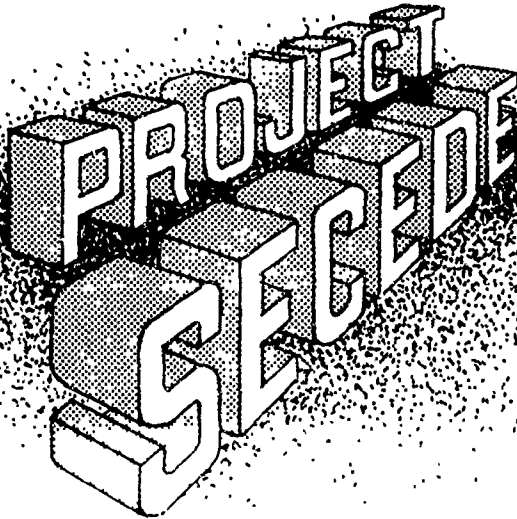


RADC-TR-71-215  
Final Technical Report  
March 1971



AD 737404

Prepared By  
Rome Air Development Center  
Air Force Systems Command  
Griffiss Air Force Base, New York 13440



PRELIMINARY SUMMARY OF OPTICAL RECORDS OBTAINED FROM 1971  
SECEDE II BARIUM RELEASE TEST SERIES

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| 13. ABSTRACT<br>Extensive optical measurements were made of the Phenomenological Development and Structural Characteristics of five primary and four secondary high altitude barium releases of the 1971 ARPA Project SECEDE II Test Program. The objectives of these measurements were to gather data on the morphological development, details on ion cloud striations, brightness profile vs time of the ion cloud emissions, and the development and motion history of the ion and neutral clouds.<br><br>To this end, a wide array of photographic instrumentation was deployed at six widely separated sites. The main content of this report is a compilation of data record summaries for each site and event. Also included are several selected black and white photographs of the different events. |  |  |

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PRELIMINARY SUMMARY OF OPTICAL DATA RECORDS OBTAINED FROM 1971  
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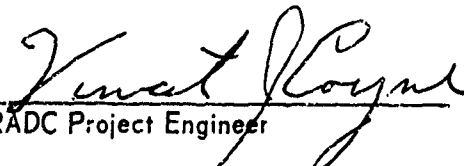
Contract Engineer: Robert Mather  
Phone: 315 330-3451

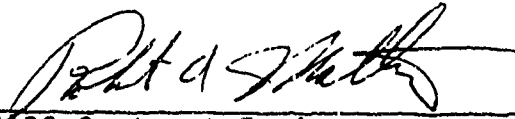
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PUBLICATION REVIEW

This technical report has been reviewed and is approved.

  
RADC Project Engineer

  
RADC Contract Engineer

PRELIMINARY SUMMARY OF  
OPTICAL DATA RECORDS OBTAINED  
FROM 1971 SECEDE II BARIUM  
RELEASE TEST SERIES

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## SECTION I

### INTRODUCTION

Extensive optical measurements were made of the phenomenological development and structural characteristics of five primary and four secondary high altitude barium releases of the 1971 ARPA Project Secede II Test Program. The overall goals of the optical measurements were to provide photographic data on the morphological development of the barium clouds, the detailed characteristics of ion cloud striations, the brightness profile and time history of the ion cloud emissions, and the relative development and geographical separation of the ion and neutral clouds for both the primary and secondary releases as a function of release altitude. The first two objectives are of particular importance to the radar and related experiments, whereas the latter two are of more significance to the theorists concerned with the general phenomenology of the large releases and the relative interaction of the atmosphere with the large and small (secondary) release clouds. To this end a wide array of photographic instrumentation was deployed at three primary optical sites and three secondary optical sites for the five twilight releases of Secede II. This instrumentation included high resolution cameras, wide angle tracking cameras, ion morphology cameras, and a variety of documentary cine and pulse cameras. Almost complete success was achieved in the operation of this instrumentation throughout the Secede test series. Appendix A contains a compilation of instrumentation plans which detail the pertinent parameters of the instrumentation used.

The purpose of this preliminary data report is to identify, insofar as is possible, what useful data was obtained so that this information can be disseminated to the Secede community for reference as quickly as possible. The main content of this report is therefore a compilation of data record summaries for each optical site for each barium release



event. In order to help in the interpretation of this information, a table listing the operational parameters of each event is presented as Table 1. Table 2 lists the geographical location of each fixed optical station. The relative location of the primary sites at Eglin AFB, Tyndall AFB, and Barin Field with respect to a nominal sub-release point are shown in Figure 1. A mobile van with a small array of optical instrumentation was pre-positioned in different locations for each barium event. Table 3 summarizes these positions. Table 4 is in effect a resume of Section III containing the record summary data and should be useful as a guide to the more detailed data in that section.

