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SR No 9663

Title of Investigation - Evaluation of the feasibility of using the Data Collection System to operate a network of hydrological and climatological station at sites remote from normal communication links.

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1532F

(E76-10093) EVALUATION OF THE FEASIBILITY OF USING THE DATA CCLLECTION SYSTEM TO OPERATE A NETWORK OF HYDROLOGICAL AND CLIMATOLOGICAL STATIONS AT SITES REMOTE FROM NORMAL COMMUNICATION LINKS (Meteorological Corp.)

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1. Identification

SR number: 9663

User ID : F368

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2. Summary

A base station constituted by a Data Collection Platform (DCP) and four sensors is evaluated on the following aspects. First, the adequacy of the sensors used in conjunction with the platform to measure four hydrometeorological variables is examined. Secondly, the continuity and availability of the measurements obtained during the period are considered. Thirdly, the data obtained is used in conjunction with climatological data obtained at other nearby conventional stations and hydrometrical data compared with those recorded at the same stations.

3. Accomplishments

Our data collection platform has been installed on July 1972. The data (air temperature and water level) that we received since then is entirely compatible with the data used for checking it.

The temperature sensor which is a platinum wire in an appropriate mounting has been placed in a standard Stevenson screen commonly used for climatological purposes. A thermograph has also been placed in this shelter in order to monitor the temperature. A maximum and a minimum thermometer were also installed in order to check these values on the thermograph. These two thermometers were read twice a day at 8.00 and 18.00 E.S.T. A similar installation was already operating at our regular climatological station about half a mile away from the D.C.P.

The water level was recorded in situ on a punched tape recorder. No other means of checking was used.

On October 1973 the D.C.P. has been transfered on a new site and was installed near Caniapiscau River ($55^{\circ}50.4'$ L.N. by $68^{\circ}25.0'$ L.W.). This new site is isolated and hard to come at, the only way to reach the station is with the help of a bush airplane, the platform is very

useful at this place since the purpose of our participation to the ERTS program is to evaluate the usefulness of such platform in a hydrometeorological network situated in a region remote from normal communication links.

At this new site two sensors have been added to the platform, one to transmit air humidity and the other to give the river ice break-off date.

4. Results

All the data that we received is entirely compatible with the data used for checking it. For the climatological data, table I shows some statistical parameters indicating its validity. The data used for these statistics come from the D.C.P., the thermograph placed near the sensor and the thermograph from the principal climatological station.

Hydrometrical data received from N.D.P.F. compare at 100% with the values recorded in situ on a punched tape recorder at the D.C.P. transmitting station.

5. Sensor technology

The sensors that we used, gave a continuous service without any failure. We use only five channels (40 digits), three 8-bit parallel digital words for water level and ice

break-off and two analog channels for air temperature and humidity.

The sensors and interfaces used are:

Temperature: Platinum resistance thermometer by Rosemount Engineering Company; Bridge and Amplifier Model 510BH. Sensor Model 104MD24ACA.

Humidity: Brady Array model 101 with signal conditioning module model 1020 M, manufactured by Thunder Scientific.

Water level: Servomanometer by Canadian Aviation Electronic coupled with a punch tape recorder, Fisher & Porter Co., Model 1551 and Modified Binary Decimal Transmitter, Fisher & Porter Model 50DB2020A.

We would like to suggest to add to the installation kit for the future antenna a brace that solidifies the antenna reflector and which is self supporting instead of using a guy wire. A sketch is presented in attachment B.

6. Communication links

In order to use the data received by platform to make some predictions such as snowmelt or water level of rivers or at dams, it is necessary to have the data on hands at least not more than 24 hours later than the transmission. Since the utilisation of a teletype channel the data have

been received on time, so we think that to operate a network of hydrometeorological stations with the help of D.C.S., the use of a teletype channel from N.D.P.F. to the user is indispensable and that this way of getting the data is the most effective.

7. Data Handling and Processing.

LANSAT Data Collection System products produced by NASA at the Goddard Space Flight Center that are destined for Canadian users are packaged and delivered to the Canadian Embassy in Washington, D.C. the data are then mailed to the Canadian Principal Investigators. This procedure usually results in a delay in receipt of data of about two to three weeks.

