hogshead = 0·29 cu. meters

LB.

1 cu. ft. = 28·32 litres

1 CU. = 16·30 C.C.

1 Fathom = 1·83 Metres

IN.

1 Qt. BACARDI = 1·14 Litres FUN

KM.

GRAVITY = 9·81 m/s/s.

1 STONE = 14 LBS.

KM. = 0·62 ST. MILES

M.

1 CHAIN = 30·48 METERS

GM.

1 CABLE = 219·46 M.

1" = 2·54 CM.

36" = 91·44 cm.
24" = 60·96 cm.
28" = 71·12 cm.

1 link = 0·20 m.

1 knot = 30·89 m/min.

1 lb. = 453·59 c

MILE

KM. = 0·54 N. MILES

1 C.C. = &

MAY 1970

C H A

NEWSLETTER NUMBER 4 Spring 1970

The appeal for input to the newsletter fell on fertile ears; there has been input from each of the regions; thank you to those who contributed.

The last edition received both adverse (it was to long) and encouraging (more of the same) criticism. Well at least it was read.

Maybe some thought should be given to changing the name from "Newsletter" to "Journal". Suggestions are welcome. A newsletter should normally be about four pages long and be published at a more regular interval. Is it possible that there is some aspiring journalist in the C.H.A. who has the time and ability to produce a regular newsletter?

As a follow up to the Step II syllabus produced in newsletter 3 the test papers from that course are included in this edition.

How will you as a hydrographer adjust to metrication in your work? How does it affect ours and related surveys? These questions are partly answered in a complete section on the subject. Your comments on this subject could be the beginning of "Letters to the Editor".

Another subject that should or could be discussed in this type of publication is our current training program. For instance "should a trainee's period of probation extend to his first full field season instead of being restricted to the training program, "should the expensive southern cruise be continued or should it be replaced by an extended academic course and the first field season.

The system of rotating junior personnel between the regions has been appreciated by those fortunate enough to have been subject to it. Someone somewhere must have been doing some creative thinking about the future for junior hydrographers.

Again a special is due to the typists of Central Region for their most helpful assistance in preparing the "Newsletter".

The cover was produced by Ken Hipkin, Central Region.

The mathematical games were submitted by Ralph Courtnage.

R.P. Golding.

The National President, Canadian Hydrographers Association, Robert "Sandy" Sandilands was born and educated in Edinburgh Scotland. He joined the Royal Navy during the war and served in the Fleet Air Arm and Combined operations.

After the war Sandy served with the fleet for a short spell before becoming an (H) specialist. He spent two years surveying for minesweepers and wreck dispersal vessels engaged in clearing the coasts of the U.K. After this experience he was engaged in surveys in the coastal waters of the United Kingdom and foreign service in the Mediterranean, Red Sea and Persian Gulf with command of his own survey vessel in the U.K.

Sandy resigned his commission with the R.N. and came to Canada in 1954 and joined the Canadian Hydrographic Service on the 13th of February of the same year. After a short stay in the Ottawa Headquarters he transferred to the west coast office.

He served as Senior Assistant on "Marabell" in 1954 and in the same capacity on "William J. Stewart" from 1955 to 1957. He became hydrographer in charge in 1958 on "Marabell" and on "Stewart" in 1959. He was a founder member of the C.H.A. and was elected to the West Coast Executive in 1969 and National President for 1970.

Sandy is a keen marine historical bug and as such is a Trustee of the Maritime Museum of B.C. When he has the opportunity he enjoys working in his garden but like most surveyors he rarely sees the results of his labours except perhaps in the early spring.

Sandy is married and has one daughter.

Dear Members,

The first quarter of the year has gone by and you will all be in the process of getting ready for another field season.

We held our National Executive Meeting in Ottawa in January and you will have heard a report on the proceedings from your Regional Vice Presidents.

I am glad to say that our membership continues to grow and take this opportunity of welcoming new members to our Association. I trust that you will find our meetings informative and rewarding and urge you to become active members of the organization and not sit back as passive "joiners" who paid dues and have no other responsibilities to the C.H.A.

A brief has been submitted to the Dominion Hydrographer outlining our aspirations in the field of offshore hydrography and surveys in the mineral resource field and I will keep you informed on any progress in this area.

In the educational field I have received some valuable information on the potential bottleneck in the step 2 hydrography course from Bob Marshall and as soon as I gather some information from the Pacific and Atlantic Regions a brief will be drawn up for submission. Through the efforts of the CHA this years step 2 candidates have received considerable data in advance of the course and we wish them well in their educational endeavours.

To those of you who have just completed the Basic Hydrography course I would suggest that you take a few minutes to give the CHA your opinions and evaluation. Course content, methods of instruction, examinations, field training is of interest to your Educational Committee and if Mr Kerr, the CHA Educational Officer, is to play a constructive role in the CHS Educational Committee he must have facts. I would suggest that you

channel this information through your Regional Educational Officers.

Some of you may have read in a recent I.H.R. of the formation of a Technical Association of Hydrographic Officers in Norway. I have written a letter to them outlining our organization and hope to have a reply before my next letter to you.

You will remember that it was suggested that our Newsletter would be an ideal publication for members to "try out" their technical papers. Who is going to lead the way?? And of course Bob Golding will always welcome your contributions for publication so keep the items of news and general interest rolling in.

To all of you going into the field this season... have a good season,

Yours truly,

L. Sandilands.

National President.

At a General Meeting of the Canadian Hydrographers Association held in Ottawa in January the National President was asked to prepare a brief for submission to the Dominion Hydrographer on the possibilities of a hydrographer obtaining a licence for offshore surveys. Part of the submission reads as follows:

"The Manual of Instructions for the Survey of Canada Lands, Part II, page A 18, para 33.2 states that " A Dominion Land Surveyor, or any other surveyor authorized by the Surveyor General may survey public lands in certain circumstances and specifically excludes public lands adjoining non-public lands". As the offshore area comprises public lands only it would appear that at the present there is no legal bar to a hydrographer being authorized by the Surveyor General to make a survey. The Canadian Hydrographers Association recommends that a concept of licencing suitable hydrographers for surveys in the offshore is a logical extension of their duties, that their understanding of the problems involved in surveying on water as a result of years of experience makes them the most suitable persons to carryout this function of legal surveys in the offshore. We feel that such a concept has advantages to the Canadian Hydrographic Service, the Canadian Hydrographers Association and to the individual hydrographer.

The C.H.A. will be most interested in the outcome of the meetings between the Board of Examiners of the D.L.S. and yourself. We see this as an opportunity to further the broad aims of the Branch and of the C.H.A. in establishing a professionally recognized hydrographer of unimpeachable competence and in providing an end goal to the educational process in which we have jointly embarked".

The reply to this brief states that MR. MARTIN HAS HAD PRELIMINARY DISCUSSIONS WITH THE D.L.S. BOARD OF EXAMINERS AND IS DISCUSSING THE BRIEF WITH DR. COLLIN. HE HAS PROMISED TO KEEP US INFORMED ON DEVELOPMENTS.

SOME THOUGHTS ON THE METRIC SYSTEM

by

G.J.A. White, ('Nautical Magazine'
August 68, Vol. 200, No. 2)

To be fashionable usually seems to consist of welcoming what is new and discarding what thus becomes old. To a certain extent, the welcome for the new is both desirable and necessary, for this is the way progress lies, but it is all too easy to regard the new thing as a panacea and to overlook what virtues the out-moded thing possessed; easier by far to call those who do look at the virtues 'reactionary'. So often, the drawbacks of the new thing appear only after it has been accepted - too late to recall the good points of the old.

This is very true of our latest fashion that of the metric system. Accepted wholeheartedly by scientists in this country for many years, and partially accepted by engineers it will in future involve everyone, seafarers and shore-dwellers alike and in the face of so many words written and spoken about its virtue, the author feels that one should look at some of the things which seafarers in particular will lose when it comes.

The use of the number ten as the basis of our counting system owes its origin to pure chance: man happens to have two hands, each with five digits. Once the system of Arabic numerals, together with the concept of the 'number' zero (to represent a column of an abacus with no beads in it), had been adopted, in place of the rather clumsy system of Roman numerals, it was a logical step to extend our system from 10 to 100 (10^2), 1,000 (10^3) and so on.

One of the inconveniences of the number 10 is that it has but two factors, 2 and 5. Some thousands of years ago, the Babylonians avoided this difficulty by going from 10, not to 100, but to 60. This is an awkward step, but the number 60 is remarkable for its large range of factors, 2,3,4,5,6,10,12, 15, and 30. Because of this, a large number of proportions of 60(one-half, one-tenth, etc.) can be expressed as whole numbers, avoiding the use of fractions.

The Government has decided that this country shall have SI, the abbreviation for 'Systeme International d'Unites', accepted at the Eleventh 'Conference Generale des Poids et Mesures' in 1960. This prescribes six basic units of measurement:

Length	metre
Mass	kilogramme
Time	second
Electric Current	ampere
Temperature	degree Kelvin
Luminous intensity	candela

To these must be added two dimensionless units for angular measure:

Plane angle	.....	radian
Solid angle	.....	steradian

Both navigator and engineer will have to work on this system in future years. As the navigator is likely to find the effects much more disturbing (to say the least) than the engineer, who should be rather more familiar with them anyway, we look first at the navigator's basic units: angle, length and time.

Angle

SI demands the radian, in place of the degree, as the unit of angular measure. At the time of writing, there seems some doubt as to whether the degree will disappear. The British Standards Institution booklet says that 'It has been recognized that some departures from strict purity and coherence are acceptable for practical reasons if agreed internationally. For instance, pure SI would acknowledge only decimal multiples and sub-multiples of the second for time measurement, whereas the minute, hour, day, month and year are in everyday use internationally and will clearly continue to be used. Similarly, the division of the Circle into 360 degrees is a recognized international practice but is not a part of the SI'. However, the nautical mile - and its derivative, the knot - are also recognized internationally, but apparently are to disappear in this country. One might, therefore, profitably examine the consequences of introducing the radian.

Latitude and longitude would be quite different. Taking the latter first, and keeping the Greenwich meridian as zero, longitude would be measured East from zero, in steps of perhaps 0.2 radian(roughly 12°) to 3.0 E. Then would come an interval about 50 per cent greater, to 3.0W, since 180° would be represented by 3.14159 ... radian (π). Latitude presents less difficulty: if the equator continues to represent zero latitude, there would be uniform steps N and S to 1.4 radian, the poles having latitude 1.57079 ... radian ($\pi/2$).

The compass rose on a chart, and indeed the compass card, would look rather different. If North remains as zero angle, then the rose and card would probably be marked out in steps of 0.02 radian a little more than one degree, from zero to 6.26 radian, followed by a larger division between this mark and zero (2π or 6.28318 ... radian). Apart from North, no compass point would be an exact number in radians: East, South and West would be approximately 1.58, 3.14 and 4.72 respectively. Deviation cards would need completely re-drafting.

Where calculation is required in navigation, the change would not be so drastic. Granted a change of scale on the sextant, it would involve no more than the use of mathematical tables in radians instead of in degrees.

