



Nautical Cartography Working Group 5<sup>th</sup> meeting

# Symbols for Wing-in-ground-effect (WIG) Craft

Proposal by the KHOA

# Introduction / Background

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- Wing-in-ground-effect (WIG)
  - Called as A ground-effect vehicle (GEV)
  - Vehicle that is designed to attain sustained flight over a level surface (usually over the sea) by making use of ground effect,
  - the aerodynamic interaction between the wings and the surface
- WIG craft
  - expected to have many advantages
  - because they are cheaper than aircraft and faster than ships
- IMO Guideline
  - Accordingly IMO developed relevant guidelines on 2018



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# Overview of WIG Craft

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- Multimodal craft
  - flies by using ground effect above the water or some other surface,
  - without constant contact with such a surface
  - supported in the air, mainly, by an aerodynamic lift generated on a wing (wings), hull, or their parts,
  - which are intended to utilize the ground effect action



# Overview of WIG Craft

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- WIG craft are categorized according to the following types
  - **Type A:** a craft which is certified for operation only in ground effect
  - **Type B:** a craft which is certified for main operation in ground effect and to temporarily increase its altitude outside ground effect to a limited height
  - **Type C:** a craft which is certified for the same operation as type B; and also for limited operation at altitude exceeding 150 m above the surface, in case of emergency and for overcoming obstacles



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# Development of IMO guidelines

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- In order to provide as much guidance as possible to those involved in the design, construction and operation of WIG craft,
- the IMO Guidelines have been prepared in three parts:
  - Part A provides general information applicable to all craft;
  - Part B includes provisions that may be subordinate to measures developed through the safety assessment recommendations of part C; and
  - Part C details the safety assessments required for all craft.



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# WIG project of ROK and Nautical chart for WIG

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- Since the WIG craft technology was designated as the core technology on 2012,
- development of 4 seats WIG and sea trial on 2001,
- implementation project of large WIG ship were executed.
- After middle size of WIG has been developed, technologies for commercialization have been followed.



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# WIG project of ROK and Nautical chart for WIG

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- Since WIG craft is classified for Ship,
- it should be equipped with nautical chart.
- In addition, WIG craft can fly up to 150m,
- it needs aviation information required in flight mode in addition to nautical chart information.
- CSPCWG9-8.7A(2012, Seoul) *“Hovercraft and WIG effect craft routes”*



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# WIG project of ROK and Nautical chart for WIG