In order to receive near real time data, the Canada Centre for Remote Sensing (CCRS) in Ottawa and NASA made arrangements for Canadian DCS data to be received at CCRS by dedicated telephone line after each orbit. The data received are recorded simultaneously on a teletype hard copier and a magnetic tape. These data are periodically inputted

to the CCRS time sharing computer system. A software data retrieval system sorts the user platforms, reformats the data into engineering units and stores individual user files on disk. The Quebec Natural Resources Department may then access his data file using a teletype remote terminal.

8. Operating cost of a gauging station equiped with a DCP

For a 60 gauging stations network situated in site remote from normal communication links and accessible only by bush airplane, the annual operating of one hydrometric station which is not equiped with a retransmission device is $5600.00. This cost include wages, travels expenses and hiring cost of bush airplanes. An allowance of $400.00 per year for depreciation of sensor, transducers and water level recorder as to be add to this amont, the whole cost il therefor $6000.00 per year for the operation of one gauging station. This cost is based on 7 visits per year to the station, it could be lowered because of fewer visits when a satellite retransmission system is use. If we suppose that 3 visites per year would be enough when a DCP is instaled at the station, then the annual operating cost for one station will become:

Operating cost = $5600.00 x 3 visits/7 visits = $ 2400.00

Allowance for depreciation of DCP and interface= 500.00

Allowance for depreciation of hydrometrie instruments = 400.00

Annual operating cost = $ 3300.00

The difference between the operation costs of a gauging station without a DCP and of one with a DCP would be:

$6000.00 - $3300.00 = $2700.00

For a 60 gauging stations network the money saved for one year would be:

$2700.00 x 60 = $162000.00

This amount does not include the data retransmission cost since at present NASA operates the LANDSAT System at no cost to the users. However it is well known that where near real time data are required from remote areas, the data can be most economically obtain by satellite retransmission rather then radio or telephone systems.

9. Conclusion

The General Electric DCP has proven to be a versatile, rugged piece of hardware and has surpassed original expecta-

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tion, it is very simple to use and do not require skilled staff for its use, installation and operation. It is well suited for use in remote site where no power is available.

From this expe_ience with the D.C.P. we conclude that the Date Collection System will be a very useful tool to operate a network of hydrometeorological stations situated in site remote from normal communication links. We intend to continue the experience with ERTS-A and to buy a convertible Data Collection Platform (C.D..P.) for use with satellites ERTS-B and GOES.

