

Ocean Class Phone/Web Meeting
December 20, 2004
2:00 pm EST
Meeting Summary

Meeting Participants:

1. Tim Askew, HBOI
2. Tim Cowles, OSU
3. Annette DeSilva, UNOLS
4. Dolly Dieter, NSF
5. Rich Findley, U.Miami
6. Charlie Flagg, SUNY
7. John Freitag, ONR
8. Toby Garfield, SFSU
9. Dave Hebert, FIC Chair, URI
10. Frank Herr, ONR
11. Gary Hitchcock, U.Miami
12. Bob Houtman, Navy
13. Pete Kilroy, NAVSEA
14. Bob Knox, SIO
15. Kristin Peterson, JJMA
16. Mike Prince, UNOLS
17. Mike Reeve, NSF
18. Clare Reimers, OSU
19. Dan Rolland, JJMA
20. Al Suchy, WHOI
21. Jason Thomas, JJMA
22. Terry Whitledge, UAF
23. Peter Wiebe, UNOLS Chair, WHOI
24. Marc Willis, OSU
25. Bob Winokur, Oceanographer of the Navy/FOFC Chair
26. Dave Hebert, URI, FIC Chair

Summary of Recommendations, Suggestions and Questions (The following list includes comments received after the meeting):

X-Craft Recommendations, Suggestions & Questions:

1. Increase longitudinal depth of working deck space aft. The present configuration does not have enough depth to be useful. During the X-Craft ship visit, Nigel Gee indicated that from frame 20 aft on the baseline drawing could be opened up and still maintain the structural integrity of the vessel. It is recommended that the maximum allowable aft opening of the superstructure be evaluated.
2. Fewer vans (~6)/smaller hanger
3. Larger staterooms

4. 1-deg multibeam receiver – If this cannot be accommodated in the hulls, explore options (sword).
5. Add working deck space forward – Explore this for both the X-Craft and SWATH. Dan cautioned that this is a high impact area.
6. Explore alternate handling systems/methods (elevators, docking systems) and locations so that large buoys, gliders, AUVs and other tethered or non-tethered instrumentation can be safely and effectively deployed and recovered in normal working sea-states. The ability to connect lifting equipment to floating instrumentation and vehicles in the water without having to use small boats is an important requirement.
7. Arrange the over-the-side handling location so that it is at the ship's pivot point. This is tied to the comment above and in particular impacts the operation of tethered over-the-side equipment so that pitching motion does not affect the deployed equipment as much.
8. The crane needs to be able to lift 20,000 lbs (a container) from a pier with a reach of 20 ft. Is it possible for these cranes to be anchored on the flight deck?
9. An aft working deck with a passageway like that shown for the monohull is desired.
10. Develop arrangement to allow doublewide vans.
11. Minimize space between vans
12. Evaluate moon pool feasibility. Larger moon-pools nearer to the pivot point or LCF have been effective on smaller twin hull vessels.
13. Minimize overhead space requirements of gantry system
14. Will powerful bow thrusters fit in the X-Craft hulls? Recent comments from KILO MOANA users indicate that the bow thrusters on the ship are underpowered. Dynamic positioning (DP) requirements needed for AUV operations should result in larger more powerful thrusters.
15. Minimize/Reduce Freeboard (aft elevator) (relates to comments in # 6 above)
16. Minimize Radiated Noise– Radiated noise from the ship engines and systems (DP) must also be minimized. New vessels will likely be required to meet ICES Standard 209, underwater radiated noise of research vessels. Radiated noise must be minimized to allow tracking of AUVs (Note recent problems associated with ABE operations from KILO MOANA). Lowering tracking equipment below the keels via a moonpool may mitigate the vehicle tracking issue. The tracking array can be lowered when needed.
17. Provide a clear 80-ft by ~8-ft length on one side (for coring and over-the-side operations). If a container is to be placed in this area, the width should be increased to 10-ft. If over-the-side equipment handling systems are located in this area, then the width needs to accommodate safe handling and landing of large CTD rosettes and other equipment.

