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**Minutes of 31st International Research Ship Operators Meeting held October 1-5, 2018 at the Mediterranean Centre for Marine and Environmental Research, (CMIMA), Consejo Superior De Investigaciones Cientificas, Barcelona, Spain**

**Monday 1 October 2018- Registration and IRSO Icebreaker**

**Tuesday 2 October 2018**

**Welcome and Administrative Remarks**

IRSO Chair Bob Houtman/NSF welcomed the attendees and acknowledged the overwhelming interest in the meeting with over 123 delegates from 23 countries. A very special thank you to the Mediterranean Centre for Marine and Environmental Research for hosting this meeting. The 31<sup>st</sup> Anniversary is a testament to the importance of IRSO with an impressive array of expertise represented. We have many representatives from marine operators, shipyards, ship-operating firms, to private companies and government agencies. Bob encouraged us all to take advantage of the talent represented here and to interact and share information.

**Round Table Introductions**

**Introduction to CMIMA- Mediterranean Centre for Marine and Environment Research and Meeting Hosts**

Jordi Cervantes/CSIC provided a warm welcome and a thank you for coming to Barcelona. He introduced CMIMA, which is part of the Spanish Research Council. The Spanish Research Council is Spain's largest public research organization. The Marine Technology Unit provides the support to the national Policy Research and Development for marine science, technology and polar programs. The UTM Marine Technology Unit started 26 years ago and has 57 staff and technicians.

**Adoption of the Agenda of the 31st meeting-**

Bob Houtman invited attendees to bring forward any additional agenda items. None were suggested and the agenda was adopted as written.

**Review of Minutes of the 30<sup>th</sup> Meeting.**

- No changes to the minutes were proposed. Minutes from the 30<sup>th</sup> IRSO meeting were unanimously approved.

**Review of the IRSO Terms of Reference (ToR).**

- Delegates were invited to review them during the meeting and to propose any edits at the close of the meeting.

**Review of Action Items**

Delegates were invited to provide input. None suggested at this time.

Bob Houtman stated that the U.S. would continue to provide funding support for the IRSO web site through October of 2020. The next UNOLS Office at the University of Washington under Doug Russell as UNOLS Executive Secretary would maintain this responsibility.

IRSO in 2019- CSIRO in Hobart, Tasmania has agreed to host the IRSO meeting in 2019. Tentative dates suggested were October 6-9, 2019. This topic would be revisited at the close of the meeting and firm dates would be provided soon.

**Review of the IRSO Website.**

- Jon Alberts/UNOLS provided an overview of the IRSO web site. This discussion began with a review of the IRSO participant types and the definitions of each.
- This included a review of the IRSO link, sections of the website on meetings, members, reports, and terms of reference. Jon thanked the delegates for their assistance in keeping the information on each institution and country accurate. This is an on-going effort as details do change.
- Members were reminded that INMARTECH 2018 would be hosted by Woods Hole Oceanographic Institution in Falmouth, Massachusetts, USA, from October 16-18, 2018.
- Finally, a list of the IRSO Action Items from the IRSO 30<sup>th</sup> meeting were reviewed with an update on what had been completed to date.

**Theme 1: Delegates Report of Activity**

**New Zealand Research Fleet- Rob Christie/NIWA**

- National Institute of Water and Atmospheric Research (NIWA) overview with videos.
- Core purpose of NIWA's organizational structure, budget, staff, and center locations.
- Nationally significant science assets include a new high performance computer center just built.

- National Environmental Monitoring Network.
- National Invertebrate Collection Aquaculture.
- NIWA operates three primary research vessels, *R/V Tangaroa*, *R/V Kaharoa*, and *R/V Ikatere*. Vessel specifications were highlighted.
- Rob Christie is Manager of NIWA Marine Resources and Greg Foothead is General Manager of NIWA vessels.
- Recent science mission for 2017/2018 included the Kaikōura earthquake with highlights after earthquake. Conducted transect again and no marine life left there.
- Survey of sound is a seabed mapping study to identify areas of high diversity.
- Vessel Replacement, working on this now. The *Tangaroa*, built in 1991 is 27 years old, due for replacement and NIWA is working on vessel replacement now.
- Seabed 2030 South and West Centre- NIWA was chosen to do this.
- Eurofleet's Plus- *R/V Tangaroa* is available in the Pacific for European research agencies through Eurofleets +.

**Research Infrastructure Databases (EurOcean\_RID and EurOcean\_RV- Sandra Isabel Oliveira Sa'/EurOcean.**

- Working towards the development of an overarching marine research infrastructures information system.
- Aspects of what we used to know, such as geographical distribution, technical capacity, contact people and operators to how we have evolved from 2006 to 2014.
- Network of operators, researchers scientists, a bottom up approach to know what is needed to build RID 2.0.
- Who we are- 13 members from 10 countries and 4 cooperating members.

**ERVO Group- Cooperation with Eurofleets +, European Marine Board, Klas Lackschewitz/Geomar & Lieven Naudts/Royal Belgian Institute of Natural Sciences**

- European Research Vessel Operators Group- informal European network with no legal status or financial resources, created in 1999 with an overview and history of the group.
- ERVO Meetings provide opportunity for research vessel operator to exchange information.
- Ideal focal point for any organization to work directly with research vessel experts.
- Now working to update the 2007 European Marine Board position paper. Per Nieuwejaar is the chair of the EMB expert working group that will write this new position paper and Valerie Mazauric/Ifremer is co-chair.

- Objectives include status of European R/V's and equipment, measure of our progress since 2007, assessing the role of ships in EOOS, exploring options for future management of vessels.
- Working on seven distinct work packages.
- Some preliminary results and meetings schedules, initiatives, etc.

**Australian Marine National Facility- Challenges of Scaling up operations from 180 to 300 days per year- Toni Moate/CSIRO**

- CSIRO and background on the Marine National Facility- highlights since IRSO 2017.
- Scaling up operations to a full year.
- *R/V Investigator* is Australia's blue water research platform, only one deep-water vessel for research in Australia. Capable of multi-disciplinary research.
- *R/V Investigator* was accepted in May 2018 as the world's first global atmospheric watch regional mobile station by the World Meteorological Organization.
- From 2014 to mid-2018, government funding was for 180 days, in July 2018, now funded up to full op year of 300 days.
- Operational challenges include safety aspects, technical and operational support, (balancing at sea and time at home for crew), voyage planning, (CSIRO plans 18 months in advance and is looking at new software for planning.
- Scheduling challenges- for planned maintenance, fueling, and equipment maintenance.
- Taking a step back to take a holistic view of each voyage.
- Transition year- CSIRO plans on 2018 to 2019 being a year of transition.
- Going digital in July 2019.
- First full year of operations at 300 days will be in 2019.
- CSIRO may also use outside vessels to get to 300 days.

