
WAYNE HEIMER - HUMAN MORTALITY IN WILD SHEEP MANAGEMENT

Wayne E. Heimer, 1098 Chena Pump Road, Fairbanks, AK 99709, Alaska Dept. of Fish and Game (Ret.)

Abstract: Modern sheep biologists have come to rely heavily on aircraft for research and management. Although aircraft facilitate census, capture, and relocation of wild mountain sheep, the human mortality cost of mountain flying is significant. Aircraft-associated mortalities are the leading cause of job-related deaths among wildlife biologists. The documented mortality rate for humans working in wild sheep and mountain goat management is one death for every 14.6 months over the last 28 years. The nature of mountain sheep and the terrain which they inhabit require operation of most aircraft at the upper margins of their design limits. Operating any machine at (or frequently beyond) its design limits leads to increased risk of failure. Nevertheless, the most common cause assigned to aircraft-associated mortalities among humans flying in mountainous habitats is not mechanical failure, but human mistakes. Typically these mistakes are characterized as "pilot error." Because most pilots are flying under the charter or direction of biologists, "pilot error" should be correctly understood as the proximate cause of death; the ultimate cause is "biologist error." Possible sources of "biologist error" will be defined in the hope that familiarization with the mortality statistics and sources of "biologist error" will eventually reduce sheep-associated aircraft mortalities among humans.

I'd much prefer talking about Dall sheep trapping to discussing human mortalities associated with mountain flying. However, I think this is an important issue for us to address. I do not hold this opinion specifically because of the recent Tiburon Island tragedy we share, but for a more compelling reason: our collective losses over the years. I doubt there is anyone in this room who hasn't either had a close call or been personally touched by an aircraft-related mortality resulting from sheep, goat, or wildlife management. The bad news is that if you haven't been involved in such a tragedy, you will be if we continue to use aircraft to the extent we have in the past. If we continue to develop "new applications" for aircraft to our work needs, this time will be shortened rather than lengthened.

PERSONAL EXPERIENCE: My initial experience with aircraft-related human mortality among sheep and goat biologists involved Jim Erickson's death. Jim was a pioneer in North American wild sheep research and management. By chance, I had met Jim and his family when I was a callow brown fat fanatic at the University of Alaska. Jim was the

Alaska Department of Fish and Game's Dall sheep biologist in Fairbanks, and neighbor to some close friends. For reasons which must have seemed justifiable at the time, Jim and his pilot went to count sheep in the Hulahula River drainage on north side of the Brooks Range. Several mistakes contributed to their deaths. They were surveying sheep in the mountains using a Super Cub on floats, the only practical way to access that area at the time. Additionally, Jim's pilot, although experienced in other aircraft, was not highly experienced with the Super Cub. Apparently, they 'spun in' and burned. Jim was a young man with a young wife and young children. Whatever the justification for taking the risks to gather Dall sheep population data in the remote Brooks Range might have been in 1970, it has been long forgotten. The data were never retrieved. By all accounts, Jim Erickson was an uncommonly good biologist, and had he lived, would probably have become one of the giants of our business.

Prior to my hire as sheep biologist for the Department of Fish and Game, I was warned about the high mortality among wildlife biologists. When word "leaked out" to the faculty of physiology I

had applied for the sheep biologist job (having found the allure of working with Dall sheep at a higher level of biological organization irresistible after years of working my way up from molecules through enzymes, cells, tissues, organs and intact mice), my academic advisor, who was not known as a compassionate man, said, "You don't want to do that, you'll soon die in a plane crash." At that time, I was young, considered myself immortal, and paid little attention to his advice; I got the job. Because of the circumstances, I was hired into the shadow of an unusually impressive human being, and living in Jim's shadow certainly impacted my career and the approach I brought to the work.

Not only did I inherit Jim's programs, which were unusually visionary for the late 1960s, I also inherited a palpable appreciation of the fact that the time any of us has to contribute may be short. This may explain why I have perhaps appeared "pushy" over the years, and why I can't abide the notion that I might know something important that you don't. After all, I could be gone soon. I appreciate the tolerance you, my colleagues, have generally shown in this regard over the last quarter of a century, and I hope you will be as kind to me in the future as you have been in the past.

