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To: D. Mc Ghee

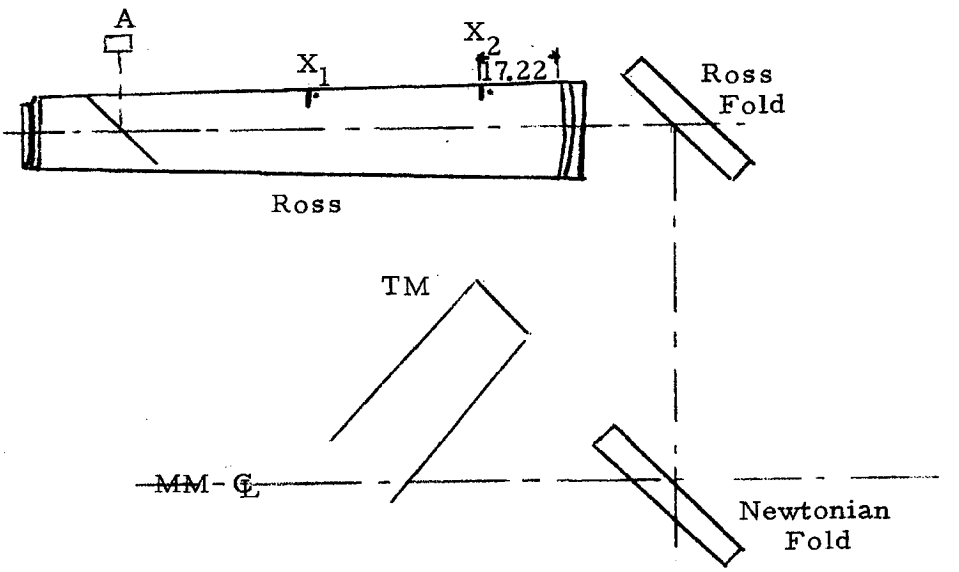
16 August 1968

Subject: Trip Report - FAMS Light Location Review at EK

From: L. E. Watson

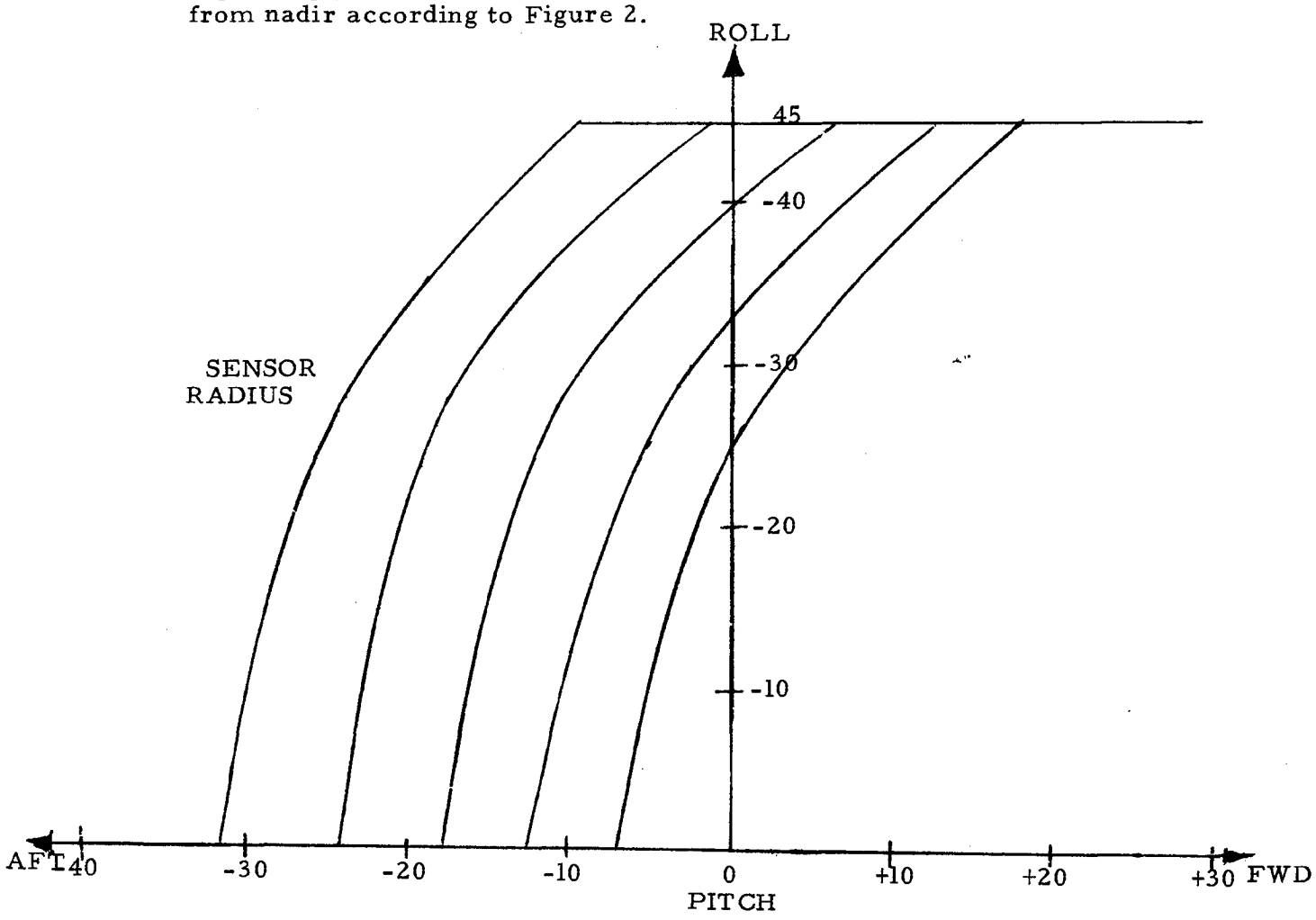
A meeting was held at the EK facility 13 August 1968 to review the Fams light location and interface implications. Attendees from Aerospace were S. Brewer and L. Watson. EK personnel included R. Keim.

