Log 8311

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: October 9, 1991

In reply refer to: A-91-95 through -100

Honorable James B. Busey
Administrator
Federal Aviation Administration
Washington, D.C. 20594

About 0915 mountain standard time, on Sunday, November 25, 1990, a fire erupted at a fuel storage and dispensing facility about 1.8 miles from the main terminal of Stapleton International Airport at Denver, Colorado. The facility, referred to as a fuel farm, was operated by United Airlines and Continental Airlines. From the time firefighting efforts were initiated immediately after the fire erupted until the fire was extinguished, a total of 634 firefighters, 47 fire units, and 4 contract personnel expended 56 million gallons of water and 28,000 gallons of foam concentrate. The fire burned for about 48 hours. Of the 5,185,000 gallons of fuel stored in tanks at the farm before the fire, about 3 million gallons were either consumed by the fire or lost as a result of leakage from the tanks. Total damage was estimated by United Airlines to have been between $15 and $20 million. No injuries or fatalities occurred as a result of the fire.[1]

United Airlines' flight operations were disrupted because of the lack of fuel to prepare aircraft for flight. Airport facilities, other than the fuel farm, were not affected by the fire. The duration and intensity of the fire, however, raised concerns about the ability of airport and local firefighters to respond to a fuel fire of this magnitude. The origin of the fire also raised concerns about the safety oversight and inspection of fuel farm pumping operations.

Although regulations at 14 CFR Part 139.321 address fuel storage, fire protection, training, and inspection, subparagraph (h) exempts the certificate holder (the operator of the airport) from requiring Part 121 and Part 135 air carriers to comply with the requirements of Part 139.321. However, there are no equivalent regulations under Parts 121 and 135 to require air carriers to accomplish what is required under Part 139. The pertinent provisions under Part 121 and 135 appear to address refueling of aircraft only, and not inspection and maintenance of the fuel storage facilities. There also appears to be considerable confusion within the

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[1] National Transportation Safety Board. 1991. Fuel farm fire at Denver's Stapleton International Airport, Denver, Colorado, November 25, 1990. Aviation Accident Report NTSB/AAR-91/07. Washington, D.C.

Federal Aviation Administration (FAA) as to which division within FAA has responsibility for inspecting fuel storage facilities on airport property. The FAA's Office of Airport Safety and Standards understands that it has responsibility for inspecting fuel storage facilities operated by fixed-base operators but questions its own legal authority to do so for fuel storage facilities operated by Part 121 and Part 135 carriers. The FAA's Office of Flight Standards Service has operated in a manner that suggests its responsibility is limited to the refueling of aircraft.

As a result of this fire, the investigation of which highlighted the deficiencies in the regulations, the FAA's Office of Airport Safety and Standards issued a policy memorandum that attempted to resolve the issue and clarify which organization within the FAA has responsibility for inspection and oversight of these fuel storage facilities on FAA-certificated airports. The Safety Board believes, however, that the appropriate course of action would be to clarify the exemption in paragraph (h) of Part 139.321. Further, the FAA should clarify which division within FAA has the responsibility for inspections of fuel storage facilities on airport property and assure that the inspection responsibility is consistent with regulatory authority.

Although the regulations are not clear as to which division within FAA has oversight with respect to inspections of fuel storage facilities on airport property, the FAA's Office of Airport Safety and Standards did conduct an annual certification inspection of Stapleton International Airport in June 1990. That inspection achieved the intended results, noting that the certificate holder (city/county of Denver) was not in compliance with Part 139.321 nor with requirements outlined in its Airport Certification Manual (ACM); specifically, the certificate holder failed (1) to maintain [adhere to] its fueling standards for protection against fire and explosion in storing and dispensing fuel on airport property, (2) to conduct quarterly inspections of fuel storage facilities, and (3) to maintain yearly training certification of fueling tenants. The failure of the certificate holder to conduct quarterly inspections of the fuel storage facilities and to comply with its ACM certificate represents an inadequate approach to fire safety and, thus, contributed to the cause of the accident. Also of concern to the Safety Board is the apparent lack of followup by the FAA to determine if the certificate holder had resolved the discrepancies noted during the annual certification inspection. Efforts are needed to determine if areas of noncompliance are, in practice, resolved by the certificate holder.

The investigation raised concern that the certificate holder was not allocating sufficient resources to perform thorough quarterly inspections of fuelers on airport property. Although the airport certificate holder inspector cannot be expected to detect all pumping equipment maintenance discrepancies, the Safety Board believes that the certificate holder's inspector should have found that AMR Combs (the company operating and maintaining United Airlines' portion of the fuel farm) was not properly inspecting and maintaining its equipment. However, only one Denver fire department inspector had been assigned to conduct quarterly inspections of all fuelers at Stapleton International Airport and he had received only minimal training to conduct these inspections. The Safety Board has not ascertained if the same conditions exist at other airports. The Board

believes, however, that the FAA, during the annual certification, should determine if the certificate holders are providing the necessary resources to perform thorough quarterly inspections of fuelers on airport property. Further, the Safety Board believes that training of certificate holder inspectors should be required, particularly because the FAA is relying on the self-inspections to certify that fuel handling is being done safely.

An analysis of the design and cost benefits of various safety features of the Denver fuel farm or the new fuel storage facility at the new Denver airport was beyond the scope of the Safety Board's investigative role. However, obvious safety deficiencies were noted during the investigation that are not addressed in existing industry codes or standards.

