

INTERSTATE COMMERCE COMMISSION
WASHINGTON

REPORT NO. 3493
SOUTHERN RAILWAY COMPANY
IN RE ACCIDENT
AT BIRMINGHAM, ALA., ON
OCTOBER 3, 1952

SUMMARY

Date: October 3, 1952

Railroad: Southern Railway

Location: Birmingham, Ala.

Kind of accident: Air reservoir explosion

Train involved: -

Train number: -

Locomotive unit number: D-E unit 4120

Consist: Light locomotive unit

Speed: Standing

Operation: Under inspection

Track: On wash rack track

Time: 5:10 p. m.

Casualties: 2 injured

Cause: Excessive pressure in reservoir
and improperly secured reservoir
head

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3493

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION
REPORTS UNDER THE LOCOMOTIVE INSPECTION ACT
OF FEBRUARY 17, 1911, AS AMENDED

SOUTHERN RAILWAY

January 5, 1953

Accident at Birmingham, Ala., on October 3, 1952, caused by
failure of a main air reservoir on a Diesel-electric
locomotive unit.

REPORT OF THE COMMISSION¹

PATTERSON, Commissioner:

On October 3, 1952, about 5:10 p.m., at Birmingham, Ala.,
while Southern Railway Diesel-electric locomotive unit 4120 was
standing on a shop wash rack track, the left main air reservoir
exploded. Two pipefitters were seriously injured.

¹Under authority of section 17 (2) of the Interstate Commerce
Act the above-entitled proceeding was referred by the Commission
to Commissioner Patterson for consideration and disposition.

DESCRIPTION OF ACCIDENT

Southern Railway Diesel-electric locomotive unit 4120 was standing on wash rack track at Finley Shop, Birmingham, Ala., October 3, 1952, about 5:10 p.m., undergoing final inspection after a monthly inspection had been made, when the left main air reservoir exploded.

An air leak had been found at the automatic brake valve. An inspector who did not know location of the reservoir cutout valve summoned two pipefitters and requested them to cut the main air reservoir pressure off of the brake pipe. The pipefitters went into the nose of the unit and closed the valve to main reservoir supply line to the No. 8 distributing valve chamber, thinking this was the valve they were seeking. Upon finding that this did not reduce the air pressure at the brake valve, they then traced the reservoir piping and found the cutout valve located at the back of the cab under the engine compartment. They closed the cutout valve and returned to the nose of the unit to open the valve which had been closed in error. The pipefitters were in the nose of the unit and the inspector was in the cab when the explosion occurred.

The convex head of the reservoir was completely blown from the cylindrical portion of the reservoir; the head was distorted and its attached piping was bent and broken. The force of the explosion drove the reservoir back against the ballast block which supported the cab deck with sufficient force to indent the top of the back head and push it into the reservoir, tearing the welded circumferential seam for a distance of 26 inches. The piping at back of the reservoir was broken at practically every threaded connection.

Both pipefitters were seriously injured and were taken in ambulances to a hospital.

DESCRIPTION OF LOCOMOTIVE UNIT

Southern Railway Diesel-electric locomotive unit 4120, model FT-A, type B-B, was built by the Electro-Motive Division of General Motors Corporation at LaGrange, Ill., in August 1945. Motive power was supplied by a 567-A, 16-cylinder, B-type, two-cycle, 1350-horsepower Diesel engine with direct connected generator. The unit was mounted on two four-wheel trucks, each axle of which was individually gear connected to a driving motor.

The weight on the driving wheels was 244,120 pounds and the maximum tractive effort was 61,030 pounds. The unit received class 2 repairs at Spencer, N. C., on June 10, 1952, at which time the air compressor was overhauled, main reservoirs given hydrostatic and hammer tests, and gages, safety valves, and all other brake equipment tested. Gages were tested and the last orifice test was made at Birmingham, Ala., on September 5, 1952. The unit had made approximately 22,846 miles since it was last overhauled.

