U. S. DEPARTMENT OF COMMERCE
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BUREAU OF AIR COMMERCE
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AIR COMMERCE MANUAL

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15 AIRCRAFT EQUIPMENT AIRWORTHINESS

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AIRCRAFT EQUIPMENT AIRWORTHINESS

INTRODUCTORY NOTE

This manual contains material intended to interpret and explain the airworthiness requirements specified in 6 CFR 15, and to present acceptable methods for showing compliance with the requirements.

It should be understood that any method which can be shown to be the equivalent of one set forth in this manual will be equally acceptable to the Secretary. Likewise, any interpretation herein shown to be inapplicable to a particular case will be suitably modified upon request. In either event such acceptance or modified interpretation will be effective as and when issued prior to subsequent incorporation in this manual which will be revised from time to time as equally acceptable methods, new interpretations, or the need for additional explanation are brought to the attention of the Bureau.

The material in this manual is so arranged for correspondence with the regulations that, for example, ACM 15.043 corresponds to 6 CFR 15.043. On the reverse side of this page will be found a form for convenience in maintaining a record of subsequent revisions.

.043 1. When possible, the identification data should be so placed that they are clearly visible in ordinary use. For wheels, the side that is normally least obscured by struts and fairing is preferred. The data must be marked on the wheel itself but may be marked on the fairing also, if desired. Parachutes should be marked so that it is not necessary to unpack the chute to read the identification. Skis with identification data on the bottom of the runner are not considered satisfactory within the meaning of 6 CFR 15.043.

.0500 1. A number, group of letters, or other suitable designation symbol will be considered the equivalent of a revision letter in the revision blocks of drawings.

.052 1. The application for special approval is a revision of the form formerly used for applications for letters of approval and has been simplified by removing items that are not general in their application. With it should be supplied a general description of the article for which approval is requested, including all pertinent information in summarized form.

2. For landing gear shock absorber struts, the information should include maximum static load, maximum impact load, and energy absorption for which approval is requested; method of absorbing energy; total stroke; distance from static load position to fully compressed position; taxiing resistance at end of taxiing stroke, and material and construction of strut. If hydraulic action is used to absorb energy, the bore, type of orifice, and type of taxiing resistance should be given.

.1021 1. The side load specified herein is not to be confused with the side load specified in 6 CFR 04 for use in design of the airplane landing gear.

.1024 1. In order to obtain good contact with the center of pressure approximately on the maximum radius of the rim, the side load may be applied, if desired, at such an angle that it has a small inward radial component. In such case, the load must be increased so that its side component is equal to the load specified in 6 CFR 15.1021. Some degree of distribution in the radial direction may appear convenient and will be acceptable provided the shears and bending moments on all parts of the wheel are maintained at least as great as if the entire side load were applied along the arc of maximum radius. A typical test set-up is shown in Figure 5 herein.

.106 1. Special attention should be paid in the design to means of preventing the tire from rolling off the rim under moderate side loads. Tires should be clearly marked to indicate size, number of plies, and whether for standard or heavy duty.

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2. In very exceptional circumstances, such as the discovery by one member of the Tire and Rim Association of new materials or processes not known or not available to the other members, the Bureau will act as a court of appeal for a special rating, but otherwise all ratings will be handled by the Tire and Rim Association.

.1101 1. The stress analysis methods applicable to floats are, in general, the same as those applicable to hulls and, to some extent, monocoque fuselages. Reference is therefore made to ACM 04 to avoid duplication herein of acceptable methods. Further, the analysis of the float itself depends greatly on the geometry of the structure attaching it to the airplane, which makes it desirable to consider the float at the same time with the airplane.

.12 SKIS

1. In accordance with a recent reciprocal agreement made with the Canadian authorities, American manufacturers of skis will no longer be required to submit data to show conformity with Canadian ski requirements when skis are made for export to Canada. Therefore, skis approved as airworthy by this country, will be automatically eligible for export to Canada. Similarly, Canadian skis made in accordance with Canadian requirements and intended for export to this country will likewise be acceptable in the United States.

