

own ship. Incidentally, if you have a seagoing yacht, you can buy, for about \$12,000, one of these little gadgets. At any rate, this shows us what is being done with satellites today in the area of navigation.

Traffic control is a more elusive thing. Right now in the North Atlantic we have the problem of increasing air traffic. During the same optimum time of day or night, every transatlantic airline wants to go across at the optimum route and altitude westbound or eastbound, as determined by wind and weather conditions. For customer convenience every line wants to fly during a few rush hours, so there are tremendous peaks where a lot of traffic is condensed into a very narrow airplane and a very narrow time window. Today they space these airliners at a minimum separation distance of 120 nautical miles, at the same altitude. This is considered reasonably safe, but they are now talking about reducing this to 90 nautical miles. This proposal has caused some heated debate among airline captains as to whether this is really a safe thing to do. If any one of these planes isn't exactly on the spot where it's supposed to be, it will endanger the plane ahead or behind. So there is a pressing demand for positive transoceanic air traffic control, particularly in the North Atlantic area.

Air traffic experts would also like this traffic control to be integrated with better weather advisory service, preferably in the form of a weather map being cast directly onto the pilot's weather radar so that he can see where he is, where the other planes are, and where the bad weather is—the whole thing in an integrated display. We believe this is a very promising thing and may be so promising that it could even become attractive for aviation over the continent.

The final item on the chart, under improving man's lot, is worldwide communication and television. Today Syncom is the only undertaking in the world that is making money out of space. They are leasing channels for transatlantic telephone now, I believe, for 11 cents a minute for telephone calls, which is a fraction of the cost to lease a cable. Again, I believe, this is only a beginning. A relay satellite system employing synchronous satellites at 22,000 miles' altitude, moving from west to east, in the plane of the Equator, with the speed of the rotating earth, provides relays that are simultaneously visible from all North America, Latin America, Europe, and Africa. They are high enough so that they are in direct line of sight, and since they rotate at a period of revolution of 24 hours, they appear to stand still at one point above the Equator, for example, a little bit east of the mouth of the Amazon River. There are several satellites sitting there at this very moment providing such radio telephone relay links.

You can use these same things for global television. In fact, they have already been used. The method is to tie up a large number of telephone channels and use them for television. But in due time there will be full-time television relay satellites of this kind. But one can go even beyond that. If we put into such a synchronous orbit a relay satellite, not only operating at a couple of hundred watts as these present things do, but put a 50-kilowatt station in there, we can go directly into home antennas on the ground. All we would have to do is give people about a 2-foot dish that's pointing at one point in the sky, and they could receive these signals directly. We call that television broadcast by satellite. The present relays, by contrast, work through