Three Kinds Of Time In Use; "Clock-Time" Not Accurate

Time Is An Important Factor In Navigation. Three Types Used

A thorough understanding of the subject of time is absolutely necessary to the navigator, for time enters into almost every problem of position finding, both at sea and in the air.

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There are three kinds of time in general use, True Solar Time, also called Apparent Solar Time, Mean Solar Time, and Sidereal Time. Apparent Time is that shown by the sun. Our clocks keep Mean or Civil Time. The earth revolves on its axis once in 24 hours, and in theory the sun crosses the meridian of any given place at exactly 12 o'clock by clock time each day. but this theory is not correct, because the earth does not revolve at a uniform rate of speed in relation to the sun. As a result during a part of the year Solar Time is fast of clock time, and part of the time it is slow. As it was impossible to construct a clock to record the complicated variations in the earth's movement in relation to the sun it was necessary to devise a system that would be uniform throughout the years to which a clock could be regulated. So the astronomers calculated the average of all the variations during the year, and called it Mean Solar, or Civil Time. This is the time kept by our watches, clocks and chronometers. It is the time sent out from the Naval Observatory at Arlington, computed from Sidereal Time.

Mean Solar Time can not be determined by observation of the sun, for the time thus obtained is the True or Apparent Solar Time, the time of the passage of the True Sun across the meridian of the observer at 12 o'clock, noon. In order to reduce this Apparent Time to Civil Time the Nautical Almanac publishes for each day and fractions thereof certain corrections called Equation of Time. This can be applied to either of the times to convert them to the other. This conversion is necessary to bring the observed sun time to the time shown by our clocks, so as to make it of use in navigation on the earth's surface, by converting time locations and spaces into spaces and locations of arc, or longitude and latitude.

Our clocks do not even keep any of the above mentioned times, only being regulated to Mean Time as shown by the Prime Meridian of Greenwich, or the zero meridian of Longitude, and verified for this country for the 75th meridian, or 5 hours slow of Greenwich Time. So very close ore the calculations of the several observatories throughout the world that they all agree on time down to a very few thousandths of a second, with Arlington the closest of them all to absolutely correct time throughout each year.

It became necessary to establish some general time divisions, as it was impossible to operate railroads and even our daily lives, on times different for every place east and west of each other. For example, even as close as Asheville is to us, Waynesville time is almost two minutes slower than is the Mean Solar Time of our neighbor. Therefore, the earth's surface was divided into belts of longitude approximately one hour in time, or 15 degrees of longitude wide, reckoned from the Prime Meridian of Greenwich. As the first 15 degrees multiple to cross the United States is that of the 75th meridian, our Naval Observatory was established close to this line, actually in 77° 03' 56.7" west from this meridian measured in time. Their observations are corrected to the 75th meridian. These time belts are given different names, as Eastern, Central, etc., standard time, and the time is kept uniform in the section about 7½° on each side of the meridians of say 75°, 90°, 105°, etc. This is our clock time.

These Standard Time divisions are reckoned slower than Greenwich, westward to the 180th meridian, and fast of Greenwich eastward to the 180th mtridian. The 180th meridian is known as the International Date Line, because in crossing this line a ship either gains or loses a day. Either two days of the date of crossing are used, or the date is rejected entirely. This is because in circumnavigating the earth a ship sailing westward travels with the sun and its day is lengthened. In sailing eastward the sun advances to meet the ship and passes on astern, and the ship's day is shortened. This gain or loss is at the rate of one hour for each 15° of longitude made good. Should this correction not be made at the 180th meridian a ship sailing around the world from and to Greenwich, or other port, would find that her date was one day ahead of the local date if she had traveled to the eastward, and one day behind if traveling to the westward. But the navigator must continue to select all data from the Nautical Almanac for the Greenwich date and not for the ship's date.

In the days of slow ship speeds it was customary to set the ship's clocks for ship time at noon observations each day. But now ships traveling east and west set their clocks to each 15° time belt as they are entered just as we change our clocks and watches for Eastern to Central Standard Time, etc.

