



Minutes of 30th International Research Ship Operators Meeting held October 16-19, 2017 at the Japan Agency for Marine, Earth, Science, & Technology JAMSTEC, Yokosuka City, Japan

Tuesday 17 October 2017

Registration- Held on Monday 16 October-Mercure Hotel Grand Floor

Welcome and Administrative Remarks

IRSO Chair Bob Houtman/NSF welcomed the attendees and acknowledged the overwhelming interest in the meeting with over 85 delegates from 21 countries. A very special thank you to JAMSTEC for hosting this meeting. The 30th Anniversary is a testament to the importance of IRSO with the broad range of topics and the energy we share to work cooperatively.

Round Table Introductions

Introduction to JAMSTEC and Meeting Hosts

Kikuo Hashimoto/Director- Department of Ship Operations, Marine Technology and Engineering Center/MARITEC-JAMSTEC provided a warm welcome to all IRSO attendees, and expressed the great honor to host this important meeting. He gave an overview of the JAMSTEC organization, research vessels, research submersibles and vehicles, along with operational performance records and cruise tracks. He also recognized Kazuhiro Maeda and Chiaki Takahashi for their outstanding efforts in organizing this meeting. Kikuo Hashimoto closed with the presentation of a gift to all participants, a Japanese fan with the IRSO 30th Anniversary logo created by JAMSTEC.

Adoption of the Agenda of the 30th meeting- Agenda was adopted as written.

Review of Minutes of the 29th Meeting.

- No changes to the minutes were proposed. Minutes from the 29th IRSO meeting were approved.

Review of the IRSO Terms of Reference (ToR).

- It has been five years since the current Terms of Reference were adopted. Delegates were invited to review them during the meeting period and propose edits at the close of the meeting.

Review of the IRSO Website.

- Jon Alberts/UNOLS did a live demonstration of the website. This included a review of the IRSO link, sections of the website on meetings, members, reports, terms of reference and an announcement that INMARTECH 2018 would be hosted by Woods Hole Oceanographic Institution in Falmouth, Massachusetts, USA, from October 16-18, 2018.

Dates for the 31th IRSO meeting.

- The Unidad De Technolgia Marina of the Spanish National Research Council graciously volunteered to host the 31th meeting in Barcelona and proposed Tuesday October 2, 2018 to Friday October 5, 2018. The meeting delegates were asked to review their calendars and a final decision would be made at the end of the meeting.
- The IRSO 2018 (31th meeting) agenda will be posted on the IRSO web site.

Theme 1: Delegates Report of Activity

Kikuo Hashimoto/Director- Department of Ship Operations, Marine Technology and Engineering Center/MARITEC-JAMSTEC

The 30th IRSO Logo can be translated as “thirty” in Japanese.

Organization and vessels of MARITEC-JAMSTEC. They work with Nippon Marine Enterprises to help manage this fleet of ships and vehicles.

- *D/V Chikyu*- LOA 210 m, built 2005
- *R/V Yokosuka*- LOA 105 m, built 1990
- *R/V Kairei*- LOA 106 m, built 1997
- *R/V Mirai*, LOA 129 m, built 1997
- *R/V Hakuho Maru*, LOA 100 m, built 1989
- *R/V Shinsei Maru*, LOA 66 m, built 2013
- *R/V Kaimei*, LOA 101 m, built 2015
- *HOV Shinkai 6500*, depth 6,500 m, built 1989
- *ROV Hyper-Dolphin*, depth 4,500 m, built 1999
- *ROV Kaiko Mk-IV*, depth 7,000 m, built 2013
- *AUV Urashima*, depth 3,500 m, built 2000
- *AUV Jinbei*, depth 3,000 m, built 2012
- *AUV Yumeirukka*, depth 3,000 m, built 2012

- *AUV Otohime*, depth 3,000 m, built 2012

Additional specific details on the *R/V Kaimei* science sampling equipment were highlighted. This includes a CTD system capable of 10,500 meter depth, a boring machine sampler to 3000 m, a 40 m piston core system, and a new 11,000 m ROV fiber optic umbilical. They are participating in the Shell X-Prize and are working on building a new Arctic Research Vessel.

McCartney

Ole Mikkelson

- Overview of the McCartney Company overboard handling systems.

