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~~BYE 1515-66~~
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22 JUL 1966

MEMORANDUM FOR: All Holders of the HEXAGON Sensor Subsystem Request for Proposal

SUBJECT : Addendum to the HEXAGON Sensor Subsystem Request for Proposal

Subsequent to the issuance of the HEXAGON Sensor Subsystem Request for Proposal on 23 May 1966, a series of questions concerning the interpretation of various parts of this document have been received from the Contractors. Copies of these questions along with answers were subsequently transmitted to all of the Contractors who received Request for Proposals. As the answers to these questions directly impact the contractors' interpretation of the Request for Proposal, they must be regarded as an integral part of that document. Attached to this memorandum is a complete list of these questions and answers. This list should be attached to all copies of the Request for Proposal in your possession and be regarded as an addendum to that document.

Leslie C. Dirks

LESLIE C. DIRKS
Chairman, Sensor Subsystem
Source Selection Board

Addendum to:
BYE-1515-66
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Addendum to the

HEXAGON Sensor Subsystem Request for Proposal

(Answers to questions received from Contractors during proposal preparation period)

1. **Question:** Reference Attachment 1, Section 2.5, Page 008. Is Sensor Subsystem Contractor responsible for conducting thermal testing of combined Sensor Subsystem and spacecraft thermal simulator?

   Answer: Yes.

2. **Question:** Reference Attachment 1, Page 014, Paragraph 3.1.

Item	Description	Quantity
6	Spare Parts	As required to support items 1 thru 5 after delivery

   Above appears in conflict with Page 015, Paragraph 3.3, which calls for spares to support items 1 thru 3 (only) Task 3.1.

   Answer: Spare parts are required to support items 1 thru 5 after delivery. Paragraph 3.3 on Page 015 was intended to provide more definitive guidance for spare parts on items 1 thru 3 and 5.

3. **Question:** The following (questions 3 thru 6 this paper) represents our interpretation of terms referred to in Appendix I, Section 2.4 and 7.2. If incorrect please clarify:

   Section 2.4 Page 023. Non-Duplicative area per day: The ground coverage provided along a 2640 nautical mile ground track, corrected for 3 percent forward overlap, using a flat earth approximation.

   Answer: The correct expression for unique ground area per day to be covered in stereo is as given on Page 022. In the example on Page 023 there is an error in the constant multiplying the swath width. Replace 2640 with 2620. The remainder of the example reflects this numerical error.

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4. Question: Section 2.4, Page 023, Design perigee altitude: A perigee altitude chosen by the Contractor for which the system is designed to provide the performance requirement set forth in Appendix I, Section 2.1.

Answer: Correct.

5. Question: Section 3.2, Page 025, Reference Orbit: An orbit for which the perigee altitude of 55 degrees N. lat. is equal to the design perigee altitude and which corresponds to an intersection of the perigee altitude abscissa with an integral day synchronous period line on Figure 2, Appendix I, the synchronous period being the one which gives minimum apogee but provides complete coverage of the area of interest as shown in Figure 1, Appendix I, within one synchronous period.

Answer: Correct.

6. Question: Section 3.2, Page 025, Access: (Reference Appendix I, Section 3.2) an orbital pattern which profides complete coverage in longitude at 25 degrees N. lat. within one synchronous period.

Answer: The term "access" refers to area falling within the swath width of the cameras. Thus, if desired, such area could be photographed. The southern extremity of the Sino-Soviet Bloc as described in Section I, of Appendix I, is the southern tip of Hainan Island which lies at approximately 18 degrees N. lat.

7. Question: Reference Appendix IV, Page 077, Paragraph 3.3.3.6. Request copy of SAFSP Exhibit 65-27 dated 27 December 1965.

Answer: A copy of SAFSP Exhibit 65-27 is being mailed this date to both BABY and ACORN.

8. Question: Appendix VI, Page 085 calls for 18 follow-on units delivered 1 every 2 months - 6/year for 3 years. Attachment II, Page 116, Paragraph 4.15 calls for 8-16-24 units over 1-2-3 year period. Should we quote both?

Answer: Attachment II, Page 116, Para 4.15 is in error. Quantities to be quoted on are 6-12-18 over 1-2-3 year periods.

