TRANSPORTATION SAFETY INFORMATION REPORT

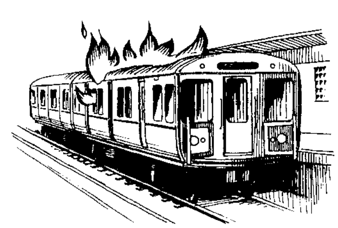
ASSISTANT SECRETARY
FOR ENVIRONMENT, SAFETY
AND CONSUMER AFFAIRS

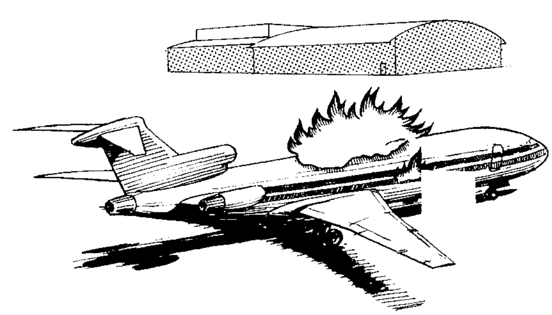
JULY, AUGUST AND SEPTEMBER 1976 QUARTERLY HIGHLIGHTS

- **Total Transportation** *fatalities for the third quarter of 1976 increased approximately 1% over the third quarter of 1975.*
- **Highway and Traffic** fatalities rose 0.8% for the quarter, but they were over 14% lower than the same quarter of the base year of 1973.
- **Rail** fatalities dropped 20.4%; accidents and injuries increased substantially.
- **Air Carrier** fatalities declined; fatal and non-fatal accidents also dropped.
- **General Aviation** fatalities increased 7.6%; fatal accidents rose slightly.
- **Pipeline** fatalities, accidents and injuries increased significantly
- **Hazardous Materials** fatalities and injuries dropped; incidents increased noticeably.
- **Rail/Highway Grade-Crossing** fatalities rose 8.0%

Feature Of The Quarter (see p. 57)

TRANSPORTATION FIRE SAFETY FOCUSES ON SMOKE AND TOXICITY





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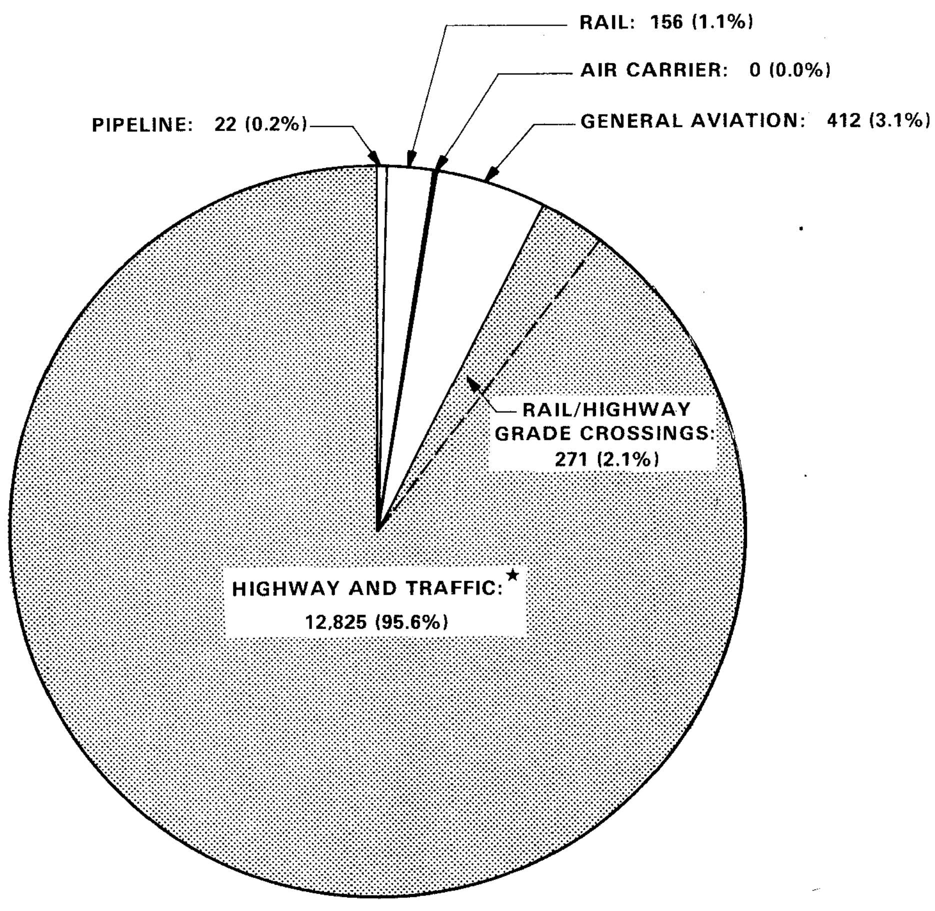
SUMMARY STATISTICS OF TRANSPORTATION SAFETY

A quarterly comparison of the fatality totals shown in Table 1 reveals that total transportation fatalities rose only slightly in the third quarter of 1976 over the third quarter of 1975. Highway, General Aviation and Pipelines all experienced an increase in fatalities when compared with the same period a year ago. These increases were offset somewhat by the Air Carriers and Railroads, who, for the second quarter in succession, showed a decline in fatalities when compared with the same quarters in 1975.

Hazardous Materials and Rail/Highway Grade Crossing fatalities differed in their trends. Fatalities resulting from Hazardous Materials incidents declined while Rail/Highway Grade Crossing fatalities increased in the third quarter of 1976 compared with the same period last year.

CHART 1 - TRANSPORTATION FATALITIES, THIRD QUARTER 1976



TOTAL FATALITIES: 13,415

★ These fatalities are based on a thirty-day definition (see glossary)

TABLE 1. TRANSPORTATION FATALITIES FOR 1976 COMPARED WITH 1975

CLASSIFICATION	JANUARY			FEBRUARY			MARCH		
	1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
HIGHWAYS & TRAFFIC [3]	3060	2989	-2.3	2811	2934	+4.4	3334	3179	-4.6
RAILROAD	51	50	-2.0	32	41	+28.1	38	38	0.0
AIR CARRIER	0	0	0.0	2	3	+50.0	0	4	[1]
GENERAL AVIATION	124	68	-45.2	103	107	+3.9	103	99	-3.9
RECREATIONAL BOATING	45	48	+6.7	47	64	+36.2	94	96	+2.1
PIPELINES	3	21	[2]	1	13	[2]	0	6	[2]
TOTAL TRANSPORTATION	3283	3176	-3.3	2996	3173	+5.9	3569	3410	-4.5
HAZARDOUS MATER. ONLY [*]	0	0	0.0	0	0	0.0	0	0	0.0
RAIL/HWY GC ONLY [*]	90	143	+58.9	85	81	-4.7	87	94	+8.0

CLASSIFICATION	APRIL			MAY			JUNE		
	1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
HIGHWAYS & TRAFFIC [3]	3395	3601	+6.1	3947	4079	+3.3	4061	3895	-4.1
RAILROAD	30	41	+36.7	53	33	-37.7	59	41	-30.7
AIR CARRIER	0	38	[1]	0	0	0.0	112	0	-100.0
GENERAL AVIATION	100	106	+6.0	106	104	-1.9	99	92	-7.1
RECREATIONAL BOATING	137	130	-5.1	240	158	-34.2	255	183	-28.2
PIPELINES	0	0	0.0	4	0	[2]	2	5	[2]
TOTAL TRANSPORTATION	3662	3916	+6.9	4350	4381	+0.7	4588	4210	-8.2
HAZARDOUS MATER. ONLY [*]	4	0	[2]	2	5	[2]	2	2	[2]
RAIL/HWY GC ONLY [*]	62	59	-4.8	77	94	+22.1	69	90	+30.4

CLASSIFICATION	JULY			AUGUST			SEPTEMBER		
	1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
HIGHWAYS & TRAFFIC [3]	4445	4571	+2.8	4346	4318	-0.6	3937	3936	0.0
RAILROAD	55	56	+1.8	81	52	-35.8	60	48	-20.0
AIR CARRIER	0	0	0.0	10	0	-100.0	0	0	0.0
GENERAL AVIATION	125	142	+13.6	144	126	-12.5	114	144	+26.3
RECREATIONAL BOATING	225	171[4]	[4]	162	124[4]	[4]	84	88[4]	[4]
PIPELINES	0	7	[2]	1	9	[2]	3	6	[2]
TOTAL TRANSPORTATION	4625[5]	4776[5]	+3.3	4582[5]	4505[5]	-1.7	4114[5]	4134[5]	+0.5
HAZARDOUS MATER. ONLY [*]	0	3	[1]	16	1	-93.8	2	1	[2]
RAIL/HWY GC ONLY [*]	85	84	-1.2	86	90	+4.7	80	97	+21.3

CLASSIFICATION	THIRD QUARTER			FIRST 9 MONTHS		
	1975	1976	% CHANGE	1975	1976	% CHANGE
HIGHWAYS & TRAFFIC [3]	12728	12825	+0.8	33336	33502	+0.5
RAILROAD	196	156	-20.4	459	400	-12.9
AIR CARRIER	10	0	[2]	124	45	-63.7
GENERAL AVIATION	383	412	+7.6	1018	988	-2.9
RECREATIONAL BOATING	471	383[4]	[4]	1289	1062[4]	[4]
PIPELINES	4	22	+450.0	14	67	+378.6
TOTAL TRANSPORTATION	13321[5]	13415[5]	+0.7	34951[5]	35002[5]	-0.1
HAZARDOUS MATER. ONLY [*]	18	5	-72.2	26	12	-53.8
RAIL/HWY GC ONLY [*]	251	271	+8.0	721	832	+15.4

[*] These fatalities are included in the above modes and Total Transportation.
[1] Not calculable.
[2] Percent changes not shown because size of base makes comparison misleading.
[3] These fatalities based on a 30-day definition (see Glossary).
[4] Figures not complete.
[5] Totals do not include recreational boating.

HIGHWAY AND TRAFFIC

SAFETY PERFORMANCE

Highway and Traffic fatalities rose in the third quarter and during the first nine months of 1976 over the same periods in 1975, as shown in Table 2. However, they continue to be significantly lower than the corresponding periods in 1973, which the National Highway Traffic Safety Administration (NHTSA) uses as the base year for statistical comparison. There were 7,220 fewer lives lost during the first nine months of 1976 when compared with the same period in 1973 -- almost an 18% reduction in fatalities.

TABLE 2. HIGHWAY AND TRAFFIC FATALITIES*FOR 1976 COMPARED WITH 1975 AND 1973

JANUARY			FEBRUARY			MARCH		
1973	1975	1976	1973	1975	1976	1973	1975	1976
3,770	3,060	2,989	3,455	2,811	2,934	4,268	3,334	3,179

% CHANGE		% CHANGE		% CHANGE	
1973-76	1975-76	1973-76	1975-76	1973-76	1975-76
-20.7	-2.3	-15.1	+4.4	-25.5	-4.6

APRIL			MAY			JUNE		
1973	1975	1976	1973	1975	1976	1973	1975	1976
4,411	3,395	3,601	4,707	3,947	4,079	5,072	4,061	3,895

% CHANGE		% CHANGE		% CHANGE	
1973-76	1975-76	1973-76	1975-76	1973-76	1975-76
-18.4	+6.1	-13.3	+3.3	-23.2	-4.1

JULY			AUGUST			SEPTEMBER		
1973	1975	1976	1973	1975	1976	1973	1975	1976
5,084	4,445	4,571	5,134	4,346	4,318	4,821	3,937	3,936

% CHANGE		% CHANGE		% CHANGE	
1973-76	1975-76	1973-76	1975-76	1973-76	1975-76
-10.1	+2.8	-15.9	-0.6	-18.4	0.0

THIRD QUARTER			FIRST 9 MONTHS		
1973	1975	1976	1973	1975	1976
15,039	12,728	12,825	40,722	33,336	33,502

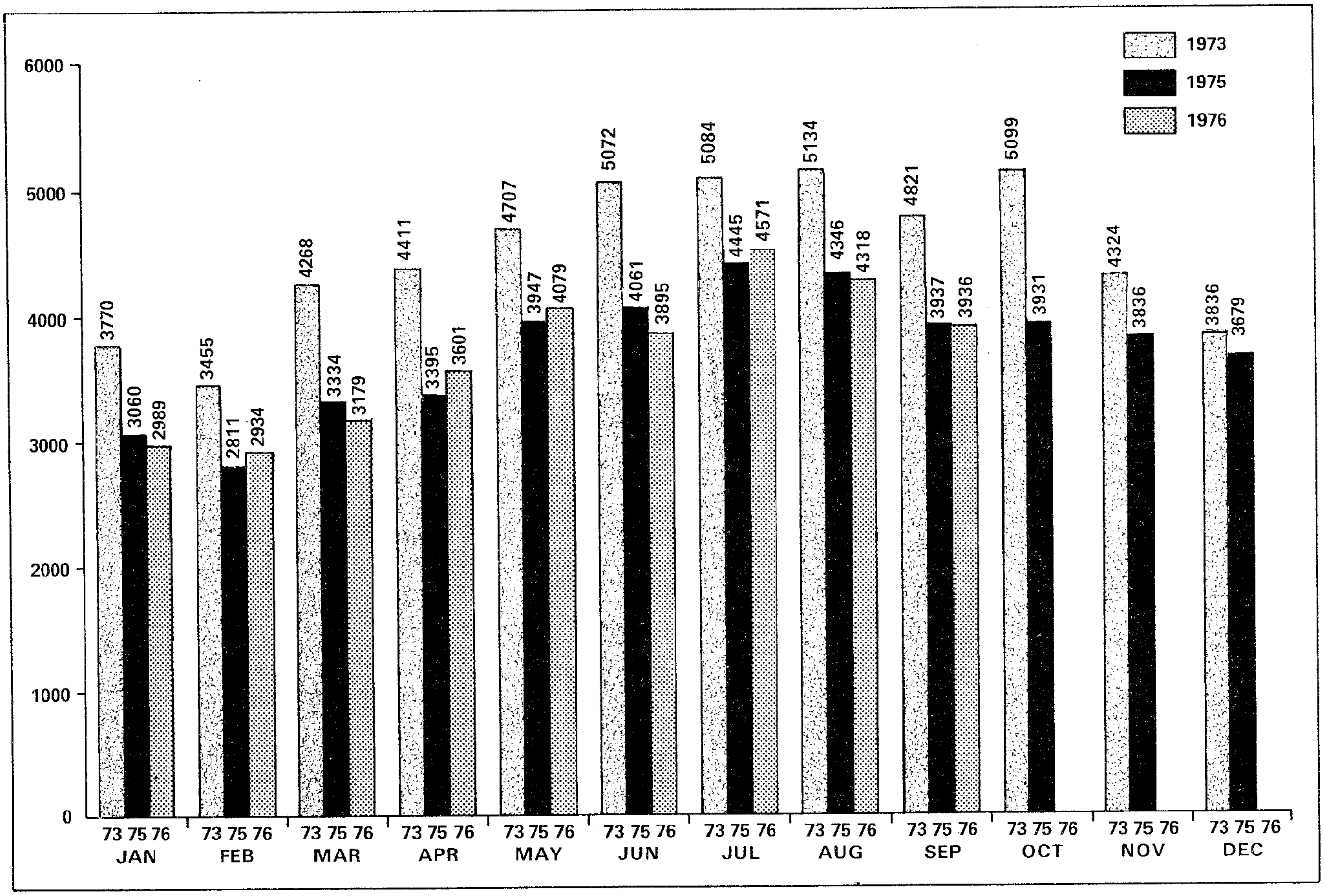
% CHANGE		% CHANGE	
1973-76	1975-76	1973-76	1975-76
-14.7	+0.8	-17.7	+0.5

These fatalities are based on a 30-day definition, i.e., a death resulting from accident injuries occuring within 30 days of the accident.

SOURCE: National Highway Traffic Safety Administration (N43-33).

*Monthly fatalities are the latest received as of this quarter.

CHART 2 - HIGHWAY AND TRAFFIC FATALITIES* BY MONTH, 1973, 1975, AND 1976



* These fatalities are based on a thirty-day definition (see glossary)

MODAL SAFETY HAZARDS

Rail/Highway Grade Crossing Accidents

Once again the dangers of having approximately 158,000 grade crossings[1] in the U.S. which do not have active signal systems such as flashing lights or gates to warn of an approaching train is evident from the following report from the National Transportation Safety Board (NTSB).

At 6:50 p.m.,c.s.t., on February 7,1976, a westbound Baltimore and Ohio freight train struck a pickup truck at an unprotected grade crossing in Beckemeyer, Illinois, when the truck crossed the tracks without stopping. Of the 16 persons in the truck, 12 were killed and 3 were injured.

[1] Report to Congress, Railroad-Highway Safety, Part II, "Recommendations for Solving the Problem," DOT, 1972.

The NTSB determined that the probable cause of the accident was the failure of the truck driver to notice the approaching train and to stop his vehicle short of the tracks. The lack of active grade crossing signals at the crossing probably contributed to this accident.

As a result of its investigation, the NTSB submitted the following recommendations to the Federal Highway Administration:

> "Develop models or formulae and criteria which, in addition to assessing the hazard of grade crossings, will produce an output which indicates the need to consolidate and upgrade crossings or to close up certain crossings. (H-76-31) (Class II, Priority Followup)"

> "Publish these models, formulae, and criteria, make them available to each State and to the operating railroads, and urge their use in assessing grade crossings. (H-76-32) (Class II, Priority Followup)"

SAFETY PROGRAM HIGHLIGHTS

The following material was supplied by the Federal Highway Administration (FHWA).

Construction Zone Safety

The FHWA has begun a rulemaking process which may lead to tighter regulations on traffic control plans in construction zones.

This process began with the publication of an "Advance Notice of Proposed Rulemaking" in the Federal Register, September 23, 1976. This Notice did not suggest any particular new regulations, but asked for suggestions and comments. In particular, FHWA wants to know whether it should require a reasonably specific traffic control plan as a part of the plans, specifications, and estimates for each project, and whether it should require highway agencies to designate a specific staff person to be responsible for the traffic control plan and other construction zone safety aspects.

Comments were received through November 22, 1976. After these comments are digested, specific proposals are expected. A general review of construction zone regulations is a part of an out-of-court settlement reached by FHWA in a suit involving the use of timber barricades on an Interstate work site.

Meanwhile, an FHWA demonstration project is promoting the use of a new type of breakaway barricade constructed of plastic pipe sections lightly fitted together. Also, a slide-tape package entitled "Temporary Barriers in Construction Zones" has been distributed to FHWA field offices. This slide-tape package shows both good and bad examples of temporary installations in various parts of the country. Emphasis is placed on the use of precast sections of concrete median barrier that has the "safety shape." The package is the first in a series of packages on safety in construction zones and it is expected that another package on the use of construction barriers will soon be ready for distribution.

Revision of Federal Hazardous Material Regulation for Motor Carriers

Safety Investigator Heber Dixon conducted an in-depth investigation of an incident which occurred May 16, 1976, on I-71, Massie Township, Warren County, Ohio, involving fire and explosion resulting from vapors escaping from around unsecured caps on "tote bins" containing adhesive, a flammable liquid, loaded in the front portion of the van trailer. Property damage amounted to $30,000.

After evaluation of the investigator's recommendation, a decision was made to incorporate preventive measures into the planned revision of Part 177 of the Federal Hazardous Materials Regulations which will require motor carriers to take positive steps to ensure that all closures on large containers are tight before the containers are loaded into the transport vehicle.

Evaluating FHWA's Safety Standards

One significant aspect of FHWA's highway safety efforts involves the Highway Safety Program Standards authorized by the Highway Safety Act of 1966.

Because of the changed perspective on safety problems and program management since 1966, Congress has determined that a new comprehensive look at the standards is in order.

The 1976 Highway Safety Act requires the Secretary of Transportation to evaluate "the adequacy and appropriateness" of the program standards and report to the Congress by July 1, 1977.

As with normal program responsibilities, FHWA is taking the lead in evaluating the 3+ standard areas, as well as the important input areas of Standard 10, Traffic Records, and Standard 18, Accident Investigation and Reporting.

The final report will combine the National Highway Traffic Safety Administration's evaluation of the "14+" Standards with FHWA's evaluation of the 3+ into a single report to the Congress. Information and data for FHWA's study will come from three sources.

The first and largest source of information will come from reviews already completed. For example, reviews of management systems and data collection and analysis systems recently completed by FHWA division offices offer sound starting points.

Other sources such as the Safety Improvement Program Annual Reports and research efforts also will be consulted.

Regions 4, 5, and 8 also have completed in-depth safety review efforts which should provide valuable information. The other two data collection efforts will be used to fill in gaps in information or gather more in-depth information.

The second effort will be a national canvass of experience with the current standards, and opinions concerning those experiences.

This canvass, done in cooperation with the National Highway Traffic Safety Administration, will be distributed to State highway agencies, Governors' Representatives for highway safety, Federal and local agencies and public and private groups.

The Office of Highway Safety also will seek the views of Region and Division offices as the administrators of this Federal-State-local program.

The third source of information will be drawn from visits to several selected States. The States visited were Maryland, Alabama, Texas, Utah, Pennsylvania, Massachusetts, Michigan, California and Washington.

Crosswalk Illumination System

The application of a specially designed crosswalk illumination system has been found to result in improved pedestrian visibility, crossing behavior and safety at high-accident urban intersections. These research findings were reported in a paper presented to the Illuminating Engineering Society Annual Technical Conference in Cleveland, Ohio, on September 2, 1976. The research was conducted by a contractor for the FHWA. In order to assist planners and engineers in the design, evaluation, and implementation of special crosswalk illumination, a Users Manual has been prepared and is available from the National Technical Information Service, Springfield, Virginia 22151 - Report No. FHWA-RD-76-9.

The Truck Drivers Handbook A Success

The response from the motor carrier industry to "The Interstate Truck Driver's Handbook" has been extremely positive. FHWA has printed only a limited number of copies and, as mentioned in the last issue of TRANSIS, they are encouraging the reproduction of the handbook by the private sector.

The purpose of the new publication, which is printed in both English and Spanish versions, is to explain the complex legal language of the Federal Motor Carrier Safety Regulations (FMCSR) in a more understandable form. It also serves as a useful training aid to truck drivers.

A limited number of copies are still available and single copies may be obtained by contacting the Director, Bureau of Motor Carrier Safety, FHWA.

Fog Guidance Strategies

The FHWA Office of Research has awarded a contract to conduct a study of the "Effectiveness of Reduced Visibility Guidance Techniques." The 2-year effort will evaluate the impact of various existing systems and guidance strategies on safety and traffic operations under reduced visibility conditions such as fog. The systems and strategies studied, for example, may involve simple signing techniques or complex fully automated guideway systems consisting of pavement inset lights, roadway lighting, advisory signing, and fog detectors. Comprehensive guidelines will be prepared for highway agencies detailing the costs, benefits, and recommendations for different categories of reduced visibility guidance systems to serve different geometric, traffic, and environmental conditions.

