[redacted]

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17 October 1968

MEMORANDUM FOR: Deputy Director for Satellite Operations, NRO

SUBJECT : CORONA [redacted] Coverage Data for Photo Reconnaissance Study

REFERENCES : 1. [redacted]
2. [redacted]

INTRODUCTION

1. A study has been performed by the Design and Analysis Division in response to Reference 1, as modified by Reference 2. Both the CORONA and [redacted] systems were investigated in terms of their geometric accessibility to individual targets and their area search coverage capability of the Sino-Soviet Bloc. Results are presented in a format similar to that suggested in Reference 1.

2. The study consisted of the following specific items pertaining to both systems:

- Geometric accessibility to individual targets in the Sino-Soviet Bloc on both a quarterly and annual basis, quantified by latitude bands
- Area search capability against the current USIB requirements for the Sino-Soviet Bloc, based on the ETAC historical cloud cover data
- Area search capability against an increased frequency coverage requirement for the Sino-Soviet Bloc, based on ETAC historical cloud cover data
- Ground resolution variation with scan angle

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3. The current USIB area search requirements are for 80-90% of the built-up areas of the Sino-Soviet Bloc semi-annually, and 75% of the underdeveloped area annually. Coverage is to be 90-100% cloud-free stereo. The increased frequency coverage requirement is for 75% of the built-up areas of the Sino-Soviet Bloc quarterly, and 80-90% of the underdeveloped area semi-annually.

4. Reference 1 requested a break-out of results by full scan coverage and that which is six feet or better ground resolution. [redacted] and all CORONA photography poorer than six feet ground resolution. Therefore only a single set of results are shown.

STUDY ASSUMPTIONS

1. The search area model used in the study consisted of an area grid, with each grid being approximately 45 x 45 n. mi. in size. This grid corresponds to that used by the ETAC historical cloud cover data. Figure 1 displays these areas graphically. There are 3532 area grids in the built-up (semi-annual) search area, and 1053 area grids in the underdeveloped (annual) search area. The current CCRP target list was utilized for the individual target accessibility portion of the study.

2. Launch rates utilized were six successful 20-day missions per year for CORONA [redacted] Orbit characteristics are shown in Figure 2.

3. A simulation utilizing the actual geometric accesses and daily historical cloud cover data was used for the search area coverage portion of the study. This simulation does not consider use of film. Basically, missions are simulated with initiation on each day of the year. The results are then averaged statistically

[redacted]

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to determine expected accomplishment, determined on the basis of at least one access with cloud cover equal to or less than a specified number of eighths. Both 1/8 and 2/8 were utilized in this study. All study results are based on the ETAC 1962 historical cloud cover data, which is judged to be the most representative of the five year set currently available.

INDIVIDUAL TARGET ACCESSIBILITY

1. The geometric accessibility of individual targets in the Sino-Soviet Bloc is presented as a function of latitude band in Figure 3 for both the CORONA [redacted] systems. Clouds and illumination are not considered in this accessibility data. A constant interval launch schedule was utilized, resulting in the annual accessibility being four times the quarterly accessibility.

2. Figure 4 displays for both systems the average number of days between successive accesses of a target during an active mission as a function of target latitude. The precise number of days between successive accesses during a mission for a specific target will vary slightly with target longitude and orbit flown. This is easily visualized by considering the patterns of coverage overlap.

CORONA AREA SEARCH CAPABILITIES

- Current USIB Search Requirements

The CORONA system is capable of achieving the current USIB search requirements with the planned launch schedule, based on six 20-day active life J-3 missions per year with a full load of ultra-thin base film (UTB). Figures 5 and 6 show the average percent of the search areas accessed at least once with less than 1 (or 2) eighths of cloud cover as a function of active on-orbit days, as determined from the simulations. Also shown on

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these figures are the actual CORONA performance results as reported by COMIREX against the built-up and underdeveloped search areas, respectively. Numbers indicated next to each asterisk are the mission number of the last mission of the reporting period. Although the actual CORONA performance conforms more closely to the 1/8 line, it is felt that the best estimate of performance is near the 2/8's cloud cover line for the following reasons:

- Extensive simulations have verified this level of performance using [redacted] targeting techniques
- None of the actual performance data shown contained missions with a UTB film load
- The advent of the new command system and targeting software will improve the ability to photograph desired areas cloud-free
- A more extensive and accurate data base will be available for uniform performance accounting

o <u>Increased Coverage Frequency</u>

1. The CORONA system should be capable of accomplishing on the average about 55-65% of the built-up area on a quarterly basis, and about 75-85% of the underdeveloped area on a semi-annual basis, utilizing an annual launch rate of six 20-day missions per year. To achieve the desired 75% quarterly coverage of the built-up area, approximately 8-12 missions per year would be required, while 6-8 launches should achieve 80-90% of the underdeveloped area semi-annually.

