

Wildland Fire / Aircraft Firefighter Fatalities in the United States compared with Ground Based Firefighter Fatalities

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Abstract. Comprehensive records of wildland and prescribed fire related aircraft fatalities in the United States were found by the author to be nonexistent. A cross referencing of records from land management agencies with wildland fire suppression responsibilities, recent NTSB files, historical newspaper accounts, police reports, interviews with individuals who had kept partial lists because of personal interest or who were personally involved in individual incidents was accomplished. Numerous incidents which were originally found to be listed as being fire mission related in agency or other documentation, were found not to be fire related and were deleted from this database. Incidents involving aviation ground crews where aircraft were not immediately involved are included in ground based firefighter fatality data (i.e. helitack crew members in entrapment situations). Much information is still missing, some data may be permanently lost. More information on fire related aircraft fatalities is still being located and investigated. The presented listings are considered by the author to be an evolving draft which establishes a baseline from which additional study may be accomplished.

Aircraft are divided into four groups; leadplanes, tankers, helicopters, and fixed-wing "other aircraft." Incident data is presented chronologically with the date, number of fatalities per incident, employment relationship of the fatalities, and a remarks and accident description section. Comparisons between aviation firefighter fatalities and ground based firefighter fatalities are made from NWCG documentation with corrections and additions prepared by this author.

The first record of fire related aircraft fatalities that the author has been able to locate occurred on the Flathead National Forest in 1955, and with subsequent findings through 1997 number 249 fatalities in 148 incidents. There has been a known total of 9 fatalities in leadplane incidents, 136 fatalities involving tankers, 45 people killed in rotor-winged craft, and 59 fatalities in fixed-wing "other aircraft." California leads the nation in leadplane, tanker and helicopter fatal incidents, while Idaho is the worst location for incidents involving "other aircraft" fatalities. In most cases the cause of aircraft fatalities remains speculative or unknown; however, several known causes commonly reoccur.

Fire related aircraft fatalities during the last 43 years account for about 29% of the total wildland fire deaths in the United States extending back to 1910 (88 years). The only category that exceeds aircraft fatalities is ground based entrapment which is approximately 45% of the national wildland firefighter related death total. Medical related fire deaths are ranked third with about 10% of the national total. Both aviation and medical related fire fatalities are relatively recent causes based on the data.

Introduction

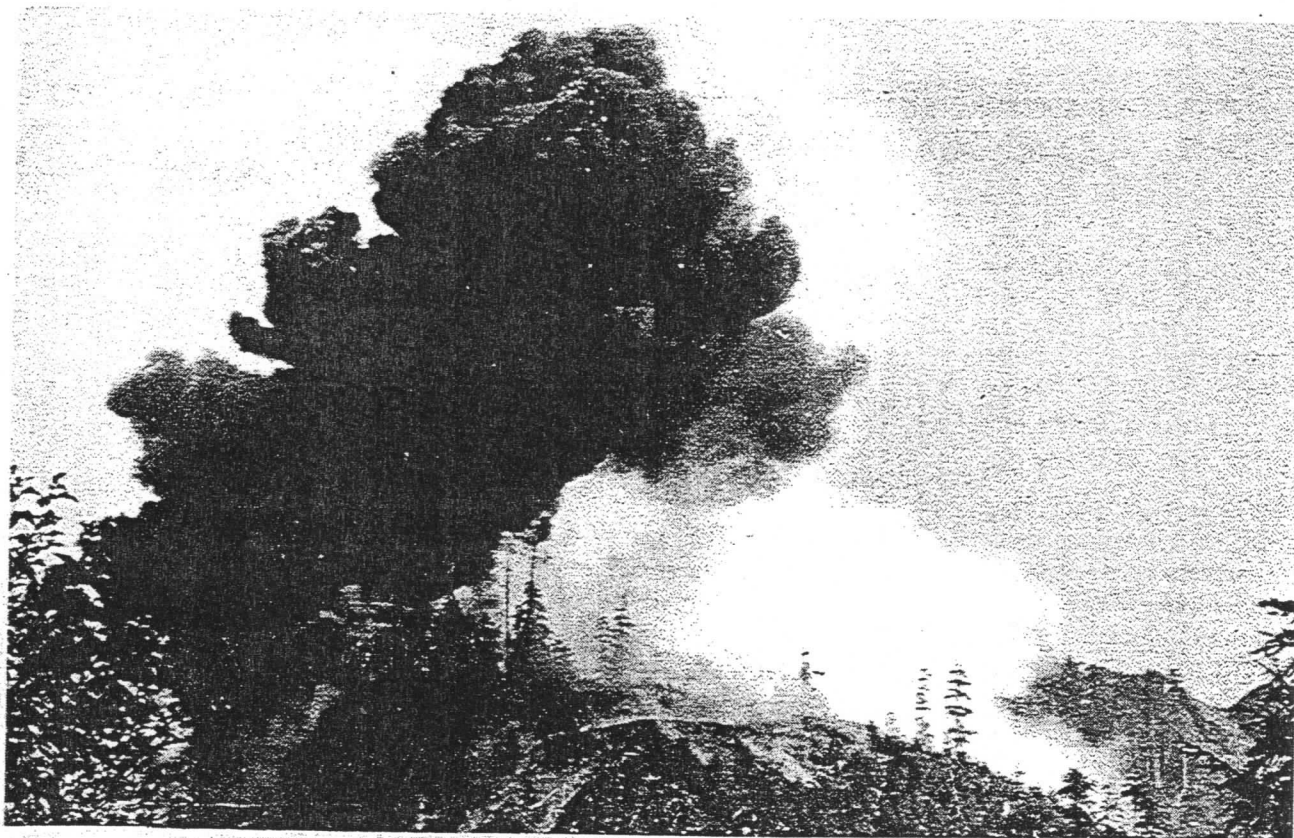
Following the publication of a list categorizing US wildland firefighter fatalities through 1993 (NWCG Safety and Health Working Team, 1994) it was observed by this author that the list of combined ground and aviation fatalities needed modification. This original publication for the first time presented US wildfire / prescribed fire fatality data in a concise database. While an excellent first cut at a never before attempted difficult task, this original database contained some erroneous data, other known data was missing, and was in particular lacking in the topic of fire mission related aviation fatalities. The original report referenced only 43 aviation fatalities associated with 27 incidents.

