Heavy-lifting: Coupled Stability & Structural Analysis in a Load-out Operation

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2 DIGITAL MODELS:

HYDROSTATIC MODEL (GHS)

STRUCTURAL MODEL (MAESTRO Marine)

Working in synchrony!
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**HYDROSTATIC MODEL:**
- Drafts & trim & hydrostatics
- Stability
- Tank status
- Ballast sequence
- Ballast pump capacity check
- Longitudinal strength & girder deflection (beam theory)
- Torque

**STRUCTURAL MODEL:**
- Finite Element model
- Automatic transfer of tank loads from GHS to MAESTRO
- Hydrostatic balance
- --> Synchrony with GHS
- Global strength & deflection, along 3 axis
- Torque
- Local structural strength: Limit State Analysis
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Cargo control in GHS:
MAESTRO Marine’s Limit State analysis:

Beyond customary stress maps.

Load bearing capability of a structural assembly as a whole. 14 failure modes.

« Evaluation patches » are rated with an adequacy parameter, always lying within the normalized limits of -1 to +1.
Engineering:

Hydrostatic model:
- Prepared in a few hours,
- Early feasibility checks: payload capacity vs drafts, longitudinal strength limits, ballast capacity, etc.

Structural model:
- 3 man-weeks. acceptable even in an initial study
- Invaluable gains in predicting structural behaviour: identifying weak zones, planning eventual reinforcing very early in the process, etc.

Model creation = one-time job, directly re-usable for future operations
Next?

Integrated « Hydro + structural » model supports at-sea operations too, opening new areas of engineering analysis and behavioural prediction:

- Combination and interaction of cargo’s and carrier’s strength and overall girder stiffness,
- Assessment of risks to the cargo’s integrity taking into account waves, sea-states, ship speed and duration of the voyage,
- Integrated Seakeeping analysis: Extreme load analysis, Fatigue analysis,

→ Voyage prediction, planning and critical decision making during the passage.
Thank you!