2. These estimates are based primarily on active on-orbit days and cloud-free availability, and would of necessity require a larger film expenditure beyond that currently used for search.

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In addition, the scheduling of missions during periods of good weather and illumination would be important, especially for the high latitude areas. The amount of film required and the resultant degradation of performance against the other current coverage requirements for the CORONA system would require extensive analysis beyond the scope of this study.

[redacted] AREA SEARCH CAPABILITIES

- Current USIB Search Requirements

1. [redacted]

2. [redacted]

- [redacted]

1. [redacted]

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2. [redacted]

[redacted]

1. [redacted]

2. [redacted]

SIGNED

[redacted]

Chief, Design and Analysis Division
Office of Special Projects

Attachment: a/s

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Distribution:

[redacted]

ORIG:D&AD/OSP: [redacted] :4037: 17 October 1968

[redacted]

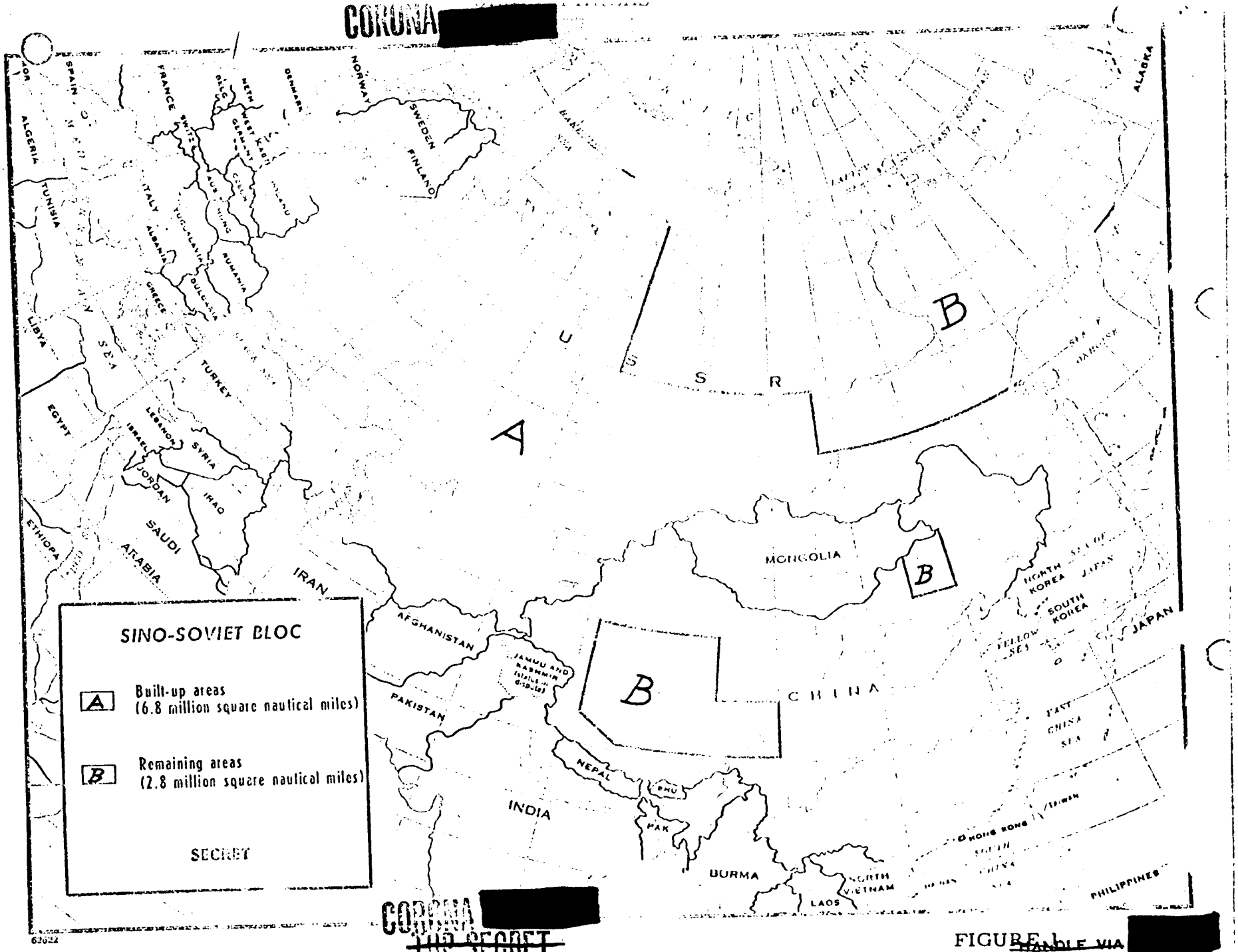


FIGURE [redacted]

~~HANDLE VIA~~ [redacted]
~~CONTROL SYSTEM ONLY~~

MISSION CHARACTERISTICS

PARAMETER	CORONA
Missions per Year	6
Mission Lifetime	20
Inclination	81.5
Perigee Altitude	85
Days Sync	11

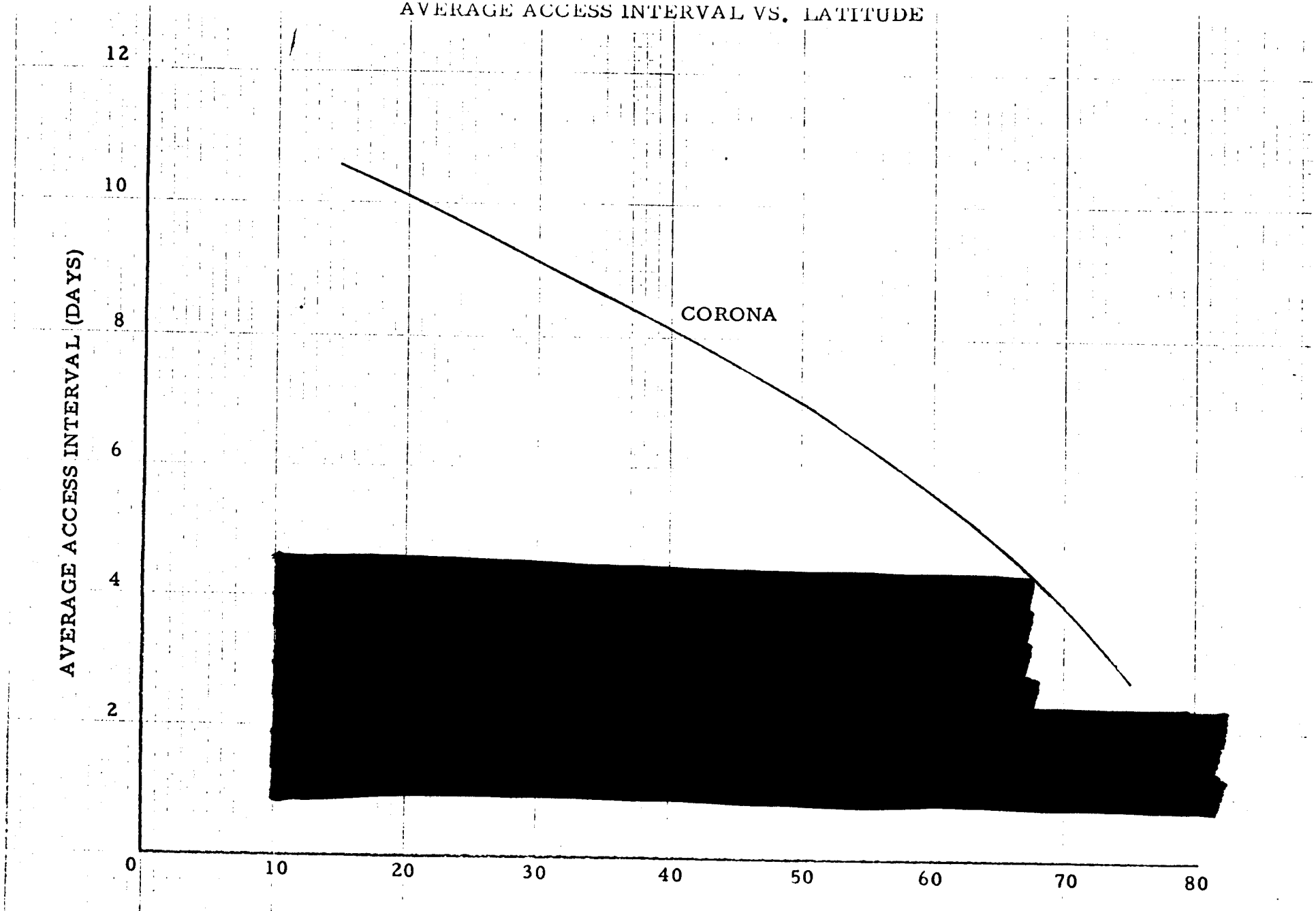
[redacted]

