R/V *Sikuliaq* Debrief Questions – UNOLS Fleet Improvement Committee 2016
Chief Scientist Name: Mitchell Lyle (OSU)
Cruise Dates/Project: March 9-12, 2016, Coring Shakedown

Dear Chief Scientist:

The UNOLS Fleet Improvement Committee requests that you provide feedback on your recent cruise on the *R/V Sikuliaq*. The purpose of these questions is to help determine how key underlined design and outfitting features of the vessel have either benefited or hindered your cruise objectives. The FIC will use your feedback to inform design recommendations for future Ice Capable and Global Class Research Vessels. A member of FIC will contact you by phone or email shortly after your cruise to get your responses. You may also submit written responses to me if you prefer.

Sincerely,

Jim Swift
FIC, Chair
Email: jswift@ucsd.edu

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1. Size: The *R/V Sikuliaq* has a LOA of 261 ft, a beam at midship of 48 ft, and has berths for 26 scientists and technicians. Science labs occupy 2250 sq ft and the deck working area is 4360 sq ft. **Has the overall size of the vessel either enabled or hindered you in meeting the science objectives of your cruise? Is there sufficient lab space of the appropriate type? Are there sufficient berths available to accommodate an optimal science party? Were the living arrangements satisfactory? Please explain using specific examples that relate to your science objectives.**

   Overall size works well for a specialty global class vessel. We made use primarily of the underway/Navigation lab space, since we were navigating cores and using multibeam/TOPAS to locate core sites. There was some space issues because techs needed to monitor sonar etc for QC and scientists needed to monitor the same data streams to identify coring spots, faults, etc. We only used the other labs for seating space and for some equipment maintenance.

   All the science berths were across from the mess decks, and the layout worked well. Our scientific party was 20, so we had 6 with single cabins. Food was good, and stewards were friendly.

2. Performance: The endurance of the *R/V Sikuliaq* is ~45 days with an expected range of 9,000 nm at 11 knots. The vessel has a design maximum speed in calm open water of 14 kt and is designed to operate in 3 ft of ice at 2 kts. **Have any of**

these performance capabilities of the vessel either enabled or hindered you in meeting the science objectives of your cruise? If the ship operated in ice during your cruise, how was the performance? Please explain using specific examples.
We did a 3 day cruise so range was not an issue. Cruising speed is similar to other research vessels.

3. Over-the-Side Handling Systems: The *R/V Sikuliaq* has been outfitted with a system that allows "hands free" launch and recovery of CTD and other systems within a Baltic Room on the starboard side using an overboarding boom with docking head and motion controlled winch systems. It also has:

- An articulating Stern A-Frame
- Port and Starboard Knuckle, Extension Boom Cranes
- Two Mo-Comp Hydro Winches (.322 EM Cable)
- Traction Winch with two tension member drums (.680 EM Cable and 9/16 3X19 Wire Rope)

Did these systems have a positive impact on your work and if so how? Are there any negative impacts associated with these systems?

We used all of this over the side equipment. We really liked the ability to do remote crane control. This meant that the crane operator could position himself where he could both watch the crane and the operation. We rigged the 0.322 conducting wire also out through the A-frame for the multicore. All the equipment worked well.

4. Hull Mounted Sonar Suite: The ships sonar flat is outfitted with:

- Kongsberg Ksync - Sonar Synchronizing system
- Kongsberg EM302 .5X1 - Multibeam
- Kongsberg EM710 .5X1 - Multibeam
- Kongsberg TOPAS PS-18 - Parametric Sub Bottom Profiler
- Kongsberg EK60 (18, 38, 70, 120, and 200 kHz) - Split Beam Sonar
- Knudsen 3260 12 kHz - Chirp PDR
- Benthos UDB-9000 - Acoustic Modem
- Teledyne RDI OS 75 kHz - Acoustic Doppler Current Profiler (UHDAS)
- Teledyne RDI OS 150 kHz - Acoustic Doppler Current Profiler (UHDAS)
- LSE 297 50 kHz - Bridge Navigation Sonar
- LSE 297 200 kHz- Bridge Navigation Sonar
- HAP 5050 Array - Self Noise Monitoring Array
- Doppler Speed Log

Which of these systems were essential to science objectives during your cruise? What is the quality of the data collected?
We used all the Kongsberg gear for swathmapping and subbottom profiling. All systems worked well. We were able to drive similar lines as a Revelle cruise in January to compare Knudsen profiles from the Revelle to TOPAS profiles from Sikuliaq. The TOPAS profiles are superior. One problem with the TOPAS is poor signal quality along certain headings (bubbles around ducers?).

5. Retractable Centerboard with mounted acoustic transducers: The *R/V Sikuliaq* is fitted with a retractable centerboard that can be lowered to 8 feet below the keel and on which there is an EK 60 array and a spare 12' acoustic well for ship and science use. Transducers are changeable alongside. **Has this arrangement had any significant positive or negative impacts on your work?**
I am uncertain whether we used any of this

6. Acoustically Quiet: The *R/V Sikuliaq* was designed, engineered and built to meet ICES 209 noise limits above 200 Hz at 8.0 knots. Radiated airborne noise within the ship is also designed to be at low levels.
a. **Did you observe any evidence of Underwater Radiated Noise affecting sonar signatures or any other science observations?**
b. Were there regular airborne noises that affected the habitability of ship spaces?
For science, Sikuliaq seemed quiet—we got good sonar. However, we were basically in calm weather. One annoying noise for ships habitability is anchors swinging and banging.

7. Vans and deck space: The van set up of the *R/V Sikuliaq* for any particular cruise is "modular" in that there is a choice between more deck space or more enclosed lab, berthing or storage space. The design of the *R/V Sikuliaq* incorporates the ability to fit three 20 ft ISO Containers vans on the aft deck for berthing, lab space or other uses and a 10 ft van forward on the 02 Deck. These vans are mounted to dedicated deck fittings, and provided with services such as power, water, comms, drains etc. **If you have used the vans, how well did they accommodate your space requirements? Did this modularity have a positive or negative impact on your cruise planning and work at sea?**
We had 1 20' reefer van, 1 10' coring van, and 1 20' container van on the fantail. There was adequate room for a coring operation despite the piston core rail occupying much of the fantail.

8. Dynamic Positioning: The *R/V Sikuliaq* was designed and outfitted with dynamic positioning (DP) capabilities. This is accomplished by using twin rotatable Z-Drives, a trainable bow thruster and a commercially available computer controlled precision navigation system. All of these components add cost, maintenance requirements and complexity to the operation of the vessel. **How important was the DP system to your work? How well did this system operate during your cruise?**
Dynamic positioning is highly important for precision coring. I was impressed that the ship was holding position to milli-minutes based on the GPS. DP worked well except for one squall that came through with winds ~40 knots. Sikuliaq was unable to hold position under these conditions.

9. Seakeeping: The *R/V Sikuliaq* has an anti-roll tank to improve seakeeping. **Did the ship's roll affect your operations or cause safety concerns? Could you tell if the anti-roll tank was in operation or not?**

We were in basically calm weather, so we normally had little roll. The roll was regular so easy to adapt to. We could not tell if anti-roll tanks were operating.

10. Lab Arrangement: The *R/V Sikuliaq* labs were pre-outfitted with lab benches and science services (air, electricity, water, seawater, etc). **Did you find the existing arrangement easy to modify and was the quantity of service outlets for air and water adequate, too many or too few?**
We did not really use these labs, so cannot make any meaningful comments.

11. Pilothouse Arrangement: The *R/V Sikuliaq* has some areas for observers to sit and stand in the Pilothouse, as well as on top of the pilothouse. **Did you find those areas adequate for science observations?**
We did not use these spaces in the pilothouse.

12. Internet access and bandwidth**: Did you plan telepresence activities and were facilities satisfactory? Did you have high speed internet or special bandwidth requirements for science? Was the internet connectivity adequate for other broader impact, science or normal communication activities?**
We did not plan telepresence activities and like all RV's would worry about bandwidth if we were to try on Sikuliaq. The internet was there but was typically slow. However, I didn't see much difference to other research vessels.

