Guided Missile Design

Handbook of Satellites and Space Vehicles. Robert P. Haviland and C. M. House. Van Nostrand, Princeton, N.J., 1965. xvi + 457 pp. Illus. $15.75.

This handbook, a volume in the series entitled Principles of Guided Missile Design, is reasonably successful in its aim to provide sufficient information to permit preliminary creative design of satellites and space systems, but partially incomplete through being out of date. For example, in chapter 8, on space environment, the most recent reference cited was published in February 1960, 5 years before the preface was written. Chapter 17, on engineering design for man in space, cites no references published after 1961, the first year of man's venture into space! If a handbook is to be very useful in such a rapidly changing endeavor as space engineering, editors and publishers must shrink publication time to 1 year, not 4.

However, the handbook is very useful in those domains where it is concerned with such topics as fundamental relationships and properties of materials. Useful data are given in 100 graphs, more than 300 figures, and numerous tables. Basic factors with dominant effects on preliminary design of space hardware are emphasized. Equations and references are generally included. The editors maintain a helpful approach, and include several systems of units in the scales on many figures—for example, atmospheric density has units of slugs/ft^3, lb/ft^3, and kg/m^3.

The first seven chapters, which treat satellite and rocket orbits and trajectories, start with Kepler's laws and orbit fundamentals, including nomographs and graphical information for orbits about all the planetary bodies. Perturbations and lifetimes for near-earth orbits are included, as well as takeoff and trajectories that reach the surface, or escape, or transfer between orbits. It is shown how earth-bound or space-borne observers may determine position in an orbit or in space. Vehicle stabilization and orientation only by solid and liquid flywheels are discussed, but propulsive, magnetic, and gravity-gradient orientation devices are not.

An extremely useful group of technical compilations, by several specialists, deals with materials in space and their susceptibility to vacuum, to sputtering and meteoritic erosion, and to charged-particle and gamma-ray bombardment.

Fundamentals of thermal control in space are discussed, with useful graphical evaluation of equilibrium temperatures of bodies with different shapes and different (α, ϵ) values.

Communications in space are treated to "provide a first estimate of the communication system required." Requisite bandwidths, noise in receivers and antennae and from nonterrestrial sources, as well as the attenuation of radio waves by rainfall, the ionosphere, and the atmosphere are discussed, as are Doppler shifts and refraction by the atmosphere and by the solar corona. There is no inclusion of many fundamental points in preliminary design, such as existing networks of tracking and telemetry stations, uses of tape recorders or command receivers, designs of satellite antennae, or PCM systems.

The chapter on power systems is comprehensive, but only two pages are used to treat common solar-cell sources, while nine pages are used to discuss unusual solar concentrators such as mirrors. No guide for preliminary design is given on some important aspects—for example, coatings to improve the thermal characteristics of solar cells or plates to give radiation protection.

Despite such detailed criticisms, this is a very useful handbook in a field of endeavor where rate of change and range of topics make a perfect handbook unfeasible. Perhaps my approval is influenced by the discerning (and human) comments in the preface—"design is still an inexact science. . . . Perhaps the best reason for the separation—into preliminary and detail design—is the fact that it increases the level of analytical effort, thereby preventing poor design. Unfortunately, *there is indication that it also tends to prevent outstanding design*" (my italics). This preface should be mandatory reading for personnel who are concerned with reliability and quality assurance.

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Museums: A History and a Guide

Museums, U.S.A. A History and Guide. Herbert Katz and Marjorie Katz. Doubleday, Garden City, N.Y., 1965. xii + 395 pp. Illus. $6.50.

In this single volume, Herbert Katz and Marjorie Katz have attempted to provide both a complete history, covering more than two centuries, and a comprehensive and informative current guide to all museums in the United States. Considering the vast compass of this undertaking, they have done remarkably well.

The work is divided into six major parts. The first is a summary of the museum movement in the American colonies, a movement which had its beginning with individual collections assembled for private scholarly research or public edification. This is followed by consideration of the major museum fields, which include art, science, history, children's, and miscellaneous collections. The exposition of the formative element leading to the establishment and development of each is particularly interesting. The chapter on science museums presents the impulses that brought them into being—the scientific interest starting in the late 18th century, coupled with their development from early cabinets of curios into the major institutes of learning they are today. In addition to the prominent "name" museums, known to the entire scholarly world, there is coverage of the unusual such as Ward's Natural Science Establishment, which started from the private collection of a 19th-century stone collector (a "rock-hound") to become during the past century an important supplier of scientific school equipment. There are stimulating and interesting descriptions of 64 museums that range from trailside installations and natural preserves to the modern formal structures which have become so familiar that we tend to take them for granted.

Included among the 150 museums of history are those of local, state, and national societies, and the house museums, as well as the large complexes like the Ford Museum and Greenfield Village, Cooperstown, Colonial Williamsburg, Deerfield Village, and Old Sturbridge. The authors make a careful and useful distinction between these establishments, which is

based on the nature of the installations (whether restoration, fabrication, recreation, or reconstruction), and on their purpose and usefulness to the public.

