

The Wolfson Stability Method: empowering small-scale fishers to mitigate the risk of capsizing.

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Session 7 (Red room) – Fishing Vessel Safety and Design

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The context

1999 → 'Fishing is amongst the most dangerous of all professions' (ILO)

2012 → 'Many of the causes of fishing accidents today are the same as those identified two decades ago' (TSB Canada)

2023 → 'Arguably the most dangerous profession on Earth' (FSF)

'The global mortality estimates are well in excess of 100,000 fishers per year' (FSF, 2022)

100,000 / year = 274 / day = 11 / hour

EU mortality rate stands at 85 per 100,000 fishers (FSF, 2022), but:

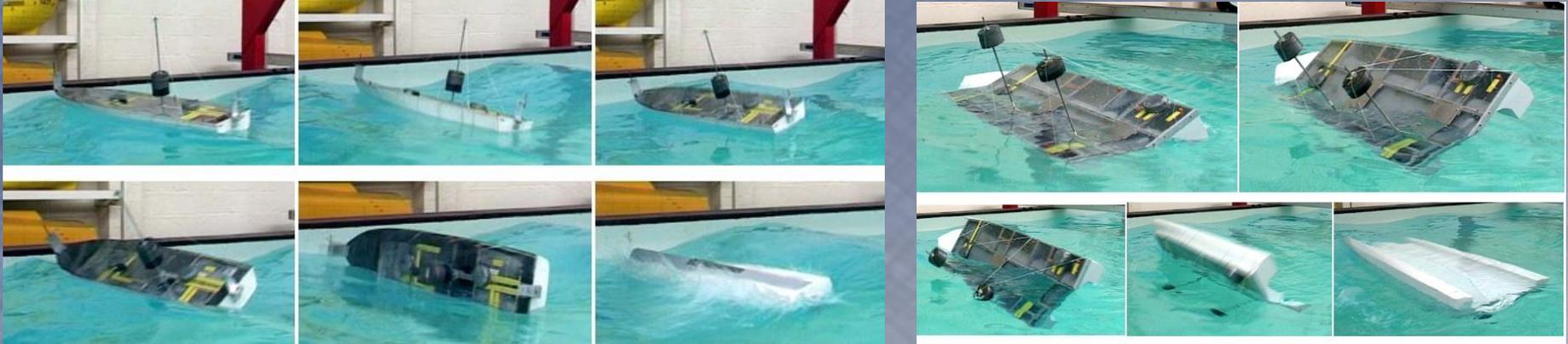
vessels of 15m length and over 28 / 100,000

vessels of less than 15m 124 / 100,000



Wolfson stability guidance

- Stems from MAIB recommendation 38/2022 – F/V Charisma
- MCA Research Projects 509, 559 & 560 (2004 – 2006)
- Predicted level of stability whilst fishing, in relation to seastate
- One page Stability Notice (SN) affixed in wheelhouse
- Vessel with stability data? → Notice states eg critical heel and warp loading
- Vessel without stability data? → **Basic Stability Notice & Freeboard Mark**



Deakin B, 'An experimental evaluation of the stability criteria of the HSC Code', FAST 2005.

Deakin B, 'Developing Simple Stability Guidance for Fishermen' STAB 2006.

Example: FV JMT (1)



- 11m scallop dredger
- lost in 2015, 2 fatalities
- MAIB Report 15/2016

Photo credit: Marine Accident Investigation Branch

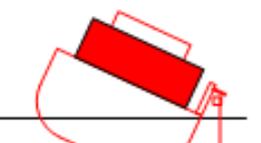
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Example: FV JMT (2)

STABILITY NOTICE				
Name JMT No. 0 Owner 0 Length 11.42 metres Beam 4.38 metres	Loading & Lifting Guidance	Safety Zone	Minimum Freeboard	Maximum Recommended Seastate
	Good margin of residual freeboard	Good margin of safety	At least 52 cm	
	Loading or lifting reduces minimum freeboard to less than 52 cm	Low level of safety	26 to 52 cm	1.4 metres
	Excessive loading or lifting reduces minimum freeboard to less than 26 cm	Danger of capsize	Less than 26 cm	0.7 metres

