CHC SAFETY & QUALITY summit DALLAS 2019

LOOKING AT THE RIGHT PLACES FOR HELIDECK SAFETY

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02 and 03 Oct/2019

#CHCSummit19

Let's start from here

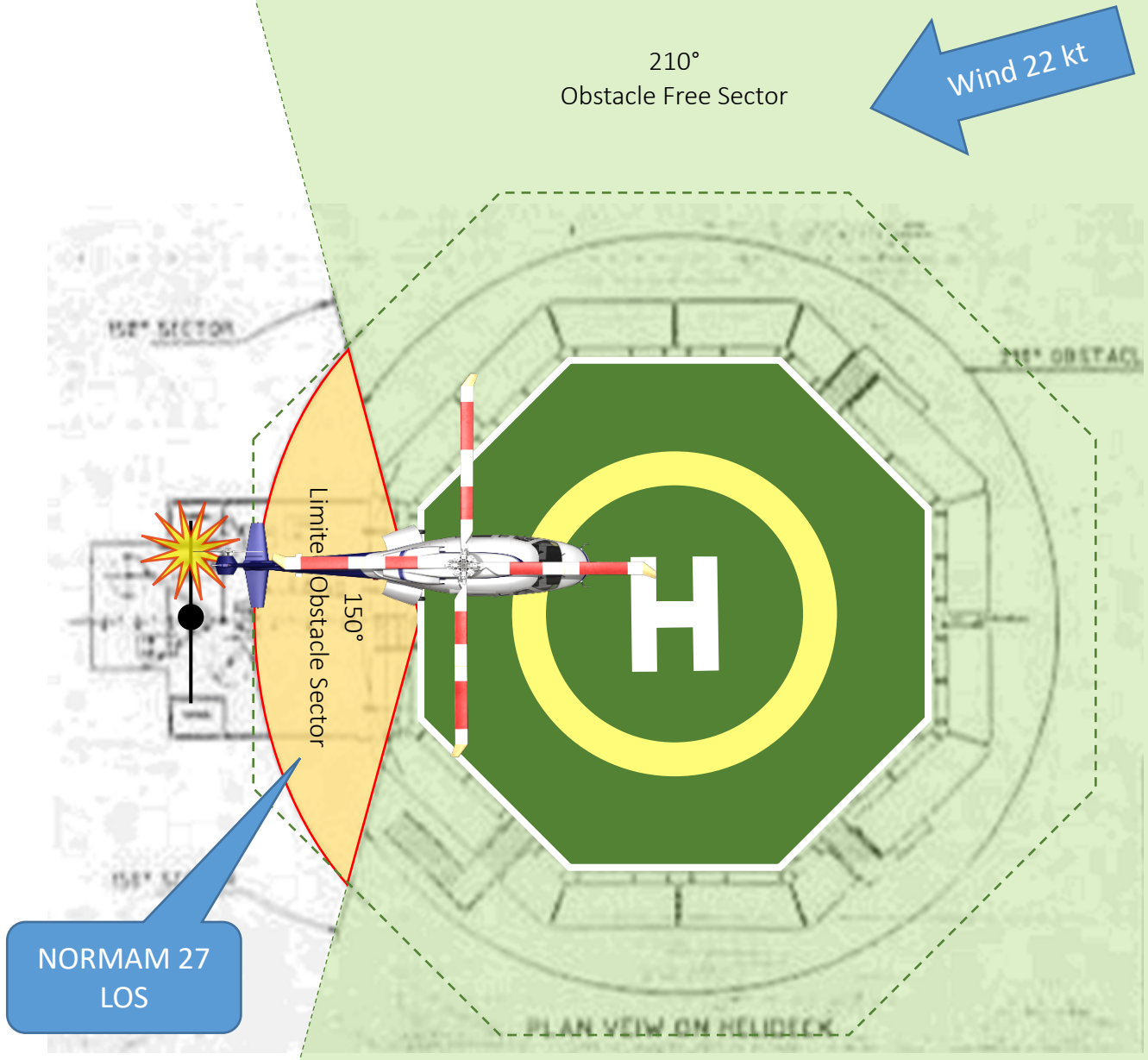
"A superior pilot uses his superior judgment to avoid situations which require the use of his superior skill"

Frank Frederick Borman, II retired NASA astronaut and engineer, Commander of Apollo 8, the first mission to fly around the Moon

Source:https://en.wikiquote.org/wiki/Frank_Borman

July 5, 2003: PT-YVM

- Vessel: Toisa Mariner
- NAA certified helideck, D-size 17,5m
- T/R impact on the yard of a mast outside the LOS, 8m high
- 5 fatal victims, no survivors



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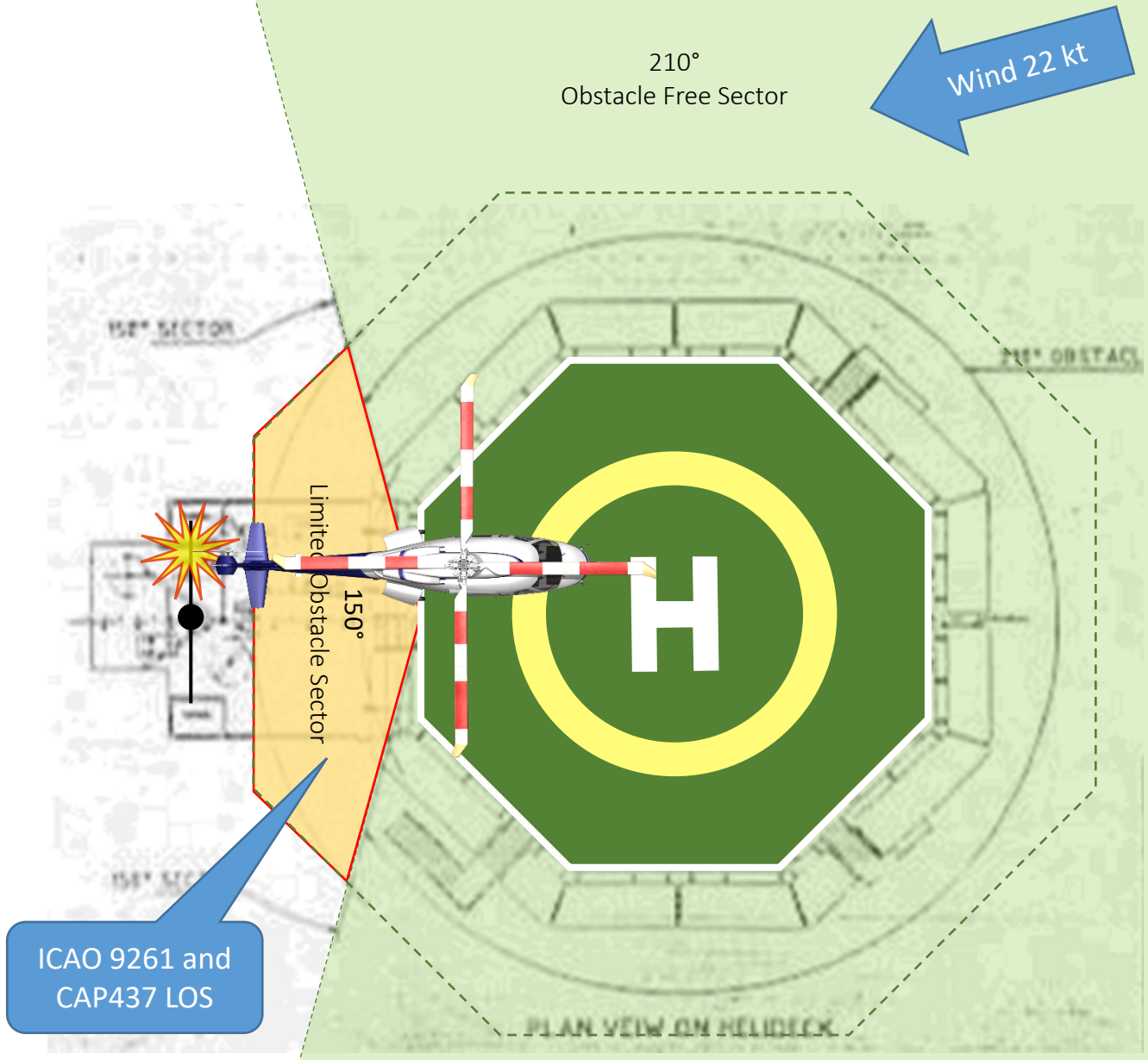

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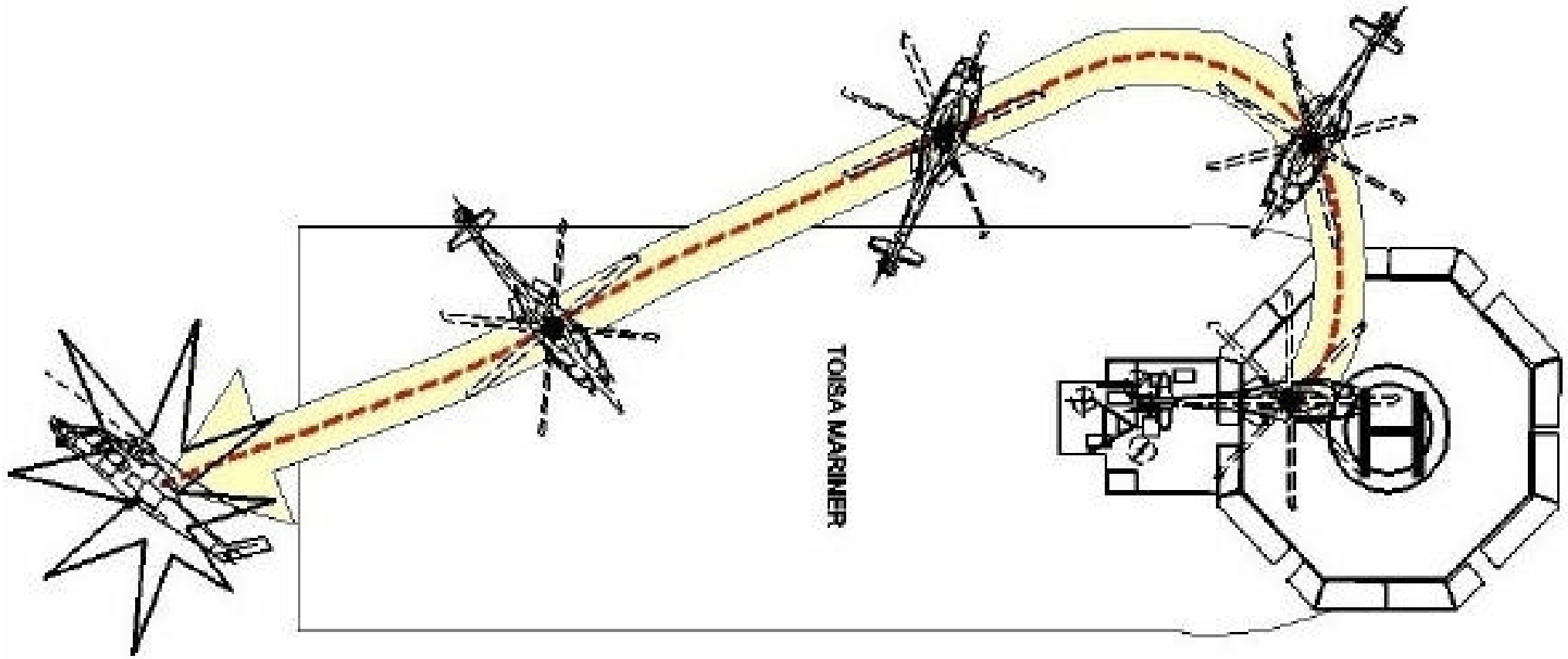
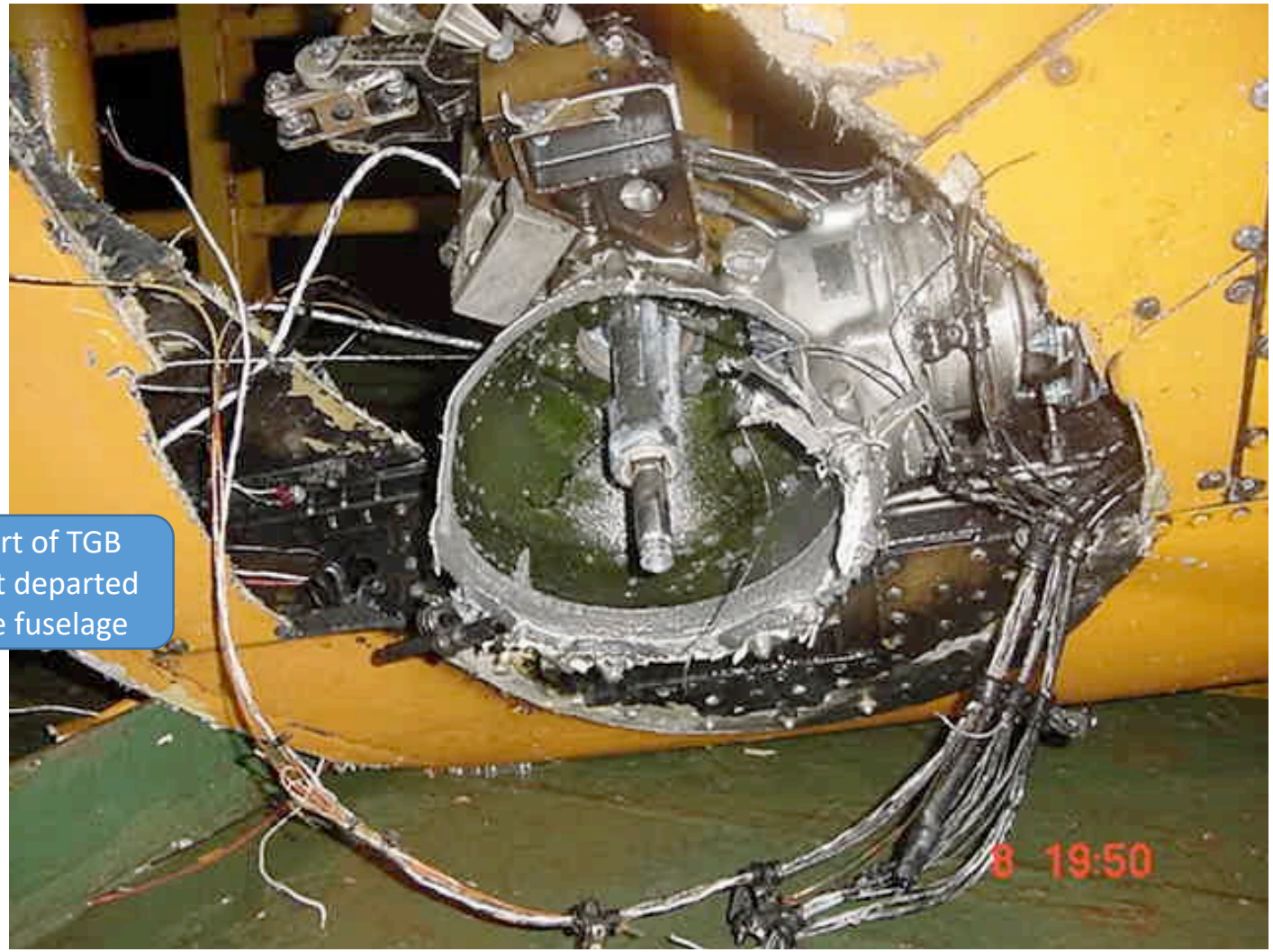