TABLE I  
SECEDE II OPERATIONAL DATA

| EVENT      | RELEASE<br>ALTITUDE<br>(km) | SUB-RELEASE<br>POSITION    | YIELD<br>(kgm) | DATE      | RELEASE TIME | SOLAR<br>ELEV. /AZ. |
|------------|-----------------------------|----------------------------|----------------|-----------|--------------|---------------------|
| NUTMEG I   |                             |                            | 48             | 16 Jan 71 | 17:34:40     | 6.0°/249.3          |
| NUTMEG II  |                             |                            | 1              | 16 Jan 71 |              |                     |
| PLUM I     | 185.9                       | 29° 52.1' N<br>86° 21.0' W | 48             | 20 Jan 71 | 17:47:06     | 7.9°/251.3          |
| PLUM II    | 184.6                       | 26° 47.3' N<br>85° 26.5' W | 1              | 20 Jan 71 |              |                     |
| REDWOOD I  | 258.6                       | 29° 41.3' N<br>86° 37.9' W | 48             | 26 Jan 71 | 17:52:08     | 7.7°/252.8          |
| REDWOOD II | 188.8                       | 28° 55.7' N<br>86° 27.4' W | 1              | 26 Jan 71 |              |                     |
| OLIVE I    | 192.5                       | 29° 49.0' N<br>86° 41.3' W | 336            | 29 Jan 71 | 17:53:57     | 7.5°/253.6          |
| OLIVE IV   | 187                         | 29° 23' N<br>86° 38' W     | 16             | 28 Jan 71 | 17:55:57     | 7.9°/253.8          |
| SPRUCE     | 192.6                       | 29° 43.1' N                | 48             | 01 Feb 71 | 17:52:04     | 6.7°/254.2          |

TABLE 2

## TIC OPTICAL SITE LOCATIONS

| <u>Site</u>       | <u>Location</u>    |
|-------------------|--------------------|
| Eglin AFB, C-6    | N30°34'<br>W86°13' |
| Tyndall AFB, 9702 | N29°58'<br>W85°28' |
| Barin Field, Ala. | N30°24'<br>W87°38' |
| Mobile Van        | --                 |
| Sumatra, Fla.     | N29°53'<br>W84°59' |
| Ft. Meyers, Fla.  | N26°39'<br>W81°43' |

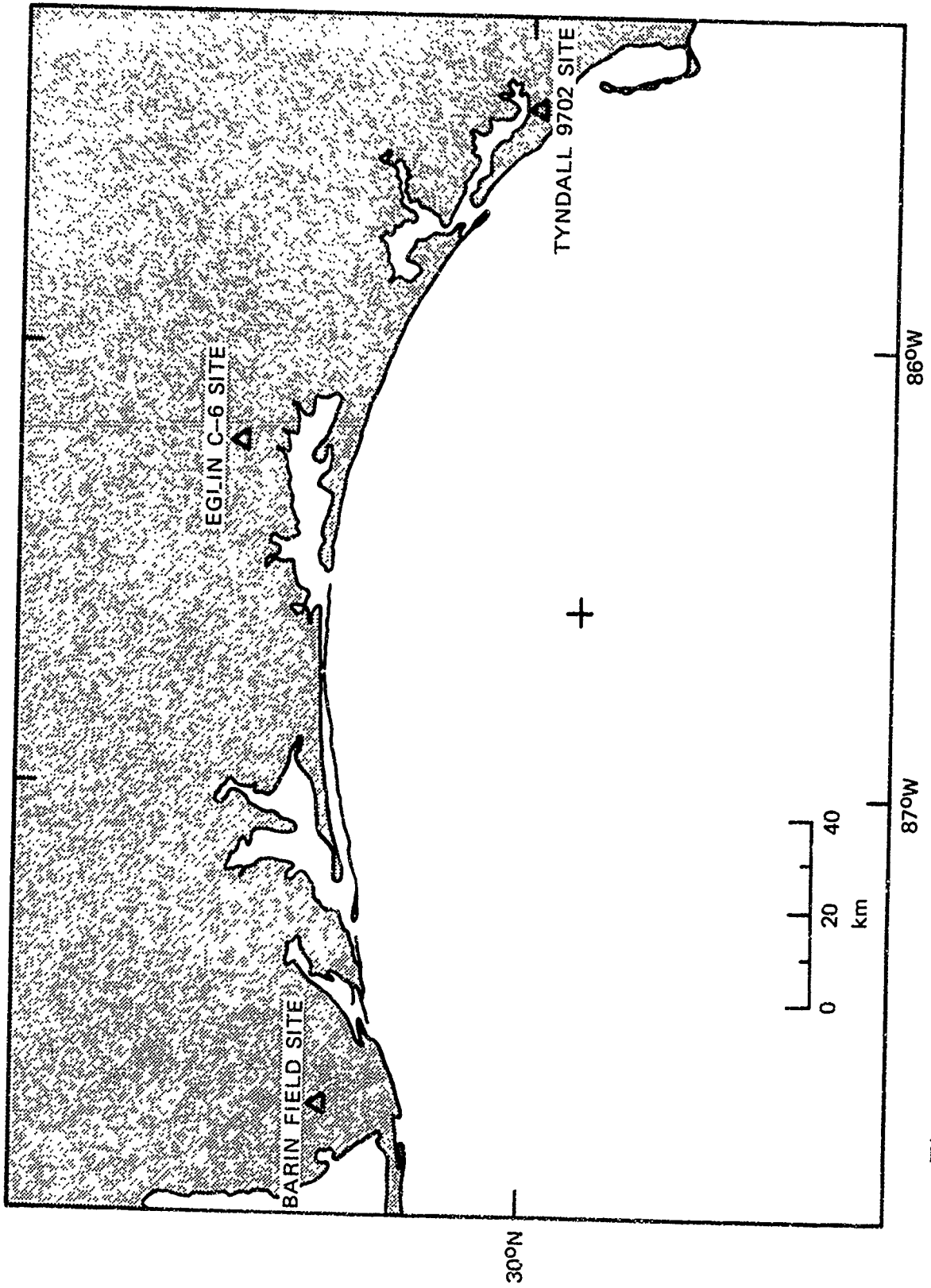


Figure 1. Planned View of Release Region Showing Primary Optical Site Locations.

