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## *Irrigation System*

Shown above is a Zimmatic center pivot agricultural irrigation system built by Lindsay Manufacturing Company, Lindsay, Nebraska. Systems like this one are composed of multiple lengths of water pipe and spray nozzles supported by wheeled towers such as the one at right. The whole system rotates around a center pivot, watering hundreds of acres—depending on the number of tower units—in a single revolution. Each three-ton tower has its own electric motor; power is transmitted to the wheels by individual gear boxes (bottom photo) that incorporate NASA lubrication technology to protect them from wear and heat stress.

Under contract with Marshall Space Flight Center, Midwest Research Institute compiled a Lubrication Handbook intended as a reference source for designers and manufacturers of aerospace hardware and crews responsible for maintenance of such equipment. The handbook details the chemical and physical properties, applications, specifications and test procedures for some 500 liquid and solid lubricants used by companies in the aerospace industry.

Engineers of Lindsay Manufacturing Company learned of the handbook through the NASA publication *Tech Briefs* (see page 118) and used it for supplemental information in redesigning gear boxes for their center pivot systems. In the new design, gears are immersed in NASA-developed lubricants that provide wearing surfaces and bearings with low-friction protective coatings. The NASA information helped reduce the amount of lubricant required and allowed selection of comparable but less expensive lubricants. The Lubrication Handbook has become a permanent part of the company's technical library, used frequently for decisions on lubrication problems, for information on specific greases, temperatures and compatibilities, and for recommending oil brands to dealers.