July 5, 2003: PT-YVM

Part of TGB that departed the fuselage



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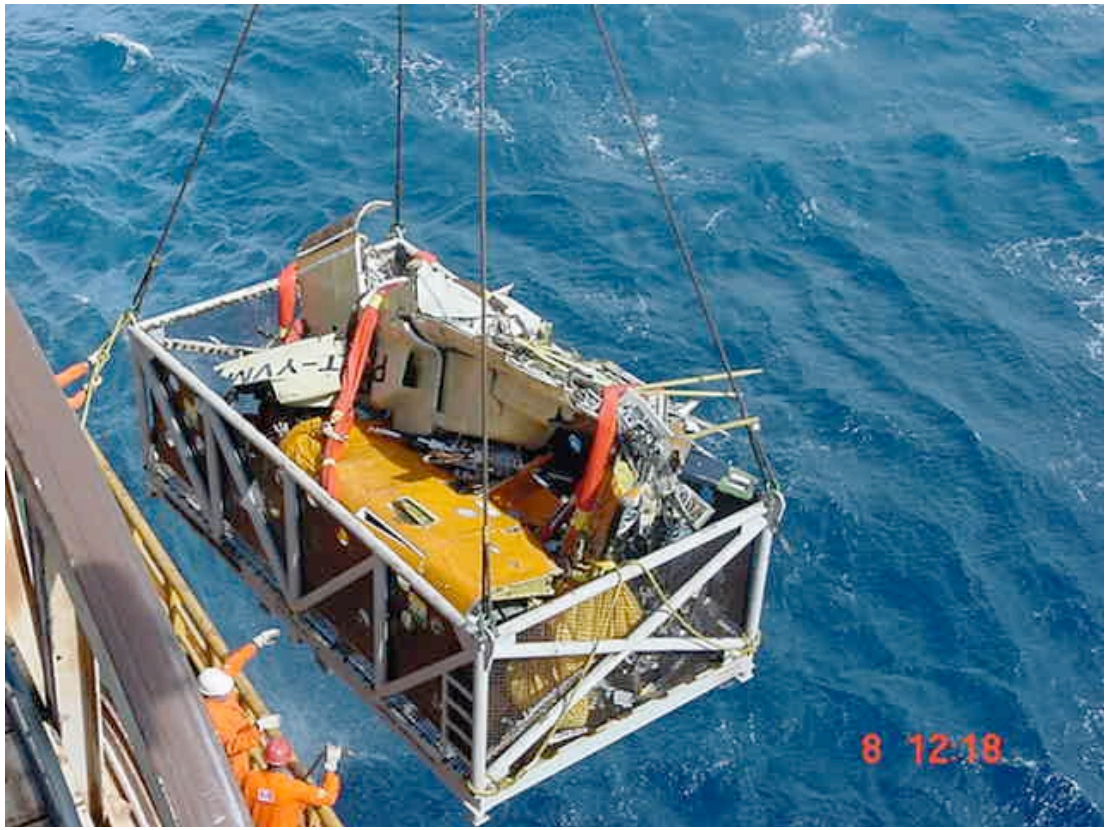


July 5, 2003: PT-YVM

- Extract from the official investigation report:
  - “The aircraft approached for landing from a sector with obstacles, according to the statements of two crewmembers of the vessel who were of the deck at the moment of the accident”
  - “The octagon-shaped helideck allowed a landing path totally free from obstacles in 5/8 of its perimeter”
  - “The transcripts of the cockpit voice recorder revealed no register of abnormal circumstances in the operation, until the collision with the obstacle”

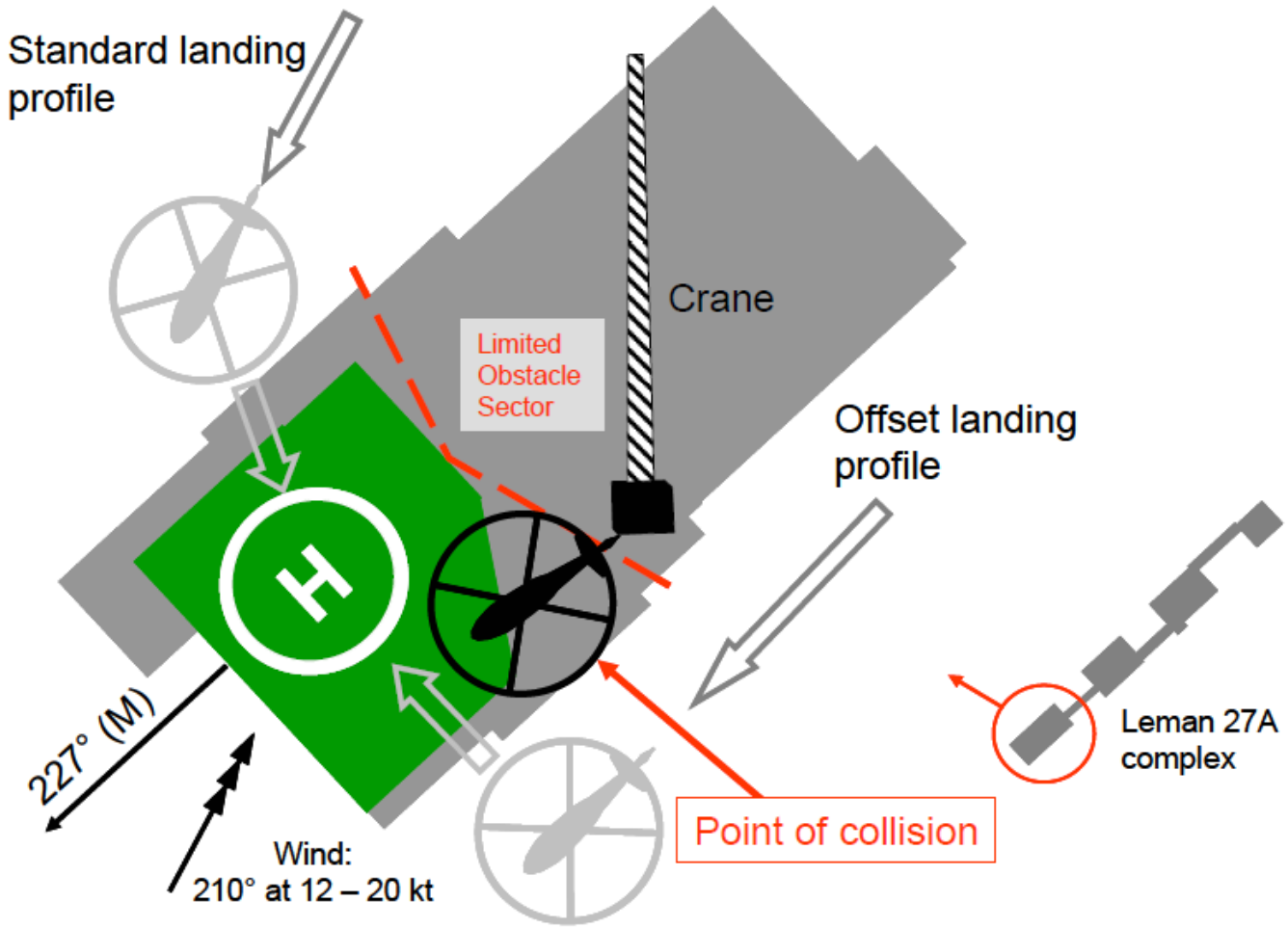
July 5, 2003: PT-YVM

- Extract from the official investigation report (continued):
  - “Since there has been no heading change to reposition the tail rotor in the final approach, the collision with the mast resulted solely from the chosen landing path, leading the aircraft to fly on top of, or very close to, the mast before the collision”
  - (…) “it would be possible to approach safely in a heading with a 30° or 45° angle, relative to the vessel’s heading, from each all the landing area would be seen”

