

General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.
- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.
- This document is paginated as submitted by the original source.
- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

"Made available under NASA sponsorship
in the interest of early and wide dis-
semination of Earth Resources Survey
Program information and without liability
for any use made thereof."

78-10180
CR-157370

(E78-10180) INPE LANDSAT SYSTEM (Instituto
de Pesquisas Espaciais, Sac Jcse) 16 p HC
A02/MF A01 CSCL 05E

N78-31479

Unclas
G3/43 00180

~~RECEIVED BY
NASA STI FACILITY
DATE: 8-22-78
DCAF NO. 002979
PROCESSED BY
 NASA STI FACILITY
 ESA - SDS AIAA~~



CONSELHO NACIONAL DE DESENVOLVIMENTO CIENTÍFICO E TECNOLÓGICO

INSTITUTO DE PESQUISAS ESPACIAIS

Made available under NASA sponsorship
In the interest of early and wide dis-
semination of Earth Resources Survey
Program information and without liability
for any use made thereof."

1. Classification <i>INPE-COM.9/RRE</i>	2. Period <i>Oct. 76/Feb. 77</i>	4. Distribution Criterion internal <input type="checkbox"/> external <input checked="" type="checkbox"/>
3. Key Words (selected by the author) <i>INPE LANDSAT SYSTEM</i>		
5. Report Nº <i>INPE-1008-RRE/031</i>	6. Date <i>April 77</i>	7. Revised by
8. Title and Sub-title <i>INPE-LANDSAT SYSTEM</i> <i>Results obtained from October 1976 up to</i> <i>February 1977</i>		9. Authorized by <i>Nauda</i> <i>Nelson de Jesus Parada</i> <i>Director</i>
10. Sector <i>CPI</i>	Code	11. Nº of Copies <i>25</i>
12. Authorship <i>Márcio Nogueira Barbosa</i> <i>Sérgio de Paula Pereira</i>		14. Nº of Pages <i>15</i>
13. Signature of the responsible <i>Márcio N. Barbosa</i>		15. Price
16. Summary/Notes <i>The main objective of this report is to present the</i> <i>current status of the INPE/LANDSAT Facilities, and the results obtained</i> <i>during the period of October 1976, up to February 1977.</i> ORIGINAL PAGE IS OF POOR QUALITY		
17. Remarks <i>Prepared for the LANDSAT Ground Station Operations Working</i> <i>Ground Meeting - INPE, April 12/14/1977.</i>		

INDEX

LIST OF FIGURES	<i>iv</i>
SECTION I - INTRODUCTION	1
SECTION II - INPE-LANDSAT SYSTEM, PRESENT SITUATION	3
2.1 - Image Production Center Staff	3
2.2 - Annual Operating Funds	4
2.3 - Operational Status of Facilities	5
2.3.1 - Cuiaba Tracking and Receiving Station	5
2.3.2 - Electronic Image Processing Laboratory	6
2.3.3 - Photographic Processing Laboratory	8
2.3.4 - Images Data Bank	10
2.3.4.1 - Users	10
2.3.4.2 - Landsat Products - Shipments	11
SECTION III - FINAL CONSIDERATIONS	13

PRECEDING PAGE BLANK NOT FILMED

LIST OF FIGURES

Figure 1 - Image Production Center - Staff 3

Figure 2 - Photographic Products Shipments to External Users ... 12

**ORIGINAL PAGE IS
OF POOR QUALITY**

SECTION I

INTRODUCTION

During the year of 1977, the Brazilian Institute for Space Research (INPE) is continuing its active participation in the LANDSAT Program. The Image Production Center is regularly acquiring, processing and disseminating LANDSAT 2 data besides keeping its production for LANDSAT 1 data.

The whole system is favorably adapting itself to the changes mentioned in the system status report presented during the last LGSOWG meeting at Ottawa, Canada.

In fact this report is to be considered as an updating of the last report, now for the period from October 1976 to February, 1977.

