

Decision No. 91466 MAR 18 1980

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

ORIGINAL

Investigation on the Commission's
Own Motion into the Safety
Applicances and Procedures of the
San Francisco Bay Area Rapid
Transit District.

) Case No. 9867
) (Tunnel Phase)
) (Petition Filed
) December 27, 1979)

Additional Appearance

Robert C. Cagen, Attorney at Law, for the
Commission staff.

FOURTEENTH INTERIM OPINION

On December 27, 1979, the San Francisco Bay Area Rapid Transit District (BART) filed a late petition requesting the Commission to extend the time for complying with a portion of ordering paragraph 2 of Decision No. 90144. Paragraph 2 reads as follows:

"Within 90 days of the effective date of this order, BART shall submit to this Commission a schedule for speedy elimination of polyurethane materials from the seat assemblies in BART cars; such schedule shall provide for full implementation within 270 days."

This ordering paragraph resulted from hearings held after a serious fire occurred on January 17, 1979, in the Transbay Tube, necessitating the closure of the Tube. By our Decision No. 89902 issued January 19, 1979, we ordered the continued closure of the Tube pending BART's compliance with a number of conditions. On April 4, 1979 by Decision No. 90144, we permitted the resumption

of revenue service through the Tube and required BART to undertake a number of safety-related tasks, including the above-referenced seat replacement.

BART's petition requests relief from that portion of ordering paragraph 2 which mandates full replacement of seats by January 4, 1980, 270 days from the effective date of Decision No. 90144. In the petition, BART also indicated its preference for low smoke neoprene seat cushions as a replacement for the current polyurethane seat cushions. In conjunction with its petition, BART filed its supporting rationale for selection of the low smoke neoprene option over other alternatives.

On February 8, 1980, we issued our notice of hearing stating: "This notice of hearing is on the Petition of the San Francisco Bay Area Rapid Transit District to extend time for compliance with Decision No. 90144 and for determination of the appropriate seat materials replacement program in cars."

The Commission staff filed a response to BART's petition on February 11, 1980, requesting that BART's petition be held in abeyance and not be acted on by the Commission until the completion of the hearings scheduled for February, 1980. Further, the staff stated that the question of whether BART should be granted more time for seat replacement is fully entwined with the question of which seat material should be ordered as a replacement for present seats. Staff contended that evidence would be adduced at hearing, demonstrating the practical replacement time for the various alternatives; and given this critical information, the Commission could then make a reasoned decision choosing the replacement material

and the dates by which the replacement must be commenced and completed.

The staff's report entitled "Review of BART Vehicle Seat Replacement and Fire-Hardening Program" was filed with the response.

The staff concluded that steel seats with a thin cushion of low smoke neoprene, or equal, is the proper and safe seat replacement alternative. Such conclusion was based on the staff report that alleged incomplete testing and analysis of seat alternatives by BART.

After due notice, public hearing was held before Administrative Law Judge J. J. Doran in San Francisco on February 14, 15, 21, 22, 26, 27, and 28, 1980. The matter was submitted after oral argument on February 28, 1980.

BART presented seven witnesses in support of its petition. The staff presented one witness. The Urban Mass Transit Administration's Regional Director, Dee Jacobs, presented testimony supporting BART. Two public witnesses testified, and a total of 33 exhibits were received.

BART proposed to replace the existing seat cushions (seat and back) with Toyad LS-200 low smoke neoprene cushions, and a 90% wool and 10% nylon cover.

BART's General Manager Bernard testified that in June, 1979 BART developed a test program and contracted with McDonnell Douglas Corporation to carry out tests on potential replacement materials and to conduct composite tests of several

materials burning together. Subsequently, full-scale tests were carried out on the most promising materials for cushion replacement.

In June and July, 1979 BART initiated an industry survey of metal seats and fire-retardant fiberglass seats in its effort to assure that alternatives were considered.

On July 3, 1979, BART submitted to the Commission its proposed plan for seat replacement. The submittal defined the program scope, the need for testing, and an estimated completion date of August, 1980.