The original 1994 report was updated in 1997 (NWCG Safety and Health Working Team, 1997). Errors and duplications still exist in the updated report. The NWCG aviation fatality database has been enlarged to 62 fatalities associated with 33 incidents. This is well below what is presented here, even though earlier working drafts of the aviation fatality list presented in Appendix 1 were circulated for comment and revision to numerous aviation personnel within most western and many eastern state, and federal land management agency offices dealing with fire & aviation.

To compile the list presented in Appendix 1 a search for records relating to wildland / prescribed fire related aviation fatalities was initiated in 1994. It was found that no comprehensive record of this topic existed nationally. Individual Federal and State land management agencies with responsibilities for wildland fire suppression had incomplete or no records regarding this topic; and after further investigation, were frequently found to have preserved erroneous data.

There were many reasons suggested why the agencies had not kept track of fire related aviation fatalities until recent years. In most cases it was suggested that a lack of specific direction to this being an "Area of Concern" was the

This is still very much a "work in progress" with more information currently being investigated. The data base presented is what is known to date and is restricted to wildfire and prescribed fire related aviation fatalities specifically on fire missions within the United States. The weeding out of the many non-fatal incidents, and the investigation of fatalities originally listed as being fire duty related but actually occurring during other job assignments such as wildlife surveys or on personal time has taken a considerable amount of effort.



Figures 1 and 2. These remarkable photographs are of the 1990 P2V (T08) air tanker crash with pilots Ralph Glasgow and Steven Bovey onboard. They had been dispatched from the tanker base at Wenatchee, WA and had only been in the air after refueling about 10-15 minutes when these photographs were taken by local news media. The "Wynoochee Fire" on the Olympic National Forest that the tanker was called to drop retardant on started from the crash in the adjacent drainage behind the air tanker of another private aircraft with 2 fatalities. The P2V deviated from its final drop course at the last moment for unknown reasons and crashed onto a mountainside logging deck and road. Prior to the arrival of the air tanker the large group of local media had wanted to be located at the logging deck site so they could have better access for photographing the original crash. This request was turned down by IC Stan Gramm for safety reasons. The first figure shows the air tanker as it strikes the mountain ridge just short of the logging deck. The second figure was taken just moments later from the same location. (Photos courtesy of Chuck Hartley, recipient of the "First Annual Safety Award" presented at the 1997 Canada / US Wildland Fire Safety Summit.)

The modified ground fatality database is only summarized in this report for comparison purposes with the fire mission aircraft fatality data. Fatalities were only listed for fire-fighting personnel (federal, state, private corporation, rural, and volunteer) and does not include untrained, civilians killed while defending property or fleeing from wildfires. Format of the database for fire mission related aircraft fatality data roughly follows that previously established by the NWCG in their earlier reports, as does the basic definitions of the various ground based fatality categories. The database presents each incident listing the year, fire name / location information, number of fatalities, agency / private affiliation of the individuals involved, and a remarks / discussion section. Question marks on the list indicate unknown data. Fatal aircraft incidents are presented first in chronological order. Aircraft are then divided into four subcategories: leadplanes (referred to as "bird-dogs" by our Canadian comrades), tankers, helicopters, and fixed-wing "other aircraft" and again presented chronologically.

considered aviation in this report) has increased slightly during the last three decades, and can be found almost exclusively within the ranks of Rural and Volunteer Fire Departments on wildland fires.

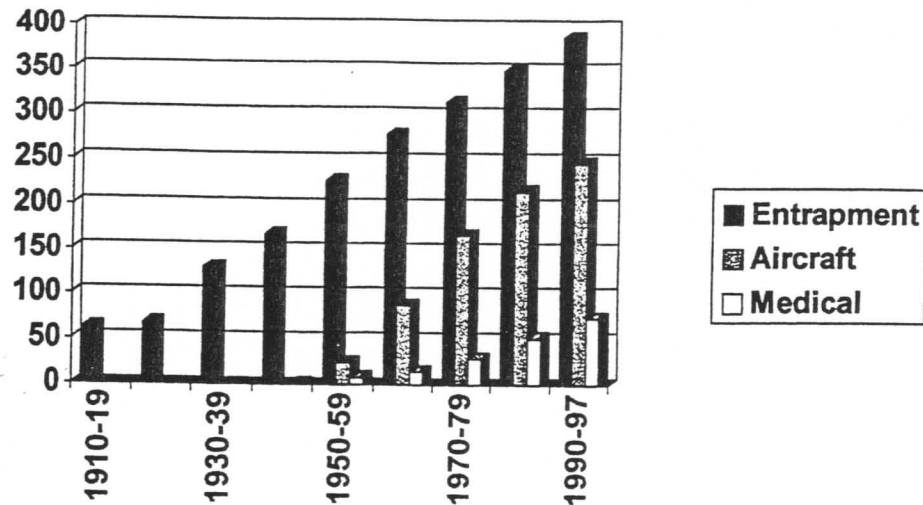


Figure 4. Cumulative firefighter deaths by decade for principle cause categories (1910 - 1997).

Winston (1997) suggests that medical related fatalities within these typically structural firefighter trained ranks may be principally related to the heavy personal protective clothing frequently worn by these firefighters and which might be contributing factors to heart attack and heat stroke. However, most western firefighters of all types now wear lighter, fire resistant material on wildland fires rather than heavy, structural turnout gear and medical related deaths are still continuing. An examination of the distribution of states in which medical fatalities have occurred shows that prior to 1983 the majority of fatalities of this nature were located in the west, and principally California. After that year the distribution of medical fatalities shifts dramatically to the central and eastern US. It should also be noted that other contributing (interacting) factors to increased medical problems might be age and overall health / physical fitness, as well as the level of wildland firefighter training of the Rural and Volunteer firefighters in comparison to Federal and State agencies, and in many cases private industry wildland firefighters (who have to pass annual physical requirements the same as Federal and State personnel). However, to the best of my knowledge this hasn't been investigated. It has been suggested that it's easy to certify individuals of Rural and Volunteer organizations to fight wildland fires, but we don't do a very good job of "de-certification." The increasing role over the last two decades, and in some cases dependency, of Volunteer and Rural firefighters participating on wildland fires in the "Wildland-Urban Interface" exacerbates the problem.

