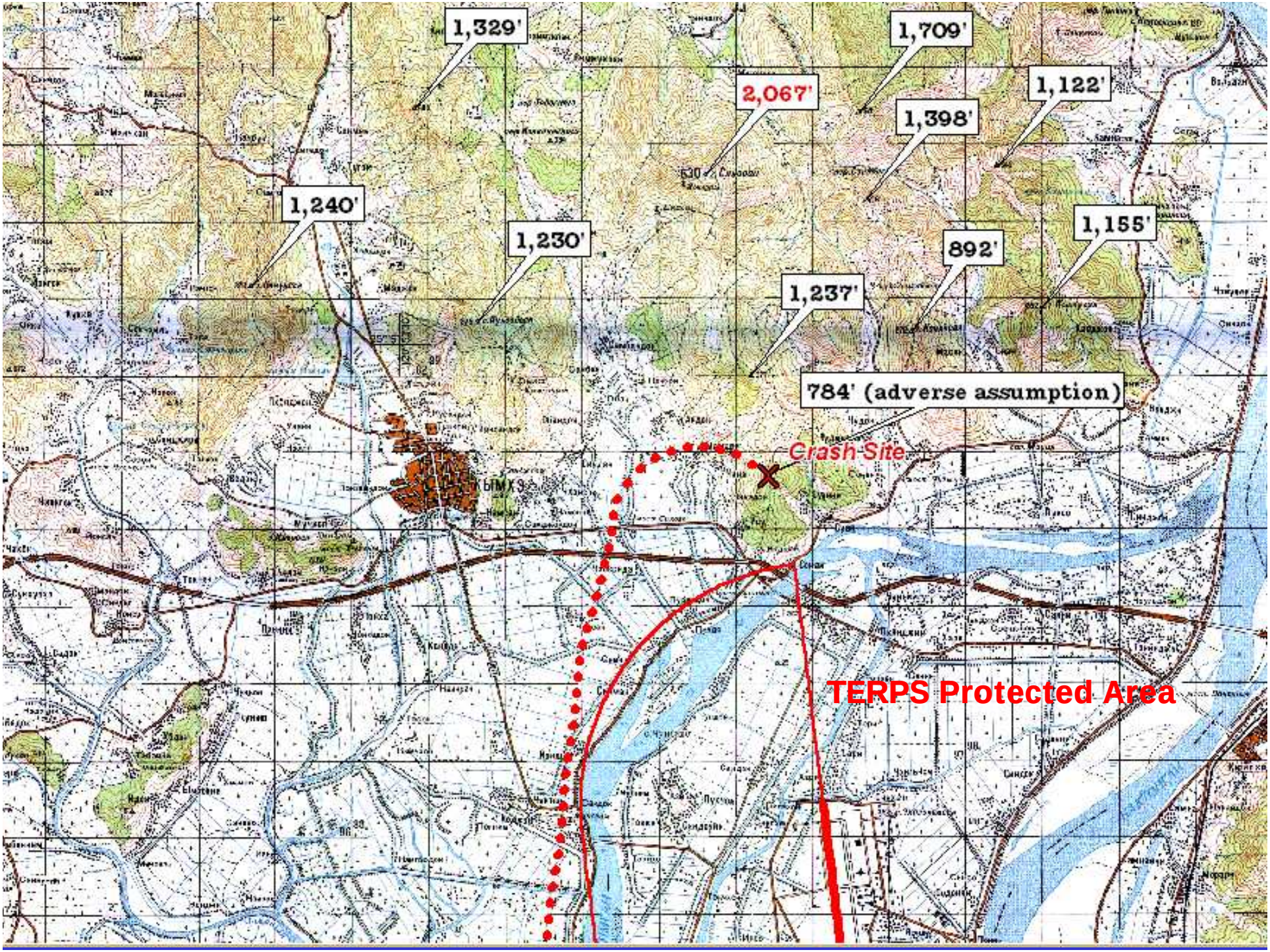
Traps on this approach?

- No notice of obstacles within 4 NM of the 18R PAPI
- Downwind too close from using the same sight picture at 700 feet as used at 1500 feet to determine downwind spacing
- Forced to circle because no better approach was available
- Tailwind - started base leg late

FLIGHT SAFETY FOUNDATION
independent • impartial • international

Traps on this approach?

- Crew not aware of TERPS Vs PANS-OPS criteria
- Chart centered South, no terrain shown North
- Captain flying right visual approach
- Threat hidden beneath nose
- No local knowledge, e.g. “Stay South of freeway”


1,329'
1,709'
2,067'
1,122'
1,398'
1,240'
1,230'
1,155'
892'
1,237'
784' (adverse assumption)
Crash Site
TERPS Protected Area

FLIGHT SAFETY FOUNDATION
independent • impartial • international

ALAR Risk Awareness Tool

- How to use the RAT
- How high were the risks for this flight?

FLIGHT SAFETY FOUNDATION

independent • impartial • international

Flight Safety Foundation

ALAR

Approach-and-landing Accident Reduction

Tool Kit

Approach-and-landing Risk Awareness Tool

Elements of this tool should be integrated, as appropriate, with the standard approach briefing prior to top of descent to improve awareness of factors that can increase the risk of an accident during approach and landing. The number of warning symbols (⚠) that accompany each factor indicates a relative measure of risk. Generally, the greater the number of warning symbols that accompany a factor, the greater the risk presented by that factor. Flight crews should consider carefully the effects of multiple risk factors, exercise appropriate vigilance and be prepared to conduct a go-around or a missed approach.

Failure to recognize the need for a missed approach and to execute a missed approach, is a major cause of approach-and-landing accidents.

Flight Crew

- Long duty period — reduced alertness ⚠⚠
- Single-pilot operation ⚠⚠

Airport Services and Equipment

- No approach radar service or airport tower service ⚠⚠⚠
- No current local weather report ⚠⚠
- Unfamiliar airport or unfamiliar procedures ⚠⚠
- Minimal or no approach lights or runway lights ⚠
- No visual approach-slope guidance — e.g., VASI/PAPI ⚠
- Foreign destination — possible communication/language problems ⚠

Expected Approach

- Nonprecision approach — especially with step-down procedure or circling procedure ⚠⚠⚠
- Visual approach in darkness ⚠⚠
- Late runway change ⚠⚠
- No published STAR ⚠

Environment

- Hilly terrain or mountainous terrain ⚠⚠
- Visibility restrictions — e.g., darkness, fog, haze, IMC, low light, mist, smoke ⚠⚠
- Visual illusions – e.g., sloping terrain, wet runway, whiteout/snow ⚠⚠
- Wind conditions — e.g., cross wind, gusts, tail wind, wind shear ⚠⚠
- Runway conditions — e.g., ice, slush, snow, water ⚠⚠
- Cold-temperature effects — true altitude (actual height above mean sea level) lower than indicated altitude ⚠

Aircraft Equipment

- No GPWS/EGPWS/GCAS/TAWS ⚠⚠⚠
- No radio altimeter ⚠⚠⚠
- No wind shear warning system ⚠
- No TCAS ⚠

Definitions of acronyms appear on next page.

FLIGHT SAFETY FOUNDATION
independent • impartial • international

Risk Mitigation

- What we can do when the risks are high
  - Mitigate, or at least acknowledge

FLIGHT SAFETY FOUNDATION

independent • impartial • international

THANK YOU