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MJD 12/16/2011

File Folder CHINA, PRC (JUNE-JULY 1982) (1 OF 2)

FOIA

F00-173/5

Box Number 007R

TUCKER

21

ID	Doc Type	Document Description	No of Pages	Doc Date	Restrictions
125860	MEMO	WILLIAM CLARK TO MALCOLM BALDRIGE RE LANDSAT-D	2	9/10/1982	B1
125874	ROUTING SLIP		1	9/11/1982	B3
125861	MEMO	SAME AS 125860	2	9/10/1982	B1
125862	MEMO	SAME AS 125860	2	9/10/1982	B1
125863	PAPER	ANNEX TO GUIDELINES	3	ND	B1
125864	MEMO	EDWARD MCGAFFIGAN TO WILLIAM CLARK RE LANDSAT-D	3	9/1/1982	B1
125866	MEMO	MICHAEL WHEELER TO THOMAS CORMACK RE GUIDELINES	1	7/24/1982	B1
125868	MEMO	EDWARD MCGAFFIGAN TO WILLIAM CLARK RE GUIDELINES	1	7/21/1982	B1
125869	MEMO	MICHAEL WHEELER TO L. PAUL BREMER, ET AL RE GUIDELINES	2	7/6/1982	B1

The above documents were not referred for declassification review at time of processing

Freedom of Information Act - [5 U.S.C. 552(b)]

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- B-7 Release would disclose information compiled for law enforcement purposes [(b)(7) of the FOIA]
- B-8 Release would disclose information concerning the regulation of financial institutions [(b)(8) of the FOIA]
- B-9 Release would disclose geological or geophysical information concerning wells [(b)(9) of the FOIA]

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ID	Doc Type	Document Description	No of Pages	Doc Date	Restrictions
125871	PAPER	ANNEX TO GUIDELINES	2	ND	B1
125873	MEMO	EDWARD MCGAFFIGAN TO WILLIAM CLARK RE LANDSAT-D	1	6/30/1982	B1

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TO CLARK

FROM MCGAFFIGAN

DOCDATE 30 JUN 82

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OF CLASSIFIED ENCLOSURE(S)

WHEELER

06 JUL 82

CORMACK, T

15 JUL 82

KEYWORDS: EXPORT CONTROLS

TECHNOLOGY TRANSFERS

CHINA P R

SUBJECT: SALE OF LANDSAT-D GROUND STATION TO CHINA

ACTION: FOR DECISION

DUE: 23 JUL 82 STATUS X FILES

FOR ACTION

FOR CONCURRENCE

FOR INFO

CLARK

COMMENTS

REF# LOG 8202738 8202993 NSCIFID (C /)

ACTION OFFICER (S)	ASSIGNED	ACTION REQUIRED	DUE	COPIES TO
Clark	X 7/21	Add-on For Decision	7/23	
	- 7/24	Paindexter approved		
Wheeler	S 7/24	for signature	7/24	
	D 7/26	Wheeler of memo to		Indy, Mc, Gw
		Mc Cormack		
Gaffigan	7/28	Recd State memo		MC, SU, Gw, Indy
	7/30	Rec'd Doc Inqurt		Su, Indy, Gw
Mc	S 8/2	prepare Memo for	8/4	
		Clark		

RECEIVED 02 JUL 82 14

TO

CLARK

FROM MCGAFFIGAN

DOCDATE 30 JUN 82

UNCLASSIFIED UPON REMOVAL
OF CLASSIFIED ENCLOSURE(S)MP
12/15/11

KEYWORDS: EXPORT CONTROLS

TECHNOLOGY TRANSFERS

CHINA P R

SUBJECT: SALE OF LANDSAT-D GROUND STATION TO CHINA

ACTION: FOR DECISION

DUE: 06 JUL 82 STATUS X FILES

FOR ACTION

FOR CONCURRENCE

FOR INFO

CLARK

COMMENTS

REF#

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	7/6	for signature	7/7	
	7/6	Wheeler Sgd memo to Agencies		MAN, MC
	7/14	Lead Jt Ingt		MC, DG, GW, Jt
	7/14	Lead CIA Ingt		
	7/14	Lead NSA Ingt		

