

C.H.S. and N.O.A.A.
STAFF EXCHANGE

1974

D.J. KEAN

CANADIAN HYDROGRAPHIC SERVICE

CENTRAL REGION

and

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL OCEAN SURVEY

LAKE SURVEY CENTER - DETROIT, MICHIGAN

ATLANTIC MARINE CENTRE - NORFOLK, VIRGINIA

STAFF EXCHANGE

1974

(July to October)

D.J. Kean
Hydrographer

SUMMARY

This past 1974 field season marked the third consecutive year of a technical exchange between the National Ocean Survey (N.O.S.) of the National Oceanic and Atmospheric Administration (N.O.A.A.), U.S. Department of Commerce, and the Canadian Hydrographic Service of the Department of Environment.

Fortunately, my exchange allowed me to observe survey operations carried out by both the Lake Survey Center (L.S.C.), Detroit, Michigan and the Atlantic Marine Center (A.M.C.), Norfolk, Virginia.

My counterpart in the exchange was Lt. D. Winters of L.S.C.

Personally, I felt the exchange was worthwhile and should be continued.

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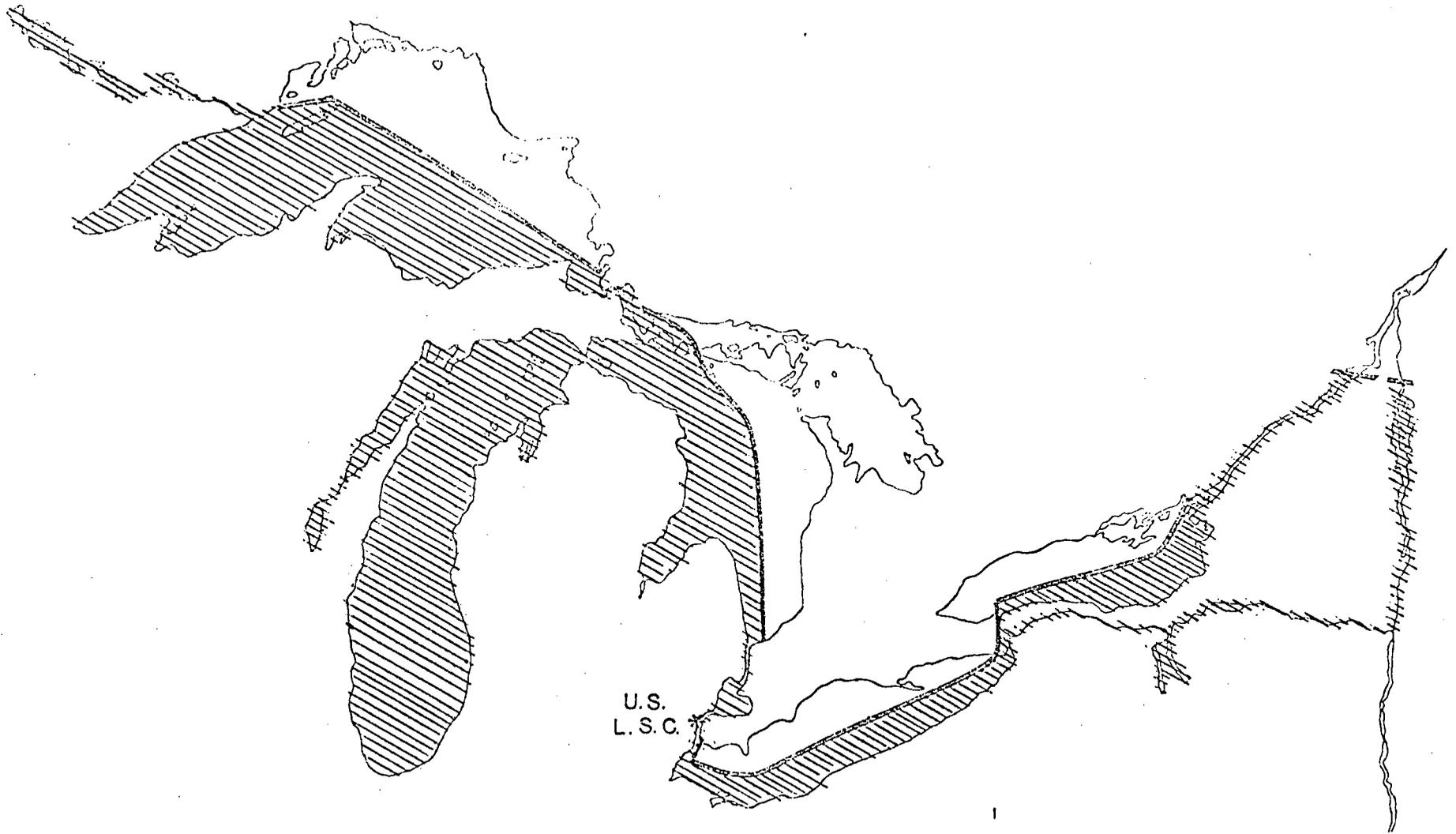
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INTRODUCTION

From 1841, until the creation of N.O.A.A. in 1970, the components of the present National Ocean Survey came under the U.S. Corps of Engineers, Department of the Army.

N.O.S. of the Department of Commerce presently houses the offices of the National Geodetic Survey (N.G.S.), the Atlantic Marine Center, the Pacific Marine Center, and Lake Survey Center.

This report covers a three and one-half month technical exchange between the National Ocean Survey and the Canadian Hydrographic Service.



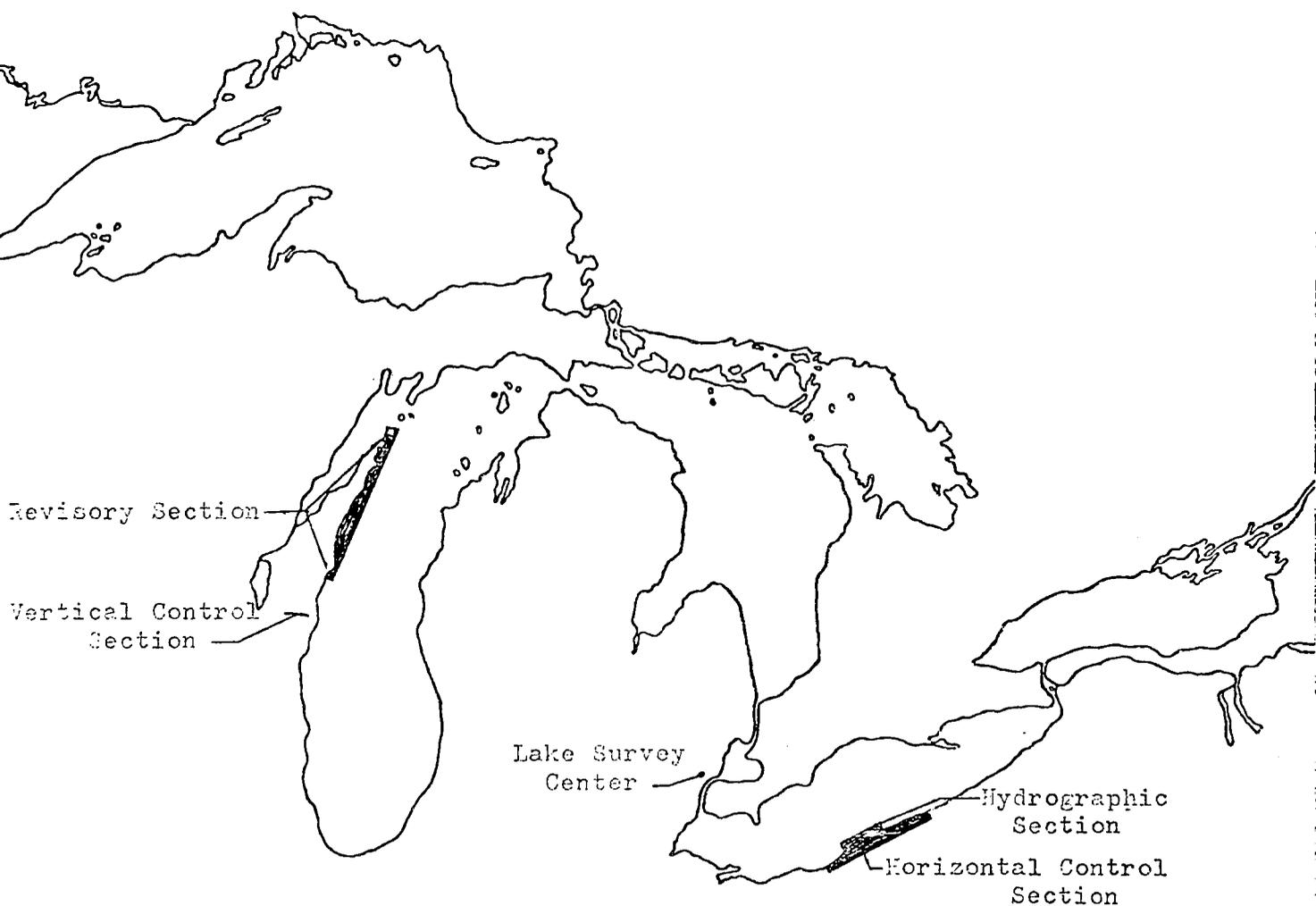
U.S. GREAT LAKES SURVEY CENTER RESPONSIBILITY



ITINERARY

LAKE SURVEY CENTER, DETROIT, U.S.A.

