The following questions were submitted in response to the July 2001 Draft Announcement of Opportunity (AO) for Next Generation Space Telescope (NGST) Flight Investigations. The questions, and NGST Program responses to them, are presented in AO page number order corresponding to the question. For each query we list the relevant document (AO or other document from the AO Library), page number, section number, question(s), and response(s).

The release date for this AO (AO-01-OSS-05) is November 20, 2001. Proposals will be due on March 5, 2002.

Doc.	Page	Section	Question	Response
AO	N/A	N/A	Where conflicts arise between NIR Cam, ISIM, observatory, and spacecraft requirements which requirements take precedence?	The Level 2 NGST System requirements take precedence over all others. The NGST Systems Engineering Board will resolve conflicts not explicitly dealt with in the Level 2 requirements.
AO	N/A	N/A	Request for AO to clearly specify or direct proposers to document describing resources for post-observation image processing on board the spacecraft	Information on the Processor resources and margins are provided NIRCam Interface Requirements (section 5.3) available under the online documents link on the NGST web site. The baseline, due to high demand on system resources is that there will be no on-board data processing of images. FPA software on the ISIM will be developed by GSFC and provided to the Instrument developers with the FPA/FPE hardware.
AO	1	1.1	Are the costs associated with conducting the GTO program in Phase E to be included in the NIRCam proposal? Are they also subject to the cost cap?	Yes. No.
AO	2	1.4	"NASA currently has budgeted a maximum of $(TBD) M, including reserves, through FY 2009 for the formulation (Phase A/B) and implementation (Phase C/D) activities, through delivery, launch, and orbital verification, for all investigations selected under this AO." Question: How much is the TBD allocation?	The dollar amount has been added to the release version of the AO.
AO	4	2.3	" Furthermore, proposers must be aware that, if they are selected, they may be asked to revise, at no additional cost to NASA, their proposed hardware as needed to meet slightly different telescope, spacecraft and mission requirements and specifications." Question: Please clarify the intent of this sentence. Does NASA intend that changes to meet revised "telescope, spacecraft and mission requirements and specifications" will be No Cost contract changes?	No. The phrase "at no additional cost to NASA" has been removed.
AO	5	2.3	" NIR Imaging Camera [NIRCam] having ~16 square arcminutes field of view" and Page 5, Paragraph 3.2.2 NIRCam IRD " The NIRCam FOV is defined as 16(8/D) 2 square arc-minutes." Are inconsistent? Clarification: Please clarify which requirement is correct.	The "approximately 16 square arcminutes" figure comes from the ASWG recommendations and is reproduced for historical traceability. For the purposes of this AO NIRCam instrument proposers are not restricted to this field of view. Investigators who desire to use a canonical NIRCam in their proposal (e.g. IDS investigations) should assume the 16(8/D)^2 field with a reference telescope diameter of 6 meters. This would produce a NIRCam field of view ~28 square arcminutes. Any FoV less than this is permitted by the NIRCam IRD.
AO	5	2.3	Is the "R≤100" description of NIRCam intended to preclude filters narrower than 1% in NIRCam?	No.

	Doc.	Page	Section	Question	Response
	AO	5	2.3	For the purposes of this AO, what multiple object selection or integrated field spectroscopic capabilities should be assumed for the NIRSpec?	Assume a multi-object spectrograph (MOS) capable of observing greater than 100 objects with $R \sim 1000$ over a 3x3 arcminute FOV. No Integral Field Unit is planned.
	AO	6	2.4	"The NASA Center will assign a Instrument Manager who will have the overall responsibility for instrument development and a Instrument Scientist who will exercise day-to-day scientific direction during instrument design and development." Question: This is given as the management philosophy for MIRI. Is there a comparable structure for NIRCam?	No. The NIRCam offeror should propose a management philosophy. The ISIM project will have an instrument manager associated with the NIRCam with whom the NIRCam PI team will interface.
0	AO	6	2.4	Will there be Canadian MIRI members?	Canada's participation in the MIR instrument is to be negotiated.
1	AO	6	3.1	Please clarify how Canadian Co-Is on NIR Cam proposals will be funded for Phase A.	Canadian scientists will be funded by their institutions/agencies.
2	AO	7	3.1	Section 3.1 states "Independent MIR instrument designs are not solicited by this AO, nor should a MIR capability (sensitivity beyond 6 microns) be included in a NIRCam PI investigation proposal". The second part of this restriction prohibits capability which could provide wavelength overlap with the planned MIR instrument and redundant capability in the event of a MIR instrument failure or elevation of the NGST ISIM operating temperature. What is the reason for this restriction?	The NGST Project does not wish to change the roles and responsibilities negotiated by the international partners.
3	AO	7	3.1	"The ESA will be responsible for ensuring the quality and timely delivery of the European contribution to the MIRI. The designated NASA Center will be responsible for accepting and verifying the quality of the European contribution to the MIRI." Question: Is there a comparable arrangement for NIRCam with agreed-to responsibilities of the CSA?	The CSA will be responsible for ensuring the quality and timely delivery of the Canadian contribution to NASA. The NIRCam PI will be responsible for assisting NASA in defining acceptance criteria and verifying compliance.
4	AO	7	3.1	Does the 10% budget allowance for "new ground-based observations" apply to NIRCam proposals?	Yes.
5	AO	8	3.2	Is the S&OC operation a separately funded effort from NIR Cam? If so, are STScI instrument development, calibration and testing considered outside the scope of the NIR Cam proposal and therefore not to be costed? Are PI or engineering interactions with STSCI and SOC operations to be included or excluded in NIR Cam costing?	1. Yes. It has its own NIR Cam responsibilities and associated funding. 2. Yes. 3. Any interactions should be included in the costs.

#	Doc.	Page	Section	Question	Response
6	AO	8 14	3.2 Table 3-1	Section 3.2 NGST Program Teaming Guidelines, paragraph 6 states "The S&OC is responsible for the operational calibration plan for the science instruments." Table 3-1 Proposal Class Aspects lists the calibration and commissioning plans as a deliverable for the NIR Cam PI. Please clarify who is responsible for the operational calibration plan.	The STScI produces the overall plan that reflects the input from the IDTs and requires IDT concurrence.
7	AO	8	3.2	The AO states that the PI and S&OC will collaborate and agree upon the development of the calibration software. Who has authority to make the final decision on these issues, the PI or STScI?	NGST Project has the final authority. However, we do not expect that option would need to be exercised.
8	AO	8	3.3	Is the Canadian contribution budget (20 million USD in 1996) indexed for inflation? Please provide index or 2001 value for Canadian contribution.	The NASA cost cap given in the AO library document: Cost Estimating Relationships and Guidelines assumes that the CSA contribution of goods and services returns a value to NASA of [U.S.] $25.8 M over the period FY02-09.
9	AO	8	3.3	For the purposes of this AO, what is the definition of "Canadian", i.e. citizenship, or institutional affiliation?	Individuals who are funded by a Canadian agency/institution are considered Canadian participants for the purposes of this AO.
0	AO	8, 16	3.10.2 3.3	Section 3.10.2 states requirement for proposers to estimate "Total NASA Cost" and section 3.3 states "identify and cost potential [Canadian] contributions." Question: Is the objective of this AO to meet all NIR Cam requirements using only NASA funding?	No.
1	AO	8	3.3	Will Canadian science team members be funded from CSA's $20M contribution?	Yes.
2	AO	9	3.3	Will there be a maximum of 4 or a maximum of 6 Canadian co-Is in the final team, i.e. if a proposal team includes 2 Canadians, will an additional 4 be added, or will the total be brought to 4?	There will be a maximum of 4 CSA funded Canadian Co-I's for the NIRCam team.
3	AO	9	3.3	What is the definition of "exclusive agreement" when applied to Canadian scientific co-Is?	US proposers may not enter into teaming agreements with Canadian scientists that preclude these Canadian scientists from participating in other NIRCam investigations. CSA would ultimately be responsible for selecting the Canadian scientists.
4	AO	9	3.4	"Responsibility for WFS&C lies with the NGST prime contractor." Question: (1) How are WFS&C impacts (e.g. mass, power, data handling) to be incorporated into the NIRCam bid? (2) Will additional funding be provided to the NIR Cam proposer to incorporate WFS&C?	(1) See NIRCam IRD. Technical budgets specified in the NIRCam IRD include WFS&C "impacts". (2) No. Participation by the NIRCam in WFS&C must be included in the proposed NIRCam SOW, and included in its associated budget. However, the detailed Interface Requirements will be negotiated following the selection of a Prime contractor and Instrument Definition Teams (IDTs).