Piloting retardant air tankers on wildland fires has had a history of being regarded as hazardous work, and has been presented to the general public in this manner through popular literature and movies. However, I found that even those that were attempting to keep track of the fatalities in this group of firefighters didn't realized the number of fatalities involved. During 1958 when the first air tanker crashed on a fire, 13 pilots lost their lives in 8 incidents. This was just the beginning of what has totaled up to be 136 fatalities in 93 incidents (about 55% of all fire-related aviation fatalities) during the last 40 years (Figure 5). Air tankers have the highest historical incidence and fatality rates of all aircraft types; about 2.3 incidents and 3.4 fatalities per year. California is the state with the greatest number of known air tanker fatal incidents (about 37%). Many fatal tanker crashes still do not have a specific crash location yet, even though I have the names of the pilots killed. So the percentage that have died in California may be even greater.

Other styles of aircraft used in the business of fire fighting haven't received as much "recognition" as air tankers but have also suffered numerous fatalities in the line-of-duty. Fixed-wing "other aircraft" has had the second highest fatality total with 59 killed (22% of aviation total). Helicopters fatalities follow with 45 killed (18%). Both of these aircraft categories include not only pilots killed, but also passengers and fire fighting crew members who were being transported, and helicopter ground support personnel killed in aircraft incidents. The first known record of a fire-related aviation fatality occurred in 1955 on the Flathead National Forest in Montana with 3 fatalities and is listed in the "other aircraft" category. Idaho ranks as the state with the highest number of fatal "other aircraft" incidents (23%) and fatalities (20%). California leads the nation in both the known location of the greatest number of fatal helicopter incidents (about 38%), and the number of helicopter related fatalities (about 56%). Leadplanes have had the least number of incidents and fatalities in the US. Leadplane fatal incidents occur most often in California where 56% of the fatalities and 44% of the incidents have taken place.

Appendix 1. Chronological listing of US fire / aviation fatalities (C. Bushey, 1997).

Date	Fire Name / Location	Fatalities	Agency	Remarks and Accident Type
				Latest revision 11/4/97 - C. Bushey
1955	Flathead NF, Montana	3	USFS	Stinson from early files at NIFC (aircraft).
1958	Silverado Canyon	2	USFS	Pilot Bill Archibald was training Carl Milligan on a fire when the tail of
	Cleveland NF, California			Beechcraft Bonanza Leadplane (V-35) broke off inflight (aircraft).
1958	Porterville, California	1	????	Tanker pilot of PBY Joseph Anthony (aircraft).
1958	????	2	????	Tanker pilots Ameli Talbot and Stewart Kilgour (aircraft).
1958	????	1	????	Tanker pilot George Jess (aircraft).
1958	Independence Lake Fire	1	????	TBM Tanker pilot Don Doughty (aircraft).
	Tahoe NF, California			
1958	Anthony Lakes Fire	2	Private	B-25 Tanker pilots James Armstrong and Charles Franco (aircraft).
	Region 6			
1958	Beaver Lake Fire	2	Private	B-25 Tanker pilots Leroy Englert and Elliott Corbertt (aircraft).
	Region 6			
1958	Magic Mountain Fire	2	USFS	B-25 (?) Tanker pilots George Carey and J. C. Brehm (aircraft).
	Angeles NF, California			
1958	Business Creek Fire	2	Private	B-25 Tanker pilots Patrick Hendricks and Virgile Sanders (aircraft).
	Payette NF, Idaho			
1958	Business Creek Fire	2	BLM	Apache from early files at NIFC (aircraft).
	Payette NF, Idaho			
1959	Moose Creek Ranger District	3	USFS	Ford Trimotor crashed on fire cargo run (aircraft).
	Nez Perce NF, Idaho			From early files at NIFC.
1959	Hill Field Fire	1	USFS	Helicopter from early files at NIFC (aircraft).
	Region 4			
1959	Tule River RD,	1	USFS	Pilot volunteered to dive low and drop in hazardous conditions on a
	Sequoia NF, California			fire in a canyon between rock bluffs (aircraft).
1960	Sequoia NF, California	1	Private	TBM Tanker pilot Donald Ackers came over a ridge on a retardant
	Tule Indian Reservation			drop and clipped the ridge (aircraft).
1960	Region 6	1	USFS	Helicopter from early files at NIFC (aircraft).
1960	Mine Fire (Millard Fire)	1	Private	TBM Tanker pilot Frank Druhl reportedly ran out of gas and crashed
	Brown Mtn, 3600 ft S slope,			(9/28/60, aircraft).
	Angeles NF, California			
1961	Higgins Ridge, Utah	1	State	Walked into main rotor (unconfirmed NWCG/SHWT report).
1961	Cannell Meadows RD	3	USFS	Helicopter (Bell 3-GB) on reconnaissance of fire crashed while
	Sequoia NF, California			returning to base due to lack of fuel (aircraft).
1961	Roberts Fire, Region 3	1	Private	TBM Tanker pilot Charles Cochrane from engine failure (6/15/61,
				aircraft).
1961	????	1	????	TBM Tanker pilot Verd Beatty (aircraft).
1961	????	1	????	TBM Tanker pilot Arthur Beall (aircraft).
1961	????	1	????	Tanker pilot Bernard Evert (aircraft).
1961	????	1	????	B18 Tanker pilot Harold Hill (aircraft)
				1961 TBM on the Tonto, TBM on the Gila, TBM on the
				Hemet NF's need to be matched with above pilots.
1961	Sitgreaves NF, Arizona	2	????	PBY (E86) Tanker pilots Doyle Keeing and Render Matthews from
				engine failure after takeoff while flying out of Winslow, AZ (aircraft).
1961	Inyo NF, California	3	USFS	Helicopter from early files at NIFC (aircraft).
1961	Tonto NF, Arizona	2	USFS	Cessna-180 from early files at NIFC (aircraft).
1962	R-2	1	USFS	T-34 pilot Maurice McFadden in a mid-air with a PB4Y2 (aircraft).
1962	Badlands north of Hemet,	1	Private	TBM 3-E Tanker (T70) Pilot Alvin "Bucky" Walters, attributed to
	California			incapacitation from a heart attack. Was on CDF contract (aircraft).
1962	Shastra-Trinity NF, California	1	Private	F7F Tanker pilot Robert Christoferson hit a tree on a retardant drop
				(aircraft). The crash started a new fire called the F7F Fire.
1962	????	2	????	Tanker pilots Theodore Schuele and William Chevrolet (aircraft).
				Possibly B17 at Fallon, NV.
1962	Porterville, California	1	????	P-61 "Black Widow" with pilot Robert Savaria (aircraft).
1962	Apache NF, Arizona	3	USFS	Cessna-180 from early files at NIFC (aircraft).
1962	????	1	????	N3N Tanker pilot Robert Hill hit a High School Gym while on a
				demonstration drop (aircraft).
1963	Near Silver City, Nevada	1	????	TBM Tanker pilot Dexter Booth Jr. (aircraft).
1963	????	1	Private	F7F Tanker pilot Louis Leach hit a tree and lost control returning to
				the airport (aircraft).
1963	????	1	????	B-26 Tanker pilot Ernest Mosely (aircraft).

