

Change of course

symposium



# It does not fit! ~~Of course it fits!!!~~

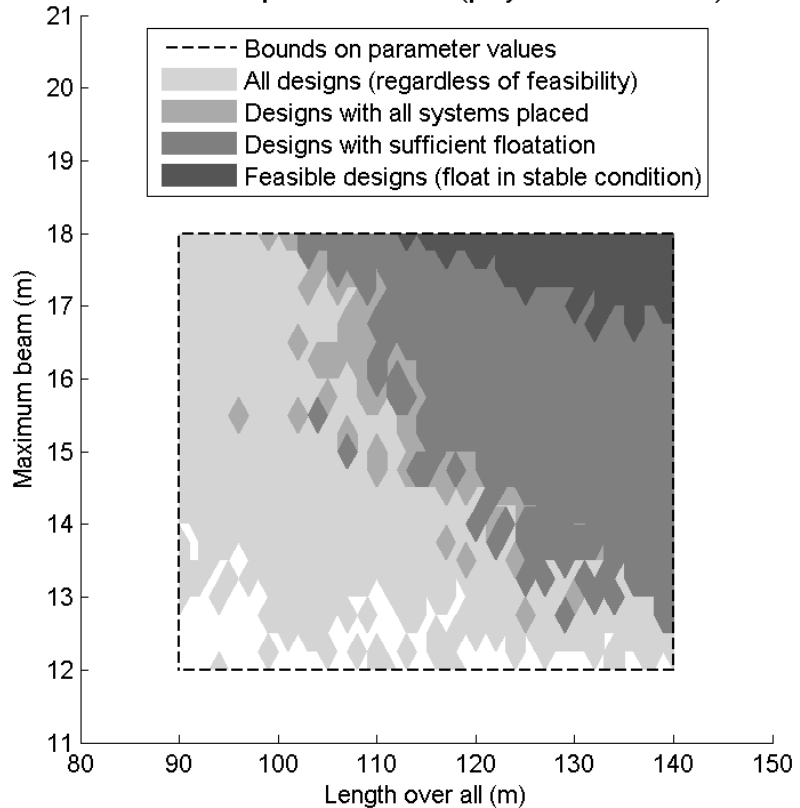
On the technical feasibility of applying alternative fuels / power sources on board of ships.

# Technical Feasibility...?

- For a container vessel that is designed and built to transport maximally 10'000 TEU...
- It is technically infeasible to be loaded with 20'000 TEU and transport them during one voyage from China to Europe.

# Ship / Power plant design...

Offshore patrol vessel (payload variation)



van Oers, 2014.

## The problem is choice...!

- From network theory the number of possible system topologies can then be calculated:

$$n_{\text{networks}} = 2^{\frac{nn \cdot (nn-1)}{2}}$$

- For my benchmark system consisting of 36 nodes, the number of networks is:

$$n_{\text{networks}} = 2^{630}$$

- The estimated number of hydrogen atoms in the observable universe according to Wikipedia is approximately  $10^{80}$  ( $\approx 2^{265}$ )

TU Delft

7

de Vos, 2018.

# Ship / Power plant design...

- What does it mean if any existing and future ships are “just” one design solution in an infinitely large design space?
- Can we then rightfully make general statements like “it is impossible, i.e. technically infeasible, to apply the battery-electric vehicle concept to large cargo vessels” or “AmmoniaDrive is the best solution!”
- Is a battery-electric container vessel for container transport between China and Europe truly technically infeasible?

Ingenieurs (in training)  
should not state easily that  
some conceptual technical  
idea is technically  
infeasible!

It is your job as an ingenieur to make ingenieuze solutions possible!

