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NATIONAL TRANSPORTATION SAFETY BOARD WASHINGTON, D.C.

ISSUED: September 6, 1978

Forwarded to:

Honorable Langhorne M. Bond
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-78-67 through -74

In a letter to the Federal Aviation Administration dated April 25, 1978, the National Transportation Safety Board expressed its concern about multiple tire failures on wide-bodied aircraft, such as that experienced by the Continental Air Lines DC-10 at Los Angeles International Airport on March 1, 1978. Your response, dated May 23, 1978, detailed several actions which the FAA had underway or was planning to initiate. The Safety Board acknowledges these actions as a step toward reducing the potential risk of tire failures. However, the Safety Board's public hearing, which was convened on May 30, 1978, as part of the investigation of the DC-10 accident, elicited much testimony regarding factors which can affect tire safety and reliability; and as a result, we believe that additional regulatory or advisory actions are needed in the areas of design standards, qualification testing, quality control during manufacture, and operational limits. Our concerns apply to retreaded tires as well as new tires.

From the hearing testimony, it became evident that some confusion exists within the industry regarding the significance of a tire's rated load, as defined by the Tire & Rim Association, and the consideration given when mating a particular tire with airframe design and intended operations. For example, under current practices, a tire may be used on an airplane if the maximum calculated static load does not exceed the tires' rated load; maximum calculated static load is based on equal load distribution between those tires which are mounted on the same axle. No margin is required for possible overload from unequal load distribution which can be created by normal differences between the two tires. These are differences in deflection characteristics between tires from different manufacturers, differences in retread levels, differences in inflation pressures, differences in outside diameters, and differences in wear. In addition, no margin is provided for possible overload caused by the angle at which the landing gear contacts the airport surface. We believe that steps must be taken to insure that such factors are considered when tires are selected and when maintenance and operational practices are established for the aircraft's service life.

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The minimum performance standards for aircraft tires, as established by TSO-C62b, have not been revised since 1962. The existing standards do not reflect the current state of the art in either tire development and testing, or in aircraft design as it affects tire usage and operational service life. For example, the tire's ability to withstand overloads created by the use of different tires on an airplane or by normal variations in inflation pressure is not considered. Also certification test requirements are not correlated with the tire's actual service, including its potential retread life, to relate the design's resistance to carcass fatigue to an established life limit. Furthermore, the TSO requires that only one tire of a given design be tested, and this may be either a preproduction or an early production tire which may not be representative of tires produced at other times during the production period. The Safety Board believes that a larger sample should be tested to assure conformance with design and quality standards.

Since TSO-C62b applies only to new tires, there is even less control over the design and quality of retreaded tires than over new tires. Standards are needed to assure that changes such as tread design, rubber composition, breaker ply, or skid depth do not adversely affect the tire's performance or projected service life. Testimony at the hearing disclosed that some retread manufacturers do qualify new retread designs by limited testing on a voluntary basis.

In addition, currently there are no methods of nondestructive inspection (NDI) available to insure satisfactorily that carcasses intended for retread are free of defects which can produce premature failure. Although it has limitations, the holographic process has been used to detect flaws or damages in the tread area of the carcass before retreading the tire or returning it to service. Some users already specify NDI for all tires either before or after retreading. Although rejection rates are between 3 and 4 percent for the typical aircraft tire, one special design tire has a 30-percent rejection rate. NDI by holography costs about \$15.00 per tire. Other methods of NDI, such as ultrasonic and X-ray, have also proven effective for detecting certain flaws in different parts of a tire. None of these, however, have proven effective in detecting common flaws, such as bead damage or fatigue in the ply structure of the sidewalls. Until effective NDI techniques are developed, the Safety Board believes that a conservative, safe upper limit should be set for the number of retread cycles allowed for each model tire.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Assess current tire rating criteria, as used by the Tire & Rim Association and as interpreted by airframe designers and Federal standards, in terms of compatibility of tire, airframe,

and intended operation to assure that adequate margins are provided for all normal conditions. (Class II Priority Action) (A-78-67)

Upgrade Technical Standard Order C-62b to reflect current engineering practices and operational conditions in both the specifications for performance standards and certification test requirements. (Class II Priority Action) (A-78-68)

Insure that the tire is compatible with the airframe by considering this compatibility during the airplane certification. Tire loads which result from design peculiarities and normal variations in maintenance and operational practices must be considered. (Class II Priority Action) (A-78-69)

Issue a new Technical Standard Order to specify performance standards and qualification test requirements for retreaded tires. (Class II Priority Action) (A-78-70)

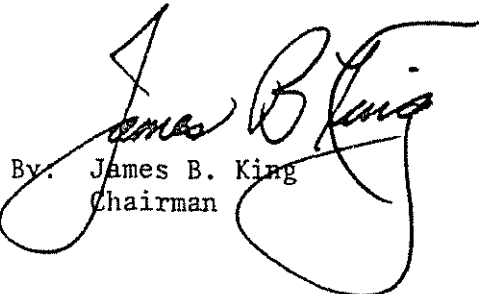
Prohibit different model tires or tires manufactured by different manufacturers from being mounted on the same axle where different characteristics between such tires can affect tire loading under normal operating conditions. (Class I Urgent Action) (A-78-71)

Require that operator maintenance and operational practices regarding tire usage, such as taxi speeds and distances and inflation pressures, are in accordance with the tire manufacturers' recommendations. (Class II Priority Action) (A-78-72)

Expedite the development of a nondestructive inspection technique which would detect flaws in tire carcasses. Require nondestructive inspection for new and retreaded tires and develop criteria based upon such inspection to withdraw a faulty tire from service. (Class II Priority Action) (A-78-73)

In the interim, establish a safe upper limit for the number of retread cycles allowed each model tire. (Class II Priority Action) (A-78-74)

KING, Chairman, McADAMS, HOGUE, and DRIVER, Members, concurred in the above recommendations.


By: James B. King
Chairman