

Presented at the FIG Working Week 2019,
April 22-26, 2019 in Hanoi, Vietnam

Hydrographic Surveys Project Team

Hydrographic Surveys Project Team Overview

Simon Ironside - Christophe Vrignaud (Chair)

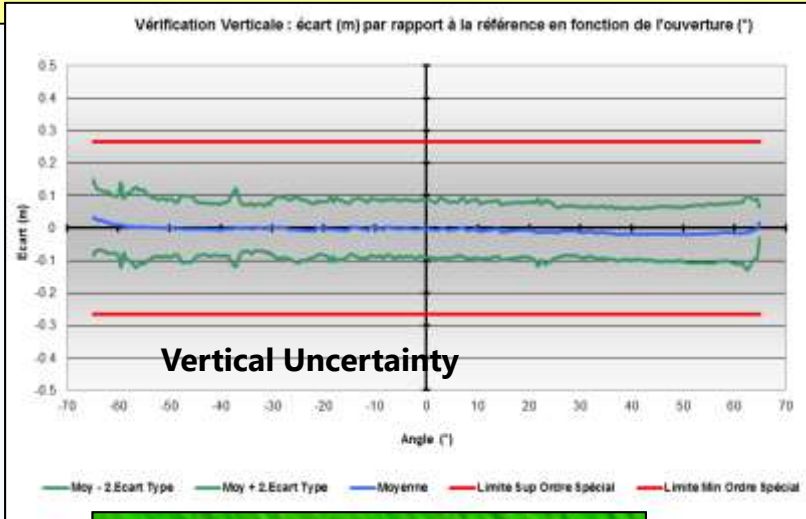
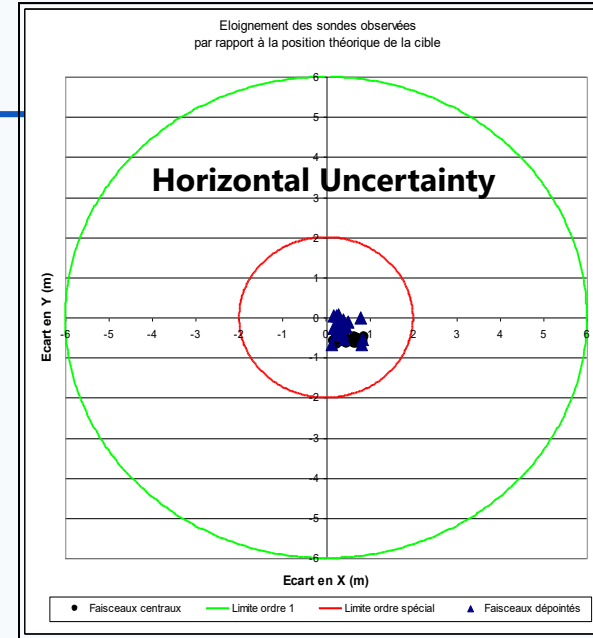
Nickolas de Andrade Roscher (Vice Chair) – David Wyatt (Secretary)



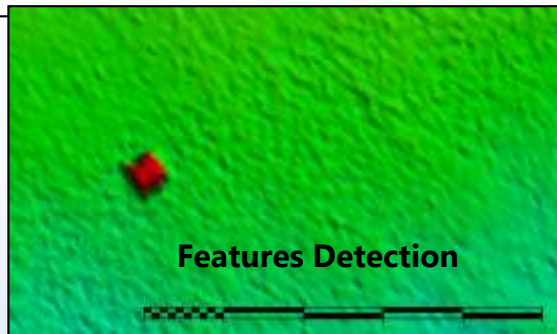
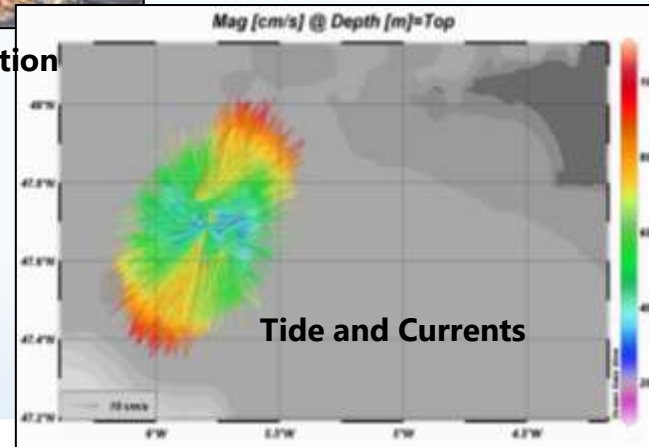
S-44 Reminders



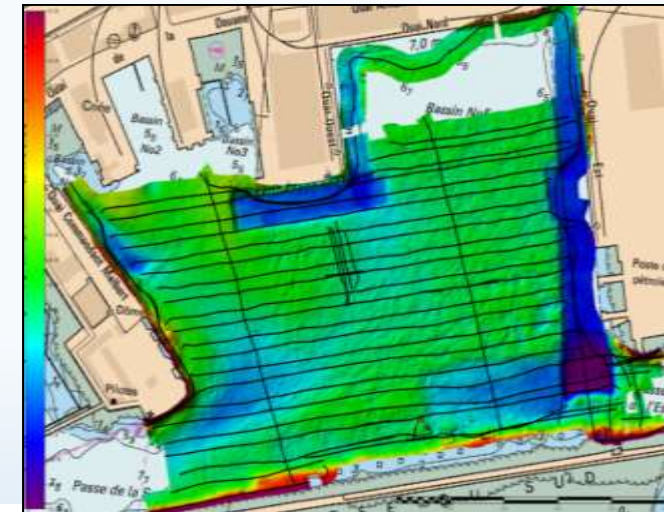
The IHO S-44 provides a standard regarding the hydrographic surveys, mainly dedicated for the safety of navigation