Freeboard Mark location

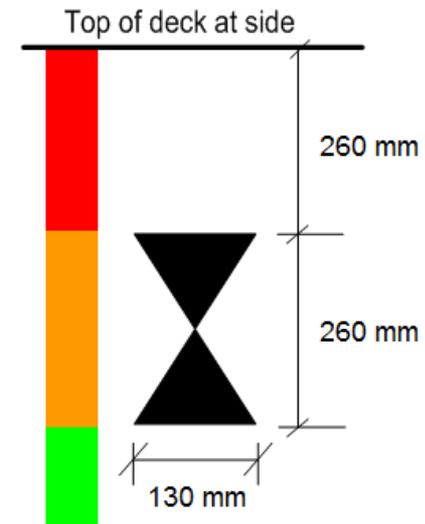
Fore/aft

min. freeboard position when fishing

Vertical

position driven by Length & Beam

Freeboard Guidance Mark - size and location



Traffic light safety rating system:

Green: 'safe' in all but extreme sea states

Amber: should be restricted to low sea states

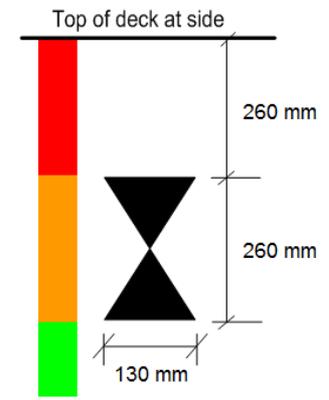
Red: 'unsafe' unless restricted to calm conditions and with extreme caution

Example: FV JMT (3)

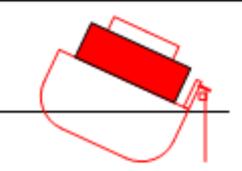


Proposed freeboard mark

Freeboard Guidance Mark - size and location



Example: FV JMT – Analysis

STABILITY NOTICE												
Name JMT No. 0 Owner 0 Length 11.42 metres Beam 4.38 metres		Loading & Lifting Guidance	Safety Zone	Minimum Freeboard	Maximum Recommended Seastate							
					Safety Zone	Minimum Freeboard cm	Freeboard at Load Conditions cm					
		Good margin of safety	At least 52	STANDARD CONDITIONS				OPERATIONAL CONDITIONS				
				Low level of safety	26 to 52	1	2	3	4	7	8	9
		Danger of capsize	Less than 26									22
Key - Standard Conditions 1: STD Depart port 2: STD Arrival Gnds 3: STD Depart Gnds 4: STD Arrival Port					Key - Operational Conditions 7: OP Tow block lift & full dredges 8: OP Full dredges on bwks 9: OP SS tipped, PS full & suspended							

Scarponi M, 2015, "F/V JMT Stability Analysis", Annex A to MAIB Report 15/2016.

Validation – casualty plot

Do vessel casualties and model test capsizes occur in the ‘unsafe zone’ ?

