

FATAL ACCIDENTS and WEATHER
(non-air carriers)

Calendar Years 1948 and 1949

May 1950

Program Planning Staff
Aviation Statistics Division

CIVIL AERONAUTICS ADMINISTRATION

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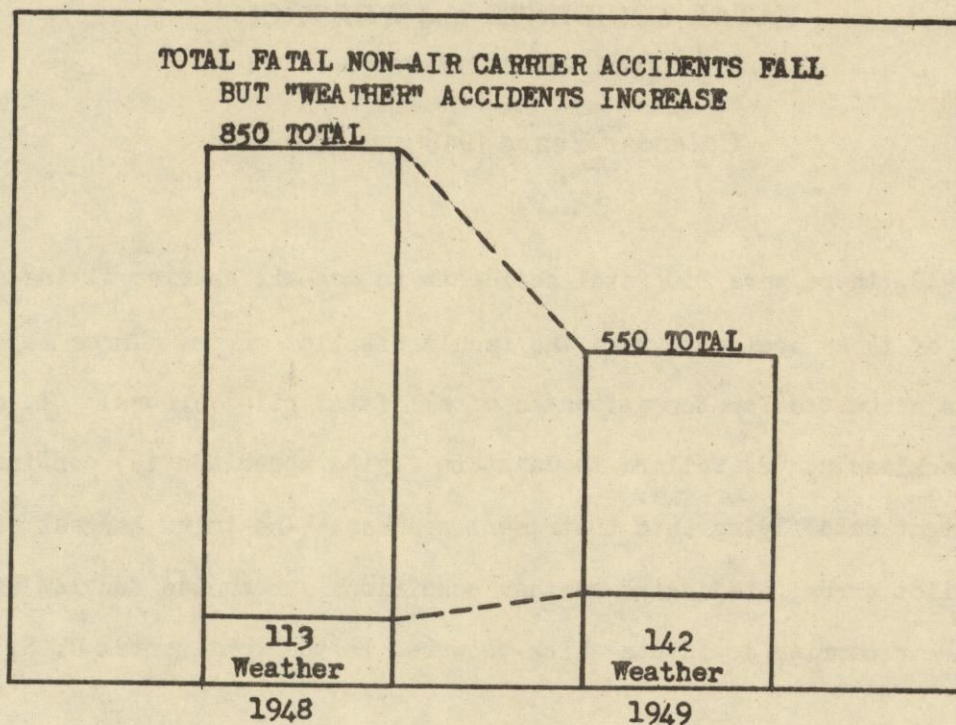
In 1948, there were 850 fatal accidents in non-air carrier flying and about 90% of these accidents were the result of pilot error. Three major categories accounted for three-fourths of all fatal pilot errors: (1) operating recklessly, (2) failure to maintain flying speed and (3) continuing Visual Flight Rule flying into instrument weather. The third largest category of pilot error, misjudging weather conditions, accounted for 14% of all fatal non-air carrier accidents which occurred in the continental U. S. during 1948.

While the national average for 1948 was only 14%, in many states fatal "weather" accidents were considerably more significant. In Connecticut and New Hampshire, "weather" accidents represented 50% of all fatal accidents, New Jersey 40%, Maryland, North Dakota and Utah 33%, Pennsylvania 24%, California, New Mexico, and North Carolina 21%, and Massachusetts 20%.

In 1949, the Civil Aeronautics Board estimates there were about 550 fatal accidents in non-air carrier flying, an encouraging drop of 35% below the previous year. Unfortunately, fatal accidents where weather was a factor ^{a/} increased rather than decreased. In 1949, there were 142 fatal "weather" accidents, almost 30 more than in 1948. This group, therefore, accounted for some 25 to 30% of all fatal non-air carrier accidents in continental U. S. last year compared with the 14% figure of 1948. Thus, weather accidents seem to be growing in significance and their implications should be carefully studied.

NOTE: CAB accident statistics were used in this study.

a/ Hereafter, in this study the term fatal "weather" accident will be used for convenience in referring to those accidents which are classified as "continuing Visual Flight Rule flying into instrument weather."



At the outset, it should be noted that the experience of two short years and only 255 cases is probably insufficient to justify any categorical statements or broad generalizations. Despite this necessary limitation, certain interesting things are brought to light through a review of the record of the past two years.

