Appendix L

Letters from Tensolite Company
May 24, 1996 and April 15, 1997

- Letter to David Hinson, FAA, notes dangers of Raychem 55 (Mil-W-22759/34) and that it is still used, page 1.

- Cites independent studies showing new hybrid wires superior to Raychem 55, page 2.

- Letter to Ed Block, former DOD wire expert, notes Raychem 55 (BMS 13-48) found on a wide variety of aircraft including helicopters, private jets, and shorter-range commercial aircraft too, page 1.

- Calls for updating FAA standards to new performance capabilities, page 2.
May 24, 1996

David R. Hinson  
Administrator  
Federal Aviation Administration  
800 Independence Avenue, SW  
Washington, D.C. 20591

Dear Mr. Hinson:

The recent ValueJet crash and the current concern over the safety of this nation’s commercial aircraft fleet have prompted me to write you this letter. The FAA has publicly announced a nationwide wiring inspection to prevent the potential for fire and uncontrolled smoke. (USA Today - front page article, Wednesday, May 15, 1996.) This renewed emphasis upon in-flight smoke and fire, especially within the wire and cable used in the airplane is a topic Tensolite Company has previously addressed.

Tensolite Company developed a much improved wire construction specifically designed to address the short comings of the standard wires. New wire insulation materials that virtually eliminate flammability and excessive smoke associated with airframe wire and cable are available, and in use today. Tensolite manufactures and markets one such new hybrid wire under the trade name Tufflite™ 2000.

It is entirely conceivable that the United States Government may choose to impose standards on the new wire insulation materials for all commercial, military and private industry airplane production and thus remove wire and cable as a variable when discussing in-flight fire and smoke. There are several types of wire used within the aerospace industry today that continue to exhibit questionable flammability and smoke generation performance. One of the more prevalent wires in use is susceptible to flammability and exhibits excessive smoke generation. This wire, developed in the early 1970’s, is constructed using cross-linked (irradiated) ETFE (XL-ETFE) as the insulation medium. (Reference Military Specification Mil-W-22759/34.) This wire is still utilized as a general ship set wire within the industry despite the fact that the hybrid wire construction now available provides very low smoke generation and minimal flammability, as well as superior mechanical performance.
Several independent studies have been conducted to investigate the possibility of identifying superior wire constructions for use in airplane environments. Between February 1989 and January 1991, McDonnell Douglas and the United States Air Force conducted what is considered the most comprehensive study directed at finding improved aerospace/airframe wire constructions. The report, titled "New Insulation Constructions for Aerospace Wiring Applications," was conducted at Wright-Patterson Air Force Base by Mr. Ron Soloman, Ms. Lynn Woodford and Mr. Steve Domalewski. I have attached excerpts of this report for your review. The report tested a variety of alternative constructions against the industry standard Mil-W-81381 polyimide wire and the Mil-W-22759/34 XL-ETFE wire. The goal of the study was to identify insulation candidates with balanced electrical, mechanical and thermal properties. Hybrid constructions were identified as having non-arc tracking characteristics, good chemical resistance, excellent handling properties and superior mechanical properties at temperatures as high as 200°C. The hybrid constructions did particularly well in arc tracking tests, mechanical properties at high temperature, flexibility tests and were far superior to Mil-W-22759 XL-ETFE in flammability and smoke generation.

In fact, the recent study which is also provided with this correspondence, ("The Increased Safety Factor With Hybrid Wire Constructions" presented at the Aerospace Electrical Interconnect System Conference in October 1995) provided results for hybrid wires as compared to XL-ETFE in a battery of tests. The results from this test which included the FAA's Smoke Test for Insulated Aircraft Wires, again proved that the hybrid wires are superior to XL-ETFE. The hybrid wire results for the smoke test showed an average of 1.3 for specific optical density. This represents exceptionally good performance. Conversely, XL-ETFE exhibited excessive smoke generation and scored an average of 173.43 for specific optical density. For comparison purposes, the hybrid wire measurement equates to only 1-2% of the light being obscured, whereas the XL-ETFE result equates to 97% of the light being obscured.

During the design of an airframe, various zones are designated by engineering to insure that certain critical criteria are satisfied. One obviously critical zone is the pressurized fuselage zone. This zone of the aircraft carries the crew and passengers. When designing wire and cable for this environment, three major concerns are predominant; smoke emission, flammability and toxicity of the fumes. Based upon the various studies performed to date and upon careful examination of the properties of the raw materials used to manufacture the wire and cable, it can be reasonably concluded that XL-ETFE, Mil-W-22459/34 wire may not be the best choice for use in this environment. The hybrid construction is perfectly suited for the pressurized zone of the aircraft due to its very low smoke generation.
It is well documented that the Mil-W-22759/34 type, XL-ETFE wire produces excessive smoke and is much more flammable when compared to the hybrid wire. This is clearly shown in the U.S.A.F./McDonnell Douglas study. The hybrid wires were also demonstrated to be superior in electrical and mechanical performance.

