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LANDSAT Follow-on Investigation #22510  
Type II Progress Report #5 -  
Three Months Ending 1 June 1976

The Use of LANDSAT DCS and Imagery  
in Reservoir Management and Operation

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Waltham, Mass. 02154

1. ACCOMPLISHMENTS

a. DCS - On 23 Apr'l 1976 the New England Division received the first of two LaBarge Convertible Data Collection Platforms that are being acquired for us by the U.S. Geological Survey. It was installed immediately for testing in the LANDSAT mode with ID 7010 but so far no sensors have been interfaced with it. Programming the DCP by means of the test set proved to be very simple and there were no problems. The power requirement is higher than the General Electric DCP's, and on 24 May we installed the Solarex photoelectric panel to charge the DCP battery. The battery still was drained within one day, and a further check showed the DCP was drawing a high current continuously. The manufacturer is investigating the trouble. A DCP listing is shown on figure 1.

A manual entitled: "Operation of the LANDSAT Automatic Tracking System" has been prepared by Timothy Buckelew of the New England Division to document the procedures and theory of operation of our downlink. The 50-page book includes text, flow charts, figures, and program listings (copy is attached to this report). Also included is a copy of our revised pamphlet entitled: "LANDSAT Satellite and Flood Control in New England" which will be distributed for general information and background.

During this quarter NED released the Paper Tape Punch (5/8 level converter) which had been provided by NASA. Since our

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downlink began operating we had no further need for paper tapes for data storage. Real time data from our downlink now is stored directly on disc by the mini computer; and backup and comparison data is still supplied by NASA on punched cards.

In connection with the daily operation of our downlink, Mr. Jack Efner of Mission Planning at GSFC kindly furnished us a copy of the horizon mask used by his group to determine time of acquisition and loss of the LANDSAT-2 spacecraft. This has helped us to anticipate the instant when LANDSAT transceivers are turned on or off.

On 13 May we received a Model 9100 Time Code generator from DATUM, INC., Anaheim, California and installed it in the Data General NOVA mini computer and implemented a program to read the time. Within a few days this program had been incorporated into our automatic tracking operation so that now we have a dependable source of standard time within the system.

b. Imagery - Work is continuing at the U.S. Army Cold Regions Research & Engineering Laboratory (CRREL) in Hanover, New Hampshire on the use of CCT's for watershed management. Specific items of progress will be described in the next quarterly report.

## 2. MAJOR PROBLEMS

a. DCS - DCP 7170 was reported stolen from its site on South Mountain, New Hampshire on 4 March 1976 and was not recovered upon investigation.

The mini computer which controls our tracking antenna still has one obscure system error which occurs during the tracking operation. We are currently tracing the source of this error.

b. Imagery - No problems were encountered concerning LANDSAT imagery.

## 3. SIGNIFICANT RESULTS

DCS - The LANDSAT DCS and our downlink continued to conform to expectations during this reporting period. A tally of DCP messages received (figure 2) shows that the number of

messages increased markedly at the beginning of the year as the downlink went into operation, but dropped off in May due to computer troubles. However, there were no flood emergencies during computer downtimes, so we were never without data when it was needed.

#### 4. MEETINGS AND VISITORS

On 1 April 1976 a command inspection was conducted by the following officials from the Office of the Chief of Engineers, Washington, D. C.:

Major General E. Graves, Director of Civil Works

Colonel P. W. Marks, Chief, Engineering Information and Data Systems Office

LTC D. S. Svendsen, Chief, Military Personnel Division, OPA

A slide show briefing by Mr. Saul Cooper, Principal Investigator, was presented to the inspection team and following that the downlink system was demonstrated by Mr. Timothy Buckelew.