**NOAA Fleet Recapitalization Plan- Scott Sirois/NOAA**

- Overview of the current NOAA fleet of 16 ships and homeport locations.
- Urgency for NOAA's Fleet recapitalization of the fleet required as NOAA has three ships over 50 years old. By 2028, without recapitalization, NOAA would only have eight ships.
- The 2016 Fleet Recapitalization Plan identified four new multi-mission vessel classes. Build new ships, have the funding, need to put into action.
- Industry day at workboat show.
- RFP released in early 2018, closed late spring of 2018 for the Navy AGOR variant.
- NAV- Navy Agor Variant timeline for the schedule and concept of operations.
- Assisted by NAVSEA using the lessons learned from AGOR Ride and Armstrong.
- Class A- There will be two ships, delivered in mid-2023 and 2024.

- Class B- still developing requirements, RFP will be released within 18 months.
- Class C- still developing requirements, RFP will be released within 24 months.

**Xiamen University and its State Key Lab for Marine Environmental Science-  
Haili Wang/XMU**

- Haili Wang presented as a new member to IRSO.
- History of XMU, founded in 1921 by Mr. Tan Kah Kee.
- Three main campuses with 2800 faculty members.
- One overseas branch in Malaysia.
- Cradle of marine science education in China. Time line since 1920's with marine science and ecology being the focus.
- Marine Environmental Science- MEL- is the state's key laboratory, founded in 2005; focus on marine geochemistry, marine ecology, toxicology and ocean ecosystems. MEL has established partnerships with universities in the U.S., South America and Europe.
- Joint Institute for Coastal Research Management established with Univ. of Delaware in June 2008 for a dual PhD program.
- *R/V Tan Kah Kee*- designed by Glostern, built in Quango. Specifications listed in slides.
- Open house with *R/V Tara* was held April 2-10, 2018 to raise awareness about marine environmental protection.
- April-May 2018 they did their first ROV cruise with Canadian ROV ROPOS. Also did outreach telepresence. ROV Ops, set records for China with 33 hour dive.
- Student Training Cruise called the Silk Road at Sea focused on expanding research areas from offshore to deep sea, connected XMU and China-ASEAN College of Marine Studies.
- In 2019, they will do a Geotraces cruise from April to June 2019; this will be an international cruise with a multi-disciplinary focus.

**Israel Oceanographic and Limnological Research, *R/V Bat Galim*  
Gideon Tibor/Israel Oceanographic and Limnological Research**

- New member presentation on the National Institute of Oceanography of the Israel Oceanographic & Limnological Research.
- Founded in 1967, annual budget of 16 million, 160 scientist, engineers, technicians and support staff.
- Seventy MSc. and PhD. Students.
- Core Activities include oceanographic research, monitoring human impacts, observing and modeling, mapping, geohazards, and the Israel Marine Data Center.

- New Research Vessel *R/V Bat Galim*, former German built support vessel, 39 meters, 528 tonnes, 14-day endurance. Overview of the refit, which used the UNOLS Science Mission Requirements for a Regional Class vessel. Israel government funded 5 million for a new vessel.
- Acoustic Test performed by Tim Gates, ship is very quiet.

### **Ifremer and the French Oceanographic Fleet** **Olivier Lefort/Ifremer**

- French Oceanographic Fleet, now with a new organizational structure since January 2018.
- Overview of (4) Global and Ocean Class vessels, (6) Coastal Fleet vessels and (6) Local vessels with a brief overview of the missions of each vessel.
- Also a complete review of the current suite of submersibles, ROVs and AUV's.
- Ifremer staff level currently at 3600 scientists, researchers, engineers.
- Annual investment and operations budget of 72 million Euros.
- Partnership at the national level with Navy and Hydrographic Dept.
- Reorganization began in 2017, and then in Jan 2018, Ifremer became the only institutional operator of the French Oceanographic Fleet.
- Genavir is a subsidiary of Ifremer and is the ship manager of the Fleet except that the *Marion Dufresne* is managed by LDAS and Coastal/Local vessels are operated by INSU.
- Slides show the new governance structure and the unit breakdown of each group and what they all do.
- Strategic challenges continue with human occupied vehicles.
- *Nautile* will be in operation until 2025, then will be replaced by a new generation deep ROV.
- A replacement plan for the Coastal Fleet will be finalized and validated by beginning of 2019.

### **JAMSTEC Fleet Management Reborn Plan** **Satoshi Tsukioka/JAMSTEC**

- Overview of the JAMSTEC fleets of ships, ROV, HOV, and AUV with details on the vehicle specifications and the capabilities of each.
- Detailed chart showing the specifications and capabilities of each vessel.
- Current budget concerns with a trend towards a reduced budget. At present, the 2016 budget was three-quarters of what the budget was in 2008, approx. a 3% drop per year.
- Diesel fuel price is a concern.
- JAMSTEC is working on a restructuring of Marine Research Platforms for 2019.
- Combine Marine Technology and Engineering Centers (Maritec) and the Center for Deep Earth Exploration (CDEX) into one organization within JAMSTEC.

- JAMSTEC will also start a 7-year restructuring in FY 2019. All 7 research vessels will be managed by a single department within JAMSTEC. Should result in more scientifically adaptable research platforms, improved communications among engineers and operators. Also planning for increased commercial usage to take advantage of vessels' idle time.
- More internationalization requested by JAMSTEC Advisory Board.

## **Theme 2 R/V Builds, Modifications and Performance**

### **Overview of the SIOSOA**

#### **Zhu Yongling/ Second Institute of Oceanography, Ministry of Natural Resources**

- Overview of Second Institute of Oceanography, established in 1966, based in Hangzhou. Now a strong non-profit oceanographic research institute focusing on marine scientific research in China Sea, oceans and Polar Regions. Also focusing on research and development of technology for marine environmental research.
- Organization chart.
- Operation and Management of the *R/V Xiangyanghong 10* with vessel specifications. Delivered in 2014, ship is 93 meters, 24 crew and 41 scientists with a 60-day endurance, 12000 nm range. List of equipment includes gondola with multibeam, ADCP, USBL, and sub-bottom profiler.
- Additional photos shown on deck handling gear, labs.
- Schedule for 2017 had 282 days.

