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Landsat Follow-On Investigation #21610
Type II Progress Report
March 31, 1976
9/30/75 — 3/31/76

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National Center, MS 467
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N76-21651
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(E76-10284) [THE USE OF THE LANDSAT DATA COLLECTION SYSTEMS (DCS) FOR RELAYING HYDROLOGIC DATA] Progress Report (Geological Survey, Reston, Va.)
$3.50

The Water Resources Division (WRD), U.S. Geological Survey (USGS) continues to assess the use of the Landsat Data Collection Systems (DCS) for relaying hydrologic data.

The primary objective of this investigation is to introduce DCS technology to WRD districts. It has become apparent from the testing of the Landsat DCS by the Geological Survey, U.S. Army Corps of Engineers and other agencies during the first 3 years of the Landsat era that DCS technology is viable. As a result of several NASA-funded Landsat investigations a small cadre of WRD professionals and technicians have gained operational and technical experience with DCS technology. An important result of the NASA-funded investigations has been the formation of a WRD-funded Data Relay Research Program, which is testing the Landsat and SMS/GOES DCS's and is evaluating the possibility of testing a commercial DCS system using commercial communications satellites. Concurrent with the WRD research program is the conduct of Landsat investigation #21610, which is intended to broaden the base of WRD familiarity with this technology. The plan is to install Landsat Data Collection Platforms (DCP) in as many of the 48 WRD districts as possible and facilitate the retrieval of these data through the USGS telecomputer network. This network is composed of two 370/155 computers in Reston, Va. and a network of over 180 remote computer terminals that are distributed in district, regional, and project offices across the United States.

The key accomplishment of this investigation during the past 9 months has been the establishment of a data transfer procedure that permits Landsat DCS data to be transmitted in real time from NASA to the Geological Survey's National Center in Reston, Va. With USGS funds and the excellent cooperation of NASA personnel at the Goddard Space Flight Center, a dedicated (9600 baud) digital communications line between the Landsat Operation Control Center (OCC) and Reston was established in the summer of 1975. All NASCOM data routed to the OCC that are identified as Landsat DCS data are rerouted in real time through the OCC computer to the dedicated line to Reston, where they are copied on a magnetic tape recorder. Twice per day, at about 9 a.m. and 4 p.m. these data are entered into the USGS computer in Reston where USGS Data Collection Platform (DCP) data are stripped off and copied onto an online disk file. Each USGS DCP file maintains a record of the most recently collected 180 DCP transmissions, which normally covers a 2-3 week period.