#	Doc.	Page	Section	Question	Response
5	AO	9	3.4	Section 3.4 states “A separate instrument will provide NGST observatory guiding functions. The NIRCam will not be required to support observatory level guiding functions”. Who on the SWG will take lead responsibility for providing NASA with advice on the guider?	The Telescope Scientist will be the responsible party on the SWG for guider issues.
6	AO	9	3.5	Section 3.5 refers to ISIM provided capabilities. Table B-5 requests some of the identified ISIM provided capabilities (e.g., structures, electronics) yet excludes others (e.g., cooling). Clarification: Please clarify what is to be provided under the NIR Cam contract, and what is to be provided under the ISIM?	Table B-5 refers to instrument level structure, electronics, etc. See NGST documents 866, 898, 899 in the AO library for further details.
7	AO	10	3.6	The proposed representation by the NIR Cam team in the detector selection – a single person – seems very light given the importance of this selection to the instrument success. How many people total will take part? What percentage of the total will be from the two instrument teams dependent on making the right choice?	The detector RfP selection is a formal process involving a small panel that has not been chosen yet.
8	AO	10	3.6	" detectors with the capabilities described in that document will be provided as GFE at no cost to the proposing team" Question: Are the associated readout electronics included in the detector GFE?	Yes.
9	AO	10	3.6	For the purposes of estimating cost and assessing risk, please clarify the NIRCam Team responsibilities for selecting the detector type (InSb or HgCdTe); and selecting the individual sensor chip assemblies (SCAs) and/or focal plane assemblies (FPAs). In particular, does the NIRCam Team: o define and/or prioritize the SCA/FPA selection criteria? o have “veto authority” to reject specific SCAs or FPAs for NIRCam use? conduct characterization testing of the SCA and/or FPAs?	The NIRCam team will assist NASA in development of the detector specifications, verification plans, and procedures.
0	AO	10	3.6	Is the NIRCam Team responsible for integrating the SCAs into FPAs?	No.
1	AO	10	3.6	Is the NIRCam team responsible for environmental qualification (structural, thermal, and/or EMC) of the FPAs?	No.
2	AO	10	3.6	When will the selection of the detector vendor, and hence the flight detector pixel size, be made?	June 2003
3	AO	10	3.6	Will the ETU detectors have the same functionality and interfaces as the flight detectors?	They may have partial functionality (reduced number of SCAs), but will have full form/fit.
4	AO	10	3.6	What are the anticipated delivery dates of the detectors for the NIRCam engineering test unit?	Delivery dates for the detectors will be determined with the PI.
5	AO	10	3.6	What are the anticipated delivery dates of the flight detectors?	Delivery dates for the detectors will be determined with the PI.

#	Doc.	Page	Section	Question	Response
6	AO	10	3.6	References the NGST AO Library document Technology Development Specifications for NGST Detectors. Will these be updated before the final AO is released?	If changes are required in document 641 they will be made prior to the release of the final AO.
7	AO	10	3.7	Would NASA consider having one of the SWG slots be specifically reserved for a "NGST Detector Scientist"?	The current plan is for the NIRCam PI and his/her team as well as the NIRSpec science team to be involved in the downselection of the NASA procured detectors. The astronomical community will have significant influence over the detector selection through these people.

#	Doc.	Page	Section	Question	Response
8	AO	11	3.7.2	"The NIRCam science instrument development team (IDT) will participate in GSFC flight software development, participate in STScI ground system software development, support integration and test efforts for the ISIM, support GSFC in acquiring and testing NIR detectors, develop instrument specific flight software, and develop documentation for the instrument." Question: This is a very extensive set of tasks. Participation, support, and development are broad statements. Please provide some guidance to allow costing of these activities.	Ground system participation is: requirements generation for I&T support, participation at reviews, and any other coordination activities between the two groups. Documentation of the instrument includes development/writing of instrument handbooks (which is the primary end-user document) in support of the Institute. The SI Flight Software Development Team will participate in the ISIM Flight Software Development as follows: The Component in which the SI Flight Software Development Team will be involved is the Hardware Interface Component to the SI of the ISIM Command and Data Handling software. This component is basically a hardware driver. This is referred to in our common command and data handling architecture as the NIRCam I/F, NIRSpec I/F and MIR I/F. The SI FSW development team will be responsible for developing the requirements, including Hardware/Software Interface specification and performance. The ISIM Flight Software Development Team will design and implement including unit test and integration into an ISIM FSW build. The SI FSW team will system-level test the component per the requirements. The SI FSW team shall provide a simulator (hardware and software) that will simulate nominal and anomalous conditions of the hardware interface in order to develop and test the ISIM C&DH SI H/W interface component. The SI FSW team will produce formal requirements to be incorporated into the ISIM FSW requirements. The SI FSW team will produce the hardware/software interface specification document. The SI FSW team will produce the system test plan and procedure documentation for incorporation into the ISIM System Test plan and procedures. The SI FSW will execute the test at the ISIM FSW development facility. The ISIM Team will provide a hardware/software test system that includes the ISIM Subsystems, Ground System and FSW to use in the development and test of their SI hardware.

	Doc.	Page	Section	Question	Response
9	AO	11	3.7.3	Would it be possible to have proposals for MIRI lead be considered for MIRI team membership, if they are not accepted for the lead position?	Complete proposals must be submitted for each class of position the offeror wishes to be considered for.
0	AO	11	3.7.4	Why is no detector expertise for MIRI Science Leader called for explicitly?	See revised AO language. While expertise in MIR detectors would certainly be an added strength for the Team Lead this is not a requirement for suitability. The MIRI Science Team should certainly contain a MIR detector expert, but this person could be a MIRI Science Team Member.
1	AO	11	3.7.5	It is unusual for the facility scientist to also be responsible as an astronomical community advocate. The facility scientist has a lot to do to help oversee the technical developments, and the IDSs and similar positions are expected to be the primary community advocates.	The NGST Project envisions a slightly different role for its Facility Scientist (FS).
2	AO	12	3.7.7	Is it consistent to suggest on page 12 of the AO that an Interdisciplinary Scientist who focuses on planetary investigations will be selected if the Level 2 requirements for the facility do not include planetary tracking?	Yes, NGST has no requirement for tracking, but the possibility that it could perform at this level is still open for study. Having a planetary IDS would greatly assist the project in formulating the requirements for such tracking. For the purpose of answering this AO proposers are referred to the Scientific Objectives and Capabilities of NGST document in the AO library to see a projected tracking capability for NGST.
3	AO	13	3.8	Are we correct is assuming that the 900 hours of GTO observation time at 70% efficiency implies that there will be 630 hours of exposure time, regardless of the efficiency of the instrument design and/or observing program?	No. The 900 hours refers to a wall-clock time from beginning of the GTO observing sequence to the completion of the final GTO exposure. The exact efficiency may be greater than 70% depending on how the observations are carried out.
4	AO	13	3.8	Can the NIRCam GTO time include observations using the other NGST instruments?	Yes.
5	AO	13	3.8	Using the HST concept of “coordinated parallel observations,” can the GTO time include coordinated parallel observations using two or three NGST instruments?	While the Level 2 requirements dictate a parallel capability in the science instruments it is envisioned that this mode would be used only for parallel calibration of an instrument (e.g. dark frames) when another instrument is executing a science exposure.
6	AO	13	3.8	It seems strange to call out all the categories here except for anything for those attached to the MST. To maintain an even approach, the MST guaranteed time, etc., needs to be described in parallel with the rest.	MIRI Science Team Members are not SWG members. The MIRI Science Lead is the MIRI representative to the SWG.
7	AO	13	3.9	Although the AO does not require implementation of EPO programs in Phase A, are Teams precluded from funding EPO planning activities during Phase A?	No.
8	AO	14	3.8	Why was there a change of 4 to 5 for the number US MIRI Science Team members (4 MST + 1 MIRI Science Leader)?	ESA and NASA will have equal numbers of scientists on the MIRI Science Team.