.120 1. For conventional aircraft with two main skis, the permissible gross weight is twice the maximum static load rating of the ski, i.e., the tail ski is not considered to support any part of the weight of the airplane since it would not do so except in the case of a perfect three-point landing.

.1200 1. Approval of a ski and approval of a ski installation on an airplane are two separate cases. The provisions of 6 CFR 15.12 cover only the approval of the ski itself for a certain maximum load. An airplane equipped with the proper strength skis will be approved after satisfactory inspection of the installation and determination by a Bureau inspector that the flight and taxiing characteristics of the airplane equipped with the ski model to be used are satisfactory. Generally, it will be sufficient for the inspector to witness landings and taxiing of the airplane on the skis, but in the case of passenger transport airplanes, the inspector will determine whether or not the ski installation has any adverse effects on the flying characteristics. If a plane is to be equipped with skis of a model that has already been approved for that model plane, witness of the landing and taxiing characteristics is not necessary, but if only the combination of that

model plane and some other ski or that model ski and some other plane, or both, has been approved, then the full inspection and tests must be conducted. A list of already approved combinations is maintained by the Bureau and is available to inspectors and the public in Chapter XVIII of the Inspection Handbook.

2. When a certain model ski has been granted a type certificate but the manufacturer does not hold a production certificate, each ski made must be inspected by a Bureau inspector, before use or sale, for conformity with the authenticated data examined and approved by the Bureau. These data are represented by a sealed drawing list, and drawings which correspond to the sealed list must be made available to the inspector. This inspection may be conducted at the time of installation on the airplane, provided that the manufacturer supplies sufficient drawings with the skis to enable the inspector to determine their conformity with the authenticated data on file in the Bureau. In order that the Bureau may be satisfied that the drawings supplied are identical with those on file, the inspector will, on his report, note the drawing numbers and the revision change letters.

3. If the manufacturer holds a production certificate, inspection of the skis for conformity is not necessary but the installation should be inspected for airworthiness and to determine that the skis bear the proper identification data.

4. If a manufacturer contemplates making only one pair of a certain model ski and does not wish a type certificate, he need not submit the application called for in 6 CFR 15.051. In this case, a letter will be written approving the ski for a certain maximum load, but if additional skis of the same model are later produced, they will be treated as if they were a new type on which approval had not yet been granted.

.1221 1. In certain types of design, a great deal of importance attaches to whether or not this load is applied in the exact center, laterally, of the ski. The structure of the ski and pedestal should be capable of withstanding the stresses produced by applying this load one-third of the ski width from the ski centerline.

.1222 1. The side load specified herein is not to be confused with that specified in 6 CFR 04 for use in the design of the airplane landing gear. The curve in Figure 6 CFR 15-1 represents approximately the maximum rolling radius of wheels of the strength indicated. Thus the ski design moment is now independent of the size of the wheel to be replaced and depends only on the static load to be carried, except in rare cases of pedestals shorter than the arm given in the above figure, in which case the moment is less in proportion to the pedestal height.

.1223 1. "Pedestal height" as used here means the distance from the center of the axle to the bottom surface of the ski runner. It is the same as the distance from the axle to the ground referred to in 6 CFR 15.1222. This requirement makes the design torque on the pedestal and the accompanying design bending moment independent of the ski length (as such) and of the size of the wheel replaced. They are also independent of the pedestal height except that if such height is less than the arm given in Figure 6 CFR 15-1, representing approximately the maximum rolling radius of wheels of that strength, then the side bending moment is reduced accordingly. Although the torque and moment are independent of the dimensions stated, they follow them in a general way by being functions of the static load for which the ski is rated. For example, skis with a higher load rating are usually longer and will have a longer torque arm under this requirement. The requirement is based on statistical data covering all skis currently approved. In rare cases in which the point of application, under this requirement, falls beyond the front end of the ski, the specified load may be replaced by an equivalent shear and moment at a suitable point on the physical ski.

