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### **Paper No. 7: Shipyard Planning and the Computer: Fact or Fantasy**

U.S. DEPARTMENT OF THE NAVY  
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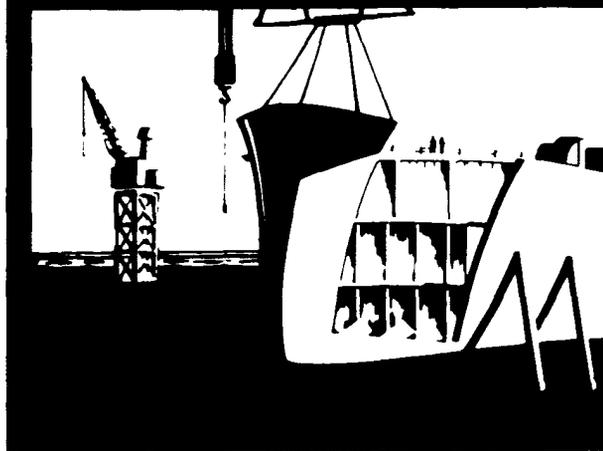
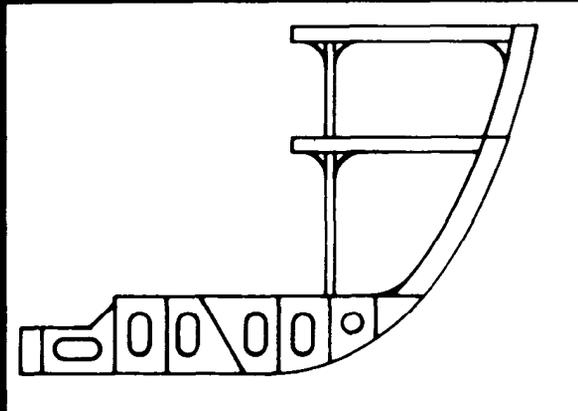
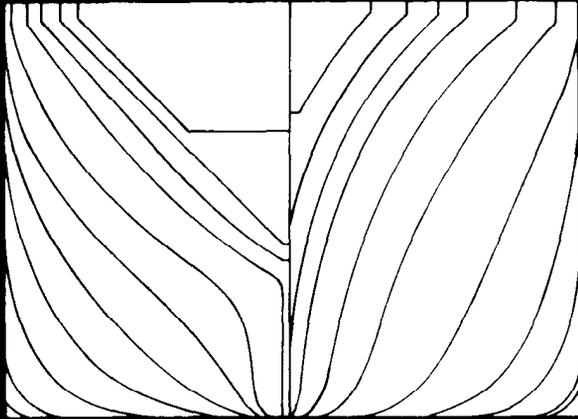
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RESEARCH  
AND  
ENGINEERING  
FOR  
AUTOMATION  
AND  
PRODUCTIVITY  
IN  
HIGH BUILDING

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## SHIPYARD PLANNING AND THE COMPUTER: FACT OR FANTASY

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### ABSTRACT

The planning environment in American shipyards has undergone a change of technique and attitude with the upswing in use of computers. Traditional planning mechanisms have given way to PERT networks and sophisticated data collection and reporting computer systems. This transition has not been as successful as was intended, as evidenced by the planning and scheduling problems faced by many of these computerized yards.

Data processing was moved from the basic accounting arena into operations research and massive production-oriented systems which has diluted the planning effort. This is caused by planners which have not evolved from production, a planning attitude that the computer can solve all problems, and management's inability to recognize the shortcomings of computer software. Technology is available to assist the shipyard with total planning and complete ship's plans and schedules. However planning, in itself, must be adapted to use this computer technology and not be driven by it.

These topics are addressed: (1) An analysis of traditional planning techniques; (2) An evaluation of data processing in the planning environment; (3) A critique of the computerized planner; (4) Recommendations for management, planning, and data processing to improve the problem areas of computers in planning.

The Planning environment of American shipyards has witnessed a noticeable change with the advent of the high-speed digital computer. The tedious laboring of the planners has given way, in part, to the sophistication of the computer and its software. While in no way does the machine intend to replace the planner, it has altered, considerably, the attitudes, methodology, and results of the planning department. This marriage, however, does not go well.

Traditional planning techniques are difficult to define since each shipyard is subject to the talents and experience of its staff. Planning and scheduling does not have a long history of formalized background, such as Engineering, and therefore, cannot be classified as to methodology, whether good or bad. Manual planning takes whatever form was first invented and subsequently modified by time and differing planning personnel. Any planning standard which may exist is merely a fallout of personnel movement from yard to yard, and defined by the type of ships being built. Planning discipline within the yard varies with management direction, influenced by any company standards which may be imposed. Company policies or procedures, however, seldom address standards for planning or scheduling.