### **Renewed Measurements of Underwater radiated noise levels after 5 years of operations, *R/V Simon Stevin***

#### **Dre Cattrijisse/Flanders Marine Institute**

- Underwater Radiated Noise- *R/V Simon Stevin* and aspects of keeping a quiet ship and what changed after 5 years.
- Features to consider include gearbox, diesel gensets, electric propulsion engines, propellers, hull appendages and auxiliaries.
- At sea underwater-radiated noise measurements at various hull speeds shows varied noise levels.
- Tests showed issues with wear and tear on mounts, vibration issues with turbos, cooling and lube pumps, seawater intake and mounting for multibeam.
- Propellers had been groomed to remove "singing props".

### ***R/V Kronprins Haakon* Ice Trials Report**

#### **Per Nieuwejaar/IMR**

- Ice Trial conducted from May 22 to June 1, 2018, north of Svalbard, Tests went very well.

- They had conducted model tests during hull design at HSVA Hamburg. Contractual performance for full-scale ice tests based on model test results.
- Slides listed ice operations requirements and the requirements of the actual tests.
- Ice thickness measurements taken from an EM Bird sensor mounted off a boom, then confirmation of ice thickness along track with ice drill.
- Vessel can break first year level ice of 1 m with a 20 cm snow layer at 4.05 kts. Ice Ridges up to 8 m thick when ramming.
- Lesson learned, interior of ship is very quiet. The moonpool filled with slush ice with hatch closed. Some slush in drop keel trunk. Evaporator sea chest showed clogging. Azimuth thrusters superb maneuvering in solid Ice. Also good in creating open water “duck pond” for gear deployment.
- Polarimetric radar – lesson learned that it is great in ice.

### **Regional Class Research Vessels, *R/V Marcus G. Langseth* Retirement Plans Ocean Observatories Initiative**

#### **Bob Houtman/NSF**

- Timeline of the RCRV process, which began in 2000 with development, design, construction, operations and divestment stages.
- Went through a right size process where five ships will be retired and be replaced by three new ships.
- Process of Oregon State University (OSU) winning award to do design refresh and then manage the build and transition to operations.
- Used a community driven Science Mission Requirements process.
- Earned Value Management system will be used to measure the construction process and payment schedule.
- Solicitation for the construction of up to three ships. Specifications of the ships listed.
- Timeline for the construction of hull No. 1, with delivery in early 2021 for hull number 1.
- RCRV- 1 will be operated by Oregon State University.
- RCRV-2 will be operated by University of Rhode Island.
- *R/V Marcus G. Langseth* Retirement- ship will be retired at end of 2020. NSF is interested in speaking with international institutions on possible provision of seismic capability for the U.S.

### **AGOR Class Midlife Refit**

#### **Mike Prince/ONR and Doug Russell/UW**

- Why consider a midlife refit? Three U.S. Navy Global Class Research Vessels, (AGOR 23 Class) designed for a 30-year service life. *R/V Thompson* delivered in 1991, *R/V Reveille* in 1996, and *R/V Atlantis* in 1997.
- U.S. Navy just built *R/V Neil Armstrong* and *R/V Sally Ride*.
- AGR 23 Class in good shape and Navy has no plans to build new globals.
- Improve efficiency, environmental compliance and to replace obsolete parts and systems.



- Core elements of the refit list include Tier 3 diesel generators, new switchboards, power management systems, and automation. Also, alarm systems.
- New DC drives and overhauled DC motors.
- Overhaul and new mounting plate for bow thrusters.
- Bring key systems into environmental regulations.
- Refurbish and replace piping, wiring, steel plating, overheads, lights.
- Timeline for *Thompson*, completed and back in service in Feb 2018, cost 52 million dollars. Then *Revelle* planned for April 2019 and then *Atlantis* for May 2020.
- Lessons Learned- chart of valuable lessons learned showed. Power notching caused major problems, put in line filters. Also, planned for 10 months and actual was 18 months.

### **ONR's Flip and DSV Alvin Upgrades**

#### **Tim Schnoor/ONR**

- ONR's Navy Oceanographic Research Vessels of the U.S. Academic Fleet- *Neil Armstrong*, *Atlantis*, *Revelle*, *Sally Ride*, *Kilo Moana*, *Thomas Thompson*, and *Research Platform- Flip*- Overview of the number of days and types of missions each vessel supports. ONR ships are working around the world.
- Fleet of research vessels- they are Navy owned, but chartered out to UNOLS operators.
- Allowed to work in UNOLS, operating with different styles, since 1960. Established day rate, with a set aside for maintenance.
- Classed by American Bureau of Shipping with a Certificate Of Inspection and Navy inspections every 5 years.
- Retired *R/V Knorr* given to Mexico and *R/V Melville* to Philippines.
- *RP Flip* and *DSV Alvin* are unique platforms.
- *DSV Alvin* was built in 1964 by Allan Vine at Woods Hole Oceanographic Institution. *Alvin* has a long history, which includes dives at the wreck of the *Titanic*. Sphere changed in 1970's then a few years ago in 2013. New larger sphere, rated for 6500 meters, 5 view ports. Current plan is that *Alvin* will be out of service at the end of 2019, when *Alvin* goes into an overhaul and is upgraded to 6500 meters.
- *Flip*- Floating Instrument Platform, built in 1962 and is a very unique platform for studying physical oceanographic properties and other unique field experiments. Stable platform, less than one meter of motion in a 10-meter sea. *Flip* hasn't been used much in recent years. *Flip* specifications provided in slides.

### **Ifremer- French Oceanographic Fleet Novelties and Projects**

#### **Olivier Lefort/Ifremer**

*ROV Ariane*.

- Hybrid Remote Operated Vehicle (HROV) began preliminary studies in 2011, then definition studies in 2012, conception and realization in 2013, with sea trials in December 2014. Then first scientific expedition in May 2017 and second year of operation in 2018. *HROV Ariane* can operate with a tether/cable or in a full autonomous mode.
- General features – Can operate from a small vessel without dynamic positioning capability and can operate to 2500 meters.
- Can be equipped in an exploration configuration or a cartographic configuration. They have had good results with canyon exploration, fauna sampling or to create 3D optical mosaics.
- Also good results in cartographic set up with digital still cameras and multibeam echo sounders.
- Been operated in 2500-meter deployments and in 500-meter shallow water configuration.