13. Other Features: **Can you describe other design, outfitting or operational features of the *R/V Sikuliaq* that had significant positive or negative impacts on your work at sea? Should these features be requirements of other new UNOLS Research Vessels? Were there any important design features missing which would benefit a wide variety of projects?**

It is really nice that the starboard crane is strong (and long) enough to load heavy equipment from the pier. This saved us from needing shore cranes to onload vans and piston core gear in the tight space at San Diego's Pier B. Having a crane that can serve to onload/offload is a feature that is very useful.

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Chief Scientist Name: Matt Heintz (WHOI)
Cruise Dates/Project: April 4-14, 2016

R/V *Sikuliaq* Debrief Questions – UNOLS Fleet Improvement Committee 2016

Dear Chief Scientist:

The UNOLS Fleet Improvement Committee requests that you provide feedback on your recent cruise on the *R/V Sikuliaq*. The purpose of these questions is to help determine how key underlined design and outfitting features of the vessel have either benefited or hindered your cruise objectives. The FIC will use your feedback to inform design recommendations for future Ice Capable and Global Class Research Vessels. A member of FIC will contact you by phone or email shortly after your cruise to get your responses. You may also submit written responses to me if you prefer.

Sincerely,

Jim Swift
FIC, Chair
Email: jswift@ucsd.edu

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1. Size: The *R/V Sikuliaq* has a LOA of 261 ft, a beam at midship of 48 ft, and has berths for 26 scientists and technicians. Science labs occupy 2250 sq ft and the deck working area is 4360 sq ft. **Has the overall size of the vessel either enabled or hindered you in meeting the science objectives of your cruise? Is there sufficient lab space of the appropriate type? Are there sufficient berths available to accommodate an optimal science party? Were the living arrangements satisfactory? Please explain using specific examples that relate to your science objectives.**

The size of Sikuliaq is sufficient for Jason ops. The lab space is limited, and required trade offs compared to the Atlantis class global. The berthing area is close to the galley making it noisy at times. The rooms are adequate.

2. Performance: The endurance of the *R/V Sikuliaq* is ~45 days with an expected range of 9,000 nm at 11 knots. The vessel has a design maximum speed in calm open water of 14 kt and is designed to operate in 3 ft of ice at 2 kts. **Have any of these performance capabilities of the vessel either enabled or hindered you in meeting the science objectives of your cruise? If the ship operated in ice during your cruise, how was the performance? Please explain using specific examples.**

The vessel performance was excellent. The capacity to hold station for ROV ops was sufficient. The endurance was not and issue and vessel speed was sufficient.

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3. Over-the-Side Handling Systems: The *R/V Sikuliaq* has been outfitted with a system that allows "hands free" launch and recovery of CTD and other systems within a Baltic Room on the starboard side using an overboarding boom with docking head and motion controlled winch systems. It also has:

- An articulating Stern A-Frame
- Port and Starboard Knuckle, Extension Boom Cranes
- Two Mo-Comp Hydro Winches (.322 EM Cable)
- Traction Winch with two tension member drums (.680 EM Cable and 9/16 3X19 Wire Rope)

Did these systems have a positive impact on your work and if so how? Are there any negative impacts associated with these systems?
Jason brings its own handling system so we did not utilize shipboard handling gear. We did however use the power distribution box provided and it helped distribute the 480V loads and was beneficial for our ops.

4. Hull Mounted Sonar Suite: The ships sonar flat is outfitted with:

- Kongsberg Ksync - Sonar Synchronizing system
- Kongsberg EM302 .5X1 - Multibeam
- Kongsberg EM710 .5X1 - Multibeam
- Kongsberg TOPAS PS-18 - Parametric Sub Bottom Profiler
- Kongsberg EK60 (18, 38, 70, 120, and 200 kHz) - Split Beam Sonar
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- LSE 297 50 kHz - Bridge Navigation Sonar
- LSE 297 200 kHz- Bridge Navigation Sonar
- HAP 5050 Array - Self Noise Monitoring Array
- Doppler Speed Log

Which of these systems were essential to science objectives during your cruise? What is the quality of the data collected? N/A

5. Retractable Centerboard with mounted acoustic transducers: The *R/V Sikuliaq* is fitted with a retractable centerboard that can be lowered to 8 feet below the keel and on which there is an EK 60 array and a spare 12' acoustic well for ship and science use. Transducers are changeable alongside. **Has this arrangement had any significant positive or negative impacts on your work? We installed our USBL head on the centerboard and it work well.**

6. Acoustically Quiet: The *R/V Sikuliaq* was designed, engineered and built to meet ICES 209 noise limits above 200 Hz at 8.0 knots. Radiated airborne noise within the ship is also designed to be at low levels.

a. **Did you observe any evidence of Underwater Radiated Noise affecting sonar signatures or any other science observations? N/A**

b. Were there regular airborne noises that affected the habitability of ship spaces?

Proximity of the galley to the berthing space interrupted sleep due to loud talking in the halls and galley.

7. Vans and deck space: The van set up of the *R/V Sikuliaq* for any particular cruise is "modular" in that there is a choice between more deck space or more enclosed lab, berthing or storage space. The design of the *R/V Sikuliaq* incorporates the ability to fit three 20 ft ISO Containers vans on the aft deck for berthing, lab space or other uses and a 10 ft van forward on the 02 Deck. These vans are mounted to dedicated deck fittings, and provided with services such as power, water, comms, drains etc. **If you have used the vans, how well did they accommodate your space requirements? Did this modularity have a positive or negative impact on your cruise planning and work at sea? We installed the Jason control vans, tool van and rigging van, ROV, LARS and winch. With these loads the additional space for science gear was limited.**

8. Dynamic Positioning: The *R/V Sikuliaq* was designed and outfitted with dynamic positioning (DP) capabilities. This is accomplished by using twin rotatable Z-Drives, a trainable bow thruster and a commercially available computer controlled precision navigation system. All of these components add cost, maintenance requirements and complexity to the operation of the vessel. **How important was the DP system to your work? How well did this system operate during your cruise? DP is critical for Jason ops and worked well.**

9. Seakeeping: The *R/V Sikuliaq* has an anti-roll tank to improve seakeeping. **Did the ship's roll affect your operations or cause safety concerns? Could you tell if the anti-roll tank was in operation or not? Prior to the cruise the A/R system was not functioning correctly and there were questions about how well the issues were understood. There seemed to be a slow resolution of the issue. I voiced concern numerous times prior to the cruise.**

However, when we operated on Sikuliaq for all of the Jason science cruises the Anti-roll tanks were operational and the vessel was quite stable.

10. Lab Arrangement: The *R/V Sikuliaq* labs were pre-outfitted with lab benches and science services (air, electricity, water, seawater, etc). **Did you find the existing arrangement easy to modify and was the quantity of service outlets for air and water adequate, too many or too few? One large lab was ok, but put all teams in one space.**

11. Pilothouse Arrangement: The *R/V Sikuliaq* has some areas for observers to sit and stand in the Pilothouse, as well as on top of the pilothouse. **Did you find those areas adequate for science observations? N/A**

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12. Internet access and bandwidth: **Did you plan telepresence activities and were facilities satisfactory? Did you have high speed internet or special bandwidth requirements for science? Was the internet connectivity adequate for other broader impact, science or normal communication activities? Internet on Sikuliaq was ridiculously slow and completely inadequate. This is a fleet wide issue not limited to Sikuliaq. The bandwidth is insufficient on most UNOLS vessels.**

13. Other Features: **Can you describe other design, outfitting or operational features of the *R/V Sikuliaq* that had significant positive or negative impacts on your work at sea? Should these features be requirements of other new UNOLS Research Vessels? Were there any important design features missing which would benefit a wide variety of projects? The Sikuliaq is a suitable platform for Jason ops. It holds station well, has reasonable pitch and roll characteristics. The available deck space was a little limited. The power distribution system is good making set up easier. The only concerns are berths and deck space. For Jason operations with multi-discipline science and multiple groups of PI's it could be tight. But the vessel works quite well for Jason ops other than these concern.**

The crew was also excellent! Jason requested help from the deck dept. for LARs. We received all help requested and it was professional and highly skilled. The bridge operators were competent in operating the vessel, holding station and providing moves required during LARS.

