[redacted]

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Handle via [redacted]
Control System

MENSURATION OF ICE FEATURES TASK

[redacted]

[redacted]

Prop Sec

NOTE

The work proposed herein must be performed in accordance with the security classification of the source material. The [redacted] cannot be responsible for obtaining a different security classification for the data produced.

I. INTRODUCTION

It is the aim of [redacted] to produce information that can be used in conjunction with larger scale detail, meteorological information, oceanograp knowledge and under ice information. The broad area information to be derivec will serve as an excellent base for compiling these other ice parameters. In addition, the information to be obtained will bring forth concepts never before realizable. These data will complement the existing body of information concer the Arctic Ice.

II. WORK TO BE DONE

The main concern of this task is the derivation of small scale quantitative information. It is not the aim of this work to investigate causal considerations or to obtain detailed qualitative information. The individual sequential functions shown in Figure 1 provide an efficient flow of data emphasis quantitative information production.

The efficient accomplishment of the work to be done presupposes discussions of the personnel assigned to the task with qualified Naval ice forecasters and research personnel. In addition, it should be noted that the working material has resolution limitations that will limit the detail derivable.

A. Working Material Selection

The initial function of the task is concerned with obtaining the usable materials from the data available. A scan and study of the existing plot sheets of runs #1 and #2 will be made. Figure #2 illustrates the areas known to have usable coverage available.

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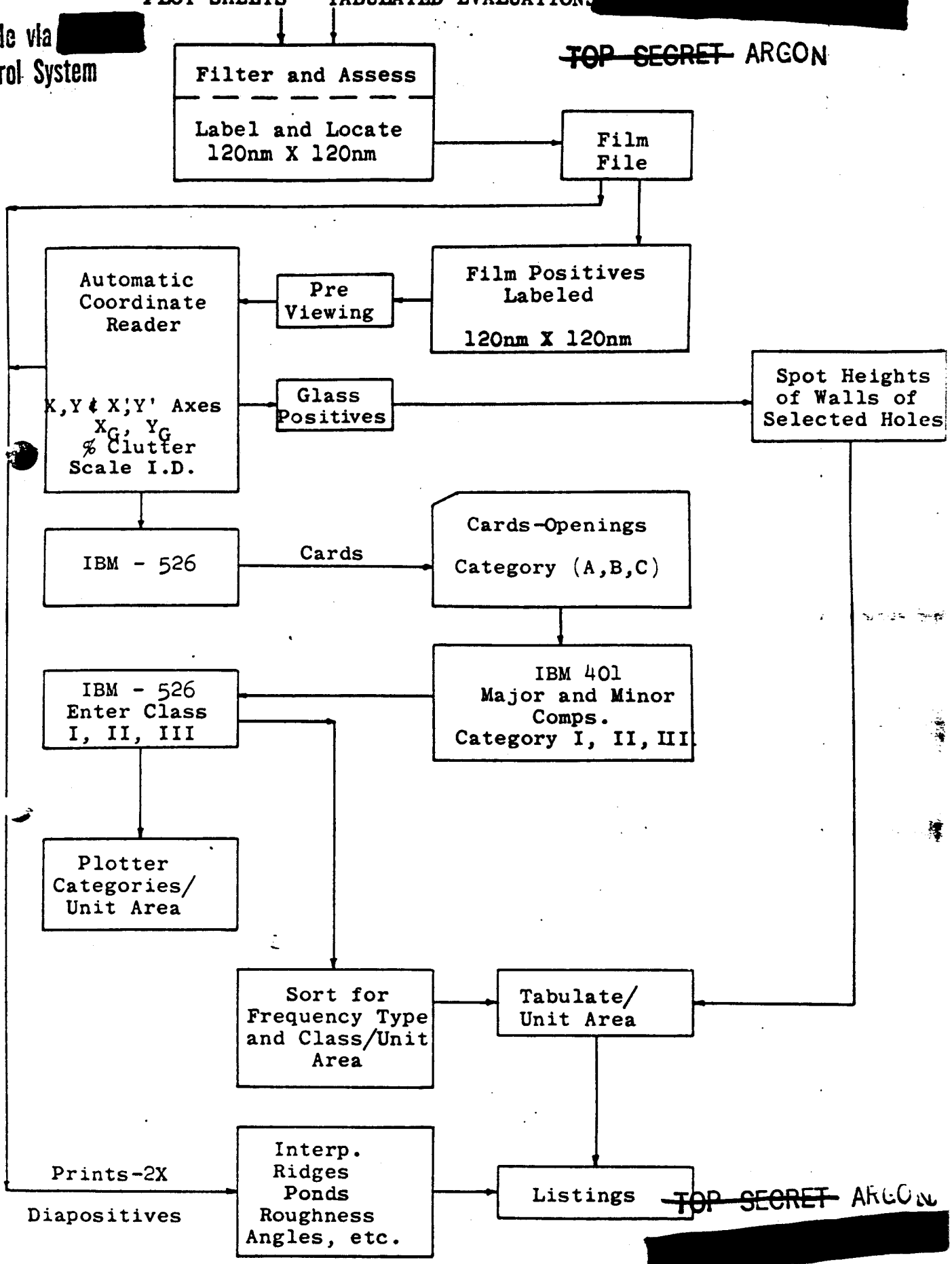