#	Doc.	Page	Section	Question	Response
9	AO	14	3.8	Will the MIRI Project Scientist from the NASA Center responsible for the delivery of the MIRI be made a member of the MST and or the SWG? Will GTO time be allocated to this Project Scientist?	The NASA Center PS will become a member of the MST. The Project Scientist will have the same GTO time as other MST members.
10	AO	14	3.9	Is there a requirement for a Canadian element of the EPO?	No.
11	AO	16	3.10	What date should be used for the NIRCam delivery to GSFC? Table 3-2 gives the date as "July 2006" while the Section 3.10.1 text reads "approximately 24 months prior to launch" which would be December 2006, given a December 2008 launch.	July 2006 is the correct flight unit delivery date. See the AO library for ISIM and NIRCam Hardware and Software Deliverables. Each delivery date other than flight model delivery date will be negotiated during phase A.
12	AO	16	3.10	Should NIRCam be designed for a 5 year nominal life, with no design feature that precludes an extended mission? Should performance budgets that are affected by mission life use 5 years "as end of life"?	Yes.
13	AO	16	3.10.1	*Section 3.10.2 Limitations on Funding for NIRCam PI Proposals* (page 16) requires proposers to "...estimate the Total NASA Cost...including reserves", however there is no place to identify reserve in *Table B-4 Total Investigation Cost Funding Profile Template* (page B-14). Please clarify how the reserve shall be identified and to what level (e.g., WBS, phase, or total).	See Appendix B for a definition of reserves. Proposers are free to identify their reserves in a manner of their choosing (by phase or WBS element), provided they are clearly called out. Proposers are required to identify the reserves in a manner of their choosing (total dollars and fiscal year phasing). These reserves will be held by the NGST Program Office.
14	AO	16	3.10.1 Table 3.2	Paragraph 3.10.1 and Table 3.2 are inconsistent. Text calls for delivery to GSFC 24 months prior to December 2008 launch of NGST, which implies December 2006 delivery. Table calls for delivery to GSFC July 2006. Question: (1) What date should be reflected for instrument delivery in our AO response proposal? (2) Are there any milestones other than the a) 6-month Phase A study, and b) instrument delivery to GSFC 24-months prior to launch for integration and testing with ISIM? If so please clarify.	July 2006 is the correct flight unit delivery date. See the AO library for ISIM and NIRCam Hardware and Software Deliverables. Each delivery date other than flight model delivery date will be negotiated during phase A.
15	AO	16	3.10.1	"The baseline NGST mission duration is five years.... Proposals to this AO should ignore the possibility of an extended mission." Question: Does this mean the requirement for instrument operational lifetime is 5 years?	Yes.

	Doc.	Page	Section	Question	Response
6	AO	17	3.14	Does the NIRCam team have the responsibility to secure Export Licenses or Technical Assistance Agreements to allow the exchange of detailed design information with the Canadian Space Agency, the Canadian Science Team members, and/or the Canadian industrial partners? Should applications be submitted during the proposal phase in order to have the license and/or TAA in place at the time of Phase A award?	The NIRCam team would have the responsibility to obtain the appropriate licenses or other approvals, (e.g. Technical Assistance Agreements, special approvals, etc.) if required, for exports of hardware, technical data, and software, or for the provision of technical assistance, with the Canadian Space Agency and/or its science and industry partners. This would also include ITAR sensitive technical data that exceeds the level of "general purpose", marketing level information or otherwise publicly available information, but falls short of detailed design information. NASA will not specifically request that proposers to this AO apply for necessary licenses during the proposal phase. However at the time of Phase A award, NASA expects the winning proposer to know what their export requirements are and work accordingly.
7	AO	21 28	4.3.3 5.7.1	Section *4.3.3 Submittal Address* (page 20) states "proposals must be received at... NGST AO Support Office, NASA Peer Review Services". Section *5.7.1 Notification of Selection and Award Administration and Funding* (page 28) states "...the Goddard Space Flight Center will negotiate and award contracts..." Clarification: Please clarify which entity is the contracting agency.	Contracts will be let by GSFC, but HQ is responsible for the review of the proposals and the selection of the investigations.
8	AO	23	5.2.2	Given that the development of the observing and data analysis plan is to be a collaborative effort of the IDT and S&OC, can we ask for support of the STSCI in developing these plans in the proposal phase?	Yes. STScI may assist proposers in developing plans, but may not charge a NASA contract for this time.
9	AO	23	5.2.2	Will the peer review receive guidance as to what constitutes a Co-I with an "insignificant or unjustified" role? What is that guidance?	Peer review panels are comprised of experts in astrophysics and instrument development. They are tasked with judging the necessity and value of Co-I involvement.
0	AO	26	5.4	Putting 70% of the evaluation weight for MIRI team members on aspects of the proposed science investigation and only 30% on their ability to carry out the responsibilities of team membership seems skewed, not consistent with the need to have them provide important technical support	The evaluation weighting has been changed for MIRI Science Team members.
1	AO	27	5.6	The AO states: "For NIRCam PI proposals, life-cycle cost may be a significant discriminator in the selection...". Is there a preferred method or metric for total lifecycle cost estimation, particularly for those costs incurred outside the NIRCam Team?	Simplicity of operation is one important metric. The STScI has demonstrated a correlation between the number of instrument modes operational costs.

#	Doc.	Page	Section	Question	Response
2	AO	28	5.7.1	"Each contract resulting from this selection will contain a priced option for bridge phase, to be exercised upon the investigation selected to proceed into phase B/C/D. The bridge phase is intended to cover a two month period of Phase B effort to provide program continuity while Phase B/C/D and E contract negotiations are complete." Question: (1) Does NASA anticipate four separate contracts for phases B, C, D, and E or one single contract for phases B-E? (2) Please provide further definition of the bridge option so that costs may be included in the proposal. (3) What is the anticipated contract type for the bridge option? (4) What are the specific tasks anticipated for the bridge option?	1. NASA anticipates awarding a single contract for phases B through E. 2. The scope of the bridge phase shall be limited to only those initial definition activities necessary to effect a smooth transition into the Phase B effort. The contractor shall provide the minimal technical and administrative effort needed to support said activities. The bridge phase effort shall not exceed $600K. 3. Estimated Cost--No Fee 4. The specific tasks shall be proposed by the offerors in a separate section of their Statement of Work (SOW), however, examples of such tasks include preliminary definition of long-lead items, development of preliminary top-level schedules, etc.
3	AO	30	6.0	How long before down-select is the Phase A Concept Study Report due? There seems to be no period reserved for NASA review and selection prior to starting Phase B. Is there a period between Phase A and the "bridge phase" where funding will be stopped while the NASA selection process occurs?	NASA intends to select a single NIRCam investigation with the AO. There is no further downselection after this AO. Funding will not be stopped during the bridge phase.
4	Appendix B	B-1	N/A	Is there a minimum font size limit for tables and figures?	Figure captions should be in 12 point type. Within figures and tables the font must not be smaller than 10 point.
5	Appendix B	B-1	N/A	Is colored text allowed?	Yes
6	Appendix B	B-2	Table B-1	Should a NASA PI fill out and return the model contract as though he/she were from a non-government institution?	No, it is not necessary for NASA employees to complete and return the model contract.
7	Appendix B	B-2	Table B-1	Are EPO, New Technology, and Small Disadvantaged Business Plans allocated one page each or a total of one page for all three?	One page for New Technology and SDB is sufficient. The EPO page limit has been increased to two pages for NIRCam PI proposals.
8	Appendix B	B-5	D.1	To what extent is the NIRCam Team responsible for conducting tradeoffs between science volume, rates, and compression factors? Given that NASA is responsible for all C&DH software for the FPA and its software (per the NIRCam IRD), why is the NIRCam proposal asked to address this?	The NASA provided shared instrument services are designed to meet the requirements of the science instruments. The science instrument teams must work with NGST systems engineering to determine and optimize these requirements.