Within a year of my hire, my partner, Tony Smith had crashed with a pilot named Bart Cox while on a sheep survey. The cause was mechanical failure, and both escaped with minor injuries. Within another year and a half, a close friend and colleague from the Fairbanks office, Spencer Linderman, and his pilot were killed counting mountain goats on the Kenai Peninsula. Like Jim Erickson, Spencer was a young man who left a young wife. Spencer's was my first Departmental funeral. The Department was quite shaken and disturbed as we wondered, "Is it worth it?" and "What could we do to prevent this sort of thing?" Being coldly analytical based on the events of Spencer's funeral and the funerals of others since, I have calculated this introspective period in the Alaska Department of Fish and Game lasts about three weeks. At the end of the three-week introspective period, it's back to business as usual. Mountain goat management was

unaffected by the loss of the data Spencer had set out to gather.

Spencer's funeral didn't seem to change anything in the Department except me. Living as I did in Jim Erickson's shadow, and influenced by Spencer's death, I made a personal commitment to reduce the flight risks associated with sheep biology. For me, this was obviously a personally adaptive decision. I hoped it might also serve future sheep biologists. Still, it didn't spare me from my own 'biologist error.' Within a year, I also crashed in an overloaded helicopter. By the grace of God, both the pilot and I walked away physically unscathed.

Criteria affecting my decision, when to fly or not, established as a result of these brushes with death included this basic litmus test: *if the data I was gathering held promise for making a difference in sheep management or increased safety for future sheep biologists, I would go... if not, I wouldn't.* This litmus test, along with scarcely having enough money for minimal aircraft charter, led to our discovery of the predictive value of what I call "internal population dynamics" which require detailed composition data which can't be gathered from aircraft (Heimer 1994). As a result of limiting flying to the necessary minimum and maximizing inexpensive ground-based observation techniques, my friends and I found that accurate ground-based recruitment and mortality assessments have predictive value which far exceeds the applicability of aerial survey data for Dall sheep management. The mathematics aren't as impressive, but the program was cheaper in terms of operating budget, and the data tracked population trends and sizes with amazing accuracy.

METHODS: In the course of writing that paper (Heimer 1994), I attempted to "cost out" the expenses and benefits of "ground-based" biology compared with "aircraft-based" biology. Clearly such an analysis involves the cost of flight time vs. on-ground field time. At the end of that analysis, I included a paragraph on the human mortality costs involved with sheep and goat management.

I compiled those data by going through the proceedings of the Northern Council as far back as the 1970 meeting dedicated to Jim Erickson's memory. I simply totaled the number of humans memorialized in those proceedings and divided by the 23 years which had elapsed in the interim. For purposes of this calculation, I included all human mortalities. This approach could have inflated the death rate because I included a Canadian incident in which a plane of searchers looking for a lost biologist went down and all on board were killed. Still, it was mountain flying related to sheep management.

RESULT: The average resultant mortality rate for humans involved in wild mountain sheep and goat research was at least one human death every 14 months. In the years between 1994 and 1998 the mortality rate declined slightly, but with the Tiburon Island tragedy, it now averages one human death every 14.6 months over the last 28 years.

DISCUSSION: When Heimer (1994) was being internally reviewed by the Alaska Department of Fish and Game, one reviewer objected to the paragraph on human mortality costs because, he said, "This paragraph is a red herring! Flying can be done safely." During the time that passed between the "red herring" comment and my retirement, four more Alaskan biologists lost their lives in work-related aircraft accidents. These accidents were related to moose surveys.

I think we are perhaps more "safety conscious" than biologists used to be, but at the same time, we've increased dependence on aircraft for sheep work. This leads me to ask the philosophical question, "Why?" Put more practically the question becomes, "What causes the 'biologist error' which, too often, results in aircraft-related human death?"

I think the most basic cause is simple denial of risk. Clearly the "red herring reviewer" just cited above was in denial of the risks associated with aerial survey (just as I was when I dismissed the advice of my old major professor and embarked

on the adventures of sheep biology and management). Denial of risk comes from two sources, biologists and supervisors. The biologists who do the work are mostly younger people who are no more closely in touch with their own mortality than was I. Youth has always believed itself invincible. Even cautious biologists will eventually be caught up in the work, and take some unreasonable risks to save money or labor so they can attain their research or management objectives. Supervisory denial may stem from the same desire to meet established goals, but is more complex. Perhaps both supervisors and biologists are unaware of the risks. I reject this possibility, and note tacit supervisory support for aerial work appears unfailingly present. I suggest this is because the supervisors probably took similar risks (and survived) as field biologists before they became supervisors. I've never heard a supervisor say, "No, the potential management or research yields associated with the athletic flying you're proposing aren't worth the risk." However, during my career, I had two supervisors suggest, and even demand that I engage in extreme high-risk flying as the basis of research and management programs. If both biologists and supervisors are actually aware of the manifest risks of mountain flying, yet continue to fly as a matter of course, I can only presume they are in denial of these risks. They must simply assume "It won't happen to me...or to my employee."

