Vol 5 A Side B

~~SECRET / E~~

PLANNED SCF NETWORK IMPROVEMENTS AND RELATED P989 DATA TIMELINESS

25 JANUARY 1978

25X1

~~SECRET / E~~

THIS PAGE INTENTIONALLY BLANK

CONTENTS

SCF TRACKING NETWORK

Currently only four of six SCF Tracking Stations support P989 readout operations.

The SCF is a worldwide network of six tracking stations used in support of military satellite programs. Four of these stations - COOK or Vandenberg (VTS), HULA or Hawaii (HTS), GUAM (GTS) and BOSS or New Hampshire (NHS) - are used to support P989 ELINT readout operations. Planned improvements at the Indian Ocean (IOS) and Thule or POGO (TTS) stations will provide potential capabilities for additional support of P989 missions with improved timeliness for retrieval of time critical information. There is a possibility that a seventh station, Oakhanger in England, may also be added to the SCF net thereby enhancing support capabilities and data retrieval even further.

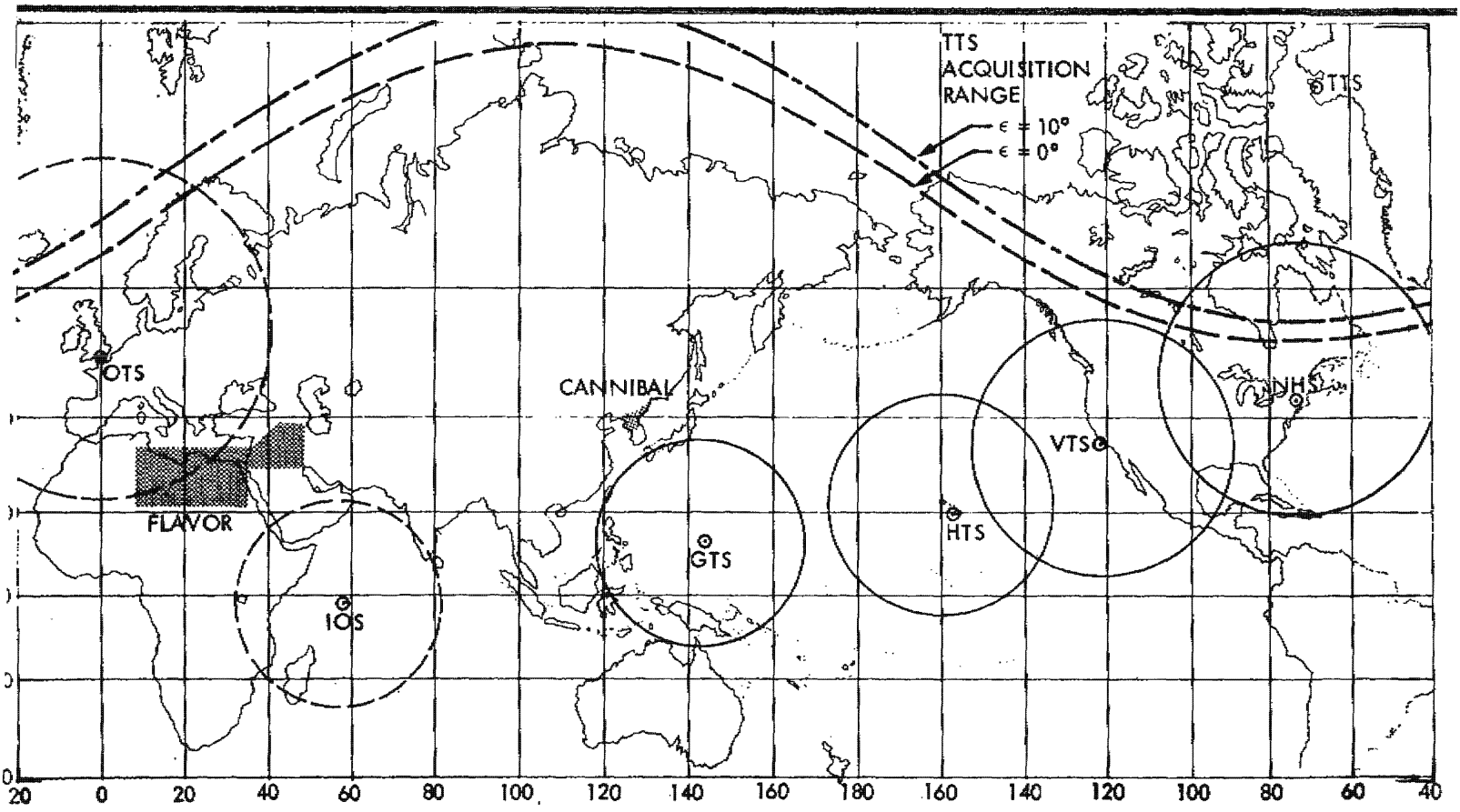
The accompanying chart shows SCF station locations with superimposed horizon-to-horizon acquisition limits for URSALA III operations. These tracking envelopes are generally applicable to RAQUEI I and IA missions as well.

25X1

~~SECRET / E~~

BIF003W/2-135349-78

SCF TRACKING NETWORK



~~SECRET / E~~

COMMUNICATIONS SATELLITE SUPPORT OF SCF OPERATIONS

Communications links between SCF stations and the STC include the use of a network of relay satellites.

A network of five synchronous equatorial (COMSAT) satellites and two satellites in 12-hr elliptic orbits are available to relay information from SCF facilities to the STC. Transmissions are in C-Band (wideband).