*R/V Thalassa* modernization-

- Post refit radiated noise profiles with four new Caterpillar generators.
- Modification of main engine control system and new converters.
- Ifremer utilized a new device for measuring radiated noise curves. An acoustic “raft” in drift mode was used with good success to develop new noise curves.

Future Coastal Vessel

- Advanced age of Fleet is Ifremer impetus for working on new vessel designs.
- 25 m and 35 m vessels are being planned for the next 3-5 years.
- Will replace older coastal vessels.
- With chart of vessel specification and vessel capabilities for each vessel.

**JAMSTEC -Construction of Research Vessel Database for Efficient Operation**

**Ken Yatsu/JAMSTEC**

- Development of research vessel database by the Department of Mathematical Science and Advanced Technology at JAMSTEC.
- Background study shows reduction in budget and total operating days for vessels.
- Goal is to provide data from statistical data sets to be used in future cruise planning. Followed a 3-step process of collecting time sequence data of vessel operations, then construction of the databases and then development of applications for sending daily vessel status report.
- There is some difficulty in creating database as much of the data is written in text sentences.
- Database structure and how it was written is shown in presentation slides.
- This represents a significant effort over a two-year period.
- Time sequence data from the past ten years of daily reports has been entered into database.

- End result will lead to improved understanding of vessel down time.

### ***RSV Nuyina- Exciting Future of the Australian Antarctic Program***

#### **Phillip Boxall/AAD**

- *RSV Nuyina* will be Australia's new icebreaker to replace *RSV Aurora Australis*.
- *RSV Aurora Australis* is 28 years old and has insufficient cargo capacity to meet current needs. Single engine, single crane and lack of redundancy in vessel systems is cause for concern. Part of the Australian Antarctic Strategy 20 Year Action Plan.
- 550 million Australia dollars.
- Role of new ship, *RSV Nuyina* will be station resupply of Antarctic and Sub-Antarctic research stations and scientific research. Then secondary support to other agencies and emergency response.
- Project Overview- RFP in 2013, then RFT in 2014, contract in place in April 2016, and construction began in July 2017 at DSNS Galati, Romania. Expected to be delivered in mid-2020.
- Vessel capability represents a significant increase over *Aurora Australis*.

#### **Wrap-Up Discussion for Day 1-**

Bob Houtman asked if there were any other discussion items for today. There were none and the Group adjourned for the day.

### **Wednesday 3 October 2018 - Day 2**

#### **Administrative Matters- Logistics- Bob Houtman/NSF & Erica Koning/NIOZ**

#### **Theme 3- Manning, Safety, and Training**

##### **Civility at Sea**

##### **Rose Dufour/NSF**

- Rose Dufour reported on recent steps at NSF for the Academic Research Fleet (ARF) to be sensitive to the gender issue.
- There are U.S. laws in place to protect against harassment. This approach has limited effect and now the focus is on changing behavior.
- It is understood that there can be misunderstandings; the goal is need to find the right balance and to be more sensitive to all aspects of the work environment.
- Rose shared her personal account of being at sea on an ARF ship about thirty years ago. This was before Title IX. She was on a 43-day cruise as only one of three women. Her account is described in the slides.

- Now as an NSF Program Director, she is in a position to direct policy on ships in the ARF.
- The “Maintaining an Environment of Respect Aboard Ships” (MERAS) Committee was formed to address these issues. This is a partnership with other U.S. Federal agencies to work together on these themes.
- MERAS is currently working on a new video, which will address these issues. Format for Module 1 is a short video, funded by NOAA, with input from Federal partners and UNOLS. Module 2 is NSF specific and funded by NSF, and Module 3 is a focus on ship’s reporting method. Preventing Harassment and Discrimination at Sea: Complaint Resolution Flow Chart.
- Other MERAS activities include a review of ceremonies at sea, which could be considered a form of hazing.
- Looking at a help-line for the Academic Research Fleet and RAINN is under consideration.
- NSF has a zero-tolerance approach and in cases involving harassment, the NSF grant will be cancelled if the individual is convicted.
- NSF/Rose wants to challenge the UNOLS operators to make changes. There are no women as marine superintendents or as full time Captains.
- You can tube a video of Module 1. Rose showed Module 1 of the NOAA portion.
- Module 2 will be NSF specific with scenarios played out.

### **Polar Code Workshop and Update Per Nieuwejaar/IMR**

- Overview of the second Polar Code workshop agenda held May 23-24, 2018 in Bergen, Norway. Detailed agenda of topics in slides.
- There has been some disconnect between regulators and operators. Regulators need practical knowledge that ship operators can support.
- European Marine Board and ERVO have an established working group called WP 3-Polar Regions. Looking to address rapid environmental changes. Members include
  - Øystein Mikelborg, Norwegian Polar Institute (WP leader)
  - Michael Klages, University of Gothenburg, Sweden
  - Franco Coren, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Italy
  - Juanjo Danobeitia, European Multidisciplinary Seafloor and Water-Column Observatory (EMSO), EU
  - Per W. Nieuwejaar, Institute of Marine Research, Norway
- Working Group looking at status of European research vessels and equipment. Measuring the progress made since 2007. Assess role of R/V’s. In addition, options for management of the Fleet.
- List of Polar Code ships and category of each.

- ARICE- Polar Research Vessels- well funded program for trans-national access for any researchers to go to the Arctic. The Polar Research vessels involved with ARICE include *Polarstern, Amundsen, Oden, Sir David Attenborough, Kronprons Haakon* and *Sikuliaq*.