BART's Director of Safety, Ralph Weule, testified that the staff was kept fully advised of BART's undertaking and that during the summer of 1979 the staff advised BART that they were supportive of the test program and the seat replacement plan. The composite testing was completed in September and full-scale testing was finished in October. A draft analysis was prepared and in late November the evaluation was reviewed by BART management, the BART Board of Directors, and the staff.

Further, Weule testified that the first indication of any difference with the staff occurred during the November 9, 1979 meeting in the board room when a staff engineer stated staff's preference for a stainless steel seat.

On November 29, 1979 the BART Board of Directors made the decision to replace the existing cushions and covers with the low smoke neoprene-wool combination. The invitation to bid was advertised January 11, 1980.

On December 27, 1979, BART filed its subject petition which still maintains its estimated completion date of August, 1980.

By letter dated January 3, 1980, to BART, the staff expressed disagreement with BART management's decision to replace existing seat cushions with a form of low smoke neoprene. Further, the staff concluded that BART's proposal was inferior to the steel seat alternative.

Staff's report recommending a steel seat with a small cushion of the same materials as proposed by BART was distributed to BART and the public on February 11, 1980.

BART opened the bids to furnish cushions for 32,000 seats on February 15, 1980. The bids are firm for 60 days from the date of opening the bids. BART's Board authorized its General Manager to award contracts on February 28, 1980 for the procurement of transit vehicle seat cushions and covers to Artcraft Industries Corporation, pursuant to notification to be issued by Bernard and subject to prior Urban Mass Transportation Administration (UMTA) approval and amendment of the grant. The ultimate exercise of such authority to award contracts awaits Commission approval of BART's preferred seat replacement program.

BART Showing

Witness Spieth, a research specialist and chemist with the McDonnell Douglas Corporation, testified about the testing performed by McDonnell Douglas. The screening effort started in August, 1979, by examining data of known materials from NASA studies and new materials selected by BART. Smoke and burn tests were performed in

the laboratory. The screening tests included burn tests, chemical analysis, and the release rates of heat, smoke, and toxic gases. After the screening tests were completed BART selected full-size seats and materials to test. Through cross-examination it was developed that the Kydex seat backing was not tested. Nor were walls, floors, or ceiling liners included in the tests. Further, potential for synergistic effects, i.e., where the total effect is greater than the sum of the two effects taken independently, was not examined.

The witness stated that he would like something thicker and with more volume than the staff proposal in order to absorb fluids that could be placed on the staff's seats. Further, the witness stated McDonnell Douglas does not full-scale test before equipment is installed. He concluded that the tests were adequate and that more testing is not needed. The full-scale tests were conducted in the Douglas Cabin Fire Simulator at the Space Simulation Laboratory, Huntington Beach, California. Tests were conducted on the current seat material and the proposed seat cushions. The materials included polyurethane foam with vinyl covering and neoprene foam with a 90 percent wool-10 percent nylon blend covering. During each of the tests, data was recorded for smoke density, cushion temperatures, radiant heat, animal response to combustion products, dynamic weighting of seats, cabin temperature, and gas sampling within the cabin atmosphere. The proposed materials exhibited improved burn resistance compared to the current materials.

Witness Williamson, Professor of Fire Protection Engineering at the University of California, Berkeley, was called by BART. He was a staff witness in the hearings held after the tunnel fire. Professor Williamson testified that the LS-200 cushion meets all the criteria he believes are important.

The witness sponsored films of a trash fire burning under the current seat and also under BART's proposed seat. The fire did not readily spread to adjacent materials with the low smoke neoprene cushions. He subjected BART's proposed materials and the staff's alternative to a fire fueled by pouring white gasoline on the cushions. He showed that BART's proposal had more neoprene that absorbed the liquid gasoline as compared to the staff's proposal which let the liquid run on the floor and burn. The witness stated it was better for the liquid to be absorbed in the thick neoprene than to drop on the floor where it could catch fire and propagate into the Kydex duct air-conditioning system.

It was his opinion that the Kydex backing on the seat assemblies did not present a significant fire risk. BART proposes to replace such backing within its fire hardening program at some undetermined date.

The professor further testified that fire may be considered a chain of events. Seats are most important because they appear early in the chain of events. His exhibits show that low smoke neoprene cushions with wool and nylon covers have excellent fire characteristics for combustible materials and can well serve to impede the fire chain.