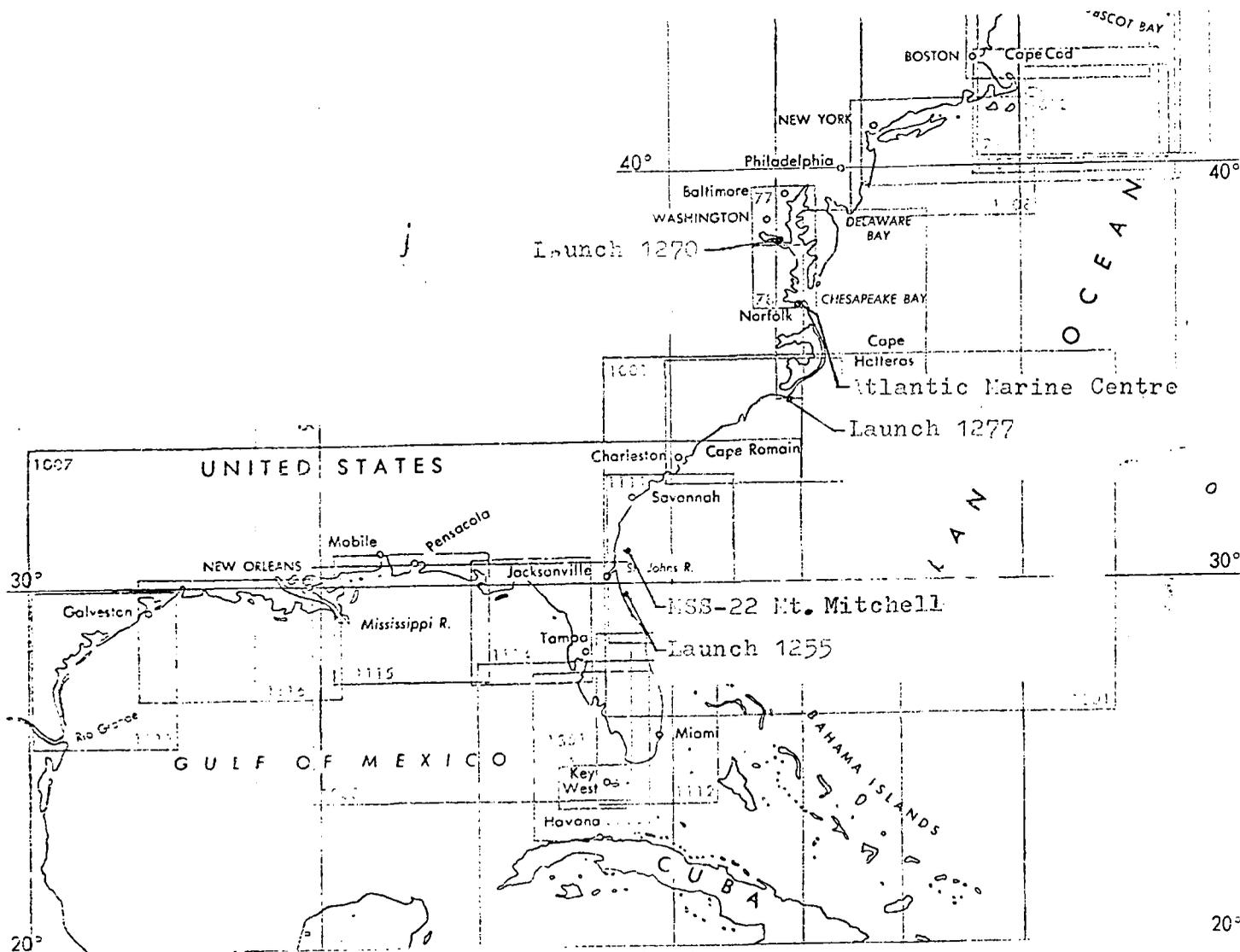
Horizontal Control Section July 1 - July 21 (3 weeks)
(Fairport Harbour, Ohio)
Hydrographic Section July 22 - August 25 (5 weeks)
(Mentor to Fairport Harbour, Ohio)
Revisory Section August 26 - September 8 (2 weeks)
(Two Rivers to Sturgeon Bay, Wisconsin)
Vertical Control Section September 9 - September 15 (1 week)
(Sheboygan, Wisconsin)
Lake Survey Center Offices September 16 - September 17 (2 days)
(Detroit, Michigan)



ITINERARY

ATLANTIC MARINE CENTER

A.M.C. offices (Norolk, Virginia)	-	Sept. 19 - Sept. 20 (2 days)
High Speed Launch Survey Party No. 1255 (St. Augustine, Florida)	-	Sept. 21 - Sept. 28 (1 week)
MSS-22 Mount Mitchell (Jacksonville, Florida)	-	Sept. 29 - Oct. 3 (5 days)
Jet Boat Survey Party No. 1277 (Moorehead City, North Carolina)	-	Oct. 4 - Oct. 6 (3 days)
Potomac River Survey Party No. 1270 (Alexandria, Virginia)	-	Oct. 7 - Oct. 10 (4 days)



EXCHANGE PERIOD

AT LAKE SURVEY CENTER, DETROIT

Horizontal Control	3 weeks or	20.0% of exchange
Hydrographic Survey	5 weeks or	33.3% of exchange
Revisory Survey	2 weeks or	13.3% of exchange
Vertical Control	1 week or	6.7% of exchange
L.S.C. Offices	2 days or	<u>1.9%</u> of exchange
<u>Total</u>		<u>75.2% of exchange</u>

AT ATLANTIC MARINE CENTER (A.M.C.)

A.M.C. offices	2 days or	1.9% of exchange
1255	1 week or	6.7% of exchange
Mt. Mitchell	5 days or	4.8% of exchange
1277	3 days or	2.8% of exchange
1270	4 days or	3.8% of exchange
Miscellaneous Travel time	5 days or	<u>4.8%</u> of exchange
<u>Total</u>		<u>24.8% of exchange</u>

U.S./CANADIAN NOMENCLATURE COMPARISON

<u>U.S.</u>	<u>CANADIAN</u>
'Horcon'	Horizontal Control Survey
Brass Disc	Rock Post (Monument)
T-Meter	Tellurometer MRA-2, MRA-3
Geo-Quads	Topographical Maps
Hydro	Hydrographic Survey
Sound Boat	Sounding Boat
Developments	Shoal Examinations
Holidays	Interlining
Fathometer	Echo Sounder
Fathogram	Echo Sounder Roll
G.P.	Geographic Position
Pointings	Geographic Azimuths
Stage	Water Level Reduction
Cross Lines	Check Lines
Range/Visual	One E.P.S. range,/one sextant angle
Smooth Sheet	Field Sheet
Boat Sheet	Boat Board
'Vercon'	Vertical Control Survey
P.S.I.	Pre-Survey Items

1. SURVEYS BRANCH

1.1 Horizontal Control Section

Introduction: This year the Horizontal Control Section (HORCON) section had planned to complete a first order traverse tie between Cleveland, Ohio and Barcelona, New York. However, with a shortage of permanent field staff and additional requirements for second and third order control for the Hydrographic Section, 'HORCON' then planned to complete their first order tie to Conneaut, Ohio.

Operations Equipment - A 50 foot office trailer was set up at Fairport Harbour, Ohio. Other major equipment included:

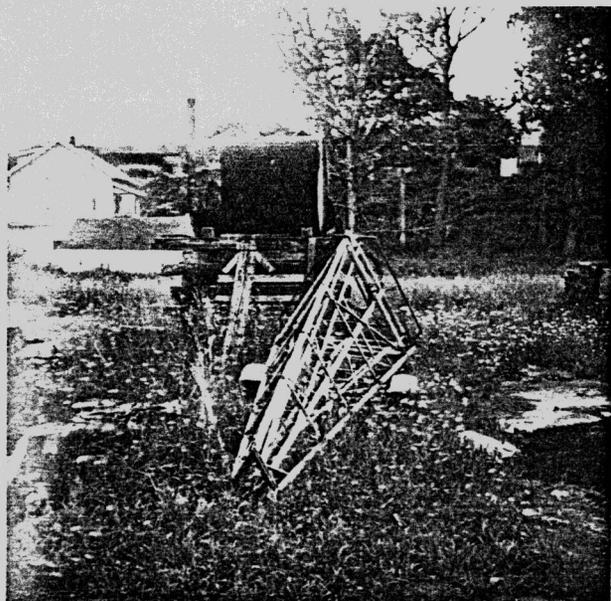
- 2 - 50' tower trucks
- 1 - International "Deuce and a half"
- 1 - Ford Torino Station Wagon
- 2 - Portable 25 foot towers on trailers
- 2 - 12' aluminum boats w/18 hp (borrowed from Hydro. Sect.)
- 1 - Wang #600 Desk Top Calculator
- 1 - AGA Geodimeter Model 8L
- 1 - AGA Geodimeter Model 6L
- 1 - Laser Ranger (on loan to Revisory Section)
- 3 - Wild T-3's theodolites
- 2 - Wild T-2's theodolites

With the departure of the 'HORCON' Section Chief in early July, the party was reduced to five people, four of which were students. All the reconnaissance work, site selection, and monumenting was well in hand by the time of my arrival on July 1.

Instrumental work, angulation and electronic distance measuring, was beginning.



