



Helicopter accessibility ‘Hollandse Kust (west)’, ‘IJmuiden Ver’ and ‘Ten noorden van de Waddeneilanden’ *Results*

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Research assignment

Helicopter accessibility “Hollandse Kust (west)”, “Ijmuiden Ver” and “Ten noorden van de Waddeneilanden”

Aim and scope:

This study analyses the helicopter accessibility of platforms located in or near the designated zones ‘Hollandse Kust (west)’, ‘Ijmuiden Ver’ en ‘Ten noorden van de Waddeneilanden’.

The method used is the same as in the previous studies on helicopter accessibility of oil & gas platforms near the offshore wind farm sites Hollandse Kust (zuid and noord, april 2017).

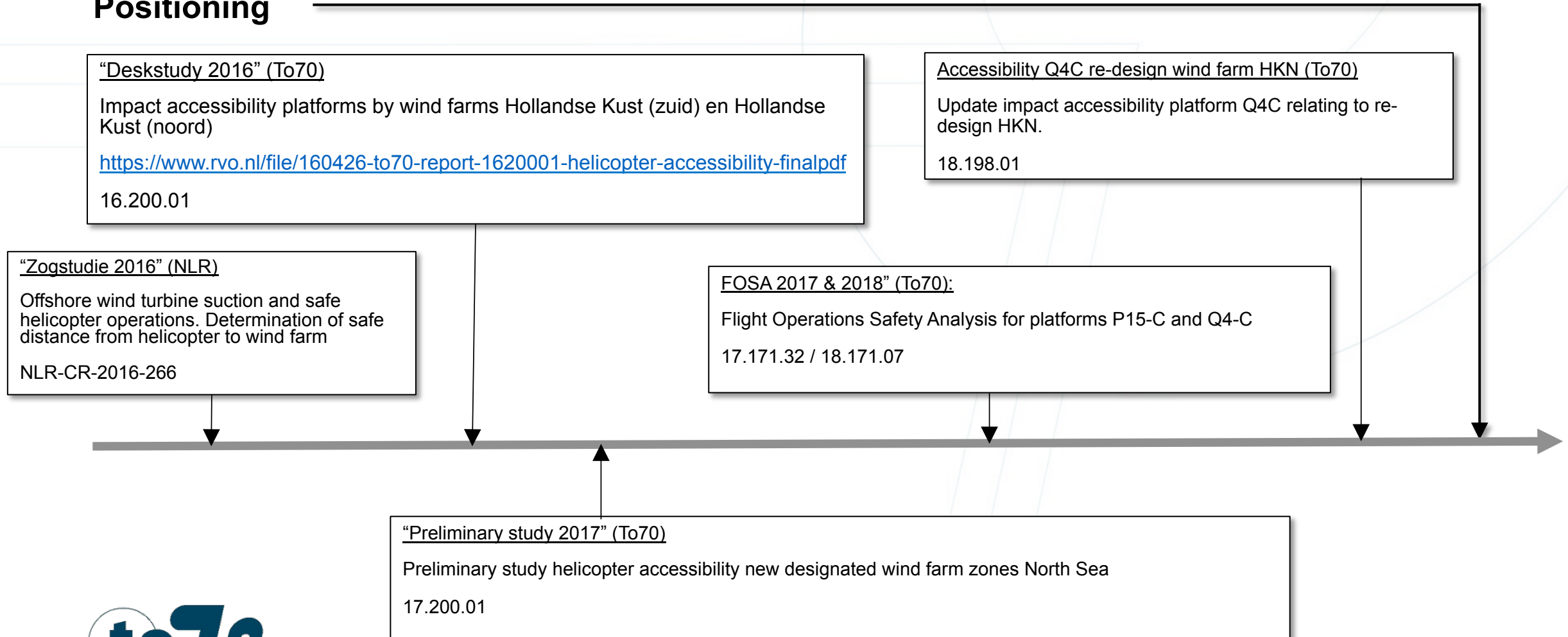
Shipping in the direct vicinity of the platforms is not an explicit part of this method, but was part of the safety assessment for platforms P15-C and Q4-C. Shipping as an obstacle was not found to restrict helicopter access to and from the platforms.

Prepared for:

Rijksdienst voor Ondernemend Nederland (RVO)

Helicopter accessibility “Hollandse Kust (west)”, “Ijmuiden Ver” and “Ten noorden van de Waddeneilanden”

Positioning



Assumptions and definitions

Accessibility

This study focusses on platform accessibility under low visibility conditions using either circling Airborne Radar Approach (ARA) procedures or enhanced class 2 procedures.

Visibility conditions

The accessibility of a platform depends, amongst other issues, on visibility conditions during and outside daytime:

- Normal visibility conditions during daytime (VMC day): approx. 75% within helicopter time window
- Low visibility conditions (during and outside daytime): approx. 25% within helicopter time window

Enhanced class 2 procedure

The enhanced class 2 procedures allow operations to and from a helideck in directions that the limited obstacle free sector would normally not permit.

Background PC2 performance

The enhanced class 2 procedures allow operations to and from a helideck in directions that the limited obstacle free sector would normally not permit.

The International Association of Oil & Gas Producers (OGP) has access to a wealth of technical knowledge and experience with its members operating around the world in many different terrains, which result in guidelines for good practice by individual members for the industry. One of the guidelines being used is that twin-engine helicopters have to be used in hostile environments (North Sea as an example).

Further, in general, the majority of present generation helicopters are not designed to full Category A and unlimited Performance Class 1 standards. Therefore, for operations in a hostile environment, Performance Class 2 helicopters are accepted by OGP. Enhanced class 2 is a combination of specific take-off and landing masses together with techniques which provides a high confidence of safety due to:

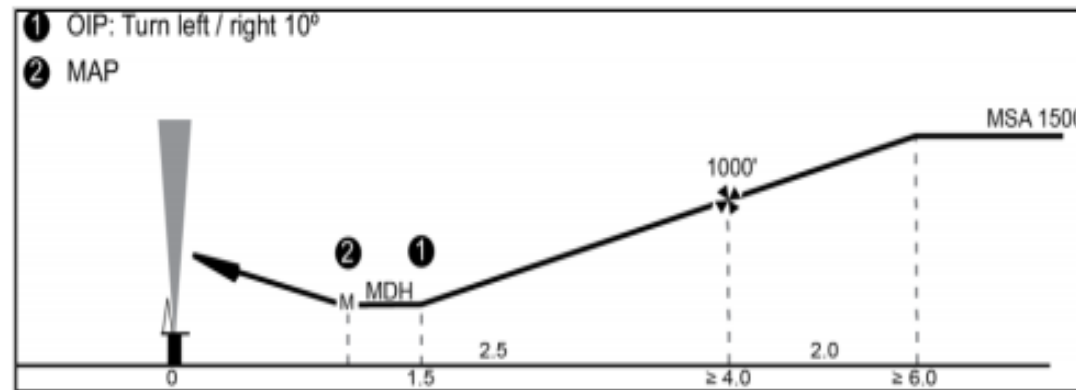
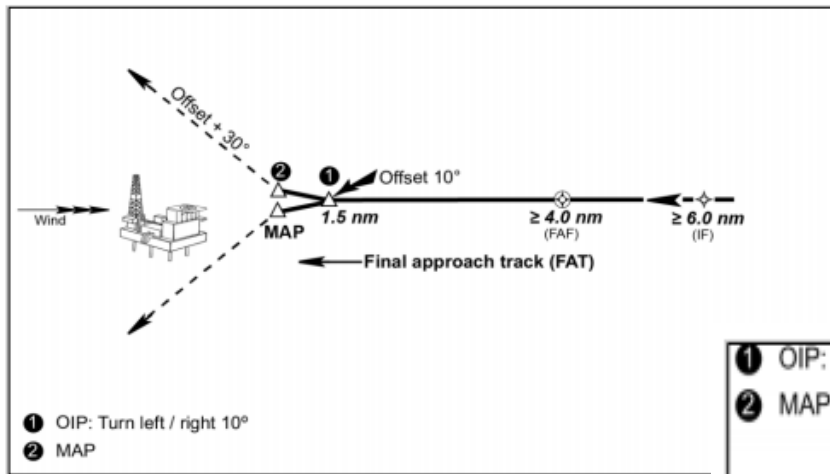
- (A) deck-edge avoidance; and
- (B) drop-down that provides continued flight clear of the sea.

Therefore, PC2 performance is applicable to twin-engine helicopters only and in hostile environments, like the North Sea (hence, including all platforms within the hostile environment).

Background Airborne Radar Approach (ARA)

An Airborne Radar Approach (ARA) is a procedure which allows to fly to an offshore platform in bad weather condition, where otherwise flights may have to be cancelled.

SPA.HOFO.125 regulation stipulates the procedure and specific requirements for operators to perform an ARA, which includes certain heights, distances and tracks for approach and missed approach sectors.



Presence of vessels

The presence of the vessel, in different positions, near platform P15-C was not considered to be of significance to flight crew workload.

This aspect reflects comments in a 2017 report from To70 (ref: 17.200.01, Preliminary study helicopter accessibility new designated wind farm zones North Sea) about the possible influence of shipping during performing ARA and circling ARA approaches on rigs.

Based on these findings, these conclusions can now be better placed in the context of their operational impact and are considered to be less significant than was first thought.

Method

The method used is the same as in the previous study on helicopter accessibility of oil & gas platforms near the offshore wind farm sites Hollandse Kust (zuid and noord, april 2017)

Departure, approach and missed approach should:

- not overlap other platforms within the 5 NM zone
- not overlap the defined buffer area for wind park generated turbulence
- Not overlap the limited obstacle sector if the sector contains critical objects preventing enhanced class 2 procedures in this direction
- Assumed path of missed approach should not be aimed at the wind farm

Except for:

- An Wind turbine stop-procedure is in place to eliminate possible wind farm turbulence



Shape type	Schematic representation
Departure sector Modelled shape: • ARA based departure sector • Length: 5 NM • 60 degrees (2x 30) sector	
Approach sector Modelled area: • ARA based final approach corridor • Length: 2,5 NM • Visual "maneuvering" circle • R = 2,5 NM	

Shape type	Schematic representation
Missed approach sector Modeled area: • 45° sector, orientated left or right of the final approach track, originating from a point 5 NM short of the destination, and terminating on an arc 3 NM beyond the destination	

Helicopter offshore flight operations: Commercial & SAR

Assumptions “commercial” flights

4.3 Accessibility calculations

The platform accessibility has been calculated by analyzing historical weather data against the derived approach and departure directions, assuming low visibility operations, during the time period reported below and with the following data and parameters for both visibility and wind:

Weather data

- Source: KNMI METAR data
- 30-minute recordings between 2011-2016 from offshore stations:
 - Hoorn (EHQE)*
 - P11-B (EHPG)*

*) Data coverage of these station: 70%-100%

Time window:

- 7:30 – 20:30 LT (corresponds to the time window for regular offshore helicopter flights)

Visibility

- During daylight period (UDP):
 - Cloud base (“lowest clouds”) ≥ 300 ft
 - Horizontal visibility: 1 NM (~1850 meter) or more
- Outside daylight period (non-UDP):
 - Cloud base (“lowest clouds”) ≥ 500 ft
 - Horizontal visibility: 1,5 NM (~2800 meter) or more

(Deskstudie 2017)

Wind

- Maximum wind: 60 kts;
- Wind speed under 5 kts are assumed as no wind;
- On departure:
 - No tailwind;
 - Maximum cross-wind 20 kts;
 - For cross-winds between 10-20 kts, minimum head wind 5 kts;
- On final approach:
 - No tailwind;
 - Maximum steering angle¹⁰: 15 degrees (assuming a groundspeed of 60 kts);

