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16. Summary/Notes <i>The main objective of this report is to present the current status of the Brazilian LANDSAT facilities and the results obtained during the period of June 1980 up to April 1981.</i>			
17. Remarks <i>Prepared for the LANDSAT Ground Station Operations Working Group Meeting - Australia - May, 1981.</i>			

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SECTION I

System Status by the end of April 1981

A - Cuiabá Tracking and Receiving Station

- During the period of June 01, 1980 up to April 30, 1981 576 new MSS orbits were recorded and introduced in the data base. The LANDSAT 3, which was being used as prime satellite, although with the MSS-line scan problem, was replaced by the LANDSAT-2 in July 21, 1980 as far as MSS data transmissions are concerned.
- During the same period 559 new RBV orbits, from LANDSAT-3, were recorded and introduced in the data base.
- The Quick-Look imagery generation system, that was down since January 01, 1980 due to the MSS line scan problem, resumed its normal operation when the LANDSAT-2 was turned-on.
In order to minimize time-consuming activities related to secondary services at Cuiabá Station it was decided to remove the Quick Look system from there and to install it at Cachoeira Paulista processing site. The Quick-Look system that has the main objective of doing the recording quality control will be replaced in next May by a hardware developed at INPE's laboratory called "MSS Data Monitor" (see Figure 1). The new hardware has the following tasks:
 - MSS byte and format synchronization
 - Presentation in a CRT display the analog signal of 1 to 6 sensors of an individual band, selectable by operator
 - Presentation in a display of the line sync. lock/unlock status.

So, no more photo activities will be executed at Cuiabá station from next May on.

