Airplane Accident Fatalities Increase Just After Newspaper Stories About Murder and Suicide

Abstract. *Fatal crashes of private, business, and corporate-executive airplanes have increased after publicized murder-suicides. The more publicity given to a murder-suicide, the more crashes occurred. The increase in plane crashes occurred primarily in states where the murder-suicides were publicized. These findings suggest that murder-suicide stories trigger subsequent murder-suicides, some of which are disguised as airplane accidents.*

Earlier research (*1, 2*) showed that (i) suicides and motor vehicle accidents increase after publicized suicides, and (ii) the more publicity given to the suicide, the greater the increase in suicides and in motor vehicle accidents. These findings suggest that suicide stories help to trigger a rise in suicides, some of which are disguised as motor vehicle accidents.

In this report I will examine the impact of murder-suicide stories. I will present quantitative evidence for a large geographic area suggesting that murder-suicide stories trigger subsequent murder-suicides.

Many murderers may try to disguise murder-suicides as accidents to protect their survivors from insurance problems and from social stigma. One type of disguised murder-suicide may occur when a pilot deliberately crashes an airplane with passengers on board. If murder-suicide stories trigger subsequent murder-suicides, fatal aircraft accidents should increase abruptly and briefly just after such stories are published.

In this report, I will examine only noncommercial aircraft accidents, an exhaustive list of which is available (*3, 4*). The murder-suicide stories to be studied consist of all stories meeting five criteria, which were established to ensure that the circumstances described in the story were as widely publicized as possible and as similar as possible to the circumstances obtaining for the pilot of a noncommercial plane. The five criteria were: (i) The story must concern deaths occurring in the United States. This criterion was established because a U.S. pilot should be more likely to identify with "American" deaths than with foreign ones. (ii) The story must concern one murderer acting alone, because a pilot bent on murder-suicide should be more likely to identify with a single murderer than with several murderers acting together. (iii) The story must concern a murderer and victims who died within a short time (*5*). This type of murder-suicide is the most likely to affect a pilot bent on murder-suicide, because a pilot who deliberately crashes his plane is likely to kill himself and his passengers nearly simultaneously. (iv) The story must concern a murderer who killed two or more victims. This type of story is likely to be heavily publicized, in contrast to the more routine murder-suicide, in which only one victim is killed. (v) The story must be carried on the front page of the *New York Times* or the *Los Angeles Times* or appear on the ABC, CBS, or NBC network evening news programs, between 1968 and 1973. The period under study ended in 1973 because that was the last year before the Arab oil embargo markedly changed aircraft traffic patterns. The study period began on 5 August 1968 because systematic recording of network television news coverage began on this date. In all, 18 stories met the five criteria (*6*).

Nonsystematic, exploratory study of airplane fatalities before 1968 suggested that airplane fatalities behave like motor vehicle fatalities (*2*) and rise to a sharp peak on day 3 after a publicized death. On the basis of these earlier results, I predicted that a day-3 peak should also be found in the study period, 1968 to 1973. As predicted, aircraft fatalities increased sharply on day 3 after publicized murder-suicides (Fig. 1, curve A) (*7*).

A single-fatality plane crash cannot imply both murder and suicide. Hence, this type of crash should not be triggered by murder-suicide stories. As expected, fatalities from this type of crash did not increase after publicized murder-suicides (Fig. 1, curve C). In contrast, however, fatalities resulting from multifatality crashes increase steeply (Fig. 1, curve B).

These multifatality crashes resulted in 461 fatalities in the 14-day period under study. Of these, 1/14 (32.93) would be expected on day 3, given the null hypothesis (H_0) of no relationship between the publicized murder-suicide and airplane fatalities. The observed number of deaths on day 3 (63) is almost twice the number expected.

One cannot test the statistical significance of this peak in terms of fatalities, however, because the appropriate significance test requires the assumption that the timing of each fatality is independent of the timing of every other. This assumption is obviously untenable for multifatality plane crashes. Instead, the significance of the day-3 peak can be assessed in terms of crashes rather than fatalities. These can be treated as independent of one another, provided one counts a midair collision between two planes as only one crash. In the 14-day period under observation, there were 156 multifatality plane crashes. Under H_0, 1/14 of these (11.14) would be expected to occur on day 3, but 19 crashes actually occurred at this time. The binomial distribution can be used to evaluate the probability of 19 or more crashes when

Table 1. Relationship between publicity devoted to a murder-suicide and number of fatal noncommercial plane crashes in the week after that story. The date of the murder-suicide was the date of the murder (the first murder if more than one was described in the story).