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	7/20	Lead Commerce Ingt		1

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FOR ACTION

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COMMENTS

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Wheeler	5 7/6	for signature	7/7	
	7/6	Wheeler Sgd send to Agencies		mw, mc
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	7/14	Rec'd CIA Inqut		
	7/14	Rec'd NASA Inqut		

DISPATCH "D" Inqut 7/14 Rec'd NASA Inqut W/ATTCH FILE (C)

ACTION OFFICER (S)	DATE	ACTION REQUIRED	DUE	COPIES
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	7/20	Rec'd Commerce Inqut		1

DISPATCH

W/ATTACH

FILE

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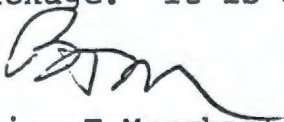
(C)

4705

13 SEPT 1982

MEMORANDUM FOR ADDRESSESS OF 10
SEPT MEMO RE LANDSAT-D GROUND
STATION FOR CHINA (U)

Inadvertly, page 3 of Tab A was
not included in the original
package. It is attached.


Brian T Merchant
NSC/S
WH Situation Room

UNCLASSIFIED WITH ~~CONFIDENTIAL~~
ATTACHMENT

MD
12/15/14

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21

<i>ID</i>	<i>Document Type</i> <i>Document Description</i>	<i>No of</i> <i>pages</i>	<i>Doc Date</i>	<i>Restric-</i> <i>tions</i>
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125860 MEMO

2 9/10/1982 B1

WILLIAM CLARK TO MALCOLM BALDRIGE RE
LANDSAT-D

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2. Transfer of technology is to be limited to that which is essential for satisfactory operation of the system.
3. The antenna will be no better than required for Landsat tracking and data acquisition; the autotrack system will be limited in response time and accuracy to that which is essential for Landsat tracking, and will track only at the Landsat S-band frequency, instead of at X-band; no fast slew, other than in autotrack, will be permitted. For example, a typical Landsat-D ground station has minimum gains of +43 dB and +54 dB over isotropic, respectively, for S-band and X-band reception. In addition, the automatic tracking system for the antenna will maintain the pointing direction of the electrical axis of the antenna relative to the true direction of a satellite transmission with an error less than 0.056 degrees in 0-30 mph winds and 0.086 degrees in 31 - 45 mph winds. These error limits will be met with a system limited to an antenna system drive speed of 2 degrees per second in mean winds of 30 mph with a readout resolution of 0.02 degrees.
4. The receivers will be fixed-tuned to the Landsat frequencies and the demodulation circuits will be hard-wired to handle the Landsat signal streams; the installed backup receivers will be hard-wire interlocked with the primary receivers so that only one or the other can operate at any given time.
5. Demultiplexing circuitry will be hard-wired to handle the Landsat data formats only.
6. To record data transmissions directly from the Landsat satellite and to prepare the data for transport or transmission from the receiving site to the data processing site, three configurations of tape recorders may be required.

For example, separate High Density Digital Tape Recorders (HDDTR's) for directly recording the 15 Mb/s data stream from the MSS and the 85 Mb/s data stream from the TM are required. Single redundant tape recorders for each of these two applications are allowable, for purposes of serving as a backup in event of failure of a recorder and for duplicating the Master High Density Digital Tapes (HDDT's). Each set of recorders will have only two selected speeds and

2. "Transfer of technology is to be limited to that which is essential for satisfactory operation of the system.
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4705 7

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THE WHITE HOUSE

12 SE 13 P 4: 1

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SEP 13 5 58 PM '82

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MID 14/5/14

MESSAGE NO. 273 CLASSIFICATION CONFIDENTIAL PAGES 4

FROM WILLIAM CLARK 456-2255 WH 5R
(NAME) (EXTENSION) (ROOM NUMBER)

MESSAGE DESCRIPTION 10 SEPT LANDSAT MEMO

TO (AGENCY)	DELIVER TO:	DEPT/ROOM NO.	EXTENSION
<u>STATE</u>	<u>SEE</u>		
<u>DEFENSE</u>	<u>FIRST</u>		
<u>CIA</u>	<u>PAGE</u>		

REMARKS:



8

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MESSAGE NO. 273

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FROM WILLIAM CLARK
(NAME)

456-2255
(EXTENSION)

WASA
(PHONE NUMBER)