Ramp and Speed Change Lane Study

FHWA signed a contract on September 30, for a study titled "Improving the Traffic Operations and Safety of Ramps and Speed Change Lanes." The contract is a 3-year study to improve traffic operations and safety at ramps and speed change lanes. A state-of-the-art evaluation including an investigation of accidents at interchanges, analytical techniques, and field observations will be used to develop cost-effective procedures and geometric design criteria to plan, design, and construct both new and existing ramps and speed change lanes. The procedure and criteria developed will accommodate a large variety of highway geometric design elements, vehicle types, and speeds to reduce the amount of driver judgment and vehicle handling now required on a ramp.

Seasonal Variations of Pavement Skid Resistance

Skid resistance of pavements undergoes what is generally called seasonal variation. Thus, a pavement may exhibit adequate skid resistance at one time, while another measurement at another time may indicate a much lower skid number. Generally the lowest skid resistance is measured in late summer. For economic and scheduling reasons skid resistance testing must be conducted during most of the year, so that a large proportion of the test data do not represent the lowest skid resistance of a particular pavement. Research is underway in Pennsylvania to identify the factors responsible for these seasonal variations and provide methods for estimating the lowest skid resistance from measurements taken at any time of the year.

Since seasonal variations are expected to vary with geographic and climatic differences, FHWA is recommending that similar studies be initiated in other States.

Improved Technique For Measuring Hydroplaning Potential of Pavements

Another instance of the application of "Space Technology Spinoff" for highway purposes is the use of a gyrostabilized inertial platform developed at the NASA Marshall Space Flight Center as the vertical reference component of a proposed new hydroplaning measurement system. In a FHWA research contract administered by the Structures and Applied Mechanics Division of the Office of Research, the Southwest Research Institute is assembling and testing a new instrumentation system which involves the use of the inertial platform in a moving vehicle to measure the hydroplaning potential of highway pavements.

Effect of Pavement Grooving

The practice of grooving highway pavement surfaces, for improved drainage of rainwater, has become widespread. Initially, grooves were sawed, primarily in Portland cement concrete pavements of low skid resistance. While this method is still used, many pavements are now grooved during construction, before the concrete has hardened. Grooving is done either longitudinally along the highway or transversely across the highway.

As reported in the last issue of TRANSIS, grooved pavements drastically reduce the frequency of skid accidents as shown by accident statistics. Thus, the safety benefit of pavement grooving has clearly been established. At the same time, however, complaints were received, primarily from motorcycle riders, that grooves constitute a hazard to them.

A recent study "Effect of Pavement Grooving on Friction, Braking and Vehicle Control" has attempted to identify any detrimental effects of pavement grooving on motorcycles and other small-tired vehicles. Tests were conducted on various groove configurations as commonly used on highways. No measurable effects on handling could be recorded. The study concluded that pavement grooves in the size range tested present no hazards.

Laboratory Investigation of Breakaway Roadside Structures

The impact performance of breakaway roadside structures, such as lamp posts and signs with slipbase supports, have generally been measured through full-scale collision tests.

FHWA has led the way in developing test procedures and methods that may make extensive full-scale crash testing of such structures unnecessary. One method is to allow a swinging pendulum mass to impact the target sign or luminaire support structure simulating a vehicle impact. A recent improvement was the introduction of a crushable portion on the impacting mass, duplicating the deformation behavior of a compact automobile and in this way more accurately predicting the full-scale vehicle impact behavior.

Coupled with the use of pendulum testing is a new laboratory dynamic fracture toughness test for making inexpensive frangible base material impact property tests of small specimens of the same materials used in prototype structures. In the coordinated use of the two techniques, the cost of testing can be reduced, and the reliability of the results can be improved.

Human Factors Considerations of Decreased Signal Lamp Intensity

Suggestions have been made to decrease night traffic signal lamp intensity as a fuel conservation measure. Proponents indicate that dimming signals will result in energy savings from wattage and safety benefits from decreased glare. In order to make a decision on whether or not signal dimming should be adopted, it was necessary to assess the effects that decreased brightness would have on safety and traffic operations.

The Human Factors Branch, Office of Traffic Operations, FHWA, performed a detailed human factors analysis of night traffic signal intensity requirements. Its emphasis was on the reception and use of information from round traffic signals and the implications of reduced brightness on visibility.

It was concluded that the 8-inch (200 mm) signal should not be dimmed. It was concluded that the 12-inch (300 mm) signal could be dimmed at night locations where background luminance conditions were low, and that dimming should be achieved on the basis of adhering to visibility criteria and in accordance with engineering judgment.

Speed-Control Signs for Small Rural Towns

A comprehensive experiment dealing with speed control and driver behavior when approaching and driving through small-town speed zones on a high-speed, rural two-lane highway has been completed. The basic objective of the experiment was to develop safe practical traffic control devices which alert drivers to the need for reducing speed when approaching concentrated areas of rural population and invoke involuntary compliance with the speed regulatory devices in a manner promoting increased safety in vehicle operation. Twelve different configurations of speed limit signs and warning devices were evaluated at the Maine Facility in the small town of Palmyra, Maine, located along U.S. Route 2. The speed regulation in effect for all sign configurations was 35 mph (56 k/m). Results showed that:

- Traffic-activated warning signals were the most effective (statistically significant) for both day and night conditions.
- During the day, signs with flashing beacons were second in effectiveness (after traffic-activated signs).
- At night, pavement markings and rumble strips were second in effectiveness (after traffic-activated signs).

Safer Highway Light Pole Bases

A series of tests were recently completed on cast aluminum transformer bases modified to improve their impact performance. These tests are noteworthy since they represent the first successes with simple, low-cost modifications to standard bases that may allow previously unacceptable bases (by AASHTO sign and luminaire support impact acceptance criteria) to be used as breakaway bases on our Nation's highways. The modification concepts stemmed from fracture research conducted within FHWA Structures and Applied Mechanics Division during the past three years. These results may well allow transformer base luminaires, made obsolete by the new AASHTO criteria, to be used as safety hardware again. It is expected that these same modification techniques can be applied to flange-base luminaires as well. The problem has been to find a way to weaken the bases to lessen the impact loads without interfering with or degrading the fatigue life of the structure. These new findings, using a concept suggested by the staff of FHWA Structures and Applied Mechanics Division, are an important step in the solution of this problem.

The following material was supplied by the National Highway Traffic Safety Administration (NHTSA):

Agencies Cooperate in Solving Tire Problem

Three Government agencies, working together, have solved a tire-highway-housing safety problem to the mutual satisfaction of each.

The Department of Housing and Urban Development (HUD) is responsible for setting standards for mobile homes. These homes are fitted with tires so they may be moved over the public highways. The Bureau of Motor Carrier Safety (BMCS) has responsibility for determinating if the tires are safe for use on the highway. The conditions of use are unusual. The tires are used only once to carry their load less than 300 miles distance from the site of manufacture. The tires in this use may be overloaded as much as 50 percent. The theory is that they can perform safely in this application because of the limited use. HUD asked the Tire Systems Division, Safety Research Laboratory (NHTSA), to develop an urgently needed test to determine if the tires can be expected to perform safely under these conditions. A test was developed in one week and presented to BMCS and HUD. Both have agreed to accept the results of a test on 30 tires.

GM Agrees to Recall and Civil Penalties in Engine Mount Case

The NHTSA and GM have reached a settlement in an engine mount case, wherein GM agreed to recall and remedy the defect, and to pay a civil penalty of $95,000. This case involved 1965 and 1967 Buick Wildcats and early production 1970 Cadillacs. These vehicles are subject to engine mount failure which may result in sudden throttle jamming and loss of vehicle control. Owners of these vehicles will now, under the terms of the settlement, have their vehicles recalled to have this dangerous condition repaired free of charge.

National Speed Limit Key to Major Safety Benefits

The 55-mph national speed limit, a by-product of the 1974 energy crisis, has resulted in safety benefits of major proportions. Throughout 1974 and 1975, the nation experienced a reduction of 17 percent in the number of people killed on the highways as compared with 1973. While fuel availability and travel in 1975 were either back to normal or exceeded the pre-energy shortage level, the country continued to enjoy the same safety benefits last year as in 1974. The fact that fewer people lost their lives leaves little doubt that the imposition of reduced speed limits was a significant factor in the fatality decline.

Accidents on the nation's highways claimed an estimated 45,674 lives in 1975. This is 6,000 less than in 1967, the year after Congress mandated a national safety effort, and some 9,000 fewer than 1973, the base year used by NHTSA for statistical comparison. While the number of traffic deaths last year rose a fraction over the 1975 number (45,535), the traffic fatality rate per 100 million vehicle miles declined to 3.47, the lowest level on record.

Other factors which have also contributed to the lowering of the fatality rate are:

- Improved designs for safer roadways,guardrails and roadside signs and the reduction of the number of other roadside hazards.
- Improved emergency medical service to assist accident victims.
- Effective modern law enforcement techniques and equipment.
- Increased public attention to both motoring and pedestrian dangers.
- Safer motor vehicles built in accordance with motor vehicle safety standards.

Decreases in the fatality rate occurred despite numerous factors which could have produced a trend in the opposite direction. Such factors are:

- The growing numbers of vehicles, drivers, and miles traveled which add up to more traffic and more opportunity for accidents to happen.
- The increase in youthful drivers (the most accident-prone age group) as a percentage of all drivers. While only 22 percent of all licensed drivers are in the 16-24 age group, they are involved in 35 percent of the fatal accidents and 39 percent of all crashes.
- The abuse of alcohol, which is involved in half the fatal accidents on the highways. Per capita consumption of distilled spirits rose 36 percent from 1965 to 1974.
- The widening disparity in vehicle mix (more heavy vehicles and more small cars on the road). In two-car collisions, it is almost always the smaller car and its occupants that sustain the greater damage.

RAIL

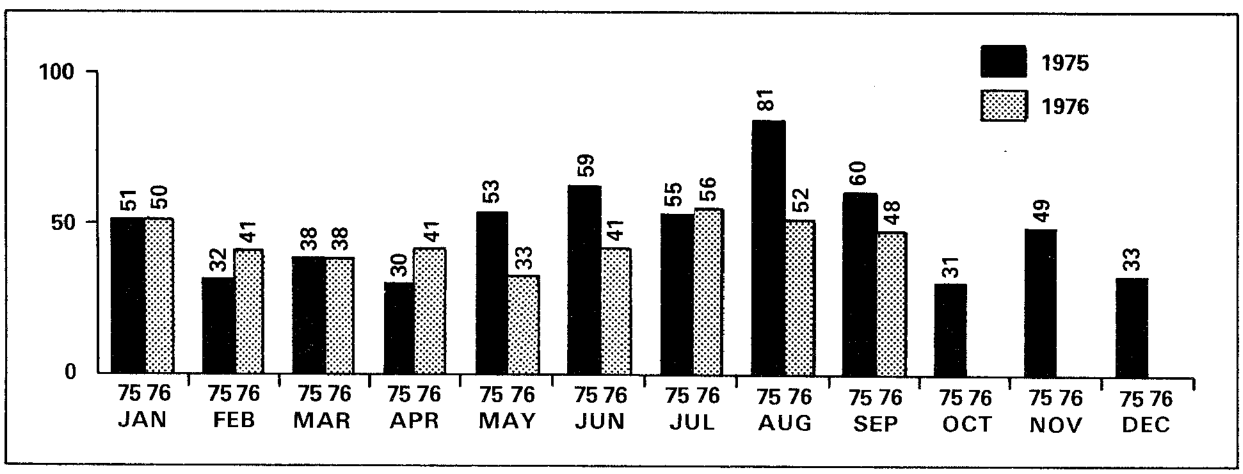
SAFETY PERFORMANCE

Fatalities due to Railroad accidents declined in the third quarter and in the first nine months of 1976 from the same periods in 1975, while Rail/Grade Crossing fatalities continued to rise, as shown in Table 3.

Train accidents and injuries increased significantly in the third quarter and during the first nine months of 1976. Accidents rose 20.3% in the third quarter and almost 22% during the first nine months when compared with the same periods in 1975. A total of 7,145 train accidents occurred in the first nine months of 1976 compared with 5,876 in the same period a year ago - a net increase of 1,269 accidents.

Injuries also increased significantly. A total of 17,804 injuries were reported in the third quarter and 47,172 in the first nine months of 1976 compared with 14,710 and 38,600, respectively, for the same periods a year ago.

CHART 3 - RAILROAD FATALITIES* BY MONTH, 1975 - 1976



* EXCLUDING FATALITES FROM RAIL/GRADE CROSSING ACCIDENTS

TABLE 3. RAILROAD FATALITIES FOR 1976 COMPARED WITH 1975

CLASSIFICATION	JANUARY			FEBRUARY			MARCH		
	1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
EMPLOYEES ON DUTY	13	10	-23.1	7	11	+57.1	12	13	+8.3
EMPLOYEES NOT ON DUTY	0	0	0.0	0	3	[1]	0	0	0.0
PASSENGERS	1	0	-100.0	0	0	0.0	2	0	-100.0
TRESPASSERS	38	47	+23.7	29	28	-3.4	30	32	+6.7
OTHERS	89	136	+52.8	81	80	-1.2	81	87	+7.4
TOTAL RR AND GC	141	193	+36.9	117	122	+4.3	125	132	+5.6
GRADE CROSSING ONLY [2]	90	143	+58.9	85	81	-4.7	87	94	+8.0
RAILROAD ONLY [2]	51	50	-2.0	32	41	+28.1	38	38	0.0

CLASSIFICATION	APRIL			MAY			JUNE		
	1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
EMPLOYEES ON DUTY	1	5	+400.0	15	1	-93.3	7	3	-57.1
EMPLOYEES NOT ON DUTY	0	1	[1]	0	1	[1]	0	1	[1]
PASSENGERS	0	0	0.0	1	0	-100.0	2	0	-100.0
TRESPASSERS	33	39	+18.2	47	36	-23.4	58	37	-36.2
OTHERS	58	55	-5.2	67	89	+32.8	61	90	+47.5
TOTAL RR AND GC	92	100	+8.7	130	127	-2.3	128	131	+2.3
GRADE CROSSING ONLY [2]	62	59	-4.8	77	94	+22.1	69	90	+30.4
RAILROAD ONLY [2]	30	41	+36.7	53	33	-37.7	59	41	-30.5

CLASSIFICATION	JULY			AUGUST			SEPTEMBER		
	1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
EMPLOYEES ON DUTY	11	8	-27.3	10	9	-10.0	14	8	-42.9
EMPLOYEES NOT ON DUTY	0	0	0.0	1	0	-100.0	0	0	0.0
PASSENGERS	2	3	+50.0	1	0	-100.0	0	0	0.0
TRESPASSERS	45	44	-2.2	70	50	-28.6	47	48	+2.1
OTHERS	82	85	+3.7	85	83	-2.4	79	89	+12.7
TOTAL RR AND GC	140	140	0.0	167	142	-15.0	140	145	+3.6
GRADE CROSSING ONLY [2]	85	84	-1.2	86	90	+4.7	80	97	+21.3
RAILROAD ONLY [2]	55	56	+1.8	81	52	-35.8	60	48	-20.0

CLASSIFICATION	THIRD QUARTER			FIRST 9 MONTHS		
	1975	1976	% CHANGE	1975	1976	% CHANGE
EMPLOYEES ON DUTY	35	25	-28.6	90	68	-24.4
EMPLOYEES NOT ON DUTY	1	0	-100.0	1	6	+500.0
PASSENGERS	3	3	0.0	9	3	-66.7
TRESPASSERS	162	142	-12.3	397	361	-9.1
OTHERS	246	257	+4.5	683	794	+16.3
TOTAL RR AND GC	447	427	-4.5	1180	1232	+4.4
GRADE CROSSING ONLY [2]	251	271	+8.0	721	832	+15.4
RAILROAD ONLY [2]	196	156	-20.4	459	400	-12.9

[1] Not calculable.
[2] These fatalities are included in the above classifications and Total RR and GC.

SOURCE: FRA, Office of Standards and Procedures, (RRS-25).

CHART 4 - RAILROAD INJURIES BY MONTH, 1975-1976

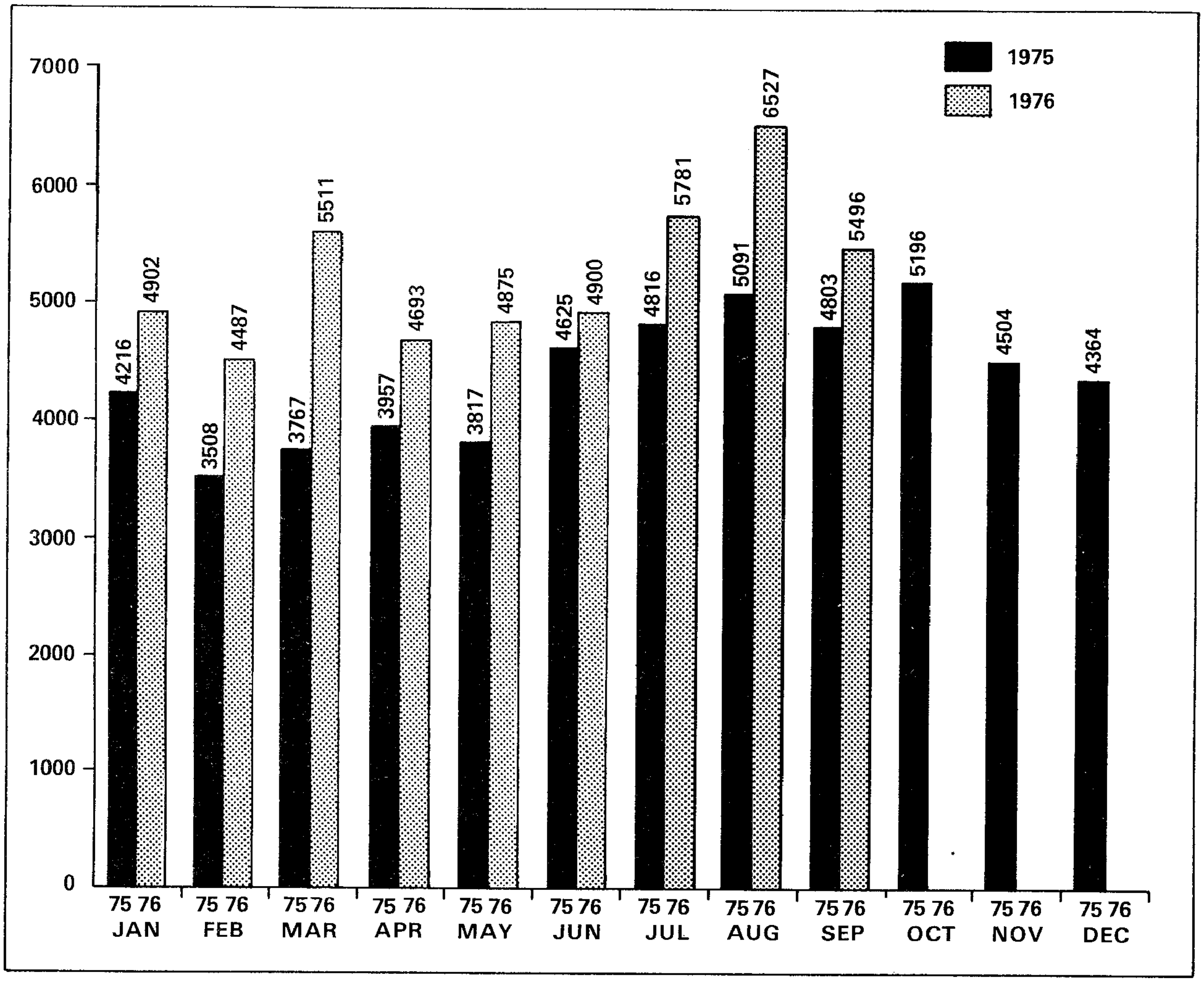
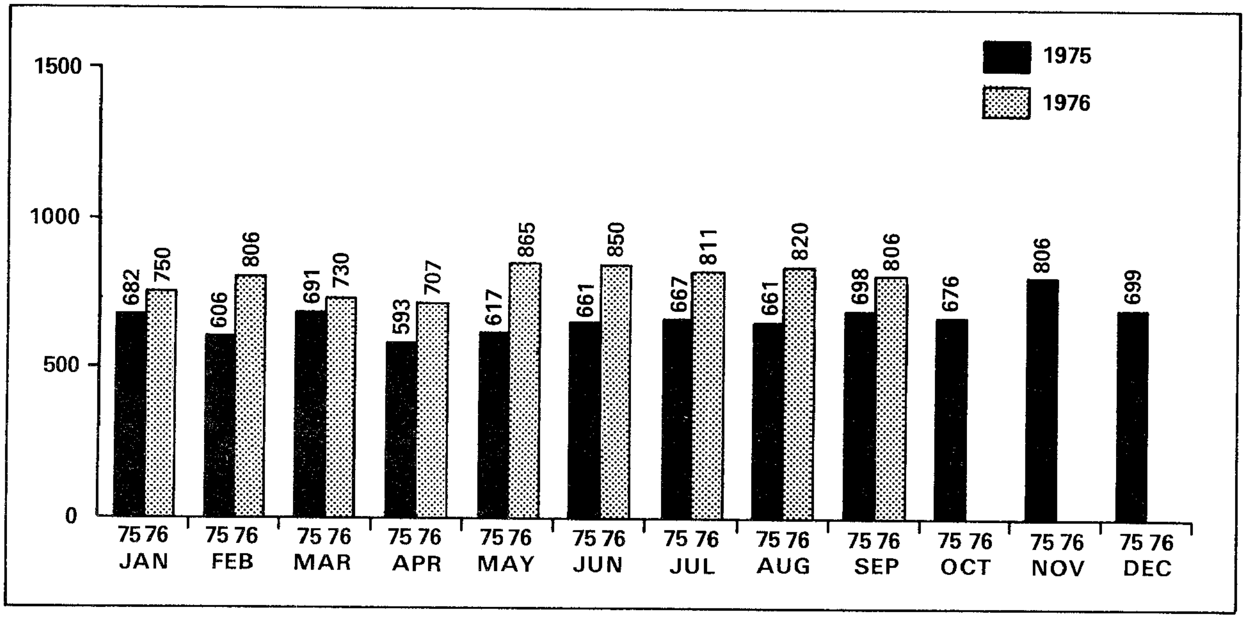


CHART 5 - RAILROAD ACCIDENTS BY MONTH, 1975-1976 ★



★ Train accidents only. Excludes train incidents and non-train incidents.

