that for the uncoated side; at 0.5 keV, the count rate for the coated side was about 1.8 times greater than that for the uncoated side.

This work was done by Abdelhakim Bensaoula, David Starikov, and Chris Boney of Integrated Micro Sensors, Inc. and Abdelhak Bensaoula of the University of Houston for **Goddard Space Flight Center**. *Further information is contained in a TSP (see page 1).*
GSC-14936-1

Domed, 40-cm-Diameter Ion Optics for an Ion Thruster

A modified design affords better performance without loss of service life.

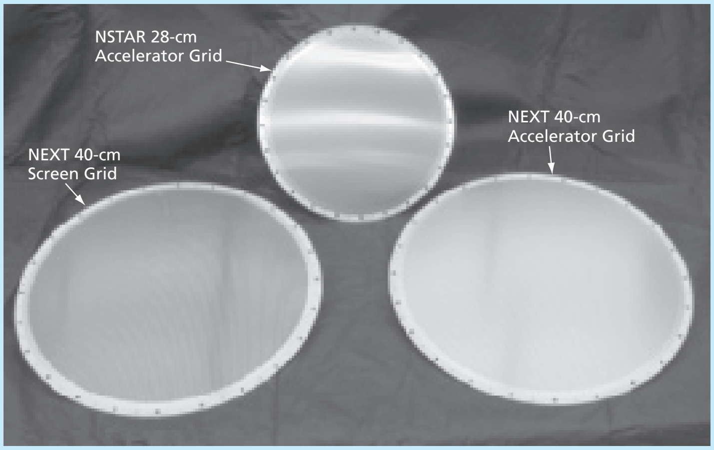
John H. Glenn Research Center, Cleveland, Ohio

Improved accelerator and screen grids for an ion accelerator have been designed and tested in a continuing effort to increase the sustainable power and thrust at the high end of the accelerator throttling range. The accelerator and screen grids are undergoing development for intended use as NASA's Evolutionary Xenon Thruster (NEXT) — a spacecraft thruster that would have an input-power throttling range of 1.2 to 6.9 kW. The improved accelerator and screen grids could also be incorporated into ion accelerators used in such industrial processes as ion implantation and ion milling.

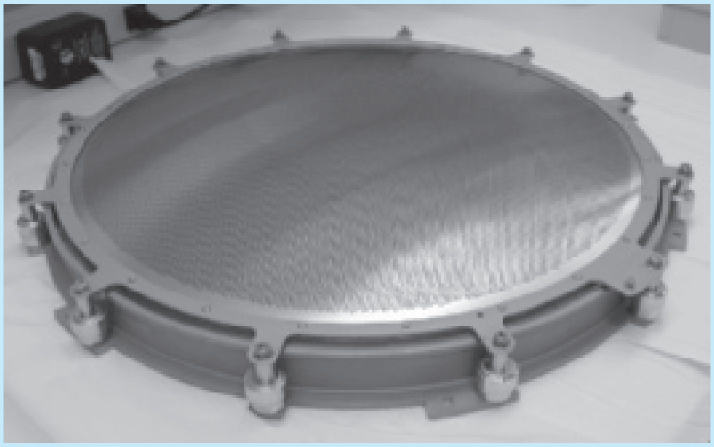
NEXT is a successor to the NASA Solar Electric Propulsion Technology Application Readiness (NSTAR) thruster — a state-of-the-art ion thruster characterized by, among other things, a beam-extraction diameter of 28 cm, a span-to-gap ratio (defined as this diameter divided by the distance between the grids) of about 430, and a rated peak input power of 2.3 kW. To enable the NEXT thruster to operate at the required higher peak power, the beam-extraction diameter was increased to 40 cm — almost doubling the beam-extraction area over that of NSTAR (see figure). The span-to-gap ratio was increased to 600 to enable throttling to the low end of the required input-power range.

The geometry of the apertures in the grids was selected on the basis of experience in the use of grids of similar geometry in the NSTAR thruster. Characteristics of the aperture geometry include a high open-area fraction in the screen grid to reduce discharge losses and a low open-area fraction in the accelerator grid to reduce losses of electrically neutral gas atoms or molecules. The NEXT accelerator grid was made thicker than that of the NSTAR to make more material available for erosion, thereby increasing the service life and, hence, the total impulse.

The NEXT grids are made of molybdenum, which was chosen because its combination of high strength and low thermal expansion helps to minimize thermally and inertially induced deflections of the grids. A secondary reason for choosing molybdenum is the availability of a large database for this material. To keep development costs low, the NEXT grids have been fabricated by the same techniques used to fabricate the NSTAR grids. In tests, the NEXT ion optics have been found to outperform the NSTAR ion optics, as expected.



Comparative View of 28- and 40-cm Grids



40-cm Grids Installed in Ion-Optics Assembly

The **NEXT 40-cm Grids** are dome-shaped as are the 28-cm NSTAR grids.

This work was done by George C. Soulas, Thomas W. Haag, and Michael J. Patterson of **Glenn Research Center**. *Further information is contained in a TSP (see page 1).*

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Commercial Technology Office, Attn: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-17598-1.