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## PROBLEMS OF THE AIR REGULATION DIVISION

J. CARROLL CONE\*

As you are no doubt aware the Air Regulation Division constitutes only one branch of the Bureau of Air Commerce, which was created to fulfill the provisions of the Air Commerce Act of 1926. There are many activities of the Bureau other than those relating to regulation. These include the provision of air navigation aids and facilities, the collection and dissemination of useful statistical information, rendering assistance to local authorities in the matter of airport location and construction, the aircraft development program and the necessary financial and administrative activities.

Since I am more familiar with the Regulation Division however and am directly connected with that phase of the work, I shall limit my remarks to it. There are, of course, many problems connected with any phase of the activities of our Bureau so I do not suffer from lack of material by thus circumscribing this discussion.

The Regulation Division is, as its name implies, that part of the Bureau of Air Commerce which is charged with the execution of all of the regulatory phases of the Air Commerce Act. These include the examination and certification as to safety and airworthiness of aircraft and all their parts or accessories, and airline operations and equipment as well as the certification as to competency of pilots and other personnel engaged in the aircraft industry.

The division, as at present organized, embraces a number of sections and services, each of which is designed to execute a specific part of the duties, namely

1. Air Line Inspection Service
2. General Inspection Service
3. Manufacturing Inspection Service
4. Registration Section
5. Safety Section
6. Medical Section
7. Enforcement Section

Before discussing the activities of these sections in detail, it is

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essential to a full understanding of the situation to describe the mass objective of the entire Bureau, which hinges upon the purpose and intent of the law under which it operates.

The purpose of the Air Commerce Act of 1926 is well illustrated by its title which reads, "An Act to Encourage and Regulate the Use of Aircraft in Commerce and for Other Purposes." Particularly significant are the words "encourage and regulate." Both the title and the Act itself appear to place equal emphasis upon the two problems of promotion of air commerce and regulation. This dual purpose, correctly interpreted and carried out, provides an excellent balance for the Air Regulation Division within itself; which is highly desirable. Its desirability lies in the fact that it forces us to weigh every problem from all sides and to arrive at an exact evaluation. This does not mean that we can or will compromise with safety at any time. The very best type of promotion that the aviation industry can have is a long safety record. The position is such, however, that we cannot guess concerning the detailed specifications defining safety and then add a little bit more to be conservative, nor can we promulgate and inflict upon the industry any superfluous regulations to guard against remotely probable contingencies. In short we are charged with the responsibility of assisting the industry in every possible way toward its desired objective of the safest and most economical and useful aircraft and aircraft operation. You can well see that this exact balancing of factors and the consequent necessity for complete knowledge concerning them is a considerable task in such a rapidly developing science as that of aircraft design and operation. It is, nevertheless, an absorbing task and one in the execution of which we would be completely happy if the financial condition of the Government and the people were such that sufficient money and facilities could be allotted to make possible all of the helpful things we should like to do.

In the Air Line Inspection Service the air line operators' problems become our own. They must maintain the maximum in safe, careful, and comfortable transportation while at the same time avoiding useless dead weight and keeping schedule completion as high as possible. The original reliability of their equipment is a matter resting largely upon the shoulders of the Manufacturing Inspection Service, about which more will be said later, but the maintenance of that equipment, the decision as to what equipment is essential, and other operational questions are under the supervision of the Air Line Inspection Service.

The most formidable air line problem is still that of weather. Remarkable progress has been made in the last few years toward combating fog and ice, the two arch enemies of aviation. Air line ships can and do fly through fog with little or no danger, thanks to multi-engine security against forced landings and reliable instruments and other navigation aids to guide the flight. They cannot land safely as yet on a fog bound airport, however, and it is essential that they be so operated as never to be faced with the necessity for trying it. Thanks to proper application of heat and devices on exposed surfaces they can also cope with a reasonable amount of ice formation. Heavy icing conditions are still dangerous however and the air line operating personnel must be constantly alert to keep their aircraft out of such conditions.