MODAL SAFETY HAZARDS

The following accident investigation was provided by the National Transportation Safety Board (NTSB):

Case No. 1

On January 9,1976, at 8:06 a.m., Chicago Transit Authority (CTA) train No. 315 struck the rear end of train No. 104 which was standing at the Addison Street Station platform in Chicago, Illinois. The impact forces extensively damaged the lead car of the moving train and the rear car of the standing train, and slightly damaged the other cars in both trains. Damage to the equipment and track was estimated to be $267,000. Of the 381 passengers who were injured in the collision, 1 passenger died.

The NTSB determined that the probable cause of this accident was the failure of the motorman of train No. 315 to perceive standing train No. 104 at a sufficient distance to permit him to stop his train before striking No. 104. Contributing to the collision were the rule which permits train operation with the automatic train control and cab signals inoperative, inconsistent enforcement of operating rules, absence of flag protection against following trains, the failure of the train phone system to provide reliable communications, and the violation of the 25-mph speed limit required by Rule 178B.

As a result of its investigation, the Safety Board issued seven recommendations to the Chicago Transit Authority, three to several major metropolitan transit authorities, and one recommendation to the Governor of Illinois.

The recommendations made to the Chicago Transit Authority were:

"Study the procedure which it implemented on January 10, 1976, to handle trains which have inoperative automatic train controls (ATC) or cab signals to insure that all hazards have been considered and their potential has been minimized."

"Implement predeparture tests at terminals to insure that the ATC, the cab signals, and the train phones are operating properly."

"Review the maintenance schedule and procedures for the ATC and the cab signals to determine their adequacy to: a) Detect the failure of nonvital functions or components and b) detect and isolate substandard or progressively deteriorating components which result in failure, so that these can be dealt with and so that the inservice failure rate can be reduced."

"Insure that the train phone system provides dependable, reliable, and backup communication for operational control and that proper procedures are in effect to provide emergency warnings and instructions."

"Update the book of operating rules so that current supervisory titles and functions are in agreement, and upgrade it so that only those rules for which employees are responsible and that are enforceable and necessary for safe operation are contained therein."

"Reassess the operating employees' training program and the method which is used currently to evaluate their understanding and knowledge of rules and operating procedures to insure that both are effective."

"Develop the full potential of the Safety Department, involve it in all phases of the system operation including operations, design, maintenance and training, and provide it with more than advisory authority so that it can require implementation of system safety programs."

The Safety Board also submitted the following recommendations to major operational rapid transit organizations:

"Prohibit trains with inoperative automatic train control or cab signals from departing a terminal for main track operation."

"Develop a procedure to discharge passengers and remove trains from service immediately if they develop automatic train control problems or cab signal problems while en route."

"Insure that communication facilities are adequate for dependable operational control and that proper procedures are in effect to provide emergency warnings and instructions."

The Safety Board submitted the following recommendation to the Governor of the State of Illinois:

"Insure that the Regional Transit Authority exercises its statutory regulatory authority over the Chicago Transit Authority, so that the Chicago Transit Authority may provide the safest practical transit service."

The following discussion was submitted by the Federal Railroad Administration (FRA).

<u>Train Accident Causes</u>

Despite intensive governmental and industrial rail safety efforts, railroad accidents in the United States continue at an increasing rate. The FRA reached this conclusion after performing a regression analysis of train accident data for the period January 1965 through March 1976. In order to facilitate the analysis, the data were categorized by major train accident cause: track defects, equipment defects, human factors and miscellaneous.

The percentage of train accidents caused by <u>track defects</u> has been increasing since 1965. Beginning in 1971 and continuing through 1976 the analysis showed the trend rising at a faster rate than for the years 1965 to 1970. Track defects caused 39.3% of the train accidents in 1975. Three major types of track defects, which accounted for 36.8% of all the train accidents in calendar year 1975, were: (1) track geometry defects, 18.8% (2) rail and joint bar defects, 11.0%; and (3) frogs, switches and track appliances, 7.0%.

Equipment defects, as a percentage of total train accidents, decreased between 1965 and 1971. In 1971, the trend changed, and the percentage of equipment related accidents began rising. Equipment defects caused 23.7% of all train accidents. The three major equipment defects, which accounted for 19% of all train accidents, were: (1) the draft system, 4.3%; (2) the suspension system, 12.2% (truck components, 3.78%; axles and journal bearings, 3.7%; wheels, 4.71%); and (3) the brakes. 2.5%.

In contrast to the increase of track and equipment related accidents, the percentage of train accidents caused by human factors continually decreased from 1965 to 1976. However, in 1970, the percentage began decreasing at a steeper rate.

Human factors accidents comprised about 23.1% of all train accidents in 1975. Of all human factors causes, the following four general human factors causes were responsible for 13.9% of all train accidents: (1) failure to protect shoving movement, to stop train in the clear and/or to leave cars in the clear, 4.9%; (2) excessive speed and/or failure to control speed, 3.1%; (3) switches improperly aligned, 3.5%; and (4) failure to properly secure a car or engine, 2.4%.

The percentage of all train accidents attributed to miscellaneous causes also has been decreasing since 1965. In 1975 when the track and equipment classifications were expanded to include some of the accidents formerly classified as miscellaneous, the number of accidents classified as miscellaneous understandably decreased.

Miscellaneous accidents accounted for 13.9% of all the train accidents in 1975. Of this percentage the three major causes of accidents which accounted for 7.5%of train accidents were as follows: Collisions with motor vehicles at grade crossings, 3.1%; interference with railroad operations by non-railroad employees, 1.6%; and overloaded, oversized or shifted lading, 2.8%.

SAFETY PROGRAM HIGHLIGHTS

The following program highlight was submitted by FRA.

System Safety Plan

To broaden and improve its present safety focus, FRA is in the process of finalizing a System Safety Plan, which will clearly define crucial safety problem areas, both present and future, and will serve as a framework for the optimal allocation of human and monetary resources. The Plan covers the following four broad interrelated areas: Hazard Identification & Priority Determination, Standards Development, Field Activities and Organization.

Hazard Identification & Priority Determination focuses on the need to shift FRA's safety stance from one of reaction to one of initiation. It deals with the availability and use of safety related data, the method of identifying potential hazards from available data and the determination of safety effort priorities.

Standards Development delineates the FRA's safety related regulatory activities. It provide a framework for regulatory review and for assessing the merits of proposed regulations in terms of safety and cost benefits. The Field Activities area of the System Safety Plan systematizes the activities of the Federal and State rail safety inspectors to ensure efficient and comprehensive use of this powerful safety tool. It provides guidelines for safety training for inspectors, as well as for a process of review for the effectiveness of inspection efforts.

Finally, to ensure a cohesive Federal rail safety effort, the System Safety Plan closely examines the FRA headquarters and field organizations as separate and as complementary entities. The FRA believes that its goal, minimization of loss of life, personal injury and property damage in the conduct of railroad passenger and freight operations, can be achieved best by realistically operating as one cohesive system, composed of several intersecting component areas.

The following program highlights were supplied by the Urban Mass Transportation Administration (UMTA).

Chicago Transit Authority (CTA) Safety and System Assurance Study.

UMTA is providing a grant to CTA for an overall study and evaluation of the technical management practices and processes applied to the operation, expansion, replacement, and improvement of the CTA rapid transit system in terms of Safety and System Assurance. This study is partially an outgrowth of recommendations from the January 9,1976 CTA accident described in the "Modal Safety Hazard" section above and UMTA insight into CTA practices and processes. Major impetus for the study was provided by the CTA General Manager.

The elements of Safety and System Assurance to be addressed are:

1. System Safety
2. Equipment Reliability
3. Equipment Maintainability
4. System Availability
5. System Dependability
6. Human Factors
7. Quality Assurance

A contractor will be concerned with the following tasks:

1. Program Plan - develop an evaluation program plan to describe the resources, approach, methods, and techniques to be applied to remaining tasks.

2. System Safety - evaluate the current CTA safety management system.
   (a) an evaluation of system operations, maintenance, capital planning, and procurement;
   (b) an evaluation of rules, bulletins, instructions, procedures, training, and supervisory roles;
   (c) the development of recommendations for a system safety plan.

3. Equipment Reliability and Maintainability - evaluate existing CTA practices and procedures and recommend a program to improve such practices and procedures.

4. System Availability and Dependability -

   (a) determine the existing availability of critical rail system equipment;

(b) recommend a program or process by which availability may be determined, recorded, and improved in operating and capital programs;

(c) determine the dependability of system service, the frequency of service interruptions, failures that cause such interruptions, and times-to-restore interrupted service;

(d) recommend a program or process by which system dependability may be measured, recorded, and improved in operating and capital programs.

Courses at Transportation Safety Institute (TSI)

The fourth quarter 1975 Transportation Safety Information Report described the establishment of a program of instruction at the Transportation Safety Institute. A prototype and a first offering of a course, "Introduction to Mass Transit Safety and System Assurance," have been conducted. The response by transit properties has been very encouraging with representative participation in the class and as associate instructors.

The scheduled courses offered to representatives of the mass transit industry, transit consultants, supplier organizations, State Departments of Transportation, and U.S. Department of Transportation for FY 1977 are the following:

		Duration	Date (1977)
1.	Mass Transit Safety and System Assurance (MTSSA) Executive Briefing	1 day	Conducted as needed
2.	Introduction to MTSSA	5 days	1/31-2/4 5/23-27 8/8-12
3.	MTSSA System Safety	5 days	1/17-21 (prototype) 4/11-15 8/29-9/3
4.	MTSSA Quality Assurance	5 days	11/29-12/3 (prototype) 2/28-3/4 6/20-24 9/26-30

A MTSSA system security course may be implemented in FY 1977. A man-system technology/human factors course and a reliability/maintainability/availability/dependability (RMA) course is scheduled to be implemented in FY 1978.

AVIATION

SAFETY PERFORMANCE

Air Carrier fatalities declined significantly in the third quarter and the first nine months of 1976 from the same periods in 1975, as shown in Table 4.

The number of accidents also declined in the third quarter of 1976. There were no fatal accidents and only five total accidents in the quarter compared with one fatal accident and 19 total accidents during the same period a year ago. During the first nine months of 1976, fatal Air Carrier accidents increased by one; however, the total number of all Air Carrier accidents declined by 35%. Twenty-four accidents were reported in the first nine months of 1976 compared with 37 for the same period in 1975.

The number of General Aviation fatalities increased in the third quarter of 1976; however, during the first nine months they have declined as shown in Table 4.

In the third quarter and during the first nine months of 1976 the number of General Aviation fatal accidents increased slightly. There were 212 fatal accidents in the quarter and 525 during the first nine months of 1976 compared with 207 and 523 during the same periods a year ago.

CHART 6 - U.S. AIR CARRIER FATALITIES BY MONTH, 1975-1976

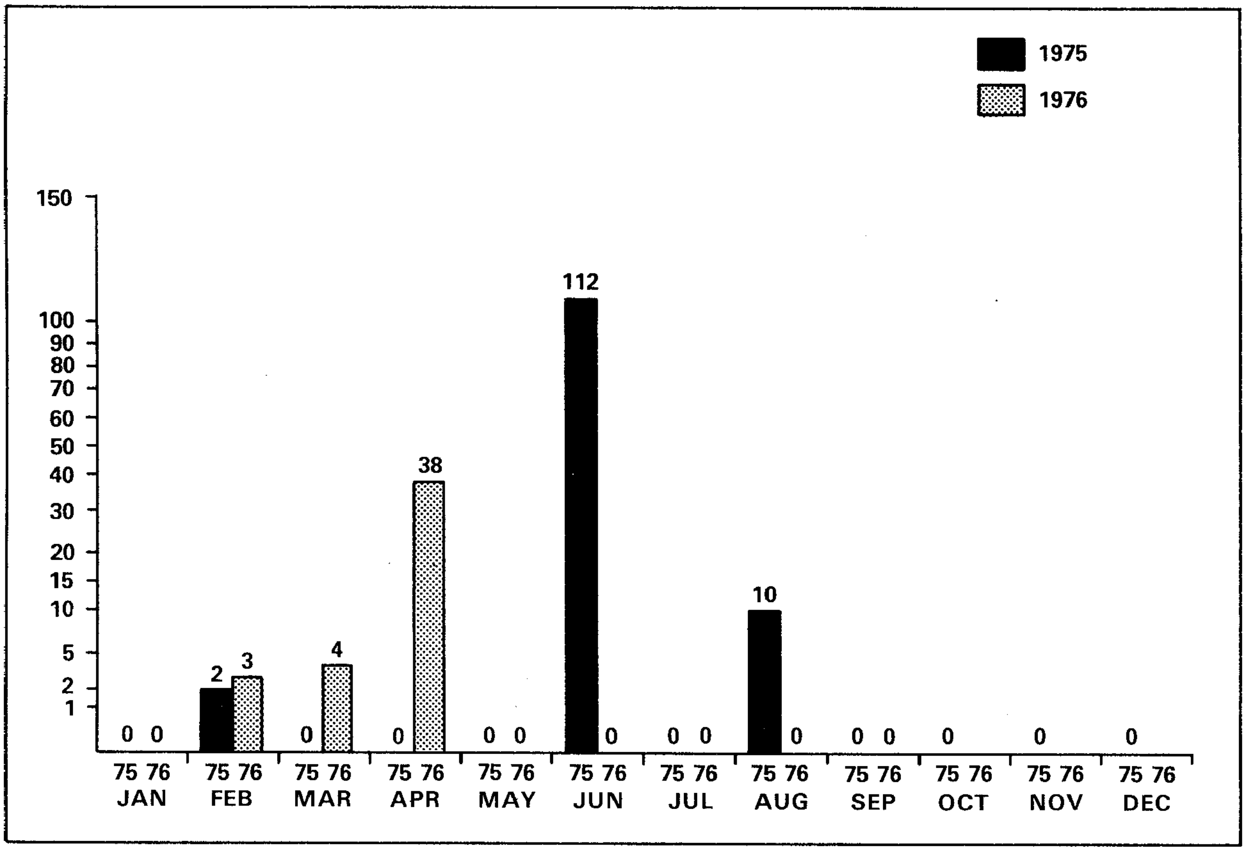


TABLE 4. AVIATION FATALITIES FOR 1976 COMPARED WITH 1975*

CLASSIFICATION	JANUARY 1975	JANUARY 1976	JANUARY % CHANGE	FEBRUARY 1975	FEBRUARY 1976	FEBRUARY % CHANGE	MARCH 1975	MARCH 1976	MARCH % CHANGE
CERTIFICATED	0	0	0.0	0	0	0.0	0	4	[1]
SUPPLEMENTAL	0	0	0.0	0	0	0.0	0	0	0.0
COMM. OPERATORS	0	0	0.0	2	3	+50.0	0	0	0.0
TOTAL AIR CARRIER	0	0	0.0	2	3	+50.0	0	4	[1]
AIR TAXI	23	16	-30.4	3	7	+133.3	6	3	-50.0
BUSINESS	13	7	-46.2	11	5	-54.5	7	6	-14.3
EXECUTIVE	8	0	-100.0	10	2	-80.0	4	0	-100.0
PERSONAL	56	39	-30.4	62	84	+35.5	74	79	+6.8
INSTRUCTIONAL	8	3	-62.5	5	7	+40.4	4	2	-50.0
AERIAL APPLICATION	2	0	-100.0	1	0	-100.0	3	2	-33.3
OTHER [2]	14	3	-78.6	11	2	-81.8	5	7	+40.0
TOTAL GEN. AVIATION	124	68	-45.2	103	107	+3.9	103	99	-3.9

CLASSIFICATION	APRIL 1975	APRIL 1976	APRIL % CHANGE	MAY 1975	MAY 1976	MAY % CHANGE	JUNE 1975	JUNE 1976	JUNE % CHANGE
CERTIFICATED	0	38	[1]	0	0	0.0	112	0	-100.0
SUPPLEMENTAL	0	0	0.0	0	0	0.0	0	0	0.0
COMM. OPERATORS	0	0	0.0	0	0	0.0	0	0	0.0
TOTAL AIR CARRIER	0	38	[1]	0	0	0.0	112	0	-100.0
AIR TAXI	6	28	+366.7	9	9	0.0	2	9	+350.0
BUSINESS	7	1	-85.7	8	5	-37.5	8	3	-62.5
EXECUTIVE	10	0	-100.0	1	2	+100.0	0	0	0.0
PERSONAL	63	66	+4.8	58	82	+41.4	63	58	-7.9
INSTRUCTIONAL	2	4	+100.0	9	0	-100.0	2	5	+150.0
AERIAL APPLICATION	3	3	0.0	1	5	+400.0	12	8	-33.3
OTHER [2]	9	4	-55.6	20	1	-95.0	12	9	-25.0
TOTAL GEN. AVIATION	100	106	+6.0	106	104	-1.9	99	92	-7.1

CLASSIFICATION	JULY 1975	JULY 1976	JULY % CHANGE	AUGUST 1975	AUGUST 1976	AUGUST % CHANGE	SEPTEMBER 1975	SEPTEMBER 1976	SEPTEMBER % CHANGE
CERTIFICATED	0	0	0.0	10	0	-100.0	0	0	0.0
SUPPLEMENTAL	0	0	0.0	0	0	0.0	0	0	0.0
COMM. OPERATORS	0	0	0.0	0	0	0.0	0	0	0.0
TOTAL AIR CARRIER	0	0	0.0	10	0	-100.0	0	0	0.0
AIR TAXI	9	22	+144.4	3	3	0.0	2	10	+400.0
BUSINESS	5	5	0.0	8	27	+237.5	13	15	+15.4
EXECUTIVE	0	0	0.0	1	3	+200.0	4	11	+175.0
PERSONAL	88	90	+2.3	110	39	-64.5	64	90	+40.6
INSTRUCTIONAL	8	13	+62.5	8	15	+87.5	2	2	0.0
AERIAL APPLICATION	8	8	0.0	5	7	+40.0	3	8	+166.7
OTHER [2]	7	4	-42.9	9	32	+255.6	26	8	-69.2
TOTAL GEN. AVIATION	125	142	+13.6	144	126	-12.5	114	144	+26.3

CLASSIFICATION	THIRD QUARTER 1975	THIRD QUARTER 1976	THIRD QUARTER % CHANGE	FIRST 9 MONTHS 1975	FIRST 9 MONTHS 1976	FIRST 9 MONTHS % CHANGE
CERTIFICATED	10	0	-100.0	122	42	-65.6
SUPPLEMENTAL	0	0	0.0	0	0	0.0
COMM. OPERATORS	0	0	0.0	2	3	+50.0
TOTAL AIR CARRIER	10	0	-100.0	124	45	-63.7
AIR TAXI	14	35	+150.0	63	107	+69.8
BUSINESS	26	47	+80.8	80	74	-7.5
EXECUTIVE	5	14	+180.0	38	18	-52.6
PERSONAL	262	219	-16.4	638	627	-1.7
INSTRUCTIONAL	18	30	+66.7	48	51	+6.3
AERIAL APPLICATION	16	23	+43.8	38	41	+7.9
OTHER [2]	42	44	+4.8	113	70	-38.1
TOTAL GEN. AVIATION	383	412	+7.6	1018	988	-2.9

* Revised using latest data from NTSB. Previous monthly data was preliminary.
[1] Not calculable.
[2] "Other" category for 1975 includes NTSB categories - Commercial Other, Non-commercial Other, and Miscellaneous. For 1976, it includes FAA categories - Industrial Special, Research & Development, Demonstration, Sport parachuting, etc.

SOURCE: 1975 Air Carrier and General Aviation data, NTSB, TE-50.
1976 Air Carrier and General Aviation data, preliminary, FAA, AFS-84.