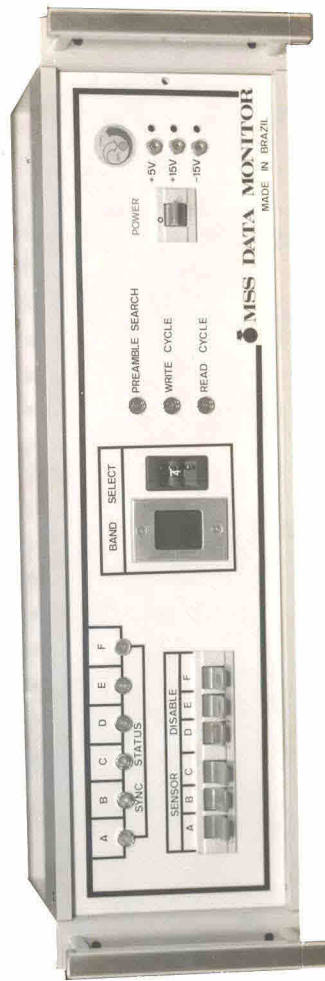


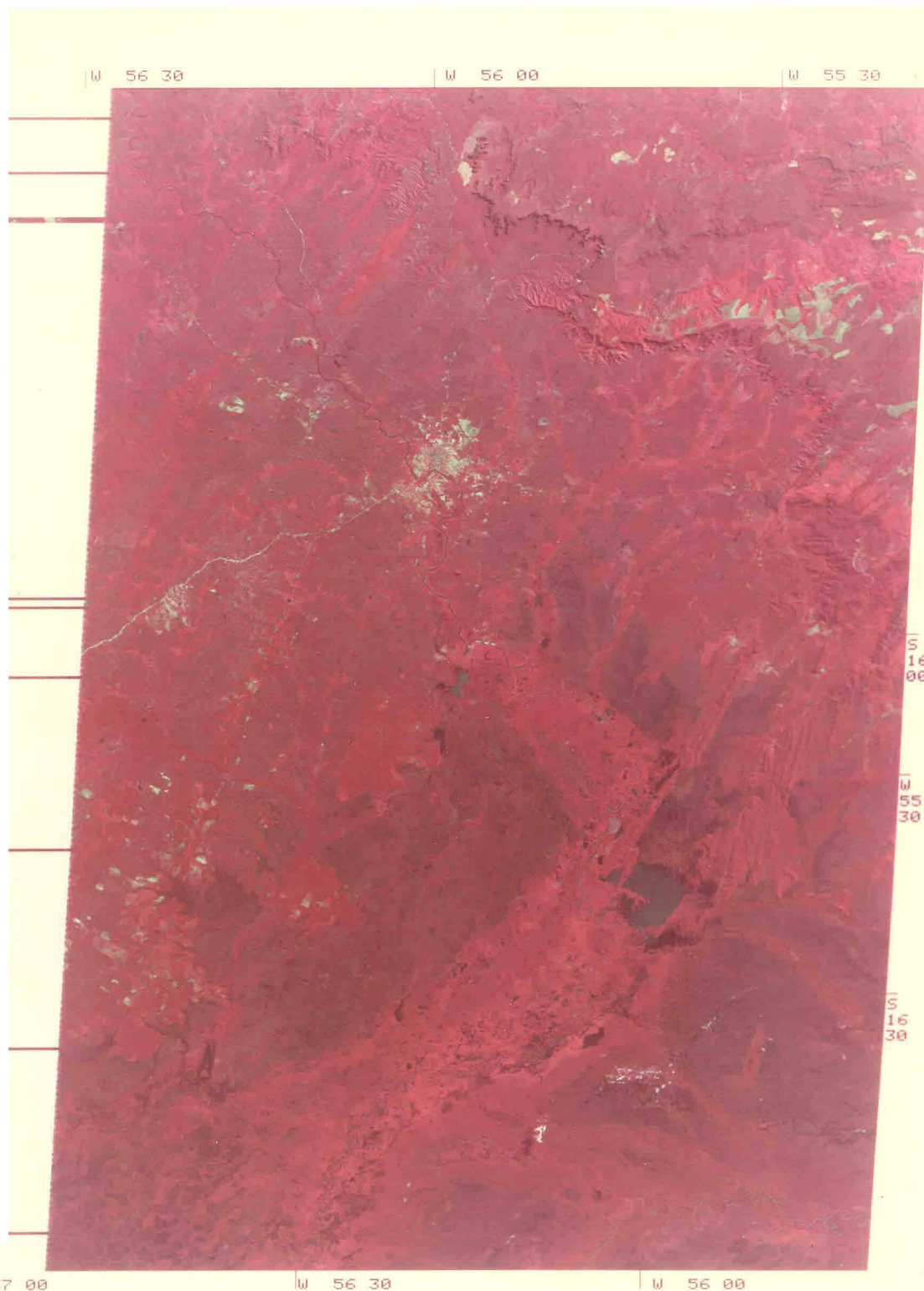
Fig. 1 - MSS Data Monitor manufactured by INPE.

- NASA Back-up Plan related to MSS data acquisitions from LANDSAT-2 is being supported by CNPq/INPE under operational basis since December 26, 1980. Installations of equipments, training and test phases started on October 20, 1980.

New NASA HDDR, which will replace the existing HDDR unit (M. Marietta model 4277), test equipments and spares are presently in the process of customs clearance at São Paulo airport.

B - Electronic Processing and Photo Laboratories:

- On August 21, 1980 INPE has been finished the tests for the correction of the line shifts (line scan problem) from LANDSAT-3 and then started the processing of the data already acquired and affected (see Figure 2). A back-log of approximately 8 months was created with the impossibility of film generation in the existente configuration of the processing system. To reduce this back-log a third shift of operation was established in the begining of this year.
- The hardware and software modifications to correct the MSS line scan problem represented an equivalent effort of 3 engineers during 1,5 months with a total cost of US\$ 6,800.00.
- Due to hardware limitations, mainly in the computer system, the CCT generation can not be performed when there is a high occurrence of line shifts within the MSS frame.
- The new bulk geometric corrections model, implemented last year, for the MSS data production on film, where satellite sistematic errors are tentatively removed through ground processing with the objective of producing an internal final error of 120 meters RMS, showed to be useful only in special cases, depending on the amplitude of AMS values/ date of acquisition (Note that NASA's AMS Mathematical Model was not implemented in our system). So, this product is under scene-by-scene basis procedure and available upon user request.