21610

TABLE 1

ERTS DCP IDS RESIDING IN THE WRD ACTIVE DATA FILE

ID	STATION NAME	TIME OF RECEPTION OF RESIDENT MESSAGES NEWEST		OLDEST		station identification #
6000	EVERGLADES P-35 NEAR HOMESTEAD, FLA.	3/19/76	04:27 GMT	2/10/76	04:21 GMT	02290832
6001	EVERGLADES STA 2-17 NR ANDYTOWN FLA	3/18/76	15:19 GMT	12/10/75	14:30 GMT	02284642
6002	EVERGLADES 2-112S NEAR MARGATE, FLA.	2/27/76	16:51 GMT	2/06/76	14:55 GMT	02284644
6004	PLAT 6004 MT BAKER SOUTH TILTMETER	3/19/76	06:19 GMT	2/23/76	19:52 GMT	484430121490001
6005	PLAT6005 AGUA E.C. GUATEMALA	3/19/76	02:46 GMT	1/30/76	16:00 GMT	142500090420001
6006	BAKER BUTTE METEOROLOGICAL STATION, ARIZ.	3/19/76	04:37 GMT	2/24/76	16:43 GMT	342700111230000
6011	PLAT 6011 PACAYA E.C. GUATEMALA	3/09/76	16:12 GMT	2/11/76	15:22 GMT	142350090333801
6014	SALINE RIVER NEAR RYE, ARK.	3/19/76	02:53 GMT	2/20/76	01:57 GMT	07363500
6016	BLACK RIVER NEAR FORT APACHE, ARIZ.	3/19/76	04:33 GMT	3/02/76	04:39 GMT	09490500
6020	SHERMAN CRATER CREEK, WASHINGTON	12/17/75	04:29 GMT	10/19/75	05:39 GMT	484611121484400
6024	EVERGLADES 206-NP NEAR MIAMI FLA	2/05/76	03:58 GMT	1/20/76	16:46 GMT	02290811
6030	GOLD C AT JUNEAU AK	3/19/76	08:22 GMT	3/05/76	05:04 GMT	15030000
6031	EVERGLADES P-14S NEAR HOMESTEAD, FLA.	3/19/76	04:26 GMT	2/24/76	04:00 GMT	02290829
6033	EVERGLADES 1-141S NEAR LOXAHATCHEE, FLA.	3/19/76	04:28 GMT	2/27/76	15:12 GMT	02281278
6034	PLAT 6034 MASAYA HIGH TILT NICARAGUA	3/19/76	04:28 GMT	2/24/76	14:55 GMT	120000086150001
6036	PLAT 6036 CERRO NEGRO E.C. NICARAGUA	1/07/76	17:13 GMT	1/06/76	18:46 GMT	123120086420401
6037	PEARL RIVER NEAR BOGALUSA, LA	1/29/76	15:54 GMT	1/08/76	02:58 GMT	02489500
6043	PLAT 6034 REPAIR MENLO PARK	1/12/76	05:10 GMT	1/07/76	18:53 GMT	372418122103206
6044	MISSISSINEWA RIVER AT MARION, IND.	3/19/76	04:34 GMT	3/01/76	15:24 GMT	03326500
6050	UGANIK R NR KODIAK ALASKA	3/14/76	19:57 GMT	8/04/75	19:28 GMT	15296000
6057	PLAT 6057 REPAIR MENLO PARK	3/19/76	02:46 GMT	3/18/76	02:37 GMT	372418122103207
6066	PLAT 6066 DOLORES TILT GUATEMALA	3/19/76	04:28 GMT	2/27/76	02:36 GMT	142348090334101
6067	BOISE RIVER NEAR TWIN SPRINGS, IDAHO	3/19/76	04:37 GMT	3/05/76	19:07 GMT	13185000
6073	WEST BRANCH SUSQUEHANNA RIVER AT LEWISBURG, PA.	3/19/76	02:54 GMT	3/04/76	15:35 GMT	01553500
6103	PLAT 6103 MT BAKER NORTHEAST E.C.	3/19/76	06:20 GMT	2/12/76	17:07 GMT	484800121470001