# Many aspects to feasibility...

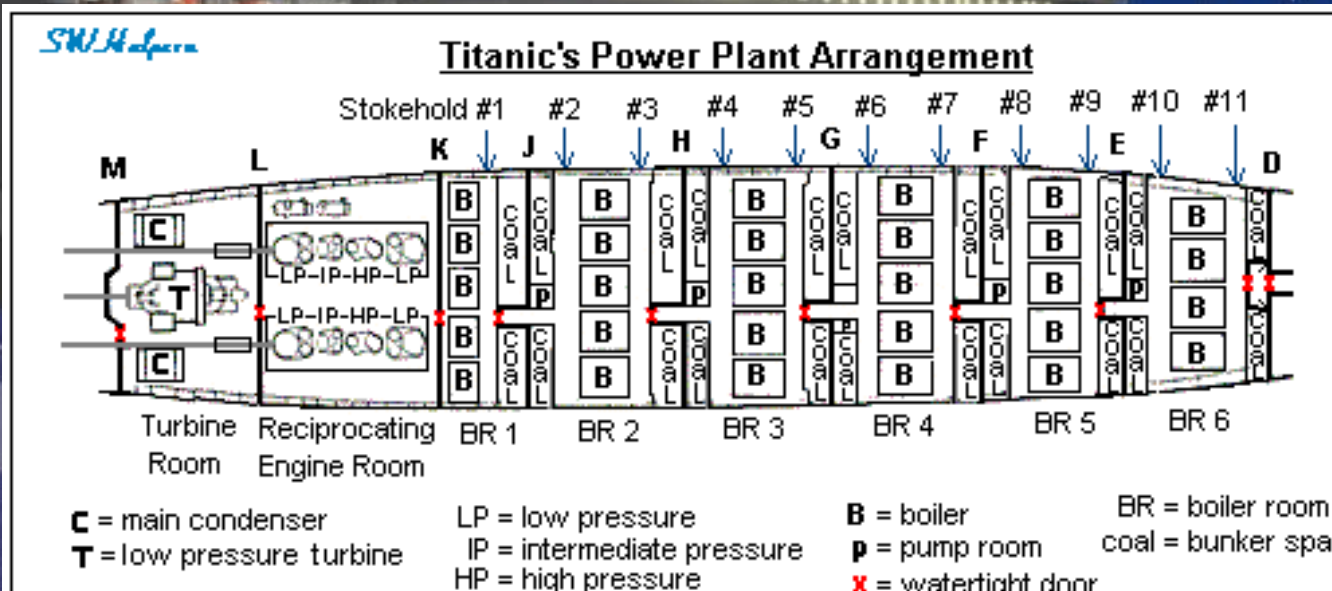
- Engines on alternative fuels:
  - Combustion stability, Safe fuel injection / admission, MPRR, emissions, etc.
- Fuel Cells on alternative fuels:
  - Lifetime, Reliability, Maintenance, Training of crew, etc.
- Batteries:
  - Do they fit? What is an acceptable operational profile?
  
- What about economic feasibility? Legal feasibility?

Ship Designers (in training)  
should not state easily that  
some conceptual technical  
idea does not fit!

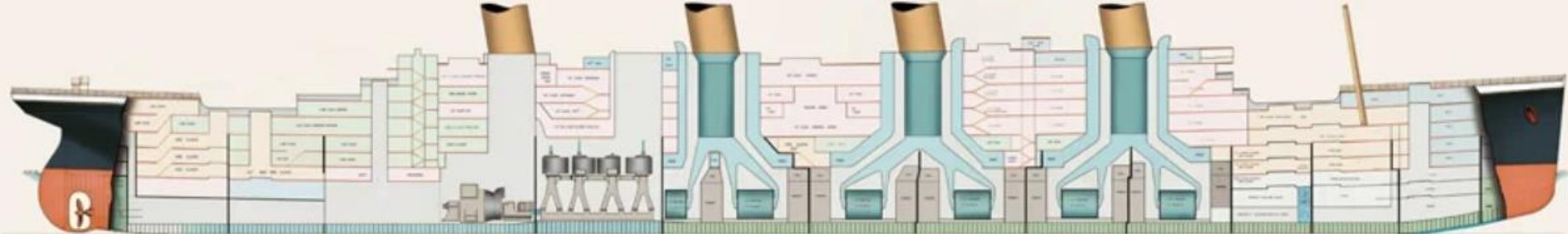
It is your job as a ship designer to make it fit!