WRS 243- 71



08MAI80 WRS: 243/71 C: S15-55/W056-18 MSS 5 7 SOL: EL38 AZ052 BB 189 LC N CNPQ/INPE/LANDSAT 380129-125922
PEF G=3 SRB: 276/23 N: S15-52/W056-18 3-11083 R01 =BRASIL= 10MAR81 CENA 0

developed by INPE.

- Software changes in the bulk processing from Perspective Projection onto SOM Projection are presently discarded based in the results obtained. To carry out the Memoranda of Understanding signed with the National agencies responsible for the cartography in the country INPE has decided to increase efforts in the area of Precision Processing, even that several ground control points are required to correct a scene and that only limited quantity of GCP's is available in the coastal zone.
- A new annotation in the film products, presenting large characters, was implemented to help the users in a better scene identification (see Figure 2).
- The INPE's analog processing of RBV data is still using an empirical table of gain and offsets to compensate the shading effects. However, the tests showed that a table like that must be used only during a particular time (in our case, one year). Besides, our correction table was derived from a 14 x 9 grid of samples. Better results could be obtained increasing the number of samples and probably decreasing the validity period of such table. The Figure 3 presents one RBV sub-scene under the corrected/uncorrected modes.
- The Photographic Laboratory since the second semester of the last year is working with the half of its capacity due to the lack of requests. This situation could be explained by the lack of recent and good quality MSS data during a reasonable period of 1980 (line scan problem). Besides, users of the geological applications area, which after 8 years of availability of data certainly have already acquired cloud-free/good quality data of their interested area, now are having a sporadic behavior as far as requests are concerned.
- To take advantage of the free-time in the Photo. Lab. it was decided to start the production of LANDSAT color mosaics of large areas. The first result (mosaic of the State of São Paulo) is presented in the Figure 4. The methodology used is based in the point of view that to

match in density black and white photos is simpler than the work related when color composed photos are used. So, the first step was to produce black and white mosaics of each one of the required bands. Afterwards, and using appropriate filters, the color composition was done as a single frame composition. This procedure improves the final cosmetic effects of the mosaic.

C - Image Data Bank

- User service centers, located in different cities, are normally in operation providing to the user community the necessary assistance. The data base presently includes 1158 users (privates companies, government agencies, universities, individuals). From this total above 161 are non-brazilian users.
- A new price list was issued on September 01, 1980. (One copy can be found in the Annex)

RBV SHADING PROBLEM

WRS 247/61 (RBV SUBSCENE C) AS IMAGED BY LANDSAT 3



As calibrated using 14 x 9
gains & offsets table



As generated without
correction (raw data)

