

HUMAN POWER

Official Publication of the INTERNATIONAL HUMAN POWERED VEHICLE ASSOCIATION, Long Beach, CA. Volume 1, Number 1

Winter 1977/1978

Commemorative Issue

Donation \$2.00



Chronology
of a Record

Photo Album

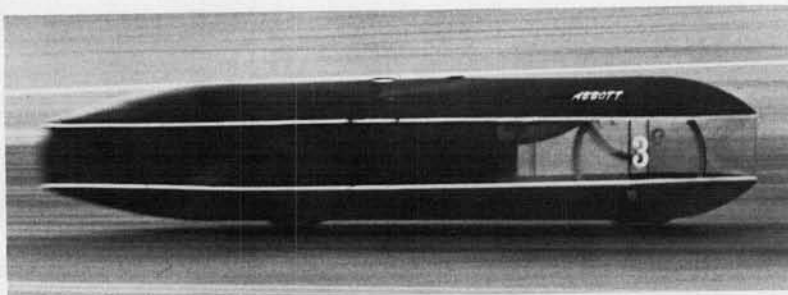
Complete Race
Results: 1975/76/77

Design of
Human Powered Boats

The Gossamer Condor



THE ABBOTT PRIZE



Allan Abbott, a young M.D. from Dana Point, California, and a renowned high speed bicyclist who appears twice in the Guinness Book of World Records, has offered \$2500 to the first human powered vehicle to reach or exceed 55 MPH (the national speed limit) for 200 meters. Any human powered vehicle which is powered by only one person may also claim this prize by reaching or exceeding 54 MPH over the same distance. If the prize is not claimed by 1 January 1985, it will be awarded to the fastest single rider vehicle for 200 meters prior to that date.

The following conditions must be met:

1) The speed must be attained entirely within the rules of the IHPVA.

2) The record run must be witnessed by at least one member of the IHPVA Board of Directors and by a second official observer who was previously designated as such by the IHPVA president.

3) The record machine must be inspected immediately after the record run by the above mentioned observers. The wheels must be inspected, along with the entire machine, to insure that no stored energy was employed during the run.

4) Detailed photographs, both with and without any streamlining, must be supplied for documentation.

After breaking two world bicycle records, Dr. Abbott recently decided to retire from active competition. In 1972 he rode a specially designed bicycle behind a race car at over 140 MPH on the Bonneville Salt Flats in Utah. A specially prepared race car completely shielded the bicycle from the wind — thus making such incredible speeds possible. This record still stands. In 1976, Dr. Abbott broke the world unpaced bicycle speed record at 47.8 MPH for 200 meters with a flying start. His aim in offering the prize is to stimulate competition and technological improvement in human powered transportation. The California State Highway Patrol has offered to issue a complimentary traffic ticket to anyone who wins.

The Abbott prize is on deposit at the Santa Fe Federal Savings and Loan, 40th St. branch, in San Bernardino, CA.

\$2500

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The IHPVA is a nonprofit organization dedicated to promoting improvement, innovation and creativity in the design and development of human powered vehicles as well as encouraging public interest in physical fitness and good health through exercise.

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Cover:

Ralph Therrio pushes the Aeroshell 2 to its limit: 49.93 MPH. Complete story by the vehicle's designer, Paul VanValkenburgh, appears on page 6.

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EDITORIAL

Human Power, volume one, number one... Great! Just what the world needs...another narrow special-interest publication.

Actually, this sort of publication is invaluable to those of us who are buried under the unmanageable deluge of information available. A magazine like *Human Power* can provide a summary of everything you need to know about one subject, in one place, updated periodically. Magazine publishers who are wise enough to spot a growing trend like this one can make a fortune in specialty markets. Since I spent a few years as a magazine editor, I have a good idea of how the game works. Essentially, the publisher's share of the cover price (perhaps 50%) just about covers the production costs of paper, printing, and facilities. The advertising revenue, therefore, has to cover editorial salaries and purchased articles and photographs. Professional journals which carry no advertising must obviously carry a higher price, rely on volunteer editors, and pay nothing to their writers. At the moment, it is not clear which way *Human Power* will go. There is definitely a need for something to fill the gap between highly esoteric journals such as *Human Factors* and *Ergonomics* and the product-oriented magazines like *Bicycling* and *Bike World*. For this first issue we have relied heavily on volunteer (coerced?) help from our amazingly talented and professionally expensive members. We have articles by Dr. Paul MacCready, Prof. Chester Kyle, Phil Norton, Randy Danta, and Bill Watson. And, of course, this issue, our logo, and our race posters would not exist without hundreds of man hours of free art and production work by designer Dick Hargrave (assisted editorially by yours truly).

A large part of the effort of grinding out a first issue is in resolving the format and orientation. The name *Human Power* gives us a great deal of latitude in editorial content, while still expressing the basic thrust of the IHPVA. *Human Power* is primarily oriented toward human-propelled transportation over land, sea, or air. At the moment, that is most commonly represented by pedal-cycles, rowboats, and a few flying machines. However, we should not ignore other popular modes of human-powered transportation such as jogging, wheelchairs, skateboards, ice skates, cross-country skiing, and so on. In broader terms, *Human Power* perhaps ought to even promote stationary power production in methods such as stairs (versus elevators), electricity generation (i.e., the pedal-powered television), the treadle sewing machine, and such reactionary devices as the manual toothbrush. Personally, I even have a great interest in using human power to overcome government mass and friction, and social inertia.

But where are we going with *Human Power*? What you see before you will be the only 1977 issue, and therefore is an annual. The next step is to become a quarterly. From that we may become bimonthly or monthly. There is certainly enough editorial material available to justify such growth. For example, there wasn't enough room in this issue for technical articles on Ventilation Air Drag, by Glen Brown, and wind tunnel data on streamlined bicycles. These and many other technical tips will be provided in future issues.

But growth will be limited by production time and costs. Although manufacturers cry out for the proper ad vehicle to reach their markets, whether there are enough *human power* products, or whether we decide to take that route, remains to be seen. If enough members and readers are willing to support and promote *Human Power*, then we won't have to sell out, or to go begging for the thousands of dollars worth of free professional help required to make our cause known.



PAUL VAN VALKENBURGH

THE GOSSAMER CONDOR

by Paul MacCready

On August 23, 1977, the Gossamer Condor won the Kremer Competition for powered flight, winning aviation's largest prize, which had been established 18 years ago and which was now worth \$87,500. The prize was for a figure-8 flight around pylons 1/2 miles apart, with an altitude exceeding 10 feet at the start and end of the figure-8, with unassisted takeoff and no stored energy. IHPVA was a considerable help in the development of the Gossamer Condor, and the Gossamer Condor has been instrumental in the development of the air division of IHPVA. This is the story.

HOW IT BEGAN

The Gossamer Condor was born in the fusion of several day-dreaming ideas when I was on vacation in July 1976, away from the mental rigors of normal business. The spark was the realization that a high performance hang glider takes only about 1 horsepower to keep it aloft (I had just completed an article on hang glider performance). If one increased all dimensions 3-fold without increasing the weight, the power required would reduce to 1/3 horsepower. This would fall within human powered flight capabilities, with a simple vehicle which could be built rather easily. Previously, I had never considered competing for the Kremer Prize. Many teams of excellent aerodynamicists and excellent craftsmen around the world had labored long and hard without success, and I certainly had neither time nor skill to justify competing. The new idea changed my thinking. The task now looked easy, and the prize was certainly enticing.