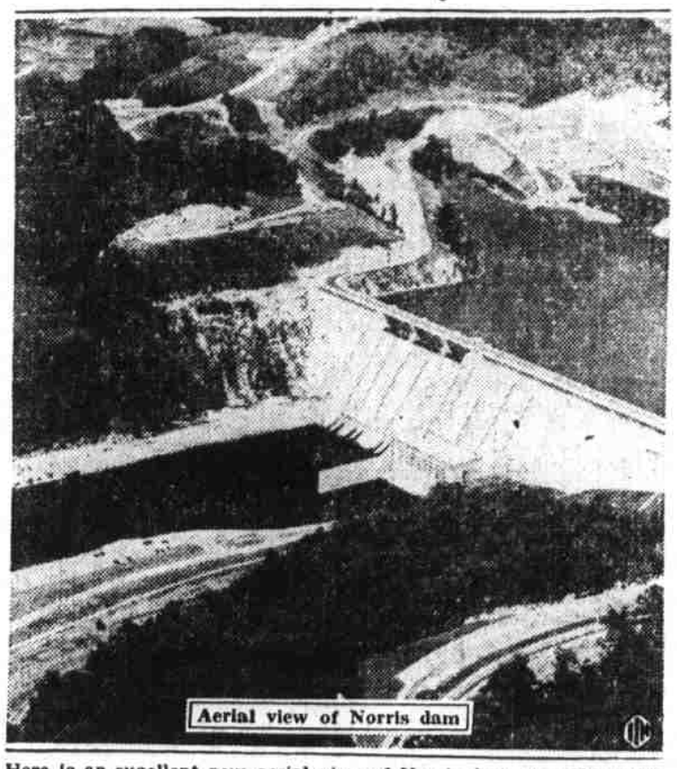
Sidereal is derived from the Latin word sidus, and means belonging to or of the stars. Sidereal Time is the "Daddy" of all time and it is from the observations of the passages of stars across the meridian that observatories secure their correct time. By the use of the stars the conditions which render the sun inaccurate as a time keeper are done away with. It is measured by the apparent yearly revolution of the stars resulting from the rotation of the earth, this rotation being so regular that the passage of the stars across the meridian occurs with great precision. Observatory clocks show Sidereal Time and their faces are divided to 24 in place of 12 hours. This time is converted into Mean Solar Time for broadcasting to the world as the standard for our clocks. Ships reckon their time in daily periods of 24 hours, as it simplifies the keeping of navigational data. This means that twenty minutes after one o'clock p. m. is 13:20 hours, four o'clock p. m. is 16 hours, while 11 p. m. is 23 hours. The Civil Day starts at midnight, as does our day, but is not divided into a. m. and p. m. periods.

No particular star is used in Sidereal Time as a point of reference. Its prime meridian passes through the point of intersection of the celestial equator and the ecliptic—the vernal equinox, or First Point of Aries Sidereal Time can be found from the passage of any star over the meridian of the observer, if the star's right ascension, or distance, from the First Point of Aries is known, just as a ship's position can be located on a chart if its distance from the "First Point" of Greenwich is known. The Nautical Almanac gives the right ascension, declination, Greenwich hour angle and time of transit at Greenwich for some fifty or more stars, and for the planets, for every day in the year. The position of many more stars are also given so that they may be used for latitude and longitude observations.

This is a very sketchy outline of a very complicated astronomical subject, but it may be enough to convince the landsman that the sailor has to know a lot more about time than is told to him by the hands of the pilot clock. While navigation, aided in its solutions as it is by tables and the Nautical Almanac, is not such a difficult subject to master for all practical purposes, it is a subject of utmost precision, and there is absolutely no room for errors on the part of the navigator. What he should know he MUST know if he is to get anywhere, and is to keep his ship from leaving her bones on the rocks. Time is one of the prime subjects for a thorough understanding. He must be able to juggle it from one form to another through all of its intricate relationships to every form of astronomical observation for position finding.

The world's worst weather is claimed for the Antarctic—the home of the blizzard.

TVA Controversy Center



Here is an excellent new aerial view of Norris dam near Knoxville, Tenn., center of the controversy raging over administration of the federal power and flood control project. Largest of the 11 TVA projects, the Norris dam is costing $36,000,000, has a maximum height of 265 feet, is 210 feet thick at the base, extends for a distance of 1,860 feet, and has a power house with a present generating capacity of 100,000 kilowatts.