DESCRIPTION AND EXAMINATION OF PARTS INVOLVED

Unit 4120 was equipped with Westinghouse No. 8-EL brake equipment and a Gardner-Denver WXE two-stage air compressor, consisting of two low-pressure cylinders 7 inches in diameter and one high-pressure cylinder 5-3/4 inches in diameter with 5-inch stroke. The maximum rating of the compressor at 800 revolutions per minute was 178 cubic feet per minute. The compressor was direct connected to the crank shaft of the Diesel engine. The air flowed from the air compressor through a 2-inch discharge pipe 18 feet long that was connected to two Wilson air coolers, which were piped in parallel. From the coolers it continued through a 2-inch discharge pipe which entered the center of the front head of the left or No. 1 main reservoir. A 1-inch safety valve was located in the discharge pipe from the air compressor. From the center of the rear head of the No. 1 reservoir, the air then entered a 1-inch pipe that was connected to a 1-inch cutout cock, then through a 1-inch crossover pipe into a single Wilson air cooler, a short 1-inch pipe, a non-return check valve, and into the center of the front head of No. 2 reservoir. A 2-inch safety valve was located in a tee at the front of the No. 2 reservoir.

From the center of the rear head of No. 2 reservoir a 1-inch final discharge line entered a dirt collector and then the air flowed to the air brake system supply pipe. At a point in the crossover pipe from the rear of the No. 1 reservoir to the front of the No. 2 reservoir following the 1-inch cutout cock was located the pipe connection to the air compressor governor and the unloader air supply.

The piping arrangement found on unit 4120 did not correspond with the recommendations for this equipment inasmuch as closure of the 1-inch main reservoir cutout cock installed in the discharge line from No. 1 reservoir and which was provided with a 1/4-inch side drain depleted No. 2 reservoir pressure

thereby nullifying air compressor governor, unloader, and the 2-inch safety valve protection. The conventional piping arrangement for the No. 8-EL brake equipment calls for the 1-inch main reservoir cutout valve to be located in the final discharge pipe from No. 2 main reservoir in such location that it will not nullify operation of the air compressor unloading facilities and the 2-inch safety valve. Investigation failed to determine whether or not the main reservoir piping arrangement as found on unit 4120 at the time of the accident was as originally installed on the unit or had been changed at some shop repair period.

The unit was equipped with two main air reservoirs; both reservoirs and related piping were located beneath the operating cab floor. The reservoirs were in longitudinal position and parallel to each other. The No. 1 or left reservoir was identified as Westinghouse No. 93063 and the No. 2 or right reservoir as Westinghouse No. 93064. The reservoirs were 24-1/2 inches in diameter and 60 inches long; capacity of each 50,000 cubic inches. The cylindrical portions were constructed of 3/16-inch boiler steel with the longitudinal lap seams secured by 3/8-inch rivets, spaced 2 inches apart, and edges of seams copper sealed. The convex ends, which were constructed of 7/32-inch boiler steel, had 2-inch flanges which were fitted and inserted into the cylindrical portions, the outer edges of which were turned inward, affording 1/4-inch retaining flanges, and then brazed. Both reservoirs were certified on August 29, 1940, and originally put in service on C.N.O. & T.P. Ry. unit 6101. No record of where or when the reservoirs were changed could be obtained.

The front convex head of No. 1 reservoir was completely blown out of the cylindrical section. Examination of the ruptured portion disclosed that approximately 75 percent of the head flange was improperly fitted, excess bronze metal had flowed between the flange and the shell, indicating ineffectual bonding. The weld around the entire circumference of the head was found to be from only a trace to 1/8 inch thick and close examination of the edge of the sheet disclosed approximately 80 percent of the braze on the head seam was ineffective. Examination of the back head showed that at some time prior to this accident, apparently because of a leak, two welds had been applied to the back head seam, one 8 inches and the other 8-1/4 inches in length.

The No. 2 reservoir did not show any signs of distortion. Previous leakage was indicated by a brazed area for a distance of 18 inches at the head fit over the original braze. All main reservoir piping and valves were tested and found to be open and free of sediment.

The air compressor intercooler 1-inch safety valve, J. E. Lonergan Company, type KDP, was placed on test rack and found to be set at 61 pounds pressure. The carrier's instructions are that this setting is to be 50 pounds.

The air compressor 1-inch discharge pipe safety valve, Westinghouse, type E-7-B, No. 536852, was removed from the unit and placed on test rack and later on dead weight tester. It did not release at 400 pounds test pressure. The seal on the valve was not broken before this test was made. Instructions of the carrier provide that this safety valve should be set to pop at a pressure of 175 pounds. The valve was again placed on the regular air test rack and subjected to 175 pounds pressure. After backing out the pressure adjusting screw 6-1/6 turns, the valve opened properly. The valve was tried at this pressure several times and operated satisfactorily each time. As the paint on the adjusting screw cap lock nut was unbroken, it is evident that this valve was not properly set when the last air test was made on June 10, 1952.

