

\*\*\* Document 4 of 25 for FBIS \*\*\*

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TO TO RUCWAAA/FBIS RESTON VA

RHCTAAA/500SS FALCON AFB CO//IN//

RHCTAAA/11SWS FALCON AFB CO//DOA//

RHDIAAA/NASA LANGLEY FLD HAMPTON VA

RHEHWSR/WHITE HOUSE SITUATION ROOM WASHINGTON DC//OSTP//

RHHMCMY/JICPAC HONOLULU HI

RUAJMAB/JDET KAMI SEYA JA

RUCEAAB/HQ AFSPC INTEL PETERSON AFB CO

RUCEAAM/COMBINED INTEL CTR CHEYENNE MTN AS CO

RUCWAAA/FBIS RESTON VA//TECHT//

RUDKMKB/FBIS LONDON UK//BBC//

RUDKMKE/FBIS LONDON UK

RUDMONI/ONI WASHINGTON DC//214//

RUEAIIS/STORAGE CENTER FBIS RESTON VA

RUEALGX/DEFINTAGENCY WASH DC

RUEANAT/NASA HQ WASHINGTON DC//FOR CODE IR//

RUEANAT/NASA HQ WASHINGTON DC//FOR CODE ID//

RUEHFR/USDAO PARIS FR

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RUEOAYC/CDRSTC CHARLOTTESVILLE VA//IAAIF-ICB/HEMMER//

RUESDI/FBIS NICOSIA CY

RUESDJ/FBIS OKINAWA JA

RUETIAV/DIRNSA FT GEO G MEADE MD//W15/G79/T5//

RULSLAJ/NAVSPC DAHLGREN VA

RUWMEMA/210SS PETERSON AFB CO//OGSI//

RUWOHEA/NASA/ARC MOFFETT FLD CA

RUWOHEA/NASA GSFC GREENBELT MD

RUWOHEA/NASA JET PROPULSION LAB PASADENA CA

RUWTAEA/NAIC WRIGHT PATTERSON AFB OH//TAI//

RUWTAEA/NAIC WRIGHT PATTERSON AFB OH//TATD/FIENE//

RUWTBCA/NASA JOHNSON SPACE CEN HOUSTON TX

RUWTNOK/HQ USSPACECOM PETERSON AFB CO//POLAD//

ACCT FBRR-EWDK

BT

CLAS UNCLAS 7S/EST01B LD

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COPY TO [REDACTED]

COUN COUNTRY: FRANCE

SUBJ SUBJ: TAKE 2 OF 2 -- HYPERVELOCITY TEST TECHNIQUES DISCUSSED

REF REF: BR1502142895 PARIS NEWS FROM PROSPACE ENGLISH DEC 94///  
EXPERIMENTAL RESULTS ((SUBHEAD))

TEXT TEXT:

((FBIS TRANSCRIBED EXCERPT)) ((PASSAGE OMITTED ON DELICACY OF EXPERIMENTS)) THE FLATNESS OF EACH INTERMEDIATE LAUNCH PLAYS A VITAL ROLE IN ACCELERATING THE LAST STAGE. ANY DIVERGENCE OF THE SHOCK WAVE, AT ANY LEVEL, MEANS A CORRESPONDING DECREASE IN ENERGY TRANSMITTED TO THE PROJECTILE, WHILE INCREASING THE RISK OF FRAGMENTING THE PROJECTILE RIGHT FROM THE BEGINNING. FOR THIS REASON THE DIAMETER OF THE PROJECTILE IS LIMITED TO A FRACTION OF THE CARTRIDGE DIAMETER (LESS THAN 25 PERCENT, BUT VARIABLE DEPENDING ON MATERIAL USED.)

BY COMBINING A JUDICIOUS CHOICE OF CARTRIDGE SIZE WITH VARIABLE PROJECTILE THICKNESS AND DIAMETERS, THIS TECHNIQUE OPENS THE WAY TO

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A VAST RANGE OF SPEEDS AND WEIGHTS. IT IS ALSO THEORETICALLY EASY TO CALCULATE PERFORMANCE.