Excellent crew!

R/V *Sikuliaq* Debrief Questions – UNOLS Fleet Improvement Committee 2016
Chief Scientist Name: Mark Zumberge (SIO)
Cruise Dates: May 30 – June 10, 2016

Dear Chief Scientist:

The UNOLS Fleet Improvement Committee requests that you provide feedback on your recent cruise on the *R/V Sikuliaq*. The purpose of these questions is to help determine how key underlined design and outfitting features of the vessel have either benefited or hindered your cruise objectives. The FIC will use your feedback to inform design recommendations for future Ice Capable and Global Class Research Vessels. A member of FIC will contact you by phone or email shortly after your cruise to get your responses. You may also submit written responses to me if you prefer.

Sincerely,

Jim Swift
FIC, Chair
Email: jswift@ucsd.edu

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1. Size: The *R/V Sikuliaq* has a LOA of 261 ft, a beam at midship of 48 ft, and has berths for 26 scientists and technicians. Science labs occupy 2250 sq ft and the deck working area is 4360 sq ft. **Has the overall size of the vessel either enabled or hindered you in meeting the science objectives of your cruise? Is there sufficient lab space of the appropriate type? Are there sufficient berths available to accommodate an optimal science party? Were the living arrangements satisfactory? Please explain using specific examples that relate to your science objectives.**

Deck space: good (adequate for Jason with some room left over)
Lab space: adequate
Berthing: adequate
Living arrangements: excellent

2. Performance: The endurance of the *R/V Sikuliaq* is ~45 days with an expected range of 9,000 nm at 11 knots. The vessel has a design maximum speed in calm open water of 14 kt and is designed to operate in 3 ft of ice at 2 kts. **Have any of these performance capabilities of the vessel either enabled or hindered you in meeting the science objectives of your cruise? If the ship operated in ice during your cruise, how was the performance? Please explain using specific examples.**

Speed: very good
Ice: n/a

3. Over-the-Side Handling Systems: The *R/V Sikuliaq* has been outfitted with a system

that allows "hands free" launch and recovery of CTD and other systems within a Baltic Room on the starboard side using an overboarding boom with docking head and motion controlled winch systems. It also has:

- An articulating Stern A-Frame
- Port and Starboard Knuckle, Extension Boom Cranes
- Two Mo-Comp Hydro Winches (.322 EM Cable)
- Traction Winch with two tension member drums (.680 EM Cable and 9/16 3X19 Wire Rope)

Did these systems have a positive impact on your work and if so how? Are there any negative impacts associated with these systems?

We only used the knuckle crane on the starboard side. Worked well – remote operation very helpful.

I noted the design of the articulating stern A-frame. I did not use it, but it looks excellent.

4. Hull Mounted Sonar Suite: The ships sonar flat is outfitted with:

- Kongsberg Ksync - Sonar Synchronizing system
- Kongsberg EM302 .5X1 - Multibeam
- Kongsberg EM710 .5X1 - Multibeam
- Kongsberg TOPAS PS-18 - Parametric Sub Bottom Profiler
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- Teledyne RDI OS 150 kHz - Acoustic Doppler Current Profiler (UHDAS)
- LSE 297 50 kHz - Bridge Navigation Sonar
- LSE 297 200 kHz- Bridge Navigation Sonar
- HAP 5050 Array - Self Noise Monitoring Array
- Doppler Speed Log

Which of these systems were essential to science objectives during your cruise? What is the quality of the data collected?

We used both multibeam systems and they performed adequately (some difficulty in shallow water).

5. Retractable Centerboard with mounted acoustic transducers: The *R/V Sikuliaq* is fitted with a retractable centerboard that can be lowered to 8 feet below the keel and on which there is an EK 60 array and a spare 12' acoustic well for ship and science use. Transducers are changeable alongside. **Has this arrangement had any significant positive or negative impacts on your work?**

The acoustic navigation of the ROV worked well.

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6. Acoustically Quiet: The *R/V Sikuliaq* was designed, engineered and built to meet ICES 209 noise limits above 200 Hz at 8.0 knots. Radiated airborne noise within the ship is also designed to be at low levels.
a. **Did you observe any evidence of Underwater Radiated Noise affecting sonar signatures or any other science observations?**
b. Were there regular airborne noises that affected the habitability of ship spaces?

I can't comment on underwater ship noise. Airborne noise was normal.

7. Vans and deck space: The van set up of the *R/V Sikuliaq* for any particular cruise is "modular" in that there is a choice between more deck space or more enclosed lab, berthing or storage space. The design of the *R/V Sikuliaq* incorporates the ability to fit three 20 ft ISO Containers vans on the aft deck for berthing, lab space or other uses and a 10 ft van forward on the 02 Deck. These vans are mounted to dedicated deck fittings, and provided with services such as power, water, comms, drains etc. **If you have used the vans, how well did they accommodate your space requirements? Did this modularity have a positive or negative impact on your cruise planning and work at sea?**

n/a

8. Dynamic Positioning: The *R/V Sikuliaq* was designed and outfitted with dynamic positioning (DP) capabilities. This is accomplished by using twin rotatable Z-Drives, a trainable bow thruster and a commercially available computer controlled precision navigation system. All of these components add cost, maintenance requirements and complexity to the operation of the vessel. **How important was the DP system to your work? How well did this system operate during your cruise?**

DP was required and the ship did well.

9. Seakeeping: The *R/V Sikuliaq* has an anti-roll tank to improve seakeeping. **Did the ship's roll affect your operations or cause safety concerns? Could you tell if the anti-roll tank was in operation or not?**

I had heard rumors about bad roll, however the anti-roll tanks were fixed just before our cruise and we had very smooth, comfortable sailing.

10. Lab Arrangement: The *R/V Sikuliaq* labs were pre-outfitted with lab benches and science services (air, electricity, water, seawater, etc). **Did you find the existing arrangement easy to modify and was the quantity of service outlets for air and water adequate, too many or too few?**

Lab space was somewhat limited compared to other ships but was OK for what we required.

11. Pilothouse Arrangement: The *R/V Sikuliaq* has some areas for observers to sit and stand in the Pilothouse, as well as on top of the pilothouse. **Did you find those areas adequate for science observations?**

n/a

12. Internet access and bandwidth**: Did you plan telepresence activities and were facilities satisfactory? Did you have high speed internet or special bandwidth requirements for science? Was the internet connectivity adequate for other broader impact, science or normal communication activities?**

Internet was slow – but similar to other UNOLS vessels. It was adequate for our purposes.

13. Other Features: **Can you describe other design, outfitting or operational features of the *R/V Sikuliaq* that had significant positive or negative impacts on your work at sea? Should these features be requirements of other new UNOLS Research Vessels? Were there any important design features missing which would benefit a wide variety of projects?**

I had a very positive experience on Sikuliaq. It is a great asset to the UNOLS community.

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Chief Scientist Name: Ian Kulin (ONC)
Cruise Dates/Project: June 3 - 25, 2016

R/V *Sikuliaq* Debrief Questions – UNOLS Fleet Improvement Committee 2016

Dear Chief Scientist:

The UNOLS Fleet Improvement Committee requests that you provide feedback on your recent cruise on the *R/V Sikuliaq*. The purpose of these questions is to help determine how key underlined design and outfitting features of the vessel have either benefited or hindered your cruise objectives. The FIC will use your feedback to inform design recommendations for future Ice Capable and Global Class Research Vessels. A member of FIC will contact you by phone shortly after your cruise to get your responses. You may also submit written responses to me if you prefer.

