

REPORT OF UNOLS WORKING GROUP
ON JOINT SHIP SCHEDULING

Part I

BACKGROUND

In accordance with the action of the UNOLS meeting on 22 May, the *ad hoc* Working Group on Ship Scheduling met at Scripps Institution July 10-11, 1980. Participants were:

G. C. Anderson, University of Washington
H. L. Clark, National Science Foundation
R. P. Dinsmore, Chairman,
Woods Hole Oceanographic Institution
E. Herron (for D. E. Hayes)
Lamont-Doherty Geological Observatory
K. W. Kaulum, Office of Naval Research
J. G. McMillan, National Science Foundation
B. H. Robison, University of California,
Santa Barbara
G. G. Shor, Scripps Institution of Oceanography
T. R. Stetson
University-National Oceanographic
Laboratory System (UNOLS)
T. K. Treadwell, Texas A & M University

The purpose of the meeting was to review and develop various existing proposals for joint and cooperative ship scheduling into a realistic and agreed upon plan for submission to UNOLS members. A further purpose of the meeting was to examine proposed 1981 ship usage data and projected funding support, and ascertain the potential impacts on 1981 ship deployment and scheduling.

Role of the Working Group

The exact role of the Working Group was discussed at some length, especially regarding recommendations on the makeup and distribution of the UNOLS fleet. Several members argued that

rearrangements within the UNOLS fleet including layups, assignments, and construction are pertinent to the overall scheduling problem and should be within the role of the Group. Others held that the composition of the fleet was the subject of several ongoing studies: OSB, NACOA, CAO, OTA, etc., and should not be part of this group's deliberations except where short term layups become part of the scheduling process.

The latter view prevailed; however, papers and inputs by members which already had been submitted and which include a discussion of the makeup of the UNOLS fleet are included as Appendix II.

Meeting Documents and Materials

Documents giving background materials and other inputs to the meeting agenda were reviewed. An inventory of these is given below and copies are attached with Appendix I.

1. Draft Plan for Joint Scheduling of large research ships of the UNOLS fleet, May 1, 1980 (R. P. Dinsmore).
2. JOI, Inc., memo and draft Letters of May 13, 1980, regarding concern and support of ships; and final letters to RADM Baciocco and Dr. F. Johnson of June 9, 1980.
3. Letter on overall fleet problem; May 28, 1980 (J. H. Martin).
4. Proposed plan for rational operation and funding of academic research ships, 7 June 1980 (G. G. Shor).

5. Suggestions for optimizing ship usage, 12 June 1980 (H. T. Rossby).
6. Report Summary: U.W./O.S.U. regional scheduling of R/V THOMPSON and R/V WECOMA, July 10, 1980 (G. C. Anderson).
7. Report Summary: Future use of R/V THOMPSON and R/V CONRAD, July 10, 1980 (G. C. Anderson).
8. Letter re ship arrangements and scheduling, July 3, 1980 (B. H. Robison).
9. Memo convening 10 July 1980 Working Group meeting, 10 June 1980 (R. P. Dinsmore).

Meeting Report

A draft of the meeting report was sent to all participants on July 23, 1980. A copy also was sent to the UNOLS Advisory Council for review at its meeting on 7-8 August 1980. Based on comments received and recommendations of the Advisory Council the following report has been compiled. In instances where the consensus view of the *ad hoc* Committee do not agree with the Advisory Council, both have been included and so noted.

In the interest of correctness certain data has been incorporated which was either not available at the July meeting, or subsequently corrected by appropriate Federal offices or UNOLS members.

Meeting Notes:

The meeting was convened at 0830 hours, 10 June 1980, in Room 114 of Scripps Administration Building and adjourned at 1600 hours on 11 June 1980. The members are very much indebted to Scripps for hosting the meeting and attending to many logistic details.

Part II

SHIP SCHEDULING

The Working Group recommends that arrangements for National and Regional ship scheduling should be implemented as soon as possible. The goals for these plans should be:

- Assure the most effective, efficient and economic utilization of ships.
- Closer coordination and cooperation between ship operating institutions.
- Long-range voyage and expedition planning.
- Improved mechanisms for scheduling scientists from non-operating labs, and meeting needs of Federal Agencies.
- Oversight of ships' conditions and capabilities especially in the areas of standardized equipment and procedures.