MESSAGE DESCRIPTION 10 SEPT LAMSAT MEAS

TO (AGENCY)

DELIVER TO:

REF/DIR

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STATE

SEE

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THE WHITE HOUSE

DEPARTMENT OF STATE

12 SE 13 P4: 1

982 SEP 13 PM 4 21

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UNCLASSIFIED UPON REMOVAL
OF CLASSIFIED ENCLOSURE(S)

W7 12/15/11

MESSAGE NO. 273

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PAGES

4

FROM WILLIAM CLARK

456-2255

WH5R

(NAME)

(EXTENSION)

(ROOM NUMBER)

MESSAGE DESCRIPTION 10 SEPT LANDSAT MEMO

TO (AGENCY)

DELIVER TO:

DEPT/ROOM NO.

EXTENSION

STATE

SEE

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PAGE

REMARKS:

Subject: LANDSAT-D GROUND STATION FOR CHINA (U) 10

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NATIONAL SECURITY COUNCIL DISTRIBUTION RECORD

Log Number: 4705

Date: 11 SEPT 1982

Subject: LANDSAT-D GROUND STATION FOR CHINA (U)

11

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THE ADMINISTRATOR, NOAA DEPT OF COMMERCE Room 5942 New State	<u>1</u>	<u>9/13/82</u>	<u>12:08 AM</u>	<u>Bonnie A. Wine</u>
THE SECRETARY OF ENERGY GA257, Forrestal Bldg				
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CHINA, PRC (JUNE-JULY 1982) (1 OF 2)

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<i>ID</i>	<i>Document Type</i> <i>Document Description</i>	<i>No of</i> <i>pages</i>	<i>Doc Date</i>	<i>Restric-</i> <i>tions</i>
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125874 ROUTING SLIP

1 9/11/1982 B3

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NATIONAL SECURITY COUNCIL DISTRIBUTION RECORD

Log Number: 4705

Date: 11 SEPT 1982

Subject: LANDSAT-D GROUND STATION FOR CHINA (U)

Classification: ☐ Top Secret ☐ Secret ☒ Confidential ☐ Unclassified

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CHAIRMAN, CEQ 722 Jackson Place, NW				
ADMINISTRATOR, GSA GSA Bldg, 18th & F Street, NW				
ADMINISTRATOR, NASA 400 Maryland Avenue, SW	1	9/13/82	11:34	John S. [Signature]
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NSC/S

Subject: LANDSAT-D GROUND STATION FOR CHINA (U)

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CLASSIFICATION: ☐ TOP SECRET ☐ SECRET ☒ CONFIDENTIAL ☐ UNCLASSIFIED

INTERNAL DISTRIBUTION

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Subject: LANDSAT-D GROUND STATION FOR CHINA (U)

Classification: ☐ Top Secret ☐ Secret ☒ Confidential ☐ Unclassified

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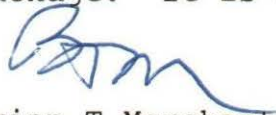
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13 SEPT 1982

MEMORANDUM FOR ADDRESSESS OF 10
SEPT MEMO RE LANDSAT-D GROUND
STATION FOR CHINA (U)

Inadvertly, page 3 of Tab A was
not included in the original
package. It is attached.



Brian T Merchant
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ATTACHMENT

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125861	MEMO SAME AS 125860	2	9/10/1982	B1

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125862 MEMO		2	9/10/1982	B1
	SAME AS 125860			

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GUIDELINES
PEOPLE'S REPUBLIC OF CHINA
LANDSAT-D GROUND STATION EXPORT

These guidelines have been agreed to among NASA and the Departments of State, Defense, and Commerce and are intended for the information of U.S. industry in formulating proposals for the sale of a ground station to the Chinese Academy of Sciences. The guidelines do not supplant the usual export licenses or in any way modify vendors' responsibilities with respect to the U.S. export licensing requirements of the Departments of State and Commerce. At this time, NASA and the Departments of State, Defense, and Commerce are predisposed to approve, subject to the usual procedure for COCOM review, issuance of an export license for a sale to the Academy structured in conformance with these guidelines. Approval of an export to China along these lines will not constitute a precedent for exports to country groups Q, W, Y, or Z. These guidelines reflect the more liberal U.S. export control policy toward China adopted by the Reagan administration.