THE DEVELOPMENT

Simple aerodynamics calculations showed that low horsepower was required in straight flight, and I felt sure that if straight flight was really that easy, some way would be found to provide controllability. First some models had to be built to check the structural concepts and to get some clues about pitch stability and controllability with and without a front stabilizer. We then built an 88 foot wingspan version in the Tournament of Roses float pavilion at Brookside Park and tested it one night in the rain before disassembling it. A complete 95 foot wingspan version was built in a hangar at Mohave Airport (a 96 foot span was planned, but the hangar dimensions determined otherwise). Wing torsional rigidity was inadequate and several new wings were built. By Christmas 1975 it was making short flights, which at last permitted quantitative testing. The longest flight at Mohave was 2½ minutes. Turn control was virtually non-existent for many control inputs with the first stabilizer and wing we experimented with. We finally discovered that if we actually provided enough control to initiate a turn by tip spoilers, the horsepower requirements for flight doubled to an unacceptable value.

In February we reassessed the controllability problems and decided, on the basis of model tests in air, model tests in water, extensive computer modeling, plus some lucky intuitions, that much smaller tip chord was needed. A revised vehicle was built in a larger hangar at Shafter Airport 12 miles northwest of Bakersfield. The smaller chord meant less area and hence higher speed, dictating that the pilot compartment be covered to decrease parasite drag. Wing rigidity requirements combined with weight limitations dictated the use of a single spar part way back in the wing, which made a double surface airfoil necessary if the span was not to be in the airstream. Thus, the present design evolved through taking what seemed the only available options.

Flights were promising right off, but then a crash due to poor controllability slowed things down. Some ingenious control techniques at last solved the problem of turns, but the horsepower needs seemed to increase weekly although the vehicle looked the same as before the crash. The aerodynamic sleuthing became more refined and the performance improved to its prior value — but now through understanding rather than luck. Structural revisions brought the weight down to 70 lbs., and with some other aerodynamic improvements the plane flew better than ever, making the prize flight August 23. In its final version the Gossamer Condor is a docile machine to fly. It has been flown by four people who have never flown an airplane before, including Chet Kyle and Joe Mastropaolo.

The real key to success was the simple construction which permitted constant revision, and quick repairs after accidents.

THE ENGINE

It was association with IHPVA that permitted development of the engine. I had known Jack Lambie for years through gliding and hang gliding activities, and through him got acquainted with the streamlined bicycle races. My involvement in the first two annual races as timer and as provider of the trophy plaques through my company, AeroVironment, Inc., introduced me to Drs. Chet Kyle and Joe Mastropaolo. Joe said I should train to do the flying myself, and so my son Tyler, then 14, and I were introduced to the ergometer and the painful fun of daily workouts. We progressed rapidly, comparing our horsepower per pound with the curve in the 1975 paper by Chet and Joe titled "The Effect of Body Position Upon Power Output In Cycling." However, although our horsepower per pound finally reached that of the test subjects, it was obvious that we would fall far short of what championship cyclists achieve. When we began worrying about other competitors

for the Kremer Prize in January, Chet went hunting for a better engine and brought Greg Miller to Mohave. Greg worked diligently with us there, making the first 2½ minute flight, and then at Shafter flew 5 minutes 10 seconds in March, the longest-duration ever for a man-powered aircraft. Then Greg had to leave for racing in Belgium. We finally made contact with Bryan Allen in Bakersfield — an amateur cyclist, and a hang glider pilot, who lived near Shafter and had time to devote to the project.

Ron Skarin came out and flew a few times, but his time was limited and he was unavailable for several months. So it was up to Bryan, with Tyler and me serving in test pilot functions. Joe Mastropaolo prescribed the exercise schedule for Bryan and continued to make an ergometer available to us. The rest is history.

Recently a fan in Sweden wrote Bryan and asked if he was going to mass produce the engine.



Side view of the fuselage shows the pedals mounted to the support pylon and the reclining seat.

Bryan trained both by bike riding and by working out on the ergometer in half-hour sessions. His peak horsepower, for the 7 minute period which is about what the Kremer flight would take, was 0.47 horsepower. At his weight of 136 lbs. this is 3.48 x 10⁻³ horsepower/lb. The test subjects in the paper by Chet and Joe were considered to have the conditioning of normal college athletes. Their weight averaged 166 lbs., and they averaged 0.39 horsepower for 7 minutes in the upright and supine position; this is 2.35 x 10⁻³ horsepower/lb. Bryan's number is 48% higher. The very best championship bike racers might be about 60% higher, so obviously Bryan was in very good shape.

Bryan's longest flight was about 8 minutes 10 seconds on August 22. He reported after the 7½ minute flight August 23 that he felt he could have flown another 1 or 2 minutes if necessary. I checked his pulse 2 minutes after the flight and it was under 120/minute. The Gossamer Condor with a 135 lb. pilot probably takes 0.33 horsepower to maintain level flight at 9.8 m.p.h. in an absolute calm, and 0.42 horsepower to turn. On the prize flight he flew faster (10.8 m.p.h.) and had to cope with some turbulence. I estimate he averaged about 0.43 horsepower for the 7½ minutes.

On the ergometer and in the Gossamer Condor Bryan used the supine position, sitting on a seat at the same level as the crank hub, with a seat back but no restraining straps; his arms were free, which permitted reading books during the ergometer sessions and manipulating controls on the Gossamer Condor.

RECORDS

Official record categories for distance and duration flights for man-powered aircraft were set up by the Federation Aeronautics Internationale (FAI) which handles records for sport aviation.



An untrained pilot airborne on a demonstration hop.

However, the rules were not carefully thought out. One rule required a surface so horizontal that no airport would pass, and only a dry lake or an ice-covered lake would be acceptable. Another rule required the surface to be vegetated. Not surprisingly, no official records were ever set. In this small field, unofficial records have so far proved adequate.

The field will be growing, and now that the Kremer Prize is no longer a goal, the incentive of records will prove valuable. I drafted a suggested set of rules which were designed to be simple, convenient for the entrant, which would not penalize the entrant who did not have an unusually good site, and which would not foster the development of overspecialized aircraft. Last spring IHPVA established a human powered aircraft section and Jack Lambie was elected as vice president to handle this section. In the meantime, it turned out that FAI was working on a new set of rules designed to overcome some of the problems with the prior ones. I wrote FAI to let them know the details of the rules I had suggested for IHPVA. At a meeting of the man-powered aircraft rules committee of FAI in June they developed a new set which incorporated the main philosophy of my suggestions but kept a few differences. These newest rules will probably be adopted officially by FAI in October 1977. It is likely that IHPVA will adopt the same set so there will be no conflict between FAI and IHPVA. I feel strongly that IHPVA is the most appropriate group to have jurisdiction over the sport of human powered flight, since the subject is so closely allied to the streamlined bike events already handled by IHPVA. It is probable that FAI would like the responsibility of such a specialized subject being handled by a specialist organization such as IHPVA. Whether official coordination between the groups is established or not, IHPVA should homologate records.