TABLE 3  
TIC MOBILE VAN LOCATION FOR SECEDE II

| <u>EVENT</u> | <u>DATE</u>     | <u>GEOGRAPHICAL COORDINATES</u> |
|--------------|-----------------|---------------------------------|
| NUTMEG       | 16 January 1971 | 30° 23.2' N 86° 29.0' W         |
| PLUM         | 20 January 1971 | 30° 44.0' N 86° 10.0' W         |
| REDWOOD      | 26 January 1971 | 30° 58.2' N 86° 18.4' W         |
| OLIVE        | 29 January 1971 | 30° 38.5' N 86° 23.8' W         |
| SPRUCE       | 1 February 1971 | 30° 23.5' N 86° 28.5' W         |

TABLE 4

OPTICAL DATA VS. STATION SUMMARY

| <u>Event</u> | <u>High Resolution</u> | <u>Ion Filter</u> | <u>Morphology</u> | <u>Primary Triangulation</u> | <u>Puff Triangulation</u> | <u>Time Lapse</u> | <u>Cine</u> |
|--------------|------------------------|-------------------|-------------------|------------------------------|---------------------------|-------------------|-------------|
| NUTMEG       | E T                    | E T B             | E T M             | E T B                        | (E) T                     | S                 | M           |
| PLUM         | E T B                  | E T B             | E T M             | E T B                        | E T                       | E S (F)           | E M         |
| REDWOOD      | E (B)                  | E B               | E T M             | E T B                        | E T (B)                   | S (F)             | (M)         |
| OLIVE        | (E) T                  | E T B             | E T (M)           | E T B                        | E T B                     | S F               | M S F       |
| SPRUCE       | E T B                  | E T               | E T M             | E T B                        | --                        | E (F)             | E M S       |

E = Eglin (C-6) M = Mobile Van

T = Tyndall (9702) S = Sumatra

B = Barin Field F = Ft. Meyers

( ) = Limited Data

## SECTION II

### GENERAL COMMENTS

The vast amount of optical data obtained on each of the five high altitude barium releases will clearly be of benefit to both experimenters and theorists alike. Degradation of data due to natural cloud cover or sky background was very minimal. The geographical positions of the primary optical sites were such as to provide good complementary perspectives of the releases. The C-6 site at Eglin AFB was in several instances such as to be looking nearly up the field lines at or shortly subsequent to the time of striation formation. Figures 2 and 3 show the Plum I event as seen from Tyndall AFB. Figure 2 shows the ion cloud as the first striated structure has appeared at R + 8 minutes. (The spherical neutral cloud appears above the ion cloud in the perspective shown). Figure 3 shows the proliferation of such structure at R + 16 minutes.

Figure 4 shows the Redwood I ion cloud in the process of developing striations at about R + 21 minutes as seen from Eglin AFB C-6 site. This perspective was looking essentially up the field lines through the ion cloud. The approximate projected dimensions of two representative aspects of the striated structure are called out on the photograph.

Figures 5 and 6 show the Spruce ion cloud at different stages of development, again looking essentially up the field lines from the C-6 site. The figures represent R + 17 minutes and R + 21 minutes, respectively. In these figures, some spatial dimensions are also shown including the so called fine structure of the order of a few tens of meters.



Figure 2. PLUM EVENT, Tyndall AFB, R + 8 min. 9 sec.





Figure 3. PLUM EVENT, Tyndall AFB, R + 16 min. 1 sec.



Figure 4. REDWOOD EVENT, Eglin C-6 Site, R + 21 min. 56 sec.