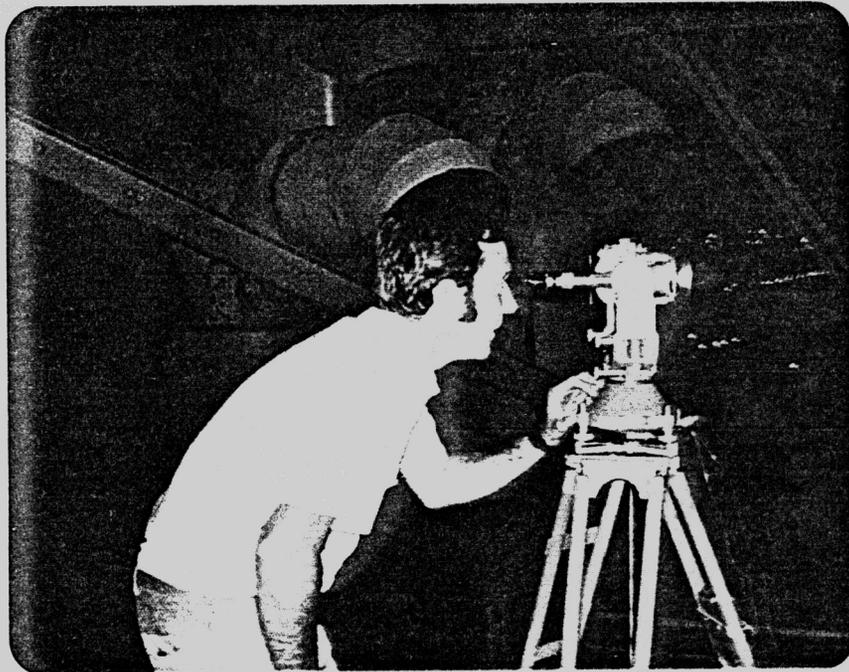
HORCON OFFICE TRAILER



25' TOWER ON TRAILER



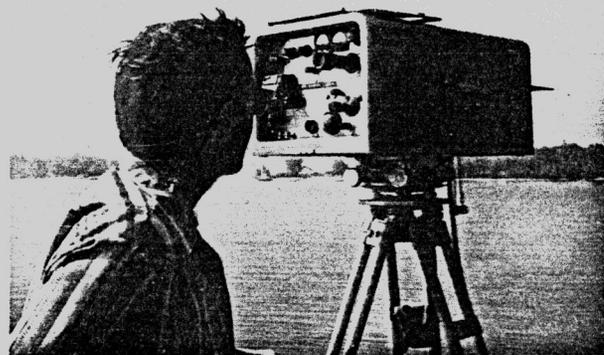
50' TOWER ASSEMBLY



NIGHT OBSERVATION - WILD T-3



LASER RANGER



MODEL 8L GEODIMETER

The Section was following National Geodetic Survey procedures for first order traversing.

Angulation was done with Wild T-3's with 12 circle positions within a mean of 4 seconds. Observing was done on 12 volt, 8 inch army lights.

Distances were measured with the model 8L Geodimeter which has a capability in range of 60 kilometres.

Because of persistent and excessive haze in and around the Cleveland area during the day, many of the distances were measured at night. This gave a better return from the reflectors. The smaller Laser Ranger was used on relatively short (2-3 km) lines for third order control.

1.2 Hydrographic Section

Introduction: This was the second year that a hydrographic survey has been carried on in Lake Erie since 1968.

The party this year continued east from Cleveland, Ohio.

The purpose of the survey was to gather bathymetric data, out to forty feet of water, for the production of small boat strip charts.

Original project plans were to complete Field Sheets 8 through 22. However, with the familiarization of the hydroplot/hydrolog system, and the 100 metre line spacing at scale 1:10,000 (versus 250 metres in 1973) progress was somewhat impaired.

Operations: Major equipment used on this survey consisted of:

- 1 - 54' launch S/V LAIDLY outfitted for hydroplot/hydrolog
- 1 - 24' 'Mon Ark' launch outfitted for range/azimuth positioning
- 2 - 'Del Norte' Trisponder 202A chains
- 1 - 30' office trailer
- 3 - vehicles
- 1 - set of MRA-3 Tellurometers
- 4 - Transits
- 1 - Wild T-2 theodolite
- 1 - Drafting Machine

Field personnel consisted of ten people; three permanent Lake Survey Centre, Detroit (L.S.C.) staff, one NOAA officer, one coxswain and five summer students.

The survey scale was 1:10,000 at 100 metre spacing and harbour insets were surveyed at 1:5,000 at 50 metre line interval spacing.

At the start of the survey, calibration of the 'Hydroplot/Hydrolog' system was done by sextant. Because of the area this required targets set at seven hundred foot intervals. This required an additional work load on both the 'Hydro' and 'Horcon' Sections. Eventually, this method was replaced by three transit cuts of geographic azimuths; this was then computed on board LAIDLAY and generally calibrations came out very well.

The 24 foot 'Mon Ark' primarily ran range/azimuth on the inshore areas to fill in the "football" areas between the transponder set-ups. Data was logged manually on board and plotted later in the office trailer using a drafting machine.

S/V LAIDLAY was operating the Hydroplot/Hydrolog system using 'Del Norte' in the range/range mode.

Sounding lines were run perpendicular and straight to the shoreline rather than on one arc.

An apparent saving of 30% on sounding miles per field sheet can be appreciated using this method.

1973

L A K E E R I E

FS 7
I-2337

FS 6
I-2336

FS 5
I-2335

FS 4
I-2334

FS 3
I-2333

FS 2
I-2332

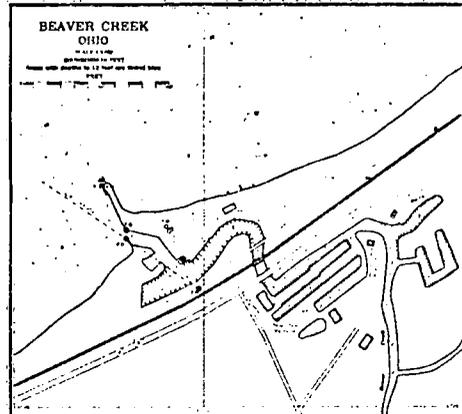
FS 1
I-2331

NATIONAL OCEAN SURVEY

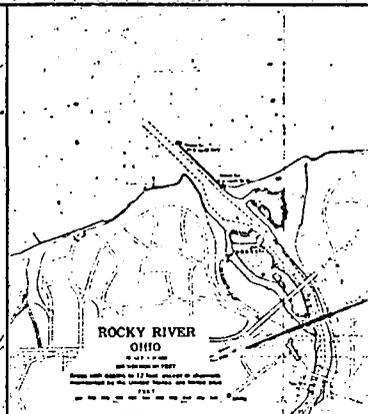


LAKE SURVEY CENTER
LAKE ERIE
MOSS POINT TO VERMILION, OHIO
CHART NO. 33
1971
POLYMER PLOTATION
SCALE 1:50,000
FOUNDED IN 1957

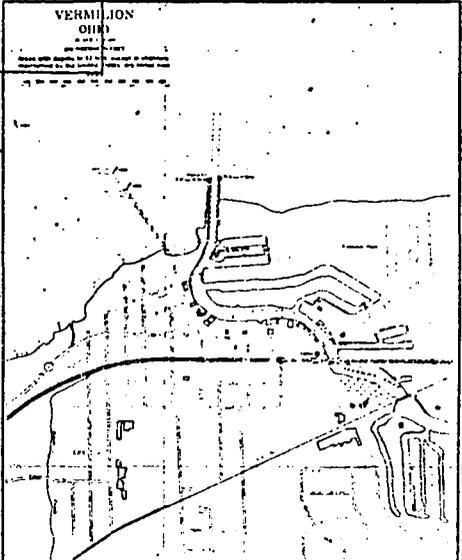
BEAVER CREEK OHIO
CHART NO. 33
POLYMER PLOTATION
SCALE 1:50,000
FOUNDED IN 1957



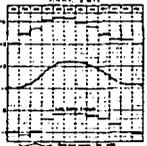
ROCKY RIVER OHIO
CHART NO. 33
POLYMER PLOTATION
SCALE 1:50,000
FOUNDED IN 1957



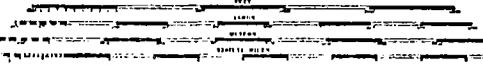
VERMILION OHIO
CHART NO. 33
POLYMER PLOTATION
SCALE 1:50,000
FOUNDED IN 1957



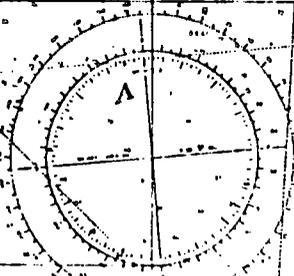
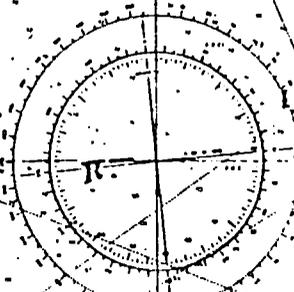
NOTE: REFERENCE TO THIS CHART AND OTHER CHARTS...
 SOUNDINGS: Bearings of leading courses are true and distance is in feet...
 BEARING: Bearings of leading courses are true and distance is in feet...
 LIGHTS: Lighted buoys are shown on this chart and are not necessarily marked...
 CHART NO. 33
1971
POLYMER PLOTATION
SCALE 1:50,000
FOUNDED IN 1957



DEPTH	WIND	WAVE	SWELL	SEA	STATE	LOCAL
10	10	10	10	10	10	10
20	20	20	20	20	20	20
30	30	30	30	30	30	30
40	40	40	40	40	40	40
50	50	50	50	50	50	50
60	60	60	60	60	60	60
70	70	70	70	70	70	70
80	80	80	80	80	80	80
90	90	90	90	90	90	90
100	100	100	100	100	100	100



1974



FS 15
I-2345

FS 14
I-2344

FS 13
I-2343

FS 12
I-2342

FS 11
I-2341

FS 10
I-2340

FS 9
I-2339

FS 8
I-2338

NOTES:
1. Bearings and angles are given in degrees, minutes and seconds.
2. Distances are given in feet.
3. Soundings are given in feet.
4. Elevations are given in feet above mean sea level.
5. Bearings and angles are given in degrees, minutes and seconds.
6. Distances are given in feet.
7. Soundings are given in feet.
8. Elevations are given in feet above mean sea level.