CHART 7 - U.S. AIR CARRIER FATAL ACCIDENTS BY MONTH, 1975-1976

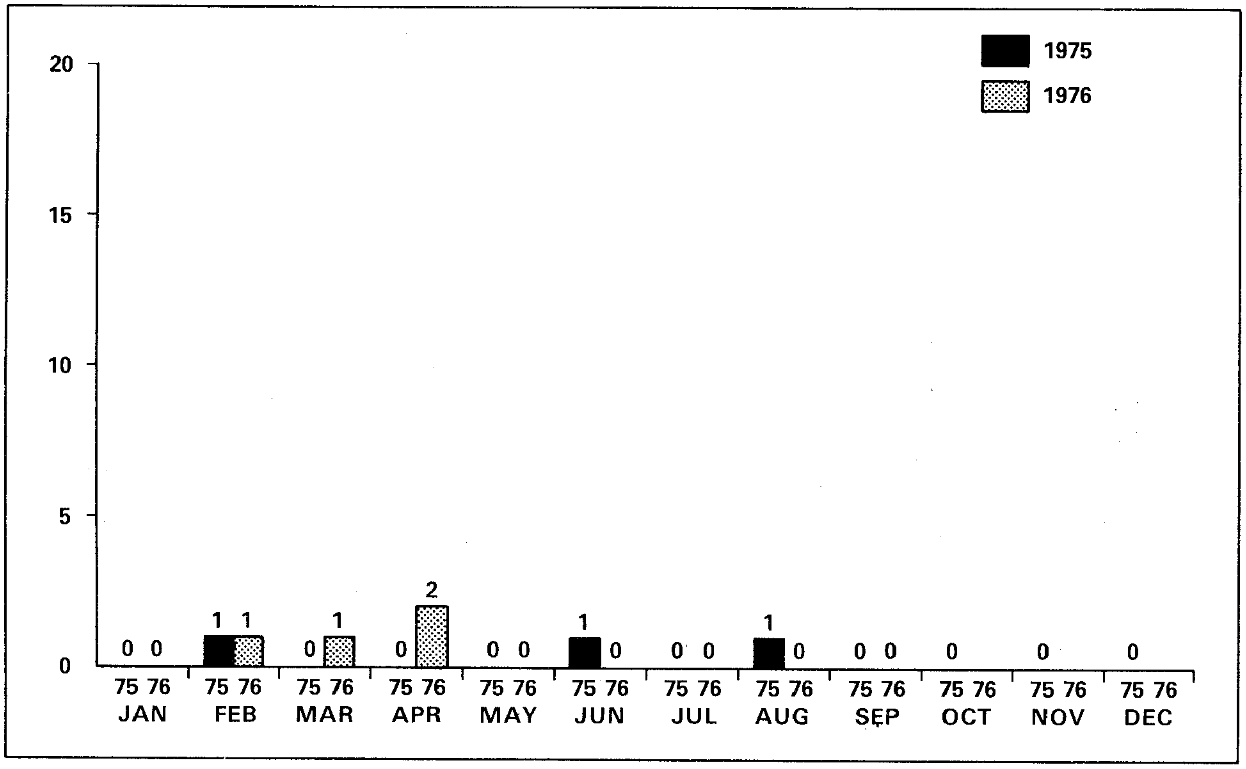


CHART 8 - U.S. AIR CARRIER ACCIDENTS BY MONTH, 1975-1976

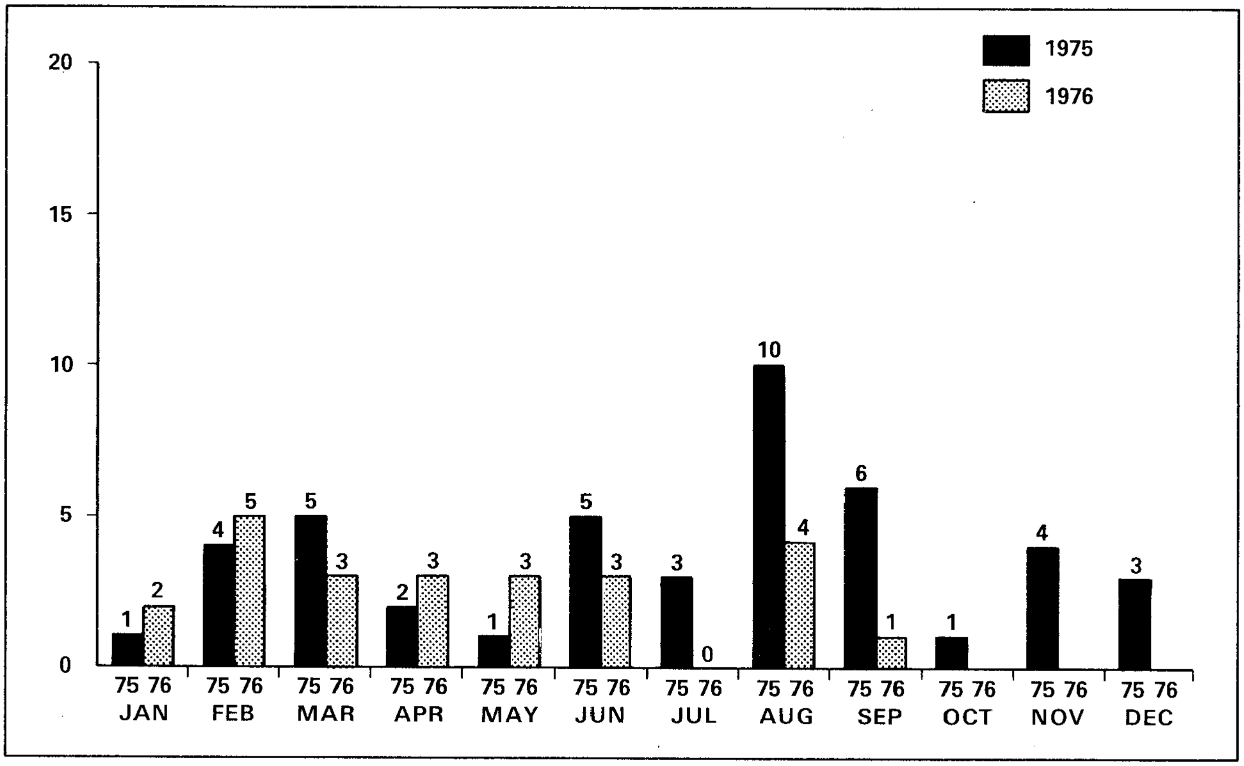


CHART 9 - GENERAL AVIATION FATALITIES BY MONTH, 1975-1976

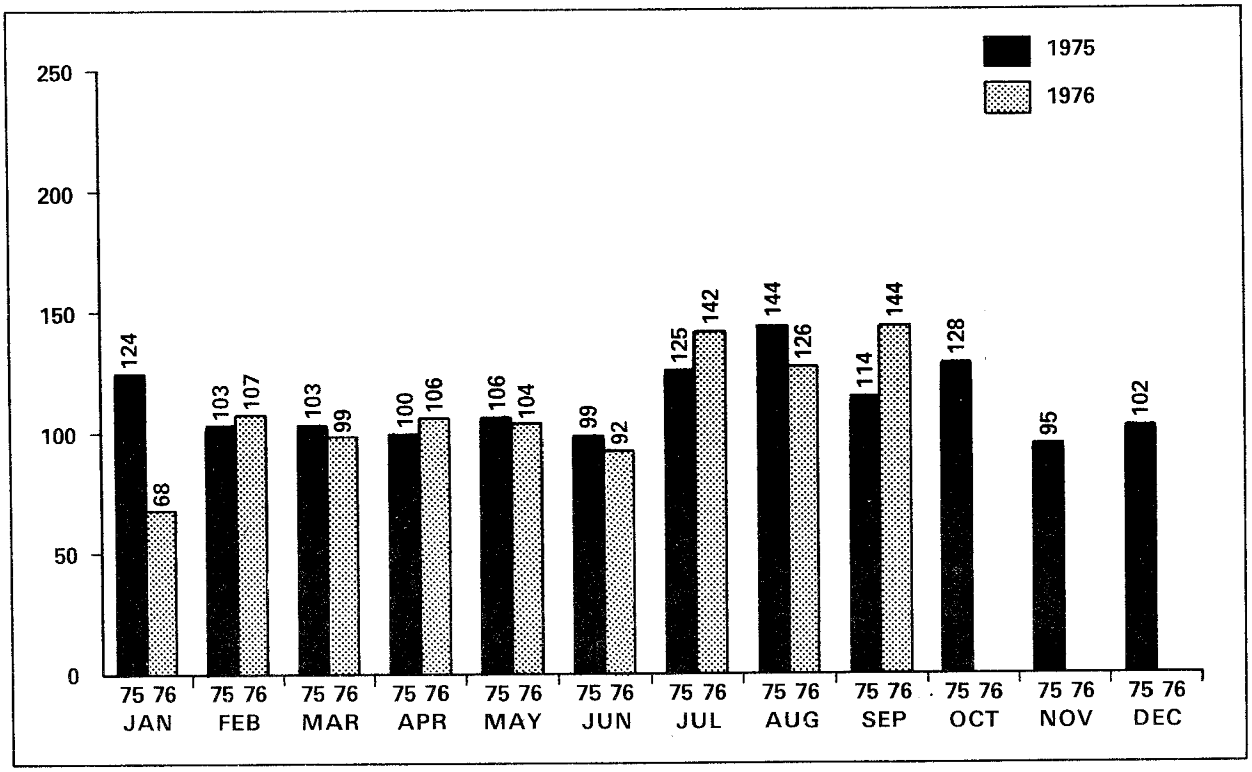
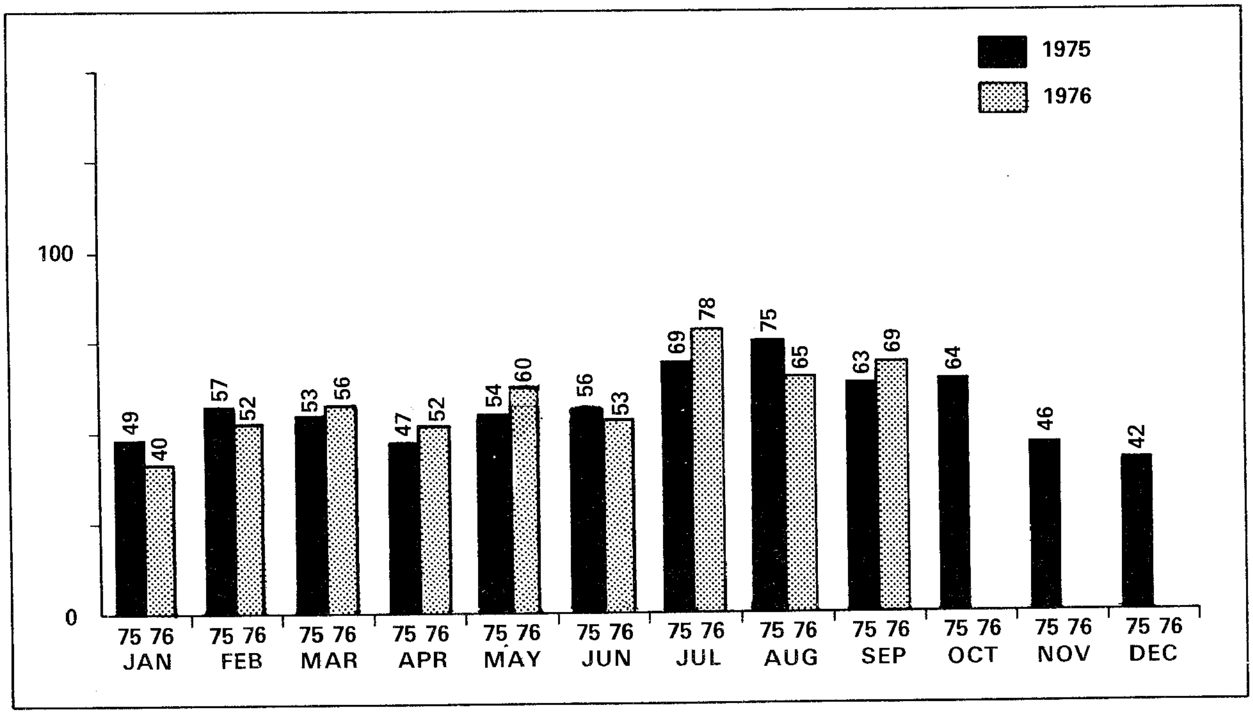


CHART 10 - GENERAL AVIATION FATAL ACCIDENTS BY MONTH, 1975-1976



MODAL SAFETY HAZARDS

Case 1

On December 16, 1975, Japan Air Lines Co., Ltd., Flight 422, slid off the north side of the east-west taxiway of Anchorage International Airport while taxiing out for a takeoff on runway 6R. The aircraft weathercocked about 70° to the left and slid backward down a snow-covered embankment with an average slope of -13°. The aircraft came to rest on a heading of 150° on a service road approximately 250 feet from, and 50 feet below, the taxiway surface.

Of the 121 persons on board, 2 were injured seriously. The aircraft was damaged substantially by impact; there was no fire.

The National Transportation Safety Board (NTSB) determined that the probable cause of this accident was the loss of directional control during taxi as a result of ice on the taxiway and strong, direct crosswinds.

Contributing to the accident were (1) the captain's decision to take off from runway 6R after receiving reports that taxiing conditions were deteriorating, and (2) failure of airport management to anticipate predictable unsafe icing conditions on the airport. This failure to anticipate these conditions resulted in delayed and insufficient preventive action.

Although the evacuation of Flight 422 was successful, some of problems identified in the Safety Board's Special Study, "Safety Aspects of Emergency Evacuations from Air Carrier Aircraft," were present in this accident. Under slightly different circumstances of a greater passenger load and a postcrash fire, lives might have been lost. The recommendations from that study (NTSB-AAR-76-12) and FAA's response of May 9,1975, with updated information as of April 1,1976, are as follows:

NTSB Recommendation:

"Issue an Advisory Circular which would provide standardized guidance to the air transport industry on effective methods and techniques for conveying safety information to passengers."

FAA Response:

"An advisory circular is being prepared which will publicize the FAR's pertaining to cabin and passenger safety in air carrier operations."

The completion date on this project was March 1976.

NTSB Recommendation:

"Amend 14 CFR 121.310 to require, after a reasonable date, that emergency evacuation slides on all floor-level exits be automatically inflated upon deployment."

FAA Response:

"FAR Part 25 presently requires each floor-level exit more than six feet above ground to be equipped with a slide which automatically deploys and inflates when the exit is opened. FAR 121 requires automatic slides for exits in airplanes currently in service with the exception of passenger entry and service doors. Automatic deployment at opening is required for these doors, but inflation can be accomplished by pulling an inflation lanyard. The fully automatic slide has not been developed to the extent that the time saving for evacuation would justify retrofitting."

NTSB Recommendation:

"Amend 14 CFR 25.812 to require that exterior emergency lighting be activated automatically when exits are opened in the emergency mode, and amend 14 CFR 121.310 to require such automatic activation after some reasonable date."

FAA Response:

"We agree with this recommendation and will initiate a rulemaking action under FAR Part 25 to require that exterior emergency lighting be activated when the assist means are erected. We will initiate rulemaking action to amend FAR 121.310, as appropriate, when FAR Part 25 has been amended."

The FAA estimated the project completion date to be May 1976.

NTSB Recommendation:

"Amend 14 CFR 121.417(c)(4) to eliminate the provision which permits carriers to use demonstrations alone to train crewmembers for certain emergency situations, thus requiring performance of drills in the operation and use of emergency exits."

FAA Response:

"A regulatory project on cabin attendant training has been initiated. It will include the items in the recommendation."

The FAA has taken action on this project in its Operations Review and it is expected to be completed by February 1977.

NTSB Recommendation:

"Require that air carriers report all emergency evacuation slide deployments, failures, and malfunctions to the FAA."

FAA Response:

"A rulemaking project (No. FS-74-47-R) is underway which will revise FAR 121.703 'Mechanical Reliability Reports. Reports of malfunctions or failures of all emergency and survival equipment will be required."

The results of this project are expected in May 1977.

NTSB Recommendation:

"Require that air carrier passengers be alerted, during pretakeoff briefings, of the need to familiarize themselves with the procedures involved in the operation of emergency exits."

FAA Response:

"We concur and will issue an air carrier operations bulletin."

The FAA has taken action on this project in its Operations Review and it is expected to be completed by May 1977.

NTSB Recommendation:

"Require that the air carriers designate the flight attendant(s) who will be responsible for use of the megaphone(s) during an evacuation, and relocate the megaphone(s) so they are within easy reach of that flight attendant(s)' seat. Consideration should be given to the installation of new, light and compact megaphones to facilitate stowage and use."

FAA Response:

"We agree that air carriers should designate the flight attendants who will be responsible for use of the megaphone(s) during evacuations and relocate the megaphones. We are considering the means by which this can be implemented.

"The present rule is within the scope and intent and provides the authority. We will implement the requirement in the near future and advise."

The FAA expects to complete this project by May 1977.

NTSB Recommendation:

"Develop a maintenance surveillance program to insure greater reliability of emergency evacuation slide systems."

FAA Response:

"FAR 121.309(b) states,'Each item of emergency and flotation equipment listed in this section and in paragraphs 121.310, 121.339, 121.340, and 121.309(b)(1) must be inspected regularly in accordance with inspection periods established in the operations specifications to ensure its condition for continued serviceability and immediate readiness to perform its intended emergency purposes."

"FAR 121.310 requires the installation of emergency evacuation equipment. In addition to the operator's responsibilities for the maintenance of the equipment, our inspectors are charged with similar responsibilities as they relate to each operator's total maintenance and inspection program. We cannot exert all of our efforts toward the surveillance of any one particular area or system. Our surveillance is normally overall with special emphasis directed to specific areas as needs arise."

"For your information, we have contracted for special training for our maintenance inspectors on the maintenance requirements, operation and inspection of emergency evacuation equipment."

A specific inspection program is expected to be developed by December 1977.

NTSB Recommendation:

"Amend 14 CFR 25.809 to require that the length of the emergency evacuation slides be such that the angle with the ground renders the slide safe and usable after collapse of one leg, or more, of the landing gear, and amend 14 CFR 121.310 to require that these new slides be installed after a reasonable date."

FAA Response:

"While the requirements contained in FAR 37.175 currently provide that evacuation slides be safe and useable with the collapse of any one or two landing gear legs, we believe that these should be reflected in FAR 25.809 and 121.310. Accordingly, we will initiate rulemaking action to amend FAR 25 and 121 which will cover the useability of evacuation slides during adverse gear collapse conditions."

The FAA plans to complete this project by December 1977.

NTSB Recommendation:

"Amend 14 CFR 121.318 to require after a reasonable date, that public address systems be capable of operating on a power source independent of the main aircraft power supply."

FAA Response:

"We will establish a project to amend FAR 121.318, as appropriate, when the proposed revisions to FAR Part 25 have been adopted."

The FAA expects to complete this project by December 1977.

Source: NTSB

Case No. 2.

On April 1, 1976, Hughes Airwest Flight 5 and Northwest Airlines Flight 603 almost collided in instrument meteorological conditions over the Spokane International Airport, Spokane, Washington. Airwest 5 executed a missed approach from the ILS approach to runway 21 at Spokane Airport as Northwest 603 departed runway 21 and began its climb. Both aircraft continued in a south-southwesterly direction until the flightcrew of Airwest 5 saw Northwest 603 and took evasive action. Airwest 5 encountered the wake turbulence from Northwest 603 which rolled Airwest 5 into a 60° to 70° angle of bank. Its captain returned the aircraft to level flight and landed at Spokane Airport without further difficulty. Northwest 603 continued to its destination. None of the 176 persons aboard the two aircraft were injured, and the aircraft were not damaged.

The National Transportation Safety Board determined that the probable cause of this incident was the inadequacy of the local air traffic control procedures to insure positive and adequate separation between arriving and departing aircraft. Contributing to the incident was the failure of the local controller to recognize and resolve the impending conflict in accordance with the basic mandate to insure positive separation between aircraft. Also contributing to the incident was the failure of the crew of Airwest 5 to follow company ILS approach procedures and the recommended FAA position reporting procedures.

As a result of this incident, the National Transportation Safety Board made the following recommendations (NTSB-AAR-76-18) to the Federal Aviation Administration:

NTSB Recommendation:

Revise the Airman's Information Manual so that the aviation community will not be misled regarding radar approach control services at locations where the tower cab is not radar equipped and the approach control facility has limited, low-altitude radar coverage capability. (Class II--Priority followup.) (A-76-91.)

FAA Response:

We believe that the information relating to radar approach control services contained in the AIM is satisfactory. It states that "radar service terminated" is used by ATC to inform a pilot that he will no longer be provided any of the services that could be received while under radar contact. Radar service is automatically terminated and the pilot is not advised when the aircraft cancels its IFR flight plan; at the completion of a radar approach; when an arriving aircraft receiving State I, II, or III service is advised to contact the tower; when an aircraft conducting a visual approach is advised to contact the tower; and when an aircraft vectored to a final approach course for an instrument approach has landed or the tower has the aircraft in sight, whichever occurs first. Controllers must inform the pilot that radar service is terminated unless the automatic termination provision applies. Therefore, we do not plan any further action on the recommendation.

NTSB Recommendation:

Review all local departure and arrival procedures and assure that they provide positive separation between aircraft whenever radar and nonradar operations interface. (Class II--Priority followup.) (A-76-92.)

FAA Response:

We accept the Board's statement that " the deficiencies have been eliminated" and consider our GENOT of April 7 to have been effective as reported by Regional Air Traffic Division Chiefs to the Director of Air Traffic Service. We do not plan any further action on this recommendation.

Source: NTSB

Case No. 3.

On January 17, 1976, a Beech D95A entered a spin in the airport traffic pattern and crashed near Montgomery County Airpark, Gaithersburg, Maryland. A flight instructor and an applicant for a multi-engine land class rating were killed in the crash.

NTSB's investigation of the accident disclosed that there are flight instructors who use the mixture control to shut down an engine in order to test an applicant's ability to identify a failed engine. This is sometimes done at traffic pattern altitudes.

Because Montgomery County Airpark is uncontrolled, the Safety Board could not confirm that the use of this training procedure contributed to the accident. However, they believe that when this procedure is used at traffic pattern altitudes, the airplane may not be at a proper position to allow an instructor to overcome possible errors in judgment or technique on the part of the applicant.

They noted that the pilot flight-test guides for multi-engine applicants, private and commercial, suggest that engine-out approach and landing demonstrations be simulated by reducing power, and do not require an engine shutdown. Since the FAA does not endorse the practice of shutting down an engine at or near traffic pattern altitudes in order to simulate engine failure on approach and landing, this practice should be discouraged.

Accordingly, the National Transportation Safety Board recommended in their report (NTSB-A-76-121) to the Federal Aviation Administration:

> NTSB Recommendation:
>
> Advise all flight instructors immediately, through flight examiner standardization programs or through direct contact with the National Association of Flight Instructors, the Aircraft Owners and Pilots Association Air Safety Foundation, and any other flight-instructor organizations, to eliminate engine shutdown and substitute reduction of power as a technique for simulated engine-out emergencies at low altitudes. (Class I - Urgent Followup) (A-76-121)
>
> FAA Response:
>
> We concur with the recommendation. The following actions are planned.
>
> 1. We will recommend to flight instructors, through the FAA Flight Instructor Refresher Unit and industry organizations approved to conduct flight instructor clinics, that they eliminate engine shutdowns at low altitudes.
>
> 2. We will provide this same information to other aviation groups and recommend that they pass it to their members.
>
> 3. We are preparing an operations bulletin advising our field inspectors to apprise the aviation community of the dangers associated with intentional engine shutdowns at low altitudes.
>
> We anticipate that these actions will be completed not later than January 1, 1977.
>
> Source: NTSB

Case No. 4

A single-engine Cessna 210 departed the Tri-Cities Airport in eastern Washington State on a flight to Seattle. As the aircraft approached the western slopes of the Cascade Mountains, the weather worsened with moderate to heavy ice being encountered in the clouds.

Before the pilot of the Cessna 210 left the Air Route Traffic Control frequency, he reported that he could no longer control the aircraft due to a heavy accumulation of ice on the wings. Soon after, the radar target (blip) disappeared from the radar scopes and no further radio transmissions were heard from the flight.

About that time, an emergency locator transmitter (ELT) signal was heard by aircraft in the vicinity of Seattle, so a U.S. Coast Guard helicopter was dispatched to search in the area where the radar target was last seen. The helicopter was able to locate the ELT with its direction finding receiver in 19 minutes. However the signal belonged to an aircraft parked on a small airport southeast of Seattle-Tacoma International. Just after locating the errant ELT, the weather deteriorated and further aerial search for the downed Cessna 210 was delayed more than 50 hours. When the aerial search was resumed, the downed aircraft was located within 15 minutes of the search base!

Each time an ELT is inadvertently activated, the same problem could occur. It is imperative that every time a pilot leaves his aircraft he checks to see that his ELT is shut off. He is the primary person to resolve accidental triggerings of ELTs.

It takes only a few seconds to tune in the emergency frequency (121.5Mhz). If an ELT is squawking, the pilot will know immediately and be able to take corrective action.

SOURCE: FAA, Northwest Regional Office

SAFETY PROGRAM HIGHLIGHTS

Aviation Safety Reporting Program

The FAA Aviation Safety Reporting Program (ASRP) through the supporting NASA Aviation Safety Reporting System (ASRS) received nearly 1,500 reports during its initial three-month operational period ending in mid-July. Information contained in these reports prompted the submission of 130 alert bulletins by NASA TO FAA.

The ASRP/ASRS is designed as an early warning system. Reports describing problems are voluntarily submitted to NASA by pilots, air traffic controllers and others in the National Aviation System.

Reports received described occurrences in nearly every type of aviation operation including domestic and charter air transport, corporate and business flying, pleasure flying, flight training and military flying. The reports dealt with air traffic control procedures, flight operations, pilot or controller workload and with hazards to others on the ground. Navigation and communication equipment problems were described. Some concerned equipment malfunctions; others described a need for reconfiguration or additions to equipment. In some cases, updating of computer software introduced automated equipment problems. Physical obstructions to air navigation were identified.