Planning managers have relied heavily on their knowledge of past ships and the experience of their individual planners. Most members of the planning staff came from the ranks of the Production department, and therefore, understood the basic essentials of at least their portion of the shipbuilding process.

Planning has normally been decentralized, placing detailed shop planners within the shop environment, and a top level planning group tasked with total ship's schedules and overall yard control. Each reports to different points within upper management which leads to varying levels of management direction, required reporting, and responsibilities.

Some yards attempt to consolidate by centralizing their planning groups. Communications within planning generally improve while links to the Production department tend to blur and disappear with time. The end result being schedules which Production will ignore unless management intervenes heavily.

Regardless of approach, planning was ultimately done "by hand", with various reports drafted by the planners and typed by clerks or secretaries. Tracking of the plan required heavy manual intervention, and rescheduling, when necessary, was usually inaccurate due to the lack of proper information. When such data was compiled, by the time the new schedule was published, it was outdated.

The field of Data Processing has been developing at a rapid pace since 1948. For many years, the computer served an important role in all aspects of industry, including the shipbuilding environment. Until recently, however, the role of the computer in shipbuilding remained at the basic accounting level. It was used to accommodate payroll, accounting, and occasionally, inventory control. With education in the field of software development on the upswing, traditional D. P. systems are being augmented with more sophisticated programs,

now advancing into the realm of Production Control, Planning, and Scheduling. Shipyard D.2. personnel are becoming acclimated to the very nature of the shipbuilding process and are developing computer systems to enhance the capabilities of the planning departments.

This transition has been slow and painful since the rigid discipline of software development, dictated by the logic of the machine, is in direct contrast to the art of shipyard planning. Shipbuilding did not advance with the advent of the computer, as did aerospace or electronics, and planning personnel have been reluctant to place strong credence in the programmers and their software.

The recent shipbuilding situation, regarding number of awarded contracts, DOD requirements, and the complexity of the vessels, has forced the planners to incorporate some use of the computer in their work. One significant application being the use of PERT systems to aid in the scheduling function. It appears, however, that planning personnel have taken a misguided step into their use of computer software.

In many ways, the speed of the computer has been harnessed to increase the overall document volume generated by the Planning department, but the sophistication of the software is not being utilized. Instead, the yard's traditional planning techniques are being dropped, with no improved methodologies replacing them.

The overall experience levels of the planners is on the decline, caused in part by Management's desires to upgrade the Planning environment with higher education levels. Knowledge of the shipbuilding process, while still important, is taking a "back seat" in attempts to increase the potential of the Planning department. Planning "to suit Production" is replaced with planning "to suit the computer", with the overall approach tending away from the shipbuilding process. D. P. builds, or buys, sophisticated software, and Planning's attitude has shifted towards that software. Insufficient, or incomplete, plans are fed to large programs with the assumption being that said software will create completed schedules. Schedules that are complete, trackable, and consistent with the Production environment, however, cannot be generated by software alone.

No computer software system has been created which understands all of the intricacies of the shipbuilding process, contrary to the assumptions of some planners. The D. P. discipline still holds to the philosophy that the best systems are those which are as general purpose as possible to enhance their applicability to a multitude of applications. This is particularly true of systems created by software suppliers who want their programs to sell in as many differing environments as possible. If the D. P. department is asked to create a "scheduling package", their inclination would be to build a system capable of supporting Engineering, ship repair, as well as new construction scheduling. Planning, however, is

seldom aware of this "generality by design", and usually misuses the software.

Planning is not wholly to blame. Management is ultimately responsible for the schedules in terms of short and long range commitments of the yard. However, management appears to be too short-sighted at the onset of the planning process, by not insisting that planning be directed at the overall development of the yard, as well as the individual ships. Management does not fully- understand what is happening in their Planning departments until it is too late, and a ship is behind schedule with no known manner of recovering. It is impossible to recover to a schedule that is incorrect in the first place.

The end result is a Planning department which does not support the needs of the yard. Many of the planning and scheduling details, such as material procurement and testing schedules, are overlooked in favor of feeding steel sequence and major outfitting plans to some piece of computer software. More noticeably, required support schedules for shop work is often ignored, due in part to the fact that such detailed information would yield an overly complex set of data to be input, and eventually extracted, from the computer. To understand this statement, consider a ship requiring 2000 major erection activities. Printed at 50 lines per page would require 40 pages of printout that must be fully understood by Planning. To properly complete the picture, as it should be done, add in 200 Engineering drawing related activities, 500 material tracking activities, 200 major test items, and 4000 shop support

activities. The total number of activities has grown to 6900 to be presented on 138 pages of computer paper. That is, 138 pages of scheduling results which must be as accurate as possible for the yard to effectively function on this construction project.