### **Polar Code Survival Training Course** **Hanna Suutaria/Arctia**

- Arctia Group- small company providing world leading icebreaker service.
- Owned by Finland, established in 2009. Primary business is icebreaking in the Baltic Sea. Also doing ice management, offshore services, oil spill preparedness and response.
- Fleet of icebreakers and some details on the ships.
- Arctic Polar Operations Fleet- 4 ships. *Fennica, Nordica, Otso, Polaris*
- Arctia is working entire Arctic Region.
- Ongoing Polar Code Training- Provide Polar Code ice navigation training and Arctic Polar Code Survival Training courses.
- SAREX Test Exercise Reports
- Arctia made their own custom training

### **Drug Testing** **Leigh Storey/NOC**

- Leigh Storey discussed the current NERC/NOC policy on drugs and alcohol on ships.
- Current policy allows two cans of beer or one glass of wine a day.
- Ship's Master can test someone at any time with sufficient reason i.e. accident, signs of inebriation etc.
- Dilemma- During embarkation and demobilization, this is the highest time for risk as the person may be jet lagged, there is pre-cruise anxiety, and there is an effort for team building normally by going out for a meal/alcohol, plans are changing, new teams joining (some with limited experience on ships) etc.
- If the event there is an inebriated member the Master administers a breathalyser test.
- One option being considered is to bring in an independent group to undertake random drug and alcohol testing.
- Reaction, this is not popular at all. Challenges include data protection/time delay in getting results of random testing/disciplinary actions (NOC and non-NOC staff).
- More education on this issue is sensible.
- NERC/NOC welcomes other thoughts and input on this issue.

### **Ship Planning- Ship Scheduling & Marine Facilities Planning** **Colin Day/NOC**

### **Marine Facilities Planning**

- Cloud Based software program for cruise planning, ship scheduling, and inventory tracking.
- Can tailor to a particular organization, whether a big or a little ship.
- Modules on program, inventory, mooring application, personnel planning, program construction, project management, reporting, and scientist portal.

### **Theme 4 Scientific Technology**

#### **Optimizing Ultra-Short BaseLine (USBL) Positioning from Research Vessels Geraint West/Sonardyne**

- Research vessels put unique demands on the USBL systems. List of ships with Sonardyne USBL systems.
- Tutorial on what USBL system does and the basic components of system was presented.
- In basic terms, the system is used to fix position by calculating the positioning using reply signals at the transceiver on the ship in range and bearing to position an ROV or other autonomous instrument below the ship.
- Overview of the challenges in using the USBL system if there pole mounted vibration or the transducer well is too close to propellers. There are steps that can be taken to alleviate the problems.
- Pushing the boundaries of the use of USBL systems.
- Optimum solution begins with optimum installation, understanding the errors, training and taking steps early in ship design to accommodate for a USBL system as part of the initial designs.
- Geraint West will attend Inmartech 2018 in Falmouth, Mass. He can provide white papers on USBL systems.

#### ***R/V Barnes Replacement- R/V Rachel Carson* Doug Russell/UW**

- *R/V Barnes* is a 53-year-old research vessel and the oldest ship in the Academic Research Fleet. Owned by the National Science Foundation and has conducted over 1000 cruises.
- Univ. of Washington's challenge was how to replace the ship.
- First step was to collect the Science Mission Requirements (SMR), then create a concept design.
- UW had to find funds to get a new vessel.
- Found a vessel in the United Kingdom, named the *R/V Aora*.
- Milestones of the procurement process after a donor came forward to give 1 million dollars to buy the ship.

- Delivered to Victoria, Canada on heavy lift ships, then UW personnel delivered to Seattle.
- List of equipment/upgrades done in Scotland shipyard to modify for Univ. of Washington's requirements.
- Necessary steps, which were required prior to vessel being designated a UNOLS vessel.
- First science cruise in Puget Sound, Washington was a great success.

### **What a modern research institute does**

#### **Leigh Storey/NOC**

- UK- National Oceanographic Centre (NOC).
- National Academy study on Oceanography in 2025 published.
- *R/V Terra Nova*- 1910-1913 to a modern facility.
- Key challenges of a research facility.
- Bringing ships into the digital age- while still using the older, basic systems.
- Workforce planning- bringing all these diverse groups together.
- Funding aspects.

### **JAMSTEC- Ways to Stable Survey Using AUV's**

#### **Satoshi Tsukioka/JAMSTEC**

- AUV research and development at JAMSTEC-Technological challenges and solutions.
- Since 2000, JAMSTEC has been operating AUV's using energy storage, underwater precise positioning and navigation.
- General Arrangement of engineering phase.
- In 2007, started site survey for IODP using the *AUV Urashima*.
- In 2010-2017 Japan funded surveys to do mineral deposit surveys around Japan.
- Research and Development added precision gravimeters and synthetic aperture sonars.
- Some collision with seabed prompted more research on sensors. Feedback control always has some delays. Looked at forward looking sonars and a visualization of the seafloor profile looking ahead of the AUV.
- Multibeam forward-looking sonar (SM2000 Kongsberg) installed.
- Integrated visualized image for operation was successful, allows operator to relax and can respond with a margin of time to avoid collision with the seafloor.
- Motion change of the AUV was more stable and improved gravimeter measurements.

### **Modern Icebreaking Research Vessel- Requirements to Design**

## **Anders Mård/Aker**

- Naval architect, ship designers for research vessels.
- Need for polar research vessels will continue to study earth's systems.
- Constant development of polar vessel technology with new methods of doing research.
- Phases of the acquisition include various aspects including political, research, community, financial, legal, ship design, shipbuilding, ship operation & logistics.
- Short video on Akers Arctic.
- Did a paper for an icebreaking conference, factors that are important to procure a new icebreaker. Good resource document.
- Establishing the budget and required design features is important. Need to be reasonable and have balanced budgets to stay on schedule.
- Trends and compromises- certain measures need to be taken to ensure proper hull form.
- Research discipline versus naval architecture- the research requirement will dictate the ship design.
- Conclusion- priority of essential factors is challenging. There will be different approaches to similar problems. Important to listen to all stakeholders. Solve the biggest technical problems early in the project. Understand the link between research needs and naval architecture.

## **Zero V Emissions**

### **Bruce Appelgate/SIO**

- Overview of the ships that Scripps Institution of Oceanography operates include *R/V Gordon Sproul*, *R/V Roger Revelle*, *R/V Sally Ride* and *R/P Flip*
- Feasibility study: Is it possible to build a capable, non-polluting Coastal research vessel that does not use fossil fuels with existing technology that is available commercially?
- Partner with Sandia, Glosten, DNV, MARAD and Scripps.
- Project Goals Issue- can it be fueled?
- Air pollution on California Coast from ships is a real problem.
- Properties of hydrogen manufacturing process allows the creation of hydrogen from solar and wind power.
- "Well to Wave" impact needs to be considered in accessing the true impact on the environment.
- Vessel design was done by Glosten to meet the science mission requirements of a complex cruise program using the Calcofi program as a starting point.
- Endurance of 2400 nm for 15 days at 12 kts.
- Comparison chart of various vessels to a Zero V.
- Regulatory- DNV has done a lot of work in this area and the USCG did not identify any show stoppers.
- Cost estimate of 80 million U.S. dollars



- Operating costs- about 8% higher than a comparable fossil fuel operated ship.
- Result of study- Yes, this is possible with current technology, at about the same cost of a same size vessel using fossil fuels.
- White paper is on Sandia web site.