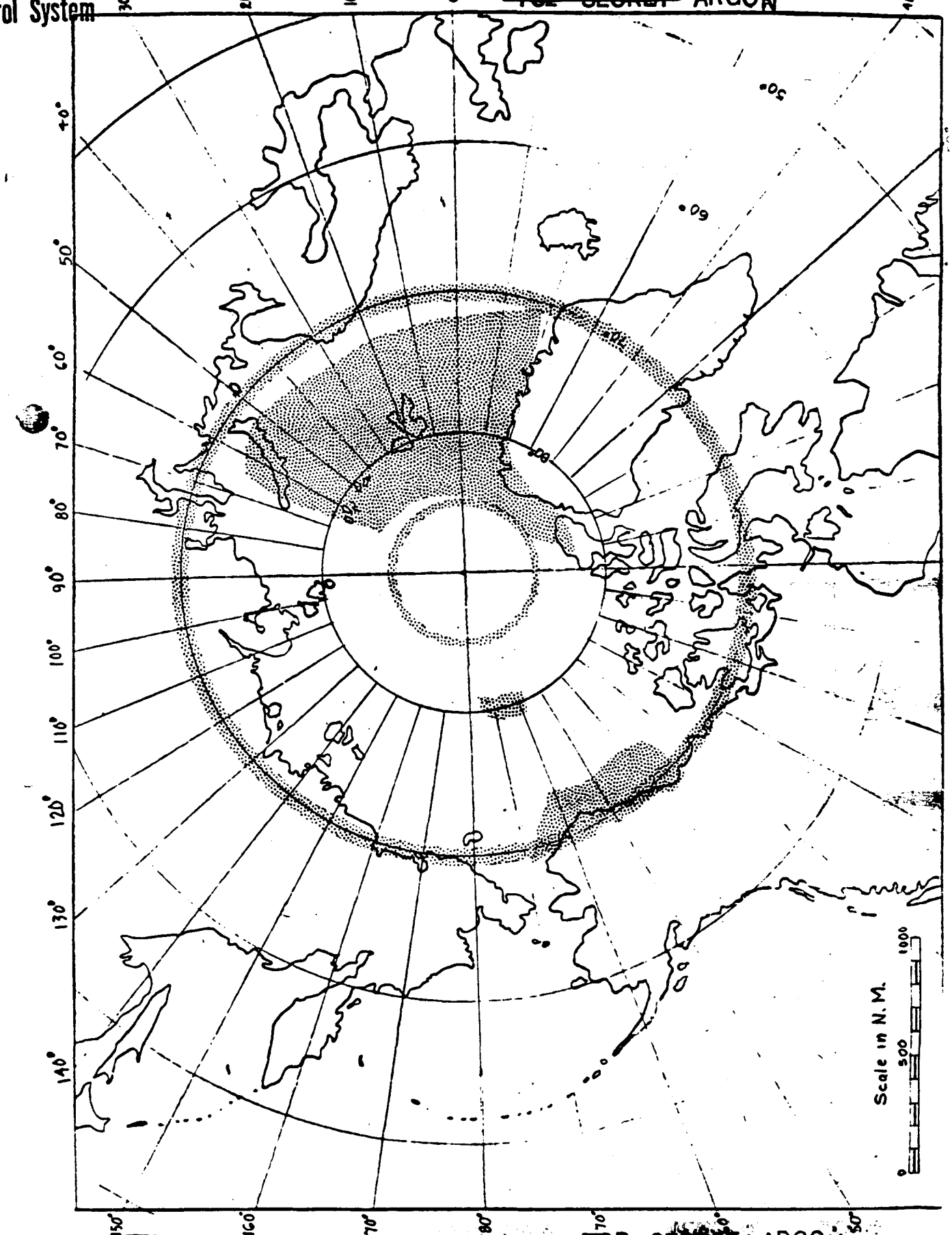
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It is estimated that some 1700 frames fall into the area of interest. Once the applicable frames are identified, their identity will be used to derive positional data and a quality evaluation. Both of these frame parameters are available from information now at [redacted]. This initial filtering process is expected to yield approximately 250 frames to be usable in subsequent operations.

These 250 frames will be reproduced in film positives format, and will constitute the working material. Following this laboratory processing 120 nm x 120 nm unit work areas will be established and labeled. It should be noted that due to the convergence and consequent overlap of coverage the work areas are expected to number approximately 350-500. The actual interpretation and mensuration task can then commence.

B. Derivation of Ice Canopy Parameters

The primary area of interest on the ice canopy is the measurement and plotting per basic unit area of surfaceable water openings completely or partially open. This portion of the measurements will be made on an Automatic Coordinate Reader. This viewing/mensuration equipment will produce rectangular coordinates at the extremeties of the minor and major axes of the openings. These rectangular coordinates provide inputs for subsequent computations to produce actual lengths of the axes.

A measure of the clutter within these openings will be made at this time and noted by the operator. The amount of clutter will be designated in 1/3's.

The identification of the unit area, the coordinates of the opening centroids within the unit area, the coordinates of the extremeties of the major

[redacted]d minor axes, coordinates of the opening centroid as well as the amount of clutter/opening will be recorded on each card. These notations will be referenced to an established grid. A card will be provided for every significan ice opening. All of these notations will be made on an IBM-526 from the Automatic Coordinate Reader.

Several ancillary products will be derived while viewing takes place. Selected openings having a datum (sea level) available will be referred to a Stereo-Method for determining Z (elevation measures) of the walls. Those areas exhibiting recognizable features of signifiance will be selected for detailed unit area interpretation (see figure 1).

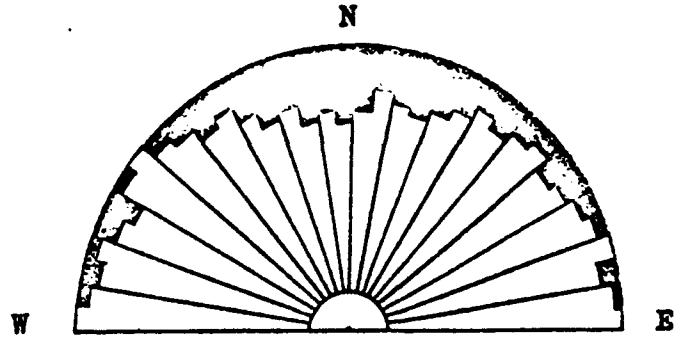
1. Computations

A primary 1401 program will take the coordinates of the extremes of the major and minor axes of the openings and convert them to actual ground distances. This computational function will yield a classification of the openings into the three size categories. These categories will be then entered on the identified cards of the unit areas. This function will be accomplished on the IBM 526. This notation will be the last made on each surface opening card. A study will determine the optimum method for obtaining ground distance.

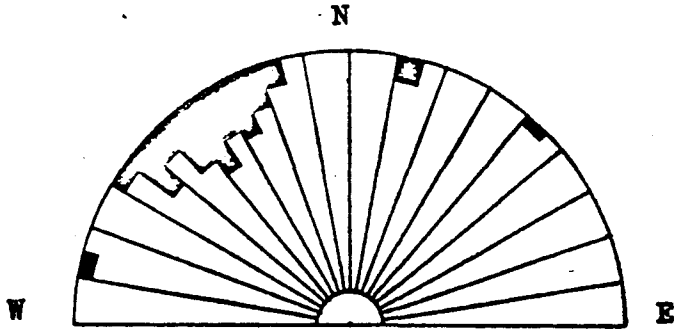
2. Sorting

Simplified sorting of the cards by category will yield the frequency and distribution of categories within any given unit area (see figure : A number of additional sorting criteria will be made in order to extract the maximum potential of the cards (see figure 4).

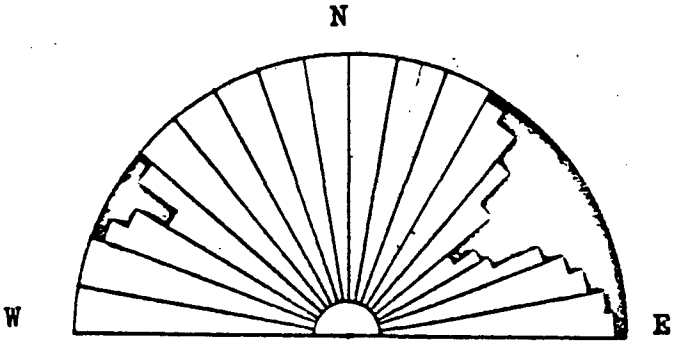
Directional Frequency of Water Openings Per Unit Area



Major Axis Greater Than
100 yds.



Major Axis Greater Than
200 yds.



Major Axis Greater Than
300 yds.

FIGURE 3 FREQUENCY DISTRIBUTION DIAGRAM

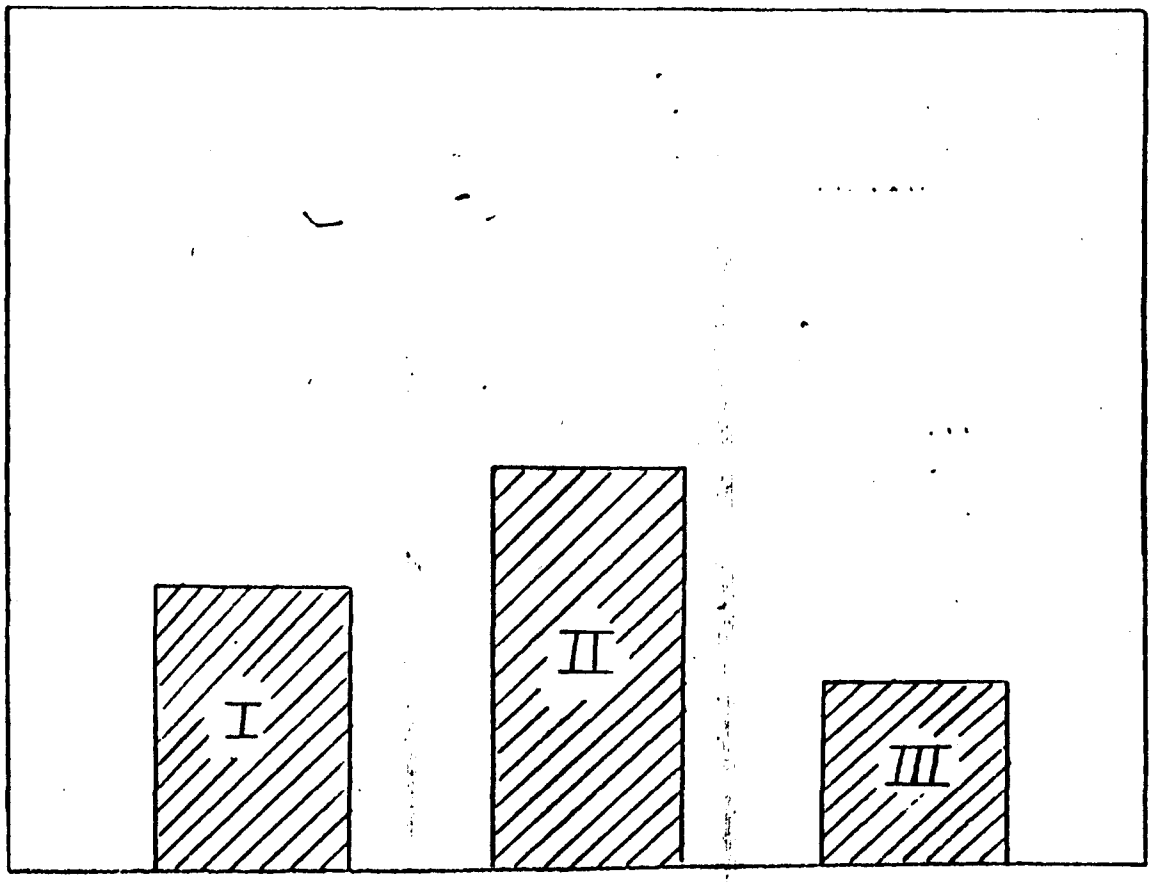


FIGURE 4 SIZE DISTRIBUTION PER UNIT AREA

I MAJOR AXIS > 100 yds.

II MAJOR AXIS > 200 yds.

III MAJOR AXIS > 500 yds.

3. Plotting ~~TOP SECRET~~ ARGON

The types of categories of openings within unit areas will be plotted in different colors. This will provide an illustration of the density of the various categories of openings within each unit area (see figure 5).

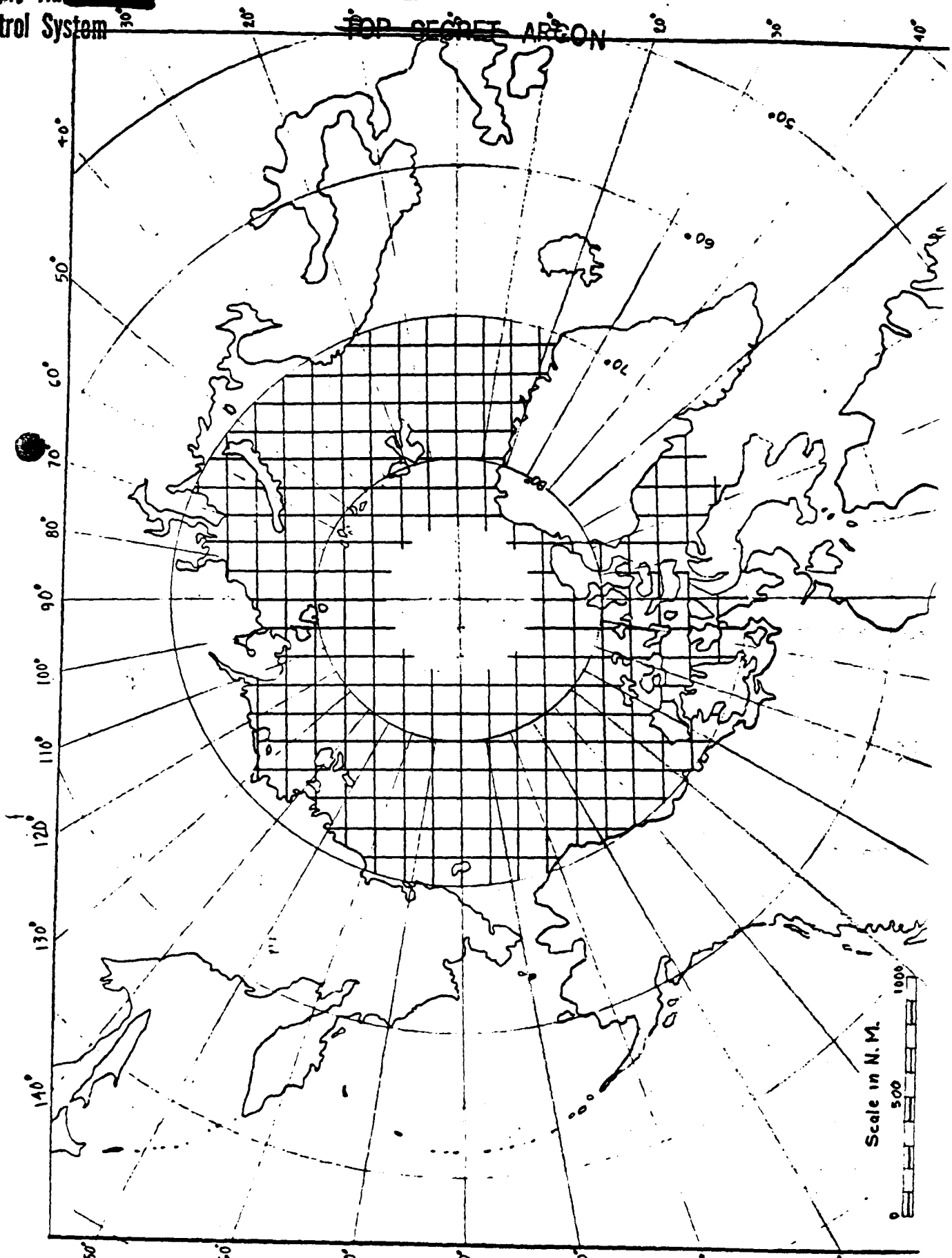
The prints and diapositive interpretation results will be plotted to produce graphics displaying ridges, elevations, ponds, hummocks and other observations.