The proposed rules require the vehicle to go over a 2 meter high hurdle once in the flight. The categories are duration, distance in straight line, and distance around a closed course. On the Kremer Prize flight the Gossamer Condor flew 7 min. 22.5 seconds, traveled about 1.35 miles through the air, and would be credited with 1.0 miles for distance around a closed course. The most successful other vehicle is the Japanese Stork which last winter flew 1.30 miles in a straight line and achieved a duration of 4 minutes 43 seconds.

WHAT NEXT?

In spite of the deletion of the money prize from the field, I am sure the field will grow. There are a lot of articles on the subject coming out now, which will culminate in January in an 11-page article in National Geographic. A one hour NOVA film on non-commercial television will be coming out in a few months.

If we were to build a completely new Gossamer Condor, it could be made to fly a little faster and yet take about 20-25% less horsepower to operate. Flights exceeding an hour would then be achievable. People have discussed having competitions for flights across the English Channel or from Palos Verdes to Catalina. As impossible as it sounds, I'm sure that such events will happen eventually.

PAUL VAN VALKENBURGH

PAUL VAN VALKENBURGH

COVER STORY



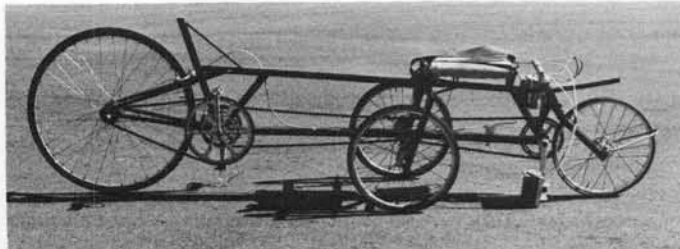
PAUL VAN VALKENBURGH

The VanValkenburgh brothers push off Ralph Therrio in fairs that shows scars of a first run rollover.

CHRONOLOGY OF A RECORD by Paul Van Valkenburgh

A lot of the credit for Team Aeroshell success in 1977 is due to Professor Chet Kyle. At the 1976 event, when Alan Abbott beat Ralph Therrio on one of my machines, Kyle observed that "It was a triumph of engineering over muscle." Since I am an engineer by trade, I took that as a challenge, and vowed to demonstrate some *real* engineering next time. I started designing that same day. Three months before the race I had a wooden mockup running on the street. Two months before the race I tested Ralph on an ergometer to check the power output of hand-and-foot propulsion. (He put out 1.84 horsepower for 6 seconds.) Four weeks before the race Ralph began welding up the frame. Two weeks before the race we were riding the final frame around on the street, making modifications for stability and comfort. At the same time, I was adapting one of my past year's bodies to fit. With a week to go we were essentially finished, but we had no tires — and that is a story in itself.

My design required 18 inch tires, which I knew existed, because I bought one with a wheel from Tom Snedden. Ralph found a couple of wheels off an old Moulton, but the tires were rotted. With a month to spare, we started calling around. I spent over eighty dollars on long distance phone calls and European telegrams to find only one source, in Italy. A local importer (Nameless) assured me he could get them airmailed here in time, at a cost of almost one hundred dollars. They never appeared. So two days before the race, we built our own tires. I cut down two 27 inch



Inner workings of the Aeroshell quadracycle, showing "trainer wheels" and hand crank/steer mechanism.

tires, disassembling the ends cord by cord, and glued them back together in a perfect overlapping splice. My wife sewed the beads back together on her sewing machine and Ralph spliced the tubes and hand-sewed the tires up on our way to the track. Obviously

PAUL VAN VALKENBURGH



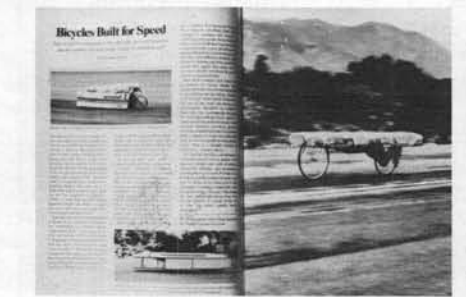
PUBLIC



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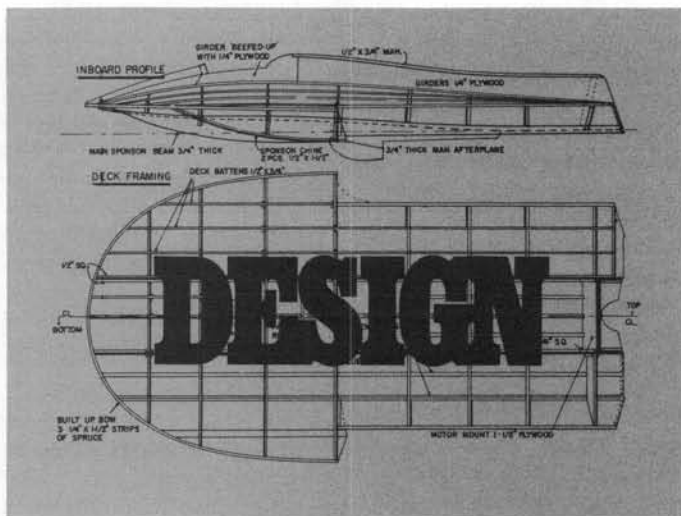
ICITY



STREAMLINED BICYCLES GENERATE PUBLICITY
 The IHPVA Speed Championships are generating worldwide publicity that is reaching literally millions interested people. Widespread enthusiasm among the media (Television, magazines, and newspapers) can be attributed to the uniqueness of the event, the technological innovations, and rising interest in energy conservation and human conditioning. Dr. Chet Kyle, president of IHPVA, is attempting to keep a record of all articles on the Speed Championships. Currently the list includes over sixty articles in forty publications and six languages. Some of the publications include:

1. Long Beach Independent Press Telegram, November 11, 1974.
2. UPI throughout USA, November 12, 1974
3. Santa Ana Register, November 10, 1974; November 12, 1974.
4. Sports Illustrated, December 16, 1974.
5. Bike World, January 1975.
6. Bicycling Magazine, January 1975.
7. Radsport (Germany), January 22, 1975.
8. Sunday Supplements, 50 Eastern Newspapers, February 1975.
9. Long Beach IPT Southland Sunday, February 2, 1975.
10. Bike World, February 1975.
11. Popular Mechanics, March 1975.
12. Long Beach Independent Press Telegram, April 3 & 7, 1975.
13. Bike World, June 1975.
14. Current Science, October 29, 1975.
15. Car and Driver, November 1975.
16. British Cycling, November 8, 1975.
17. Bicycle Journal, December 1975.
18. Bicycling Magazine, January 1976.
19. Sunset Magazine, April 1976.
20. Los Angeles Times, Centinela South Bay Edition, April 15, 1976.
21. Los Angeles Times, San Fernando Valley Edition, April 15, 1976.
22. Berkeley Gazette, April 27, 1976.
23. El Mundo Deportivo (Spain), April 9, 1976.
24. Christian Science Monitor, May 14, 1976.
25. Competitive Cycling, June 1976.
26. Velo News, June 1976.
27. Bike World, June 1976.
28. Shimano World, Summer 1976.
29. Road and Track, August 1976.
30. Science Digest, August 1976.
31. Radmarkt (German), September 1976.
32. Bike World, September 1976.
33. Panorama Magazine, (Italian), June 15, 1976.
34. Welt Am Sonntag, (German), May 5, 1975.
35. Majazil, (German), May 1976.
36. Hong Kong Cycling Association Bulletin, (Chinese), 1975.
37. Hong Kong Cycling Association Bulletin, (Chinese), 1976.
38. American Bicyclist and Motorcyclist, March 1976.
39. Bicycle Journal, February 1976.
40. Bicycling Magazine, July 1976.
41. Bicycling Magazine, August 1976.
42. British Cycling, June 5, 1976.
43. Boy's Life, December 1976.
44. Stern Magazine, (German), November 17, 1976.
45. National Geographic World, April 1977.
46. Horizon Magazine, July 1977.
47. Bicycling, February 1977.
48. Bike World, January 1977.
49. Bicycling, July 1977.
50. Bike World, July 1977.
51. Los Angeles Times, Centinela South Bay Edition, April 24, 1977.