Coffee break and poster session

The Center for Deep Earth Exploration (CDEX) of JAMSTEC

Shin'ichi Kuramoto reported on the *D/V Chikyu* Project

- Deep Sea Drilling vessel outfitted for scientific expeditions to understand the earth's mantle and biochemistry
- Supporting the International Ocean Discovery Program 2013-2023
- Overview of the Expeditions from 2007 to 2016, studying life in extreme environments, microorganisms and hydrothermal systems
- Overview of technological drilling challenges into the mantle requiring new riser systems and carbon fiber technology
- Challenge # 1- Operation in securing a sustainable budget
- Challenge # 2- Secure resources for pre-drilling site surveys
- Challenge # 3- Promoting the next generation of scientists
- Lessons learned- 50-60 USD in annual operating costs and helping the public to understand relevance of marine seismic research

KAUST- Research Activity and Core Lab

Justin Mynar and Edward Lloyd reported on KAUST build in Aramco, Saudi Arabia.

- First institution to have a research vessel in Saudi Arabia
- Built and endowed by King Abdullah, modelled after Caltech
- Mission
- Extremely high tech helps to inspire innovation
- Coastal Marine Resources Center where *R/V Thuwal* is operated
- Areas of interest include mapping the Red Sea, instrument development and calibration, scientific diving, several government projects, building relationships with other coastal states

South African Maritime Safety Authority

Ian Calvert

- Established on April 1, 1998 under the SAMSA Act 5 of 1998 with focus on ensuring safety of life and property at sea, protect the environment and promote South African maritime interests
- Operate (2) research vessels- *FRS Ellen Khuzwayo* & *FRS Ellen Africana*
- Operate (3) vessels for protection, fisheries work and enforcement, search and rescue and environmental protection, *PV Lillian Ngoyi*, *PV Ruth First*, *PV Victoria Mxenge* and an *OPV Sarah Baartman*
- Operate a maritime training vessel for cadets and working with Maersk for placement
- Working with India on joint science expedition
- Building (2) new pollution protection vessels
- Stressed importance of working together, sharing resources and encourage IRSO to help join nations in a cooperative effort

"Our future as human beings depends on our intelligent and prudent use of the oceans. And that in turn will depend on the determined efforts of dedicated women and men from all parts of our planet". Nelson Mandela- November 1997

Theme 1- continued.

ERVO-Overview of Objectives and Update on Future Activities

Olivier Quedec/IFREMER

Lieven Naudts/Royal Belgian Institute of Natural Sciences

- European Research Vessel Operators
- History, organizational structure and objectives of ERVO
- Member countries, meetings and recent accomplishments and upcoming actions
- June 12-14, 2018 Annual Meeting- La Valletta, Malta

Schmidt Ocean Institute

Eric King

- Overview of Schmidt Ocean Institute and future plans
- Software Development and autonomous vehicles are recent focus
- Outward communication, live streaming, strong outreach programs
- SIO Annual Report- video shown

Iceland Marine and Freshwater Research Institute

Solmundur Mar Jonsson - Fleet and Finance Manager

- MFRI employs 180 employees who are specialists in generalization

- Managing sustainable exploitation of fish stocks
- Ecosystem fisheries management, fishing technology
- Seafloor and habitat mapping
- Center of climate change research
- Oceangoing *R/V Bjarni Saemundsson*- 56 m, built in 1970
- Oceangoing *R/V Arni Fridriksson*, 70 m, built 2000

Theme 2 R/V Builds, Modifications, and Performance

Office of Naval Research- Shakedown to Science Verification

Tim Schnoor/ONR- slides presented by Jon Alberts/UNOLS

- U.S. Navy Vessels of the U.S. Academic Research Fleet, details on (6) vessels and (1) *Flip* platform
- New Ocean Class Research Vessel *AGOR 27 Neil Armstrong*, 238 ft., delivered September 2015 and the *AGOR 28 Sally Ride*, 238 ft., delivered July 2016
- Details on the transition to full operations included shakedown cruises, deep water winch testing, sea acceptance testing and science verification cruises with experienced sea-going scientists
- Post Shakedown availability shipyard periods for adding fixed ballast and adding additional deck structure for science vans
- Examples of overboard handling systems
- *AGOR-23 Class R/V Thompson, Revelle, and Atlantis* midlife refits to extend service life beyond 30 years. Details on systems replaced.

National Science Foundation New Vessels

Bob Houtman

- History of the Regional Class Research Vessel Acquisition Process through development, design, construction, and planned operation
- Specific details highlighted on each of the stages
- Importance of community input and science which drives mission requirements
- Interagency coordination of U.S. Academic Research Fleet
- Modernizing the Fleet with advanced technologies
- Regional Class Research Vessels- Up to 3 hulls, 193 ft, 1500 tons.