Seafloor Characterization

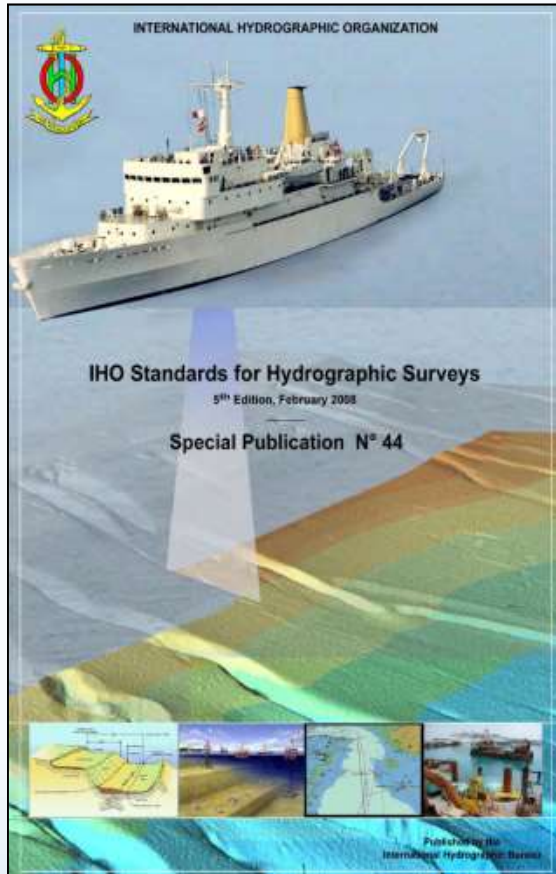


Coverage, postioning of coastline and aids of navigation



S-44 Reminders

S-44 (5th Edition – February 2008) : Special Order, Ordre 1a, Ordre 1b and Ordre 2 – **10 years old !**



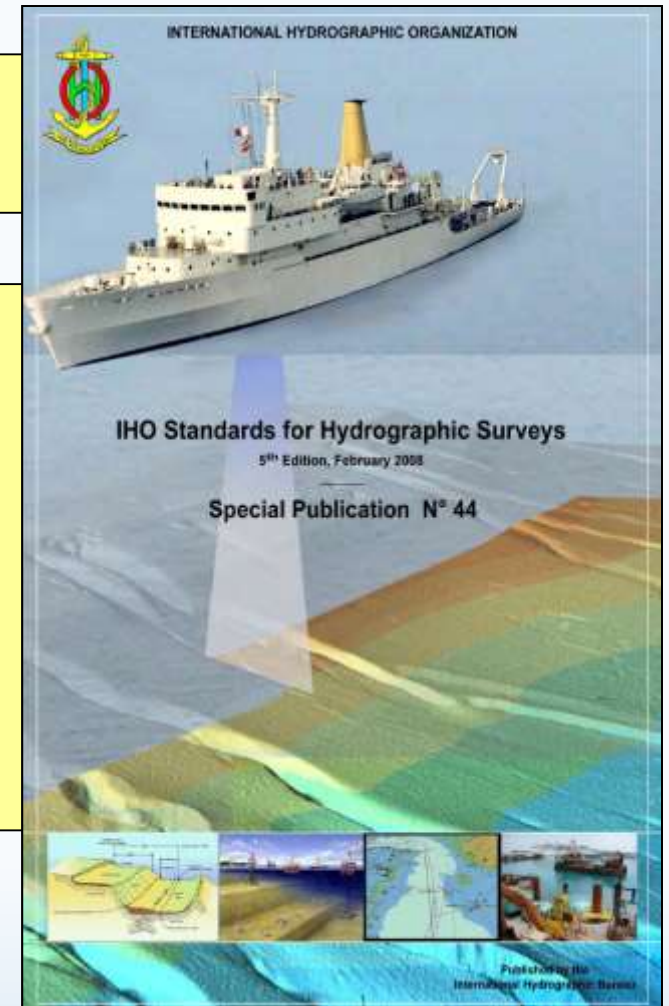
Reference	Order	Special	1a	1b	2
Chapter 1	Description of areas.	Areas where under-keel clearance is critical	Areas shallower than 100 metres where under-keel clearance is less critical but <i>features</i> of concern to surface shipping may exist.	Areas shallower than 100 metres where under-keel clearance is not considered to be an issue for the type of surface shipping expected to transit the area.	Areas generally deeper than 100 metres where a general description of the sea floor is considered adequate.
Chapter 2	Maximum allowable THU 95% <i>Confidence level</i>	2 metres	5 metres + 5% of depth	5 metres + 5% of depth	20 metres + 10% of depth
Para 3.2 and note 1	Maximum allowable TVU 95% <i>Confidence level</i>	a = 0.25 metre b = 0.0075	a = 0.5 metre b = 0.013	a = 0.5 metre b = 0.013	a = 1.0 metre b = 0.023
Glossary and note 2	Full Sea floor Search	Required	Required	Not required	Not required
Para 2.1 Para 3.4 Para 3.5 and note 3	Feature Detection	Cubic <i>features</i> > 1 metre	Cubic <i>features</i> > 2 metres, in depths up to 40 metres; 10% of depth beyond 40 metres	Not Applicable	Not Applicable
Para 3.6 and note 4	Recommended maximum Line Spacing	Not defined as full sea floor search is required	Not defined as full sea floor search is required	3 x average depth or 25 metres, whichever is greater For bathymetric lidar a spot spacing of 5 x 5 metres	4 x average depth
Chapter 2 and note 5	Positioning of fixed aids to navigation and topography significant to navigation. (95% <i>Confidence level</i>)	2 metres	2 metres	2 metres	5 metres
Chapter 2 and note 5	Positioning of the Coastline and topography less significant to navigation (95% <i>Confidence level</i>)	10 metres	20 metres	20 metres	20 metres
Chapter 2 and note 5	Mean position of floating aids to navigation (95% <i>Confidence level</i>)	10 metres	10 metres	10 metres	20 metres



S-44 Reminders

The only document, with international range, dealing with uncertainty for hydrographic surveys

- A minimum to be achieved – coming from countries with different points of view
- Dedicated for safety of navigation (5^{ième} Edition)
- To be used by qualified hydrographers
- Specify only the objective
- No specification about the way to do the survey
- Can be modified by hydrographic offices according to their local needs



IHO - Hydrographic Surveys Project Team

HSPT created in March 2017 – Extract from the Terms of References :

2. Objective

To maintain IHO standards which apply to hydrographic surveys: to prepare a draft 6th Edition of IHO publication S-44 - *Standards for Hydrographic Surveys* for approval by IHO Member States (MS).

When undertaking this task the Project Team (PT) should consider, as a minimum, the following matters, in support of safety of navigation data products and services:

- (i) Review the existing edition of S-44 (5th edition) and identify any deficiencies in either the standards or explanatory content;
- (ii) Following review, update the content and structure of S-44 to the extent identified during the review, with the intention of publishing revisions as a 6th edition of S-44;
- (iii) On completion of publication of a 6th edition of S-44, submit a proposal and recommendation to the Hydrographic Services and Standards Committee (HSSC) on whether the PT should continue as a standing working group and, if so, what tasks have been identified to justify transition to a standing working group.



IHO - Hydrographic Surveys Project Team

→ First meeting (HSPT1) : Paris, June 2017

- 10 limitations about the S-44 identified
- Online Questionnaire defined about the S-44
- Work on "Table 1" and on a possible Matrix alternative



→ Second Meeting (HSPT2) : Niteroi, July 2018



HSPT – le Questionnaire

Defined by HSPT and Administrated by IFHS

Disseminated by HSPT, IFHS, IHO et members HSPT

From mid-August 2017 to the End of November 2017

38 Questions



500 replies from all over the world

→ Results statically relevant !!