CHESTER KYLE



DESIGN OF HUMAN POWERED BOATS

by Randy Danta

Human powered boats are an exciting challenge to designers with a nautical bent, since there are virtually no restrictions on design, and creativity is likely to be the key to success. Before construction begins, however, it may be helpful to examine some of the presently known design principles, and various factors that affect a boat's speed.

HULL DESIGN

The most basic feature of any boat design is the means used to produce lift. Lift is what keeps the craft on, in, or over the water while in motion. Objects which sink to the bottom are classified as anchors and are unlikely to win any races.

The most widely known hull type gets lift by floating and is called the displacement hull. It gets its name because, while floating, it displaces a volume of water equal to its own weight. The shape of the submerged portion is irrelevant to a floating object while it is drifting freely. Moving a displacement hull through the water, however, requires power to overcome the inertial, viscous, and turbulent drag forces associated with its motion.

As the bow of the boat advances, the water must separate and move around the hull. Forces used to move the water sideways are termed "inertial" forces, and increase with the speed and size of the boat. To keep inertial drag forces as small as possible, the hull should have a narrow beam and a shallow draft.

As the hull moves, water tends to cling to all submerged surfaces and must constantly be brushed away. This clinging force is due to viscosity of the water and is minimized by a smooth underside with a minimum wetted area. Since a circle has a smaller perimeter than any other shape of equivalent area, a rounded hull cross-section is probably a good choice. Deep "V" shaped hulls and other refinements seen on motor boats are designed to improve seaworthiness and are not recommended because they tend to reduce top speed.

Speed is also reduced by improperly shaped lines which produce turbulence as the boat moves. Each time a ripple, eddy, or splash is produced, speed is sacrificed. Losses due to these effects are classed as "turbulent drag" losses. Obviously, the energy used to splash, spin, or otherwise agitate the water could more effectively be used to increase forward speed.

Another retarding effect which plagues the displacement hull is "wave drag" which arises suddenly once the boat reaches its maximum "hull speed." As the hull is driven faster, an unavoidable bow wave is produced which lengthens in pitch as speed increases. Soon the wave length equals the length of the hull, and the stern begins to settle into the trough between wave peaks. To increase speed still further requires driving the craft uphill — an impossible proposition for most deep displacement boats. The only ways to avoid the effects of "wave drag" are to make a very long hull, a very shallow draft, or both.

The racing shell used for Olympic rowing competition is well adapted to overcome the above mentioned drag forces. It is very long and lightweight with only a few inches of draft. Its surface is smooth, and it has graceful lines which result in very little wake or turbulence. It is doubtful that the displacement-type hull can be easily improved for purposes of human powered racing. Therefore, other hulls and lift means are presently being investigated, including catamaran, planing, air cushions, and hydrofoils.

The catamaran is essentially an adaptation of the displacement hull, using two relatively narrow pods to produce the required buoyancy. Since the pilot needn't sit in the hull, the width of each pod may be narrower than the width of his hips. Narrower displacement pods are desirable because sideways movement of surrounding water is reduced along with inertial drag forces. Dual hull designs are also inherently stable due to their wide stance, which helps to counteract the shifting mass of the human powerplant. Also, since the pods are not occupied, they may be sealed on top and designed with near zero freeboard. Such a design allows use of readily shaped foam as a construction material.

Planing is a lift technique which minimizes inertial forces because the craft is induced to skim on the surface of the water rather than plow through it. To achieve planing motion, a relatively flat underside is angled slightly upward with the nose out of the water. As full power is applied, speed and lift increase until the craft rises to the skimming position typical of a water ski. Once the craft is "in plane," power may be conserved slightly. Planing speed of a human powered boat is a matter of speculation, since a great deal of power and/or surface area is believed necessary. Since human power is limited to bursts of under one horsepower, it is conceded that wide planing surfaces may be necessary despite the corresponding loss due to viscous drag. It has been suggested to use variable length planing surfaces, perhaps dammed at the edges with air introduced below the waterline to lessen viscous skin effects. These matters are open for experimentation and may provide exciting and useful results.

Hydrofoils act in water much as an airplane wing acts in air, and are presently used to lift high-powered boats out of the water for higher speeds in rough water. Lift of a hydrofoil is produced by inclining the foil upward in the direction of travel. This "angle of attack" causes water deflected downward to support a load, depending on surface area, angle of attack, and foil geometry. Increasing surface area correspondingly increases viscous drag, and a high angle of attack bears the penalty of high inertial drag or complete stall. Therefore most successful hydrofoil craft utilize small foils and big engines. It is unknown whether a human powered vehicle can be supported by hydrofoils, or whether the resultant speed will be at all noteworthy.

Air cushion vehicles are relatively new and are feasible for travel over land as well as water. Lift is produced by pressurizing a layer of air between the craft and the surface, and depends upon the sealing effect of a flexible skirt. Human power for an air cushion vehicle must be distributed between the two independent functions of pumping air to the cushion and generating forward thrust.

POWER TO MAKE IT GO

Along with selection of hull design, a mechanical system must be developed to transmit human power. Any such system will have less than perfect efficiency, based on the sum of losses in the input, transmission, and thrust mechanisms. Since the human body consists of many muscle groups, there are endless possible movements which can be utilized to drive machinery. Therefore, endless speculation surrounds the subject of what mechanism is best. Some of the well recognized mechanisms for extracting human energy are circular hand cranks, foot cranks, linear treadles, rowing machines, and treadmills. Selection of an efficient energy extraction mechanisms is, in most cases, influenced by the design of the transmission and thrust components of the system. A thrust system based upon a linear motion may not adapt well to a circular power input motion, and vice versa. Although complete mechanical isolation can be achieved between components of a system, this is not

HUMAN POWER SEACRAFT

by Bill Watson, V.P.-Water

The IHPVA has expanded its scope of interest seaward by officially voting to recognize speed records set by human powered water vehicles. To this date the fastest officially recognized vehicles of this type are the sleek racing shells used in Olympic rowing competition. It is hoped, however, that by applying scientific technology, entirely new concepts in vehicle design will bring about major increases in existing speeds.