A more chilling possibility exists where supervisors are concerned. If supervisors are aware of the risks of mountain flying and still approve (or even, demand) high-risk flights or programs based on high-risk aircraft use, we may infer a supervisory mentality that parallels that of military combat commanders. In this case, leaders understand there will be casualties, but consider obtaining the objective worth risking the mortality costs.

Alternately, biologists and supervisors could be operating under the assumptions of fatalistic philosophy. If both believe that "when your number is up, it's your time," the willingness to take risks not commonly considered prudent may be rationalized.

Finally, I suggest a certain machismo accompanying flying and adventurous field work contributes to increased human mortality. High risk flying, capturing animals from helicopters, and “hanging it all out” are exciting. Many of my colleagues consider these activities exhilarating and fun. How many times have we lingered in bars telling and hearing ‘near-miss’ stories? In my case, too many; I hope not in yours. For too many biologists, the ‘adventure rush’ of doing of field works seems more the point than the management progress which should justify the ‘doing.’ The too-frequent result is that biologists who do not relish the risks are frequently considered by their more macho colleagues as lacking “the right stuff.” This results in a “peer pressure” to fly in spite of the risks.

As an example I cite the story of a friend and colleague in the Alaska Department of Fish and Game who paid the social price for declining to “relish the risks” after a serious helicopter crash. He was engaged in wolf shooting from a helicopter piloted by the same fellow who had crashed with me. As they made a downwind approach on a wolf pack, a gust from behind them overrode the lift by “zeroing out” the helicopter’s airspeed, and they fell to the earth. Fortunately both scrambled out of the helicopter with minor physical injuries moments before it caught fire and burned to a small pile of ashes. When my friend told his supervisor that he didn’t want to fly anymore, his supervisor honored his wish. However, other staff members surreptitiously and disparagingly whispered that he’d lost his nerve. This is a difficult story to tell, but I fear the machismo root of ‘biologist error’ is among the more common causes of human mortalities. Shamefully, it is also the least rational.

Although I think we’re more safety conscious than biologists used to be, I am less than encouraged by the lack of creativity we show with respect to decreasing risks associated with flying for research and management. I may be overly pessimistic, but a recent exchange of correspondence may illustrate this point. Kevin Hurley (who continually looks for employment for me) forwarded a recruitment notice for an Alaska sheep biologist position to me. Within it, I noted the following job duty:

Flying in small aircraft for extended periods in mountainous terrain during turbulent or cold weather while radiotracking, capturing wildlife, or conducting aerial surveys.

When I wrote the project supervisor (a colleague whom I like and respect) inquiring about the risks of mountain flying in turbulent weather, I was reassured that:

I don’t take the risks associated with this project or any other lightly. For 15 years, I have run research projects here in Alaska that require substantial flying and have done so without incident, largely because I fully recognize those risks and don’t have my ego all tied up with getting the job done. I am notorious for being very picky about which pilots I’ll work with. Further my staff and I never second-guess or pressure a pilot to do anything, a trait that is surprisingly rare from what I hear from pilots.

I think you need to be cautious about over-interpreting that sentence in the job announcement. I purposely put in the verbiage about turbulence and mountain flying so that prospective applicants would know that we are not running a flightseeing operation and to weed out folks prone to motion-sickness. I fully discuss the flying aspects of the job with every person that calls me regarding the job and this will be a major portion of any upcoming interviews of candidates. The reference to [flying in extreme] cold must be taken in context. You stated a -30°F cutoff in your letter, which is highly reasonable and the industry standard up here, but to many people seeing this announcement -30°F is extreme cold that they have never experienced!

While I endorse and respect the supervisor’s approach to safer flying, I found the announcement chilling, and wondered what survivor’s benefits

would be associated with the position. I also wondered if the goals of the project were worth "dying for." I doubt they are, but chances are that if safety guidelines are followed, there will be no human mortalities associated with the project. I also doubt sheep management will be changed by what is learned for the risks taken.