Air reservoir system 2-inch safety valve, New York, equivalent to Westinghouse No. 515561, rated capacity 800 cubic feet per minute, was removed from the unit but because of accident damage could not be tested.

Air compressor governor unloader pilot valve, type 7-Aux-525, was placed on test rack and the valve lifted at 141 pounds and seated at 130 pounds. The carrier's seal on the governor was not broken at the time this test was made. All air gages were tested on dead weight tester and found to be correct.

In order to estimate the elapsed time between the time the reservoir cutout valve was closed and the time at which the explosion occurred, a test was applied on the No. 2 main reservoir. The original 1-inch main reservoir cutout valve with the 1/4-inch drain was applied to this reservoir. The reservoir was charged to 140 pounds pressure (the working main reservoir pressure) and the cutout valve was then closed thereby opening the 1/4-inch drain. It required 4-1/2 minutes for the air pressure to drop from 140 pounds to atmospheric pressure. The inspector stated he spent about 1 minute in removing the suppression member from the brake valve after the air pressure had depleted before the explosion occurred. This would indicate that about 5 minutes 50 seconds had elapsed during which the Diesel engine operated at idling speed and the attached air compressor continued to build up pressure in the No. 1 main reservoir.

All the appliances which were not damaged or defective were reapplied to unit 4120 after both main reservoirs were renewed and the main reservoir air piping altered. Tests applied to the unit were satisfactory.

INSPECTION AND REPAIR REPORTS

The last annual inspection was made on June 10, 1952, at Spencer, N. C. The last monthly inspection was made on September 5, 1952, at Birmingham, Ala.

The daily inspection and repair reports for 30 days prior to the accident were examined and these showed no defects reported which would have any bearing on this accident.

SUMMARY OF EVIDENCE

One of the pipefitters stated that they were summoned by the inspector to unit 4120 to cut the main reservoir air off the brake valve. They immediately went to the unit, first entering the nose in order to find the cutout cock. Thinking the valve to the main reservoir supply line to the No. 8 distributing valve chamber was the valve sought, they closed it. Upon finding that this action did not deplete the air on the brake valve, they proceeded to trace the main reservoir air piping in order to find the cutout valve. It was found to be located at the back of the cab under the cab floor and was accessible only from the front of the engine compartment. After closing the main reservoir cutout valve, his co-worker returned to the nose of the unit to open the valve which first had been closed in error and called to him to come and verify this action. Immediately after he started into the nose of the unit, the explosion occurred and he was practically blown back into the operating cab. He had been struck in the chest by an unknown object and found breathing difficult. The dust in the cab at this time was very heavy and he crawled on his hands and knees to the left cab door. After descending to the ground by the left steps, he called for help for the other pipefitter who had been trapped in the nose of the unit.

The other pipefitter could not be interviewed at the time of this investigation due to his condition. His left leg was so badly injured that amputation between hip and knee had been necessary.

The inspector stated that the machinist inspector told him there was a leak at the brake valve on unit 4120. He went into the cab and put it in emergency position several times but this did not stop the leak. He went to the air room to get a suppression portion and in the meantime the unit had been backed out of the shop to the wash track. He returned to the unit and looked for the cutout cock back of the main reservoir but could not find it at the usual location. Then went to the shop and told the two pipefitters to come to the unit and show him where the cutout cock was located. They returned to the unit and the pipefitters looked for the cutout cock in the nose and back toward the engine. In the meantime he went back to the brake valve and noticed the pressure reducing. He sat there a minute or two waiting for the pressure to decrease sufficiently to permit changing the suppression portion. He had removed the two 1/2-inch nuts when the explosion occurred. He called the pipefitters and did not hear them answer. By this time the dust had settled so that he could look down in the nose of the unit where one of the men lay on the floor. He entered the nose and helped the injured man up and then noticed the condition of his leg. Help was summoned, a tourniquet was placed on the mangled leg, and ambulances were called. The inspector stated that he did not hear any safety valves release at any time.

CAUSE OF ACCIDENT

It is found that this accident was caused by defective brazing at a head of a main air reservoir and accumulation of excessive air pressure resulting from improper piping arrangement and an inoperative air compressor safety valve.

Dated at Washington, D. C., this 5th day
of January, 1953.

By the Commission, Commissioner Patterson.

SEAL

GEORGE W. LAIRD,
Acting Secretary.