By the terms of the agreement between the U.S. Government and the People's Republic of China which was signed on January 31, 1979, the PRC will purchase from U.S. industry, "under suitable conditions," a ground station capable of receiving and processing data from the Landsat-D earth resources satellite, now under development. More recently, the Chinese were advised that the United States does not object in principle to providing a split ground station configuration. A split ground station, as opposed to an integrated ground station which has the receiving system and data processing system colocated at one site, is composed of two separate elements, a receiving system and a data processing system whose sites may be separated a distance of approximately 120 kilometers. The following is intended to outline the essential performance features of such a station, along with export control conditions to be applied by the United States.

Essential Characteristics

Direct reception of data from a Landsat satellite can occur only when the U.S. operator has commanded the satellite to broadcast data within range of the ground station. To receive and process the data, the ground station must have the following features:

1. A tracking antenna and feed system capable of tracking the satellite with sufficient accuracy, and receiving at S-band and X-band for Landsat-D. The antenna must be pointable on command for initial acquisition and must track automatically on the satellite signal.
2. Receivers for the S- and X-band signals, with demodulation circuits for the Landsat signals.
3. Recorders capable of bit transfer rates of 15 Mb/s and 85 Mb/s for the serial data streams from the Multispectral Scanner (MSS) instrument and the Thematic Mapper (TM) instrument, respectively, on Landsat-D.
4. Demultiplexing equipment designed to re-sort the serial data streams from the satellite into formats suitable for the application of corrections and interpretive techniques.
5. Electronic data processing equipment and software for the insertion of geometric and radiometric corrections and for the generation of computer-compatible tapes (CCT's) at 1600 and 6250 bpi and a laser beam recorder (LBR) for the generation of film imagery.
6. Image enhancement equipment for improved interpretation of the processed data.
7. Test equipment and spares to keep the station in operating condition.
8. Training in operation and maintenance of the station.

Technical and Procedural Guidelines

The following guidelines indicate conditions for approval of an export license:

1. Turn-over of the equipment and technical data required for reception and processing of X-band telemetry from Landsat-D, including the 85 Mb/s high density digital recorders required for the Thematic Mapper data stream, will not occur until X-band, high data rate signals from Landsat-D are available for reception and processing.

2. Transfer of technology is to be limited to that which is essential for satisfactory operation of the system.
3. The antenna will be no better than required for Landsat tracking and data acquisition; the autotrack system will be limited in response time and accuracy to that which is essential for Landsat tracking, and will track only at the Landsat S-band frequency, instead of at X-band; no fast slew, other than in autotrack, will be permitted. For example, a typical Landsat-D ground station has minimum gains of +43 dB and +54 dB over isotropic, respectively, for S-band and X-band reception. In addition, the automatic tracking system for the antenna will maintain the pointing direction of the electrical axis of the antenna relative to the true direction of a satellite transmission with an error less than 0.056 degrees in 0-30 mph winds and 0.086 degrees in 31 - 45 mph winds. These error limits will be met with a system limited to an antenna system drive speed of 2 degrees per second in mean winds of 30 mph with a readout resolution of 0.02 degrees.
4. The receivers will be fixed-tuned to the Landsat frequencies and the demodulation circuits will be hard-wired to handle the Landsat signal streams; the installed backup receivers will be hard-wire interlocked with the primary receivers so that only one or the other can operate at any given time.
5. Demultiplexing circuitry will be hard-wired to handle the Landsat data formats only.
6. To record data transmissions directly from the Landsat satellite and to prepare the data for transport or transmission from the receiving site to the data processing site, three configurations of tape recorders may be required.

For example, separate High Density Digital Tape Recorders (HDDTR's) for directly recording the 15 Mb/s data stream from the MSS and the 85 Mb/s data stream from the TM are required. Single redundant tape recorders for each of these two applications are allowable, for purposes of serving as a backup in event of failure of a recorder and for duplicating the Master High Density Digital Tapes (HDDT's). Each set of recorders will have only two selected speeds and

equalizations, one for the record speed and one for the playback speed. Each set of recorders, i.e., MSS/MSS recorders and TM/TM recorders, will be hard-wire interlocked, such that both recorders in a set cannot operate simultaneously at the maximum record rate. One recorder in a set can record satellite transmission at the high data rate while the other recorder in the same set can play back at the low data rate (during CCT formulation), or both recorders can operate simultaneously at the low data rate--one playing back and one recording--while duplicating the Master HDDT's. In the event of failure of one recorder in a set, the interlock allows the other recorder in the set to operate at both speeds, but tape duplicating will not be possible unless both recorders retain low speed capability.