Fig. 3 - RBV shading problem

SECTION II

STATISTICS

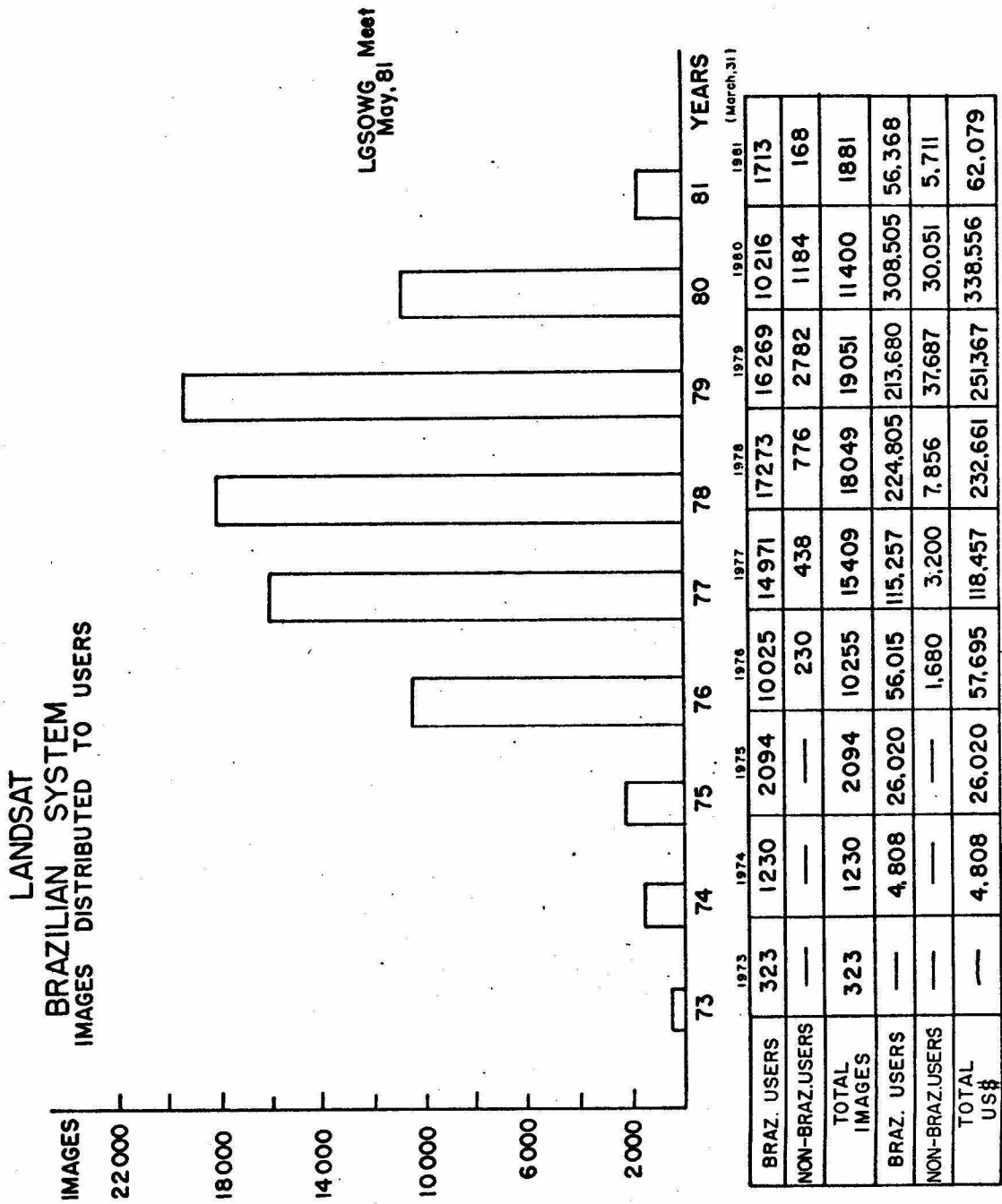
- Scenes Received and Recorded x Scenes Converted to Images
- Images Distributed to Users and Revenues
- CCT's Produced to Users and Revenues
- Images and CCT's Distributed (summary)
- LANDSAT Data Sales/Distribution Analysis for the year of 1980 (quarterly)