Murderer	Date of murder-suicide	Newspaper circulation	Networks carrying story (*13*) (*N*)	Multifatality plane crashes (*N*)
F. Chegwin	08/07/68	856,621	Unknown	6
S. Kline*	12/18/68	1,032,655	Unknown	6
C. Bray*	12/19/68		1	
R. McLachlan	01/01/69	3,470,925	Unknown	5
C. Stein	02/10/69	0	1	3
T. Walton	02/21/69	0	3	3
C. Gish	05/14/70	0	1	4
J. White	09/23/70	440,570	3	7
E. Pruyn	01/26/71	634,371	1	2
R. Putnam	07/13/71	1,044,660	2	4
G. Giffe	10/04/71	3,220,174	3	8
G. Logan	11/26/71	966,293	0	8
R. Cowden	12/13/71	404,957	1	4
J. Van Praag	03/07/72	981,661	0	4
H. McLeod	05/29/72	3,764,339	3	8
D. Tolstet	10/06/72	0	1	2
R. Jordan	01/23/73	0	1	2
S. Cloud	10/18/73	823,935	0	4

*The bracketed murder-suicide stories occurred at almost the same time and were treated as one story.

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$p = 1/14$; $n = 156$. This probability is .0160. Hence, there is a statistically significant day-3 peak in multifatality crashes (*8*).

If murder-suicide stories do indeed help to trigger some fatal airplane accidents, then the more publicity given to a murder-suicide, the more airplane accidents should increase just after the murder-suicide. This hypothesis will be tested after an index of newspaper publicity is described.

In the midpoint of the study period, there were 1838 daily newspapers in the United States (*9*); thus, it is not easy to measure the total amount of newspaper publicity devoted nationwide to a murder-suicide. The measurement procedure adopted here seems plausible and is convenient. Almost half of all the operative civilian aircraft in the United States are concentrated in only nine states (*10*). The largest newspaper from each of these states was examined to determine which murder-suicide stories were carried on the front page (*11*). The publicity devoted by these newspapers (Table 1) could then be used as an index of the total amount of publicity devoted by all newspapers. For any given story, the value of this index was calculated from

$$\sum_{i=1}^{9} x_i y_i$$

where x_i is the circulation of newspaper i at the time of the story and y_i is the number of days that story stayed on the front page. Five stories were not carried by any of the newspapers examined, only by the television networks. For these five stories, the value of the newspaper index was of course 0.

As predicted, the amount of newspaper publicity devoted to a murder-suicide was strongly correlated with the number of multifatality crashes following the story ($r = .637$; $P < .005$, one-tailed test) (*12*). In contrast, television publicity does not seem to be significantly correlated with the occurrence of multifatality plane crashes. The number of networks covering a murder-suicide story on the network evening news programs (Table 1) was taken as an index of the amount of network television publicity devoted to the story. This index was nonsignificantly correlated ($r = .379$; $P = .082$; one-tailed test; $n = 14$) with the number of multifatality plane crashes occurring after each story (*13*). For the 14 stories for which information on both television and newspaper coverage is available (Table 1), the correlation between newspaper coverage and crashes ($r = .734$) was almost as high as the multiple correlation between newspaper-television coverage and crashes ($R = .737$). Evidently, newspaper coverage alone predicts multifatality crashes almost as well as newspaper and television coverage combined (*14*).

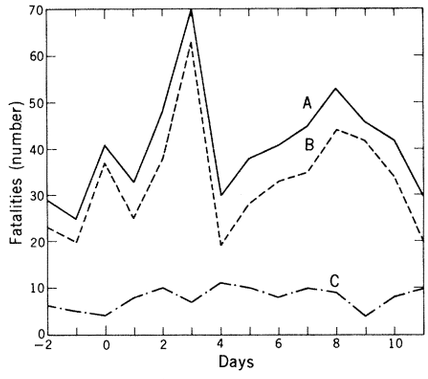

Fig. 1. Daily fluctuation of U.S. noncommercial plane fatalities for a 2-week period before, during (day 0), and after publicized murder-suicides. (Curve A) Fluctuation of fatalities for all noncommercial plane crashes: (curve B) fluctuation of fatalities for multifatality noncommercial plane crashes: and (curve C) fluctuation of fatalities for single-fatality noncommercial plane crashes. Noncommercial flying refers to "the use of an aircraft for purposes of pleasure, personal transportation, . . . private business, in corporate/executive operations, and in other operations, wherein there is no direct monetary fee charged" (*3*). Planes owned in the United States but crashing outside the 50 states are excluded from this analysis.