March 9, 2008: G-BKXD

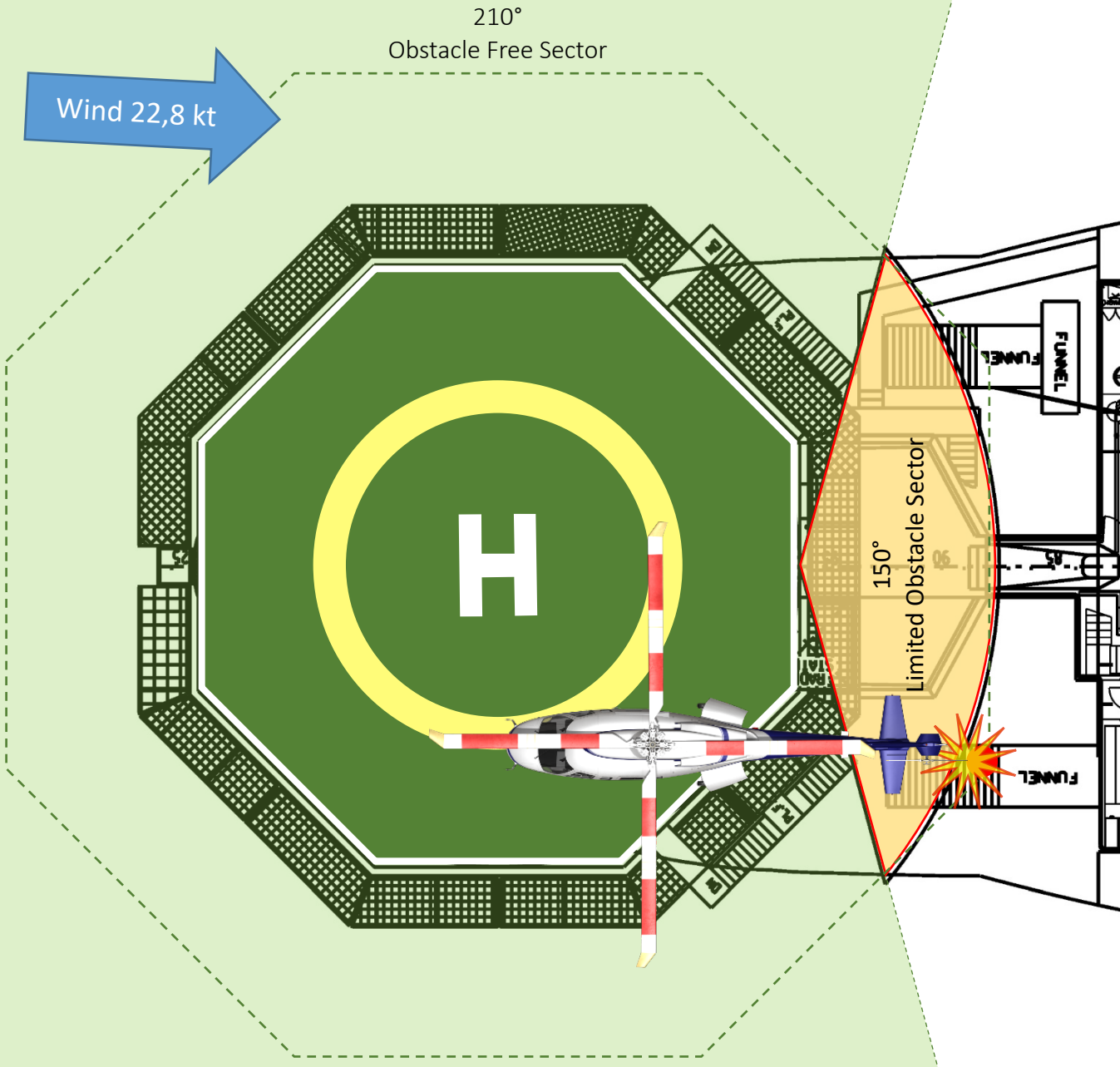
AAIB Synopsis:

"While maneuvering to land on an offshore helideck, the helicopter's Fenestron tail fairing struck the guardrails of a deck mounted crane. Choice of approach profile, limited helicopter performance, approach technique and possible fatigue were considered to be factors in the accident"



July 2, 2012: PR-CHO

- Vessel: Lochnagar
- NAA certified helideck, D-size 17,5m
- T/R impact on the top of the safety railing of a ladder attached to a smokestack, outside the LOS
- No victims

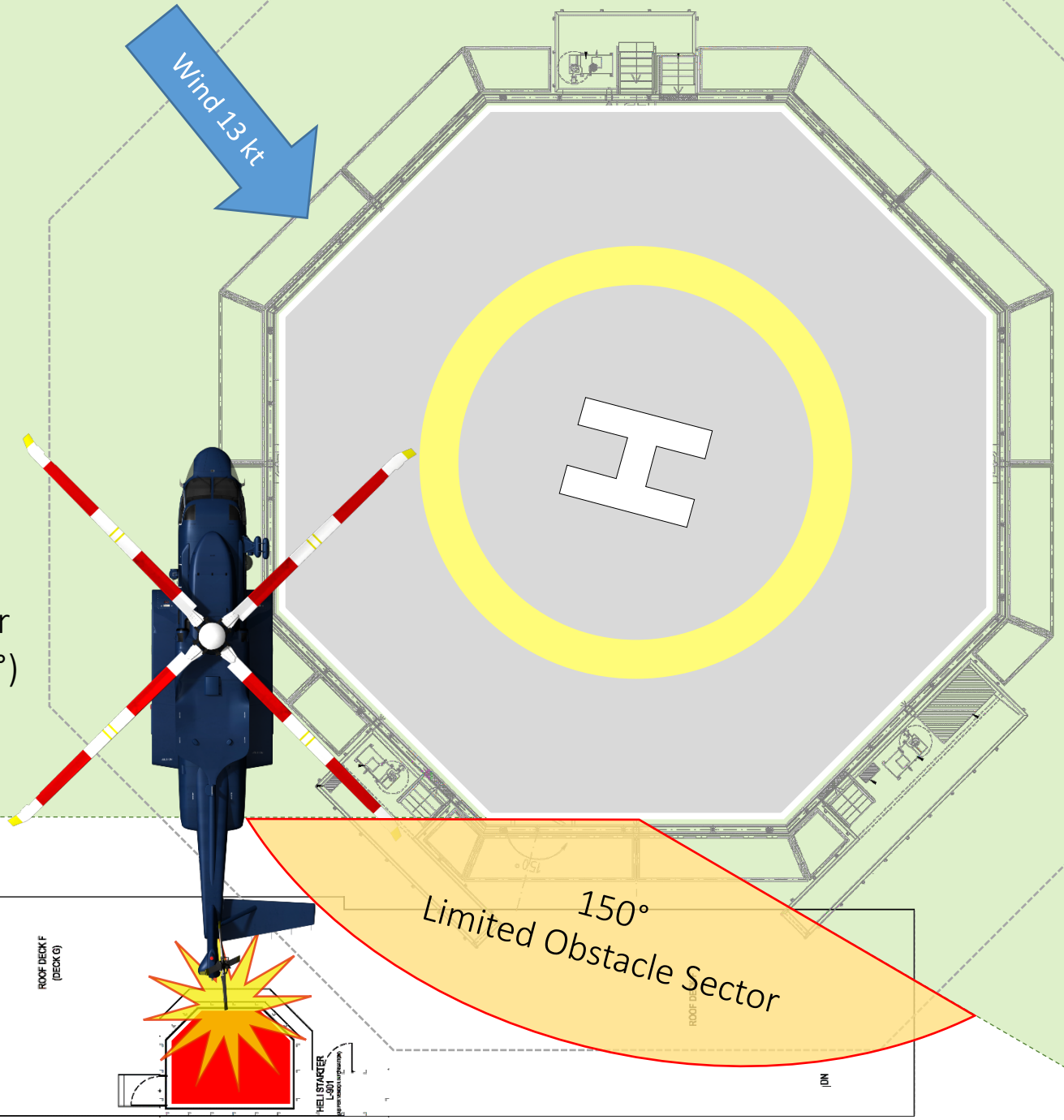


July 2, 2012: PR-CHO

July 2, 2012: PR-CHO

April 16, 2017: PR-CHR

210° Obstacle Free Sector (swung 15 °)

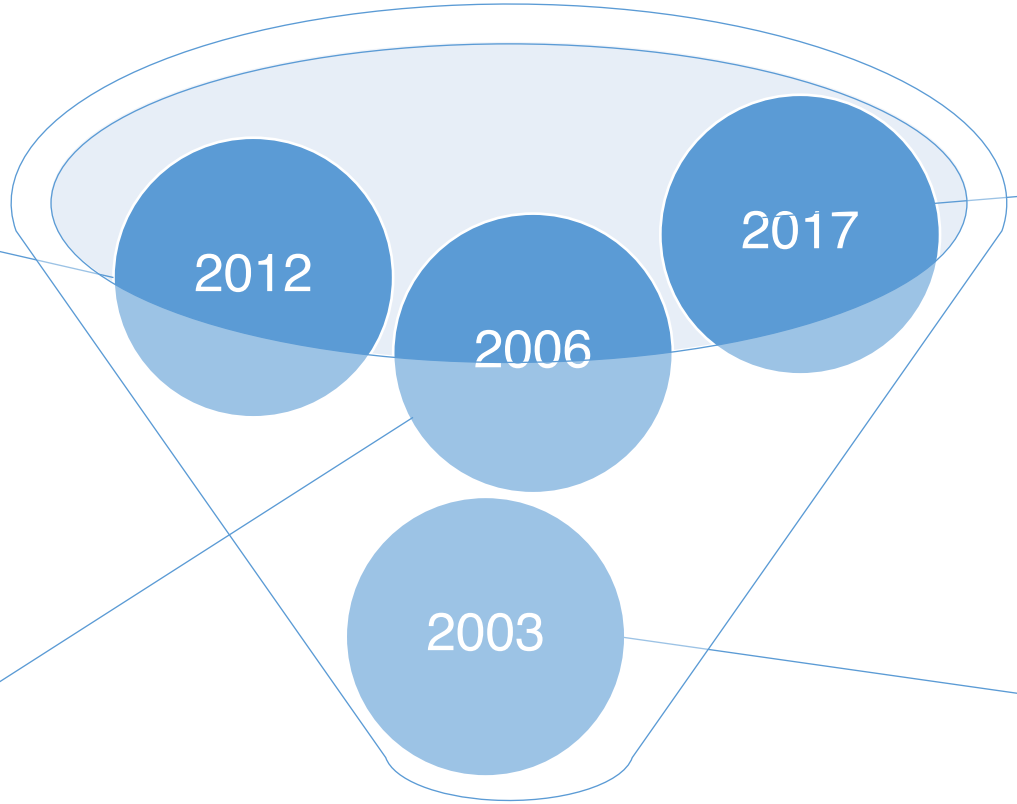


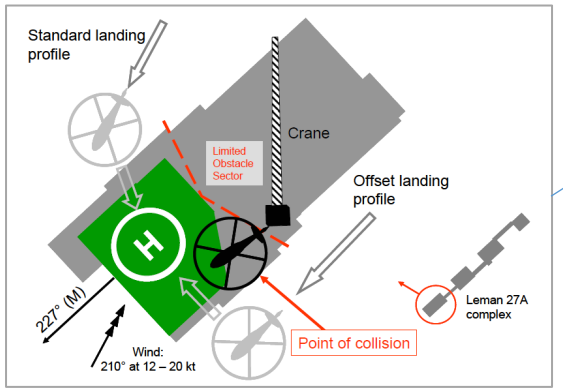
April 16, 2017: PR-CHR

- Vessel: Sevan Brasil
- NAA certified helideck, D-size 23m
- T/R impact on two rotating radar antennas
- No victims

April 16, 2017: PR-CHR

April 16, 2017: PR-CHR

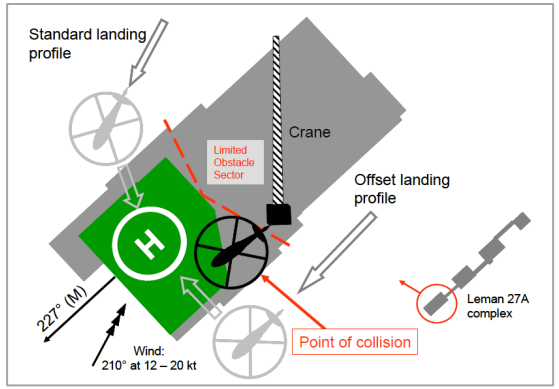

2012
2006
2017
2003


Standard landing profile
Crane
Limited Obstacle Sector
Offset landing profile
Leman 27A complex
227° (M)
Wind:
210° at 12 – 20 kt
Point of collision


STOLT OFFSHORE S/A – TOISA MARINER
05.07.03-14:36:18 7524551/394729 -821M 77Deg

?