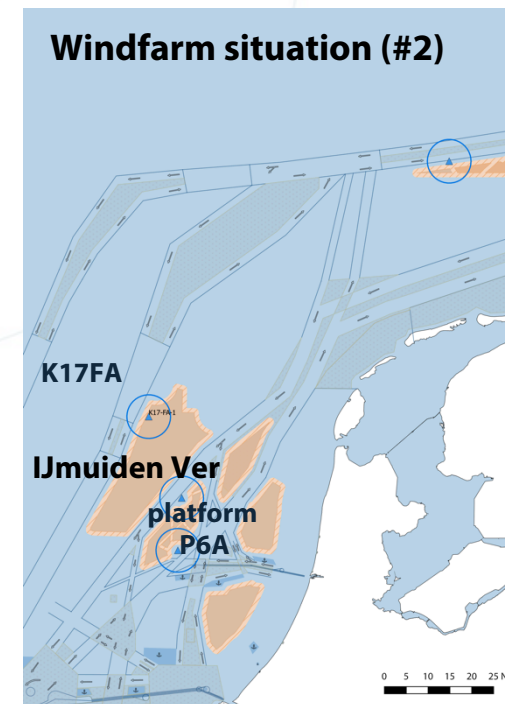
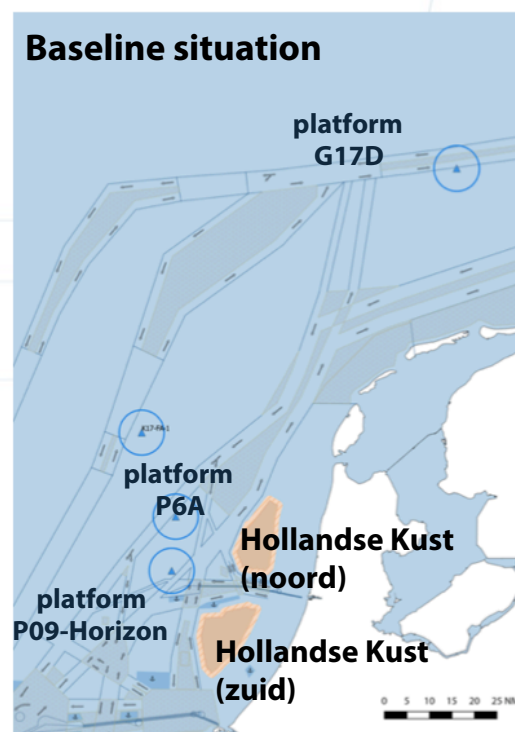
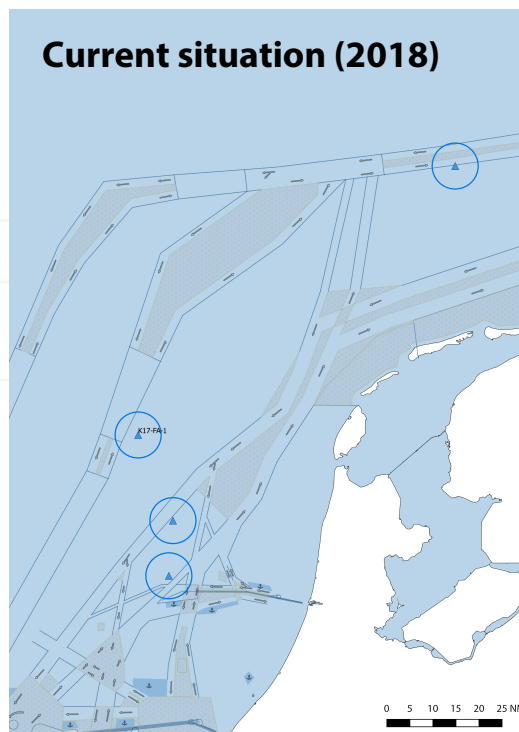
(Deskstudie 2017)

Assumptions “SAR” flights (oil & gas specific)

- Similar visibility and windspeed limitations apply to SAR flights as for commercial flights
- Employability for SAR is 24 hours per day (instead of regular 07:30-20:30 for commercial flights)

Accessibility calculations (offshore windfarm situations and platforms)

Offshore windfarm situations

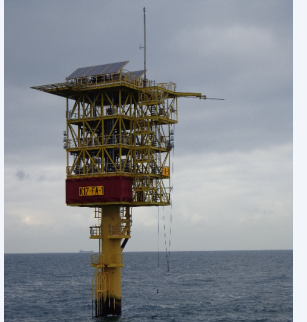
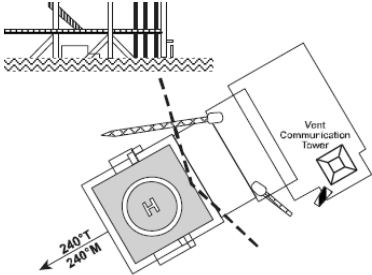
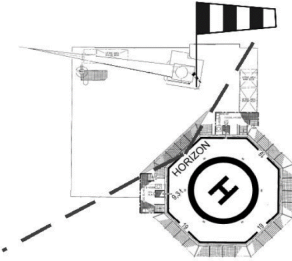
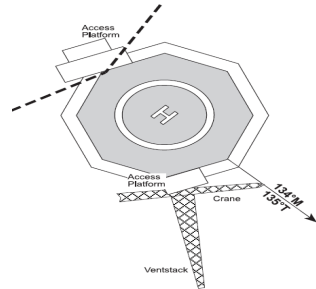


Platforms in scope:

P09-Horizon	-	✓	✓	-
P6A	-	✓	✓	✓
G17d-A	-	✓	✓	-
K17-FA1	-	-	-	x*

*K17-FA1 does not have a helideck (see next slide)

Characteristics of platforms in scope

	P6A	P09-Horizon	G17d-A	K17-FA1
Picture				
Layout				
Flight Operation	- Helideck is certified - NHV - 4 x per week (about 208 per year) - PC2E performance verified by CHC	- Helideck is certified - CHC – 95 x per year - PC2E performance verified by CHC	- Helideck is certified - Unknown number of flights - PC2E performance verified by CHC	No helideck - HLL* does not mention K17-FA1) - Reference http://werkenindeoffshore.nl/nam-k17fa/

* HLL: Helideck Limitations List. A list of the HCA (Helideck Certification Agency) with helideck landing limitations.

SAR operations

Nature and size Search and Rescue

- North Sea 982 rigs, 143 on Dutch territory (approx. 2.500 people)
- SAR covered aeronautical and maritime part of Netherlands (this includes Oil & Gas, surfers, boats, etc)
- 4 helicopters, 1 permanent crew, divided over 2 bases (Den Helder and Maasvlakte)
- On paper 8 passengers (type helicopter Dauphin AS365N)
- 20 min response-time (rotors-run)

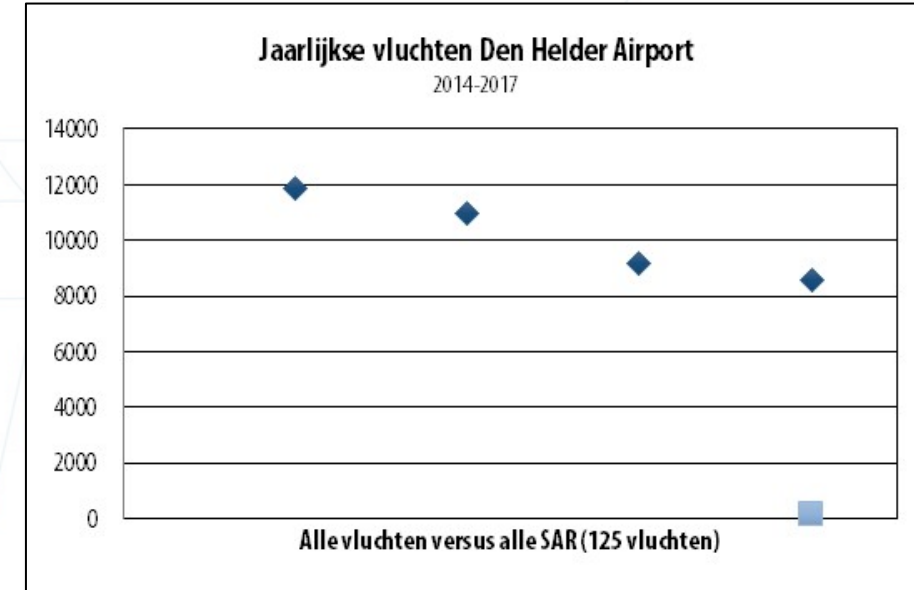
(Interview NHV/Wintershall 14.02.2018)



Nature and size SAR

- Precise amount SAR flights unknown for HKW, IJmuiden Ver and Waddeneilanden.
 - Yearly amount flights from Den Helder is about ten thousand (see graph)
 - About 125 SAR flights per year, of which 60-70% Oil&Gas related (*Interview NHV/Wintershall 14.02.2018*)
 - Statistical about 1% of all flights are SAR
- For normal operations the following can be indicated*:
 - Commercial flights by NHV about 4 x per week (about 208 x per year) to P6A (*mail NHV 24.07.18*)
 - Statistical average 2 SAR flights per year to P6A
 - Commercial flights by CHC about 95 x per year to P9 – Horizon (*mail CHC 26.07.18*)
 - Statistical average 0,8 SAR flights per year to P9-Horizon

* The amount of flights will increase with activities like maintenance, well-service activities and additional drilling



Accessibility results

Explanation of symbols and colors

		Water
		Shipping routes
		Shipping separation zone
		Anchorage area
		Wind park
		1 NM buffer-zone (for wind park generated turbulence)

<u>Scales:</u> - Inner dotted circle: R = 1,5 NM (used to visualize the rig limited sector) - Outer dotted circle: R = 2,5 NM (used to visualize the maneuvering area) - Blue circle: R = 5 NM (the HTZ circle)		Platform HTZ outside wind farm zone
		Platform HTZ inside wind farm zone
		Rig Limited obstacle sector (drawn up to 1,5NM)
		Sub-sea completion position (P15-C only)
		Cable or pipeline and maintenance area
		5 NM zone / HTZ boundary
		ARA based approach or departure directions
		Approach or departure directions based on enhanced class 2 procedure
		Visual circling direction possible
		Possible visual approach directions

Explanation P6A variants | HKW

P6A variant	HKW	IJmuiden Ver	Description
P6A #1	✓	-	Wind farm HKW complete wind farm (preliminary study)
P6A #2	✓	-	Wind farm HKW smaller wind farm
P6A #3	✓	-	Wind farm HKW smaller wind farm
P6A #4	✓	✓	Wind farm HKW, Wind farm IJmuiden Ver smaller wind farm
P6A #5	✓	✓	Wind farm HKW and Wind farm IJmuiden Ver smaller wind farm
P6A #6	✓	✓	Wind farm HKW and Wind farm IJmuiden Ver smaller wind farm

Explanation P09 – Horizon variants | HKW

P09 - Horizon variant	HKW	Description
P09 - Horizon #1	✓	HKW complete wind farm (preliminary study)
P09 - Horizon #2	✓	HKW smaller wind farm

Explanation G17d-A variants | Boven de Waddeneilanden

G17d-A variant	Boven de Waddeneilanden	Description
G17d-A #1	✓	Boven de Waddeneilanden complete wind farm (preliminary study)
G17d-A #2	✓	Boven de Waddeneilanden smaller wind farm

P6-A #1

Wind farm HKW | complete wind farm

Baseline

Possible departure directions:

- Between 230° - 320° (090° sector)

Possible approach directions:

- Between 275° - 040° (220° sector)

Estimated accessibility 60-80% (preliminary study)

Wind farm

Possible departure directions:

- Not possible (wind farm too close)

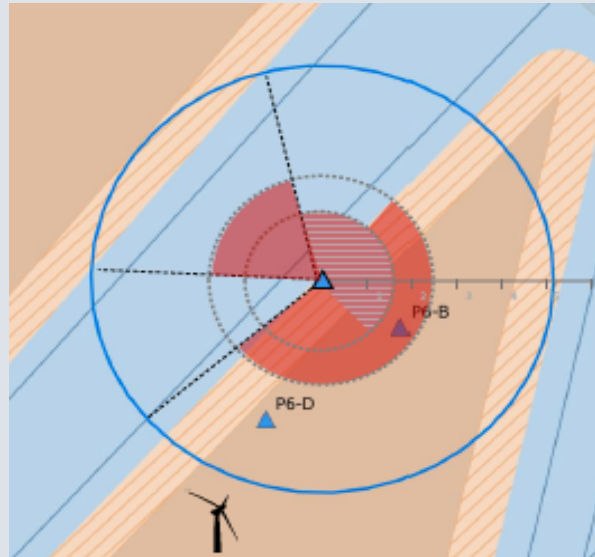
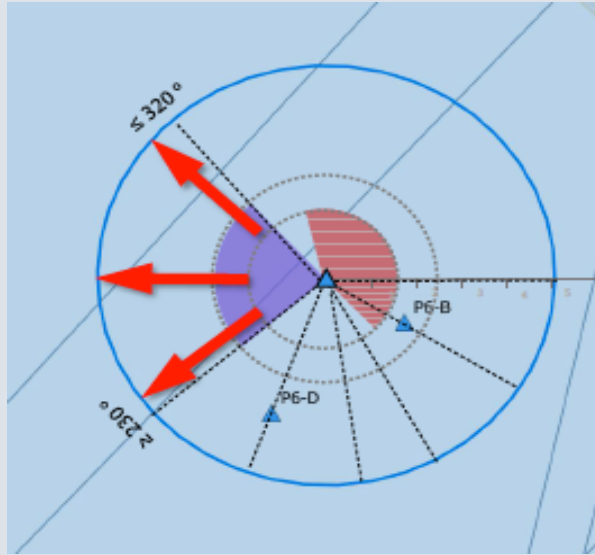
Possible approach directions:

- Approach is not possible

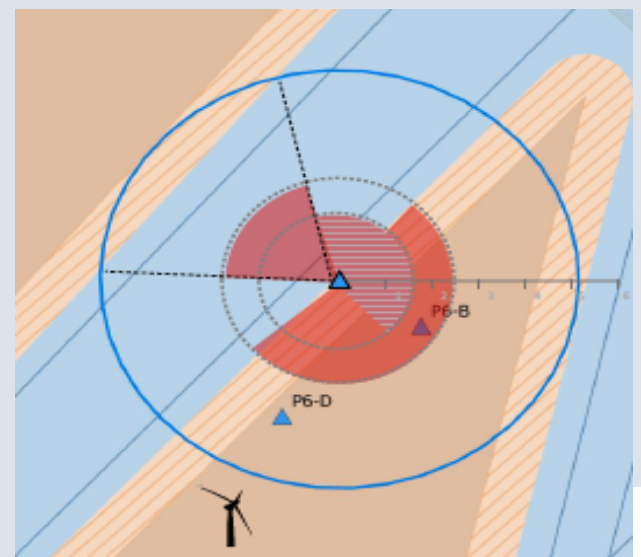
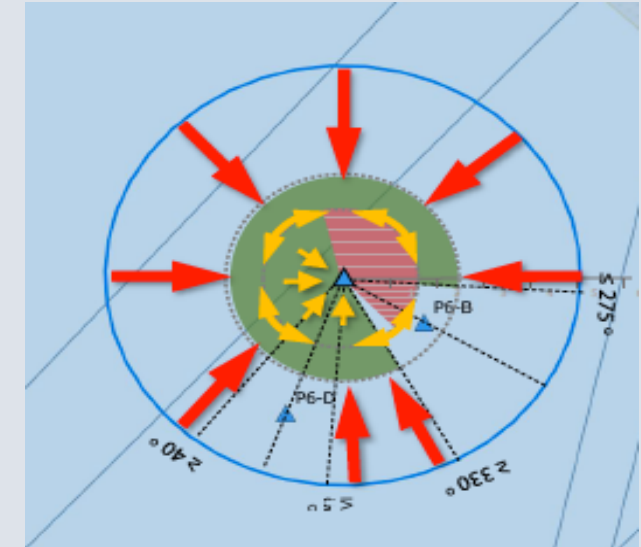
Estimated accessibility 0 % (preliminary study)

Assumed (in preliminary study):
Wind farm Stop-procedure NOT available

Departures



Approaches



P6-A #2

Wind farm HKW | smaller wind farm

Baseline

Possible departure directions:

- Between 230° - 030° (160° sector)
- Between 150° - 170° (020° sector)

Possible approach directions:

- Between 040° - 275° (235° sector)
- Between 330° - 005° (035° sector)

Calculated accessibility 96.1%

Wind farm

Possible departure directions:

- Between 230° - 030° (160° sector)

Possible approach directions:

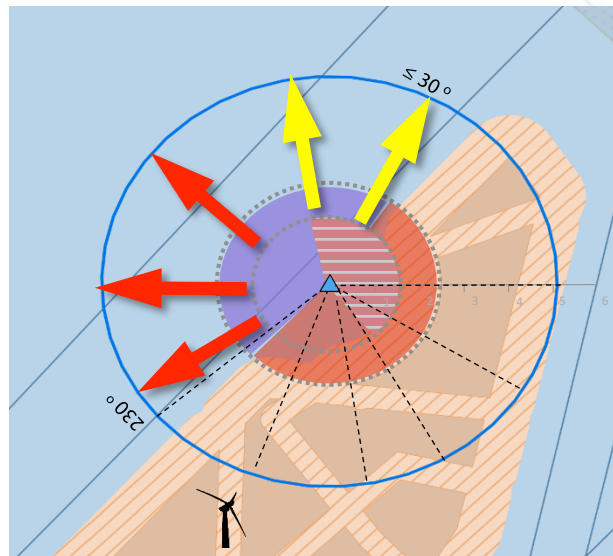
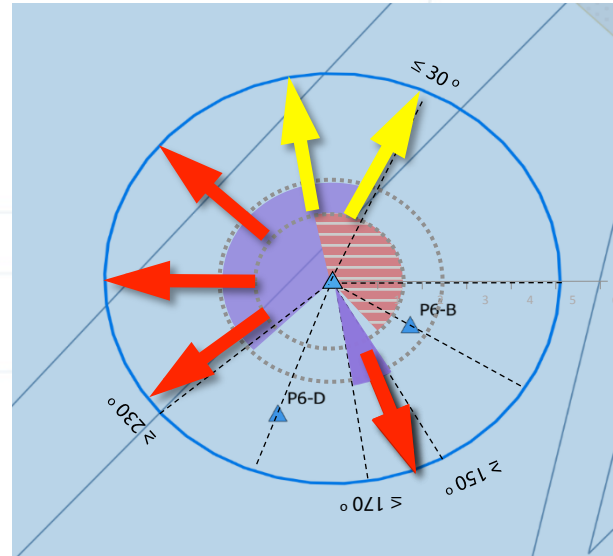
- Between 040° - 090° (050° sector)
- Between 180° - 210° (030° sector)

Calculated accessibility 90,7%

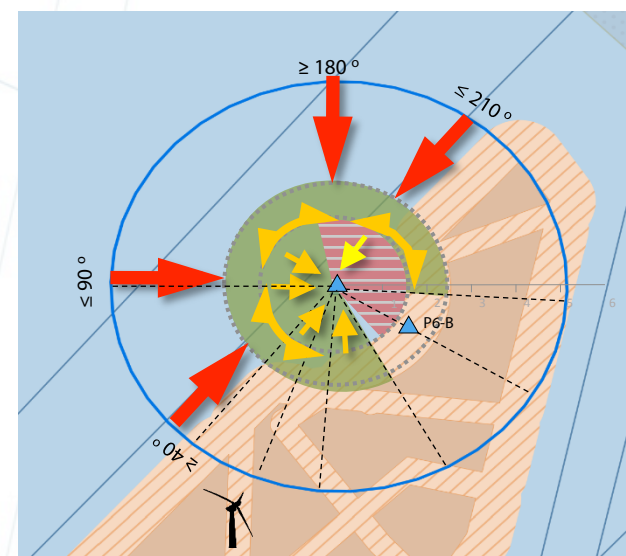
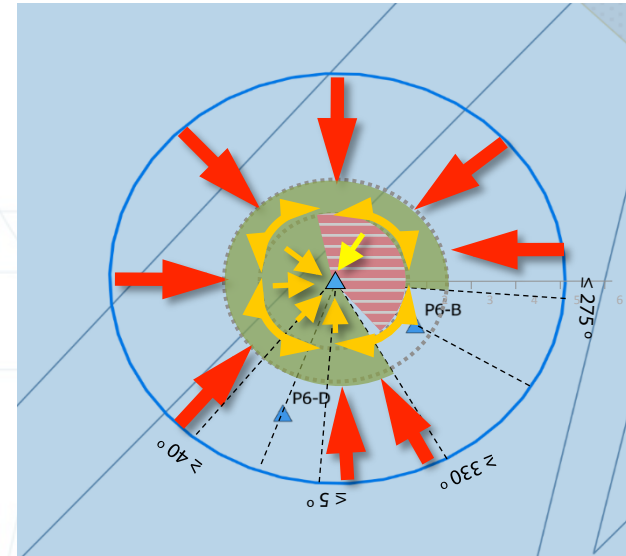
Assumed:
Wind farm stop-procedure active



Departures



Approaches



0 1 2 3 4 5 NM

P6-A #3

Wind farm HKW | smaller wind farm

Baseline

Possible departure directions:

- Between 230° - 030° (160° sector)
- Between 150° - 170° (020° sector)

Possible approach directions:

- Between 040° - 275° (235° sector)
- Between 330° - 005° (035° sector)

Calculated accessibility 96.1%

Wind farm

Possible departure directions:

- Between 230° - 030° (160° sector)
- Between 150° - 170° (020° sector)

Possible approach directions:

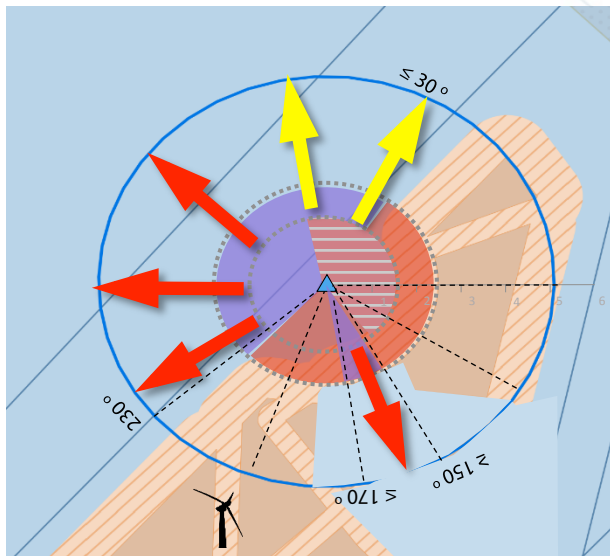
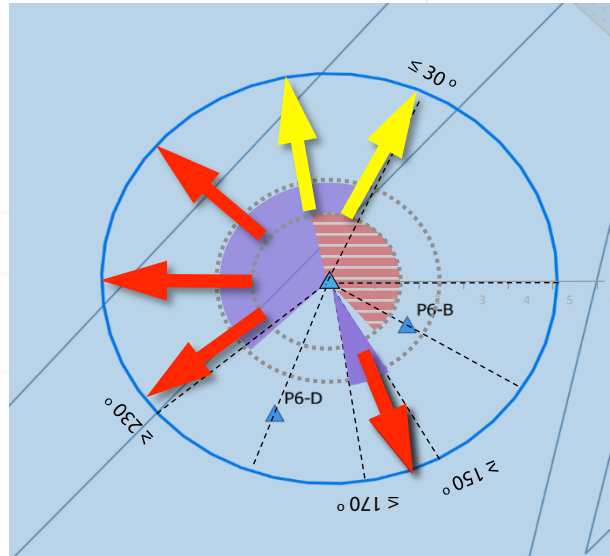
- Between 040° - 090° (050° sector)
- Between 180° - 210° (030° sector)
- Between 330° - 005° (035° sector)

Calculated accessibility 96.0%

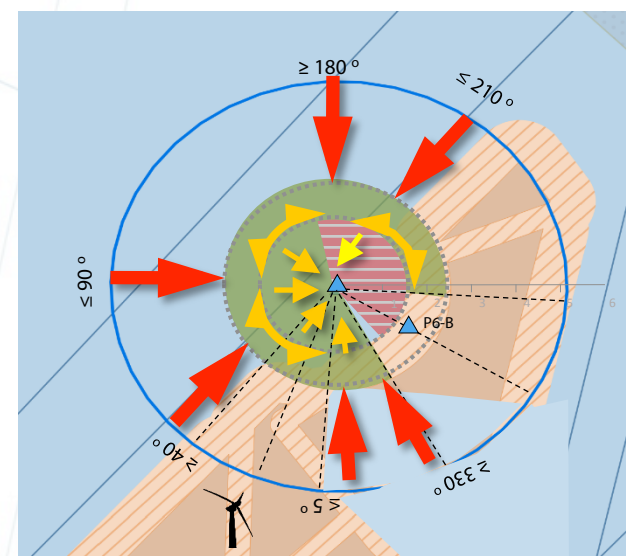
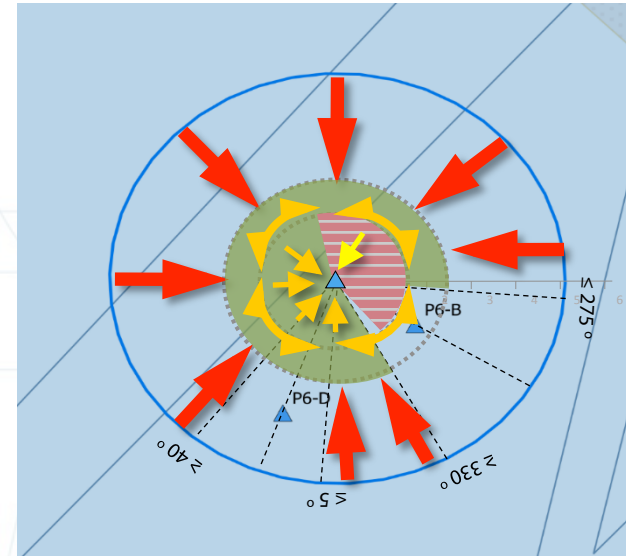
Assumed:
Wind farm stop-procedure active



Departures



Approaches



0 1 2 3 4 5 NM

P6-A #4

Wind farm HKW, Wind farm IJmuiden Ver | smaller wind farm

Baseline

Possible departure directions:

- Between 230° - 030° (160° sector)
- Between 150° - 170° (020° sector)

Possible approach directions:

- Between 040° - 275° (235° sector)
- Between 330° - 005° (035° sector)

Calculated accessibility 96.1%

Wind farm

Possible departure directions:

- Between 350° - 030° (040° sector)
- 230°

Possible approach directions:

- Between 040° - 210° (170° sector)
- Between 180° - 200° (020° sector)

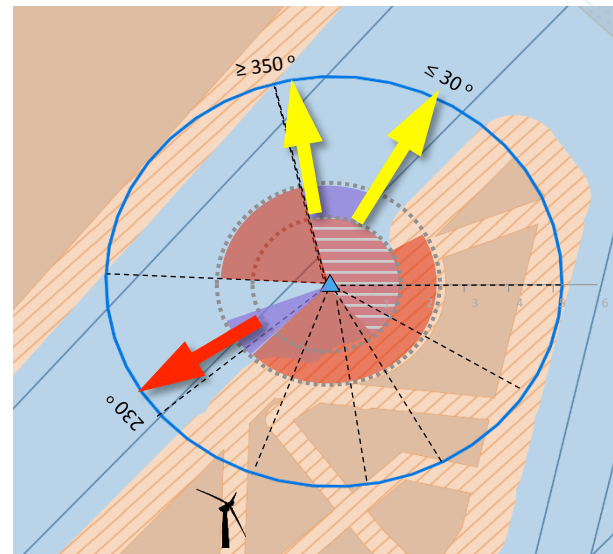
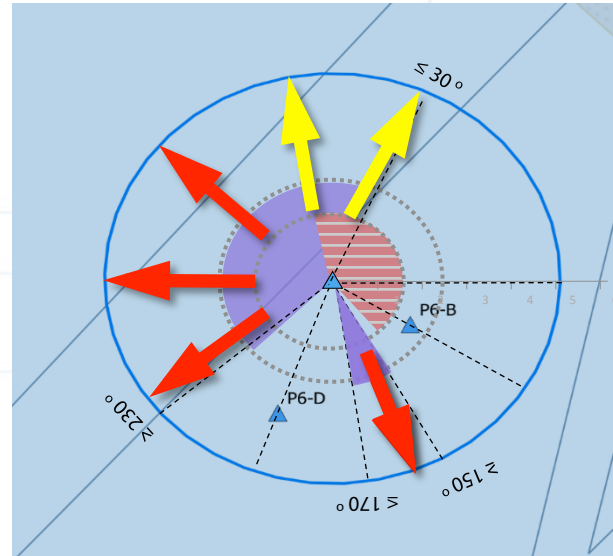
Calculated accessibility 89,8%

Assumed:

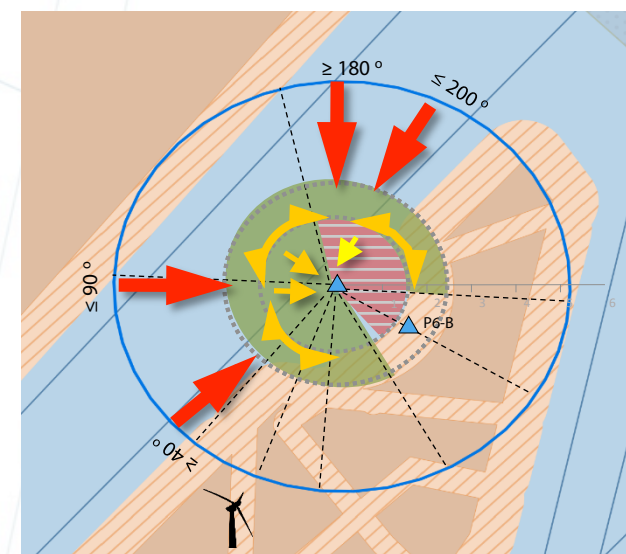
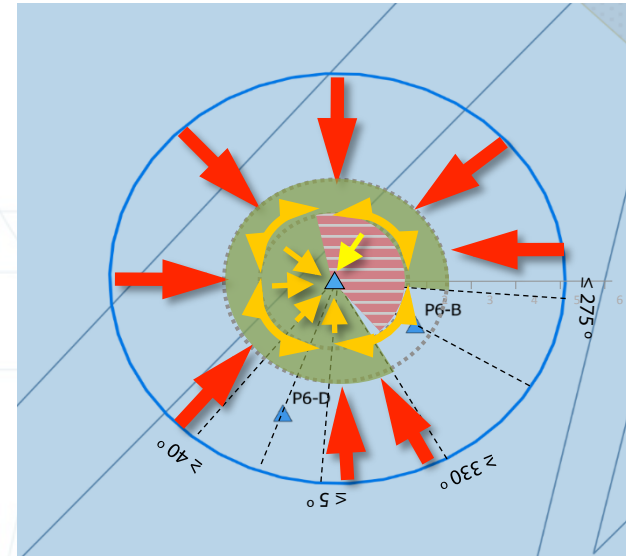
Wind farm stop-procedure active



Departures



Approaches



0 1 2 3 4 5 NM

P6-A #5

Wind farm HKW and Wind farm IJmuiden Ver |
smaller wind farm

Baseline

Possible departure directions:

- Between 230° - 030° (160° sector)
- Between 150° - 170° (020° sector)

Possible approach directions:

- Between 040° - 275° (235° sector)
- Between 330° - 005° (035° sector)

Calculated accessibility 96.1%

Wind farm

Possible departure directions:

- Between 350° - 030° (040° sector)
- Between 150° - 170° (020° sector)
- 230°

Possible approach directions:

- Between 040° - 210° (170° sector)
- Between 180° - 200° (020° sector)
- Between 330° - 005° (035° sector)

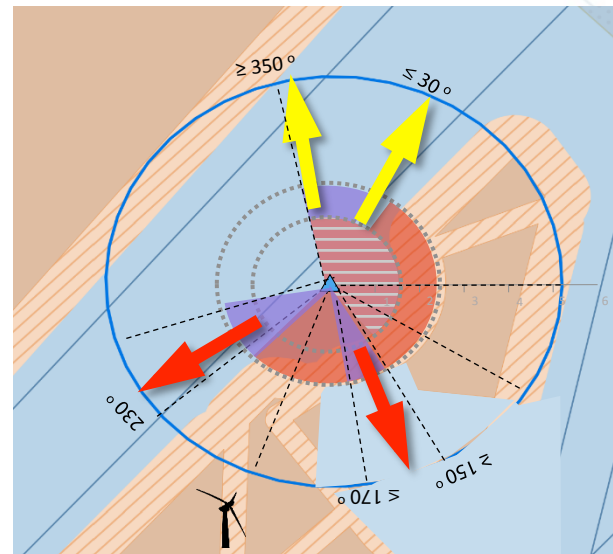
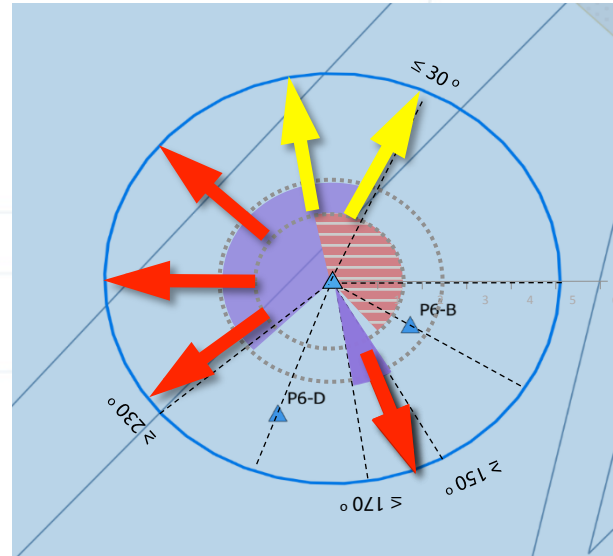
Calculated accessibility 95.1%

