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March 6, 1965

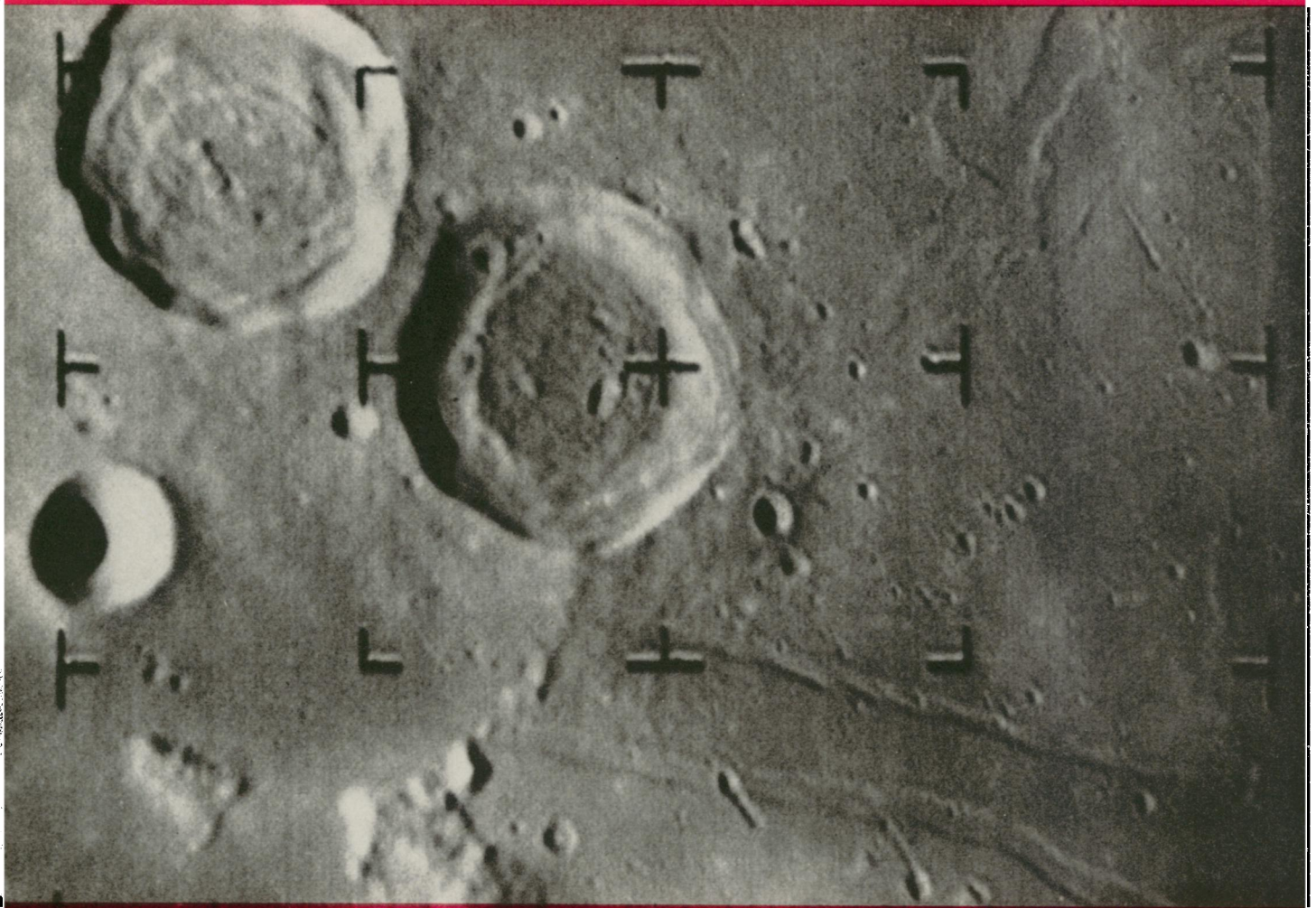
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THE WEEKLY SUMMARY OF CURRENT SCIENCE



NASA

Sabine and Ritter

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Fighting fatigue with stress

Stress is a double-edged sword. Favorable residual stress induced in a material to offset the effects of life-limiting load stresses can add dramatically to its fatigue durability.

Recently a member of our staff discovered an ingenious method of controlling the residual stress distribution in through-hardened steel ball bearings. Called *Marstressing*, it involves diffusing foreign atoms into the metal surface to lower the temperature at which austenite starts to transform to martensite during quenching. Then, instead of beginning at the surface as it ordinarily would, transformation starts below the diffused layer and proceeds outward, accompanied by the usual 3-4% volume expansion. But when the surface region transforms, its expansion is opposed by the already hardened interior. Surface material is caught in a squeeze. Result: a high residual compressive stress near the surface where rolling contact failures normally originate.

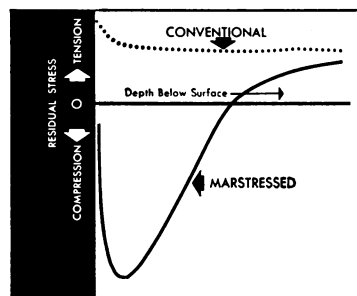
Marstressing is one of the key features in New Departure Division's new NDur line of bearings which boasts life at least three times the former rating when run on standard New Departure fatigue life tests. Still other product applications are being explored by other GM divisions.

Back of *Marstressing* are GMR innovations in X-ray diffraction techniques and more than two decades of research on residual stress.

The principle behind *Marstressing* is relatively simple, but simple answers have a way of occurring most frequently where the road has been prepared by careful, persistent research.

General Motors Research Laboratories

Warren, Michigan



Comparison of subsurface stress patterns in conventionally hardened and *Marstressed* parts