In addition, satellite data to be transported from the receiving site to the data processing site will be in the form of 9-track Computer Compatible Tapes (CCT's). Two 9-track tape recorders, one for redundancy, but hard-wire interlocked so that both recorders cannot record simultaneously, will be used to record playback data from the 15 Mb/s and 85 Mb/s HDDTR's at their low playback speeds. The record/playback system will further be configured to preclude simultaneous low speed playback/record of the MSS/MSS and TM/TM recorders during duplication of Master HDDT's. The system will also be configured such that recording of CCT's cannot occur during the low speed tape duplication process. That is, each step in the preparation of duplicate Master HDDT's and CCT's for both MSS and TM data will be sequential.

Total daily time for the record/playback processes of acquiring satellite data, preparing Master HDDT's, and preparing CCT's for both MSS and TM data will be at least 18 hours, exclusive of maintenance and based on an average daily throughput. For purposes of illustration, a set of six tape recorders--two Sangamo Sabre X 14-track recorders for recording 15 Mb/s data from the MSS, two Sangamo Sabre X 28-track recorders for recording 85 Mb/s data from the TM, and two Memorex 3228 9-track recorders for recording CCT's--configured to meet the stated requirements for recorders at the receiving site, were calculated to require in excess of 18 hours per day to handle the estimated average daily throughput.

7. Controllers to control the HDDTR's and the CCT recorders at the receiving site may be controlled by the same small computer used to control antenna tracking, with the computer sized appropriately.
8. Electronic data processing equipment at the data processing site will be limited in amounts and speeds to that which is essential to handle the

estimated daily station throughput for Landsat and other civil remote sensing applications. Design of the data processing system, e.g., the numbers, speeds, and capabilities of CPU's, memories, special processors, etc., must be justified based on the projected daily throughput and the data processing functions to be conducted. Daily operation of the data processing system, based on these requirements, will be at least 10 hours, exclusive of any maintenance.

The operational requirements of the data processing system do not exceed the parameters for computer systems for which there is a presumption of approval for China. (See Federal Register of December 29, 1981.) Therefore, the operational parameters of the data processing system will be defined at those levels. For example, the processing data rate (PDR) in the guidelines is 68 Mbits/second. For comparison, the VAX 11/780 has a PDR of 58 Mbits/second.

In addition, the processing capability of any array processor shall not exceed 2 million equivalent multiplies per second, based on standard operand word lengths.

Software (object code only and no source code) for the electronic data processing equipment will be furnished complete, so no software development information will be part of the export. Modifications in software will be supplied by a U.S. contractor, as required. The laser beam recorder will be bimodal in spot size, configured to provide only the level of performance required for the Landsat function.

9. Image enhancement equipment shall have: (1) an equivalent multiply rate of not more than 800,000 operations per second, which is not differentiated between fixed point and floating point, (2) not more than 512 resolvable elements along any axis when the system permits 256 shades of gray or color, (3) an output of not more than 8 million image elements per second, and (4) software embodying object code only and no source code.
10. Test equipment will not exceed in quantity and capability that which is necessary to verify status, diagnose faults, and validate performance

of replacement parts at the card, drawer, or major element level. On-site spares will not exceed estimated six-month requirements appropriate to the age of the station. Spares replenishment will be the responsibility of the U.S. contractor and shall be on an exchange basis, e.g., a maintenance float pipeline will be established by the contractor wherein substitute modules are provided for station operation while faulty cards, drawers, etc., are refurbished at the contractor's or his subcontractor's locations. Exact specification of licensable spares (including estimated overall system impact) will be provided to the U.S. Government for review and approval.