Other visitors during this quarter included:

Mr. Robert Bielo, Executive Director of the Susquehanna River Basin Commission, Pennsylvania

Mr. Geoffrey Clark, Raytheon Service Company, Burlington, Massachusetts

Mr. Jerry McCall, Massachusetts Department of Environmental Quality Engineering (Mr. McCall is exploring the use of LANDSAT imagery to detect red tides)

Dr. John Wallace, Meteorological Systems, Incorporated, Lexington, Massachusetts

Mr. Kim Reed, Telecommunications Consultant, Adelaide, Australia

Approximately a hundred other people also learned of NED's data collection activities, either by visiting the downlink or attendance at Mr. Buckelew's presentation.

#### 5. RECOMMENDATIONS

Recommendations are not included at this time beyond what has been suggested in the past.

#### 6. FUTURE PLANS

Plans are unchanged from those presented in earlier reports.

#### 7. ACCOUNTING

A tabulation of the dollar value of the imagery data ordered and received through 30 May 1976 for this investigation follows:

<u>Type of Imagery</u>	<u>Value of Data Allowed</u>	<u>Value of Data Ordered</u>	<u>Value of Data Received</u>
LANDSAT Prints and Transparencies (standing order)		Does not apply	\$8,300
	A total of \$9,900		
LANDSAT Prints and Transparencies (retrospective orders)		0	0
LANDSAT Computer Compatible Tapes	\$3,800	0	0
Aircraft Imagery	\$ 360	0	0

Total NASA funds expended on this investigation as of 30 May 1976 are \$48,044.52.

  
SAUL COOPER  
Principal Investigator

LANDSAT-2 - DCP INFORMATION SHEET  
 U.S. ARMY CORPS OF ENGINEERS, NEW ENGLAND DIVISION 15 APRIL 1976

DCP NO.	STATION NAME	PARA-METER(S)*	LAT	LONG
7147	ST. JOHN RIVER AT NINEMILE BRIDGE, ME.	RS WES	46 42 00	69 42 59
7101	ST. JOHN RIVER AT DICKEY, ME.	RS WQ	47 06 44	69 05 25
7355	MICHAUD FARM AT ALLAGASH FALLS, ME.	WES	46 57 05	69 11 43
7273	ST. JOHN RIVER AT FORT KENT, ME.	RS	47 15 27	68 35 35
7071	PENOBSCOT RIVER AT WEST ENFIELD, ME.	RS	45 14 12	68 38 56
7272	CARABASSETT RIVER NEAR NORTH ANSON, ME.	RS	44 52 09	69 57 20
7356	SACO RIVER AT CORNISH, ME.	RS	43 48 35	70 46 53
7271	STINSON MOUNTAIN, N.H.	P	43 50 06	71 46 49
7127	SOUTH MOUNTAIN, N.H.	P	42 58 59	71 35 21
7201	PEMIGEWASSET RIVER AT PLYMOUTH, N.H.	RS	43 45 33	71 41 10
7207	MERRIMACK RIVER NEAR GOFFS FALLS, N.H.	RS	42 56 54	71 27 52
7214.7331	COLD REGIONS LAB, HANOVER, N.H.	T	VARIABLE	
7246	WACHUSETT MOUNTAIN, MA.	P	42 29 24	71 53 15
6063	IPSWICH RIVER NEAR IPSWICH, MA. (1)	RS	42 39 35	70 53 39
7106	NORTH NASHUA RIVER AT FITCHBURG, MA.	RS	42 34 34	71 47 19
7142	CHICOPEE RIVER AT CHICOPEE FALLS, MA.	WQ	42 09 37	72 34 52
7021	WESTFIELD RIVER AT WEST SPRINGFIELD, MA.	WQ	42 05 59	72 38 28
----	NED HEADQUARTERS, WALTHAM, MA.	T	42 23 46	71 12 56
7335	BRANCH RIVER AT FORESTDALE, R.I.	RS	41 59 47	71 33 47
7345	PAWTUXET RIVER AT CRANSTON, R.I.	RS	41 45 03	71 26 44
7254	CONNECTICUT RIVER AT HARTFORD, CT.	RS	41 46 10	72 40 04
7242	CONNECTICUT RIVER NEAR MIDDLETOWN, CT.	RS	41 33 40	72 36 45
7206	PORTER BROOK NEAR MANCHESTER, CT. (2)	RS	41 45 55	72 30 12