### **ICES 209 after running URN Per Nieuwejaar/IMR**

- Between 2017 to 2018, all IMR research vessels sent to Hegemes Noise Range and all vessels are measured.
- ICES 209 standards set in 1995 recommended an upper limit to underwater-radiated noise for fisheries research vessels at 11 kts.
- Per recommends, it is time to revisit this to better understand what the science is before going to the cost of meeting ICES 209.
- What is the impact if higher noise level is allowed at the lower frequencies < 1000 Hz?
- Some of the things that can be done to quiet the ship is to look at propellers. A minor increase in speed gives significant increase in noise levels. New propellers may create phenomena of singing propellers. Could be solved by grinding trailing edge of each blade.
- Noise profile charts of each of the IMR vessels was shown, see slides for particulars and if the curve is met. If a problem is found, then a solution is also found.
- Fix propeller blades, shaft mounting, blade pitch and rpms with a chart to show what to do order to meet the PI's requirements for the science.
- Comparing ICES 209 to Silent R method.

### **Operational Strategies for fuel consumption minimization Aodhan Fitzgerald/MI**

- All public bodies must reduce energy consumption by 33% by 2020 to stay in compliance with Ireland's National Energy Efficiency Plan (NEEAP 3).
- Marine Institute's two ships *R/V Celtic Explorer* and *R/V Celtic Voyager* fuel usage at 10 kts for the *Celtic Explorer* is 5600-6000L per 24 hrs and *Celtic Voyager* at 9 kts uses 1900-2100 L per 24 hrs.
- R/V vessels are multi-purpose and consumption varies greatly by survey type. MI is looking at different metric by survey type.
- MI conducted an energy audit to track usage for each activity and to establish some audit recommendations.
- Established a list of fuel reduction measures that can be taken.

- XOCEAN Autonomous Surface Vessel is a new ASV, which is 4 m and has 14-day endurance.
- Quick overview of this new tool and some ASV operations issues.
- Has done a fisheries acoustic project with good results.
- Had to go to UK waters, as Ireland wanted an onboard lookout (human), a camera mounted on ASV illustrates a look out was kept.
- They have developed an ASV user guide.

### **Visit to Research Vessel and Museum**

Day 2- At 1430 the Group visited the research vessels *R/V Angeles Alvarino* and the *R/V Sarmiento de Gamboa*. Then a visit to the Barcelona Maritime Museum, the site of a 13<sup>th</sup> century Barcelona Shipyard.

### **Day 3- Thursday 4 October 2018** **Administrative Matters/Logistics**

Bob Houtman/NSF and Erica Koning/NIOZ paid special tribute to Jordi Cervantes and CSIC Team for ship and maritime museum tours.

### **Theme 5: Legal and Insurance**

#### **Risk Management, Insurance, and Admiralty Law** **Dennis Nixon/URI**

Main Themes of the presentation were on marine insurance, maritime news and recent regulatory changes.

#### **Insurance**

- Premiums have come down in recent years. Operators should be seeing a reduction in costs.
- Protection and Indemnity (P & I) Clubs- this is the liability insurance. There are 30-40 clubs in the world, most in the UK. There has been a 6% reduction in cost in recent years.
- Hull insurance pays for loss of ship's hull.
- Wreck removal of the Costa Concordia is still affecting premium rates. Most expensive loss in history.
- U.S. government does not purchase hull insurance, they are self-insured. U.S. buys P & I.
- In 2008, world recession has plummeted hull values, still has not recovered.
- Insurance is based on current market value of the ship.
- Issues to monitor- list of the risks that the insurance companies take into considerations,
- Factors affecting cost include high value risks, oil price, fires, climate change, navigation, human factors, cyber risks, value accumulation, and Arctic risk.

- Woods Hole Oceanographic Institution was able to drop insurance cost by 75%, by just shopping for a new company, and kept the same coverage.

### **Research Vessel News-**

Autonomous ships- IMO is working on a set of regulations by December 2020 to regulate them.

### **Regulatory News**

- *M/V El Faro* findings and background on the loss. Factors included weather, ignored forecast information, open scuttles to vent holds, loss of oil pressure in steam powered plant and limited experience in steam inspections.
- Ballast water issues- Still hotly contested in the U.S.
- Cyber Security- IMO now requires by 1 January 2021 to have a cyber-security plan. Ship will need to be able to operate manually.
- ABS and Lamar University Mariner Safety Research Initiative. Reporting of near misses is not well done. The aviation industry does a good job of this.

### **Relevant Legal Decisions-**

- Status of ROV technicians.
- Different laws apply to different classes of workers.

### **Canada Department of Fisheries and Ocean Jennifer Vollrath/DFO**

- Foreign research clearance process in Canada reviewed.
- Post WWII research clearances started to develop with the 1958 Law of the Sea.
- Any foreign state must apply using the UN application to Canada embassy, at least 45 days before mission.
- In 2017, DFO had 63 requests to conduct marine research within the Canadian EEZ, with most in the Atlantic Ocean.
- Department of Fisheries & Ocean requested clearance to work within foreign exclusive economic zones 21 times.
- Chinese Research Vessel *XUE Long* requested to work in the Canadian Arctic. This "*Snow Dragon*" request came in mid-June of 2017 for a voyage in September of 2017.
- Four members from Canada joined the voyage to collect multibeam data in the high Arctic.
- Important for safe navigation, data acquisition, seafloor mapping and international collaboration.