#	Doc.	Page	Section	Question	Response
9	Appendix B	B-6	D.2	Please provide information about the ISIM design concept to allow the NIRCam Team to assess the possible instrument location within the ISIM. In particular, the following interface information is needed: o Location (or potential locations) of the telescope focal plane within the ISIM volume. o Location (or potential locations) of the GFE Detector Radiator relative to the ISIM and the required proximity between the Radiator and the detectors. o Location (or potential locations) of the FPE relative to the ISIM and the required proximity between the FPE and the detectors. o Locations (or potential locations) of the NIRCam kinematic latches within the ISIM.	This information will be available prior to the start of the NIRCam Phase-A but cannot be made available for the proposal effort as it is dependent upon selection of the Observatory Prime Contractor. Actual volume and location is dependent on ISIM packaging studies and negotiation with each instrument provider AO responders should use focal plane coordinates (3.2.1) and generalized ISIM volume description (3.3.1) provided in the IRD. The ISIM project and instrument PIs will determine these locations after ISIM has completed preliminary packing studies. The FPE may be located as many as 6 meters from the focal planes. Dependent on ISIM packaging studies and ISIM structure design to be conducted during NIRCam phase A.
0	Appendix B	B-6	D.2	For “heritage items,” what cost information is required: cost of original or cost savings from using heritage design? Please provide explicit instructions in the cost section as to how this information should be presented.	What a cost evaluation measures are data about the cost of the original item. That's what is meant by "cost information about the referenced sources of heritage." We also ask for a comparison--both in performance and cost parameters--between the sources of heritage and the proposed system. See sections Appendix B, Section D.2 and Appendix B Section F.
1	Appendix B	B-6	D.2	To what extent is the NIRCam Team responsible for in-flight calibration?	The PI leads the effort, decides what to image and when, analyzes data, leads anomaly resolution, delivers calibration products, etc. The S&OC produces the proposal based on that direction, processes it, runs the data through the pipeline, helps analyze it, and assists in developing calibration products. After commissioning S&OC assumes full responsibility.
2	Appendix B	B-6	D.2	What is meant by, “Proposers with additional mission operations support beyond what is currently planned by the STScI ...”. Could an example of an “additional” requirement be provided?	STScI will assume leadership for instrument operations and calibrations after commissioning (i.e., acceptance of the instrument by the NGST Program Office). This phrase has been deleted from the Appendix.
3	Appendix B	B-7,8	D.2	It appears that the same information on the Co-Is’ roles, responsibilities, experience, and capabilities is required in both Part d of the SCIENCE INVESTIGATION and in the MANAGEMENT AND SCHEDULE section. Is this intentional?	The Appendix has been modified. This information should be included in the MANAGEMENT and SCHEDULE section only

#	Doc.	Page	Section	Question	Response
4	Appendix B	B-8	E	If it is important for the Proposal to distinguish the status of Science Team members, please provide definitions of Co-I, collaborator, and "other science team member". Please clarify whether funding can be, must, or must not be provided to each.	Co-I's must be funded (not necessarily by the PI) and their source of funding identified. Collaborators can be funded, but not by the PI in support of NGST work. Other science team members can be funded. Science team members could include post-doctoral fellows, graduate students, and scientific programmers.
5	Appendix B	B-8	G	For NASA PI-Lead proposals, can the selection of non-government Science Team members be justified by the "sole source" procurement rationale, or must they be competitively selected? Are STScI employees considered to be "available under existing NASA contracts?	1) Per NFS 1872.502(a)(3)(iv), "If a NASA employee submits a proposal as a principal investigator, any requirement for hardware necessary to perform the investigation must either be competed by the installation acquisition office or a justification must be written, synopsized, and approved in accordance with the requirements of FAR and the NASA FAR Supplement." The guidance at NFS 1872.502(3)(i) and (ii) will be considered when making a determination as to whether team members qualify and should be accepted as a sole source. 2) STScI employees are not considered to be available under an existing NASA GSFC contract.
6	Appendix B	B-9	H	To what extent is the NIRCam Team responsible for defining the "instrument to spacecraft integration and test" schedule?	Test plans/scenarios/PI participation will be jointly developed with the ISIM Project –instrument deliverables are key drivers in the preliminary ISIM I&T schedules
7	Appendix B	B-9	H	Could a schedule covering launch through observatory commissioning be provided to aid in phasing post-launch activities and their associated costs?	For the purposes of this AO commissioning ends six months after launch. Offerors submitting proposals for NIRCam science investigations should submit a cost estimate for phase E science activities. These estimates should include postdoctoral and graduate student support, summer salary, travel to scientific meetings, etc.
8	Appendix B	B-9	H	Is a descope plan for the Canadian $20M required in all 3 sections: D, G and H?	Yes, "Canadian descope" implications must be included in all three sections
9	Appendix B	B-10	H	The AO requires "...a detailed breakdown of the CSA funded elements of the instrument." Please clarify what information is required for a detailed cost breakdown.	See table B-4 for an example of a possible breakdown scheme. Breaking down costs by the WBS element level is sufficient.
0	Appendix B	B-12	I	Do draft International Agreements for non-US partners need to be submitted for Canadian Scientists, or are these not allowed?	Draft agreements, other than those certifying the agreement of Canadian scientists and their institution to support the proposal effort are not required.
1	Appendix B	B-12	I.2	Is the wording listed in the sample statement of commitment sufficient, or should it also state the role of the co-I?	The wording is sufficient as given. The role of the Co-I is described in the Management section of the proposal.
2	Appendix B	B-13	I.2	Are Draft International Agreements required for the Canadian team members (CSA or Canadian Scientists or Industry) of NIRCam	No agreements beyond the Statements of Commitment are required.

#	Doc.	Page	Section	Question	Response
3	Appendix B	B-14	Table B-4	Footnote to Table B-4 Instrument costs must include the costs of two identical instruments and any spares. Question: Are the "two identical instruments" to be flight qualified?	This footnote was included erroneously. The request for two identical instruments has been removed.
4	Appendix B	B-15	N/A	What inflation factors should be used to convert the CSA $20M [US] from FY96 to FY02 dollars?	The NASA cost cap given in the AO library document: Cost Estimating Relationships and Guidelines assumes that the CSA contribution of goods and services returns a value to NASA of [U.S.] $25.8 M over the period FY02-09.
5	Appendix B	B-15	N/A	Given that the ISIM provides power conversion and harnessing, why is "power distribution" included as one of the NIRCam WBS elements?	Appendix table has been changed. This element was incorrectly listed. It has been removed.
6	Appendix B	B-15	N/A	Should the CSA contributions be listed as a separate line item in Table B-4? Will the funding profile of the CSA contribution be specified in the AO or left to the NIRCam Team to propose? Will CSA funding be available during Phase A?	Yes. They are to be included in the contributions section in the bottom half of the table Proposers should include their proposed funding profiles for US and CSA. Yes
7	Appendix B	N/A	N/A	Will the winning NIRCam team be allowed to share GSFC Project resources in areas such as Configuration, Document, and Information Management?	Personnel services in these areas will not be provided. However, the team will be given access to standard project information in these areas.
8	Cost Est. Rel. and Guidelines	2	N/A	"In the event that an offeror to this AO proposes an instrument design concept involving a larger or smaller detector complement, this CER will be used to estimate the resulting potential cost impact to the NGST system." Question: The CER indicates potential savings to the NGST system cost of fewer detectors and additional costs for more detectors. (1) If additional detectors are proposed, will the additional cost indicated by the CER be used to normalize bidders cost proposals? (2) If fewer detectors are proposed, will the cost savings be available to the bidder for other use?	If additional or fewer detectors are proposed, the NIRCam cost cap will be debited or credited by the amount indicated in the CER.
9	Cost Est. Rel. and Guidelines	2	N/A	How is the Detector Complement CER to be used by the NIRCam Team? Should the higher/lower cost associated with proposing more/fewer pixels be included in the cost proposal? If so, how? Should it be counted against the cost cap?	If additional or fewer detectors are proposed, the NIRCam cost cap will be debited or credited by the amount indicated in the CER.
0	IDT & SOC Roles and Responsibilities	1	N/A	The sentence "The NGST will be operated for NASA by the NGST Science and Operations Center (S&OC) located at the Space Telescope Science Institute (STScI). A combined science operations and flight operations center will exist that is expected	The existing AO wording correctly reflects the NGST Program's plans and philosophies.