There are occasional omissions, as one might anticipate in such a far-reaching work, and some of these are important. Clark's Indian Museum in St. Louis, which existed from 1818 to 1838, is not mentioned; nor is Robert Leslie's Museum of Technology in Philadelphia, which pioneered in its field in the late 18th century. The Armed Forces Institute of Pathology's Medical Museum is described, but no mention is made of its historical collection of more than 500 microscopes, which is believed to be the largest and most significant in the world.

An extensive appendix provides an alphabetical list of museums (by state and city), giving their address, type of collections, and visiting hours. There are 40 illustrations of the wide range of installations, buildings, and exhibits described in the text. The bibliography is comprehensive, and the index is thorough and well organized.

This book is not the most comprehensive reference work on the subject, but it serves as a useful supplement to Coleman's *The Museum in America*, in that it covers the period since 1939. *Museums, U. S. A.* does not pretend to be a scholarly work, but it achieves its objective as a handy volume of reference that will be useful to the general museum visitor and of interest to the scholar.

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Today's Youth in Tomorrow's Society

The Next Generation: The Prospects Ahead for the Youth of Today. Donald N. Michael. Random House, New York, 1965. xxvi + 218 pp. $4.95.

Donald Michael has set himself the task of making reasonable predictions about the immediate future and of persuading selected portions of the responsible public to face the problems these forecasts bring into view. *The Next Generation* is the third such endeavor he has made. The first had to do with the implications of space activities and the second with cybernetics. This book, based on a report prepared in 1963 for the Office of the Special Assistant on Juvenile Delinquency of the Department of Health, Education, and Welfare, is directed to those who are involved with youth planning. Its focus is on foreseeable changes in our society, such as the growth of megalopolis, the ever-widening separation in our society of the professionally trained, the technically trained, and the unskilled, and the increasing rationalization of life, that will bear on the chances of youth in the next 20 years.

It is striking that the audience to whom the book is addressed and the group whose problems are central to it appear only in a series of questions the author raises in the appendix. He treats "youth" as if young people comprised a bounded segment that is the concern of another bounded segment made up of those who "plan and implement youth development programs." Writing in a relentlessly flat style modeled on objective reports to interested top management, he lays out what will probably happen if—and this is left open—other things do not happen. The implications are bedded down in understatement and irony.

This style of presentation undoubtedly is effective, as the reader begins to pick up the clues and argues that, after all, something can be done. It is not necessary to continue on this or that devastating road. We do not need to wait so long before taking action. The author makes grim statements, carefully supported by highly selected summary studies on different aspects of American society. The reader responds with an ethical recalcitrance and an optimism that, because they are his creation, may well be effective. Michael draws a picture of a repulsive world (in which, he admits, a few people may have a very good time). His own repulsion is conveyed to the reader not by preaching or exhortation but by the carefully calculated movement of the spotlight he turns on a future that can be changed only by decisive, responsible action now.

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Perspectives in Physiology

Homeostasis and Feedback Mechanisms. A symposium of the Society for Experimental Biology (Cambridge University, England), September 1963. G. M. Hughes, Ed. Published for the Company of Biologists on behalf of the Society for Experimental Biology by Academic Press, New York, 1964. viii + 460 pp. Illus. $15.50.

This book is an example of the symposium volume at its best. All contributions are germane to the central theme, aptly described by the title. Homeostasis, of course, provides an approach rather than a specific field of inquiry and, since Bernard, has been one of the most powerful principles available to guide the physiologist. Consequently this symposium is of uncommonly general interest and deserves a wide readership. The volume proceeds from the more concrete and conventional papers to somewhat abstract contributions; this arrangement, together with the background material provided in many of the papers, enables the book to be profitably and enjoyably read in its entirety.

The contributions represent a diverse assemblage of problems, united by their common point of view—that the integration of the organism as a whole is as significant as the nature of its components. The papers of Pantin, Bartholomew, Hart, and Benzinger may be described as physiological ecology. Weis-Fogh, Mittelstaedt, Merton, and Fender consider neuromuscular systems, while Cross, and Jones and Bellamy discuss neuroendocrine mechanisms. Several facets of respiratory physiology are described by Hughes, Andersen, and Randle. Robertson, Wigglesworth, and Harker treat the special problems posed by the application of the concept of homeostasis to genetics, development, and diurnal rhythms, respectively. Detailed analysis of an osmoregulatory system is described by Shaw. In more theoretical discussions, Goodwin, Frank, and Machin attempt to apply statistical mechanics, information theory, and feedback theory to biological systems. Since many readers will be ignorant of the terminology and applications of systems analysis, Machin's paper might be read as an introduction to the chapters by Mittelstaedt, Merton, and Fender.