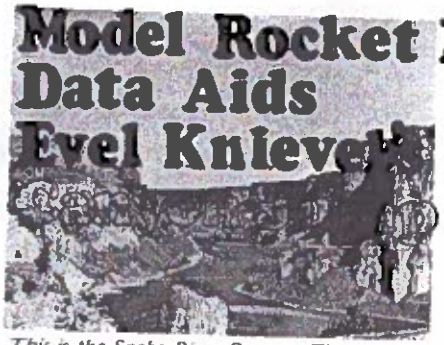
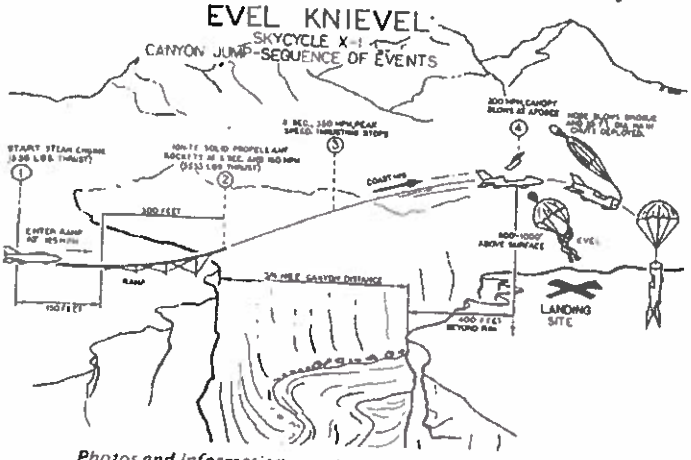
Model Rocket Engines Data Aids Evel Knievel's



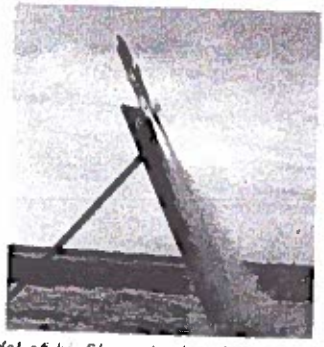
This is the Snake River Canyon. The jump will be going from the left side of the photo to the right.

This is a nose view of the Skycycle on its transportation dolly. The basic body is pearlescent white, the top band candy blue with silver stars, the bottom band and fin stripes are candy red, and the lettering is done in gold leaf.

At the Twin Falls, Idaho jump site the angle of the model rocket launcher is checked. Holding the protractor is Bob Traux of Potomac, Maryland, designer of the steam rocket engine; Evel Knievel wears a striped shirt; in the t-shirt is John Lancaster, who pilots Knievel's Beech Duke and is also his mechanic; the fourth man is Mike Grey of the Twin Falls Chamber of Commerce.



Photos and information courtesy Doug Malewicki and Bruce Williams



Left – Evel Knievel launches a model of his Skycycle electrically. – Right – The rocket model fired from the optimum launch angle and containing a Cineroc crashed on the other side of the canyon because the parachute did not deploy.

On May 7, 1972, Evel Knelvel climbed into his Skycycle X-1 to static test fire the 1500 pound thrust steam rocket propulsion unit for the first time in public. He later demonstrated the stop-start safety features of the engine to the crowd gathered at the Twin Falls, Idaho take-off ramp site. The actual jump is scheduled for July 4, 1973.

Later that same afternoon, the designer of the X-1, NAR member and Cox employee Doug Malewicki, and Evel rode up to the top of the ramp and launched three scale model rockets of the Skycycle for test purposes. The same computer program used for optimization of the real Skycycle's flight trajectory across the canyon was used to analyze the models' flights. Programmer Bruce Williams (NAR #9996, and Pacific Regional CB Chairman) came up with a program that would analyze the flight of any rocket at any time during that flight. It is capable of handling thrust expressed in any system of units, and it analyzes the vehicle as it goes up the take-off ramp as well.

The first balsa and cardboard model rocket was powered by an F engine and launched at a 25 degree launch angle. The computer said that this would carry the model to the corner of the opposite rim of the 600 foot deep Snake River Canyon.

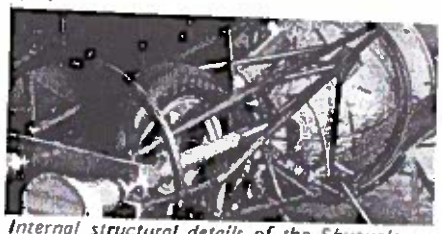
Evel pushed the launch button, the model blasted up its short 5 foot ramp with an acceleration of 40 g's (far too much for humans to withstand) and arced across the canyon in a perfectly stable flight. Several hundred observers saw the parachute deploy a mere 50 feet above the ground; the model subsequently landed 15 or 20 feet below the desired corner point on the sheer face of the canyon wall. Malewicki was elated with the plus or minus 1% accuracy achieved. (Bruce Williams claims that the inaccuracy was in the engine, *not* the program.) The computer program was based on Newton's laws of motion involving the forces of rocket thrust, vehicle weight, and aerodynamic drag. These laws are familiar to advanced model rocketeers, and apply equally well to models, Skycycles, and full size NASA Saturn V's.

Skycycle model rocket number two was to be launched at a better trajectory angle of 45 degrees and carried an Estes Cineroc super 8 high speed movie camera in the hope that some spectacular film of the jump would be obtained. If all worked well, the rearward looking lens would show the rocket engine flame pouring out and the crowd below gradually disappearing as the model rocket got further and further away from the take-off ramp. Post flight analysis of the film frame by frame would also provide valuable distance, velocity, and acceleration data with respect to time.

Countdown, Evel pushes the launch button, lift off, applause, going, going, going, going, impact! The chute never deployed! The crowd again applauded upon seeing how far beyond the rim it got—they didn't realize it was a failure.

Launch number three—no Cineroc this time. Countdown, lift off, plenty of altitude past the landing rim, starting to come down, *chute deploys*, people on the far side run towards it and just about snatch it out of the air. A perfect flight! Malewicki's comment to Knievel, "Too bad we don't have three tries when you're in the real Skycycle."

(Editor's note: Doug Malewicki will be making exact scale model rocket plans of the Skycycle available. They are full size, based on Estes BT-70, and will contain all the necessary painting details and an assortment of black and white printed photos. To get a set, mail $2.00 to Doug Malewicki, 1577 Skyline Drive, Laguna Beach, California 92651.)



Internal structural details of the Skycycle are pictured here. The high-speed 350 mph tires cost $80 each. They are 8 ply with .050" rubber on the outside only so that centrifugal forces will not throw the rubber off. The steam ball has fibreglass and aluminum foil insulation. The nozzles are sealed to prevent contamination. The "training wheel" pneumatic system runs off the small cylindrical tank lying almost horizontally in front of the rear tire. The normal cycle-type clutch handle allows Knievel to raise the "gear" into the streamlined shell of the body. This system is used for zero and low speed support only. (Photo by David Ross)

The steam rocket engine has a 28" diameter, ½" thick titanium pressure vessel—surplus from a Titan missile. There is only one moving part in the engine, the valve which opens on command. The total power of the engine can be varied by limiting the initial pressure and temperature. The thrust level is varied by inserting washers of various sizes into the valve to limit full opening. Pictured with the engine is Doug Malewicki.