The 12-hr relay satellites are used primarily to support tracking stations in the northern latitudes but also provide backup capabilities for GTS, HTS and VTS operations. They

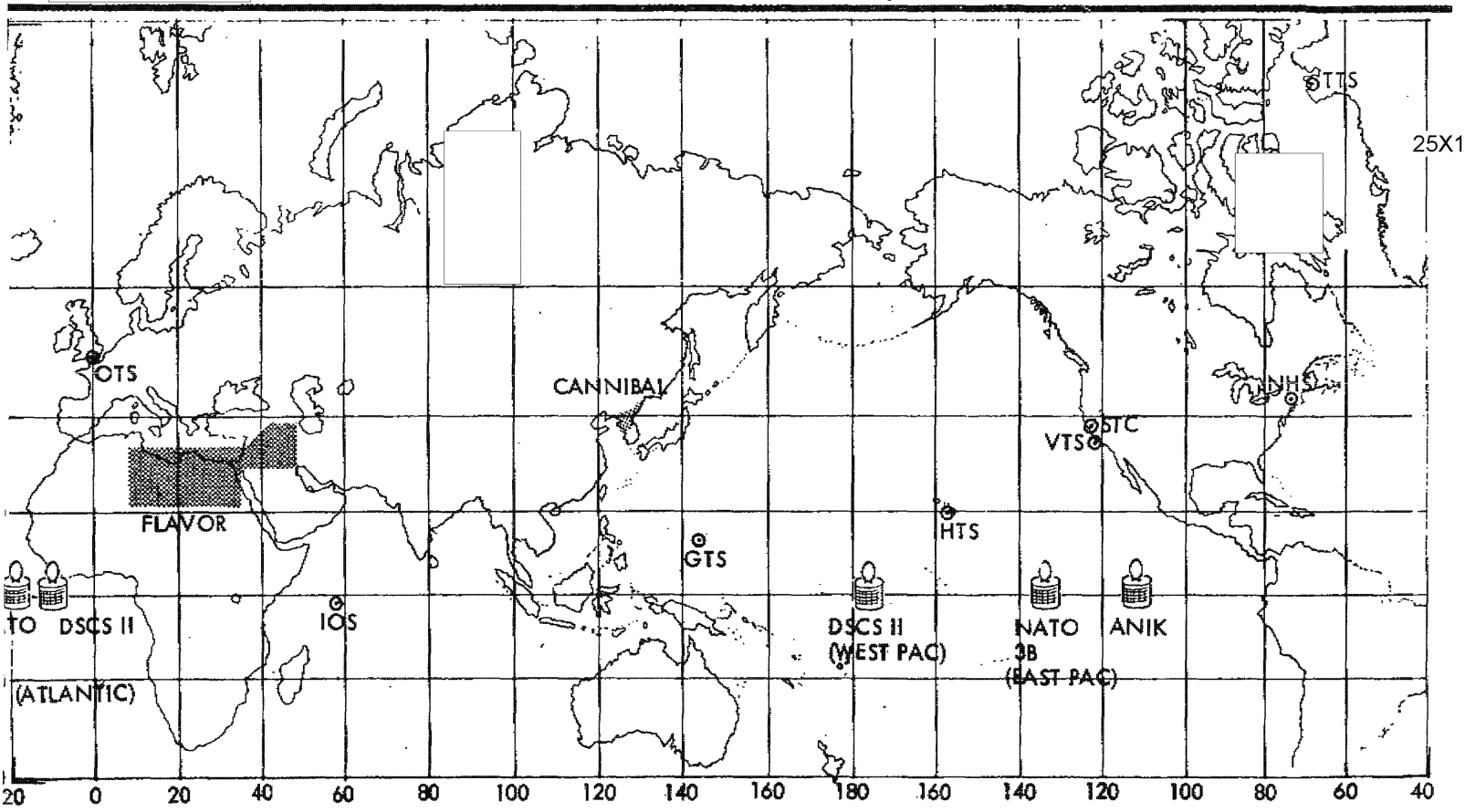
25X1

SECRET / E

BIF003W/2-135349-78

25X1

SCF – SUPPORTING COMMUNICATIONS SATELLITES



SECRET / E

CURRENT SCF P989 SUPPORT ACTIVITIES

Four SCF stations currently supporting P989 operations are capable of relaying retrieved readout data to the STC in real time using wideband transmission via relay satellites or a direct microwave transmission.

Four SCF stations* currently supporting P989 operations are capable of receiving and relaying data to the STC in real time using FM wideband transmissions at 1.024 MBPS (Bi-Phase). The specific communications links are:

- COOK (VTS) - Direct microwave link to STC
- HAWAII (HTS) - To STC via NATO 3B (Eastpac)
- GUAM (GTS) - To STC via DSCS II (Westpac)
- BOSS* (NHS) - To STC via NATO 3B (Eastpac)

Subsequent transmission from the STC

Information can also be relayed to the STC

25X1

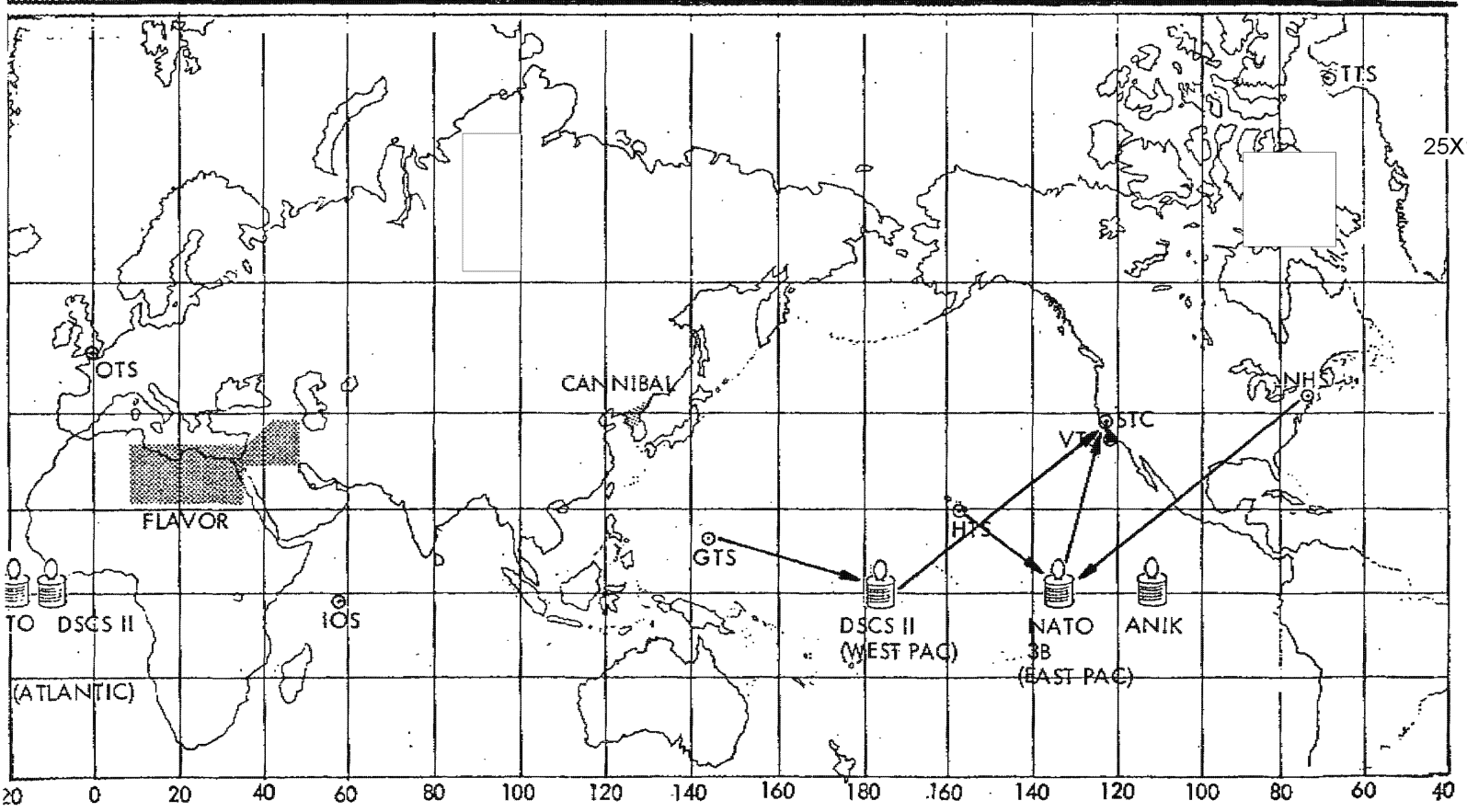
*BOSS will be capable of Interim Wideband FM transmissions in mid-January 1978 (ECP 1071)