With variations in wind, tide, and currents, it is difficult to measure the exact speed of a water vehicle. The shells ordinarily race against each other over 2000 meters measured from a standing start. Therefore, there are records for various 2000 meter courses around the country. Average speeds seem to be 9 to 10 knots. The Human Power aquatics division hopes to see these records fall to designers of much faster vehicles. These might include propeller driven catamarans and hydrofoils, high aspect ratio planing hulls, hovercraft, or possibly even fish-like (swimming) submarines. If speeds cannot be accurately measured in no wind conditions, all racing may have to be done side by side with other vehicles. Rules will have to be established to allow different vehicles around the country to compare their speeds with each other. Starting from a standing start may be required. Taras Kiceniuk Jr.'s Human Power Aircraft (ground effect) could easily skim a few inches over the water at over 20 knots, trailing a string in the water to make it technically a water craft. Starting from a standstill would prevent this.

The IHPVA is considering offering a prize for the first human power sea craft to advance the 2000 meter speeds by a reasonable amount. But goals other than just straight line speed should be considered in designing these sea vehicles. It is hoped that they will someday develop into practical and seaworthy craft.

a very efficient approach. An example of such a divorced system would be to drive a generator with crank, transmit the resulting electrical power over wires, and produce thrust using an electric motor and propeller. Such a system is hopelessly inefficient and is only used at present by municipal electric power departments and other projects financed by taxes.

The most familiar power system for human powered water vehicles is that used on the rowboat. Since rowing transmits power directly from the rower to the water there is very little transmission loss except for slight friction at the oarlocks. The sliding seat used on racing shells allows the longest possible oar movement and so represents an advantage. But a large fraction of the torso must also be accelerated forward and backward with each stroke, and energy for this body movement is not available for useful power. Other inefficiencies occur at the outboard ends of the oars and cannot be overcome even by the most skillful oarsmen. First is the water which clings to the oar and is lifted during each return stroke. Second is the eddies which the oar produces. And third is the non-parallel angle at which the oars push during all but a small fraction of the total power stroke.

The most likely alternative to rowing is a propeller driven by a rotating shaft. The shaft bearings and other associated power transmission components represent power losses not associated with the oar. But this technique has the advantage of allowing pedaling and had cranking for power production. Some experimentation will be necessary to determine an optimum propeller design for this purpose.

Other propulsion systems which are adapted to rotational drive include paddlewheels and various moving belt designs. Like the oar, those devices rotating on an axis perpendicular to the direction of thrust usually must be raised above water while returning forward. An exception might be a submerged belt with hinged scoops which open for the power stroke and close on the return stroke.

Other less conventional thrust mechanisms might operate as a fish by flapping or "sculling" against the water. Such a motion may prove very efficient and also adapt to the human body with a minimum of mechanization. Perhaps a rubber suit with a fish-like rail section will prove the lightest, most maneuverable, and fastest implementation of human power to an aquatic environment. Imagine a race contested by mermaid-like creatures who hobble to the dock and deftly swim away at the sound of a starting gun.

Those having access to smooth water can start building vehicles immediately and refining their performance over 2000 meters. Others without a water course will have to conduct thrust and lift experiments at home in the bathtub. This will undoubtedly represent somewhat of a problem for many owing to the large number of laps which must be counted.



1978 IHPVA SPEED CHAMPIONSHIPS

The 1978 International Human Powered Speed Championships will be held at Ontario Motor Speedway, Ontario, California on Saturday, **May 6, 1978** from 7:00 a.m. until noon. The early starting hour was scheduled to avoid the winds which can dramatically affect the performance of human powered vehicles.

The '78 Speed Championships will feature the traditional flying start 200 meters and a new event, the 25 kilometer (about 15½ miles) road race. The road race will employ a LeMans type start and will be open to both single and multiple rider vehicles. (A LeMans start requires that riders run across the track to their vehicles before mounting and starting.) Each vehicle will be allowed a maximum of two helpers to assist in vehicle entry and push-off. Road racing human powered vehicles should be built with adequate visibility, ventilation, and maneuverability. Team tactics in the road race will be limited to pace lines of no more than four vehicles per team. Blocking will not be allowed. Some experts are predicting lap speeds of up to 40 m.p.h. and average speeds of 35 m.p.h. for the road race!

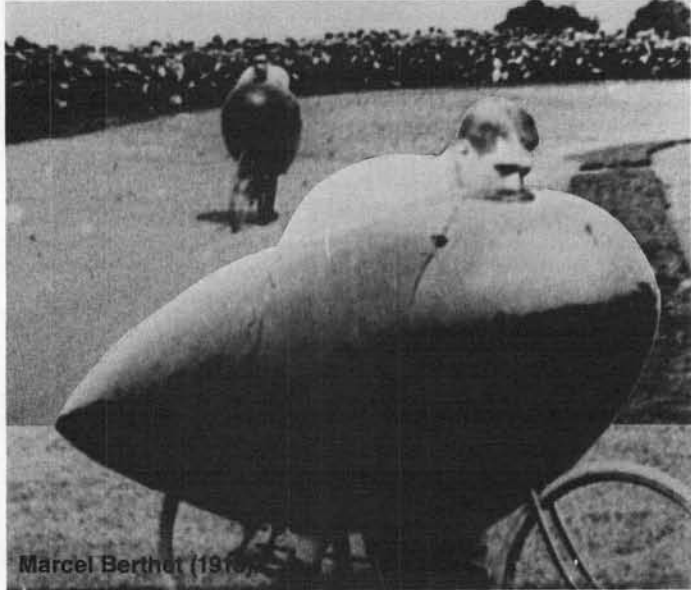
Excitement has been added to this Spring's Speed Championships by the recent announcement of the Abbott Prize, a \$2,500.00 award offered by Dr. Alan Abbott to the first *multiple* powered vehicle to reach 55 m.p.h. or to the first *individually* powered vehicle to reach 54 m.p.h. whichever occurs first.

The 1978 IHPVA Speed Championships will be a spectacular event for entrants and spectators alike. Please plan to attend and pass the word to your friends.

If you have a question concerning the upcoming Speed Championships or if you wish to be placed on the mailing list for entry forms write to:

Phil Norton
IHPVASC
505 California Drive
Claremont, Calif. 91711

BACKGROUND



Marcel Berthel (1917)

IHPVA PHOTO

THE HISTORY OF IHPVA

Now that the Speed Championships and the IHPVA have gained international recognition and acceptance, it might be interesting to briefly note where they originated. As with the creation of almost anything, the story is a bit devious. It started in 1973 with Dr. Chester Kyle, a professor of Mechanical Engineering, and Jack Lambie, an Aerodynamics Consultant from Orange, California. At that time, two of Dr. Kyle's mechanical engineering students at California State University, Long Beach, decided to measure the rolling resistance of various bicycle tires. Coasting tests in a 1/8 mile long hallway at CSULB showed high pressure sew-up tires were superior to clinchers as everyone knew in the first place. But the tests also showed that the wind resistance of a bicyclist was over 90% of the total drag on a bicycle at speeds over 25 MPH. It occurred to them that everything else is streamlined to cut wind resistance, why not a bicycle? This began a continuing series of tests on streamlined bicycle shapes and human power output.