Sincerely,

Jim Swift
FIC, Chair
Email: jswift@ucsd.edu

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1. Size: The *R/V Sikuliaq* has a LOA of 261 ft, a beam at midship of 48 ft, and has berths for 26 scientists and technicians. Science labs occupy 2250 sq ft and the deck working area is 4360 sq ft. **Has the overall size of the vessel either enabled or hindered you in meeting the science objectives of your cruise? Is there sufficient lab space of the appropriate type? Are there sufficient berths available to accommodate an optimal science party? Were the living arrangements satisfactory? Please explain using specific examples that relate to your science objectives.**

The vessel size and configuration was excellent. Our largest hinderance was not so much the vessel but the positioning and configuration of the ROV kit aboard. Deck space was tight with all our gear loaded but the ships master made great efforts to accommodate our requirements and fit all the gear. Lab space for ONC purposes was great. Berth availability was sufficient although the design of the shared toilet / shower space with a one inch gap between the doors and thresholds meant any noise from the w/c was heard in both cabins. The mess and lounge have ample space for off duty activities. The sauna was not used by science staff and the gym was very limited. The ships layout shows the gym has been turned into the Galley office and the treadmill was positioned in the main deck hallway.

2. Performance: The endurance of the *R/V Sikuliaq* is ~45 days with an expected range of 9,000 nm at 11 knots. The vessel has a design maximum speed in calm open water of 14 kt and is designed to operate in 3 ft of ice at 2 kts. **Have any of these performance capabilities of the vessel either enabled or hindered you in meeting the science objectives of your cruise? If the ship operated in ice during your cruise, how was the performance? Please explain using specific examples.**

Ships performance was sufficient for our requirements. Transit distances were less than 30 hours from port and ships speed did not come into paly as an issue.

3. Over-the-Side Handling Systems: The *R/V Sikuliaq* has been outfitted with a system that allows "hands free" launch and recovery of CTD and other systems within a Baltic Room on the starboard side using an overboarding boom with docking head and motion controlled winch systems. It also has:

- An articulating Stern A-Frame
- Port and Starboard Knuckle, Extension Boom Cranes
- Two Mo-Comp Hydro Winches (.322 EM Cable)
- Traction Winch with two tension member drums (.680 EM Cable and 9/16 3X19 Wire Rope)

Did these systems have a positive impact on your work and if so how? Are there any negative impacts associated with these systems?

The A frame was used by the science team due to the resistance of the ROV team to launch in weather / sea states with loads under their vehicle. Thus the A Frame was a great second option to deploy our gear. Built in capstans on the A Frame worked excellently and were used during deployments and recoveries. The Starboard crane was used extensively and the ease in operation with the crew worked well. The Baxter bolt pattern on deck was very useful although the two different sizes of bolt holes did take a bit to get used to. The winches were used with deployments when the ROV was not able to operate with the loads or in weather with no issues other than the passing of shackles through the sheave at the A frame.

4. Hull Mounted Sonar Suite: The ships sonar flat is outfitted with:

- Kongsberg Ksync - Sonar Synchronizing system
- Kongsberg EM302 .5X1 - Multibeam
- Kongsberg EM710 .5X1 - Multibeam
- Kongsberg TOPAS PS-18 - Parametric Sub Bottom Profiler
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- HAP 5050 Array - Self Noise Monitoring Array
- Doppler Speed Log

Which of these systems were essential to science objectives during your cruise? What is the quality of the data collected?

Our is an instrument maintenance cruise so we do not specifically conduct science as a primary task. We did however in weather conduct EM 302 multibeam surveys that were successful. Data quality was better than the Thompson but not as good as the Nautilus EM302. Ship should consider regular patch tests / calibrating of these systems.

5. Retractable Centerboard with mounted acoustic transducers: The *R/V Sikuliaq* is fitted with a retractable centerboard that can be lowered to 8 feet below the keel and on which

there is an EK 60 array and a spare 12' acoustic well for ship and science use. Transducers are changeable alongside. **Has this arrangement had any significant positive or negative impacts on your work? Centerboard was used for the ROV USBL transducers. Excellent to have this for the ROV operations.**

6. Acoustically Quiet: The *R/V Sikuliaq* was designed, engineered and built to meet ICES 209 noise limits above 200 Hz at 8.0 knots. Radiated airborne noise within the ship is also designed to be at low levels. **Have you noticed any difference compared to other vessels, and has this had any positive or negative impacts on your work?**
The ship was super quiet in operating. Loved the quiet design on the engineroom and equipment. No impact on our operations but when the ROV was operating we did have a difficult time with acoustical releases at depth.
7. Vans and deck space: The van set up of the *R/V Sikuliaq* for any particular cruise is "modular" in that there is a choice between more deck space or more enclosed lab, berthing or storage space. The design of the *R/V Sikuliaq* incorporates the ability to fit three 20 ft ISO Containers vans on the aft deck for berthing, lab space or other uses and a 10 ft van forward on the 02 Deck. These vans are mounted to dedicated deck fittings, and provided with services such as power, water, comms, drains etc. **If you have used the vans, how well did they accommodate your space requirements? Did this modularity have a positive or negative impact on your cruise planning and work at sea?**
The ROV kit did not fit well to allow access to the hanger and forward labs. Not a lot of possibilities to improve this.
8. Dynamic Positioning: The *R/V Sikuliaq* was designed and outfitted with dynamic positioning (DP) capabilities. This is accomplished by using twin rotatable Z-Drives, a trainable bow thruster and a commercially available computer controlled precision navigation system. All of these components add cost, maintenance requirements and complexity to the operation of the vessel. **How important was the DP system to your work? How well did this system operate during your cruise?**
The DP system was a necessary requirement for allowing the ships crew to maintain station. There are ships that do not have DP and still can hold station but the automated system does make it easier.
9. Lab Arrangement: The *R/V Sikuliaq* labs were pre-outfitted with lab benches and science services (air, electricity, water, seawater, etc). **Did you find the existing arrangement easy to modify and was the quantity of service outlets for air and water adequate, too many or too few?**
Arrangement was very good.
10. Pilothouse Arrangement: The *R/V Sikuliaq* has some areas for observers to sit and stand in the Pilothouse, as well as on top of the pilothouse. **Did you find those areas adequate for science observations?**
Not applicable for ONC work.
11. Internet access and bandwidth**: Did you plan telepresence activities and were facilities satisfactory? Did you have high speed internet or special bandwidth requirements for science? Was the internet connectivity adequate for other broader impact, science or normal communication activities?**

ONC had the Highseas Net increase the bandwidth to the ship a considerable amount compared to normal operations. ONC also brought aboard our own telepresence system. There were issues with the conductivity to shore and there was a disconnect with ship staff and shore staff on the abilities to fix outages. The ship also has a dead zone with blockage of signal at some ships headings.

12. Other Features: **Can you describe other design, outfitting or operational features of the *R/V Sikuliaq* that had significant positive or negative impacts on your work at sea? Should these features be requirements of other new UNOLS Research Vessels? Were there any important design features missing which would benefit a wide variety of projects?**

The ship overall was great. The design is a great improvement over some previous designs. The need to better integrate in the ROV kit into the ship design would be a benefit for ONC.