Thus far I have shown that (i) multifatality crashes increased after murder-suicides and (ii) the more newspaper publicity devoted to a story, the more plane crashes followed it. I will now show that (iii) the increase in multifatality plane crashes occurred mainly in the states where the murder-suicide was publicized. This result would be expected if multifatality plane crashes are triggered by publicized murder-suicides.

Some definitions must be supplied. The "experimental period" consisted of the 7 days (0 to 6 days) after the publicized murder-suicide. The "control period" was the remaining 7 days designated in Fig. 1. For any given story, the "publicity area" was the state or states known to be receiving newspaper publicity about the story (*15*). The "nonpublicity area" consisted of all the remaining states.

If plane crashes increase mainly in the area where the murder-suicide is publicized, there should be a disproportionately large number of crashes in the publicity area in the experimental period. On the other hand, given H_0, the publicity area should not differ from the entire United States with respect to the probablity that a crash would occur in the experimental period. In the 14-day interval under study, there were 121 multifatality crashes in the entire United States; of these, 63 (or .52) were in the experimental period. In the publicity area there were 20 multifatality crashes; 15 of these were in the experimental period. Given H_0, the probability of 15 or more crashes in the experimental period in the publicity area can be evaluated with the hypergeometric distribution, one-tailed (*16*), where

$$P(x \geq 15) = \sum_{x=15}^{20} \frac{\binom{Np}{x}\binom{N-Np}{n-x}}{\binom{N}{n}} =$$

$$\sum_{x=15}^{20} \frac{\binom{63}{x}\binom{58}{20-x}}{\binom{121}{20}} = .0213$$

Hence, multifatality plane crashes increased disproportionately in the areas where the murder-suicides were publicized.

The evidence thus suggests that (i) some persons are prompted by newspaper stories to commit murder as well as suicide, and (ii) noncommercial airplanes are sometimes used as instruments of murder and suicide. Taken in conjunction with previous research (*1, 2*), the results suggest that the impact of newspaper stories may be at once more general and more grave than was previously suspected (*17*).

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References and Notes

1. D. P. Phillips, *Am. Sociol Rev.* **39**, 340 (1974).
2. ———, *Science* **196**, 1464 (1977); *Am. J. Sociol.*, in press.
3. U.S. National Transportation Safety Board, *Briefs of Accidents U.S. Civil Aviation* (Government Printing Office, Washington, D.C., periodic issues). Commercial aircraft accidents have also been studied (D. P. Phillips, in preparation).
4. I know of no large-scale, quantitative studies suggesting that noncommercial planes are sometimes used as instruments of both murder and suicide. There are some case studies suggesting a suicidal (but not a homicidal) component in some noncommercial plane crashes [H. L. Gibbons, J. L. Plechus, S. R. Mohler, *Aerosp. Med.* **38**, 1057 (1967); R. E. Yanowitch, J. R. Bergin, E. A. Yanowitch, *ibid.* **44**, 675 (1973); P. J. Stevens, *Fatal Civil Aircraft Accidents* (Wright, Bristol, England, 1970)]. D. R. Jones [*Aviat. Space Environ. Med.* **48**, 454 (1977)] reviewed earlier work and also provided a case study. In addition, indirect evidence of a suicidal component in some crashes might perhaps be inferred from toxicological findings [D. L. Lacefield, P. A. Roberts, C. W. Blossom, *Aviat. Space Environ. Med.* **46** 1030 (1975)] and possibly from personality tests of pilots involved in accidents [M. G. Sanders and M. A. Hofmann, *ibid.*, p. 186; M. G. Sanders, M. A. Hofmann, T. A. Neese, *ibid.* **47**, 177 (1976)]. However, the two last-named studies present mutually contradictory evidence.
5. This time period was defined arbitrarily as 48 hours. However, in practically all cases, the deaths of the murderer and his victims occurred within 24 hours of each other. In almost all cases the murderer shot himself, but in a few cases (McLachlan, Stein, Putnam, and Cloud) the murderer was killed by the police after refusing

to surrender. These four cases have been treated as suicide, because the murderer could have avoided death had he so desired. Cases like these, in which the victim precipitates his own death, have long been considered by some researchers to be a type of suicidal behavior. See, for example, M. Wolfgang, in *Suicidal Behaviors*, H. Resnik, Ed. (Little, Brown, Boston, 1968), pp. 90–104.