18. Provide outside deck space for Radiation Van - Radiation vans probably have to remain outside superstructure as the present policy states.
19. Are there any safety considerations required for landing a helicopter on the a ship? Are specialized fire-fighting systems and/or support personnel required?
20. Vessel Draft - An X-Craft optimized for speeds up to ~15 knots and for station work, would likely result in hull configurations that require deeper drafts. The vessel draft should not be so large that it precludes all but a few ports. Evaluate ways to minimize draft.
21. Stack Arrangement – Evaluate modification of the stack arrangement so that only a port stack is needed. Investigate routing of the starboard exhaust to the port stack and the fresh air intake and exhaust could possibly be on the inboard side above the STBD machinery space or aft of the machinery space.
22. Side Walkways – Evaluate ways to provide a STBD side walkway at the main deck level without compromising structural integrity. Walkways on both port and STBD sides would be optimal.
23. Small Hanger Arrangement – move vans forward into storage area.
24. Berthing – Is it possible to have some berthing below the main deck level?

SWATH Recommendations, Suggestions & Questions:

25. The vessel draft should not be so large that it precludes all but a few ports. Evaluate ways to minimize draft or have a variable draft capability. JJMA will try to evaluate the impacts of a variable draft (amt of ballast, rough estimates).
26. Increase longitudinal depth of working deck space aft. The present configuration does not have enough depth to be useful.
27. Fewer vans (~6)/smaller hanger
28. 1-deg multibeam receiver – If this cannot be accommodated in the hulls, explore options (sword).
29. Explore alternate handling systems/methods (elevators, docking systems) (see comment 6 for X-Craft above).
30. An aft working deck with a passageway like that shown for the monohull is desired.
31. Evaluate moon pool feasibility (see comment 12 for X-Craft above)
32. Minimize/Reduce Freeboard (aft elevator) (see comments for X-Craft above)
33. Minimize Radiated Noise– Radiated noise from the ship engines and systems (DP) must be minimized. New vessels will likely be required to meet ICES Standard 209, underwater radiated noise of research vessels. Radiated noise must be minimized to allow tracking of AUVs (Note recent problems

associated with ABE operations from KILO MOANA). Lowering tracking equipment below the keels via a moonpool may mitigate the vehicle tracking issue. The tracking array can be lowered as needed.

34. Provide a clear 80-ft by ~8-ft length on one side (for coring and over-the-side operations). If a container is to be placed in this area, the width should be increased to 10-ft. If over-the-side equipment handling systems are located in this area, then the width needs to accommodate safe handling and landing of large CTD rosettes and other equipment.
35. Provide outside deck space for Radiation Van - Radiation vans probably have to remain outside superstructure as the present policy states.
36. Are there any safety considerations required for landing a helicopter on the a ship? Are specialized fire-fighting systems and/or support personnel required?
37. Will powerful bow thrusters fit in the SWATH hulls? Recent comments from KILO MOANA users indicate that the bow thrusters on the ship are underpowered. Dynamic positioning (DP) requirements needed for AUV operations should result in larger more powerful thrusters.
38. Side Walkways – Evaluate ways to provide a STBD side walkway at the main deck level without compromising structural integrity. Walkways on both port and STBD sides would be optimal.

Monohull Recommendations, Suggestions & Questions:

39. Optimize length to beam ratio for optimal sea keeping. The 1989 wide-beam monohull design was estimated to have slightly better seakeeping than the largest ships in the current UNOLS fleet. Also, larger beam vessels gain some of the advantages for more real estate that you get with twin hull vessels.
40. Fewer vans.
41. Review EWING Replacement plans since the LEGEND is basically a big monohull (Length 235, Beam 56 feet) with a box superstructure opened at the end. LDEO plans to cut it open at the side to allow general oceanographic use.
42. It looks from the drawings that a container is slightly higher or the same height as a normal deck, hence the wasted space above the containers and the depression in the monohull lower level. Can space be minimized?
43. Evaluate a monohull variant that falls in size between the baseline and lengthened variant to increase mission storage space
44. Identify methods for transporting/handling the ROVs aboard ship (how will they be moved around the ship?)
45. Provide outside deck space for Radiation Van - Radiation vans probably have to remain outside superstructure as the present policy states.

