NASA has two companies under contract for Phase A/B (formulation phase) designs for the Next Generation Space Telescope (NGST). Each company will have a unique architecture. The allowable volume for the CSA Instrument will be different for the two architectures. All else will be common. The study parameters are stated below.

Optical Telescope Assembly Parameters

Optical Telescope Assembly Parameters

1) F/number = 23
2) Exit Pupil distance = 3473 mm, as measured from the image surface - toward the primary (+V1)
3) Image Radius of Curvature = 3487 mm (concave, curved side facing +V1)
4) Axial Position of Focal surface = 2100 mm (in -V1, as measured from vertex of primary).
5) The nominal chief ray entering the NIRCAM volume (after reflection at the roof mirror) has the following characteristics (all coordinates and cosines are with respect to the primary vertex):

For Architecture A:

a) off axis coordinates are V1= -2100, V2 = 80 mm, V3 = 285 mm
b) Direction Cosines are N_{V1} = 0.99 , N_{V2} = 0.057, N_{V3} = 0.072

for Architecture B:

c) off axis coordinates are V1 = -2100, V2 = -55 mm V3 = -175 mm
d) Direction Cosines are N_{V1} = 0.377 , N_{V2} = 0.21, N_{V3} = 0.90

6) The (full) size of the image at the OTA focal plane is 110 mm x 110 mm.
7) The roof mirror has a nominal radius of curvature of 8000 mm

Generic Thermal design considerations

Integrated Science Instrument Module (ISIM) Thermal Design Overview

The ISIM team has a goal of a completely isothermal design for the cold components of the ISIM. However, prudence suggests using the Yardstick ISIM thermal guidelines when doing the initial design of a CSA INSTRUMENT.

The Yardstick ISIM uses large shared radiators to passively cool the near infrared (NIR) focal plane assembles to 30 K or below. Other radiators are available for dissipating parasitics, mechanism heat load, and cooling optics to below 40 K. The NIR cameras can access these warmer radiators to transfer parasitic and mechanism dissipations by coupling to the optical bench or via direct strapping to the radiators. The large NIR radiator is positioned for maximum view to space and is approximately eight square meters in size. Each individual NIR instrument will have its focal plane assembly thermally coupled to the NIR radiator with a thermal strap.

It is expected that each instrument will thermally isolate its focal plane assembly as much as possible. The instrument itself will be highly thermally coupled to the main ISIM optical bench in order to homogenize the overall ISIM optics' temperatures. It is expected that any parasitics due to harnessing directly to the cold focal plane assembly from warm (~270 K electronics) will be minimized by thermally staging the harness at higher temperatures and by careful selection of harness materials, composition, and layout.

Instrument Conductive Interfaces.

Mechanical Mounting

The instrument will kinematically mounted to the ISIM main optical bench. This optical bench is maintained at a temperature of 30-35 K. The instrument can transfer a maximum of 13 mW of mechanism and parasitic heat to the optical bench when the bench is at 35 K

Focal plane assembly thermal straps

The thermal straps between the focal plane assembly and radiator shall be designed to minimize the focal plane assembly to radiator gradient to less than 0.5 K. The focal plane assembly to strap interface will be provided by the focal plane assembly vendor. Alternately, the focal plane assembly to strap interface shall be designed by the instrumenter and its interface gradient should be less than 100 mK. The instrument can transfer a total of 30 mW including parasitics to the large NIR radiator which is at 27-30K.

Focal plane assembly Harness

The NGST provided design allows for approximately 13 mW of parasitics to reach a focal plane assembly via harnessing.

Radiative Interfaces

For preliminary analyses consider the instrument to be enclosed in a cavity with a wall emittance of 0.7 and an average temperature of 37 K.

Mass

The mass of the CSA instrument shall be less than 60 kilograms including CSA held contingency. This includes the printed wiring boards described below but not the harness between the instrument and the electronics.

Focal Plane Assembly

NASA will provide the Focal Plane Assembly.

Mechanisms

CSA will provide all mechanisms.

