

Avalauncher Developments

Story and photos by John Brennan

The impetus to start my company, Avalanche Mitigation Services (AMS) was the result of a quest to uncover the history of the Avalauncher. Monty Atwater, a leading pioneer of avalanche forecasting and safety in North America and co-developer of the Avalauncher, has always held hero status in my world since I cut my teeth on the old blue US Forest Service Avalanche Handbook several decades ago. Ironically, Atwater authored the first version of this handbook late in 1952.

Another irony is that I never liked history in school. Maybe the history of some brewery held allure but even that was short lived. Researching Atwater's involvement in the evolution of the Avalauncher was a labour of love, culminating in a road trip in the Spring of 2005 that helped tie enough loose ends together so that I could publish the results of my research in this journal (see *A Brief History of the Big Bang*, Vol 75, Winter 2005).

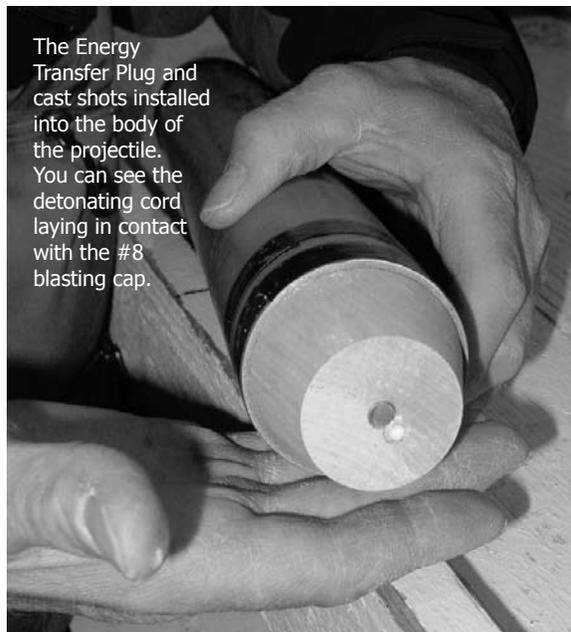
It was also at this time that I decided to form AMS. The company has both long- and short-range goals. First up was to introduce an Avalauncher that was scientifically engineered with a bottom line of user safety. We believe strongly that the true art of engineering surrounds simplicity of design. While it is easy to complicate a design and significantly drive up expense, it is through an intricate understanding of not only the mechanics but also the history of the Avalauncher that the Falcon GT was developed. The founding vision of AMS is to hold a *moral liability* to our customers as our primary goal—our contractual insistence on remote firing proves that. Integrity and honesty fall in closely as does our insistence on competitive pricing.

Another founding vision of AMS was to complement our Avalauncher with a Variable Payload System projectile (VPS) using readily available, economical, powerful and reliable precast explosives. Although AMS had successfully prototyped and demonstrated two unique systems using this approach since our company's inception, it was with patience and perseverance that we held off entering the market until we had what we considered to be *the* elegant solution—a solution using standard industry materials and practices, as confirmed by industry experts and explosive distributors alike.

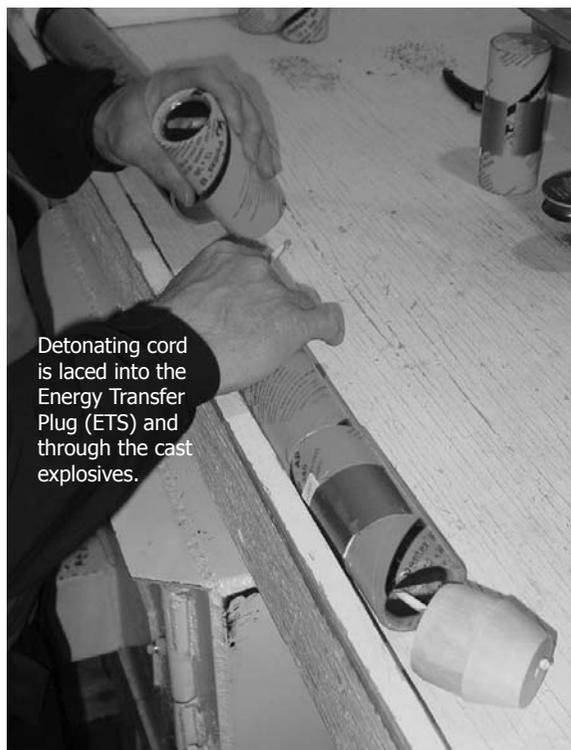
Well, the wait is over! The Falcon RT VPS projectile uses 12 ounce/ 340-350 gram precast explosives and 50 grain detonation cord. A tried and true Avalanche Control System's tail fin provides the launch platform. As opposed to some of our earlier R & D efforts, the current production model leaves the #8 Blasting Cap in its customary position on top of the tail fin's 209 primer ferrule.

The "brains," if you will, of the VPS is a short CNC-machined hardwood plug—the ETS, or Energy Transfer System. This technology was developed for our first R & D projectile in 2005. The current plug has two holes drilled into it. One is a blind well which partially encapsulates the detonator while a second tunnel hole accepts 50 grain detonator cord. The holes are oriented so that the det cord lies directly in contact with the entire length of the detonator.