9. Question: Reference Attachment II. Section 2.5E, Page 097, Area of access per day: This term, which is used in Attachment II,

Section 2.5E is understood to mean the ground area covered in one day between 25 degrees and 70 degrees N. latitude, corrected for 3 percent forward overlap. Question: Is this understanding correct? (Note that correction for territorial outlines is not made.) What are the limits of longitude to be used? Should correction be made for orbit convergence?

Answer: The area of interest referred to on Page 097 is the Sino-Soviet Bloc as outlined in Figure 1, following Page 021. The western extremity of the Sino-Soviet Bloc is defined by the Bering Strait at approximately 170 degrees W. lat. The eastern extremity of the Sino-Soviet Bloc is defined by the E. Germany/W. Germany border at approximately 10.5 degrees E. longitude. In computing the area of access per day it is sufficient to compute the nautical miles of ground track per day which lie within the geographic boundaries of the Sino-Soviet Bloc and multiply that number by the camera swath width. In laying out the ground track for this computation assume an orbital inclination of 90 degrees. Also, assume that successive passes on a given day intersect the equator at 22.5 degree longitude increments. Include in your response to Section 2.5E a tabulation of the longitude of ground track intersection with the equator you used for this computation. AIX does not understand the meaning of the term "orbit convergence" in this context.

10. Question: Section 2.5F, Page 098, should the units of weight penalty for orbit maintenance be pounds per day instead of pounds per day per foot of diameter?

Answer: Section 2.5F, Page 098 is in error. The expression for orbit maintenance should be pounds per day instead of pounds per day per foot of diameter.

11. Question: It is our assumption that the contrast numbers given in Table II, Appendix I, Page 030B are for daylight exposure without filters. Please verify.

Answer: Correct.

12. Question: Should not the R/V weight as a function of film load be considered in computing nominal days in orbit.

Answer: Yes. On Page 098, Paragraph F, Item 3, the expression for payload weight is in error. Add to the right hand side of this equation the R/V weight as read from Figure 4. Note that the take-up cassette weight is included in the R/V weight plotted on the ordinate of Figure 4.

13. **Question:** Reference Appendix I, Section 2.4, Page 022. We are assuming that the term "non-duplicative coverage" first used in Section 2.4 of Appendix I, refers to coverage not duplicated on preceding lateral panoramic scans of a particular orbital pass, and does not refer to possible duplication of coverage between separate orbital passes on the same or other days. If not correct, please advise correct interpretation.

Answer: Correct. Please refer to the sample calculation on Page 023 of the RFP.

14. **Question:** Reference Appendix IV, Section 3.3.3.1, Page 074. Is it possible that there is a decimal point error in the input level for gaussian random vibration which is stated as 0.40g squared/cps.

Answer: No. The level of 0.40 g squared/cps is a qualification level for components mounted to the SBA structure. For items as heavy as the Sensor Subsystem, it is anticipated that the dynamic coupling will actually cause a roll-off at 3DB/octave below 550 cps, and this modification to the spectrum may be used as a guide. The final details of the qualification spectrum will depend upon the detailed properties of the Sensor and SBA designs.

15. **Question:** Section 3.3.3.2, Page 075, Figure 1A. Again, does half sine shock input duration of 35 milliseconds, as stated on Figure 1A, have a decimal point error?

Answer: Yes. Figures 1A and 1B should read 0.35 plus 0.05 ms.

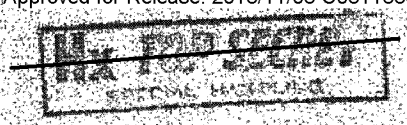
16. **Question:** Reference Attachment II, Section 2.5F, Page 099. We assume units of external diameter "D" to be in feet and units of length "L" to be in inches. Is this correct.

Answer: Correct.

17. **Question:** Reference Attachment II, Section 2.5F, Page 099. Also, we assume that sections of the SS at diameters, other than max (such as take-up reels), are excluded from the length dimension.

Answer: Correct

18. **Question:** Page 022-023, Paragraph 2.4. Consideration of stereo angle has been omitted from coverage equations. We assume this to be intentional for purposes of simplification. Is this correct?