There were eight fuel storage tanks in the area of the fuel farm where the fire occurred. Tank capacities ranged from 420,000 gallons to 2,100,000 gallons. Tanks 3 and 4 were completely destroyed by the fire; tanks 2, 5, 8, and 10 received extensive damage; and tank 1 received smoke damage.

The investigation revealed that only tank 10 had an internal fire valve with external fusible links that would automatically close when exposed to heat from a fire. Further, only the control valves on the piping to tanks 2 and 5 were fail-safe--that is, they were designed to automatically close if either electrical power or air pressure was lost. The control valves installed on tanks 1, 3, and 4, were not fail-safe; air pressure had to remain on the valves' control system for the valves to close automatically in the event of an electrical power failure. If the air pressure was lost, the valves had to be closed manually. However, because of the intensity of the fire at tanks 3 and 4, firefighters were unable to manually close the valves to these tanks. The Safety Board concludes that had tanks 3 and 4 been equipped with fail-safe control valves and internal fire valves with fusible links, the amount of fuel that fed the fire would have been significantly reduced, and consequently, the duration and intensity of the fire lessened. The lack of such valves, therefore, contributed to the severity of this fire. The Safety Board believes that all above-ground fuel storage tanks should be equipped with internal fire valves and that all control valves on above-ground fuel storage tanks should be fail-safe. Consequently, the Safety Board urges the FAA to require that all tanks at fuel storage facilities on airport property be equipped with an internal fire valve and fail-safe control valves. Further, the Safety Board believes that the National Fire Protection Association Standard 30 should require that internal fire valves and fail-safe control valves be installed on all above-ground fuel storage tanks.

Monitoring equipment, for both temperature and vibration, is available for the type of motor/pump units involved in this fire. The monitoring equipment can be "hardwired" into the control system and will automatically shut down the motor/pump unit in the event of excessive temperature or vibrations. According to the manufacturer, this monitoring equipment can be installed for about $1,200 to $2,000 per motor/pump unit. The cost for a new pump is about $20,000. Had equipment that monitors excessive temperatures and vibrations with automatic shutoff capability been installed on motor/pump

unit 3, the equipment would have detected the vibration of the motor on motor/pump unit 3, shut down the unit, and the fire would not have occurred. Therefore, the Safety Board urges the FAA to examine the feasibility of mandating the use of temperature and vibration monitoring equipment on all fuel pumping systems located on airport property.

Airport firefighters and the Denver fire department promptly responded to the fire and immediately began to attack the fire. However, because the firefighters were unable to maintain a continuous flow of foam onto the fire, the fire reignited and quickly intensified. Airport and local firefighters did not have, nor could they be expected to have, a sufficient supply of foam concentrate to fight a fuel fire of this magnitude. However, the Safety Board is concerned that the city of Denver, and the fire department in particular, apparently had not contemplated a fire of this type as no procedures or contingency plans were in place for doing so. Arrangements for an outside contractor to provide onsite expertise were made only after Continental became concerned that the fire would impinge on its holding tanks. The lack of procedures or a contingency plan for responding to a fuel farm fire of this magnitude prolonged the duration of the emergency. The Safety Board believes that this investigation indicates that certificate holders should have contingency plans for fighting very large fires, such as fuel farm fires.

Therefore, as a result of its investigation of this accident, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require the airport certificate holder to be responsible for inspections of all fuel tank farms on airport property and to provide the necessary resources, including training of personnel, to perform thorough quarterly inspections of fuel storage facilities on airport property. (Class II, Priority Action) (A-91-95)

Clarify which division within the Federal Aviation Administration has responsibility for inspections of fuel storage facilities on the property of certificated airports and assure that this inspection responsibility is consistent with regulatory authority. (Class II, Priority Action) (A-91-96)

Require operators of fuel farm facilities on the property of certificated airports to install fail-safe control valves and internal fire valves with fusible links on all above-ground fuel storage tanks. (Class II, Priority Action) (A-91-97)

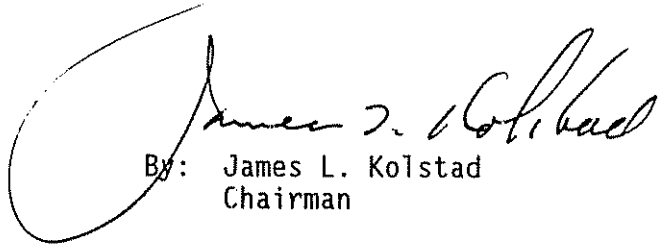
Require airport certificate holders to ensure that fuel operators locate the fuel farm control systems, one or more emergency shutoff switches, and the recording equipment in an area remote from the pumping equipment and outside a spill containment area. (Class II, Priority Action) (A-91-98)

Examine the feasibility of mandating the use of temperature and vibration monitoring and shutdown equipment on all fuel pumping systems located on the property of certificated airports. (Class II, Priority Action) (A-91-99)

Require airport certificate holders to have contingency plans for responding to very large fires, such as fuel tank farm fires. (Class II, Priority Action) (A-91-100)

Also, as a result of the investigation, the Safety Board issued recommendations to AMR Combs, the National Fire Protection Association, the Airport Operators Council International, Inc., and the American Association of Airport Executives.

Chairman KOLSTAD, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT concurred in these recommendations.



By: James L. Kolstad
Chairman