A substantial number of ASRP/ASRS reports involved human error. Careful analyses by reporting personnel of why they erred suggests that many of them have learned from their experiences. Some of these reports will be useful instructional tools in future airman education programs. Others have provided insights into system factors that contribute to such errors, and these system factors have been described in bulletins forwarded to FAA for investigation and action.

Even without computer assistance, a careful review of reports to date has begun to yield insights into certain less obvious problems in the National Aviation System. Analytical studies of these problems are underway or are planned for the near future.

Twelve reports concerning aircraft accidents were identified and forwarded to the National Transportation Safety Board and the FAA as required. No reports contained information relating to a criminal offense. All other reports received by ASRP/ASRS had reporting persons' names removed, as specified in the FAA/NASA memorandum of agreement.

The ASRP/ASRS is receiving a broad base of support within the aviation community. The quality of the reports has made it possible to gain an appreciation of the problems without extensive research. Thus, ASRS has been able to disseminate information about these problems promptly and effectively. This is the primary aim of the ASRS and of the FAA's Aviation Safety Reporting Program. Pilots and aircrew members submitted 62% of the reports and air traffic control personnel accounted for 34%. Phases of flight during which problems were observed and reported on included preflight and ground taxi (6%), takeoff and climb (18%), cruise (22%), descent (16%), approach and landing (27%) and all flight phases (11%).

Source: Office of Aviation Safety

FAA Chief Says Airport Screening Program Continues to be Effective

In September, the FAA released a report showing that the nation's passenger screening program at airports resulted in the detection of 2,840 firearms and seven explosive or incendiary devices in the first six months of 1976. During this period there were no successful hijackings of U.S. airlines. In the same six month period, there were three completed hijackings elsewhere in the world. "These figures are convincing evidence that this country's anti-hijacking program has been and remains effective despite the hijacking of a U.S. airliner on September 10," said Dr. John McLucas, FAA Administrator. "In fact, it's interesting to note that the hijackers in this instance studied the screening system carefully and decided they could not smuggle actual weapons on board the aircraft. So they carried a number of ordinary objects through the system and used them to construct dummy bombs once on board." Dr. McLucas went on to say, however, that "bluff hijackings" of this kind are a unique threat to aviation security and may require additional measures. For example, he noted that the FAA is sponsoring development work on electronic "sniffers" that can detect minute quantities of the gases given off by explosives.

The report also shows that the 2,840 firearms seized during the six-month period, in which 191 million passengers were screened, represented an increase of 16 percent from the 2,440 detected in the last six months of last year.

SOURCE: FAA, Press Release No. 76-81, Office of Civil Aviation Security Service

Mountaintop Monitors for Maydays

FAA is testing the use of radio receivers on five mountain peaks in the Pacific northwest to help listen for distress signals from downed aircraft. Receivers are tuned to 121.5 MHz, the emergency frequency used by emergency locator transmitters (ELTs) which activate automatically when an airplane crashes. The receivers, which will be tested throughout the coming winter, pick up the ELT signals but provide no direction finding; this is done by follow-up aircraft or ground vehicles. The receivers are located at manned FAA long-range radar sites on Laurel Mountain and Haymaker Mountain in Oregon; on Cascade Mountain and Sawtelle Peak in Idaho; and on Mica Peak near Spokane.

SOURCE: FAA Director, Northwest Region

Ground Proximity Warning System

On September 1, Federal Air Regulation 121.360 required the full operational use of a Ground Proximity Warning System (GPWS) on all jet powered aircraft heavier than 12,500 lbs. (5,670 kg.) used by airlines, air taxis or air travel clubs.

The mandatory use of GPWS was first proposed by the FAA in 1974. After careful assessment of recent aviation accidents it appeared that a system which provided a warning of a potentially hazardous approach to the ground could eliminate or reduce the danger of controlled flight into terrain and could enhance aviation safety.

Basically, the GPWS consists of a computer which receives input data from various sources:

- radio
- barometric altitude rate sensor or,
- air data computer
- landing gear and flaps position
- glide slope receiver

Using these inputs,the GPWS computer can provide an aural and visual warning to a pilot if the system detects a situation in which a series of preset parameters are exceeded. The aural warning may consist of a "Whoop! Whoop! Pull Up!" exclamation or the word "Glide Slope" if the aircraft is excessively low on the glide slope while executing on ILS approach. The visual warning consists of a flashing red light.

A warning is provided for several inflight situations:

- excessive rate of descent when the aircraft is below 2500 ft. above ground level.

- excessive closure rate with rising terrain.
- a negative rate of climb after take-off.
- the aircraft not in the proper landing gear and/or flap configuration when lower than 500 ft. above the ground.
- excessively low on a glide slope.

Foreign air carriers have shown much interest in GPWS and several foreign airlines have already installed the GPWS.

SOURCE: FAA, Flight Standards Service

Aviation Safety Research and Development

The basic responsibilities of the Federal Aviation Administration are to insure the safe and efficient utilization of the nation's airspace, by both military and civil users, and to foster the development of civil aeronautics and air commerce. To support these responsibilities, the Administration conducts a wide range of research and development activities. Notable R & D efforts during the reporting period follow.

Conflict Alert. Early in the reporting period, FAA completed the installation of its conflict alert system, which flashes a warning signal on the radar displays used by air route traffic controllers to alert them when aircraft are potentially in conflict with each other. By January, all 20 en route Air Route Traffic Control Centers (ARTCC's) in the contiguous 48 States had completed the initial step of the program, which provided conflict alert in the high altitude sectors above 18,000 feet; at year's end, the system was operational at 19 centers from an altitude of 12,500 feet and above. All ARTCC's are expected to operate the ATC system with a conflict alert capability from the base of radar coverage up by the middle of the coming calendar year.

The conflict alert system is a computer program that has been added to the centers' central computers, which provide service to aircraft flying under instrument flight rules. The system projects what the flight paths of aircraft will be in the next two minutes. When their paths are projected to be closer than the required horizontal or vertical minimums established by FAA, the data tags identifying the aircraft (which appear on the controllers' radar scope) begin to blink and the words "conflict alert" appear next to a separate display of aircraft identities. The controller is thereby alerted to the possibility of a conflict and radios one of the pilots to give him a new heading and/or altitude to keep the aircraft safely separated. FAA standards require a 5-nautical-mile horizontal separation or a 1,000-foot vertical separation between aircraft flying in en route controlled airspace in the contiguous 48 States.

Wind Shear. Since early 1971, six air carrier accidents have occurred in which wind shear was a major contributing factor. Wind shear—the change in speed or direction of wind encountered by descending or ascending aircraft—can have an immediate and dynamic effect on an aircraft. If it occurs at a low altitude, it can be extremely hazardous. During 1976, FAA conducted a data-collection program in an effort to define the hazard and to find ground-based airborne solutions. Several promising methods were investigated in flight simulators; these methods will be employed during 1977 in flight tests. A ground-based detection and warning system was installed at Dulles International Airport. In addition, the agency made arrangements with the National Weather Service to undertake the prediction of wind shear conditions at several east coast airports during the 1976-1977 fall and winter seasons.

Fire Safety. This effort is directed at reducing the severity of post-crash fires and thus increasing the time for emergency evacuation in survivable accidents. During the reporting period, FAA completed laboratory burn tests of currently-used cabin interior materials. The gases resulting from these burning materials were ranked according to the relative toxic hazard they pose. Also undertaken was a fire management study, which established the relative merits of various methods of preventing and/or controlling postcrash cabin fires.

A mathematical model was developed to simulate cabin fire propagation on a computer. After refinement, this model will predict cabin flammability characteristics quickly without conducting actual burn tests. Full-scale burn tests were conducted on a surplus C-133 transport fuselage to verify the above concepts. The fire hazard potential of typical flight attendant uniforms was also tested in order to develop improved fire safety standards for these garments. FAA is now in the process of establishing a permanent fire-test facility. (See feature article for report on fire safety.)

General Aviation Safety. FAA's research and development efforts are directed at a variety of general aviation safety problems--crash survivability, pilot competence, and flight safety. Primary emphasis is placed on improving the crashworthiness of light planes, the need for flight safety improvements to prevent crashes, and the need for a reduction of pilot-related causes. During 1975 and 1976, FAA developed a mathematical technique for analyzing the responses of light-aircraft airframes to the dynamic loads that occur during a survivable crash. The technique will be validated by using full-scale crash tests in cooperation with NASA. Concurrently, a technique for predicting occupant, seat, and restraint-system responses to crash loads, which had been validated earlier, was integrated into the airframe model. This study is expected to provide the basis for revised structural standards for light aircraft; it is also expected to provide a method that can be used to demonstrate compliance with the new standards.

Flight Service Station Modernization. The present Flight Service System (FSS) is comprised of 292 stations in the contiguous 48 states with an authorized staffing of 4653 flight service specialists. In FY-75, the system provided approximately 58 million flight services, of which 16 million were pilot weather briefings and included 8 million flight plans filed. These services were provided to all of the flying public including general aviation, scheduled air carriers and the military.

General aviation,consisting of approximately 161,000 aircraft as of January 1,1975, was by far the largest FSS customer. There are several problems facing the existing FSS. The present operations are highly labor intensive. In too many cases each pilot must be provided a weather briefing for his intended route of flight by a flight service specialist on a one-to-one basis. The problem is compounded by the projected doubling of demand for flight services by 1985 and a near tripling of demand by 1990.

From the hardware standpoint, much of the equipment now in use is deteriorating and/or obsolete. Although advanced technology has been successfully utilized to automate the en route and the terminal elements of the air traffic control (ATC) system, none of this available technology has been applied to flight service stations. Weather data is distributed by teletype and displayed on flight service specialists' clipboards--a most awkward and inefficient operation.

Simply stated, the major problem facing the FSS is to provide means to satisfy the demand on the system in a more efficient, less costly manner while at the same time enhancing safety.

Recognizing the growing urgency of the problem, the Department of Transportation in the fall of 1971 formed the joint Office of the Secretary of Transportation (OST)/Federal Aviation Administration (FAA) Flight Service Station Evaluation Team to conduct an analysis of existing and future FSS functions and to develop recommendations for an improved FSS design. The report of the OST/FAA team recommended a new automated FSS concept to replace the existing labor-intensive system. A key feature of this automated concept was automatic pilot preflight weather briefing and flight plan filing through remotely located terminals with little or no assistance from a flight service specialist.

From the experience gained in the activities at the Atlanta Flight Service Station and the Washington Air Route Traffic Control Center (ARTCC), a three-phase program for the Flight Service System Modernization Program has evolved. The Near Term Phase (1976-1980) is dedicated to providing immediate improvements in the existing system to hold the safety level and minimize any growth of unmet demand. Included is widespread use of mass weather dissemination with more route-oriented recordings, more frequent updates, and more telephone lines for greater accessibility. An interim alphanumeric display of weather data using a video display may be introduced at selected high-activity stations. Other improvements in the form of closed-circuit television for facsimile data distribution, more radio direction-finding facilities, improved flight service specialist consoles, and nationwide implementation of en route flight advisory service (EFAS) will occur during this 1976 to 1980 time frame.

The Intermediate Phase of the FSS Modernization Program builds directly from the OST/FAA study and the Aviation Weather and NOTAMs System (AWANS) activity. This system configuration will include 20 automated flight service hub stations that are planned to be co-located with the ARTCC's. Additionally, there will be a central Aviation Weather Processor (AWP). The AWP will interface with the Weather Message Center, located at Kansas City, and will maintain and provide the current aviation weather data base required by the 20 hub stations. In addition to the 20 hub stations, the Aeronautical Center will be provided with the equipment necessary for training, and similarly, the National Aviation Facilities Experimental Center (NAFEC) will be equipped to provide both a system support and a system development capability.

Deployment of this 20-hub modernized system will occur in the 1980 to 1985 time frame. At these stations are deployed, the functions of existing flight service stations surrounding the hubs will be consolidated into the hub station and existing flight service stations closed. By approximately 1990, this process should be complete and all flight service stations of the present system phased out.

The Enhancement Phase (1983 to 1986) capitalizes on the Intermediate Phase that provides the initial automation base system. During this phase, a Voice Response System and a family of Direct Access Devices will become available for the users. These features will continue to remove the specialist as a "middle man" between the user and the data he needs, but does allow the specialist to be available for special, nonroutine requirements. Hence, growing demands can be met without increasing staff and hopefully the staff can be gradually decreased.

Briefings on the Modernization Program have been provided to representatives of general aviation user groups, unions, industry and flight service-specialists. Procurement of this system is expected to be initiated in the spring of 1977.

Aviation Security. FAA's civil aviation security program is designed to prevent or deter acts of terrorism or sabotage aboard aircraft and at airports.

This year in the Research and Development phase of this program the FAA has:

- Conducted a one-year airport operational evaluation of an automatic device designed to detect handguns and explosives hidden in hand-carried luggage. The device employed X-ray absorption technology. Development of a similar device for checked baggage is underway.
- Evaluated a personnel explosive detector based on vapor-sensing technology.
- Completed a laboratory determination of explosive vapor characteristics.
- Experimented with locker designs in an effort to determine how to minimize the exposure of people to explosions at airports.
- Studied the feasibility both of a thermal neutron explosive detector system and a nuclear magnetic resonance explosive detector system and began the development of engineering prototypes.

Aviation Medicine. The primary purpose of FAA's medical research program is to increase pilot and aircrew effectiveness. This is a high priority objective because human error or failure ranks as a major cause of aircraft accidents. An additional objective of the program, also of high priority, is the seeking out of improved means for aircrew and passenger survivability during various aircraft emergencies.

Among the more significant aeromedical studies conducted during the reporting period were the following:

- Completed a study on the supplemental-oxygen needs of working flight attendants during decompression. The study showed that to remain conscious while exposed to this decompression profile, attendants must obtain supplemental oxygen within 15 seconds after the onset of decompression. Recommendations for flight attendant procedures during decompression have been made.
- Completed a study of computerized data obtained from airman medical examination reports made to determine the value of periodic medical assessments. Particular attention was paid to the frequency with which safety-significant medical information had been discovered for various age groups. The results of the study, and a companion review of medical literature dealing with periodic medical examinations, will be used in determining the optimum frequency for airman examinations.
- Conducted certain baseline studies on pilots performing approach and landing operations in a visual flight simulator. The results of this and similar studies will help in making selections of visual approach slope aids for future installations at airports.

Air Traffic Control and Air Navigation Research and Development

FAA's R & D efforts are also directed at improving the Federal airways system by applying existing technology to air traffic control and air navigation problems. The aim of these efforts is to keep the current system operating safely with maximum efficiency, and to provide for the expansion of the system to meet foreseeable future needs.

Discrete Address Beacon System (DABS). DABS is an advanced version of the traffic control radar beacon system in which an airborne transponder signals aircraft identity and altitude when triggered by signals from ground interrogator antennas mounted on FAA radar reflector screens. This information is processed and displayed directly on the radar scopes used by air traffic controllers. The chief advantage of DABS is its capability to interrogate and receive a transponder reply from a specific aircraft rather than from all aircraft in the zone of coverage as is the case with the present radar beacon equipment.

Since DABS addresses aircraft on an individual basis, it provides a natural vehicle for a data link between aircraft and the ground--a link that can be used for automatic communications. The data link will be the basis for future implementation of a ground-based collision avoidance service called Intermittent Positive Control. This will involve air traffic control computers tracking aircraft using transponder and other information and flashing a warning when potential traffic conflicts are detected. DABS will permit the assignment of a permanent identity code to all aircraft presently in operation and to those to come in the foreseeable future.

In March 1976, FAA ordered $11.9 million worth of DABS equipment, including three ground sensors and 30 airborne transponders. The ground sensors will be co-located with radars at FAA's National Aviation Facilities Experimental Center at Atlantic City, N.J., Philadelphia International Airport, and at Elwood, N.J. The airborne units will be installed in air carrier and general aviation aircraft. Multi-site testing of the three engineering models is not expected to begin before 1978.

Microwave Landing System (MLS). This system, is one of the most important elements of FAA's Upgraded Third Generation ATC System. The development of this system, which began in the early 1970's, is now in its third phase--prototype development and evaluation.

Over the last 24 months, FAA has been testing an experimental MLS configuration at NAFEC. Starting in mid-1976, the agency began taking delivery of two sets of two prototype MLS configurations from two separate contractors (each contractor developed one version of each prototype). One prototype (the so-called Basic Narrow system) is designed for use at air carrier airports; the other (the so-called Small Community system) is designed for use at general aviation airports. One Small Community System and one Basic Narrow System were deployed at NAFEC; the second Basic System was installed at Crow's Landing, California. The second Small Community System will be delivered about January 1977 and will also be sent to NAFEC. The systems are being deployed to provide maximum participation in testing and demonstration by both military and civil pilots.

ARTS (Automated Radar Terminal System) III. In 1975, FAA completed the long-term installation of ARTS III, its automated terminal system, at 61 major terminal areas in the contiguous 48 States. In 1976, the agency took the initial step in enhancing the capabilities of this system when it contracted to provide 29 of the higher density terminals with primary radar tracking and improved beacon tracking. In addition, all 61 ARTS III systems will be provided with continuous radar recording capabilities.

At present, ARTS III displays alphanumeric data tags on radar scopes only for those aircraft equipped with a transponder for automatic reporting of identity and altitude. The data tags show this information as well as the computed ground speed of the aircraft. The enhanced ARTS III will enable controllers to put data tags on the radar scope for aircraft without a transponder, permitting continuous identification.

NAS En Route Stage A. Steps have been taken to enhance the capabilities of the automated en route system, NAS En Route Stage A, which is operational at all 20 of FAA's ARTCC's in the contiguous 48 States, by launching a long-term software development program. Several types of computer program developments were contracted for. One involves a redesign to improve efficiency of the present computer program. The redesign will extend the life of en route computers by increasing computer storage and processing capacity. The additional capacity is needed to accommodate air traffic growth and allow addition of new automation functions. Other development activities involve software changes required to accommodate such upgraded features as DABS, collision avoidance, and FSS automation (see above).

Additionally, the contractor will develop the following new ATC automation functions:

- Flight Plan Conflict Probe. This will provide controllers with computer assistance in the long-range planning of conflict-free paths through en route airspace. The computer will update flight plans, check an aircraft's intended flight path, determine potential conflicts, and suggest alternatives to correct potential conflicts.

- Control Message Automation. This will provide processing of two-way communications with aircraft using a data link. The system will process and generate a variety of aircraft control messages such as ATC command, restrictions, and weather advisories.

- Conflict Resolution. This is an extension of the Conflict Alert program described under the Aviation Safety section earlier in the report. It will use flight plan and tracking data to give the controller suggested resolutions to potential conflicts.

- En Route Metering. This function will help regulate air traffic passing from en route to terminal airspace control. Because acceptance rates may be exceeded for periods of time due to bad weather and many nearly simultaneous arrivals, smoothing of the traffic flow is needed to prevent overloads in the terminal area and minimize fuel consumption. Metering will aid the controller in sequencing traffic in the en route airspace and adjusting the rate of flow into the terminal airspace.

SOURCE: FAA, Systems Research and Development Service

MARINE

WATERBORNE TRANSPORT

SAFETY PERFORMANCE

Waterborne Transport safety performance data are not included in this quarter's report because they are reported on an annual basis.

MODAL SAFETY HAZARDS

U.S. Flag Lash Vessel Engine Room Fire

A fire of major proportions recently occurred in the engine room of a U.S. flag Lash vessel resulting in multiple loss of life. Preliminary investigation of the subject casualty indicates the fire possibly resulted from ignition of diesel oil which entered the engine room from overflow of a generator lube oil tank. Since the fuel oil fill line is located adjacent to the lube oil fill line, the probability is being investigated that diesel oil was inadvertently pumped into lube oil tank during fueling operations. It is understood that improper connection during fueling of another Lash vessel resulted in a similar overflow without ignition several months ago. The Merchant Vessel Inspection Division has instructed cognizant OCMI's to advise all Lash vessel owners and operators of this situation. Coast Guard inspectors are advised to be alert for similar situations on other vessel classes.

SAFETY PROGRAM HIGHLIGHTS

Fire Pump Separation

Coast Guard regulations require redundant fire pumps and power supplies for a variety of commercial vessels. (See 46 CFR 34.10-5(f), 76.10-5(h) and 95.10-5(h).) These regulations also specify that the fire pumps must be separated physically so that a fire in a single space will not disable a vessels total fire pump capability.

A recent casualty involving a foreign flag passenger vessel reinforced the wisdom of this provision and the need for vigilance in attention to detail not only in the plan review stage but during vessel construction. The vessel was fitted with two fire pumps in adjacent compartments to a center compartment which was the main machinery space. In theory, the pumps were isolated; however, the electrically driven pumps were powered by common cabling which ran through the three spaces. A fire in the main machinery space severed the cable to the adjacent spaces and created a circuit breakdown that made the pumps inoperable. As a result, the vessel suffered considerable damage and did not return to the passenger vessel trade.

Gaseous Fixed Fire Extinguishing System Controls

Carbon dioxide or Halon 1301 total flooding fire extinguishing systems are acceptable for the protection of various shipboard spaces, such as machinery spaces, boiler rooms, paint lockers and emergency generator rooms. The currently acceptable arrangements for these systems require a remote system release to be installed in the proximity of the protected space as well as at the agent storage bank. With this arrangement, a dual release capability is afforded in the event the remote release station is rendered inoperable due to fire or other emergency at that location. On 10 February 1975, parts 34, 76, 95, 181 and 93 of Title 46 of the Code of Federal Regulations were amended to require that additional instructions be posted at all remote release stations explaining how to release the system from the main cylinder bank if the remote release does not or cannot be operated. This requirement is applicable only to those systems where the agent storage cylinders are located external to the protected spaces.

Since these amendments have become effective, installations have been noted where the agent storage cylinders were located inside the protected space and instructions were posted by the extinguishing system remote release station which directed personnel to enter the protected space to release the agent if the remote release failed. This misinterpretation of the regulations creates a potentially hazardous if not impossible situation for shipboard personnel to contend with. Protected spaces should not be entered to release any fixed fire extinguishing system, and any instructions which require actions of this nature should be removed.

Marine Investigation - A New Division Within the Office of Merchant Marine Safety

On 25 June 1976, the Marine Investigation Division was established within the Office of Merchant Marine Safety. Rear Admiral W. M. Benkert formally dedicated the new division which is headed by Captain Alfred E. Hampton.

This reorganization at the Headquarters level consolidates the investigative functions of the Marine Safety Program which were formerly within the divisions of Merchant Vessel Personnel and Merchant Vessel Inspection. In addition a branch has been formed specifically to perform safety evaluation. The creation of the new organization was brought about by the growth of responsibilities related to the investigatory role in the marine safety field and the increasing awareness of a requirement for a division in the Office of Merchant Marine Safety wholly dedicated to the investigative function and the review, evaluation and follow-up processes necessary to instigate corrective safety measures. One of the primary functions of this division will be to insure a higher quality of investigative work throughout the marine safety field and provide a strong base of leadership and support for investigative activities. The Marine Investigation Division will prove to be an asset to objectives of the Coast Guard's marine safety mission.

