UKCM
Pros and cons of different methods

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Topics

- Under keel clearance management issues
- Available technical methods
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  B. Onboard calculation based on ENC charts and water level measurement
  C. Onboard use of detailed bathymetric charts
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- Conclusions

Under keel clearance management issues

- For all vessels or for a named individual vessel
  - Generic method usable by anybody
  - Formulas tailored for individual vessel, but real-time data generic for everybody
  - Everything for a single individual vessel
- How to control result of the method
  - Who is liable ?
    - Hydrographic Office as publisher of material
    - Authority operating tidal gauges, etc.
    - Master of individual vessel
- Timeline
  - For current time
  - Prediction of near future (hours)
  - Prediction of any future time (planning days or months ahead)

A: Onboard calculation based on ENC charts and tidal tables (1)

- Onboard
  - Technically this method would modify depth information of ENC charts based on "external information" **manually entered by the user** or **semi-/fully automatically by manufacturer** provided link to digital versions of the tidal table
  - Safety contour of the ECDIS would be adjusted by the "external information"
- Onshore
  - No authorized digital, computer support of the required "external information" for this method
  - An ECDIS or ECS manufacturer could create his own solution
- Liability
  - IHO S-52 standard **does not allow** this method to be used in **Type approved ECDIS** required for IMO mandatory carriage for SOLAS vessel
  - Obviously also use for non-SOLAS purposes is doubtful

A: Onboard calculation based on ENC charts and tidal tables (2)

- Pro
  - Simple to use electronic version of the traditional paper based method
  - Operate also without real-time data transfer
    - Pre-loaded ENC charts and tidal tables

- Con
  - Electronic version cause over reliance, while this method is not better than traditional manual methods by the mariners
  - Legal use is doubtful => liability and insurance risk for the owner of the vessel

B: Onboard calculation based on ENC charts and water level measurement (1)

- Onboard
  - Source material is ENC chart plus water level information for a limited set of points
  - Onboard calculation using interpolation combines water level information with ENC

- Onshore
  - Government or government authorized private actor provides real-time measurements (and predictions) of water level for a limited set of points

B: Onboard calculation based on ENC charts and and water level measurement (2)

- Issues
  - Needs a standardized mathematic formula how to interpolate water level changes between the reported points
  - Good results require both reported points based on measurements and reported points based on modelling
    - System needs a shore based service provider
  - Service provider is responsible for all calculations and predictions
  - Government authority could authorize and supervise the service provider

- Pro
  - Single radio transmission of water level information (real-time and/or predicted) serves all vessel
  - Small amount of real-time data transfer

- Con
  - Currently no standardized mathematical formula for onboard use
  - Prediction for future planning is not so straight forward as real-time case
    - Especially planning long before actual sailing is not straight forward

C: Onboard use of detailed bathymetric charts (1)

- Used in Portable Pilot Unit (PPU)
- Onboard
  - Receive tailored time series of bathymetric charts
  - Use the received chart as provided plus onboard knowledge of draught, squat, etc. vessel specific
    - Onboard squat, banking effect, etc. calculations could use the provided detailed bathymetric charts
- Onshore
  - Processing executed by a Service provider
    - Could be government or government authorized private
  - Service provider performs all calculations about the amount of water for a time series
  - Service provider could have subject matter experts to check results of calculations

C: Onboard use of detailed bathymetric charts (2)

- Liability
  - The sea bottom information is controlled by the Service provider
  - Government authority could authorize and supervise the service provider
  - Vessel is responsible to set the "safety contour" based on onboard knowledge
- Pro
  - Applicable to all vessels in the area
  - Total control of tidal adjust by responsible government authority
- Con
  - Require large amount of data transferred to the vessels
  - Squat part of the UKC remains responsibility of the vessel
  - Availability of advance planning

D: “Zone method”, onboard calculation based on ENC and zone charts (1)

- On table at IHO TWCWG
  - S-112: Develop and maintain a standard for the transmission of real-time tidal data
  - S-10X: Develop and maintain a product specification for dynamic application of tides in ECDIS
- Onboard
  - No interpolation onboard, just apply the offset value reported for a zone
- Onshore
  - Processing executed by a Service provider
    - Could be government or government authorized private
  - Service provider performs all calculations
  - Service provider could have subject matter experts to check results of calculations

D: “Zone method”, onboard calculation based on ENC and zone charts (2)

- Liability
  - The complete adjust process is controlled by the service providing zone charts and adjust values
  - Service provider is responsible for all calculations and predictions
  - Government authority could authorize and supervise the service provider
  - Vessel is responsible to set the “safety contour” based on onboard knowledge
- Pro
  - Applicable to all vessels in the area
  - ENC and zone charts are stable => no need for large real-time data transfer
  - Total control of tidal adjust by responsible government authority
- Con
  - Squat part of the UKC remains responsibility of the vessel
    - Needs more free water tolerance
  - Availability of advance planning

E: UKCM as proposed by Australia for IHO HSSC-7 (1)

- Onboard
  - Overall planning in advance is available in a generic office computer
  - Real-time execution in ECDIS as simple go/no-go areas overlaid on ENC chart
- Onshore
  - Executed by a Service provider
    - Could be government or government authorized private
  - Service provider perform all calculations
  - Service provider could have subject matter experts to check results of calculations

E: UKCM as proposed by Australia for IHO HSSC-7 (2)

- Liability
  - Vessel is responsible only to follow the plan and monitor health of their technical arrangements
  - Service provider is responsible for all calculations and predictions
  - Government authority could authorize and supervise the service provider

- Pro
  - Simple to use for vessel => just follow the instructions
  - Best possible technical result
  - Simple go/no-go charts are quite small in data volume
  - Availability of advance planning

- Con
  - Individual service => only paying clients benefit

Conclusions

- Long time dilemma since previous century
  - Attempts to build generic system applicable for every vessel
  - Without full control of the result the government authorities have not been willing to allow tidal adjustment, dynamic tidal, etc.
- My personal view
  - **UKCM method** is the **best for ultimate need** to manage largest possible vessels for a given sea-area
  - **Zone method** is the **most generic solution** – digital age replacement of paper-based charts and tidal tables/water level announcements

Thank you for listening

- Questions ?