Ireland Marine Institute- Update on Progress of Celtic Voyager Replacement

Aodhan Fitzgerald

- Marine Institute *R/V Celtic Explorer* 65 m, built 2003 and *R/V Celtic Voyager*, 31 m, built 1997
- Operate year round with 2 crews per vessel
- Technical and Operational support outsourced
- Vessel specifics, operational tempo, and typical operating area

- Ireland has a large Exclusive Economic Zone, increase in the number of Irish funded scientists
- Current Fleet not able to meet the demand for shiptime
- Objective in building a new vessel
- Potential designs include a 50 m vessel, 21 day endurance
- New Vessel Operating costs and Options analysis models have been completed
- Risk Analysis of each of the models

NATO- New Concept for Fixed Price Technical Support and Planned Maintenance

Ian Sage

- Change of flag to Italian Military with Italian Navy Crew, results in full ship management no longer being the appropriate operating model
- Maintenance still a NATO responsibility and requirement for full global support remains
- Maintenance of ship major cost driver, but some is planned which can be at a fixed price
- Internationally competed and contract in place 1 May 2017- Firm fixed price
- Arrangements built in for corrective maintenance
- More predictable for planning future budgets
- Evaluating success of program now

Industry Views on Fixed Price Maintenance

Douglas Lang

- Management change is making fixed price maintenance possible
- Advances in ship to shore communications causing shift in responsibility ashore
- Significant changes for both ship's personnel and marine superintendents roles
- Factors such as appetite for risk, technical and supplier change in strategy
- Shore based diagnostics and reduced on board capability drives need for tech support ashore
- Fixed price –thorough knowledge of ship helps
- Full oversight of ship equipment is required
- Set a robust maintenance schedule with agreed upon spares
- Choose an overarching management system- they chose ISO 50001- Asset Management Systems
- Pros and Cons of fixed price with conclusions

IFREMER- R/V *Thalassa* Midlife Refit

Marc Nokin

- *R/V Thalassa*- 73.6 m, built in 1996
- Timeline of midlife refit from early shipyard meetings in autumn 2016 through to sea trials in autumn 2017
- Expand vessel capabilities from fisheries and physical oceanography to marine geosciences and deep sea research
- List of scientific equipment upgrades, new fairing under the keel
- Two new cranes, new generator sets, new power management systems
- Sercel solid streamer renewed
- New AUV rated to 6000 m
- New science program for Dr. Jean-Louis Etienne to build a vertical science platform similar to U.S. Navy *Flip*. Planned 2-year expedition in the Southern Ocean.

China- Xiamen University- New Build

Haili Wang

- New Research Vessel of Xiamen University- *R/V Tan Kah Kee*, founding father of XMU
- Marine biological research began at XMU in 1921
- Specifications of vessel, global vessel with flexible deck and lab layouts
- CTD handling systems, Clean labs, Excellent seakeeping and station keeping DP
- Well outfitted with acoustics sonars and seafloor mapping
- Capable of supporting autonomous vehicles
- Design began in 2012, construction began in 2015, launch 2016, delivery April 2017
- Vessel 77.7 m, 3611 gt, 50 day endurance
- Detailed specification of deck, labs, over boarding systems provided in slides
- Completed (2) science verification cruises, a shakedown cruise and (2) scientific expeditions

NOAA New Build AGOR Variant

Scott Sirois

- NOAA Fleet Recapitalization Plan from 2016
- NOAA Fleet of 16 ships facing increasing age and obsolescence issues
- NOAA – 8 ships to retire within the next 10 years
- Fleet plan identifies 4 new vessel classes

- Proposed Fleet Recapitalization Schedule presented with anticipated challenges
- Recommendation to build on recent U.S. Navy AGOR documentation to leverage design and expedite procurement schedule
- U.S. Navy providing acquisition assistance and technical expertise
- Detailed list of mission requirements and vessel specifications presented
- Anticipated delivery schedule of 2023

R/V Aranda Refit Underway

Juha Flinkman/SYKE-Finnish Marine Research Centre

- Major refit/conversion now in progress, planned completion of 2018, extend life of ship to 2030. Hull cut in two areas, added ~ 6 meters, now 66 m.
- *Aranda* capable of multi-disciplinary science with Arctic polar capacity, aiming for Polar Code PC6
- Vessel has extensive experience working in Baltic winter conditions
- Arctic strategy adopted by Finnish government in 2013, focus on Arctic
- Low sound emission, ICES 209
- Capable of hydro-acoustic surveys, robotics and gliders, AUV and ROV deployments
- Moon pool for sampling in ice

New Belgian Research Vessel to Replace Belgica

Lieven Naudts/Royal Belgian Institute of Natural Sciences

- Plans for a new multidisciplinary research vessel to replace the *R/V Belgica*
- Timeline of projects, started in 2005 with feasibility study of replacement or modernization of *Belgica*
- Build a new research vessel agreed upon by Council of Ministers in 2014
- Public Tender posted in 2017, Maximum budget 45 million Euros
- Science Mission Requirements established 2015-2016
- Commence build in 2018 with mid 2020 delivery anticipated
- Full Ocean Research Vessel of 65 m
- Range of operations planned for North Sea, Mediterranean Sea, and North Atlantic Ocean
- Very detailed vessel characteristics presented in slides