11. The U.S. prime contractor will be required to maintain an on-site presence for the first two years of operation of the station and quarterly visits thereafter for the next four years, i.e., a total of six years of operation of the ground station. The minimum on-site presence for the first two years will be one person working a normal eight-hour workday at one of the sites and alternating between them as necessary for training, operation, and maintenance. The U.S. prime contractor shall report fully and frankly on the utilization of the system to the U.S. Department of Commerce.
12. Training will not be provided on equipment which differs from that to be exported. To the maximum extent possible, training will be in China, using the station equipment in the course of operations. The number of Chinese technicians to be trained by the contractor will not exceed the number required to operate and maintain the station. The level of detail will not be beyond the card, drawer, or major element level.
13. Chinese access to technology and technical documentation including software will be governed by a detailed technology transfer control plan which will be prepared by the U.S. Landsat ground station contractor and approved by the U.S. government. Chinese will have access to contractor plants only for their own program and only to the degree necessary for satisfactory operation and maintenance of their station. No manufacturing techniques or design expertise will be transferred.

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125866 MEMO

1 7/24/1982 B1

MICHAEL WHEELER TO THOMAS CORMACK RE
GUIDELINES

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125868 MEMO

1 7/21/1982 B1

EDWARD MCGAFFIGAN TO WILIAM CLARK RE
GUIDELINES

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125869 MEMO

2 7/6/1982 B1

MICHAEL WHEELER TO L. PAUL BREMER, ET AL
RE GUIDELINES

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PEOPLE'S REPUBLIC OF CHINA
LANDSAT-D GROUND STATION EXPORT

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By the terms of the agreement between the U.S. Government and the People's Republic of China which was signed on January 31, 1979, the PRC will purchase from U.S. industry, "under suitable conditions," a ground station capable of receiving and processing data from the Landsat-D earth resources satellite, now under development. More recently, the Chinese were advised that the United States does not object in principle to providing a split ground station configuration. A split ground station, as opposed to an integrated ground station which has the receiving system and data processing system colocated at one site, is composed of two separate elements, a receiving system and a data processing system whose sites may be separated a distance of approximately 120 kilometers. The following is intended to outline the essential performance features of such a station, along with export control conditions to be applied by the United States.

Essential Characteristics to be Licensed

Direct reception of data from a Landsat satellite can occur only when the U.S. operator has commanded the satellite to broadcast data within range of the ground station. To receive and process the data, the ground station must have the following features:

1. A tracking antenna and feed system capable of tracking the satellite with sufficient accuracy, and receiving at S-band and X-band for Landsat-D. The antenna must be pointable on command for initial acquisition and must track automatically on the satellite signal.
2. Receivers for the S- and X-band signals, with demodulation circuits for the Landsat signals.
3. Recorders capable of bit transfer rates of 15 Mb/s and 85 Mb/s for the serial data streams from the Multispectral Scanner (MSS) instrument and the Thematic Mapper (TM) instrument, respectively, on Landsat-D.
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5. Electronic data processing equipment and software for the insertion of geometric and radiometric corrections and for the generation of computer-compatible tapes (CCT's) at 1600 and 6250 bpi and a laser beam recorder (LBR) for the generation of film imagery.
6. Image enhancement equipment for improved interpretation of the processed data.
7. Test equipment and spares to keep the station in operating condition.
8. Training in operation and maintenance of the station.

Limitations on the Configuration to be Licensed

The following limitations are to be imposed on the licensed export:

1. Turn-over of the equipment and technical data required for reception and processing of X-band telemetry from Landsat-D, including the 85 Mb/s high density digital recorders required for the Thematic Mapper data stream, will not be permitted until X-band, high data-rate signals from Landsat-D are available for reception and processing.

2. Transfer of technology is to be limited to that which is essential for satisfactory operation of the system.
3. The antenna will be no better than required for Landsat tracking and data acquisition; the autotrack system will be limited in response time and accuracy to that which is essential for Landsat tracking, and will track only at the Landsat S-band frequency, instead of at X-band; no fast slew, other than in autotrack, will be permitted. For example, a typical Landsat-D ground station has minimum gains of +43 dB and +54 dB over isotropic, respectively, for S-band and X-band reception. In addition, the automatic tracking system for the antenna will maintain the pointing direction of the electrical axis of the antenna relative to the true direction of a satellite transmission with an error less than 0.056 degrees in 0-30 mph winds and 0.086 degrees in 31 - 45 mph winds. These error limits will be met with a system limited to an antenna system drive speed of 2 degrees per second in mean winds of 30 mph with a readout resolution of 0.02 degrees.
4. The receivers will be fixed-tuned to the Landsat frequencies and the demodulation circuits will be hard-wired to handle the Landsat signal streams; the installed backup receivers will be hard-wire interlocked with the primary receivers so that only one or the other can operate at any given time.
5. Demultiplexing circuitry will be hard-wired to handle the Landsat data formats only.
6. To record data transmissions directly from the Landsat satellite and to prepare the data for transport or transmission from the receiving site to the data processing site, three configurations of tape recorders may be required.