SYMBOLS:
1. Obstructions to navigation.
2. Obstructions to navigation.
3. Obstructions to navigation.
4. Obstructions to navigation.
5. Obstructions to navigation.
6. Obstructions to navigation.
7. Obstructions to navigation.
8. Obstructions to navigation.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL TIDE GAUGE SERVICE

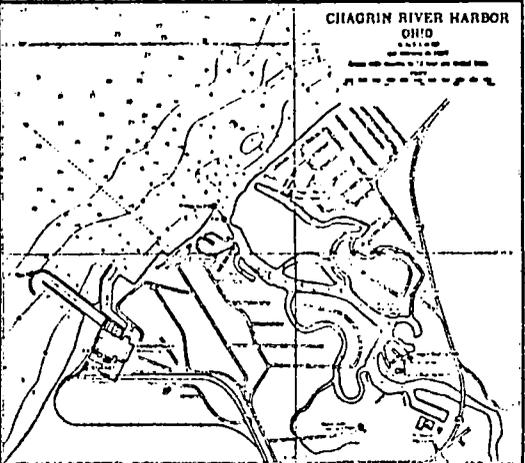
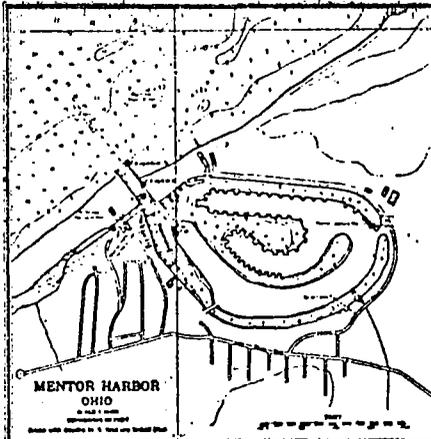


LAKE SURVEY CENTER
LAKE ERIE
AMITAHULA TO CUYAHOGA RIVER, OHIO

CHART NO 34
1971

SCALE 1:50,000
UNITS: FEET

NOTE:
1. Bearings and angles are given in degrees, minutes and seconds.
2. Distances are given in feet.
3. Soundings are given in feet.
4. Elevations are given in feet above mean sea level.
5. Bearings and angles are given in degrees, minutes and seconds.
6. Distances are given in feet.
7. Soundings are given in feet.
8. Elevations are given in feet above mean sea level.



NOTE:
1. Bearings and angles are given in degrees, minutes and seconds.
2. Distances are given in feet.
3. Soundings are given in feet.
4. Elevations are given in feet above mean sea level.
5. Bearings and angles are given in degrees, minutes and seconds.
6. Distances are given in feet.
7. Soundings are given in feet.
8. Elevations are given in feet above mean sea level.

1974

FS 22
1-2352

FS 21
1-2351

FS 20
1-2350

FS 19
1-2349

FS 18
1-2348

FS 17
1-2347

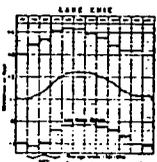
FS 16
1-2346

FS 15
1-2345

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL TIDE GAUGE SURVEY

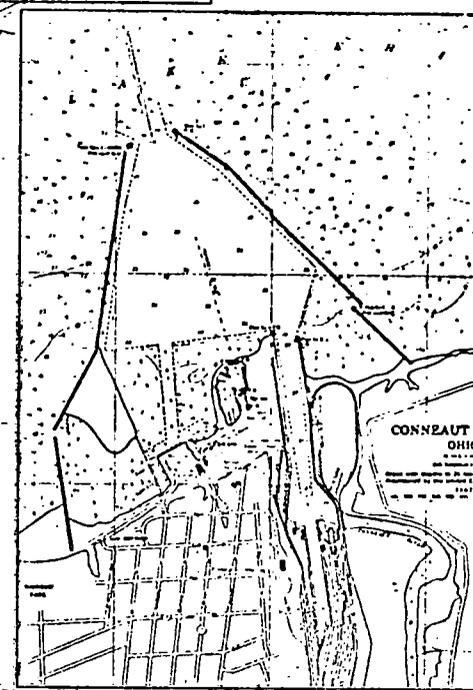
LAKE SURVEY CENTER
LAKE ERIE
SIXTEENMILE CREEK, IFA, TO CUNNIFAIT, OHIO
CHART NO 32
1971

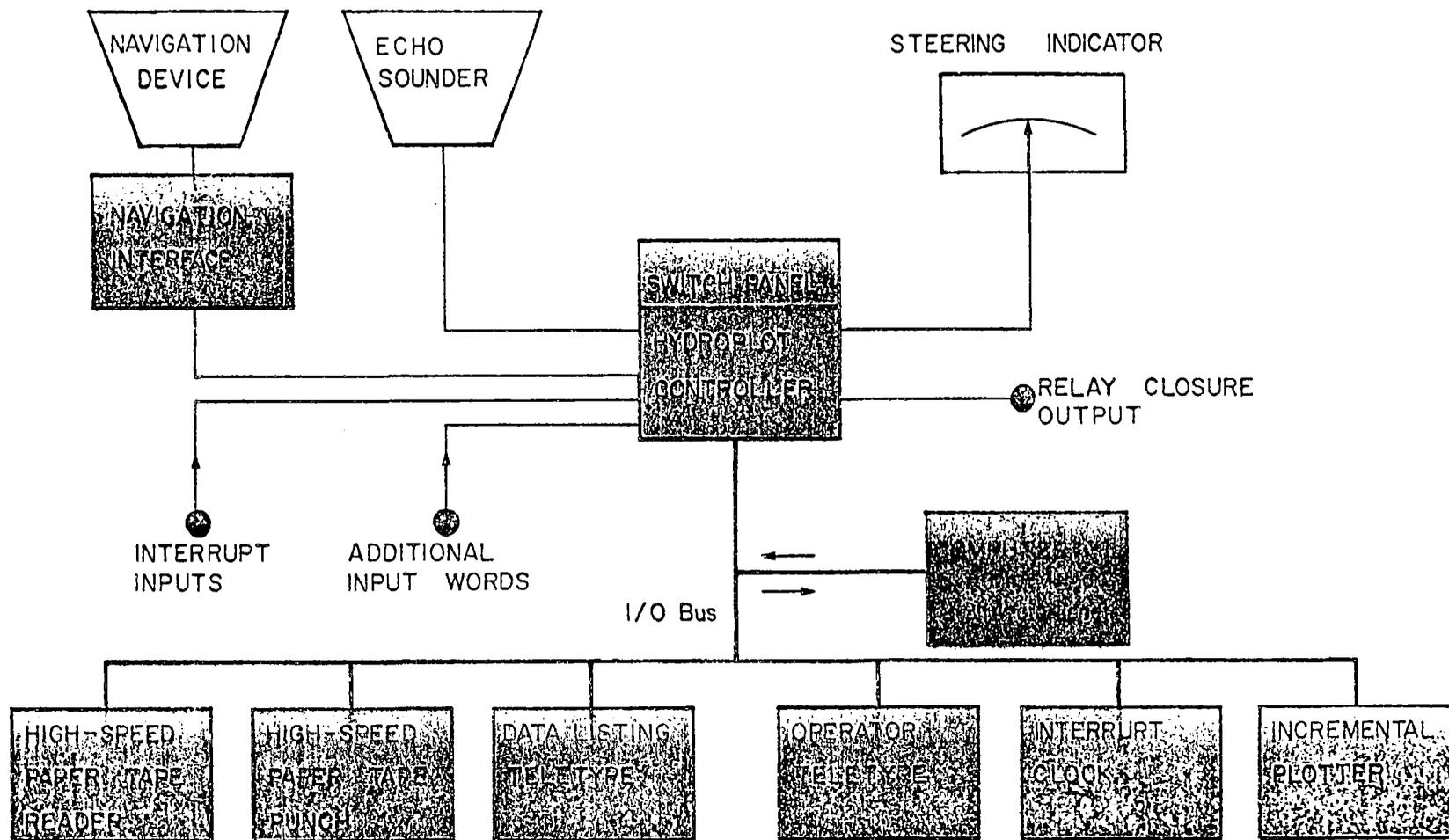
DEPTH	SYMBOL
10	○
20	○
30	○
40	○
50	○
60	○
70	○
80	○
90	○
100	○
110	○
120	○
130	○
140	○
150	○
160	○
170	○
180	○
190	○
200	○
210	○
220	○
230	○
240	○
250	○
260	○
270	○
280	○
290	○
300	○
310	○
320	○
330	○
340	○
350	○
360	○
370	○
380	○
390	○
400	○
410	○
420	○
430	○
440	○
450	○
460	○
470	○
480	○
490	○
500	○
510	○
520	○
530	○
540	○
550	○
560	○
570	○
580	○
590	○
600	○
610	○
620	○
630	○
640	○
650	○
660	○
670	○
680	○
690	○
700	○
710	○
720	○
730	○
740	○
750	○
760	○
770	○
780	○
790	○
800	○
810	○
820	○
830	○
840	○
850	○
860	○
870	○
880	○
890	○
900	○
910	○
920	○
930	○
940	○
950	○
960	○
970	○
980	○
990	○
1000	○



LAKE ERIE

Scale of Bearings of True Coast as shown therein. U.S.A. Bearings to other water ways of Lake Erie shown on this chart are true. True bearings are shown by the true bearing symbol. Bearings of other water ways are shown by the magnetic bearing symbol. Bearings of other water ways are shown by the magnetic bearing symbol. Bearings of other water ways are shown by the magnetic bearing symbol.