### **U.S. State Department- What is Marine Scientific Research.**

## **Allison Reed and Matt Kastrinsky**

- Brief review of the 1982 Law of the Sea Convention with an overview of the Marine Scientific Research Process and the Articles within the Convention.
- Types of marine scientific research that require diplomatic clearance.
- About 40 requests a year from foreign scientists come into the State Dept. in Washington to work inside the U.S. EEZ. Various steps in the process as part of the U.S. interagency review has resulted in an increase in the time to process an application.
- For U.S. scientists in foreign waters, the State Dept. receives ~ 400 clearance requests.
- U.S. State Department facilitates the process with working with U.S. embassy in each host country.
- New “Rats” online system is coming with a projected launch in 2019. It will be a cloud based system and will be more user friendly, with email alerts, and training modules.
- MSR Trends & Challenges, Allison Reed discussed this portion of the process.
- Each of the coastal states have different concerns and questions. The U.S. State Dept. is seeing more questions and requests for greater detail.
- UN Standard Form A does not have all the fields that are needed.
- Challenges in getting the clearances for AUV’s, drifter, gliders, and Sailandrones.
- Extreme weather events such as hurricanes.
- Mexico has evolving forms and requirements that make it difficult to get a clearance now.
- Flag of the Vessel or Nationality of the Chief Scientists determines how to do the clearance request. Contact MSR team at: [Marinescience@state.gov](mailto:Marinescience@state.gov)
- IOC Executive Council has ruled that Argo free-floating sensors require notification of the coastal states as it enters the EEZ.

## **Theme 6 Cooperation and Outreach**

### **Eurofleets 3 Proposal**

#### **Aodhan Fitzgerald/MI**

- Community proposal following onto Eurofleet 1 and Eurofleet 2.
- Program will run for 4 years from 2019 to 2023.
- Aodhan submitted a proposal in March 2018 and it has been funded.
- Objectives of the program include open access to an integrated and advanced Fleet of 27 research vessels, seven ROVs, five AUV’s and telepresence.
- Priority to research on sustainability of the oceans.
- There are 42 partner organizations. List of countries and ships that will participate can be viewed in the slides.
- There is trans-national access between other programs such as ARICE with with Eurofleets.

### **European Research Fleet: options for future management and coordination Giuseppe Magnifico/CNR**

- Preliminary findings of the European Marine Board Working Group on Research Vessels. Options for management and coordination of the European Research fleet.
- WP6- Assess progress made since the European Ocean Research Fleet Position Paper 10 from March 2007. Future development of Research Vessel management and coordination, including future management of the Fleet within Europe. Find ways to strengthen collaboration, enhance capability. A new written report will be developed.
- WP6 European Marine Board has created a new questionnaire on these core activities:
  - National Research Vessel Management
  - Application for ship time
  - Vessel and Equipment replacement or new builds
  - Cruise support process
  - Training support of marine technicians, marine crew, shore-based personnel
  - Future Opportunities
  - Contact Information and Consent
- Preliminary results of the report was provided on slides with data from each member country.
- National partnerships- Recommendations and initial findings with details on specific programs highlighted.
- Desktop analysis has been completed on the 2007 recommendations, at what level as the recommendation been met, and actions still needed.
- Future perspectives for enhancing coordination- Eurofleets + will facilitate open access.
- WP 8 will be a Foresight Legacy & Roadmap document proposing a plan for long-term transnational access.
- Much work remains to be done, but a plan is in place on how to move forward.

### **Training Crew, Technicians, and Office Staff in developing countries Per Nieuwejaar/IMR**

- Many people from developing countries do not have opportunities to learn from the experts which would help to advance their programs.
- Since 1975, Norway has been working in Africa.
- Many ships have been given to these countries but countries do not have the resources to keep ships up and operating.

- The foreign aid programs really have not made much of a difference over the past 2 decades.
- A ship is built but due to many reasons, the ship is not used at all with many things left uncompleted.
- What can be done? Per's slides offered some solutions and good ideas on how everyone can pitch in to make a significant difference in the world. The United Nations is somewhat interested.
- Training of management and staff, to establish shore based vessel departments.
- UNESCO has an Ocean Teacher global academy – online.
- GEBCO program.

### **Craft Risk Management Standard for Biofouling- New Zealand Greg Foothead/NIWA**

- New Zealand has new regulations in place to help prevent biofouling. This is intended to try to curb the transfer of invasive species.
- New Zealand has a unique environment and they want to protect it.
- There are specific steps, which can be taken before the ship gets to New Zealand waters.
- There are certain criteria based on the length of stay of the vessel in New Zealand. There is a short stay category of 20 days or less and long stays of 21 days or more.
- The New Zealand laws are the world's first biofouling standard at national level, which came into force on 15 May 2018.
- Pointers on how to comply were shared and a case study of the *R/V Marcus G. Langseth* visit was discussed. The forms were submitted before the laws were in effect.
- Ministry for Primary Industries is the New Zealand agency that is responsible for these regulations and the enforcement of them.
- MPI biofouling webpage can be found at: [www.mpi.govt.nz/biofouling](http://www.mpi.govt.nz/biofouling)
- Greg Foothead/NIWA has offered his assistance to the IRSO community for understanding these new regulations.

### ***R/V Investigator*- Education and Outreach Activities. Toni Moate/CSIRO**

- Marine National Facility- Educator on Board Program is an Australian professional development program for teachers on board in science, technology, engineering and mathematics, the STEM fields.
- Provides berths on board ship for primary and secondary teachers to sail on *R/V Investigator*.
- Professional development in real world applications.

- Gives students and teachers real experience to inspire their careers.
- Promotes the accomplishments of the *R/V Investigator*.
- Next generation of teachers.
- Pilot Program ran from January to March 2017 with 51 days in the Southern Ocean. Very positive experience for the CSIRO Educator on Board.
- “Atlas of living Australia”.
- Additional material presented by Toni Moate on the issue of harassment. She discussed examples of harassment on 60-day voyages, with many different countries. There were some issues even before arrival on the ship. With several problems, CSIRO decided to hire an outside investigator to review the bullying charges and harassment charges. Many lessons have been learned but Toni asked the audience what other organizations are doing to improve diversity, such as adding more women in the maritime workforce?

### **Research Vessels of New Zealand and Australia (RVONZA) New Collaborative Forum**

#### **Rob Christie/NIWA**

- RVONZA is a new consortium between New Zealand and Australia; several agencies are involved.
- Objectives are to promote safe, efficient, and environmentally responsible operations of research vessels.
- Share best practices on design, management and operation of ships.
- Explore and develop opportunities for collaboration.
- Act as a voice to promote the research ship community.
- Big Ocean, only a few ships, so New Zealand and Australia had to collaborate.
- First Meeting held in Wellington in April 2017, details of agenda provided.
- Action items developed and work has begun with positive outcomes started.