1. Geographic Distribution of "Weather" Accidents:

The map on page 16 shows the location of each of the 255 fatal "weather" accidents which occurred in non-air carrier flying in continental United States during calendar years 1948 and 1949. Accidents are concentrated along the East and West coasts and in the area west and southwest of the Great Lakes where weather conditions are subject to rather sudden changes and, as a consequence, where forecasting is difficult.

California, with 39 fatal "weather" accidents in this two-year period, had more than three times as many as the second ranking state of Washington

which had 12. Only four other states had ten or more fatal "weather" accidents — Pennsylvania and New York had 11 each; Texas and New Jersey had 10. For the complete distribution of accidents by state, see table on page 12.

In terms of Civil Aeronautics Administration Regions, the geographic distribution was as follows:

Non-air Carrier Fatal "Weather" Accidents
1948 and 1949

	<u>Number</u>	<u>% of Total</u>
CAA Region 1	67	26
CAA Region 6	49	19
CAA Region 3	46	18
CAA Region 2	27	11
CAA Region 4	24	10
CAA Region 7	23	9
CAA Region 5	<u>19</u>	<u>7</u>
Total Continental U. S.	255	100

2. Exposure Rates:

While the preceding section on geographic distribution tells us which states and which CAA regions had the greatest numerical volume of fatal "weather" accidents, this does not in itself definitely mean, for example, that California had the worst record among all the states nor that CAA Region 1 had the poorest record among the seven regions in the continental United States. In order to make a valid comparison between states and regions it is necessary to have some idea as to the volume of flying performed. Unfortunately, data on hours flown by individual state are very sketchy and so this exposure basis was eliminated. The next state exposure base to be considered was the number of civil aircraft registrations, on the assumption that where there was the largest number of aircraft, there would also be found the greatest accident risk.

In terms of number of civil aircraft per fatal "weather" accident, Vermont

(a state with very few aircraft) ranked first and California (which consistently has had the largest number of civil aircraft) fell back to 20th position. See table, page 12. This tabulation shows a wide variation in accident exposure with Vermont at the one extreme with one fatal "weather" accident for each 65 civil aircraft and Missouri at the other extreme with more than 1,100 civil aircraft per fatal "weather" accident. Four states — Delaware, Iowa, Louisiana, Rhode Island — and the District of Columbia had no fatal "weather" accident during the two-year period. It should be pointed out that these states without a fatal "weather" accident may simply represent fortunate quirks of fate rather than offer conclusive proof as to the character of weather conditions for the area. For instance, Delaware and southern New Jersey have similar terrain and weather, but there were three fatal "weather" accidents in southern New Jersey and none in Delaware. Rhode Island and Connecticut also have similar weather, but there were six fatal "weather" accidents in Connecticut and none in Rhode Island.

Thus, while an exposure rate in terms of civil aircraft per fatal "weather" accident represents some improvement over wholly unweighted data, it is still subject to a serious limitation. One of the chief assets of an airplane is its ability to cover considerable distance in comparatively short time. Investigation of these 255 fatal "weather" accidents showed that in 38.8% of the cases — 99 accidents — the mishap took place in states other than the state in which the aircraft was registered. See table, page 12. In addition, many other aircraft were operating in unfamiliar portions of their own states so that perhaps half of these fatal "weather" accidents involved aircraft flying in territory not well known to them. In 19 of the 49 areas (including the District of Columbia), half or more of the fatal "weather" accidents involved out-of-state aircraft.

<u>State</u>	<u>Fatal "Weather" Accidents</u>	<u>Accidents by Out-of-state Aircraft</u>	<u>Per Cent Out-of-state Aircraft</u>
Nevada	3	3	100
Alabama	2	2	100
New Hampshire	1	1	100
Connecticut	6	5	83
Indiana	4	3	75
Pennsylvania	11	8	73
South Carolina	3	2	66
Mississippi	3	2	66
Minnesota	8	5	62
Utah	5	3	60
New Jersey	10	6	60
Nebraska	6	3	50
New Mexico	4	2	50
North Dakota	4	2	50
Tennessee	4	2	50
Georgia	4	2	50
Kentucky	2	1	50
South Dakota	2	1	50
Missouri	<u>2</u>	<u>1</u>	<u>50</u>
Totals	84	54	64

Next these accidents were reviewed by CAA Region since these areas represent much larger geographical districts and it was felt that, perhaps, the aircraft involved in fatal "weather" accidents would be registered within the CAA Region in which the accident occurred even though they were not registered in the same state. This assumption proved fairly accurate since the figures show only 17% of the cases — 43 accidents — involved aircraft from other CAA Regions. However, in two of the seven Regions, 20% or more of the fatal "weather" accidents involved aircraft from other CAA Regions.

