

on this problem than on any other class of accidents. Because every time you have two train service employees injured by being struck or run over, one of them is killed.

A later poster on the same subject was entitled "What a Whale of a Difference a Few Feet Make!" It illustrated the vast difference from a safety point of view that a few feet can make when a man chooses to cross a track quite close to the end of a standing box car, behind which an engine may be approaching, and the same man doing the same thing at such a distance from the box car that he can readily see down the other track whether or not an engine is approaching.

Address

By WILLIAM BUSHNELL STOUT

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Detroit Aviation Society

The speaker said in part: When we start any new engineering development we get great punishment for our ignorance. In fact, I sometimes think there is only one sin in the world and that is ignorance, because we do get punished for it, and very quickly. And when we start a new industry of which we know nothing, when we are trying to find out what it is we are trying to do, we are in a very dangerous period of development. Then as we begin to realize and recognize those dangers, and use our intelligence to get around them, we get to a point of development where it is not dangerous any more, only hazardous. Then as we study further and acquire experience we come to a point where that industry by the application of intelligence and study becomes a safe and practical thing.

When we started in on aviation it was dangerous. There is no question about that. As we look back now we know just how dangerous it was. We knew nothing about what we were trying to do. We knew nothing of the stresses in the air. We had an idea that flying wouldn't require any particular strength; if you would just make something that was light enough it would go up in the air. So the first airplanes were made of very flimsy materials, put together with stove bolts, and with under-powered engines. They would just barely get off the ground and we knew nothing about flying. When a man got up and happened to pull the stick back and climbed too steeply so that he lost his speed and by losing his speed lost his lift and fell down, we called that a "nose dive" which was a very fatal thing.

Then we came to the idea—and it was forced on us very emphatically—that airplanes had to be strong. Our airplanes today are built to stand tremendous velocities. I was up in a ship yesterday that cruises at two hundred miles an hour, which is four times the stress that was felt in the Miami cyclone, and yet this ship sails along without any trouble or interference and is a thousand times safer than the first airplanes that would only go forty miles an hour.

This development was brought about by means of a whole lot of structural analysis. It required a good deal of experimental work to take the guess-work out of the building of the structural part of the airplane.

In the past, while we were learning what was going on, many wings came off. We started in with structures that were designed for flying loads and with a factor of safety of three or four times the flying load. At slow speeds, we got away with it. Then we began to step up the speeds. We got up to around 150 miles an hour and then, without any warning, and with no apparent reason, all of a sudden a wing would stay behind in the air and the airplane would dive ahead.

When one particular accident occurred that was given a great deal of prominence at the time, a very thorough investigation showed the trouble to be compression cracks in spruce spars. In other words, we had been making airplanes of wood and they were perfectly satisfactory at slow speeds because the stresses on the wood weren't sufficient to bother us, but when we got to high speeds the compression cracks began to develop, and after awhile the spar would fracture just like a fatigue crack. Immediately wooden airplanes were dropped from all air lines.

All of these developments have a very direct connection with safety. The newer things bring higher speeds, and on account of the higher speeds they must bring

new methods of stopping, new methods of grade crossing control, new methods of control of the automobile driver, who isn't always as smart as he might be, and a whole lot of other things.

On the air lines we find that the greatest handicap is the human element and undoubtedly we have the same difficulty as is indicated by these posters. In the early days when we first started flying on our lines in Detroit, we had about four instruments on the dash. We had pilots with pretty good training—probably a couple of hundred hours in the air, the best available in that day.

Those pilots would take those planes and fly them. If there was a fog, they would land. They didn't know anything about flying blind. If they got into a fog they didn't know whether they were upside down or rightside up, and no man in the world could tell.

Today, however, things are different. Yesterday in Detroit I rode in a ship at a speed of 200 miles an hour which had about \$6,000 worth of instruments on the dash. The dash is a small area and it is just full of instruments of every kind. The pilot who has flown for many, many years can fly blind even better than he can fly when he looks out of the cabin. He has a radio beam on which he flies accurately as on a string from one town to another. When he wants to land, he can pull down his flaps and land in a space the length of a good sized room.

As part of his training, every six months the pilot goes out with a Department of Commerce man. He is put in the cabin and everything is shut up so he can't see a thing. They take him out for an hour and lose him. He doesn't know what direction he is going. The instruments are covered. At the end of an hour's time they pull the covers off the instruments and tell him to find out where he is. He has to go through a number of maneuvers first, right and left turns, etc. Then he has to find a certain city and tell the instructor, or the man who is examining him, when he is over the airport.

Suppose they leave from Pittsburgh and fly in the direction of Detroit. They fly for an hour. Well, this other chap doesn't know but what they are down in Washington, because he can go a long distance in an hour, at 200 miles an hour.

At the end of that time, he is turned loose and told to take the Department of Commerce examiner to the airport at Cleveland. He feels around, until he picks up a beacon. He listens to the beacon until he locates it and finds out what beacon it is—between which two cities it is. That gives him his clue as to where he is. Then he takes a compass course until the picks up the beacon running into Cleveland, follows the beacon into Cleveland, and when he gets over the airport, by the landing signal on the beacon, he signals his examiner. If he does that successfully he can fly for another six months or until his next examination.

You will see that we go to the greatest extremes on everything connected with the air lines to insure the safety of passengers because undoubtedly air transportation, to the man in the plane, and everyone else, is the most hazardous type of transportation we have developed as yet. For that very reason, it can be made the safest, because we have to take these safety precautions, whether we want to or not.

Progress and Possibilities in the Prevention of Injuries to Railroad Employees

By T. H. CARROW

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The speaker said in part: In the year 1924, the Committee on Statistics concluded that the bulk of all injuries to employees were chargeable to the human element and that "by improved training, supervision and discipline," which implied the formulation and enforcement of safety rules, a 5 per cent reduction in the casualty rate could be effected each year, which, by the end of 1930, would be equivalent to 35 per cent, which figure was established as the safety goal. It is important to bear in mind that up to 1924, discipline, which was mentioned in the committee's report as a primary means of improving the employee injury record, had not been invoked to any appreciable extent by very many roads.