SECRET / E

BIF003W/2-135349-78

25X1

CURRENT SCF-STC COMMUNICATIONS LINKS



SECRET / E

CURRENT DATA RETRIEVAL TIMELINESS

Data timeliness is affected by the time interval between collection and readout. For TCR areas, the average time to readout is about 60 min.

The timeliness of intercepted data relates to the required and/or actual availability of data to various users. Obviously data required in real or near real time become driving factors in defining operational requirements for data retrieval. For example, two geographical areas, one in the Middle East designated FLAVOR and another called CANNIBAL encompassing the Korean Penninsula are identified as areas for time critical reporting (TCR) with requirements that intercepted data from these locations are to be read out at the next opportunity (available SCF station) following collection. Currently, for URSALA III missions, this represents a time interval of from 11 min to 88 min from readin to readout with average times of about 60 min during actual operations in December 1977.

The accompanying table shows typical intervals between collection and retrieval for intercepts over various areas of interest. Although primarily for URSALA III operations, the data are generally applicable to current and upcoming P989 missions.

URSALA III DATA RETRIEVAL TIMELINE SUMMARY

Area	Direction Over Target	Time from R/I to R/O (Min)			
		COOK	HULA	GUAM	BOSS
	ASC	225	420	87	27
	DESC	271	461	13	79
	ASC	319	516	88	29
	DESC	173	256	11	71
	ASC	222	323	609	30
	DESC	72	352	634	71
	ASC	22	125	417	23
	DESC	69	69	357	488
	ASC	28	35	230	295
	DESC	684	69	304	488
	ASC	484	29	226	291
	DESC	489	72	68	293

25X1

POTENTIAL DATA RETRIEVAL TIMELINESS IMPROVEMENTS

Timeliness of TCR data can be enhanced by 9 min to 28 min if a SCF network-wide improvement to a wideband communications system is achieved.

Reduced time for retrieval of TCR area intercept data is a primary goal of P989 operations. The accompanying chart illustrates the time savings potential from these areas when a SCF network-wide wideband transmission capability is implemented including a facility at Oakhanger*. Adding a P989-capability at POGO reduces the readin-readout interval on ascending passes for both CANNIBAL and FLAVOR tasking. Assuming a comparable capability at Oakhanger results in a real time readout capability over the FLAVOR area using tape recorder bypass (transpond) operations. Note that tape recorder cycling is not required during transpond operations thereby prolonging the useful life of vehicle recorders. 25X1

*Note: Only times of less than one orbit period are included in this chart for purposes of clarity.

MINIMUM TIME-TO-READOUT IMPROVEMENTS

(ASSUMES URSALA III OPERATIONS)

Area	Direction Over Target	COOK	HULA	GUAM	BOSS	IOS	POGO*	OAKHANGER
	ASC			87	27		15	
	DESC			13	79		85	
	ACS			88	29		20	
	DESC			11	71			80
	ASC				30		15	
	DESC	72			71		80	
	ASC	22			23		15	
	DESC	69	69			15	80	
	ASC	28	33				13	5**-60
	DESC		69				80	5**-60
	ASC						10	5*
	DESC			68	68		85	5*

25X1

* Assumes minimum elevation of 5 deg. For minimum elevations of 10 deg, add 1 min to time intervals.

** Real time tape recorder bypass (transpond) operations requiring tape recorder cycling. Time interval reflects R/O duration before data transfer for processing.

THIS PAGE INTENTIONALLY BLANK

P989 [redacted] GOALS

Ultimate P989 operational goals are based on receiving intercept data at STC [redacted] near real time during data collection activities.

Time critical reporting of specific signals of interest from specific geographic areas is a primary consideration of P989 and [redacted] The ultimate reporting condition is to receive data through the STC [redacted] during actual P989 data collection with near real time receipt as a first alternative. The incorporation of wideband transmission capabilities at all SCF stations will greatly assist in achieving these goals. Consequently, the remainder of this report addresses near and long term planned SCF network inprovements with discussion of requirements for P989 interface with these improvements and their eventual impact on P989 [redacted]

25X1

~~SECRET / E~~

25X1

PLANNED NEAR-TERM SCF NETWORK IMPROVEMENTS

Improvements to SCF tracking stations to be completed in 1978 or early 1979 will provide additional P989 support capabilities.