46. Are there any safety considerations required for landing a helicopter on the a ship? Are specialized fire-fighting systems and/or support personnel required?
47. Minimize Radiated Noise– Radiated noise from the ship engines and systems must be minimized. New vessels will likely be required to meet ICES Standard 209, underwater radiated noise of research vessels.

Meeting Summary Report

Welcome - Frank Herr (ONR) welcomed the meeting participants and asked that they use the meeting to provide additional requirements to Dan Rolland. Based on the UNOLS input he will continue with more detailed design efforts.

Review of Ocean Class Hull Selection Studies – The remainder of the meeting was devoted to reviewing the status of the Ocean Class hull selection studies. Dan Rolland, JJMA, lead the discussion by guiding the group through a PowerPoint slide package. The slides are available on the UNOLS web page at http://www.unols.org/projects/fic_ocean/xcraft/JJMA_slides_122004.pdf. As each slide was presented, questions and comments followed. The report below summarizes these discussions.

Dan provided a brief description of the project and reviewed the new SMRs provided by the Navy http://www.unols.org/projects/fic_ocean/xcraft/Navy_SMRs_1201.pdf.

SMR Question (Bob Knox) – Are the additional Navy SMRs indicative of the future direction of ONR research, or do they represent future Navy sponsored research directions? Reply (Frank Herr) - The new SMRs represent Navy research directions in the out years. Systems will likely become more modular to lower costs. The SMRs represent more of a Navy sponsored research direction, rather than ocean science direction.

Ship-use Question (Peter Wiebe) – Will the Navy increase their use of UNOLS vessels as a result of the new capabilities described in the SMRs? Reply (Frank Herr) – It is not clear at this time.

Summary of Variants - Dan reviewed the hull variants that were examined in the study. These include:

- 3 monohulls (Phase II Baseline, Lengthened, Wider Beam)
- 2 SWATHs – 14-feet longer than KILO MOANA (Large hangar, small hanger)
- 3 X-Craft (Large hangar, half hangar, small hangar)

All of the variants have been designed to meet the UNOLS SMRs with some exceptions. JJMA has developed draft arrangements for each of the variants. They will continue the study by working to refine the designs.

X-Craft Variants (slide 3) – The X-Craft variants have the same overall dimensions as the ONR X-Craft, but with wider hulls. The slender hulls are not required for a slower speed X-Craft. Question – will slender hulls be required for a 24-knot speed capability?

Van Question (Peter Wiebe) – Are the vans shown on the X-Craft arrangements all standard size vans, 20' x 8'? Can doublewide vans be accommodated? The ROV support vans used with Jason II are doublewide. Reply (Dan Rolland) – Only single width, standard UNOLS vans (20' x 8') were considered in the arrangements. On the X-craft there is a steel stanchion located between each van for support. The stanchions are needed to support the weight of the helicopter on the upper deck. Since, we are starting with a new design, the van arrangements could likely be modified so that doublewide (side-by-side) vans could be accommodated. Dolly pointed out that the doublewide vans used for the ROVs are transported in two halves and connected when installed aboard ship.

Slide 3 shows the X-Craft arrangements for the three hangar variants. A large hangar allows 1,730 ft² of lab space, while the small hangar allows 800 ft².

Space Comment (Peter Wiebe) – There appears to be a lot of lost working space with the van arrangements. There is a lot of space between each of the vans.

Deck Area Discussion:

- Comment (Rich Findley) – Rich remarked that he and Tim Askew had recommended a larger aft deck area on the X-Craft, by moving the hanger forward. The arrangements shown on slide 3, each have small deck areas. While visiting the shipyard the Naval architect had indicated that this would be feasible. Marc Willis added that a larger deck is needed to accommodate operations like long coring. The current configuration does not include a deck space large enough for long coring operations. Reply (Dan Rolland) – They can explore ways to make the aft deck area more open, but indicated that it would be a challenge. Dan pointed out that the aft deck area would need to accommodate space for engine and generator equipment, etc. Also, an exhaust stack would be needed for each hull (the ONR X-Craft waterjet configuration does not have stacks, exhaust is through the hull).
- There was general consensus that without a larger working deck this X-Craft configuration is a showstopper. Deck space is needed to accommodate coring, mooring recovery/deployments, and a variety of other over-the-side operations. This is a serious issue that requires additional attention by Dan. A clear 80-ft by ~8-ft length is needed to allow coring. There is a desire to be able to pull along side equipment for recovery/deployment operations.
- Suggestion (Rich Findley) – To add more aft deck area, perhaps one side of the hangar could be designed with less overhang to accommodate long coring. Reply (Dan Rolland) – Dan expressed concerned with removing too much of the hanger space. The hangar is needed for structural strength. Also, he is concerned about not having a symmetric structure on the catamaran design.