→ Analyze done by Iain Slade (IFHS/Fugro), Simon IronSide (FIG/Eliot Sinclair), and Christophe Vrignaud (Shom)



HSPT - Questionnaire

Objective :

- One of the goal of the questionnaire is to see how the S44 is used, but also, to give guidance on how to update the document for the future.
- These slides to come give a snapshot of some of the results of the survey.
- For a more comprehensive view, we recommend Hydrographic Offices review the entire results.

HSPT Web page: [Questionnaire Results](#)



IHO Hydrographic Services and Standards Committee (HSSC)
Project Team on Standards for Hydrographic Surveys (HSPT)
S-44 Questionnaire

This questionnaire is intended to gauge the views of users and stakeholders on a range of topics that will help to inform the decision-making processes of the IHO HSSC Project Team on Standards for Hydrographic Surveys (HSPT) on the future evolution of IHO Standards for Hydrographic Surveys Special Publication No. 44 (S-44). The current (5th) edition was adopted in February 2008, a copy can be downloaded free-of-charge from the IHO website: https://www.iho.int/iho_pubs/standard/S-44_5E.pdf

We greatly value your opinions and hope that you will find 10 minutes to complete the online questionnaire, all completed questionnaires will be treated in the strictest confidence and processed anonymously. However, if you don't mind providing your name and email address the final question allows you to do so.

The closing date for responses is Friday 17th November 2017.

Section 1 is compulsory. Please answer all of the remaining questions as appropriate.

Section 1: About you

* 1. To the nearest whole year, how long have you been involved in hydrography, or an allied industry or profession?

- | | | |
|-------------------------------|-------------------------------|-------------------------------|
| <input type="radio"/> 0 - 5 | <input type="radio"/> 16 - 20 | <input type="radio"/> 31 - 35 |
| <input type="radio"/> 6 - 10 | <input type="radio"/> 21 - 25 | <input type="radio"/> 36 - 40 |
| <input type="radio"/> 11 - 15 | <input type="radio"/> 26 - 30 | <input type="radio"/> 41+ |

* 2. In which industry sectors(s) are you currently working and/or have you previously worked?
(Tick all that Apply)

- | | | |
|---|--|---|
| <input type="checkbox"/> Academia | <input type="checkbox"/> Geophysical | <input type="checkbox"/> Oil & Gas |
| <input type="checkbox"/> Coastal | <input type="checkbox"/> Geotechnical | <input type="checkbox"/> Ports & Harbours |
| <input type="checkbox"/> Construction | <input type="checkbox"/> Instrumentation | <input type="checkbox"/> Renewables |
| <input type="checkbox"/> Dredging | <input type="checkbox"/> Military | <input type="checkbox"/> Research & Development |
| <input type="checkbox"/> Environmental | <input type="checkbox"/> Navigation/Charting | <input type="checkbox"/> Seismic |
| <input type="checkbox"/> Fisheries | <input type="checkbox"/> Oceanography | <input type="checkbox"/> Subsea Engineering |
| <input type="checkbox"/> Other (please specify) | | |



HSPT - Questionnaire

- Questionnaire Results - about respondents “Experience” (Q1)

Only 11% of respondents have been involved in hydrography less than 5 years → **the questionnaire responses are based on considered professional opinion.**

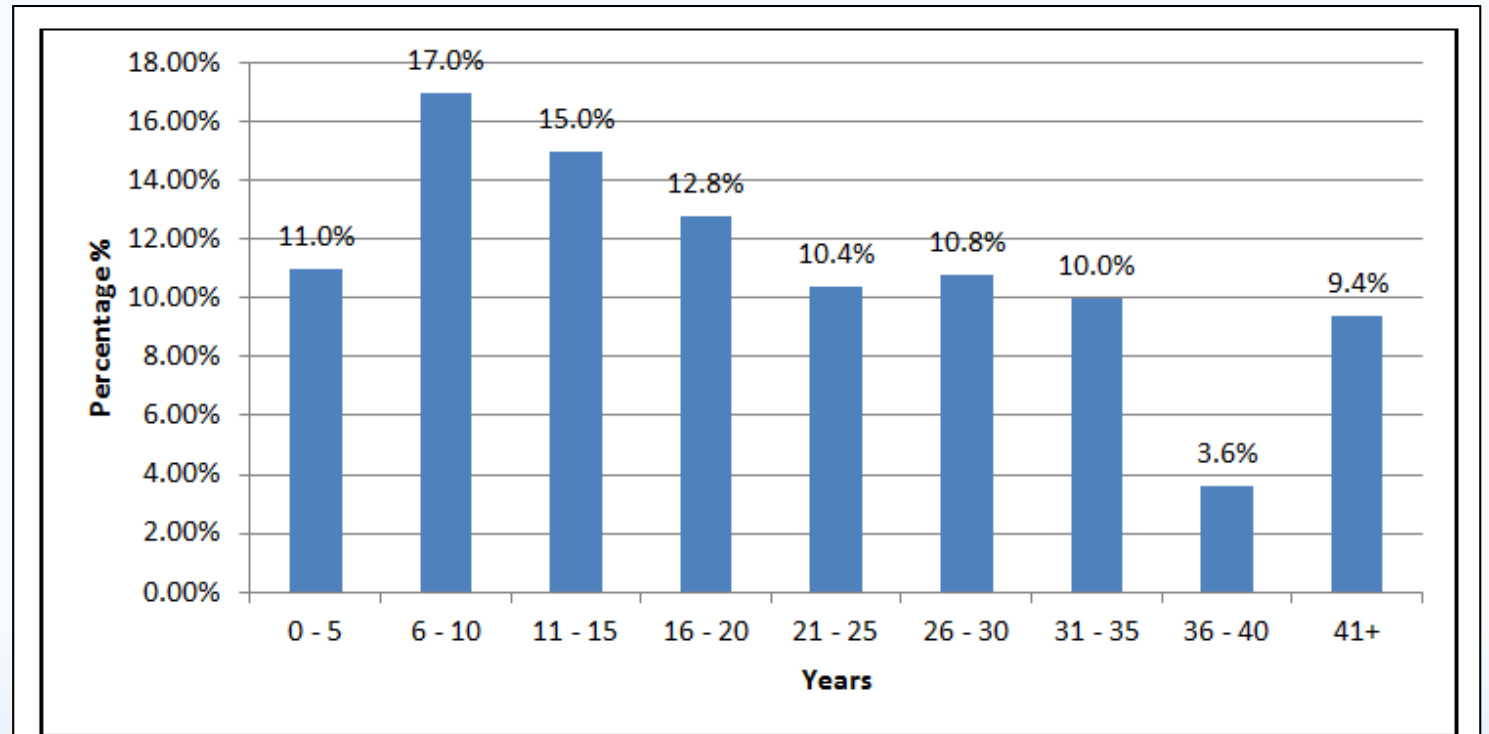


Figure 3.1: Q1 Questionnaire Respondents Years of Hydrography or Allied Experience.



