

## The National Oceanographic Partnership Program - Status

- Congress working on "NOPA 2" - FY98
  - Same fundamental components: \$28.5M
  - Added element - Ocean observations \$10M
- FY 99 and outyears
  - Agencies developing budgets (Navy, NSF, NOAA indications)
- Linkage to international efforts - Year of the Ocean -- Expo '98 / Lisbon

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## UNOLS in the process

- What has the NOPP done for the member institutions -- ship usage & science? Getting the word out.
- FY '99: Continuing NOPP
- Implement the CORE / UNOLS MOA: Staying in touch with your state's Congressional delegations.

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## Concluding Thoughts

- Partnership development critical at national and regional levels
  - Visibility
  - Optimal resource utilization
  - Building stable political bases
- NOPP concepts critical to newer thinking (e.g. Press report) on national S&T, and education investments

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# *Appendix XI*

## Z-Drive Issues and Questions

**R. A. Knox, June 1997; with help from T. Althouse, R. Pittenger, J. Coburn**

1. 6 ships have Z-drive propulsion, powered by electric motors: Knorr, Melville, Thompson, Revelle, Atlantis, Brown. All Z-drives are Lips units. In addition several (5?) Navy TAGS ships have similar Lips

~Z-drive systems.

## 2. Significant differences:

### **Knorr/Melville**

1500 hp motors  
1350 hp thrusters  
port/starboard same  
shrouded props

### **AGOR 23,4,5,6**

3000 hp motors  
4000 hp thrusters  
port/stbd different  
open props

It is thus possible in principle to overtorque thrusters in Knorr/Melville, not AGORS. Controls limit the motors to prevent this. INSURV procedures to prevent overtorque while still accomplishing required quick reversal demonstrations are being worked out.

3. Melville: Broken gear tooth casualty on starboard lower unit in 1993, almost certainly bad metallurgy (insufficient case hardening depth, and some plain bad metal). Since then, lower gears have been inspected during casualty repair, and twice since, most recently this year in Melbourne. Tooth contact patterns are good. Dye penetrant tests reveal no cracks. No adverse indications from oil analysis or vibration data.

4. Knorr: Spalled tooth on port lower unit found in March 1997 drydock. No prior noise or other obvious indications of failure or impending failure. Replacement gear due to be installed at Halifax in July. Broken gear will be analyzed by Diehl as was done for Melville gear in 1993.

5. For Knorr/Melville there is thus far no indication of any upper gear problems, and one of the two lower gear casualties has a very probable, fixable cause. Should the tests of the broken Knorr gear indicate bad metallurgy, it would be crucial to obtain a full set of spare lower gears, since there is no demonstrable manufacturing difference between the gears that have broken and the original gears that still survive. Since all 4 units (2 per ship) are identical, one complete lower gear set is the prudent spares inventory. If the cause of the recent Knorr failure is not bad metallurgy, a spare set might still be valuable; should discuss then.

For Knorr/Melville there is no clear evidence of any groundings or collisions with objects that could have shocked the gears. The propeller shrouds may afford some protection in this regard.

6. Thompson: Two lower gears failed in 1994; replacements were made with gears originally intended for Revelle. Metallurgy was the prime suspect, although insufficient tooth contact was pointed to by some (Diehl). Lips produced credible evidence at that time that the gears could have been overstressed by grounding the ship while HMI was moving it.

1996 drydock in Dubai to fix thruster oil leak also disclosed sheared heads on half the bolts fastening the port thruster to the foundation. Again, HMI grounding is a possible cause.

Recent Thompson failure is to the upper gears; this is the first upper gear problem in any of the ships. Torques on the upper gears are intrinsically much less than on lower gears. This raises the question of observation, alignment testing, etc. for upper units generally, heretofore thought not to be as critical a matter as on lower gears. Clearly, the broken gears should be thoroughly examined for possible bad metallurgy, etc. There is anecdotal evidence (Diehl comment to Althouse), but not hard data, to suggest that the upper gear tooth contacts may not have been optimum. This possibility should be investigated.

Neither upper nor lower gears on Thompson had been load-tested for tooth contact prior to their failures.

7. Revelle: In the wake of the Thompson lower unit failure in 1994 and the redirection of ~Revelle gears to Thompson, SIO successfully pressed NAVSEA to test lower gear tooth contact under load for AGOR