The tail rotor hit an obstacle because the helicopter was not entirely within the Obstacle Free Sector

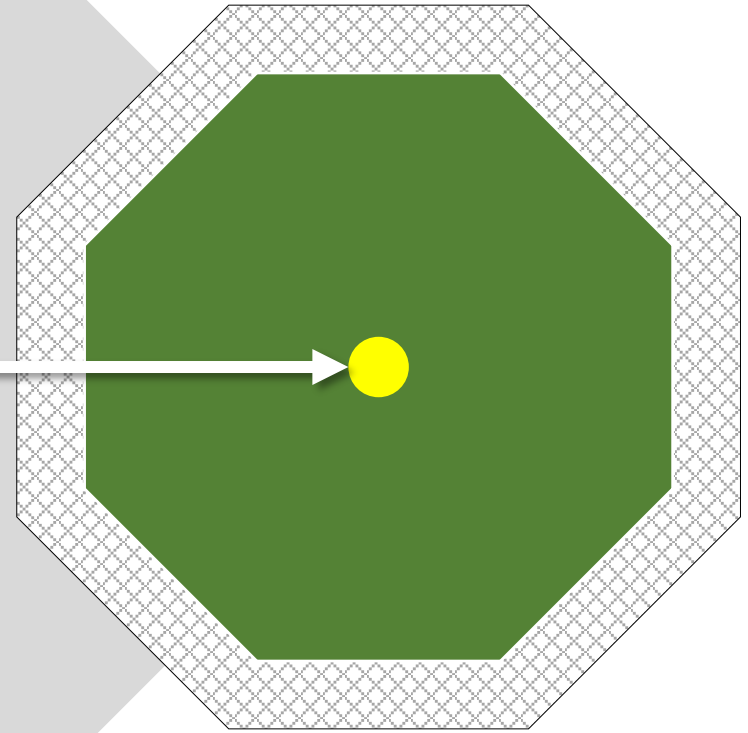


Why?

Why aren’t all helidecks like this?

… or like this?

SOP for pilots to place the center of the smallest imaginary circle that encompasses the maximum dimension of the helicopter on top of the yellow dot on the helideck



The routine challenge for offshore helicopter pilots

Preventing that parts of their helicopters that they can't see hit obstacles outside their visual field, based on the imaginary limits of an Obstacle Free Sector

A multi-variable equation

- Choosing a landing path that:
  - Is entirely clear from obstacles
  - Leads to touch down on an area where clearance from obstacles is ensured, whatever the heading of the helicopter
  - Is compliant with cross wind limitations

ICAO Doc 9261 Heliport Manual 2018

- 2.2.1.5 (…) “the preservation of obstacle-protected surfaces (**the most basic safeguard for all flights**), which include:
  - the minimum 210° obstacle-free surface (OFS);
  - the 150° limited obstacle surface (LOS); and
  - the minimum 180° falling ‘5:1’ gradient with respect to significant obstacles”

Is it OK to decline "*the most basic safeguard for all flights*"?

Obstacle Free Sector

ICAO Doc 9261 Heliport Manual 2018, Definitions

- "A sector, not less than 210 degrees, extending outwards to a distance that will allow for an unobstructed departure path appropriate to the helicopter the TLOF is intended to serve, within which no obstacles above the level of the TLOF are permitted"

Obstacle Free Sector

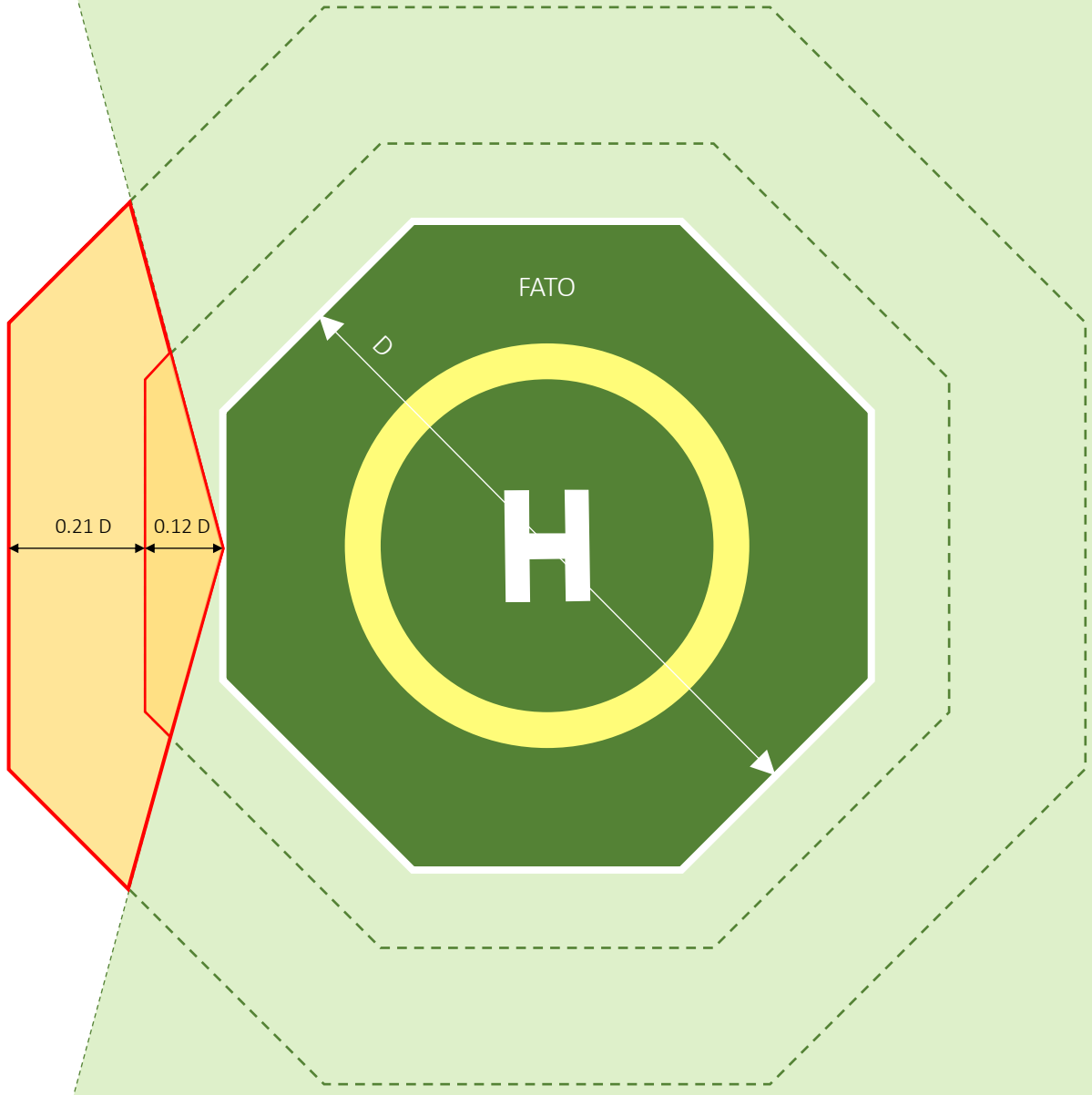
CAP 437 Sep/2018, 3.7.2

- “From any point on the periphery of the above mentioned D circle an obstacle-free approach and take-off sector should be provided which totally encompasses the safe landing area (and D circle) and which extends over a sector of at least 210°”

Limited Obstacle Sector

ICAO Doc 9261 Heliport Manual 2018, 4.1.6 and 4.1.7

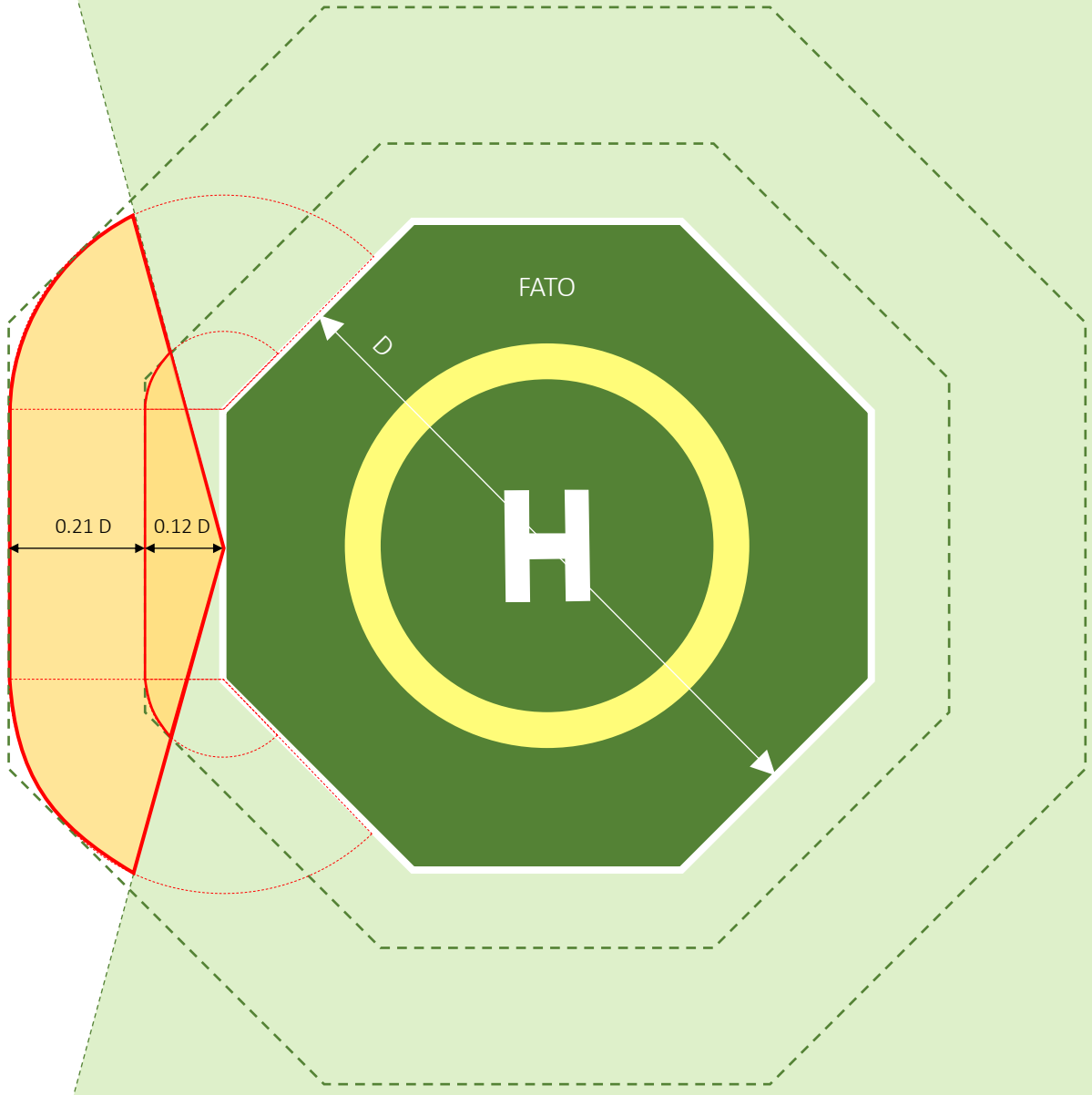
- “Outer limits of the LOS are parallel to the perimeter of the FATO (coincident with a TLOF of 1D)”