Assumed:

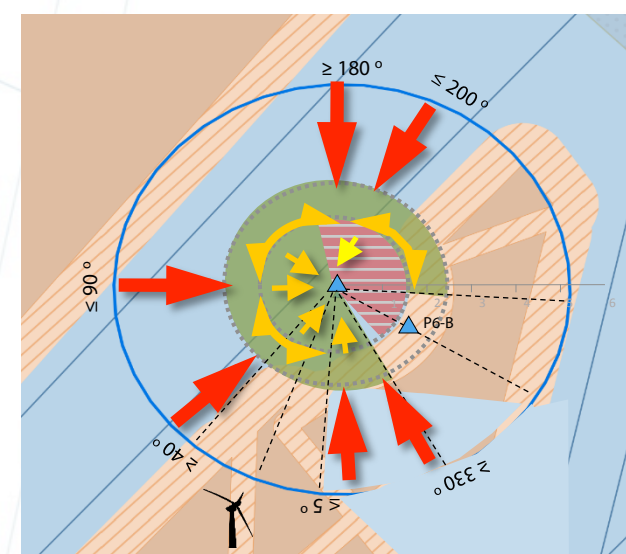
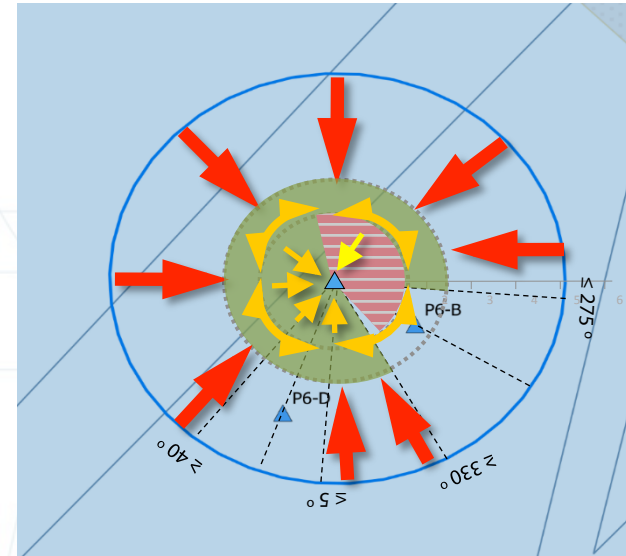
Wind farm stop-procedure active



Departures



Approaches



0 1 2 3 4 5 NM

P6-A #6

Wind farm HKW and Wind farm IJmuiden Ver |
smaller wind farm

Baseline

Possible departure directions:

- Between 230° - 030° (160° sector)
- Between 150° - 170° (020° sector)

Possible approach directions:

- Between 040° - 275° (235° sector)
- Between 330° - 005° (035° sector)

Calculated accessibility 96.1%

Wind farm

Possible departure directions:

- Between 230° - 030° (160° sector)
- Between 150° - 170° (020° sector)

Possible approach directions:

- Between 040° - 090° (050° sector)
- Between 180° - 200° (020° sector)
- Between 330° - 005° (035° sector)

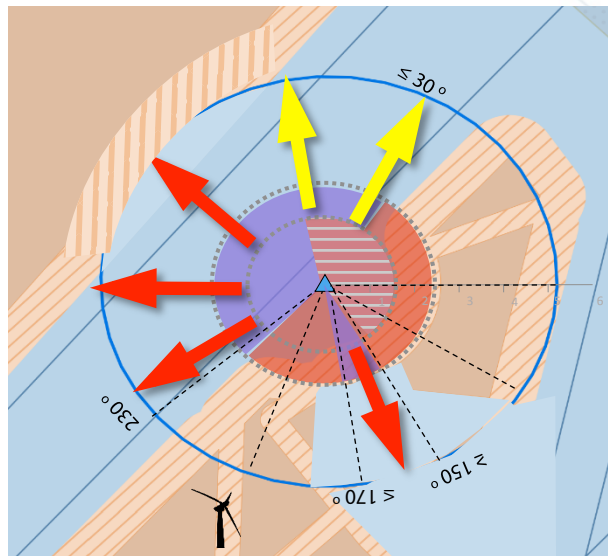
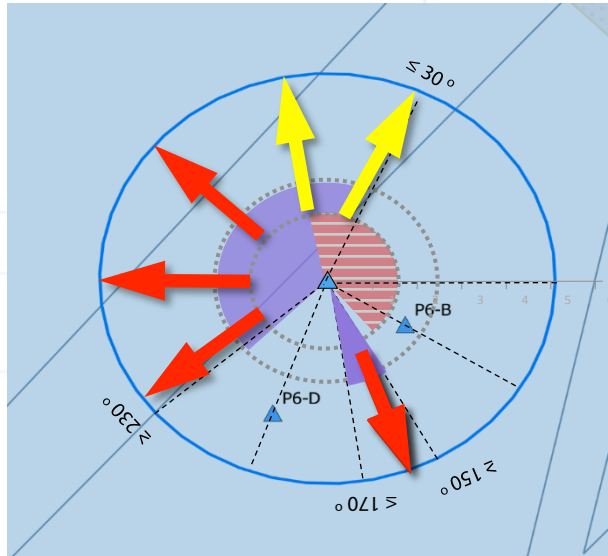
Calculated accessibility 96.0%

Assumed:

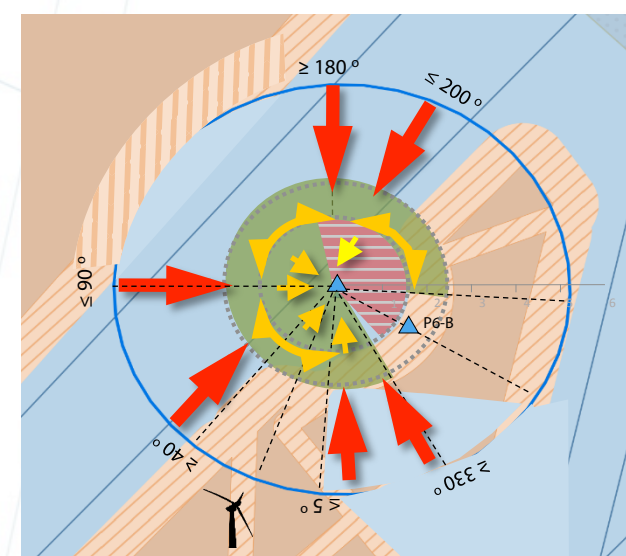
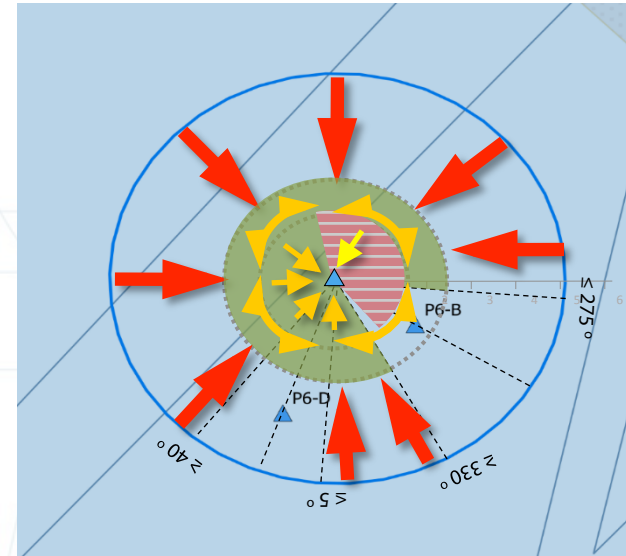
Wind farm stop-procedure active



Departures



Approaches



0 1 2 3 4 5 NM

A horizontal scale bar with alternating black and white segments, representing distances in nautical miles (NM).

P09 Horizon #1

Wind farm HKW | complete wind farm

Baseline

Possible departure directions:

- Between 060° - 210° (150° sector)

Possible approach directions:

- All (360° sector)

Estimated accessibility 70-90% (preliminary study)

Wind farm

Possible departure directions:

- Not possible

Possible approach directions:

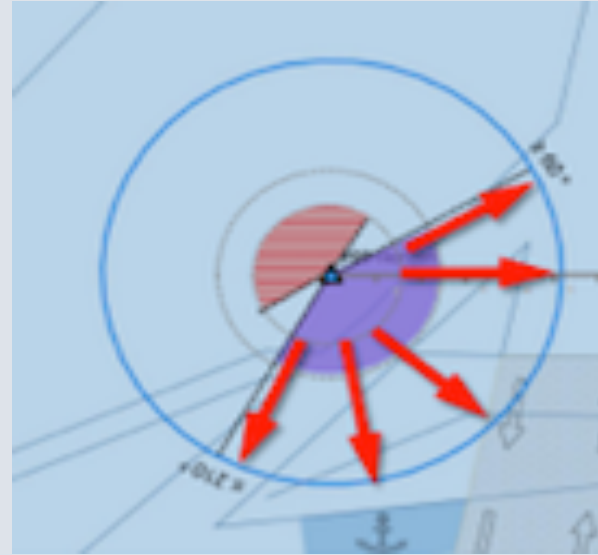
- Not possible

Estimated accessibility 0 % (preliminary study)

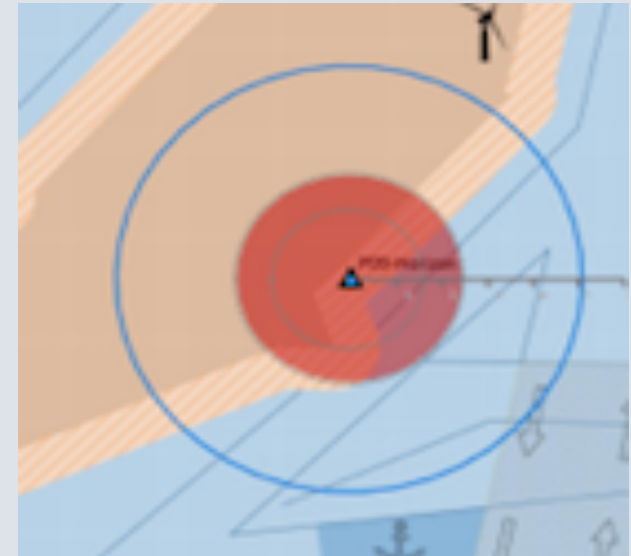
Assumed (in preliminary study):
Wind farm Stop-procedure NOT available



Departures



Approaches



0 1 2 3 4 5 NM

A horizontal scale bar with alternating black and white segments, representing distances in nautical miles (NM).