Appendix 1 continued (C. Bushey, 1997).

Date	Fire Name / Location	Fatalities	Agency	Remarks and Accident Type
1971	28 miles SW of Flagstaff, Coconino NF, Arizona	2	????	Cessna 206 on a fire recon crashed while directing a retardant drop (7/17/71, aircraft).
1971	Lake Minchumina, AK	1	BLM	Firefighter was struck and killed by a helicopters main rotor while exiting the craft following an emergency landing after engine failure (unconfirmed NWCG/SHWT report, aircraft).
1971	Near Placerville, California	1	Private	TBM (T37) Tanker pilot Richard L. Ranck, struck a tree after a retardant drop. He was flying on a CDF contract out of Columbia (9/4/71, aircraft).
1972	Near Cedar City, Utah, Cedar Breaks N. Monument	2	Private	B-17 pilots Wayne Waller and David Poindexter lost power to an engine and were unable to drop their load before crashing into the terrain (aircraft).
1972	North end of Pinaleno Mtns Arizona	2	USFS	Aero-Commander 500-A on fire recon, cause unknown (6/2/72, aircraft).
1972	Mederia Fire Cibola NF, New Mexico	2	????	B-17 flying too low, wing broke off and crashed nose first (7/12/72, aircraft).
1972	Bear Fire California	1	Private	Bell 205 A-1 transporting firefighters over Topa Topa Ridge came into landing zone at wrong altitude, touched down and slide down into the canyon. Five others injured in the crash (8/26/72, aircraft).
1973	Battle Mountain Fire North of Eureka, NV	2	????	B-17 crashed dropping retardant and wing hit the ground (7/12/73, aircraft).
1973	Humburg Fire Lassen NF, California	1	Private	TBM-3E (E28) Tanker pilot Harry Owens in midair collision with Leadplane Cessna 310 on retardant drop (8/12/73, aircraft). Leadplane landed ok. TBM was on USFS contract.
1973	Tuolumne-Calaveras Ru, CA	1	Private	Helicopter pilot Dick Rodgers based out of Columbia AP (aircraft). Was operating under a CDF contract.
				Unconfirmed reports of 1-4 passenger fatalities.
1974	Region 4	4	USFS	C-182 stall/spin into terrain on a recon flight (5/29/74, aircraft).
1974	Grama Fire Apache-Sitgreaves NF, AZ	2	Private	PV2 Tanker pilots Larry Mortinson and Timothy Chittendren stalled on a steep final approach (6/12/74, aircraft).
1974	Boise Airport, Idaho	1	Private	B-26 (D28) Tanker pilot John Fletcher during a taxi collision at BOI with a small aircraft resulting in a fire. Both aircraft were under tower control. Other pilot was also killed but was non-fire (6/12/74, aircraft).
1974	Mt. Graham, Region 3	2	Private	PB4Y2 Tanker pilots George Stell and Greg Stell (son), controlled flight into terrain on a low retardant drop, possible stall or tree strike (6/27/74, aircraft). Greg was in the left seat.
1974	Near Ukiah, California	1	Private	F7F (E31) Tanker pilot Bill Benedict, struck a tree after a retardant drop (8/31/74, aircraft). The fire was started by an arsonist shooting tracer bullets who was apprehended and convicted of manslaughter.
1974	Near Rhonerville, California	1	Private	F7F (E23) Tanker pilot Dick Miller, lost power on take-off, mixtures found in auto-lean instead of full rich, ran off the end of the runway (9/26/74, aircraft). On CDF contract.
1974	Near Rhonerville, California	1	Private	F7F (E22) Tanker pilot Mike Fagen, fuel starvation on take-off, wrong tank selected (10/21/74, aircraft). On CDF contract.
1974	Region 6	2	USFS	Helicopter on fire mission (7/27/74, aircraft).
1974	Kiana, AK	1	Private	A Piper Twin being used for air attack crashed attempting a take off with only one engine unconfirmed NWCG/SHWT report, aircraft).
1975	Near Cedar City, Utah	2	Private	B-17 (T99) Tanker pilots Alford Adolph and Robert Rzyalinski crashed enroute to the fire (7/17/75, aircraft).
1976	Battlement Creek Fire Grand Valley, CO	1	Private	B-26 (T56) Tanker pilot Don Goodman, controlled flight into terrain during positioning for a retardant run (7/16/76, aircraft).
1976	Grass Valley, California	1	Private	S-2 (T94) Tanker pilot Bill Sears, possible incapacitation due to a heart attack (6/29/76, aircraft). On CDF contract.
1976	Grand Junction, CO	1	Private	B-26 (T59) pilot Ed Jenks flew into a high altitude box canyon and crashed into a mountain while on a retardant drop. Plane was on BLM contract and dropping on initial attack for the USFS (8/8/76, aircraft).
1977	Middle Fire Angeles NF, California	1	LACFD	Bell 205A-1 (Helo 14) owned by the LACFD and a Bell 212 owned by Arizona Helicopters Inc. under USFS contract experienced a mid-air collision during a steep final approach to avoid powerlines at night with night vision goggles. A third ship was also operating at the time but was not involved. The LACFD pilot, Thomas P. Grady, had already made several retardant drops on the fire (7/24/77, aircraft).