Limited Obstacle Sector

CAP 437 Sep/2018, 3.7.4

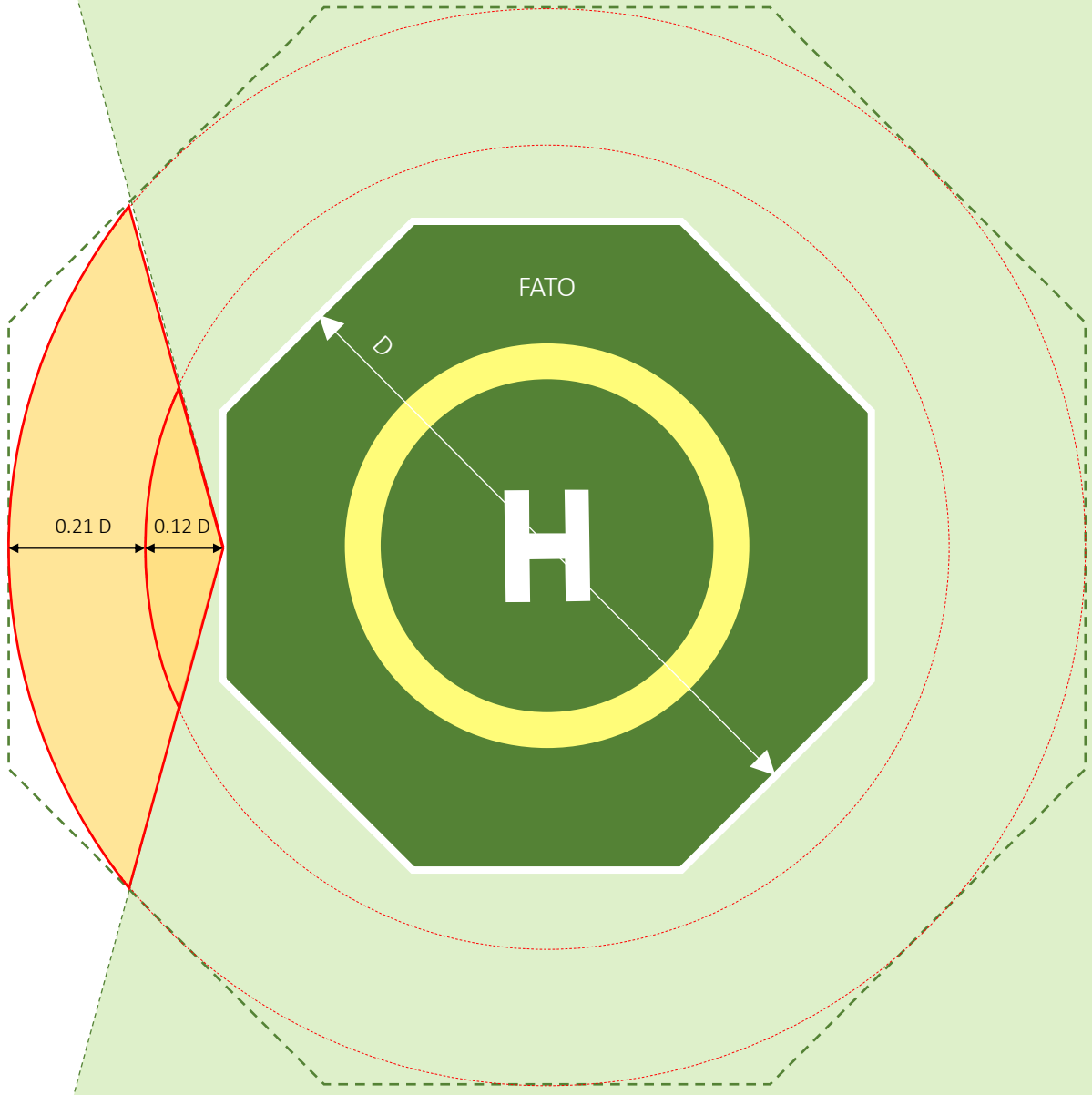
- Outer limits of the LOS match ICAO Doc 9261
- It is possible to replace the angled corners of the two LOS segments with arcs of 0.12D and 0.33D centered on the two adjacent corners of the landing area (FATO)



Limited Obstacle Sector

NORMAM 27 (Brazil), 0404

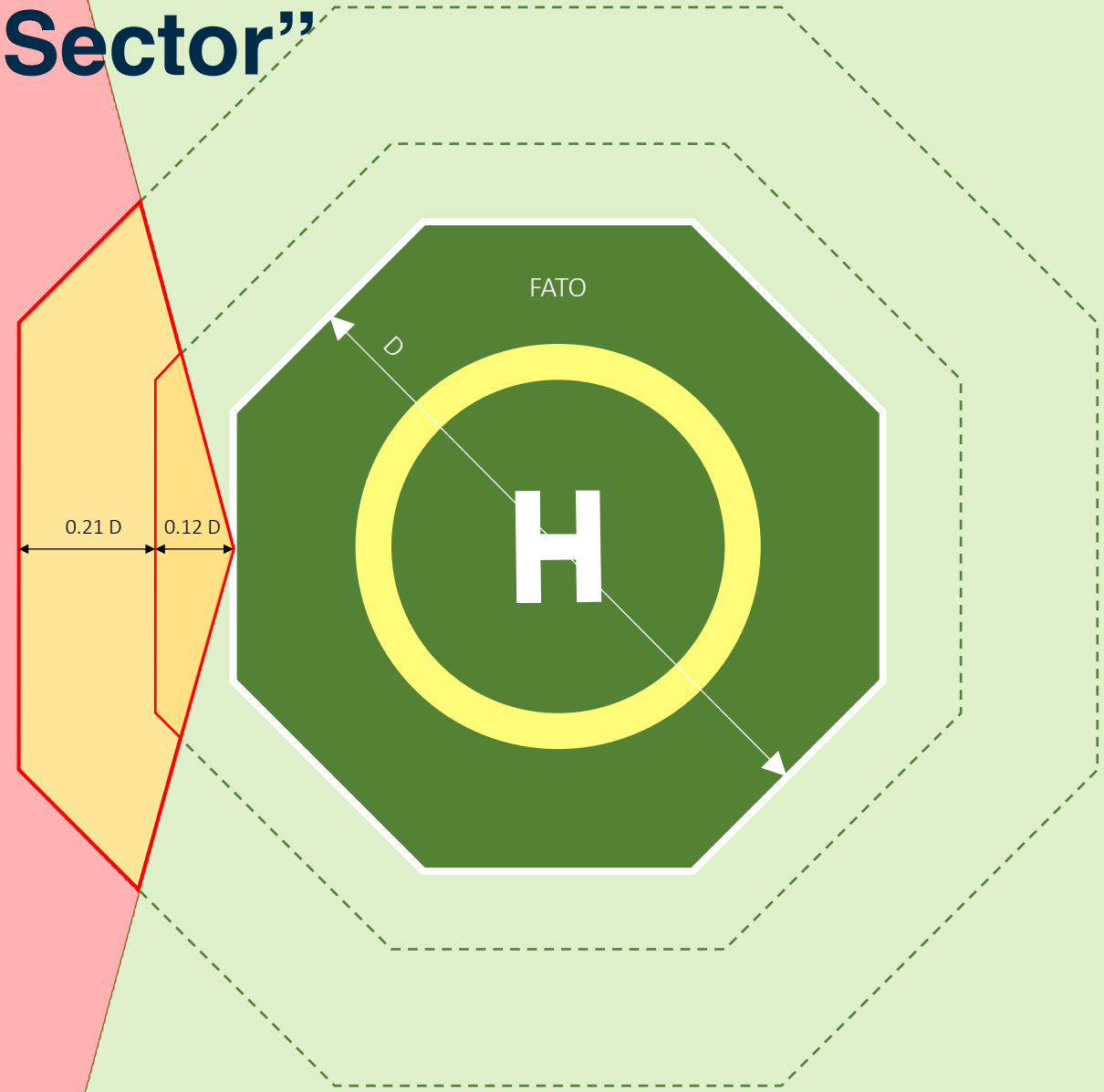
- Outer limits of the LOS are arcs of 0.62D and 0.83D from the center of the FATO

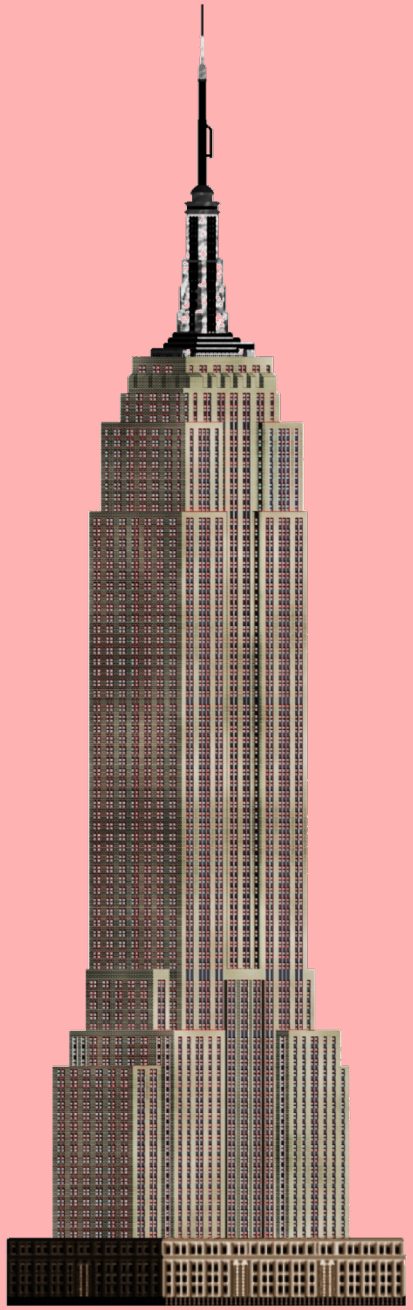


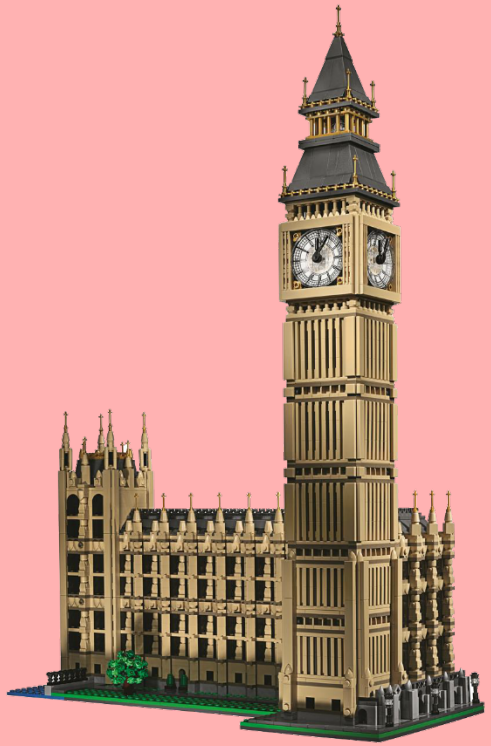
The “Unlimited Obstacle Sector”

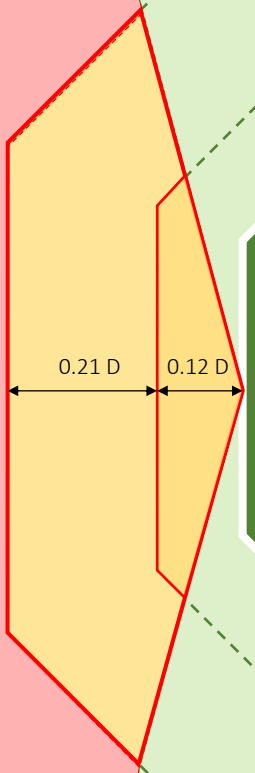
ICAO Doc 9261 Heliport Manual 2018, 4.1.7

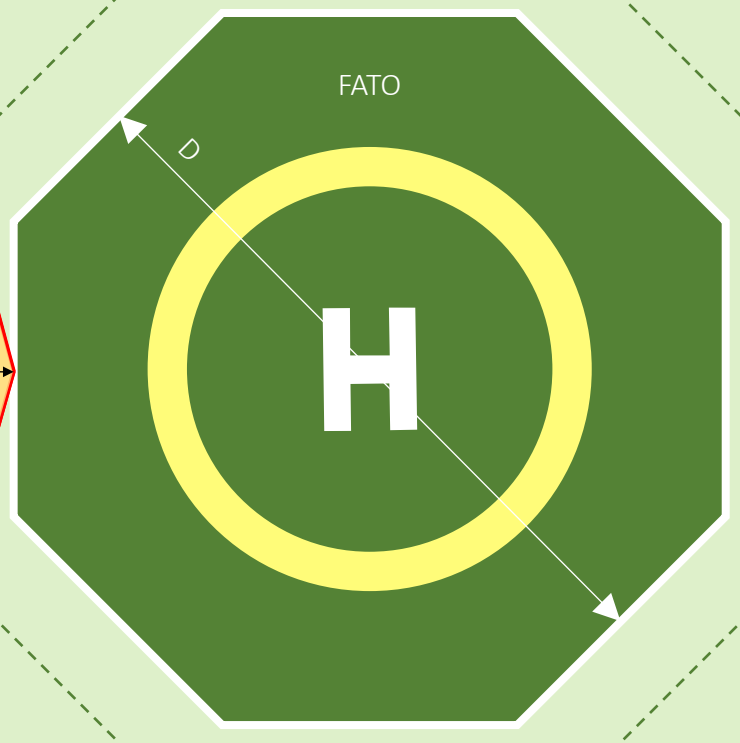
- Once beyond 0.33 D from the edge of the FATO, obstacle height restrictions no longer apply