#	Doc.	Page	Section	Question	Response
1	IDT & SOC Roles and Responsibilities	1	N/A	The last word in the title needs an "i" at the end.	Typo fixed in final release.
2	IDT & SOC Roles and Responsibilities	2	N/A	Can we assume that the I&T version of the ground system developed by the S&OC is a GFE item? Does this ground system interface with the GFE S/C simulator or with the instrument directly?	Yes, the I&T version of the ground system will be a GFE item. The system will interface to the simulator. Based on the final ground system I&T requirements for which the IDTs will provide input, the generic interface to the instruments will be determined. However, any ground support hardware required to interface the instruments to this generic ground system interface is the responsibility of the IDT.
3	IDT & SOC Roles and Responsibilities	2	N/A	Will this I&T ground system be capable of operating and performing data reduction/analysis functions for the ETU and Flight Unit at the same time, or, can two versions be provided?	Two copies/strings of I&T ground system equipment/software will be provided.
4	IDT & SOC Roles and Responsibilities	2	N/A	Please provide a schedule for the S&OC interactions with the NIRCAM team, including delivery of the I&T version of the ground system, support of the S&OC supplied ground system operator, establishment of the operations working group, and the development of software tools for observation planning.	I&T Ground System delivered 2/04 for Science Instrument Flight Software and 3/05 for Science Instrument I&T, Operators start in 3/05, Observation planning tools start 6/08.
5	IDT & SOC Roles and Responsibilities	2	N/A	Page 2: 1st paragraph second sentence: "...I&T, operational and calibration requirements, ... In orbit check out requirements,	Sentence has been rewritten, "...instrument operations and calibration requirements and procedures (with assistance from the S&OC).
6	IDT & SOC Roles and Responsibilities	2	N/A	Page 2: 2nd paragraph, first sentence "..operate them during commissioning and science operations,..."	See revised language in document

#	Doc.	Page	Section	Question	Response
7	IDT & SOC Roles and Responsibilities	2	N/A	Page 2:3rd paragraph, suggest wording "The flight commissioning of the instruments will be a joint responsibility of the ISIM Project, the IDT teams, and the S&OC."	The existing AO wording correctly reflects the NGST Program's plans and philosophies.
8	IDT & SOC Roles and Responsibilities	3	N/A	3rd Page, top paragraph, last sentence. "The SI IDTs may submit requests for modifying the PRD. These requests and the subsequent changes will be maintained by the S&OC for configuration control.	No. The IDTs will initially populate the database. The S&OC will combine these changes with others and put them under configuration control.
9	IDT & SOC Roles and Responsibilities	3	N/A	3rd page, fourth paragraph Do the ISIM Project and the S&OC have the lead responsibilities for the development of the ISIM interface requirements, ISIM level I&T procedures, observing modes, calibration procedures, data reduction tools, and data reduction pipeline design?	Data analysis tool development and data analysis pipeline development are led by the S&OC. All other functions are led by other NGST teams with S&OC support as requested by the NGST Program.
00	IDT & SOC Roles and Responsibilities	3	N/A	We recommend dropping the last three sentences of the third paragraph of page 3. If the IDT teams are in a support role in this area, their contributions will be a certain FTE of effort that will be allocated as appropriate when the time arises. That allocation will entail interaction with the S&OC and the ISIM Project naturally.	The existing AO wording correctly reflects the NGST Program's plans and philosophies.
01	IDT & SOC Roles and Responsibilities	4	N/A	Commissioning: Here the responsibility for the Commissioning Plan is given to the S&OC, with lots of review. The sharing of the responsibility for developing the actual observation planning is a bit vague. Certainly, the IDT teams should "support" the development of the observation plans. Again, if support = FTE, the actual assignments can be made rationally at the time. The mods to the ground procedures for turn-on will be done by the S&OC with input and review by the teams.	See revised language in document.
02	IDT & SOC Roles and Responsibilities	N/A	N/A	Suggest the phrase, "as directed by the ISIM Project" to be dropped in the first sentence of the last paragraph. It isn't required in this document and the explanation of adjusting staffing in the semi-annual operations plan is beyond the scope of this document[s].	Statement has been rephrased.
03	Inst. Del. Doc. List	N/A	N/A	Are these documents the responsibility of the ISIM Team with NIRCam sharing the responsibility for production, or are all of these documents to be produced by the NIRCam Team? Could clarification be provided as to the NIRCam role for each document?	The Instrument Deliverable Documents List will be replaced with a Science Instruments Data Requirements Document. This document provides a description and content requirements for each document. Unless otherwise noted in the DRD, all documents are the responsibility of the NIRCam team.

#	Doc.	Page	Section	Question	Response
04	Inst. Del. Doc. List	N/A	N/A	Which of these documents are due during Phase A?	See the new Science Instrument Deliverable Items List in the AO Library.
05	Inst. Del. Doc. List	N/A	N/A	There appears to be redundant content between documents FSW-04, -06, and -12 and -05, -01/-02 and -13 respectively.	**FSW -01**, Software Product Plan The Flight Software (FSW) Product Plan defines the overall approach to developing and managing the FSW. It includes team deliverables, necessary receivables, metrics, etc. **FSW-02**, Software Configuration Management Plan Flight Software (FSW) Configuration Management Plan defines in detail, the configuration management process for the FSW, simulators, and their associated products. **FSW-04**, SI Flight Software Architecture Document The Architectural Document records the logical/functional design information for the non-common C&DH components for the SI flight software. This includes design rationale and trades, the selected architecture of the software including at least one level of decomposition, the relationships and interface description between the levels, and the allocation of the software requirements to lower levels. **FSW-05**, SI Software Detail Design Document The Detailed Design Document records the design information for the non-common C&DH components of the SI flight software. This includes design rationale and tradeoffs, the selected design of the flight software including its decomposition into compilation and code units, the design of all interfaces, and the mapping between the logical or functional design of the flight software and its detailed design units. **FSW-06**, SI to ISIM ICD The SI FSW to ISIM FSW Interface Control Document (ICD) defines the formats for data exchanged between the non-CC&DH flight software and the ISIM flight software. **FSW-12**, SI Software Delivery Package The SI Software Delivery Package is required with submittal of each software release for Government acceptance. Each delivery version will require a separate package. There are three items comprising the software delivery package. The first item is the delivery letter describing what is being delivered. The second item is the software on appropriate media. The third item is accompanying documentation. **FSW-13**, SI Software Users Guide The SI Software User's Guide contains procedures and data required for the operational use of the FSW.