LANDSAT
BRAZILIAN SYSTEM
SCENES RECEIVED AND RECORDED
x
SCENES CONVERTED TO IMAGES

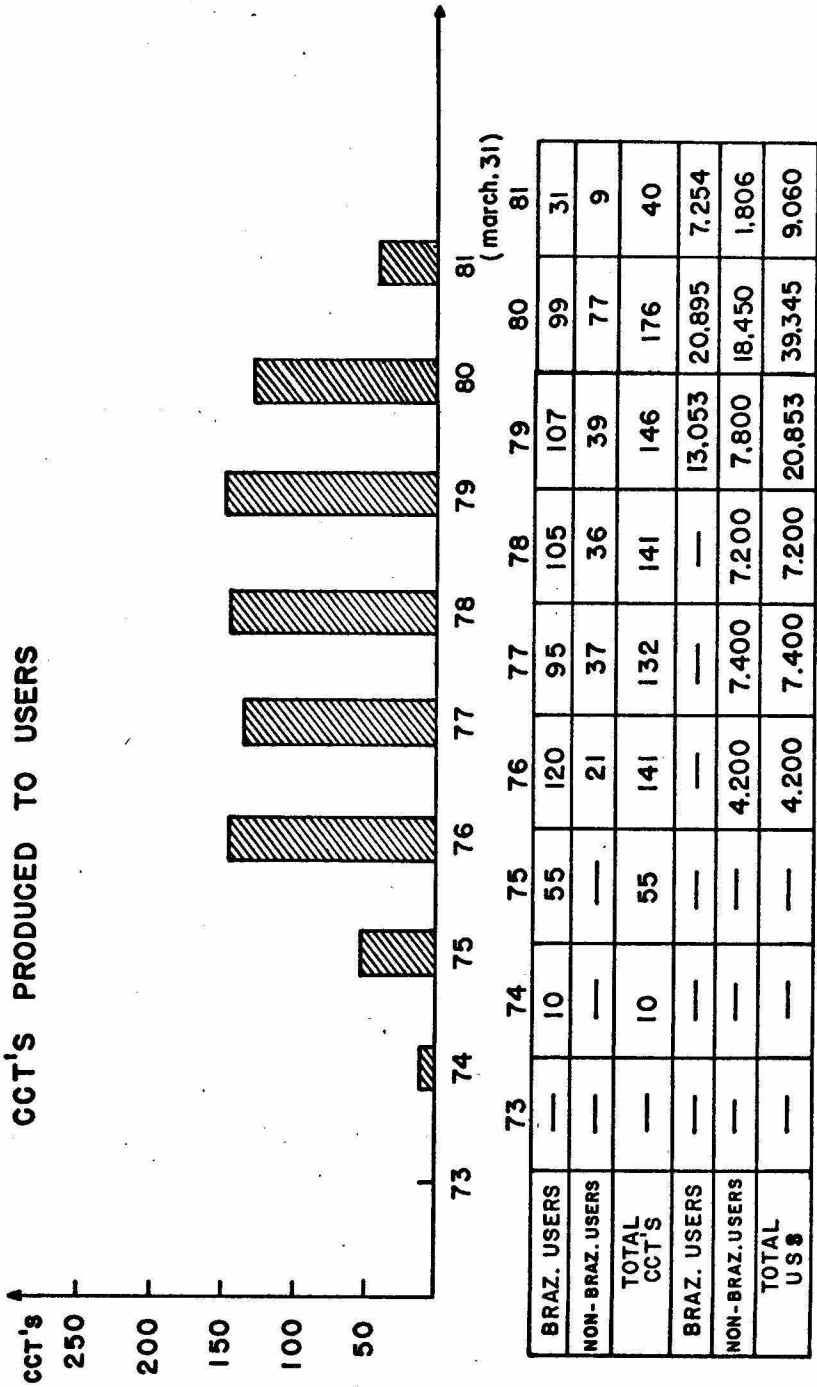
RECEIVED & RECORDED		YEARS												1981 march,31	
SATELLITES		1973 (may)	1974	1975	1976	1977	1978	1979	1980						
LANDSAT 1	MSS	6114	14674	23112	32528	↑	↑	↑	↑						↑
	RBV	—	—	—	—	—	—	—	—						—
LANDSAT 2	MSS	—	—	1550	3370	19632	23952	32532	38626						43092
	RBV	—	—	—	—	288	↑	↑	↑						↑
LANDSAT 3	MSS	—	—	—	—	—	11487	17364	25768						—
	RBV	—	—	—	—	—	1579	9477	23161						28023
TOTAL	MSS	6114	14674	24662	35898	52160	67967	82424	96922						101388
	RBV	—	—	—	—	288	1867	9765	23449						28311
TOTAL	MSS	—	—	2232	5581	11162	19722	25281	27136						28450
	RBV	—	—	—	—	—	—	802	3470						4517

* CCT'S ARE CONVERTED BASED ON USER'S REQUEST

LGSOWG Meet
may , 1981



LANDSAT
BRAZILIAN SYSTEM
CCT'S PRODUCED TO USERS



LGSOWG Meet
may, 1981

LANDSAT
 BRAZILIAN SYSTEM
 IMAGES AND CCT's DISTRIBUTED

QUANTITY	PROD.	YEARS										81 (march,31)
		73	74	75	76	77	78	79	80			
	Images	323	1230	2094	10255	15409	18049	19051	11400	1881		
	CCT's	—	10	55	141	132	141	146	176	40		
REVENUE	Images	—	4,808	26,020	57,695	118,457	232,661	251,367	338,556	62,079		
	CCT's	—	—	—	4,200	7,400	7,200	20,853	39,345	9,060		
TOTAL US \$		—	4,808	26,020	61,895	125,857	239,861	272,220	377,901	71,139		