SECTION II

INPE-LANDSAT SYSTEM, PRESENT SITUATION

2.1 - IMAGE PRODUCTION CENTER STAFF

Recently, additional maintenance personnel was assigned to the system to allow a better long term stability of the production line. The present situation can be seen below:

FACILITIES	SKILL CATEGORY				TOTAL
	ADMINISTRATORS	MAINTENANCE		OPERATORS	
		ENGINEERS	TECHNICIANS		
Cuiaba Tracking and Receiving Station	1	2	1	7	11
Electronic Processing Lab.					
- 1st shift	1	4	5	2	12
- 2nd shift	-	1	2	-	3
- 3rd shift	-	-	3	-	3
Photographic Processing Lab.					
- 1st shift	1	-	7	16	24
- 2nd shift	-	-	1	4	5
Image Data Bank	1	-	-	4	5
Management; Production Planning and Control	1	-	-	3	4
TOTAL	5	7	19	36	67

Fig. 1 - Image Production Center - Staff

Administrators - General managers for facility and systems and their staff, each with 4 years experience.

Engineers - Engineering graduates with minimum of 2 years experience.

Technicians - Trade School graduates with 2 years experience

Operators - Secretaries, clerks, equipment operators.

2.2 - ANNUAL OPERATING FUNDS

Comparative table between the allocated funds for 1976, the amount effectively spent up to the end of the year, and the allocated funds for 1977 is presented below:

FUNDING CATEGORIES	ESTABLISHED FOR 1976 (US\$)	SPENT DURING 1976 (US\$)	ALLOCATED FOR 1977 (US\$)
. Spare parts consumables	350,000.00	416,000.00	305,000.00
. Equipments	247,000.00	158,000.00	91,000.00
. Salaries	460,000.00	460,000.00	558,000.00
. Furniture & Tools	30,000.00	27,000.00	43,000.00
. Other Expenses	98,000.00	175,000.00	91,000.00
. Buildings	-----	-----	250,000.00
T O T A L	1.185,000.00	1.236,000.00	1.338,000.00

- . The difference between the value actually spent during 1976 and the one established for that year resulted from cuts in other projects of INPE.
- . The above table does not include the costs for the usage of the satellite.

2.3 - OPERATIONAL STATUS OF FACILITIES

2.3.1 - CUIABA TRACKING AND RECEIVING STATION

- . Recorded LANDSAT-1 MSS data (from May 1973 to February 1977) =
= 1544 orbits.
- . Recorded LANDSAT-2 MSS data (from January 1975 to February 1977) =
= 317 orbits.
- . Quick-Look imagery production reassumed at the end of February 1977.
- . Data acquisition of LANDSAT-2 (MSS data) is being normal from 20/Oct/1976 on, after the discontinuation of transmission of MSS LANDSAT-1 data.

The improvements to be made at the Quick-Look Formatter are tentatively scheduled for the middle of 1977. The manufacturer has contacted us and no further delays are being expected after placing the order.

ORIGINAL PAGE IS
OF POOR QUALITY

Cuiabá experienced problems with the quality of some MSS tapes which resulted in recording poor quality data, during the period that goes from 24th to 29th December, 1976.

2.3.2 - ELECTRONIC IMAGE PROCESSING LABORATORY

- . Processed LANDSAT-I MSS data (up to February 28, 1977) = 405 orbits.
- . Processed LANDSAT-2 MSS data (up to February 28, 1977) = 19 orbits.
- . No deliverable RBV data processed yet.
- . Generated CCT scenes (from October 1976 to February 28, 1977) = 75.

During the last five months the Electronic Laboratory produced a *net* number of 143 new orbits (approximately 3.100 scenes) besides 90 orbits regenerated for the Photographic Laboratory master archive. In the past, the Photographic Laboratory did not have second generation negative film to produce products to users. The procedure was to use the first generation that now needed to be regenerated. So, the production rate for films (orbits) increased from 13,4 orbits/month to 28,6 orbits/month.