$$H_{crit} = \frac{Range \sqrt{RM_{max}}}{10 * Beam}$$

$$(H_s)_{crit} = \frac{H_{crit}}{2}$$

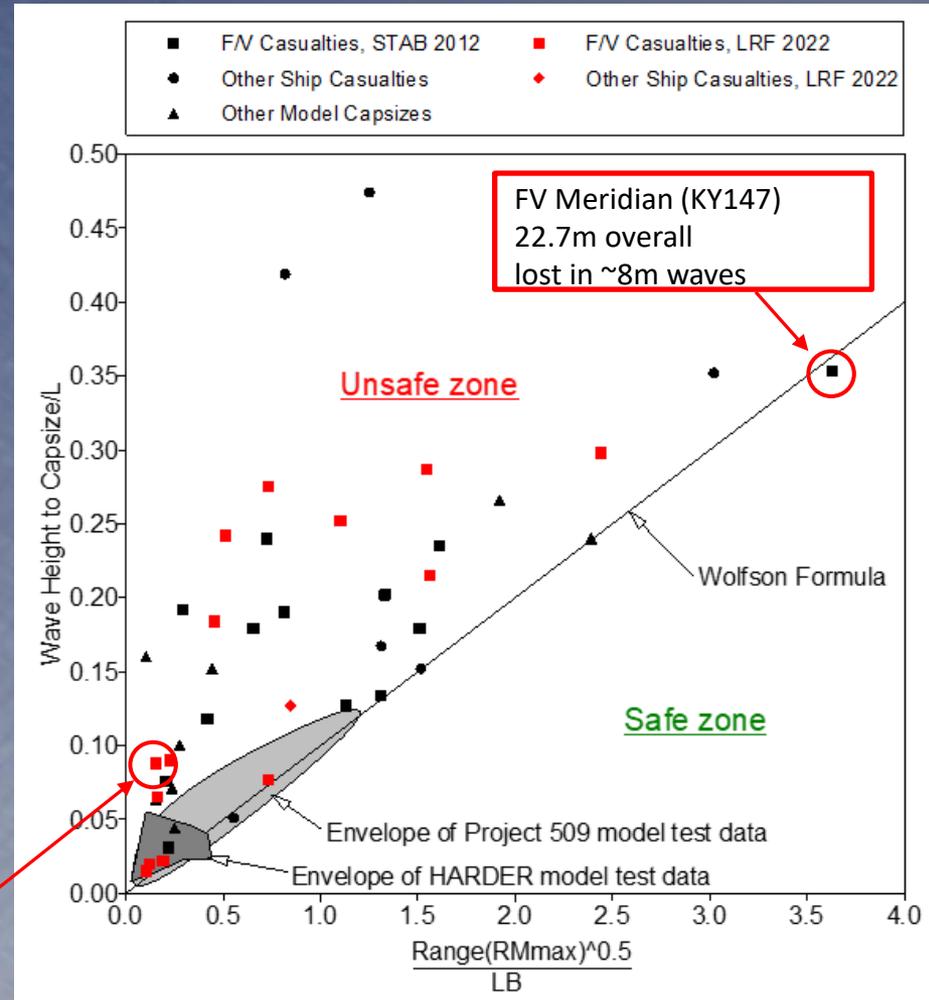
where:

H : Regular wave height (wave basin)

H_s: Significant wave height (at sea)

Implies the minimum wave height to capsize is twice the significant (1 in ~2000 waves for typical sea states)

F/V JMT (M99)



From guidance to UK policy

Recognition by UK policymakers and fishing industry stakeholders

- (2010-2018) MGN 427F 'Under 15m stability guidance'
- (2018-present) MGN 526F 'Stability guidance for FV – Wolfson method'
- The 2021 U15m Code of Practice implemented MAIB recommendations to MCA, e.g. 2016/130 '*...all existing vessels to be marked using the Wolfson Method or assessed by use of another acceptable method.*'
- **2021 - U15m Code of Practice:**
 - Wolfson Notice mandatory for new, low-risk vessels under 12m RL
 - Wolfson Notice mandatory for all existing vessels under 15m LOA
 - Wolfson Mark recommended for all under 15m vessels
- **2022 - Marine Guidance Note 503 Amt.1 (F) 'Simplified stability tests'**
more on that in the next slide...

Key U15m freeboard rules (UK)

- Decked vessels with <300mm freeboard are restricted to 20 miles from safe haven and favourable weather conditions.
- Decked vessels with <200mm freeboard cannot operate commercially unless equivalence/compliance is demonstrated.
- Non-compliant decked vessels will be considered open boats and must align with open boat requirements.



How to carry on fishing?