Length

Non-acceptance of the radian is a clear breach with SI, yet a similar breach concerning length, albeit a temporary one, is condemned in a recent note in the Journal of the Institution of Navigation.

The first change on charts will be the conversion of soundings from fathoms to metres, together with tide tables in the same units. The introduction of the metre will follow some time later. The inconsistency here, of course, is that retention of the degree involves retention of the most natural and simple scale of measurement - that of latitude. On charts of such a size that one scale is effective for the whole area, one metre scale will suffice - though, to be as useful as the latitude scale, it surely should appear on each side, from top to bottom, alongside the latitude. But the Mercator chart demands a variable distance scale, which presumably can only be provided in the same way. What the Institute of Navigation article condemns is that, because the distance scale will take some time to appear, the proposals will 'metricize the navigator in the vertical plane but leave him unchanged in the horizontal plane'. What is also open to criticism is the eventual appearance of two scales - one of latitude, one of metres, side by side, the former being due solely to the retention of the degree.

Time

As the basic unit is to be the second, we should expect speeds to be in metres per second which indeed is the SI requirement. A speed of 10 knots will become about 5 metres per second. Up to a point, this is workable at sea, until we want to convert speed into time taken for a distance. If the latter, say, is that from Gibralter to Naples, we should know this in kilometres and the conversion from metres to kilometres means only multiplying by 1,000. But SI, followed exactly, means units of time in seconds, kiloseconds and megaseconds! If we refuse to accept these latter two, then kilometres per second is an inconveniently small unit, so we shall undoubtedly come to use kilometres per hour, another breach with SI. This again, the British Standards Institute accept in their booklet.

Time alone will tell just how we shall adapt to the metric system - and indeed how much of the true metric system we shall eventually adopt. For the time being, it certainly seems that we shall have a mixed bag of SI and non-SI units and that we shall lose many of the advantages of our present system.

* * *

THE CHART AND THE METRE

(Extract from 'Safety At Sea International')

by

Rear Admiral G. S. RITCHIE

The announcement that the United Kingdom was to adopt the

metric system for showing heights and depths on charts was made at the International Hydrographic Conference in May 1967, and undoubtedly encouraged the formation of a small committee of six leading cartographic countries to study the possibilities of a truly international chart - at least on the smaller ocean chart scales. This committee, consisting of the United States, Japan, France, Germany, the Netherlands and the United Kingdom, is expected to propose recommendations to the International Hydrographic Bureau early next year for consideration by the member states.

The committee will put forward two agreed chart schemes covering the whole world on scales of 1/7 1/2 and 1/3 1/2 million; about 15 of the former charts will be required and 75 of the latter. If these schemes are accepted by a majority of the member states, then individual states members will be asked to adopt for compilation and maintenance purposes one or more of these charts. It is fairly confidently expected that between ten and twenty member states will co-operate in this work so that all the charts will be adopted.

Then only the adopting member state will carry out the laborious compilations, while any other member state will receive reproduction material for the asking and may reproduce this chart which, while still retaining its international number, may also be given a national number and included in any national series.

The general adoption of the metric system for heights and depths, together with the standardization of styles and symbolization, which has developed over many years under the guidance of the International Hydrographic Bureau, will mean that although the international series will be compiled by many member states, the charts of different nations will look remarkably similar and will be familiar and readily useable by navigators of all nationalities.

Experience by the United States, the Netherlands, France and the U.K. with facsimile reproduction agreements has shown that shipowners will still be able to find all their chart requirements in one national series, and that the Notices to Mariners covering this series will adequately maintain corrections for the international charts incorporated in the series.

Provided the I.H.B. members generally accept the proposals of the committee outlined above, this progressive international chart scheme could begin to develop before the end of 1970. The opportunities for reducing laborious and time consuming compilation work are immense, particularly for those member states who previously maintained full world cover with their national charts. The scheme will hasten the day when all maritime nations will use the metre and decimetre for showing depths, and navigators will recognize this single unit of depth measurement wherever they go on the charts of any nation.

THE METRIC SYSTEM

by

Mr. S. G. Gamble,
Director,
Surveys and Mapping Branch,
Dept. of EM&R, Ottawa.

If you look in Collin's Encyclopedia between "measurements electfical" and "the meat packing industry" you will find quite a bit of information about the metric system under the heading "measurement standards and units of". The neighbouring subjects suggest that we must be concerned with both scientific as well as prosaic measurements. It is unquestionably trade and commerce that has had the greatest influence on systems of measurements. In earlier times each community, or at least each region, had its own idea of the length of a foot, the weight of a pound, or whatever units of measurements it used. About the only common thing was the dozen and we even have the variation here of the baker's dozen! As trading became more widespread, so did the need for better and more widely accepted systems of measurement. What was subsequently called the "metric system" resulted from decisions taken by the National Academy of France in the years 1791 and 1795. The effort that went into determining this distance is well documented and it was over forty years before the metric system was officially adopted by France on the 4th July, 1837, for all commercial transactions. The length of a metre as derived from the observations was permanently recorded by two "X" marks on a platinum iridium bar and this was subsequently accepted internationally.

In 1875 the International Bureau for Weights and Measures was established with membership from eighteen countries. The Bureau became the custodian of the official metre as well as the unit of weight, which is the kilogram. Three officers of the Bureau hold keys to separate locks to its place of safe-keeping at Sevre, France. Dr. L.E. Howlett, former Director of Applied Physics of the National Research Council was for many years Canada's representative to this august body. He served, in turn, as Vice President from 1961 to 1964 and as President from 1964 to 1968 and was one of the three big holders. Incidentally, he was also a member of our National Advisory Committee.

To bring you up to date, in the 1950's the Bureau was looking for an indestructible standard, that is, one that could be determined at any time in the future with consistent results. This resulted in the action taken in 1960 by the Bureau when the metre was determined as the length of 1650763.73 wave lengths of the radiation in vacuum corresponding to the unperturbed transition between the levels of 2p and 5d of the atom of kruptton (the orange red line).

It would seem that in attempting to be scientific in deriving the basic unit, little concern was given to the needs of the very important segment of the economy that was forcing the adoption of international standards. Had more attention been given to the needs of those who are taking the most measurements, such as carpenters, tailors and merchants generally, I believe that something nearer to the foot would have been selected. Again, many of the units in the metric system are scarcely ever referred to. We speak of kilometres, metres, centimetres and millimetres but how often do we refer to hectametres, decametres and decimetres, and the same applies to the units of weight. We jump directly from the kilogram to the gram and forget about the in-between units. Also, of even more practical consideration, is the fact that the millimetre is too coarse for such things as carpentry and the 1/100 too fine. In fact, to me, the ideal sort of measurement is the 10th, 100th, or 1000th part of a foot and it is unfortunate that the French did not specify 10 million or 100 million metres as the circumference rather than quadrant of the earth, either equatorial or meridianal. It should not be surprising that those using English system have not rapidly adjusted towards the introduction of the metric system.

To summarize, the metric system is fine for scientific and engineering purposes but leaves something to be desired in the trades and industry. However, we seem to be stuck with it, so how do we deal with it.

* * *

THE METRIC SYSTEM

by

Mr. P. Fitzgerald-Moore,
Exploration & Production Div.,
Shell Canada Ltd., Calgary, Alberta.

The Systême Internationale has the advantages of rationality and universality.

Canada, as the recipient of a large immigrant population and because of its international aid, much of which involves surveying and mapping, should be a leader in metriculation.

The fact that we use different volumetric measurements to the U.S.A. shows that we are not automatically tied to the system they use.

There are objections to S.I. namely its decimal base (an octal would have been preferable) and its complex nomenclature for powers of ten (but you don't have to use the names).

Moreover it still permits, and in the case of the Curie prescribes, non-decimal units. The main ones we have to contend with are units of time and angle. Scientists should measure all time in seconds: even the age of the earth, which is 12×10^{16s} units of angle should be in decimals too but no advantage is seen in the grade over the degree.

Emotions are involved and some feel that the units of measurement should relate to the human body. This of course can only be true in the mesoscropic realm anyway, but in that realm convenient multiples of the metre exist.

The main objection to change is the mass of data recorded in the old units. With the entry of this data into computerized data banks, this objection vanishes as conversion can be mechanized.

This is true now for numerical data and will be true for graphic data when the art of digitization has further advanced. Recently great advances have been made in this field in the oil industry.

We now have a thoroughly hybrid practice. Doctors prescribe in minims and get their lab results in millimetres. The government puts out maps on the scale of 1:50,000 and we measure the distances on them in miles. We survey in feet and fix our position on the map by U.T.M. in metres.

This state of affairs is chaotic and can only be ended by sending the Imperial System after the Empire which gave it its name - into Limbo! The best service the proponents of the metric system can perform, besides preaching, is to work on the design and implementation of the computerized data banks that will make conversion possible and economically feasible.

* * *

THE METRIC SYSTEM - NOTES

FOR A POSITION PAPER

by

A.F. Jacobs, Esq.,
Staff Geologist, Tenneco Oil & Minerals Ltd.,
Calgary, Alberta.

First proposal for a decimal system dates from 1670 and was brought forward by Gabriel Mouton who was the Vicar of St. Paul's Church in Lyon in France. At that time weights and measures were based

on a variety of changeable standards, things like the width of one's thumb, the length of one's foot, an arm's length or the weights of various arbitrary packages of goods or liquids. It was not until the age of rationalism, associated with the French Revolution that some of these ideas could be put into practice. The Paris Academy of Sciences proposed to France's National Assembly in 1791 that the metre and the kilogram be adopted as standards of measurements of length and weight, the metre being 10^{-7} x 1/4 of the earth's circumference, the kilogram being the weight of one cubic decimeter of water at its greatest density. Several other units evolved from this, like the arc, a measure of surface area being 100 square metres and the litre, the volume of one cubic decimeter. It is interesting to note here that the relationship between the kilogram and the litre size represents one of the few flaws in the metric system. The litre or cubic decimeter of water had to be constructed in order to determine the weight standard. At that time, this cubic decimeter of water could not be measured with sufficient accuracy and there remains a difference to this day of twenty-eight parts per million, therefore, one litre is equivalent to 1.000028 cubic decimeter. In 1964, the litre was re-defined as a special name for a cubic dm.

Under the rationalistic mood of the French Revolution, this metric-kilogram system was made compulsory in France in 1801. It was necessary however, in 1837, to pass a law under which all other measurements, other than metre and kilogram, were prohibited by law after 1840. It appears, therefore that the public at large was not willing to abandon the old familiar system. Outside France, Greece and the Netherlands were the first countries to follow France's example. In 1875, an International Bureau of Weights and Measures was established by International treaty and from that day the metric system has been established around the world.