New Build Progress- Norway

Per Wilhelm Nieuwejaar/Institute of Marine Research

- Norwegian Research Vessel Upgrade Projects
- *R/V Dr. Fridtjof Nansen*- built at Astilleros Gondan in Spain. Contract signed in March 2014, cutting steel in January 2015, vessel launched December

2015. Seatrials in October to December 2016. Working around West Africa, will be in Indian Ocean in 2018.
- *R/V Kronprins Haakon*- built at Fincantieri. Contract signed in November 2013, cut steel in June 2015. Built in two sections at Riva Trigoso Yard and Muggiano Yard, then assembled in August 2016. Seatrials in June 2017, delivery in December 2017. Anticipate supporting science missions in June 2018.
 - New Coastal Research Vessel- Government proposes new research vessel to be built. 30-35 m, 15 bunks, trawling, CTD, coring, ROV, fisheries acoustics, total cost 8 million Euros.
 - Experience has shown large shipyards not set up for tailored vessels. Small family yards are more efficient.

Guest Speaker- Glosten & Noise Control Engineering

Ken Fitzgerald/Glosten & Jesse Spence/Noise Control Engineering

- Organizational Chart for Glosten and Noise Control Engineering with recent merger
- New build basis of design with *R/V Sikuliaq* underwater radiated noise requirements
- Balancing performance and cost
- Fixing noise issues of an existing vessel poses interesting engineering challenges. Bow thrusters of *R/V Atlantis* and *R/V Revelle* took considerable effort.
- Noise control engineering should begin with the earliest stages of the ship design. If you wait, it will cost more and be less effective. A better approach is to follow a list of steps you can take in the concept design to achieve the level required.
- Establish and decide upon noise criteria that are appropriate for the vessel
- What is achievable, you must perform an analysis and then set the expectations for the vessel. Treatments can be modified if there are actual changes in the final build.
- Training of the shipyard personnel is key to the noise plan. With a strong plan, you can avoid many of the construction errors in the build.
- Rearranging the general arrangements of spaces could be used to meet noise requirements
- Post-construction- noise is not a static event. Need to maintain the isolation mounts, groom the propellers to avoid cavitation issues.
- Conducting noise profiles at permanent test ranges is important. An acoustic measurement buoy is also an option.

Wednesday 18 October- Day Two

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

Theme 3- Manning, Safety, and Training

NOAA- Gender Climate/Safe Workplace

Scott Sirois

- Background on NOAA organization. With 16 ships, multiple labs and science centers across the United States and 5 different mission types, NOAA has diverse personnel pool they work with.
- NOAA had a complaint that was reported but kept within the line office at a low level. Issue was lost in the shuffle and HQ was not aware of it, which gave the appearance that NOAA - HQ was ignoring the issue. Headquarters realized it needed to address policy and procedures in harassment prevention.
- NOAA is addressing this issue head-on. It is a prevalent issue in the workplace and not just specific to ships. However, on ships with tight quarters it requires an understanding of the working shipboard climate.
- NOAA started with an immediate fleet wide safety stand down
- Reporting tools are required which when in place can elevate the issue. Training videos, U.S. Coast Guard Investigative Services, and the RAINN hotline are all tools that can help with any situation.
- Policies must come from the top down. Leverage existing resources and partnerships.
- NOAA/Office of Marine and Aviation Operations efforts have been adopted across the entire NOAA agency
- Result from the NOAA effort thus far is that by raising the issue, more people are comfortable talking about it. They are creating a healthy environment and a safe workplace.
- The gender climate and workplace environment needs to also include conversations and policies to protect the LGBT community

Arctia Finnish Multipurpose Icebreakers

Hanna Suutarla

- Arctia is a Finnish state-owned organization is both an owner and an operator of icebreakers. Basic task is to keep the Baltic Sea open with ice management, oil spill response and offshore services.
- Arctia owns/operate (9) ice-breakers – Details on the *MSV Fennica*, *MSV Otso*, and *MSV Nordica* were given
- Operating in the Arctic & Sub Arctic, Baltic, North Sea, Greenland Sea, Davis Strait, Sea of Okhotsk, Chukchi Sea and Beaufort Sea. Also the Northern Sea Route and the Northwest Passage.

