

Marine Facilities Advisory Board

National Oceanography Centre, Southampton

26th and 27th March 2019

Prof Mark Inall, Scottish Association for Marine Science – Out-going Chair (MI)
Prof Carol Robinson, University of East Anglia – In-coming Chair (CR)

Dr Adrian Baker, Defence Science and Technology Laboratory (AB)
Colin Day, National Oceanography Centre (CD)
Dr Natalie Powney, Natural Environment Research Council (NC)
Dr Sophie Fielding, British Antarctic Survey (SF)
Dr Maarten Furlong, National Oceanography Centre (MF)
Dr Kate Hendry, University of Bristol (KH)
Dr Kerry Howell, University of Plymouth (KHo)
Dr Joanne Hopkins, National Oceanography Centre (JH)
Dr Erica Koning, Royal Netherlands Institute for Sea Research (EK)
Dr Chris McGonigle, Ulster University (CM)
Prof Mark Moore, University of Southampton (MMo)
Helen Oldridge, National Oceanography Centre (HO)
Dr Alex Phillips, National Oceanography Centre (AP)
Leigh Storey, National Oceanography Centre (LS)
Dr Andy Rees, Plymouth Marine Laboratory (AR)
Prof Russell Wynn, National Oceanography Centre (RW)
Dr Nick Wright (Newcastle) (NW)
Prof Angela Hatton, National Oceanography Centre (AH)
Dr Graham Allen, British Oceanographic Data Centre (GA)

Secretariat: Jackie Pearson, National Oceanography Centre (JP)

Apologies

Prof Christine Peirce, University of Durham
Julie Pringle-Stewart, National Oceanography Centre
Randolph Sliester, British Antarctic Survey
Dr Tim Smyth, Plymouth Marine Laboratory
Professor Mike Elliott, University of Hull
Dr Nick Wright (Newcastle) (NW), day two
Prof Angela Hatton, National Oceanography Centre (AH), day two
Dr Graham Allen, British Oceanographic Data Centre (GA), day two

Participating remotely, Day One

Professor Matt Mowlem (NOC) (MM)
Dr Nick Wright (Newcastle) (NW)

Participating remotely, Day Two

Professor Matt Mowlem (NOC) (MM)
Dr Matthew Palmer (NOC) (MP)

MI opened the meeting by welcoming in-coming Chair, Professor Carol Robinson, from the University of East Anglia and Helen Oldridge from the National

Oceanography Centre. Apologies had been received from Dr Tim Smyth, Professor Mike Elliott, Professor Christine Peirce and Randy Sliester.

Item 1 – Introductions from current members and new members

- 1.1 MI invited the members to introduce themselves. MI is outgoing Chair and has Chaired the Board for three years. CR is a microbial oceanographer. NW is an electrical engineer and computer scientist, AB works with the National Oceanography Centre (NOC) and his role includes robotic systems.
- 1.2 **NOC members and advisors** - MM is Head of OTE Group, AH is Director of Science and Technology and is on this Board as advisor; RW is MARS Chief Scientist – Government and Defence Engagement; LS is Associate Director and Head of National Marine Facilities (NMF). LS was a nuclear engineer and has worked for NOC for five years; HO is Head of Scientific Engineering, MF is Head of Marine Autonomous and Robotic Systems (MARS). AP is Head of MARS Development. CD is Programme Manager for NMF. GA is Head of the British Oceanographic Data Centre and used to be a sea-going physical oceanographer and is on this Board as advisor. JH is based at the NOC in Liverpool and has ten years sea-going experience. MP is the newly-appointed MARS Chief Scientist-Science Community Engagement.
- 1.3 NP works at NERC in marine planning, is interim joint head of Capital and is representing Dr Mike Webb today. KH is a marine biogeochemist with a focus on coastal processes. KHo is a deep sea benthic ecologist and has had experience of using the *Isis* ROV. Previously KHo was on the Cruise Programming Review Group. CM is from the University of Ulster and is a marine ecologist and geophysicist. EK is National Marine Facilities Officer for the Royal Netherlands Institute for Sea Research, AR is a biogeochemist from Plymouth Marine Laboratory (PML), SF is a zooplankton ecologist from British Antarctic Survey (BAS). EK, AR, MM, RW and SF are retiring members, attending their last meeting today.
- 1.2 MI thanked EK, AR and SF for their service to MFAB.

Post meeting note: The Secretary omitted to advise MI that MM and RW were also retiring members so thanks are now recorded for MM and RW.

Item 2 - Overview of MFAB – history and future – Mark Inall

- 2.1 MI gave a presentation on the history of the Marine Facilities Advisory Board (MFAB). The Board has just undergone the biggest change in membership to date. He covered the role of the Cruise Planning Executive Board (CPEB), which approves use of equipment. MFAB reports to the CPEB and is the route through which Principal Investigators (P.I.s) interact with the CPEB.