Coast Guard Inspectors at Trans-Alaskan Pipeline

At the request of the Department of Transportation, five Coast Guard marine inspectors, qualified in weld inspection and radiography were sent to Alaska. The team is inspecting welding and radiography of the pipeline's girth welds to assure compliance with DOT pipeline safety standards. Each marine inspector is assigned to a separate camp along the pipeline's 798-mile length at each of the pipeline's five construction sites.

New York Vessel Traffic Service a Step Closer

The New York Vessel Traffic Service (VTS) came a step closer to reality on July 15, 1976 with the award of a 1.9 million dollar contract to the Motorola Corporation. The Motorola contract provides Automatic Data Processing equipment and reserves government options for procurement of communications and closed circuit television equipment. The Motorola equipment will interface with high resolution radar equipment, supplied by AIL Inc., to provide New York Harbor with the most sophisticated VTS yet designed. The New York VTS will manage vessel traffic through continuous monitoring of vessel movements, real time analysis of vessel traffic patterns and constant communications with mariners. The New York VTS is scheduled for operation in July 1978.

Portable Fire Fighting Module

On 25 June 1976, a contract was awarded to Northern Research and Engineering Company of Cambridge, Massachusetts, for production of a light weight, portable fire fighting module. The prototype unit is scheduled for delivery one year from contract award. The unit is being developed as a joint Coast Guard/NASA project.

The unit is sized for use aboard the new 32' HPB's and larger Coast Guard vessels and will be air deliverable by H-3 helicopters. The module will have a five by six foot base and will be four feet tall. It will be wholly self-contained including pump, prime mover, three hour fuel supply, suction and discharge hoses, fire fighting monitors and nozzles, and protective clothing. The unit will be operable either from a vessel or a dock from its trailer. The total weight of the unit will be less than 2300 pounds.

The unit will be capable of pumping over 2000 gallons per minute of water or water and foam in combination. It will be self priming with an effective suction lift of over twenty feet.

Hazardous Chemical Discharge Amelioration Personnel Protection Project

A test of the Coast Guard Modified Protective Outfit, Toxicological, Microclimate Controller (POTMC) chemical protective clothing was conducted at the Atlantic Strike Team, Elizabeth City, NC on 19 August 1976. The purpose of this test was to confirm emergency procedures to be followed should a person fall into the water.

The test was accomplished by having an individual wearing the outfit jump into the water and follow the outlined emergency procedures. The results of the test were as follows:

1. The inherent buoyancy of the outfit is sufficient to support an individual on the waters surface.

2. The emergency procedures outlined are more than adequate.

3. The individual can swim while wearing the outfit.

4. The flotation collar, provided as a modification to the original POTMC, will provide sufficient buoyancy to maintain a flooded outfit on the water surface.

The POTMC has been selected by the Marine Environmental Protection program manager to be supplied to the Strike Teams and to various Captains of the Ports (COTP's) for use in protecting personnel from hazardous chemicals. The specification was handed-off in March 1976, and procurement of the outfit has been undertaken by the Ocean Engineering Division.

Container Fire Test Series

During the week of 19 July 1976, full scale fire tests were conducted at the Coast Guard's Fire and Safety Test Facility to examine potential fire hazards of intermodal shipping containers. The tests, conducted on Little Sand Island in Mobile Bay, Alabama, were planned in three segments. The first part of the tests was conducted to determine whether a fire within a sealed container is capable of burning through the container shell; the second part was planned to determine the effects of an external pool fire exposure on a single level of containers; and the final segment was intended to evaluate an external pool fire exposure on a stack of containers, three high.

For the test series, standard 8 foot by 8 foot by 20 foot containers, constructed of steel, aluminum and fiberglass panels were tested.

Preliminary results of the tests indicate that normally sealed containers in good repair would not tend to sustain interior combustion. During the test series, all interior fires proved to be oxygen regulated. The external fire tests showed that aluminum containers offered little resistance to fire, while steel and fiberglass reinforced plastic (FRP) containers showed greater resistance.

RECREATIONAL BOATING

SAFETY PERFORMANCE

An update of the boating fatality count has shown that fatalities declined 25.5% (161 fewer) in the second quarter and 17% (139 fewer) in the first half of 1976 from the same periods in 1975. Preliminary reports show 383 fatalities thus far for the third quarter of 1976.

Fatalities shown in Table 5, though preliminary due to delays in reporting, reflect the seasonal trend, with many fatalities during the summer months and fewer in the winter, spring, and fall. Figures are not available for the third quarter, therefore, data for 1975 are not comparable with these preliminary data for 1976.

TABLE 5. RECREATIONAL BOATING FATALITIES FOR 1976*COMPARES WITH 1975

JANUARY			FEBRUARY			MARCH		
1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
45	48	+6.7	47	64	+36.2	94	96	+2.1

APRIL			MAY			JUNE		
1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
137	130	-5.1	240	158	-34.2	255	183	-28.2

JULY			AUGUST			SEPTEMBER		
1975	1976	% CHANGE	1975	1976	% CHANGE	1975	1976	% CHANGE
225	171[1]	[1]	162	124[1]	[1]	84	88[1]	[1]

SECOND QUARTER[2]			FIRST 6 MONTHS[2]		
1975	1976	% CHANGE	1975	1976	% CHANGE
632	471	-25.5	818	679	-17.0

[1] Data incomplete.
[2] Due to incomplete data for July, August and September, 1976, statistics for third quarter and first 9 months are not reportable.

SOURCE: USCG, (G-Bd). *Monthly fatalities are the latest received as of this quarter.

CHART 11 - RECREATIONAL-BOATING FATALITIES BY MONTH, 1975-1976

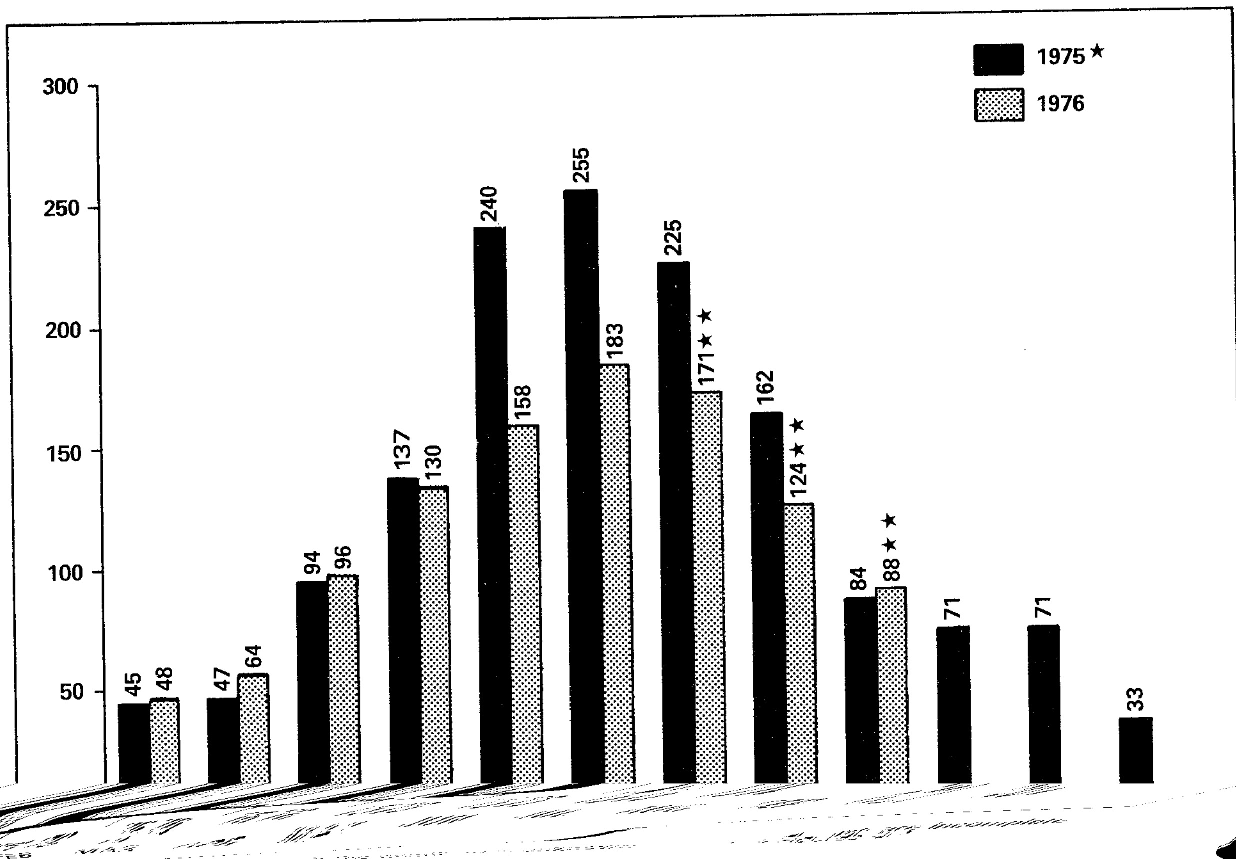
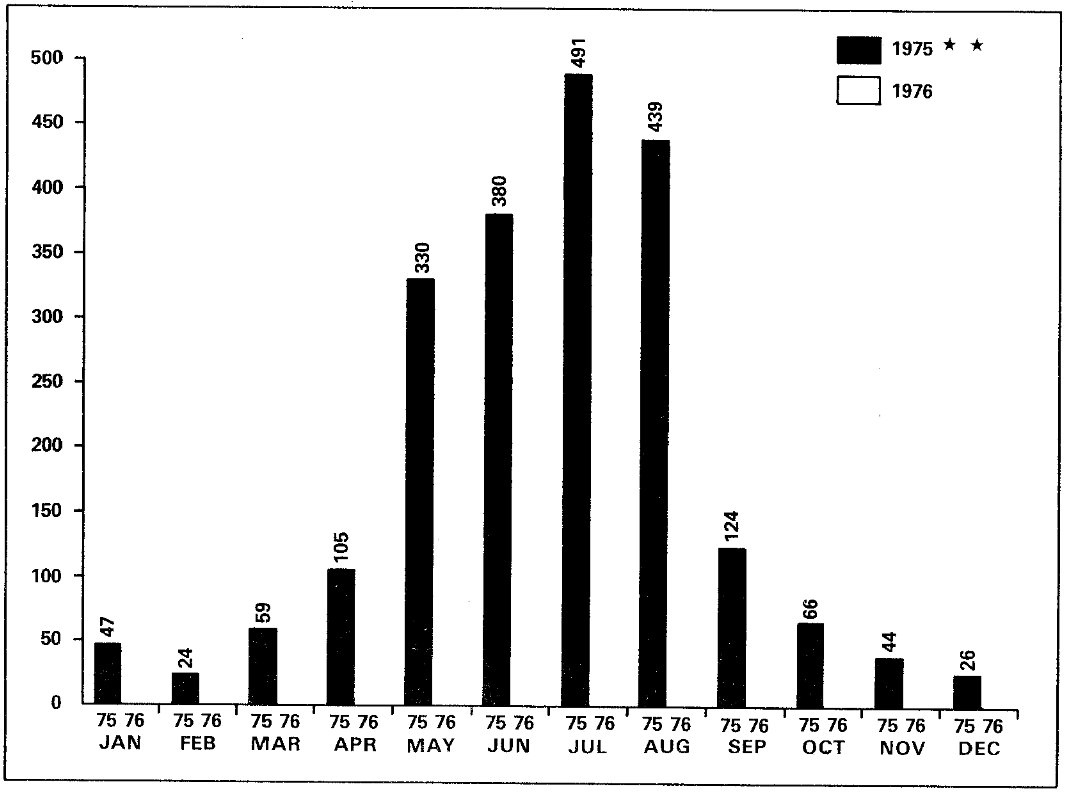
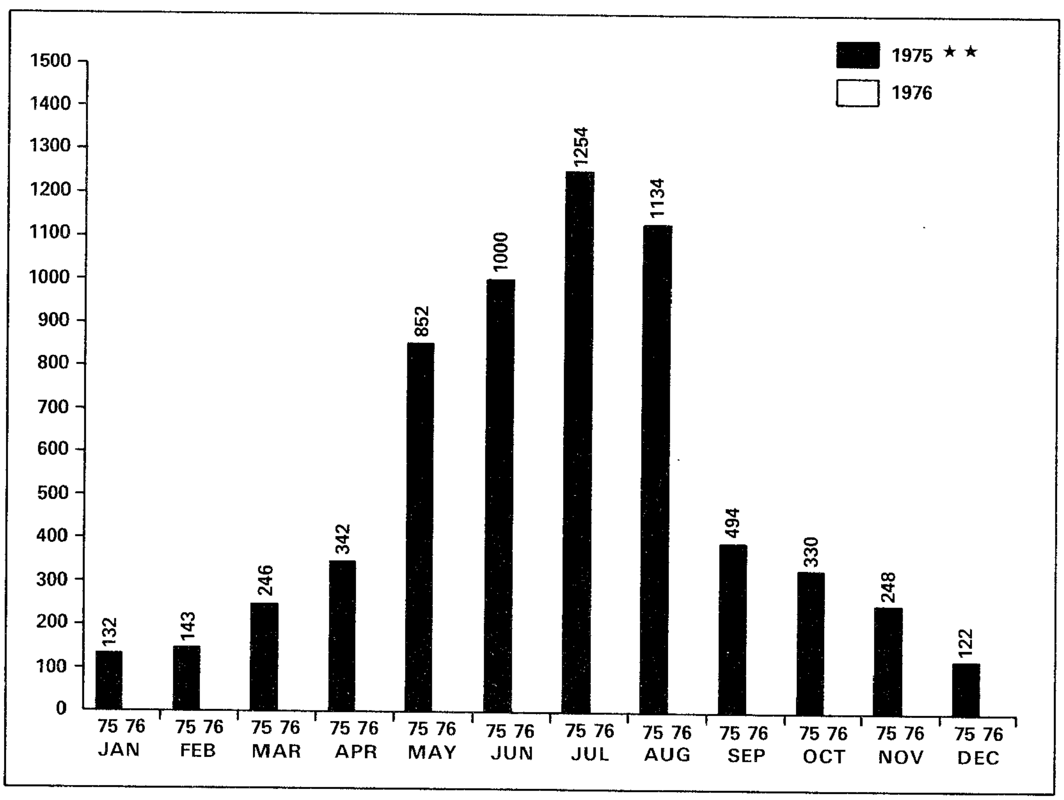


CHART 12 - RECREATIONAL-BOATING INJURIES BY MONTH, 1975-1976★



★ Updated annually ★ ★ Does not include one injury for which the month is unknown

CHART 13 - RECREATIONAL-BOATING ACCIDENTS BY MONTH, 1975-1976 ★



★ Updated annually ★ ★ Does not include 11 accidents for which the months are unknown

MODAL SAFETY HAZARDS

The following boating accident report is believed to be of special significance and is published in the hope of preventing future accidents of this nature.

Case No. 1

Four men, duck hunting early on a November morning in the State of Idaho, were using a 16-foot aluminum canoe to retrieve ducks which they had shot down. The men decided to move to an island in the lake and used the canoe, in two trips, to move them and their gear. The island was off limits to hunters and when spotted by the refuge manager the four men climbed back into the canoe, with their gear, and started paddling out onto the choppy lake. At this time the canoe had a freeboard of about four inches, and was obviously overloaded. The canoe turned broadside to the waves, and capsized. One man put on a personal flotation device, the only other PFD was pushed out of the men's reach by the wind and waves. The water temperature was 39° F.

Two men in another canoe attempted a rescue. It took nearly an hour in the strong wind and choppy water for these two rescuers to bring two of the men ashore. The two rescuers were then too tired to safely attempt another rescue. The two men picked up were stripped of their wet clothing, placed in sleeping bags and rushed to a hospital twelve miles away. One man died on the way to the hospital. The two men in the water died before rescuers could arrive with a powerboat. The only survivor was released after six hours of treatment for hypothermia.

The violation of good boating practices by overloading the canoe caused the capsizing of the vessel. Insufficient personal flotation devices and the failure to don the ones available contributed to a worsening situation. Despite the efforts of the rescuers,three men died of hypothermia.

Hypothermia is the reduction of the body's vital core temperature. If someone is immersed in water, even water in the 60-degree range, death can result within a relatively short period of time from the loss of this vital core heat. Exposure, another term for hypothermia, also affects mountain climbers, hikers, or persons lost in the outdoors in cold weather. The Coast Guard is studying hypothermia and attempting to educate the public of the hazard of exposure to cold water through public information and educational efforts.

SAFETY PROGRAM HIGHLIGHTS

Hypothermia

On September 10, 1976,during the Fall Conference of the National Association of Search and Rescue Coordinators in Cheyenne, Wyoming,personnel from the Coast Guard's Office of Boating Safety conducted a worshop on hypothermia. The Coast Guard is actively training its own personnel and informing the recreational boating and maritime community of the danger of hypothermia. Hypothermia is the rapid reduction of the body's vital core temperature. During the early fall and late spring, the colder air and water temperatures pose a distinct danger to recreational boaters. Hypothermia caused by accidental immersion in very cold water for substantial periods of time results in many tragic deaths each year.

Investigation of Boating Accidents

The Coast Guard has developed a new accident investigation handbook which will assist its investigators in gaining information which will help to reveal causes of accidents and facilitate the development of remedies. A recent publication, the "Boating Accident Investigator's Manual" (CG-472), meets a specific recommendation of the National Transportation Safety Board and is designed to aid the individual investigator in doing his work in an efficient and thorough manner. The new Coast Guard publication complements the Boating Accident Investigation Manual for state and local law enforcement officers developed by the International Association of Chiefs of Police under a grant from the Coast Guard.

Visual Distress Signals

The Office of Boating Safety is soliciting comment on visual distress-signaling devices. Several studies have indicated that one-third of the operators of boats who found themselves in need of assistance did not receive any, and that 45 percent of the search-and-rescue incidents to which the Coast Guard responded would have been facilitated if the boat operators had carried visual distress signals.

A visual signaling device should alert potential rescuers, aid in locating a distressed vessel, reduce the time it takes for rescue or assistance and lessen the risk of further misfortune to the boater.

Operation Sail

During the recent three-day bicentennial weekend in New York City, 225 sailing vessels and many modern naval vessels gathered for Operation Sail. Three years of intensive planning brought together the largest fleet of sailing ships ever assembled in the Western Hemisphere. The thousands of spectator craft at these events were controlled by Coast Guard units, including over 100 auxiliary patrol vessels. Recapitulation of the weekend of activity showed a fourfold increase of assistance cases to 612 with 1,553 people assisted. No deaths or injuries were attributed to Operation Sail.

MATERIALS TRANSPORT

PIPELINES

SAFETY PERFORMANCE

Fatalties resulting from incidents involving pipelines transporting natural gas and hazardous liquid materials reported to the Office of Pipeline Safety Operations (OPSO) increased significantly in the third quarter and the first nine months of 1976 over the same periods in 1975, as shown in Table 6.

The number of pipeline accidents and injuries also increased during this reporting period. In the third quarter of 1976, 470 pipeline accidents occurred compared with 420 in the same quarter of 1975, an increase of about 12%. During the first nine months of 1976, 1221 accidents were reported compared with 1186 in the same period last year.

Injuries for the third quarter and the first nine months of 1976 increased 30.6% and 7%, respectively. A total of 94 injuries were reported in the third quarter and 335 during the first nine months compared with 72 and 313, respectively, for the same periods in 1975

CHART 14 - PIPELINE FATALITIES BY MONTH, 1975-1976

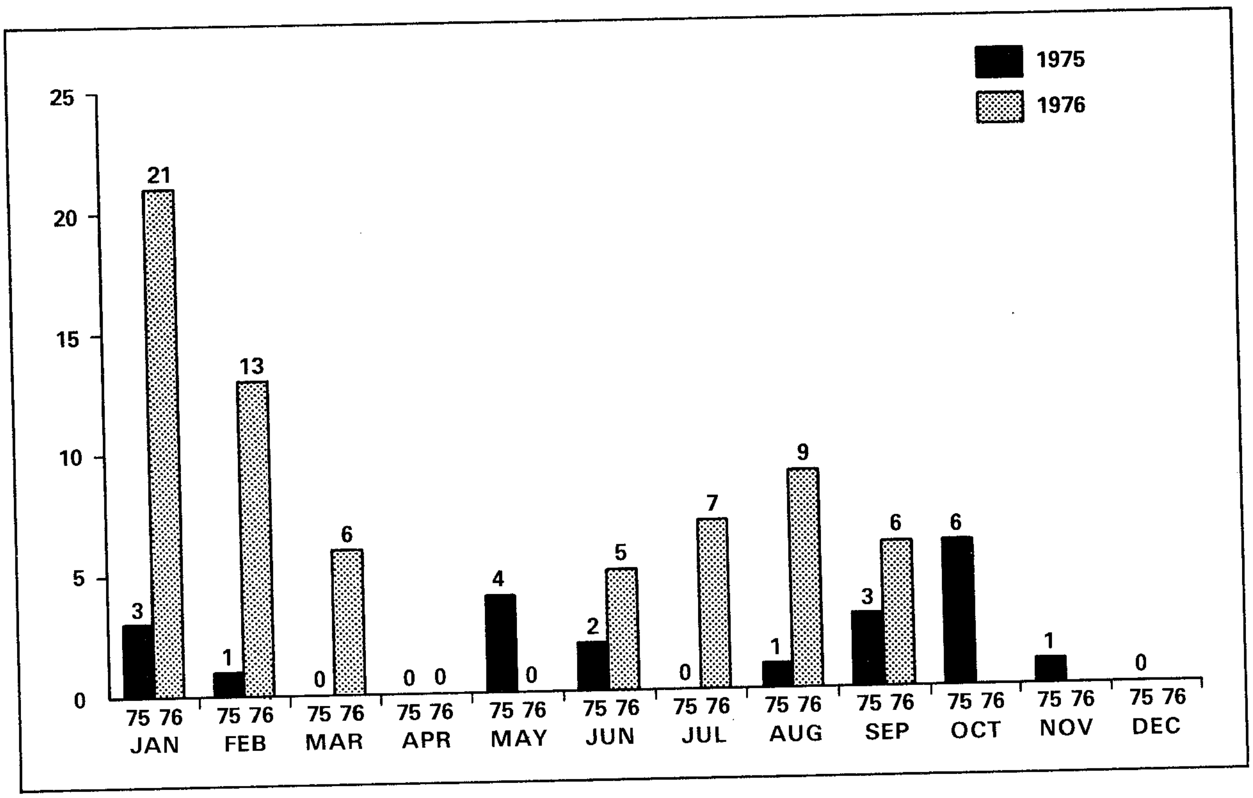


TABLE 6. PIPELINE FATALITIES FOR 1976* COMPARED WITH 1975

CLASSIFICATION	JANUARY		FEBRUARY		MARCH	
	1975	1976	1975	1976	1975	1976
GAS DISTRIB. [2]	0	21	1	8	0	6
GAS TRANS.	0	0	0	0	0	0
LIQUID TRANS.	3	0	0	5	0	0
TOTAL	3	21	1	13	0	6

CLASSIFICATION	APRIL		MAY		JUNE	
	1975	1976	1975	1976	1975	1976
GAS DISTRIB. [2]	0	0	0	0	2	4
GAS TRANS.	0	0	0	0	0	1
LIQUID TRANS.	0	0	4	0	0	0
TOTAL	0	0	4	0	2	5

CLASSIFICATION	JULY		AUGUST		SEPTEMBER	
	1975	1976	1975	1976	1975	1976
GAS DISTRIB. [2]	0	6	1	1	3	6
GAS TRANS.	0	1	0	8	0	0
LIQUID TRANS.	0	0	0	0	0	0
TOTAL	0	7	1	9	3	6

CLASSIFICATION	THIRD QUARTER			FIRST 9 MONTHS		
	1975	1976	% CHANGE	1975	1976	% CHANGE
GAS DISTRIB. [2]	4	13	+225.0	7	52	+642.9
GAS TRANS.	0	9	[1]	0	10	[1]
LIQUID TRANS.	0	0	0.0	7	5	-28.6
TOTAL	4	22	+450.0	14	67	+378.5

[1] Not calculable.
[2] Based on written reports from operators with more than 100,000 customers plus telephone reports from operators with fewer than 100,000 customers.