Ian Kulin Additional Comments/responses to Sikuliaq Review

1. **Acoustic issue was noise more from ROV and proximity to release but hull could also be a part of the issue.**
2. **Dead Zone would be fixed with a better positioning of dish or a second dish (R/V Falkor). Not sure re-positioning is an option.**
3. **Cabin finish was nice other than Chief Sci cabin at head needs a shelf verses a void where pillow falls to below from top bunk and the gap on the doors. Not great to hear all the sounds from in the W/C.**
4. **Choice on ship alone would lead me back to the TG Thompson but this is a difficult choice. The Captain (Adam Seaman) on the Sikuliaq was super in dealing with our requests. Some Captains (most) are not so flexible. The issue for us would be the number of deployments we have and the configuration of Jason aboard the ships. If Jason in the new one vehicle, through frame lift is mobilized with all on the Port side of Thompson we would then be free to move from the lab to the aft deck with no obstructions. There is more deck space on the T-AGOR-23 vessels so I would go that way. The living conditions are better on the Sikuliaq (quiet and new cabins etc) but depending on who you get for captain and crew (cooks very important) I could lean either way. The one large lab on the Thompson is also nice for our needs.**

Based on my responses to his completed survey:

Ian - this was a very thorough response and I really appreciate it.
So a couple of questions:
1. Do you think the acoustic release problem was due to ship design/placement of the release transponder or just luck of the draw? Since you specifically mentioned it, it seems to be the former.
2. With respect to internet, besides shore/ship staff "disconnects" that are fixable, you did note heading dead zones; I've experience this on Thompson. So, do you think that relocating the antenna could fix this? Or, is it a permanent problem? In other words, your recommendation?
3. I get the impression you were not too impressed with the fit/finish of the cabins (doors) and the "gym." Is this a fair reading?
4. I have one more question for you that was not exactly on this survey:
The Sikuliaq is classified as a Global class vessel like Thompson, Revelle, and Atlantis. You had problems with the deck space for the ROV operations, so given the choice, would you use Sikuliaq again for a cruise like this, or go with another Global, and your reasons for doing so?
Thanks, Greg

Chief Scientist Name: Jeffrey McGuire (WHOI)
Cruise Dates/Project: June 29 - July 5, 2016

R/V *Sikuliaq* Debrief Questions – UNOLS Fleet Improvement Committee 2016

Dear Chief Scientist:

The UNOLS Fleet Improvement Committee requests that you provide feedback on your recent cruise on the *R/V Sikuliaq*. The purpose of these questions is to help determine how key underlined design and outfitting features of the vessel have either benefited or hindered your cruise objectives. The FIC will use your feedback to inform design recommendations for future Ice Capable and Global Class Research Vessels. A member of FIC will contact you by phone or email shortly after your cruise to get your responses. You may also submit written responses to me if you prefer.

Sincerely,

Jim Swift
FIC, Chair
Email: jswift@ucsd.edu

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1. Size: The *R/V Sikuliaq* has a LOA of 261 ft, a beam at midship of 48 ft, and has berths for 26 scientists and technicians. Science labs occupy 2250 sq ft and the deck working area is 4360 sq ft. **Has the overall size of the vessel either enabled or hindered you in meeting the science objectives of your cruise? Is there sufficient lab space of the appropriate type? Are there sufficient berths available to accommodate an optimal science party? Were the living arrangements satisfactory? Please explain using specific examples that relate to your science objectives.**

The overall size of the vessel was sufficient for our cruise. In particular, the back deck was able to accommodate all of the space needed for the Jason ROV team (lab vans, winch, etc) and still have sufficient working area for us to assemble and deploy a large mooring. The only downside to the deck space would be that with Jason's equipment installed, there was no path to move any large equipment inside. This might potentially be a problem on a combined Jason and OBS cruise if something was wrong and required access to the high bay, cranes, etc to be fixed in a shelter location. The lab space was more than sufficient for our purposes. The living arrangements were good. The number of berths was sub-optimal in that we had to fill nearly every berth. In particular, we decided against bringing along people for an outreach/telepresence component to ensure a more reasonable environment for the science team.

2. Performance: The endurance of the *R/V Sikuliaq* is ~45 days with an expected range of 9,000 nm at 11 knots. The vessel has a design maximum speed in calm open water of 14

kt and is designed to operate in 3 ft of ice at 2 kts. **Have any of these performance capabilities of the vessel either enabled or hindered you in meeting the science objectives of your cruise? If the ship operated in ice during your cruise, how was the performance? Please explain using specific examples.**

Our cruise was short (7 days) and not particularly taxing to the endurance. The one aspect that deserves mention is that the repaired anti-roll tanks worked extremely well. The vessel was very stable in moderate swell (2-4 m).

3. Over-the-Side Handling Systems: The *R/V Sikuliaq* has been outfitted with a system that allows "hands free" launch and recovery of CTD and other systems within a Baltic Room on the starboard side using an overboarding boom with docking head and motion controlled winch systems. It also has:

- An articulating Stern A-Frame
- Port and Starboard Knuckle, Extension Boom Cranes
- Two Mo-Comp Hydro Winches (.322 EM Cable)
- Traction Winch with two tension member drums (.680 EM Cable and 9/16 3X19 Wire Rope)

Did these systems have a positive impact on your work and if so how? Are there any negative impacts associated with these systems?

Our mooring deployment with the A-frame and winches worked well. The split-drum winch from the winch pool worked perfectly. The new small platform for the aft overhang was a great addition that allowed us to deploy the mooring without any damage or real difficulty.

We launched one very heavy package off of the A-frame (a few km cable spool) that did not go smoothly in large part due to its weight. This should probably be reviewed (already has been?) with the Bosun to streamline future such deployments. This may have been the science party's fault as it was a last minute addition to the cruise and was clearly not thought through enough to make it go smoothly the first time.

4. Hull Mounted Sonar Suite: The ships sonar flat is outfitted with:

- Kongsberg Ksync - Sonar Synchronizing system
- Kongsberg EM302 .5X1 - Multibeam
- Kongsberg EM710 .5X1 - Multibeam
- Kongsberg TOPAS PS-18 - Parametric Sub Bottom Profiler
- Kongsberg EK60 (18, 38, 70, 120, and 200 kHz) - Split Beam Sonar
- Knudsen 3260 12 kHz - Chirp PDR
- Benthos UDB-9000 - Acoustic Modem
- Teledyne RDI OS 75 kHz - Acoustic Doppler Current Profiler (UHDAS)
- Teledyne RDI OS 150 kHz - Acoustic Doppler Current Profiler (UHDAS)
- LSE 297 50 kHz - Bridge Navigation Sonar
- LSE 297 200 kHz- Bridge Navigation Sonar

- HAP 5050 Array - Self Noise Monitoring Array
- Doppler Speed Log

Which of these systems were essential to science objectives during your cruise? What is the quality of the data collected?

We did collect some EM300 multibeam data during our bad weather days. I have not looked at it (it was for another group) but my understanding is that they are happy with it.

5. Retractable Centerboard with mounted acoustic transducers: The *R/V Sikuliaq* is fitted with a retractable centerboard that can be lowered to 8 feet below the keel and on which there is an EK 60 array and a spare 12' acoustic well for ship and science use. Transducers are changeable alongside. **Has this arrangement had any significant positive or negative impacts on your work?**

The acoustic navigation of the ROV and other over-the-side packages worked very well.

6. Acoustically Quiet: The *R/V Sikuliaq* was designed, engineered and built to meet ICES 209 noise limits above 200 Hz at 8.0 knots. Radiated airborne noise within the ship is also designed to be at low levels.

a. **Did you observe any evidence of Underwater Radiated Noise affecting sonar signatures or any other science observations?**

b. Were there regular airborne noises that affected the habitability of ship spaces?

No obvious problems with underwater noise other than one acoustic release that did not work (not clear what the problem was).

Noise levels in cabins were unusually low, very good ship from that perspective.

7. Vans and deck space: The van set up of the *R/V Sikuliaq* for any particular cruise is "modular" in that there is a choice between more deck space or more enclosed lab, berthing or storage space. The design of the *R/V Sikuliaq* incorporates the ability to fit three 20 ft ISO Containers vans on the aft deck for berthing, lab space or other uses and a 10 ft van forward on the 02 Deck. These vans are mounted to dedicated deck fittings, and provided with services such as power, water, comms, drains etc. **If you have used the vans, how well did they accommodate your space requirements? Did this modularity have a positive or negative impact on your cruise planning and work at sea?**

As above, the Jason vans, winches,… were all well accommodated on deck as were other containers for storage, etc.