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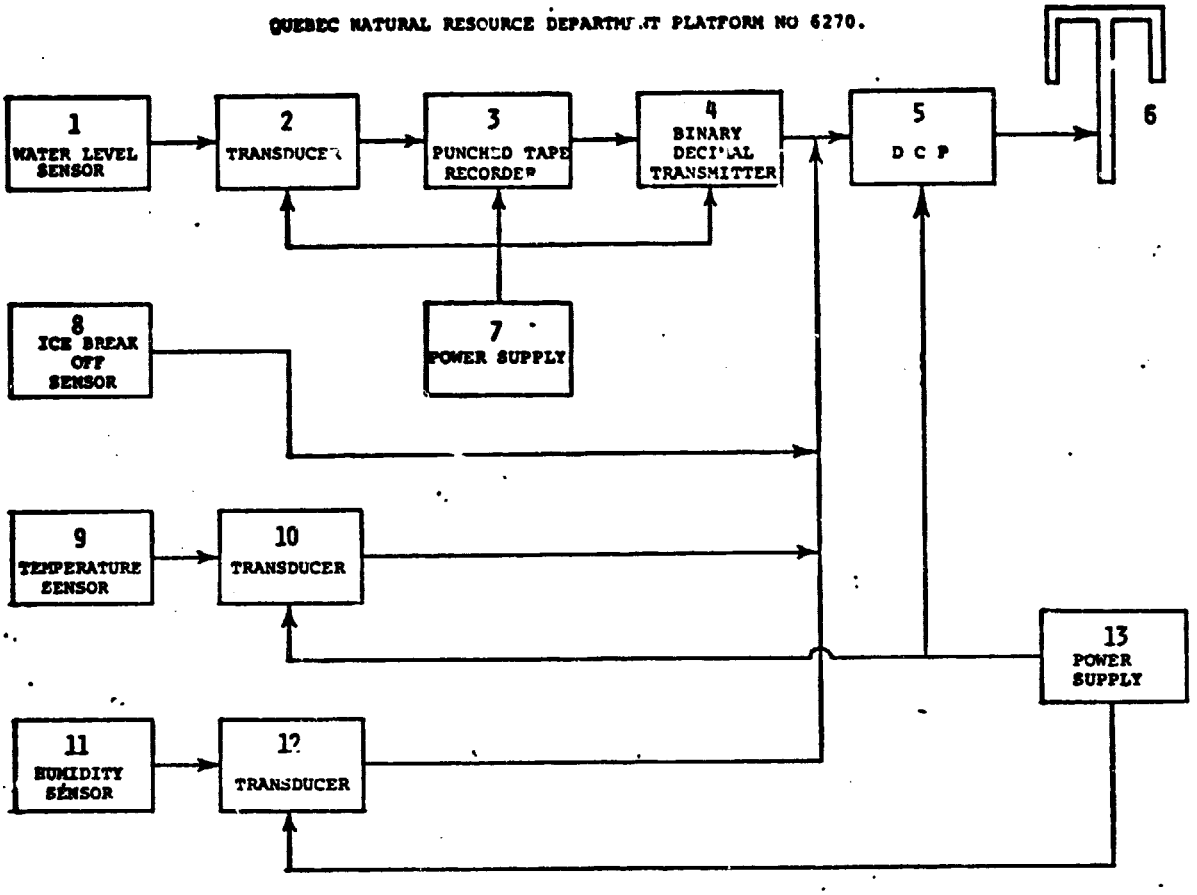
SENSOR TO DCP INTERFACE SYSTEM

PLATFORM Nº 6270

QUEBEC NATURAL RESOURCE DEPARTMENT

BLOC DIAGRAM OF SENSOR/DCP INTERFACE SYSTEM USE WITH THE QUEBEC NATURAL RESOURCE DEPARTMENT PLATFORM NO 6270.



LEGENDE :

1- Pressure sensor - Water level detector.

2- Pressure to rotation transducer - Servomanometer (Canadian Aviation Electronic).

3- Recorder - Punch Tape Recorder (Fisher & Porter Co. Model 1551).

4- Signal conditioner - Modified Binary Decimal Transmettel (Fisher & Porter Model 50DB2020A).

5- Data Collection Platform DCP.

6- Antenna.

7- 7.5 VDC - Power supply for servomanometer, punched tape recorder and Binary decimal transmitter.

8- Close loops in river ice which open when ice break off.

9- Temperature sensor - Platinum resistance thermometer Model 104MD24ACA (Rosemount Engineering).