SOURCE: Materials Transportation Bureau, OPSO, (MTP-40).

*Monthly fatalities are the latest received as of this quarter.

CHART 15 - PIPELINE INJURIES BY MONTH, 1975 - 1976

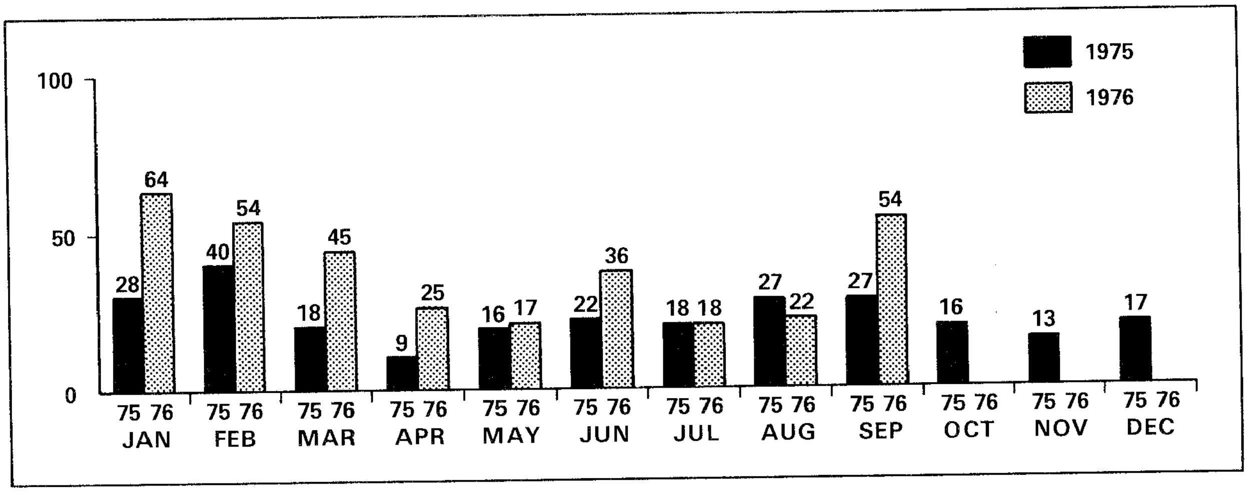
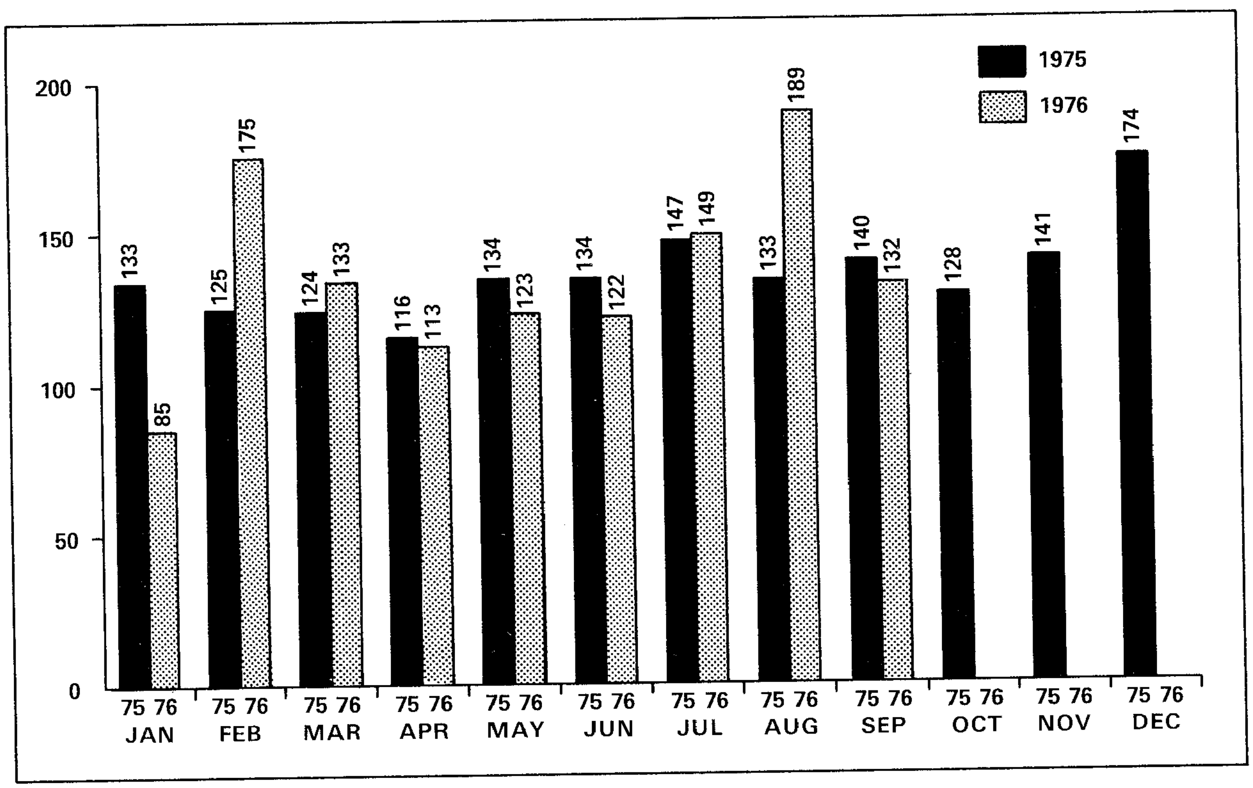


CHART 16 - PIPELINE ACCIDENTS BY MONTH, 1975 - 1976



MODAL SAFETY HAZARDS

- On August 8, in Allentown, Pennsylvania, an explosion and fire resulted in two fatalities, 10 injuries, and destruction of five houses. Safety personnel from the Pennsylvania Public Utility Commission, the National Transportation Safety Board (NTSB), and OPSO conducted an onsite investigation.

- On August 9, near Monroe, Louisiana, a 20-inch interstate gas transmission line was hit by a road grader and the subsequent explosion and fire destroyed three homes and caused six deaths and one injury. Representatives of OPSO and NTSB conducted an investigation on the scene. Investigation disclosed that some time after the pipeline was buried, construction reduced the earth coverage over it.

SAFETY PROGRAM HIGHLIGHTS

During the third quarter, the OPSO took several actions concerning the Federal safety regulatory programs for gas and liquid pipelines. Principal among these activities were the following:

- On July 7, the OPSO published in the Federal Register a clarification concerning the corrosion control requirements for gas pipelines contained in Sections 192.457 and 192.465 of 49 CFR. The clarification answered several questions regarding electrical survey methods, compliance with specified deadlines, cathodic protection requirements, civil penalties, and waiver policies.

- Early in July, the Materials Transportation Bureau (MTB) and OPSO initiated several actions to monitor construction work and remedial weld programs on the Trans-Alaska crude oil pipeline system. These inc uded: (1) Steps to identify all the girth welds not meeting the prescribe DOT standards, to have the irregularities corrected, and to assure that the remainder of the construction work is carefully monitored to prevent any recurrence of problems; (2) Alyeska Pipeline Service Company was directed to furnish DOT a plan and a schedule for correcting all welding deficiencies, actions being verified to assure compliance; (3) An onsite DOT task force was assigned to monitor pipeline work during the balance of the 1976 construction season; (4) The Deputy Secretary of DOT, along with representatives of other concerned Federal agencies, conducted an onsite inspection of the Trans-Alaska Pipeline System in July to further evaluate the field construction procedures; and (5) On July 21, Deputy Secretary John W. Barnum and MTB Director James T. Curtis, Jr., appeared before the Senate Interior and Insular Affairs Committee to testify concerning the construction of the Trans-Alaska Pipeline System.

- Also in July, for the first time, OPSO achieved 100 percent voluntary participation of State agencies in the gas pipeline safety programs with the receipt of a Section 5(b) agreement application from the New Jersey Board of Public Utility Commissioners. This 100 percent total includes agencies in the District of Columbia and Puerto Rico.

- On August 9, MTB issued amendments to the gas (Amendment 192-27) and liquid (Amendment 195-11) pipeline safety regulations to better assure the safe operation of offshore pipeline facilities.

- On September 22, OPSO proposed to amend the gas pipeline safety standards concerning corrosion control for small metal fittings in plastic pipelines. The proposed amendment would allow the installation of small, electrically isolated alloy fittings in plastic pipelines without coating and cathodic protection if (1) an operator can show by tests, investigation, or experience in the area of application, that corrosion control is provided by alloyage, and (2) the fitting is designed to prevent leakage caused by localized corrosion pitting.

The following pipeline safety compliance, training, and information activities were carried out by MTB and OPSO during the third quarter of 1976:

- Technical programs were presented at the following major State, industry, and engineering conferences:

  On August 2, at the Midwest Gas Association Annual Gas Operations School in Ames, Iowa.

  On August 17, at the meeting of the ASME Gas Piping Standards Committee in Minneapolis.

  On August 18, at the annual Alabama Gas Short Course at the University of Alabama in Tuscaloosa.

  On August 18, at the annual meeting of the American Public Gas Association in New Orleans.

  On September 29, at the Kentucky Gas Seminar in Prestonburg, Kentucky.

- On September 1-2, the Eastern Region Federal/State meeting of gas pipeline safety State agency personnel was held in Newport, Rhode Island.

- Five 2-day gas industry safety seminars conducted by the Transportation Safety Institute (TSI) and OPSO were held in Texas, Wisconsin, and Louisiana at which 218 pipeline safety personnel from industry, the States, Federal agencies, and the public participated.

- Three 5-day safety courses for State agency personnel were conducted by TSI and OPSO in Oklahoma City.

Investigation of pipeline technology was pursued actively with significant progress noted in the following areas:

- On July 30, DOT awarded a contract for a technical study to be conducted by AMF/Advanced Systems Laboratory, Inc., of Santa Barbara, California, on the problems of hydrogen stress cracking, hydrogen embrittlement, stress corrosion cracking, and corrosion fatigue. Purpose of the study will be to provide OPSO with an appraisal of the seriousness of these problems and remedial actions which may be utilized for operating gas and liquid pipeline systems.

- On August 17, DOT awarded a study contract to Van Houten Associates, Inc., of New York, New York, to provide OPSO with an appraisal of domestic and foreign practices utilized to assure the safe operation of offshore gas and liquid pipeline facilities. Elements of this study contract include: (1) surveying present offshore pipeline practices with regard to design, construction, operation, and maintenance; (2) analyzing prospective hazardous conditions which would affect offshore pipeline facilities;

(3) determining the relative safety of offshore pipelines in various environments; (4) reviewing present U.S. and foreign safety regulations for offshore pipeline facilities and their operations; and (5) preparing recommendations for further research and other actions to improve the safety of offshore pipelines.

- On September 2, DOT awarded a study contract to IIT Research Institute of Chicago, Illinois, to evaluate the effectiveness of programs for the prevention of damage to pipelines by outside forces. Elements of the study include: (1) analysis of State and local laws directed at pipeline and utility line damage prevention; (2) determination of the role of cooperative groups' such as underground coordination councils; (3) review of data reported to OPSO on individual gas failures and liquid pipeline accidents; (4) review of activities of industry, contractor, utility, and labor actions; (5) review of research and technical programs; (6) review of activities of other Federal, State, and local government organizations and legislative proposals; and (7) preparation of recommendations for future research, regulations, or other actions.

HAZARDOUS MATERIALS

SAFETY PERFORMANCE

Fatalities resulting from the accidental release of hazardous materials declined in the third quarter and the first nine months of 1976 as compared with the same periods of 1975, as shown in Table 7.

The number of reported incidents, however, increased in the third quarter and the first nine months of 1976. A total of 3,412 incidents occurred in the third quarter and 9,322 during the first nine months of 1976 compared with 3,028 and 7,973, respectively, for the same periods a year ago.

The number of injuries resulting from the hazardous materials incidents declined in the third quarter, but increased almost 23% during the first nine months of 1976. There were 245 injuries reported in the third quarter and 698 during the first nine months of 1976 compared with 259 and 570, respectively, for the same periods last year. It should be noted that a large percentage of reported injuries and fatalities can be attributed to a very small number of incidents. Only 12 of the 3,412 reported incidents occurring during the third quarter of 1976 accounted for 80% (4) of the fatalities and about 49% (120) of the reported injuries. In addition, approximately 50% of the 698 injuries reported during the first nine months of 1976 resulted from only 14 serious incidents.

TABLE 7. HAZARDOUS MATERIALS FATALITIES FOR 1976 COMPARED WITH 1975

JANUARY		FEBRUARY		MARCH	
1975	1976	1975	1976	1975	1976
0	0	0	0	0	0
APRIL		**MAY**		**JUNE**	
1975	1976	1975	1976	1975	1976
4	0	2	5	2	2
JULY		**AUGUST**		**SEPTEMBER**	
1975	1976	1975	1976	1975	1976
0	3	16	1	2	1

THIRD QUARTER			FIRST 9 MONTHS		
1975	1976	% CHANGE	1975	1976	% CHANGE
18	5	-72.2	26	12	-53.8

SOURCE: Materials Transportation Bureau, OHMO, (MTH-31).

CHART 17 - HAZARDOUS MATERIALS FATALITIES BY MONTH, 1975-1976

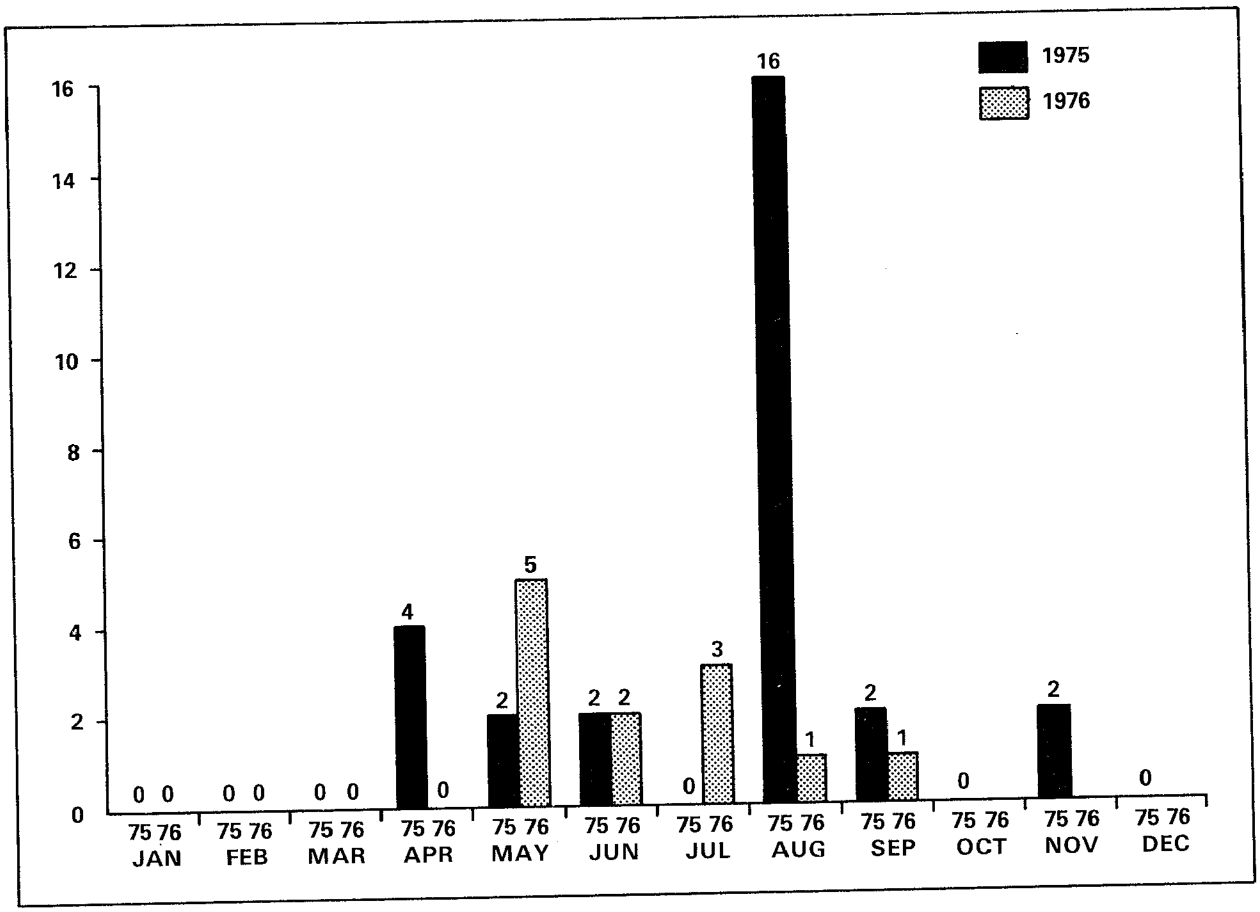


CHART 18 - HAZARDOUS MATERIALS INJURIES BY MONTH, 1975-1976

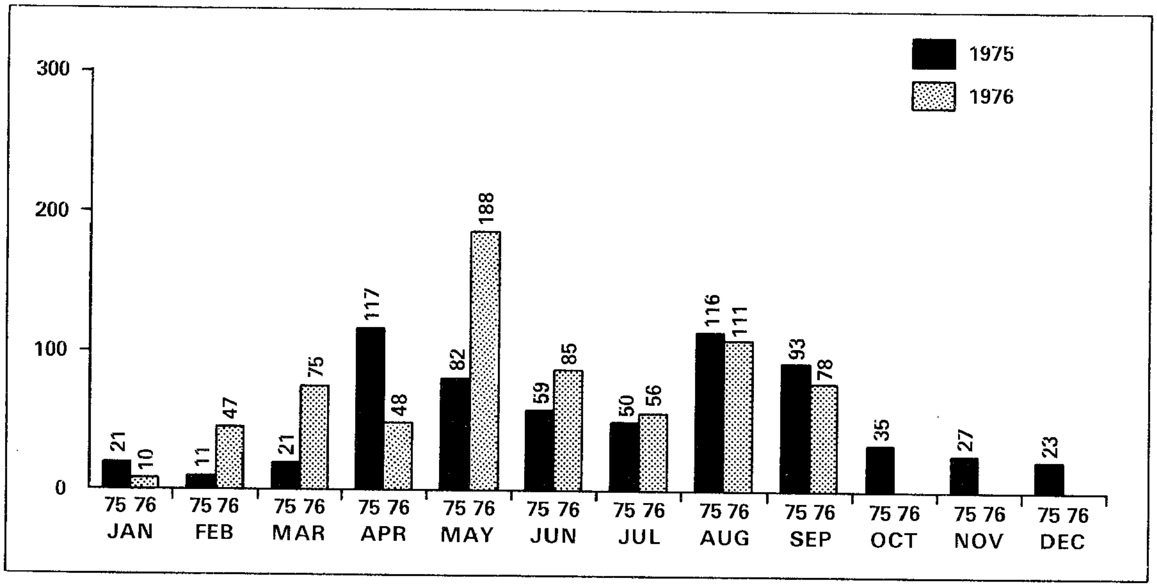
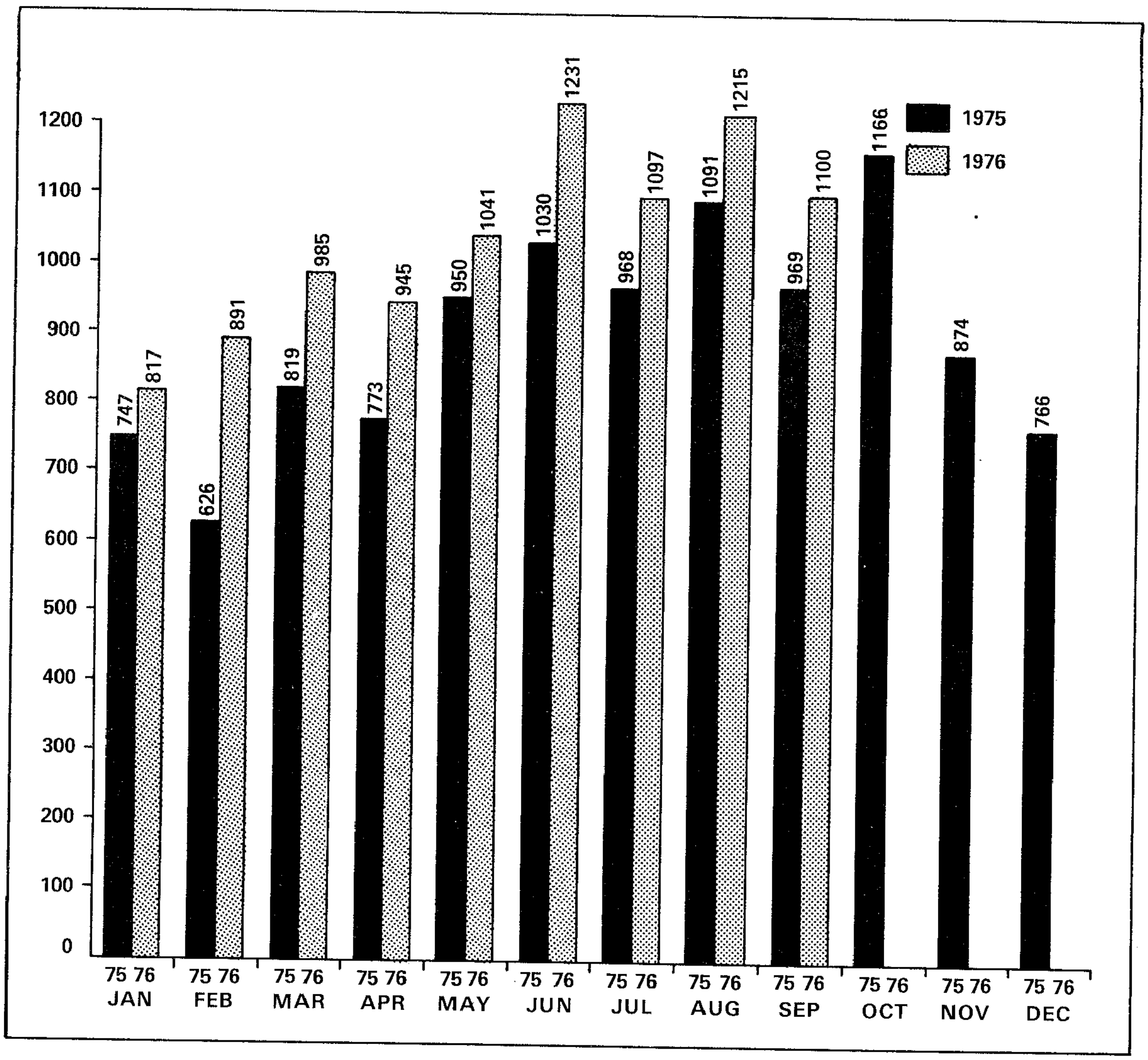


CHART 19 - HAZARDOUS MATERIALS INCIDENTS BY MONTH, 1975-1976



MODAL SAFETY HAZARDS

The following tank truck unloading incident is significant and is published as an example of current problems encountered in the safe transportation of hazardous materials.