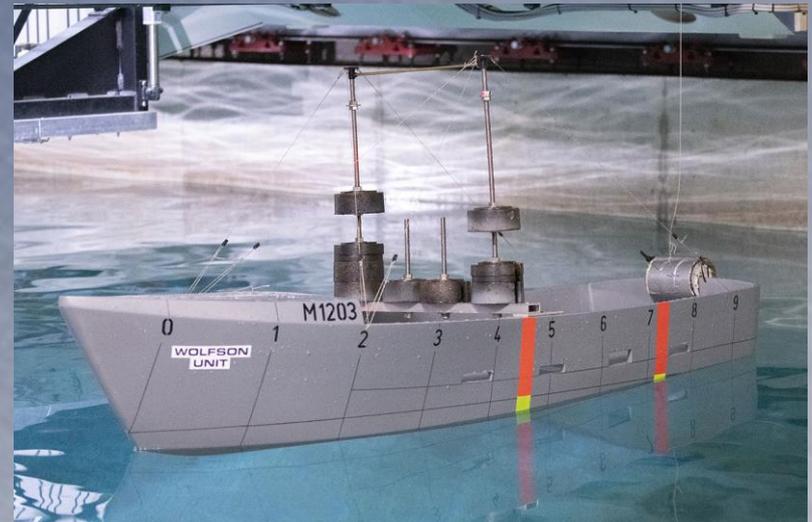
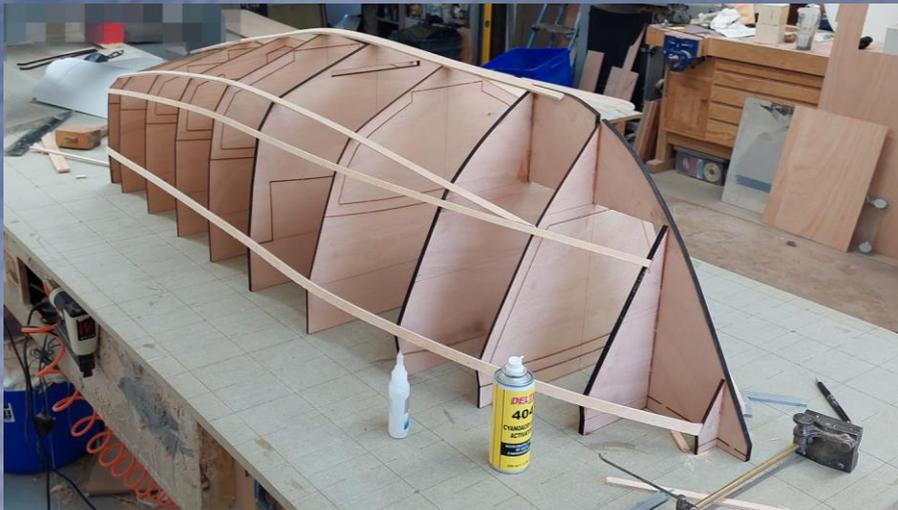
- raise deck and adjust freeing ports accordingly → unsafe and expensive
 - reduce lightship displacement → safe, but expensive (re-registration?)
 - 'roll back' vessel to the standard it was designed to → there may not be one
 - convert to open boat → potentially unsafe if unsupervised
- 2022 - MGN 503 Amt. 1(F) offers a 'conditional certification' option ie low-freeboard vessels must operate within a geographical / weather orientated allowance.