	Doc.	Page	Section	Question	Response
06	ISIM Provided Services			Are the GFE harnesses provided for ETU also being provided for the Flight Unit?	ISIM is responsible for focal plane to FPE harness within the instrument cold section and all harness exterior to PI provided components. Who provides test harness, method of penetrating vacuum chambers etc. to be negotiated during phase A.
07	ISIM Provided Services			Will the GFE S/C Simulator simulate all power, command, and data handling interfaces between NIRCam and NGST?	NIRCam command and data handling interfaces are with the GFE ISIM C&DH system – The required fidelity of the S/C and Ground software simulators to be delivered to NIRCam will be discussed/determined following Observatory Prime Contractor and NIRCam Phase-A selections
08	ISIM Provided Services			Can more than one S/C Simulator be provided to enable concurrent testing of the ETU and Flight Unit? (Or does the S/C Simulator have the capability to test more than one instrument at a time?)	The number of ISIM and/or S/C flight software and hardware simulators required for efficient build and test of the NIRCam will be discussed/determined following Observatory Prime Contractor and NIRCam Phase-A selections
09	ISIM Provided Services			Are the GFE thermal items to be provided for both the ETU and Flight Unit?	Both units – the Module/ISIM interface closeout blankets are for ISIM I&T and are not GFE to the NIRCam team for instrument level test
10	ISIM Provided Services			Please describe the functionality and intended use of the GFE FPA simulator.	The GFE FPA simulator is intended to provide “simulated” SCA/FPA output(s) for early development/testing of the FPE and C&DH systems prior to receipt of ETU FPAs
11	ISIM Provided Services			Please describe the design of the Harness Parasitic Heat Removal System. Does the system remove heat from the Detector to FPE harness or the ISIM electronics to NIRCam harness or both?	This item is currently a concept only – the design has not been undertaken – the intent is to remove parasitics from both cables
12	ISIM Provided Services			Will a NIRCam electrical simulator (ie an “operations bench” using HST parlance) be a deliverable item?	Yes – this is the intent of the ETU control cards listed – coordination with the ISIM electronics and software teams may require breadboard versions also for ISIM C&DH development
13	ISIM Provided Services			Will the OTE simulator be designed for use both at room temperature and at the ISIM operating temperature, under vacuum?	Yes
14	ISIM Provided Services			What wavelengths will the OTE Simulator cover?	Only those necessary to perform an adequate test of the instrument, the actual number required will be discussed/determined following Observatory Prime Contractor and NIRCam Phase-A selections.
15	ISIM Provided Services			For inclusion in the NIRCam WFE budget, what is the anticipated WFE of the OTE simulator?	To the extent practical the OTE simulator will have wave front error equivalent to that allocated to the OTE.

	Doc.	Page	Section	Question	Response
16	ISIM Provided Services			What is the required delivery date for the NIRCam ETU? What is the required functionality of the NIRCam ETU?	The NIRCam ETU delivery date will be discussed/determined following Observatory Prime Contractor and NIRCam Phase-A selections . Full functionality will be required; however performance may be degraded relative to that expected of the flight unit. For example higher wave front error on the optics may be acceptable and the GFE ETU FPA may have reduced capability. The ETU will be used in ISIM I&T to "qualify" I&T test procedures for the flight integration/delivery and the ETU will also be used at the Prime Contractor Facility for testing of the Wavefront Sensing and Control System for the Observatory.
17	Level 2 reqs.	N/A	3	For the purpose of this AO, does the AO or Level II document take precedence?	The Level 2 requirements take precedence
18	Level 2 reqs.		3.2.15.3	What portion of the observatory's 70% efficiency is allocated to the NIRCam?	Allocation of the observing efficiency budget is to be determined.
19	NGST AO Library Scientific Objectives	3	N/A	The document entitled *"Scientific Objectives and Capabilities of NGST"* includes sensitivity charts. The Web Time Estimator for NGST (http://www.ngst.stsci.edu/nms/main/nms_flux_form.html), good agreement is seen at 1um, but at 5um the document chart implies that a S/N=10 detection is achieved at 5 nJy in 10,000 sec while the Web estimator gives 15.5-17.7 nJy. Which is to be used for the purposes of proposal preparation?	For the purpose of this AO proposers should reference the sensitivity charts in the AO Library. The graph correctly reflects the current NMS values. Care must be taken when reading values near 5 microns because of the steepness of the curve. However, the web Time Estimator is primarily a research tool and contains parameters that may change with time. We have added some explanatory material to the Scientific Objectives and Capabilities document documenting the assumptions that went into the derivation of the sensitivity curves.
20	NIRCam IRD		N/A	Inconsistency in NIRCam FOV (Level 2 and NIRCam IRD section 3.2.2)	Level 2 Specification are correct and take precedence
21	NIRCam IRD		N/A	Are wavefront errors in units of nm rms?	Yes
22	NIRCam IRD		N/A	How cast in stone are instrument positions?	Final instrument locations will be determined once both the prime contractor and instrument PIs are under contract
23	NIRCam IRD		1.1	Must the NIRCam interface to the telescope be via a Pick-Off Mirror?	The design approach should be determined by the NIRCam PI – the NIRCam optical design will be dependent on the envelope/location within the ISIM, to be determined following selection of the Observatory Prime Contractor, and no interferences with the other SIs and the FGS are allowed. Therefore, a pick-off mirror may be required.

#	Doc.	Page	Section	Question	Response
24	NIRCam IRD		3.2.1	Is the NIRCam design bound by the description of the Reference Telescope? Are the relay optics required to have unit magnification? Is there a requirement for critical sampling at 2.0 microns (i.e., not 1.9 or 2.1)? If so, is this defined as 0.5*1.22*(2.0microns)/(6.0meters) pixel size?	For the proposal effort, the NIRCam design is bound by the Reference Telescope parameters and the detector pixel size. The NIRCam optics performance, including relay, are the selection of the PI. Following selection of the Observatory Prime Contractor, the Reference Telescope will be replaced by the Observatory Telescope Element The science requirement for PSF sampling is to be determined by the PI. The OTE is required to be diffraction limited at 2 microns. Level 3 decomposition of the above requirement is not yet available. However, critical sampling near this wavelength may be necessary for wave front sensing and control.
25	NIRCam IRD		3.2.1	Does the Reference Telescope WFE apply at one location in the NIRCam field-of-view, or is it a peak or RMS value over the entire field?	RMS over the entire field.
26	NIRCam IRD		3.2.2	Should “a maximum NIRSpec FOV” read, “a maximum NIRCam FOV”?	Yes, this is corrected in the revised IRD.
27	NIRCam IRD		3.2.3	Can we assume that a portion of the telescope focal plane can be inside the NIRCam instrument volume? Is there a field mask or other baffling at the telescope focus? Is it the responsibility of NIRCam to provide the field mask?	Yes, provided that the NIRCam does not block access to the focal planes of the other instruments and the FGS. NIRCam may do whatever it wants with its portion of the focal plane.
28	NIRCam IRD		3.2.4	For the purposes of cost estimating, can the NIRCam Team assume that the WFS components (optics, optics mounts, pupil imaging mechanism, harness, software, ground test equipment, etc.) are GFE? What are the alignment tolerance and positional repeatability requirements for the 6 optical components? Please provide rationale for the use of filters with the WFS optics. Does WFS require the ability to use multiple filters (ie multiple wavelengths) with each WFS optic? Does the pupil imaging capability require the pupil image to cover a certain number of pixels on the detector? What is the volume of the pupil imaging subsystem? For the purpose of estimating life cycle for NIRCam mechanisms, what is the anticipated frequency of WFS operations? Is it anticipated that the NIRCam focus mechanism will be moved every 24 hours to accommodate telescope focal plane movement?	Yes – IRD revised to indicate that these items will be provided by the Observatory Prime Contractor The Observatory Prime Contractor has responsibility for the WFS&C system for the Observatory and any components required within the NIRCam, alternatives and the implementation details will be determined/discussed with the selected Prime during the NIRCam Phase-A During commissioning of the Observatory and as required (every 30 days TBR) during operations Focus mechanism movement may be required following each WFS operation. However, we do not anticipate the OTE focus changing with each wave front correction. Criteria for and how often to move the focus mechanism should be science driven and thus determined by the PI.

