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28 May 1969

MEMORANDUM FOR: [REDACTED]

SUBJECT : NPIC Duping Studies

As you know, since the January 1969 CCB meeting, we have been working with NPIC in an attempt to get them to state their desires, needs, requirements, etc., relative to the dupe product. I believe that we are now well underway. On 27 May 1969, I had a meeting with [REDACTED] (NPIC Executive Director) and several of the senior officers of NPIC [REDACTED] etc.). At this meeting, [REDACTED] gave his full support to our intended studies and directed the members of his staff to actively work on what the Center wants on duplicates considering all the problems (image quality, tone reproduction, formatting, search versus targets, etc.)

Attached is a copy of a working paper which I put together (at [REDACTED] request) to guide the NPIC efforts. I believe that I did not say anything in the paper that you do not agree with or that you do not support.

[REDACTED]

CCB70SP

Attachment: A/S

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CORONA [REDACTED]

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CCB/NPIC

DUPLICATION STUDIES

1.0 INTRODUCTION

The [REDACTED] R&D CCB has requested NPIC (OSP twx no. [REDACTED] to perform studies to enable definition of NPIC's duping requirements. This request encompassed all aspects of the duplication problem including image quality, tone reproduction and formatting. NPIC twx no. [REDACTED] indicated that they would undertake such a study.

The CCB has been grappling with this problem as R&D proceeds at [REDACTED] in anticipation of [REDACTED]. They have been attempting to identify logical improvements in either duping equipment and/or techniques which would minimize the loss in image quality, and present to the PI a duplicate that contains the maximum possible information that technology can produce. In trying to identify solutions to the problem, however, it has become clear that the desires of NPIC be concisely stated. While it is realized that many of these "desires" are dependent on subjective evaluation, we would prefer to rely on NPIC's educated subjective evaluation and not someone else's (such as [REDACTED]).

2.0 THE PROBLEM

It is almost as difficult to state the problem clearly as it will be to obtain meaningful answers. One cannot over-emphasize the importance of careful consideration of duping requirements. It is a simple fact that the cost of satellite missions is too high to lose any information between the original and the duplicate. Further, as the quality of satellite systems improves, the ability to reproduce all the recorded information on the duplicate becomes more difficult. Studies conducted at AFSPPF, for example, clearly illustrate this problem. They have conducted analysis with both CORONA and [REDACTED] to evaluate the loss in resolution between the ON and DP and have reported the following information.

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CORONA

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CORONA (J-1)

In-Flight  
Camera Resolution

Loss in Resolution on Duplicate

63-77 1/mm	2 %
78-98 1/mm	9 %
99-120 1/mm	16 %

CORONA (J-3)

63-77 1/mm	12 %
78-98 1/mm	6 %
99-119 1/mm	6 %
120-140 1/mm	12 %

While this data does not completely agree with NPIC's assessment, the important observation is the disturbing trend to lose more resolution (percentage-wise) as performance increases. (NPIC agrees with this.) This is, of course, to be expected based on pure theoretical considerations\*. If one projected the indicated ON to DP losses to the [REDACTED] the numbers would be something like 25 to 30 per cent loss.

First, it should be stated that the question to be addressed is not to determine if there is a significant loss in current duplication. For this is not the main concern. The main concern, clearly stated, is that the Government no longer truly controls the type and quality of duplicates produced but is at the mercy of the prime processing contractor. The general effort, therefore, is directed toward allowing NPIC to be in a position to understand the duplication process and

\* In the case of CORONA, for example, the MTF of the 2430 is virtually equal to the nominal MTF of the camera system in question.

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hence allow them to specify what they want, regardless of current practices. This is not to say that current procedures and results are of no interest, because they certainly are. Before one can truly postulate specs, an understanding of current practices is essential. This leads one to attempt to define the major problems to be addressed.

### General Problem

The general problem is for NPIC to define the specifications for duplicates. These specifications fall into three categories; namely, (1) image quality, (2) tone reproduction (density, contrast) and (3) formatting. The three areas are not necessarily independent.

The general problem leads to some specific questions which should be addressed; for example,

A. Does NPIC want different duplicates (specs) for target readout than for search problems? We have applied this concept to other aspects such as data blocks, H.O.'s, etc., but not to the main use.

B. Does NPIC want the PAR 170B printer type product? This involves an assessment of "problems," if any, intra-frame in the current product.

C. Are their applications where enlargements would be preferred to contacts, particularly for target readout?

### Specific Questions

There are some specific problems that must be addressed; for example,

A. A primary question to be sorted out is how to measure the quality of a duping process. While much analysis has been done with CORN targets, this certainly is not the best way to investigate this problem. Ideally, subjective comparison techniques could be worked out that would allow some quantitative analysis of duping processes. Working out techniques for assessing the quality of duplicates is fundamental to this entire effort.

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B. Are the right kind of duplicates being made for the intended use? This is a question of sorting out how the duplicates are being used at all stations. For example, DP's should not be used for making paper prints. A secondary question is, do the specs change as the primary use changes?

C. Are we sending our "foreign" customers the correct dupes considering their use. [REDACTED] was a good example of this where it was recently determined that they were using a high contrast DP to make prints from when what they really wanted was a low contrast DN.

This is not an attempt to list all the relevant questions but only those that seem significant and would allow further thoughts and discussion.

### 3.0 ADDITIONAL NPIC ACTIONS

Other tasks are desired to be undertaken by NPIC in support of this effort. For example,

A. NPIC needs to support CCB activities more directly, particularly in those areas that effect processing and duplication. The PAR 170B printer is a good example. This was a device that would alter the duplicate with respect to current practices; yet when discussed, the CCB had no input from NPIC that would assist in making a decision. As a result, the CCB has deferred this item until NPIC takes a position. The point is that many proposed PARs are directly related to NPIC interests, and the Center should carefully evaluate these proposals and make recommendations to the Board.

B. In a similar vein, NPIC should be more forthright in suggesting PARs that should be undertaken, particularly in the area of duplicating studies. The Board is most anxious to have inputs from NPIC on efforts that would be of benefit to the using community. NPIC has never (to my knowledge) suggested a single PAR. In this area, particularly [REDACTED] might provide data that NPIC could use to evaluate duplicates. Westover should also be considered.

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