(NASA-CR-192432) HYPERVELOCITY IMPACT AND SCALING ABOVE 10 KM/SEC Final Technical Report No. 8, 1 Jul. - 31 Aug. 1992 (Auburn Univ.) 2 p

N95-70308

Unclas

Z9/39 0030360

TECHNICAL REPORT
AUBURN UNIVERSITY
AUBURN UNIVERSITY, ALABAMA 36849

CONTRACTORS' NAME: AUBURN UNIVERSITY

CONTRACTORS PERFORMANCE ADDRESS: SPACE POWER INSTITUTE

231 LEACH CENTER, AUBURN UNIVERSITY, AL 36849

CONTRACT / GRANT NUMBER: NAG8-39131 **DELIVERY ORDER NO. 1**

AWARD AMOUNT: [redacted] PERIOD OF PERFORMANCE: 12 MONTHS - EFFECTIVE

AWARD DATE OF DELIVERY ORDER: AUGUST 8, 1991 - AUGUST 7, 1992

CONTRACTING OFFICER: ELAINE HAMNER

COTR: Principal: L. J. SMITH - Alternate: Angela Mount

REPORTING PERIOD: **July 1, 1992 THRU August 31, 1992**

DATE OF SUBMISSION: September 29, 1992 (Report # 8)

PROGRAM TITLE: "HYPERVELOCITY IMPACT AND SCALING ABOVE 10 KM/SEC"

REMARKS: SEVENTH TECHNICAL REPORT

Several experiments were conducted on materials supplied by the NASA Marshall Scientists. The most recent experiments involved impacting a series of thin foils of thickness on the order of 0.001 inches. The purpose of the experiments were to examine the penetration as a function of velocity, study the secondary debris distribution and prove the technique for determining ballistic limits. The experiment was successful and the materials plus diagnostic information was returned to NASA Marshall.

The ballistic film technique using 0.9 micron plastics has been extensively used to examine breakup within the gun acceleratoring stage. Breakup seemed to be more prevalent for spheroidized material. Examination of the spheroidized material reveals that many of the particles have microcracks which apparently enhances breakup during acceleration. We are currently investigating options to improve the quality of the spheroidized material.

The translation stage is working perfectly. This device and associated software greatly reduce the data reduction process. This technique has been used extensively on all experiments.

PRECEDING PAGE BLANK NOT FILMED

A visit was made to the Technical University at Munich, Germany to examine a similar hypervelocity facility. The velocities achievable are comparable to those in our facility, but the number of particles and variety of particles accelerated are much less than in our facility. Collaborative efforts were discussed.

For some particles, the ballistic film penetration produces breakup. The German experience was similar. They employ self-made 0.1 μ film. We have purchased 0.5 μ film and intend to continue using them in the future.

We have accomplished the following:

Exposed numerous samples to hypervelocity impact as per NASA Marshall instructions

Compared damage to LDEF experience. Published paper "Hypervelocity Impact Facility for Simulating Materials Exposed to Impact by Space Debris", in the proceedings of the Second Post-Retrival LDEF Conference.

* crater morphologic and velocity data for impact velocities as high as 12 km/sec were produced

* preliminary ballistic data experiment successfully conducted

* established unique diagnostic suite both for velocity and impact characterization

PRECEDING PAGE BLANK NOT FILMED