It is the duty of the Regulations Division to see that suitable precautions along these and many other lines are constantly enforced by all operators, while at the same time refraining from inflicting unfair or unnecessary regulations which would tend to make the operations an economic impossibility. It is only fair to say at this point that we have had the whole-hearted cooperation of the operating companies in our efforts toward a common objective, and that, without this cooperation the difficulties of our job would be multiplied enormously.

The field activities of our General Inspection Service are also interesting and varied. These deal with the maintenance of aircraft engaged in miscellaneous or private operation and the licensing of airmen. Because of the restricted funds available our service in the field lacks some of the features we should like to incorporate. The inspectors must be held to rather restricted itineraries and do not have the time available to visit unscheduled places as contingencies arise, except in cases of emergency. It would be very helpful in this connection if applicants for licenses or renewals, or any one desiring the services or advice of an inspector would arrange to appear promptly at the place and time on his schedule which is most convenient to them. We are eager to provide the maximum possible service to each individual and late arrivals by applicants or negligence in anticipating a license expiration frequently add unnecessary difficulties. It is anticipated that we will some day have sufficient personnel available to permit attention to other than these routine duties. Advice and support for civil clubs, chambers of commerce, model flying clubs, high school classes and the like in the dissemination of accurate aeronautical information and the creation of interest in aviation is a worth-while job

to which we might contribute. Advice and assistance to private owners of aircraft would also pay large dividends in owner satisfaction and the public record of aviation because such owners must assume the responsibility of properly maintaining their aircraft between the periods of our annual inspections.

The Manufacturing Inspection Service, dealing with the airworthiness requirements for aircraft and their parts and accessories and the inspection of new type aircraft, is a service of a highly technical nature. It is also in a position to contribute greatly to the betterment of the aircraft industry.

In order to properly fulfill our dual obligations of regulation and promotion in this phase of our work we are constantly looking as far ahead as we can see. As soon as a particular trend in aircraft design is indicated, many times even before the industry itself is aware of such a trend, we, in coordination with the Army Air Corps, the Navy Bureau of Aeronautics and the National Advisory Committee for Aeronautics, attempt to initiate and carry through a research program looking toward a solution of the structural, aerodynamic and operational problems which may result from that trend.

Since research is essentially a slow matter, the development and application of certain aircraft devices almost invariably comes along before such a research program can be entirely completed. At the same time, by constantly being alert, we usually have sufficient knowledge by the time the first applications are made to permit of satisfactory handling. I believe that this particular phase of our work illustrates better than any other the intimate relation between promotion and regulation as well as the cooperation existing between the various aircraft technical agencies of the Government.

I might make this point clearer by means of an illustration taken from our records. You have probably noted that on modern aircraft moveable trailing edge tabs are being widely used on the control surfaces as trimming and balancing devices. Such tabs on the elevators are largely replacing adjustable stabilizers. They also have many other uses, having become quite popular for lateral trimming on cantilever monoplanes where there is no other means of accomplishing that function, and for relieving the control loads on large aircraft. When these devices were first experimented with, neither the industry nor ourselves had any knowledge of a great many important factors concerning them. We had no idea as to the aerodynamic loads that they would have to carry. Nor

did we know anything of the proper proportions which should be used in designing them in order to prevent dangerous flutter or overpowering of the pilot's control. We therefore immediately started collecting information from all available sources, and the National Advisory Committee for Aeronautics at our request commenced a research program on this subject. By the time that our manufacturers had decided that these tabs were desirable devices and were flooding us with inquiries concerning them, we had sufficient information at hand so that we were able to tell the manufacturers how to make safe and satisfactory installations.

While discussing new developments I do not wish to give you the impression that we are by any means fully satisfied with our existing design requirements for aircraft and their components. Even were there to be no new developments in the industry we would continue our constant efforts to find out more about the complex problems inherent in aircraft design so that the regulations may be simplified and so that the resulting aircraft may be easier to build and lighter in structural weight. That these problems are complex is evidenced by the fact that no one in the world is as yet fully informed concerning many of them. They embrace the fields of aerodynamics, mathematics, structures, metallurgy, harmonics and a good many others.

