

## Guidance and Control of Short-Range Tactical Missiles

**I**N virtually all of the applications areas of interest to our AIAA community, there are both demanding challenges and fruitful opportunities for those of us in the guidance, control, and dynamics field. As previously announced, it is our intention to highlight one of these important technology areas from time to time by devoting part of an issue of the Journal of Guidance and Control to one specific area. This issue contains the results of our first efforts to do this.

Considerable research and development effort has been directed toward the guidance and control of short-range tactical missiles in recent years. In this special section we focus on the air-to-air and surface-to-air defensive scenarios. In both cases guidance laws currently in use on existing and fielded missiles may be inadequate in the battlefield environments envisioned for the 1990's and beyond. Performance criteria will probably require applications of newly developing theory which, in turn, will necessitate a large computation capability relative to classical guidance technology. Until very recently this task has been relegated to large computers, in many cases ground-based. The microprocessor, now enjoying significant technological advancement, will allow increased use of on-board computation. Hence, the recently developed theory can now be applied to small missiles formerly incapable of carrying the necessary guidance and control computer.

Four papers dealing with significant portions of this technology have been selected for this special section via the manner described in the September-October 1980 issue of this Journal. The lead article is a survey paper by Pastrick, Seltzer, and Warren which contains a comprehensive search of the guidance and control literature oriented toward tactical missiles. The paper then describes ongoing and proposed research and development efforts and summarizes the state-of-the-art in a generic format. From here the issue follows two paths: first is the use of several modern control approaches to the guidance and control problem in order to demonstrate the improved performance now possible with this powerful approach to the analysis and synthesis of algorithms; second is the use of microprocessors to host such algorithms in these small missiles. In the modern control category there are two papers. The first, by Anderson, uses two distinct approaches to formulate guidance laws and the results are compared in several scenarios. In the second, by Johnson, the analog theory of disturbance accommodating control is extended to include digital controllers. The resulting procedure enables the tactical missile guidance law to account for the dynamics of input disturbances defined by analytic-deterministic functions. In the final paper of this section, the other path is explored—microprocessor realization of the guidance laws. In this paper, by Albanes, a flight-proven mechanization of a digital control scheme in a microprocessor is described. Design, implementation, and verification issues are all covered.

As is normally the case, the organization and management of any new or unusual activity requires a substantial investment in time. The idea for this subject area was first discussed in the summer of 1979 at the Guidance and Control Conference in Boulder, Colorado. Since that time two people have patiently sorted through issues, manuscripts, and editorial and clerical constraints to assist the editors in reaching this point. They are Dr. Sherman Seltzer of the Control Dynamics Company and Dr. Harold Pastrick of the U.S. Army Missile Command at the Redstone Arsenal. I'd like to personally thank them for their efforts on behalf of this Journal.

*Donald C. Fraser*  
Editor-in-Chief