Output volume is not the only problem concerning the analysis of the plans and schedules. All too often, software packages are deemed best if they present every detail of the data. While detail is necessary, data summarization is required to assist both Planning and Management with a comprehensive overview of the yard's load and problem areas. Few packages, however, are capable of reporting high level summaries, suitable for inspection by middle or top management. In addition, the bulk of the plan's details must be analyzed on an exception basis to allow Planning the ability of focusing on the problems rather than having them piece through all detailed reports for problem isolation. Of importance to note in this discussion is that general purpose computer programs cannot sufficiently accommodate the specific needs of the American shipyards, both in terms of data summarization and problem isolation by exception reporting.

The Planning environment, whether it be a centralized planning department or decentralized planning groups, has been doing this work for years without a computer to foul things up. But the new Planning/D.P. relationship seems to have short-circuited this total planning process. With the increased speed and storage capabilities of most large scale

computers, planning and scheduling can be done at the yard level as well as the individual ship's level. Total integration of ship, shop, engineering, and material requirements can be accommodated, even considering the increased complexity of the resultant schedules.

A new discipline needs to be developed with regard to planning and its use of the computer. Planners must be trained in the use of the computer software tools which D.P. is presenting to them. Interdepartmental communications need to be restructured in such a fashion as to augment the use of the machine and its output. No longer is the massive amount of data to be a hinderance to the Planner or Management, but rather, an incentive to utilize as much of the computer's power to the benefit of the yard. Support schedules need no longer be isolated from the primary ship's erection schedule just because the total plan seems too large.

Data Processing must also be included in this revitalized Planning approach. Computer software tools must be designed to be industry specific, geared to accommodate the massive data manipulation problems associated with our heavy manufacturing environment. Data must be accessible by many in the yard, yet controllable by minimizing the number of persons capable of updating that information, for the purpose of data integrity. As systems are developed, Data Processing must assist Planning in the establishment of a data control, since numerous factions within the yard will be required to provide input and updates to the data upon which Planning must make meaningful planning

and scheduling decisions. Where multiple programs are involved, Planning and D.P: must work together to insure that all departments in the yard understand their responsibility to the planning endeavor, and that the systems used by those departments maintain information in alignment with some master planning system, whether computerized or manual.

The end result is plausible and possible. Total ship's plans and schedules directly under control by the Planner, all incorporated under the exacting guidelines of the machine. Complex? Surely, but the sophistication of the D.P. department can be used to prepare mechanisms by which the total ship's complexity- can be broken down into finer lines of detail, and be digestible by the differing Planning functions. management also benefits by the increased solidarity of the Planning environment in developing the plans and schedules for individual ships, as well as the entire yard.

The basic premise for re-establishing the proper perspective of the Planning environment is a thorough analysis of the elementary principles upon which shipyard planning is based. The intent of the computer is to serve the needs of the yard, and planning standards and methodologies should not be directed toward the fulfillment of the D.P. department. Instead, an overall evaluation of the needs of the Planning department must be performed, with the following points being considered:

- \* Discrete ship, shop, and support planning philosophies
- \* Techniques and Methodologies

- \* Required policies and procedures
- \* A formalized training program

Once the planning discipline is established, computer tools can be properly defined, and the D.P. department can begin its role with regard to the yard's planning needs. With this basic foundation, Planning can then begin to function in its proper capacity, relating the shipyard's short and long term goals in terms of the total environment: Engineering, Material acquisition and control, Production manpower, Facilities, and Data Processing.

The intent of this thesis has been to expound upon some of the pitfalls of the Planning and Data Processing interaction, as has evolved with the increased capabilities of the computer and its software. It has been observed that, with increased attention to the machine, Planning has lost some of its emphasis on its techniques and methodologies, both at the individual ship level as well as the total yard level. As computers become larger and more powerful, and as the D.P. personnel become more knowledgeable of the shipyard, the emphasis of Planning should be to capitalize on this technology, rather than be directed by it. Increased use of the computer will not solve the Planning dilemma being faced by today's computerized yards, but rather, the Planning department must re-evaluate its position, capabilities, and intentions within the structure of the yard and the industry.

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