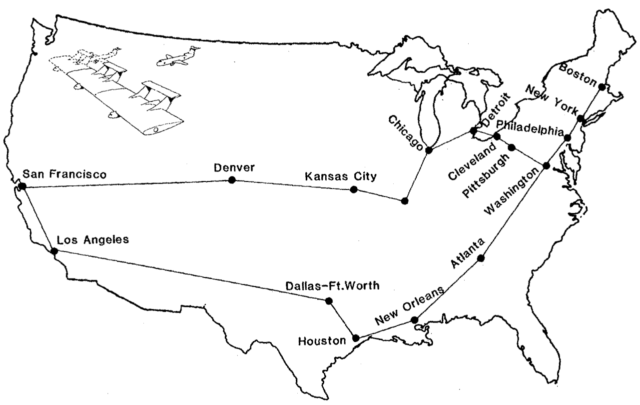
But Do They Have Metal Detectors?

The airliner of the future may never touch down at conventional airports if studies conducted by the National Aeronautics and Space Administration (NASA) take wing. Instead, a family of 4000-passenger aircraft would circle the country continuously at the same speed and height as current jet transports while passengers would shuttle to and from the behemoths on specially designed auxiliary aircraft. If present-day technology were used, says Hubert C. Smith of Pennsylvania State University, such an Aerial Relay System would reduce total fuel consumption of U.S. airlines by as much as 33 percent and would sharply reduce congestion around major airports.

The American airline industry is rapidly approaching a crisis point, according to Albert C. Kyser of the NASA Langley Research Center. The system is already carrying about ten times more traffic than it was designed for, and projections by S. E. Erikson and E. W. Liu of the Massachusetts Institute of Technology indicate that passenger volume will increase substantially by the year 2000. Already, however, 15 of the largest airports in the United States are operating on a quota basis which means that they are turning away business. If passenger traffic tripled, Kyser says, construction of new facilities to meet the demand would cost at least $50 billion and expansion of the aircraft fleet would cost an equal amount.



The initial route proposed by Smith would begin and end in Boston.

The modern jet airliner, furthermore, represents an awkward compromise between the characteristics necessary for efficient, quiet takeoffs and landings and those required for fuel-efficient cruising at altitude. Kyser reasoned that a separation of these functions to create a "flying airport" could increase fuel economy while also providing substantial improvements in comfort and convenience to the passengers. Such a system could also provide an ultimate capacity many times greater than that of the existing system.

The main liner, as conceived by Kyser, would be a flying wing. Ideally, it would be composed of individual modules, each 100 meters wide and carrying 800 passengers. These modules would be joined together in flight to form one large liner, but individual modules could land periodically for maintenance. The liner would be designed with laminar flow control (LFC), a technique in which air is directed over the plane's surface to reduce friction. LFC cannot readily be adapted to conventional airliners because of the maintenance problems associated with contamination of the surface by insects and dust particles while the plane is on the ground; such contamination would be negligible for a plane that rarely lands. With LFC, the flying wing would have as little as one-third the drag of current large jet transports.

The liner, furthermore, would not need high-lift flaps for takeoffs and landings or heavy landing gear. The engines could be specialized for cruise: they would need neither noise suppressors nor thrust reversers. And the plane would have to carry only a relatively small amount of fuel, since it would be refueled each time a feeder plane connected with it. The liner would thus have a very high lift-to-drag ratio and a very high efficiency of operation.

The feeder planes would be specialized for takeoff, climb, and landing, with little compromise to achieve high efficiency in cruise. They would, in fact, be similar to short-haul planes now in use by some airlines, but would probably be embellished with all-weather landing systems and other refinements for reliable operation in the terminal area. The feeders would most likely dock with the liners by flying into a bay in the liners' rear.

Passengers in such a system might be placed in individual seats hung from an overhead track, much like a ski lift. Transfers between the feeders and the main aircraft, as well as shifts within the liner itself, could then be performed automatically by computer control. Baggage would be handled by a parallel system. Because of the configuration of the system, passengers would have about twice as much total space as on a conventional jetliner, and weight would be saved because the liner would never carry empty seats. During off-peak hours, cargo could be handled by the same system.

Smith has studied the economics of the system under a NASA contract at the University of Virginia and contends that they are feasible even with current technology. For a beginning system, he envisions a circular route in which each liner would service 17 of the country's 22 major airports. The route would begin and end in Boston, and would include Washington, Atlanta, Los Angeles, San Francisco, Chicago, and others. The other five major airports—Las Vegas, Miami, Minneapolis, Seattle, and Tampa—could be served initially by connecting flights to one of the system's 17 airports. The complete round trip would take 24 hours. Twenty flights each day (ten traveling the loop clockwise and ten counterclockwise), Smith says, could handle a significant fraction of transcontinental traffic. For trips greater than 1,800 miles, he adds, the system "would be more efficient in terms of passenger miles per gallon of fuel than any other mode of transportation.

The techniques for rendezvous of the aircraft are not a major issue in the implementation of such a system, say Smith and Kyser, since air-to-air refueling is already established as a safe procedure. The chief problems will be working out all the complexities of the system and gaining passenger and airline acceptance of the proposal. But, adds Kyser, "for an advanced national air transportation system such as this, operational complexity would be acceptable if it were required for the sake of efficiency and effectiveness."—THOMAS H. MAUGH II

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