LGOWG Meeting
 May , 1981

CNPq/INPE

LANDSAT PRODUCT SALES / DISTRIBUTION ANALYSIS
FOR THE FIRST QUARTER (JAN-MAR) 1980

I.A - Total number of LANDSAT images by frames sold or distributed to users and monetary value in US dollars

	Black & White	Color	Total
Frames	1,476	119	1,595
U.S. dollars	26,242.27	2,064.87	28.307.14

B - Total number and total sales in U.S. dollars of MSS scenes sold or distributed to users in CCT's form

Number of MSS CCT's: 38 U.S. dollars: 7,969.68

C - Total LANDSAT products sold or distributed for the quarter:

Photographs (Color and B & W frames):	1,595	US\$ 28,307.14
CCT's	38	US\$ 7,969.68
TOTAL		US\$ 36,276.82

II. Classification of sales and distribution of photo. products and CCT'S by type of user.

USER TYPE	PHOTO PRODUCTS		CCT's	
	% BY MONEY	% BY FRAMES	% BY MONEY	% BY CCT's
A. National Government	25,40	20,61	15,86	21,31
B. State/Provincial Governm.	8,18	9,74	3,45	4,76
C. Academic	11,08	18,15	-	-
D. Industry	18,86	11,19	1,33	1,75
E. Individuals	23,33	27,27	-	-
F. Outside the country	13,14	13,04	79,36	72,18
TOTAL	100,00%	100,00%	100,00%	100,00

CNPq/INPE

LANDSAT PRODUCT SALES / DISTRIBUTION ANALYSIS
FOR THE SECOND QUARTER (APR-JUN) 1980

I.A - Total number of LANDSAT images by frames sold or distributed to users and monetary value in US dollars.

	Black & White	Color	Total
Frames	4,486	514	5,000
U.S. dollars	97,827.85	12,783.54	110,611.42

B - Total number and total sales in U.S. dollars of Mss scenes sold or distributed to users in CCT's form

Number of MSS CCT's: 62 U.S. dollars: 14,604.89

C - Total LANDSAT products sold or distributed for the quarter:

Photographs (Color and B & W frames):	5,000	US\$ 110,611.42
CCT's	62	US\$ 14,604.89
	TOTAL	US\$ 125,216.31

II. Classification of sales and distribution of photo. products and CCT'S by type of user.

USER TYPE	PHOTO PRODUCTS		CCT's	
	% BY MONEY	% BY FRAMES	% BY MONEY	% BY CCT's
A. National Government	28,20	37,75	36,60	36,60
B. State/Provincial Governm.	1,51	0,46	0,27	2,56
C. Academic	16,90	19,04	7,95	11,51
D. Industry	28,88	22,34	1,50	2,56
E. Individuals	15,20	10,87	-	-
F. Outside the country	9,31	9,54	53,58	46,77
TOTAL	100,00%	100,00%	100,00%	100,00%

CNPq/INPE

LANDSAT PRODUCT SALES / DISTRIBUTION ANALYSIS
FOR THE THIRD QUARTER (JUL-SEP) 1980

I.A - Total number of LANDSAT images by frames sold or distributed to users and monetary value in US dollars

	Black & White	Color	Total
Frames	2,353	208	2,561
U.S. dollars	90,049.61	8,049.42	98,099,03

B - Total number and total sales in U.S. dollars of MSS scenes sold or distributed to user in CCT's form

Number of MSS CCT's: 41 U.S. dollars: 8,404.96

C - Total LANDSAT products sold or distributed for the quarter:

Photographs (Color and B & W frames):	2,561	US\$	98,099.03
CCT's	41	US\$	8,404.96
TOTAL		US\$	106,503.99

II. Classification of sales and distribution of photo. products and CCT's by type of user

USER TYPE	PHOTO PRODUCTS		CCT's	
	% BY MONEY	% BY FRAMES	% BY MONEY	% BY CCT's
A. National Government	54,10	59,23	51,71	55,75
B. State/Provincial Governm.	0,90	0,40	-	-
C. Academic	5,99	4,56	6,65	10,28
D. Industry	22,20	16,66	-	-
E. Individuals	5,11	4,12	-	-
F. Outside the country	11,70	15,03	41,64	34,15
TOTAL	100,00%	100,00%	100,00%	100,00%