Three possible locations for the FAMS light were discussed. These are designated A, X_1, X_2 as shown in the following sketch of the Ross Barrel.



Tentatively GE is considering the sensor location at station "500" with the sensor center at a position 52 inches below the MM center line. They have indicated to EK that the sensor requires a three-inch diameter light beam for adequate coverage at the sensor plane. It is estimated that an additional 1.5 inches in diameter overlap will be required to take into account sensor light line-of-sight uncertainties due to air bag/launch lock differences, assembly tollerances, handling variations, on-orbit zero-G effects, thermal effects, etc. Therefore, a beam diameter of approximately 4.5 inches

at the sensor plane is needed. The alignment sensor should be located as far below the MM center line as possible since the bottom edge of the TM vignettes the FAMS light beam from top and the vignetting proceeds downward as the TM moves aft or is rolled out from nadir according to Figure 2.



With the FAMS light located at position A the lower portion of the beam is limited by the bottom of the Newtonian folding mirror. With the light at X_1 or X_2 the lower portion of the beam is limited

by the protrusion of a supporting bracket structure for the invar spacer rods. The light coverage at station "500" is essentially uniform as follows.

FAMS LIGHT LOCATION	BEAM LIMIT BELOW MM CENTER LINE AT STATION "500"		LOS AT START OF TM BEAM VIGNETTING (4.5 IN. BEAM DIA.)		SENSOR CENTER LOCATION DISTANCE BELOW) MM CENTER LINE
	UPPER	LOWER	PITCH (0 ROLL)	ROLL (0 PITCH)	
A	16 in.	51.5 in.	$+1^{\circ}$	0	49.25 inches
X_1	15 in.	54.6 in.	-11°	31°	52 inches
X_2	15 in.	56.1 in.	-11°	31°	52 inches
X_2	15 in.	56.1 in.	-17°	38°	53 inches

FIGURE 3

Position A is the easiest to implement with least interface complications. Positions X_1 and X_2 will have approximately 10 to 20 times the light intensity at the sensor, but both require optical corrector elements in order to meet GE's 10 arc/sec beam divergence criteria. Also, there are power supply and electrical cabling complications, and the calibration method would be considerably more difficult. A thorough study of these alternate locations have not been made by EK. Positions X_1 and X_2 provide the same operational capability (i. e., the ability to sense alignment with tracking positions aft of nadir and at increased roll angles) with the sensor location centered 52 inches below MM center line. (See Figures 2 and 3) Additional operational capability can be achieved if the sensor position can be lowered an additional inch, as indicated by Figure 3.

During the meeting several questions were raised regarding the operational requirements of the GE alignment sensor. These were:

1. Is it imperative that an alignment check be made once per second or will it suffice to take measurements less frequently and update by computer programming?

2. Is the sensor location centered at 52 inches below the MM center line at station "500" fixed or can it be moved further down?

3. What is meant by GE's specification of ± 10 arc seconds divergence, i. e., is this decollimation, aberrations, etc?

4. What is the power requirement for the sensor?

It is recommended that an inhouse review of the GE alignment sensor requirements be made. Apparently, EK is under the impression that they will be responsible to design and install the FAMS light. If this is eroneous it should be clarified with them.

Also, GE may have the false impression that if a GaAs source, which radiates essentially monochromatic energy at 9000 A^{o}, is used they may leave the light on continuously. There is a signed interface agreement (12 June 1968) which requires that the FAMS light be off during shutter operation and during the operation of the EK alignment sensor. EK reaffirmed that the 9000 A^{o} energy would cause interference with their sensor.

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