.203 ANGULAR LIMITS

1. The provisions of this regulation are illustrated in Figures 1 through 4 herein.

.204 LIGHT INTENSITY

1. The provisions of this regulation are illustrated in Figures 1 through 4 herein.

.3000 1. The anchorage referred to consists of the actual rivets, bolts, cable, wire or other means of attaching the belt to the aircraft structure. A fitting sewed into a safety belt as a permanent part of the belt is regarded as an end fitting and is not an anchorage within the meaning of this regulation. Safety belts are usually tested with a sleeve or a piece of tubing through the loop and, therefore, such belts must be used on fittings that are not sharp enough to cut the webbing nor sufficiently yielding to apply most of the load to the edges of the webbing. Preferably such belts should be attached to the airplane in a manner simulating the attachment used in the static test, which generally means the use of a sleeve or tubing as stated above.

.3030 1. The second sentence is intended to insure that the quick-release mechanism would not be so distorted by a 1000 pound load as to be impossible to operate thereafter. If it can be operated in any reasonable manner, even though it requires pulling on the belt or belt end in addition to the ordinary release motion, it will be considered satisfactory.

.3132 STRENGTH TEST

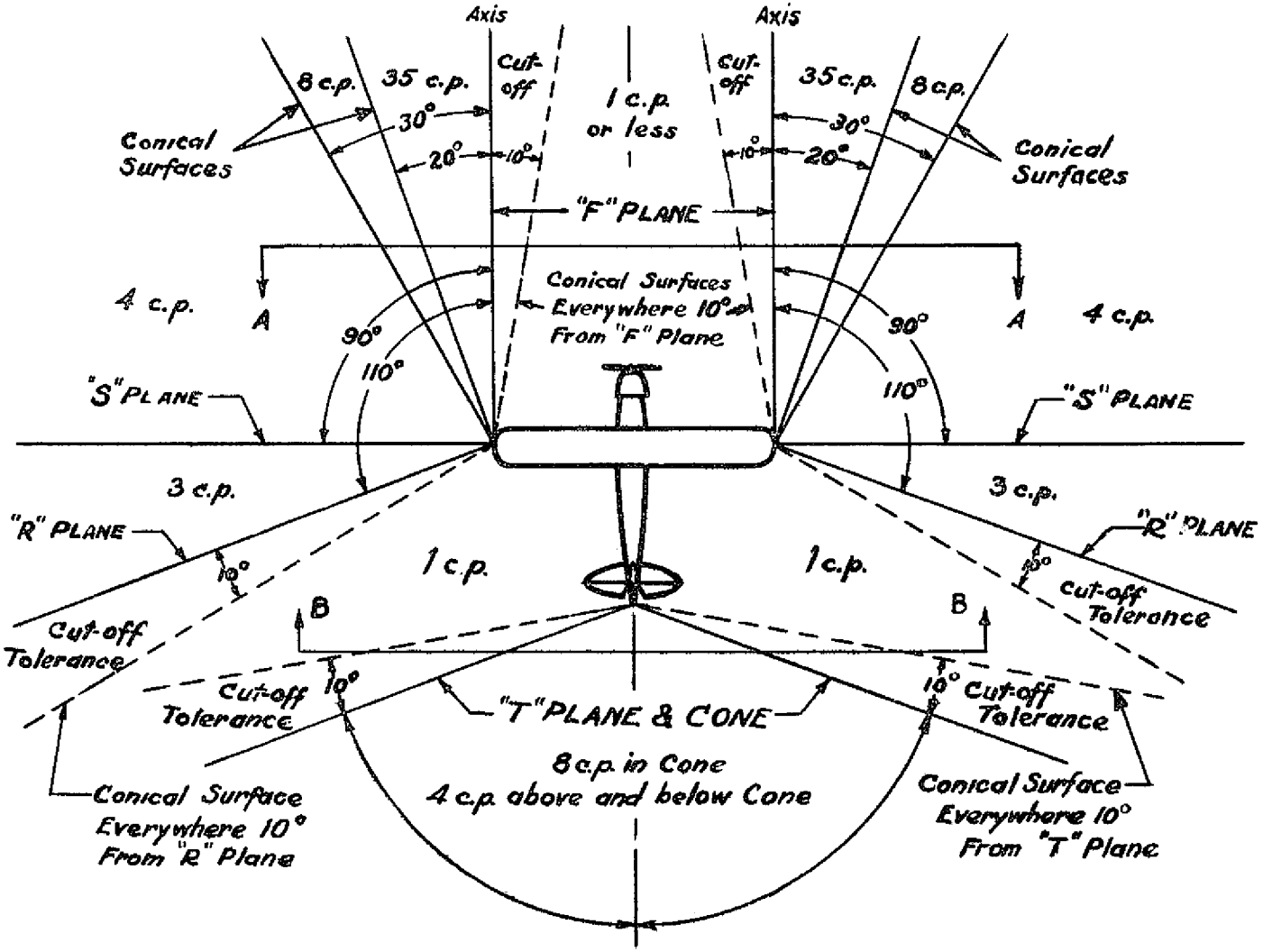
1. If possible, the 600 pound weight should also be in the shape of a dummy and should be fastened into the harness in the normal manner. A 170 pound dummy with a hollow compartment in which 430 pounds additional weight could be placed is suggested.