6. Two of these stories (Kline and Bray) occurred at almost the same time. In accord with previous procedure (*2*) they were treated as one to avoid problems of statistical dependence. Information on television network evening news coverage was provided by *Vanderbilt Television News Archives* (Joint University Libraries, Nashville, periodic issues). Weekend stories before July 1970 were excluded from the analysis, because until then weekend broadcasts were not recorded in the archives.
7. The particular 2-week period studied was chosen so as to make Fig. 1 comparable with earlier results for automobiles (*2*). The graph of airplane accidents after murder-suicide stories resembles that of automobile accidents after suicide stories. In both, there is a primary peak on day 3 after the publicized death and a secondary peak on day 8. This secondary peak is at present unexplained.
8. An alternative approach to testing statistical significance would be to use one or another variant of the *t*-test to determine whether the number of crashes on day 3 is significantly larger than the number to be expected from an analysis of the crashes in the other 13 days studied. This approach is probably not valid, because the data do not meet the assumptions of the *t*-test. For the reader who wishes, nonetheless, to use the *t*-test, the following are the number of multifatality crashes from 2 days before to day 11 after the story: 7, 8, 12, 6, 10, 19, 9, 10, 13, 12, 14, 15, 12, 9.
9. *Ayer Directory of Publications* (Ayer, Philadelphia, yearly volumes).
10. The top nine states with respect to ownership of operative U.S. civil aircraft are (in order) California, Texas, Ohio, Illinois, Florida, Michigan, New York, Pennsylvania, and Washington [Department of Transportation, *Census of U.S. Civil Aircraft 1970–1971* (Government Printing Office, Washington, D.C., 1971), table 7].
11. The nine newspapers examined are *Los Angeles Times*, *Dallas News*, *Cleveland Plain Dealer*, *Chicago Tribune*, *Miami Herald*, *Detroit News*, *New York Times*, *Philadelphia Bulletin*, and *Seattle Press Intelligencer*. For three states (Texas, New York, and Washington) the largest newspaper was not easily available, and the second largest paper was used (*9*).
12. This significance level is valid only under the assumption that the joint distribution of the two variables is bivariate normal. I do not know whether this assumption holds for these data. The assumption is not required for assessing the significance of the Spearman ρ ($\rho = .707$, $P < .005$, one-tailed correlation, corrected for ties, for the data in Table 1).
13. Because of the failure of recording equipment and other factors, the Vanderbilt Television News Archives does not have information on the total number of networks covering the stories about Chegwin, Kline, or McLachlan. Consequently, these stories were excluded in the calculation of the correlation between the television publicity devoted to a story and the number of crashes after that story. The correlation with television publicity may be weak because the networks almost never reported the murder-suicides as lead stories. In contrast, the newspapers studied did treat the murder-suicides under examination as lead stories and carried them, very visibly, on page 1.
14. For these stories, the partial correlation between newspaper coverage and the number of multifatality crashes (correcting for television coverage) is .683. Single-fatality crashes should not be triggered by murder-suicide stories; hence, the fluctuation of single-fatality crashes after a story should not be correlated with the amount of newspaper publicity devoted to that story. This prediction is consistent with the data ($r = -.050$).
15. Because television publicity seems to be nonsignificantly related to plane crashes, television news coverage was ignored in this analysis, and stories receiving no newspaper coverage (only television publicity) were excluded from the analysis.
16. P. Hoel, *Introduction to Mathematical Statistics* (Wiley, New York, 1965), pp. 116–117; F. Mosteller, R. E. K. Rourke, G. B. Thomas, *Probability with Statistical Applications* (Addison-Wesley, Reading, Mass., 1970), table 3-3. In this analysis, $N = 121$ rather than 156 as in the binomial analysis, because the present analysis omits crashes associated with five stories publicized only on television and three missing planes that crashed in unknown locations. One would prefer to code crashes by "place of take-off" rather than by "place of crash" but this is not possible because the publication describing the crashes studied (*3*) often does not provide information on place of take-off.
17. The day-3 peak might be argued to result from a fortuitous association between a day-of-the-week cycle in murder-suicide stories and a day-of-the-week cycle in multifatality plane crashes. For example, if most murder-suicides occurred on Wednesday and most plane crashes occurred on Saturday, crashes would peak 3 days after murder-suicides, even if murder-suicides had no effect on plane crashes. However: (i) If the day-3 peak were due to a day-of-the-week cycle in plane crashes, the peak in crashes on day 3 should be followed by an equally large peak 1 week later (on day 10), 2 weeks later, and so on. There is no evidence of a peak on a day 10. In fact the number of crashes on this day (12) was almost precisely equal to 11.14, the number to be expected if crashes are uniformly distributed from day −2 to day +11. (ii) More generally, if the "day-of-the-week" argument were correct, there should be a strong, positive correlation $r_{x,x+7}$ between the number of multifatality crashes on day x and the number of multifatality crashes on day $x + 7$. If this argument is not correct, then $r_{x,x+7}$ should be approximately 0. For the data displayed in (*8*) $r_{x,x+7} = -.0206$. This does not support the "day-of-the-week" argument. (iii) If the "day-of-the-week" argument were correct, there would be no causal connection between publicized murder-suicides and plane crashes; hence, there should be no correlation between the amount of publicity given to a murder-suicide story and the number of crashes thereafter. In addition, there should be no correlation between the location of the publicity devoted to the murder-suicide and the location of the plane crashes occurring just afterward. Both of these predictions are inconsistent with the data.
18. I thank M. Murphy, city editor of the *Los Angeles Times*; M. Pritchett and J. Pilkington, Vanderbilt Television News Archives; J. Coolman and J. Cruse, University Library, University of California, San Diego; H. Field, R. Kuever, S. Ostroff, and S. Newcomb for helping to collect and analyze data; and B. Berger, F. Davis, M. Davis, J. Gusfield, C. Mukerji, and J. Wiseman for comments and criticisms.

