

Forum

The D-Day Invasion of Europe, 1944

Commander J. M. Sharpey-Schafer, RN

With the fiftieth anniversary of D-Day on 6th June 1944, it may be appropriate to recall some of the problems of navigation for land, sea and air. This is a personal and, to some extent, untold account.

In the two-year run-up to the invasion, it came to light that the only maps of France, the Low Countries and Germany held in the UK were of mid-1850s vintage, based on triangulations of Napoleon's day, because pre-war the Army had never counted on France being overrun and had thus expected the French to provide up-to-date maps.

It was therefore decided to conduct a vertical air photo survey to include the northern European coastline to a depth which extended south of Paris and Berlin. This was successfully carried out for a year and a half by RAF Mosquito aircraft, stripped of all armament, so that they were faster than the German fighters of the time.

The whole survey had to be flown on east–west courses and, with cloud intervening and some aircraft drifting off track or chased off by the German fighters, about fifty percent had to be flown twice. A tremendous task.

The criteria laid down by the army was for an accuracy of 20 yards at 20 miles for gunnery, which meant a scale of 1:25000 (approximately 3 inches per mile) and, separately for planned river crossings by Bailey Bridges, of 3 inches horizontally and vertically. A tall order.

The Royal Engineers (RE), the British land surveyors *par excellence* throughout the Empire for 100 years, stationed a battalion in a Surrey mansion (its beautiful parquet floors indented with the soldiers hob nail boots) to put the photo map together. Towards the end, a few of us Naval hydrographic surveyors did a three-week course with them to learn the photo mapping trade.

Because of barrel and pin-cushion optical errors of camera lenses, the technique used was to scribe carefully a central point from the fiducial marks (crosses top/bottom and left/right on the internal glass plate which appeared on the print). In principle, the most reliable accuracy was for any ray from that centre (equivalent to a bearing). So one identified some precise object, a house corner, a bush or other mark which appeared on three contiguous photos (overlapping by sixty percent) and preferably lying in directions 045° , 135° , 225° and 315° , drawing rays to them from the photo's centres. From a tracing of the rays, a stiff plastic template with slots for the rays was cut by machine. Then these templates were strung together with studs that could move in the slots, and a string of up to 30 of them was fitted between two triangulation marks by shaking the whole assembly on a large ping-pong table. Indeed, at times there were whole rectangles of adjacent air photo flights slotted together to fit four or more trigonometrical marks of Napoleon's day.

That, of course, provided the framework. Thereafter, masses of detail had to be added by plotting rays on three overlapping photos; a man-power problem even for a battalion of soldiers.

Meanwhile, it had been realized from radar observation and the fall of shot of big-guns, that there was something wrong with the distance between Dover and Calais. So the following operation was set up. First, the RAF photographed three selected French coastal headlands to record the existing bomb craters. Then, at five English trigonometrical points, manned by RE and Naval surveyors with their theodolites trained on those headlands, the RAF dropped new bombs on each in turn, reporting by radio telephony so that the surveyors, with a touch of the tangent screws, could record the direction of the flash. The next day, the RAF re-photoed the headlands to record the positions of the new bomb craters, which were subsequently connected to suitable French trigonometrical marks such as church spires, via the photo survey.

The outcome of that operation was made public after the War at a seminar, where RAF and Naval scientists heatedly disagreed about the speed of light and thus of radar signals. It transpired that the distance between Dover and Calais was a quarter of a mile wrong on all the maps and charts. It had not really mattered before because ships had fixed their positions by one coast or the other, but not both. The Hydrographer, Admiral Edgell, chairing the meeting, told us, 'When, as a Commander, I was responsible for fixing the controlled mine loops across the Strait of Dover against the U-boats in the First World War, I never could make the fixes from the two sides agree. Now that lost quarter of a mile explains it.'

A second photo course with the RE involved calculating the depths close to shore on the actual invasion beaches for the landing craft. In the summer of 1943, during an American Army landing exercise on Slapton Sands, Devon, the landing craft grounded on an outer, uncharted bar and, in their enthusiasm to rush the beach, some 400 American soldiers were drowned in the deeper water beyond the bar. It was hushed up at the time. Much the same thing had happened in New Guinea, in the Pacific.