It must have been apparent that there was as much need for a universal and decimal system of measurement in science and technology as there was in household and trade practice. Nevertheless, it was not until 1904, more than 100 years after the recommendation to the Paris Academy of Sciences that Georgi proposed a system of physical units incorporating the metre, the kilogram and the second; also in use was the similar centimetre, gram, second system or c.g.s. system. This system was universally adopted in 1946, which is only a short time ago. The physical sciences could not have done without this system and it is difficult for people not originally educated in this system to see the simplicity and universality of it. To give you just one example; the dyne is the unit of force which is defined by that force which, acting on one gram for one second produces a velocity of one centimetre per second; so, one dyne is one centimetre per second per second. Now, the joule is a unit of energy or work which is defined in terms of the dyne. It is the amount of energy necessary to displace the point of application of the dyne one centimetre in the direction of force. While this is a purely mechanical energy unit, the joule can also be defined as the energy expended in one second by an electric current of one ampere in a resistance of one ohm and the unit of power of the watt

is defined in terms of dynes. I don't want to tire you with an explanation of physical units but I want to illustrate the point that our entire system of scientific measurement now depends on the old concept of the metre and the kilogram and further derived units leading to a number of physical units which are all defined in terms of each other along decimal lines, and therefore easily convertible. Therefore, it seems to be a foregone conclusion that conversion of existing non-metric units into the metric system will eventually take place, and it is interesting to see that in Britain where the old system was more deeply ingrained than anywhere else, definite steps are now being taken for a conversion to a metric, decimal system. But then, over half of Britain's export trade is with metric system countries.

* * *

APPLICATION OF THE METRIC SYSTEM TO CANADIAN CHARTS

by

Mr. M. Bolton,
A/Chief & Regional Hydrographer,
Pacific Region,
Marine Sciences Branch, Dept. of EM&R.

International Aspects

The primary aim of the International Hydrographic Bureau since its foundation in 1919 has been to ensure that mariners could use charts produced by any country regardless of language. One of the major differences has been the fact that the English speaking countries used the fathom as their unit of depth while most other countries used the metre. To eliminate this problem the first International Hydrographic Conference in 1919 passed the following technical resolution:

"A 1 Unit of Measurement

I It is strongly recommended that all countries, as soon as convenient, adopt the metric system for their nautical publications.

II It is agreed that until such system is adopted by all countries, each country continue to use its present unit of measurement. Each country not yet using the metric system shall report to the International Hydrographic Conference on the progress made towards the implementation of paragraph I until the adoption is completed".

For many years the English speaking hydrographic offices

maintained a united front in that they could not afford the expense and confusion involved in making this conversion. The status quo was maintained until recently when several countries indicated changes in policy.

Our first experience of the metric system for charting came in 1960 when a special section was established to meet Canada's obligations to the General Bathymetric Chart of the Oceans (GEBCO). This world-wide charting scheme is sponsored by the IHB and the contributing countries provide plotting sheets showing all soundings in metres. When Canada submitted the first block of sheets in 1967 the C.H.S. decided to publish the results as charts 896 and 897 which depict Canadian Arctic Waters and are presently on display.

Development of Canadian Policy

In 1968, we carried out a complete review of our policy on metrication. Canada is heavily dependent on overseas trade for her prosperity. Many of the ship operators are more familiar with metric than non-metric charts. As we were just about to reconstruct all of our Arctic charts, this presented an opportunity to implement metrication on a block basis which otherwise might not re-occur for another twenty years. The main users of Arctic charts were consulted and they raised no objections to a proposed change in units.

With these facts in mind the following policy statement was prepared and has received Departmental approval:

> "Canadian Hydrographic Service Interim Policy Statement No. 1. Adoption of the Metric System for Charts and Publications, 14 August 1969.

As a result of recent review of the policy and technical considerations which must be recognized in the adoption of the metric system for the charts and publications of the Canadian Hydrographic Service the following guidelines have been developed. These are looked upon as the first steps in the formulation of a detailed program designed to lead to the conversion of all charts and publications covering waters of commercial importance within the next twenty years. The guidelines are not intended to be rigid and may be changed as our final policy emerges.

1. Nautical Charts - Conversion will proceed in the following stages:

a) All new and reconstructed charts of the Arctic in the 7000 series will be produced in the metric format effective July 1969. This will proceed on a systematic area basis according to the following initial priorities:

   i) Parry Channel and Prince of Wales Strait
   ii) Beaufort Sea
   iii) Queen Elizabeth Islands

b) International Chart 109, 110, 111 and 501 sponsored by the International Hydrographic Bureau.

c) All new and reconstructed charts in Hudson Bay, Hudson strait and the Labrador Coast, in the 5000 series, will be produced in the metric format, effective July 1969.

d) Effective July 1969 all material used in the compilation of all other charts is to be retained to facilitate eventual recompilation in metric format. When resources permit a metric compilation is to be prepared.

e) Effective September 1969 all first editions, reconstructions and new editions will show tidal information in both feet and metres. The information in feet will be carried until the chart is converted to metric format and the tide tables of the area converted to metres.

2. Special Charts - All bathymetric charts, Nautical Resource charts and the Canadian contribution to the General Bathymetric Chart of the Oceans (GEBCO) will use the metric system. The specifications for other special charts will for the metric system be used unless specifically decided otherwise.

3. Sailing Directions - Sailing Directions will continue to show all heights or depths in both feet and metres. In the next new edition of the Arctic Pilot the metric information will be shown first. As each of the other pilots is taken in hand for a new edition a decision shall be made, based on the progress of chart conversion, on whether similar action shall be taken.

4. Tide Tables - Vol. 4 of the Tide Tables, covering the Arctic will be converted to metric units in 1973. Other areas will be converted when about one third of the charts of the area are in metric format.

5. Field Data and Equipment - As far as practicable, all new echo sounders will either have metric scales or be readily converted to the metric system. Field procedures will be modified as convenient and field sheets produced in metric form. Priority in this will be given to Arctic, Northern and offshore surveys.

6. General - In accordance with the recommendations of the IHB the knot and nautical mile will continue to be used where appropriate".

From time to time this policy will be reviewed and decisions reached on the best way to implement the conversion program on the Pacific and Atlantic coasts. The reaction of the chart user will be significant in determining the scope and pace of further conversions. Probably the inland waters of Canada, where recreational boaters are the largest chart users, will be the last area to be converted. We estimate that total chart conversion will take about 25 years.

THE MERCATOR PROJECTION

(Contributed to the Bulletin by Rear Admiral R.W. KNOX, USC & GS (Ret.) former President of the Directing Committee).

The year 1969 marks the 400th anniversary of the publication of Mercator's map of the world and hydrographers and cartographers might well pause a moment to pay tribute to this scholar and his renowned document. For nautical purposes this map, or chart, stands alone as the greatest contribution in map history of all time, and is the prototype of the modern nautical chart. The fact that Mercator's results were derived by an approximate formula in no way detracts from his remarkable achievement, as it was not until the calculus was invented -- some hundred years later -- that it was possible to compute accurate meridonal parts.

Small-scale maps and charts on the Mercator projection often have been criticized, but not by mariners. Critics invariably cite Greenland as "too large" and Alaska as "too far north". Actually, there are no errors in either areas or distances on a Mercator chart. As the projection is computed on a strict mathematical formula, these apparent inconsistencies can be accurately ascertained and accounted for, if desired. As the projection is conformal, both area and scale are correct in any restricted locality and an intelligent use of the marginal scale will serve to compare relative sizes of areas in different latitudes. The same is true with distances, and may readily be demonstrated by measuring the distances along both a great-circle and rhumb line between two points. It will be found that the stepping units along the curve become greater than those along the straight line, and that the measured distance over the seemingly longer great-circle course is thereby decreased.

The advantages of the Mercator chart to the navigator are many and well-known and need not be discussed here. The disadvantages are few, the most important of which is that radio and visual bearings to distant points must be converted from true bearings to mercatorial bearings for accurate plotting on the chart, a simple operation.

The Mercator chart is of equal, and perhaps greater, importance to hydrographic offices than it is to the mariner. All such charts being similar mathematically, when brought to similar scale on a common latitude, will fit in their relationship one to the other, and adjacent charts of uniform latitude scale will join exactly and will remain oriented when joined without this universal system the task of hydrographic offices and national geographic institutes in providing wide chart coverage for naval and merchant marine use would be vastly increased.

The Mercator chart has been pre-eminent in navigation for more than three centuries and unquestionably will remain so as long as ships follow the loxodrome. Thus, a continuing monument to the genius of Mercator is the universal use of his projection and the millions of

charts published each year, all carrying as part of their titles "Mercator Projection".

FOOD FOR THOUGHT

No one can tell another how to live so as to come out best in the long run, but it is possible to mention certain things that will help a youth towards learning for himself. One thing is certain; you do not find life worth living; you make it worth living.

Few people are self-sufficient. They need appreciation of what they are doing. It may not be public acclaim, which is distasteful to some. What everyone needs is understanding of his purpose and effort, and a sharing of his feeling that the work of his hands, whether beautiful or useful, is important.

It is a rule of business and the professions to give the tools to those who can handle them.

Education provides knowledge by which the student may guide himself in the best development of his capacity for efficient and happy living. It is not true to say the education is becoming more complex, but it would be true to say that because society is becoming more complex it is necessary that education be more complete.

Extracts from the Royal Bank of Canada
Monthly Letters.

DRAMA AT SEA

The recent cruise 70-002 of CSS BAFFIN was extraordinary in its length, the "direct" passage from B.I. to Bermuda taking eight days. During that time we were subject to the bad weather which one normally expects but hopes to avoid in that part of the North Atlantic. BAFFIN slipped from her fueling berth at 8.00 p.m. AST on January 8 and proceeded out over the gravity range heading for longitude 64°W which she was to follow enroute for Canouan, St. Vincent and Barbados in the eastern Caribbean. During our first day on passage we went through the usual procedure of finding what was not well secured. The geophysicists and hydrographers were soon well aware of their failings in this regard but apart from a smashed recorder door, all other damage was light. The crew had more difficulty in trying to cope with fuel drums which came adrift in the helicopter hanger and on the flight deck. This problem was efficiently dealt with, but in order to reduce the hazard, 22 hours after leaving Texaco we were hove to. A few hours later we tried to resume our line, but again were beaten by the excessive rolling imposed on the ship by the aroused sea. We resumed our "hove-to" situation for the next 2½ days, gently progressing in a westerly direction and causing much sarcastic excitement by being headed for New York. By this time everyone on board was feeling rather tired, the rolling of the ship making it difficult to perform even the simplest task during the day and making it almost impossible to sleep at night. However our return to a southerly course cheered everyone despite the continued rolling motion. Less than a day later we were hove to again for a few hours, the going was definitely poor. Resuming our course heading for 64°W in the vicinity of Bermuda and trying to outpace an approaching storm, the bridge radio brought us news of the distress of the TINA MARIA DONCINE. On the morning of January 13 we were heading in her general direction listening to the conversation between the distressed vessel and a U.S. plane which was circling overhead. We entered into the conversation and during the afternoon we altered course to proceed to her assistance. What followed is somewhat hazy. The only person who can really tell the story is the skipper of the TINA MARIA. The following comments are gleanings from the observations of personnel on board BAFFIN (sometimes second or third-hand), together with eavesdropping on conversations with other participants in the "Drama at Sea".