HSPT - Questionnaire

- Questionnaire Results - about respondents “Industry Sectors” (Q2)

Respondents identified their principal industry sectors as **Navigation and Charting**.

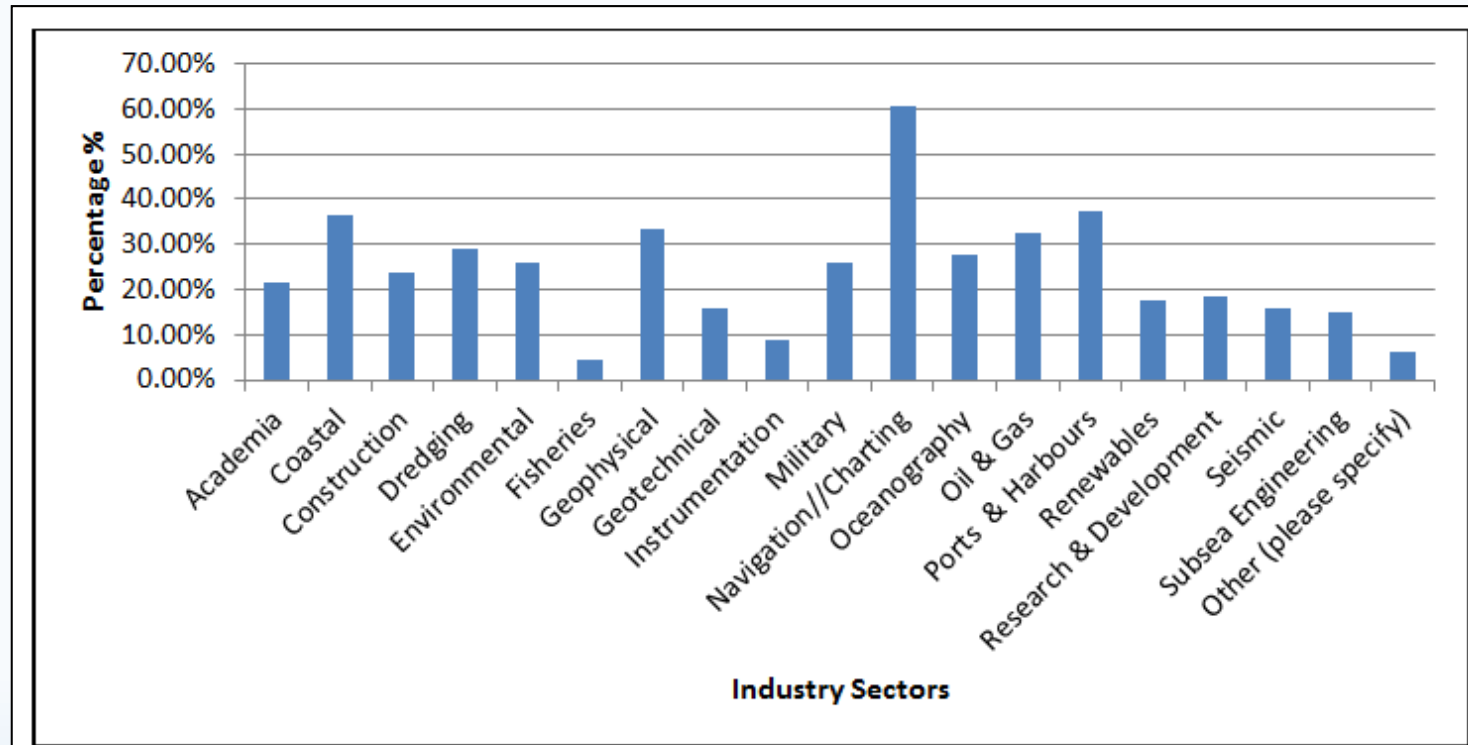


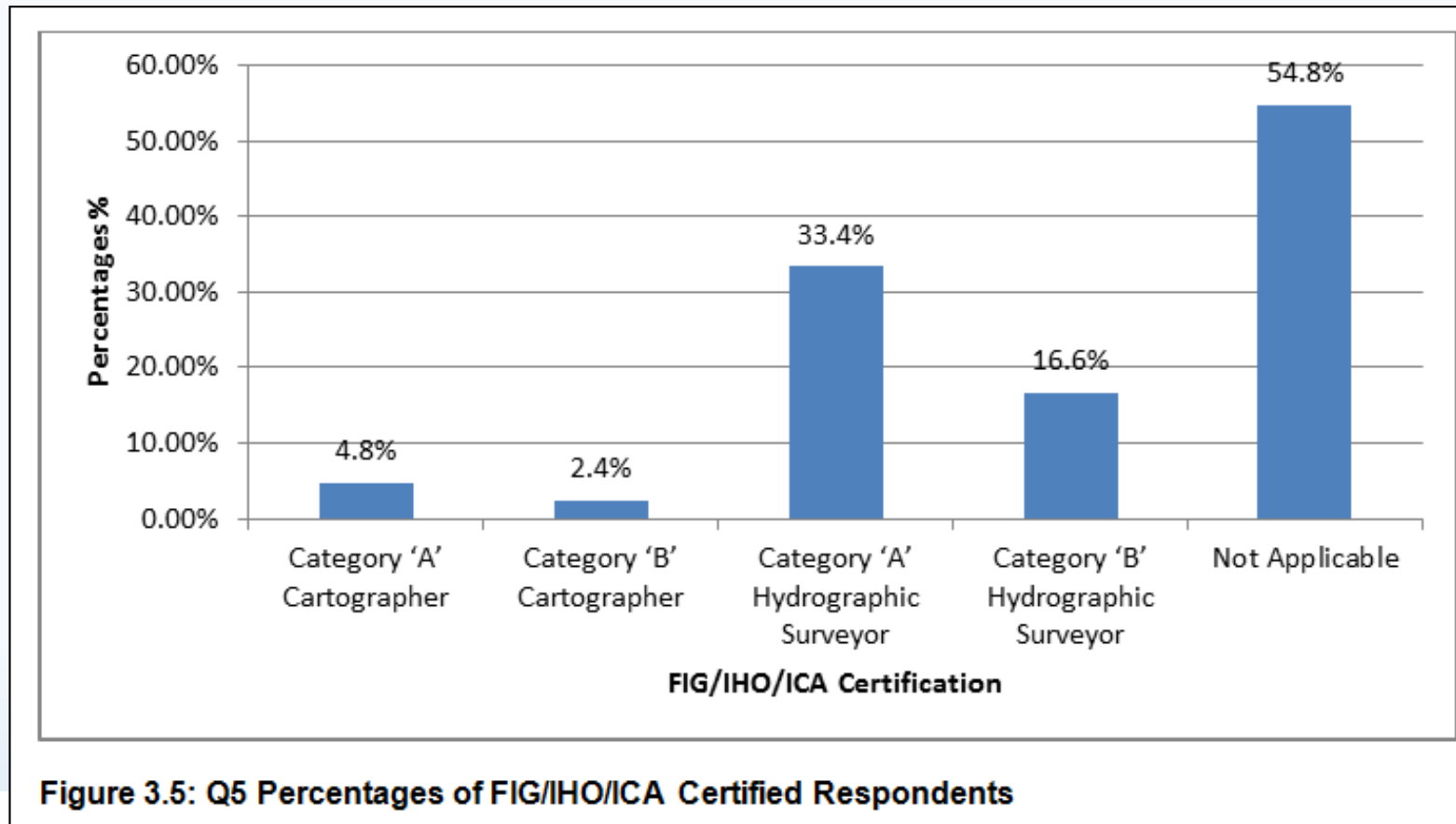
Figure 3.2: Q2 Industry Sectors where Questionnaire Respondents are or have Previously Worked.