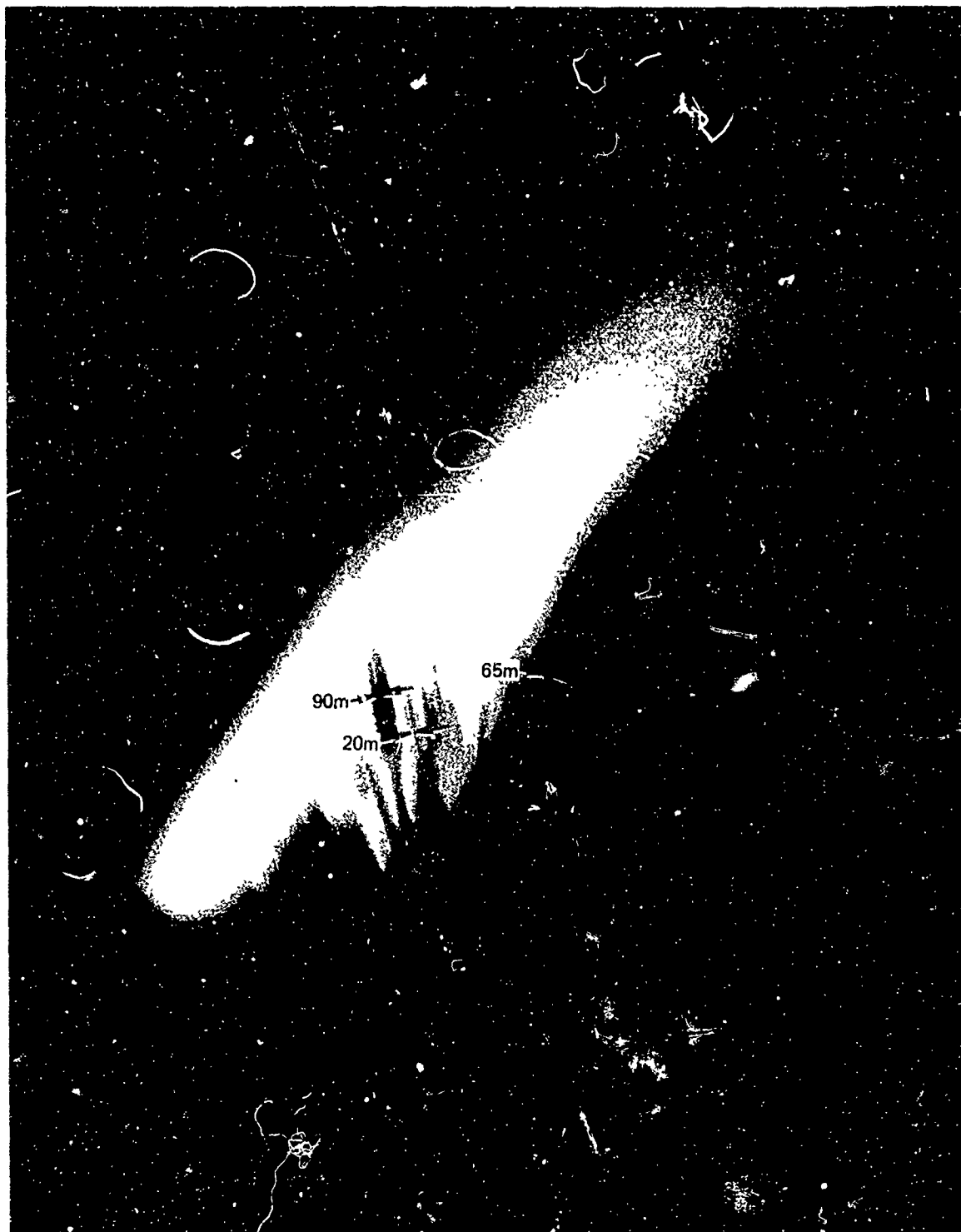


Figure 5. SPRUCE EVENT, Eglin C-6 Site, approx. R + 17 min. 30 sec.



Figure 6. SPRUCE EVENT, Eglin C-6 Site, approx. R + 21 min. 30 sec.

SECTION III

DATA RECORD SUMMARIES

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 16 January 1971      STATION: C-6  
 EVENT: Nutmeg      LOCATION: Eglin AFB, Fla.      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE            | RECORD SUMMARY  |
|------------|----------------------|---|
| 71311-B    | 2484/70mm 300mm f.l. | Very good high resolution data, fine structure in striations.             |
| 71311-A    | EF/70mm 300mm f.l.   | Very good high resolution data, fine structure in striations.             |
| 71313      | 2484/70mm 105mm f.l. | Good filter record (4554A)  |
| 71314      | EF/70mm 100mm f.l.   | Good morphology record, some natural clouds evident.                      |
| 71315      | SO397/5" 178mm f.l.  | Very good track data to end of record. Valuable as morphology record too. |
| 71316      | EF/70mm 50mm f.l.    | Fair to poor data on small cloud due to natural cloud cover.              |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 16 January 1971      STATION: 9702  
 EVENT: Nutmeg      LOCATION: Tyndall AFB      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE              | RECORD SUMMARY  |
|------------|------------------------|---|
| 71321      | EF/70mm    150mm f.l.  | Very good record of neutral and ion cloud, fine structure in striations. Natural clouds during first portion of record. |
| 71323      | 2484/70mm    75mm f.l. | Good filter record (4934A) with and without filter. Good structure.   |
| 71325      | EF/70mm    50mm f.l.   | Processing intermittently bad, but good track data of small cloud. Small cloud striation data good at late times.       |
| 71324      | SO397/5"    178mm f.l. | Very good primary cloud track record. Fine detail of early striations.  |
| 71322      | SO397/5"    308mm f.l. | Fine detail of striations throughout late times.  |

TECHNOLOGY INTERNATIONAL CORPORATION

DATA RECORD SUMMARY

OPERATION: Secede II

DATE: 16 January 1971

STATION: \_\_\_\_\_

EVENT: Nutmeg

LOCATION: Barin Field, Ala.

PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE           | RECORD SUMMARY   |
|------------|---------------------|--|
| 71331      | EF/70mm 254mm f.l.  | Good record overall, some good striation data. Natural clouds at early times.                                      |
| 71332      | 2484/70mm 75mm f.l. | Good filter record; shows ion cloud structure before and after striations.   |
| 71333      | SO397/5" 178mm f.l. | Very good track record in spite of extensive cloud obscuration throughout. Striations of about 100 meters evident. |