P9- Horizon # 2 Departures

HKW | smaller wind farm

Baseline

Possible departure directions:

- Between 60° - 210° (150° sector)

Possible approach directions:

- All (360° sector)

Calculated accessibility 85,3%

Wind farm

Possible departure directions:

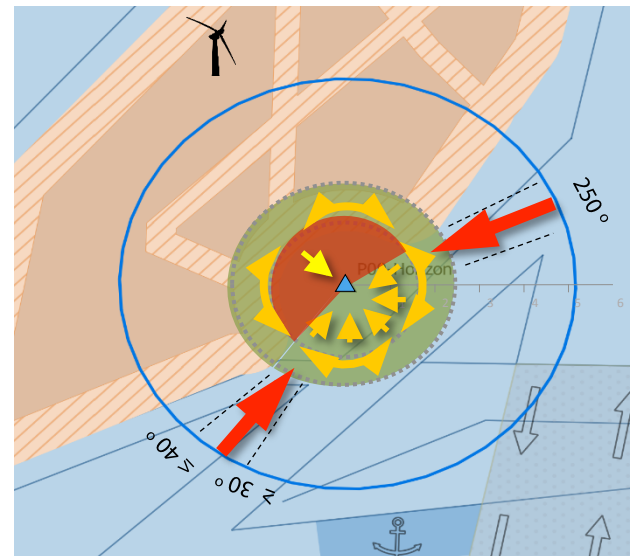
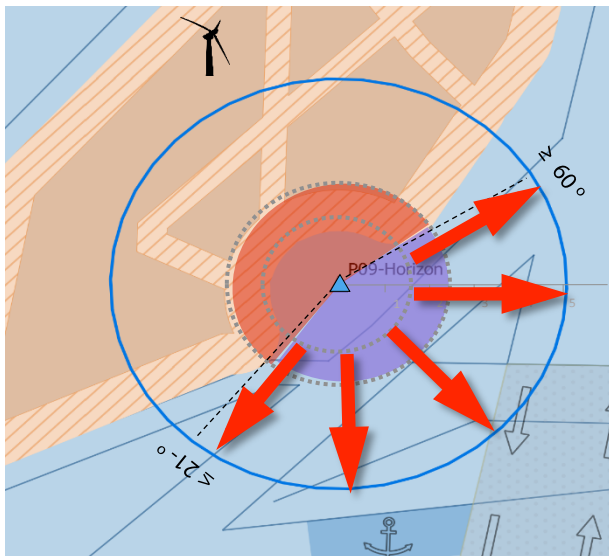
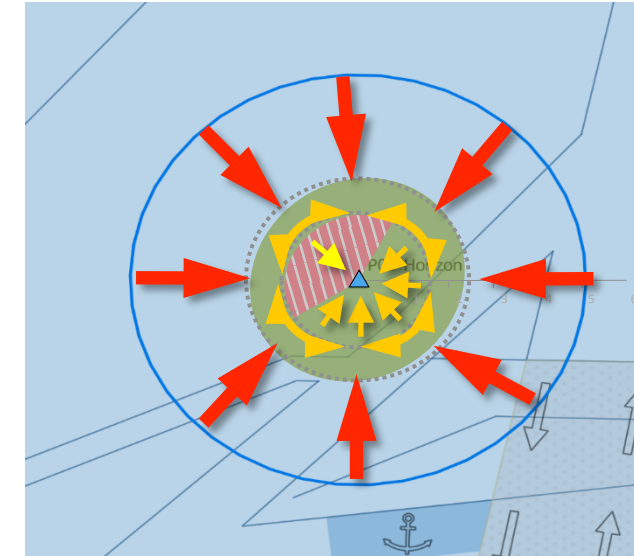
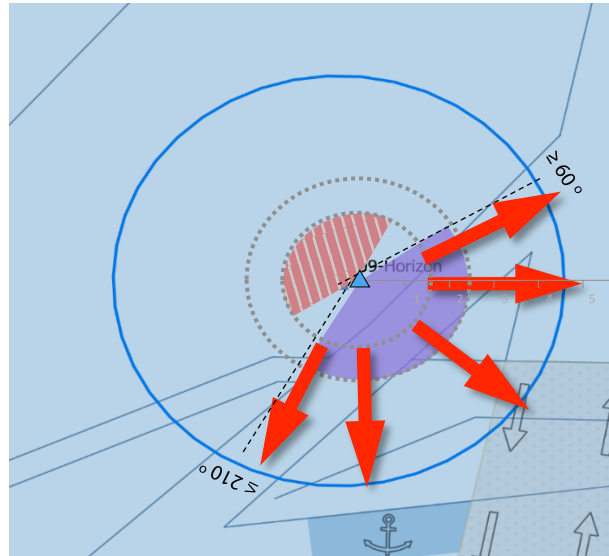
- Between 60° - 210°

Possible approach directions:

- 250°
- Between 30° - 40°

Calculated accessibility 83.9%

Assumed:
Wind farm stop-procedure active



0 1 2 3 4 5 NM

G17d-A #1

Boven de Waddeneilanden | complete wind farm

Baseline

Possible departure directions:

- All (360° sector)

Possible approach directions:

- All (360° sector)

Estimated accessibility: 90 - 95% (preliminary study)

Wind farm

Possible departure directions:

- Between 225° - 080° (225° sector)

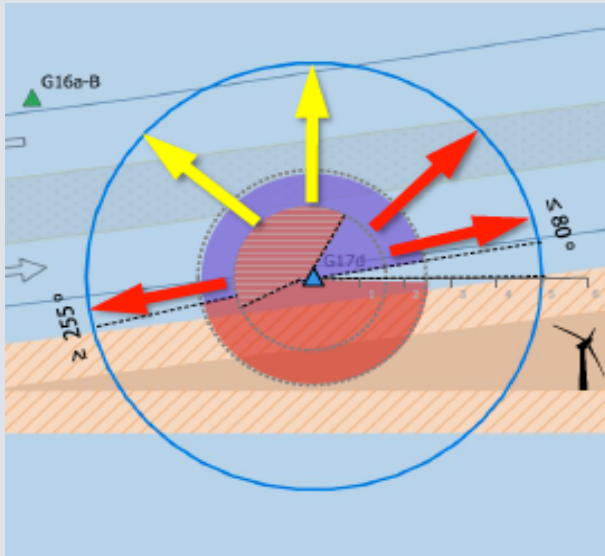
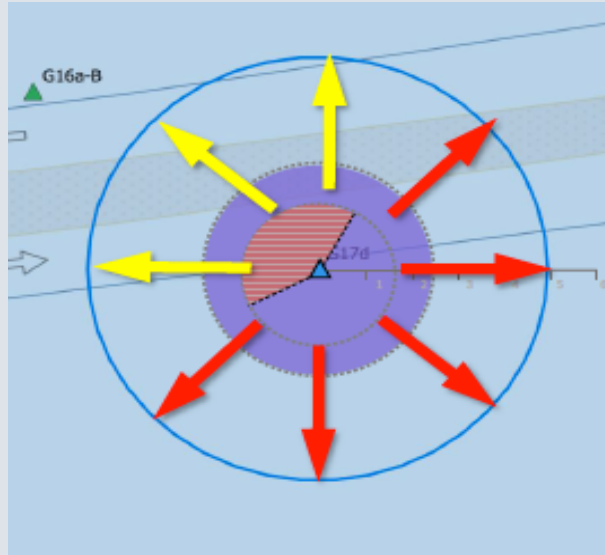
Possible approach directions:

- Between 225° - 265° (10° sector)
- Between 075° - 085° (10° sector)

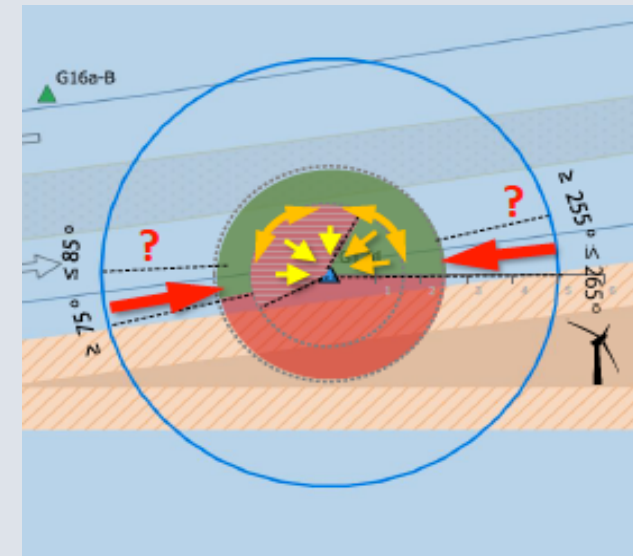
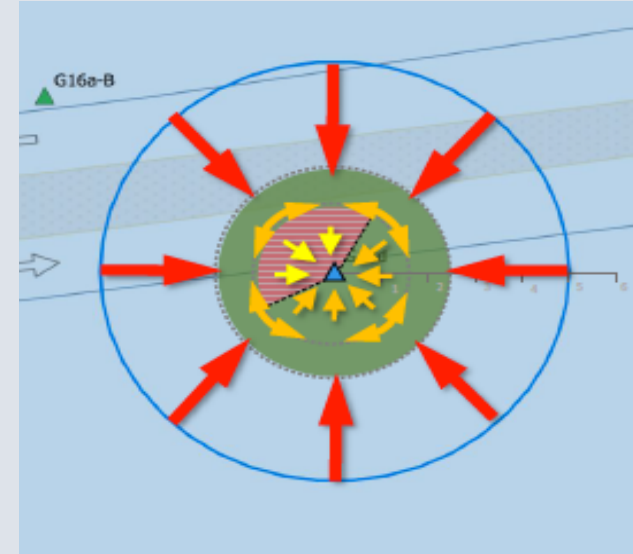
Estimated accessibility: unknown (preliminary study)

Assumed (in preliminary study):
Wind farm Stop-procedure NOT available

Departures



Approaches



0 1 2 3 4 5 NM

G17d-A # 2

Boven de Waddeneilanden | smaller wind farm

Baseline

Possible departure directions:

- All (360° sector)

Possible approach directions:

- All (360° sector)

Calculated accessibility: 96.3%

Wind farm

Possible departure directions:

- Between 170° - 90°

Possible approach directions:

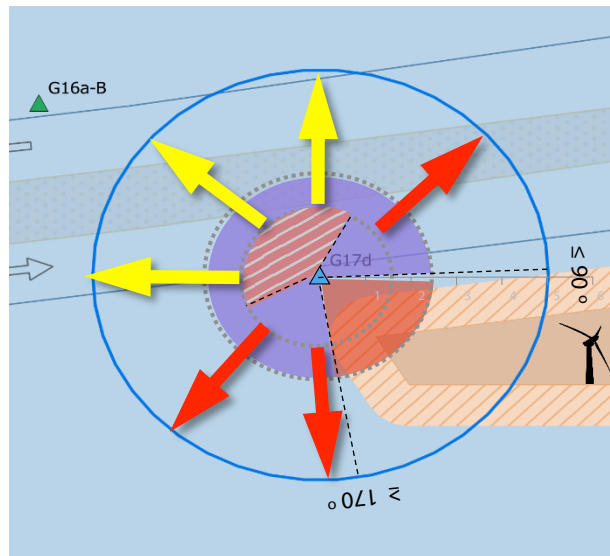
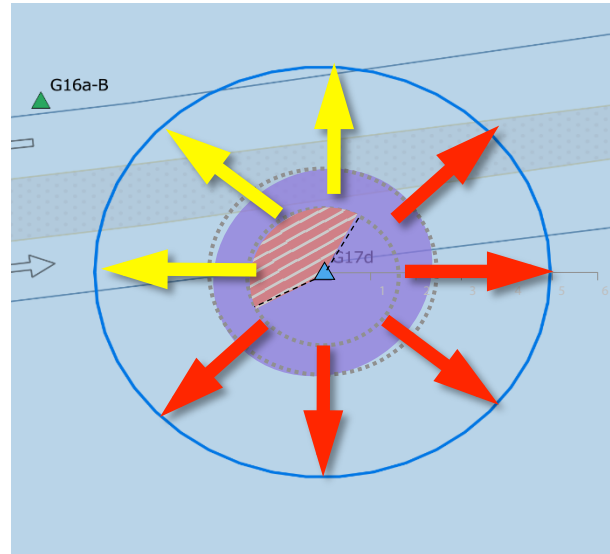
- Between 355° - 260°