In order to accomplish these goals better for scheduling purposes, it is recommended that the larger vessels of the UNOLS fleet be divided into groups having common operating or geographic considerations. The Working Group has recommended three groups: "Eastern" and "Western" Regional Fleets, and a "Long-Range" Fleet. To the former would belong most sea-going UNOLS ships of less than 200 feet, and the latter would include the six larger ships. Each fleet would have a cognizant coordinating group comprising one representative from each of the operating institutions, a member of the UNOLS Advisory Council, and observers from the Federal Sponsoring Agencies.

On this basis the fleet makeup would be as follows:

<u>Western</u>	<u>Long-Range</u>	<u>Eastern</u>
ALPHA HELIX	MELVILLE	GYRE
KANA KEOKI	T. WASHINGTON	ISELIN
WECOMA	T. G. THOMPSON	CZRV #1
CAYUSE	KNORR	CZRV #2
VELERO IV	ATLANTIS II	CAPE HENLOPEN
NEW HORIZON	CONRAD	ENDEAVOR
		OCEANUS

In reviewing the above, the UNOLS Advisory Council considered that the large ships constituting the proposed "Long-Range Fleet" would be better constituted as a part of the respective regional fleets. The UNOLS Advisory Council therefore proposes two major divisions -- Eastern and Western Groups as follows:

<u>Western</u>	<u>Eastern</u>
MELVILLE	KNORR
T. WASHINGTON	ATLANTIS II
T. G. THOMPSON	CONRAD
ALPHA HELIX	GYRE
KANA KEOKI	ISELIN
NEW HORIZON	CZRV #1
WECOMA	CZRV #2
CAYUSE	CAPE HENLOPEN
VELERO IV	ENDEAVOR
	OCEANUS

A good case can be made for each of these arrangements. Those favoring a separate large ship fleet argue that those ships bear the brunt of economic and operational scrutiny. Long-range voyages and expeditions are usually drawn from this group. And it is suggested that the large ships require longer term (two-year) scheduling.

Note: The Advisory Council recommended that MOANA WAVE temporarily be deleted from the list of UNOLS ships until its return from current Navy assignment.

On the other side it is submitted that more schedule interaction exists between large and small ships in a given region than between large ships in different oceans. Furthermore, two scheduling groups overlapping the same area would be an undesirable situation.

The majority of participants and reviewers appear to be of the latter persuasion.

Coordinating Groups

It is intended that each of the fleet components exercise a strong role in ship scheduling, operations, layups, review, and oversight with *regard to the fleet as a whole*. In order to insure cognizance within the region, each group should include representatives from all major operating institutions within the region. Makeup of the groups is recommended as follows:

Western

U. Alaska
U. Hawaii
U. Washington
Oregon State U.
Moss Landing Lab
U. Southern California
Scripps Institution
Member, Advisory Council
Observers: NSF, ONR

Eastern

Texas A & M
Rosenstiel School
Duke U.
U. Delaware
U. Rhode Island
Lamont-Doherty
Woods Hole
Member, Advisory Council
Observers: NSF, ONR

It should be noted that regardless of whether or not a separate large ship group is identified, the regional groups would include all major operators (i.e., LDGO in the Eastern and U. Washington in the Western).

If a Long-Range Fleet component of large ships were separately identified, its coordinating group would comprise the following:

Long-Range

U. Washington
Scripps Institution
Lamont Doherty
Woods Hole
Member, Advisory Council
Observers: NSF, ONR

Each of the coordinating groups would include, as a full member, a UNOLS Advisory Council member who represents an institution which does not operate a major ship. The role of this member will be to directly represent the interests and needs of ship users from non-operating institutions. This arrangement is undertaken to insure that the parochial interests of the operating institutions are at least partially balanced by an advocate of the growing group of ship users who work at institutions which do not operate ships. This will also allow for a more accurate representation of the needs of the scientific community as a whole on the coordinating groups.

Procedures

In the conduct of this scheme the following procedures are recommended:

- 1). Close and continuing liaison between members of the Group should be maintained.
- 2). Requests for ship use will be submitted to the intended operating lab and to the UNOLS Office. Regional group members will circulate copies of, or inventories of, ship use requests as they are received. *It is intended that all members be aware of all requests within the region.*
- 3). Initial ship operating schedules will be prepared by

individual labs considering the UNOLS Fleet as a whole. Preliminary schedules and subsequent iterations will be circulated to all members of the Group. Even at this stage care should be exercised to place the proposed use on the most appropriate ship and to avoid duplications.

4). Regular meetings will be held as frequently as necessary in order to develop schedules; and in any event well before the semi-Annual UNOLS meetings. Opportunities exist to meet again at the UNOLS meetings. Additional meetings between sub-groups of the region will be necessary to coordinate special activities within the region or between regions.