Answer: Camera pitch attitude should be taken into account when projecting the in-track and cross-track coverage per frame on to the ground.

19. Question: Page 064, Paragraph 2.2. Because of the omission of a requirement for optical performance demonstration, we assume that actual optical elements are not required in the prototype sensor system model. Is this correct?

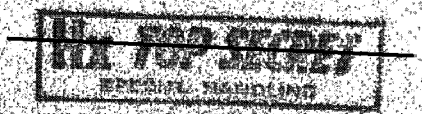
Answer: It is desirable for the prototype sensor subsystem model to be "configured as nearly identical to flight hardware as possible." It is desirable but not a firm requirement that this prototype be fabricated on production tooling. As the prototype will be used to check out the ACF equipment and procedures as well as to demonstrate compatibility with the space vehicle, there is a minimum requirement that the prototype be capable of exercising all of the sensor subsystem contractor supplied ACF equipment. The prototype must contain optical elements, however, it may not be a firm requirement that the optical system perform to flight specifications. In the proposal the contractors should clearly identify any differences between the prototype sensor subsystem and flight hardware, and justify these differences.

20. Question: Page 099, Paragraph 2.5F. We assume the reference to external diameter, little d, in the first paragraph under incremental system weights actually applies to the space vehicle structure rather than to the sensor system as implied by the nomenclature in the fourth paragraph under incremental system weights. Is this correct?

Answer: Little d as used on Page 099 refers to minimum diameter cylindrical envelope which just encloses the Sensor Subsystem. In other words, the definition given in Para 4 under incremental system weights on Page 099 is to be understood throughout.

21. Question: Does the two (2) inch wall thickness implied by consideration of Paragraph 3.3.7, Page 028, apply for all vehicle diameters?

Answer: With reference to Page 029, Para 3.3.7, change 110 inches to read 114 inches. All of the diameters quoted in this RFP refer to the Sensor Subsystem diameter. The difference between external space vehicle diameter and the maximum Sensor diameter that can be accommodated in the space vehicle has to do with the depth of the structural members used to support the space vehicle skin. The detailed configuration and, therefore, the actual shape of the envelope



available to the Sensor Subsystem cannot be determined until space vehicle design has been completed. For the purpose of the proposal an increase in Sensor Subsystem diameter from the maximum of 114 inches as specified in Paragraph 3.3.7 will be considered if there is an essential requirement for more diameter.

22. Question: We assume from the two paragraphs quoted above that maximum allowable vehicle external diameter is 9.5 feet, and maximum allowable Sensor System diameter is 110 inches. Is this correct?

Answer: It is desired that the external space vehicle diameter be 120 inches or less, however, an increase over 120 inches will be considered if there are decisive overall advantages to be gained.

23. Question: Table I, following Page 005. Clarification of the variation in time between delivery and launch of Sensor Systems is requested. Flight system nbr. 2 (milestones 17 and 19) is two (2) month, flight system nbr. 3 (milestones 18 and 23) three (3) months, all other flight systems are four (4) months.

Answer: Correct Table I, following Page 005, as follows:

Item 20 deliver Sensor Subsystem nbr 5 34th month
Item 21 deliver Sensor Subsystem nbr 6 36th month
Item 24 deliver Sensor Subsystem nbr 7 38th month.

24. Question: Page 080, Para 1.2. Relative to verification of static resolution of optics and film transport performance (in second paragraph) we assume that this testing will be conducted in a controlled temperature environment. Is this true?

Answer: The Sensor Subsystem Contractors should define all requirements relevant to the handling and test of the Sensor Subsystem.

25. Question: Page 085, Para 1.9 and Page 116, Para 4.15. For purpose of estimating the follow-on program, we assume that all 18 flight articles will be contracted for at the same time. Is this correct?

Answer: Correct. However, the procurement of follow-on flight articles may be funded incrementally.

26. Question: Page 16, Para 3.1. Relative to the organization of Volume II, please advise if it is desired that the Preliminary Program Plan be submitted as a Statement of Work Task or in accordance with the paragraph 3.1 Program Plan Requirements set forth in Appendix II of the Statement of Work.