<u>CAA Region</u>	<u>Fatal "Weather" Accidents</u>	<u>Aircraft from other CAA Regions</u>	<u>Percentage</u>
Region 2	27	9	33
Region 5	19	4	21
Region 7	23	4	17
Region 6	49	8	16
Region 1	67	9	13
Region 3	46	6	13
Region 4	24	3	12½

3. Weather Data:

In order to discover the relationship between weather conditions and fatal "weather" accidents, the frequency of contact flying weather over a period of years at a number of designated weather stations was averaged by state. See Table, page 13. This method has certain limitations since weather is essentially a local phenomenon and conditions at any particular weather station, or group of weather stations, are only partially representative of the entire state. Despite this qualification, some general observations can be made.

The data show that with few exceptions those states with the largest percentage of contact flying weather also have relatively few fatal "weather" accidents. Only five states with large percentages of contact flying weather also rank high in number of fatal "weather" accidents. These states are California, Texas, Oklahoma, Utah and Nebraska.

Two possible explanations for the seemingly bad record in these states in contrast to their good flying weather may be offered. First, many of these accidents represented out-of-state aircraft owners. This was especially apparent in the case of Utah and Nebraska where we have previously noted that 60% and 50% of the accidents, respectively, were charged to out-of-state aircraft. This suggests that perhaps unfamiliar terrain may have contributed to

some of these accidents almost as much as the principal cause — continuing VFR flight into instrument weather.

Second, aircraft owners in states which normally have a very high proportion of contact weather may tend to count on the existence of such good conditions, then become lax in checking weather reports so as to make proper allowance for infrequent, though potentially dangerous, unfavorable weather.

4. Distribution of Fatal "Weather" Accidents by Month:

Two years, embracing one of the worst winters the United States has ever experienced, are not sufficient to show seasonal distribution. The following table is, therefore, presented solely for reference to these two specific years and is not meant to be the basis for broader generalizations. Two cases will illustrate the importance of this limitation. In 1948, January accounted for 3% of the year's fatal "weather" accidents; in 1949, the same month accounted for 10%. Even greater contrast is found in the figures for December. In 1948, this month represented 13% of the total for the year; in 1949, December was only 1% of the total.

The complete monthly figures for 1948 and 1949 follow:

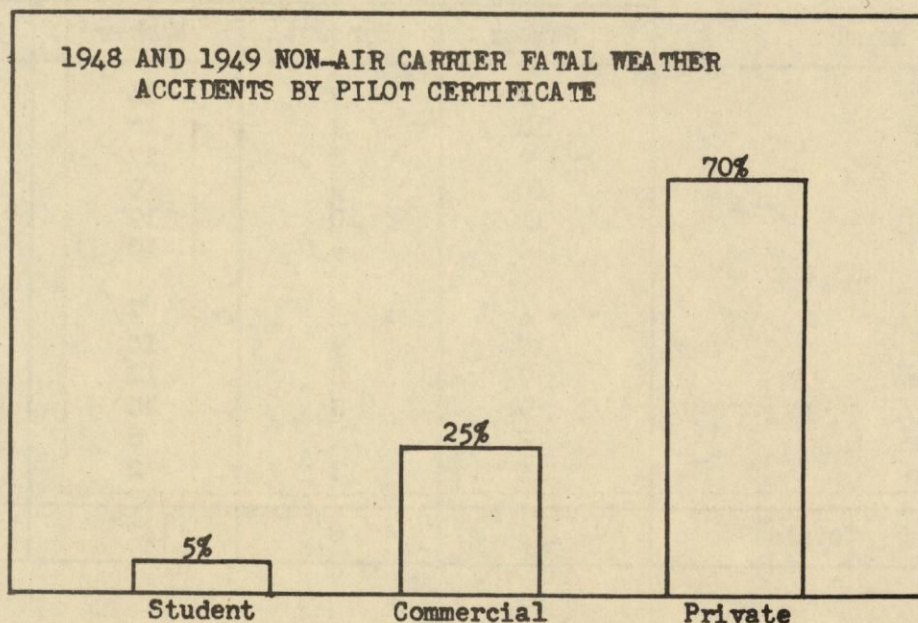
Month	1948		1949	
	Number	Percent	Number	Percent
January	4	3	14	10
February	10	9	16	12
March	9	8	17	12
April	10	9	9	6
May	11	10	19	13
June	10	9	10	7
July	4	3	7	5
August	10	9	10	7
September	9	8	12	8
October	9	8	20	14
November	12	11	6	5
December	15	13	2	1
Totals	113	100	142	100