Polar Code Workshop and Our Implementation Activities

Per Wilhelm Nieuwejaar

- Polar Code Workshop held at NATO Centre for Maritime Research and Experimentation in Muggiano, Italy on April 26-27, 2017
- Workshop was well attended by 40 representatives from U.S., Japan, Norway, France, Denmark, Spain, Finland, Italy, UK, Germany, Ireland, Netherlands and New Zealand
- Workshop was very successful due to efforts by Ian Sage, Yves Perron, Natalina Arena and Per Nieuwejaar
- Maps of the maximum extent of Arctic and Antarctic waters
- Polar Code covers ship equipment, design and construction, operations and staffing
- Key Findings of Polar Code Workshop and all workshop documents can be downloaded at:
<https://www.dropbox.com/sh/wrj2adymjp2q7qj/AAAEqTdTn5Icigv3xe4W5ota?dl=0>
- There are some areas not covered by the Polar Code, which should be considered when research vessels are doing Polar work. This list of areas are the practical side when working in harsh environments. Topics include training of personnel, helicopter operations, towing and deploying gear in ice-covered waters, use of a moon pool and drop keels, ice windows over transducers, scientific diving, work boats, support to a vessel in an emergency, firefighting, oil spills, and shelters in the event of need to abandon the ship.
- The Polar Code does not provide much guidance on surviving in Polar Regions. This could be a topic for IRSO to consider for future workshops and meetings.
- Next Workshop- Spring of 2018 was suggested and Per Nieuwejaar offered to host it in Tromso, Norway

Survival Training-Japan-NSTC Nissui Marine

Hiroki Oumi

- Nippon Survival Training Center is a subsidiary of NISSUI, created in 2011 as Japan's first marine survival training center. Two offices in Kitakyushu and Tokyo.
- Established to ensure worker's safety in offshore development. Focus on decreasing the incident and accident rates in marine field.
- They have established standards for the maritime workforce, with courses taught in both Japanese and English
- Facilities include training pool, helicopter evacuation equipment, life rafts and lifeboats, a firefighting facility and a working at height facility
- Safety Culture in Japan differs somewhat from other countries. In Japan, focus is on authority providing security and safety procedures. Recognition

that major cause of accidents is human error. Security can be ensured by control systems, training and regulations.

- Continue to promote the significance of the training, motivation for the training and trends in industry to create training techniques
- Training web site: <http://n-s-t-c.com>

The Management of the Investigation Engineer of the Scientific Research Vessel

Xinyuan Diao/Chinese Academy of Science

- History of the Institute of Oceanology-Chinese Academy of Science- oldest, largest, important center for marine research in China, established in 1950
- Organization includes 745 staff, 110 postdocs, 552 graduate students of which 260 are doctoral students
- Operating six research vessels from one base- *R/V Chuangxin I* and *Chuangxin II*, *R/V Kexue I*, *R/V Kexue II*, *R/V Kexue III* *R/V Chuangxin*.
- Details on the Faxian ROV system, rated to 4500 m and the ROV Handling systems were provided
- Current focus on development of autonomous underwater observing system
- List of cruise tracks and some scientific discoveries were shared

Theme 5 Legal and Insurance

Marine Insurance-Admiralty Law- Relevant Court Cases

Dennis Nixon/URI- UNOLS Risk Manager

- Annual talk to IRSO on the world insurance market, relevant news and legal decisions
- In the world insurance maritime sector, cargo loss is the highest portion of the industry with annual premium of 27.5 billion dollars; however, annual underwriting premiums have gone down 18 % since 2014
- In the 2016 hull insurance sector, the annual premiums are 7 billion dollars, with a 10 % decrease since 2015
- Average age of the world's fleet of ships over 100 GT is going up with research vessels now averaging 25 years. P & I pool claims have gone down in recent years.
- In the area of vessel news, the NSF plans to build up to 3 new regional class research vessels and there has been an increase in small institution owned research vessels
- In the area of regulatory news, the United States Coast Guard released the final report on the sinking and loss of the crew of the *M/V El Faro*. Other areas include warnings on lifejacket lights, safety alerts on CO2 firefighting systems, need to raise awareness on cyber security issues. Local regulatory standards are coming into effect on emission standards.

- Recent collisions and groundings. Some causes include over reliance on GPS systems and reduced situational awareness of bridge officers. Lack of training has caused two recent collisions for the U.S. Navy with significant loss of life.
- Some recent legal decisions include a court ruling that a shore-based oil terminal was responsible for failing to search for hazards to navigation as a tanker approached an oil terminal and it struck a submerged object. Another ruling found an ROV technician is a seaman and the Fair Labor Standards Act (FLSA) claims by the individual were denied because seaman are exempt.
- Ocean Guardian- new tool for international compliance at sea. This is a tool coming out of the cruise ship industry to keep track of local laws in order to be in compliance.