Item 3 – Discussion – opportunity for new members to raise questions

- 3.1 There is no link between the MFAB and the Cruise Programme Review Group (CPRG), although the Chairs meet to discuss the big decisions. CPRG meets twice a year with the decision-making meeting in September/October.
- 3.2 A role of NMF is to react to feedback from the community. For example, a few years ago, numerous Post Cruise Assessments (PCAs) indicated problems with bandwidth so NMF bought a new dome for the ship and increased bandwidth.
- 3.3 AH asked if outcomes of expeditions could be made available. This would need to be referred to Professor Paul Tyler, Chair of CPRG.
- 3.4 AB asked how the community is made aware of the range of equipment available. Completion of a listing of the contents of the National Marine Equipment Pool, in one space, has been requested by this Board and is a work in progress. There is a website which features the large-scale equipment. The [National Marine Equipment \(NMEP\) Portal](#) gives instant visibility on most of the large items of equipment.
- 3.5 Most NERC-funded equipment is held by the NMEP at NOCS, although some is held by the Scottish Association for Marine Science (SAMS), the British Antarctic Survey (BAS) and the British Geological Survey (BGS). MM asked whether the equipment not at NOCS is still under the stewardship of NOC. If equipment is NERC-owned, and designated as 'National Marine Equipment Pool' it will be brought into the same management framework. Some equipment is on long-term loan but will still be part of the pool. JH asked if items on long-term loan are still shown on equipment lists. CD answered that if NERC equipment is classified as in the 'extended national pool', then it depends on how it was purchased and what NERC's view is as to whether the equipment should be made readily available. Equipment held by the NMEP at SAMS is being reviewed at the moment. The RRS *Sir David Attenborough* (SDA)-funded equipment is also being discussed at the moment. If the NMEP takes on a large item, this must be maintained and ready for use by the community. Equipment bought for the NMEP is managed by NMF. Much of NMF's NMEP budget is spent on maintenance but sometimes capital becomes available.
- 3.6 SF referred to equipment bought for the SDA which is identifiable on the Ship-time & Marine Equipment (SME) form as a request item. How will the change in NOC's governance affect the NERC marine equipment pool? This is in discussion with NERC. The ships will remain NERC-owned and operated by NMF under a bareboat charter. The NMEP will be under the ownership of NOC but the rules and regulations will still apply. i.e. it is funded by NERC and is there to be used by the community, either via an SME or Autonomous Deployment Form (ADF) in accordance with the mechanism that NERC requires.
- 3.7 SF asked whether scientific projects take priority over commercial projects.

LS answered that the CPEB makes this decision. NERC has flat-funded NMF since 2016/17 and there has been overspend year on year. NMF has proposed options on cost cutting but NERC has not yet taken up these options but rather, has encouraged NOC to generate revenue without disrupting the science programme. Presently, there are three options:-

- 1.) Cut capability and capacity
- 2.) Prioritise commercial work over science
- 3.) NERC provides more funding.

The decision comes back to CPEB and then to the NERC Executive Board.

- 3.8 Equipment funded by NC-Large-scale Research Infrastructure funding is available to the community and its use is prioritised. The situation may differ for items in the NMEP not funded by this mechanism. It was queried whether the reference to this should be removed from the Terms of Reference.
Action: Secretariat
- 3.9 MI reminded the group that the frequency of MFAB meetings was reduced from twice a year and LS had suggested supplementing the annual meeting with working groups. For example, the ROV WG has just had its first meeting, and the second meeting is due soon. There will be a final meeting in the summer and will report later in the year to the CPEB.
- 3.9.1 MI commented that the call for new members had been more open this time. Previously it had been on an invitation only basis. There has been a step change in access to the marine portal now.
- 3.9.2 The Technology Roadmap (TRM), written by Maaten Furlong, Andy Henson, and Helen Oldridge, comes to MFAB for review. It is intended to inform the community, principally via the Marine Facilities Advisory Board, about how technology is developing and what may develop over the next five years, within the limits of the NMF budget. NMF meets annually to look at the equipment and see what needs to be replaced etc. If there is money left, we then look at the TRM. This is why NMF would like more engagement with MFAB, to ensure that what we may consider buying, matches the science need. MF explained how the TRM is constructed and advised that aspirations may change. It is a living, updatable document. This year's TRM reports what has changed since last year and shows the equipment that NMF would like to acquire.
- 3.9.3 KH referred to the visibility of MFAB and asked if there could be a database where members could post the meetings they plan to attend. The Secretary could make literature available for members to distribute at those meetings. At the moment, we target the membership of the *Challenger* Society, the NOC Association and MASTS meetings for this.
- 3.9.4 CR suggested highlighting the objectives of MFAB to those who complete an SME; similarly, we can flag MFAB via the NERC newsletter. Marine Facilities Planning is compliant with GDPR, so it would be possible for MFAB to use the

NMEP list of email addresses to contact registered science users of the NMEP, both to highlight the role of MFAB and seek input on future equipment requirements. **Action: Secretariat/CR/CD**