Calculated accessibility: 96.2%

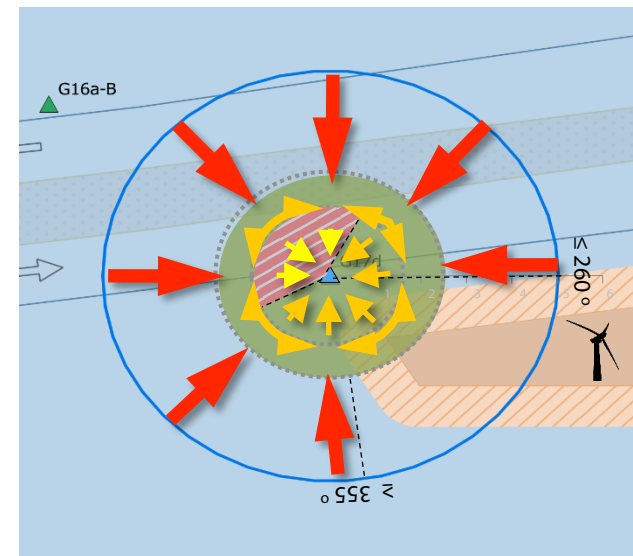
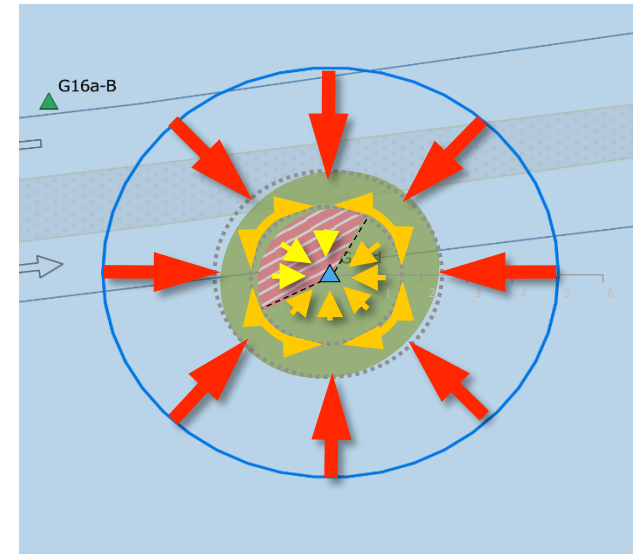
Assumed:
Wind farm stop-procedure active



Departures

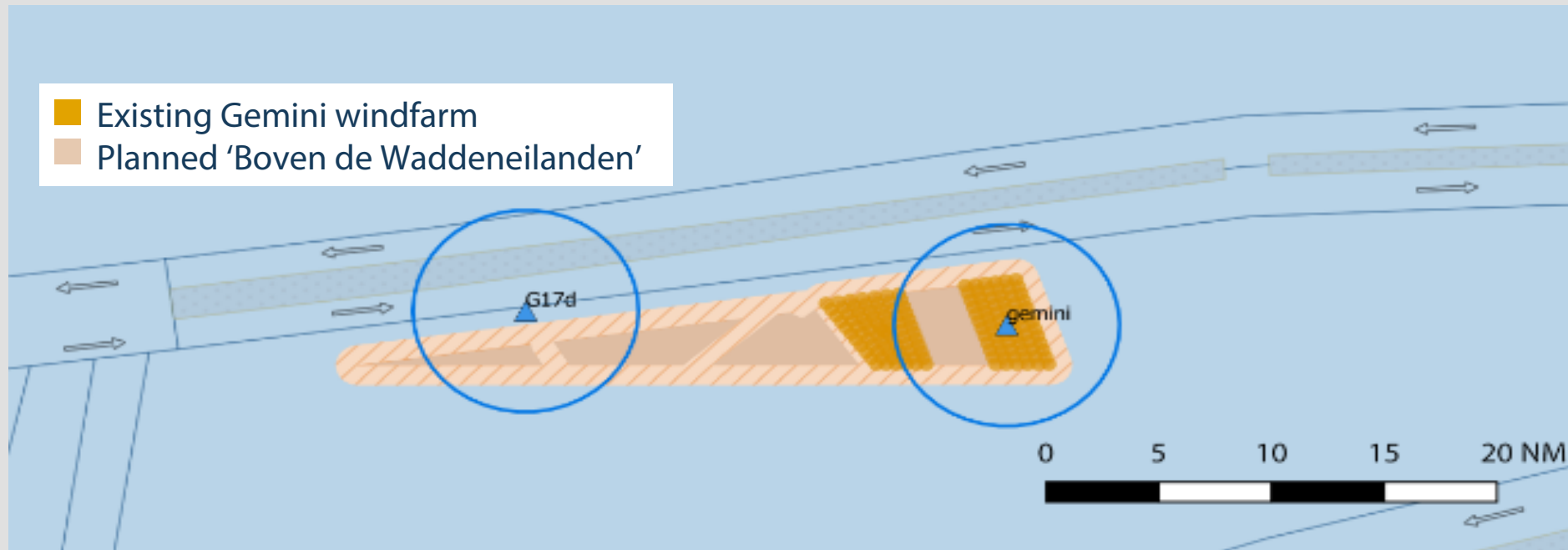


Approaches



0 1 2 3 4 5 NM

Gemini platform and wind farm 'Boven de Waddeneilanden'



Observations:

- Gemini platform is already located in an existing wind farm
- Wind farm 'Boven de Waddeneilanden' is partly located within the 5 nm circle of Gemini
- Provided the planned part between the existing Gemini wind farm remain unused, there is no effect for helicopter accessibility to be expected

Overview accessibility commercial

Platform	Baseline	Windfarm
P6A # 1 (results preliminary study) • Wind farm HKW complete windpark	Estimated: 60-80%	Estimated: 0%
P6A # 2 • Wind farm HKW smaller wind farm	96.1%	90.7%
P6A # 3 • Wind farm HKW smaller wind farm	96.1%	96.0%
P6A # 4 • Wind farm HKW, Wind farm IJmuiden Ver smaller wind farm	96.1%	89.8%
P6A # 5 • Wind farm HKW and Wind farm IJmuiden Ver smaller wind farm	96.1%	95.1%
P6A # 6 • Wind farm HKW and Wind farm IJmuiden Ver smaller wind farm	96.1%	96.0%
P09 - Horizon #1 (results preliminary study) • Wind farm HKW complete wind farm	Estimated: 70-90%	Estimated 0%
P09 – Horizon #2 • Wind farm HKW smaller wind farm	85.3%	83.9%
G17D # 1 (results preliminary study) • Boven de Waddeneilanden complete wind farm	Estimated: 90-95%	unknown
G17D # 2 • Boven de Waddeneilanden smaller wind farm	96.3%	96.2%
Gemini	Provided the planned part between the existing Gemini wind farm remain unused, there is no effect for helicopter accessibility to be expected	



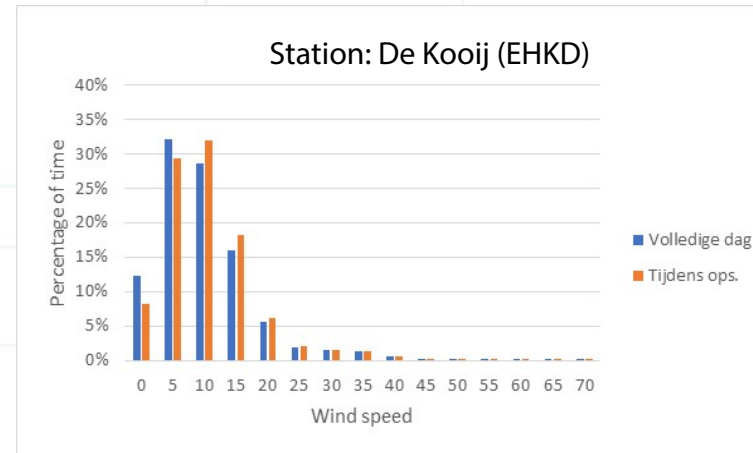
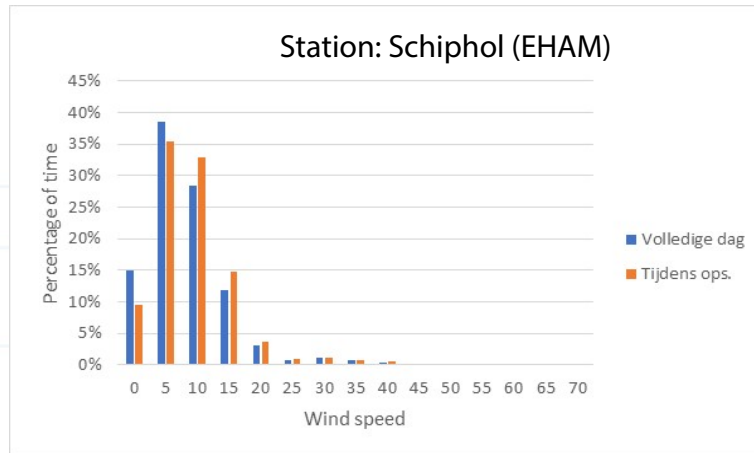
Overview accessibility SAR

Platform	Baseline	Windfarm
P6A # 1 (results preliminary study) • Wind farm HKW complete windpark	Estimated: 60-80%	Estimated: 0%
P6A # 2 • Wind farm HKW smaller wind farm	94.2%	88.2%
P6A # 3 • Wind farm HKW smaller wind farm	94.2%	94.1%
P6A # 4 • Wind farm HKW, Wind farm IJmuiden Ver smaller wind farm	94.2%	87.4%
P6A # 5 • Wind farm HKW and Wind farm IJmuiden Ver smaller wind farm	94.2%	93.2%
P6A # 6 • Wind farm HKW and Wind farm IJmuiden Ver smaller wind farm	94.2%	94.1%
P09 - Horizon #1 (results preliminary study) • Wind farm HKW complete wind farm	Estimated: 70-90%	Estimated 0%
P09 – Horizon #2 • Wind farm HKW smaller wind farm	84.3%	82.2%
G17D # 1 (results preliminary study) • Boven de Waddeneilanden complete wind farm	Estimated: 90-95%	unknown
G17D # 2 • Boven de Waddeneilanden smaller wind farm	94.5%	94.4%
Gemini	Provided the planned part between the existing Gemini wind farm remain unused, there is no effect for helicopter accessibility to be expected	

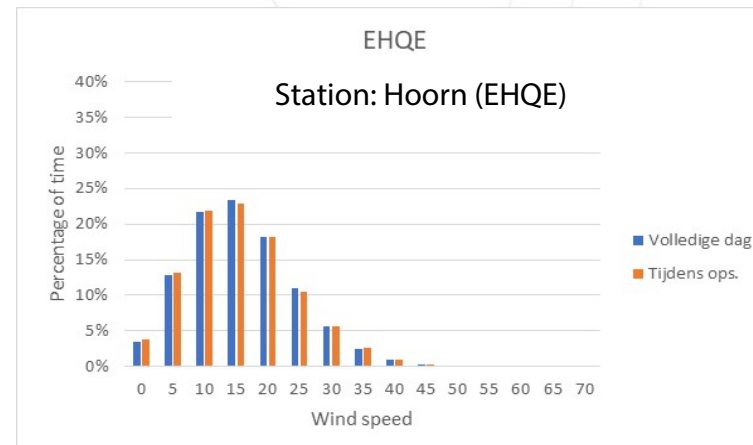
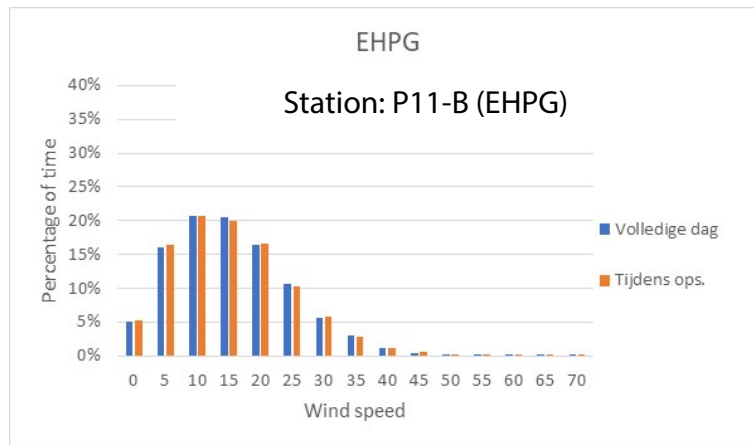