HSPT - Questionnaire

- Questionnaire Results - about respondents “Certification” (Q5)

45.2% of respondents identified as IHO Certified Hydrographers or Cartographers (Cat. A/Cat. B)



HSPT - Questionnaire

- Questionnaire Results - about respondents (Q6)

72.6% of the respondents replied as an individual. 22.6% responded on behalf of company/organization and 4.8% responded on behalf of an IHO Member State (= 24 MS : India, Brazil, Germany, Finland, Denmark, Thailand, Oman, South Korea, Italy, (x2) Portugal, Sweden, Indonesia, France, Malaysia, USA (x5), Papua New Guinea).

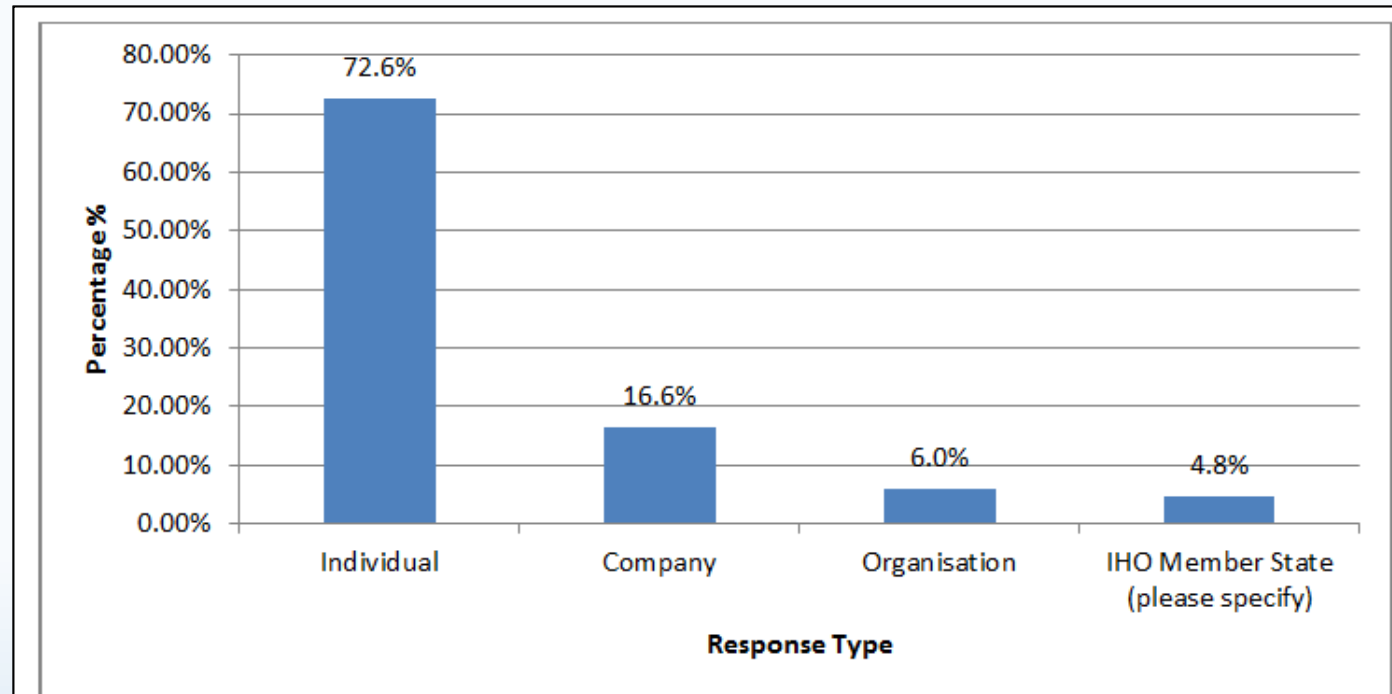


Figure 3.6: Q6 S-44 Questionnaire Response Type



HSPT - Questionnaire

- Questionnaire Results - about respondents “Most Used Platform” (Q9)

Nearshore and coastal vessel are the most commonly used platforms (71.6%) and **use of autonomous vehicles is considered significant** (Surface: 22.6%, Underwater: 24.6%, Aerial: 15.8%).