#	Doc.	Page	Section	Question	Response
29	NIRCam IRD		3.2.4.1	o states "The NIRCam shall incorporate a focus mechanism (±2 mm stroke) because, in the process of optimizing the wave front of the Telescope, the optimum location of the secondary mirror may force a change in the location of the Telescope focal plane." o Is the implication of these statements that during the periodic wavefront corrections, possibly as frequently as every twenty four hours, any changes in telescope focal length are to be compensated by adjustments of the internal focus mechanisms of all instruments rather than adjusting the primary/secondary to focus to a fixed focal plane during mission operations? This is contrary to typical operations (e.g. HST) and would imply for example, an evolving telescope prescription, and would put higher lifetime requirements on all instrument internal focus mechanisms. o What ramifications does the changing telescope focus have on the design of the NIRSpec MEMS device, which requires location at the focal plane? o Is this requirement compatible with the ASWG-recommendation for a "low cost coronagraphic capability" which would require a coronagraphic stop at the telescope focal plane?	The instrument focus mechanisms for both NIRCam and NIRSpec are required to mitigate risks such as: loss of instrument functionality due to launch shift, zero-*g* release, and long term changes in the OTE optics system. Decomposition of a lifetime requirement for this mechanism is not yet available. However, roughly 10 actuations per year are thought to be adequate. The specified stroke is negotiable. Specific ramifications of these focus adjustments for the design of the NIRSpec MEMs are to be worked out between the US NIRSpec MEMs producers and ESA which is responsible for the NIRSpec. Specific ramifications of these focus adjustments for a coronagraphic mode are design dependent and therefore TBD.
30	NIRCam IRD		3.2.4.1	Are we to assume that the 2mm required motion of the Focus Mechanism is to accommodate a 2mm motion of the telescope focal plane, and that the actual motion of the NIRCam focus mechanism will be scaled appropriately for the instrument design?	The 2mm motion is a worst case estimate. The motion requirement may be determined through discussion with the selected Observatory Prime Contractor during the NIRCam Phase-A study. The stroke size will be driven by both WFS and PI science requirements
31	NIRCam IRD		3.2.5	Please provide estimates of the anticipated alignment error between the ISIM and the Telescope for inclusion in the instrument/ISIM/Telescope alignment error budget.	This information may be available prior to the start of the NIRCam Phase-A but can not be made available for the proposal effort as it is dependent upon selection of the Observatory Prime Contractor
32	NIRCam IRD		3.2.5	Is the 56nm wavefront error allocation a peak or RMS value over the field?	RMS
33	NIRCam IRD		3.3	Does the Observatory and/or ISIM provide full or partial micrometeoroid protection for NIRCam?	The NIRCam is mounted to the ISIM structure. The ISIM structure is enclosed within the Observatory provided ISIM thermal radiator system. This enclosure should provide "substantial" protection
34	NIRCam IRD		3.3	What radiation shielding does the Observatory and/or ISIM provide for the NIRCam detectors?	The detectors are being designed for the predicted NGST radiation environment (NGST document 570)
35	NIRCam IRD		3.3	What light shielding does the ISIM provide for NIRCam?	The ISIM and NIRCam are enclosed within the ISIM thermal enclosure that is also required to admit no more light than is permitted by a decomposition of the NGST level 2 stray light requirements. We anticipate light entering through the OTE primary mirror central hole will be the primary source of stray light.

	Doc.	Page	Section	Question	Response
36	NIRCam IRD		3.3.2.1	For the purpose of this proposal, should the weight and volume for the instrument pick-off and associated hardware be included in the instrument weight and volume limitations defined in sections 3.3.7.1 and 3.3.2.1? Insufficient information is given to reasonably define the pick-off.	Yes
37	NIRCam IRD		3.3.2.1	First sentence: Is the NIRCam inserted into the ISIM structure in the +z direction, i.e. through the PM? Or is the intent to insert it from the back and have it attach on the side of the PM? Since there is a `keep-out' zone that extends	See section 3.3.5 The instruments are normally integrated with the ISIM prior to shipment to the prime. The ISIM team has a goal of being able to remove and insert an instrument without deintegrating the ISIM from the observatory. This is a very challenging goal. A less challenging goal is to be able to remove and replace a FPA without deintegrating the ISIM from the observatory. A still less challenging goal is to be able to remove and replace a FPA without deintegrating the instrument from the ISIM. These goals will be strong considerations during ISIM packaging studies.
38	NIRCam IRD		3.3.2.1.1	states that the PI should reserve volume for the WFS&C Mechanism/Pupil Imaging Lens. Who provides this mechanism, lens, and drive. How much volume is required?	The NGST Prime contractor is responsible for WFS&C. The volume required is TBD.
39	NIRCam IRD		3.3.3	from what material is the ISIM bench made?	TBD – ISIM will choose its structural material during the instrument phase A.
40	NIRCam IRD		3.3.6	Is there minimum first frequency stiffness requirement for NIRCam?	50 Hz (TBR)
41	NIRCam IRD		3.3.7.1	For the purpose of computing Margin and Contingency as defined in AO 01-OSS-XX page B-10, should 122 kg be considered the “maximum possible value” for mass?	The correct mass for the cold (<40 deg K) part of the ISIM is 183 kg. Other masses are as stated in the IRD. All are the delivered masses, therefore each PI must maintain appropriate margin to ensure delivered masses are within his/her allocation.
42	NIRCam IRD		3.3.7.1	The 122kg mass limit is a challenging requirement.	The correct mass for the cold (<40 deg K) part of the ISIM is 183 kg. Other masses are as stated in the IRD. All are the delivered masses, therefore each PI must maintain appropriate margin to ensure delivered masses are within his/her allocation.
43	NIRCam IRD		3.3.7.1	What support structure does the 0.75 kg for the WFS filters include? And are the “filters” mentioned here the same as the “optics” in section 3.2.4?	None – all support structure is within the NIRCam filter wheel design. Yes
44	NIRCam IRD		3.3.8	What can we assume about the momentum environment for NIRCam? In particular, what are the input loads/frequencies produced by the Fast Steering Mirror?	As with the determination of the allowed momentum the instrument may react into the ISIM, the momentum reacted from the OTE/ISIM to the instrument will be determined following selection of the Observatory Prime Contractor