NOTE: a - 281 orbits - Jan/75 to Sep 30/76 - 21 months

b - 143 orbits - Oct/76 to Feb 28/77 - 5 months.

This number of 28,6 new orbits/month could not be higher only due to the reduced quantity of acceptable quality 70 mm film (S0 - 219) rolls.

Concerning RBV data, we are presently testing our operational software to generate film imagery, calibrated under computer control.

On August/September of this year we expect the delivery of the additional computer subsystem that will increase our processing capabilities, specially with regard to the production support activities, software development, production control, Photographic Laboratory support and data dissemination.

The computer subsystem will be a PDP 11T/34 with the following characteristics:

- 48K words memory
- 7.5 M Bytes disc memory
- 2 display terminals
- 1 hardcopy terminal
- 1 printer (180 characters per second)
- 1 bus switch (to allow sharing the Mag Tape Units with the existing system).

2.3.3 - PHOTOGRAPHIC PROCESSING LABORATORY

The principal equipments installed for production in the Laboratory can be seen in the table below:

QUANTITY	DESCRIPTION	MANUFACTURER
2	Versamat Film Processor - Model 11 CM	Kodak
1	4 DP-Paper Processor	Kodak
1	Ektachrome RT Processor - Model 1811	Kodak
1	Colorado Continuous Printer	Kodak
1	Video Color Analyzer	Kodak
1	Enlarger - Model 184 (B/W and Color)	DURST
2	Printer (B/W and Color)	Log E
1	Composite Printer Enlarger	I ² S
1	Microfilmer	Fuji
	EQUIPMENTS INSTALLED AFTER OCTOBER 1976	
1	Continuous Color Print Processor - Model 431 (being tested)	Kodak
1	Large Size Reproductions (being tested)	ELENCO
1	Enlarger - Model 600 (operational)	DURST
1	Microfilm Processor Machine (operational)	3M
1	Microfilm Duplicating Machine	Commicromat

During the year of 1976 (up to December 31) the following numbers represent the Photographic Laboratory production for LANDSAT products.

PRODUCTS	QUANTITY (IMAGES)
. Bulk 70 mm B/W Positive Transparency	2.676
. Bulk 70 mm B/W Negative Transparency	1.189
. Bulk 9,5" B/W Paper Print	4.439
. Bulk 9.5" B/W Positive Transparency	369
. 1:500.000 B/W Paper Print	1.154
. 1:250.000 B/W Paper Print	428
T O T A L	<hr/> 10.255

During the months of January and February considerable changes had affected the Photographic Laboratory production. These changes were related to the following activities:

- . establishment of the final parameters for the automated production line with respect to the B/W 2nd and 3rd generation film products and 3rd generation paper products;
- . development of primary tests for color composites which will help the CCRS adviser (Mr. Ernest Nagy), that is coming to Brazil, in the establishment of the final parameters for the color production line.

It must be mentioned that the former constraints in our importation channels had forced us to accommodate our production to the material (paper and chemistry) available in Brazil. However this procedure caused us several problems concerning the quality of our 3rd

generation products, this is, density range, contrast and appropriate characteristic curve for our typical ground truth (for example, images of Amazonas region). Thus, we had to adopt the imported paper, significantly changing our processing parameters, and forcing the automated system to be extensively used to generate test images. The majority of production for those months was manual, resulting in a number of images, about 1000 B/W images, besides 100 color images, for demonstration purposes.

Any way, there is the firm objective to achieve about 30.000 images by the end of this year which would require an average rate of 3.000 images/month during the next months.

An evidence of the success concerning the revision of the operational procedures established in the Photographic Laboratory Quality Control is that none of the images, provided to external users during the period from July to December 1976, was returned to the Center.

2.3.4 - IMAGES DATA BANK

2.3.4.1 - USERS

A policy adopted by INPE for the dissemination of the LANDSAT data, mainly with the actual prices and reduced delivery times, continues to contribute for the growth of the number of users engaged on the research and exploitation of natural resources. Table below represents the actual status.