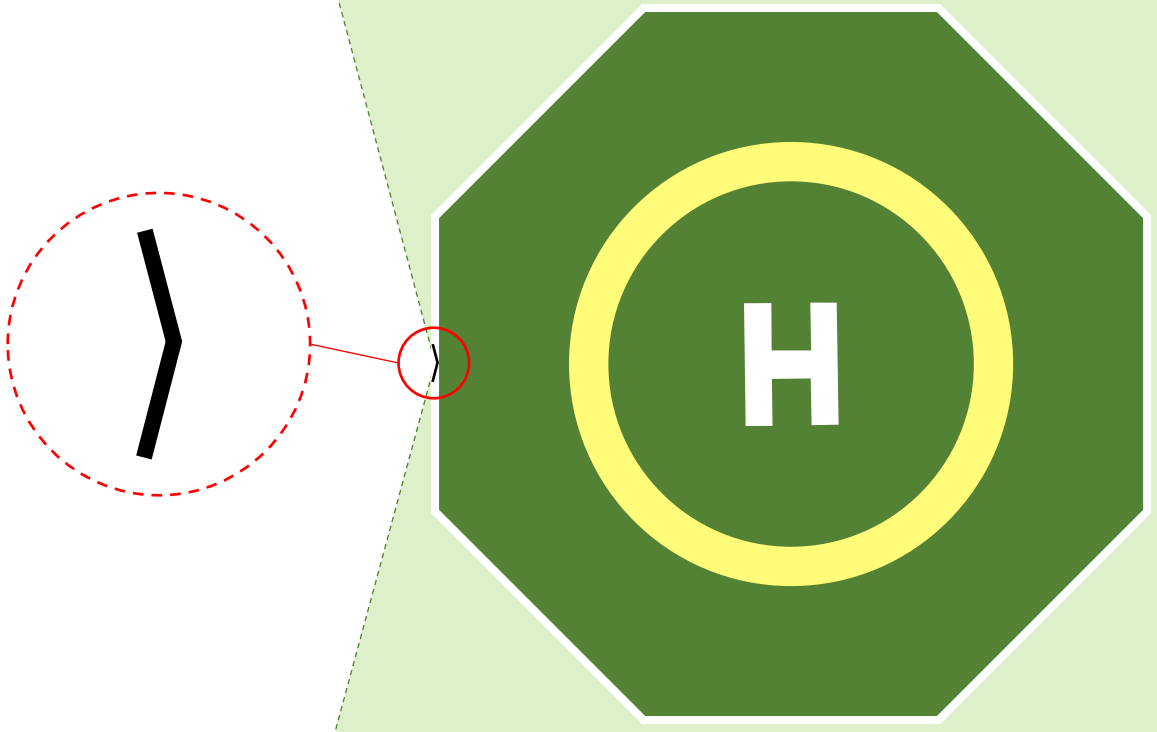

0.21 D
0.12 D


FATO
D
H

The chevron

ICAO Doc 9261 Heliport Manual 2018, 5.9.3

- "The purpose of the chevron is widely misunderstood to provide a form of visual indication to the aircrew that the OFS is clear of obstructions"
- "However, the marking is too small for the purposes of aircrew and instead is intended as a visual tool for a helicopter landing officer (HLO) (who has charge of the helideck operation on the ground) to ensure that the 210 degree OFS is clear of any obstructions, fixed or mobile, before giving a helicopter clearance to land"



If pilots are not supposed to see the chevron, how can they become aware of the limits of the OFS?

The H letter on heliports

ICAO Annex 14 Aerodromes, Volume II Heliports, item 5.2.2.7

- “A heliport identification marking shall be oriented with the cross arm of the H at right angles to the preferred final approach direction”

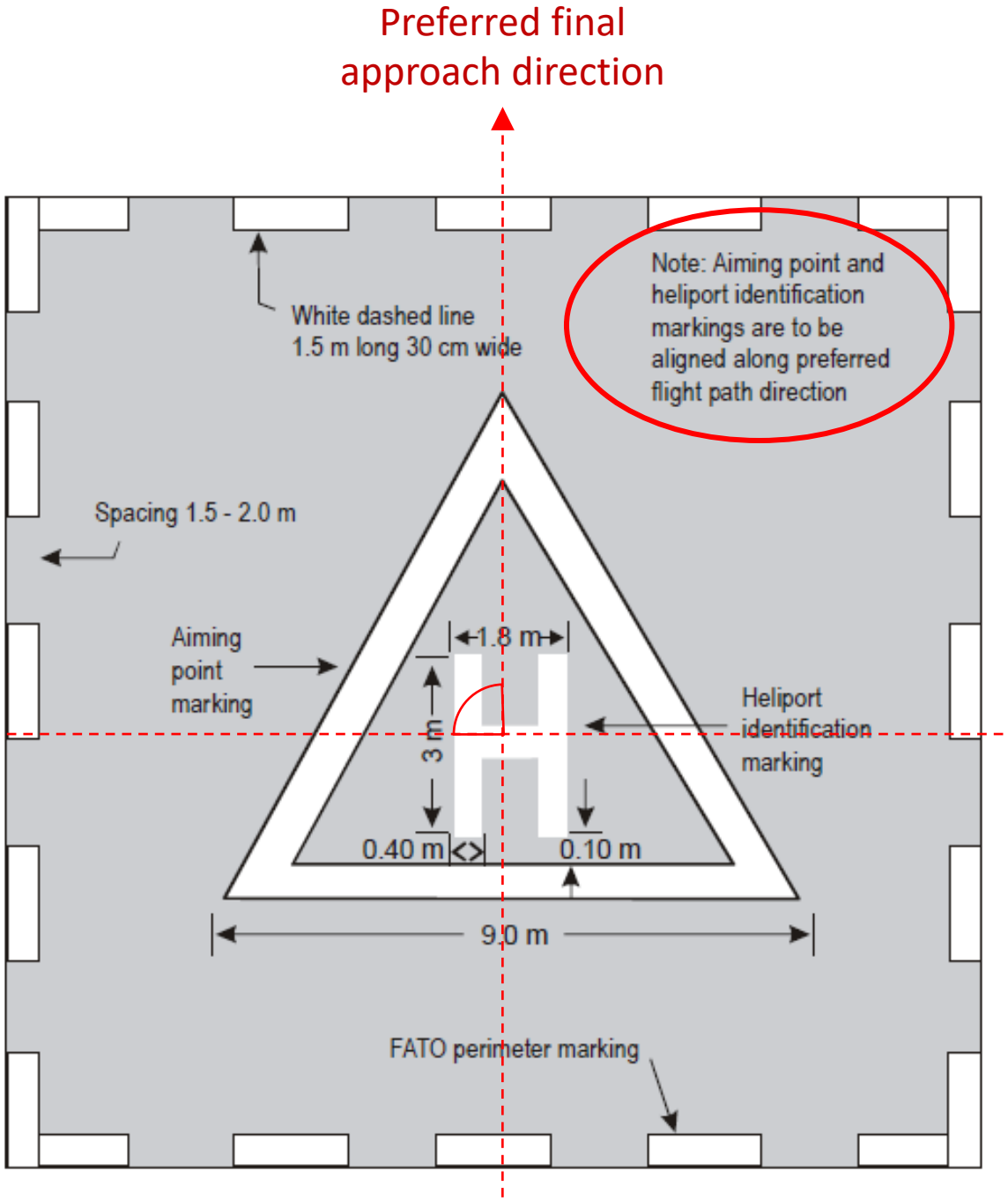


Figure 5-1. Combined heliport identification, aiming point and FATO perimeter marking

The H letter on helidecks

No mention to “preferred approach direction

ICAO Annex 14 Aerodromes, Volume II Heliports, 5.2.2.7

- (…) “For a helideck the cross arm shall be on or parallel to the bisector of the obstacle-free sector”

CAP 437, 4.14

- “A white heliport identification marking ‘H’ marking should be marked co-located with the TD/PM with the cross bar of the ‘H’ lying along the bisector of the OFS”

ICAO Doc 9261 Heliport Manual 2018, 5.3.3

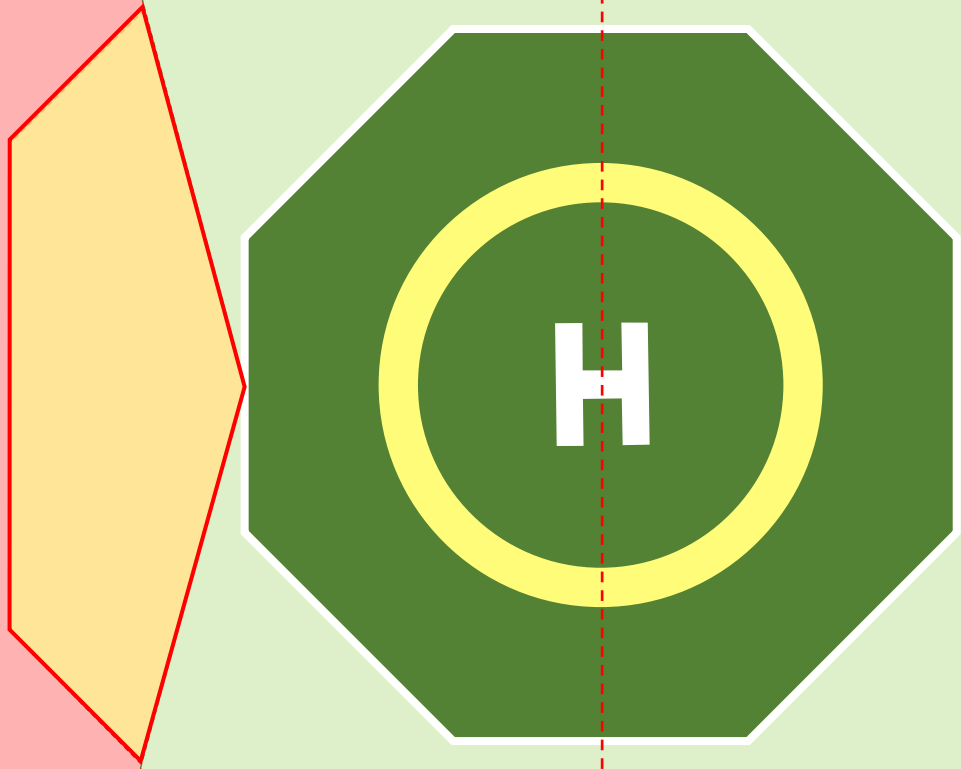
- “For a helideck, and for a purpose built shipboard heliport, the centreline of the cross bar of the “H” should be passed through by the bisector of the obstacle-free sector (OFS)”

NORMAM 27, 0504

- (…) “The horizontal bar of the “H” must coincide with the bisector of the OFS” [except for a swung OFS]