.5 1. Locking device regulations are not given in 6 CFR 15 at present but when such regulations are prepared, they will appear as item 6 CFR 15.5. For the time being, the following information may be of value to those who wish to obtain approval of such an item.

2. Data should be submitted showing the merit of the device as compared with the standard aircraft bolt, nut and cotter pin. Vibration tests whould be made on various sizes of the locking device and in each case, the test jig should include the standard bolt, nut and cotter pin as a matter of comparison. If the device is made in several kinds of material, each should be represented in the test. Obviously, an aluminum alloy device will not be approved on the basis of tests made on a similar steel device. In addition to the above vibration tests, reports of the behavior of the device in service should also be submitted. These reports should show the length of time that the particular device was used and also what purpose it served. Because the behavior of locking devices subjected to vibration and to repeated loosening and backing off is a matter of importance in connection with aircraft usage, the data should stress these points. Since certain types of devices are not suited for use when subjected to temperatures of over 250°F, the test data should show the effect of temperature on the device in question. Certain devices are likely to be unsatisfactory if used on a rotating part and therefore, the effect of rotation should be determined by test.

3. If a locking device has been approved by the Army or the Navy for use in aircraft, the device may automatically be approved by the Bureau of Air Commerce for a similar use, provided that the manufacturer submits a copy of the report and test data upon which either of these agencies approved the device for use.

4. ACM 04.4020 may be referred to for information concerning certain types of locking devices already approved and the restrictions imposed on their use.



Angles and Intensities of "Airline Forward" and "Rear" Position Lights

FIG. 1

FIG. 2 (Showing Section B-B of Figure 1.)