In 1974, Jack Lambie quite independently started building a streamlined bicycle after some trial calculations that showed that man should be able to travel at over 50 MPH under his own power on a bicycle with proper streamlining. By coincidence Lambie and Kyle met at a conference on the Aerodynamics of Race Cars before either of them had completed their vehicles. So they agreed to test them in the CSULB hallway. The results of this first meeting of streamlined bicycles in the USA was modestly described as fantastic, or the greatest thing since television. The streamlining cut the air resistance by over 60%. However there were a few nasty problems with the machines such as instability to cross winds, overheating of the rider who was almost hermetically sealed into the wing-shaped shell, front wheel wobble as the fairing vibrated, poor visibility, dust filling the enclosure, etc.

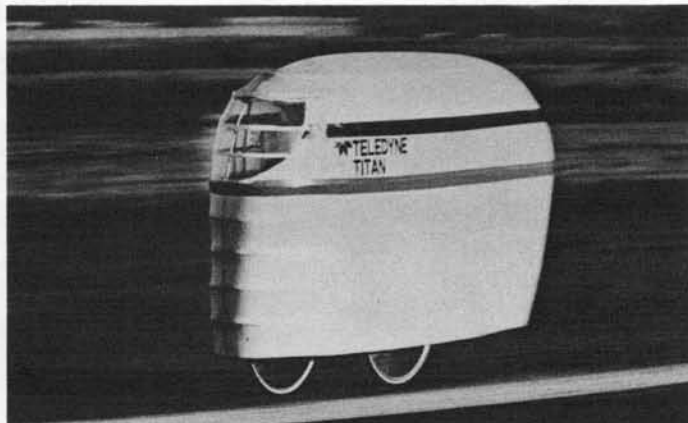
Nevertheless, after solving enough of the problems so that the bicycle was rideable, Dr. Kyle decided to see how fast the streamliner would go. Barry Harvey of the Teledyne Corporation kindly offered to donate a light weight titanium racing bicycle for the trials. Harvey convinced USA Olympic cyclist Ron Skarin that he should try to ride the machine. There followed two months of practice in the early dawn hours (to avoid the wind) at the Los Alamitos Naval Air Station, California, on the main air strip. On November 11, 1974, Ron Skarin startled the cycling world by going over 40 MPH for a whole mile in the Kyle-Teledyne streamliner.

The notoriety gained by this record breaking effort led to the creation of the 1st International Human Powered Speed Champ-

ionships, April 5, 1975. Lambie and Kyle organized and ran the first race almost single handed, with some welcome assistance from Dr. Paul MacCready who was the official timer and donated the trophy plaques for the winners. About 300 spectators showed up in the bitter cold dawn at the Irwindale Raceway along with 14 of the strangest pedal powered vehicles ever seen. The singles race was won by Ron Skarin at 44.69 MPH, and the multiple rider class was won by Phil Norton and Chris Deeton at 44.87 MPH.

In 1976, Jack Lambie and his wife Karen went around the world on a tandem (without fairing), and Dr. Kyle organized and ran the Speed Championships with the help of his students and other volunteers. This time \$2500 in prizes were donated by Raleigh Industries and trophies by Aerovironment Inc. Held on April 24, 1976 at Irwindale Raceway, over 2000 people and 26 vehicles came to the event. Allan Abbott won the singles race at 47.80 MPH, and the Mount Baldy Cycle Club streamlined triplex, ridden by Darryl Le Vesque, Alan Stephens and Mark Orr won the multiple rider category at 48.95 MPH.

In the meantime it became obvious that an organization was necessary to guide the new sport. So on March 28, 1976, the International Human Powered Vehicle Association was born. Allan Abbott was elected the first President, Alec Brooks Vice President, and Chester Kyle the Executive Secretary. Rules were established for sanctioning races and recognizing land speed records set with human powered vehicles of unlimited design (the International Cycling Federation recognizes records set with standard racing bicycles only). More recently, the IHPVA has added rules for setting records in the air and on water. It was hoped that the stimulus provided by the Speed Championships and by other events sponsored by the IHPVA would encourage radical changes and improvements in human powered transportation throughout the world.



IHPVA PHOTO

The Kyle streamliner renewed interest in aerodynamics in 1974, with Ron Skarin setting new speed records.

The Speed Championships have received wide coverage in Europe and there was a recent record attempt under IHPVA rules in Germany. Although no record was set it is an encouraging beginning. Several dozen major articles have appeared about the Speed Championships in US and foreign magazines and newspapers. The IHPVA has Directors from 14 countries who are world renowned in cycling. Dr. Paul MacCready, Official Timer at the past three Speed Championships, and a charter member of the IHPVA, has recently won the \$87,500 Kremer Prize for human powered aircraft. It is obvious that the members of the organization are an unbelievably active and creative group.

The April 30, 1977 International Human Powered Speed Championships was by far the most successful yet. Held at Ontario Motor Speedway, California, under the direction of Darryl LeVesque, over 50 vehicles were entered, and over 2000 spectators attended. The infamous 50 MPH barrier was still standing at the end of the race — but not by much. The singles prize went to Ralph Therrio at 49.38 MPH, and the multiple rider winners were Gibby Hatton and Jerry Ash at 49.93 MPH. The sponsors, Shimano and Bud's Bike Shop of Claremont, California, donated \$2500

(continued on page 19)

Chester Kyle

Professor of Mechanical Engineering, California State University, Long Beach. Helped organize first International Human Powered Speed Championships with Jack Lambie. Founder, IHPVA March 28, 1976. Built and tested some of the first streamlined bicycles in the USA, Cycling Researcher, Actively races standard bicycles in the Veterans Class.

PRESIDENT**Randy Danta**

Industrial Electronics Engineer for IEEE Corporation, Van Nuys, Calif. Entered last three Speed Championships as a competitor and vehicle designer and builder. Author of technical articles on electronics and holder of several patents. Enthusiastic bike commuter and tourist.

EXECUTIVE VICE-PRESIDENT**Phil Norton**

High School psychology teacher, West Covina, California. Built and rode the fastest tandem entry in the first and second Speed Championships. Fastest 200 meter time in the first race (46.27 MPH) Races bicycles, (Category III road, Category II track).

VICE PRESIDENT – LAND**Jack Lambie**

Aerodynamics Consultant, Orange, California. Co-Organizer of International Human Powered Speed Championships, built and flew an exact replica of the Wright Brothers Aircraft. Pioneered many models of gliders and hang gliders. In 1976, Lambie and wife

VICE PRESIDENT – AIR**ALLAN ABBOT, (USA)**

MD in Dana Point, California. Past President IHPVA; Winner singles category 1976 International Human-Powered Speed Championships. Holder of World Bicycle Motor paced speed record 140.5 MPH (1972). Bicycle and motorcycle racer. Jungle doctor in Peruvian Amazon. Leaving (1977) to cruise Mexico and South Pacific on 24 ft. yacht.

JOSE DOMINGO AEREQUI (Spain)

President of Zeus Industries, Abadiano, Spain. Largest manufacturer and exporter of bicycle components in Spain.