8. Dynamic Positioning: The *R/V Sikuliaq* was designed and outfitted with dynamic positioning (DP) capabilities. This is accomplished by using twin rotatable Z-Drives, a trainable bow thruster and a commercially available computer controlled precision

navigation system. All of these components add cost, maintenance requirements and complexity to the operation of the vessel. **How important was the DP system to your work? How well did this system operate during your cruise?**

Worked very well. Also the ability to DP the ship from the Jason van worked perfectly, both ship crew and Jason team made this aspect work well.

9. Seakeeping: The *R/V Sikuliaq* has an anti-roll tank to improve seakeeping. **Did the ship's roll affect your operations or cause safety concerns? Could you tell if the anti-roll tank was in operation or not?**

Yes, worked great; Huge improvement over previous cruises from what I'm told.

10. Lab Arrangement: The *R/V Sikuliaq* labs were pre-outfitted with lab benches and science services (air, electricity, water, seawater, etc). **Did you find the existing arrangement easy to modify and was the quantity of service outlets for air and water adequate, too many or too few?**

We did not have any wet lab operations. Everything else was fine.

11. Pilothouse Arrangement: The *R/V Sikuliaq* has some areas for observers to sit and stand in the Pilothouse, as well as on top of the pilothouse. **Did you find those areas adequate for science observations?**

Yes

12. Internet access and bandwidth**: Did you plan telepresence activities and were facilities satisfactory? Did you have high speed internet or special bandwidth requirements for science? Was the internet connectivity adequate for other broader impact, science or normal communication activities?**

The restriction of science party email access is particularly limiting/frustrating. If there was a way to upgrade this it would be a big improvement. You are basically asking a bunch of small business owners to exist without email for a week or more. It's not really feasible in the modern world given their responsibilities back home.

13. Other Features: **Can you describe other design, outfitting or operational features of the *R/V Sikuliaq* that had significant positive or negative impacts on your work at sea? Should these features be requirements of other new UNOLS Research Vessels? Were there any important design features missing which would benefit a wide variety of projects?**

UNOLS
UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

Chief Scientist Name: Deb Kelley (UW)
Cruise Dates/Project: June 11 – Aug 14, 2016

R/V *Sikuliaq* Debrief Questions – UNOLS Fleet Improvement Committee 2016

Dear Chief Scientist:

The UNOLS Fleet Improvement Committee requests that you provide feedback on your recent cruise on the *R/V Sikuliaq*. The purpose of these questions is to help determine how key underlined design and outfitting features of the vessel have either benefited or hindered your cruise objectives. The FIC will use your feedback to inform design recommendations for future Ice Capable and Global Class Research Vessels. A member of FIC will contact you by phone shortly after your cruise to get your responses. You may also submit written responses to me if you prefer.

Sincerely,

Jim Swift
FIC, Chair
Email: jswift@ucsd.edu

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1. Size: The *R/V Sikuliaq* has a LOA of 261 ft, a beam at midship of 48 ft, and has berths for 26 scientists and technicians. Science labs occupy 2250 sq ft and the deck working area is 4360 sq ft. **Has the overall size of the vessel either enabled or hindered you in meeting the science objectives of your cruise? Is there sufficient lab space of the appropriate type? Are there sufficient berths available to accommodate an optimal science party? Were the living arrangements satisfactory? Please explain using specific examples that relate to your science objectives.**

Although we "made" the *Sikuliaq* work for the 2016 Cabled Array cruise, the ship is realistically too small to do our operations and maintenance cruises on it optimally, particularly with the Jason v2.5 configuration. We had an extremely crowded deck with our gear and Jason's. For example, during movement of heavy equipment on deck to be latched under Jason, almost all infrastructure had to be swung out over the side of the ship, often with Jason also hanging out over the water. During transfers, because of limited deck space, and because of the operational "fix" to swing items such as >2000 lb secondary nodes off the starboard side and past the crane, it was harder for the crew to find tie down places on the deck for tag line management.

Because of the winch and van placements, there was no direct path from the main lab-Baltic room to the fantail, but required multiple 90° turns to get to the crowded fantail. This made moving equipment, samples, people etc to-from the inside of the ship a pain, especially with the tall watertight basal portions of the door from the mainlab to the Baltic Room.

The decrease from 36 to 24 berths on the Sikuliaq was tough on our team for intense 24/7 operations including deck, equipment testing and prep, dive operations etc. The Chief Sci was very close to halting operations because of team exhaustion…lucky or not, weather came up and/or transit runs so we were able to use this time to recoup. However, the team would prefer to not relive these working conditions again. Because of the smaller science team, some work normally done on the Operations and Maintenance Cabled Array cruises was not done onboard – e.g. complete cleaning of instruments and platforms once they were recovered on deck after being in the water for a year, filling in of our equipment inventory onboard, completion of Cruise documentation etc. The lack of berthing also reduced the amount of metadata collected during ROV operations and our ability to process video imagery and keep our cruise website up to date (something the community negatively conveyed to us).

2. Performance: The endurance of the *R/V Sikuliaq* is ~45 days with an expected range of 9,000 nm at 11 knots. The vessel has a design maximum speed in calm open water of 14 kt and is designed to operate in 3 ft of ice at 2 kts. **Have any of these performance capabilities of the vessel either enabled or hindered you in meeting the science objectives of your cruise? If the ship operated in ice during your cruise, how was the performance? Please explain using specific examples.**

The Sikuliaq did not work in ice during this cruise.

The Captain insisted that he would not transit at more than 8 knts on the return trip, requiring us to leave site early with loss of at-sea time. The ship transited faster than this (averaging over 10 kts), and ended up driving way north and circling off the Straits of Juan de Fuca to use up time prior to coming into the UW dock.

One item that it would be good to explore is the settings for the anti-roll tanks if the ship is going to continue work in the NE Pacific. The roll is tuned to 10.5 seconds and longer period waves to accommodate polar conditions. However, in the NE Pacific, the summer is dominated by 6-8 sec period waves. So, every once in a while, the load change merges with the waves, creating some "interesting" ship dynamics.

3. Over-the-Side Handling Systems: The *R/V Sikuliaq* has been outfitted with a system that allows "hands free" launch and recovery of CTD and other systems within a Baltic Room on the starboard side using an overboarding boom with docking head and motion controlled winch systems. It also has:

- An articulating Stern A-Frame
- Port and Starboard Knuckle, Extension Boom Cranes
- Two Mo-Comp Hydro Winches (.322 EM Cable)
- Traction Winch with two tension member drums (.680 EM Cable and 9/16 3X19 Wire Rope)

Did these systems have a positive impact on your work and if so how? Are there any negative impacts associated with these systems?

CTD ops went off well. The main impact was that the boom cranes take up a significant amount of deck space, which is an issue for deck-space intensive cruises such as ours. We did utilize the starboard crane and appreciated its heavy weight capacity. The port crane was not able to move due to interference with the Jason vans. We had to limit stacking vans to be able to allow the trawl wire to lead to the A-frame from the flag block. The A-frame worked well during mooring deployments and recoveries.

4. Hull Mounted Sonar Suite: The ships sonar flat is outfitted with:
- Kongsberg Ksync - Sonar Synchronizing system
- Kongsberg EM302 .5X1 - Multibeam
- Kongsberg EM710 .5X1 - Multibeam
- Kongsberg TOPAS PS-18 - Parametric Sub Bottom Profiler
- Kongsberg EK60 (18, 38, 70, 120, and 200 kHz) - Split Beam Sonar
- Knudsen 3260 12 kHz - Chirp PDR
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- LSE 297 50 kHz - Bridge Navigation Sonar
- LSE 297 200 kHz- Bridge Navigation Sonar
- HAP 5050 Array - Self Noise Monitoring Array
- Doppler Speed Log

Which of these systems were essential to science objectives during your cruise? What is the quality of the data collected?