Answer: Section 3.1 of Attachment II sets down detailed instructions for the preparation of Volume II. If further information or clarification is required, please elaborate on above question.

27. Question: Page 628, Para 3.2.1. What voltages are planned to be available at the interface?

Answer: Nominal primary power supply voltage will be 28 volts DC.

28. Question: Reference Appendix I, Section 4.4, Page 031. Our interpretation of the second paragraph of Section 4.4, is that the provision for a capability to operate over extended missions - up to 90 days duration - refers to design and parts selection with respect to wear out problems only and does not enter into calculations for design film weight capacity. If incorrect, please clarify.

Answer: Your interpretation is correct.

29. Question: Attachment 1, Appendix I, Table 1, Page 030A, Film-type SO-362 modulation value for spatial frequency 50 lines per millimeter reads 3,025. We are assuming this to be 0.035. If incorrect, please clarify.

Answer: Your assumption is correct. For SO-362 the modulation required at 50 lines per millimeter is 0.035 not 0.025. Please correct Table I following page 030 accordingly.

30. Question: Figure I-2 following Page 5, in order to properly categorize AGE and in-plant equipment, we assume that any item of test equipment required at factory that is identical to an item required at A-7P will be considered in-plant AGE. All other test equipment required in-plant will be considered special purpose test equipment and not as AGE. If above assumption is not correct, please furnish your definitions of in-plant AGE as opposed to special purpose factory test equipment.

Answer: Your understanding is correct.

31. Question: Page 065, Para. 2.3.: The mass properties model is assumed to be static in character, simulating the Sensor Subsystem size, mass, inertia, and center of gravity rather than dynamic, wherein it would also simulate motions and momentum effects of the Sensor Subsystem. Is this correct?

Answer: Correct.

32. Question: Page 128, Para 3.3.9. In order to enable the design of film take-up cassette, please describe the requirement for the S/I camera film take-ups, i.e.: is there a S/I camera film take-up in each recovery vehicle? If so, is it integral with the GSS sensor take-up? What is the interface relationship between these two take-ups? We assume that it will be permissable to orient the GSS sensor take-up spool axes parallel to the spacecraft pitch axis; is this correct?

Answer: The S/I camera film take-up configuration has not yet been established. For the purposes of this proposal, design the main camera take-up assembly with the assumption that there will be no interference from the S/I camera film take-up. On the question of main camera take-up spool axis orientation, a recent detailed study has lead to the conclusion that orienting the spool axis parallel to the spacecraft pitch axis is feasible.

33. Question: Please clarify film load requirements to be incorporated in sensor design. Should the supply and take-up cassettes be designed with capacity for the total film weight calculated as described in Section 2.5 of Appendix I to Attachment I and Section 2.5 of Attachment II, or for 30 day or 50 day missions as defined in Para 4.4 on Page 031 utilizing the weight of film per day calculated as described in Section 2.4 of Appendix I to Attachment I.

Answer: The take-up and supply cassettes should be designed for a 30 day mission based on the film requirements specified in Para 2.4, Page 022.

34. Question: Relative to Attachment II, Para 2.5C, Page 096. We interpret this paragraph to mean the ground area weighted ground resolution over the ground projection of the entire frame and not the non-duplicative ground area. Is this correct?

Answer: Correct.

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35. Question: The thermal model in Para 3.1.2.3, Page 068 is assumed to be the same thermal model as that referred to in Para 2.5, Page 008. Is this correct?

Answer: Correct.

36. Question: (ref question 35) If correct, we assume that the requirements of Para 3.1.2.3, Page 068 will be met with a joint engineering test effort by GSS sensor and space vehicle contractors in a test program conducted at the space vehicle contractor's plant following delivery of the thermal model in month 9. Is this correct?

Answer: The Sensor Subsystem thermal tests described in Para 3.1.2.3 are to be conducted by the Sensor Subsystem contractor. The GFE space vehicle simulator referred to is not intended necessarily to be an engineering model or prototype of the Sensor Subsystem housing. However, it will be designed to simulate the thermal interface environment as seen by the Sensor Subsystem per the interface requirements to be defined by the Sensor Subsystem contractor. Note that even though the thermal tests are to be conducted by the Sensor Subsystem contractor, the thermal model is a deliverable item.