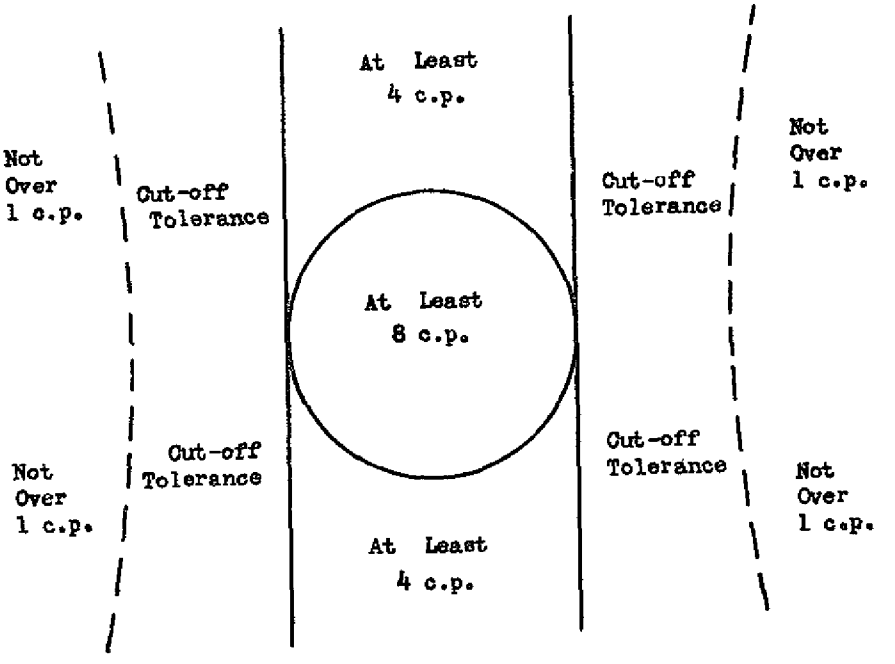
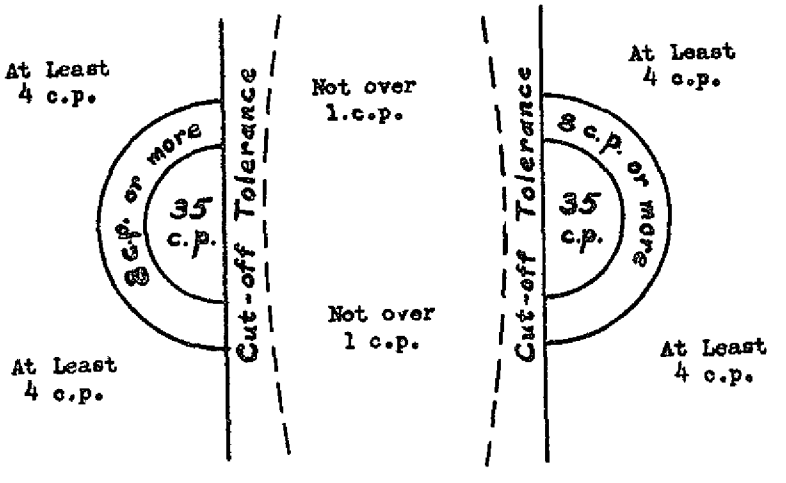
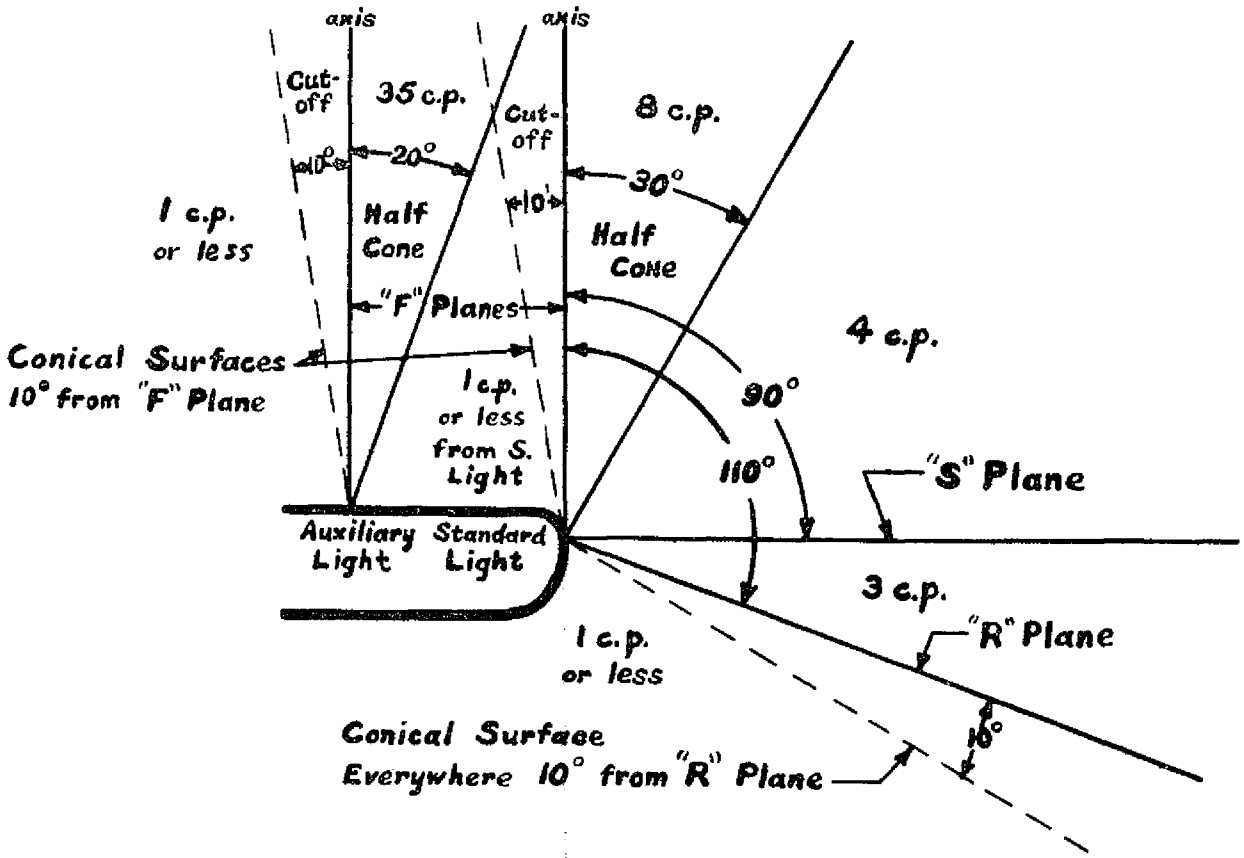