Multibeam Echosounder is the main sensor used by respondents – also SBES+SSS

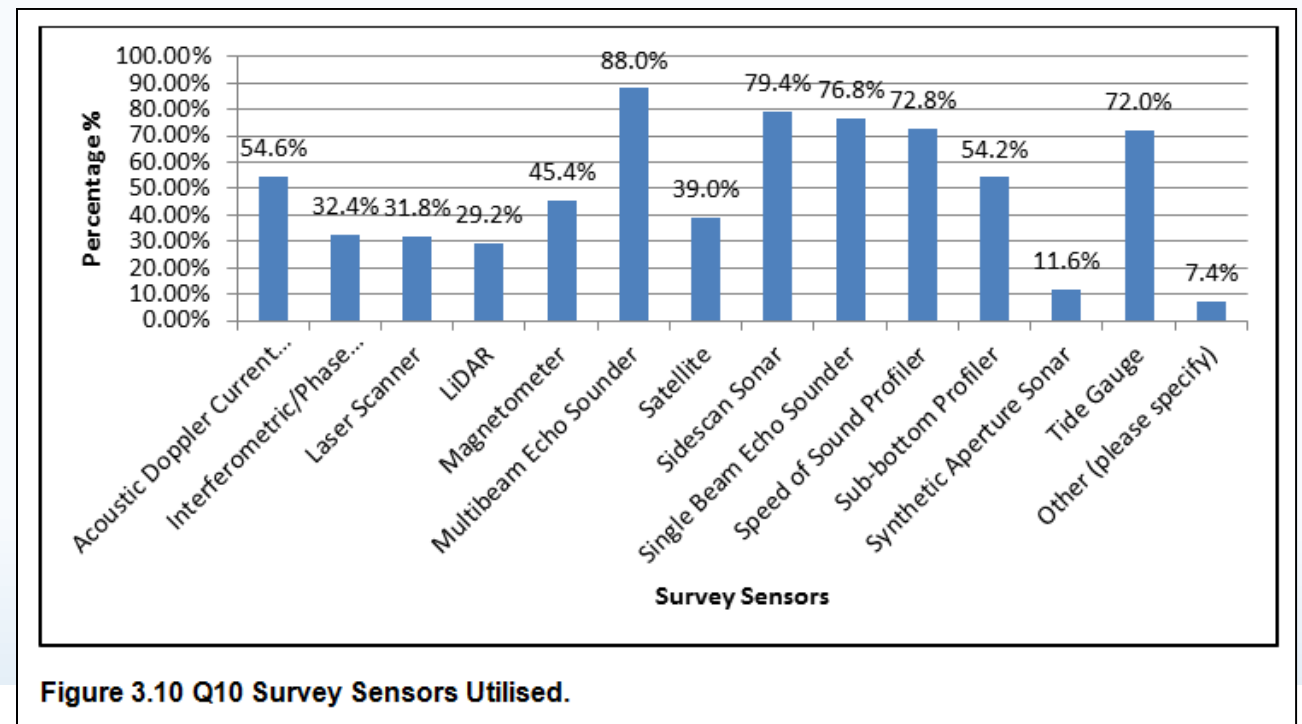


Figure 3.10 Q10 Survey Sensors Utilised.

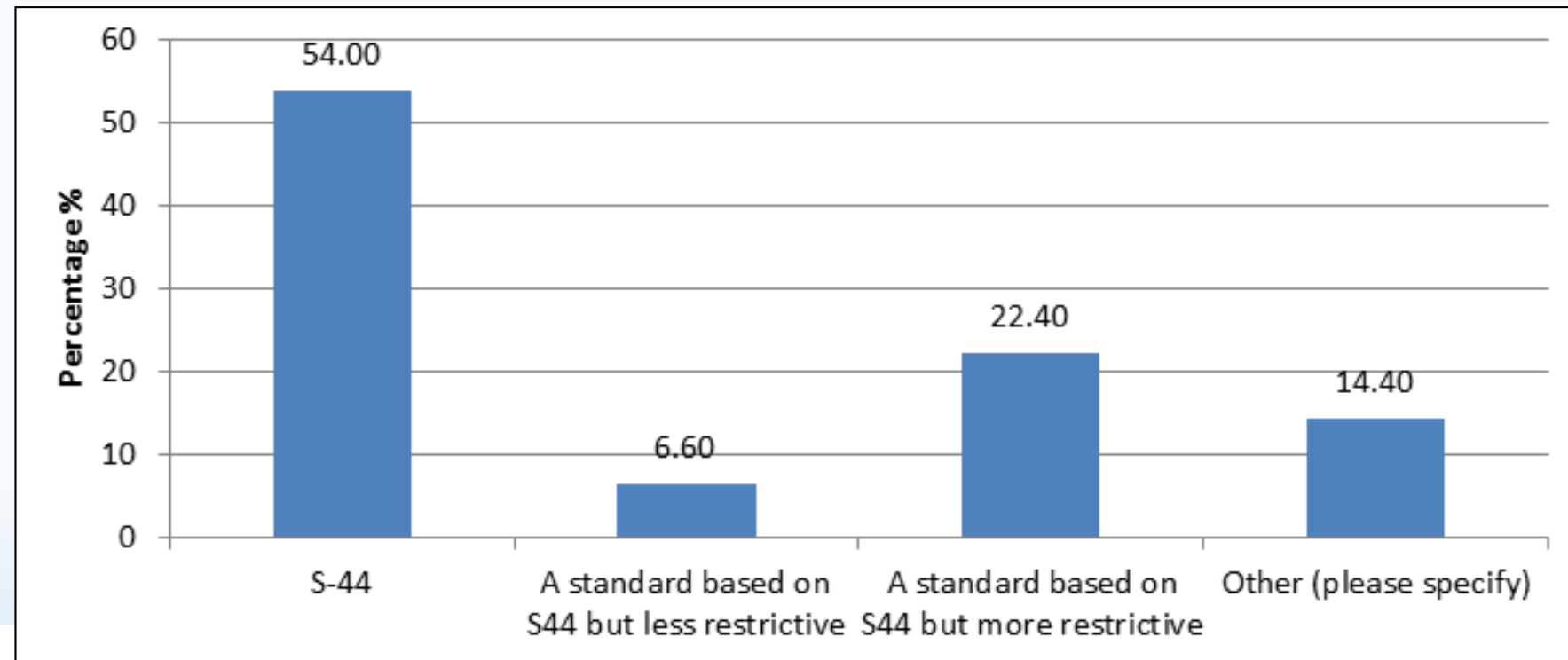


HSPT - Questionnaire

- Questionnaire Results: “Documented Standard?” (Q12)

A large majority of the surveys undertaken by respondents are based on a documented standard (83%).

Of those, 54% use S-44, 22.4% use a standard more restrictive based on S-44 and 6.6% use a standard less restrictive based on S44 (most mentioned criteria: client specifications, in-house standards, LINZ, NOAA specs.).