It is our hope that the FAA and/or the U.S. Department of Transportation could help to insure the safety of all future aircraft by specifying the use of the new hybrid wire, which will carry more stringent specification requirements than the current standard for general ship set wiring. Thus, this would eliminate the wire and cable as a variable when discussing the potential for fire and uncontrolled smoke. At a minimum, this would provide a margin of safety for all new aircraft and serve to escalate the commercial fleet to a higher level of safety.

In closing, we believe the hybrid wire is the safest and most advanced wire available. This conclusion is based upon factual evidence and comprehensive independent testing. The hybrid wire provides the optimum factor of safety needed to perform within the harsh environment of an airplane. Smoke, flammability and toxicity are not an issue with the hybrid wire construction, unlike the significant issues related to XL-ETFE wire.

Thank you for your attention to this matter. We believe that the issue of the type of wire used on airplanes should be given the FAA’s proper attention. I would be happy to discuss this issue with you or your representatives in greater detail at your convenience.

Sincerely,

John E. Berlin
Tensolite Company

JEB/tkh
April 15, 1997

Ed Block
107 Fairview Avenue
Hulmeville, PA 19047

Dear Ed:

It was a pleasure getting a chance to talk with you and sharing our similar views/frustrations on the recent events surrounding airframe wire and cable. It is unbelievable to me that our government cannot take initiative and do something proactive, especially when the technology is readily available. Hopefully your efforts will highlight to the public the real issues and the real alternatives. There is a better wire that is safer and offers future margin. We just simply need to adopt it full scale - industry wide.

As you may recall, Tensolite was instrumental in developing the state-of-the-art composite airframe wire being used on a handful of airframe platforms today. Boeing uses their BMS 13-60 on all 737 and 757 production, while McDonnell Douglas is working on standardizing all military and commercial aircraft on composite tape technology wiring. This includes all Navy aircraft. McDonnell Douglas is working on their SMD1 specification, which will end up as Mil-W-22759/80 - /92 sometime later this year.

During the course of our development of BMS 13-60 we discovered that the competing wire (BMS 13-48 - Irradiated Tefzel) had some serious safety flaws. BMS 13-48 is used on all Boeing wide body production and is used widely throughout the industry on aircraft ranging from helicopters to private jet and regional jet aircraft. In head-to-head comparison testing the composite wires outperformed the irradiated ETFE, BMS 13-48 type wires in every category. Several tests demonstrated huge differences in performance. Technically - there is no choice other than the composite wire.

The recent ValuJet crash highlighted the safety aspects of aging aircraft. Wiring was noted on several occasions in the media as a possible area of concern. I now suspect that this may have been some of your doing. We focused on the fact that the composite tape wrapped wires offered superior electrical and mechanical performance with the added safety benefit of virtually zero smoke generation and the best flammability characteristics of any wire in use today. This led us to investigate what type of safety standards existed and much to our surprise the Code of Federal Regulations that the FAA uses to certify
new aircraft utilized a grossly out of date requirement for flammability and did not even address smoke generation. This led me to believe that it was time to modify the requirements and to incorporate the latest wire performance as the minimum standard, thereby improving future generations of aircraft. We submitted a formal Petition for Modification to the FAA which seeks to have 14 CFR 25. App. F, Part (a)(3) and 14 CFR 25. App. F, Part I (b)(7) modified to reflect state-of-the-art regarding the design and manufacturing of insulated airframe wire - focusing on flammability and smoke generation characteristics.

As I related to you this morning on the telephone, our Petition seems to have hit a brick wall. Priorities have been set at a higher level within the FAA that do not allow for our Petition to become a fully sanctioned project. The latest statement is that the FAA will formally reject our petition and then open up a Rule Making Project through ARAC (Aviation Rule Making and Advisory Committee) thereby involving the Joint Aviation European Authorities. This is suppose to help our effort by harmonizing the Rule Making Project between the USA and the rest of the world. It seems that it is just slowing the whole process down. I have had meetings with European Aviation people and the consensus is that the ARAC process would take years to complete.

I have attached the original correspondence that we forwarded to the then FAA Administrator - David Hinson for your review. This may give you yet another perspective on aircraft wire technology and safety. During the implementation of your own strategy on wire, it may be helpful to add that the composite wire technology that exists today, and is flying on many aircraft, is the safest choice. We will continue our own efforts in an attempt to get our government to take a proactive approach towards wire safety. Let me know if I can help you in any way and please keep me in your loop as I am very concerned with this very important issues. I will do the same for you as I continue my efforts. Good luck!

Sincerely,

John Berlin