Spring meetings are for the purpose of developing the best possible ship schedules using the following criteria:

- Knowledge of funded scientific programs
- Appropriateness of ships assigned
- Combining compatible projects
- Minimizing unproductive transits

Fall meetings will produce the final schedules for the ensuing year assuming that both science and ships' operations funding are reasonably well known. At this stage all ship schedules should be revised using the above criteria, stressing both appropriateness and efficiency. In addition, the anticipated costs of ship operations *vis-a-vis* projected agency funding shall be reviewed to determine potential funding shortfalls or surplus. Recommendations should be made to the funding agencies regarding practical alternatives in case of a funding shortfall. Alternatives to be considered include:

- Reduction of operating days
- Further combination of projects
- Deferment of projects
- Ship layups for significantly economic periods

5). Based on the criteria for effective scheduling, and on the needs and resources of science and facilities funding, the coordinating group is to have authority and responsibility to recommend specific ships for temporary periods out of service. Such recommendations shall be included within the schedule and shall be transmitted specifically to UNOLS and to funding agencies.

6). Permanent retirement from the fleet or other disposition may be a matter of consideration by the coordinating groups based on accumulated out-of-service or unscheduled periods. Other factors in this determination include ship capability and material condition. Such recommendations shall be transmitted by the group to UNOLS via the Advisory Council and to funding agencies.

7). Although meetings are intended to be working sessions between members, nothing should preclude a potential investigator or user from attending a meeting for the purpose of discussing ship use requirements or problems.

8). The evolution of major expeditions and distant voyages should be the development of scientific meetings and discussions, but the planning and scheduling for such cruises should rationally be a long-range effort through a coordinating group. This should ensure the widest participation possible as well as develop sound funding arrangements well

in advance. In this regard, information should be communicated widely to all potential participants.

9). In the event that a ship is proposed to operate as a "dedicated" facility, the coordinating group can assist in developing participation in the facility. Conversely, the group must ensure that investigators displaced by the dedicated operation are accorded opportunities on other vessels.

10). Chairing of the coordinating group(s) should be rotated amongst the members probably on an annual basis. In addition to setting the meetings, the chief role of the chairman is to ensure that the principles and procedures are observed.

11). Recommendations of the coordinating groups in the matter of joint schedules shall be transmitted concurrently to UNOLS Members, the Advisory Council, and to Federal Sponsoring Agencies.

Part III

ASSESSMENT OF 1981 SHIP FUNDING

In addition to developing a joint ship scheduling scheme, the Working Group was charged with examining proposals for 1981 ship operations support and comparing these with anticipated funding in order to assess the extent of the funding problem and its potential impact.

Proposal data were examined from sixteen operating institutions representing twenty-seven¹ ships of which four appeared to be less than a full year's operation. Data available are shown in Table 1. Total 1981 costs and profile of proposed support is shown by the following along with comparable 1980 estimates.

<u>Sponsor</u>	<u>\$ M</u>			
	<u>1981 Proposed 6/30/80</u>	<u>1980 Proposed 6/30/79</u>	<u>1980 Outlook 7/1/79</u>	<u>1980 Actual 7/1/80</u>
NSF	25.119	19.160	17.5	18.157
ONR	3.423	3.600	3.5	3.276
OTHER	4.707	4.311	4.8	3.801
Total	33.243	27.071	25.8	25.276

1 - On the recommendation of the Advisory Council, the MOANA WAVE is not included in these data inasmuch as its current operation and support is outside the scope of UNOLS.