BART's Witness Weule testified that he has been given complete charge of the seat cushion replacement program. BART

developed broad-based standards designed to break the fire chain and prevent the fire from spreading to other seats and the walls. The witness described the work done by McDonnell Douglas and how the staff was kept abreast of events. Prior to the tests the staff visited the McDonnell Douglas facility and, in Mr. Weule's opinion, appeared to be fully supportive of the tests. The staff was invited to but did not attend the full-scale tests. However, it was stated that test results were sent to the staff.

With respect to the proposed seat cushion replacement contracts, the witness testified that the bids were opened February 15, 1980. The proposed contract calls for a 10-day bonding period and delivery of 32,000 cushions within 139 days of the contract award. Arcraft Industries was the low bidder on each of the two 16,000 seat changeout programs. Installation should be completed within two weeks thereafter. He estimates it will take 12 to 14 months for seat replacement under the staff's proposal.

Witness Procter, Operations Research Specialist with BART, testified that if the staff's steel seats were adopted, an adapter would be required between the seat and wall to connect the present wall connections to the connections on the steel seat which are different from the present seat. In addition, the adapter would need to go through the safety certification process.

BART's Director of Engineering (Ganstwig) testified that the two Arcraft Industries contracts totaled \$4,230,000. He also testified that 98,000 pounds was the maximum weight per car including passengers, and the track weight limit was 100,000 pounds. Further, these weight limits have never been exceeded.

UMTA Testimony

Jacobs testified as a representative of a governmental agency that has a safety responsibility and a financing responsibility with respect to certain rapid transit properties, including BART. He testified that UMTA's first funding priority is to provide 80 percent of the capital costs of necessary safety improvements.

Further, he testified that on September 15, 1978, UMTA made a capital grant to BART for \$11 million, \$2.8 million of which was intended for replacement of all the seat cushions and covers. Now, some 17 months later, the cost is estimated to be \$4.2 million, due in part to inflation and because the low smoke neoprene material, which is significantly superior from a fire safety standpoint, is more costly than the material proposed by BART at the time the grant was originally approved.

The witness stated that UMTA began sponsoring the development of fire safety standards in 1973, when no national safety standards for mass transit existed. Preliminary standards were issued as proposed guidelines several years ago. They remain in proposed guideline form until UMTA can go through the formal rule-making process to make the standards mandatory. The U. S. Department of Transportation's System Center (TSC) has done extensive research in developing the standards, including a thorough survey of national and international material fire safety standard development efforts. TSC has established an extensive materials test data bank to help in the development of safe and practical standards. During the examination of the UMTA witness, it was

shown that there are no acceptable toxicity standards in the proposed guidelines applicable to the combustible materials used in transit systems.

The UMTA witness stated that BART's proposed seat cushions and covers far exceed the nationally recognized UMTA guidelines. He also understands that the staff's steel seat replacement exceeds the UMTA guidelines and offer some undefined margin of safety over BART's proposal. However, after considering all of the factors, he recommends that the Commission allow BART to proceed with its current seat cushion replacement program. Factors, other than safety, which favor BART's proposal are implementation timeliness, public acceptance, and financial considerations. The steel seat option would delay the grant making and procurement process by a good number of months. UMTA and the transit industry would regard the steel seat proposal as a degradation of the quality of BART service, and UMTA would have a difficult time approving the stainless steel transit seating. It would appear to UMTA that the initial cost of the stainless steel seats would be considerably higher than the cushion replacement program. Also, the witness would find it very difficult to sign a grant to pay any additional amount of scarce federal dollars for a significant degradation of transit service in order to provide a marginal and relatively unmeasurable element of safety. The witness concluded that the stainless steel seat is not necessary or reasonable and that BART's cushion replacement program is necessary and reasonable.

Public Testimony

Two members of the public stated in general that the seats should not be hard. Further, one thought hard seats might divert passengers to automobiles.