One of the most difficult technical problems at present is that of resonant vibrations. If the engine impulses or the air forces acting on any part of the airplane happen to coincide in frequency with any adjacent part of the airplane structure, trouble is to be expected. We have already had some trouble from this source and are still trying to develop a satisfactory means for predicting and thereby avoiding these conditions. Another problem which recently was presented to us by the industry for study and solution pertained to the installation in previously approved airplanes of engines of higher power or engines with a permissible higher power for short periods, as for instance during take-off.

The airworthiness requirements dated October 1, 1934, specified that in such cases a complete new stress analysis must be submitted. We studied the problem carefully and within a month or two devised and made effective a new regulation permitting the desired operation provided the engine mount only was analyzed for the higher power. Under this system, a placard is posted in the cockpit stating the operational limits for the engine for one minute at take-off and for any other time except take-off, and stating further the indicated cruising and other operational airspeeds for

the airplane. Thus not only is take-off made safer, but higher true airspeeds are possible with the same power at higher altitudes at limited indicated airspeed. These advantages are obtained at a minimum of engineering expense to the manufacturer.

The problems which confront our Registration Section are nearly all of a type which can only be solved by educational efforts. For instance, a surprising number of individuals appear to believe that the Bureau through its Registration Section can find missing husbands, brothers and sweethearts, that it can abrogate state laws with reference to licenses and intrastate flying, and that it settles disputes as to ownership of aircraft as between partners. These latter are of course matters subject to civil action before juries within the state. Because of the negligence of some owners in the matter of notifications to the Department concerning the sale of aircraft and the name and address of the purchaser, our records in many instances are incomplete and not entirely satisfactory.

The Safety Section is designed to promote safety through its handling and analysis of accident reports and records. Until comparatively recently, the Bureau has been severely handicapped in accident investigation in that it was without authority to hold public hearings, subpoena witnesses, or take testimony under oath. Investigations were of necessity informal and our inspectors were dependent largely on the good will of witnesses and such information as they chose to disclose.

From the standpoint of arriving at the cause of an accident, this worked out surprisingly well, but only through understandings with the witnesses that they would not be quoted. Also, information so obtained had no legal value and therefore could not be passed on to the public except in the form of general statistics which were of no use to those seeking information relative to specific accidents. This had the effect of throwing an air of secrecy around aircraft accidents and aroused a considerable criticism against what was popularly thought of as a Department policy. This condition was as unsatisfactory to the Bureau as to the public and Congress was prevailed upon to amend the Air Commerce Act to remedy the situation. This amendment was made effective on June 19, 1934, and since that date, public statements have been prepared covering all major accidents. These statements give a brief description of the accident, all pertinent facts and our Accident Board's opinion as to cause. The effects of this amendment have been very gratifying. The Bureau is able to secure details

heretofore lost and by being able to publicly discuss individual accidents, has entirely eliminated the original cause of criticism and uninformed suspicion against the integrity of aviation enterprise.

In our Medical Section, numerous changes in policy have been accomplished lately for the purpose of eliminating certain problems which existed. The system of reporting results of physical examinations of pilots has been simplified to require only two types of examinations; first, an original one taken for a student pilot's license, and second, a renewal examination which is the same for all licenses. As a further result, fees for medical examiners were simplified and reduced. Physical standards for pilots were revised and simplified, and air line pilots are now examined every ninety days to furnish data for a study of fatigue and the effects of long distance flying. An extensive survey was made of aeronautical activity in all parts of the country, as a result of which additional medical examiners were appointed in localities where the degree of activity warranted it.

The Enforcement Section attends to the legal aspects of these activities, under the supervision of the Solicitor of the Department of Commerce and their problems arise from and are related to the work of the other sections.

The points I have mentioned constitute a very brief recital of the salient points which are germane to the subject under discussion. There are, of course, a multitude of other details which might be of interest and I hope that I may have the opportunity of discussing them further with you at some future time. For the present I will close this talk with an earnest assurance to you that the Regulation Division is constantly working toward the solution of its problems, and that it intends to continue explaining, revising and simplifying its technical and operational requirements with a view to promoting the progress of the entire industry insofar as the dictates of safety indicate and permit.