5. Pilot Certificate:

In terms of pilot experience, it is noted that by far the largest number of accidents was charged to persons with private pilot ratings, 178 accidents or 70% of the total. Next in importance was the commercial pilot category with 63 accidents or 25% of the total. Student pilots accounted for the remaining 14 accidents, 5% of the total. It is significant that one-fourth of these accidents involved thoroughly experienced pilots, those holding commercial pilot certificates. This fact was emphasized in the Civil Aeronautics Board safety analysis entitled "The Human Equation in Aircraft Accidents" as follows:

"The fact that a high percentage of experienced pilots gets into this kind of trouble makes it that much harder to reduce this type of accident. The experienced pilot will be the first to agree that it is bad business to continue VFR flight into instrument weather. But apparently too many of them seem to feel that occasionally it is all right for them to do it, because they are experts. Also, when a pilot flying VFR gets through some bad weather successfully, he is likely to have the feeling that it wasn't so bad after all. Each such brush with the weather is likely to make any subsequent weather flying seem less formidable. This in itself can make pilots feel that they are not getting into worse conditions than on former flights. Unfortunately, too often they get into something they can't handle."

A complete tabulation of these fatal "weather" accidents by state and by type of pilot certificate appears on page 14.



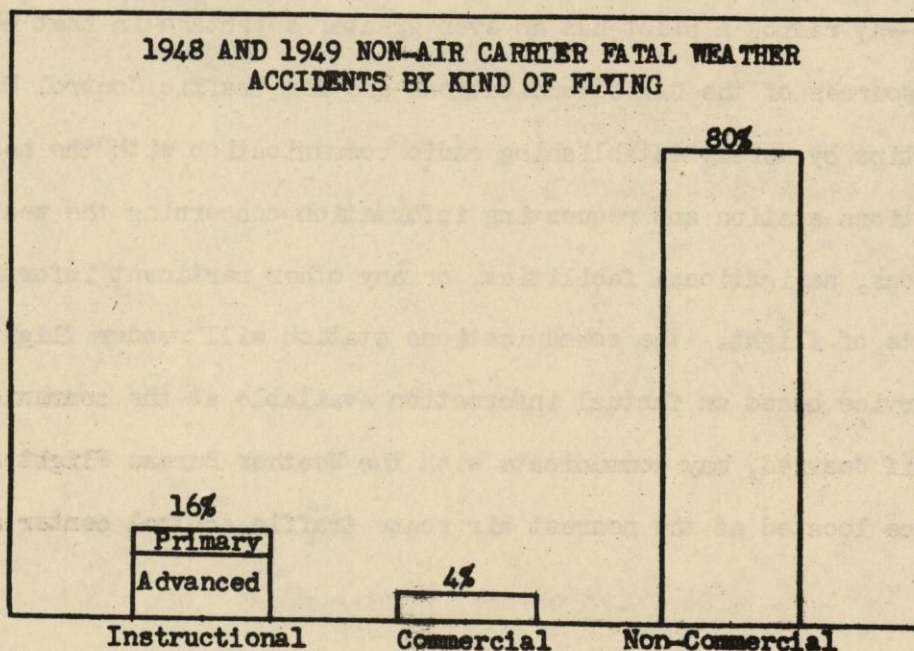
6. Kind of Flying:

Non-commercial flying accounted for 80% (204) of all the 255 fatal "weather" accidents in the two-year period 1948-1949. This class of flying involves the personal use of an airplane either for pleasure or as a means of transportation in connection with a business. It includes use of aircraft by either private or commercial pilots for pleasure, transportation, or business, whether the aircraft is personally owned, rented, or borrowed, where no money is paid by passenger or shipper for such transportation.