TECHNOLOGY INTERNATIONAL CORPORATION

DATA RECCRD SUMMARY

OPERATION: Secede II      DATE: 16 January 1971      STATION: \_\_\_\_\_  
 EVENT: Nutmeg      LOCATION: See Below      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO.            | FILM TYPE                 | RECORD SUMMARY   |
|-----------------------|---------------------------|--|
| 71341<br>(Mobile Van) | EF/70mm      75mm f.l.    | Good color record at late times. over-exposed at early times, clouds during much of time but structural data good. |
| 71342                 | 2484/35mm      100mm f.l. | Good B/W record showing striation structure with good definition.  |
| 71343                 | MS/16mm      25mm f.l.    | Fair cine record of early expansion.   |
| 71351<br>(Sunnatra)   | EF/35mm      50mm f.l.    | Good documentary record of neutral and ion cloud formation.  |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 20 January 1971      STATION: C-6  
 EVENT: Plum      LOCATION: Eglin AFB      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE            | RECORD SUMMARY   |
|------------|----------------------|--|
| 71411-A    | EF/70mm 300mm f.l.   | Very good high resolution record. Probe track seen at very late time.                      |
| 71411-B    | PXN/70mm 300mm f.l.  | Very good high resolution data of striations.  |
| 71413      | 2484/70mm 105mm f.l. | Very good filter record, shows striations in good detail (4554A)                           |
| 71414      | EF/70mm 100mm f.l.   | Excellent morphology record throughout. Early time asymmetry especially good.              |
| 71415      | SO397/5" 178mm f.i.  | Excellent track record, excellent striation and morphology data.                           |
| 71416      | EF/70mm 50mm f.l.    | Excellent track of puff release; shows development of puff striations very clearly.        |
| 71418      | EF/35mm 50mm f.l.    | Very good time lapse documentary, striated end of ion cloud falls off frame at late times. |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 20 January 1971      STATION: 9702  
 EVENT: Plum I      LOCAT N: Tyndall AFB      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE              | RECORD SUMMARY   |
|------------|------------------------|--|
| 71422      | SO397/5"    308mm f.l. | Good track, very good striation data.                                  |
| 71421      | EF/70mm    150mm f.l.  | Excellent resolution of striations and ion cloud structure throughout. |
| 71425      | EF/70mm    50mm f.l.   | Excellent puff cloud track, also shows development of striations.      |
| 71423      | 2484/70mm    75mm f.l. | Excellent filter record; very good striation data.                     |

TECHNOLOGY INTERNATIONAL CORPORATION

DATA RECORD SUMMARY

OPERATION: Secede II      DATE: 20 January 1971      STATION: \_\_\_\_\_  
 EVENT: Plum      LOCATION: Barin Field, Ala.      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE              | RECORD SUMMARY  |
|------------|------------------------|---|
| 71433      | SO397/5"    178mm f.l. | Very good track data, excellent striation data.                                   |
| 71431      | EF/70mm    254mm f.l.  | Very good striation data, some variations appear to be under 100 meters in width. |
| 71432      | 2484/70mm    75mm f.l. | Good filter record; no obvious striations.  |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 20 January 1971      STATION: \_\_\_\_\_  
 EVENT: Plum      LOCATION: See Below      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO.            | FILM TYPE            | RECORD SUMMARY   |
|-----------------------|----------------------|--|
| 71441<br>(Mobile Van) | EF/70mm 75mm f.l.    | Excellent morphology record, striation development extremely well documented.          |
| 71442                 | 2484/35mm 100mm f.l. | Excellent B/W record of striation structure.   |
| 71443                 | MS/16mm 25mm f.l.    | Good cine record, has zero time frame.   |
| 71451<br>(Sumatra)    | EF/35mm 50mm f.l.    | Very good documentary record throughout.   |
| 71461<br>(Ft. Meyers) | EF/35mm 100mm f.l.   | Good documentary, shows late time striations, some natural cloud obscuration at times. |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 26 January 1971      STATION: C-6  
 EVENT: Redwood      LOCATION: Eglin AFB      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE            | RECORD SUMMARY   |
|------------|----------------------|--|
| 71511-B    | 2484/70mm 300mm f.l. | Very good record, early series show striation ends well, late frames show some structure.  |
| 71513      | 2484/70mm 105mm f.l. | Good filter data, excellent record striation development.  |
| 71514      | EF/70mm 100mm f.l.   | Very good color morphology record throughout, shows initial sphere in good color, also horseshoe cloud, then striations. Satellite track seen. |
| 71516      | EF/70mm 50mm f.l.    | Very good track and morphology of small cloud. Large cloud included in FOV. Satellite track seen.  |
| 71511-A    | EF/70mm 300mm f.l.   | Excellent high resolution coverage of striation development in color.  |
| 71515      | SO397/5" 178mm f.l.  | Very good track and morphology record. Striation development well documented.  |
| 71519      | PXA/5" 178mm f.l.    | Same as above in B/W.  |

TECHNOLOGY INTERNATIONAL CORPORATION

DATA RECORD SUMMARY

OPERATION: Secede II      DATE: 26 January 1971      STATION: 9702  
 EVENT: Redwood      LOCATION: Tyndall AFB      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE           | RECORD SUMMARY   |
|------------|---------------------|--|
| 71522      | SO397-5" 300mm f.l. | Excellent morphology record - ends before onset of striations since camera changed to 7" system. |
| 71524      | SO397-5" 178mm f.l. | Very good track record of ion cloud. Excellent early time neutral cloud images showing color.    |
| 71523      | EF/70mm 75mm f.l.   | Very good morphology record. Good early time images (A/C navigational lights seen).              |
| 71525      | EF/70mm 50mm f.l.   | Excellent track record of puff cloud and neutral and ion separation.                             |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 26 January 1971      STATION: \_\_\_\_\_  
 EVENT: Redwood      LOCATION: Barin Field, Ala.      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE              | RECORD SUMMARY   |
|------------|------------------------|--|
| 71532      | 2484/70mm    75mm f.l. | Good filter record; some striations evident.                                       |
| 71533      | SO397-5"    178mm f.l. | Very good track record, small cloud data at early and late (1 frame only) time.    |
| 71531      | EF/70mm    254mm f.l.  | Good color record, shows striation development, images affected by exposure times. |