The det cord passes through and couples *every* explosive together in the body of the projectile so that complete and instantaneous detonation of all the precast primers occurs on impact. As advertised with the six-foot-tall French Avalauncher projectile, the benefit of having a significant portion of the projectile detonate above the surface of the snow cannot be overstated. As opposed to the quickly attenuating effect of the snowpack on the energetic effects of the explosive blast, which is common in shorter Avalauncher projectiles, air can transmit the avalanche-producing shockwave over a much greater radius of influence. This air blast affect is most pronounced with our longer projectiles, such as the 48 oz/ 1.4 kg, 60 oz/ 1.7 kg and the 72 oz/ 2.1 kg versions.



The Energy Transfer Plug and cast shots installed into the body of the projectile. You can see the detonating cord laying in contact with the #8 blasting cap.



Detonating cord is laced into the Energy Transfer Plug (ETS) and through the cast explosives.

From Hans Gubler’s ground breaking article *Artificial Release of Avalanches by Explosives*¹, it was stated that, “The minimal effective range results in a minimum radius of 17-120 m for shots above the dry snow cover and of less than 6 m for shots in the snow cover.” This statement refers to 1 kg shots. The article also states that “...the best efficiency results from charges ignited 1-2 m above the snow cover, using explosives with high detonation velocities.”

Hal Hartman, an applied physicist who has spent over three decades dealing with snow control issues, comments: “Although air blasts are effective triggers, we often overlook, or forget to articulate, the value of detonating explosives in the snowpack. Clearly, detonation results in structural rearrangement of the snowpack which later resists deformation by external loads and serves to interrupt fracture propagation pathways. For example, quantitative strength measurements of blast craters and the snowpack in close proximity to the blast craters show that the advantageous effects persist for up to 45 days. In economic terms, an explosive ‘works’ for you around the clock at pennies per day, even while you sleep. So it depends on what strategy is being applied—avalanche release, testing the snowpack for instability or actively altering snowpack structure.”

It’s interesting to note that precast explosives were used in the original Avalauncher projectiles and for well over a decade following the system’s introduction in the early 1960s. Thousands and thousands of shots have been fired successfully with precast explosives forming the payload of Avalauncher projectiles—nothing new here. The decision to have the projectiles poured directly with explosive material in the mid-1970s was the result of simple economics—an explosive manufacturer offered the service for almost the same price as the precast explosives.

The latest VPS projectile was tested with varying payloads (24, 36 and 48 ounce versions) this spring at the Aspen Highlands. Snow Safety Director Peter Carvelli was “very impressed by the design, the ease of assembly and the shot repeatability during this trial. I like the flexibility of the system, which allows greater or smaller payloads, as I’m a proponent of larger payloads in general. My employers appreciate the significantly lower price point as well, which will allow me to use a greater number of rounds while still keeping within budget (*author’s note: sub \$40 total cost to target for 36 ounce version*). I particularly like the ignition system which is simple, straight forward and dependable. Here at the Aspen Highlands we have had an Avalauncher since beginning our expansion into Highland Bowl in 1994. I have been the gunner and mechanic during that time, and as the gun plays a large role in our operation I have a good bit of experience with the various, basic rounds available since 1994, namely the Trojan, Dyno AV 100 and CIL Snowlauncher and Stubby. The AMS round compares very favourably with all of them. This product is definitely worth a try.”

Similar testing took place at Arapahoe Basin and Snow Safety Director Leif Borgeson felt “the components are well conceived, professionally prepared, and easily assembled. We fired a handful of the 24, 36 and 48 ounce rounds out of our Falcon GT gun without issue. The projectiles loaded and launched just like the (projectiles) that we currently buy. Over the years we have used a wide variety of projectiles and this system from John holds the promise of reducing costs and allowing us to tailor our payloads to specific needs. The potential cost reductions will allow us to use more projectiles and still remain within our budget.” He adds, “John Brennan and Avalanche Mitigation Services have always been responsive to our questions. I like his pro-active approach to those who use Avalaunchers.”

An ASME-certified design of our Avalauncher is now available in both a standard and extended range model (45 litre pressure vessel capacity) and by the time you are reading this, both versions should be ok’ed by WorkSafeBC for sale in BC. AMS is also pleased to announce the introduction of several other new products that address the needs of all Avalauncher owners and explosive users. Please pay a visit to our web site for all our product listings, to see articles that we have published and to learn more about us and our company. At AMS we prefer to let our customers be our main salesman and a testimonial section is filled with their comments. We look forward to your hearing *your* comments and concerns. www.avalanchemitigation.com



RT Projectile Payload Chart

<u>KG</u>	<u>Pound</u>	<u>Ounces</u>	<u>Shots</u>	<u>Length</u>
0.3	0.8	12	1	13"/33 cm
0.7	1.5	24	2	18"/46 cm
1	2.3	36	3	23"/58 cm
1.4	3	48	4	28"/71 cm
1.7	3.4	60	5	33"/84 cm
2.1	4.5	72	6	38"/97 cm

¹Journal of Glaciology, Vol. 19, No. 81, 1977