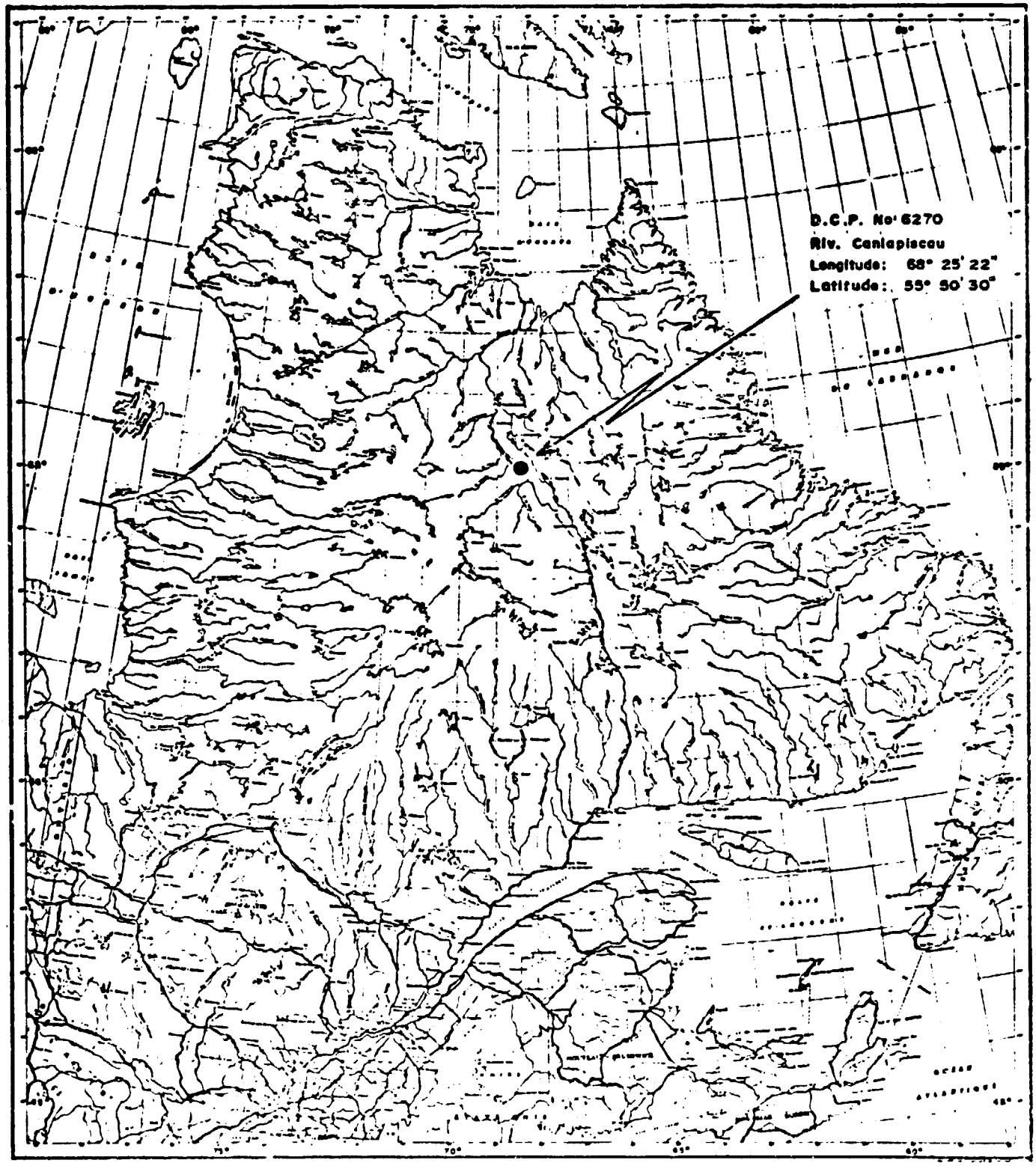
10- Résistance to voltage transducer - Bridge and amplifier model 510BH (Rosemount Engineering).

11- Humidity sensor - Model 101 (Brady Array).

12- Signal conditioning module - Model 1020M (Thunder Scientific).

13- Power supply for temperature and humidity transducer and for the DCP.