- 3.9.5 NMF is looking at the SME and ADF and plans to link applicants to further information which could also link to the TRM. NMF is keen to receive advice on how the available funding might be spent. Suggestions included having a separate form where people can advise what their future requirements might be. It might be also helpful if the section of the post cruise assessment form comes to MFAB. This has already been discussed and assessments are reviewed and presented to CPRG. Highlights from the distillation of the cruise programme process could be made available to MFAB. Essentially, this would be a process of identifying any problems and capturing future aspirations. **Action: CD/Secretary**
- 3.9.6 The Programme Review Group reviews what NMF has done and MFAB identifies what we are doing but there is a gap on future needs. **Action: CR to talk to Paul Tyler.**
- 3.9.7 MM asked about how equipment used for long-term ocean monitoring programmes, e.g. RAPID, which doesn't sit in the NMEP so isn't available for the community, is managed for the UK. The UK has the UK Integrated Marine Observing Network (UK-IMON). Dr Matthew Palmer is the new Chair and partners include Cefas and the Met Office. UK-IMON coordinates the marine observing network and includes the NMEP. BEIS has just agreed to fund a three year post that will spend some time in the IOC. This position is part of the G7 initiative and the post holder will act as a link to GOOS (the Global Ocean Observing System). The post will be advertised and co-ordinated by NOC and will be appointed at NERC Band level three or four.
- 3.9.8 The large-scale ocean observing programmes are somewhat removed from the NMEP. There was a suggestion to invite their representatives to brief MFAB, however, it was felt that MFAB may not be the correct forum for this.

Item 4 – Standing item: Update on new medium/large equipment

- 4.1 This paper was appreciated, however, it would be helpful if, for the next meeting, the Board could see the detail of the items bought. **Action: Secretary to liaise with NERC**
- 4.2 The visibility of equipment held by the UK marine science community has been made possible by the NOC Association which has created an on-line database, the [UK Marine Science and Technology Compendium](#). The Secretary was asked to circulate the link to the Board, and the Board to advise the Secretary of amendments or updates needed for their own Institutes and to encourage colleagues to do the same. **Action: Secretary/Board**
- 4.3 It would be helpful to know if the MFAB had influenced the capital spend of £1m detailed in this paper.

Item 4a – Data Working Group

- 4a.1 GA invited the Board to agree the terms of reference. AR volunteered to be a member of this WG at the last meeting, however as this is his last meeting, it was suggested that Tim Smyth from Plymouth Marine Laboratory could be a member instead. To note, non-MFAB members can also be on working groups. **Action: GA (CR to contact TS)**
- 4a.2 NW asked if there is a need to think about data visualisation on the vessels. MF confirmed that NMF has some capability here - operational data products which enable the first look at data. Historically, operational data products were the DVD you got at the end of the expedition. It would be good if we could generate the quality of figures that we might ultimately publish in the science paper. NW agreed and noted that there are some good visualisation tools available now. CD advised that when NMF supplies equipment from the NMEP, the application process asks questions about data. We need to know what process will be employed after capture of the data. We record and archive data and there is a limited amount of processing. We do ask what level of processing the community wants. Usually, the answer is just gather, archive and do a cursory QA. If more than this is required, we can add technicians but this is an additional expense and requires extra berths. To get the next level of data processing would be a different remit for NMF.
- 4a.3 SF noted that we are moving into more automated forms of handling data and there may not necessarily be a need for additional support. In terms of the membership of the working group, SF recommended approaching Dr Alexander Tate, Senior Data and System Architect, British Antarctic Survey. KHo agreed it would be good to standardise data and obtain underway data in a useful format. In terms of extra staff, this might just require a training course for a scientist on board. There have been issues in archiving images from ROV *Isis* and Autosub and being able to see what information is held by the British Oceanographic Data Centre. Can this be resolved? HO advised that currently, NMF is drafting a data management policy with BODC.
- 4a.4 JH talked about using visualisation techniques on the AMT programme. It might be possible, for example, to build up the profile of CTD transects crossing all the ocean environments.
- 4a.5 Some countries live stream data from ships although this incurs cost. There is now the capability to stream from a device to shore without using a ship.
- 4a.6 GA confirmed we can get some visualization on board. Standardization of data output from the data collection systems is possible, but before progressing effort would need to be invested in a clear definition of the scope of the standardization effort. We know scientists need access to data as soon as it has been collected on board. MI agreed on the issue of formats and suggested that it would be best not to try to encompass marine autonomous systems as well.

- 4a.7 SF noted that there have been problems using data on the two NERC ships. There should be a group that can advise how we can achieve consistency in output across the three ships. There seems to be a problem with harmonisation of data. AP advised that NMF is aware of these issues and work is on-going here.
- 4a.8 CR suggested checking that the membership of the working group matches its remit and invited members to contribute. JH, SF and KH all indicated their interest. GA agreed to look at this. **Action: GA**

Close of day one

During the dinner, on behalf of Professor Ed Hill, Executive Director NOC, AH thanked MI, the out-going Chair and presented him with a ship's crest representing RRS *Discovery*.