JORGEN BEYERHOLM, JR. (Denmark)

Sports Reporter for largest newspaper in Denmark. National Cycle Ball Champion 1960-65, 1971-72. Captain of Danish Professional Cycling Team 1970-75. Captain, 1975-76 Danish Amateur team, Town of Marjorco (Spain). President of Cycleball section of Danish Cycling Federation.

COMMENDATORE**TULLIO CAMPAGNOLO (Italy)**

Owner and President of Brevetti Internazionali Campagnolo, the largest manufacturer of bicycle racing components in the World. Champion Professional Bicycle Road racer before World War II.

FRED DE LONG (USA)

Plant Engineer for E.S.B. Incorporated, Pennsylvania. Technical Editor of *Bicycling Magazine*, *American Bicyclist* and *Motorcyclist*. Member of American National Bicycle Standards Technical Advisory Group. Member International Standards Organization Technical Committee. Worked on Bicycle Manufacturers Association Service Manual Project; *Cycling Manual for Boy Scouts of America*. Presents Proficiency and Training Courses (Cycling) throughout USA. Former Cycle racer and present en-

thusiastic tourist, (12 countries, 20 States).

WOLFGANG GRONEN (Germany)

Retired former Coach of German Professional Cycle Racing Team. Owns largest Archive of historic bicycle photographs and literature in Europe. Prolific Cycle Journalist. Personal friend of scores of European amateur and professional bicycle racers and coaches. Technical consultant on cycling to German Sports Universities.

RENE JACOBS (Belgium)

Editor of *Belgian Cycling Journal*. Publisher of *Velo*, a facts yearbook on Cycling.

EDDY MERCKX (Belgium)

Professional Bicycle Racer. Holder of the World Hour Record (49 Km 431 m, Mexico, 1972). Winner of Tour d'France 4 times, and winner of scores of major races and tours in Europe. The best known and most successful bicycle racer in the World today.

SIR HUBERT OPPERMAN, O.B.E.

(Australia)

Australian Member of Parliament. Holds numerous long distance cycling records set over 40 years ago and never broken including 850 miles in 24 hours behind motors (1932) and from Lands End England to John O'Groats in 63 hours 22 minutes (1929). The most renowned long distance cyclist of all time. Author of numerous articles and books.

HELMUT QUINDT (Austria)

Director of Steyr-Daimler Puch Company, Austria's largest bicycle manufacturer.

GERARD SILLEN (Holland)

Sports Editor of Dutch newspapers. President of Royal Dutch Soccer Federation. Well known cycling journalist covering all major events in Europe. Active in organizing Dutch Youth Sports Organizations.

CHARLEY TANTEL (France)

Director of the French Cycling Journal

Karen rode around the World on a tandem. Helped build and develop Kremer prize winning "Gossamer Condor."

Bill Watson

Pattern maker, Van Nuys, Calif. Participated in 1976 and 1977 Speed Championships taking 6th and 7th place respectively, with very ingenious and well built machines. Charter member IHPVA. Helped build man-powered aircraft that made the first successful self-powered takeoff in the USA (1975-76). Building a human-powered boat. Enthusiastic bicycle tourist.

VICE PRESIDENT – WATER**Peter Boor**

Partner and Manager of Bud's Bike Shop, Cucamonga, Calif. Graduate physicist and mathematician. Charter member of IHPVA. Vice President Southern California Cycling Association, President Mount Baldy Cycle Club. Active Veteran bicycle racer.

TREASURER**Robert Alexander**

Traffic Engineer, Bicycle Traffic Consultant, road surface materials expert. Long time recreation cyclist and author of dozens of scientific and popular articles related to transportation and cycling.

HISTORIAN**Dick Hargrave**

Owner, Graphic Design firm, Los Angeles, Calif. Charter member IHPVA. Designed and helped build fairings for first and third race. Designed posters and programs, 1976-77 races. Hobby, low-speed aerodynamics and vehicle design in general.

EXECUTIVE SECRETARY

L'Official du Cycle. Active European Amateur Cycle racer and tourist.

SHINICHI TORIYAMA (Japan)

Director of his own Bicycling Research Laboratory. Vice President of Japan Cycling Club. Bicycling writer and publisher for popular, scientific and industrial publications. Organized several International Cycling tours. Original research on bicycle stability, human power output, and tire rolling friction.

OTTO WEINMANN, JR. (Switzerland)

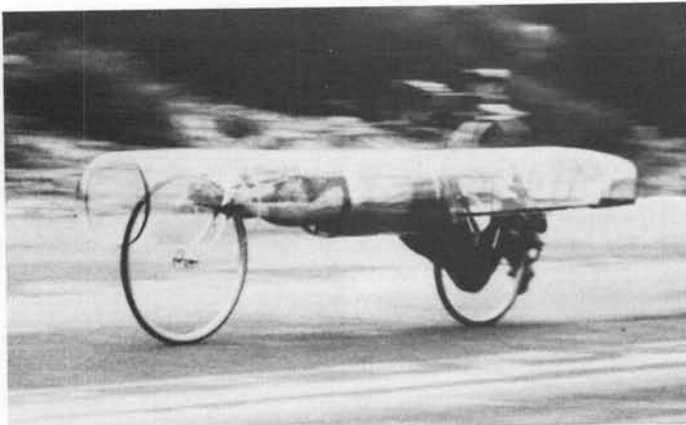
Assistant to the President, Weinmann Company, Worlds largest manufacturer of Aluminum Caliper brakes and lightweight rims. Worked in all phases of the manufacturing operation in Weinmann's three European plants (Switzerland, West Germany and Belgium).

FRANK WHITT (England)

Retired Chemical Engineer. Author of popular and scientific journal articles on basic bicycle science. Researcher on human power out-put, cycling wind resistance, bicycle component efficiency, and other technical topics. Owner of large cycling research library. Past president, Southern Veteran Cycling Club. Co-author of *Science of Cycling* (1975) with Gordon Wilson. An active cyclist.

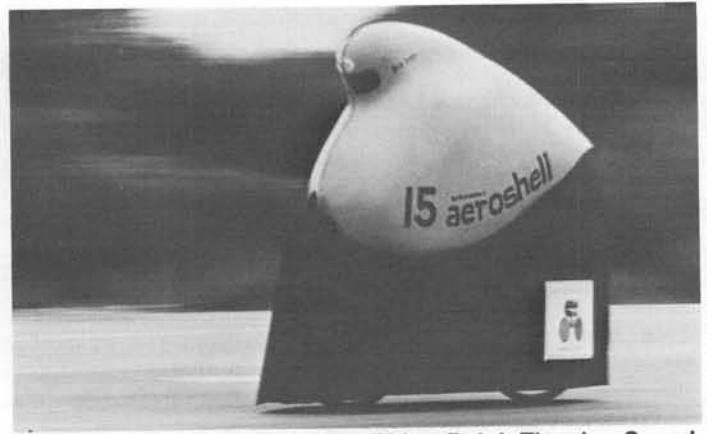
DAVID GORDON WILSON (USA)

Professor of Mechanical Engineering, Massachusetts Institute of Technology. Co-author of *Science of Cycling* (1975) with Frank Whitt. Offered well-known prize for design of best Human Powered land transportation vehicle (1967). Designer and builder of widely publicized recumbent bicycles. Patents on wet weather bicycle brakes. Research on bicycle accidents for U.S. Consumer Products Safety Commission. Cycle tourist (1/4 million miles).