	Doc.	Page	Section	Question	Response
45	NIRCam IRD		3.3.9	Can we assume that the orbit raising scenario will provide an extended period with the ISIM at a relatively warm temperature for on-orbit instrument outgassing? Will the ISIM design provide vent paths for instrument outgassing?	Yes. Cool down does not start until the Observatory Sunshield is deployed. Deployment time will be determined by Mission Ops drivers including outgassing requirements. Yes
46	NIRCam IRD		3.4.1	Is the intent of the ISIM heaters to preclude the need for any instrument heaters?	No
47	NIRCam IRD		3.4.1	What are the operating temperatures of the ISIM and Detector radiators? What is the limit on NIRCam power input the ISIM radiator?	Requirement is 29.5K which allows for 0.5K delta between the detector and the radiator See Paragraph 3.4.4
48	NIRCam IRD		3.4.2.1	What does `science instrument complement' refer to? Is there another structure to which the SIs attach that in turn attach to the ISIM structure?	The NIRCam, NIRSpec, and MIRI. No – each instrument (NIRCam module) mounts directly to the ISIM structure.
49	NIRCam IRD		3.4.2.2	Is there a limit on the amount of harnessing for temperature sensors in NIRCam, given the parasitic heat load concern?	Parasitic heat loads were calculated using an assumption of 90 38awg wires for temperature sensors (total for ALL modules)
50	NIRCam IRD		3.4.2.2	What is the total allowed parasitic flux conducted to the NIRCam? Why does this section only refer to the mechanisms?	Total is the cited value in this section plus the FPA parasitics cited in section 4.3.1.2. Section excludes FPA – IRD wording will be changed to indicate interconnections to the ISIM C&DH system (mechanism control, calibration control, housekeeping)
51	NIRCam IRD		3.4.3	NIRCam not NIRSpec	Will correct in IRD
52	NIRCam IRD		3.4.7	Will NIRCam really be subjected to 0.34ATM pressure during storage?	This is a potential lower limit which may be encountered during air transportation of the ISIM
53	NIRCam IRD		3.5.1	What is the FPE temperature and how close is it located relative to the cold NIRCam	FPE will operate at nominally 280K. The FPE is located outside the ISIM thermal enclosure (30K region)and will be up to 6 meters (cable routing distance) from the NIRCam
54	NIRCam IRD		3.5.4.2	Please reconcile the max power of 12W with 2W x 2 cards = 4W	Maximum allocation assumed 2 cards per module and 3 modules. The revised IRD has only the 12 watt number.
55	NIRCam IRD		3.5.5	The NIRCam IRD version 1a(06/18/02) appears to contradict AO 01-OSS-XX P3.2 pg 8 and "NGST Instrument Development Team and Science and Operations Center Roles and Responsibilities". What part of the EGSE will be provided through the S&OC?	NIRCam IRD provides for the ISIM C&DH system – the ISIM C&DH system will in turn interface with the S/C simulator, the SSR simulator and the S&OC system

#	Doc.	Page	Section	Question	Response
56	NIRCam IRD		4.0	What is the 3D nature of the particle radiation shielding of the FPA? How much mass should NIRCam carry for the shielding?	This is partially dependent on the prime down select. NIRCam shielding required will depend on Focal plane vendor chosen and the design of the prime provided ISIM enclosure.
57	NIRCam IRD		4.2.2	What support structure does the 0.25 kg/FPA include?	The 0.25 kg is per SCA – the SCAs will be combined/packaged into an FPA. For example, a 4k x 4K FPA would have a 1 kg mass. The FPA will provide full support of the SCAs and will have defined mounting points to interface with the PI provided FPA/Instrument Bench interface.
58	NIRCam IRD		4.3.1	Does the 150mW heat load from the NIRCam detectors to the detector radiator mean the total for all FPAs? Does it assume a particular number of detector pixels?	Yes Assumed a maximum of 6 SCAs per module x 3 modules plus margin
59	NIRCam IRD		4.3.3	Will the GFE detector temperature sensors be sensitive over 30K-20C?	TBD
60	NIRCam IRD		4.3.3	Will GFE detectors have heaters for on-orbit decontamination?	TBD
61	NIRCam IRD		5.2	Is the NIRCam Team responsible for software for target acquisition?	No, the S&OC is responsible
62	NIRCam IRD		6.2	Please define “operational mode” in regard to: filters, exposure times, dithering, detector read-out schemes, optical elements, etc. By way of example, how many modes would the Yardstick NIRCam instrument have?	The term "instrument modes" is defined operationally as any instrument state or method of operation that requires significant effort to support in either the Science & Operations Center development or in science operations. Generally, there will be a corresponding cost for the development of the instrument itself. The usual example of a mode is a particular FOV/filter (or grating setting)/detector-type combination. For the Yardstick NIRCam, the number of modes would simply be the number of filters (+ wavefront control pupil optics) if only one readout mode is required. Note that detector readout schemes that involve changes in readout patterns or biases that make measurable, non-linear changes in the output signal or require additional data formats or storage requirements are almost as costly to support as a different detector-type. Thus, the number of distinct readout schemes that must be supported will multiply the number of modes accordingly. (2 readouts, 5 filters = 10 modes). The same statement may apply to different apertures for spectrographs.

#	Doc.	Page	Section	Question	Response
63	NIRCam IRD	6 8	3.2.4 3.3.2.1.1	Will alternate suggestions for ways to do the pupil viewing be accepted, rather than adding a 6kg mechanism? See also Section 3.3.2.1.1. How will the TBD dimensions of this mechanism be determined so proposers know what to allow for? Will the instrument team provide the mechanism and hence identical to others they provide or will it be a new type? Who controls it? Who tests it?	The Observatory Prime Contractor has responsibility for the WFS&C system for the Observatory and any components required within the NIRCam. Alternatives and the implementation details will be determined/discussed with the selected Prime during the NIRCam Phase-A.
64	NIRCam IRD	7	3.2.4	The AO states: "If the PI proposes the NIRCam as a single module, the WFS hardware shall be fully redundant. If the PI proposes the NIRCam as a multiple module system, each module shall incorporate the WFS hardware." This wording would require a six-module instrument to have six sets of WFS hardware, whereas a single module system would need only two. It would be better to state something like "The WFS hardware shall be fully redundant regardless of whether a single of multiple module system is proposed."	If the PI proposes multiple modules, a minimum of two modules must have the WFS hardware installed.
65	NIRCam IRD	7	3.2.7	Are optical models required as a response to the Phase A AO? If the models are required in the proposal, do they have to be included within the page limit?	Preferred – ISIM Systems Engineering could start the SI packaging study to determine SI envelopes with the selected Prime's ISIM architecture early.
66	NIRCam IRD	8	3.3.2.1	May the fast steering mirror be used by the instrument (when it is prime) for dithering?	NIRCam may request small pointing changes/dithers, but the fast steering mirror is under the control of the observatory pointing control system. See the NGST Level 2 requirements document for clarification of dithering performance.
67	NIRCam IRD	9	3.3.7.1	"The total mass allocation for the NIRCam optics module(s) shall be 122 kg" Question: Does the 122-kg total mass allocation include contingency or is a separate mass contingency carried by ISIM?	The correct mass for the cold (<40 deg K) part of the ISIM is 183 kg. Other masses are as stated in the IRD. All are the delivered masses, therefore each PI must maintain appropriate margin to ensure delivered masses are within his/her allocation.
68	Phase A Model Contract		B-1	What does the parenthetical item "(with Science Data)" mean in terms of the Phase A Concept Study Report (deliverable #1)?	Phrase deleted. This did not apply to this AO.

	Doc.	Page	Section	Question	Response
69	Phase A Model Contract	N/A	B-1	How long will NASA need to evaluate the Phase A CSRs and make a down-select decision? Does this evaluation period start after or during the 6 months of Phase A?	The NIRCam will be selected through this AO. The CSR will be used to evaluate the readiness to proceed into subsequent project phases. This evaluation occurs after the completion of the Phase A study.
70	Phase A Study Report	A-2	A	Page A-2: please describe mission activities included in "Phase F".	The NGST Program does not currently have a phase F in its plan. This sentence has been deleted.
71	Phase A Study Report	10	F	Section F item 5 is missing	Paragraph numbering has been fixed
72	Phase A Study Report	15	N/A	"The cost plan should provide information on the anticipated costs for phases A through E for the preferred baseline launch date. A detailed cost proposal with cost or pricing data as defined in FAR 15.401 is required for Phases B/C/D/E." Question: (1) Phase A costs will have already been submitted with the Phase A proposal. Should this refer to only Phases B through E? (2) Is the cost proposal submitted as part of the Concept Study Report the only cost proposal that is required for Phases B through E?	(1) No. See the Introduction of the Phase A Study Report Guidelines. (2) Yes. The Government reserves the right to request additional or more detailed cost or pricing data in support of the NIRCam Concept Study Report.
73	Tech. Dev. Specifications for NGST Detectors	N/A	N/A	Will the GFE detectors and associated electronics, software, and ground system support subarray readout?	See NGST web document number 641
74	Tech. Dev. Specifications for NGST Detectors	N/A	N/A	What are the expectations for detector persistence with regard to the magnitude of the residual image and its decay time?	See NGST web document number 641