Day 3- Thursday 19 October 2017
Administrative Matters/Logistics

U.S. State Department Communications Concerning Marine Scientific Research Projects.

Amanda Wright/U.S. State Department

- Law of the Sea and graphic display of the coastal and applicable part of UNCLOS as it applies to each zone. What types of Marine Scientific Research (MSR) will require diplomatic clearances. Recent trend is an increase in the number of different countries on one application, which is indicative that “science knows no borders”.
- Article 250 states that communications for MSR projects need to be filed through official channels
- Some recent trends and challenges include increase in the number of applications; some coastal states do not have a system in place, increase in bureaucracy and evolving requirements and disputed maritime boundaries. The firm 6-month requirement needs to be followed.
- Other challenges include determining when the activity is not marine scientific research. Questions arise on AUV, drifters, gliders and sail drones as to when MSR regulations apply. There has been an increase in citizen science and the question on whether this should come under MSR is being asked. Marine Mammals are being fitted with sensors. Is this part of the MSR process?
- Post Hurricane Impacts- CY 2017 saw many areas severely impacted by hurricanes
- This has affected the ability of the coastal states to process applications and extra time is being required since their infrastructure in many cases has been destroyed

- Research Vessels are encouraged to provide aid and assistance as much as possible
- Research Authorization Tracking System- RATS 2.0 Redevelopment. The U.S. State Department is making significant improvements to the online system. Many enhancements and improvements are being planned. Beta testers will be needed.
- U.S. State Department now has a team of three staff members working in the MSR office. Allison Reed, Amanda Williams and Matt Kastrinsky. They share one e-mail address: Marinescience@state.gov

Theme 4 Scientific Technology

Joides Resolution – Capabilities, Challenges & Future Expeditions.

Mitch Malone- Texas A&M University, IODP Program

- International Ocean Discovery Program- a collaboration of 23 member nations and three vessel platforms. U.S. supporting the *JOIDES Resolution*, Japan supporting the *Chikyu* and ECORD supporting mission specific platforms
- *Joides Resolution*, built in 1978, midlife completed in 2009, 143 m. Midlife took 2 years to complete with significant improvements to the vessel. Highly capable vessel and laboratories for all aspects of collecting and analyzing core samples.
- *Joides Resolution* schedule since 2014- The ship is in the 4th year of a campaign in the Pacific and Indian Ocean. The science proposal pressure is what drives the cruise track, which could bring the ship into the Atlantic Ocean.

JAMSTEC Trial of 11,000m UROV

Kikuo Hashimoto & Hidehiko Nakajo

- Untethered Remotely Operated Vehicle (UROV) – development began at JAMSTEC back in 1990's. Cable system with a “spooler” can store 10 km of fiber optic cable.
- In detached mode, vehicle can move freely without cable tension. Steps for deployment are launch-descend, then vehicle detaches at 7000 meter depth, conduct observations, then ascend and recovery.
- Advanced Technology- ultra high sensitivity camera system
- Compact Optical Transmission Module
- In May 2017, sea trials conducted in the Mariana Trench and successfully reached 10,897 m
- Second operation was to search for a missing vehicle in 5320 m of water depth
- Results- Mariana Trench sea trial very successful using UROV. Camera photographed benthic creatures in real time with a 4-K video transmission.

Changing R/V Technical and Operational Requirements- National Marine Facilities/NERC

Colin Day

- Technical and operational impacts for research vessel operators for ship's personnel to support increasingly more complex research ships
- Rate of technological change for scientific sampling equipment and ship systems has expanded dramatically in last 10 years
- Cruises tend to be more multidisciplinary with each science group bringing aboard more advanced sampling gear. An example is a cruise that deploys an Autonomous Underwater Vehicle, (AUV) for a 24-hour period, while other groups are doing biological sampling at the same time. Puts a strain on technicians and vessel crew.
- Operators are required to respond with highly skilled technical support
- In new shipbuilding, there can be a tendency to under evaluate the support resources and infrastructure needed to support it
- Limited availability of portable sampling and survey equipment and skilled technical personnel may influence reaching the full potential of advanced ships
- Impact on the overall infrastructure needs to be part of the ship design and build process

EMSO-ERIC- New European Research Infrastructure Consortium

Juanjo Danobeitia/CSIC

- EMSO- Large Scale- European Research Infrastructure- a seabed and water column observation node providing real time environmental process data for researchers, marine technology engineers, policy makers, industry and the public
- Organized as a research consortium with members from France, Greece, Ireland, Italy, Portugal, Romania, Spain, and United Kingdom
- Providing data on global ocean warming and acidification, marine resource sustainability, real time warning data for earthquakes, ecosystem and climate change, as well as earth interactions
- Success of observatory relies on listening to your people, strong collaborations, and a fast system of communication for real time distribution
- EMSO is part of the international ocean observatory network. Such as OOI/US, Ocean Networks Canada, DONET/Japan, ECSSOS/China, MACHO Taiwan, and IMOS Australia. Information is exchanged across all of these ocean observatories.