1981 SHIP COST DATA
FROM PROPOSALS TO NSF
30 June 1980

	Op. Days *-Estimate #-Part Year	Total Cost \$K	NSF Portion	ONR Portion	"Other" Portion
THOMPSON	290	2,140	1,808	229	103
WASHINGTON	293	2,747	2,110	638	--
CONRAD	270	2,072	1,328	744	--
MELVILLE	326	3,249	3,249	--	--
KNORR	277	2,649	1,329	96	1,224
ATLANTIS II	293	2,870	2,479	392	--
Total		15,727	12,303	2,099	1,327
Average	292	2,621			
KANA KEOKI	321	1,360	818	390	153
WECOMA	273	1,690	1,597	--	93
ENDEAVOR	273	1,766	1,533	58	175
OCEANUS	264	1,689	1,171	409	109
NEW HORIZON	228	1,530	429	107	993
ISELIN	248	1,384	893	112	379
GYRE	270	1,826	926	135	764
VEMA	# 225	1,052	701	70	281
Total		12,307	8,068	1,281	2,947
Average	263	1,538			
ALPHA HELIX	163	932	835	--	97
CAYUSE	200	465	370	--	95
VELERO IV	192	629	629	--	--
E. B. SCRIPPS	167	523	470	34	19
CZRV #1	*# 140	580	580	--	--
CZRV #2	*# 140	325	325	--	--
EASTWARD	# 128	492	492	--	--
WARFIELD	160	463	451	--	12
Total		4,409	4,152	34	223
Average	193	551			
HOH	140	66	50	--	17
ONAR	200	145	114	--	30
LONGHORN	162	256	154	9	92
CALANUS	171	184	184	--	--
BLUE FIN	245	159	94	--	65
Total		810	596	9	204
Average	183	162			
TOTAL		33,243	25,119	3,423	4,701

Anticipated support in 1981 according to the best estimates available appears to be:

	<u>\$ M</u>		
	<u>High</u>	<u>Low</u>	<u>Probable</u>
NSF	22.0	20.0	21.0
ONR	4.1	3.2	3.4
<u>OTHER</u>	<u>6.2</u>	<u>5.5</u>	<u>6.1</u>
Total	32.3	28.7	30.5

An analysis of these figures reveals that the probable total 1981 funding is about \$2.7M less than currently projected costs. Of this net shortfall, about \$4.1M is NSF; ONR is about even; and a \$1.4M surplus exists in "other" support which has not yet been proposed (largely USGS ship funds for Bering Sea work). If this latter amount can be distributed, a \$2.7M shortfall still remains in hoped-for NSF support.

Meeting the Shortfall

At this stage for 1980 planning (July, 1979) the anticipated shortfall appeared to be \$27.071M - \$25.8M = \$1.3M. It is not uncommon to record a projected shortfall between original proposed costs and projected funding. In the past this has been made up by deferred maintenance and operations. However, escalating fuel and other costs in late 1979 made it clear that the proposed 1980 figures were highly understated and that the real shortfall would have been twice the amount indicated or as much as \$3.0M. Clearly, "normal" practices would not have sufficed, and the shortfall was largely met by layups in the fleet during

1980:

MELVILLE - 6 months
CONRAD - 10 months

It probably can be assumed that 1981 proposals have caught up with inflation trends, and some cutbacks in support probably can be tolerated without major perturbations. It is difficult to assess the full extent of this, but certainly not much in excess of \$1.0M leaving a \$1.7M shortfall or as much as \$3.1M if other outside support (such as the \$0.8M USGS) cannot be realized.

Summarizing, it appears realistic to state that for currently proposed or projected operations by the UNOLS fleet in 1981 a funding shortfall of between two and three million dollars can be forecast.

In order to meet this shortfall, the following measures may be considered:

- Retirements
- Reduced Ship Operations
- Layups

Retirements

Retiring a ship, that is, striking it permanently from the inventory of the UNOLS fleet is a step which arouses the most discussion and controversy. On one hand it is the most predictable and cost saving measure available. It is usually done on ships which have reached the end of their useful life or are so little employed that the conclusion is easily reached. However, when it becomes a matter of eliminating a ship because the entire fleet is under utilized, it becomes another matter. In general,

it is a step favored by institutions not operating ships, but viewed with nervousness and concern by ship operators (it might be their ship).

Those opposing the elimination of a capable ship argue that forthcoming science projects should and will need that capability. Furthermore, history has shown that a ship once removed is an irrevocable action. Those favoring a match of current ship usage to ship capacity have the advantage of statistics on their side.

The Working Group was not prepared to recommend the retirement of any ship at this time. (An exception here is the VEMA which the Group understands already is planned for retirement sometime in 1981.) The Group recognizes, however, the many recommendations for and strong trends which may dictate a resort to this measure. It recommends that the fleet coordinating groups make such recommendations based on demonstrated and cumulative non-productivity over a period of years.

Reduced Ship Operations

Still another approach to reduced ship costs lies in amending the concept of operations. If and when large ship operating days total less than 280, they are referred to as "under utilized" and some sort of a taint applies. All-out efforts are made by our operators to maintain high averages often at the expense of maintenance and other considerations. The 1981 proposals show a large ship (over 200 ft.) average of 292 days and an intermediate ship average of 272 days. If these days were reduced by about 10%, savings in fuel alone would be significant along with improvements in shipboard maintenance.