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Sex Pheromone of the Tsetse Fly: Isolation, Identification, and Synthesis of Contact Aphrodisiacs

Abstract. *Sex pheromones isolated from the cuticle of the female tsetse fly,* Glossina morsitans morsitans *Westwood, release mating behavior in the male fly at ultrashort range or upon contact with baited decoys. Three active components were identified as 15,19-dimethylheptatriacontane, 17,21-dimethylheptatriacontane, and 15,19,23-trimethylheptatriacontane. Chemical and biological comparisons show that the natural and synthetic compounds are identical.*

The tsetse fly *Glossina morsitans morsitans*, a carrier of trypanosomes, is the major vector of Rhodesian sleeping sickness. The use of domesticated animals across tropical Africa is limited to areas free of this fly owing to transmission of trypanosomes in animals and the resulting disease, nagana (*1*). We now report the isolation, identification, and synthesis of sex recognition pheromone components (*2*) produced by the female of this species of tsetse fly. Three compounds were isolated from female flies, and all of these independently cause release of mating attempts by the male at ultrashort range or upon contact. These three compounds are 15,19-dimethylheptatriacontane (**1**), 17,21-dimethylheptatriacontane (**2**), and 15,19,23-trimethylheptatriacontane (**3**).

A sex recognition pheromone that stimulates males on contact was demonstrated in *G. morsitans* and was shown to be associated with the nonpolar cuticular lipid extract of adult female flies (*2*). Adult males initiated sexual behavior but did not persist in attempts to mount and copulate with live or dead male flies or with females thoroughly extracted with solvent. Live or dead females gave rise to male sexual behavior subjectively described as (i) mounting, (ii) attempting to orient to the copulating position, and (iii) flexing of genitalia with attempted engagement of the genitalia in 76 to 79 percent of the tests. Live males showed these strong stimulant activity responses when presented with a black shoelace knot (pseudofly) treated with extracts of dead females. Copulatory attempts began apparently only after contact with the pseudofly (*2*). These observations were consistent with those of previous workers who were unable to demonstrate a sex attractant operating at long range and who observed that "the male does not seem to identify the female fly until within 1–2 cm" (*3*). However, these workers (*3*) were not able to determine how the male differentiates between another male or another species and noted "the apparent absence of a mating stimulus other than visual" (*3*).

Since the initial identification of an attractant of the male housefly, *Musca domestica* L. (*4*), that causes aggregation of males and females in the field (*5*), male mating stimulants have been identified in several species of muscoid flies. A series of 1,5-dimethyl paraffins was reported in extracts of female flies of *Stomoxys calcitrans* (L.) (*6*), while *Fannia canicularis* (L.) and *M. domestica* (*7*) have male stimulatory compounds identified as

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