7124.6216 (3) RL AT GST GT WP  
 7042.7325 (3,4)

7010.7304.7171.7220.7233 SPARES

- \* P - PRECIPITATION
- WES - WATER EQUIVALENT OF SNOWPACK
- RS - RIVER STAGE
- RL - RESERVOIR LEVEL
- WQ - WATER QUALITY (TEMPERATURE, CONDUCTIVITY, PH AND DISSOLVED OXYGEN)
- AT - AIR TEMPERATURE(S)
- GST - GROUND SURFACE TEMPERATURE
- GT - GROUND TEMPERATURE(S)
- WP - WIND PASSAGE
- PV - PARAMETERS VARIABLE
- T - TEST SET

- (1) DCP BELONGS TO U.S. GEOLOGICAL SURVEY, BOSTON, MA.
- (2) DCP ON LOAN TO U.S. GEOLOGICAL SURVEY, HARTFORD, CT. - ON DEMONSTRATION AT THE MANCHESTER NATURE CENTER
- (3) DCP ON LOAN TO U.S. ARMY COLD REGIONS RESEARCH AND ENGINEERING LAB, HANOVER, N.H.
- (4) NOT YET INSTALLED

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DCP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
7147	23	116	220	103	44	0	0	0	0	0	0	0	506
7101	0	0	0	0	0	0	0	0	0	0	0	0	0
7355	6	41	208	169	20	0	0	0	0	0	0	0	444
7220	40	145	302	132	0	0	0	0	0	0	0	0	619
7071	30	68	92	259	250	12	0	0	0	0	0	0	709
7272	0	0	80	80	109	8	0	0	0	0	0	0	277
7356	23	11	127	175	166	11	0	0	0	0	0	0	513
7170	24	101	0	0	0	0	0	0	0	0	0	0	125
7127	28	126	273	255	217	11	0	0	0	0	0	0	910
7201	25	89	168	135	0	0	0	0	0	0	0	0	417
7233	8	0	0	152	59	0	0	0	0	0	0	0	219
7331	0	0	0	134	158	13	0	0	0	0	0	0	305
7246	29	0	0	0	11	12	0	0	0	0	0	0	52
7106	27	111	273	233	203	11	0	0	0	0	0	0	858
7242	0	0	14	282	237	14	0	0	0	0	0	0	547
7142	40	106	229	222	211	9	0	0	0	0	0	0	817
7021	0	0	0	125	120	10	0	0	0	0	0	0	255
7207	27	96	10	0	47	11	0	0	0	0	0	0	191
7304	0	0	0	0	0	0	0	0	0	0	0	0	0
7345	16	10	6	229	199	14	0	0	0	0	0	0	474
7254	0	0	12	247	230	12	0	0	0	0	0	0	501
7335	0	0	0	0	9	0	0	0	0	0	0	0	9
7206	17	80	185	170	115	5	0	0	0	0	0	0	572
7042	0	0	0	0	0	0	0	0	0	0	0	0	0
7325	0	0	0	0	0	0	0	0	0	0	0	0	0
7010	0	0	0	5	75	0	0	0	0	0	0	0	80
7012	0	0	0	0	0	0	0	0	0	0	0	0	0
7171	0	0	0	0	0	0	0	0	0	0	0	0	0
7271	0	0	80	209	155	0	0	0	0	0	0	0	444
7273	0	0	0	149	245	15	0	0	0	0	0	0	409
TOTALS	363	1100	2279	3465	2880	166	0	0	0	0	0	0	

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NOT OURS- 1099

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Figure 2