Appendix 1 continued (C. Bushey, 1997).				
Date	Fire Name / Location	Fatalities	Agency	Remarks and Accident Type
1984	Near Salinas, California	1	Private	S-2A (T100) Tanker pilot Ed Real stalled after a drop run and turning into rising terrain. On CDF contract (9/28/84, aircraft).
1985	Hubbard Creek Fire Okanogan NF, Washington	1	Private	Allouette III (H624) with pilot Joe Coke crashed when a 100 foot, 3/8 inch diameter unweight steel cable "long-line" attached to a cargo hook became entangled in the tail rotor and main rotor systems (8/9/85, aircraft).
1985	Near Spokane, Washington, Region 6	2	Private	PBY Tanker pilots James Dunlap and Tim Trudell, hit a submerged log while scooping water (aircraft).
1986	Near Columbia AP, California	2	Private	S-2 (T77) Tanker pilots Richard Boyd and Clarence Lind, stalled after dropping retardant on a training flight (aircraft). CDF contract.
1986	Enroute to the Burdick (E275) and Wakefield (E278) fires near Hotchkiss, Colorado	1 3	Private BLM	Aerospatiale SA315-B "Lama" departed Montrose, CO with a pilot and 3 firefighters to investigate two possible lightning caused fires. The helicopter impacted static cables across the Gunison River. The rotor system departed and the aircraft impacted and burst into flames (8/5/86, aircraft). Pilot James D. Daughtery, Lee Steingotter, Phillip Hamilton, Harald Siewers were killed.
1987	Whalen Fire, 6 miles W of Castle Crages State Park, Shasta-Trinity NF, California	3	Private	C-119 G(J) (T135) with pilots Bill Berg, Charles Peterson and Mechanic Stephen Harrell, inflight failure of right wing, left wing tip and tail boom during a retardant run. Plane was out of Redding, CA
1987	California, Region 5	1	Private	S-2A (T79) Tanker pilot Donn Johnson stalled after making a left climbing turn immediately after a drop (10/7/87, aircraft). On CDF contract.
1987	White Sands Missile Range, New Mexico	2	Private	P2V (T07) Tanker pilots Nathan Knob and Woodward "Red" Miller, out of Alamogordo, New Mexico crashed while under Army contract. Some question as to the cause; may have been controlled flight into terrain while on a retardant run, or it has been suggested based on holes observed in the plane that it may have been accidentally shot down (aircraft). Nathan was Army Knob's son.
1987	LaGrande, Oregon	2 5	Private BLM	Cessna 207 transporting people to fire hit canyon wall (aircraft).
1988	Lost Fire Bighorn NF, Wyoming	1	BLM	Aerospatiale SA315-B "Lama" (Helo 201) experienced loss of tail rotor authority while looking for a place to land. Craft spun and impacted upright on a large boulder, rolled and came to rest upside down. BLM Radio Tech Merrin Rodgers who was to replace batteries at the remote repeater in the Cloud Mountain Wilderness was thrown from the craft into the main rotor because of belt failure apparently due to UV light exposure. Three others injured in the crash (8/19/88, aircraft).
1988	Havilah Fire Sequoia NF, California	1	USFS	BE-58P with pilot Chuck Watkins stalled and spiraled following a retardant run and a steep climbing turn (8/12/88, aircraft).
1988	West of John Day, Ochoco NF, Oregon	1	USFS	DHC-6 Twin Otter with pilot Dave Schas crashed on a shuttle flight between Redmond and LaGrande. Pilot believed to have fallen asleep and flew into the terrain (7/14/88, aircraft).
1988	Jackson Hole Airport, WY	1	Private	Beech 200 with pilot Kuykendall on USFS contract to shuttle fire personnel crashed shortly after takeoff after making 3 erratic dives and pitches before impacting the ground in a verticle position. He was returning to Redding, California (9/11/88, aircraft).
1988	Dinkleman Fire Wenatchee NF, Washington	2	Private	Bell 204C on contract to the WA DNR and out of Vancouver, BC crashed. Both Canadians on board were killed (9/12/88, aircraft).
1990	Silver Creek Fire Colville Reservation, Keller, WA	1	Private	Bell 204-B pilot Robert P. Wiebe (Canadian) on a USFS contract impacted after flying behind a ridge. Before impact the pilot radioed concerning the weight of his external load. The bambi bucket was later found to be configured with a non-standard cinch strap which showed signs of excessive stretching. Investigation revealed that a loss of power had occurred due to loss of all 2nd turbine rotor blades, precipitated by a stress rupture failure of 3 consecutive blades induced by high operating temperatures (9/11/90, aircraft).
1990	Wynoochee Fire Olympic NF, Washington	2	Private	P2 V (T08) pilots Ralph Glasgow and Stephen Bovey, controlled flight into terrain during the final on their retardant run. Plane was flying out of Wenatchee, Washington (9/30/90, aircraft).

Appendix 1 continued (C. Bushey, 1997).

