Long-Range Planning Issues

Coordination of Multi-Vehicle Operations at Observatory Sites

Four key issues for multi-vehicle operations:

- **Safety**
  - ***Alvin*/RHOV**
  - **ROVs**
  - **AUVs**
- **Navigation**
- **Seafloor Compatibility**
- **Seafloor Traffic Control**

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Safety

- ***Alvin*/RHOV**
  - ? **Standard = minimum 1 water-depth spacing**
  - ? **Has been relaxed for "untethered" seafloor objects**
  - ? **AUVs: *ABE/Sentry* OK but "torpedo" AUVs???**
  - ? ***Alvin* & *Nautile* have worked together: 1997**
- **ROVs - keep all vehicles separated by 1 water-depth**
- **AUVs**
  - ? **Safe launches achieved with ROVs deployed from same ship**
  - ? **Safe launches achieved during HOV ascent**
  - ? **We know how to send an AUV to sleep on seafloor**
  - ? **Key to avoiding trouble is good navigation**

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Multi-Vehicle Navigation

- **Long Baseline**
  - ? Multi-frequency for multi-vehicle operations
  - ? Compatibility with USBL systems (e.g. *Posidonia*)
  - ? Ability to import both LBL and USBL into common space
- **Experience to date**
  - ? AUV *ABE* (LBL) & ROV *Quest* (*Posidonia* USBL)
  - ? AUV *ABE* (LBL) & ROV *Jason* (DVL, LBL turned off)
  - ? HOV *Alvin* (LBL) & HOV *Nautile* (LBL)
- **Future developments**
  - ? *Jason*/pan-NDSF acoustic controller board (Howland)
  - ? Compatible with new beacon system (Yoerger/Bradley)
  - ? Merge LBL- & USBL-space (Singh/Whitcomb/Yoerger)

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Seafloor Compatibilities

- **HOV/ROV inter-operability**
  - ? **Common instrument & package “handles”**
  - ? **Install, connect, activate/deactivate, disconnect, recover**
  - ? **Moorings - ROVs from top; HOVs from base**
- **AUV docking: “one size fits all”**

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Seafloor Traffic Control

- **High Latitude Observatories (e.g. RCO)**
  - ? **12 months seafloor operations per annum**
  - ? **6 months weather window (4 months to be conservative)**
  - ? **Requires 2-3 vehicles concerted effort each summer**
  - ? **(Ruggedize ROVs for longer seasons in NE Pacific?)**

- **Careful coordination required**
  - ? **Prioritization of operations**
  - ? **Compatibilities of vehicles - safety & operations**
  - ? **Single coordination point needed for each observatory**