Instructional flying accounted for 16% (41) of the total fatal "weather" accidents that took place in the past two years.

The remaining 4% (10) of all the fatal "weather" accidents in 1948 and 1949 occurred in commercial flying. This classification includes all non-air carrier flying for direct financial return, with the exception of instructional flying. It includes passenger carrying operations, both local and cross-country, advertising, banner towing, photography, skywriting and crop control.

The state-by-state compilation of fatal "weather" accidents by type of flying is shown on page 15.



7. Weather Checks:

There are no figures available showing how many of these accidents involved pilots who had carefully checked on weather conditions in contrast to those who failed to check the weather outlook. However, an indication that few pilots checked on the weather would seem to be implied by the fact that flight plans were filed in only seven of the 113 fatal "weather" accidents that occurred during 1948.

Wider adoption of a policy of checking weather reports prior to each cross-country flight would surely do a great deal to improve the non-air carrier safety record. In addition, aircraft equipped with either one-way or two-way radio have considerable advantage in that they can obtain weather information and forecasts that are broadcast by the CAA airway communication stations along their flight route.

A pilot of an aircraft equipped with a receiver only can listen to regular scheduled weather broadcasts from the CAA communications stations along the route of flight and can also over-hear communications from the ground stations to other aircraft in flight which may be of value to him.

With two-way radio, a pilot has an even greater advantage in that he has the entire resources of the CAA Communications and Air Traffic Control Divisions at his fingertips by merely establishing radio communication with the nearest CAA communications station and requesting information concerning the weather, field conditions, navigational facilities, or any other pertinent information along his route of flight. The communications station will render flight assistance service based on factual information available at the communications station and, if desired, may communicate with the Weather Bureau Flight Advisory Weather Service located at the nearest air route traffic control center and

obtain a special forecast for the pilot. Thus, the private pilot with two-way radio has available virtually all ground resources of a scheduled air carrier in the nature of flight assistance service if he desires to make use of these facilities.

8. Instrument Ratings:

One of the most striking things which stands out in a review of "fatal" weather accidents in this period is the virtual complete absence of instrument training on the part of these pilots. It has previously been noted that flight plans were filed in only seven of the 113 fatal "weather" accidents that occurred in 1948. Significantly, in none of these cases did the pilot hold an instrument rating. Figures for 1949 are not yet available, but it is feared that they may show little improvement over 1948 despite the efforts to encourage instrument training which have been made by the Civil Aeronautics Administration.

Moreover, only four (1 $\frac{1}{2}$ %) of the 255 pilots involved in fatal "weather" accidents during the past two years held instrument ratings and none of these four pilots, who were qualified to fly IFR, had filed flight plans. Thus, we find the paradox of seven flight plans being filed by pilots unqualified for instrument flight while at the same time four qualified pilots failed to file plans.

Each private pilot must be made to realize the fact that unless he is qualified on instruments and his plane is equipped with adequate instruments he should avoid IFR conditions.