6107	KADASHAN R AB HOOK C NR TENAKEE AK	3/19/76	08:22 GMT	3/10/76	17:52 GMT	15106920
6110	PEARL R AT POOLS BLUFF NR BOGALUSA LA	3/09/76	16:10 GMT	2/07/76	04:08 GMT	02490193
6114	SOUTH FORK WALLA WALLA RIVER NEAR MILTON,OREG.	3/19/76	04:37 GMT	2/07/76	04:10 GMT	14010000
6115	SOUTH FORK BOISE RIVER NEAR FEATHERVILLE, IDAHO	7/30/75	04:52 GMT	7/08/75	04:26 GMT	13186000
6116	ELKHORN R AT WATERLOO NEBR	3/19/76	04:27 GMT	3/06/76	05:05 GMT	06800500
6117	PLAT 6117 MIDDLETON ISLAND DUAL TILT	3/19/76	08:08 GMT	3/16/76	06:05 GMT	550000155000001
6121	EVERGLADES 3-62S NEAR ANDYTOWN, FLA.	2/06/76	02:17 GMT	1/06/76	01:10 GMT	02286960
6122	EVERGLADES 3-65S NEAR MIAMI, FLA.	1/23/76	15:21 GMT	11/27/75	00:42 GMT	02289043
6132	PLAT 6132 REPAIR MENLO PARK	NO DATA TRANSMISSIONS IN DATA FILE				372418122103201
6136	SOUTH PLATTE RIVER AT HENDERSON, CO.	3/19/76	04:36 GMT	3/01/76	18:39 GMT	06720500
6151	WHITE RIVER NEAR FORT APACHE, ARIZ.	3/09/76	16:12 GMT	9/28/75	05:20 GMT	09494000
6152	EVERGLADES 202-NP NEAR MIAMI FLA	3/19/76	02:52 GMT	2/19/76	16:11 GMT	02290862
6154	PLAT 6154 BUENA VISTA E.C. GUATEMALA	3/19/76	04:34 GMT	2/07/76	05:55 GMT	142633090413301
6162	PLAT 6162 REPAIR MENLO PARK	3/19/76	04:25 GMT	2/18/76	01:43 GMT	372418122103202
6163	PLAR 6163 SAN CRISTOBAL TILT NICARAGUA	3/19/76	04:26 GMT	2/20/76	14:33 GMT	124052087012601
6165	WEST CLEAR CREEK NEAR CAMP VERDE, ARIZ.	3/19/76	04:36 GMT	3/05/76	04:57 GMT	09505800
6176	PLAT 6176 REPAIR MENLO PARK	3/19/76	04:29 GMT	3/03/76	02:57 GMT	372418122103203
6177	MORMON MOUNTAIN METEOROLOGICAL STATION, ARIZONA	3/19/76	04:35 GMT	3/03/76	04:45 GMT	345700111310000
6204	DUCK RIVER NEAR SHELBYVILLE, TENN.	3/19/76	02:49 GMT	1/25/76	02:53 GMT	03598000
6213	PLAT 6213 TELICA E.C. NICARAGUA	NO DATA TRANSMISSIONS IN DATA FILE				123612086513301
6225	MORMON MOUNTAIN METEOROLOGICAL STATION, ARIZONA	1/08/76	17:23 GMT	6/01/75	16:52 GMT	345700111310000
6227	DELAWARE BAY AT SHIP JOHN SHOAL LIGHTHOUSE NJ	10/16/75	01:55 GMT	1/09/75	14:18 GMT	01412350
6230	LAKE ELEANOR NEAR HETCH HETCHY, CA.	3/19/76	04:36 GMT	2/19/76	05:17 GMT	11277500
6235	EVERGLADES 3-64S NEAR MIRAMAR, FLA.	3/19/76	04:30 GMT	2/27/76	04:14 GMT	02286970
6236	EVERGLADES 20K-NP NEAR MIAMI FLA	2/26/76	04:16 GMT	2/07/76	00:43 GMT	02290868
6237	MISSISSIPPI RIVER AT NEW ORLEANS, LA.	3/19/76	04:31 GMT	3/01/76	02:52 GMT	07374508
6240	PLAT 6240 REPAIR MENLO PARK	3/19/76	04:33 GMT	1/27/76	04:50 GMT	372418122103204
6245	ITHICA OFFICE,NEW YORK	6/23/75	15:33 GMT	5/20/75	01:25 GMT	
6247	PLAT 6247 MASAYA LOW TILT NICARAGUA	3/19/76	04:27 GMT	2/26/76	02:27 GMT	120000086150002
6256	EVERGLADES 3-63S NEAR ANDYTOWN, FLA.	3/19/76	04:30 GMT	12/19/75	04:28 GMT	02286998