4. Interpretation

One of the most important operations of this task will be interpretation. The working material will be opaque prints and transparent diapositives. Both will be used in order to take advantage of different types of viewing equipments (opaque materials and transparencies) at [redacted] and in this way derive maximum potential information.

a. The determination of surface roughness, within the resolution limits of the working materials, as reflected by ridges, hummocks rafting is to be accomplished during this function. Techniques similar to those used in obtaining roof densities in urban areas for radar predictions will be used. Selected sub-areas having a datum available, in close proximity, will be used to determine height of these features. Height determinations of the order of 200 feet are the smallest increments possible using the available work material.

b. The determination height will be possible only in areas having a datum reference (sea level) available. Again these measurements will be limited by the resolution of the available working materials.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Scale in N.M.
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[redacted] Control System

c. Relative N-S and E-W visual traverses per unit area will be made to detect, identify and count the ridges present. Limitations are imposed by the dynamic resolution of the system producing the working materials. However, interpretation clues obtained during indoctrination may ameliorate the task. These findings will be graphically portrayed and tabulated for each unit area.

d. Ice thickness is a parameter that may be difficult to obtain due to the resolution and Z information derivation capability. However, if a datum is in close proximity, attempts will be made to obtain Z information.

e. Although the puddling feature is familiar to the personnel assigned to this task, additional discussions and briefings covering other similar features are felt to be necessary. The interpretation clues and signatures of these features should be better known and understood. At present it seems that these features are interpretable. Graphics, text and tabulations will be made for each unit area concerning puddling. Thaw holes also fall into this area of present uncertainty.

f. The listing of icebergs and ice islands that fall within the resolution limits will be graphically shown and the best coordinates available used to identify these features.

g. In a number of instances excellent sequential coverage is available. It is expected that this sequential coverage will be used to provide measurements of changes in the size and location of features during the period covered. This sequence will be from 1.5 to 72.0 hours.

NOTE

The a priori interpretation information furnished the assigned personnel will [redacted]

greatly influence the efficacy of interpretive

[redacted] Control System

5. Photo Work

The Photo Laboratory work required for this task will be accomplished in the quality control lab at [redacted]. Transparencies and positive prints will be produced for the various functions detailed previously.

III. SUMMARY

The functions outlined in the Generalized Data Flow, Figure 1, and detailed in the previous test provide an efficient flow of data throughout the task. Throughout, a rapid approach, accuracy, and completeness are assured.

The proposed plan requires no new developments or costly testing. In this way pre-task preparations are minimized. In addition, existing materials, techniques and equipments will be utilized.

The products of this task will be graphic, textual, and tabular form for each unit area. The variety of formats available insures compatibility with other existing reference information. The body of information will be a reference file of ice canopy parameters indexed by each unit area.

The unique experience in ice forecasting and related fields available at the U.S. Navy Oceanographic Office is expected to provide [redacted] Task Personnel with the necessary background information in ice related disciplines. Since this indoctrination is the only one required, immediate reaction and results can be expected shortly after task commencement.

Since this task is neoteric in nature, a certain amount of uncertainty is present at this time. However, the work outlined here will be accomplished and should new aspects of this task be derived, they will serve as a basis for U.S. Navy Oceanographic Office/[redacted] discussions.

IV. TENTATIVE PRICE

		Amount
1. Material		$ [redacted]
2. Direct Labor		
Artist/Writer	165 hrs. @	[redacted]
Photo Laboratory	240 hrs. @	
Principal Engineer	165 hrs. @	
Radar Photo Analyst, Sr.	1045 hrs. @	
Radar Photo Analyst	1045 hrs. @	
3. Engineering Overhead @ 150%		[redacted]
4. Other Direct Costs		
Travel and Living		[redacted]
Computer Service		
5. Subtotal		[redacted]
6. General & Administrative Expense @ 8.7%		[redacted]
7. Total Estimated Cost		[redacted]
8. Profit @ 12%		[redacted]
9. Total Fixed Price		[redacted]

V. PERSONNEL

The resumes of the professional personnel that would devote their time to this project are included. It is to be noted that [redacted] reserves the right to equitably alter this list. In addition, to the personnel noted, an illustrator, programmer and photo technician would be assigned for the period of work.

*** NOTICE OF REMOVED PAGES ***

Pages 15 through 19 of CORONA, ARGON, LANYARD programmatic information are not provided because their full text remains classified.