**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 26 January 1971      STATION: \_\_\_\_\_  
 EVENT: Redwood      LOCATION: See Below      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO.            | FILM TYPE            | RECORD SUMMARY  |
|-----------------------|----------------------|---|
| 71541<br>(Mobile Van) | EF/70mm. 75mm f.l.   | Excellent color morphology record. Striation "separation" from ion cloud very clearly defined. Satellite track seen.                    |
| 71542                 | 2484/35mm 100mm f.l. | Very good B/W record of striation development.  |
| 71543                 | EF/16mm 25mm f.l.    | Fair cine record of early expansion at 12 frames/sec.   |
| 71551<br>(Sumatra)    | EF/35mm 50mm f.l.    | Cine portion of record starts late. Remainder of record good documentary.   |
| 71561<br>(Ft. Meyers) | EF/35mm 100mm f.l.   | Fair documentary record overall. Very good early cine data at 5 f.p.s. Unusually good color exposure of early stabilized neutral cloud. |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 28 January 1971      STATION: C-6  
 EVENT: Olive      LOCATION: Eglin AFB      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE                 | RECORD SUMMARY   |
|------------|---------------------------|--|
| 71614      | EF/70mm      100mm f.l.   | Excellent morphology record showing contrast in development of different size releases. Late time development of large cloud striations shown well. Very strange shadow evident at lower (or southern) boundary of ion cloud. Vehicle track at early time. |
| 71613      | 2484/70mm      105mm f.l. | Very good filter record of large ion cloud. Shadow effect very pronounced.   |
| 71616      | EF/70mm      50mm f.l.    | Excellent morphology record obtained at constant intervals.  |
| 71611-A    | EF/70mm      300mm f.l.   | Excellent HR coverage of early time shows one or more vehicles leaving main burst (close to each other).   |
| 71611-B    | PXN/70mm      300mm f.l.  | Few frames - no outstanding data.  |
| 71611-C    | EF/70mm      300mm f.l.   | Few good frames of late time striations. Shadow very pronounced.   |
| 71615      | SO397/5"      178mm f.l.  | Probe seen entering and leaving at early times. Excellent early time images. Excellent track and overall morphology record of both releases. Shadow very distinct.   |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 28 January 1971      STATION: 9702  
 EVENT: Olive      LOCATION: Tyndall AFB      PROJ. ENGINEER: \_\_\_\_\_

Note: Some natural cloud obscuration during first 5-10 minutes.

| RECORD NO. | FILM TYPE           | RECORD SUMMARY  |
|------------|---------------------|---|
| 71621      | EF/70mm 150mm f.l.  | Very good record of primary event. Striations very distinct at late times. Excellent frames of small cloud striations interspersed. |
| 71623      | 2484/70mm 75mm f.l. | Excellent filter record (4554A) of both events. Late time striations quite distinct.  |
| 71625      | EF/70mm 50mm f.l.   | Very good morphology record with constant intervals between frames. Development of small cloud striations well documented.          |
| 71624      | SO397/5" 178mm f.l. | One vehicle (small release) evident. Good late time morphology. Good early time release images.                                     |
| 71622      | PXA/5" 308mm f.l.   | One vehicle track. Remaining record fair.   |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 28 January 1971      STATION: \_\_\_\_\_  
 EVENT: Olive      LOCATION: Barin Field, Ala.      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE               | RECORD SUMMARY   |
|------------|-------------------------|--|
| 71631      | EF/70mm    254mm f. l.  | Two vehicles seen at 4 and 7 o'clock at early time. Generally good record, although no striations seen. (Small cloud not evident.)   |
| 71632      | 2484/70mm    75mm f. l. | Good overall filter record (4554 A) of both clouds. Striations evident in small cloud.   |
| 71633      | SO397/5"    178mm f. l. | Main vehicle tracked before first detonation. Second vehicle with flashing light tracked into (?) main burst region, and out (?) of main burst. Excellent track and morphology record. Small cloud striations well documented. |
| 71634      | PXA/5"    306mm f. l.   | Two vehicle tracks evident. Overall data: good coverage of small cloud striations, large cloud striations not evident.   |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II  
EVENT: Olive