Several SCF station improvements are planned for 1978 which can provide additional capability and improved timeliness to P989 data retrieval operations. These include:

- IOS - Two Microdyne 1100R wideband receivers are presently being installed with related support equipment to provide Shuttle Orbital Flight Test (OTS) support. Also to be installed is a two-way digital communications system (DSIS) intrface. These modifications will provide the capability to receive and, in real time, transmit wideband data to the STC at data rates of 1.024 MBPS (NRZ). The communications link from IOS to STC will include relay through two COMSATs - DSCS (Atlantic) and NATO 3B (Eastpac). Operational date for these improvements is early 1979. Note - these efforts should be tracked closely by P989 to ensure systems compatibility.

- POGO - Conversion of the Data Link Terminal antenna system to facilitate reception of P989 data. Data will be received and recorded with subsequent playback and transmission to the STC [redacted]. 25X1 The station will be elevation-limited to passes less than 70 deg because of antenna tracking rate considerations and to low elevations above 5 deg because of signal strength requirements. Estimated completion date: April 1978. Note - these modifications will provide a capability comparable to the former operations at NTS.

~~SECRET / E~~

ADDITIONAL NEAR-TERM IMPROVEMENTS

In addition to installing FM wideband receiver capabilities at BOSS and transmit capabilities at IOS, in 1978, the P989 data system will be modified to include DSIS, a two-way digital communications link. Current schedules call for modifications to be completed at GTS, HTS and NHS during 1978. Finally, the GUAM facility is currently being modified for activation of GUAM-B equipment which will provide BENTPIPE* operations from the STC by mid-1978. Although there will be little impact on individual vehicle data retrieval timeliness at GUAM, the expanded capability will provide for simultaneous communications with two mission spacecraft thereby reducing potential delays due to vehicle conflicts.

---

* BENTPIPE refers to a two-way command and control system whereby all transmissions are either originated or terminated at the STC via essentially unmanned SCF stations. DSIS is an integral part of these operations.

THIS PAGE INTENTIONALLY BLANK

FUTURE SCF NETWORK IMPROVEMENTS

Longer term SCF station modifications will essentially upgrade the entire network to provide wideband data transmission capabilities via COMSAT's from all facilities.

Improvements to the SCF network in the post 1978 period are essentially aimed at providing FM wideband receive and/or transmit capabilities at all existing stations in the network and possibly at a seventh station, Oakhanger. Some of these improvements include:

- IOS - Permanent installation of wideband receive and transmit capabilities with communications links to STC via DSCSII-Atlantic, Fort Dietrick and NATO 3B.
- POGO - Installation of a 45 ft antenna to provide wideband receive capability with real time transmissions to the STC via ANIK. This improvement will relegate [redacted] operations to a backup function with a corresponding relaxation of vehicle tracking and data rate limitations. 25X1
- Oakhanger - Possible incorporation of FM wideband receive capability adaptable to P989 mission support. The communications link to STC would use DSIS and would be routed via NATO 3A, Fort Dietrick, and NATO 3B.

THIS PAGE INTENTIONALLY BLANK

Several P989-related equipment installations may be required to provide SCF compatibility for mission support.

As planned and/or future improvements to SCF network stations are implemented some P989-peculiar equipment may be necessary at various facilities for compatibility with P989 missions. Some of these requirements include the following:

- o IOS - Plugin equipment (e.g., DEMODS) to Microdyne 1100R receivers for P989-related functions and possibly MODEMS for signal transmission.
- o POGO - None
- o Oakhanger - Tracking, telemetry and communications capabilities with FM receivers, MODEMS and related equipment for data retrieval and real time transmission of data to STC using DSIS.

FUTURE P989-RELATED COMMUNICATIONS LINKS

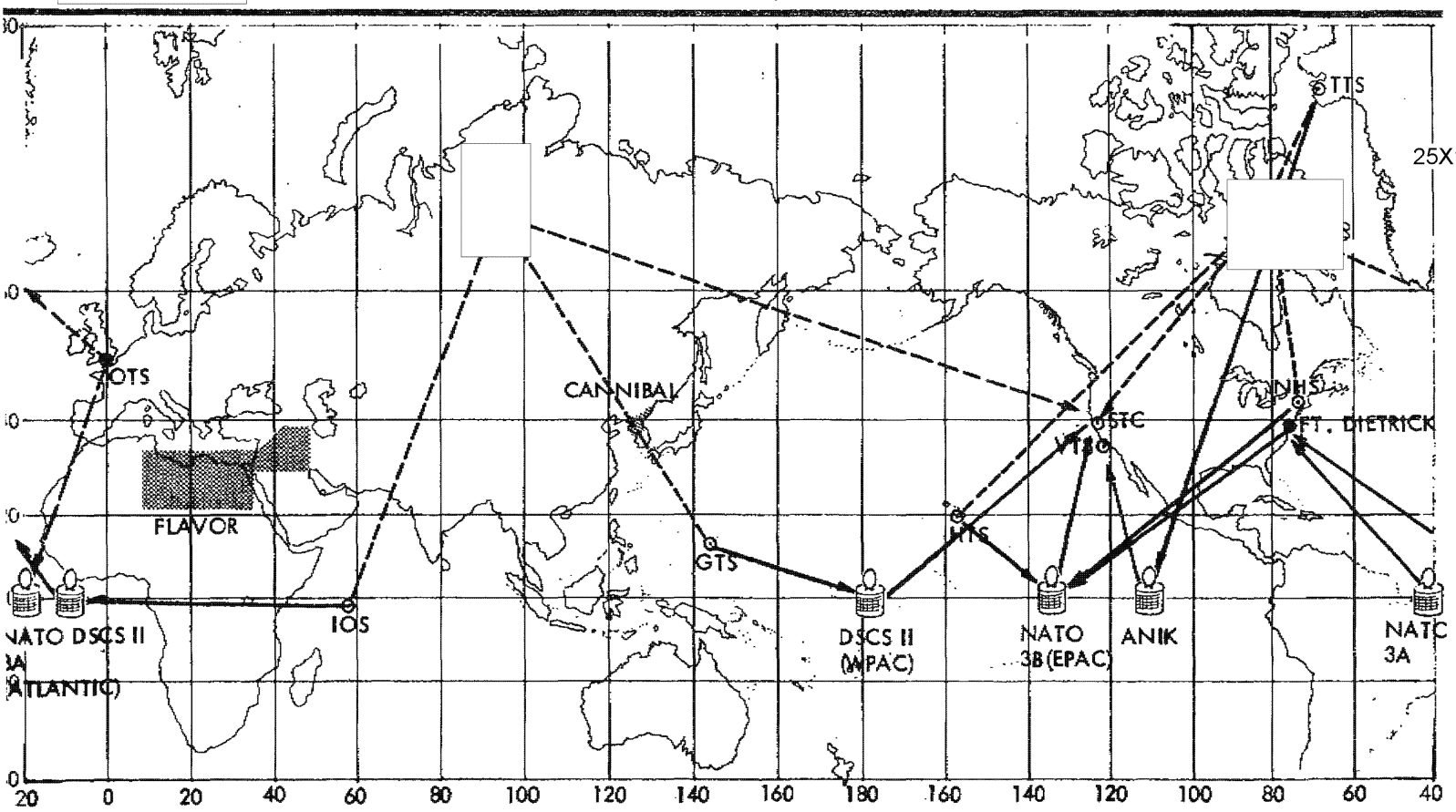
Implementation of all near term and future improvements to SCF sites and the possible inclusion of Oakhanger within the net will provide a real time transmission capability for retrieved P989 data and facilitate implementation of the BENTPIPE operating mode with the STC using DSIS. The resulting communications links are shown in the accompanying figure. The inclusion of the [redacted] represents a backup capability from all stations. 25X1

