DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ATLAS OF MARS
1:5,000,000 TOPOGRAPHIC SERIES
MARE BOREUM AREA
M 5M 90/0 RMC, 1977
I-1027 (MC-1)

NOTES ON BASE

This is one map in a series of topographic map sheets covering the entire surface of Mars at nominal scales of 1:25,000,000 and 1:5,000,000 (Batson, 1973; 1976). The major source of map data was the Mariner 9 television experiment (Masursky and others, 1970).

ADOPTED FIGURE

The figure of Mars used for the computation of the map projection is an oblate spheroid (flattening of 1/192) with an equatorial radius of 3393.4 km and a polar radius of 3375.7 km. This is not the height datum which is defined below under the heading "contours".

PROJECTION

The polar stereographic projection is used for this sheet, with a scale of 1:4,290,000 at lat 65°. Longitudes increase to the west in accordance with usage of the International Astronomical Union (IAU, 1971). Latitudes are areographic (de Vaucouleurs and others, 1973).

CONTROL

Planimetric control is provided by photogrammetric triangulation using Mariner 9 pictures (Davies, 1973; Davies and Arthur, 1973) and the radiotracked position of the spacecraft. The first meridian passes through the crater Airy-O (lat 5.19° S) within the crater Airy. No simple statement is possible for the precision, but local consistency is about 10 km.

MAPPING TECHNIQUE

Selected Mariner 9 pictures, transformed to the polar stereographic projection, were assembled in a mosaic at 1:5,000,000.

Shaded relief was copied from the mosaic and portrayed with uniform illumination with the sun to the west. Many Mariner 9 pictures besides those in the base mosaic were examined to improve the portrayal (Levinthal and others, 1973; Green and others, 1975; Inge and Bridges, 1976). The shading is not generalized and may be interpreted with nearly photographic reliability (Inge, 1972).

Shaded relief analysis and representation were made by Jay L. Inge.

ALBEDO MARKINGS

The markings superimposed on the shaded relief were hand copied from pictures that were computer enhanced especially to show low frequency tone variation (Batson and Inge, 1976). The surface in these pictures is illuminated from a variety of angles from the camera line of sight. The markings therefore delineate boundaries of local brightness variations only and should not be considered as a true measure of albedo. No attempt was made to use Earth based telescopic albedo data.

Airbrush portrayal of albedo markings was done by Jay L. Inge.

CONTOURS

Since Mars has no seas and hence no sea level, the datum (the 0 km contour line) for altitudes is defined by a gravity field described by spherical harmonics of fourth order and fourth degree (Jordan and Lorell, 1973) combined with a 6.1 millibar atmospheric pressure surface derived from radio-occultation data (Kliore and others, 1973; Christensen, 1975; Wu, 1975).

The contour lines (Wu, 1975) were compiled from Earth-based radar determinations (Downs and others, 1971; Pettengill and others, 1971) and measurements made by Mariner 9 instrumentation, including the ultraviolet spectrometer (Hord and others, 1974), infrared interferometer spectrometer (Conrath and others, 1973) and stereoscopic Mariner 9 television pictures (Wu and others, 1973).

Formal analysis of contour-line accuracy has not been made. The estimated vertical accuracy of each source of data indicates a probable error of 1-2 km.

NOMENCLATURE

All names on this sheet are approved by the International Astronomical Union (IAU, 1974, 1977). Double and triple letter designations for craters refer to position on the map and are derived from a grid based on equidistant meridians and parallels; the alphabet (I and O omitted) runs in the direction of increasing longitude (W) and latitude (N). The complete designation of a crater is the name of the quadrangle followed by a double or triple letter. The prefix BOR (identifying the Mare Boreum sheet) is part of the complete designation but, for brevity, is not shown on most craters. Some craters have commemorative names; letter designations for these craters are shown in parentheses. Where craters lie mostly on an adjoining map, their letters are derived from the other map; where craters lie exactly on the boundary of two maps, their letters are derived from the eastern or southern map.