Docking Suggestion (Peter Wiebe) – Peter suggested that a docking capability be explored as an alternative option to over-the-side retrievals.

Moon Pool Suggestion (Charlie Flagg) – Installation of a moon pool should be explored. There is a lot of open space between hulls. Reply (Dan Rolland) - Dan indicated that the moon pool installation on the KILO MOANA was not successful. The wav dynamics between the hulls create challenging operating scenarios. This is a high-risk area, but they can study this further. Model testing is needed. This same suggestion applies to the SWATH variants. Mike Prince commented that MBARI is pleased with the WESTERN FLYER's moon pool. The Western Flyer moon-pool and handling arrangement was designed in, is further forward (closer to the pivot point) and larger. It has large doors to close it up and occasionally has slamming against the bottom in very high seas. They use it exclusively to deploy and recover the TIBURON ROV, which is comparable in size to the JASON II, and have done so in weather where ALVIN and JASON II were not launched from larger vessels. So a well-designed moon-pool might be a viable answer for the twin hull, but it uses a lot of internal real estate.

Forward Working Deck - Peter suggested that the X-Craft include a working deck space forward to take advantage of the clear water for deployments. This would be of interest to a variety of researchers. Dan Rolland indicated that they could be looked into this further

Monohull Variants (Slide 4) – Three monohull variants are being studied by JJMA. The baseline variant is the same design studied in Phase II. It is a 2500-ton variant. The lengthened variant has 32 added feet to allow additional vans. It is just less than 3000 tons.

Question - Peter Wiebe asked if there are any preferences regarding van arrangement, transverse vs. fore/aft. Reply – The general opinion seems to favor fore/aft.

Dan Rolland explained that on the monohull variants all vans are undercover. The space is a bit cramped. The vans would be lowered into the space from the upper deck. JJMA has not designed an arrangement for the wide beam monohull. They are first studying the vessel's seakeeping characteristics to determine if there are any benefits with this variant. There may be some drawbacks with the wide beam variant that they would like to identify. There may also be some issues with increased fuel costs. The wide beam variant has a beam of 52 ft.

Bob Knox commented that the UNOLS SMRs call for two standard vans. The new requirement for increased modularity (additional vans) should be further evaluated if it appears that it is becoming a design driver in the hull selection.

Marc Willis pointed out that the Dutch have a vessel, PELAGIA, that is designed to accommodate multiple lab vans, many below deck. The Dutch are pleased with the

vessel. The Dutch ship is very modular and is about 230-ft long. The ship has been in service over 10 years. It carries up to nine vans with one in a storage location.

Dan Rolland stated that with additional vans in the Baseline monohull, mission storage space is reduced from the Phase II monohull. He indicated that it might be good to have a monohull variant that falls in size between the baseline and lengthened variant.

Question – How will the ROVs be supported on the monohull? How will they be moved around the ship (where will they be stored and how will they be deployed? Are there issues related to having the vans located in below a deck?)? This will need to be further explored.

Question - Peter Wiebe asked if UNOLS could get additional information about the vehicles (AUVs and UAVs) that the Navy plans to use from these ships. It would be helpful to know the vehicle dimensions so that we could determine how the vehicles could be moved around.

Questions – What is the optimal speed for the variants under study? Reply - Dan indicated that the ship speed is optimally 10-12 knots.

Draft Question – What is the draft of the X-Craft variant? Reply – Dan indicated that the X-Craft draft is approximately 14-ft plus any sonar appendages.

SWATH Variants (Slide 5) – Dan reported that instead of using the KILO MOANA design for the study, they started with a new SWATH design that is 14-ft longer. The variant has the same beam. Two variants have been considered, large hangar bay and small hangar bay. The arrangements are similar in both designs No weight analysis has been done yet. Vans would be loaded through hatches.