SECRET / E

BIF003W/2-135349-78

25X1

PLANNED SCF – STC COMMUNICATIONS LINKS



SECRET / E

THIS PAGE INTENTIONALLY BLANK

POTENTIAL DATA TIMELINESS IMPROVEMENTS

Upgrading the entire SCF network to provide wideband capabilities to the STC for P989 mission support from all stations will result in a general improvement in the timeliness of collected data. The following data show representative timelines for various operations including areas over which transpond (tape recorder bypass) operations can be performed. They specifically represent timeline improvements reflecting future POGO, IOS and OTS wideband capabilities.

POGO ACQUISITION CAPABILITIES

POGO will acquire P989 spacecraft during all ascending passes over the African and Eurasian continents.

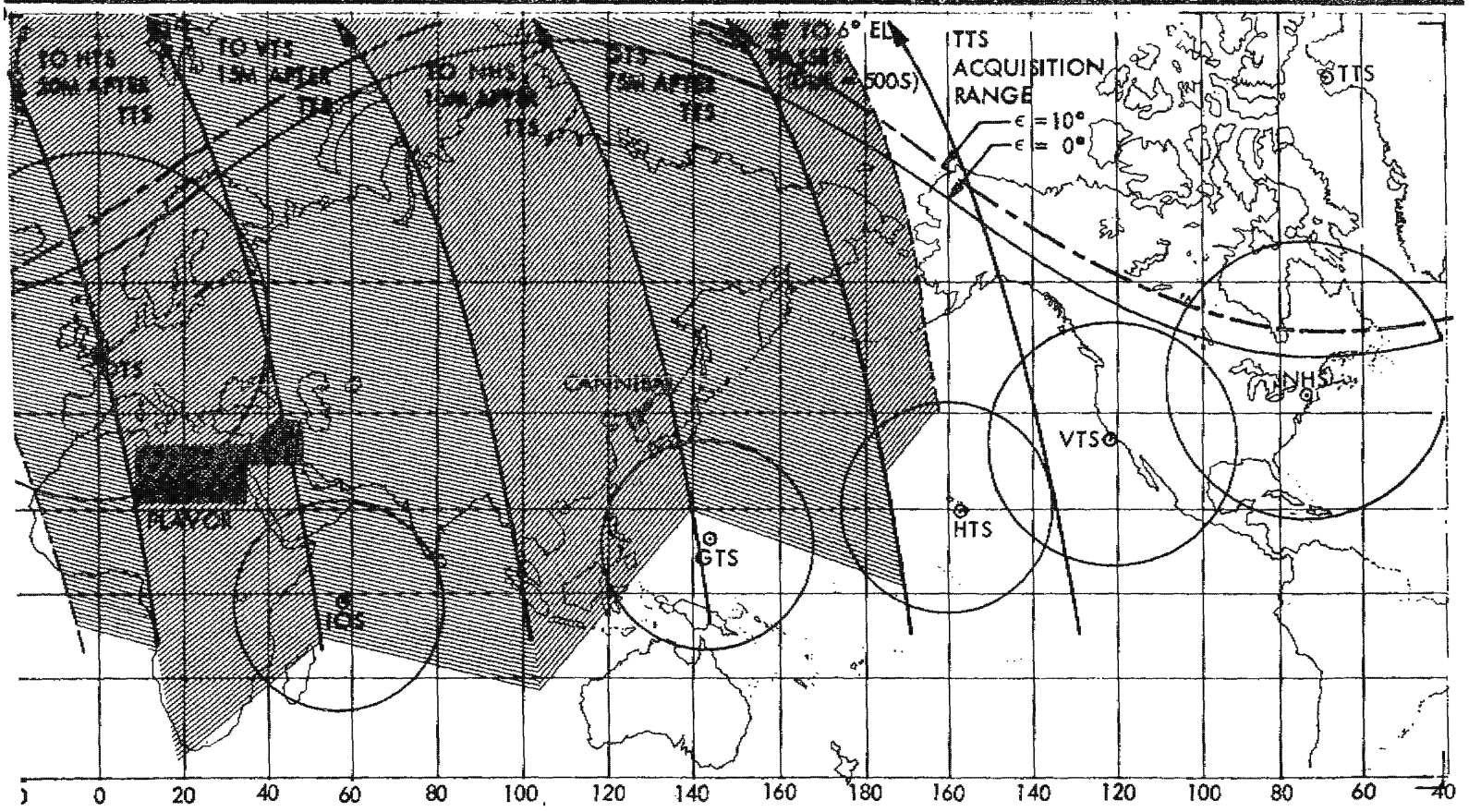
The acquisition envelope shown for POGO (TTS) assumes wideband receive and transmit capabilities at the station. With these assumed capabilities, POGO's unique location provides virtually global coverage of all P989 vehicle ascending passes with acquisitions within 20 min after the vehicle crosses the equator. The two designated TCR areas will be in contact for readout at POGO within 10 min to 15 min after tasking, assuming a 5 deg elevation pass. For a 10 deg minimum elevation pass, times are increased about 1 min. The accompanying figure dramatically illustrates these conditions also showing time intervals for contacts with stations after passing POGO and regions within which the contacts are possible. Note that two daily passes in or near the Bearing Straits will require low (5 deg to 6 deg) elevation acquisitions with durations of about 500 secs. These passes cannot be acquired if the Data Link Terminal antenna is limited to elevations greater than 5 deg.