Wave basin tests - method

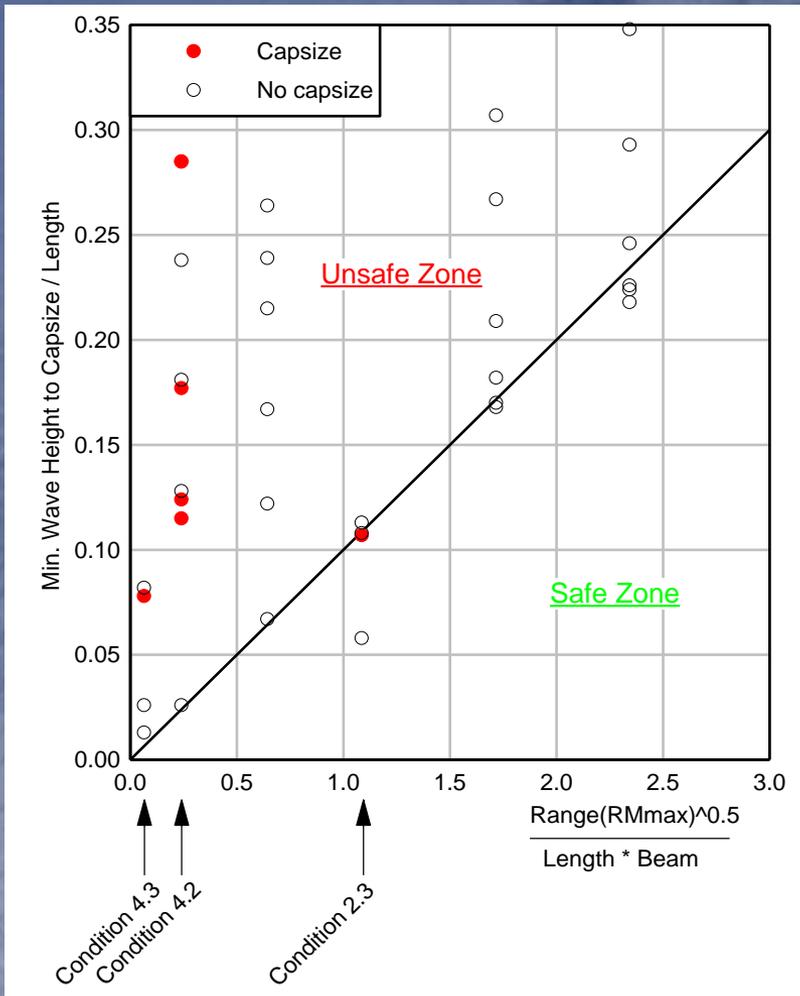
- Is there a case for a sea state orientated allowance based on the Wolfson Method?

Wolfson Unit report 2900 'Evidencing a Seastate Allowance for Inshore Fishing Vessels by Model Scale Testing (Phase I)', December 2003.

- Survivability tests in regular waves on a 10.4m typical potter, 1:6 scale, unrestrained
- Boldrewood Towing Tank, 138 x 6 x 3.5m, largest university tank in the UK
- 2 days' testing, 70 total runs, 6 conditions, 2 variants: decked and open boat



Wave basin tests - results



- all 7 capsize events occurred in the 'unsafe zone' ie at a wave height \geq critical height predicted by the Wolfson method
- no capsize events in the 'safe zone'
- all capsize conditions had $\geq 5^\circ$ list, deck swamped, vessel beam on and heeled towards the waves
- At the 'marginal' load conditions tested, the model survived when operated within the Wolfson seastate-based limits.

Examples of Stability Notices

Safety Recommendations for Decked Fishing Vessels of Less than 12 metres in Length and Undecked Fishing Vessels

Annex XI

An example of a stability

		Danger of Capsize
	<ul style="list-style-type: none"> Some catch on deck Gear on deck Empty cargo hold 	
	<ul style="list-style-type: none"> Considerable catch on deck Gear on deck Empty cargo hold 	

Simple efforts for maintaining stability

- # Close doors and hatches
- # Ensure scuppers are open to allow water to drain
- # ...

or

STABILITY NOTICE

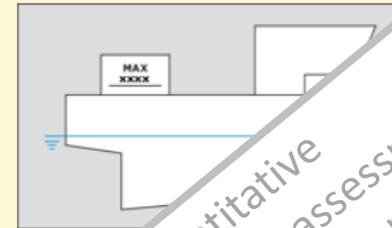
Vessel Name: XXXX | Vessel Type: XXXX
Fishing Species: XXXX | Source: XXXX



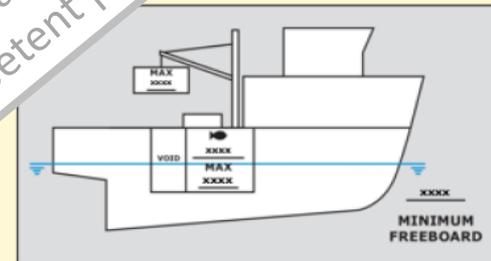
CRAB POTS
NUMBER OF POTS ON DECK



NUMBER OF CREW



NO SKIFF ONBOARD

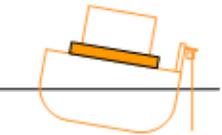
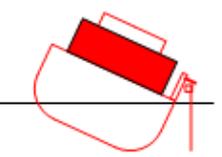