- Proposal to facilitate access to oceanographic research vessels as a long term strategy
- EMSO-ERIC Strategy – Main focus
- Prepare a 5 year action plan and financial projection
- Establish strategy for financial sustainability
- Develop a science and technology plan
- EMSO-ERIC long term goals
- Increase European Node Coverage
- Enlarge membership of other neighboring countries
- Enhance greater international cooperation
- Increase visibility
- Increase interaction with other European Union programs

Using Research Vessels for Aircraft Searches; Recent Marine Institute Experience

Aodhan Fitzgerald

- Irish Coast Guard CHC Helicopter on search and rescue mission on 14 March 2017 crashed into the Atlantic Ocean on west coast of Ireland. Loss of four personnel just 200 meters off a rocky coast.
- Question posed: Do research vessels have a role to play in search and recovery for aircraft as well as vessels. Research vessels can be tasked to help as state-owned assets. Research vessels are often nearby for a rapid response, outfitted with the right equipment and technical capability.
- Sonardyne Scout USBL dispatched to scene to conduct survey of the area and locate Flight Data Recorder
- *ROV Holland I* brought into search effort. Weather, surge, proximity to rocky coast all affected the work. ROV did locate wreckage from helicopter and remains of one crewmember that were then recovered. Large media presence required coordination.
- Mapping survey performed by *R/V Celtic Voyager* improved bathymetry data, which had been poorly charted previously
- Lessons learned from this effort included confirming the Sonardyne Scout is an excellent tool for initial search surveys. Many research vessel Ultra Short Baseline systems have this capability. ROV was useful for final location of wreckage. Weather and sea conditions are significant factors to consider. ROV more effective in 40 meters of water than divers would be, with less risk to the personnel.
- Dynamic Positioning capability is important. A multi-agency led rescue effort without a single commander created difficulties. A large media presence required a press officer to serve in managing the communications and public interactions. Families of the victims required extra care and sensitivities.
- Action Items to come out of the situation include a Memorandum of Agreement to be put into place to formalize the relationship. Regular training with equipment and other agencies needs to be conducted.

- Preparations that research vessels can take in advance are having the technical information on acoustic pingers and search techniques. Train with multi-agencies in locating and recovering of pingers. Inventory equipment that is suitable for search operations both aboard the ship as well as a list of sources available worldwide.

Results of Eurofleets 2 and Plans for Eurofleet+ Project

Aodhan Fitzgerald

- Eurofleets- “New operational steps toward an alliance of European research fleets”
- History of the Eurofleets program and how program has evolved
- Eurofleets2 proposal review process from proposal submission to success or rejection of the proposal was described. This program had proposals from 50 principal investigators from 17 nations. The program enables access to a ship that a scientist in the past may not have been able to work on.
- Eurofleets2 granted 24 cruises at a funding success rate of 48% for 206 funded ship days. Scientific disciplines included geophysics, physical oceanography, geology, biology, fisheries research and geochemistry.
- Highlights from *R/V Sanna*, *R/V Hesperides*, *OGS Explora* expeditions gave a measure of the successes
- Summary- Eurofleets 2 is now completed and program was successful in establishing a proposal evaluation system for European ship time proposals, ensured scientific excellence, promoted international collaborations and training for early career scientists. Enabled trans-national access to ships and bringing together multidisciplinary science projects and scientists.

Eurofleets 2- Joint Research Activities 1- Part II Regional R/V Guidelines and Generic Designs.

Aodhan Fitzgerald

- Design specifications and guidelines for Regional Research Vessel- focus underwater-radiated noise, bubble sweep down, working decks
- Innovative basic designs of research vessels- study of new technologies available in hybrid propulsion, hull design, hybrid and autonomous underwater systems. Aim to develop tools independent of the ship so that assets can be shared across platforms.
- Improved lithium battery technology for more vehicle autonomy
- Availability of software tools for 3 D reconstruction and processing of the data aboard ship
- Improved exchange of shipboard information streams with shore-side personnel
- EVIOR portal for publishing data

- Now looking toward Eurofleet Plus with more emphasis on ROVs, AUVs, and training. If Eurofleet Plus is funded it will kick off in late CY 2018.

