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AID Report 62-145
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Report 61-138]

19 September 1962

ITEM OF INTEREST
Prepared by

Aerospace Information Division

SUBJECT: Dimensions of Mars

SOURCE: Lebedeva, I. I. Measurement of the diameter and oblateness of Mars on the basis of photos obtained in 1956. IN: Akademiya nauk SSSR. Komissiya po fizike planet. Izvestiya, no. 2, 1960, 41-45.

On the basis of photos of Mars obtained during the opposition of 1956 it has been possible to determine the equatorial diameter and the oblateness in the photo-visual and photo-red systems. Four plates containing 70 images of the planet were obtained by Parshin in Tashkent on the guidar of the normal astrograph with a magnifying lunar-solar camera (size 9 x 12 cm). Measurements were made with a Repsold instrument. The negatives were taken on Agfa Isochrom plates with a yellow filter and on Agfa Rotrapid with a red light filter. The survey therefore was made in relatively narrow sectors of the spectrum with effective wavelengths of 550 mμ and 635 mμ, corresponding approximately to the photo-visual and photo-red photometric systems. The polar and equatorial diameters were measured on each image.

The final value of the Martian equatorial diameter, expressed in angular measurement reduced to a distance of one astronomical unit, is:

Photo-visual system	9.13"
Photo-red system	8.97"
Difference	0.16"

The difference, amounting to 2% of the diameter or 0.0095 mm in linear measurement, is attributed to the Wright effect. The absolute value of the diameter is smaller than the one obtained by Sharonov in visual measurements (9.22" - 9.67") or others obtained through photographic methods, viz., Trumpler (9.32"), van de Kamp (9.48"), or Camichel (9.34"). It almost coincides with the value obtained by Wright in the photo-visual system $\lambda = 560$ mμ: 9.17".

The values of the equatorial distance expressed in kilometers are:

Photo-visual system	6618 km
Photo-red system	6496 km

These values are less than those generally appearing in texts, which are based mainly on visual micrometric and heliometric observations, viz., those of Russel (6770 km), Rabe (6860 km). The difference in values obtained is ascribed to the unequal action of irradiation.

The final value obtained for the oblateness of Mars is:

$$\varepsilon = \frac{1}{127} = 0.0079 \pm 0.0022.$$

The mean values of ε derived from the two light systems were:

Photo-visual system	0.0084
Photo-red system	0.0072

The latter value lies between the mean value of oblateness found on the basis of visual micrometric and heliometric measurements, about 1/100, and the value obtained on the basis of inequalities of satellite movement, about 1/190.