DATE: 28 January 1971  
LOCATION: See Below

STATION: \_\_\_\_\_  
PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO.            | FILM TYPE            | RECORD SUMMARY   |
|-----------------------|----------------------|--|
| 71641<br>(Mobile Van) | EF/70mm 75mm f.l.    | Good morphology record, natural cloud obscuration in mid-portion.  |
| 71642                 | 2484/35mm 100mm f.l. | Good B/W record except for natural clouds, some striations at late times.  |
| 71644                 | SO397 500mm f.l.     | Small field of view, long exposure, and clouds minimize data value.  |
| 71643                 | EF/16mm 25mm f.l.    | Very good cine record of early release history, second and third releases documented clearly.  |
| 71651<br>(Sumatra)    | EF/35mm 50mm f.l.    | Good documentary record of primary release. Slightly overexposed throughout.   |
| 71661<br>(Ft. Meyers) | EF/35mm 100mm f.l.   | Good cine record from beginning (5 fps.). Shows all 3 late releases. Good documentary coverage of morphology of main and fourth release although resolution only fair. |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 1 February 1971      STATION: C-6  
 EVENT: Spruce      LOCATION: Eglin AFB      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE            | RECORD SUMMARY   |
|------------|----------------------|--|
| 71714      | EF/70mm 100mm f.l.   | Excellent morphology record. Shows development of striations up field lines, shows rayed shadow of ion cloud against neutral cloud. Frames 176, 177, 178 show flashing light at R +25 min. |
| 71711-A    | EF/70mm 300mm f.l.   | Good record of development and hardening of ion cloud  |
| 71711-B    | PXN/70mm 300mm f.l.  | Excellent B/W record of striation development, fine structure clearly evident  |
| 71711-C    | EF/70mm 300mm f.l.   | (Same as -B)(in color) Flashing light in late frame  |
| 71713      | 2484/70mm 105mm f.l. | 4934A Filter - Excellent record throughout, shows multiple structure in ion cloud shadow   |
| 71716      | EF/70mm 50mm f.l.    | Very good morphology record of ion with neutral cloud at constant 5 sec. intervals. Flashing light trajectory shown. Moon evident  |
| 71715      | SO-397/5" 178mm f.l. | Very good track record. Good track of flashing lights (red and blue)   |
| 71718      | EF/35mm 50mm f.l.    | Excellent time lapse documentary record  |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 1 February 1971      STATION: 9702  
 EVENT: Spruce      LOCATION: Tyndall AFB      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE           | RECORD SUMMARY  |
|------------|---------------------|---|
| 71721      | EF/70mm 150mm f.l.  | Excellent morphology of striation development. Very fine structure evident ~ 100 meters. Moon reflections in lens prominent but do not seem to degrade HR data. Good early frames also. |
| 71723      | 2484/70mm 75mm f.l. | Very good filter record. Shows striations at 4554A, fine structure ~ 200-400 meters.  |
| 71725      | EF/70mm 50mm f.l.   | Interesting record, good small scale, wide angle coverage of event. Effect of moon severe.  |
| 71722      | SO397/5" 308mm f.l. | Excellent morphology record, good definition of striation effect particularly at late times. Effect of moon not very severe.  |
| 71724      | SO397/5" 178mm f.l. | Very good track record. Also shows good definition of striation development.  |

**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 1 February 1971      STATION: \_\_\_\_\_  
 EVENT: Spruce      LOCATION: Barin Field, Ala.      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO. | FILM TYPE           | RECORD SUMMARY   |
|------------|---------------------|--|
| 71731      | EF/70mm 254mm f.l.  | Excellent late time high resolution data.  |
| 71733      | SO397/5" 178mm f.l. | Excellent track and late time morphology record. Very good detail of striation formations. |
| 71734      | PXA/5" 307mm f.l.   | Very good B/W record of striations at late times. Should densitometer well.                |



**TECHNOLOGY INTERNATIONAL CORPORATION**  
**DATA RECORD SUMMARY**

OPERATION: Secede II      DATE: 1 February 1971      STATION: \_\_\_\_\_  
 EVENT: Spruce      LOCATION: (See below)      PROJ. ENGINEER: \_\_\_\_\_

| RECORD NO.            | FILM TYPE                | RECORD SUMMARY  |
|-----------------------|--------------------------|---|
| 71741<br>(Mobile Van) | EF/70mm      75mm f.l.   | Excellent morphology record showing both neutral and ion cloud. Ion cloud striation development very well recorded with very good resolution. No significant moon effect. |
| 71742                 | 2484/35      100mm f.l.  | Good B/W total light record showing striation development very clearly. Good structure evident.   |
| 71744                 | SO397/5"      500mm f.l. | Good record. Long exposure time (15 sec) degrades sharpness of striations.  |
| 71743                 | EF/16mm      25mm f.l.   | Good cine record of early expansion of release to about R +120 sec at about 12 frames per sec.  |
| 71751<br>(Sumatra)    | EF/35mm      50mm f.l.   | Good cine record of expansion, showing good color asymmetry at about 5 frames per sec.  |
| 71761<br>(Ft. Meyers) | EF/35mm      100mm f.l.  |   |

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APPENDIX A

INSTRUMENT PLANS

# INSTRUMENT PLAN

OPERATION: SECEDE II

DATE: January-February 1971

STATION: C-6

EVENT: ALL

LOCATION: Eglin AFB

PROJ. ENGINEER: \_\_\_\_\_

| POSITION | INSTRUMENT       | FOCAL LENGTH | FILTER             | FILM                        | f/n  | SHUTTER/RATE      | REMARKS       |
|----------|------------------|--------------|--------------------|-----------------------------|------|-------------------|---------------|
| 11       | H-B / Delft      | 300mm        | --                 | EF-475 / 2484<br>70mm x 15' | 0.9  | variable          | FOV 12°       |
| 12       | Canon 7s / Canon | 50mm         | --                 | 2484<br>35mm x 50 exp.      | 0.95 | variable          | FOV 26° x 40° |
| 13       | B-C / Delft      | 105mm        | 4554Å <sup>o</sup> | 2484 Sp. 475<br>70mm x 150' | 0.75 | variable          | FOV 21°       |
| 14       | B-C / Deltamar   | 100mm        | --                 | EF-475<br>70mm x 100'       | 1.4  | variable          | FOV 32° x 42° |
| 15       | K-46 / Ektar     | 178mm        | --                 | SO 397<br>5" x 100'         | 2.5  | 5-10 sec.         | FOV 36° x 36° |
| 16       | B-C / Canon      | 50mm         | --                 | EF-475<br>70mm x 100'       | .95  | 5-10 sec.         | FOV 46°       |
| 18       | FR IV-C/Canon    | 50mm         | --                 | EF-5241                     | .95  | cine-<br>2-5 sec. | FOV 20° x 26° |
| 19       | K-46/Ektar       | 178mm        | --                 | PXA 5" x 100'               | 2.5  | 5-10 sec.         | FOV 46°       |