Ocean Facilities Exchange Group (OFEG)

Colin Day/NERC

- “A Bottom Up Approach to Research Fleet Coordination and Harmonisation”
- Represents Europe’s leading oceanographic research organizations and provides a forum for the exchange of ships and major equipment opportunities on global and ocean class ships
- Designed to maximize overall scientific output- established in 1996 between NERC/UK, IFREMER/France & BMBF/Germany, which formed a collaborative approach to bartering, ship time and equipment without exchange of funds
- Between 2002-2006, NIOZ/Netherlands, CSIC/Spain and IMR/Norway became members, establishing the name of OFEG
- Procedures and policies have been established for sharing equipment that is supported by technically qualified support staff to ensure success
- Benefits of OFEG- Greater access for scientists to ships, equipment and geographic locations. Reduces transit times and costs, while increasing number of assets available in a given year.
- OFEG meets twice per year to work out exchanges and details. Work to fill gaps. Available during the year to provide support as needed. In the future, they may share planning systems, such as the Voyage Planning System: www.marinefacilitiesplanning.com

Theme 6 Cooperation and Outreach

Nexton Oxford Deep Ocean Research

Oliver Steed

- Collaborative Multi-Disciplinary Research Missions- a proposal for partnership
- “History and Mission of the organization: to explore the depth of the ocean and reveal the unknown for the benefit of humankind”
- Promote international collaboration among partners in four main areas: scientific research, capacity development, public engagement and education, and policy
- Indian Ocean is next planned mission for 2018 to 2021. Encouraging partners to join the program. Nexton has invested in HOV, ROV and access to other tools. Undertake research into the bathyl zone for baseline measurements of the Indian Ocean. Will help provide data important for setting policy for governance and conservation.

British Antarctic Survey (BAS) *RRS Sir David Attenborough* Design Concepts and Build-

William Whatley

- The British Antarctic Survey, (BAS) are currently building a new ship
- Specifications: 128.9 m in length, 24 m. beam, 7 m draft, 16200 GRT
- ECO Speed hull coating
- Will have an ice-strengthened small boat with multibeam to carry eight people for inshore surveys
- Will work in Antarctica from September to May, out of Punta Arenas, Chile and Falkland Islands
- Keel laid 17 October 2016 with launch date to be March 2018
- Sea Trials will be one year long with first voyage planned to Antarctica in September 2019
- Being built at Cammell Laird Shipyard- Liverpool, England
- BAS is moving to a single ship operation with a planned 100% crew change on a 3-month duration. Ship will have a 60-day endurance.
- *RRS Sir David Attenborough* will be the first Polar Compliant ship to be built in the UK. Ice class PC5.
- BAS is also improving the infrastructure at the BAS Station-Rothera. Improvements to the dock, warehouse and storage containers will all be done.

GEBCO-

Jin Tani

- GEBCO-established in 1901- Project to provide the most authoritative bathymetric database of the world's oceans
- Maintains a list of feature names
- Working on a process to fill the gaps as only 15% of the world's ocean have good data on ocean depth. Olex data boxes on vessels of opportunity will help to improve the data sets.

Introduction of Venue for IRSO 2018

Jordi Sorribas Cervantes

- IRSO 2018 will be hosted by Unidad De Tecnologia Marina, Spanish Research Council (CSIC) in Barcelona, first week of October 2018
- Overview of Barcelona, second largest city in Spain on the Mediterranean Sea
- Venue will be the Mediterranean Center for Marine and Environmental Research

IRSO Action Items- The following list of action items from the IRSO 30th 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? The TORs reference “European and Non-European countries”. Should the use of these terms be used?
- Articulate the relationship between IRSO and INMARTECH
- IRSO Registration fee- Is the 300 Euro still a realistic estimate?
- Develop a glossary to define an IRSO member, delegate, participant, observer and an emeritus member
- Review the IRSO web page for any changes or additions. For example- add a Polar Code section to the IRSO web site.
- Review delegate list from each country. Update the list on the IRSO web page.
- Based on a question from an IRSO member as to how IRSO is organized, additional text on the organizational make-up of IRSO is needed.
- Per Nieuwejaar/Norway has offered to host a Polar Code workshop in 2018
- Create new IRSO listserv dedicated just to delegates, industry reps
- Update any changes to the [IRSO Community@unols.org](mailto:IRSO_Community@unols.org) listserv
- Begin to develop an agenda for IRSO 2018. Suggested topics include green ship technology, technical support.

Meeting Adjourned: Thursday 19 October 2017 at 1500 hrs.

IRSO Annual Dinner

JAMSTEC hosted a wonderful reception and dinner on Thursday 19 October 2017 at the Kanonnzaki Keikyu Hotel for the 30th IRSO Conference Dinner and Farewell Party “Aqua Belle”.