SECRET / E

BIF003W/2-135349-78

25X1

POGO & SCF ASCENDING PASS NETWORK ACQUISITIONS



SECRET / E

THIS PAGE INTENTIONALLY BLANK

IOS ACQUISITION CAPABILITIES

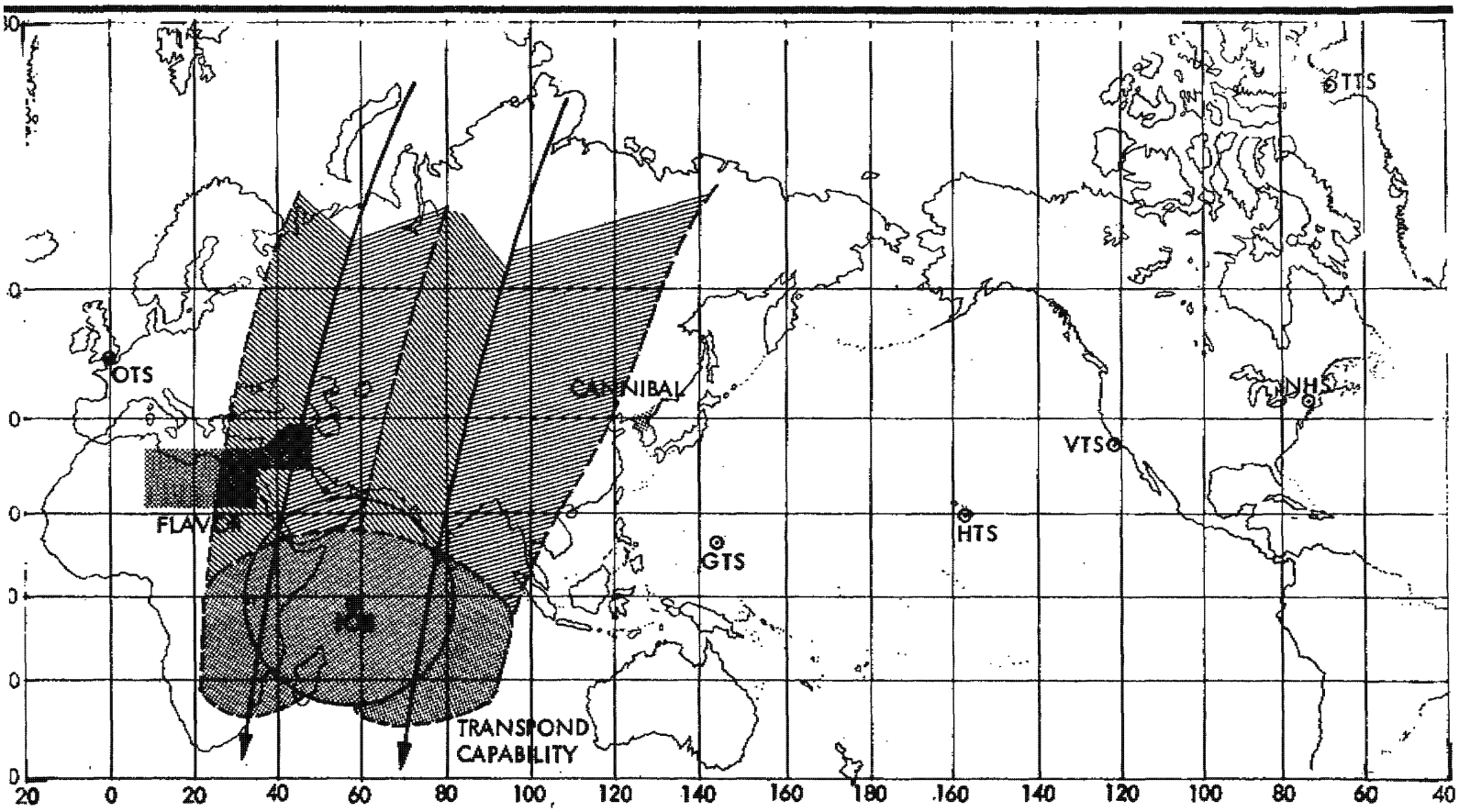
Simultaneous collection, readout and transmission of intercept data over the Indian Ocean and parts of Eastern Africa is provided by future wideband capability installations at IOS.

Tape recorder bypass or transpond operations are defined as vehicle tasking during which command, readin, readout and data transmission are done simultaneously in real time. The advantages are timely data acquisition and bypassing the requirements for tape recorder cycling which ultimately results in a longer useful life for the tape recorders. With installation of wideband receive and transmit capabilities at IOS, Eastern Africa and most of the Indian Ocean* can be tasked in the transpond mode providing zero-time data recovery to the STC [redacted] 25X1