For example, separate High Density Digital Tape Recorders (HDDTR's) for directly recording the 15 Mb/s data stream from the MSS and the 85 Mb/s data stream from the TM are required. Single redundant tape recorders for each of these two applications are allowable, for purposes of serving as a backup in event of failure of a recorder and for duplicating the Master High Density Digital Tapes (HDDT's). Each set of recorders will have only two selected speeds and

equalizations, one for the record speed and one for the playback speed. Each set of recorders, i.e., MSS/MSS recorders and TM/TM recorders, will be hard-wire interlocked, such that both recorders in a set cannot operate simultaneously at the maximum record rate. One recorder in a set can record satellite transmission at the high data rate while the other recorder in the same set can play back at the low data rate (during CCT formulation), or both recorders can operate simultaneously at the low data rate--one playing back and one recording--while duplicating the Master HDDT's. In the event of failure of one recorder in a set, the interlock allows the other recorder in the set to operate at both speeds, but tape duplicating will not be possible unless both recorders retain low speed capability.

In addition, satellite data to be transported from the receiving site to the data processing site will be in the form of 9-track Computer Compatible Tapes (CCT's). Two 9-track tape recorders, one for redundancy, but hard-wire interlocked so that both recorders cannot record simultaneously, will be used to record playback data from the 15 Mb/s and 85 Mb/s HDDTR's at their low playback speeds. The record/playback system will further be configured to preclude simultaneous low speed playback/record of the MSS/MSS and TM/TM recorders during duplication of Master HDDT's. The system will also be configured such that recording of CCT's cannot occur during the low speed tape duplication process. That is, each step in the preparation of duplicate Master HDDT's and CCT's for both MSS and TM data will be sequential.

Total daily time for the record/playback processes of acquiring satellite data, preparing Master HDDT's, and preparing CCT's for both MSS and TM data will be at least 16 hours, exclusive of maintenance and based on an average daily throughput. For purposes of illustration, a set of six tape recorders--two Sangamo Sabre X 14-track recorders for recording 15 Mb/s data from the MSS, two Sangamo Sabre X 28-track recorders for recording 85 Mb/s data from the TM, and two Memorex 3228 9-track recorders for recording CCT's--configured to meet the stated requirements for recorders at the receiving site, were calculated to require in excess of 16 hours per day to handle the estimated average daily throughput.

7. Controllers to control the HDDTR's and the CCT recorders at the receiving site may be controlled by the same small computer used to control antenna tracking, with the computer sized appropriately.
8. A low speed microwave link with a transmission rate of 2.1 Mb/s or less to transfer the MSS and TM data sequentially from the receiving site

to the data processing site is allowable instead of transporting the data in the form of 9-track CCT's. As in (4), the record/playback process will be sequential so that the total daily record/playback time will be at least 16 hours for either approach.

9. Electronic data processing equipment at the data processing site will be limited in amounts and speeds to that which is essential to handle the estimated daily station throughput for Landsat and other civil remote sensing applications. Design of the data processing system, e.g., the numbers, speeds, and capabilities of CPU's, memories, special processors, etc., must be justified based on the projected daily throughput and the data processing functions to be conducted. Daily operation of the data processing system, based on these requirements, will be at least 10 hours, exclusive of any maintenance.

The operational parameters of the data processing system will be limited to those stated on page 62829 of the Federal Register, Volume 48, Number 249, 29 December 1981-Rules and Regulations.

The limiting processing data rate (PDR) in these guidelines is 68 Mb/s. For comparison VAX 11/780 has a PDR of 58 Mb/s.