HYDROPLOT System Block Diagram

CODE:

Steering Indicator- L/R Indicator

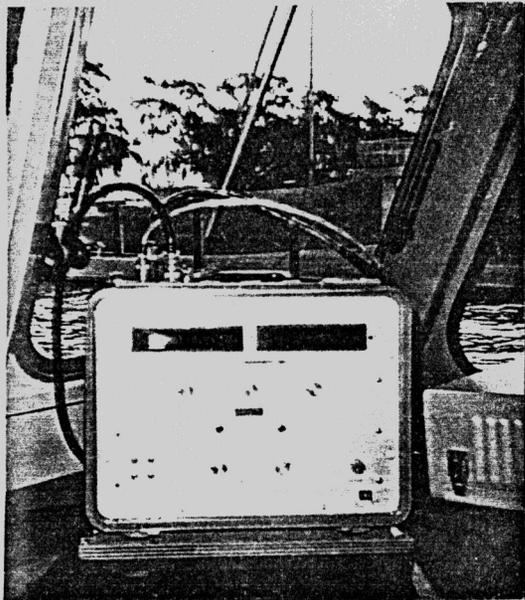
Echo Sounder-Raytheon DE 723

-Raytheon Digital Depth Monitor

Computer-DEC PDP 8/e

Teletype-Model ASR-33

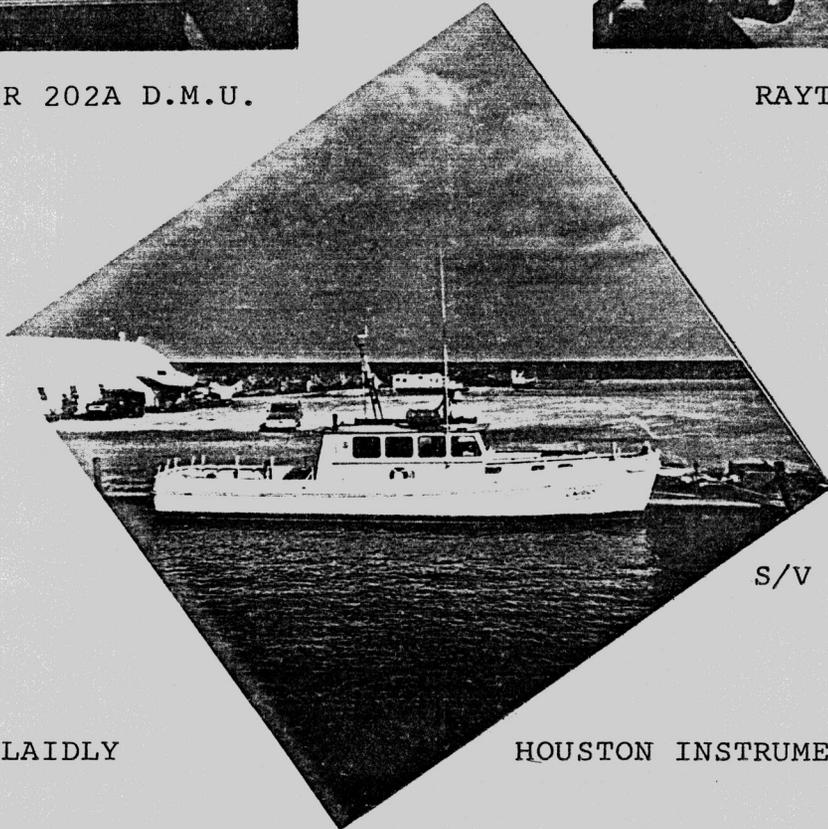
Plotter-Houston Instruments Complot Model DP 3



TRISPONDER 202A D.M.U.



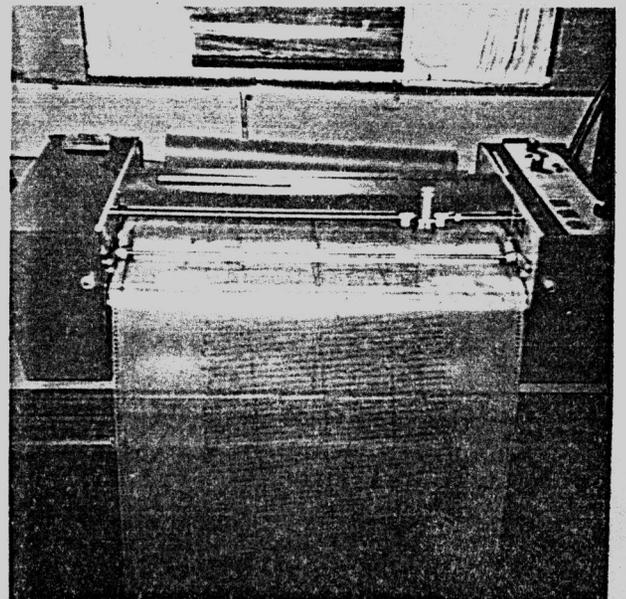
RAYTHEON DE-723
SOUNDER



S/V LAIDLIE

ON BOARD LAIDLIE

HOUSTON INSTRUMENTS 22" COMPLIT
PLOTTER



1.3 Revisory Section

Introduction: This year's revisory schedule was the western trip, which includes the waters of Lakes Michigan, Winnebago, and St. Clair, as well as the Fox, St. Clair, and Detroit Rivers.

Operating on their triennial cycle this western revisory was last done in 1971.

Operations: The field party this year comprised seven people with major equipment as follows:

- 1 - 19' 'Maritime' launch w/2-50 h.p. Evinrudes
- 1 - 21' 'Mon Ark' launch (not used due to fuel line clogs)
- 1 - 35' 'Holiday' Rambler office trailer
- 3 - vehicles
- 2 - Wild T-1 theodolites
- 1 - Wild T-2 theodolite
- 1 - K&E transit
- 2 - 'Bludworth' fathometers
- 1 - HP 65 calculator
- 1 - HP 45 calculator
- 1 - drafting machine w/portable table

By the time I joined the party on August 26, they had revised the St. Clair and Detroit Rivers, Lake St. Clair, and from Muskegon, Michigan (mid-eastern shore of Lake Michigan) around the lake to Two Rivers, Wisconsin. As a rule, the party spends one week in each area.

From their base at Two Rivers, each of Manitowoc, Two Rivers, and Kewaunee were revised.

A move to Sturgeon Bay, Wisconsin (75 miles north) then completed harbours at Algoma and Sturgeon Bay as well as the area out to Gills Rock and Washington Island. At the end of the second week and on my departure the party was moving to Oshkosh to start on Lake Winnebago and the Fox River.

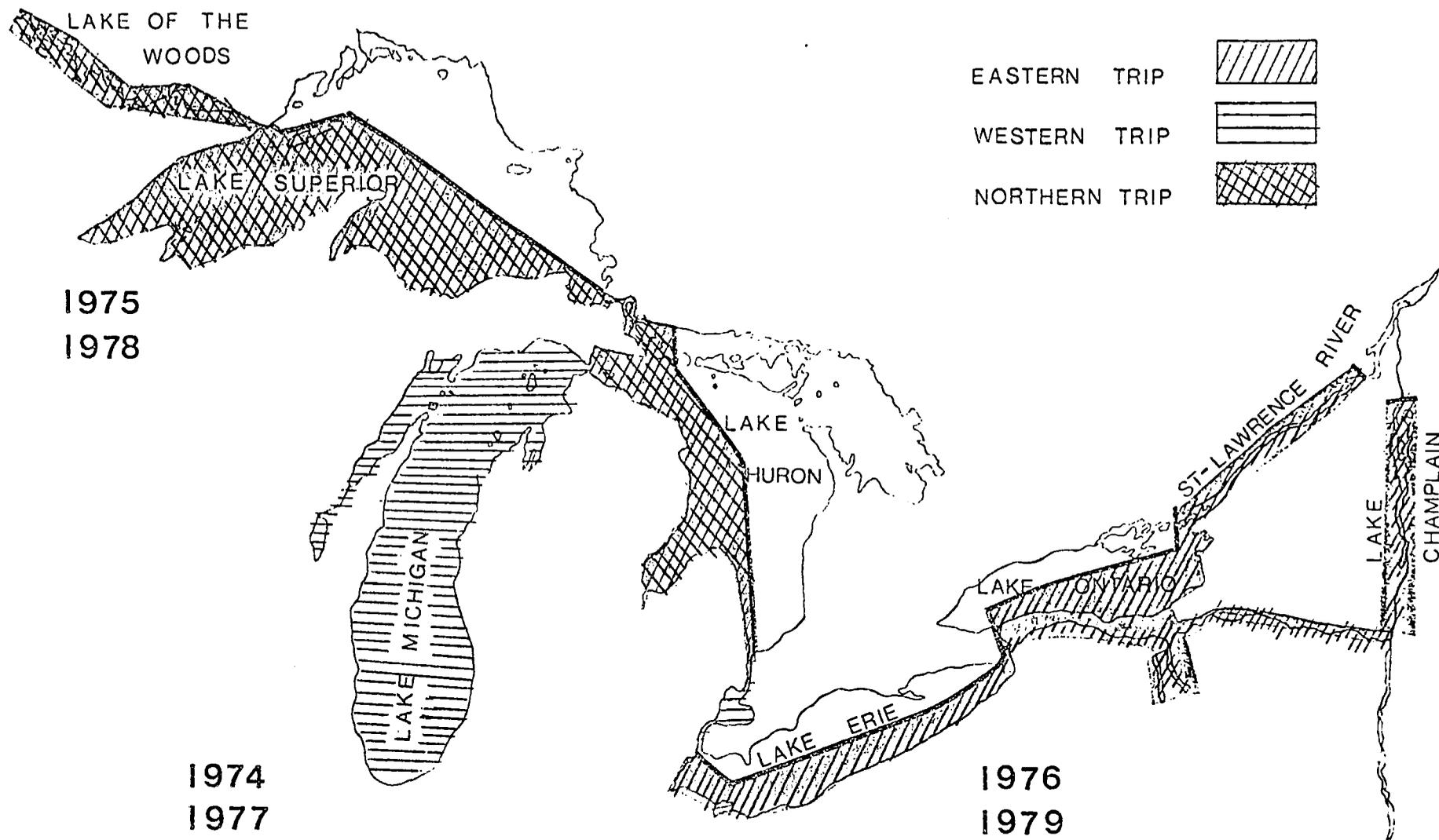
Revisionary methods include a truck-check and a boat-check to verify existing features on the chart. These features include place names (of towns, streets, industries), landmarks, new waterfront construction, shoreline changes, etc.

Soundings are checked along wharf faces, in the main channels, and the approaches to harbours.

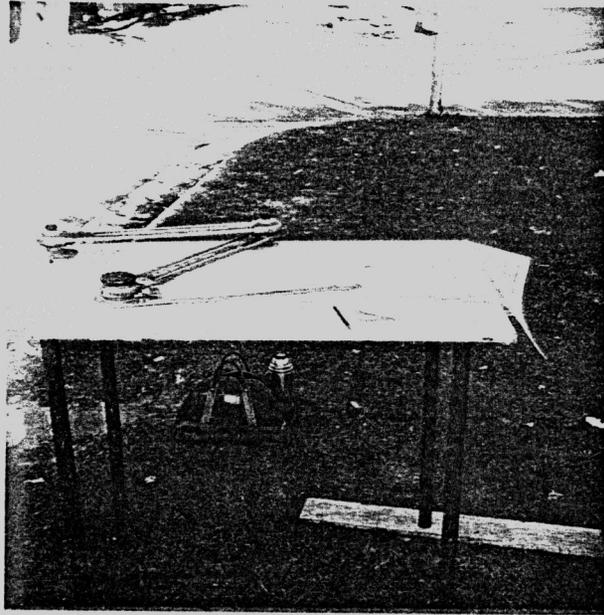
To do this, a portable drafting table is located on shore. A paper overlay over a cronaflex copy of the chart is used to plot both the fixes and underway scaled-reduced soundings.

This system employs three transit cut-off angles to position the launch. Three instruments are set up over known points (hubs), which are established by stadia and angles, either along the shoreline or on the breakwalls. All existing landmarks are cut in thereby establishing a local 'control' related to the chart.

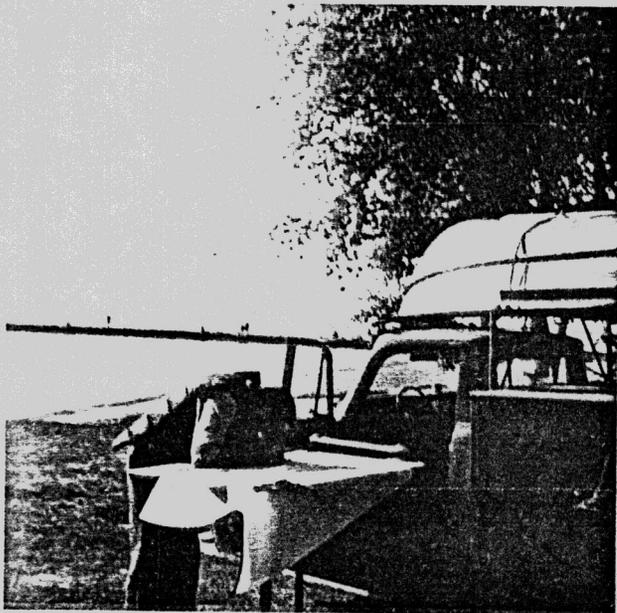
VHF radios maintain communication between the hubs, launch, and plotter. Two of the three angles (using the best cut) are used to plot the fix by means of the drafting machine. The third angle is used as a check-fix or if one angle is missed.



REVISORY SECTION SCHEDULE



DRAFTING MACHINE, PORTABLE TABLE



DRAFTING MACHINE AT WORK



A BUMPING ACCIDENT

1.4 Vertical Control Section

Introduction: The goal of this section was to run a precise level line between Fond-du-Lac and Sheboygan, Wisconsin. This was the last leg to close a precise level circuit from Green Bay through Oshkosh and Fond-du-Lac to Sheboygan.

Operations: This party fielded four men and major equipment included:

- 1 - 30' office trailer
- 3 - vehicles
- 3 - telescopic rod sets
- 4 - 'Zeiss' NI2 automatic levels
- 2 - plane-parallel plate micrometers

In this survey a programmed H.P. calculator has replaced the note-keeper. Rod readings are typed in on the keyboard and a paper tape output becomes the field record.

The 120 volts required to power the calculator come from a small trailer in tow behind the vehicle.

The trailer houses a 4 h.p. propane gas engine, battery charger, two 150 amp/hr batteries and a converter which supplies power to the calculator.

Levelling is carried out with a Zeiss NI2 automatic level with attached plane-parallel plate micrometer (basically a tilting lens).

Special Kern rods, graduated in cms and mm., complete with a fish eye bubble and two telescoping legs are used.

Via VHF radio, between instrumentman and calculator operator, the instrumentman relays the rod readings (left, top, right side) in turn. The operator types these readings into the calculator which then checks that the:

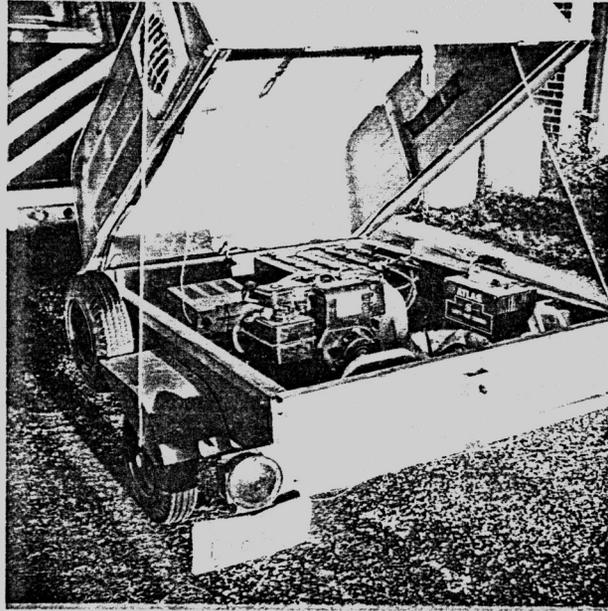
- a) B.S. and F.S. distances are less than 50 metres
(maximum distance possible under ideal conditions)
- b) difference in B.S. and F.S. is less than 3 metres
- c) running total of B.S. and F.S. are within 5 metres
of each other, and
- d) left and right side rod readings differ by a built
in constant (in the rod) of 59250.

By reading the rod to the fifth decimal place (read 3 on the rod, 2 on the micrometer), precise levelling is carried out.

The maximum allowable error on a two-way level run is $1.5 \text{ mm}\sqrt{K}$, where K is the distance in kilometres.

Depending on the terrain and time of day, the maximum distance that can be levelled, under ideal conditions, is five miles per day per instrumentman.

The permanent bench marks, which are set alternately with temporary bench marks at one-half to one mile intervals, are either standard brass discs or brass bolts. The T.B.M.'s are either brass bolts or copper coated iron rods which are driven in the ground to bedrock.



POWER SOURCE



TO RUN



H. P. CALCULATOR



20084.
 2367.
 78333.
 36.70000
 10.4

38495.
 4184.
 -97746.
 35.40000
 10.4

33155.
 3564.
 -91408.
 35.40000
 10.4

21438.
 2482.
 80688.
 34.20000
 10.4

26906.
 3173.
 86157.
 48.30000
 10.4

27907.
 3280.
 -87158.
 49.00000
 10.4

TYPICAL PRINTOUT

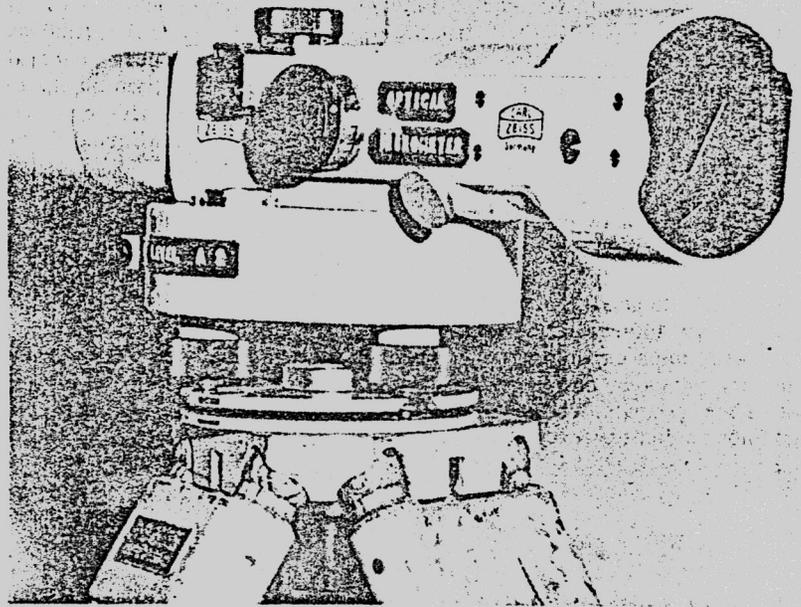


FIG. 14.—ZEISS NI 2 LEVEL WITH PLANE-PARALLEL MICROMETER ATTACHMENTS



FIG. 7.—GRADUATION PATTERN DOUBLE SCALE PRECISE LEVEL ROD—5 MILLIMETER INTERVAL

KERN ROD, RIGHT SIDE DIFFERENCE

59250

1.5 L.S.C. Offices

By mid September the Detroit offices were undergoing a major shuffle. The complete Reproduction Branch (including engraving, plate and camera, press section) had moved to Rockville, Maryland. The whole of the Limnology Division (including the Branches of Water Motion, Water Characteristics, Lake Hydrology, Limnologic Systems, Laboratory) transferred to Ann Arbor, Michigan. The Fleet Services Branch of the Facilities Division was slated for Monroe, Michigan in two weeks. Also, the Computer Services Division were on the way to Ann Arbor, Michigan by the end of September.

The Marine Mapping and Charting and Administrative Divisions made up the activity throughout the vacated sixth floor offices.

Although the field surveys were still out, I was given a one day tour of the remaining three Branches of the Marine Mapping and Charting Division.

a) Photogrammetry Section (Surveys Branch)

This section provides accurate planimetry for the Lake Survey Centre, primarily for the harbour charts. The majority of the maintenance and updating of the charts is done in conjunction with the Revisory Section's three year cycle. Other sources of information may come from the U.S. Coast Guard, U.S. Corps of Engineers, Canadian Hydrographic Service, or various U.S. Power Squadrons.

The method of analytical aerotriangulation is used for bridging as well as positioning aids to navigation and landmarks. This technique uses a PUG-4 to pug-mark points (surface drilling) on the film diapositive. A mono-comparator logger-card punch system gives position information. Other equipment includes a Belfort stereo plotter and three Kelsh plotters. Stereo plotter models compiled in this section are reduced photographically and positioned to within 1.0 metre at a scale of 1:15,000.

1.5 L.S.C. Offices (Cont'd.)

b) Chart Section (Compilation Branch)

The bulk of the charts are kept up-to-date by the work done by the Revisory Section. This section (Chart Section) works in conjunction with the triennial schedule for Revisory Surveys on the Great Lakes. New editions were normally printed every three years in accordance with the Revisory schedule. However, with the recent move of the Reproduction Branch to Rockville, the printing cycle may be revised.

c) Gauging Section (Water Levels Branch)

The present network, throughout the Great Lakes, consists of approximately 70 permanent gauges. Of the present gauges, eight are telemetry and the rest are either Fischer and Porter with punch paper tape outputs or the Stevens A-35 analog recorders.

During the summer months, additional temporary gauges are established in the area to be covered by the Revisory Survey. These are recovered by the Revisory Section on their return trip from the field to Detroit.

2. ATLANTIC MARINE CENTER (A.M.C.)

2.1 A.M.C. Offices

A.M.C. in Norfolk, Virginia is the headquarters for the Eastern Region of N.O.A.A., N.O.S. The entire east coast of the United States as well as the Gulf of Mexico, Puerto Rico and the Virgin Islands fall under the charting responsibilities of A.M.C.

A total area of two and one-half million square miles of water is represented in these areas.

1974 marked the second and final year of project SCOPE (Southern Coastal Plains Expedition) along the southeast coastal states. The SCOPE survey area stretched from Cape Hatteras, North Carolina to Cape Canaveral, Florida and extended seaward to the 110 fathom contour.

While at A.M.C., I was fortunate to observe the following operations:

- a) Photogrammetric Bathymetry Section
- b) Compilation Section
- c) Verification Branch, and
- d) Electronic Data Processing Branch.
- a) Photogrammetric Bathymetry Section

A successful photobathymetry survey in Puerto Rico (i.e. contours obtained from a conventional hydrographic survey as compared to contours obtained through aerial photography) was completed and verified. Then an area around the Virgin Islands was selected for a similar survey - by using colour aerial photography and precise stereometric techniques accurate contouring up to twenty feet or greater was obtained.

2.1 A.M.C. Offices (Cont'd.)

a) Photogrammetric Bathymetry Section (Cont'd.)

Foul areas and shoal areas (excessive coral heads) were contoured by this method. All that was required was one or two check lines by launch.

Vertical Control is solved by a two-media block aerotriangulation in areas where tidal stations are non-existent. In other areas where water levels do exist, additional stations are established to determine accurate tidal datums; once this is determined, tide-controlled photography is flown.

By relating the time of the photography with the stages of the tide (tide reductions) the mean high water line and the mean low water line can be delineated.

This section is also involved in the construction of airport 'Obstruction Charts' and 'Tidal Current Charts'. The airport charts give precise positions and heights for all obstructions within the airport boundary, and in particular to those that lie at either end of the runways. Takeoff clearances can be calculated using length of runway, size and weight of plane, and height of the obstruction.

For the 'Tidal Current Charts' a series of arrows and figures are displayed for each hour of the tidal cycle. By setting out a series of floating targets in an area and flying the aerial photography, the movement of the targets can be tracked thus giving direction and distance travelled over a time lapse interval.

2.1 A.M.C. Offices (Cont'd.)

b) Compilation Section

All photo compilation for the N.O.S. hydrographic surveys is done by this section.

The shoreline plots produced here is the final shoreline for the smooth sheets.

This section is concerned with updating shoreline changes from any recently acquired photography. The changes are made on plastic overlays at chart scale.

A field edit party physically goes into the field with the updated copy and verifies the copy as correct, or survey in any additional information.

As these overlays become complete they are sent to Rockville, Maryland for appropriate chart changes.

c) Verification Branch

This Branch is responsible for verifying that all information shown on the smooth sheets is correct and complete; verifiers check the following:

- (i) positions of horizontal control stations
- (ii) horizontal and vertical accuracies of the soundings
- (iii) accuracy of the shoreline
- (iv) the new data as opposed to existing data for discrepancies or deletions, and
- (v) smooth tide correctors.

In the final steps, the verifiers draw on the shoreline and contour the smooth sheet.

Through the complete processing system at A.M.C. the smooth sheet is now completed in approximately one-third the time required by conventional hand inking methods.

2.1 A.M.C. Offices (Cont'd.)

d) Electronic Data Processing Branch

The processing of hydrographic data from the initial raw data, recorded on paper tape by the field parties, to the smooth sheet plot is this branch's responsibility.

For a complete description of the shore-based 'Automated Processing Unit', please refer to "The Automated Acquisition and Processing of Marine Data for Coastal Mapping" by Mr. Robert G. Fish, Lt. Cdr. C.H. McClure, and Lt. Cdr. J.L. Wallace. (Appendix "A", Staff Exchange 1973 E.F. Thompson, C.H.S.).

2.2 High Speed Launch Survey Number 1255

Introduction: A combined shore party employing sister launches numbered 1255 and 1257 were working to complete project 'SCOPE' along the north-eastern coast of Florida.

The party was based in St. Augustine, Fla. Since launch number 1257 was in the boatyard to replace a cracked shaft and receive hull sanding and painting, my week was spent with number 1255.

Operations: Two commissioned officers and two survey technicians comprised this survey.

Major equipment was:

- 1 - 59' launch capable of 22 knots \pm
- 1 - Hydroplot/Hydrolog system
- 1 - Raydist chain range/range
- 1 - station wagon

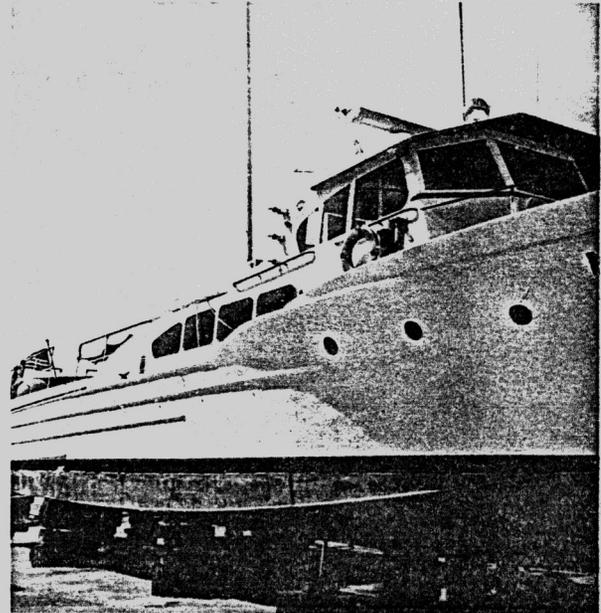
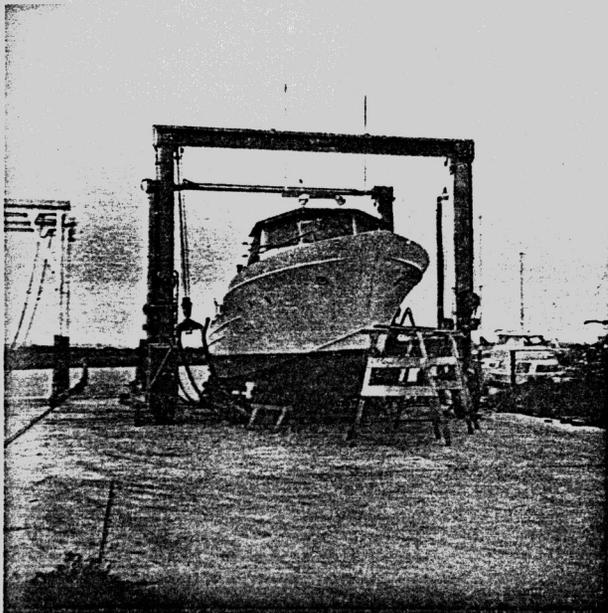
This party was fully automated with the Hydroplot/Hydrolog system for collecting and processing the bathymetry. These two launches (1255, 1257) remain in the field for twelve months of the year (except for a 2-3 week Christmas break).

The survey area included lines of 10 miles in length, running seaward from shore.

With this high speed launch running at 20 knots daily, mileages of 120 were not uncommon.



HIGH SPEED LAUNCH 1257



LAUNCH 1257 SCRAPING, SANDING, PAINTING

2.3 MSS-22 MT. MITCHELL

The MT. MITCHELL was also in the process of completing their last smooth sheet for project SCOPE before returning to A.M.C. for winter layup. Their survey area was offshore to the north-east of Jacksonville, Florida. The N.O.A.A. ship MT. MITCHELL is a class II ship, 231' in length, with a displacement of 1794 long tons at 13' draft. She has a cruising speed of 14 knots with a range of 8000 n.m. and endurance of 24 days. She carries three sound boats ("Plastic Pigs"), two life boats and two life rafts. The 26' sound boats are constructed of eight layers of plastic, weighing six and one-half tons, and are capable of six to six and one-half knots speed.

On board there is a complement of seventy which includes eleven officers and six in the survey department.