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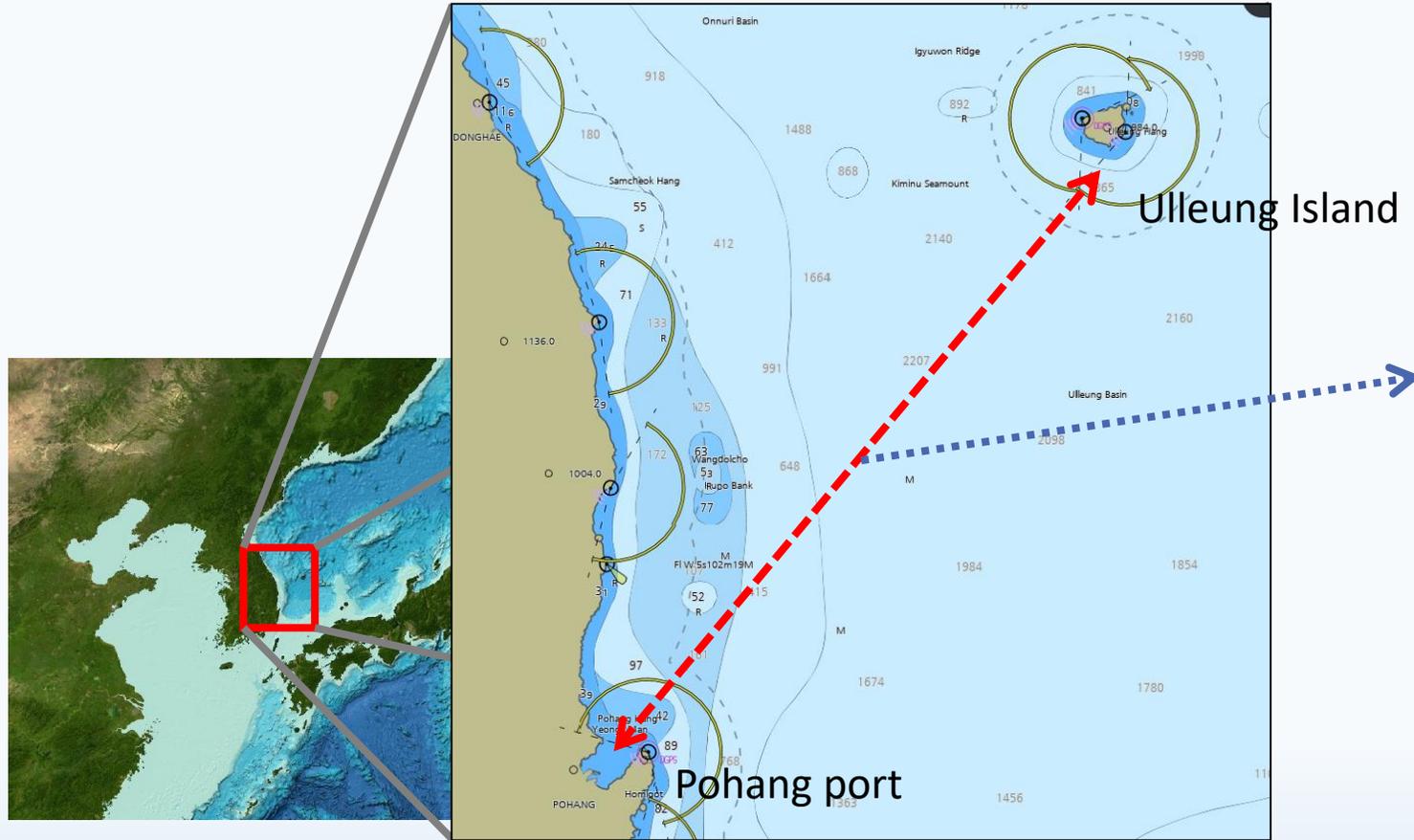
- The aviation information includes
  - flight prohibited area, flight restricted area, airport control zone, nuclear development area, Military operation area, aviation shooting training zone and air defense identification area.
  - additional information : take off zone, safe height for navigation, non-returnable area and speed restricted area.
- A nautical chart should be developed incorporating relevant information for the safe and efficient operation of the WIG craft.



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# WIG project of ROK and Nautical chart for WIG



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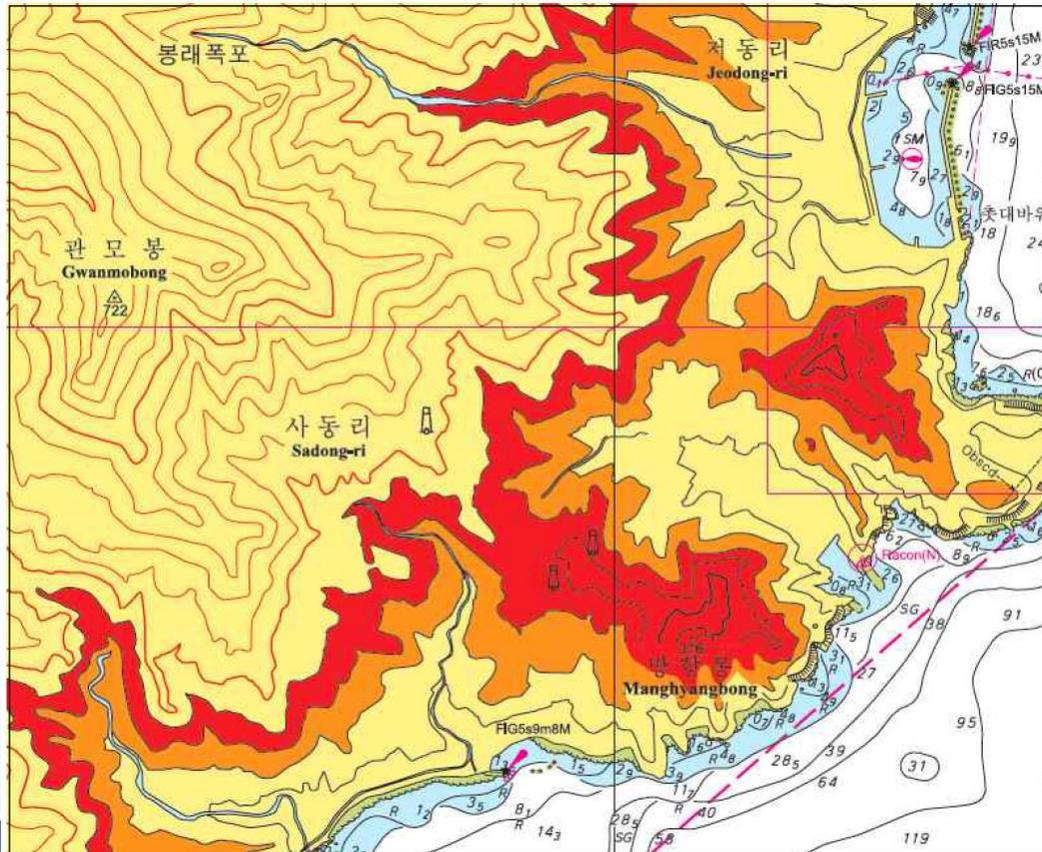
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NCWG 5 - Stockholm, Sweden (5 - 8 Nov. 2019)

