

25-09

INITIAL REPORT: TAT-8 SURVEY FOR AT&T COMMUNICATIONS

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Preface: Interim Report

Data collected during cruise RC25-09 (Surveys for TAT-8 on R/V Robert Conrad) are presently being reduced and edited. Based on our evaluation of data to date, we believe that we obtained the desired bathymetric survey data over the entire path of the TAT-8 route between the European Branch point and Way point #20, near 53° W south of Newfoundland. We also obtained Range-Range LORAN navigation data over most of this route, although there are some periods (up to 12 hours maximum) during which LORAN data were not recorded (mostly due to low signals). Information on earth magnetic field strength was collected throughout the cruise, except for approximately 12 hours during the French slope survey, where we experienced problems.

As per our contract obligations, we expect to produce charts of specified scale and a final project report prior to 31 December 1984. Copies of this report will be submitted to the State Department for foreign cruise reporting obligations, as well as to both the Office of Naval Research and the National Science Foundation. Due

to prior commitments of the Principal Investigator, we will not be able to submit data for inspection prior to the first week of October, as I will be at sea on another project until 30 September, and will need a few days to review charts prior to submitting them.

We believe that the objectives of the program were achieved in full during cruise 25-09, and we feel that these data provide a unique and very useful set of topographic and geophysical information concerning processes at a slow-spreading ridge. We feel that they will be of considerable interest to the academic community as well as providing appropriate bathymetric control for deployment of TAT-8.

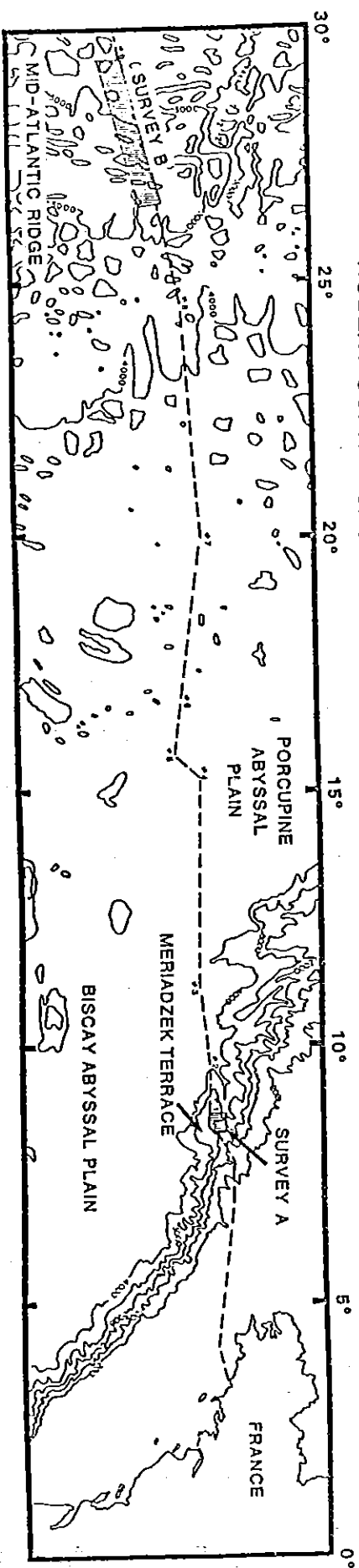
The following report contains omissions, and is somewhat incomplete, for which I apologize.

INTRODUCTION

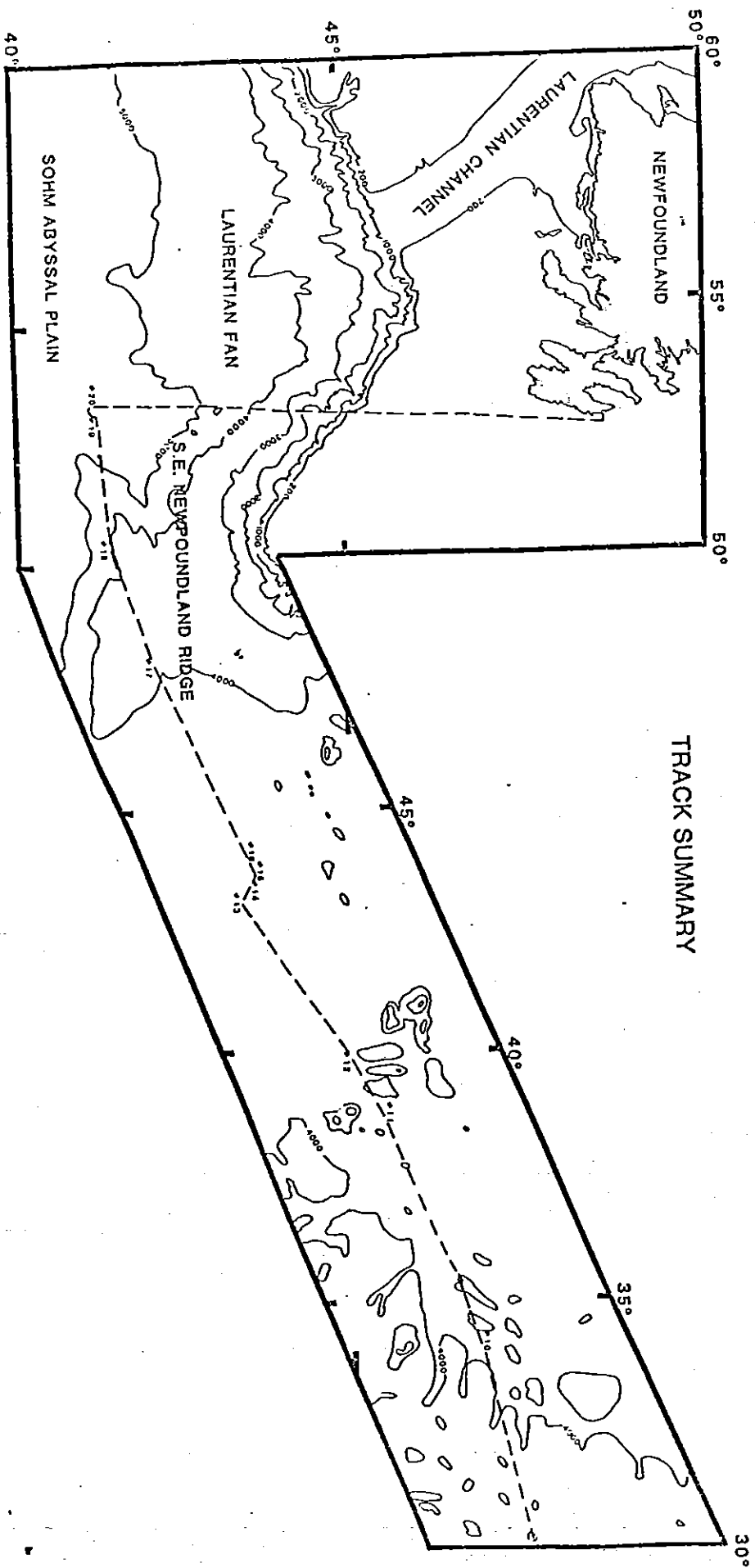
The following report summarizes observations made during a research cruise (R/V CONRAD 2509) carried out in July-August 1984. Instrumentation, described below, included a multi-narrow beam echosounder system (SeaBeam), with which a bathymetric survey was

conducted between Brest, France and St. John's, Newfoundland, Canada, along a major portion of the intended path of TAT-8, which will be the first fiber-optic trans-Atlantic cable deployed for telephone communication.

ROBERT CONRAD CRUISE 25-09 : SURVEYS FOR TAT-8 JULY/AUGUST 1984



TRACK SUMMARY



SeaBeam: description and operational characteristics

The SeaBeam multibeam echosounder on R/V Robert Conrad is a real-time multi-narrow beam swath mapping system which includes instrumentation built by General Instrument Corporation (transducer arrays, narrow-beam echosounder, echo processor), as well as a data acquisition system based on two VAX 11/730 computers. Contoured data are merged with real-time navigation (LORAN C or Transit Satellite fixes dead reckoned using a 2-axis Doppler speed log and heading). Contours are displayed in the ship's laboratory on a high-speed plotter fully merged with navigation within minutes after acquisition. This rapid display of acquired data allows one to modify surveys almost instantly, and is of paramount importance to surveys such as the proposed program, in which it is desirable to expand investigation of specific seabed features (seamounts, canyons) without unnecessarily surveying large areas of low interest.

Data post-processing is largely completed at sea, using the second VAX 11/730 computer and a second plotter. Navigation errors are removed, and any necessary changes in contouring or scale are accomplished. Final data processing is carried out following the cruise at the Graduate School of Oceanography of University of Rhode Island in Narragansett.

SeaBeam data may be displayed as contours spaced as closely as 10 meters, using the nominal sound velocity for seawater of 1500 m/sec. Corrections will be provided based on the 1980 "Echo-Sounding Correction Tables" published by the British Hydrographic Department (D.J.T. Carter). True sound velocity profiles of the upper water column are acquired during the surveys, using expendable bathythermographs, so that ray-bending and beam-forming are properly incorporated in the contoured data. Data are acquired at a rate determined by water depth, which in the deepest section of the proposed track is approximately every 8 seconds, or every 30 to 35 meters along track. The data recorded on each "sounding" include the depth and horizontal range of up to 15 discrete points across track, including the vertical point directly beneath the ship. The cross-track swath of data extends to a maximum range of approximately 75% of water depth, with a seafloor "footprint" of approximately 2.67 degrees width for each data point. This means that maximum lateral resolution of a given beam is limited to approximately 50 meters in shallow water (1000 meters depth) and 200 meters in deep water (4000 meters depth). Normal procedure is to average several consecutive soundings along track to nominally produce a square section of seabed for contouring. All data are recorded as discrete points, however, and alterations in averaging interval may be made in reprocessing.

The absolute accuracy of SeaBeam is a rather difficult problem to assess. Perhaps the best assessments of system characteristics have been conducted by the U.S. Navy (on the NOAA research vessel Surveyor) and by the Centre Oceanologique de Bretagne (on the French research vessel Jean Charcot). In the former study (internal report of the U.S. Naval Oceanographic Office), SeaBeam data from a survey off Northern California were found to have an RMS repeatability of 6 to 8 meters, and were similar to values obtained using the classified SASS multibeam system operated by the Navy. One conclusion of that report is "As a bottom mapping array sonar system, SEABEAM is completely acceptable and certainly better than any single beam sonar system." Quite similar results are reported by Renard and Allenou (International Hydrographic Review, January 1979, p.35-67) which describes the exhaustive tests carried out on the Charcot SeaBeam system. System performance tests of comparable detail have not yet been carried out on Conrad. However, testing conducted during acceptance trials in January 1984 and further examination of system performance during three subsequent cruises suggests a comparable precision.

An Operation Summary and Technical Report

by

A. Shor

(has been submitted to A.T. & T.)