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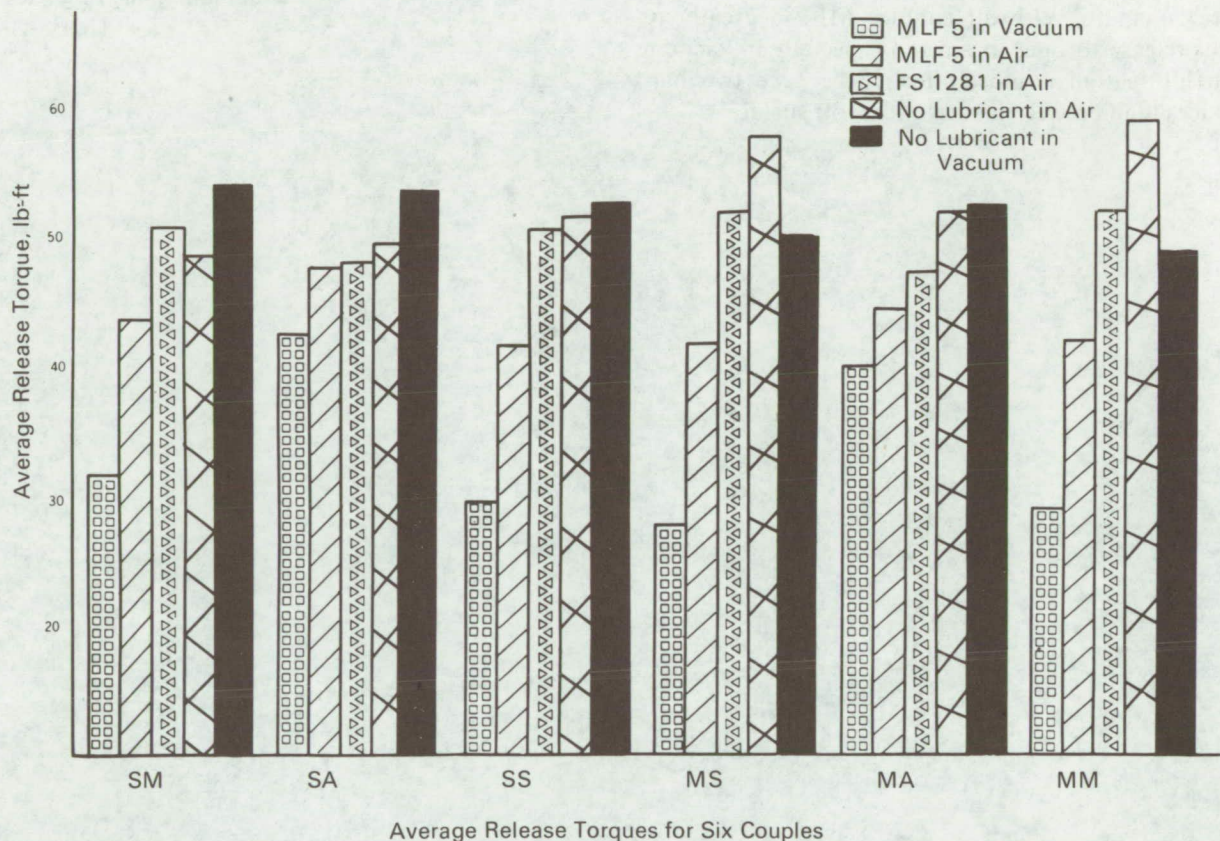
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NASA TECH BRIEF



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Comparison of Release Torques of Tightened Bolts in Vacuum and Air



Release torques were determined in air and in partial vacuum (10^{-6} to 10^{-7} torr) for 0.5-in. NC-2 bolts tightened to 60 lb-ft. The bolt-nut couples were as follows: stainless-steel bolts in nuts of stainless steel (SS), mild steel (SM), and aluminum (SA); and mild-steel bolts in nuts of stainless steel (MS), mild steel (MM), and aluminum (MA). All couples were tested with and without two lubricants: FS-1281, a fluoro-

silicone; and MLF-5, a sodium silicate bonded dry-film lubricant containing MoS_2 , graphite, and gold powder.

Without lubrication and in air the release torque was highest with SM and MS couples; in vacuum, only SA showed significantly higher torque, but all couples except MM suffered some galling of threads. In air, application of FS-1281 made all release torques

(continued overleaf)

more constant, yet the average torque remained high—within 7 or 8 lb-ft of the tightening torque. The danger of contamination of the (vacuum) ion pumps prevented tests with the grease under vacuum.

In air, application of MLF-5 to the bolt threads significantly reduced all release torques. In vacuum the same lubrication reduced dramatically the overall-average release torque to roughly 50% of the tightening torque; both SA and MA couples showed release torques about 70% higher than those for pairings of the harder metals.

It is concluded that release torque is a function of material, lubricant, and environment. Without lubrication the torque varies little between air and vacuum, but galling is more probable in vacuum. Grease FS-1281 reduces torques only slightly but makes them more constant. With all couples MLF-5 greatly reduces release torques in air and especially in vacuum; such lubrication is more effective between two hard surfaces than between a hard and a soft surface.

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.65)

Reference:

NASA-TM-X-53936 (N70-17607) Bolt
Torque Tests in Vacuum

Patent status:

No patent action is contemplated by NASA.

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