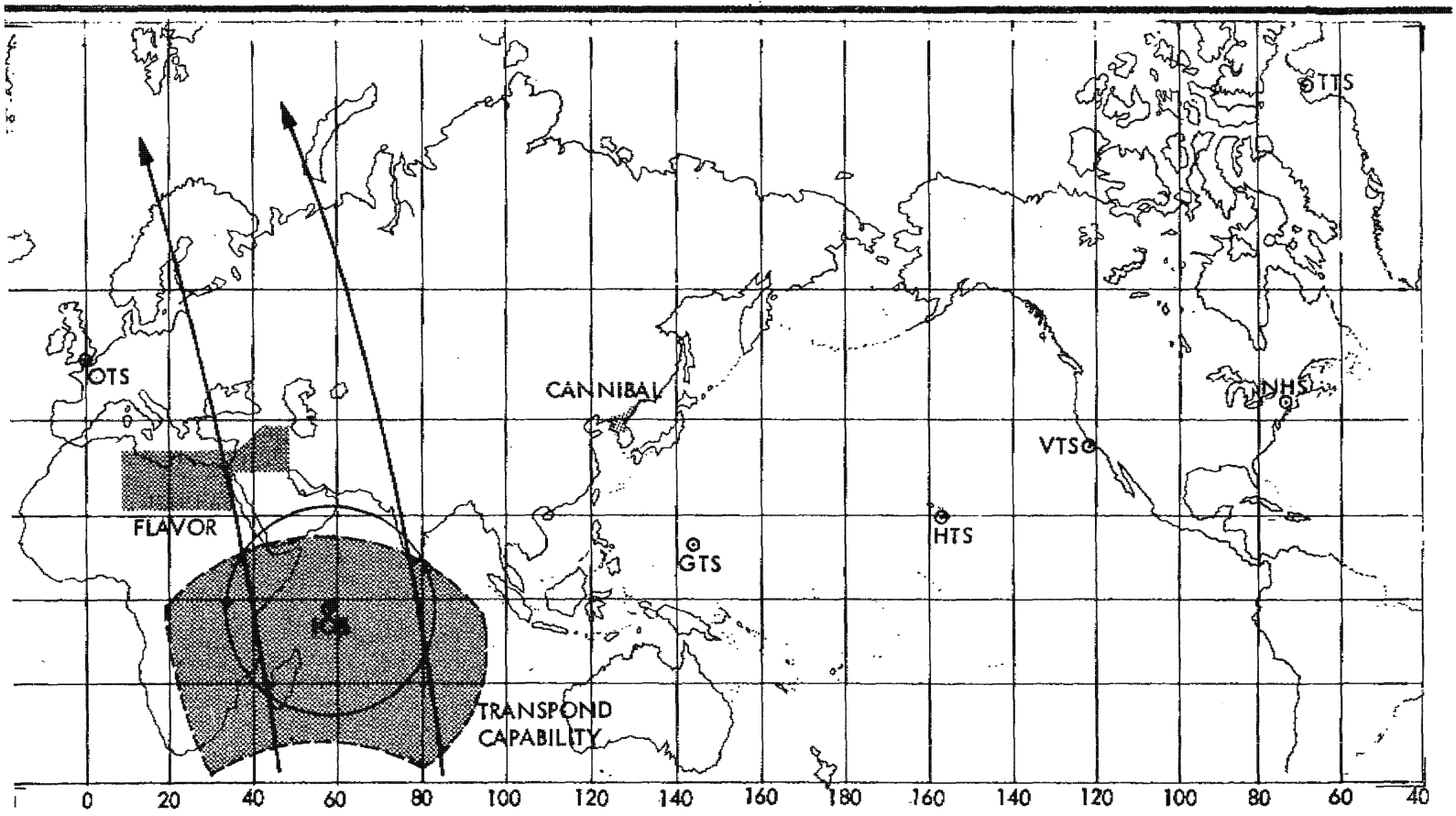
Normal or precommanded tasking operations to be read out at IOS cover a significant portion of the Eurasian land mass. On descending passes, intercept operations will cover most of the USSR East of Moscow through the western half of PRC with maximum time to readout at IOS of about 15 min after first land fall. During ascending passes, IOS can precommand tasking for essentially the entire Flavor TCR area, all of western USSR and most of western Europe with readout at OTS within 2 min on some passes and at POGO within 11 min to 15 min.

*The asymmetry of the real time viewing envelope is due to spacecraft spin axis orientation.

IOS CAPABILITIES – DESCENDING PASSES



IOS CAPABILITIES – ASCENDING PASSES



THIS PAGE INTENTIONALLY BLANK

OAKHANGER ACQUISITION CAPABILITIES

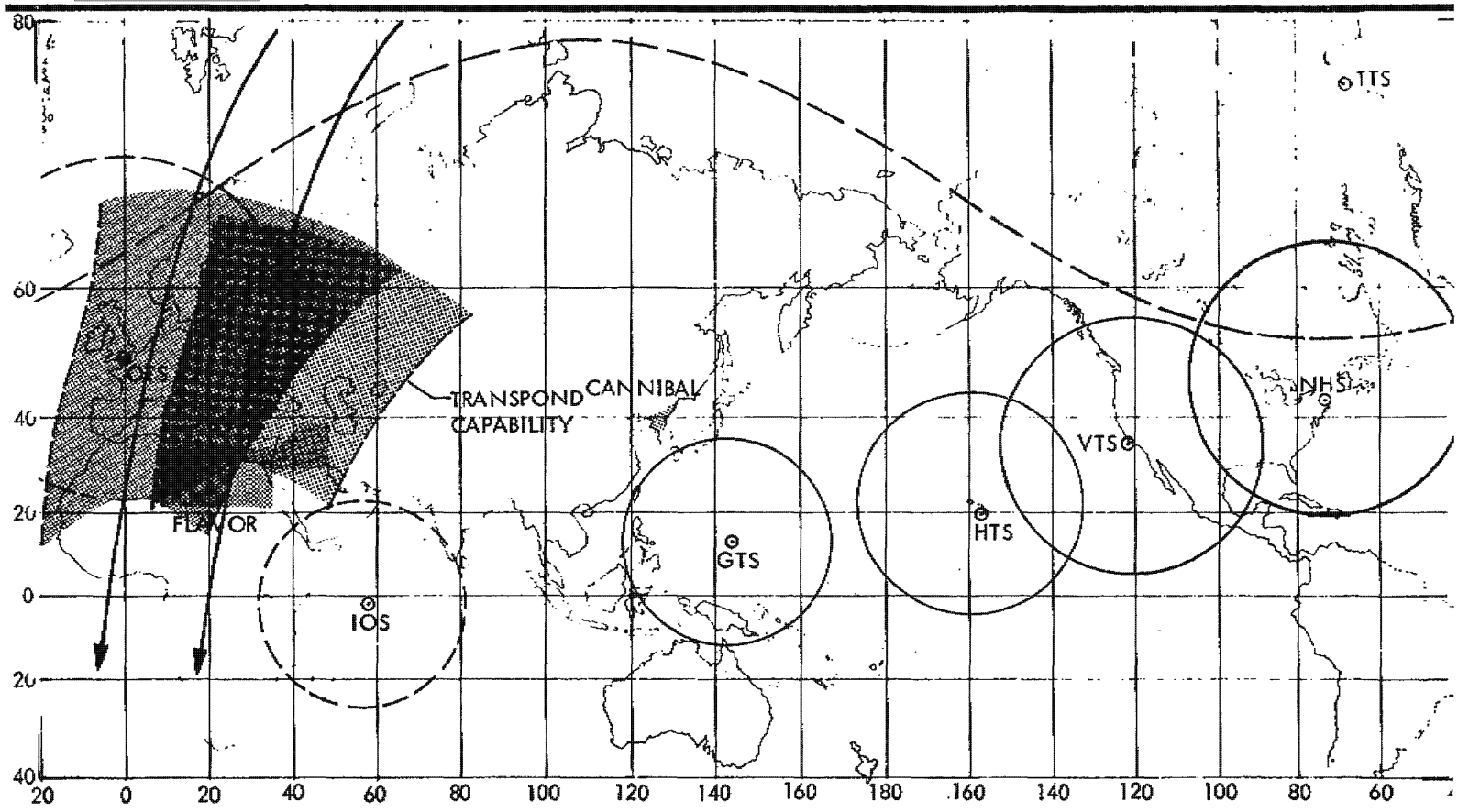
Transpond operations can be conducted for tasking over all critical areas in Western Russia with an assumed wideband receive capability at OTS.