Date	Fire Name / Location	Fatalities	Agency	Remarks and Accident Type
1997	7 miles N of Point of Pines, San Carlos Reservation	1	Private	Baron 8KB on fire reconnaissance went down with a Safford Aviation pilot and a BIA employee (6/2/97, aircraft).
1997	Bear Valley Helisite, 22 miles SE of Hollister, California	1	BLM	OV-10A Bronco piloted by Dave Kyle on a training mission was observed initiating a barrel roll to the right at approx 200 agl which it did not complete prior to impact in excess of 150 mph. Aircraft disintergrated and burned on impact (6/10/97, aircraft).
1997	Hemlock Fire San Beradino NF, Highland, California	1	Private	Pilot Floyd Hiser Sr. died when his Bell 206L-1 crashed while making water drops on an arson caused forest fire. He was reported to have radioed "flame out" twice. Another aircraft in the vicinity saw a cloud of dust and the craft at the bottom of a ravine (aircraft, 7/6 97).
	Total	249		

Following is a chronological breakdown by aircraft type of the above previously listed fatalities.

	Leadplane Fatalities			
1958	Silverado Canyon Cleveland NF, California	2	USFS	Pilot Bill Archibald was training Carl Milligan on a fire when the tail of Beechcraft Bonanza Leadplane (V-35) broke off inflight (aircraft).
1962	R-2	1	USFS	T-34 pilot Maurice McFadden in a mid-air with a PB4Y2 (aircraft).
1964	R-3	1	USFS	T-34 pilot Lou Parker in a mid-air with a TBM (aircraft).
1981	Fire name not recorded, 8 mi SW of Richlands, North Carolina	1	NCDNR	T-34 Leadplane pilot Merton Jackson, stall/spin (5/15/81, aircraft).
1988	Havilah Fire Sequoia NF, California	1	USFS	BE-58P with pilot Chuck Watkins stalled and spiraled following a retardant run and a steep climbing turn (8/12/88, aircraft).
1991	Ziplock Fire Cibola NF, New Mexico	1	USFS	Leadplane 34 (Beechcraft 58P) with pilot Henry Kim leading Air Tanker 119 pulled up after retardant run, started a left turn and continued to roll left until almost inverted and nose down (6/21/91, aircraft). Plane was out of Albuquerque, New Mexico.
1995	Butterfield Fire, Ramona, California	1	USFS	BE-58P Leadplane (56) with pilot Michael Smith was in approach to land at an uncontrolled airstrip when he collided with Tanker T19 landing at the same time (6/21/95, aircraft).
1997	Bear Valley Helisite, 22 miles SE of Hollister, California	1	BLM	OV-10A Bronco piloted by Dave Kyle on a training mission was observed initiating a barrel roll to the right at approx 200 agl which it did not complete prior to impact in excess of 150 mph. Aircraft disintergrated and burned on impact (6/10/97, aircraft).
	Leadplane Subtotal	9		
	Tanker Fatalities			
1958	Porterville, California	1	????	PBY Tanker pilot Joseph Anthony (aircraft).
1958	????	2	????	Tanker pilots Arnell Talbot and Stewart Kilgour (aircraft).
1958	????	1	????	Tanker pilot George Jess (aircraft).
1958	Independence Lake Fire Tahoe NF, California	1	????	TBM Tanker pilot Don Doughty (aircraft).
1958	Anthony Lakes Fire Region 6	2	Private	B-25 Tanker pilots James Armstrong and Charles Franco (aircraft).
1958	Beaver Lake Fire Region 6	2	Private	B-25 Tanker pilots Leroy Englert and Elliott Corbertt (aircraft).
1958	Magic Mountain Fire Angeles NF, California	2	USFS	B-25 (?) Tanker pilots George Carey and J. C. Brehm (aircraft).
1958	Business Creek Fire Payette NF, Idaho	2	Private	B-25 Tanker pilots Patrick Hendricks and Virgile Sanders (aircraft).
1959	Tule River RD, Sequoia NF, California	1	USFS	Pilot volunteered to dive low and drop in hazardous conditions on a fire in a canyon between rock bluffs (aircraft).
1960	Sequoia NF, California Tule Indian Reservation	1	Private	TBM Tanker pilot Donald Ackers came over a ridge on a redardant drop and clipped the ridge (aircraft).
1960	Mine Fire (Millard Fire) Brown Mtn, 3600 ft S slope, Angeles NF, California	1	Private	TBM Tanker pilot Frank Drufhl reportedly ran out of gas and crashed (9/28/60, aircraft).
1961	Roberts Fire, Region 3	1	Private	TBM Tanker pilot Charles Cochrane from engine failure (6/15/61, aircraft).
1961	????	1	????	TBM Tanker pilot Verd Beatty (aircraft).

