file Multics Misc.

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I have no idea who inserted this favorable report on Multics in the June, 1971 issue of NAVAL RESEARCH REVIEWS. Peter Neumann spotted it and passed it on.

FJC:cpd

Command. One model was provided by the Aerojet General Corporation and the other by the Bell Aerosystems Company.

Tests of the two models demonstrated that both can run up on the beach through surf up to and including 12-foot breakers and retract or return to the water through 12-foot breakers. The test data has been used by Aerojet General and Bell Aerosystems to optimize their designs.

Each company is now constructing two full-scale test craft under Navy contract to be considered in the final selection. All four test craft are 165 tons and approximately 100 feet in length, 50 feet wide and 23 feet high.

The six-foot models are also being modified to match design changes, and they will be tested further for surf performance at Hydronautics. In this way major problem areas in regard to the performance of the air cushion AALC in heavy surf will have been corrected by the time construction is completed. It is believed that this will lead to the production of amphibious vehicle prototypes that will be much closer to operational standards than has been previously possible.

Twenty-Four Million Dollar Gamble Pays Off

The concept of a Multiplexed Information and Computing Service (MULTICS), which would provide a continuous, reliable, 7-days-a-week, 24-hours-a-day, time-shared computer system capable of meeting nearly all present and near future computer requirements, grew out of and is an extension of the basic concepts and philosophy of the Compatible Time-Sharing System (CTSS) developed at MIT during the late 50's and early 60's.

Many diverse objectives were incorporated into the plans for MULTICS, including the ability to alter the number of central processors and the amount of core and secondary storage in response to system needs even while users are logged in, and the development of a paging type virtual memory capable of accommodating extremely large and complex problems, thereby permitting problems that were too cumbersome to be tackled in the past to be successfully pursued, while at the same time retaining a sufficiently small overhead to permit the small user to operate efficiently and cost-effectively. Other features, including the ability for two or more users to share a single copy of a file as data in core memory and to obtain controlled access to other users' file directories, were to be incorporated into the system.

In 1963, the Office of Naval Research with Advanced Research Projects Agency support, initiated funding of this ambitious project. In order to achieve the goals outlined above, an entirely new set of computer hardware had to be designed. This was undertaken by the General Electric Co., which made numerous modifications to its 635 series machine. The most gargantuan task was, however, the programming effort. At times, substantially over 100 programmers were working on various aspects of the system. Complexity grew to such a point that coordination of the effort became a superhuman task, and a point was ultimately reached where the possibility of salvaging even a marginally useful system was in doubt. Some observers had written the project off as a daring but unsuccessful experiment. Slowly the system programming came under control and was gotten on the air with a single terminal which was later stepwise expanded to a point where over 40 users can be simultaneously and effectively serviced. Many programs had to be revised and refined as many as a dozen times before efficient operation was achieved.

Today a practical system is available which is so much in demand at MIT that expansion of the facility cannot keep up with requests for service. Although the system is now cost competitive, further refinements are almost daily being made, many of which result from experience gained by observation of the MIT user groups. The real significance of MULTICS is, of course, the impact which its development is having on the planning of new computer systems. While the total investment in this effort has been substantial, it is already apparent that the money has been well spent and the future will see a handsome return on this investiment.

Concepts of library search are not yet good enough to satisfy some users, and telephone lines still limit the system's input-output capabilities. These limitations must be overcome before large systems can be efficiently linked on the network. MULTICS will also have to explore ways of organizing the simultaneous use of large numbers of processing units.

As these problems are solved the MULTICS approach offers great promise for the improvement of command and control and logistics systems as well as the management of large, complex programs.

Cover Caption

In the illustration, the vertical segments denote increments of altitude and the horizontal indicate levels of energy rate. The high-performance aircraft begins its climb at a low altitude and at a subsonic speed chosen to have a high energy rate. After passing the transonic region, some potential energy (altitude) is bled-off in a shallow dive while kinetic energy (speed) is rapidly increased. This process is then reversed to exchange speed for altitude. Throttle is maintained at a maximum setting throughout the transit. In performing a minimum-time climb, maximum energy rates, dE/dt, can be maintained only by flying a Mach versus altitude schedule as shown by the ridgeline. An aircraft's flight characteristics determine its particular energy rate contour; the one illustrated is typical of a high-performance aircraft, e.g., an F-14 or F-15. Such contours can be developed for subsonic aircraft as well. An energy rate contour for the Sopwith Camel can be determined but is not shown. Its maximum energy state, indicated in terms of terminal speed (Mach) and altitude, is greatly surpassed by modern military aircraft. (Provided by courtesy of Honeywell, Inc., Systems and Research Division)

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