TYPE	QUANTITY OF USERS*
. normally requesting and receiving data	110
. sporadically requesting and receiving data	46
. only receiving data catalogues and information	19

* Users - companies or individual researchers - year of 1976.

In the beginning of this year, after revising our user files, we decided to temporarily remove about 25 names that during the year of 1976 did not request any kind of data or information. These names will certainly be again incorporated at any time they show interest in the products.

2.3.4.2 - LANDSAT PRODUCTS - SHIPMENTS

The following chart (Figure 2) shows photographic products shipments, per year, to *external users*.

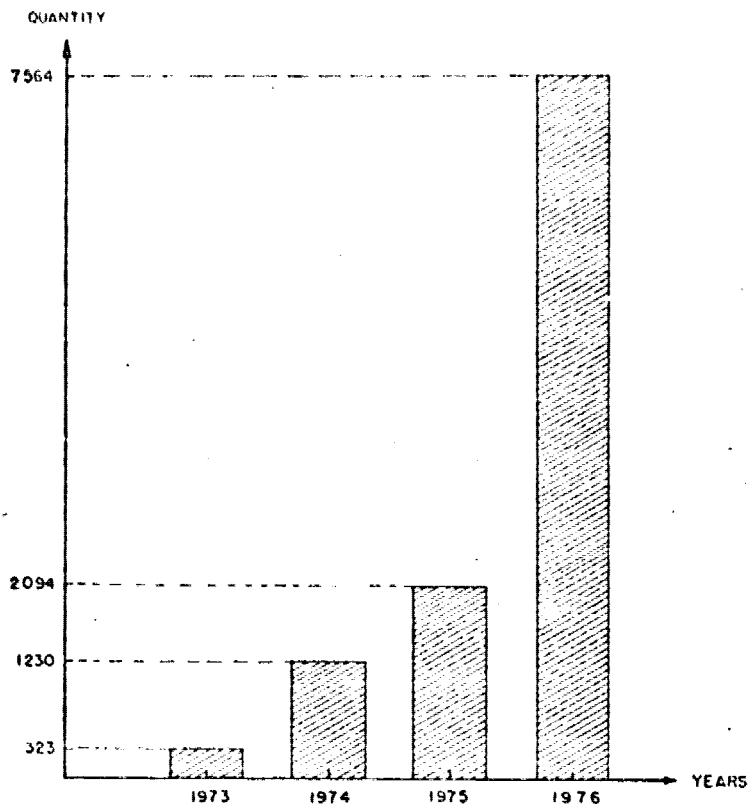


Fig. 2 - Photographic Products Shipments to External Users.

A percentage breakdown by scale of photo-products shipped to users is shown below:

SCALE	% SHIPMENTS (1976)
1:3.704.000 (70 mm)	38
1:1.000.000 (9 1/2")	47
1:500.000	11
1:250.000	4

a) The 1:1.000.000 includes transparencies and paper prints

b) Black and White products only.

**ORIGINAL PAGE IS
OF POOR QUALITY**

SECTION III

FINAL CONSIDERATIONS

The Image Production Center, during January and February 1977 has presented a slight decrease in its overall system throuput due to the unavoidable effects from the deep changes in the Photographic Laboratory in switching from a manual to an automated production. Naturally, the system had its potentiality greatly increased and by the next months the production level will compensate this situation.

The Cuiaba Tracking and Receiving Station is now performing with an excellent degree of reliability as far as noiseless recording and tape alignment are concerned. This has improved in a special way our CCT data quality.

The Electronic Laboratory with the additional maintenance personnel is having now opportunity to exercise its production mode for RBV data under an operational basis. Research and Development personnel are conducting tests with the purpose of improving the geometric accuracy of film products.

Concerning the modifications to provide the existing system with the capability to input and process the LANDSAT-C IR thermal band, INPE has established a working group to study the feasibility of implementing the required changes with their own research and development staff. Any way, the alternative to contact external manufacturers is still being considered.