MFAB: 27th March 2019

Item Five: Minutes and actions, March 2018

Professor Angela Hatton, Dr Graham Allen were not able to attend day two. Dr Kerry Howell had to leave at 11:00.

- 5.1 CR advised the outcomes of the actions from the March 2018 meeting.

Action 3.1. – NMF is working to get the message out about this so this is on-going.

Action 7.8 - There had been difficulties getting the sensor system commissioned so it has not been used. Some time has passed now but it should be ready to implement if needed, but is not yet commissioned.

- 5.2 EK referred to an error at point 4.6 in relation to OEFG. LS agreed to correct this with the Secretary. **Action: Secretary**

Item Six: Update from the Cruise Programme Executive Board - Leigh Storey

- 6.1 LS started by thanking members for their commitment to MFAB. He reminded all that NMF supports 'expeditions', not 'cruises'.
- 6.2 LS updated the Board on the CPEB meeting in October 2018. Some Post Cruise Assessments have included comments that the performance of Autosub6000 was not as expected. Some criticisms are acceptable, some are not. It is important that we ensure clarity on the capability of platforms.
- 6.3 RRS *Discovery* has been at sea for over 650 days and is back soon. This has been challenging logistically and involved high technician loading. The NERC ships are crewed and available all year.

- 6.4 The Ships Management User Cost Group is a joint group with NERC and NOC to ensure we forecast the user cost element of programmes efficiently. NMF predicted an overspend in the 19/20 programme and proposed options to NERC on how to manage this. NERC agreed to cover the overspend and NOC will bring in more income via charter. The accounts will be in balance in 19/20 thanks to varying our income streams, including commissioned charter.
- 6.5 There was discussion about removal of Autosub6000 from the NMEP to complete some upgrades. This impacted the science programme. Other kit was removed for upgrading without impact.
- 6.6 The Ship Track Advisory Group (STAG) looks at longer-term programming of the NERC ships. NP advised there is a meeting in May to talk about the remit of the group.
- 6.7 MM advised that it is important to make expectations known at point of proposal rather than six months down the line. For example, how does the community keep up with the capability on MAS platforms? CD advised that if an SME is programmed, the relevant equipment documents should be available. If they are not available, applicants will know in advance. CD confirmed that the SME should characterise the capabilities of what the equipment will be able to deliver. If kit is standard, users can be referred to data sheets but there are some things that NMF do that is specific to them or sometimes there is in-house kit. MM talked about managing expectations of PIs. The planning cycle can compound this problem. A rolling planning process would be helpful.
- 6.8 JH said that it is important to write proposals knowing the capability of the equipment. MF explained that NMF has updated the SME process to show capability of equipment. NMF also needs to know, for example, the maximum current likely and how close PIs will want to go to the sea bed. We have improved the ADF process to take into account the abilities of systems. Applicants are advised to speak to the engineering manager before completing an SME.
- 6.9 CD agreed with JH that it is important for scientists to have understanding of capability in advance of writing proposals. He advised that NMF is bringing the MARS capability into the wider body of NMF Programme Management. The reliability of Autosub6000 is an ongoing issue. If NMF is worried about capability, we have to remove that vehicle to assess / solve the technical problems before bringing it back on line. There was a problem with the Strategies for Environmental Monitoring of Marine Carbon Capture and Storage (STEMM) project. We do want applicants to talk to Marine Planning and key people within NMF, the equipment suppliers. It is important to get a dialogue with NMF early if detailed equipment knowledge needs to be looked at. We need to look at this loop: PI - grant development - SME submission, NMF. The MFAB is a route to discuss this, as is the Principal Scientist workshop. MF suggested asking the MARS chief scientist role to help with this.

- 6.9.1 CR asked whether this subject needs a working group. SF explained that there used to be meetings every year which focused around autonomous vehicles and agreed it would be helpful to have updates on the capabilities of the vehicles. In addition, P.I.s must have an understanding of the capability in their field so this issue isn't solely the responsibility of NMF.
- 6.9.2 MP said that it is not his role to describe what Marine Autonomous and Robotic Systems (MARS) delivers, but to make the links work more effectively. Maybe we need to build on the Marine Autonomy & Technology Showcase (MATS) showcase event. MP would like feedback on how to take this forward. CR suggested adding this topic to a P.I workshop. It is important for scientists to know the availability of equipment, well in advance of calls. This issue isn't limited to MAS platforms, e.g. seismics capability.