In addition, the processing capability of any array processor shall be limited to a minimum time of 20 milliseconds for the array processor to perform a 1024 point real Fast Fourier transform (FFT) algorithm with fixed or floating point and for all word lengths. (Definition of different capabilities for several different word lengths is impractical and normally 16 bit words or above are used.)

The FFT processing time for the array processor is determined by including the time for the information to be transferred from the memory of the host computer and returned to the host computer, but assuming that the best memory available from the supplier is used in the host computer (rather than the actual memory). It also includes the time consumed in the array processor memory for those cases where the array processor has internal memory. It does not include the data reorder time.

Software for the electronic data processing equipment will be furnished complete, so no software development information will be part of the export. Modifications in software will be supplied by a U.S. contractor, as required. The laser beam recorder will be bimodal in spot size, configured to provide only the level of performance required for the Landsat function.

10. Image enhancement equipment (not part of the ground station per se, but likely to be procured for the use with it) will be limited to equipment capable of: (a) performing a two dimensional complex FFT over a 512 by 512 element image field in not less than 40 seconds; fixed point additions and/or multiplications at a rate not exceeding 250,000 operations per second; or floating point additions and/or multiplications at a rate not exceeding 100,000 operations per second; (b) providing an output of not more than 8 million image elements per second; (c) displaying not more than 256 shades of gray or color; and (d) having a raster resolution of not more than 580 lines when the system permits 256 shades of gray or color.
11. Test equipment will be limited in quantity and capability to that which is necessary to verify status, to diagnose faults, and to validate performance of replacement parts at the card, drawer, or major element level. Spares will be at that level, and on-scene stocks will be limited to the estimated six-month requirements appropriate to the age of the station. Spares replenishment will be the responsibility of the U.S. contractor and shall be on an exchange basis, e.g., a maintenance float pipeline will be established by the contractor wherein substitute modules are provided for station operation while faulty cards, drawers, etc., are refurbished at the contractor's or his subcontractor's locations.
12. The U.S. prime contractor will be required to maintain an on-site presence for the first two years of operation of the station and quarterly visits thereafter for the next four years, i.e.,

a total of six years of operation of the ground station. The minimum on-site presence will be one person working a normal eight-hour workday at one of the sites and alternating between them as necessary for training and operation and maintenance. The U.S. prime contractor shall be obligated to report fully and frankly on the utilization of the system to the U.S. Department of Commerce.

13. Performance of operation and maintenance by a U.S. contractor will be proposed, in addition to arranging for the required U.S. prime contractor presence. If this proposal is not accepted, then training in station operation and maintenance will be provided by a U.S. contractor on equipment identical to that to be exported. To the maximum extent possible, training will be in China, using the station equipment in the course of operations. The number of Chinese technicians to be trained by the contractor will be limited to that actually required to operate and maintain the station; and the level of detail will be no better than the card, drawer, or major element level.
14. Chinese access to technology and technical documentation including software will be governed by a detailed technology transfer control plan which will be prepared by the U.S. Landsat ground station contractor and approved by the government. In broad terms, Chinese access in contractor plants will be specifically limited to their own program and then only to the degree necessary for satisfactory operation and maintenance of their station. No access to manufacturing techniques or design expertise will be allowed.

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ANNEX TO GUIDELINES

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THE SECRETARY OF COMMERCE
Washington, D.C. 20230

JUL 17 1982

4705 50

MEMORANDUM FOR Michael O. Wheeler
Staff Secretary
National Security Council

The Department of Commerce concurs on the draft guidelines subject to the following comments on the classified annex.

Paragraph 10 of the "Annex to Guidelines, People's Republic of China Landsat-D Ground Station Export" should be revised to reflect the future role of the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) as the operational manager of the Landsat-D system beginning in January 1983. The following statement should be inserted at the end of this paragraph.

"Similar arrangements will be contained in an agreement that NOAA will soon negotiate with the Chinese for the direct reception of Landsat-D data and that will become effective at the time the Landsat-D system is transferred from NASA to NOAA."

With regard to Paragraph 11 of the Annex concerning the use of the ground station, I wish to assure you that provisions similar to those in the NASA agreement documents will be included in the NOAA agreement with the Chinese.

Once concurrence has been reached by all the pertinent agencies, I believe that Commerce will be the appropriate agency to distribute these guidelines to industry. ✓

Thank you for the opportunity to comment on this material.

Secretary of Commerce

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