Wind farm design & Stop procedure

Stop procedure – windspeed distribution (4 stations)



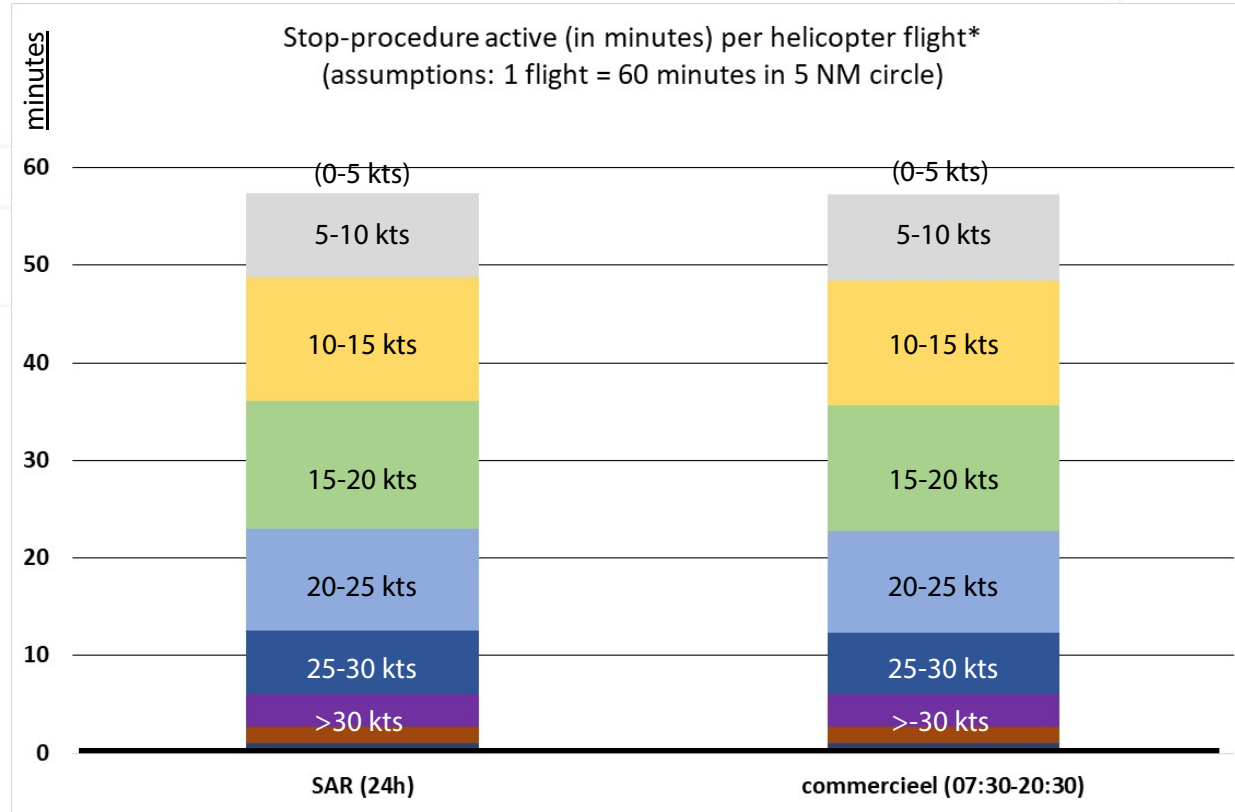
Onshore meteo stations



Offshore meteo stations

Observation: The difference in windspeed between day and night is off-shore smaller than on-shore.

Stop-procedure required: 1 hour per flight/platform



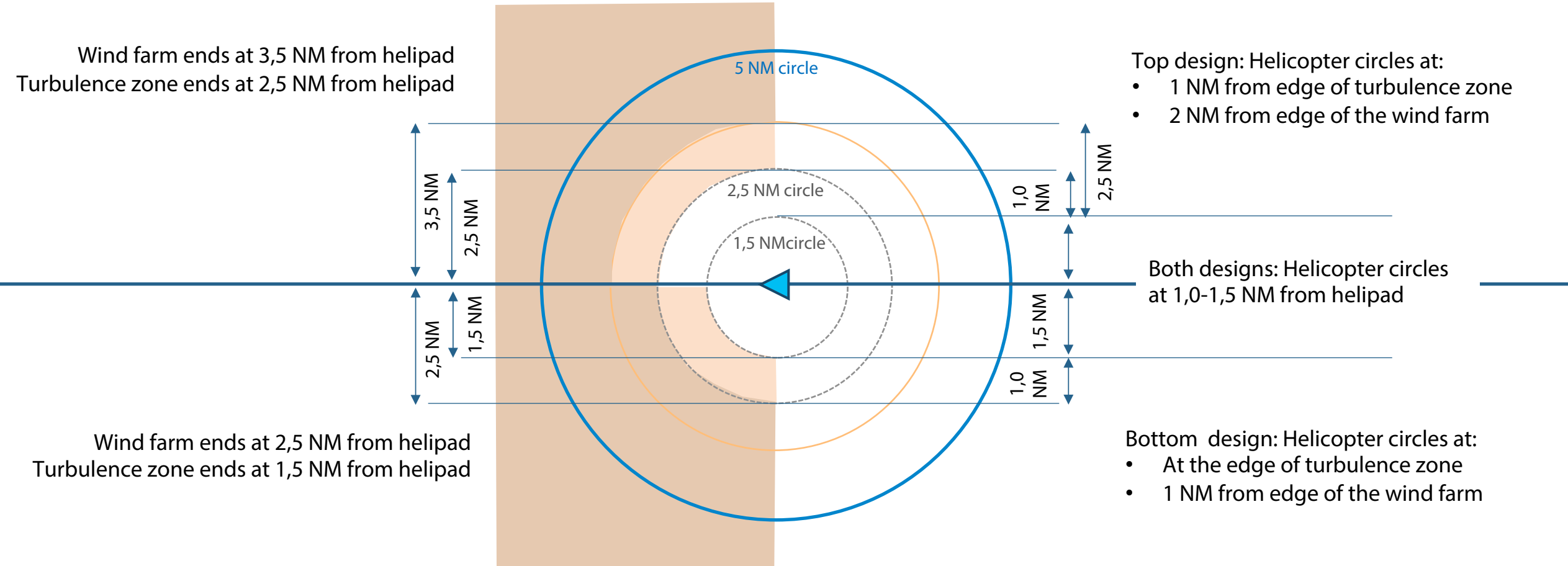
Assumption:

- Windturbine/park must be inactive when the helicopter is in the 5 NM zone
- For each flight, the helicopter resides in the 5NM circle for 60 minutes:
 - 15 min. during approach
 - 15 min. on deck
 - 15 min. during departure
 - 15 min. buffer

Wind farm design and stop-procedure

TOP DESIGN

Helicopter circles at sufficient distance from turbulence zone → **Stop-procedure IS NOT required**



BOTTOM DESIGN

Helicopter circles at Insufficient distance from turbulence zone → **Stop-procedure IS required**

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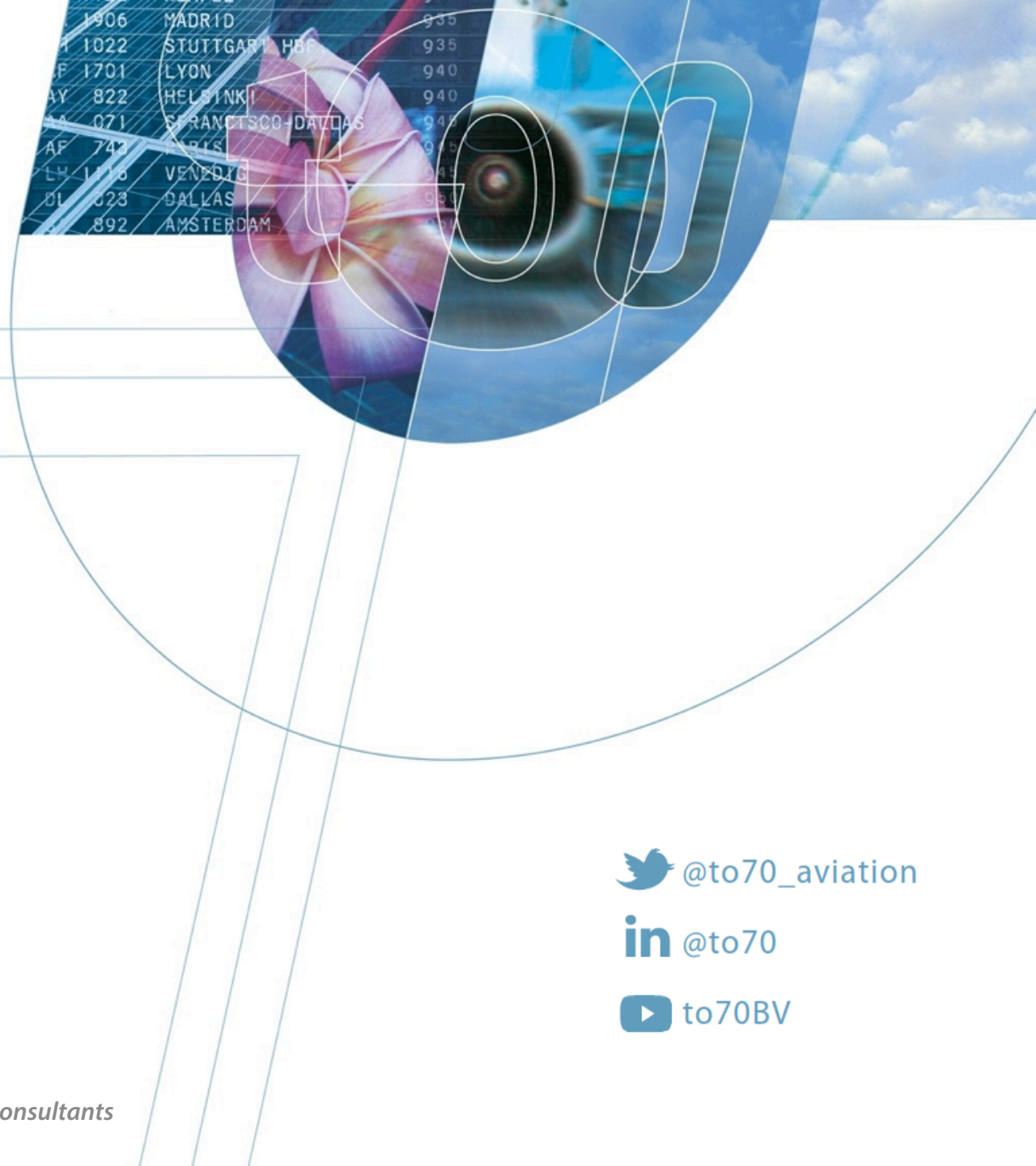


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