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TO ACORN INFO CITE ADIC 9333

ATTENTION: MR. MADDEN
FULCRUM
SUBJECT: CAMERA ACCEPTANCE TESTING
REF: WATSON/DIRKS 2 JAN, DISCUSSIONS

1. IT IS THE FEELING OF THE PROJECT OFFICE THAT CAMERA SYSTEM PERFORMANCE CANNOT BE PROPERLY DISCUSSED EXCEPT IN THE CONTEXT OF THE ACCEPTANCE TESTS THAT THE SYSTEM MUST SATISFY. FOR THIS REASON, IT IS IMPORTANT TO DEVELOP A PRELIMINARY ACCEPTANCE TEST PROCEDURE PRIOR TO THE END OF PHASE I. THESE PRELIMINARY ACCEPTANCE PROCEDURES SHOULD NOT BE REGARDED AS FINAL OR BINDING ON EITHER PARTY FOR THE PURPOSES OF ANY HARDWARE CONTRACT THAT MAY AT SOME FUTURE TIME BE NEGOTIATED.

2. IT IS REQUESTED THAT ACORN UNDERTAKE THE DEFINITION

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CLASSIFIED MESSAGE

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OF A PRELIMINARY ACCEPTANCE TESTING PROGRAM IN THE CONTEXT OF THE IMAGE QUALITY PREDICTION WORK CURRENTLY IN PROCESS. THE ACCEPTANCE TESTS SHOULD: (1) MEASURE THE INTEGRATED DEGRADATION OF IMAGE QUALITY DUE TO DETERMINISTIC OR NON-STATISTICAL ERROR SOURCES (SEE DEFINITION OF TERMS NOTE BELOW), AND (2) ESTIMATE THE DISTRIBUTION IN PERFORMANCE CAUSED BY THOSE STATISTICAL ERROR SOURCES AMENABLE TO LABORATORY TESTING. BOTH DIRECT AND INDIRECT TESTS OF IMAGE QUALITY MAY BE USED. THREE BAR TARGET RESOLUTION IS NOT A PREFERRED MEASURE OF IMAGE QUALITY. EVERY EFFORT SHOULD BE MADE TO DISCOVER PRACTICAL TECHNIQUES FOR ASSESSING IMAGE QUALITY IN TERMS OF THE MODULATION TRANSFER FUNCTION OF THE CAMERA SYSTEM IN VARIOUS MODES OF OPERATION. INDIRECT MEASURES OF PERFORMANCE ASSESSMENT SUCH AS FILM VELOCITY SYNCHRO-

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NIZATION MAY ALSO BE PART OF THE GENERAL ACCEPTANCE TEST PLAN.

3. THE PROJECT OFFICE EXPECTS TO PARTICIPATE IN VARIOUS ASPECTS OF THIS EFFORT - - PARTICULARLY IN SETTING THE PERFORMANCE LEVELS THE CAMERA SYSTEMS MUST ACHIEVE ON THE VARIOUS TESTS. SINCE THESE DECISIONS DEPEND STRONGLY ON THE DESIGN TOLERANCES PLACED ON THE SYSTEM, IT IS IMPORTANT TO ESTIMATE INsofar AS POSSIBLE THE EXPECTED DISTRIBUTION (OVER MANY CAMERA SYSTEMS) OF THE TEST OUTCOMES. THIS INFORMATION, TOGETHER WITH ESTIMATES OF THE PRODUCTION DIFFICULTY ASSOCIATED WITH THE GIVEN SET OF DESIGN TOLERANCES, WILL FORM THE BASIS FOR AN ACCEPTANCE TESTING PHILOSOPHY WHICH WILL GUARANTEE A SMOOTH FLOW OF SATISFACTORY SYSTEMS.

4. WORK ON THIS PROGRAM SHOULD COMMENCE IMMEDIATELY.

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8 JAN. IS SUGGESTED AS A DATE FOR PROGRESS DISCUSSIONS.

5. PROPOSED DEFINITION OF TERMS. TO FACILITATE DISCUSSIONS OF CAMERA PERFORMANCE, IT IS PROPOSED THAT IMAGE DEGRADING SOURCES BE CLASSIFIED AS EITHER "DETERMINISTIC" OR "STATISTICAL".

DETERMINISTIC SOURCES OF DEGRADATION ARE THOSE FIXED ALIGNMENT AND MANUFACTURING ERRORS THAT ARE WITHIN SPECIFIED TOLERANCES BUT NONETHELESS MAY ACT IN COMBINATION TO PRODUCE A MEASURABLE IMAGE DEGRADATION. INCLUDED IN THIS CLASS OF IMAGE DEGRADING SOURCES ARE THOSE ERRORS WHICH VARY IN A KNOWN, PREDICTABLE WAY WITH CAMERA OPERATING PARAMETERS.

6. A TYPICAL DETERMINISTIC DEGRADATION SOURCE IS ERROR IN THE DETERMINATION OF CAMERA FOCAL LENGTH. SINCE FOCAL

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LENGTH ENTERS IN THE CONSTANT OF PROPORTIONALITY BETWEEN OPTICAL BAR ROTATION RATE AND FILM DRIVE VELOCITY, THE FILM VELOCITY WILL ALWAYS BE BIASED OFF NOMINAL BY A DECREMENT RELATED IN A KNOWN FUNCTIONAL WAY TO V/H. FURTHERMORE, ALTHOUGH THE ERROR IN FOCAL LENGTH DETERMINATION MAY NOT BE KNOWN, IT IS INVARIANT FOR ANY GIVEN CAMERA SYSTEM. A SIMILAR EXAMPLE IS FILM DRUM MISALIGNMENT. ALTHOUGH THE AMOUNT OF MISALIGNMENT MAY DEPEND ON THE ANGULAR VELOCITY OF THE DRUM, IT IS CLEARLY CHARACTERISTIC OF A GIVEN CAMERA SYSTEM AND DOES NOT VARY IN A RANDOM FASHION THROUGHOUT THE OPERATIONAL LIFE OF THE CAMERA. THESE DETERMINISTIC ERRORS MAY NOT BE INDIVIDUALLY MEASURABLE NOR EVEN IF THEY ARE, IT IS NOT NECESSARILY DESIRABLE TO DESIGN THEM OUT OF THE SYSTEM. THE MAGNITUDE OF ANY PARTICULAR DEGRADATION SOURCE

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MAY ALSO CHANGE IN AN UNPREDICTABLE WAY FROM ONE CAMERA SYSTEM TO ANOTHER, BUT ALL ERROR SOURCES THAT ARE FIXED FOR A GIVEN SET OF CAMERA OPERATING PARAMETERS WILL BE CLASSIFIED AS DETERMINISTIC.

7. NOTE THAT DETERMINISTIC DEGRADATION SOURCES MAY BE EITHER STATIC OR DYNAMIC IN CHARACTER IN THE SENSE THAT IMAGE DEGRADATION FROM THE OPTICAL DESIGN DUE TO A PARTICULAR SOURCE WILL BE APPARENT WHEN THE CAMERA IS NOT IN OPERATION (SUCH AS MIRROR SURFACE IRREGULARITIES) OR ONLY WHEN THE CAMERA IS OPERATING (SUCH AS FOCAL LENGTH MEASUREMENT ERROR).

8. YOUR COMMENTS ARE SOLICITED.

END OF MESSAGE

J. Maxey
JACKSON D. MAXEY
 C/SPS/DDS&T
 RELEASING OFFICER

John J. Crowley
JOHN J. CROWLEY
 SPS/DDS&T
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Leslie C. Dirks
LESLIE C. DIRKS
 SPS/DDS&T
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