FIG. 3 (Showing Section A-A of Figure 1.)





Angles and Intensities of "Standard" and "Auxiliary" Position Lights

FIG. 4

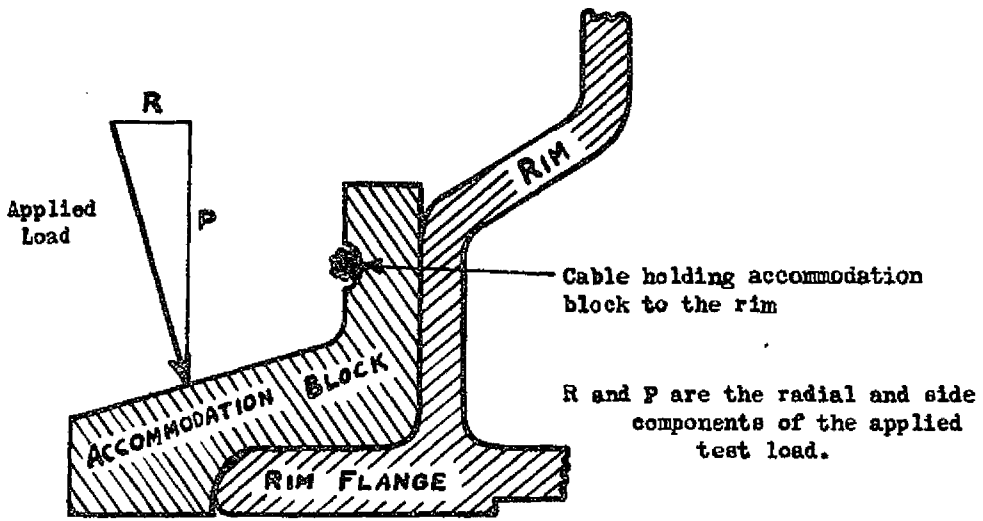


FIG. 5 Typical Vertical Set-up for Side Load Test of Wheel