CNPq/INPE

LANDSAT PRODUCT SALES / DISTRIBUTION ANALYSIS
FOR THE FOURTH QUARTER (OCT-DEC) 1980

I.A - Total number of LANDSAT images by frames sold or distributed to users and monetary value in US dollars

	Black & White	Color	Total
Frames	1,992	248	2,244
U.S. dollars	91,630.61	9,780.76	101,538.41

B - Total number and total sales in U.S. dollars of MSS scenes sold or distributed to users in CCT's form

Number of MSS CCT's: 35 U.S. dollars: 8,365.47

C - Total LANDSAT products sold or distributed for the quarter:

Photographs (Color and B & W frames):	2,244	US\$ 101,538.41
CCT's	35	US\$ 8,365.47
	TOTAL	US\$ 109,903.88

II. Classification of sales and distribution of photo. products and CCT's by type of user.

USER TYPE	PHOTO PRODUCTS		CCT's	
	% BY MONEY	% BY FRAMES	% BY MONEY	% BY CCT's
A. National Government	52,75	54,68	49,18	48,46
B. State/Provincial Governm.	2,71	2,18	-	-
C. Academic	6,60	6,17	-	-
D. Industry	25,99	27,77	14,96	17,25
E. Individuals	8,63	4,07	-	-
F. Outside the country	3,32	5,13	35,86	34,29
TOTAL	100,00%	100,00%	100,00%	100,00%

SECTION III

LANDSAT-D Project Status

- Bid (only TM capabilities): April 30, 1980
- Proposals received by: Scientific Atlanta (USA), SEP (FR), MBB (FRG)
MDA (CAN)
- INPE's Decision : May 30, 1980
- Companies Selected : Scientific Atlanta (Receiving Sub-System)
SEP (Recording and Processing Sub-Systems)
- INPE's Participation : System Analysis (approx. 9 men.month)
Software development (approx. 52 men.month)
Film Recorder Integration (approx. 2 men.month)
Receiving x Recording Sub-systems Integration
(approx. 2 men.month)
- Project Duration : SEP part - 27 months
S. Atlanta part - 14 months
- Commercial contract signatures: SEP - December 18, 1980
S. Atlanta - March 27, 1981
- Characteristics of the New CNPq/INPE Landsat-D System:
 - Receiving Subsystem (Scientific-Atlanta) at Cuiabá
 - . Dual band/dual feed tracking & receiving antenna system
 - . Minicomputer system to generate antenna pointing data and assist tracking
 - . Communications-satellite time acquiring & synchronizing system
 - . Boresight system for better pointing

- Recording Subsystem (SEP) at Cuiabá

- . 28-track NASA-compatible HDDR with second recording speed to act as MSS backup recorder
- . B&W TV display system (interfaced to the minicomputer system mentioned above) for visualization of acquired data and preliminary cloud cover assessment
- . CRT analog display for signal quality check
- . possible extension to extract Payload Correction Data from TM Stream and make it available for the minicomputer system.

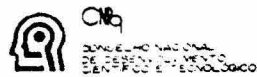
- Processing Subsystem (SEP) at Cachoeira Paulista

- . 32-bit computer system with 800/1600 bpi magtapes, to control the production processes and handle the user aid and management functions.
- . 256 MB dedicated to hold a full TM picture (7 bands)
- . 67 MB database disk to hold image index, production and management files
- . TV display system to allow visualization and interactive manipulation (controlled by the computer) of images loaded onto the 256 MB disk
- . B&W flatscreen CRT monitor wired in parallel with the Color TV to allow taking pictures of the video with a specially coupled photographic camera. This system is meant for production of Quick-Look imagery.
- . 5" continuous film Electron Beam Image Recorder for production of high-resolution B&W images
- . Production process:
 - pipeline HDDT to TV display Quick-Look image generation
 - pipeline HDDT to EBR high-resolution image generation
 - HDDT to 256 MB disk image loading
 - interactive image manipulation on disk (contrast stretch, edge enhancement, haze removal, etc.)
 - disk to CCT (BIL or BSQ, 800 or 1600 bpi) recording
 - disk to EBR high-resolution image generation