The TINA MARIA DONCINE is understood to have been from Honduras. She was enroute with a crew of seven from Bedford, Mass., to the Cape Verde Islands with a deck cargo of two used cars plus a quantity of used clothing. She is (or was - we are yet to hear of her fate) a 168 foot schooner with two 75 foot high masts. As we came up to the TINA MARIA and took over the escort from the aircraft, they managed to

get their engine started, and headed towards Bermuda. This good fortune did not last long and their engine soon overheated and they were helpless in the storm. At 2330 Z we were within ¾ mile of TINA MARIA in the approximate position 35° N, 64° 30'W . During the day the U.S. patrol plane had been offering to fetch any equipment required from the States but much of this assistance had been refused. We were able to provide more direct assistance and informed the schooner that we carried a helicopter and that in the morning we would be able to ferry over to her food, water and any engineering or medical assistance we could provide. Despite having said she was without food and water, she seemed very reluctant to accept any assistance. While we patrolled alongside during the night, the schooner crew tried to repair the engines and reduce the level of the water which she had shipped.

In the morning the weather was worse and it was not possible for us to fly the helicopter. It may have been possible to put over a boat but not recover it. Bermuda radio were informed of the situation and eventually an aircraft was despatched from the island to drop supplies. While the aircraft was on its way, the spirit of the schooner crew reached its lowest point. They declared that everyone was very tired, they were unable to repair the equipment and they considered they would be better off taking to their damaged boats enroute to BAFFIN. The approach of another aircraft did not seem to cheer them but an offer to provide direct assistance if the aircraft failed was accepted very enthusiastically. At about 2.oo p.m. the aircraft arrived on the scene and, having made a rendezvous with us, she circled TINA MARIA to assess the situation. Flying as low as possible over the ship while avoiding her masts, a line was dropped over her bow. On one end of the line was one life raft, and at the other end was another one plus two packages of supplies. The crew were scrambling enthusiastically in order to get the relief supplies and managed to collect everything safely. At this point we were asked if we could close on TINA MARIA. We were then about five miles distant and heading into the sea, unfortunately away from them. It was decided that the sea conditions were so severe that we were unable to turn about and we continued to ride out the storm. Several other vessels were contacted inthe vicinity. All were hove to except the SS PRESIDENT JACKSON which was heading into the area enroute for New York. In the early hours of the morning the PRESIDENT JACKSON came alongside TINA MARIA, picked up the crew directly and headed for the States with all crew members safe. That was the end of the affair so far as we were concerned. Twenty-four hours after the TINA MARIA was abandoned, we were able to turn back to our modified planned course and head for the sun.

The remainder of the cruise was relatively uneventful. At 2050 Z on January 16 we were due east of Bermuda, eight days after leaving the Institute. We arrived in St. Vincent on January 21 to find that on passage we had fed a magnetometer fish to the sharks. Somewhere enroute a creature had bitten off 5

feet of the fibreglass tail and left a beautiful dental impression on the remaining portion. The anxiety of certain personnel to have a dip in the sea markedly diminished at this time. The bathing was reserved for our arrival at Canouan the following day. The island is beautiful and unspoilt and in the two days spent there it seemed that the trainee hydrographers would be very welcome during their stay of the next few weeks. The population of 900 has little means of making a livelihood and the value of attempts to "improve their lot" was the subject of interminable discussion amongst ourselves and with the islanders. Apart from the effective way in which the children solicited money without directly asking, the only monetary gain went to the owner of one of the local "liquor stores". His sales of Heineken and Guiness (obtained solely for the tourists) skyrocketed under the heat of the midday sun.

(Extract from "B.I. World")

Remember when hippie meant big in the hips,

And a trip involved travel in cars, planes and ships?

When pot was a vessel for cooking things in,

And hooked was what grandmother's rug may have been?

When fix was a verb that meant mend or repair,

And Be-In meant merely existing somewhere?

When neat meant well-organized, tidy and clean,

And grass was a ground cover, normally green?

When groovy meant furrowed with channels and hollows,

And birds were winged creatures, like robins and swallows?

When fuzz was a substance, real fluffy, like lint,

And bread came from bakeries - and not from the mint?

When roll meant a bun, and rock was a stone,

And hang-up was something you did with the phone?

It's groovy, Man, groovy, but English it's not,

Me thinks that our language is going to pot.

Author Unknown

DIRECTOR OF INDUSTRIAL PRIORITIES

Statement of Duties

Without direct or intermediate supervision, and with a broad latitude for independent judgement and discretion, the incumbent directs, controls and regulates the movement of interprovincial commerce representing a cross section of the Canadian economy.

On the basis of personal judgement, founded in past experience, conditioned by accumulated knowledge and disciplined by mental intransigence, the incumbent integrates the variable factos in an evolving situation and, on the basis of a simultaneous cogitation, formulates a binding decision relative to the priority of flow of provincial and interprovincial commerce both animate and inanimate. These decisions are irreversible and not subject to appelate review by higher authority, nor can they be reversed by the legal determination of any echelon of our judicial complex. The decisions of the incumbent are important since they affect, with finality, the movement of agricultural products, forect products, minerals, manufactured goods, machine tools, construction equipment, military personnel, defence materials, raw materials and products, finished goods, semi-finished products, small business,large business, public utilities and government agencies.

In the effective implementation of these responsibilities,the incumbent must exercise initiative, ingenuity imagination, intelligence, industry and discerning versatility. The incumbent must be able to deal effectively with all types of personalities and all levels of education, from college president and industrial tycoon to truck driver. Above all, the incumbent must possess decisiveness and the ability to implement co-ordinated motivation on the part of the public consistent with the decision the incumbent has indicated. An erroneous judgement or failure to appraise properly the situation could create confusion of personnel and equipment generating a catastrophic loss of mental equilibrium by innumerable personnel of Canadian industry who are responsible for the formulation of day to day policy and guidance implementation of the conveyances of transportation both intraprovincial and interprovincial.

How would you rate this job if you were the classification Officer ? What salary do you think should be paid ?

Turn to page .....

"PUBLIC RELATIONS AND THE HYDROGRAPHER"

CHS PARTICIPATION AT 14TH ANNUAL NEW ENGLAND BOAT SHOW

By J.S. Warren.

Several months ago I was asked and I agreed to attend the 1970 New England Boat Show, with the Canadian Hydrographic Service display booth. The boat show was held between Feb.20 and March 1 at Suffolk Downs outside Boston, Mass. I was dissuaded from trying to get pre-determined answers to questions I thought would be asked by visitors to the boat show, on the grounds that you could study for 100 yrs. and still be confronted with a question you hadn't thought of. As it turned out my advisors were correct.

To me the boat show was enormous, there were 600 boats on display and I was told 360,000 people passed through the turnstiles. On the first Sunday alone, I believe there were 150,000 people. They were packed into 2 floors of display underneath the stadium at Suffolk Downs.

These huge boats (sailboats and powerboats) many of which were in the $14000-40000 category were meant to be sold. The first display as you entered the door was set up by the First National Bank which advertised financing of boats as well as other things.

The Canadian exhibits consisted of our CHS display which has appeared at Seattle and Cleveland and a display sponsored by the Department of Industry Trade & Commerce. Along with Industry,Trade & Commerce there were several Canadian boat builders with their own wares on display. The whole concept was to promote tourism in Canada. The CHS display was set up to inform the visitors of the availability of Canadian Charts. We had many charts of the Atlantic Region on display. In fact,it was quite interesting to see how these "maps" as most visitors called them, could start some lengthy discussions of honeymoons, trips planned, and old hometowns etc. There are some 300,000 people of Canadian origin in the Boston area alone. To be sure,

C.H.A. ATLANTIC BRANCH

Minutes of Meeting Apr. 24/70

Mr. E. Comeau called the meeting to order at 12:25 with 15 members present. The secretary-treasurer read the minutes and they were approved.

The Treasurer's Report was read and adopted. The present regional bank balance is $222.86.

The Vice-President asked that all incorrectly worded C.H.A. certificates be returned to him and he would in turn forward them to National President. He also wished to be informed of those qualified who have not yet received certificates.

Mr. Comeau read correspondence from the National President stating that a brief regarding the position of hydrographer in the offshore legal survey had been submitted to the Dominion Hydrographer but advised that this brief should not go to general membership circulation. Various members expressed their objection on this matter which led to the following motion by Mr. F.L. Degrasse. All correspondence in the form of briefs, etc. have prior approval of the C.H.A. executive before being submitted to management. The motion was seconded by Mr. R.K. Williams and carried.

The Vice-President read a list of names of those eligible to take Step 2 Hydrography Course up to the year 1973. After some discussion it was recommended a new list be drawn up excluding E.G. 7's and be based on the number of years experience after completing the Basic Hydrography Course. Mr. Comeau stated he would compile a new list.

Mr. Comeau stated the minutes of the National Meeting will be circulated.

Mr. Comeau called for a vote in favor of holding a dance after the members return from the field. The vote was affirmative. The dance will be held during the last week in November and organized by the rotation staff.

Mr. Degrasse put forward a motion that during the coming field season the secretary/treasurer be given authority to purchase floral wreaths with C.H.A. funds when required, for C.H.A. members and their immediate families. The motion was seconded by Mr. R.K. Williams and carried.

Mr. Comeau called for suggestions regarding sports activities. No interest was shown on this matter.

Mr. Williams suggested that an annual picture be taken of all the hydrographers of the Atlantic Region and submitted for the Newsletter. No interest was shown regarding this matter.

The meeting adjourned at 13:15.

K.T. White,
Sect'y/Treas. A.O.L.

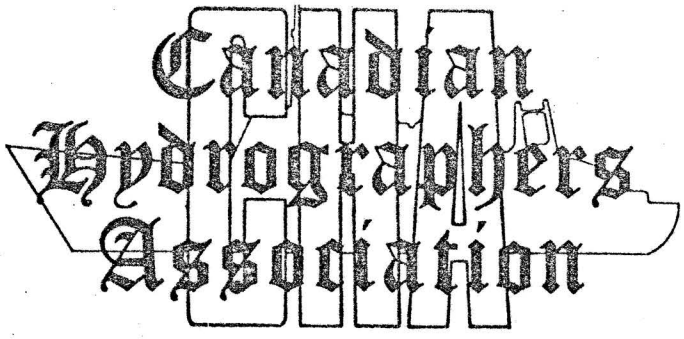
IN THE PAST THERE HAS BEEN SOME CONFUSION IN DISTINGUISHING BETWEEN THE TERMS "NAVIGATION" AND "POSITIONING". IS THERE A DIFFERENCE? - WE SAY THERE IS AND OFFER THE FOLLOWING STATEMENT OF OBJECTIVES TO DISTINGUISH BETWEEN THE TWO:

NAVIGATION - THE PRIMARY OBJECTIVE OF NAVIGATION IS THE SAFE AND EFFICIENT PASSAGE OF A VEHICLE FROM ONE POINT TO ANOTHER. INTEREST IN THE PROPERTIES OF THE PATH TRAVERSED IS SUBSIDIARY TO SAFE AND EFFICIENT PASSAGE.