FIGURE 2

INDIVIDUAL TARGET ACCESSIBILITY

LATITUDE BAND (DEGS)	TOTAL TARGETS	QUARTERLY ACCESSES CORONA [redacted]	ANNUAL ACCESSES CORONA [redacted]
Above 70	11	120	480
60-70	211	1,530	6,120
50-60	2,429	11,670	46,680
40-50	1,602	6,240	36,960
30-40	614	2,220	8,880
20-30	321	960	3,840
Below 20	17	60	240
TOTALS	5,205	22,800	103,200

FIGURE 3



CORONA [redacted]
~~TOP SECRET~~

FIGURE 4

~~HANDLE VIA~~ [redacted]
~~CONTROL SYSTEM ONLY~~

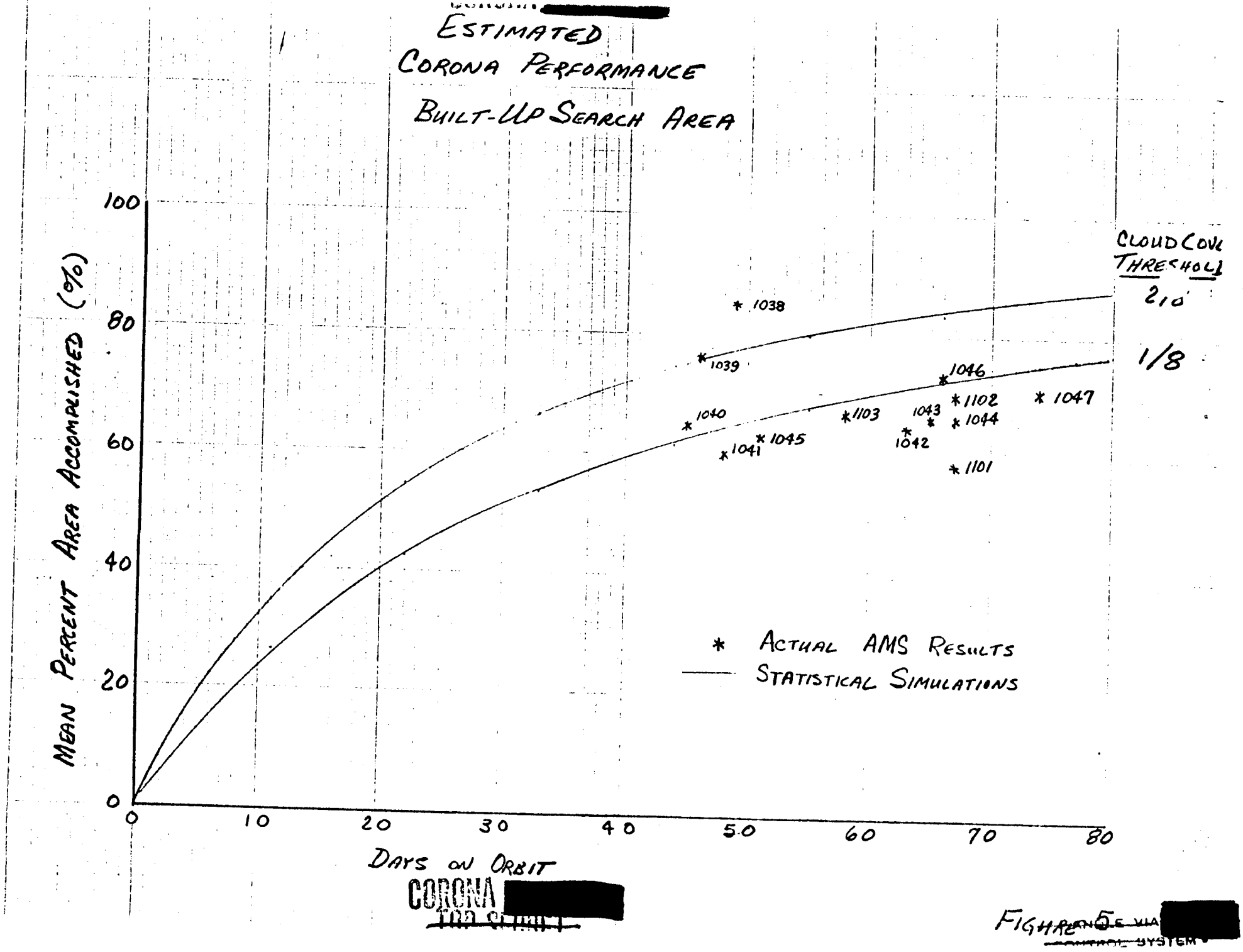
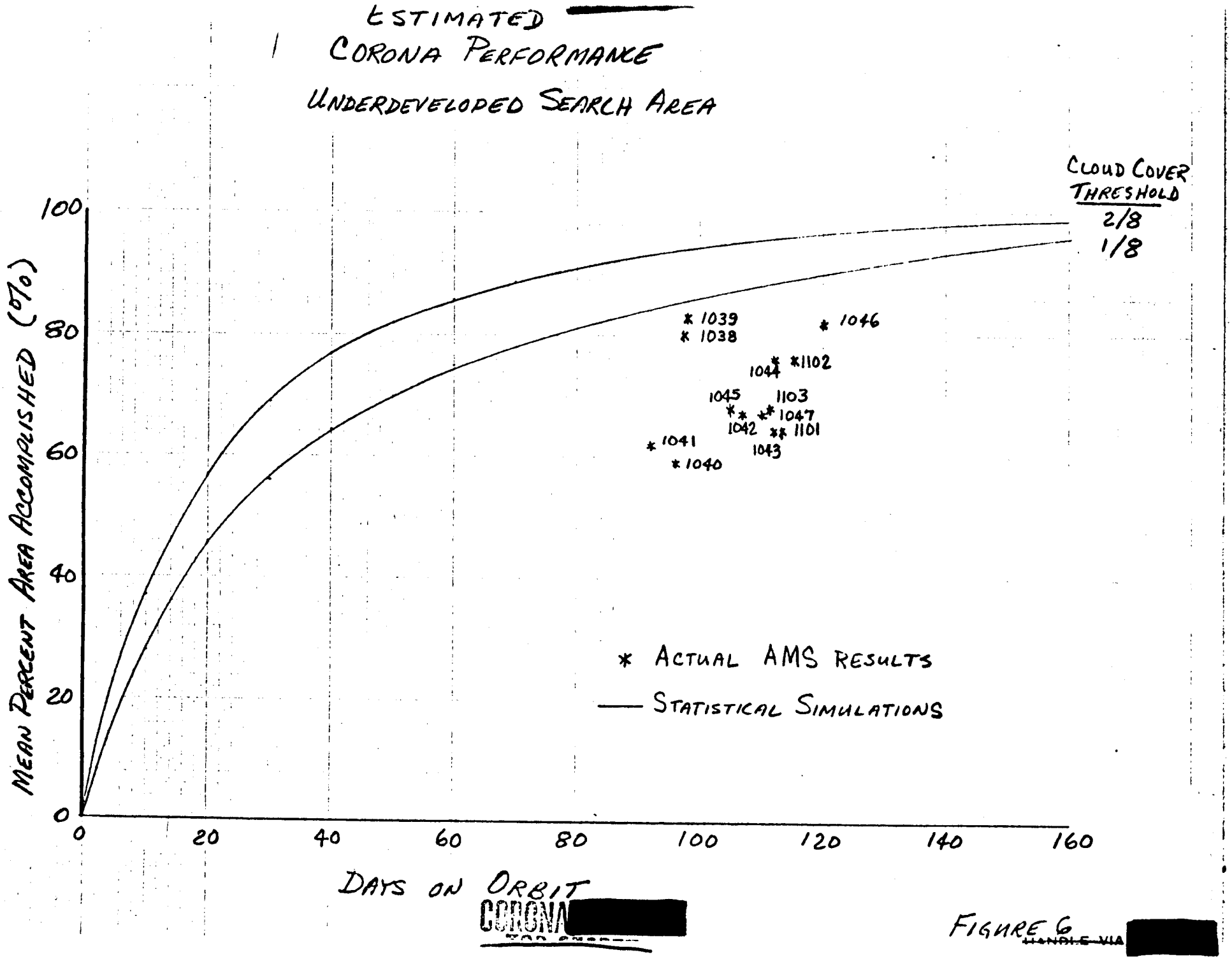


FIGURE 5 [redacted]



CORONA [redacted]
TOP SECRET

FIGURE 6 HANDLE VIA [redacted]

NOTICE OF REMOVED PAGES

Figures 7 through 8 are not provided because their full text does not contain CORONA, ARGON, LANYARD programmatic information.