NON-AIR CARRIER FATAL WEATHER ACCIDENTS, 1948 and 1949

State	Fatal Accidents Involving Weather		Aircraft per Fatal Weather Accident		Aircraft From Other States	Aircraft from Other CAA Regions
	Number	Rank	Number	Rank		
Alabama	2	11	480	32	2	1
Arizona	2	11	583	35	1	0
Arkansas	3	10	378	27	1	0
California	39	1	267	20	6	4
Colorado	2	11	645	36	0	0
Connecticut	6	7	121	3	5	1
Delaware	0	13	-	44	0	0
Dist. of Columbia	0	13	-	44	0	0
Florida	3	10	909	41	1	1
Georgia	4	9	350	26	2	1
Idaho	3	10	265	19	1	0
Illinois	6	7	778	40	2	0
Indiana	4	9	681	37	3	0
Iowa	0	13	-	44	0	0
Kansas	4	9	689	38	0	0
Kentucky	2	11	414	30	1	0
Louisiana	0	13	-	44	0	0
Maine	3	10	209	10	0	0
Maryland	4	9	249	15	1	0
Massachusetts	7	6	204	9	3	1
Michigan	8	5	559	34	2	1
Minnesota	8	5	262	18	5	3
Mississippi	3	10	235	12	2	2
Missouri	2	11	1,136	43	1	1
Montana	1	12	972	42	0	0
Nebraska	6	7	277	21	3	2
Nevada	3	10	134	5	3	2
New Hampshire	1	12	296	22	1	0
New Jersey	10	4	167	7	6	1
New Mexico	4	9	191	8	2	1
New York	11	3	412	29	3	0
North Carolina	8	5	221	11	3	3
North Dakota	4	9	261	17	2	1
Ohio	8	5	558	33	3	1
Oklahoma	7	6	332	24	3	1
Oregon	7	6	245	14	3	2
Pennsylvania	11	3	384	28	8	4
Rhode Island	0	13	-	44	0	0
South Carolina	3	10	257	16	2	0
South Dakota	2	11	432	31	1	1
Tennessee	4	9	301	23	2	1
Texas	10	4	767	39	2	1
Utah	5	8	106	2	3	2
Vermont	3	10	65	1	1	0
Virginia	6	7	237	13	2	1
Washington	12	2	345	25	3	2
West Virginia	5	8	133	4	2	1
Wisconsin	6	7	345	25	2	0
Wyoming	3	10	159	6	0	0
Totals	255	-	-	-	99	43

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Moreover, only four (1½%) of the 255 pilots involved in fatal "weather" accidents during the past two years held instrument ratings and none of these four pilots, who were qualified to fly IFR, had filed flight plans. Thus, we find the paradox of seven flight plans being filed by pilots unqualified for instrument flight while at the same time four qualified pilots failed to file plans.

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Kansas	4	9	689	38	0	0
Kentucky	2	11	414	30	1	0
Louisiana	0	13	-	44	0	0
Maine	3	10	209	10	0	0
Maryland	4	9	249	15	1	0
Massachusetts	7	6	204	9	3	1
Michigan	8	5	559	34	2	1
Minnesota	8	5	262	18	5	3
Mississippi	3	10	235	12	2	2
Missouri	2	11	1,136	43	1	1
Montana	1	12	972	42	0	0
Nebraska	6	7	277	21	3	2
Nevada	3	10	134	5	3	2
New Hampshire	1	12	296	22	1	0
New Jersey	10	4	167	7	6	1
New Mexico	4	9	191	8	2	1
New York	11	3	412	29	3	0
North Carolina	8	5	221	11	3	3
North Dakota	4	9	261	17	2	1
Ohio	8	5	558	33	3	1
Oklahoma	7	6	332	24	3	1
Oregon	7	6	245	14	3	2
Pennsylvania	11	3	384	28	8	4
Rhode Island	0	13	-	44	0	0
South Carolina	3	10	257	16	2	0
South Dakota	2	11	432	31	1	1
Tennessee	4	9	301	23	2	1
Texas	10	4	767	39	2	1
Utah	5	8	106	2	3	2
Vermont	3	10	65	1	1	0
Virginia	6	7	237	13	2	1
Washington	12	2	345	25	3	2
West Virginia	5	8	133	4	2	1
Wisconsin	6	7	345	25	2	0
Wyoming	3	10	159	6	0	0
Totals	255	-	-	-	99	43