Item 7 - National Marine Equipment Pool – Leigh Storey

- 7.1 National Capability – Large Research Infrastructure (LRI). There will be a mid-term review by NERC to check on value for money. The Owner and Ready To Go (ORTG) costs support two Royal research ships. User costs include, for example, fuel. The new funding model for NMF is flat cash.
- 7.2 **National Marine Equipment Pool** - any capital left would go to the CPEB or be added to next year's programme. NERC's decision on ship capital funding means that the ships will still be in a good state, 25 years from now.
- 7.3 **Operationally-focused Engineering Groups** - we have a good group of engineering managers who have worked here for many years. Retention of SQEP – Suitably Qualified Experienced Personnel - we don't want to lose people but have struggled with the AUV and glider group.
- 7.4 **NMF staff turnover** - this is skewed because if ship staff go off sick, we get agency staff in. We have a problem in keeping technicians; problems include low % pay rises. There are 180 staff in NMF. We have lost 18 staff. There will be more data at the next meeting.
- 7.5 Results from a review of PCAs from the 2017/18 programme showed a 93% rating (satisfactory or better) for delivery by both ships of multidisciplinary science. NMF will provide the data for the next meeting. **Action: LS**

Item 8 - Technology Road Map (TRM) Maaten Furlong

- 8.1 The TRM is updated annually and NMF is working to embed it within the teams. We want individual teams to see it and use it as the guide. It shows current capabilities, science drivers but we need to know if the drivers are correct – this is the remit of the MFAB. Essentially, NMF provides a service to deliver data. MF asked, given that the remit is a holistic strategy for future equipment requirements, should we include issues around development of the Marine Facilities Planning and the British Oceanographic Data Centre?

- 8.2 MF explained it should be possible to provide underway data. NMF is updating the HyBIS as a Modular Payload Underwater System and is developing control software. There is work on-going on the heavy compensation on RRS *Discovery* which will make HyBis more useful.
- 8.3 NMF would appreciate guidance from MFAB about as to where NMF should drive capabilities.
- 8.4 The Autosub6000 AUV had to be pulled out of the programme as the vehicle was suffering with reliability and legacy issues so has been removed from the National Marine Equipment Pool. Unfortunately, the vehicle has parts which can't be replaced. NMF is adding a container as a control van and this will enable the build of a replica vehicle so there will always be spare parts.
- 8.5 NMF has bought a *Deepglider* which has been trialled successfully. NMF would like to buy another *Deepglider*. How many *Deepgliders* should NMF acquire, compared to the other gliders? Again, this is where NMF would appreciate guidance from MFAB.
- 8.6 NMF bought a C-Worker 4 – this is still an immature system and there were issues with the radios and over-the-horizon communications. There have been problems with the launch and recovery system and the payloads need to be tested.
- 8.7 The NMEP has a selection of unmanned surface vehicles (USV). Three are still experimental, so still high risk and probably not useable for scientists yet. The applications of unmanned surface vehicles are not yet clear.
- 8.8 In using a long-range vehicle, it may be possible, in the future, to have a small number of underwater Ev charging stations dotted around the ocean so that vehicles can be recharged.

Item 9 – Comment and feedback from the Board - All

- 9.1 LS invited comments from the Board noting that any decisions made will still need approval from the CPEB. It was proposed that for questions raised, a member of the Board will be allocated to talk to those in their community with the expertise to provide guidance to NMF. MP said that there had already been a lot of discussion around MARS but we do need to enhance community engagement and this should include current users and the broader community. LS noted that this was the reason for the WG concept.
- 9.2 AB commented that it will be difficult for the community to engage as the document doesn't have a priority list of equipment or a time frame. This needs to be completed before the document goes to the community. For example, when giving 'future updates', what is the time frame? MF agreed to prioritise items and the point about time scales is well made, however, it also commits the NOC and we won't necessary know about upcoming programmes or, indeed, staff availability.

- 9.3 SF suggested making the availability of the TRM a standing item at the *Challenger* Conference.
- 9.4 MM suggested that NMF looks at how international organisations do similar activities. For example, there is a framework used for ocean observing to show priorities and there are roadmaps that give a Technology Readiness Level assessment vs time. Perhaps a blend of these two processes may help. It would be good to also link each piece of equipment to a data sheet which would help P.I.s to write proposals. A workshop is a good way forward – for example, there is a sensors and instrumentation roadmap.
- 9.5 MP added that it is important to explain the full scientific objectives behind the roadmap. It isn't necessarily the role for NMF to make the full scientific justification. Perhaps this would benefit from a working group for the TRM. CR asked if there is a volunteer to lead this working group? MP said that there is a need for an autonomous systems working group. CR added that this is a higher level strategy working group and we shouldn't focus only on autonomous instrumentation. MF added that there is already a ROV working group and there has been a seismics working group. CR was thinking more of a WG that would consider the mechanisms, a communication strategy to set up a workshop with the different areas covered. CR agreed to think about this and contact members individually. Both Matt Mowlem and Matthew Palmer indicated that they are happy to help. **Action: CR**

Item 10 MARS Chief Scientist – Leigh Storey

- 10.1 MP advised that MF and AP will be the key contacts for this role. RW is Acting Director for Government, International and Public Engagement (GIPE) and will continue to deal with MARS around media, stakeholders, the Ministry of Defence and the Foreign and Commonwealth Office so this role differs to the role that will be undertaken by MP. MP is also Chair of the UK Integrated Marine Observing Network (UK-IMON).