Simultaneous collection, readout and transmission of intercept data (transpond operations) for a large portion of Europe and Western Russia is possible if wideband receive capabilities are added to Oakhanger. The transpond capability extends to areas covering portions of North Africa and the Middle East. On ascending passes, the area covered extends to just east of Moscow whereas on descending revs, all USSR missile test ranges are subject to tape recorder bypass tasking.

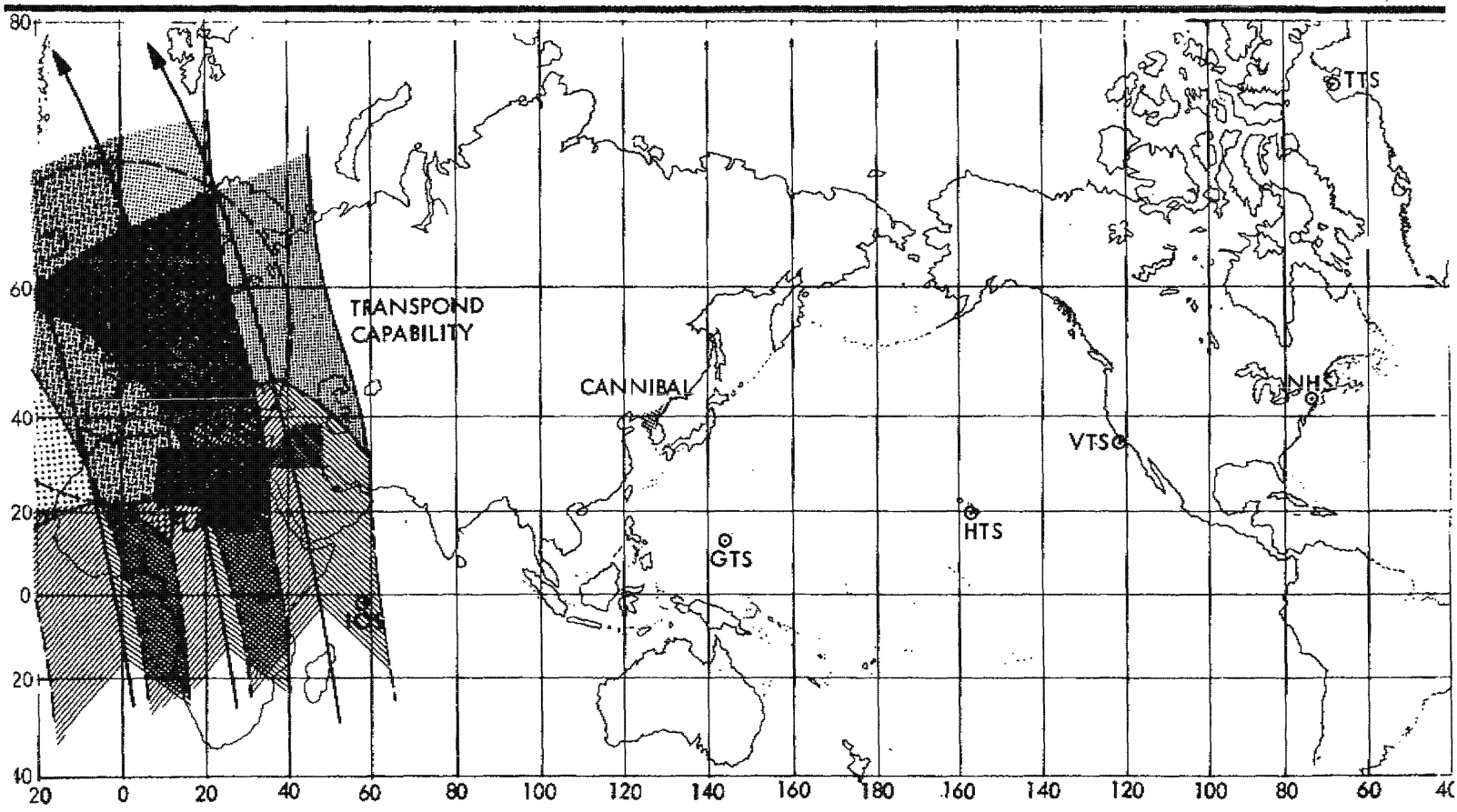
A unique condition exists for transpond operations over the FLAVOR TCR area. Portions of the Middle East area are in view during each of two successive passes but at no time is the entire area subject to simultaneous collection and transmission of data. Yet during the repeating cycle of the orbit, the entire area can be covered by a transpond operation in about 4½ days.

On ascending passes, any task commanded from IOS can be readout at OTS within about 10 min.

OTS CAPABILITIES – DESCENDING PASSES



OTS CAPABILITIES - ASCENDING PASSES



DESCENDING PASS TARGET COVERAGE

During descending pass collections, data readout can be accomplished within 75 min for any target area of interest.

Aside from transpond operations from OTS and IOS, data collection anywhere within the Eurasian/African target area can be read out at an SCF tracking station within 75 minutes assuming POGO is operational with wideband capability. The accompanying figure shows potential readout times showing fields of view for readout at IOS, OTS and GTS. Note that GTS can receive data within 8 min after readin over the Sea of Okhotsk.

TIME TO READOUT – DESCENDING PASSES

ASSUMES MAX FIELD OF VIEW & R/O COVERAGE