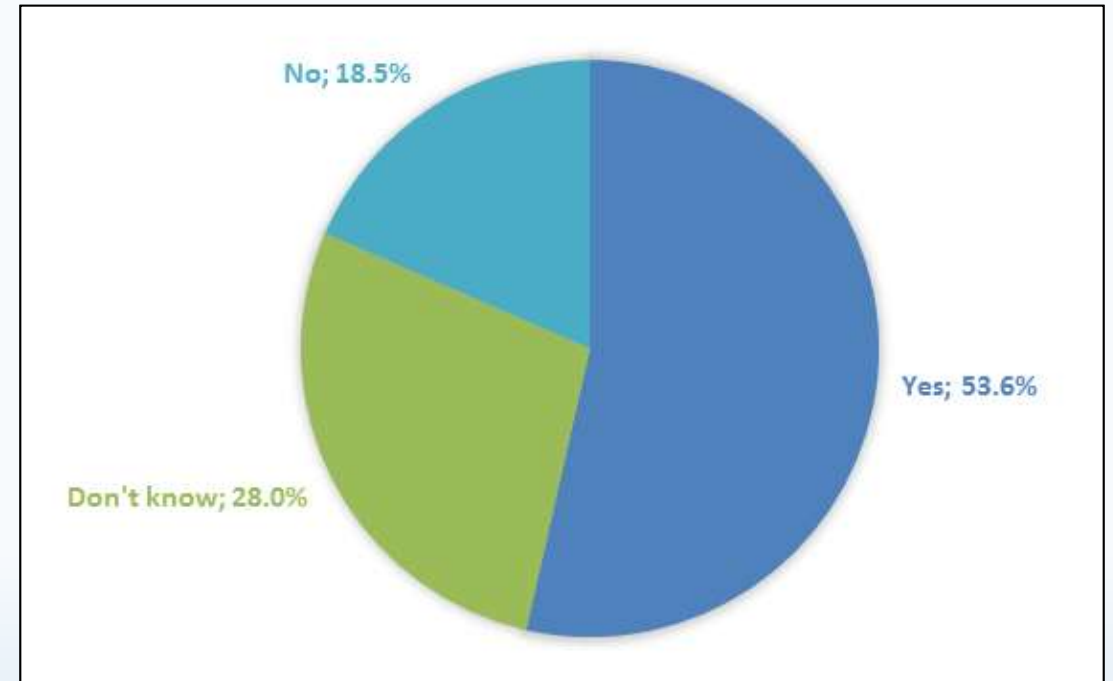


HSPT - Questionnaire

- Questionnaire Results: “S-44 relevant and S-44 Sufficiently Strict?” (Q15, Q17, Q19)

83.5% of the respondents consider S-44 Edition 5 is relevant to them.

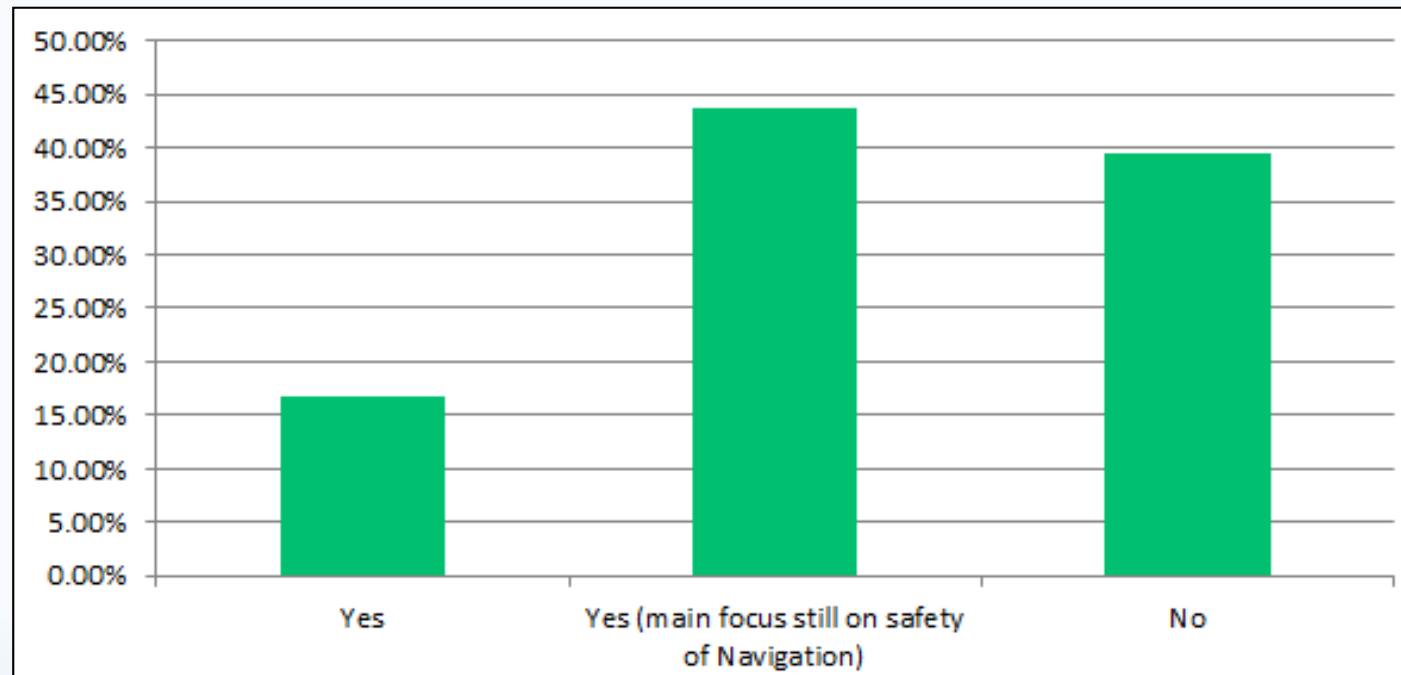
Furthermore, regarding the exclusive purpose of safety of navigation, the majority consider S-44 as sufficiently strict (53.5%).



HSPT - Questionnaire

- Questionnaire Results: “S-44 extended to other purposes” (Q25)

A majority (60.8%) consider S-44 should be extended for other purposes and includes 43.6% who think the S-44 focus must be safety of navigation.



HSPT – S-44 6Ed. Preliminary summary (and dedicated team in charge of chapters)

• Preface		
• Introduction		
• Glossary	→	AML/GER/Argans/FRA
• Acronyms	→	AML/GER/Argans/FRA
• Chapter 1 – Classification of Surveys	→	CAN/PRT/ITA/GBR
• Chapter 2 – Horizontal and Vertical Positioning	→	NOAA/NLD/SWE
• Chapter 3 – Depths	→	BRA/PRT/SWE
• Chapter 4 – Features and Nature of the bottom	→	NGA/iXblue/Fugro
• Chapter 5 – Tides, Water Levels and Currents	→	iXblue/Fugro/NLD/NAVO/CAN
• Chapter 6 – Topographic Surveys	→	SWE/CAN
• Chapter 7 – Metadata	→	AUS/iXblue/Fugro/FRA
• Chapter 8 – Table 1 and Matrix	→	CAN/BRA/NGA/Fugro/iXblue/GBR
• Annex A – Quality Control	→	NLD/FRA/iXblue/CCOM-JHC/CAN/NAVO/BRA/AML/PRT
• Annex B – Data Processing	→	NLD/FRA/iXblue/CCOM-JHC/CAN/NAVO/BRA/AML/PRT
• Annex C – Grid Considerations	→	NAVO/NOAA/PRT/AUS/CCOM-JHC/Fugro/BRA/SWE



HSPT – The Matrix Approach

The « Matrix » concept:

- To complet the « Table 1 » (Table 1 will stay in the S-44 – probably as it is)
- The matrix is a tool for other needs (not mandatory to use)
- A tool to specifiy surveys, according to the real needs
- A tool to qualify a survey, a posteriori
- This Matrix approach maintains the core philosophy of S-44 concept, but now allows expansion and future growth.