As an example: if the large ship average were 260 days/year (still a respectable number in comparison to other fleets), a 30-day savings in fuel, food, and overtime would amount to as much as \$3,000/day. This would result in a six-ship cost reduction of \$540,000. Similar reasoning for eight intermediate ships (25 less days @ \$1,500/day) should save \$300,000, and smaller vessels might realize \$100,000. The total of this would amount to about \$1.0M which is in the same order as the very first set of reductions shown earlier (Pg. 14) and probably duplicates it but in a more or less planned-for fashion. It is apparent that it does not fully compensate for the anticipated shortfall.

Advantages of reduced operating days are:

- . Reduced overall costs - especially in view of increasing fuel and overtime.
- . More maintenance availability by ships crew.
- . Preserves numbers of ships from retirements due to overcapacity; hence retaining geographic and capability range.

Disadvantages are:

- . Increased daily rates would probably apply to those sponsors who fund on a daily rate basis.
- . Total savings is probably not as great as a full fledged layup. That is, six ships operating 180 days less will not save as much as one ship out of service for $\frac{1}{2}$ year.
- . Although shipboard maintenance will be improved, the added opportunities for maintenance may tend to devour the savings.

In general, the Working Group favored further consideration of reduced operating days as a systematic means of planned cost savings.

Ship Layups

The Working Group considered that recommendations for lay-

ups are within the purview of the scheduling process but that adequate information must be available regarding the distribution of funded science support, or that layups be planned well in advance so that proposal planning, both science and ship operations can proceed in an orderly fashion. In other words, ships should be layed up that have no work to do, or ship and science planning should start in the full knowledge that certain ship(s) will not be available.

The Working Group recommends that the Fleet Coordinating Groups be empowered to recommends layups as a part of the scheduling process when that Group is fully advised of the profiles of funded science projects.

Regarding layups, the Working Group recommends that up-to-date information should be compiled on the cost savings of layups of various durations. It was noted that in view of fuel costs becoming a dominant factor, the previously considered "six-month minimum layup" may be becoming obsolete. Furthermore, because several operators have now gone to a salary and benefit cost accrual system, shorter term layups are more cost effective than before.

Another factor is the inclusion of planned maintenance with a layup period. For example, if each of the six large ships each went to a biennial four-month maintenance availability, the result would be three ships each layed up four months per year (12 months equivalent out of service), and that overall fleet maintenance would be systematically improved.

In regard to the 1981 situation, the Working Group is not in a position to recommend specific layups inasmuch as inform-

ation on funded science programs was not available to it. However, based on overall statistics and the current stage of ship scheduling, the Working Group considers that about two one-half year layups of larger vessels, and two one-half year layups of smaller vessels will be required in order to meet the projected shortfall in ship operating support.

TABLE 11

1980 SHIP COST DATA
FROM PROPOSALS TO NSF

30 June 1980

	Op. Days *-Estimate #-Part Year	Total Cost \$K	NSF Portion	ONR Portion	"Other" Portion
THOMPSON	266	1,921	1,886	35	--
WASHINGTON	299	2,358	1,510	825	23
CONRAD	# 23	116	--	--	116
MELVILLE	# 178	1,537	1,485	--	52
KNORR	247	2,033	837	732	463
ATLANTIS II	323	2,681	2,765	--	--
<i>Total</i>		10,646	8,483	1,592	654
<i>Average</i>	284	2,248			
KANA KEOKI	239	918	326	517	75
WECOMA	279	1,478	1,351	26	101
ENDEAVOR	263	1,415	1,040	97	278
OCEANUS	257	1,383	861	350	185
NEW HORIZON	210	1,250	647	354	249
ISELIN	171	1,074	728	88	258
GYRE	254	1,555	559	126	870
VEMA	366	1,334	838	36	459
<i>Total</i>		10,407	6,350	1,594	2,475
<i>Average</i>	291	1,301			
ALPHA HELIX	144	912	862		50
CAYUSE	182	390	235	--	153
VELERO IV	180	606	471	--	--
E. B. SCRIPPS	161	461	286	89	86
EASTWARD	216	764	626	--	138
WARFIELD		499	389	--	109
<i>Total</i>		3,632	2,870	89	536
<i>Average</i>	176	605			
HOH	111	38	25	1	12
ONAR	172	94	70	--	24
LONGHORN	100	140	101	--	39
CALANUS	187	176	176	--	--
BLUE FIN	230	143	82	--	61
<i>Total</i>		591	454	1	136
<i>Average</i>	160	147			
TOTAL		25,276	18,157	3,276	3,801