POSITIONING - THE PRIMARY OBJECTIVE OF POSITIONING IS TO ATTACH SPATIAL COORDINATES TO MEASURED PROPERTIES. INTEREST IN THE PATH TRAVERSED IS SUBSIDIARY TO THE MEASUREMENT OF PHENOMENA.

IF YOU DON'T AGREE, PLEASE SUGGEST AN ALTERNATIVE SO FUTURE CONFUSION CAN BE AVOIDED.

Hydrographic Development,
Atlantic Region.



LASER DEPTH SOUNDER

A DEPTH SOUNDER USING A BLUE/GREEN LASER AS A SOURCE HAS BEEN DEVELOPED FOR USE FROM A HELICOPTER BY RAYTHEON UNDER CONTRACT TO THE U.S. NAVAL OCEANOGRAPHIC OFFICE FOR USE IN ITS HYSURCH PROGRAM. THE SOUNDER IS INTENDED FOR USE FROM THE SHORELINE TO ABOUT THE THREE OR FOUR FATHOM LINE. THE DEPTH CAPABILITY DEPENDS LARGELY UPON THE MURKINESS OF THE WATER THAT MUST BE PENETRATED. IN VERY MURKY WATERS THE SYSTEM HAS ALREADY ACHIEVED A MAXIMUM DEPTH OF 18 FEET FROM AN ALTITUDE OF 500 FEET. THE EQUIPMENT IS QUITE HEAVY AND BULKY IN ITS PRESENT FORM, HOWEVER, IT IS A VERY INTERESTING DEVELOPMENT AND HAS CONSIDERABLE POTENTIAL. THE HELICOPTER THAT CARRIES THE LASER SOUNDER WILL ALSO BE EQUIPPED WITH AERIAL CAMERAS USING IR AND COLOR FILM.

Hydrographic Development,
Atlantic Region.

April 24, 1970

Dartmouth, N.S.

To Mr. G.W. (Cook) LaCroix

(on his retirement)

Before your retirement arrangements can be completed we require the following information.

If you are filling this out after the effective date of your retirement, be certain that you do not use a government pen or pencil.

1) What was your waist measurement:
   a) on entering the Public Service?
   b) on retiring from the Service?
2) When you think of the size of your pension do you -
   a) gloat. b) sneer c) shudder
   d) chuckle e) blush f) cry
3) If you find your pension inadequate do you plan to -
   a) work b) steal
   c) cheat on your income tax d) starve
4) After retirement do you plan to -
   a) travel b) make public appearances
   c) write your memoirs d) become a hippie e) carry on as before

Note

If 3 (b) is checked, send a copy of this form to the Dept. of Justice

If 3 (c) is checked, send a copy of this form to the Dept. of Revenue

If 3 (d) is checked, send a copy of this form to the Dept. of Health & Welfare

If you have forgotten how to write during your time in the Public Service just return five(5) blank copies to make our "IN" basket look good.

Your "Bluenose Friends"

CONFERENCE 70

The Ninth Annual Conference was a great hit
All true hydrographers learned quite a bit
Not only from what was said and what was writ
But also their tremendous capacity to sit and sit.

Chairman Tom demonstrated he has the real flair
(Although at times he indicated he might be a pair)
To transmit scientific wit and wisdom thru the air
Then flowed the most choice introductions from the chair.

Our Illustrious Great White Father led things off
And to him my dented bowler I must doff
His intro, though brief, made not one of us scoff
Perhaps, alas, because we didn't understand it enough.

B and B, they managed the registration floor
With one in the lobby, and the other at the door
Though quite often neither seemed to be there any more
They could be found in the bar, their throats all raw.

Then each speaker, who had had no real rest
Each of them exhibiting appropriate zest
And each really sure that only he was the best
But when all's said and done, no doubt best is west.

The Admiral did, does and will continue to shine
As long as there's ice, and lots of crude oil to mine
The tanker was awesome and the talk she was fine
But I wish they would serve a more adequate wine!

The room of the beaches for some reason was not free
The food was not good, nor the music nor the tea
The most obvious attraction, at least for little old me
Were the girls, then more girls, all easy to see!

Finally, as all things must, it came to an end
So come next year on to Halifax we'll send
Great minds, cast iron stomachs, two elbows to bend
And an extra week's leave in which to repent and mend.

(With appropriate apologies to the Poet Laureate of Central Region.)

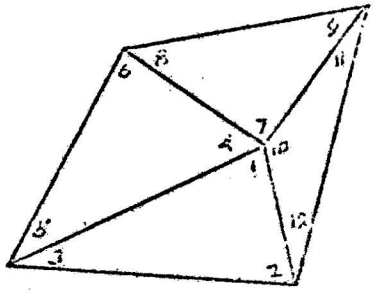
Test Paper

Survey General

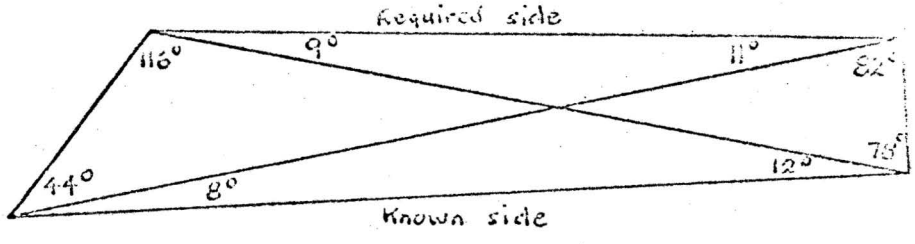
June 11, 1969

Pass Mark: 55%

Maximum Marks	Question
4	1. The strength of a position plotted by resection is dependent to a large extent on good cuts of the position circles. To achieve good cuts, a favourable combination of two conditions is required. What are they?
6	2. On a tellurometer traverse the horizontal angles at one station were measured with the instrument off-centre. The computed adjustment does not seem right and a rough check of the correction angle c" is required. Explain briefly the semi-graphic method of obtaining c in seconds (a sketch will help).
3	3. In finding the spherical excess for a triangulation figure the approximate method (1" of excess for every 60 square nautical miles) is frequently used. Give the maximum spherical excess for which this approximate method is good if the excess is required to an accuracy of 0.1 second.
6	4. List the conditions to be satisfied in a simple adjustment of the four-sided central point figure shown in the sketch. (Numbers serve only to identify angles.)
3	5. What principles do we apply in a simple position adjustment of a traverse?
4	6. List the "Maximum Anticipated Errors in Adjusting Horizontal Control" (as given in Technical Instruction No. 1) for second and third order, for both length and azimuth.
4	7. In selecting a site for a main station of a control network consideration must be given to a number of items. Name at least six of them.
5	8. A distance measured above sea level must be reduced to sea level. Derive the formula for the distance reduced to sea level.



Maximum Marks	Question
2	9. When measuring a stadia distance the rod is held 5° off vertical, an error is introduced. Which of the following indicates the size of the error: 1:50, 1:250, 1:500, 1:750, 1:1000
5	10. An aircraft flying at 16,000 ft. above MSL photographed a lake which is 500 ft. above MSL. The scale of the lake on the photograph was found to be 1:31,000. Give the focal length of the camera used to take the photograph.
2	11. When setting a survey tablet in concrete (the top part of a concrete monument which extends a few feet underground) certain unwanted problems arise if the concrete mixture was too wet and no precautions were taken to ensure proper curing of the concrete. Name at least two main ones.
5	12. When levelling over soft ground there is a possibility of the instrument sinking slightly between readings. If this happens an error is introduced at each set-up.
(2)	(a) Are these errors cumulative?
(3)	(b) Give at least two ways of minimizing this error.
6	13. To indicate the strength of figure, find R_1 and R_2 for the following quadrilateral:



6 (3)	14. (a) Name at least five principal parts of a modern theodolite.
(3)	(b) Briefly describe their function or purpose.
5 (3)	15. (a) Explain the relationship between the error, m, of a single observation, and the mean error, M, of the arithmetic mean of a number of observations as used to determine the number of sets of observations to be taken.

Maximum Marks		Question
	15.	continued
(2)		(b) If the error in a single observation, m, is determined to be ±4", what would be the expected mean error M of 4 observations, and 16 observations?
10	16.	The following angles have been measured at one station and should close. No sector has been omitted. For various reasons, a weight has been assigned to each angle as indicated. Find the adjusted value of each angle.

Angle	Weight
57-08-17.2	2
122-23-28.7	1
98-10-48.1	3
82-17-31.6	2

3	17.	What are three principal sources of error in theodolite measurements which are NOT corrected by changing face nor using various circle positions?
4	18.	Two sources of error associated with the Wild N2 level are Roll, or Cross error, and Tilting Error. State the conditions that these refer to.
2	19.	What two main factors govern the accuracy classification of levelling instruments?
5 (3)	20.	(a) Name three adjustable errors of a sextant and briefly describe the conditions they refer to.
(2)		(b) Name the non-adjustable errors of a sextant.
8	21.	Tellurometer measurements are said to be affected by "ground swing". What is ground swing, and what factors affect ground swing?
2	22.	What name is given to the system used by tellurometer to determine distance?

APPENDIX I

Explanation of the Quantities R_1 and R_2

In any survey figure, the quantity R is equal to $\frac{D-C}{D}\sum\left(\delta_A^2 + \delta_A\,\delta_B + \delta_B^2\right)$ where A is the angle opposite the required side in a triangle, B is the angle opposite the known side, δ is the sixth-place difference in logarithmic sine corresponding to one second variation in angle, D is the number of observed directions, and C is the number of geometric conditions determining the strength of the figure. D is found by summing all the directions observed for the figure and subtracting the two belonging to the starting line, which is considered fixed. C is found from the formula:

$$C = 2L - L^1 - 3S + S_u + 4,$$

where L = the total number of lines,

L^1 = the number of lines observed one way,

S = the total number of stations,

S_u = the number of unoccupied stations.