6257	BAYOU LAFOURCHE AT LAROSE, LA.	3/19/76	04:29 GMT	2/13/76	15:35 GMT	07381230
6262	PLAT 6262 SAN CRISTOBAL E.C. NICARAGUA	1/12/76	05:08 GMT	1/07/76	04:40 GMT	124052087012602
6264	SANDY RIVER NEAR MARMOT, OREG.	3/19/76	04:37 GMT	2/17/76	17:52 GMT	14137000
6266	TONGUE RIVER AT STATE LINE, NEAR DECKER, MONT.	3/19/76	04:36 GMT	2/10/76	04:27 GMT	06306300
6274	PLAT 6276 PACAYA TILT KILLED BU LAVA	2/20/76	16:16 GMT	1/26/76	04:40 GMT	144500091420001
6275	SILVIES RIVER NEAR BURNS,OREG.	3/19/76	08:19 GMT	2/24/76	05:46 GMT	10393500
6276	PLAT 6274 SANTIAGUITO E.C. GUATEMALA	NO DATA TRANSMISSIONS IN DATA FILE				142303090372101
6277	DELAWARE R AT TRENTON NJ	2/18/76	14:17 GMT	1/20/76	02:31 GMT	01463500
6301	TONGUE R BL BRANDENBERG, NR ASHLAND, MT.	3/19/76	04:39 GMT	3/11/76	05:36 GMT	06307830
6306	WASHITA RIVER NR DURWOOD, OKLA.	3/19/76	04:29 GMT	3/01/76	15:25 GMT	07331000
6307	WEST WALKER RIVER AT HOYE BRIDGE NEAR WELLINGTON	3/18/76	04:27 GMT	2/19/76	03:41 GMT	10297500
6311	PLAT 6311 IZALCO E.C.	3/19/76	04:28 GMT	2/10/76	04:22 GMT	134915089374801
6313	EVERGLADES 201-NP NEAR MIAMI FLA	3/19/76	04:29 GMT	2/24/76	04:04 GMT	02290861
6315	PLAT 6315 ICELAND E,C.	3/19/76	01:13 GMT	2/24/76	00:41 GMT	660000020000001
6320	PLAT 6320 FUEGO TILT GUATEMALA	3/19/76	04:26 GMT	2/18/76	16:03 GMT	142640090503701
6324	CAYUSE PASS SNOW COURSE	3/19/76	04:37 GMT	2/10/76	04:23 GMT	465214121314600
6325	MAVERICK METEOROLOGICAL STATION, ARIZ.	3/19/76	04:36 GMT	3/04/76	17:20 GMT	334500109290000
6327	MISS. R. AT LOCK AND DAM 2 AT HASTINGS, MINN.	7/22/75	16:31 GMT	4/27/75	02:42 GMT	05331577
6332	SOUTH FORK BOISE RIVER NEAR FEATHERVILLE, IDAHO	3/19/76	04:39 GMT	2/24/76	18:21 GMT	13106000
6334	PLAT 6334 SAN CRISTOBAL E.D. NICARAGUA	NO DATA TRANSMISSIONS IN DATA FILE				124052087012605
6341	SUSQUEHANNA RIVER AT HARRISBURG,PA.	3/19/76	02:52 GMT	2/27/76	16:50 GMT	01570500
6342	PLAT 6342 MT BAKER NORTHEAST TILTMETER	3/19/76	04:35 GMT	1/29/76	05:03 GMT	484800121470002
6343	WILLAMETTE RIVER AT SALEM,OREG.	3/19/76	06:19 GMT	3/02/76	17:15 GMT	14191000
6344	JUNIATA RIVER AT NEWPORT, PA.	3/19/76	02:55 GMT	3/03/76	01:21 GMT	01567000
6351	MIDDLE SANTIAM RIVER NEAR CASCADIS, OREG.	3/19/76	04:38 GMT	2/09/76	16:52 GMT	14185800
6361	L BEAVER C NR EAST LIVERPOOL OH	3/19/76	02:53 GMT	3/02/76	15:26 GMT	03109500
6362	EVERGLADES 1-142S NEAR DELRAY BEACH, FLA.	2/04/76	14:42 GMT	1/01/75	16:35 GMT	02281291
6365	PLAT 6365 ST. AUGUSTINE ISLAND E.C.	1/23/76	08:05 GMT	1/19/76	21:34 GMT	592233153221501
6367	BITTEROOT RIVER NEAR DARBY, MT.	3/19/76	06:21 GMT	3/01/76	02:56 GMT	12344000
6370	PLAT 6370 REPAIR MENLO PARK	11/14/75	17:19 GMT	11/14/75	15:30 GMT	372418122103205