Staff Showing

Senior Reliability and Quality Engineer (Jameel) testified on behalf of the staff. The staff recommended a steel seat with a small cushion insert of Toyad LS-200 low smoke neoprene with a wool/nylon cover or equal. A pair of seats would have a 34-inch off the shelf width and, as such, would be 10 inches narrower than BART's seats. It would be necessary to design and certify an adapter to couple the seats to the wall of the car. The staff witness estimated that the adapter design could be accomplished by a junior engineer in approximately one day.

Staff's rationale for recommending the stainless steel alternative focused on two factors: (1) the alleged inadequacy of BART's materials' testing program and the corresponding uncertainty over the performance of low smoke neoprene in major fire situations like the January 17, 1979 Transbay Tube incident; and (2) a desire to reduce the fuel content of BART cars in view of the large quantities of flammable and toxic materials used in and on the current BART vehicle.

It was staff's position that BART's testing program measured the combustion behavior of seats in a given orientation under specific ignition, ventilation, and input heat flux conditions. Staff contended that the fire behavior of a number of different

materials, such as, seats, flooring, wall liners, etc. arranged in a complex geometry cannot be predicted from the testing which has been done by BART. Staff concluded that the behavior of the low smoke neoprene under actual fire conditions is unknown since no attempts were made by BART to relate the laboratory behavior of seat material to actual fire situations.

In conjunction with this above-mentioned view, staff testified regarding the importance of reducing the amounts of combustible material aboard BART vehicles and the paramount need for an extensive fire-hardening program to reduce the fire risks associated with flammable materials on the BART cars. In staff's opinion, several factors such as flammability and toxicity, cost, increase in weight, etc., will dictate the extent of BART's fire-hardening program.

With respect to the above-referenced factors, staff presented the following testimony: (1) use of nonflammable materials for seat replacement and fire-hardening will result in a savings of time since flammability and toxicity testing will not be required; (2) while the capital costs of the stainless steel option and the low smoke neoprene are comparable, stainless steel seats have a longer service life and lower maintenance costs; (3) the stainless steel seat option would save the weight of 1,100 pounds/car over the cushion change-out option, and (4) the stainless steel seat option with thin cushions will result in less available fuel load on the BART vehicle.

It was the staff's position that the lower flammability and toxicity associated with stainless steel, its longer service life and lesser weight would allow BART important flexibility in

designing and implementing an effective vehicle fire-hardening program. This contention taken in conjunction with staff's view that inadequate information exists regarding the fire behavior of BART's replacement material prompts a staff recommendation that BART should be ordered to replace all existing BART vehicle seats with stainless steel seats with thin cushions of LS-200 neoprene/90% wool-nylon cover materials or equal. Staff also recommended that the Kydex backing of the current seats be removed irrespective of the seat replacement alternative ultimately sanctioned by the Commission.

Discussion

Since the Transbay Tube fire of January 17, 1979, there has been universal agreement that the flammability and toxicity of the current polyurethane seat assemblies require their immediate replacement. Decision No. 90144, issued on April 4, 1979 and directing BART to replace the existing seats within 270 days, underscored the Commission's view that replacement of the hazardous polyurethane materials should be the highest priority for BART.

Irrespective of institutional constraints which affect BART's ability to act expeditiously, it is quite disturbing that more than one year has elapsed without resolution of the problem. It is equally disturbing that BART would wait until December 27, 1979, one week before the expiration of our deadline for replacement of the hazardous seat material to petition the Commission for an extension of time. BART is close to being delinquent with respect to the fire-hardening program mandated by our April 4, 1979 order

and has not yet petitioned for an extension to time. This cavalier attitude towards the Commission's order is a direct threat to the safety of BART's patrons who are the prime beneficiaries of our requirements.

The Commission has been legislatively mandated to independently oversee the safety of BART's appliances and procedures.

It would be an abdication of our statutory responsibility to unquestioningly accept BART's petition for extension time and the proposed seat replacement program on its face just as it would be improper to unilaterally adopt an untested and unchallenged staff position. BART's delay has placed the Commission in the difficult position of either foregoing full analysis of the safety characteristics of various seat replacement alternatives or further delaying the replacement program which is already unacceptably late. To avoid repetition of this unfortunate circumstance with respect to the equally important fire hardening program, BART will be directed to file a monthly status report with the Commission, detailing its progress with the fire-hardening program.