37. Question: Relative to question one, ADIC 2779, (question 33 this paper) we interpret the answer to be: the take-up and supply cassettes should be designed for 30 active mission-life days based on the film requirements specified in Para 2.4, Page 022. Active mission-life days are related to nominal days on orbit by Figure 2, Page 099B. Is this correct?

Answer: Make no reference to Attachment II in computing film weight for take-up and supply cassette design. Para 2.4 of Page 022 defines the procedure for computing the quantity of film required per day. This number should be multiplied by 30 days to arrive at the total quantity of film to be used in designing the take-up and supply cassettes for the purposes of this proposal.

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CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

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30 AUG 1966

MEMORANDUM FOR : Director, National Reconnaissance Office

SUBJECT : HEXAGON Sensor Subsystem Source Recommendation

REFERENCES :
(1) BYE-52304-66, dated 29 April 66
(2) BYE-1670-66, dated 22 July 66
(3) BYE-1671-66, dated 21 July 66
(4) BYE-1514-66, dated 12 May 66
(5) BYE-52333-66, dated 20 May 66
(6) BYE-1522-66, dated 8 July 66
(7) BYE-1680-66, dated 8 July 66
(8) BYE-1516-66, dated 27 May 66

1. In accordance with the direction of the Director, National Reconnaissance Office Action Memorandum No. 6 (Reference 1), the HEXAGON Sensor Subsystem Source Selection Board has conducted an evaluation of the proposals received from Perkin-Elmer and Itek (References 2 and 3). This memorandum represents a summary of the findings of this evaluation proceedings along with a source recommendation.

2. The Source Selection Board has examined all aspects of the referenced proposals and evaluated them against the specifications and requirements contained in the HEXAGON Request for Proposal (Reference 4). To the best of the board's knowledge and ability, all the relevant information and experience has been brought to bear in this evaluation. The adequacy and merits of the contractor's proposed designs as well as the technical and managerial capabilities of the companies to prosecute the development program were considered. It is the unanimous conclusion of the Source Selection Board that Perkin-Elmer is the better qualified of the two contractors. Therefore, the board recommends that you approve the selection of Perkin-Elmer as the HEXAGON Sensor Subsystem contractor.

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SUBJECT: HEXAGON Sensor Subsystem Source Recommendation

3. In accordance with your direction (Reference 5), the HEXAGON Sensor Subsystem Request for Proposal was released to Perkin-Elmer and Itek on 23 May 1966. The proposals were received from these two contractors on 22 July. In order to facilitate a detailed evaluation of these proposals, a Technical and Operations Evaluation Group and a Management, Production, and Logistics Evaluation Group were constituted (References 6 and 7). These evaluation groups were charged with an in-depth analysis of the proposals and they in turn drew on various advisors and consultants to aid them in their work. The two evaluation groups reported their findings to the Source Selection Board on 29 July. Copies of these findings are included as Attachments Three and Four.

4. The Source Selection Board has weighted the Evaluation Group ratings in accordance with a procedure developed prior to the receipt of the proposals (Reference 8). The scoring for the Itek proposal is tabulated in Attachment One to this memorandum and that for the Perkin-Elmer proposal in Attachment Two. Itek scored a total of 54.7 points out of a possible 100 and Perkin-Elmer scored 69.3 points. The Source Selection Board has reviewed the Evaluation Group ratings and has found no reason to take exception with the Evaluation Group judgments.

5. The preponderance of the differential between the Perkin-Elmer and the Itek scores is attributable to the Technical and Operations Evaluation Group's rating. In this area Itek received a total of 39.1 points and Perkin-Elmer 54.9. Although both technical proposals met the general requirements and specifications of the RFP, the Perkin-Elmer proposal is clearly better suited to the overall search and surveillance mission as defined in the RFP. The Perkin-Elmer system has a higher performance potential both in terms of resolution and in terms of mission duration. The Perkin-Elmer system meets the 2.7' nadir resolution specification at an altitude of 72.5 nm while the Itek system must operate at an altitude of 84 nm to meet the same specification. The Perkin-Elmer camera system is 700 pounds lighter than the Itek camera system. When configured for a 30-day mission, the Perkin-Elmer space vehicle will probably be at least 1,000 pounds lighter than the Itek space vehicle. The 10% resolution margin and the overall weight margin of the Perkin-Elmer system over the Itek system were judged by the Source Selection Board to be significant factors.