- auxiliary functions as ephemeris calculation, geometric corrections computation, radiometric correction computation, etc.
- . User aid functions
 - image index searches
 - catalog issuing
 - request entry and follow up
- . Management functions
 - work order generation and updating
 - production scheduling
 - production logging
 - image index updating
 - QC assessment
 - control of tapes & films
 - statistics
- . Products
 - Quick-Look : 70mm, B&W, annotated pictures of 185 x 185 km ground area video subsampled, corrected for earth rotation (contrast stretched if desired) 50 scenes from one band in real-time rate
 - Bulk film : 5", B&W, annotated pictures of 185 x 185 km ground area full resolution video, radiometrically corrected, system-corrected geometry
 - Bulk CCT : BIL or BSQ, 300 or 1600 bpi, full resolution video, radiometrically corrected, no geometric correction but correction model included in header
 - Precision Products: to be later developed by INPE

ANNEX

CNPq/INPE's Price List for LANDSAT Products



LANDSAT DATA / PRICE LIST					
PHOTOGRAPHIC PRODUCTS					
IMAGE	SIZE	SCALE	FORMAT	BLACK & WHITE UNIT PRICE	COLOR COMPOSITE UNIT PRICE
MSS					
50 mm		1:3,704,000	Film Positive	US\$ 15.00	US\$ N.A.
50 mm		1:3,704,000	Film Negative	18.00	N.A.
185 mm		1:1,000,000	Film Positive	29.00	37.00
185 mm		1:1,000,000	Paper	18.00	29.00
370 mm		1:500,000	Paper	34.00	58.00
740 mm		1:250,000	Paper	80.00	N.A.
RBV					
50 mm		1:1,963,000	Film Positive	15.00	N.A.
50 mm		1:1,963,000	Film Negative	18.00	N.A.
196 mm		1:500,000	Film Positive	29.00	N.A.
196 mm		1:500,000	Paper	18.00	N.A.
393 mm		1:250,000	Paper	34.00	N.A.

HIGH CONTRAST PHOTO PRODUCTS (MSS DATA)

A new electronic / photographic processing is available for photo products, at 3 X the price of the normal processing, in all sizes and formats except 50 mm. Recommended for the Amazonian Region.

COMPUTER COMPATIBLE TAPES (CCT)				
TYPE	TRACKS	bpi	FORMAT	SET PRICE
Bulk	9	800	2 tapes (set)	US\$ 250.00
Edge-Enhanced	9	800	2 tapes (set)	450.00


There is an additional 30 days delay if an export licence to foreign countries is required. CCT's are normally shipped collect.

IMPORTANT:

- RBV data in the scale 1:100,000 also available under soecial request and controled by EMFA (Armed Forces Ministry) based on present law for aerial material distribution (Unit Price US\$ 120.00).
- Minimum order: US\$ 30.00
- Prices valid from September 1, 1980

September, 1980


Nelson de Jesus Parada
Director

 INPE - INSTITUTO DE PESQUISAS ESPACIAIS
SEDE: SÃO JOSÉ DOS CAMPOS SP - AV. DOS ASTRONAUTAS Nº 1760 - CA. POSTAL 818 - FONE 015 288911 - TELEFAX 015 288911 - CEP 12.200
SALVADORA BA - BRAS. SP - RUA PIAUI Nº 150 - CA. POSTAL 31 - FONE 065 81.577 - TELEFAX 065 81.580 - CEP 4.130
GUARULHOS SP - RUA DA CONDIÇÃO Nº 11 - CA. POSTAL 118 - FONE 080 321.88.4 - TELEFAX 080 321.88.4 - CEP 12.000
NATAL RN - AV. SAULINO P. DE MENDONÇA Nº 100 - CA. POSTAL 30 - FONE 084 23.234 - TELEFAX 084 23.234 - CEP 58.000
PORTALEZA RS - RUA DO GUEBRO Nº 1 - CA. POSTAL 281 - FONE 080 22.4.4988 - CEP 90.000