As previously discussed, the replacement of the hazardous polyurethane seat materials is unacceptably late. In weighing the safety merits of the competing proposals of BART and the staff, we must give the greatest weight to the alternative which can be installed most rapidly. It is difficult to compare estimates of time to complete the two proposals because one is based upon firm commitments while the other, steel seats, is based upon mere statement of vendors. However, BART has testified that cushion seat replacement can be accomplished in 163 days from the date of contract while the steel seat with the cushion insert should take at least six months longer. We find this evidence compelling.

While certain aspects of staff's proposal are attractive, i.e., decreased flammability, toxicity, weight, it must be noted that staff did not contend that BART's proposal was unsafe. Evidence of

record indicates that the Toyad LS-200 neoprene with a 90% wool/10% nylon cover provides orders of magnitude reductions in heat release rate, toxicity and smoke release over present materials. Further testimony, buttressed by tests conducted by Professor Williamson indicate that seat cushions made of BART's proposed material will no longer be a weak link in the fire propagation chain inside the vehicle.

Based upon the evidence, we will accept BART's contention that its proposed seat materials will not propagate fire to an adjacent seat or create a condition leading to flashover within the car and thus meets criteria for acceptable fire performance.

Though staff's stainless steel seat option offers certain safety advantages, the shorter installation time required for BART's replacement program militates in favor of its selection. Therefore, we will adopt BART's proposal. However, BART is placed on notice that it should seriously consider stainless steel seat options as a viable alternative in the design and procurement of future rolling stock.

Findings of Fact

1. The McDonnell Douglas toxicity tests of low-smoke neoprene seats covered with wool/nylon covers demonstrated reasonably acceptable fire characteristics.
2. Flammability tests conducted by Professor Williamson, of the University of California, Berkeley, also demonstrated reasonably acceptable characteristics of low-smoke neoprene cushions with wool/nylon covers.
3. None of the material tests took into account the presence of other flammable materials in BART cars, including floors, walls, and ceiling liners.
4. No tests have been conducted to determine or evaluate potential synergistic effects of low-smoke neoprene seat materials with other combustible materials present in BART cars.
5. No full-scale mock-up tests of the proposed materials have been performed.
6. The seat replacement program ordered completed by January 4, 1980, in Decision No. 90144, has been unacceptably delayed.
7. Any further delay in completion of the seat replacement program would prolong public exposure to an unacceptable safety hazard.
8. BART's proposed low-smoke neoprene cushions exceed UMTA's proposed safety guidelines.
9. BART's implementation schedule will result in elimination of the polyurethane seat cushion materials within 163 days after contract execution.
10. Further design and testing would be required to adapt the seats recommended by the staff to fit BART vehicles.
11. The staff-proposed seat changeout would take at least six months longer than the BART-proposed cushion changeout.
12. It is essential that the fire hardening program be expedited to reduce the fire risks associated with combustible materials on BART vehicles.

Conclusions of Law

1. An extension of time to comply with Ordering Paragraph 2 of Decision No. 90144 is unavoidable.
2. BART should be authorized to immediately proceed with its proposal in order to eliminate the risk to the public from the present seats in the shortest possible time.
3. Public safety requires that our order be made effective immediately.

FOURTEENTH INTERIM ORDER

IT IS ORDERED that:

1. BART is hereby granted an extension of time of 180 days from the effective date of this order for compliance with Ordering Paragraph 2 of Decision No. 90144.
2. BART may proceed to replace the polyurethane seat cushions in transit vehicles with cushions made of low-smoke neoprene covered by a blend of 90 percent wool/10 percent nylon fabric.
3. BART shall work with the Commission staff to promptly develop an extensive fire hardening program for the entire vehicle and report monthly to the Commission on the status of the program.

The effective date of this order is the date hereof.

Dated MAR 13 1980, at San Francisco, California.

John E. Snyer

 PRESIDENT
Richard W. Howell

 SECRETARY

Donald J. Quinn

 COMMISSIONERS

Commissioner Clair T. Dedrick, being necessarily absent, did not participate in the disposition of this proceeding.