Item 11 Innovation – Maaten Furlong

- 11.1 NMF uses **Confluence** software for documentation storage.
- 11.2 NMF aims to complete calibration in house as at the moment, the sensor payload on a glider has to be sent away for three months at a time. We are changing the Launch and Recovery System (LARS) for Autosub to use the infrastructure on the ship. At the moment, we use a land-based crane system.

Item 12 Reliability analysis – Helen Oldridge

- 12.1 HO talked about selecting the best times to do maintenance so that it is the least disruptive for the programme. NMF is introducing tier 1 and tier 2 competencies and wants to implement training opportunities when possible. We aim to enable technicians to download information packs about the equipment they are using.

- 12.2 NMF has had a specific set of risk assessments completed for the moorings and hopes to roll out a similar system for autonomous deployments e.g. gliders, to minimise losses.

Item 13 Ship fitted equipment – Colin Day

- 13.1 The RRS *James Cook* and RRS *Discovery* ships have different ice classes. Both will need to comply with the new polar code to go north or south of 60 degrees. The new polar code potentially limits the number of people who can be on a ship. LS agreed to ensure that the Chief Scientist's handbook includes details on the number of berths and science berths that are available.
Action: LS
- 13.2 The usual passage speed for vessels is 10 knots - we are restricted to 10 knots for planning purposes. This is achievable but requires three generators although this is less efficient. Cost of fuel is one of the factors which also must be considered. NMF is required to report its carbon footprint and this needs to be kept low. In addition, we need to ensure that we deliver the best science. SF talked about the possibility of changing speed to generate more time. If, for example, the speed is reduced from 10 knots per day, this could generate possibly an extra day. Currently, speed changes are not factored into marine planning. Some expeditions require significant transit time which has an impact.
- 13.3 CD responded that NMF does operate on the basis of maximum duration. The other issue is the vessel design, its loading and use of fuel. If the duration of 40 days becomes less viable, alternatives may be more expensive. Other considerations are those instances when NMF is required to carry extra containers for other groups. There is also the issue of weather and sailing against current. We need to better inform the science community about the issues to be considered in planning expeditions.
- 13.4 SF asked whether NMF adds in more days to a submitted SME if the number of days requested are insufficient. CD answered that if you ask for 25 science days and the port is six days from the station, then these days are added to the science days. If the number of days requested are unlikely to be enough, NMF would advise the applicant accordingly. We feed back to P.Is how to best manage their science. It is possible to miss user-supplied equipment. For example, some P.I.s identify collaborative equipment which might need extra space, extra load and these are issues to think about. This all comes back to a need to get feedback.
- 13.5 There are now 30, instead of 28, science berths on RRS *Discovery*. There are training berths on both ships for technical and marine side. There can be an extra science berth available on both vessels depending on the requirement. Both ships are multi-disciplinary global class vessels.
- 13.6 Deep coring technology is challenging and NMF is looking at developing at sea deep sea trial activities to bring this technology on-line. The problems with

the RRS *Discovery* winches are now largely solved although some problems remain.

- 13.7 CD asked the Board if members wanted to develop how we look at ship-fitted systems in the future.

Item 14 Update on Marine Facilities website – Colin Day

- 14.1 The system has been supporting the programme since 2015 so 2016 was its first full year. The NMEP inventory is part of this system so we are able to manage the whole process from application through to programme delivery, project management etc. We are coming towards the end of the core development of the major sections of the MFP but there is still work to do.
- 14.2 The benefit of the shared, fully integrated modules is that every piece of information that is entered can be cross-referenced and queried. HO and MF are developing a new project on rolling equipment maintenance in relation to the live programme.
- 14.3 A reporting tool is available that will provide data on expeditions. One gap is the costing module. Once the system is mature, reporting and costing will be the last modules to add. We want to build a database within the MFP to make the costing process efficient and get more capability out of them. There may be a potential for a 'ready reckoner' which will give an idea of costs of expeditions at an early stage. It will be good to streamline and automate certain parts of the process.

Item 15 OCEANIDS – Alex Phillips

- 15.1 The development group in MARS which is funded through large capital projects such as OCEANIDS or competitively won grants.
- 15.2 There is new platform development. There are three new Autosub Long Ranges, set up for long endurance and under ice work. They will have, potentially, 5,800 km capability. We need the community to talk to us about what needs to be achieved so that we can advise on the capability of the vehicles.
- 15.3 NMF wants to upgrade the control systems on all the Autosub vehicles. We have various sensors projects which NMF will integrate into existing fleets.
- 15.4 NMF is reducing the user costs of the ALR1500 by developing rechargeable batteries which will be more economical than the existing ones.
- 15.5 Autosub2KUI will be replacing Autosub3.
- 15.6 NMF is now transferring data from the gliders automatically into BODC.

