

U.S. STANDARD ATMOSPHERE SUPPLEMENTS, 1966

U.S. COMMITTEE ON EXTENSION TO THE STANDARD ATMOSPHERE*

Environmental Science Services Administration
National Aeronautics and Space Administration
United States Air Force

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the co-chairman of COESA)

The U.S. Committee on Extension to the Standard Atmosphere, COESA, announces that a new book, the U.S. Standard Atmosphere Supplements, 1966, is ready for publication by the U.S. Government Printing Office. It will be available for initial distribution to associated aerospace and scientific organizations very early in 1967. Additional copies also will be made available to the public through the GPO at a very nominal cost.

COESA authored the U.S. Standard Atmosphere, 1962, a companion volume containing detailed tables of atmospheric parameters to 700 km. The International Civil Aviation Organization, ICAO, adopted in 1964 an extension of the ICAO 20 km Standard Atmosphere to 32 km, following COESA's 1962 atmosphere. This 32 km (105,000 ft) extension is set for implementation by all appropriate national authorities on 12 November 1966, in time for use by supersonic transport aircraft.

COESA is a group of organizations that banded together in 1953 to take actions required to provide the then, new-born space industry with a realistic description of the atmosphere extending beyond altitudes of conventional aircraft operations. The sponsors of this effort are the Environmental Science Services Administration of the Department of Commerce, the National Aeronautics and Space Administration and the United States Air Force (through the Air Force Cambridge Research Laboratories). In addition, thirty organizations, representing government, industry, research institutions, and universities participated in this endeavour.

The U.S. Standard Atmosphere Supplements, 1966 was prepared in response to a need for atmospheric models depicting conditions other than idealized mid-latitude mean, represented by the tables of COESA's U.S. Standard Atmosphere, 1962. Tables of typical winter and summer conditions for various latitudes extend through the troposphere, stratosphere and mesosphere, about 80 km. Eight of these are continued to the lower thermosphere, where they merge into three different boundary conditions at 120 km, summer, winter and spring/fall. Models related to the wide range of conditions in the thermosphere associated with varying solar activity, geomagnetic activity and zenith angle of the sun, diverge upward from these boundary conditions and extend to 1000 km (~3 million feet).

The substance of this publication is two major sets of tables; those for the region below 120 kilometers, keyed to seasonal and latitudinal variations; and those for 120 to 1000 kilometers, keyed to solar activity, geomagnetic activity, and solar angle. These two sets of tables, though separated, have mutual boundary conditions so that users will be able to select for any location, season, and solar activity, the appropriate continuous profiles of atmospheric properties from the surface up to 1000 kilometers. Profiles of atmospheric