HSPT – The Matrix Approach

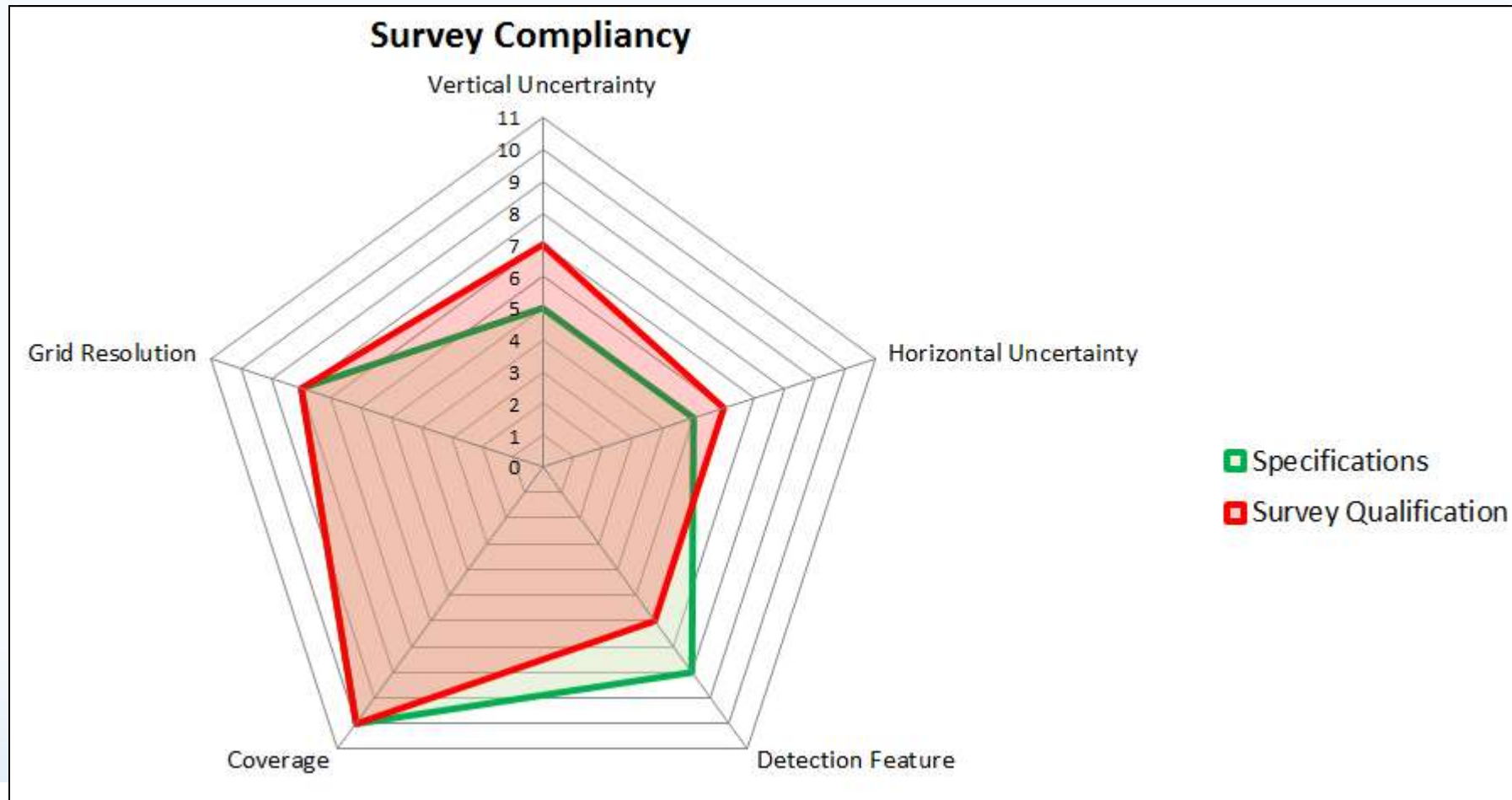
Cells in grey used for S-44 Orders (Safety of Nav. Hydrographic Survey)

		1	2	3	4	5	6	7	8	9	10	11
A	Total Horizontal Uncertainty (m)	20+10% depth	5+5% depth	50.0	20.0	10.0	5.0	2.0	1.0	0.5	0.25	0.1
B	Total Vertical Uncertainty (m)			50.0	20.0	10.0	a = 1.0 b=0.023	a = 1.0 b=0.013	a = 0.5 b=0.013	a = 0.25 b=0.0075	a = 0.15 b=0.0075	0.1
C	Feature Detection (m ³)	Not Required		10% depth	20.0	10.0	5.0	2.0	1.0	0.5	0.25	0.1
D	Seafloor Coverage / Line Spacing	Not Required	5 x average depth	4 x average depth	3 x average depth or 25 meters	2 x average depth	10%	25%	50%	75%	100%	200%
E	Positioning of Fixed Aids (m)	Not Required		10.0	5.0	2.5	2.0	1.5	1.0	0.5	0.25	0.1
F	Positioning of Coastline & Topography (m)	Not Required		50.0	25.0	20.0	10.0	10.0	5.0	2.0	1.0	0.5
G	Floating Navigation Aids (m)	Not Required		100.0	50.0	25.0	20.0	15.0	10.0	5.0	2.0	1.0
H	Survey Data Grid Resolution(m ²)	100.0	50.0	10.0	5.0	2.0	2.0	1.5	1.0	0.5	0.25	0.1
I	Grid Source Sounding Density (pts/bin)			Interpolated	<1	1	5	10	25	50	100	>100
J	Current	Not Required									0.1knot / 10°	
K	Seafloor characterization	Not Required										Mandatory
L	Mosaic Résolution (m)	>5	5	2	1	0.75	0.5	0.25	0.10	0.07	0.05	0.02
M	??											



HSPT – The matrix Approach

Possible display of a result "Specifications vs Qualification"



HSPT - Calendrier

Time table to come:

- Intersessional work on chapters until the next meeting (HSPT3, Mars 2019) : objective provide a draft of the 6th edition
- Provide a version v1.0.0 by the end of 2019 (based on the work done during HSPT2 et HSPT3 and intersessional activities)
- Feedback to IHO/HSSC (HSSC11, May 2019)
- Last meeting at the end of 2019 – or beginning of 2020) for last updates according to members stats feedbacks
- Release the final 6th edition to HSSC in 2020.



Thanks you....