We utilized the EM302 system and ADCPs. We would have utilized some of the other systems, but the techs were not trained on these, so we did not use them.

5. Retractable Centerboard with mounted acoustic transducers: The *R/V Sikuliaq* is fitted with a retractable centerboard that can be lowered to 8 feet below the keel and on which there is an EK 60 array and a spare 12' acoustic well for ship and science use. Transducers are changeable alongside. **Has this arrangement had any significant positive or negative impacts on your work?**

Positive as it provided a more stable location for the USBL system for navigation and also for communication with acoustic releases**.**

6. Acoustically Quiet: The *R/V Sikuliaq* was designed, engineered and built to meet ICES 209 noise limits above 200 Hz at 8.0 knots. Radiated airborne noise within the ship is also designed to be at low levels. **Have you noticed any difference compared to other vessels, and has this had any positive or negative impacts on your work?**

The quietness did not noticeable impact our work since most of our at-sea activities involved ROV operations, however the quiet was appreciated in minimizing fatigue for overall operations.

7. Vans and deck space: The van set up of the *R/V Sikuliaq* for any particular cruise is "modular" in that there is a choice between more deck space or more enclosed lab, berthing or storage space. The design of the *R/V Sikuliaq* incorporates the ability to fit three 20 ft ISO Containers vans on the aft deck for berthing, lab space or other uses and a 10 ft van forward on the 02 Deck. These vans are mounted to dedicated deck fittings, and provided with services such as power, water, comms, drains etc. **If you have used the vans, how well did they accommodate your space requirements? Did this modularity have a positive or negative impact on your cruise planning and work at sea?**

Because of deck space limitations, we removed the Sikuliaq 10 ft van and left it at the UW, and placed our 10 ft spares van forward. There wasn't any room to accommodate the berthing vans. We had the Jason Control Vans, plus two stacked container vans on the fantail, as well as flat racks on top of two of the vans. To fit equipment such as a winch with appropriate fleet angles, the Jason vans were not utilizing the dedicated fittings, but had to be placed on beams across the deck to distribute the load.

8. Dynamic Positioning: The *R/V Sikuliaq* was designed and outfitted with dynamic positioning (DP) capabilities. This is accomplished by using twin rotatable Z-Drives, a trainable bow thruster and a commercially available computer controlled precision navigation system. All of these components add cost, maintenance requirements and complexity to the operation of the vessel. **How important was the DP system to your work? How well did this system operate during your cruise?**

Because we were extensively using an ROV, the DP capabilities were critical. They were also critical for our mooring installations. This system worked very well.

9. Lab Arrangement: The *R/V Sikuliaq* labs were pre-outfitted with lab benches and science services (air, electricity, water, seawater, etc). **Did you find the existing arrangement easy to modify and was the quantity of service outlets for air and water adequate, too many or too few?**

The Marine Tech was very helpful in trying to best accommodate our lab needs. For an instrument installation intensive cruise and one that also required significant lab space for instrument testing, sample processing and analyses, the number of sinks significantly hampered use of what would have been good lab bench areas. In addition, because the associated "benches" are metal, there isn't any place to effectively tie gear down on these benches. The Marine Tech, per our suggestion, cut plywood covers to fit the bench tops and secured these, increasing our work areas. We were very appreciative of this. The ship also nicely added a specific (208V, 3 phase) outlet for our equipment.

10. Pilothouse Arrangement: The *R/V Sikuliaq* has some areas for observers to sit and stand in the Pilothouse, as well as on top of the pilothouse. **Did you find those areas adequate for science observations?**

Yes, although we did not use this space much because of such intense deck-ROV operations.

11. Internet access and bandwidth**: Did you plan telepresence activities and were facilities satisfactory? Did you have high speed internet or special bandwidth requirements for science? Was the internet connectivity adequate for other broader impact, science or normal communication activities?**

We did not use the shipboard telepresence system because the ship operators were not trained to use this even though it has been on the boat for a while. Because higher bandwidth is a requirement for us to conduct our operations, we secured 3Mb off ship/2 Mb to ship enhanced satellite through HiSeasNet. In prior years we utilized 2Mb/2Mb on the TGT. Adequate training for the Marine Techs was not provided such that we were never able to utilize/access this capability fully, which severely impacted requirements we had for ship-shore two-way communications. This included non-functioning VOIP phones and Internet connections lost every 10 minutes for the Chief and Co-Chiefs. In addition, the 50MB/day throttle was emplaced for all but 5-6 of the science team due to the belief by the Sikuliaq technicians that, without this, the bandwidth would be saturated. Within the first week the lead of the Jason group had given up on using his own computer for communications.

It is our belief that there is a networking issue on the ship. In prior years on the TGT we let virtually all the science party have full access to the Internet, using the exact same configuration except that we had even higher bandwidth off the Sikuliaq this year. The failure of this system meant that ship to shore communications were absent during critical operations when we absolutely needed to communicate with our team on shore – this included, for example, placing instruments inside of black smokers and the need to see the live streaming of data and being able to have two-way communications with our team in the onshore operations center at the UW, discussion of operations involving mooring installations, discussions regarding mobilization and demobilization etc.

12. Other Features: **Can you describe other design, outfitting or operational features of the *R/V Sikuliaq* that had significant positive or negative impacts on your work at sea? Should these features be requirements of other new UNOLS Research Vessels? Were there any important design features missing which would benefit a wide variety of projects?**

I am not sure why the decision was made to place the Chief Sci and ADA cabins (turned into a Chief Sci cabin) in the noisiest parts of the ship (e.g. above the bow thrusters and next to the lounge). With 24 hr round the clock operations, it was frustrating to not have a quieter place to work/sleep. I am used to standard ship noise, but this is the first UNOLS ship I have sailed on where the Chief Sci cabins are above the bow thrusters.

The UNOLS ships should move towards having higher bandwidth capabilities across the fleet…in this day and age, it is very difficult to go to sea for 35-40 days without

reasonable access to the Internet/communications. In addition, our ability to reach/communicate with the public would be best served by this addition.

It would be helpful to consider having worktables in the main labs with adjustable legs so that science parties can adjust their work heights to the operational requirements. This would facilitate increasing the storage areas for some teams, and computer spaces for others.

We constantly move equipment around the deck (we call it “deck checkers”) to position for ROV deployments and recoveries. The equipment ranges from ~600 lbs to 3500 lbs, so adequate tag lines are essential. TGT has mobile deck crucifixes that work well for this task, but they appear to be unique to Thompson. These should be standard on ships for these types of operations.

R/V *Sikuliaq* Debrief Questions – UNOLS Fleet Improvement Committee 2016
Chief Scientist Name: Bernie Coakley (UAF) and Rob Pockalny (URI/GSO)
Cruise Dates: December 2-17, 2016

Dear Chief Scientist:

The UNOLS Fleet Improvement Committee requests that you provide feedback on your recent cruise on the *R/V Sikuliaq*. The purpose of these questions is to help determine how key underlined design and outfitting features of the vessel have either benefited or hindered your cruise objectives. The FIC will use your feedback to inform design recommendations for future Ice Capable and Global Class Research Vessels. A member of FIC will contact you by phone or email shortly after your cruise to get your responses. You may also submit written responses to me if you prefer.

Sincerely,

Jim Swift
FIC, Chair
Email: jswift@ucsd.edu

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1. Size: The *R/V Sikuliaq* has a LOA of 261 ft, a beam at midship of 48 ft, and has berths for 26 scientists and technicians. Science labs occupy 2250 sq ft and the deck working area is 4360 sq ft. **Has the overall size of the vessel either enabled or hindered you in meeting the science objectives of your cruise? Is there sufficient lab space of the appropriate type? Are there sufficient berths available to accommodate an optimal science party? Were the living arrangements satisfactory? Please explain using specific examples that relate to your science objectives.**

This was a somewhat unusual cruise. As our objective was training future PIs and Chief Scientists, we were instructed to sail with a "full house." We had the participants stand watches, observing and examining the underway data as it accumulated. We did not make much use of the other labs, so there was ample space.