CSA will provide the mechanism controllers on a printed wiring board that is CPCI (TBR) bus compatible and is 6U (TBR) size. NASA shall provide a CPCI (TBR) slot in the ISIM Electronics Box for the CSA instrument Mechanism Controller card. The ISIM Electronics Box shall also provide the required power for the CSA instrument mechanisms and the CPCI (TBR) card.

Engineering Telemetry/Calibration Source Controller

CSA will provide the engineering telemetry / calibration source controller through an CSA supplied printed wiring board that is CPCI (TBR) bus compatible and is 6U (TBR) size. NASA shall provide a CPCI (TBR) slot in the ISIM Electronics Box for the engineering telemetry / calibration source controller card. The ISIM Electronics Box shall also provide the required power for the card.

Harness

CSA will provide the CSA instrument internal harness. NASA will provide the flight harness between the ISIM electronics box and the CSA instrument.

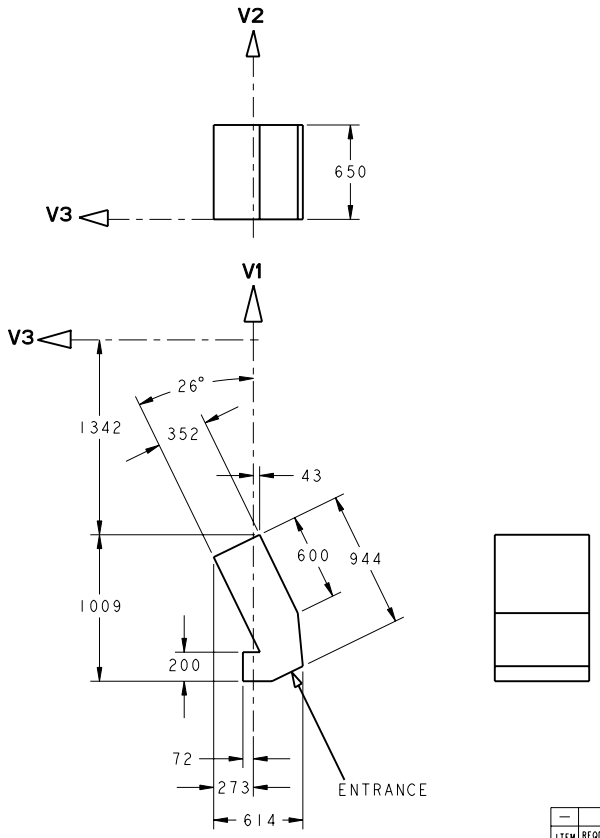
Science Data Control and Science Data

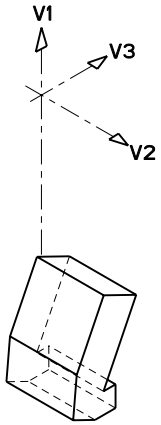
NASA will provide CSA with an engineering model of the ISIM computer with flight software installed. NASA will allocate CSA 2 CPCI (TBR) bus compatible slots in this computer for CSA instrument mechanism control, engineering telemetry collection, and calibration source control. CSA will provide software objects to be inserted into the flight software to configure and control the CSA instrument. NASA will update the flight software as new versions go under configuration control.

Science data from the FPA will be collected and formatted by the NASA supplied flight software.

CSA instrument volume allocation follows:

REVISION				
SYM	ZONE	DESCRIPTION	DATE	APPROVAL





PRELIMINARY

ITEM NO.	REQD	REQD	PART NO.	DESCRIPTION	MATERIAL	MATERIAL SPEC & NO.
	—	—	—	-	-	-

LIST OF MATERIAL

METRIC

HYBRID METRIC/INCH

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MM

DIMENSIONAL TOLERANCES:

0.X	±0.1
X	±0.2
XX	±0.3
XXX	±0.8
XXXX	±1.5
ANGLE	±1.0°
RADCHAM	±0.5

FINISH IN MICRO-METERS

REMOVE ALL BURRS AND SHARP EDGES R0.25 OR CHAMFER MAX.

