Assistant Chief, Full-Scale Research Division

Head, 8-Foot Tunnels Branch, FSRD

Prediction of future aeronautics

Short range prediction.- In the not too distant future, subsonic airplanes will cruise near the speed of sound, perhaps at the speed of sound. The lift to drag ratios for these airplanes will be relatively high by present standards. Further, the new engine techniques should allow relatively low specific fuel consumption. As a result, the range factor for such airplanes will be substantially higher than at present. This performance gain will reduce the weight of the power plant and fuel to a relatively small proportion of the airplane rate for ranges at which subsonic aircraft will be utilized. It is hard to see how expected further improvements in aerodynamics can provide substantial gains in overall direct operating costs in the more advanced future.

Long range prediction.- Methane has substantially better specific energy-weight than does kerosene and such a fuel could be used for all high performance aircraft; transonic, supersonic, and hypersonic. I have checked with the General Electric people through Mr. John Kutney and they see no problem in using Methane in a turbine engine. However, Methane is a gas at atmospheric pressures and temperature and it causes considerable problems when utilized in aircraft in liquid form, although not nearly the problems associated with liquid hydrogen. Because of its potential, I think considerable research will be done in the future to solve the problems of using Methane.

The biggest gain in overall direct operating costs will probably come in advances in materials for aircraft. Obviously, fiber technology is going to have an impact on future aircraft. I don't see why fiber glass isn't used in present aircraft. I know they say it is more expensive than metal for airplanes, but it would seem to me that somehow we could use such a technology. Boron filaments, instead of glass, would, of course, provide a substantial improvement.
I think it is well recognized by everyone now that the most important problem of commercial aviation is at the airports. Here is where we must come up with some really good, new ideas. We just can't go on building bigger airports further away from centers of population. All weather operation capability must be perfected and used by the commercial airlines. Also, some system to move airplanes at the airport as efficiently as automobiles on superhighways must be developed. For example, maybe overpasses and underpasses on the ramps would help.

Richard T. Whitcomb

RTWhitcomb:aec
TO:  All Concerned  

FROM:  Assistant Chief, Full-Scale Research Division  

SUBJECT:  50th Anniversary Celebration - Prediction of the Future of Aeronautics  

In the course of preparation of material for the 50th Anniversary Celebration, there is need for some considered and enlightened predictions of the future of aeronautics in the year 2000 AD and perhaps beyond. I am looking for more than just a limited projection of present technology; I'm looking for some brainstorming of technical advances which may be made to happen because there is a need. 

Take the supersonic transport, for example. One must be appalled at the low payload ratio of only 8 percent. Of the remainder about 60 percent is associated with the propulsion system - the rest is in structures and equipment. Obviously, this has got to go. When hydrogen fusion becomes a reality with unlimited power on the ground, can energy be beamed to the aircraft via laser techniques? Now that aircraft are being designed and built with gross weights of a million pounds, does onboard nuclear propulsion have a new potential? In the field of structural materials a revolution seems to be brewing in the areas of fiber technology, exotic new alloys, and advanced fabrication techniques. Similarly, advances in electronic technology must be reflected in new systems of air traffic control, landing aids, etc. 

These are some of the long-range projections which should be considered when making your predictions for the year 2000 AD. Although you have been selected because of knowledge in a given specialty, don't necessarily limit yourself to this if you have some ideas in other areas. 

If possible I would like to have your comments in my hands by Friday, September 8 (M/S 403). Your cooperation is requested.

Donald D. Baals  
4661 M/S 403  

DDBaals:dbv
Aeronautics Prediction in Year 2000 AD

1. **Propulsion**
   a. Air breathing (Fossil fuel, H₂, etc.)
   b. Electrical, magnetic, nuclear

2. **Aerodynamic**
   - Subsonic/Transonic
   - Supersonic
   - Hypersonic

3. **Structures**

4. **Operating Problems**
   - ATC/NAV/Blind Landing/Instrumentation
   - Noise

5. **Aviation in General**
   - V/STOL + personal aircraft
   - Commercial aviation (CTOL)
   - High speed ground transportation

(J. O. AGA-814)