Appendix 1 continued (C. Bushey, 1997).				
Date	Fire Name / Location	Fatalities	Agency	Remarks and Accident Type
1972	Near Cedar City, Utah, Cedar Breaks N. Monument	2	Private	B-17 pilots Wayne Waller and David Poindexter lost power to an engine and were unable to drop their load before crashing into the terrain (aircraft).
1972	Mederia Fire Cibola NF, New Mexico	2	????	B-17 flying too low, wing broke off and crashed nose first (7/12/72, aircraft).
1973	Battle Mountain Fire North of Eureka, NV	2	????	B-17 crashed dropping retardant and wing hit the ground (7/12/73, aircraft).
1973	Humburg Fire Lassen NF, California	1	Private	TBM-3E (E28) Tanker pilot Harry Owens in midair collision with Leadplane Cessna 310 on retardant drop (8/12/73, aircraft). Leadplane landed ok. TBM was on USFS contract.
1974	Gramma Fire Apache-Sitgreaves NF, AZ	2	Private	PV2 Tanker pilots Larry Mortinson and Timothy Chittendren stalled on a steep final approach (6/12/74, aircraft).
1974	Boise Airport, Idaho	1	Private	B-26 (D28) Tanker pilot John Fletcher during a taxi collision at BOI with a small aircraft resulting in a fire. Both aircraft were under tower control. Other pilot was also killed but was non-fire (6/12/74, aircraft).
1974	Mt. Graham, Region 3	2	Private	PB4Y2 Tanker pilots George Stell and Greg Stell (son), controlled flight into terrain (aircraft). Greg was in the left seat.
1974	Near Ukiah, California	1	Private	F7F (E31) Tanker pilot Bill Benedict, struck a tree after a retardant drop (8/31/74, aircraft). The fire was started by an arsonist shooting tracer bullets who was apprehended and convicted of manslaughter. On a CDF contract.
1974	Near Rhonerville, California	1	Private	F7F (E23) Tanker pilot Dick Miller, lost power on take-off, mixtures found in auto-lean instead of full rich, ran off the end of the runway (9/26/74, aircraft). On CDF contract.
1974	Near Rhonerville, California	1	Private	F7F (E22) Tanker pilot Mike Fagen, fuel starvation on take-off, wrong tank selected (10/21/74, aircraft). On CDF contract.
1975	Near Cedar City, Utah	2	Private	B-17 (T99) Tanker pilots Alford Adolph and Robert Rzyalinski crashed enroute to the fire (7/17/75, aircraft).
1976	Battlement Creek Fire Grand Valley, CO	1	Private	B-26 (T56) Tanker pilot Don Goodman, controlled flight into terrain during positioning for a retardant run (7/16/76, aircraft).
1976	Grass Valley, California	1	Private	S-2 (T94) Tanker pilot Bill Sears, possible incapacitation due to a heart attack (6/29/76, aircraft). On CDF contract.
1976	Grand Junction, CO	1	Private	B-26 (T59) pilot Ed Jenks flew into a high altitude box canyon and crashed into a mountain while on a retardant drop. Plane was on BLM contract and dropping on initial attack for the USFS (8/8/76, aircraft).
1978	San Luis Obispo Ru, CA	1	Private	AIRCO 53 piloted by J. Holstein with CDF employee Paul Belville. HVFS took this case to court to get Public Safety Officer Benefits ACT death benefits for Leadplane/Tanker pilots. Benefits initially granted, later turned over on appeal by government (aircraft).
1978	Ukiah, California	1	Private	S-2A (T95) Tanker pilot James M. "Dick" Lippitt stalled while on final to retardant drop on a CDF contract (8/20/78, aircraft).
1978	Redding, California	1	Private	S-2 Tanker pilot Ted Bell on a CDF contract (aircraft).
1978	????	1	????	DC7 Tanker pilot Victor Mortan (aircraft).
1978	????	1	????	DC7 Tanker pilot Donald Baxter (aircraft).
1978	????	1	????	DC7 Tanker pilot John Davis (aircraft).
1978	????	1	????	DC7 Tanker pilot Darwin Kern (aircraft).
1978	????	1	????	DC7 Tanker pilot John Turner (aircraft).
1978	????	1	????	DC7 Tanker pilot Larry Myers (aircraft).
1979	Near Banning Pass Southern California	2	Private	C-119 Tanker pilots Denny Connors and Richard Ray, inflight failure of right wing as an 18 foot section separated at the same time the retardant was dropped (6/8/79, aircraft). On CDF contract.
1979	Charles Fire Plumas NF, California	1	Private	S-2A (T80) Tanker pilot Gayle Eaton, stall and spin during the base to final turn (6/13/79, aircraft). On CDF contract.
1979	Cayuse Saddle Fire Near Superior, Montana	2	Private	B-17 (T10) pilots Joe LeRoux and Bob Masters controlled flight into terrain while turning final after 2nd half of load (7/21/79, aircraft).
1979	Fire name not recorded, 7 mi SW of Sierra Gorda, North Carolina	1	NCDNR	L-19 pilot Charles Colton crashed after improper compensation for wind conditions (3/27/79, aircraft).
1980	Near Banning Pass Southern California	2	Private	DC-4 (T118) Tanker pilots Clyde Alford and Ron Letnes, midair collision with DC-4 Tanker T119 (12/2/80, aircraft). T119 landed ok. Planes had been released from fire and were returning to home base in Tucson and were flying in formation when accident occurred.