# Inside Titanic

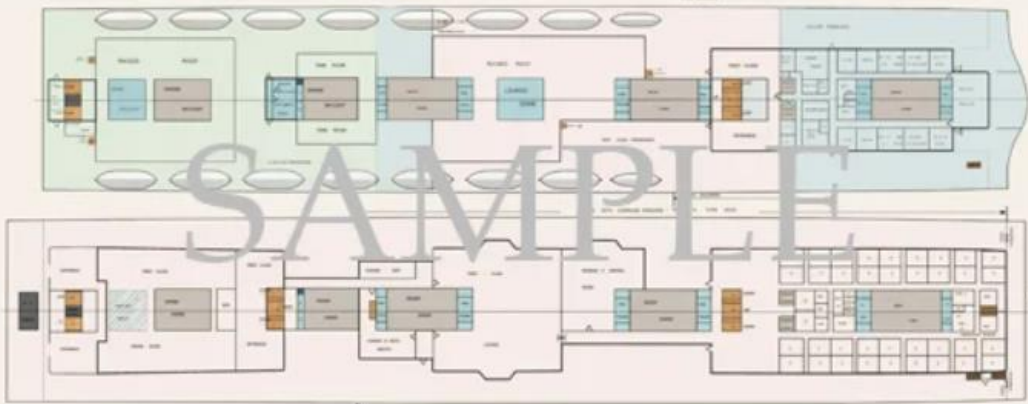


# RMS Titanic



**GENERAL ARRANGEMENT TITANIC**

**ENDPAPERS**  
 ORIGINAL DESIGN DRAWINGS FOR OLYMPIC AND TITANIC PREPARED BY HARLAND & WOLF AND APPROVED IN BELFAST ON 29 JULY 1908 BY BRUCE ISMAY AND OTHER WHITE STAR LINE DIRECTORS. Redrawn and PLAN BASED ON ORIGINAL PLANS "Harland & Wolf".  
 LENGTH OVER ALL - 882ft 9in.  
 GROSS TONNAGE - 46,328 54  
 HULL NUMBER - 401



**GENERAL ARRANGEMENT**  
 S. S. N° 400  
 850 X 92 X 64 - 6  
 SCALE 8-11/16" = 1'  
 DESIGN '10'

**FIRST CLASS**

190 SINGLE BERTH ROOMS	190 BEDS
34 TWO-BERTH ROOMS	68 BEDS
114 THREE-BERTH ROOMS	342 BEDS
<b>TOTAL 338 ROOMS</b>	<b>500 BEDS</b>

**SECOND CLASS**

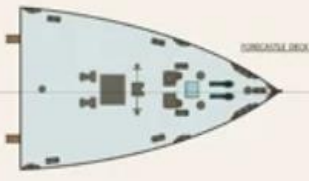
102 TWO-BERTH ROOMS	204 BEDS
128 FOUR-BERTH ROOMS	512 BEDS
<b>TOTAL 230 ROOMS</b>	<b>716 BEDS</b>

**THIRD CLASS**

IN ENCLOSED ROOMS	1528 BEDS
IN OPEN BERTHS	240 BEDS
<b>TOTAL</b>	<b>1768 BEDS</b>

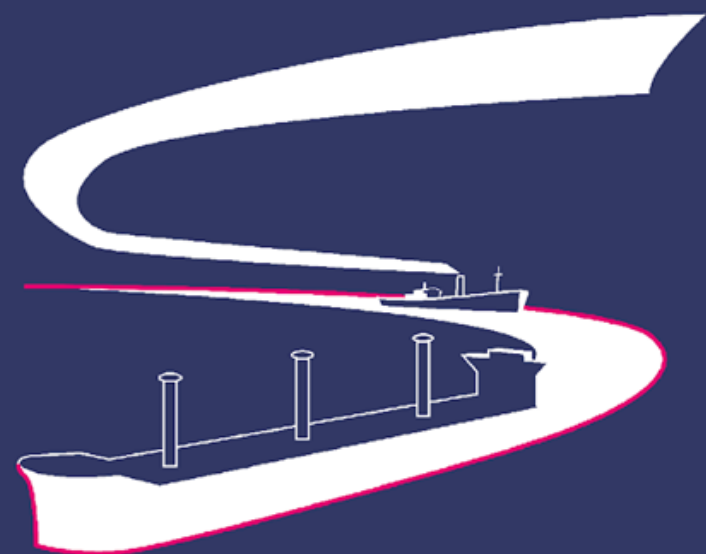
**SEATS IN SALOON**

FIRST CLASS	516
SECOND	546
THIRD	516



There is room for the engine room...!!!

~~It does not fit!~~  
Of course it fits!!!



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