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## INSTRUMENT PLAN

OPERATION: SECEDE II

DATE: January-February 1971

STATION: 9702

EVENT: ALL

LOCATION: Tyndall AFB

PROJ. ENGINEER: \_\_\_\_\_

| POSITION | INSTRUMENT   | FOCAL LENGTH | FILTER             | FILM                       | f/n  | SHUTTER/RATE | REMARKS       |
|----------|--------------|--------------|--------------------|----------------------------|------|--------------|---------------|
| 21       | B-C / Delft  | 150mm        | --                 | EF-475<br>70mm x 100'      | 0.75 | variable     | FOV 21°       |
| 22       | K-46 / Ektar | 300mm        | --                 | SO 397<br>5" x 100'        | 2.5  | 5-10 sec.    | FOV 21° x 21° |
| 23       | B-C / Farron | 76mm         | 4934A <sup>o</sup> | 2484 Sp 475<br>70mm x 150' | .87  | variable     | FOV 30°       |
| 24       | K-46 / Ektar | 152mm        | --                 | SO 397<br>5" x 100'        | 2.5  | 5-10 sec.    | FOV 36° x 36° |
| 25       | B-C / Canon  | 50mm         | --                 | EF 475<br>70mm x 100'      | .95  | 5-10 sec.    | FOV 46°       |

ADDITIONAL INFORMATION:

## INSTRUMENT PLAN

OPERATION: SECEDE II

DATE: January-February 1971

STATION: \_\_\_\_\_

EVENT: ALL

LOCATION: Barin Field, Ala.

PROJ. ENGINEER: \_\_\_\_\_

| POSITION | INSTRUMENT   | FOCAL LENGTH | FILTER | FILM                       | f/n  | SHUTTER/RATE | REMARKS       |
|----------|--------------|--------------|--------|----------------------------|------|--------------|---------------|
| 31       | B-C / Delft  | 254mm        | --     | EF-477<br>70mm x 100'      | 2.1  | variable     | FOV 13° x 18° |
| 32       | B-C / Farron | 76mm         | 4554 Å | 2484 Sp 475<br>70mm x 100' | 0.87 | variable     | FOV 30°       |
| 33       | K-46 / Ektar | 178mm        | --     | SO 397<br>5" x 100'        | 2.5  | 5-10 sec.    | FOV 36° x 36° |
| 34       | K-46 / Ektar | 306mm        | --     | PXA 5" x 100'              | 2.5  | 5-10 sec.    | FOV 21° x 21° |

ADDITIONAL INFORMATION:

# INSTRUMENT PLAN

OPERATION: SECEDE II

DATE: January 1971

STATION: Mobile Van

EVENT: ALL

LOCATION: Eglin AFB Area

PROJ. ENGINEER: \_\_\_\_\_

| POSITION | INSTRUMENT      | FOCAL LENGTH | FILTER | FILM                   | f/n | SHUTTER/RATE | REMARKS       |
|----------|-----------------|--------------|--------|------------------------|-----|--------------|---------------|
| 41       | PS-10F/Deltamar | 75mm         | --     | EF-477<br>70mm x 100'  | 1.7 | 5-10 sec.    | FOV 42° x 42° |
| 42       | Canon 7s/Canon  | 100mm        | --     | 2484<br>35mm x 50 exp. | 2.0 | variable     | FOV 20° x 26° |
| 43       | AN-N6           | 25mm         |        | EF 16mm x 50'          | 1.8 | 12 fps       | FOV 9° x 12°  |
| 44       | K-46/B & L      | 500mm        |        | SO397<br>5" x 100'     | 5.6 | 15 sec.      | FOV 12° x 12° |

ADDITIONAL INFORMATION:

# INSTRUMENT PLAN

OPERATION: SECEDE II      DATE: January 1971      STATION: SRI      X Site #4  
 EVENT: ALL      LOCATION: Sumatra, Fla.      PROJ. ENGINEER: \_\_\_\_\_

| POSITION | INSTRUMENT     | FOCAL LENGTH | FILTER | FILM              | f/n | SHUTTER/RATE         | REMARKS       |
|----------|----------------|--------------|--------|-------------------|-----|----------------------|---------------|
| 51       | FR-IVC / Canon | 50mm         | --     | EF<br>35mm x 100' | .95 | Cine-<br>2-5-10 sec. | FOV 20° x 26° |

ADDITIONAL INFORMATION:

# INSTRUMENT PLAN

OPERATION: SECEDE II      DATE: January 1971      STATION: S-2  
 EVENT: AL/L      LOCATION: Ft. Meyers      PROJ. ENGINEER: Pitts

| POSITION | INSTRUMENT     | FOCAL LENGTH | FILTER | FILM              | f/n | SHUTTER/RATE       | REMARKS       |
|----------|----------------|--------------|--------|-------------------|-----|--------------------|---------------|
| 61       | FR-IVC / Canon | 100mm        | --     | EF<br>35mm x 100' | 2.0 | Cine-<br>5-10 sec. | FOV 10° x 13° |

ADDITIONAL INFORMATION: