Forum

Landfall and Coastal Lighthouse: A Canadian Perspective

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1. BACKGROUND. In the mid-seventies, the Canadian Coast Guard was tasked with developing 'Level of Service Statements' in order to quantify the effectiveness and efficiency of their aids to navigation programmes. The targets established concerned the extent, quantity, quality and limitations of the service to be provided. Subsequently a Level of Service Statement was developed, as was a procedures manual for the design and review of short-range aids to navigation systems.

2. THE STATEMENT. The Canadian Coast Guard will provide short-range aids to navigation for use in accordance with accepted international practice where justified in the interest of safety and environmental protection, based on professional judgement supplemented by benefit/cost and risk analyses as required. The short-range aids to navigation systems provided will ensure a design availability, based on the worst month of visibility during the navigational season, of 85 percent for certified commercial traffic, 75 percent for other commercial traffic, and 65 percent for pleasure craft traffic. Short-range aids to navigation systems will be operated and maintained to ensure an operational reliability of 99 percent. When visual aids alone cannot achieve these percentage availability levels, radar aids will be provided for certified commercial users, and aural aids for the uncertified commercial users. Pleasure craft traffic will be provided with visual aids only.

3. THE DECISIONS.

(i) Certified commercial users are vessels operating with relevant charts and publications, equipped with radar, radio and radio positioning equipment in accordance with regulations, being used for commercial purposes and operated by professionally trained and certified personnel (Class IV Fishing Master Certificate of Competency or higher).

(ii) Other commercial users are vessels being used for local commercial activities (fishing, tours) within an area where the operator has appropriate local knowledge. Such vessels may, or may not, be equipped with radar and other electronic navigational equipment.

(iii) Pleasure craft are vessels operated for recreational activities by the owner, or under rental or loan.

(iv) It is assumed that all classes of user have the largest scale nautical chart for the area and a compass, or other equivalent navigational equipment, of sufficient accuracy to make a landfall with a dead reckoning navigational error no greater than 10 percent of the distance travelled between positions fixes, and that the operator will be able to use the equipment accordingly.

4. THE DIFFERENCE. The major difference between the Canadian policy and the

design methodology of other countries is the acceptance of the deterioration of a system with weather. This requires that historic data be collected for each site and be used when designing or reviewing the aids to navigation. Environment Canada has extensive records for most areas and are our major source for data.

Secondly, Canada recognizes the landfall capabilities of the certified commercial user and does not design, but confirms, landfall with a landfall light. Landfall designs are only for short-range (ten mile dead-reckoning) for non-certified users, using the Netherlands Research Institute formula:

$$\mathbf{P} = \mathbf{R} + \mathbf{D} + \mathbf{S}$$

where **P** = Perception requirement, **R** = Radial error, **D** = Danger area, **S** = Safety margin.

Thirdly, the Canadian system is based on total risk reduction – not on the concept of relative risk. This means that both the system designed for one-half mile and that designed for three-mile visibility have all relevant hazards marked, as well as the required aids to meet the visibility criterion.

5. THE IMPACT. Due to a design criterion based on the worst weather month of the navigation season, the mariner enjoys a high degree of availability. Analysis of existing systems indicates that our visual aids systems adequately support navigation in reduced visibility from one-quarter mile to one-half mile on our fog-bound east coast, and to up to three miles in parts of Canada where fog is less frequent.

When analysing the frequency and strength of onshore winds against fog horns, it was soon realized that the mariner is usually much better served by an offshore sound buoy or buoys than by a high power shore-based fog horn.

In areas of poor visibility during the navigation season, analysis shows that, often, a few well-placed light buoys are of greater service to the mariners than a high intensity light on land. They provide a better mark of hazards and earlier confirmation of position than can be achieved with shore lights.

Elimination of large fog horns dramatically cuts the power requirements for a lightstation and the need for buildings to house power-generating and fog-detecting equipment. This, coupled with shore lights of a lesser intensity, allows a change to simple tower structures and small solar power systems. This represents a large saving in capital, operational and maintenance expenses.

6. CONCLUSION. The description, 'safer, less expensive system', seems as though it should be an oxymoron, as we have come to expect that safety comes with a heavy price tag. The Canadian experience is that the two can be compatible, at least some of the time. It would never be contended that provision of short-range aids to navigation is an inexpensive operation, but we have found that our procedure to measure the effectiveness of the system to the mariner is allowing some cost savings.

If the availability of a system of short-range aids to navigation is to be accurately assessed, the expected weather conditions must be taken into account. To design a system without is to adopt the office mentality that so annoys mariners, wherein it is always fine weather and high tide behind the desk.

KEY WORDS

1. Lights and buoyage. 2. Safety. 3. Economics.