The berthing space was fine. A bit cramped, but what do you expect at sea? The plumbing worked well. There were no issues as far as housekeeping was concerned.

The size of the vessel was not an issue for this project.

One stand out aspect of this cruise was the cooking. Both cooks did an outstanding job preparing meals and making arrangements for off watch people. The food was consistently very good. The cooks were also very responsive to dietary requirements of the participants.

2. Performance: The endurance of the *R/V Sikuliaq* is ~45 days with an expected range of 9,000 nm at 11 knots. The vessel has a design maximum speed in calm open water of 14 kt and is designed to operate in 3 ft of ice at 2 kts. **Have any of these performance capabilities of the vessel either enabled or hindered you in meeting the science objectives of your cruise? If the ship operated in ice during your cruise, how was the performance? Please explain using specific examples.**

We did not encounter ice, so that was not an issue. The ship performed well throughout the cruise. We lost no time or opportunities to mechanical problems.

3. Over-the-Side Handling Systems: The *R/V Sikuliaq* has been outfitted with a system that allows "hands free" launch and recovery of CTD and other systems within a Baltic Room on the starboard side using an overboarding boom with docking head and motion controlled winch systems. It also has:

- An articulating Stern A-Frame
- Port and Starboard Knuckle, Extension Boom Cranes
- Two Mo-Comp Hydro Winches (.322 EM Cable)
- Traction Winch with two tension member drums (.680 EM Cable and 9/16 3X19 Wire Rope)

Did these systems have a positive impact on your work and if so how? Are there any negative impacts associated with these systems?

We made only limited use the A-frame and the CTD handling system. These performed well. The crew was very talented at handling the gear and efficient in executing our requests.

4. Hull Mounted Sonar Suite: The ships sonar flat is outfitted with:

- Kongsberg Ksync - Sonar Synchronizing system
- Kongsberg EM302 .5X1 - Multibeam
- Kongsberg EM710 .5X1 - Multibeam
- Kongsberg TOPAS PS-18 - Parametric Sub Bottom Profiler
- Kongsberg EK60 (18, 38, 70, 120, and 200 kHz) - Split Beam Sonar
- Knudsen 3260 12 kHz - Chirp PDR
- Benthos UDB-9000 - Acoustic Modem
- Teledyne RDI OS 75 kHz - Acoustic Doppler Current Profiler (UHDAS)
- Teledyne RDI OS 150 kHz - Acoustic Doppler Current Profiler (UHDAS)
- LSE 297 50 kHz - Bridge Navigation Sonar
- LSE 297 200 kHz- Bridge Navigation Sonar
- HAP 5050 Array - Self Noise Monitoring Array
- Doppler Speed Log

Which of these systems were essential to science objectives during your cruise? What is the quality of the data collected?

We were particularly dependent on the swath systems (EM 302 and 701) and the TOPAS sub-bottom profiler. These worked well during most of the cruise. The swath width was

limited during much of our transit through deep water. This is to be expected with a 30 kHz system.

A larger problem was bubble sweep down, which substantially influenced the 302 when the ship was taking wind across the bow. The bubbles getting under the hull resulted in narrower swaths and lower quality data during the first few days of the cruise. I understand that there is not much that can be done about this. Anything on the hull that would direct bubbles away from the transducers would probably be lost or rendered useless by ice impact.

5. Retractable Centerboard with mounted acoustic transducers: The *R/V Sikuliaq* is fitted with a retractable centerboard that can be lowered to 8 feet below the keel and on which there is an EK 60 array and a spare 12' acoustic well for ship and science use. Transducers are changeable alongside. **Has this arrangement had any significant positive or negative impacts on your work?**

We made no use of the centerboard.

6. Acoustically Quiet: The *R/V Sikuliaq* was designed, engineered and built to meet ICES 209 noise limits above 200 Hz at 8.0 knots. Radiated airborne noise within the ship is also designed to be at low levels.
a. **Did you observe any evidence of Underwater Radiated Noise affecting sonar signatures or any other science observations?**
b. Were there regular airborne noises that affected the habitability of ship spaces?

The ship seemed to be on the quiet side for research vessels. This also affected the staterooms and made for a better environment. We observed no influence of the ships own noise on the acoustic data we collected.

7. Vans and deck space: The van set up of the *R/V Sikuliaq* for any particular cruise is "modular" in that there is a choice between more deck space or more enclosed lab, berthing or storage space. The design of the *R/V Sikuliaq* incorporates the ability to fit three 20 ft ISO Containers vans on the aft deck for berthing, lab space or other uses and a 10 ft van forward on the 02 Deck. These vans are mounted to dedicated deck fittings, and provided with services such as power, water, comms, drains etc. **If you have used the vans, how well did they accommodate your space requirements? Did this modularity have a positive or negative impact on your cruise planning and work at sea?**

We had no vans on board during our cruise.

8. Dynamic Positioning: The *R/V Sikuliaq* was designed and outfitted with dynamic positioning (DP) capabilities. This is accomplished by using twin rotatable Z-Drives, a trainable bow thruster and a commercially available computer controlled precision navigation system. All of these components add cost, maintenance requirements and

complexity to the operation of the vessel. **How important was the DP system to your work? How well did this system operate during your cruise?**

We only employed the DP system once during the cruise. There were some problems with the forward thruster, which the ship's crew worked out after a few days.

9. Seakeeping: The *R/V Sikuliaq* has an anti-roll tank to improve seakeeping. **Did the ship's roll affect your operations or cause safety concerns? Could you tell if the anti-roll tank was in operation or not?**

I am told that the ship had a tendency to roll, even in very moderate seas. The weather was superb most of the time we were on board. Whether this is due to the recent retuning of the anti-roll tanks, I could not say. On the whole it was a very nice ride.

10. Lab Arrangement: The *R/V Sikuliaq* labs were pre-outfitted with lab benches and science services (air, electricity, water, seawater, etc). **Did you find the existing arrangement easy to modify and was the quantity of service outlets for air and water adequate, too many or too few?**

We did not make much use of these facilities.

11. Pilothouse Arrangement: The *R/V Sikuliaq* has some areas for observers to sit and stand in the Pilothouse, as well as on top of the pilothouse. **Did you find those areas adequate for science observations?**

The pilothouse was fine. The helm and the master were always very welcoming and engaged in our activities. This was much appreciated.

12. Internet access and bandwidth**: Did you plan telepresence activities and were facilities satisfactory? Did you have high speed internet or special bandwidth requirements for science? Was the internet connectivity adequate for other broader impact, science or normal communication activities?**

We had no special need for high speed internet. We would always ask for faster internet, but mostly the arrangements on board quite acceptable. We could not stream video, but at most times it was not a big problem to keep up with e-mail and access various news sites.

There were some times when the internet on Sikuliaq was alarmingly slow. This appeared to be due to heavy use by the Kilo Moana, which was streaming video and capturing the available shared bandwidth. Better coordination between the ships using these channels or making alternative arrangements for heavier use by some programs would result in improved internet access for everyone.

13. Other Features: **Can you describe other design, outfitting or operational features of the *R/V Sikuliaq* that had significant positive or negative impacts on your work at**

sea? Should these features be requirements of other new UNOLS Research Vessels? Were there any important design features missing which would benefit a wide variety of projects?

Our program did not do much to stress the capabilities of the ship. That said, the ship and crew did an excellent job. All the crew performed admirably and welcomed us into their "house." In particular Bern Mckiernan and Steve Hartz gave us excellent support throughout the entire trip.

We would also like to express our sincere thanks to the engineers on board who were able to "fabricate" a missing piece to a gravity core that we borrowed from U. of Hawaii for our cruise. They did not have a template to work form, but they designed a mechanism that allowed us to recover a 1 m gravity core in 5 km water depth.