# WIG project of ROK and Nautical chart for WIG

- Prototype Nautical Chart for WIG craft

Contour symbol for WIG



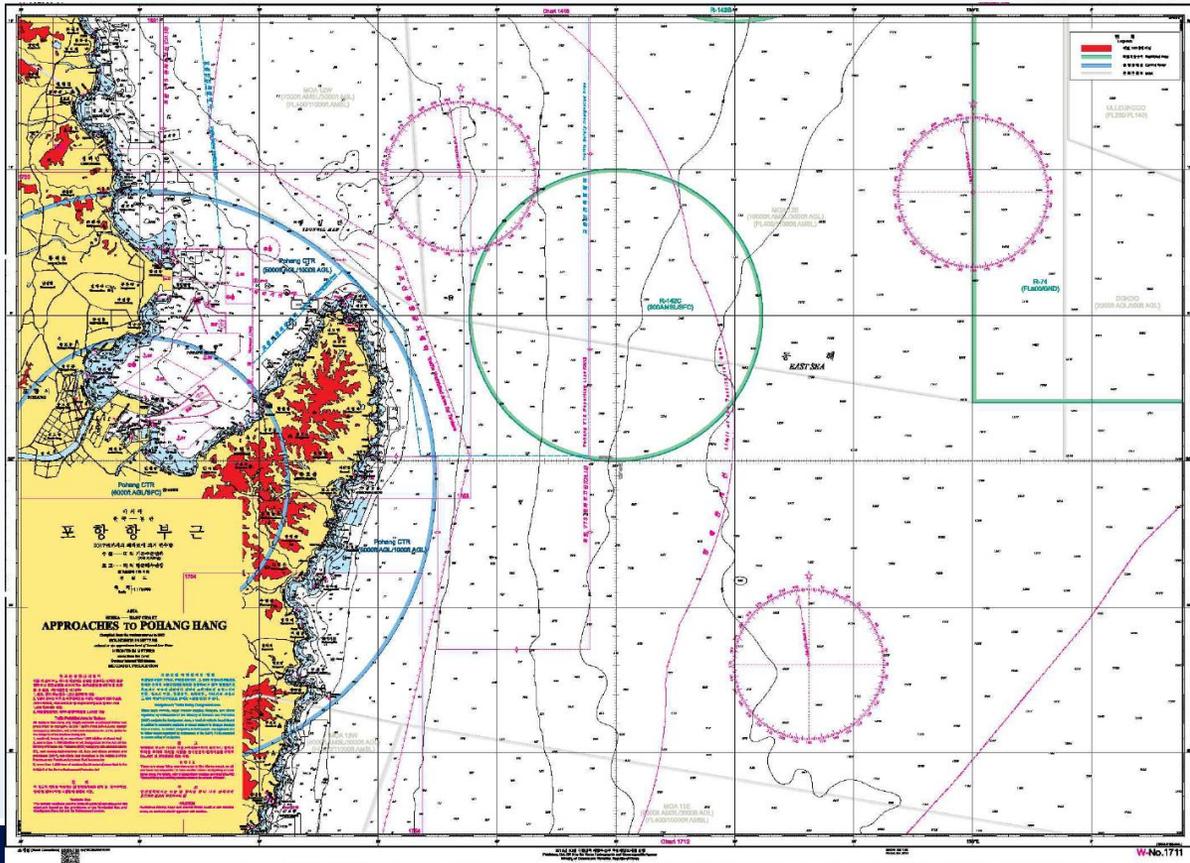
Priority and Color table

우선순위 (priority)	HPD 색상표	색상	위그선 운항정보 구역명칭
①	17,28		비행금지구역 (PROHIBITED AREA)
②	7,31		비행제한구역 (RESTRICTED AREA)
③	25,30		공항관제권 (CONTROL TOWER)
④	20,21		방공식별구역 (ADIZ)
⑤	22,8		원자력발전구역 (DANGER AREA)
⑥	11		경계구역 (ALERT AREA)
⑦	24,33		군작전공역 (MOA)

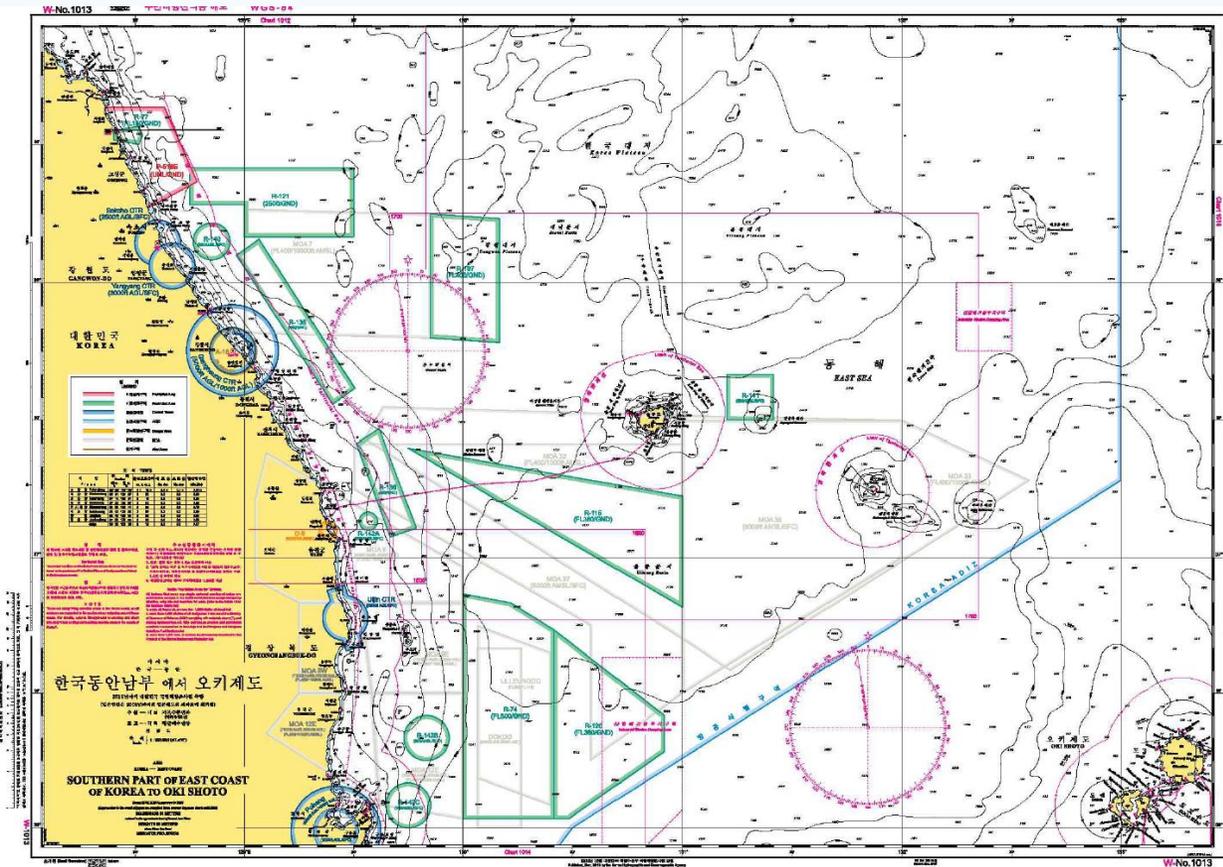
# WIG project of ROK and Nautical chart for WIG

- Prototype Nautical Chart for WIG craft

## Approach to Pohang Hang



## Southern part of east coast of Korea to Oki shoto



# Conclusions

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- The development of WIG craft technology made sailing the WIG ship in some countries.
- Accordingly, a nautical chart for WIG craft should be developed to support safe and efficient navigation.
- In addition to the existing chart information,
- review of the aviation information and necessary information is required.



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# Recommendations

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- For WIG craft, the aviation information and other additional information mentioned in this document should be considered for inclusion in the IHO nautical chart standards.
- KHOA will take a task to investigate S-4 and related documents to modify if necessary.



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