Comment - Mike Prince commented that the side bay door should be located close to the ship's pivot point to optimize over-the-side handling.

Comment – It was pointed out that the SWATH has similar drawbacks as the X-Craft with the small aft deck area.

Variant Arrangements (slides 7-29) – Dan reviewed the arrangements for the three X-Craft Variants. JJMA kept the overall X-Craft dimensions the same as the ONR X-Craft hull. Some of the differences with the ONR variant include:

- A more conventional pilot house
- Opened up the bow to look more like a conventional ship
- Added stacks
- A commercial (light) helicopter is shown on the upper deck
- Deeper draft - approximately 16 feet
- The crew staterooms are all singles (this applies to all variants). The staterooms are small.

Dan indicated that the study hasn't addressed detailed hull shape.

Question (Annette) – What is the hull material for the X-Craft variant? Reply - Dan replied that the hull would likely be steel. Aluminum is not an economic choice and there is no advantage for a slow speed ship. For this study, JJMA does not plan to consider the hull material.

Comment - Mike Reeve commented that the helicopter range would be very limited since fuel is not going to be carried aboard the ship.

Comment - The gantry system takes up a lot of overhead space. There is a huge space issue with the gantry system.

Question - Peter Wiebe raised the issue of whether powerful bow thrusters could fit in the X-Craft hulls? Dan indicated that this would need to be explored.

Question - Dolly asked if the X-Craft survivability has it been explored? Reply - Dan indicated that they think the X-Craft would be adequate. They have done some stability studies for the monohull, but not for the X-Craft.

Question – Bob Knox continued by asking if the X-Craft would be survivable at high sea states. We need to be able to operate in high sea state, an unrestricted operations capability. Reply - Dan indicated that since JJMA started their study with a new X-Craft design (as opposed to the ONR X-Craft) the ship is designed for unrestricted operation. This is an important requirement from ONR.

Question – Charlie Flagg asked if the wedge shaped hull is required? Dan replied that they haven't done a lot of hull work yet and that the hull shape could probably be modified.

SWATH Draft Discussion – there was a lengthy discussion on draft. The SWATH draft is 25 ft, which may be a constraint. Many of the current UNOLS homeports cannot accommodate a 25-ft draft vessel.

The concept of a variable ballast hull was discussed. Dan stated that the variable ballast SWATH must be designed so that they float and they must have a significant ballast system. It would probably make the ship larger. Dan indicated that there might be fuel efficiency issues for the variable ballast SWATH when transiting in the submerged condition.

There was general consensus that the Ocean Class vessels must be able to enter and tie up in UNOLS homeports. We shouldn't consider a SWATH that cannot be accommodated in the ports traditionally visited by the current UNOLS vessels. UW, OSU, SIO, URI, and WHOI cannot take a 25-ft draft vessel.

The KILO MOANA beam is 88 ft. The X-Craft beam is 72 ft.

Question - Charlie Flagg asked what the variants would look like if the additional vans were not needed. Dan replied that the big open hangers would not be needed. On the SWATH, the vessel would probably look more like KILO MOANA and the might be able to open the deck a bit. However, Dan cautioned that on the SWATH and X-Craft the box-like structure is needed to hold the hulls together. You can't cut into the box too much.

Over-the-End operations - Rich Findley commented that operations on WALTON SMITH are conducted by orienting to the seas. Equipment is deployed/recovered of the aft and it works well. WALTON SMITH freeboard is 4-6 ft. Bob Knox asked if KILO MOANA has had the same success with backing into the seas. This should be examined. Marc Willis stated that cores (~30-ft) were recently taken using KILO MOANA. Should check.

Suggestion – The estimated X-Craft freeboard is 15 ft. It was suggested that an aft elevator system be explored to reduce the X-Craft freeboard.

Question – (Annette) What is the optimum number of vans needed to meet the Navy's future requirement? Reply (John Freitag) – The Navy hasn't indicated an optimal number for the vans. However, they would like them to be in an HVAC space and allow modularity. After discussion it was suggested that 6-8 vans would probably meet the Navy's requirements.