MINISTÈRE DES RICHESSES NATURELLES — DEPARTMENT OF NATURAL RESOURCES



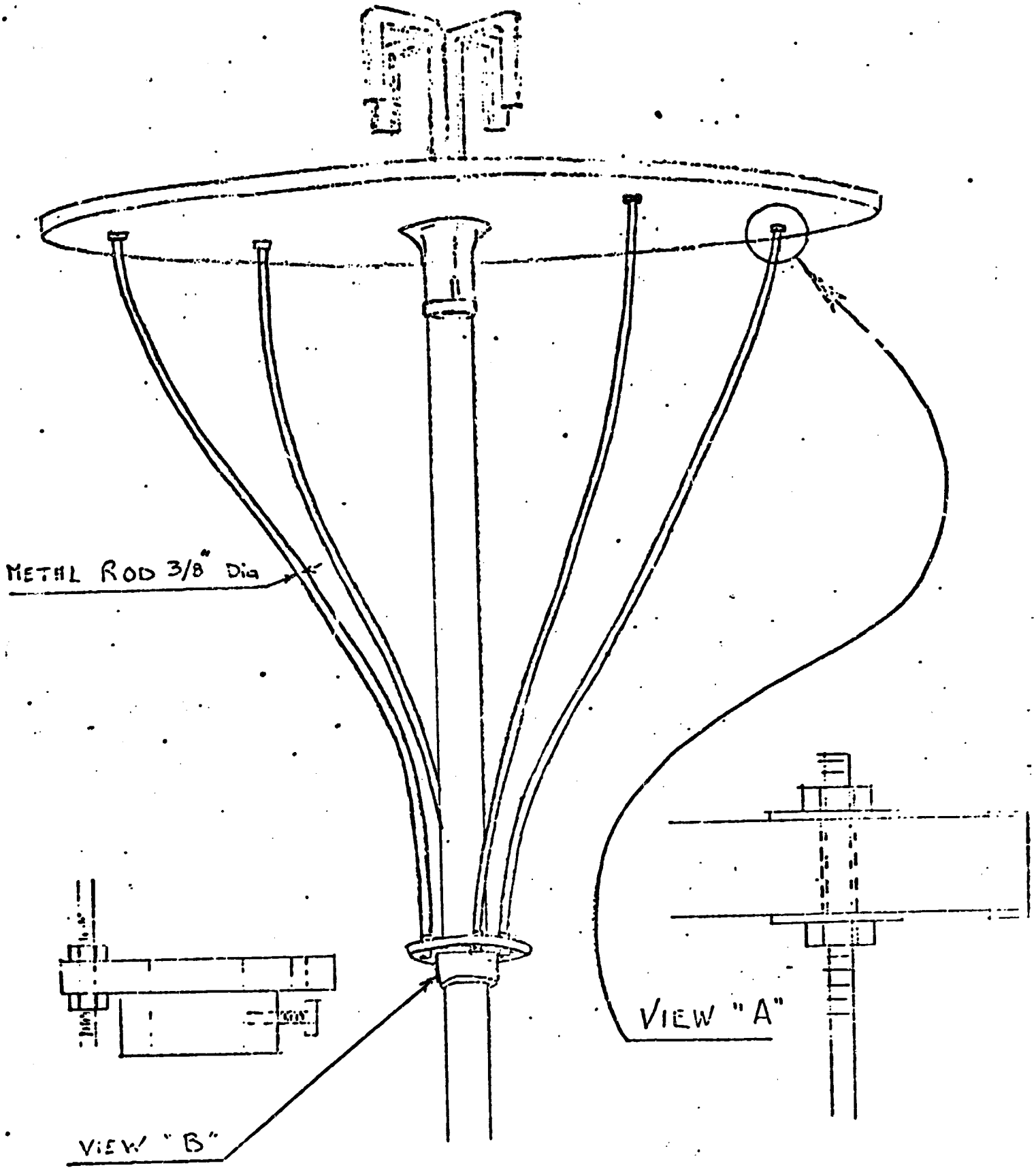
PROVINCE DE QUÉBEC

TABLE I

Statistical parameters on the data received through ERTS-1 and recorded by other means.

Statistical parameter	ERTS-1	Thermograph (THG)	Principal station (STP)
Number of entries	396	123	396
Maximum value	67.6	60.0	70.5
Minimum value	30.0	36.0	30.0
Median	49.4	48.0	50.0
Mean	48.6	47.9	50.0
Mode	50.2	49.1	54.9
Coefficient of skewness	-0.09	-0.19	-0.12
Coefficient of curtosis	-0.01	-0.18	-0.19
Standard deviation	6.88	5.62	7.60
Autocorrelation	0.89	0.89	0.87
Linear regressions (least square)	THG = 0.90 ERTS + 8.5		
		THG = 0.76 STP + 13.54	
	ERTS = 0.80 STP + 8.4		

Attachment "B" 9D



BRACE FOR DCP ANTENNA REFLECTOR

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