RECOMMENDATIONS: I fully realize that this presentation will have minimal effects on those of you who fly. Still, I shall offer this advice:

First, be creative in finding ways to gather better data with less flying. Technical progress doesn't consist of thinking up more innovative applications of aircraft to field situations that create high risk. Nevertheless, such applications are often represented and recognized as technical advances. As an example, I offer the following analysis of a recent "techniques paper" from Alaska (Scotten and Pletscher 1998). This paper reports on the successful use of the Robinson R-22 helicopter (an inexpensive, two-place piston-powered ship) for neonatal Dall lamb capture, and recommends it for expanded application as a research and management tool. I suggest this recommendation may amount to 'biologist error.'

In researching the Robinson R-22 I corresponded with the New Zealand CAA (equivalent to the USA's Federal Aviation) because I'd heard of high accident rates for this machine in the venison trade in New Zealand. In response to my inquiry regarding piston powered and turbine powered helicopter reliability and safety, a CAA supervisor said there is a "... significant difference between the turbine powered and piston powered groups in terms of engine failure type accidents." (P. Nadler N.Z. CAA supervisor pers. commun.). With respect to suitability of the Robinson R-22 for "in close" work at 3,000 to 4,000 feet of elevation (where Dall ewes lamb), the N.Z. CAA had this to say:

Like all helicopters, the Robinson needs to be flown with an adequate margin of power available vers the power required for any given manoeuvre. The problem with the Robinson [model R-22] is that it

can be difficult to judge when this margin exists. This problem almost certainly accounts for more accidents than any other cause. Why is this such a problem for the Robinson? I guess the answer is simple, it's a small helicopter designed to carry two people and some fuel. If the helicopter is asked to carry more than this the design limits can be very easily exceeded (P. Nadler, N.Z. CAA supervisor pers. commun.).

With these comments from the New Zealand CAA, I suggest following the recommendations of Scotten and Pletscher (expanded use of the Robinson R-22 for Dall sheep work in Alaska, let alone for other mountain sheep living at higher altitudes) will lead to unacceptable risk levels. It would certainly have been appropriate for these authors to report the results of the lamb mortality study where the little helicopter was used. I don't think it was responsible to represent use of the R-22 as a technical advance or recommend this marginally-powered ship for athletic, "in-close" mountain flying. I think focusing on the management relevance of the data they gathered and simply stating they "got away with" using the R-22 would have been more responsible. True technical advancement will limit dangerous activities while improving data quality. Too often techniques papers confuse the two. If you can find any other way to get the work done, avoid flying in the mountains.

[Author's late note: While this conference was underway, a Robinson R-22 chartered by the Alaska Department of Fish and Game crashed because of inadequate power for the task to which it had been applied. Fortunately, neither the pilot nor the biologist was injured.WH]

Second, if you must fly, fly as little as possible. Don't fly unless you are convinced the data you're going to collect are worth risking your life. In the last analysis, this means that you consider the results worth "dying for."

Third, when you fly, be careful. Never push yourself, your pilot (or his machine), or people under

your supervision. Don't ever fly with a pilot you don't know to be experienced, competent, cautious, and independent enough to tell you "No!"

Fourth, when possible, hire a professional to do unusually athletic flying and capture work. You may think this is fun, but the professionals are probably better at it than you are, and their risk of failure, while unacceptably high by some standards, is considerably lower than yours.

Finally, if you must fly, negotiate for just compensation for the risks you take. In Alaska, the death rate among biologists is clearly higher than that for police and firefighters. During an unusually enlightened period (following Jim Erickson's death) field personnel in the Alaska Department of Fish and Game were included in the police and fire retirement program. Under that program, if you could "cheat the grim reaper" for 20 years, you could retire with full benefits. Unfortunately, recognition of the grim actuarial statistics associated with job-related death was withdrawn several years ago because of its apparent cost. Biologists in Alaska are, at this time, inadequately compensated for the risks they take. My advice? Get involved with your union or collective bargaining unit and negotiate inclusion in your state's "police and fire" retirement system. You're worth it!

EPILOGUE: We should never forget that deaths affect those who remain alive. Jim Erickson's children are now grown. Still, as adults they developed an interest in knowing about their biological father. Consequently, their mother, Alexandra Coy, who had remarried more than 20 years ago, contacted me to see what I might be able to offer. I was able to supply her with a copy of the memorial page from the Northern Wild Sheep Council proceedings dedicated to Jim's memory as well as the acknowledgement sections of various papers I had written crediting Jim with work he had started, and upon which our further work had been based. Eventually she called me with thanks for what I had been able to provide, and asked if Fish and Game was still doing the same amount of flying. Unfortunately, I had to tell her that despite my efforts to make sheep field

work safer, the Department was more dependent on aircraft than ever before. Alexandra didn't understand. Neither do I.

LITERATURE CITED

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