—	10°	12	14	16	18	20	22	24	26	28	30	35	40	45	50	55	60	65	70	75	80	85	90°
10°	428	359																					
12	359	299	253																				
14	315	253	214	187																			
16	284	225	187	162	143																		
18	262	204	168	143	126	113																	
20	245	189	153	130	113	100	91																
22	232	177	142	119	103	91	81	74															
24	221	167	134	111	95	83	74	67	61														
26	213	160	125	104	89	77	68	61	56	51													
28	206	153	120	99	83	72	63	57	51	47	43												
30	199	148	115	94	79	68	59	53	48	43	40	33											
35	188	137	106	85	71	60	52	46	41	37	35	27	23										
40	179	129	99	79	65	54	47	41	36	32	29	23	19	16									
45	172	124	93	74	60	50	43	37	32	28	25	20	16	13	11								
50	167	119	89	70	57	47	39	34	29	26	23	18	14	11	9	8							
55	162	115	86	67	54	44	37	32	27	24	21	16	12	10	8	7	5						
60	159	112	83	64	51	42	35	30	25	22	19	14	11	9	7	5	4	4					
65	155	109	80	62	49	40	33	28	24	21	18	13	10	7	6	5	4	3	2				
70	152	106	78	60	48	38	32	27	23	19	17	12	9	7	5	4	3	2	2	1			
75	150	104	76	58	46	37	30	25	21	18	16	11	8	6	4	3	2	2	1	1	1		
80	147	102	74	57	45	36	29	24	20	17	15	10	7	5	4	3	2	1	1	1	0	0	
85	145	100	73	55	43	34	28	23	19	16	14	10	7	5	3	2	2	1	1	0	0	0	0
90	143	98	71	54	42	33	27	22	19	16	13	9	6	5	3	2	1	1	1	0	0	0	0
95	140	96	70	53	41	32	26	22	18	15	13	9	6	4	3	2	1	1	0	0	0	0	
100	138	95	68	51	40	31	25	21	17	14	12	8	6	4	3	2	1	1	0	0	0		
105	136	93	67	50	39	30	25	20	17	14	12	8	5	4	2	2	1	1	0	0			
110	134	91	65	49	38	30	24	19	16	13	11	7	5	3	2	2	1	1	1				
115	132	89	64	48	37	29	23	19	15	13	11	7	5	3	2	2	1	1					
120	129	88	62	46	36	28	22	18	15	12	10	7	5	3	2	2	1						
125	127	86	61	45	35	27	22	18	14	12	10	7	5	4	3	2							
130	125	84	59	44	34	26	21	17	14	12	10	7	5	4	3								
135	122	82	58	43	33	26	21	17	14	12	10	7	5	4									
140	119	80	56	42	32	25	20	17	14	12	10	8	6										
145	116	77	55	41	32	25	21	17	15	13	11	9											
150	112	75	54	40	32	26	21	18	16	15	13												
152	111	75	53	40	32	26	22	19	17	16													
154	110	74	53	41	33	27	23	21	19														
156	109	74	54	42	34	28	25	22															
158	107	74	54	43	35	30	27																
160	107	74	56	45	38	33																	
162	107	76	59	48	42																		
164	105	79	63	54																			
166	113	86	71																				
168	122	93																					
170°	148																						

Test Paper

Hydrography

June 12, 1969

Pass Mark: 55%

Maximum Marks		Question
8	1.	There are numerous factors which can introduce errors into the horizontal position accuracy of a sounding on a field sheet. List at least four different, common sources of error that can be minimized by taking all necessary care and caution. NOTE: For the sake of this question it is assumed that measured values (sextant angles, etc.) were read correctly.
5	2.	When planning a sounding pattern for a survey area, there are two basic requirements that should guide the planning. What are they?
4	3.	It was stated that the desirable spacing of fixes along a sounding line is between 1 and 1.5 inches at scale.
(2)		(a) Why should it not be more than 1.5 inches?
(2)		(b) Name the two conditions which make it necessary to fix the position at intervals other than those given above.
4	4.	Using Department of Transport specifications for ranges, give the minimum and maximum horizontal angular separation allowable at a point on the range where the vertical separation is six minutes.
4	5.	Photo-plots, when used as a basis for survey operations, should be checked in the field. Name at least three separate items that must be checked.
6	6.	A vessel underway is required to take bottom samples.
(3)		(a) Which sampler, in common use, would give the best results? Why?
(3)		(b) Which sampler, in common use, should not be used? Why?
4	7.	How should a white light be described which shows its light in the following manner? (The line indicates the light is showing.)

Maximum Marks		Question
4		8. In Standing Order 68-1 details are given for displaying information on field sheets. In a sketch show how the required information should be displayed, on the field sheet, for main station "Tawa". This station was monumented in 1964 (rock post number 5731). NOTE: Correct size is not required as part of this sketch.
3		9. There are different methods of examining shoals which may be used for different requirements. Under what conditions would it be sufficient to run interlines and/or crosslines only?
6		10. When stretchlining a wharf in the traditional manner, there are three critical points to watch if the work is to be accurate. (a) What are they? (b) What must be done to ensure accuracy?
4		11. Name at least two of the main qualities we look for in field sheet material.
3		12. Interlines should be run when gaps appear in the regular sounding pattern. Assume that the bottom topography is as anticipated when the sounding pattern was determined. Give the minimum distance between actual lines at which interlines should be called for when regular lines were spaced ½ inch apart.
5	(2) (3)	13. (a) What is the main concern of commercial navigation? (b) How do our charts help the navigator of a commercial vessel?
6		14. Two types of transducers are in common use in echo sounders. Name these two types, and briefly describe them.
6	(4) (2)	15. (a) Name four factors in an echo sounder which determine its characteristics. (b) Briefly describe the effect of any two of these.
4		16. Name two types of sweep gear in general use, and list one advantage and one disadvantage of each.
4		17. List at least four common sources of error in measuring a depth with a leadline.
9	(3) (6)	18. (a) What factors determine the velocity of sound in water? (b) Briefly, what is the effect of each?

Maximum Marks		Question
7	(4)	19. (a) The "hyperbolic effect" was discussed as a potential problem. What are the difficulties that arise in the interpretation of a sounding graph because of this effect?
	(3)	(b) What is the maximum possible error due to separation of transducers, and why?
4		20. If an echo sounder is designed to be operated with a velocity of 820 fms/sec and has a fixed stylus speed of 41 rpm, what range would be represented on a graph which uses 40% of the stylus travel?

Test Paper

Radio Aids

June 13, 1969

Pass Mark: 60%

Maximum Marks		Question
4	1.	What is the Doppler effect?
4	2.	What is the "right hand rule"?
8	3.	What are the four possible types of wave paths and explain each one?
4	4.	Define hyperbola.
3	5.	How is the angle of intersection between hyperbolae determined?
3	6.	What three factors govern the accuracy delivered by an Electronic positioning system when used in the hyperbolic mode?
3	7.	What is created by a moving electric field?
3	8.	Why is an electromagnetic wave retarded more by land than by water?
4	9.	Define Wavelength. Draw a sketch.
3	10.	Draw a clear sketch to show the three conditions of coverage to be considered when drawing accuracy contours for a hyperbolic system.
9	11.	What are the general laws, based upon Maxwell's theory, which govern the propagation of electromagnetic waves?
6	12.	Explain how a Mini-Fix system uses the time sharing technique.
5	13.	Why is it important to establish a monitor station within the survey area?
4	14.	What is meant by "phasing in the chain"?
5	15.	Why can the phase lag never be considered separately from the assumed velocity of propagation?
6	16.	What are the sources of error of an electronic positioning system operating on a Medium frequency?

Maximum Marks		Question
6	17.	If, during calibration of an electronic positioning system, we find we have a chain error which is proportional to the lane number, how would we adjust for this?
10	18.	Explain, in detail, the steps you would take to draw a hyperbolic lattice, accurate enough for a rough preliminary plot.
10	19.	When we plot our position within a circular lattice we find that the angle subtended by the two slave sites is 50 degrees. Our system is operating on a frequency of 2MHZ and we assume a velocity of 3×10^5 Km/s. With an error of $\pm$ 0.10 lanes, what is the maximum error, in meters, that we can expect at this point?

Test Paper

Projections

June 11, 1969

Pass Mark: 55%

Write on one side of answer sheet only and not more than one question per sheet, please.

Maximum Marks		Question
5	1.	(a) Define, or give a brief description of the spheroid.
4		(b) A geodesist concerned with measuring the size and shape of the spheroid would position his triangulation stations so that the triangulation nets run predominantly in a north-south direction. Explain briefly the reason for this.
4		(c) Explain also, in general terms, the difference between:
(2)		(i) raduis of curvature in the meridian and normal to the meridian;
(2)		(ii) ellipticity and eccentricity.
12		(d) With a Wild T-4 theodolite, you take observations at Laplace Stations at every 200 miles approximately.
(6)		(i) What observations would you make at these stations?
(6)		(ii) What would you compute from these observations?
5	2.	(a) The distortions which may occur when projecting the curved surface of the earth onto a flat plane can be categorized under four main headings. List these distortions.
5		(b) Some projections are orthomorphic or conformal. Define, or briefly describe this quality.
5		(c) Although a surveyor is interested in measuring distances and representing distances on a projection, why does he not develop a projection which is scale true?
5		(d) Many projections are superimposed systematically on a grid system. Why is this custom desirable for the surveyor?
5		(e) A surveyor will sometimes use a projection which is free of none of the four main distortions. Why would he do this?

Maximum Marks		Question
5	3. (a)	With the aid of a sketch, describe the Simple Conical Projection. Assume the earth is a sphere of radius "R".
5	(b)	The formulae which you might use to plot a graticule of the earth's surface on this projection could be $x = R \cot \phi \sin (\Delta \lambda \sin \phi)$ $y = R \cot \phi (1 - \cos [\Delta \lambda \sin \phi])$ Explain modifications to these formulae when the shape of the earth is considered to be spheroidal.
5	(c)	Describe briefly the Polyconic Projection and explain how it was used to form the International World Map of 1 in 1,000,000.
5	(d)	List the advantages of the Polyconic Projection as used by the Canadian Hydrographic Service.
5	(e)	List the disadvantages of this projection from a surveyor's viewpoint.
10	4. (a)	A glaciologist has located the positions of a number of glacier mouths in an uncharted fjord about 15 miles long by 2 miles across. He knew the latitude and longitude of one position accurate to one minute of arc and has surveyed, computed and plotted the positions of the glaciers on a chart of his own making, using the "flat earth" principle.
(5)		(i) Explain the advantages of this method.
(5)		(ii) From the hydrographic surveyor's viewpoint, list the disadvantages and limitations of the method.
15	(b)	Some years later, the glaciologist wishes to connect by a traverse his small independent survey to a C.H.S. traverse about 100 miles away. You have convinced him to compute his surveying on the U.T.M. grid system. List, briefly and in general terms, the steps he must compute from a known latitude and longitude on the C.H.S. traverse to his own station on a glacier, noting the corrections which he must apply to his survey measurements.

Test Paper

Tides and Water Levels

June 13, 1969

Pass Mark: 60%

Maximum Marks		Question
10	1.	Give the definition of HHWLT.
15	2.	Name the two main effects that shallow water has on an incoming tide, and explain briefly why.
15	3.	Name at least two separate conditions that tend to make a tide diurnal (or mainly diurnal).
20	4.	On the attached sheet is a co-tidal chart and a tidal record from the reference port. At position (A) on the co-tidal chart a sounding of 112 ft. was obtained at 1430.
(15)		(a) Compute the tidal reduction to the nearest 0.1 ft.
(5)		(b) Apply the reduction and give the reduced sounding to the nearest foot.
		NOTE: In your answer show the whole computation, i.e. do not give only the final answer.
20	5.	You have installed a temporary gauge near Little Brook in St. Mary's Bay, N.S. It has been operating satisfactorily for several weeks and you now wish to establish a datum at the gauge by transfer from Yarmouth. Spring Tides occurred about mid May and you have chosen the readings from your tide record as shown.