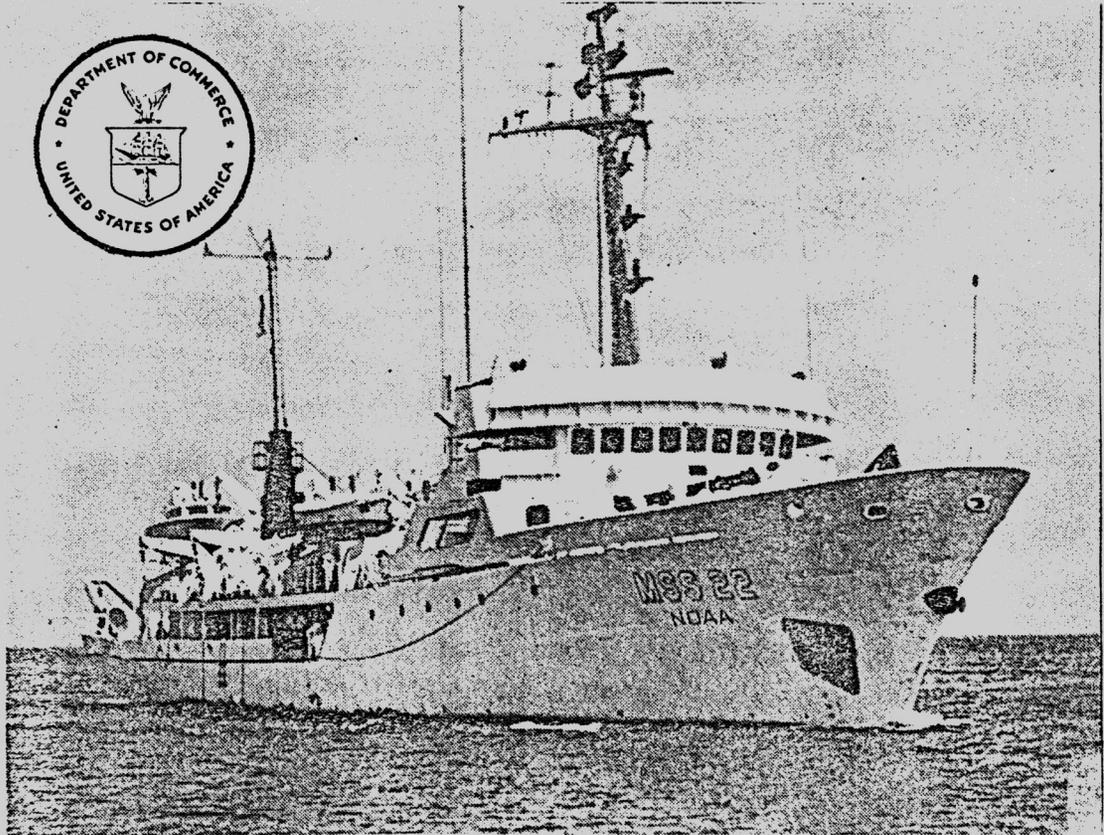
The fully outfitted MT. MITCHELL was on the Hydroplot/Hydrolog system using sea-fix hyperbolic for positioning. Only one of the sound launches was capable of logging data, but processing was done on the parent ship.

Field operations for the MT. MITCHELL generally last from mid January (Puerto Rico) through mid October.

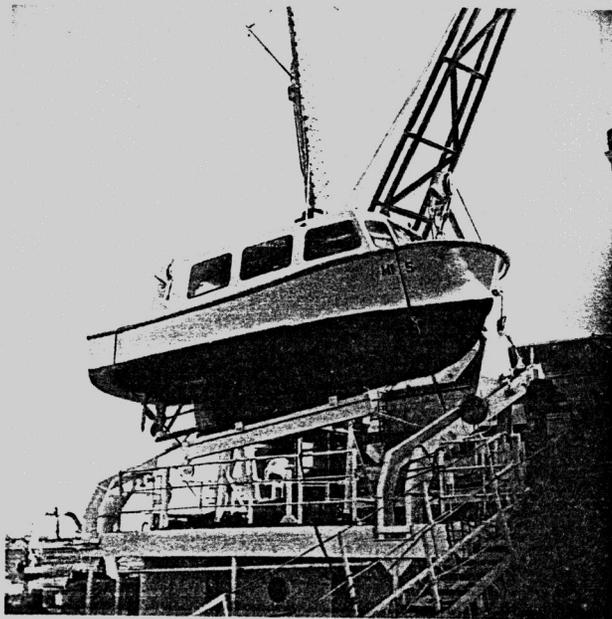
2.4 Jet Boat Survey (1277)

This shore based party was completing their second survey in Moorehead City, North Carolina.

Two officers, one coxswain, and one survey technician staffed the survey party. A 29 ft. 'Mon Ark' launch with jet-drive and outfitted for Hydroplot/Hydrolog using 'Del Norte' range/range positioning was the survey vessel on this survey. This particular survey was first completed in June, 1974.



MOUNT MITCHELL



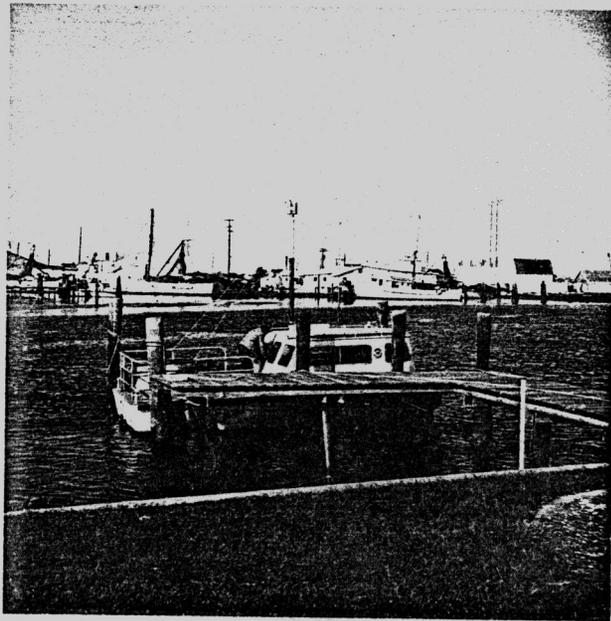
PLASTIC "PIG"

2.4 Jet Boat Survey (1277) (Cont'd.)

A photobathymetry survey was also done using photography flown in November, 1973.

When the end results were compared, discrepancies showed up. The area consists of a great number of sand bars and subsequent shifting shoaling. It was felt that the photobathymetry survey took priority and, therefore, a re-survey of the area was in its final stages on my arrival.

The diesel driven 'Mon Ark' only drew one and one-half feet, but due to no keel was very uncontrollable at sounding speed.



29' MON ARK W/JET DRIVE

2.5 Potomac River Survey

Introduction: This survey was in full operation on the Potomac River, two miles to the south of and adjacent to the Washington National Airport, down river from Washington, D.C.

This group used to be part of the 'Chart Discrepancy Unit', which is similar to our Revisory Survey.

Operations: Personnel comprised two officers and three crew.

Other major equipment included:

- 1 - 24 ft. "Penn Yan" tunnel drive
- 1 - 19 ft. open skiff w/85 h.p.
- 1 - 35 ft. office trailer
- 1 - International Travelall
- 1 - Del Norte chain
- 3 - Sextants

Positioning was done with the 'Del Norte' system in the range/range or range/visual (i.e. one Del Norte range and one sextant angle from the launch) mode.

All the plotting was done on board the skiff while underway.



"PENN YAN" TUNNEL DRIVE



OPEN SKIFF WITH PLOTTING TABLE
(Mounted over 5 gal. gas tanks)

3. OBSERVATIONS - GENERAL

- 1) Of all the survey parties I visited this summer, save for MT. MITCHELL, none carry either an electronic technician or gas engineer. Seldom does an electronic technician travel to the field party.
- 2) The prime difference between N.O.S. and C.H.S. field parties is that they field separate horizontal and hydrographic parties, whereas ours is combined.
- 3) In general, calibration of the electronic positioning system (Del Norte, Raydist Seafix) for the Hydroplot/Hydrolog system is done by sextant, which leaves something to be desired in absolute accuracy.
- 4) Fathometer bar checks are not necessarily done twice daily but may go for two or three days.
- 5) In the 'Del Norte Trisponder 202A' positioning system operating in areas of interference, erroneous readings are picked up. With the Hydroplot/Hydrolog system the pen will move to the false reading and then come back to the on line plot.

I understand software is being developed to set a limit of how far the pen should track the bad reading before discarding it. Software is also being developed to smooth out the swell in high seas on the fathogram to mean out the saw tooth effect.

3. OBSERVATIONS - GENERAL (Cont'd.)

- 6) All surveys were sounding in feet - metrication has not been started to date.
- 7) Lake Survey Center, Detroit, provided me with a fixed itinerary. At A.M.C. the various surveys were listed and it was my choice to decide which ones I would like to observe in operation.
- 8) N.O.S. small boat charts are printed on both sides of the paper, continued from "A" side to "B" side.
- 9) Roving cartographers spend up to two months with a survey party and an equivalent period of time at A.M.C. headquarters on a rotating basis.
- 10) Monumenting of stations is done prior to running horizontal control in the 'HORCON' Section at L.S.C.
- 11) The Houston Instruments Complot Plotter, Model DP 3, has a plotting area limited to 22" in width.

Skewed projections may be used through software. The plotting sheets (boat sheets) can be skewed from 0 to 360 degrees and individual characters may be rotated from 0 through 360 degrees. Another option of expanding or reducing the size of the plotted figures is provided through software.
- 12) Pre-survey Items (P.S.I.) are shown on charts supplied to the survey party to be verified as the survey progresses. These items include potential hazards from older surveys, reported shoals, wharf ruins or piles for least depth. Wrecks are of prime concern. Positions for fish havens (made from dumping of used automobiles, tires, or ship hulls), nature of the bottom and least depth is checked by the field party.

4. CONCLUSIONS AND RECOMMENDATIONS

During my exchange, I found that N.O.S. goals parallel those of the C.H.S. The final product - the chart, is the most accurate, up to date and complete document possible.

Overall, their methods of collecting and displaying the bathymetry are quite similar to those in the Canadian Hydrographic Service.

In the sense of meeting and working with other hydrographic personnel, I found the experience quite rewarding.

The work and the problems related to the work are common in both agencies. It would seem that personnel from the L.S.C., more so than A.M.C., are more specialized in their sections. Field staff associated with the 'HORCON', 'HYDRO', 'REVISORY' and 'VERCON' Sections are assigned on a permanent basis. The officers at A.M.C. on the other hand spend from 18-24 months assigned to one particular survey.

I felt a longer period of time could have been spent with A.M.C. A period of two months with each of L.S.C. and A.M.C., but not spending more than two weeks with any one survey party would have been ideal.

In conclusion, I would like to express my thanks to the Lake Survey Center staff and to Messrs. W. Monteith, R. Stachon, T. Kuchciak, R. DeCroix, and E. Kulp. My thanks also go to the Atlantic Marine Center staff and to Cdr. R. Land, Lt. Cdr. J. Rolland, Lt. D. Yeager, C.O. Cdr. R. Buffington, Ens. F. Keinschmidt, and Lt. j.g. R. Wells.

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