### **Improving the EMSO-ERIC Collaboration for the benefit of Marine Science**

#### **Juanjo Danobeitia/EMSO-ERIC**

- EMSO-ERIC-Improving the EMSO-ERIC/ERVP collaboration for the benefit of marine research through a consortium approach.
- EMSO-ERIC mission to support research in marine ecosystems, climate change and geo-hazards to achieve sustainable management and protection of marine resources and to attain an efficient and reliable service of geo-hazard warning.
- EMSO-ERIC works to stimulate and support technology development.
- Eight regional facilities and three test sites from North Atlantic to Mediterranean to the Black Sea.
- Slides provide list of all research facilities across all countries.
- Phase 1 Approach - collecting information, then Phase 2 - processing information.
- Mapping- focus on excellence is important.

- Promote collaborative approach to engineering and logistics, generic instrument module to increase ease of use across the sites.
- Collaboration access to research vessels, long term collaboration is needed to have sustainability.
- Avoiding duplicate effort of having different ships in the same region can help.
- Atlantos and AORA- cross basin/global research vessel infrastructure sharing.

### **Electric Winches and Non-Hydraulic A-Frames Ole Aarup Mikkelsen/MacArtney**

- Brief overview of MacArtney service, brands and offices around the world.
- Green demands are requiring a new approach to different machinery.
- Electric is one option with no hydraulic lines in the water is a benefit.
- Advantages of electric winches include no oil spills, quieter, better efficiency, better reaction time, especially when heave compensation winches are in use.
- Can regenerate energy in the payout as the motor acts as a generator. Need to burn off this energy either in the brake resistor or take this energy and feed it back into the ship power management system. Can recover 70% of the power.
- Not more expensive than a hydraulic winch.
- Non-hydraulic cylinders for A-frames is good for environmental protection.
- Electrical actuators have been used in industry for years but not common for a marine environment. MacArtney researching use of electrical actuators to be used on A-frames and docking heads.

### **Manning Questionnaire Results & Safety Training and medicals for scientists, why bother? Erica Koning/NIOZ**

- Operation and Manning questionnaire last done in 2012.
- Presented on some early results of the survey completed in 2018, with responses from 32 operators representing 96 ships.
- Survey points included operator, outsourcing, ISM certification, technical support, policy on alcohol, safety training, and medical personnel.
- Alcohol- still 15 that allow it on their ships. Smoking inside is banned completely.
- PST personal safety training.
- Medical exams for crew, the STCW regulations apply, but for the scientists there is none unless the flag state or operator requires it.



- Why ask a scientist to get a medical exam, reasons include advancing age of scientist and technicians, increasing chances of medical problems, prevention, cost of a medical diversion, and overall responsibility of the ship operator for everyone's well-being.
- Safety Training- important due to infrequency of going to sea, unfamiliar environment, not to burden the crew.
- In NIOZ, they require a Personal Safety Techniques training, which is a one-day course for scientists and includes donning a survival suit, life vest, and embarking into a life raft. NIOZ requires PST and a medical exam.
- It would be very useful to have a standard across nations of training and for medical and safety.

### **Spanish Big and Singular Science Infrastructure**

#### **Jose Ignacio Doncel/ Deputy General Director for Large Scientific and Technical Infrastructures**

- Spanish Map of Research Infrastructure- for inclusion, must be unique, publically owned, meet funding investment levels, have a strategic plan and operate in accordance with National, European and international strategies.
- What is ICIS- Unique scientific and technical Infrastructure with resources open to competitive use, by scientists, industry, both national and international.
- List of facilities includes telescopes, super computers, and Spanish Oceanographic Research Fleet.
- Overview of the ships in the Fleet. Overview of the financing models of the different vessels.
- Criteria to be part of the big infrastructure- must be unique or exceptional, public ownership, funding investment, and have a strategic plan.
- Approach- They have a long-term plan, well established assessment and evaluation process.
- Road Map for Spain- There must be coordinated and cooperative use of these facilities. Road Map is a great tool for planning the next 25 years.
- Spanish Research Fleet of 10 ships with a slide showing the specifications on each vessel.
- Funding scheme of the Fleet under the Ministry for the Global vessels.

#### **IRSO Action Items- The following list of action items from the IRSO 30<sup>th</sup> Annual Meeting held in Yokosuka, Japan are listed below.**

- Terms of Reference, it has been 5 years since the TOR were adopted. Are there any recommended changes to the terms of reference? – Completed and carried forward to IRSO 31 Meeting.

- Articulate the relationship between IRSO and INMARTECH- Completed.
- IRSO Registration fee- Is the 300 Euro still a realistic estimate – Yes, action completed.
- Develop a glossary to define an IRSO member, delegate, participant, observer or an Emeritus Member- Completed.
- Review the IRSO web page for any changes or additions - Completed. Additional content welcome.
- Review delegate list from each country. Update the list on the IRSO web page- Completed and carried forward to IRSO 31 Meeting.updates.
- Based on a question from IRSO member as to how IRSO is organized, additional text on the organizational make-up of IRSO is needed – Carried forward to IRSO 31 Meeting.
- Per Nieuwejaar/Norway has offered to host a Polar Code workshop in 2018- Completed.
- Create new IRSO listserv dedicated just to delegates, industry reps - Carried forward to IRSO 31 Meeting.
- Update any changes to the [IRSO\\_Community@unols.org](mailto:IRSO_Community@unols.org) listserv - Completed
- Begin to develop an agenda for IRSO 2018. Suggested topics include green ship technology, technical support – Completed thanks to Bob, Erica, Raquel, and Jordi, and all our speakers!

**IRSO Action Items- The following list of action items from the IRSO 31st Annual Meeting held in Barcelona, Spain are listed below.**

- New IRSO chair-elect election- Completed.
- Terms of Reference- Members invited to submit any proposed edits to Chair and Vice Chair. .
- IRSO Member type definitions, (IRSO Emeritus?)- Open item.
- Add description to IRSO web site on how IRSO is organized – To be completed by Chair and Vice Chair.
- Create new IRSO listserv dedicated just to delegates, industry reps – To be completed by IRSO Web Manager.
- Add new IRSO members to IRSO web site- Completed, but ongoing.
- Polar Code Workshop Report- To be added by IRSO Web Manager to web site.
- IRSO 2019- Confirm dates – Completed. The 32nd International Research Ship Operators (IRSO) meeting will occur October 7-11, 2019 in Hobart, Australia.