GROUND RESOLUTION VS SCAN ANGLE

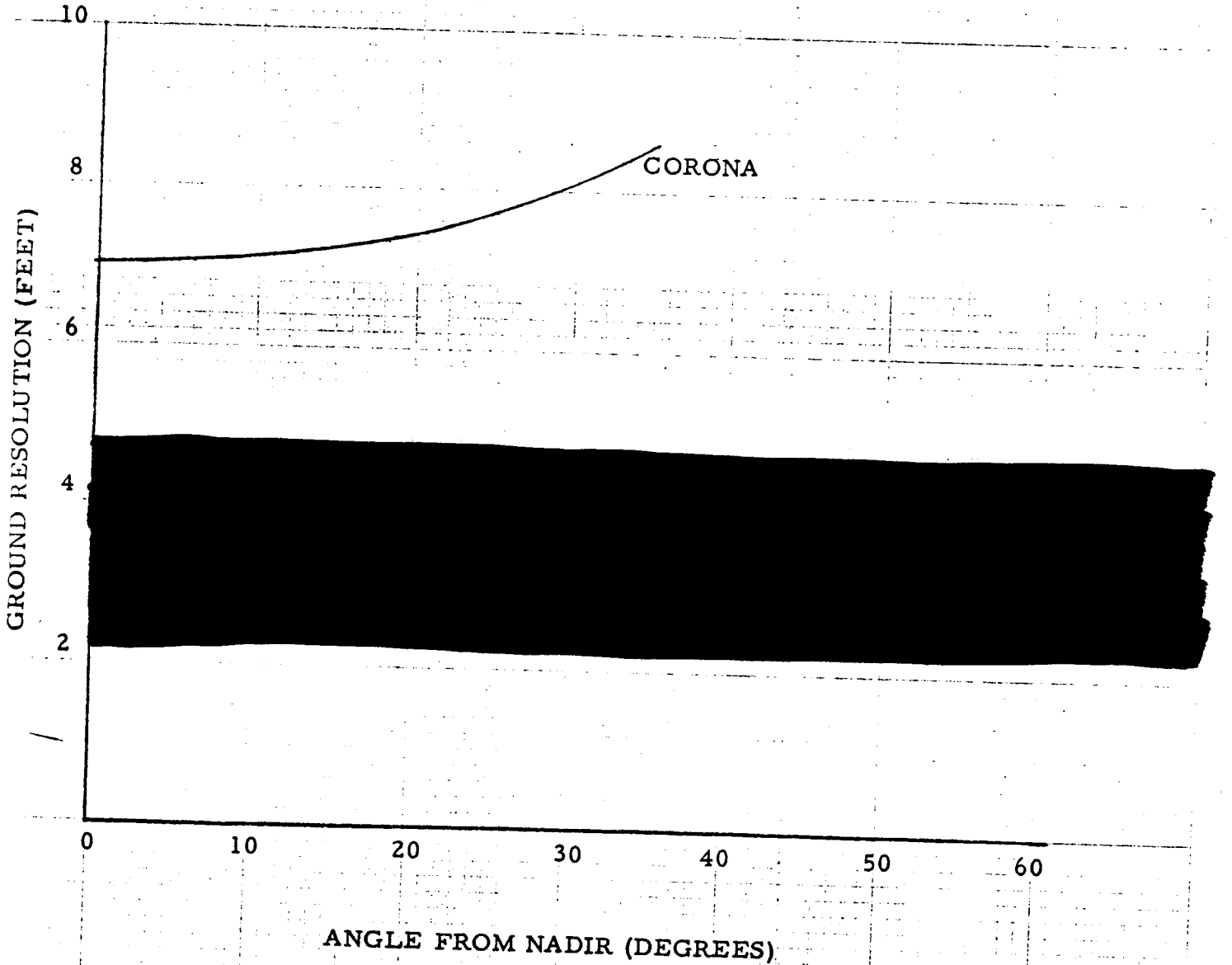


FIGURE 9