PERCENTAGE FREQUENCY OF CONTACT FLYING WEATHER FOR THE UNITED STATES

State	Percent	Rank
Alabama	90.0	22
Arizona	99.4	1
Arkansas	89.0	24
California	91.8	14
Colorado	94.5	5
Connecticut	83.5	41
Delaware	79.0	45
Dist. of Columbia	84.0	40
Florida	94.1	6
Georgia	89.4	23
Idaho	94.0	7
Illinois	77.0	47
Indiana	85.0	36
Iowa	90.0	19
Kansas	90.5	17
Kentucky	87.0	28
Louisiana	90.0	21
Maine	84.3	38
Maryland	83.0	42
Massachusetts	86.5	29
Michigan	84.8	37
Minnesota	90.0	20
Mississippi	89.0	25
Missouri	86.0	31
Montana	95.3	4
Nebraska	91.7	15
Nevada	98.7	2
New Hampshire	84.0	39
New Jersey	79.0	46
New Mexico	96.0	3
New York	85.6	34
North Carolina	85.3	35
North Dakota	92.5	11
Ohio	82.7	43
Oklahoma	92.5	12
Oregon	90.3	18
Pennsylvania	79.6	44
Rhode Island	a/	a/
South Carolina	86.0	32
South Dakota	90.5	16
Tennessee	88.6	26
Texas	93.0	9
Utah	92.0	13
Vermont	93.0	10
Virginia	86.0	33
Washington	87.0	27
West Virginia	a/	a/
Wisconsin	86.0	30
Wyoming	94.0	8

a/ Insufficient data to permit ranking.

Source: Derived from Weather Bureau study "Classified Weather for the U. S.", December 1946.

FATAL WEATHER ACCIDENTS BY TYPE OF PILOT CERTIFICATE

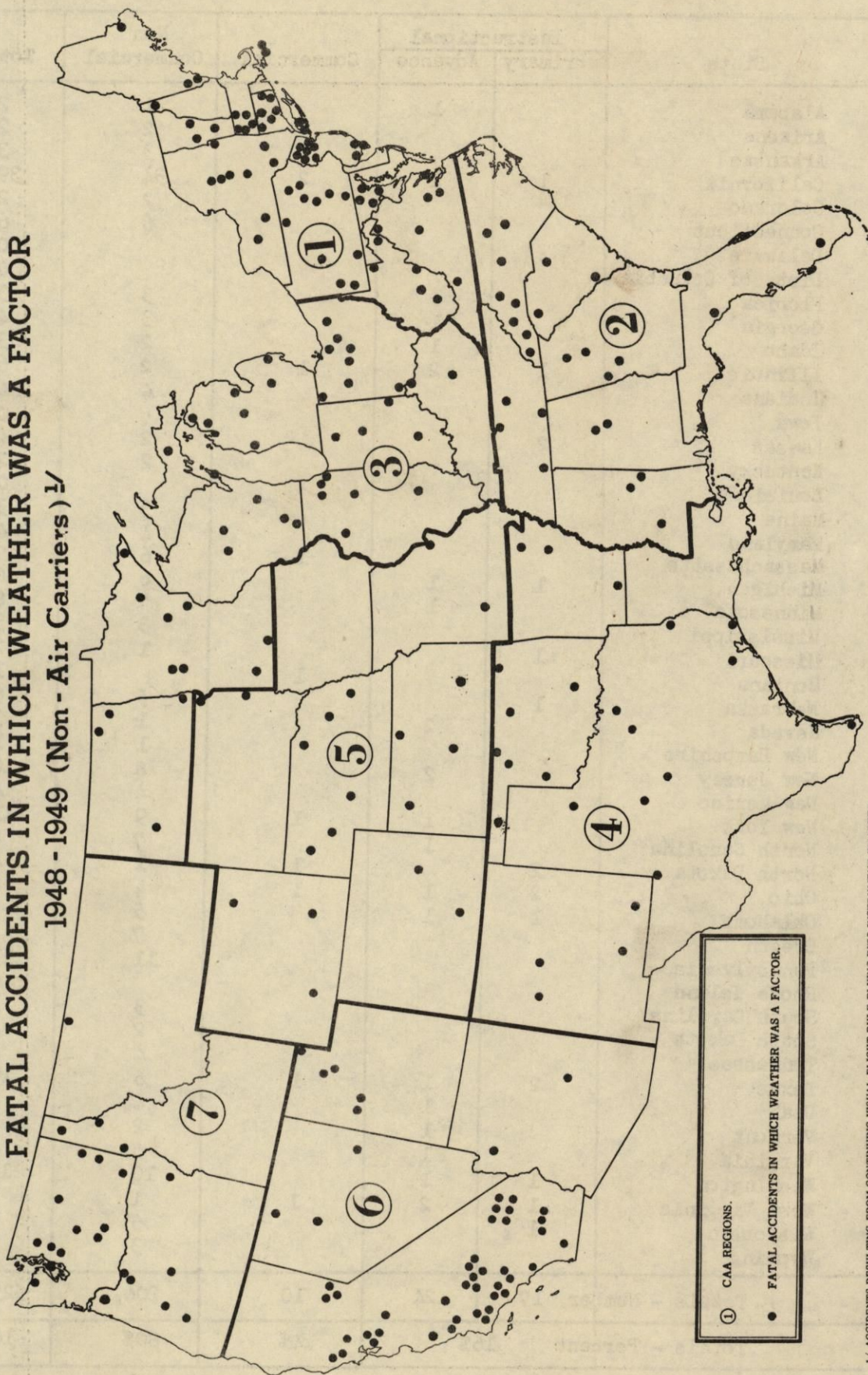
State	Student	Private	Commercial	Total
Alabama		1	1	2
Arizona		1	1	2
Arkansas		3		3
California	1	32	6	39
Colorado		2		2
Connecticut		5	1	6
Delaware				0
Dist. of Columbia				0
Florida		2	1	3
Georgia		3	1	4
Idaho		1	2	3
Illinois	1	3	2	6
Indiana		4		4
Iowa				0
Kansas	1	1	2	4
Kentucky		1	1	2
Louisiana				0
Maine		2	1	3
Maryland		3	1	4
Massachusetts		5	2	7
Michigan		7	1	8
Minnesota		5	3	8
Mississippi		1	2	3
Missouri		1	1	2
Montana			1	1
Nebraska	1	5	0	6
Nevada		2	1	3
New Hampshire		1		1
New Jersey		7	3	10
New Mexico		3	1	4
New York		8	3	11
North Carolina		5	3	8
North Dakota	2	1	1	4
Ohio	2	3	3	8
Oklahoma		5	2	7
Oregon		5	2	7
Pennsylvania		9	2	11
Rhode Island				0
South Carolina		3		3
South Dakota		2		2
Tennessee		2	2	4
Texas	2	6	2	10
Utah		4	1	5
Vermont		3		3
Virginia		6		6
Washington	1	8	3	12
West Virginia	2	2	1	5
Wisconsin	1	3	2	6
Wyoming		2	1	3
Totals	14	178	63	255