Appendix 1 continued (C. Bushey, 1997).				
Date	Fire Name / Location	Fatalities	Agency	Remarks and Accident Type
1996	Kinston Jetport, N. Carolina	1	State	WSK PZL Mielec M18A Tanker pilot Gerald Lee Sundstrom, a NC Div of Forest Service seasonal, crashed into a wheat field in a nose low attitude approx 1 minute after takeoff to a fire in a nearby county (5/11/96, aircraft).
1997	Blandburg, Pennsylvania	2	Private	Locheed P2V (B-26, T39) piloted by Walter John Hirth and copilot William Babka shortly after dropping a load of fire retardant on a 200 acre fire near Bellwood Reservoir in Blair County. Airplane was flying under contract to the Pennsylvania Dept. of Conservation and Natural Resources, Div. of Forest Fire Protection. This was the first crash of an airplane used in wildfire suppression in Pennsylvania (5/20/97, aircraft).
	Tanker Subtotal	136		
	Helicopter Fatalities			
1959	Hill Field Fire Region 4	1	USFS	Helicopter from early files at NIFC (aircraft).
1960	Region 6	1	USFS	Helicopter from early files at NIFC (aircraft).
1961	Inyo NF, California	3	USFS	Helicopter from early files at NIFC (aircraft).
1961	Higgins Ridge, Utah	1	State	Walked into main rotor (unconfirmed NWCG/SHWT report).
1961	Cannell Meadows RD, Sequoia NF, California	3	USFS	Helicopter (Bell 3-GB) on reconnaissance of fire crashed while returning to base due to lack of fuel (aircraft).
1964	Okanogan NF, Washington	1	USFS	Helicopter from early files at NIFC (aircraft).
1965	Snoqualmie NF, Washington	1	USFS	Helicopter from early files at NIFC (aircraft).
1968	Canyon Fire Angeles NF, California	1	Private	Alouette 3-1966 was taken over by vp of corporation who was not familiar with terrain and lost control of craft when sling bucket started to oscillate (8/26/68, aircraft).
1970	Fork Fire Bichota Canyon, 2 miles NE of Rincon Ranger Stn., Angeles NF, California	1 4	Private USFS	Alouette II ferrying firefighters developed engine trouble, crashed and burned after it flew into a cloud of smoke just after lifting off. The wreckage was found 800 ft below the ledge in a steep canyon. Four of the fatalities were passengers; William Wales, Stephen Gramer, Edward Henderson, George Lopez and Ronald Scott (9/28/70, aircraft).
1971	Lake Minchumina, AK	1	BLM	Firefighter was struck and killed by a helicopters main rotor while exiting the craft following an emergency landing after engine failure (unconfirmed NWCG/SHWT report, aircraft).
1972	Bear Fire California	1 6	Private USFS	Bell 205 A-1 transporting firefighters over Topa Topa Ridge came into landing zone at wrong attitude, touched down and slide down into the canyon. Five others injured in the crash (8/26/72, aircraft).
1973	Tuolumne-Calaveras Ru, CA	1	Private	Helicopter pilot Dick Rodgers based out of Columbia AP (aircraft). Was operating under a CDF contract.
				Unconfirmed reports of 1-4 passenger fatalities.
1974	Region 6	2	USFS	Helicopter on fire mission (7/27/74, aircraft).
1977	Middle Fire Angeles NF, California	1	LACFD	Bell 205A-1 (Helo 14) owned by the LACFD and a Bell 212 owned by Arizona Helicopters Inc. under USFS contract experienced a mid-air collision during a steep final approach to avoid powerlines at night with night vision goggles. A third ship was also operating at the time but was not involved. The LACFD pilot, Thomas P. Grady, had already made several retardant drops on the fire (7/24/77, aircraft).
1984	Round Top Mtn Heliport, Prescribed Burn, Nez Perce NF, Idaho	1	USFS	Bell 206 BIII contracted to the USFS became entangled in cables for a helitorch. Helispot crew member Dale Uptmor was attempting to correct the problem when the helicopter started a 180 degree spin while hovering over the helitorch. Uptmor was struck by the tail rotor as he was moving away from the craft (8/22/84, aircraft).
1985	Hubbard Creek Fire Okanogan NF, Washington	1	Private	Allouette III (H624) with pilot Joe Coke crashed when a 100 foot, 3/8 inch diameter unweight steel cable "long-line" attached to a cargo hook became entangled in the tail rotor and main rotor systems (8/9/85, aircraft).

Appendix 1 continued (C. Bushey, 1997).				
Date	Fire Name / Location	Fatalities	Agency	Remarks and Accident Type
1970	Harrisville District, Huron-Manistee NF, Michigan	1	????	Piper Pacer fire patrol plane crashed and burned (7/6/70, aircraft).
1971	28 miles SW of Flagstaff, Coconino NF, Arizona	2	????	Cessna 206 on a fire recon crashed while directing a retardant drop (7/17/71, aircraft).
1972	North end of Pinaleno Mtns Arizona	2	USFS	Aero-Commander 500-A on fire recon, cause unknown (6/2/72, aircraft).
1974	Region 4	4	USFS	C-182 stall/spin into terrain on a recon flight (5/29/74, aircraft).
1974	Kiana, AK	1	Private	A Piper Twin being used for air attack crashed attempting a take off with only one engine unconfirmed NWCG/SHWT report, aircraft).
1979	Near Romona AP, California	1	Private	The pilot, Marvin F. Foster, was killed when his private aircraft PA 38 converged from a high extended left base entry with a CDF contract S-2A on a standard left downwind for Romona. The PA was destroyed, the S-2A had light damage and landed ok (9/10/79, aircraft).
1980	Majors Fire Snell Resource Area, Ely District, BLM Ely, Nevada	1 Private 3 BLM		Cessna 206 with pilot Farrell Gayle and 3 BLM fire temporaries; Joseph Bass, Daniel Hase, and Todd Harrison were on a flight to paracargo delivery of radio batteries when the plane crashed into the side of a mountain. Paracargo wrapped around aircrafts tail (7/11/80, aircraft).
1981	Minidoka Fire Paul, Idaho	1 Private 2 BLM		Cessna-182 pilot attempted a go-around after a bounced, hard landing, struck powerlines and crashed (6/26/81, aircraft).
1981	Redding Airport California	4	USFS	Beechcraft Baron 58P with pilot Larry Pettibone and three passengers (George Mundel, Joseph Hohl, and Roscoe Bertollicci) crashed shortly after takeoff on the roof of the fire cache building. The passenger group was a preseason airtanker inspection team located at Chico, CA (5/7/81, aircraft).
1981	????	1 Private 1 USFS		Aircraft crash with contract pilot (unknown) and USFS Gene Ahrendt looking for new fire starts from lightning (9/9/81, aircraft).
1987	LaGrande, Oregon	2 Private 5 BLM		Cessna 207 transporting people to fire hit canyon wall (aircraft).
1988	West of John Day, Ochoco NF, Oregon	1	USFS	DHC-6 Twin Otter with pilot Dave Schas crashed on a shuttle flight between Redmond and LaGrande. Pilot believed to have fallen asleep and flew into the terrain (7/14/88, aircraft).
1988	Jackson Hole Airport, WY	1	Private	Beech 200 with pilot Kuykendall on USFS contract to shuttle fire personnel crashed shortly after takeoff after making 3 erratic dives and pitches before impacting the ground in a verticle position. He was returning to Redding, California (9/11/88, aircraft).
1997	7 miles N of Point of Pines, San Carlos Reservation	1 Private 1 BIA		Baron 8KB on fire reconnaissance went down with a Safford Aviation pilot and a BIA employee (6/2/97, aircraft).
	Other Aircraft Subtotal	59		
				Montana Prescribed Fire Services, Inc.
	This is an evolving draft as more information is revealed. Your help in this process is appreciated.			Attn.: Chuck Bushey 1333 Colton Blvd., Billings, MT 59102-2436 E-mail: cbushey@wtp.net <i>mpfs@minispring.com</i>
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