A NUMBER OF TEST SHOTS HAVE BEEN FIRED USING COPPER, ALUMINUM AND, MORE RECENTLY, LIGHTER MATERIALS SUCH AS MAGNESIUM. THREE TYPES OF TEST DIAGNOSTICS ARE GENERALLY USED, PARTICULARLY FOR SPEED MEASUREMENT: FLASH X-RAY AND LASER DOPPLER INTERFEROMETRY FOR THE SINGLE-STAGE AND OCCASIONALLY TWO-STAGE LAUNCHERS, AND CHRONOMETRIC SWITCHES FOR THE THREE-STAGE LAUNCHERS.

#### PROMISES AND PROBLEMS ((SUBHEAD))

THE BEST TEST RESULTS OBTAINED TO DATE ARE:

- 2-STAGE: 9.5KM/S (9 GRAMS OF STEEL)
- 3-STAGE: 13.8 KM/S (1.75 GRAMS OF ALUMINUM)

THE MULTISTAGE LAUNCHER TECHNIQUE IS POTENTIALLY WELL ADAPTED TO THE STUDY OF SPACE DEBRIS, SINCE THE PROJECTILES USED ARE ORTHOCYLINDERS WITH VARIABLE FORMATS, THAT CAN BE MODELED AND ARE VERY GRADUALLY ACCELERATED, THANKS TO THE MULTISTAGE DESIGN AND THE PRESENCE OF AIR LAYERS.

THE MATERIAL IS HOMOGENEOUS, DOES NOT DEFORM DURING FLIGHT, AND THE PROJECTILES REMAIN IN A SOLID STATE. HOWEVER, FIRING IN A VACUUM MAY BE REQUIRED FOR LONG FLIGHTS TO AVOID INADVERTENT ROTATION OR BRAKING.

THIS TECHNIQUE OFFERS A HIGH DEGREE OF FLEXIBILITY IN ACHIEVING MASS/SPEED GOALS, BUT PROBLEMS - MAJOR ONES - STILL EXIST, IN TERMS OF PROJECTILE SEPARATION AND LAUNCHER COST.

UNLIKE THE HYPERVELOCITY JETS, A LARGE AMOUNT OF MATTER IS ACCELERATED ALONG WITH THE PROJECTILE ITSELF.

AS FOR THE SINGLE-STAGE LAUNCHERS, SEVERAL TECHNIQUES HELP TO ELIMINATE, OR AT LEAST LIMIT, THE "UFOS" - UNDESIRABLE FLYING OBJECTS. ONE IS OF COURSE THE CONICAL FORM OF THE PROJECTILE SUPPORT RING THAT CAUSES A SLIGHT DEVIATION IN THE TRAJECTORY OF THESE UNDESIRABLE FRAGMENTS. ANOTHER IS TO INSTALL ALONG THE TRAJECTORY INCLINED "FRAGMENT SKIMMERS" WITH HOLES CALIBRATED ACCORDING TO THE SIZE OF THE PROJECTILE. FOR THE MULTISTAGE DESIGN, THE WEIGHT OF THE INTERMEDIATE STAGES CAN BE VARIED, THUS TAKING MAXIMUM ADVANTAGE OF THE SO-CALLED "BILLIARD BALL" EFFECT: I.E., THE COMPLETE HALT OF A STAGE WHEN IT HITS THE NEXT ONE, AND OPTIMIZED TRANSFER OF QUANTITATIVE INERTIA.

ALSO WORTH NOTING IS THE NON-NEGLIGIBLE, AND UNEXPECTED, ADVANTAGE OFFERED BY THE ACTIVE INTERMEDIATE MEDIA, WHICH AFTER DETONATION ARE TRANSFORMED INTO GASES THAT HAVE NO EFFECT ON THE TARGET. ((PASSAGE OMITTED ON COST FOR USE IN SPACE DEBRIS TESTING))

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