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Directorate of Military
Survey, War Office.
12th November, 1945.

To:-

Colonel A. G. Matthews,
Chief, Intelligence Division,
c/o ST & D (RE)
1801 K Street N. W.
Washington, D. C.

Dear Matty,

Many thanks for your letter of October 26th regarding proposed new world-wide grid systems.

I think there can be no doubt that the polyconic is a bad military grid because it is not orthomorphic and does not therefore give the required degree of accuracy in rapid "plane" computations for range and bearing; or the same facility as an orthomorphic projection in rapid small instrumental surveys interpolated by "plane" methods.

The present haphazard plaster of grids which has grown up all over the world (particularly in British areas of responsibility) is also a headache even though these are orthomorphic. They frequently lead to junctions in awkward places, although there is no reason to suppose that the junction bugbear will be overcome by any cast-iron 6-degree system; or indeed by any grid system at all.

The main point I think is that before we change at all we want to make quite certain that we are changing in the direction of the far future and not merely to meet some transient consideration. It is bound to be many years before we get on to a new system and we shall merely have had the vast labour and confusion for nothing if by then we have changed our minds again.

We have been considering this matter at this end and have decided at any rate to try out a "mesh" system based upon the graticule rather than the use of a "plane" grid at all.

The advantages of a mesh system are as follows:

(a) It would obviate all grid junctions everywhere at any rate on the smaller scale maps. There would, however, be some discontinuity remaining on large scale maps across the boundary of disparate survey systems (e.g.:- the frontier of two countries) where fundamental geographic positions are not in sympathy.

(b) It would vastly facilitate inter-Service cooperation. The Navy, for instance, always work on some sort of graticule system of reference if they can and are only induced to accept "plane"

grids for bombardment purposes under protest. The Air Force similarly hate grid junctions which always fall awkwardly for such purposes as fighter defense. Many anti-air defence systems cannot in any case operate across a grid junction, e.g.:- the use of "fruit machines" for vectoring defending aircraft.

The question has for instance arisen in particularly acute form in relation to Coast Artillery which may otherwise be forced to switch at very short notice between no less than three grids; one for landward firing in support of ground operations; one for seaward firing in conjunction with the Navy; and one at the shortest notice for employment in an A.A. role.

The disadvantages of a mesh system may be summarized as:-

(a) Computations for range and bearing will not be as simple, although it is likely that for the most rapid purposes the introduction of a scale factor in one direction will be sufficient; the value of the scale factor being suitably broadcast by, for instance, marginal information on maps.

(b) All trig. lists would have to be cast into the graticule. We should no longer be able to use the results of foreign surveys neat in their own native projection.

(c) The vast cost and probable confusion over a long period of time involved in any change.

We are, however, trying out a mesh system in experimental areas in conjunction with the Artillery. I do not know what the answer will be but I certainly think that we must go into this much broader question in detail before we make any alteration whatever.

If it is decided to stick to grids and to introduce a world-wide system then I think the six-degree Transverse Mercator proposal is as good as any. One advantage of it which has probably been brought to your notice is that the Russians do this and have adopted the six-degree belts of the International 1/1M map. The Germans were also proposing to do so. We get a considerable portion of the globe already covered for us on this system therefore (always assuming that we can get any data out of the Russians, which is doubtful). Conversely it may be considered an advantage to the Russians for us to facilitate their study of our surveys and to utilize them. This aspect of the question very soon runs into deep water.

Although the introduction of a world system of grids such as the Transverse Mercator proposal looks very tidy I doubt very much whether it would work out quite as tidily. A meridian boundary, in the nature of things must always ignore such factors as a grid junction falling awkwardly in a possible battle area and also such factors as the straight utilization of National surveys, which of course are placed on a National projection rather than a purely geographic one. We might accordingly find that we had undertaken all the disadvantages of change for very little if we were to adopt such a stereotyped proposal.

Another question that arises is the choice of a unit. We are likely to standardize on the metre for grid systems. The main reason is that the British Army must accustom itself to training, and even maybe fighting overseas where it will frequently get foreign maps dished up with the least possible alteration in the shortest possible time. In the majority of cases foreign material and trig. data would be in metres. There is moreover a growing world tendency (not as yet very evident in America) to get on to such an International unit as the metre for basic surveys, even though the common linear units of the country may be different. For instance the new surveys of Great Britain are coordinated in metres and all post-war O.S. maps will carry a metric grid. It would of course be a great advantage if we could both do the same but I do not know how you view the chances of getting the metre adopted for such purposes in America. At first sight I should not have thought the chances were very great.

If we go onto a "mesh" system the question of degrees or grades or mils or possibly some other system altogether will arise. It is necessary to have some decimal sub-division of angle for this purpose but the centesimal system works out too small and the mil works out too large as applied to latitude and longitude on the earth's surface. The sexagesimal minute is about right but is not decimally sub-divided, nor does it spring decimally from a parent unit. The answer may be to adopt as the unit tens and ecimals of sexagesimal minutes. We are adopting the latter for our preliminary trials.

I will let you know how this question progresses and shall be grateful for any further developments your side. I think it is important that we should keep in close touch with one another even though we may not finally be able to adopt the same system. In fact I feel a little guilty about not having briefed you sooner.

M. HOTINE
Brig. D. Survey

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