Seakeeping Analysis (slides 30 and 31) – Dan Rolland reported that the seakeeping analysis is in progress. They are evaluating the wide beam monohull variant and their preliminary results show degradation of performance. They will continue to evaluate the variant to determine if there is an optimal length to beam ratio.

They will evaluate the X-Craft seakeeping with a heavier displacement, which is needed to meet SMRs.

Operating Costs (Slides 33 and 34) - Dan reviewed his operating cost calculations. He guided us through the calculations used in estimating the van impacts on operating costs. The study assumed that there were 28 vans in the UNOLS vanpool. Dolly Dieter indicated that there are only 3-4 vans per coast. More vans would be needed to accommodate a modularity capability in the Ocean Class. This is important. The cost of additional van construction has to be factored into the ship construction cost. John Freitag indicated that perhaps the van construction cost would be included in the ship construction and additional vans would be provided to each selected operator on delivery. Dan reviewed the costs for use of the vans, which includes the van day rate and shipping fees.

Comment – It is important to recognize that the process of unloading vans and unpacking takes a long time. It is very unlikely that there would be any savings in time in port, in fact it might result in an increase of in-port time. Maneuvering containers onboard ship will take time.

Dan indicated that he needs to recalculate and fine-tune some of the operating cost figures, but it was clear that adding vans would significantly increase day rates.

Charlie Flagg commented that the operating costs were numbing. They are roughly 50% to 100% (\$5.5M - 6M vs. \$3M-3.3M) greater than the current intermediate vessels. Dan replied that the crew size is a driver and with the new regulations it is unlikely that they can be reduced.

Ability of Hull Types to meet SMRs (Slide 35) – Dan’s last slide showed the ability of the variants to meet the SMRs. There are no SMRs that cannot be met to some degree. The reason for this is that the ships are being designed from scratch so that they can meet the SMRs.

Open Discussion:

Noise - Dolly asked if noise had been evaluated. Noise introduced into the environment of the ship interior, and also into the marine environment, mainly from the ship engines is a concern. Engine noise will inevitably become subject to environmental standards. NSF insists that new ships be designed to operate more quietly than the best of the vessels currently in the fleet.

Peter Wiebe added that KILO MOANA’s DP system is too noisy for tracking the AUV ABE. The DP system was needed to stay on station. On monohulls there hasn’t been a problem tracking ABE. On KILO MOANA they cannot track the AUV and stay on station. Dana Yoerger has written a memo, which details the AUV/DP noise problem on KILO MOANA. Peter indicated that if future directions require the ability to support AUV fleets quiet ships will be needed. The DP issue on SWATHs and perhaps X-Craft will need to be evaluated.

Tim Askew commented that HBOI ships use a transponder deployed through a moonpool well below the hull to avoid ship system radiated noise when tracking their vehicles.

Pete Kilroy suggested that the Navy SMRs should include wording to indicate that the AUV operations must be compatible with DP / bow thruster radiated noise.

Vessel Draft – There was additional discussion on vessel draft constraints. It was generally agreed that there should be a draft constraint for the Ocean Class ships or variable drafts should be explored. The ships should be able to be home ported in all possible homeports.

In conclusion, the meeting participants provided a list of recommendations to provide JJMA for refinement of the three hull variants. These will be circulated for further comment:

X-Craft Recommendations:

- More deck space aft
- 80-ft by 8-ft deck space on side
- Fewer vans (~6)/smaller hanger
- Larger stateroom
- 1-deg multibeam receiver – If this will not work on the X-Craft explore options (sword)
- Add deck space forward – Explore this for both X-Craft and SWATH. Dan cautioned that this is a high impact area.
- Explore alternate handling systems/methods (elevators, docking systems)
- Arrange over-the-side locations at the ship's pivot point.

SWATH:

- Draft reduction or variable draft – Dan will try to evaluate the impacts of a variable draft (amt of ballast, rough estimates)
- Manage/reduce freeboard

Monohull:

- Optimize length of beam ratio for optimal sea keeping
- Fewer vans.

Peter Wiebe asked if any of the variants are able to operate at the speed indicated in the Navy SMRs. Dan indicated that they plan to further evaluate the impact of this.

Mike Prince will contact Marieke (NIOZ) for information/feedback regarding van use on their vessel PELAGIA.

Adjourn – 5:15 pm EST.