

**A REPLY TO THE ARTICLE  
ENTITLED " NOMINAL RANGE "**

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The Italian Naval Hydrographic Institute comments in the above article on the reasons for voting against the inclusion in nautical documents of the " nominal range " of lights as defined by the International Association of Lighthouse Authorities (IALA) and expresses the wish that if they have misunderstood any point they will be given further explanation.

**Luminous intensity and nominal range of a light**

We are, of course, both agreed that nominal range and luminous intensity are not in essence different. It is their numerical representation which differentiates them. The scale for practical values of luminous intensity can amount to about nine orders of magnitude, whereas the performances of the corresponding nominal range are very often expressed by one or two orders of magnitude. It seemed useful to compress the scales correspondingly, in the same way as acoustical engineers, irked by the extremely wide extent of audible acoustical powers have borrowed from telecommunications engineers the notion of the " decibel ".

**Nominal range and luminous intensity in average weather**

It so happens, in fact, that the " clear weather range ", already put into practice in the Light Lists of both Germany and the United Kingdom, has prepared for this conversion. "Nominal range" only differs from the range in clear weather by a slight adjustment concerning the reference visibility, which had to be somewhat reduced on account of the fact that the value

adopted by Germany and the United Kingdom seemed a little too optimistic for general use, and also to allow the definition of this reference visibility to be expressed simply and readily.

We think, indeed, that important progress has been made by replacing the notation of the value of the reference atmospheric transmission coefficient, i.e. 0.8, by the value of the reference meteorological visibility, i.e. 10 miles, for this is assuredly more concrete as well as of more use to mariners.

One may wonder why "average weather range", which is already explicitly used in France and it would seem implicitly in Italy, has not been retained since it would allow two lights with the same luminous intensity but situated in different coastal areas to be catalogued as having different luminous ranges which to some extent would take into account climatic differences.

The members of the IALA Sub-Committee who were called upon to decide this question found themselves up against a practical impossibility, and they were also guided by considerations of an operational nature. The indication of average weather range presupposes that it has been possible to determine the visibility for half the time on the actual site. At many points on the globe this is not done, and to do so would need much time and money. Even in countries where weather condition statistics have been established for a long while they have often been so for fairly wide areas (for example, the Atlantic coast of France) which reveal themselves fairly heterogeneous, so much so that local visibility values for quite half the time are markedly and considerably different from the values that are valid for the region taken as a whole. With the needs of the mariner in mind, the Committee also came to the conclusion that while on his bridge the mariner is interested essentially in the luminous range of a light in the actual meteorological visibility conditions at the exact moment he wants to use the light to get his bearings, and not in the value that this range could take on for a statistical average of 50 % of the time. If, therefore, the mariner wishes to calculate the range of a light, either by reference to his books or else by intuition as a result of his long practical experience, he must not only be able to estimate the actual meteorological visibility of the moment — using both the information he has obtained from his books as well as his own observations — but also take account, in one form or another, of the light's luminous intensity. The use of a single system of reference, whether this be luminous intensity or nominal range, is certainly preferable to average weather range whose reference often unaccountably varies from one spot to another. We have moreover the advantage of being able to refer to a single graph or table that will be valid for any ship's position. Furthermore, on a graph it will be much easier to read nominal range than luminous intensity, as the numbering will only vary from about 1 to 40 instead of from one to a hundred million or more. Then again, for acquiring an intuitive technique it will be easier to work in nominal range which is of the same nature and can therefore be compared directly with the desired result.

The North Sea mariner expects to find the light he is seeking at a shorter distance than nominal range. Similarly, in the Mediterranean the mariner can expect to find the light at a distance longer than nominal range. If he

is in the habit of everywhere somewhat decreasing the unduly high ranges taken from the instrument manufacturers' advertisements, then he will as easily get used to increasing the ranges he finds in nautical documents when he is in places where the visibility is very good.

For the Italian coasts, for instance, the luminous range is for most of the time higher than the nominal range. This is because, since the weather there can be classed "very clear", the visibility is better than 10 nautical miles, which is the value chosen as the reference value for nominal range. On these favoured coasts there is no serious problem for the mariner. It is only when visibility becomes bad that real difficulties arise.

### **Luminous intensity values**

Scientific rigour here demands that we do not seek an illusive accuracy but that we adopt a system that does not give the illusion of an accuracy higher than it actually is. The notation of luminous intensity in candelas which is shown by at least one and often two significant figures involves a measurement accuracy of the order of one in ten, or even of one in one hundred. The numbering of nominal range — with figures rounded off to the nearest nautical mile — gives consecutive values of luminous intensity in the ratio of 1.5 or 2 in usual circumstances. This corresponds better to the actual uncertainty about luminous intensity values under practical conditions. And this is scientifically more honest.

### **Geographical range**

We are both agreed that geographical range and luminous range originate from different phenomena. The mariner, however, has to compare them if he wishes to evaluate the distance short of which he can use the light. Nautical documents therefore have to present these ranges, insofar as is possible, in terms that are comparable.

### **Remarks**

As regards visibility statistics, it should be noted that these are of use to engineers devising a system of lights, or when making the choice of characteristics for an installation. These statistics can also benefit a mariner preparing his voyage, but certainly to a much less extent the mariner on his bridge while actually en route, at a time when he is grappling with the local conditions of the moment and not with conditions determined from statistical averages.

Let it also be noted that in practice the Moon and its azimuth are not liable to influence the luminous range of a light. In photopic vision — and this is the only sort of vision involved when observing visual signals — the

thresholds of illumination are in fact remarkably stable over the whole range of natural background luminances by night.

Finally, let us reiterate that we are agreed that the notation of the intensity of lights in candelas should be retained, for so long as mariners wish, not only side by side with the nominal range in miles in the List of Lights, but also as abscissae underneath the graph of luminous ranges and below the scale of nominal ranges in miles. The user will be the final judge of what he prefers : to reckon with intensity in candelas (or kilocandelas), or else to reckon with nominal range in nautical miles.

We are persuaded that he will abandon without regret the notion of atmospheric transmission per unit of distance.

### **Conclusion**

Briefly, there has been no basic misunderstanding. We approve of the various principles emerging aptly from the Italian Hydrographic Institute's contribution. These are the universal character of the notions, the choice of a means of expressing these notions in order that mariners may find them easier to use (either by consulting documents or else by acquiring an intuitive reflex), and numeric or graphic formulation in keeping with the inevitable scattering of practical data.

We hope that the present reply will clarify the motives that led the IALA to recommend the system of nominal range as the one best satisfying the principles that have now emerged more clearly. This system benefits from the experience gained in the use of the notion of "clear weather range", and adds to it the new facility given it by the generalization of the use of "meteorological visibility".