Little Brook

	H.W.	L.W.
May 16	15.8	3.8
	15.9	4.1
May 17	16.2	4.2
	16.1	3.9
May 18	16.1	4.1
	15.9	3.9

Maximum Marks	Question

5. continued

From Atlantic Coast Tide Tables - Vol. I, the corresponding values of Yarmouth are shown as follows:

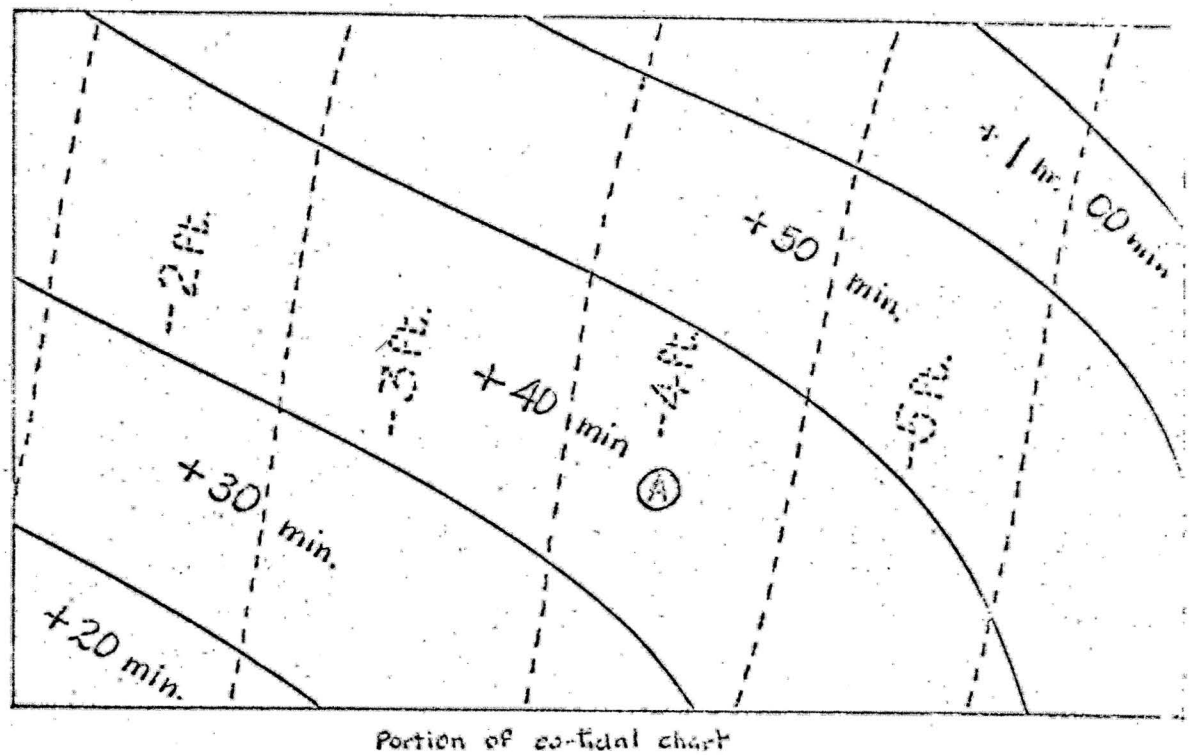
Day	Time	Ht.	Day	Time	Ht.
May 16	0340	18.1	May 18	0535	17.9
	0950	1.7		1140	2.1
	1620	18.3		1805	17.7
	2220	2.3			
May 17	0440	18.1	May 19	0020	1.9
	1050	1.9			
	1715	17.9			
	2325	2.1			

(15) (a) From the above information transfer datum from Yarmouth to Little Brook, and indicate where it is in relation to the zero of the Little Brook gauge.

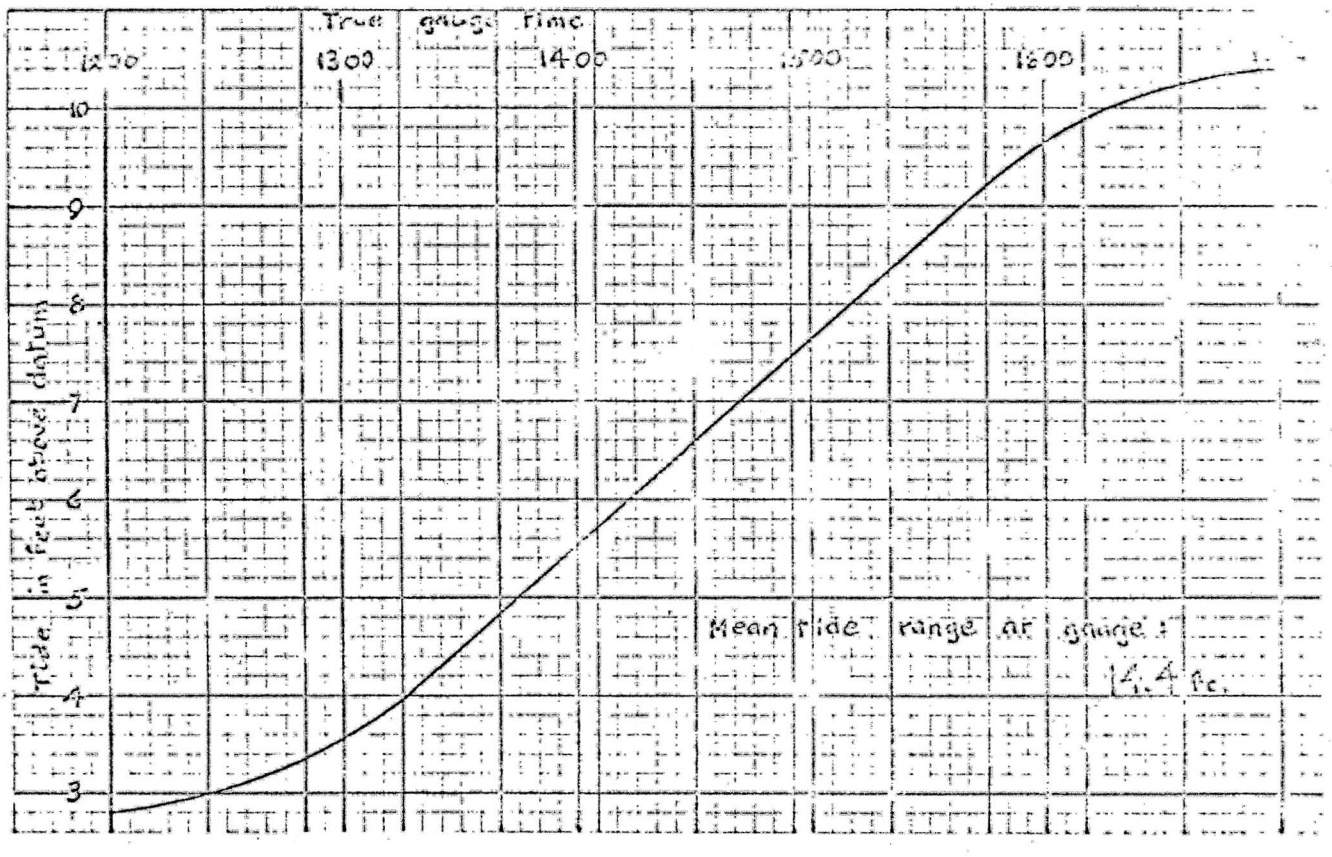
(5) (b) If the Little Brook gauge reads 5.0 ft., what is the height of tide above datum?

15 6. List five factors to be considered when installing a staff gauge.

5 7. Why must care be taken not to "overtighten" joints when connecting tubing for an Ottboro pressure unit?



Portion of co-tidal chart



Test Paper

Currents

June 13, 1969

Pass Mark: 55%

Maximum Mark	Question
25	1. (Note: In this question you may neglect the effect of earth's rotation, i.e. neglect Coriolis force.) (a) If a wind is blowing over the surface of a lake from east to west, what direction would you expect the current to have (i) at and near the surface, (ii) near the bottom? (b) What force drives (i) the surface current, (ii) the deeper current?
25	2. (a) If you had observations from current meters and a tide gauge at the same location in a channel and found that maximum flood current occurred at the same time as high water and maximum ebb current occurred at the same time as low water, would the tide be a progressive wave or a standing wave? (b) In the other type of wave (progressive or standing) from that in (a) at what time in relation to high water would maximum flood current occur?
25	3. (a) If you found from reliable current meter records that the tidal streams near the surface differed significantly from those deeper down, what phenomenon might you expect to be present? (b) How could measurements of temperature and salinity help to confirm or deny the possibility of this phenomenon occurring?
25	4. Describe a method that might be employed for spot measurements of current near the surface by a field party not provided with a regular current meter.

Test Paper

Chart Production

June 11, 1969

Pass Mark: 55%

Maximum Mark		
40		1. Explain the compilation of a new chart by defining the various phases or steps in the procedure.
40		2. Describe the drafting procedures by explaining the following:
	(15)	(a) The preparation of the base chart for reproduction.
	(15)	(b) The preparation of the overlay for names, notes, etc.
	(10)	(c) The preparation of the colour proofs.
20	(10)	3. Why are Notices to Mariners issued?
	(10)	Explain the procedure in the Canadian Hydrographic Service for processing Notices to Mariners.

Test Paper

Seamanship and Navigation

June 12, 1969

Pass Mark: 70%

Maximum Marks	Question

Part I - Chartwork - Chart 3652

12 1. Find the compass course to steer from A, 180°(T) 3 miles from Packena Point to B, 270°(T) 5 miles from Amphitrite Pt. light allowing for a current setting 200°(T) at 2 knots. Ships speed is 12 knots. Use deviation card 3B and variation for 1969.

12 2. While steering a course of 300°(T) and approaching Esteban Point, the light bore 328°(T) at 1000, log 38.7. At 1040, log 43.9, the light bore 025°(T). Assuming the vessel is making 5° leeway due to a strong NE'ly wind, find the distance off Esteban Pt. Lt. at 10.40.

8 3. A transit shown on the chart as being in line 073°(T), is in line bearing 068° by compass. If the variation is 21°E, what is the deviation?

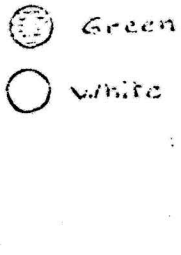
4 4. Where would you find the value of:

(1) the variation
(2) the deviation?

4 5. Why is the Mercator's projection favoured by mariners for navigational charts?

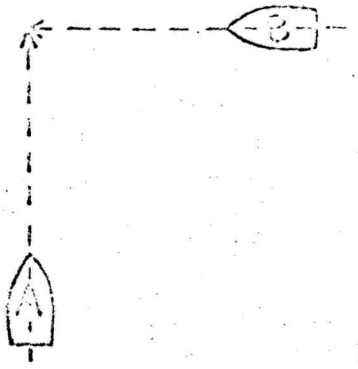
Part II - Rule of the Road

8 6. What is the occupation of the vessel, whose lights are illustrated to the right?

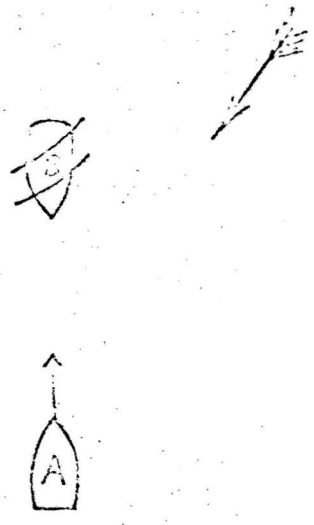


(1) Fishing
(2) Anchored
(3) Not under command
(4) Surveying

Maximum Marks	Question
8	7. In the situation illustrated to the right both A and B are power driver vessels. If you were in charge of A, would you, (1) avoid collision by altering course to port, (2) avoid collision by altering course to stbd., (3) maintain course and speed, (4) sound the danger signal?



8	8. In the situation illustrated to the right A is a power driven vessel and B is a sailing vessel. The arrow indicates the wind direction. If you were in charge of A would you, (1) avoid collision by stopping your engines, (2) avoid collision by altering course to port, (3) avoid collision by altering course to starboard, (4) expect the sailing vessel to keep out of your way?



8	9. The fog signal for a power driven vessel making way through the water is, (1) two prolonged blasts, (2) one prolonged blast, (3) one prolonged blast followed by two short blasts, (4) rapid ringing of the bell.
8	10. Only one of the following statements is true, which one? (1) A power driven vessel always keeps out of the way of a sailing vessel. (2) Fishing vessels always have the right of way, i.e. are the privileged vessel. (3) A burdened power driven vessel, i.e. one which is required by the Rules to keep out of the way, must slacken speed or stop or reverse. (4) An overtaking vessel always keeps out of the way of the overtaken vessel.

Maximum Marks	Question

Part III - General

4 11. Which of the following extinguishing agents should never be used on an oil fire,

(1) carbon dioxide,
(2) water jet,
(3) water spray,
(4) dry chemical?

4 12. The inflation process of a lifecraft is commenced

(1) by jerking the painter
(2) by means of a small hand bellows or pump
(3) after removal of the raft from the canvas valise as plastic container
(4) invariably on deck before launching.

4 13. Which publication gives details of weather forecasts and broadcast times

(1) Meteorological Branches weather manual,
(2) DOT list of lighted aids to navigation,
(3) DOT list of radio aids to navigation,
(4) DOT notices to mariners?

4 14. If a craft is overdue and you report the matter to the Search and Rescue authorities, list all the information you would provide to them.

4 15. Describe briefly the manner inwhich you would handle a 45 ft. launch when required to put this craft alongside, starboard side to, a berth alongside which a current is running. The launch has a right handed propeller.

MATHEMATICAL GAMES

Question No. 1

Frederik Pohl, a top writer of science fiction and the editor of Galaxy magazine, thought of this amusing stunt, which appeared in a recent issue of a magic magazine called Epilogue. Computer programmers are likely to solve it more quickly than others can.

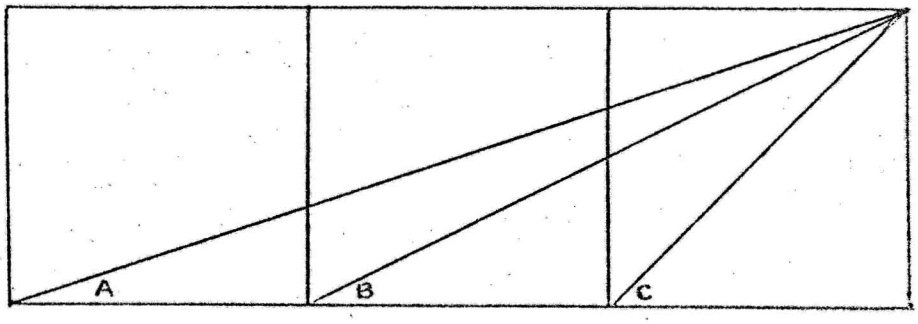
Ask someone to draw a horizontal row of small circles on a sheet of paper to indicate a row of coins. Your back is turned while he does this. He then places the tip of his right thumb on the first circle so that his thumb and hand completely cover the tow of circles. You turn around and bet you can immediately put on the sheet a number that will indicate the total number of combinations of heads and tails that are possible if each coin is flipped. For example, two coins can fall in four different ways, three coins in eight different ways and so on.

You have no way of knowing how many coins he drew and yet you win the bet easily. How?

Question No. 2

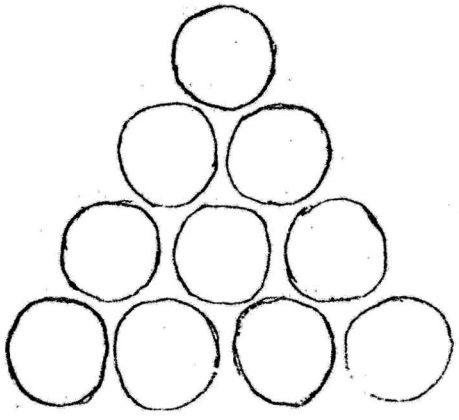
Using only elementary geometry (not even trigonometry), prove that angle C in the illustration below equals the sum of angles A and B.

I am grateful to Lyber Katz of the Bronx, N.Y., for this charmingly simple problem. He writes that as a child he went to school in Moscow, where the problem was given to his fourth-grade geometry class for extra credit to those who solved it. "The number of blind alleys the problem leads to," he adds, "is extraordinary".



Question No. 3

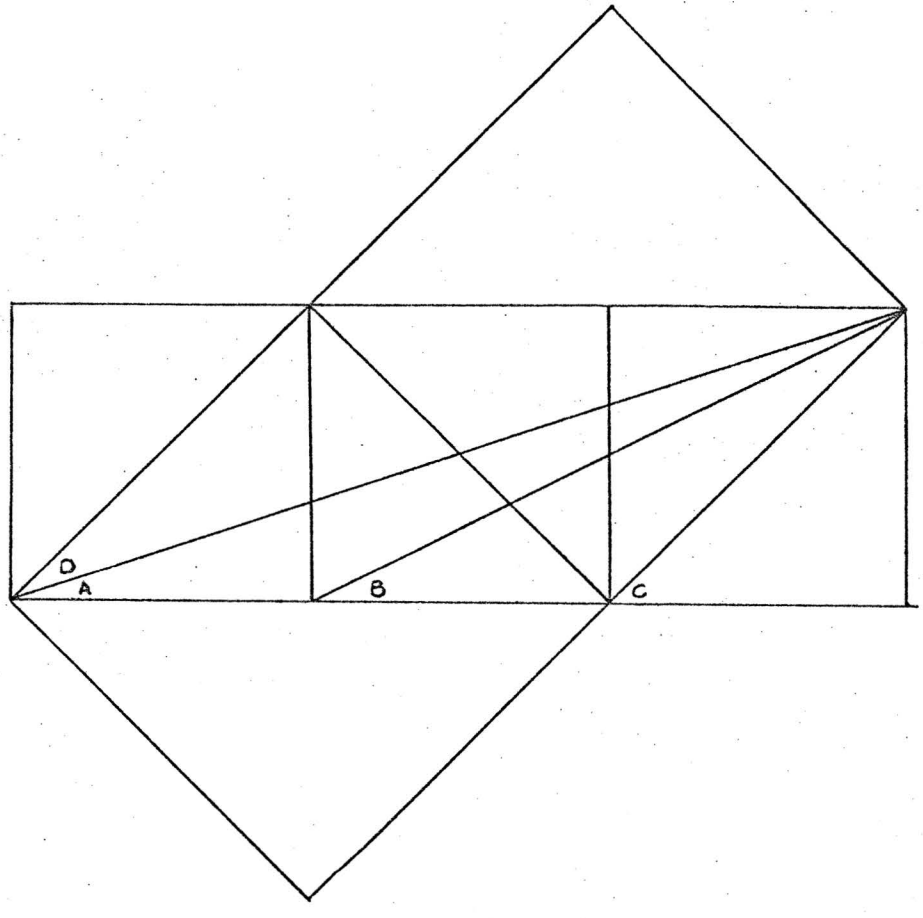
Kobon Fujimura, the leading puzzle authority of Japan, devised this tricky little puzzle, which appears in one of his recent books. Arrange 10 pennies in the familiar bowling-ball formation (see illustration below). What is the smallest number of coins you must remove so that no equilateral triangle, of any size, will have its three corners marked by the centers of three pennies that remain? Not counting rotations and reflections as different, there is only one pattern for the removal of the minimum number of pennies.



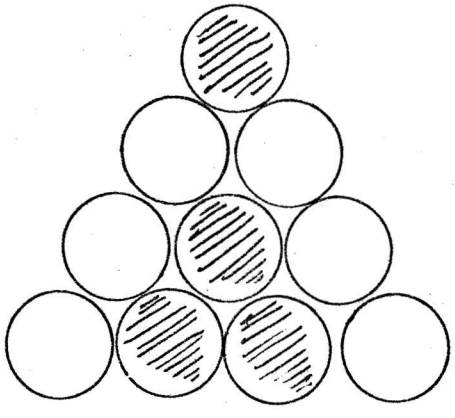
Answers to Mathematical Games

No. 1 - In order to win the bet draw a 1 to the left of the tip of the thumb that is covering the row of circles. When the thumb is removed, the paper will show a binary number consisting of 1 followed by a row of 0's. Assuming the 0's to represent n coins, this binary number will be equivalent to the decimal number 2^n, which is, of course, the number of ways n coins can fall heads or tails.

No. 2 - There are many ways to prove that angle C in the figure is the sum of angles A and B. Here is one (see illustration below) Construct the squares indicated by grav lines. Angle B equals angle D because they are corresponding angles of similar right triangles. Since angles A and D add to angle C, B can be substituted for D, and it follows immediately that C is the sum of A and B.



No. 3 - The four pennies shown shaded (see illustration below) are the fewest that must be removed from the 10 so that no three remaining coins mark the corners of an equilateral triangle. Barring rotations, the pattern is unique; it is, of course, identical with its reflection.



The answer to the job description

At highway construction projects where only one way traffic is possible, the incumbent of the position waves a red flag and tells which car to go first.

Bob Golding

It is with deep regret that we record the sudden death of Bob Golding, our Editor. Bobs surveying career began in 1948 when he joined the Topographical Survey of the Surveys and Mapping Branch, following seven and one-half years in the R.C.A.F. In 1951 he transferred to the Hydrographic Service. During his career as a Hydrographer he served in many parts of Canada, on shore based parties and aboard ships. He was a member of the Canadian Hydrographers Association from its inception and has given freely of his time and energy in getting our fledgling publication on its feet. It is through his efforts that this newsletter was compiled.

The Association mourns the loss of a hard working member and our condolences go out to his wife and family.

B.R. Russell

The Pacific Branch mourns the death of Ben Russell, who died suddenly in June. He was a mariner who saw service with the RN and RCN and joined the Hydrographic Service in 1953. During his career as an hydrographer he served in varying field capacities, including Hydrographer-in-Charge, onboard the west coast ships and launch parties. Due to ill health he came ashore and in recent years was in charge of West Coast Sailing Directions.

He was a member of the Canadian Hydrographers Association from its inception.

His ashes were scattered at sea where he had spent so much of his life. He was a fine shipmate who will be missed by all with whom he sailed.