- 15.7 OCEANIDS Sensors – there are five sensor programmes. The aim of these programmes are to be at Technology Readiness Level 8 by the end of the programme.
- 15.8 There is a lot of technology under development. Trials work is split into platform trials and platform-sensor combination trials. AB asked how NOC's work compares to international colleagues. In terms of long endurance and long range, Autosub is months ahead of others but in terms of multi-vehicle collaboration, we are a bit behind.

Item 16 - OCEANIDS 2 – Alex Phillips

- 16.1 A challenge with OCEANIDS 1 was that it came around at short notice so we weren't able to engage with the community as much as we would have liked.
- 16.2 What lies ahead from 2021 – 2026? Capital investment has been huge. We need to think about how to do more with the assets that we have. For example, can we put them together in different ways to do smarter stuff? We aren't stretching the autonomous kit too much at the moment. Much of the activity, for example, is simply going between waypoints. How do we want to stretch the capability of these vehicles? e.g. do we want to respond to features we have seen in the environment? Can we bring down the costs of the vehicles? Can we make them less dependent on humans?
- 16.3 Before OCEANIDS we had six kinds of vehicles. We wanted to move to one pilot, one system and multiple vehicles. There is a lot of work to be done to optimise vehicles in the water. There is potential to get a lot more out of an asset in the water without a large pilot overhead. How about sharing information between platforms? Can we share information from ship to satellite to vehicles?
- 16.4 Do we need vehicles that can get within a couple of meters of the sea floor? We want input into ideas that can be pulled through into a potential programme. From March to September this year NMF wants ideas of what the community wants. We also need the link through to business and new growth. September to March is the time to refine ideas and identify key people to work with and sort out funding to start projects from 2021 – 2026.
- 16.5 KH asked about the possibility of sampling capabilities. AP confirmed that this is in discussion. MM advised that there are water and particle samplers already.
- 16.7 CR closed this session by thanking the presenters.

Item 17 Capital Expenditure Proposals – Carol Robinson

17.1 Four proposals were reviewed (below) in advance of the meeting by pairs of assessors who are members of the Board. Their feedback was circulated across the Board membership for review and overall grading at the meeting.

Applicant/s	Institution	Item
Eleanor Frajka-Williams, Nicholas Harmon	National Oceanography Centre and University of Southampton	Paros Scientific Seismic + Ocean Sensors-Absolute Pressure Gauge
Bramley Murton	National Oceanography Centre	Full heave compensation for the deep-tow conducting f/o winch
Adrian Martin	National Oceanography Centre	Trace metal clean snowcatcher
James Thorburn	University of St Andrews	National Acoustic Network

17.2 Board members were invited to step out of the meeting if a proposal was from their own institution or if their support had been indicated on a proposal.

17.3. Feedback will be provided, in confidence, to applicants within a month of the meeting. **Action: Secretariat / CR**

17.4 Regarding the proposal for full heave compensation. CD advised that heave compensation is available on the ships but is the community aware? It is not requested. MM said he hasn't asked for it because it hasn't been used before so there is a reluctance to use. **Action: CD/NMF to raise awareness**

17.5 There will be a request for proposals for Round Two at the end of April to be reviewed by assessors and discussed in a virtual meeting in September.

17.6 It was agreed to add more guidance to the notes for applicants, for example, what is the size of the user community for your idea? What is your vision for how much this item of equipment would be used. **Action CR/Secretariat**

17.7 It was agreed to provide better guidance for reviewers. **Action: Secretariat**

Item 18 Working Groups (WG) – Leigh Storey

18.1 The Seismics WG reviewed the state of equipment in the NMEP. The decisions made went to the CPEB in October who supported the recommendation for funding.

18.2 The Remotely Operated Vehicle working group has met once and will meet again at the end of March. The recommendations will go to the CPEB at the

end of October. The ROV *Isis* is expensive, particularly if it needs to be shipped some distance away.

- 18.3 Rather than a new working group for the Technology Roadmap, the membership of MFAB could review it with CR as Chair. We should allocate a section to a member of the Board, based on their expertise, and ask them to advertise it to their communities. We can review feedback at the virtual meeting. It should be added to the web site and advertised at the NOC Association, to encourage input. **Action: Secretariat/CR**

Item 19 – Any Other Business – Carol Robinson

- 19.1 There is one membership vacancy and, as SF is rotating off, it would be useful to have a seagoing scientist from BAS. Rather than another open call, let's discuss and find someone from BAS to join the Board. There is also a vacancy for an International Barter Partner, once EK rotates off. Again, rather than an open call, we could link in with OFEG, and solicit their recommendations. **Action: CR to discuss and invite new members**
- 19.2 There will be another equipment call in April 2019.
- 19.3 There will be a virtual meeting in September, one month before reporting to the CPEB.
- 19.4 Thoughts for the next meeting – perhaps get presentations in advance and have smoother IT connections.
- 19.5 LS thanked retiring members EK, SF and AR as they had been 'critical friends' for MFAB. He presented each with a letter from Professor Ed Hill and a small gift. A letter of thanks and small gift were posted to retiring member Professor Christine Peirce who had been unable to attend the final meeting.
- 19.6 In closing, CR invited the members to comment on the meeting in terms of sections that worked well and areas where improvements might be made.
Abridged comments include:

"It was good to see where MFAB sits in national picture, to learn about best practice and areas where OTE can help. We need to change the limits of MFAB and decide who takes responsibility for the areas we are not covering." MM

"This was my first opportunity to learn about MFAB and it's been interesting to see the situation and similarities in Northern Ireland. Next time, we should tighten up the advice on how to review proposals." CM

"It was nice to sit down with NMF and better not to cram everything into one day. A two day meeting is handy." JH

"I've learnt a lot and it's been good to engage in discussion. There needs to be clearer instructions for reviewers." KH

"I would ensure that ad hoc working groups involve more than just MFAB members." SF

"It has been interesting seeing the UK perspective. Does MFAB receive feedback from the international community? It might be good to find a way to share ideas with the International Research Ship Operators forum." EK.

"I have been listening to areas where we can improve from the NERC marine planning side. It would be good to increase communication as a whole. NP MFAB has had a difficult gestation since its inception. It's important that NMF don't control the agenda and we want to be challenged. We need informed, experienced scientists and operators really pushing us and telling us what we can do better. We need challenging feedback!" CD

"It was rather a full agenda!" AP

"I agree...it has been a lot and it was hard to think about how to cover it all"
MF

"In the bids for capital, it would be good to see if this links into the road map."
HO

"It would be good to have a better understanding the boundaries of some of the areas covered, for example, the boundary of NMF. Obviously OCEANIDS are fed through different route but would be good to show this on a diagram."
AB

LS explained that there is some flexibility between budgets. CD added that it would be worth having a conversation about the £1.5M. This is the capital budget envelope. If, for example, we lose a trace metal CTD frame, that's our funding gone. LS explained that NMF manages loss as a priority, so first we replace lost equipment.

JH asked about capital. If someone asks for kit that no one has the expertise to operate and the money is available to buy it, is there then the funding to train someone to use it?

MM added that it is good to see not just operational side but also the work behind the scenes. In terms of recruiting extra people, does NMF fully cover the areas we need to cover? For example, should we map the expertise onto the road map?

SF suggested appointing an atmospheric scientist as a member of the MFAB.

"When I started on the MFAB, it was dictated by NOC but now the relationship is working better with the community. I think once a year is not enough. You should probably try and engage more than once a year. The overnight worked well." AR

“My highlight was seeing Dr Sophie Fielding talking to Jane Stephenson, Head of the National Oceanographic Library about the archives...it was nice to see a scientist learning about how her work would have been done, decades earlier. Things to improve will be for the link ups to external members and to get presentations in advance.” JP

- 19.7 CR closed the meeting by thanking the group and agreed that perhaps it would be better next time to spread out the agenda. It is good to maximise the time we have to work together. The overnight was good. We now need suggestions for the venue for the next meeting. Ideas included Norwich, Liverpool or Bristol. **Action: Secretariat**

Actions

Item number	Detail	Responsibility
3.8	Check reference to NC-Large-scale Research Infrastructure in Terms of Reference and delete as necessary.	Secretariat
3.9.4	Highlight objectives of MFAB to those who complete SME; flag via NERC newsletter. Contact registered science users of MEP, to highlight role of MFAB and seek input.	Secretariat/CR/CD
3.9.5	Highlights from the distillation of the expedition programme process to be made available to MFAB.	Secretary/CD
3.9.6	Talk to Paul Tyler about the gap on future needs.	CR
4.1	Talk to NERC about the detail to be included in the next version of the expenditure document.	Secretary
4.2	Circulate link to the UK Marine Science and Technology Compendium and ask members to advise of amendments and updates needed.	Secretary
4a.1	Note the alternative suggestions for members on the data working group.	GA
4a.8	Check membership of the working group matches its remit and invite members to contribute.	GA
5.2	Correct error at point 4.6 in relation to OEFG.	Secretary/LS
7.5	Results from the review of PCAs from the 2017/18. NMF will	LS

	provide the data for the next meeting.	
9.5	Initiate a TRM WG	CR/Secretariat
13.1	Ensure that the Chief Scientist's handbook includes details on the number of berths and science berths that are available.	LS
17.4	Raise awareness of heavy compensation capability.	CD/NMF
17.6	Improve guidance for applicants.	CR/Secretariat
17.7	Improve guidance for reviewers.	CR/Secretariat
18.3	Enable the community to provide feedback on the Technology Roadmap	CR/Secretariat
19.1	Seek and appoint new member from BAS and an international barter partner	CR
19.7	Source potential venue for next meeting.	Secretariat