Meanwhile, a Cambridge scientist had devised an equation for estimating the depth in shallow water (up to 18 feet) from measurements of the speed of the wave crests (c 10 knots) as recorded on a series of timed vertical air photos by distances from some identifiable inshore mark (such as a bush) on contiguous prints. The survey was again flown by Mosquitos along the direction of the beach and the results were accurate to 0.5 feet in 6 feet depth or, less importantly, to 2 feet in 18 feet depth. It required a reasonable swell of about 5 feet height and bright sunlight in the early morning or late evening to define the swell tops decently.

An odd job for the author with a radar lieutenant at about this time was to site the Master and two Slave transmitters for the first-ever Decca chain for the D-Day invasion. They were required to be more than a quarter of a mile from any telephone line or wireless transmitter but, on spotting a likely lonely barn on a remote hill, we found that nearly everywhere was already occupied by Army units standing by for the invasion. Eventually, all was in place and HMS *Scott* led the minesweepers across the Channel at the head of the D-Day invasion fleet.

When the Decca chain was set up about two months before D-Day, there was a trial with two MLs (motor launches) which met perfectly to within 20 yards in thick fog in mid-Channel. However, a further trial was desirable close in to the coast, near Cherbourg so, while a cluster of MGBs (motor gun boats) created a diversion two miles offshore to mix it with the German E-Boats, an ML crept in close until it could fix its position by good coastal marks. To everyone's horror, the Decca disagreed by a third of a mile.

There was considerable scratching of heads at the RE photo survey office. Recalling that the survey depended on a triangulation of Napoleon's day, it was eventually determined that the three provinces, the Pas de Calais, Pas de Havre and Pas de Cherbourg had been surveyed at different times and that very little trouble had been taken to connect them together. The consequence was that there was a 'bend' in the north of France between the three triangulations.

Later, and just after the War, the RE resurveyed the triangulations across the north of Europe, particularly the connections from one country to the next. For example, the connection between Denmark and Sweden was some 195 metres adrift. Around that time, it was estimated that, with poor connections between countries, the distance from London to Istanbul might be half a mile out, and much the same for London to Gibraltar.

A year or two after the War the first Thames Decca chain came into use by Merchant Shipping. It was extended, with rather a poor angle of cut, to the six-cable-wide deep water channel along the Dutch coast and was giving errors of up to four cables. The charts had not been corrected for the latest RE's geodetic data which was, at that time, still classified.

KEY WORDS

1. History.
2. Military navigation.
3. Maps and charts.

The ECDIS Paradox

L'Ingénieur Général J. N. Pasquay

(*Directeur du Service Hydrographique et Océanographique de la Marine, Paris*)

In the January issue of the *Journal of Navigation*,¹ Dr F. Bianchetti explains what he calls 'The ECDIS Paradox'. As Hydrographer, I want to make my comments on the author's affirmations and proposals.

1. The main points about Dr F. Bianchetti's EPNIS concept can be summed up as follows:

1.1 Current paper charts are inadequate for the safe navigation of large ships. Consequently ECDIS, defined as equivalent to paper charts, is also inadequate.

1.2 Definition by an authority of the 'usable space' for a given category of ships and loading conditions. Navigation to be conducted in this 'usable space' only.

1.3 Setting up all rules and procedural instructions for the voyage in the usable space.

1.4 Automatic warnings in case of any violation of the rules and instructions.

1.5 The paper chart to be maintained as a back-up of last resort.

2. My remarks will address these points in order:

Point 1.1 The reasons given by the author for the inadequacy of the present paper charts are not convincing.

Depth figures, depth contours, wrecks, etc. shown on charts are not purely 'scientific/geographic' information. This information is indispensable for SOLAS class ships, both for route planning and for the voyage itself. When for any reason the ship must deviate from her planned route the mariner needs to have this information immediately for his safety.

'Positional clues' are indispensable even if the ship is fitted with an integrated radio-navigation system (Loran-C, GPS, etc.). The position derived from such systems must be