MC-1: Abbreviation for Mars Chart 1.
M 5M 90/0 RMC: Abbreviation for Mars 1:5,000,000 series; center of sheet, 90° latitude, 0° longitude, shaded relief map, R, with albedo markings, M, and contours, C.

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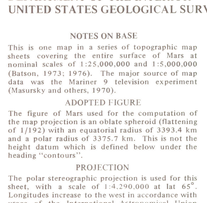
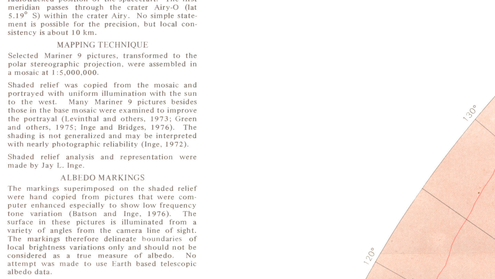




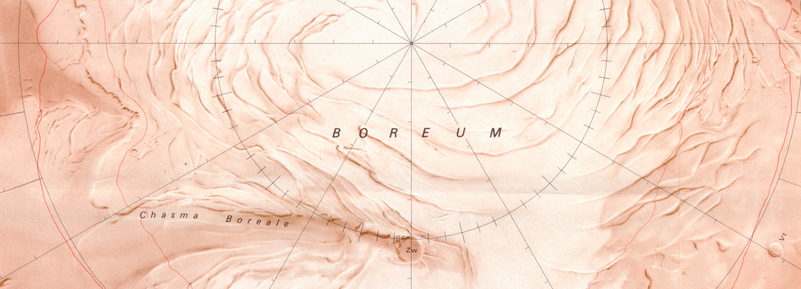
Albedo features from International Planetary Patrol photographs, Lowell Observatory, Flagstaff, Ariz.

QUADRANGLE LOCATION
Number preceded by I refers to published topographic map

Index No.	DAS No.	Index No.	DAS No.
1	12910063	12	11441994
2	12153097	13	12353320
3	12152887	14	11603890
4	11977009	15	11835991
5	11800151	16	12012989
6	12994317	17	12188937
7	11487114	18	12364746
8	12502275	19	12317550
9	10386714	20	11446134
10	11800911	21	12538255
11	11627910		

INDEX TO MARINER 9 PICTURES
USED TO MAKE THE ALBEDO MARKINGS OVERLAY

Most of the pictures indexed above were specially processed to accentuate albedo markings. Only the useful image areas of the pictures are outlined. The DAS numbers may differ slightly (usually by 5) among various versions of the same picture.



TOPOGRAPHIC MAP OF THE MARE BOREUM AREA OF MARS

MC-1

M 5M 90/0 RMC

1977

A-camera pictures		B-camera pictures			
Index No.	DAS No.	Index No.	DAS No.	Index No.	DAS No.
1	12152887	1	8237664	9	10171004
2	9011603		13499253		12991268
3	13328496	2	13316880		13216880
4	11800011		13499893		12502515
5	11800151		10616529		12502585
6	11977149	3	12906733		12502655
7	12502275		13352010		12987537
8	11482114	4	13352000		13215963
9	11627910		13352930		13499093
10	13028127		10616599		12991408
11	11627710		10616669		12991238
12	11658750		12906593	10	13499023
13	11481974		13499163	11	13217609
14	11836131		13352860	12	12870683
15	11658890		12906663		13216950
16	11446134	5	10386954	13	8551694
17	12538255	6	10386884		9451124
18	12364456	7	10386814		13463253
19	12013729	8	13463043		13352790
20	11835991		13463113		12870613
21	12364316		13463183		12991198
22	12188797		12538425	14	7975868
23	12012989		12538495	15	7975658
24	12153097		12538565		
			12538635		
			13927318		

INDEX TO MARINER 9 PICTURES

The mosaic used to control the positioning of features on this map was made with the Mariner 9 A-camera pictures outlined above, identified by vertical numbers. Also shown (by solid black rectangles) are the high-resolution B-camera pictures, identified by italic numbers. The DAS numbers may differ slightly (usually by 5) among various versions of the same picture.

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