FATAL WEATHER ACCIDENTS BY KIND OF FLYING

State	Instructional		Commercial	Non Commercial	Total
	Primary	Advance			
Alabama		1		1	2
Arizona				2	2
Arkansas				3	3
California	1	2	2	34	39
Colorado				2	2
Connecticut				6	6
Delaware					0
Dist. of Columbia					0
Florida				3	3
Georgia		1		3	4
Idaho		1		2	3
Illinois	1	2	1	2	6
Indiana				4	4
Iowa					0
Kansas	2			2	4
Kentucky				2	2
Louisiana					0
Maine				3	3
Maryland				4	4
Massachusetts			1	6	7
Michigan	1	1		6	8
Minnesota		1		7	8
Mississippi				3	3
Missouri	1			1	2
Montana			1		1
Nebraska	1			5	6
Nevada		2		1	3
New Hampshire				1	1
New Jersey		2		8	10
New Mexico				4	4
New York		1	1	9	11
North Carolina		1		7	8
North Dakota	2		1	1	4
Ohio	2	1	1	4	8
Oklahoma	1	1		5	7
Oregon				7	7
Pennsylvania				11	11
Rhode Island					0
South Carolina				3	3
South Dakota				2	2
Tennessee				4	4
Texas	2	1	1	6	10
Utah		1		4	5
Vermont		1		2	3
Virginia		1		5	6
Washington	1	1		10	12
West Virginia	1	2	1	1	5
Wisconsin	1			5	6
Wyoming				3	3
Totals - Number	17	24	10	204	255
Totals - Percent		16%	4%	80%	100%

FATAL ACCIDENTS IN WHICH WEATHER WAS A FACTOR

1948 - 1949 (Non - Air Carriers) 1/



1/ ACCIDENTS RESULTING FROM CONTINUING VISUAL FLIGHT RULE FLYING INTO INSTRUMENT WEATHER.