Σ lighter camera + smaller, lighter spacecraft

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SUBJECT: HEXAGON Sensor Subsystem Source Recommendation

6. In addition to the performance margin cited above, the Itek system poses a significantly larger development risk than does the Perkin-Elmer system. The Itek tolerances throughout will be more difficult to meet than the corresponding Perkin-Elmer tolerances. This implies that the Itek development program would be characterized by a greater risk of schedule slippage and a greater risk of falling short of the performance objectives.

7. The Itek system contains more and larger optical elements than does the Perkin-Elmer system. As all of these optical elements must be fabricated to exceptionally excellent surface quality, the follow-on production program in the case of the Itek system can be expected to result in greater difficulties in meeting the schedule and performance objectives than would be the case for the Perkin-Elmer system. The tighter tolerances on all of the Itek camera mechanisms will also contribute to follow-on procurement performance and schedule problems. In addition, the Itek system has significantly less performance margin than does the Perkin-Elmer system and, therefore, the probability of routinely meeting performance objectives will be lower for the Itek system than the Perkin-Elmer system.

8. Both contractors were deficient in their technical proposal presentations. Both made numerous errors in their design and analysis as well as in computing the performance parameters specified in the RFP. These errors were sufficiently serious to lead the Source Selection Board to question the adequacy of the engineering teams that prepared the proposal. This was particularly so in the case of Itek. However, the Source Selection Board has concluded that either company has adequate technical resources to pursue a development program if they choose to allocate these resources to this program.

9. The level of design detail presented in the Perkin-Elmer proposal as compared to that presented in the Itek proposal clearly indicates that the Perkin-Elmer design is appreciably more mature than that of Itek. The Source Selection Board conclusion is that the schedules proposed by both companies are very tight. However, from a technical risk viewpoint Perkin-Elmer has a better chance of meeting their schedule than does Itek.

SUBJECT: HEXAGON Sensor Subsystem Source Recommendation

10. In the Management, Production and Logistics Evaluation area, Itek scored 15.6 points and Perkin-Elmer 14.5. This small differential in favor of Itek is largely attributable to Itek's experience on the CORONA and LANYARD programs. While this differential is real, it is not nearly large enough to cause the Source Selection Board to re-evaluate the selection of Perkin-Elmer as the recommended contractor. From a Management, Production and Logistics point of view, there is no serious doubt about the capability of Perkin-Elmer to prosecute the proposed program. However, this program will tax the corporate resources to such an extent that prior to the award of any substantial new government business, a contractor facility capability survey should be conducted.

11. The development program cost proposals as adjusted by the Cost Evaluation Group are 74.587M for Itek and 81.848M for Perkin-Elmer. The Itek follow-on production program unit cost is approximately 10% higher than is the Perkin-Elmer follow-on unit cost. Over the expected duration of the program, these cost differentials tend to be cancelling and in any case are sufficiently small so that in the judgment of the Source Selection Board they should not have a bearing on the choice of contractor.

12. All of the above considerations have influenced the Source Selection Board's conclusion that the contractor best qualified for this program is Perkin-Elmer. Although the Perkin-Elmer system holds greater performance potential than the Itek system and is characterized by a significantly lower level of development risk, it is nonetheless a state of the art technical undertaking which will require a maximum effort by all concerned if it is to have a successful conclusion. It is the view of the Source Selection Board that this contractor's willingness to bring to bear necessary assets will significantly influence the degree of success that will be achieved. It is of great importance that this be clearly understood by the contractor prior to the initiation of a development program.

Louis C. Dirks

LESLIE C. DIRKS
Chairman, Sensor Subsystem
Source Selection Board

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SUBJECT: HEXAGON Sensor Subsystem Source Recommendation

CONCUR:

F. S. Buzard
Colonel F. S. Buzard

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James H. McDonald

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