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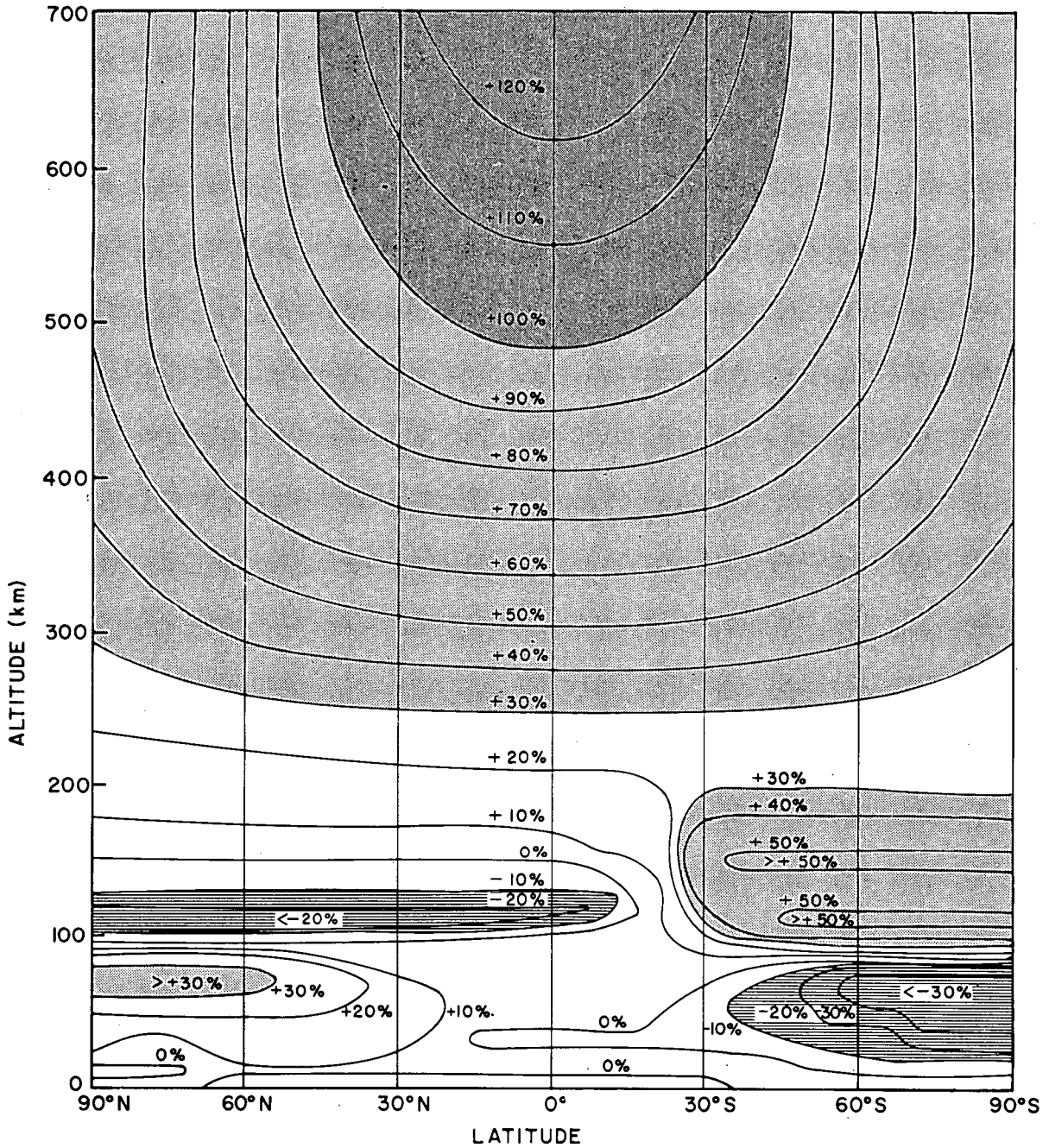


Fig 1. Typical pole to pole cross section - percentage departure of density from 1962 Standard at 1400 hours local time, sun at 23°N, Maximum Exospheric Temperature of 1500°K

properties for any orbital or re-entry trajectory can thus be estimated. An example of the percent departure of density from the 1962 Standard Atmosphere over a north-south trajectory for a typical situation is shown in the Figure. Altitude is limited to 700 km since the 1962 Standard terminates at this level.

In addition, this publication contains information on diurnal variations in density up to 90 kilometers, refined analytic expressions which represent pressure and density profiles of the 1962 Standard and 1966 Supplementary Atmospheres to 80 kilometers, and a mid-latitude ozone model up to 50 kilometers. Tables providing the altitude variation of geopotential surfaces as a function of latitude are also included to facilitate application of the atmospheric tables to all locations. For those interested in aircraft pressure altimetry a set of detailed pressure altitude tables from the surface to 10 millibars is provided.

The general background leading to development of this publication is contained in the Foreword. Technical background is presented in Part 1 - Basis of the Tables. Parts 2 and 3 provide detailed insight on the development of the two major sets of tables and include presentations of pertinent supporting data. Part 4 contains the additional material on analytic approximations, ozone, and geopotential-geometric altitude relations. Parts 5 and 6 are the detailed tables of the atmospheres. Throughout the document, figures and tables have been introduced to permit visual comparisons of the varying conditions presented. Major tables are presented in both English and metric systems below 120 kilometers. Above 120 kilometers, metric tables are provided.