Case No. 1.

A tractor and tank trailer containing gasoline began unloading at a service station in St. Charles, Mo. on August 4, 1976. The driver decided to give the station owner his copy of the shipping papers and walked away from the trailer. As he entered the station, there was an explosion. A fire ensued engulfing and subsequently destroying the tractor and tank trailer, severely damaging the service station and causing heat damage to adjacent buildings. Fortunately, no injuries or fatalities resulted, but total damage was estimated at $100,000.

The initial explosion, although the exact cause has not yet been determined, might have been prevented, if the driver had stayed at the vehicle until unloading had been completed, as required by the regulations. Specifically, Section 177.834(i)(2) of Title 49 of the Federal Code of Regulations states, in part, that, "A motor carrier who transports hazardous materials by a cargo tank must ensure that the cargo tank is attended by a qualified person at all times during unloading." Furthermore, Section 177.834(i)(3) specifies that, "A person 'attends' the loading or unloading of a cargo tank if, throughout the process, he is awake, has an unobstructed view of the cargo tank, and is with 7.62 meters (25 feet) of the cargo tank."

SAFETY PROGRAM HIGHLIGHTS

Inspections Create Greater Awareness of Regulations

In an effort to assure compliance with the published regulations, the Compliance Branch of the Office of Hazardous Materials Operations conducted numerous inspections of shippers, carriers, container manufacturers and drum reconditioner facilities throughout the country. In addition to explaining the regulations to industry personnel, discrepancies are noted and reported to the management of the involved firms. Flagrant violations are referred to the modal administrations for possible legal action. Through seminars and inspection visits, the Compliance personnel have created a greater awareness of the regulations. As a result, more carriers are reporting incidents, as can readily be seen by the increasing number of Hazardous Material Incident Reports received.

Seminars on New and Revised Regulations

As part of a continuing effort to inform and assist carriers, shippers, container manufacturers, fire-fighting personnel, law enforcement personnel and all others who have direct or indirect responsibility for safe transportation of hazardous materials, the Office of Hazardous Materials Operations conducted a total of eight seminars in four different cities during the third quarter of 1976. Intermodal seminars were held in Crystal City, Virginia; Boston, Massachusetts; and Newark, New Jersey, in July, and Atlanta, Georgia, in August. Seminars for the purpose of explaining the new and revised regulations published in Docket HM-112 were conducted in Newark, N.J. in July, and Atlanta, Georgia, in August. Combined attendance at all seminars in the third quarter exceeded 2,100 people.

TRANSPORTATION FIRE SAFETY FOCUSES ON SMOKE AND TOXICITY

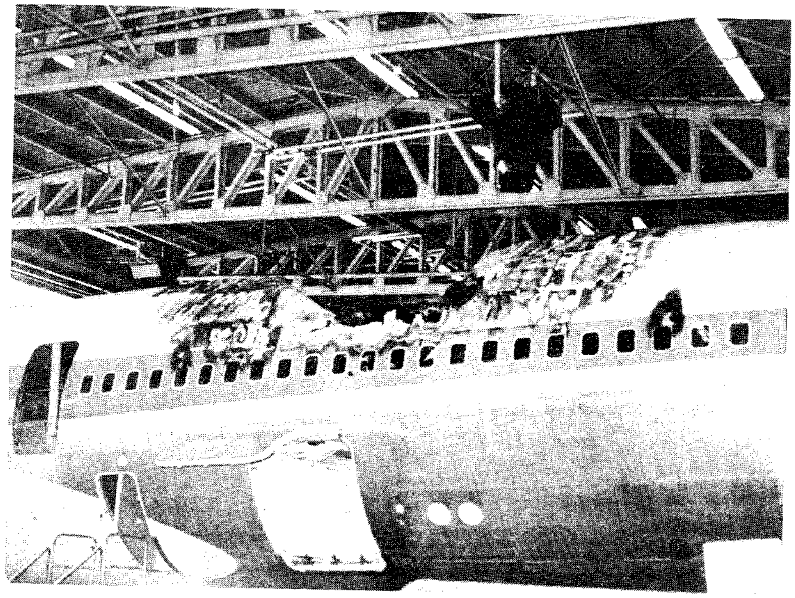
Product designers and materials engineers faced with the job of specifying plastics for transportation, particularly mass transit vehicles and aircraft, are concerned today over the problem of selecting equipment made of plastics because of uncertainties about material specifications on combustibility. Bernie Miller, Executive Editor of Plastics World, expressed this concern in an assessment of plastics in transportation.

This was typical of the industry reaction to Federal efforts to broaden the flammability specifications for materials used in transportation beyond the traditional criteria to include smoke and gases produced from burning plastic. This Federal activity is being focused on aircraft, rail rapid transit, passenger railcars and buses.

Some commonly used plastics that readily satisfy present flammability requirements of ease of ignition,burn time, burn length before self-extinguishment and the amount of flaming droplets produced,may decrease in use because their flame retardant systems generate excessive smoke and/or toxic products.

Toxic gases produced from combustion complicate the materials decision. Toxicity must be considered even though there is no concensus on test methods and toxic gas standards. Together these uncertainties make the selection of plastic materials used in transportation equipment very difficult.

Further, even the current flammability test methods are being reviewed and may be revised. It is widely recognized that small-sample flammability tests, while highly useful as screening tests, may not adequately predict the behavior of a large amount of the same materials in an actual fire.



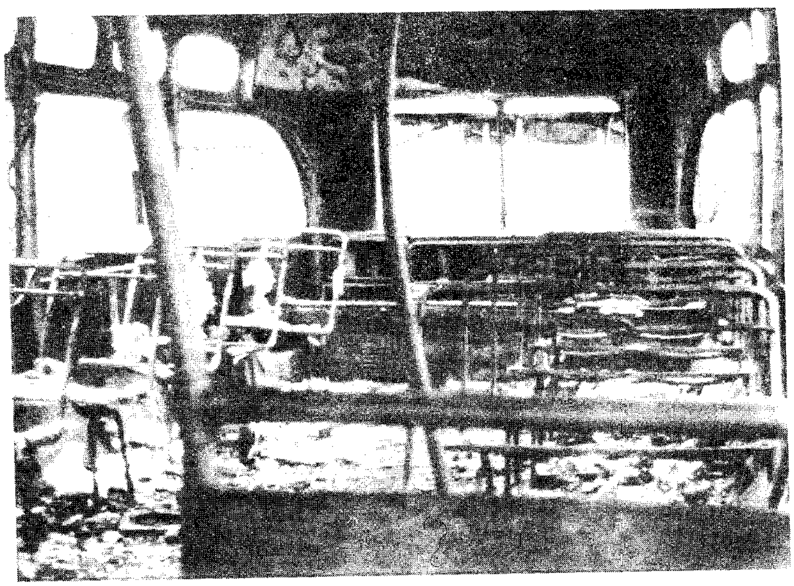
Fire burned through the fuselage of this unoccupied aircraft while it was on the ramp

The National Material Advisory Board's study on the fire safety aspects of plastics in its major application areas, including transportation, is now in preparation at the National Academy of Sciences. This comprehensive 14-volume study reportedly will raise serious questions about the fire performance of some materials used in transportation equipment.

A proposed FAA rule on smoke emission would supplement the flammability standards for cabin materials as currently embodied in Federal Air Regulation (FAR) 25.853. This regulation specifies, for various cabin materials, self-extinguishing times, char lengths, and flaming-drip times in a vertical burn test. For other materials, maximum horizontal burn rates are specified. In practice, however, the internal standards of the airframe manufacturers are usually tighter than standards in FAR 25.853. The FAA is currently evaluating industry's response to the proposed rule which is intended to minimize smoke build-up during a survivable aircraft crash and subsequent fire, so that cabin exits remain visible for 4-5 minutes after the crash.

The aircraft industry has been urging postponement of the smoke rule on the grounds that smoke and toxicity are intimately related. It contends it would be impractical to reengineer for low-smoking materials in the absence of specific toxicity objectives. The decisions on adopting the smoke rule and on proceeding with rulemaking on toxicity are expected in a few months.

The Transportation Systems Center (TSC), the Department's technical support facility at Cambridge, Massachusetts, has developed guidelines under the sponsorship of the Urban Mass Transportation Administration (UMTA). These are not formally imposed or required as yet, but may be promulgated through appropriate regulatory action. Use of these guidelines to date has been entirely voluntary. Eight properties have used these TSC guidelines.



Interior of this subway train was completely burned out after a fire occurred.

UMTA is also funding a computerized data bank of materials at TSC, scheduled to become operational later this year. The data bank will provide designers with performance information for the major transit applications, including panelling, seating, flooring, glazing, electrical and thermal insulation, light diffusers and fabrics. The bank will have data on flammability and smoke indices and will be programmed to rank materials by specified performance parameters for various types of applications.

Passenger compartments use plastics in the form of sheets, laminates, and composites, and in cushioning foams and cable insulation. The main applications of plastic in aircraft cabins are wall and ceiling panels, galley, lavatory and class-divider panels, light diffusers, window surrounds, seat backs and tray tables. Other uses are passenger service consoles, window dust shields, air ducts, luggage compartment doors and seat cushioning. A typical wide-body jet has about 3 tons of these components. More than half of this weight is panelling, usually consisting of a Nomex (polyimide) paper core laminated between epoxy-glass fabric and faced with a Tedlar (PVF) protective film over a decorative film.

In the newer transit cars, the plastic applications are mainly wall and ceiling panelling, glazing, seating (cushioned or uncushioned), light diffusers, and in some designs like BART, end caps that include the motorman's cab. The weight of combustibles may exceed 4 tons. In older transit equipment, thermoformed sheet materials have been commonly used for sidewall and ceiling panelling, air conditioning ducts and some seat shells.

In aircraft, polycarbonate is being used for seatbacks, armrests, window reveals, passenger service units and interior lighting. Some heavy grades of polycarbonate which have reasonable flammability performance are marginal for smoke generation. Boeing is currently evaluating phenolics for use in these applications as well as for panels, trim parts and overhead-bin doors in its wide-body aircraft. Besides low flammability, the phenolics have low smoke generation. For transit uses,polycarbonate seems to offer improved flame resistance as well as markedly better smoke characteristics.

In seating, the main focal point is cushioning foams. Urethane has been the widespread choice heretofore. However, the publicity surrounding last year's burn tests at the Fire Research Center of the National Bureau of Standards on the interiors of a bus and subway car of the Washington, D.C., transit system may have foreclosed much of urethane's future, at least in transit applications. The problems demonstrated were rapid fire spread and smoke buildup following ignition of the foam cushioning. Efforts are underway to retard ignition and flame-spread with some type of protective coating.

No flexible foams are available that meet both flammability and smoke emission limits,although standard neoprene cushioning foam is a significant improvement over urethane. A long range possibility for seat cushioning is polyimide foam, which has excellent flammability and smoke characteristics. Semi-rigid types of polyimide foam with marginal seating qualities have been available for several years. Recently,NASA's Johnson Space Center in Houston has developed a flexible formulation with good seating properties. However, a production process is several years away.

Wire and cable insulation is due for some changes, particularly in rapid transit. New York Transit Authority statistics show that the large majority of disabling train fires are of electrical origin. Much of the serious smoke and fumes from such fires originate in the wire and cable insulation. DOT has no smoke standards for cable insulation at this time, but the availability of the flame-resistant, low-smoke fluorocarbons has moved these materials rapidly into that application.

Railcar design will see some major innovations with the introduction next fall of the ACT-1 (Advanced Concept Train) commissioned by UMTA. About 4000 pounds of plastics, largely reinforced polyester, are used in these "design idea" cars.

The car bodies, including side panels, are being built by Avco Corp., Nashville, Tennessee. All interior components are molded by Fiber Science, Inc., Salt Lake City, Utah. The assembly will be done by AiResearch Div., Garrett Corp., Torrance, Calif.

The interior panels, seats and other components are fabricated by hand-layup from a proprietary composite developed by Fiber Science. The formulation utilizes flame-retardant polyester (Diamond Shamrock Dion FR 6657) with about 50% alumina for low smoke. The standard fire-retardant gel coat is protected by a vandal-resistant coating of DuPont Imron urethane.

A novel reinforcement system using glass-cloth fabric gives the composite the same strength properties as conventional chopped glass and mat construction, but at half the weight and one-third the thickness.

In other major interior applications, Lexan MR-4000 is used for the light diffusers, the see-through windows in the compartment dividers, and the exterior glazing of the double-hung windows. Seat padding, where used, is either neoprene foam alone or a composite of pneumacel mat covered with 3/4 inch of neoprene foam.

The car exterior also leans heavily on plastic composites. The largest components are the car's end caps, which are about 9-1/2 feet wide, 9 feet high and 8 feet long and assembled from two vertical halves. These hand-layups are fabricated from an alumina-filled formulation based on an Ashland Chemical FR polyester, Hetron 301L.

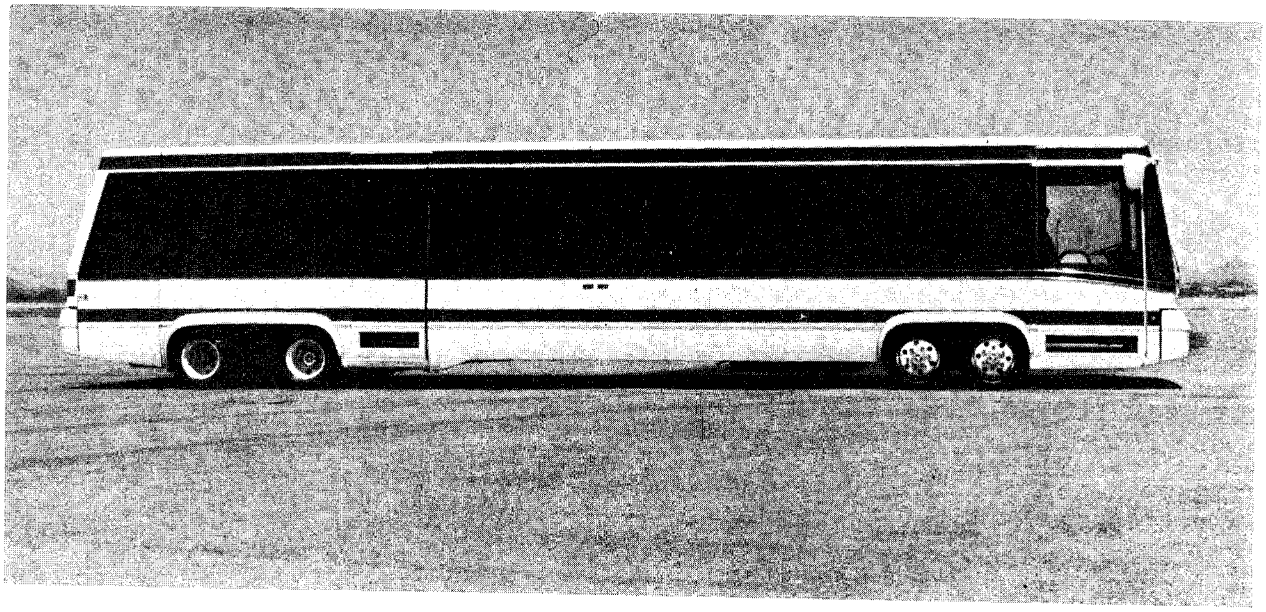
The car sides are panelled with an aluminum-honeycomb construction faced with a 50-mil layer of glass-epoxy (Narmco 3203) and an exterior stainless-steel cladding. Roof panels are of similar construction, but utilize a "paper" honeycomb core to provide the dielectric strength to withstand 600 volts, 4000 amps in case of power-wire contact.

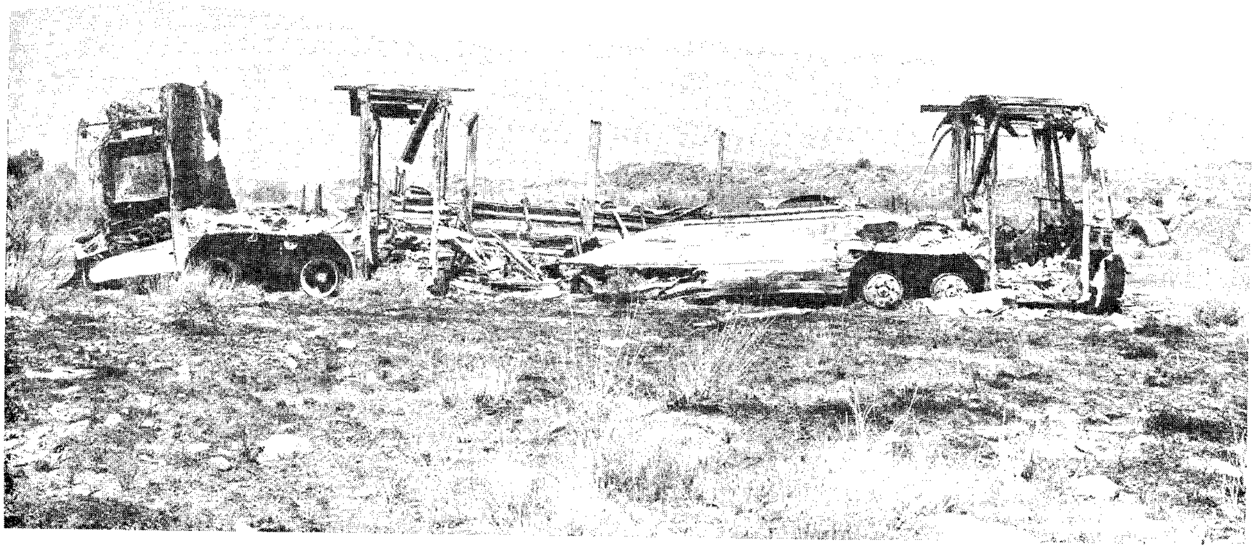
Answers to the materials problem will begin to emerge in the next year or so from the fire research programs now underway at NASA, FAA, the National Academy of Science and the National Bureau of Standards.

Private-sector research is being carried on at airframe manufacturers, large resin companies and numerous private and university research facilities.

Several million dollars will be spent on contract research and grants this year, and at least that much on the in-house programs of government and industry laboratories. Most of the effort is concentrated on aircraft applications, but the answers that are developed inevitably will carry over into the other forms of transportation.

The current materials research programs include: conducting burn tests of materials and furnishings in full-scale mockups of passenger compartments to study fire dynamics and combustibility characteristics and to obtain correlation with small scale lab tests, developing analytical methods for toxic off-gases and establishing protocols for measuring toxicological limits. Considerable effort is also going into evaluating promising materials for practical, near-term use and into the possibilities of adapting advanced materials for commercial application. One of the materials being evaluated is the high performance, pyrolysis-resistant polymers that NASA studied for use in the manned space vehicle program.





Top: Side view of Rohr Transbus prototype urban coach.
Bottom: View of coach after being destroyed by an accidental fire. There were no injuries. If a full load of passengers had been aboard, there would have been adequate time for evacuation. All materials in the coach met Federal Motor Vehicle Safety Standards (FMVSS) 571.302.

For material specifiers, several studies due to be reported later this year will be of particular interest. One is the toxicity study on 75 representative aircraft cabin materials being conducted jointly at FAA's two research centers, the National Aviation Facilities Experimental Center (NAFEC) in Atlantic City and the Civil Aeromedical Institute (CAMI) in Oklahoma City.

The NAFEC facility is measuring the amount of the seven significant off-gases (including CO, HCN, HCl) produced by the closely-controlled pyrolytic decomposition of these materials. Using the same 75 materials and test methods, the CAMI group will measure the times to both incapacitation and death of rats exposed to the off-gases from equal weights of the test materials. The objective of these integrated studies is to develop a hazard-ranking method for use in selecting cabin materials.

The FAA's cabin-fire safety program is following two parallel routes - materials engineering and fire-control techniques. One part of the materials engineering program is to develop a basic lab method by which materials can be ranked according to their total combustion hazard, i.e., flammability, smoke, toxicity and flash-over propensity. The second part of the FAA materials engineering program is developing a mathematical model of a cabin fire. The purpose of the model, being developed at the University of Dayton Research Institute with input from Boeing, is to predict the rate of fire growth of a cabin fire involving various combinations of materials. If successful, this model would be a major tool for evaluating the fire-safety characteristics of a cabin design without using the costly large chamber tests.

The Department of Transportation, Office of the Secretary, is also funding four separate but related studies on flammability and toxicity. The first of these will demonstrate a methodology for the assessment of a fire risk in transportation based upon the data base and the materials and test specifications currently in use. The second will study the thermal decomposition of common plastics used in vehicle interiors and develop test specifications. The third is a basic study of the effects of specific products of combustion on rats. The fourth will provide a symposium to acquaint materials engineers with the latest information about the useability and safety of common plastics.

It is now recognized that the fire safety problem is far more complex than it was thought to be in the late sixties, when the concern mainly was flammability. The major improvements in flame retardance have intensified the problems of smoke and toxicity.

There will be no miracle polymer to solve the problem. The solution will come from a better understanding of the total fire hazard and a more sophisticated handling of the materials that now exist -- via coatings, composites and fire-oriented design thinking.