☐ FLIGHT HARDWARE ☒ NON-FLIGHT
☒ HARDNESS TEST NOT REQUIRED
☐ TEST HARDNESS PER ASTM E-18, LOCATION OPTIONAL
☐ TEST HARDNESS PER ASTM E-18 WHERE INDICATED ON FIELD OF DRAWING THUS ⊙
☒ NO NON-DESTRUCTIVE EXAMINATION (NDE) REQ'D
☐ NDE REQUIRED PER S-313-009 CODE

THIS DRAWING WAS PRODUCED USING
SOFTWARE: PRO/E VERSION: 2000i
FILE NAME: 2028847
MODEL NAME: CONTROL-VOL-NIRCAM

NEXT ASSY	USED ON
-	-
-	NGST

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION **Goddard Space Flight Center** Greenbelt, Maryland

NAME	INIT.	DATE
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DRAWN SKINNER		
APPROVED M JUROTICH		
APPROVED P GEITHNER		
APPROVED J LAWRENCE		
APPROVED S SEIPEL		
APPROVED-ENGINEER G HOBBS		

DRAWING INTERPRETED PER GSFC-X673-64-1

TITLE

CONTROL VOLUME

CSA INSTRUMENT (1 MODULE)
ARCHITECTURE A
NEXT GENERATION SPACE TELESCOPE

GC 2028847 REV -

CODE: 543 SCALE: 1/20 WEIGHT: SHEET: 1 OF 1

FOLD LINE

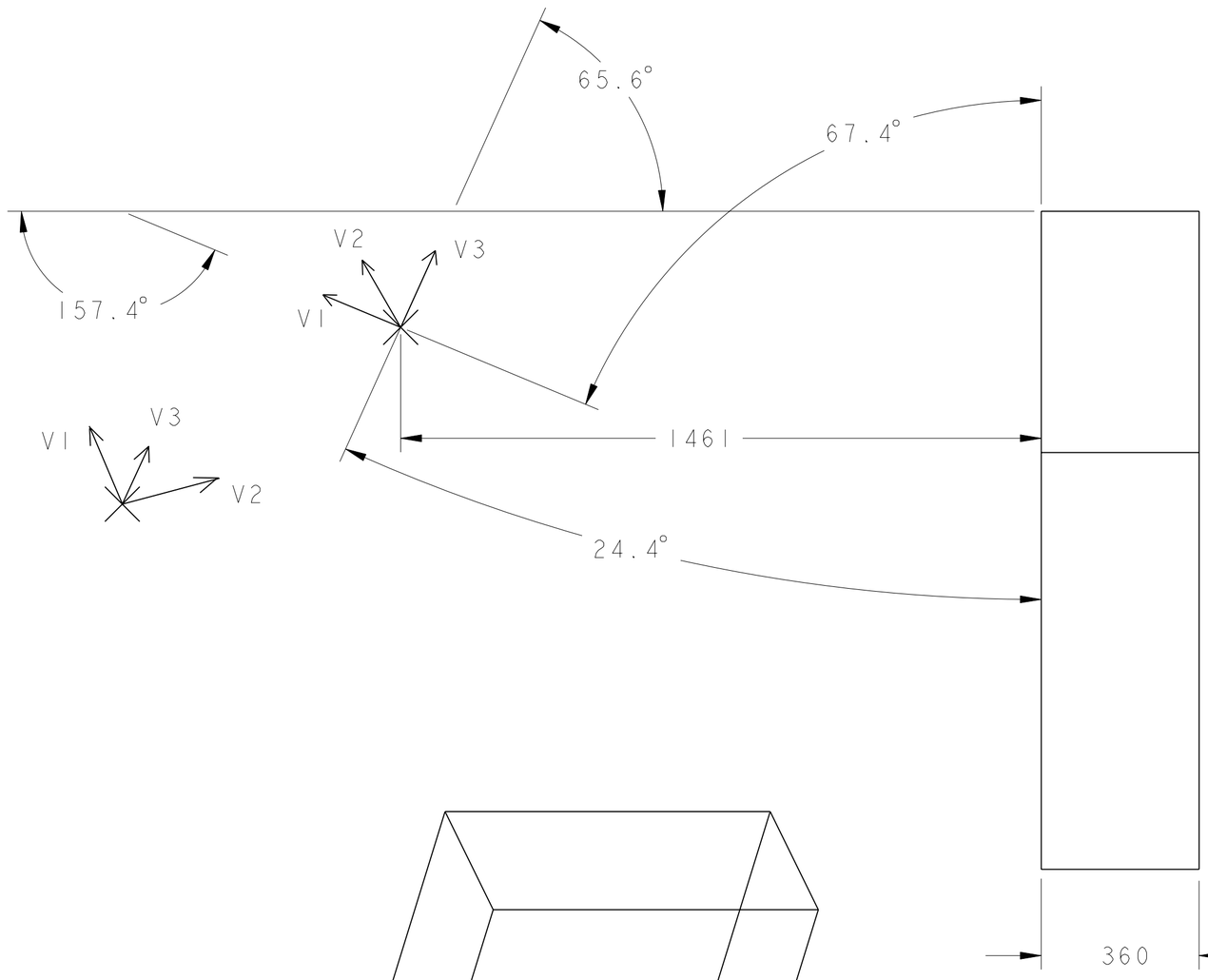
FOLD LINE

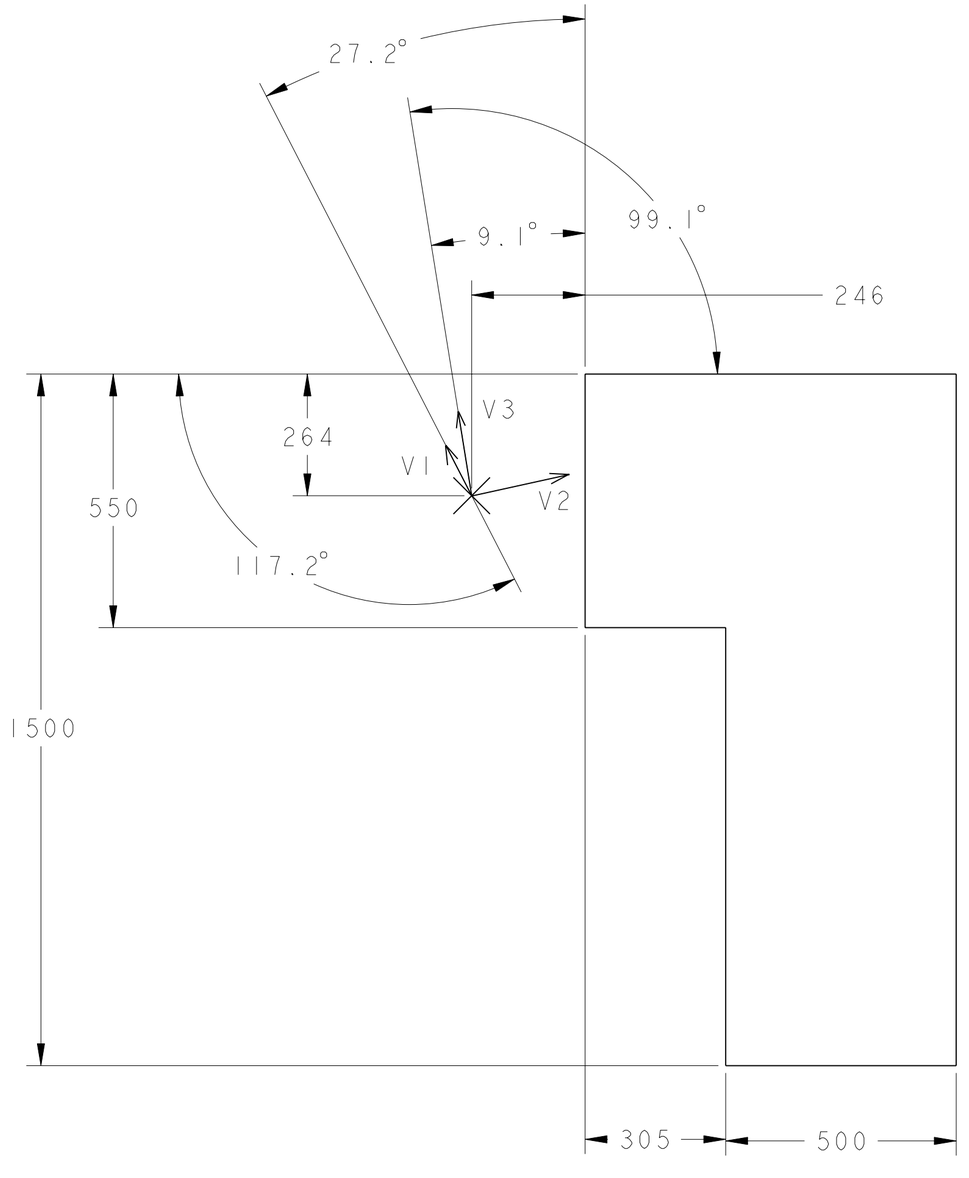
GC 2028847 REV -

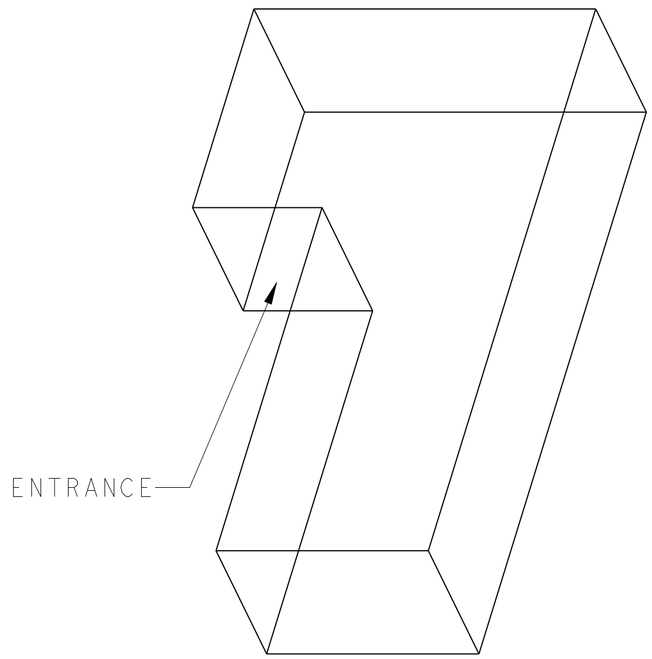
NOTES: UNLESS OTHERWISE SPECIFIED

PRELIMINARY

REVISION				
SYM	ZONE	DESCRIPTION	DATE	APPROVAL







SCALE 1/10

PRELIMINARY

ITEM NO.	REQD	REQD	PART NO.	DESCRIPTION	MATERIAL	MATERIAL SPEC & NO.
—		—	—	-	-	

LIST OF MATERIAL

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- [ ] FLIGHT HARDWARE [ ] NON-FLIGHT
- [X] HARDNESS TEST NOT REQUIRED
- [ ] TEST HARDNESS PER ASTM E-18, LOCATION OPTIONAL
- [ ] TEST HARDNESS PER ASTM E-18 WHERE INDICATED ON FIELD OF DRAWING THUS ⊙
- [X] NO NON-DESTRUCTIVE EXAMINATION (NDE) REQ'D
- [ ] NDE REQUIRED PER S-313-009 CODE

THIS DRAWING WAS PRODUCED USING
SOFTWARE: PRO/ENGINEER VERSION: 2000i
FILE NAME: 2028797
MODEL NAME: 2028797 1.2+

NEXT ASSY	USED ON
	NGST/ISIM

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION **Goddard Space Flight Center** Greenbelt, Maryland

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DRAWN Tom Hanyok		
CHECKED		
APPROVED P. Geithner		
APPROVED M. Jurotich		
APPROVED-STRESS J. Lawrence		
APPROVED-ENGINEER S. Seipel		

DRAWING INTERPRETED PER GSFC-X673-64-1

TITLE

CONTROL VOLUME, CSA INSTRUMENT (SINGLE MODULE) ARCHITECTURE "B" NEXT GENERATION SPACE TELESCOPE

GC 2028797 REV 1

CODE: 544 SCALE: 1/10 WEIGHT: SHEET: 1 OF 1

FOLD LINE

FOLD LINE

GC 2028797 REV 1