NOTES:

- PLACEMENT OF DECK EQUIPMENT MUST NOT INTERFERE WITH FREEING PORTS
- ENSURE FREEING PORTS ARE FREE AND CLEAR AT ALL TIMES
- FISHING GEAR TO BE KEPT AS LOW AS POSSIBLE
- DURING CARGO/LIFTING OPERATIONS KEEP HEEL/LIST TO A MINIMUM

Wolfson SN + Mark - a happy medium ?

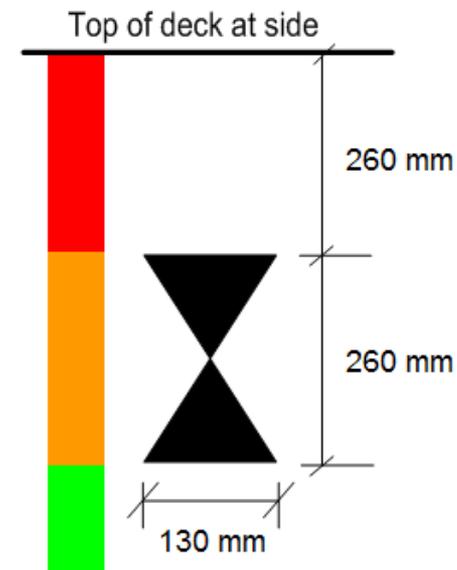
Safety Recommendations for Decked Fishing Vessels of Less than 12 metres

STABILITY NOTICE				
Name	No.	Owner	Length	Beam
JMT	0	0	11.42 metres	4.38 metres
Loading & Lifting Guidance		Safety Zone	Minimum Freeboard	Maximum Recommended Seastate
	Good margin of residual freeboard	Good margin of safety	At least 52 cm	
	Loading or lifting reduces minimum freeboard to less than 52 cm	Low level of safety	26 to 52 cm	1.4 metres
	Excessive loading or lifting reduces minimum freeboard to less than 26 cm	Danger of capsize	Less than 26 cm	0.7 metres

STABILITY NOTICE

Vessel Name: JMT | Vessel Type: Fishing Vessel
Fishing Species: ... | Source: ...

Freeboard Guidance Mark - size and location



NOTES:

- PLACEMENT OF DECK EQUIPMENT MUST NOT INTERFERE WITH FREEING PORTS
- ENSURE FREEING PORTS ARE FREE AND CLEAR AT ALL TIMES
- FISHING GEAR TO BE KEPT AS LOW AS POSSIBLE
- DURING CARGO/LIFTING OPERATIONS KEEP HEEL/LIST TO A MINIMUM

Simple efforts for maintaining stability

- # Close doors and hatches
- # Ensure scuppers are open to allow water to drain
- # ...

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Take-away points

- 1) Stability is variable, under the control of the skipper and may be inadequate.
- 2) Skippers need simple, easily accessible stability guidance.
- 3) Skippers need safe operating limits that are “easily measurable and relevant to the vessel’s operations” (TSB Recomm. M16-03)

The Wolfson Method:

- 3) is based on residual freeboard and enables vessels without stability data to operate safely, within seastate-based limits.
- 4) provides skippers with a Freeboard Mark (topsides) and a traffic light safety rating system, the Stability Notice (wheelhouse).
- 5) only requires Length and Beam.
- 6) is supported by fishing vessel casualty data up to 2022, validated by wave basin tests and endorsed by marine accident investigators.
- 7) now mandatory in the UK for all for new, low-risk vessels U12m (RL) and for all existing U15m (LOA) vessels.
- 8) is publicly available and free for all.

Thank you for your attention !

Acknowledgements:

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