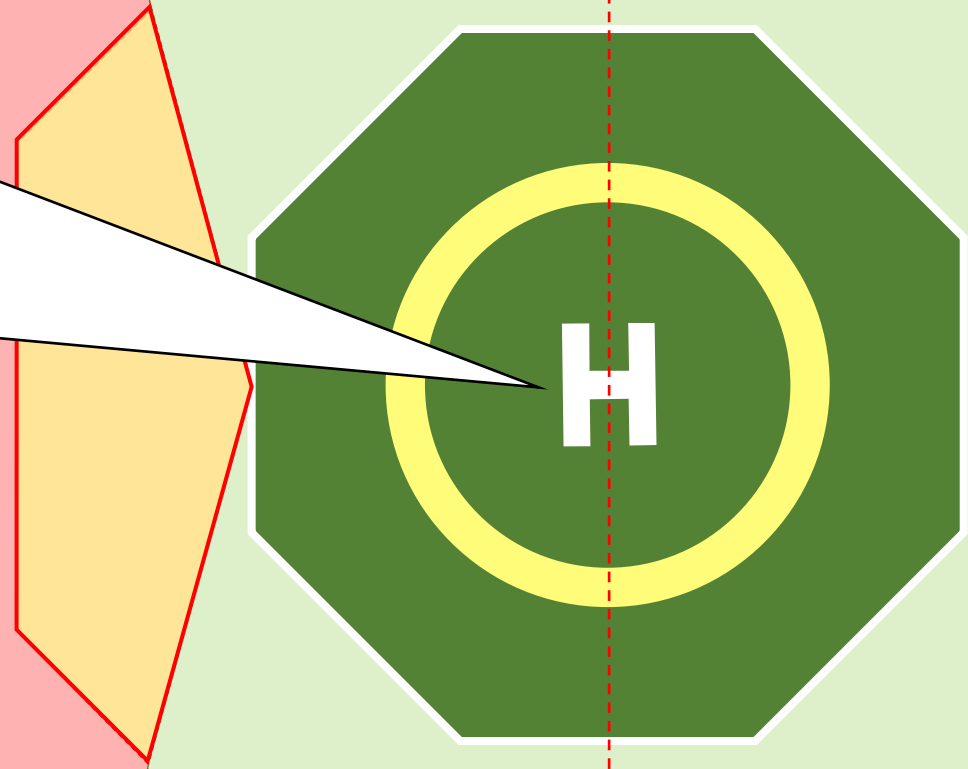
Yet, this remains true for helidecks

- Consider the two sides limited by the longitudinal direction of the H letter
- One side contains the largest portion of the OFS
- The other side contains:
  - Smaller portion of the OFS
  - Limited obstacles
  - Unlimited obstacles



Yet, this remains true for helidecks

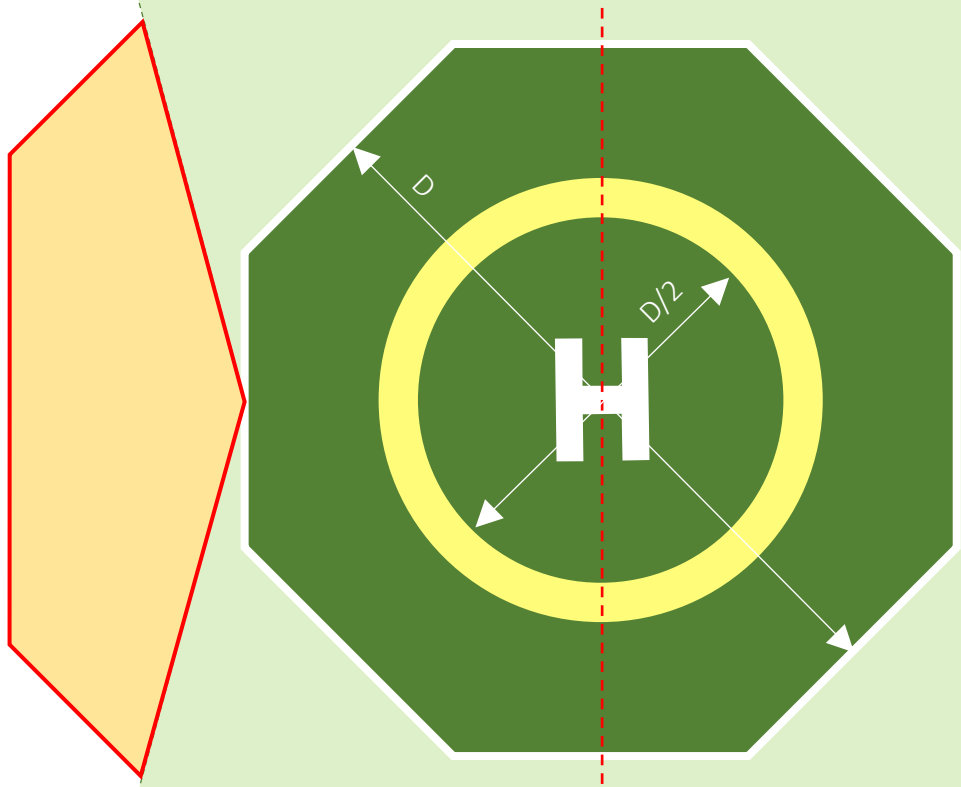
Pilots must interpret the relative position of the **H** letter to obtain awareness of the limits of the OFS



Touchdown/positioning marking

ICAO Doc 9261 Heliport Manual 2018, 5.7.1

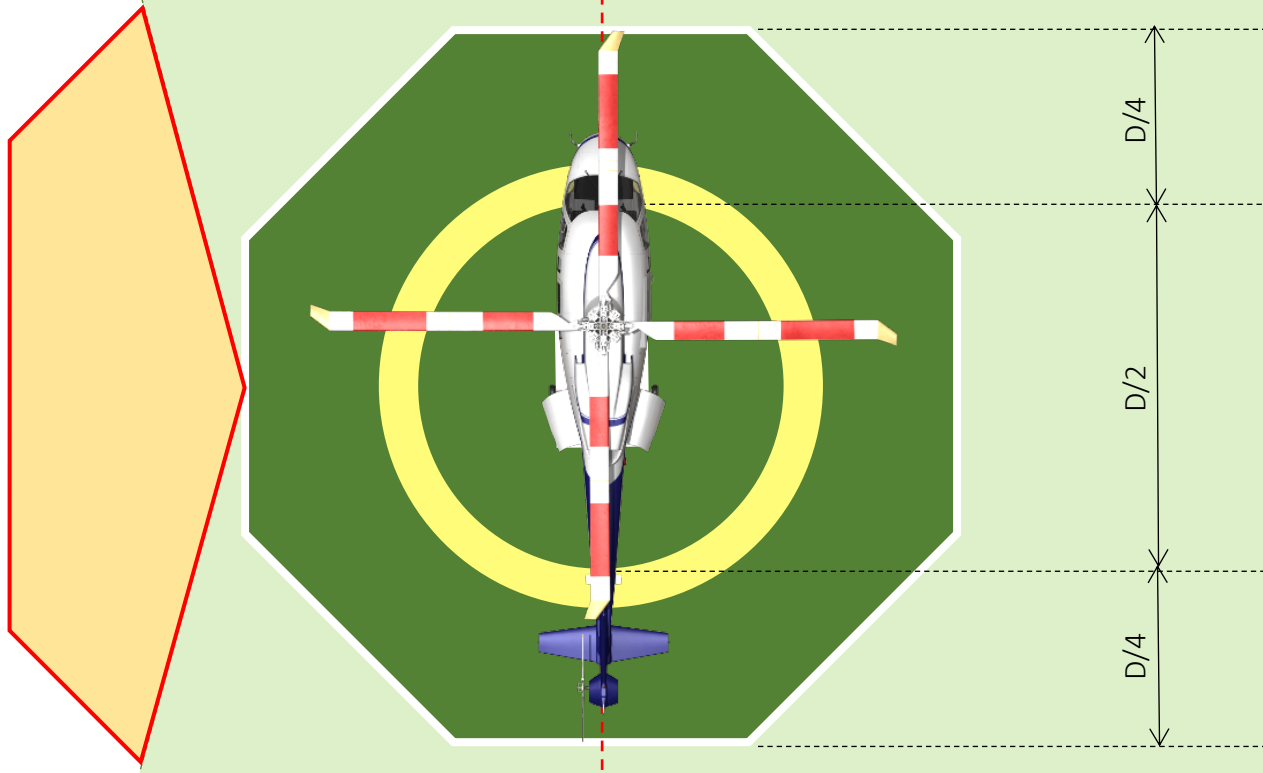
- "A TD/PM circle should be provided on a helideck or shipboard heliport to assist a helicopter to touchdown and be positioned accurately by the pilot. The TD/PM is so located that when the pilot's seat is over the marking, the whole of the undercarriage is comfortably within the TLOF and all parts of the helicopter are clear of any obstacles by a safe margin"



Why “the pilot’s seat”

HCA document “Visual Cues on Landing Sites”, 3.2.2 Omni-directional markings (TD/PM)

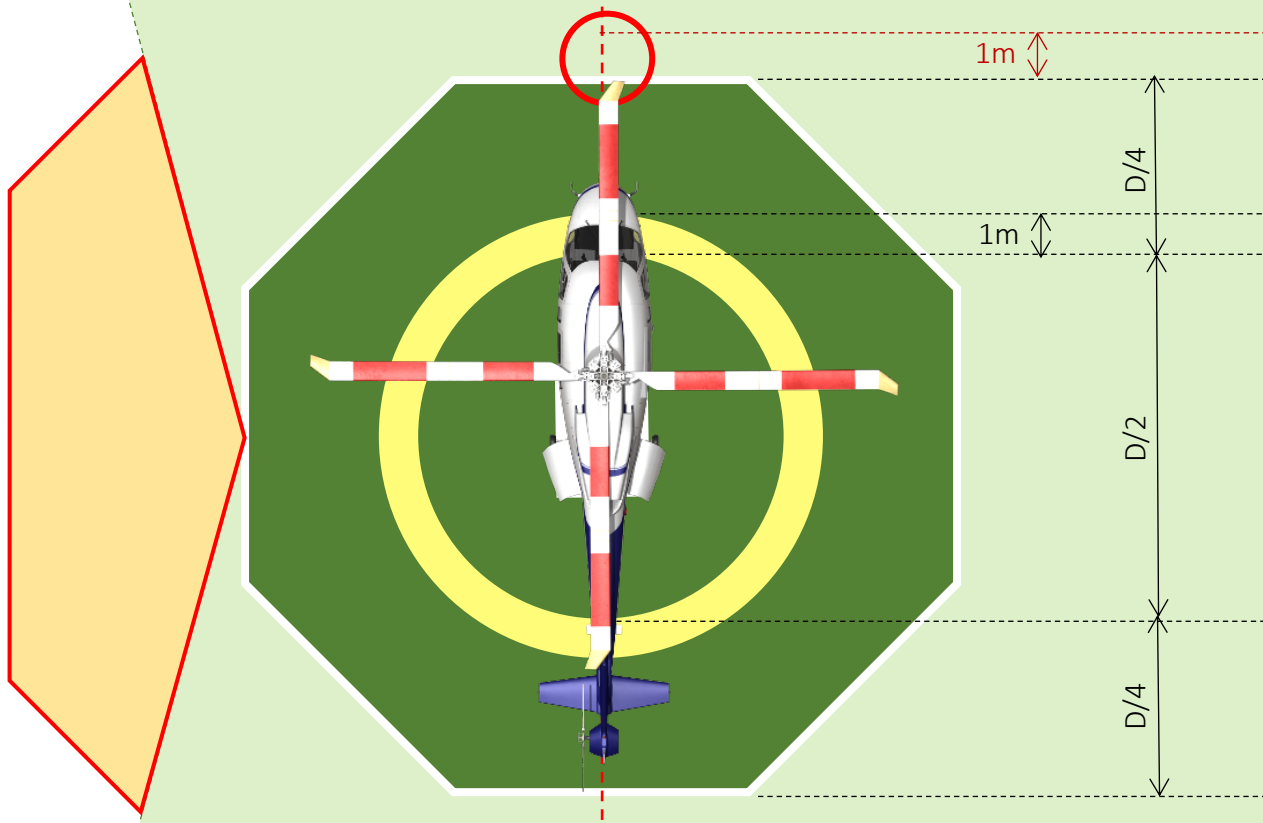
- “Empirically, it has been established that, for the overwhelming majority of single-rotor helicopters (and within small margins), the pilot sits 0.75D forward of the furthest position of the tail-rotor and 0.25D from the front of the main rotor”



Why “the inner circumference”

HCA document “Visual Cues on Landing Sites”, 4 “Use and abuse of the TD/PM on a helideck

- “It has to be stressed that the correct positioning is achieved when the pilot is situated immediately above the inner circle of the TD/PM, not above the painted portion of the line (which could introduce a positioning error of up to 1m)”



Key indications

H letter

Safe paths to the TD/PM

TD/PM

Safe space to touch down

Yeah, but what about the wind?