6371	COWLITZ RIVER BELOW MAYFIELD DAM, WASH.	3/19/76	04:37 GMT	2/10/76	18:39 GMT	14238000
6372	PLAT 6372 FUEGO E.C. GUATEMALA	1/12/76	17:43 GMT	1/06/76	18:46 GMT	142640090503702
6373	POWERLINE RAINGAGE AT BLACK MESA, ARIZONA	3/01/76	04:34 GMT	2/06/76	05:50 GMT	363130110240000
6401	WISCONSIN RIVER NR. WISCONSIN DELLS, WIS.	7/20/75	16:27 GMT	7/17/75	14:20 GMT	05404000
6402	SUSQUEHANNA RIVER AT TOWANDA, PA.	2/23/76	16:32 GMT	2/23/76	16:28 GMT	01531500
6541	BATTLE CREEK AT INTERNATIONAL BOUNDARY	3/19/76	04:37 GMT	3/17/76	16:49 GMT	06149500

WRD districts then retrieve the data at a frequency to meet their experimental needs. Their retrievals are supported by common software that are used to pass the raw data directly to the user or pass the raw data to processing programs where the data are converted to an engineering unit in a standard USGS format and routed to the user's computer terminal.

In general this procedure works well and provides near real time processed data to WRD district offices. Table 1 is a list of all Landsat DCP stations that are supported by the WRD file. Most of these DCP's are operated by WRD districts, but a small percentage are operated by Peter Ward of the Survey's Geologic Division.

PROBLEMS

Several problems have interrupted this data flow:

(1) Occasionally NASA tracking station personnel (at NTTF, Goldstone, Fairbanks) generate excessive amounts of test data that, on a weekend in particular, can fill up the Reston magnetic tape with large amounts of test data, causing the tape to run out prematurely. Normally a modest amount of test data are sent before a Landsat pass to verify that the communications system is working well. The Landsat OCC has informed tracking station personnel of the problem, and their cooperation has been good, although occasionally the problem recurs.

(2) Recently a WRD DCP in the field malfunctioned and transmitted data at a rate of 2 or 3 messages per second rather than the normal 1 message per 180 seconds. The resultant high data rate caused the Reston magnetic tape to fill up over a weekend and data were lost. The DCP (ID6402) was turned off, and sent to J. E. Painter at GSRC to determine the cause of the malfunction.

(3) Transient power failures at Reston have caused the magnetic tape recorder to fail, resulting in data loss.

Those problems are tolerable for an experimental system but the WRD may attempt to backup the tape recorder with a minicomputer in early FY 77 to eliminate the problem.

SIGNIFICANT RESULTS

WRD personnel in about 25 districts are using DCS technology and are introducing the technology to many of the 550 local, state, and federal agencies with which they cooperate. This hands-on experience is necessary to introduce the technology as a precursor to follow on operational system.

PUBLICATIONS

Numerous talks have been given to local, state and federal agencies about this Landsat investigation. A sample of these talks include:

- Meeting at the Boston WRD office with Corps of Engineers personnel from the Cold Region Research Lab to demonstrate DCS data retrievals from the Reston Survey computer. The Corps has shown interest in retrieving their DCP data from the USGS computer in Reston.

- a paper given to the American Society of Civil Enginners National Capital Section, entitled "Development and Applications of Water Resources Data Collection Systems via Satellite.", March 19, 1976.
- Meetings with WRD district staff and cooperating agency officials on WRD data relay research in the Nevada and Oregon districts, week of March 29, 1976.
- a paper (in press) to be given to the International Seminar on Operation of Hydrologic Services which will be held in Ottawa, Canada in July 1976. The paper is entitled "Use of Earth Satellites for Automation of Hydrologic Data Collection."

RECOMMENDATIONS

It would be useful if the OCC could provide the WRD with backup DCS data on magnetic tape for those periods when data are interrupted by the problems cited above.

FUNDS EXPENDED

No NASA funds have been expended. This investigation is supported by USGS funds.

R. W. Paulson
Principal Investigator