Considering the wind

- A Pilot's awareness of the limits of the OFS must not be affected by the wind, because the **obstacles just don't care** about the sometimes dramatic challenges imposed by the wind
- Compliance with the limits of the OFS must remain mandatory while pursuing a suitable wind for landing
- **If the wind is such that a pilot can't comply with the OFS limits and the applicable cross wind limitations, the helicopter should not land**

Just knowing the markings is not enough

- Determining if your helicopter is at risk from obstacles near the helideck, based on the interpretation of the relative position of the TD/PM and the H letter

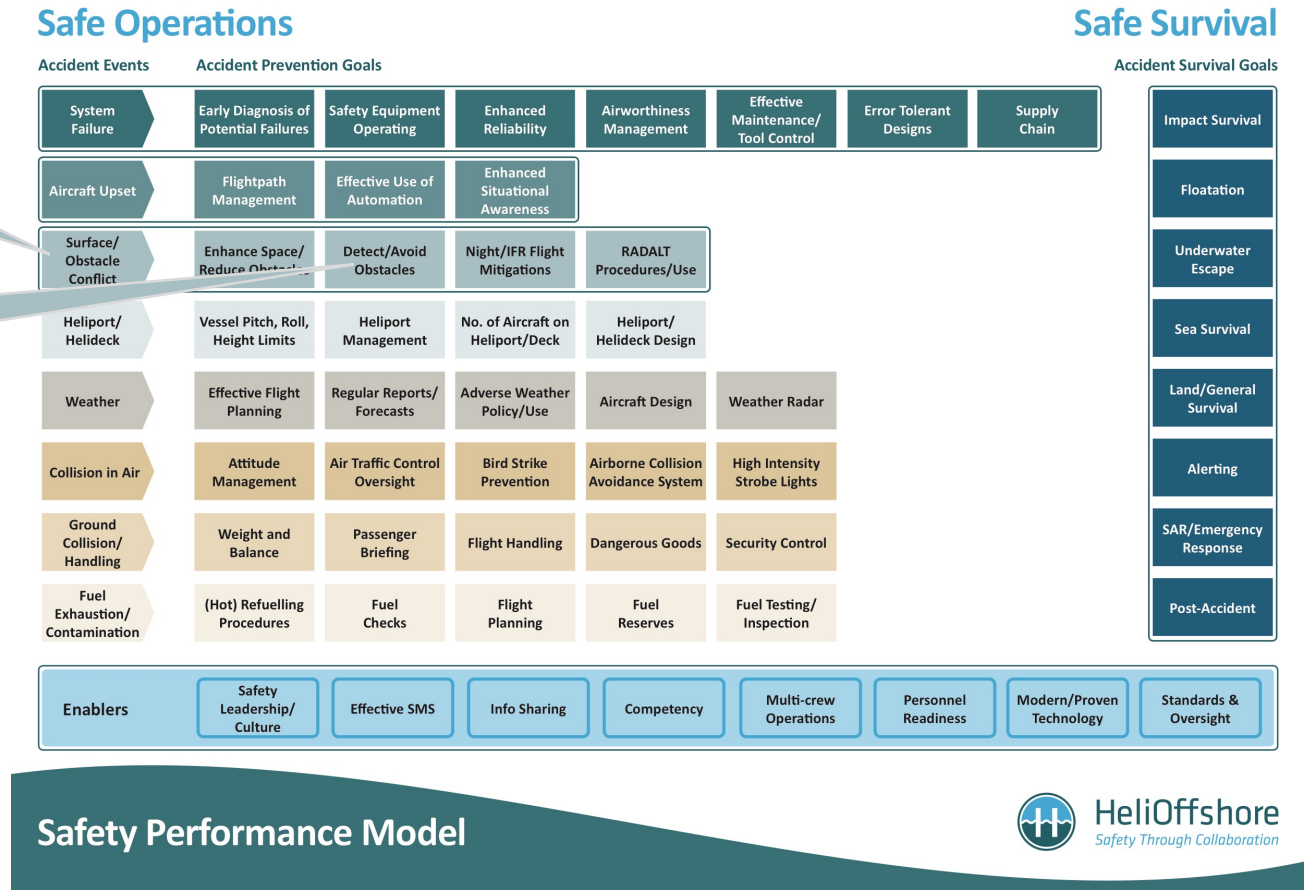
Under no circumstance the separation from obstacles near the helideck should be a guess

It must be ascertained by means of the precise interpretation of the relative positions of the H letter and the TD/PM

Helioffshore Safety Performance Model

Surface/Obstacle Conflict

Detect/Avoid Obstacles

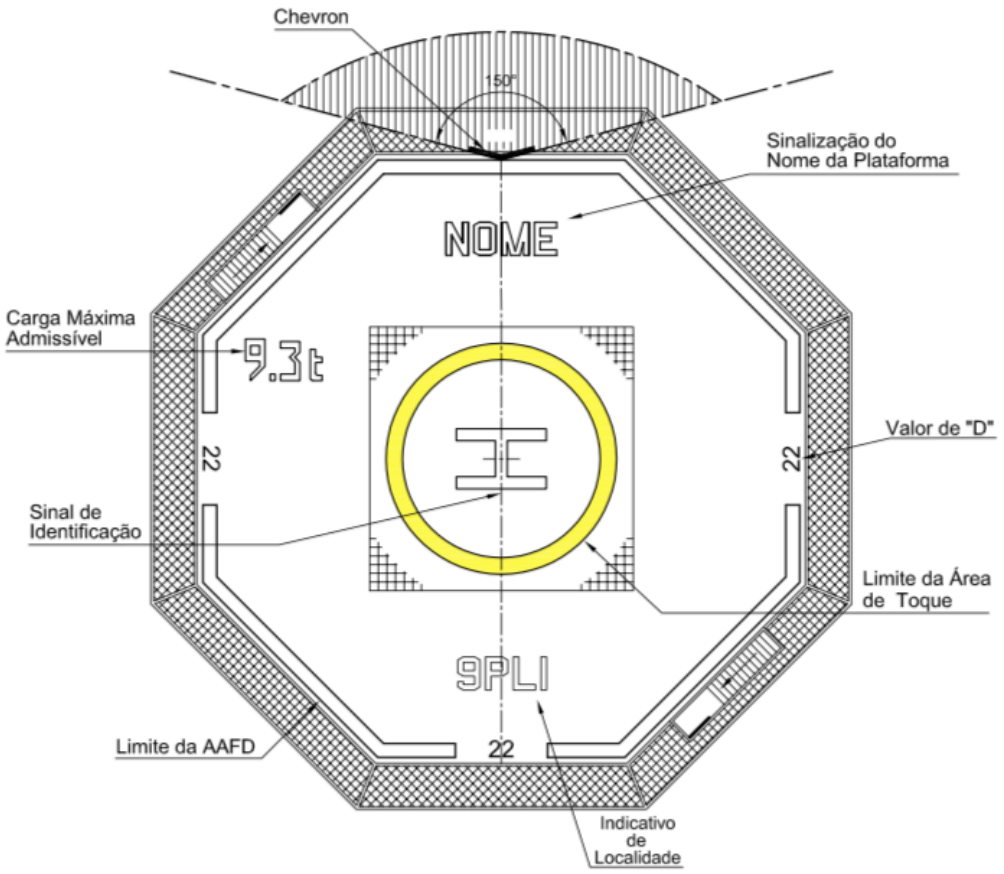


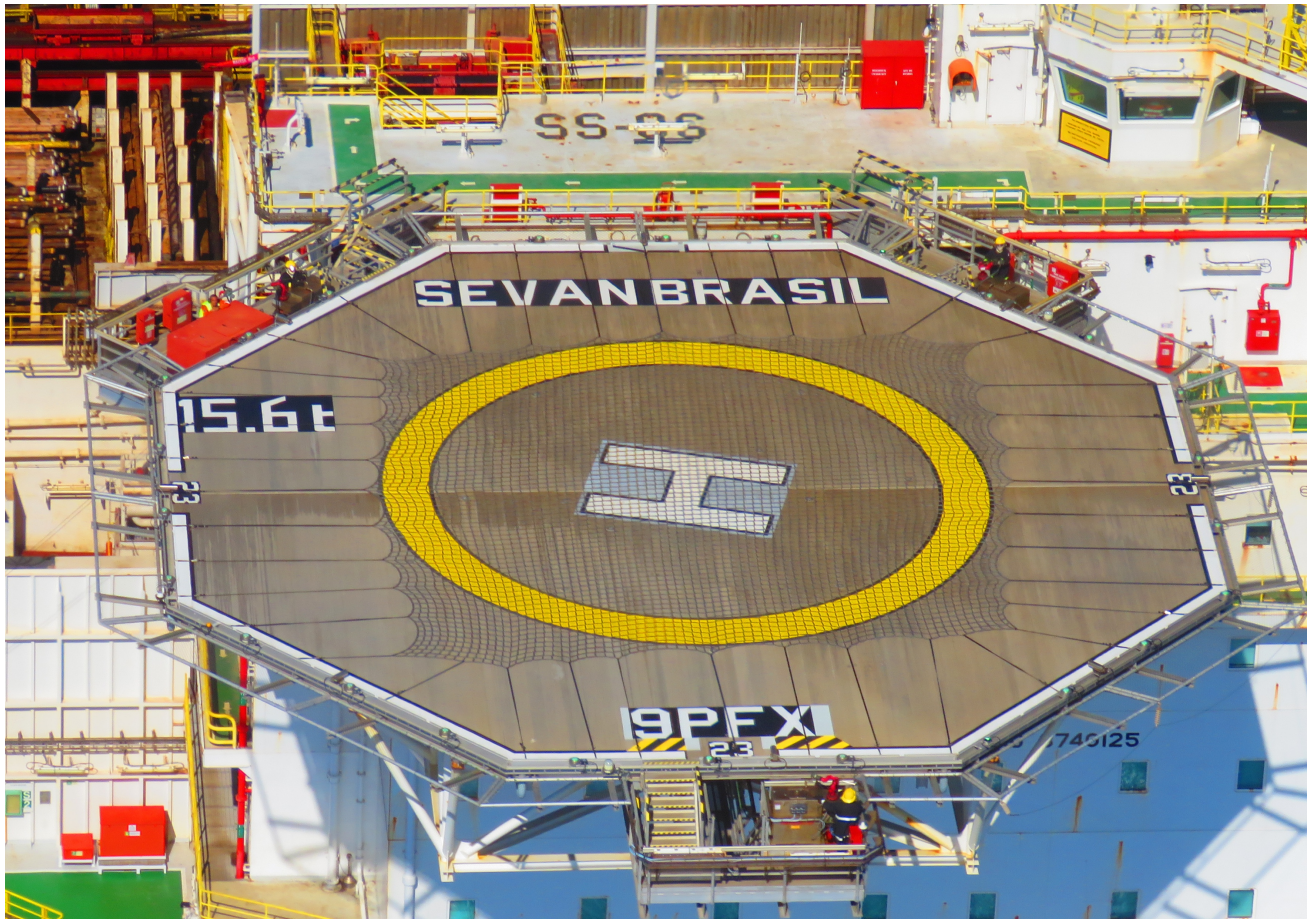
The correct interpretation of the relative position of the H, the TD/PM and the name of the facility can ensure avoidance, even when there are undetected obstacles

Preventing wrong deck landings in Brazil

- In Brazil, many WDL events indicated that, although there were two pilots in the cockpit, the task of identifying the correct helideck was not benefiting from the multicrew operation
- The Maritime Authority requires the ICAO location indicator painted as a helideck marking (NORMAM 27), as proposed by Petrobras
- Petrobras requires that pilots circle the offshore helideck to confirm its ICAO location indicator. Paying for returning flights is a formal policy in its Aviation Safety Case

ICAO Location Indicator (NORMAM 27)





Preventing wrong deck landings in Brazil

- A simple procedure:
  - PF calls out the ICAO Location indicator that he sees on deck
  - PM checks what he heard against the flight plan
  - In case of any discrepancy, the approach should be aborted
- A single identification error from one of the two humans in the the cockpit will not lead to a wrong deck landing