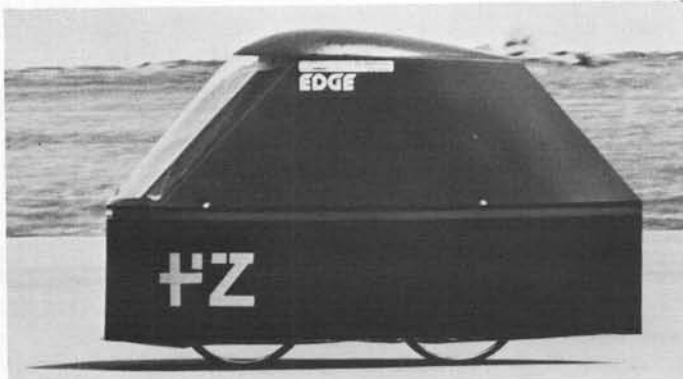
IHPVA PHOTO

Owner: Alan Abbott • Rider: Alan Abbott • Speed: 38.87 MPH (1975)



IHPVA PHOTO

Owner: Paul VanValkenburgh • Rider: Ralph Therrio • Speed: 46.51 MPH (1976)



IHPVA PHOTO

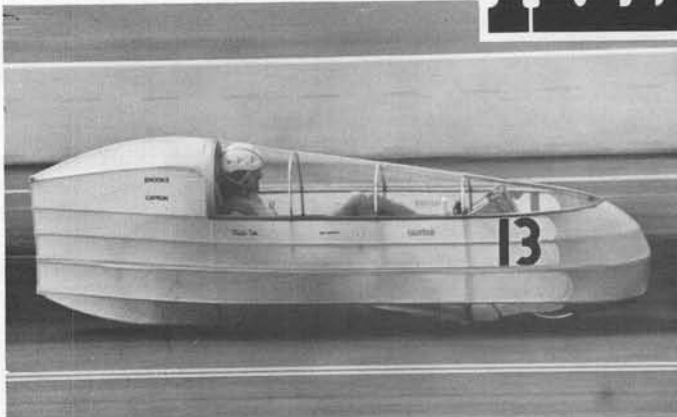
Owner: Jerry Wiegert • Rider: Cliff Halsey • Speed: 46.03 MPH (1977)



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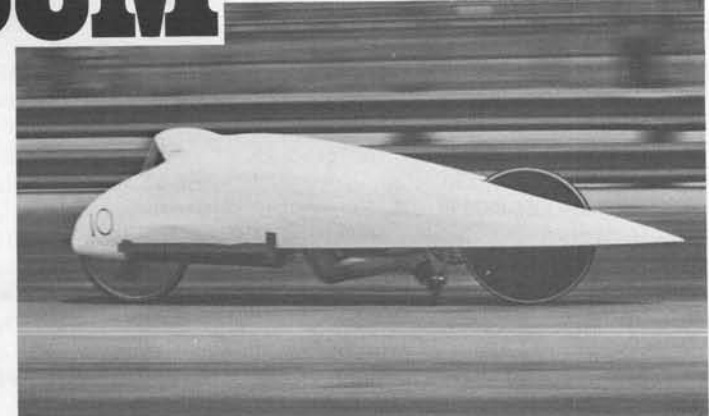
Owner: Bill Watson • Rider: Bill Watson • Speed: 44.74 MPH (1977)

ALBUM



GEORGE NAOUM

Owner: Alec Brooks • Rider: Mark Capron • Speed: 43.78 MPH (1977)



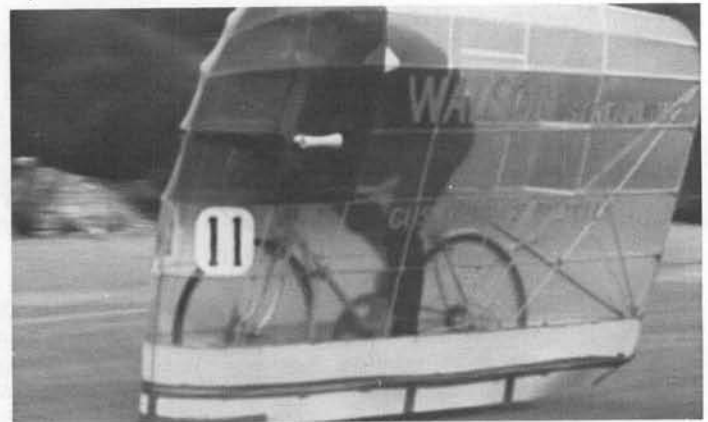
GEORGE NAOUM

Owner: Gardner Martin • Rider: Norman Gall • Speed: 42.65 MPH (1977)



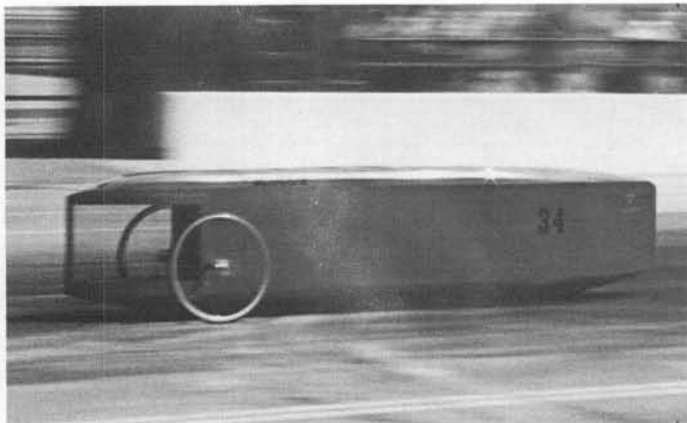
GEORGE NAOUM

Owner: Schwinn Paramount CC • Rider: Butch Stinton • Speed: 42.65 MPH (1977)



IHPVA PHOTO

Owner: Bill Watson • Rider: Bill Watson • Speed: 42.33 MPH (1977)



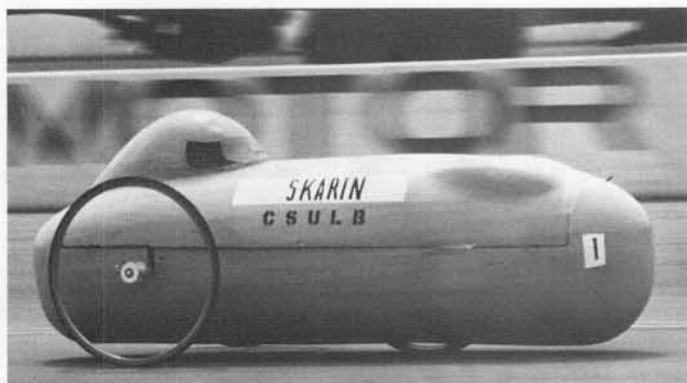
GEORGE NAOUM

Owner: Tom Slocum • Rider: Tom Slocum •
Speed: 39.73 MPH (1977)



PAUL VAN VALKENBURGH

Owner: David Saks • Rider: David Saks •
Speed: 39.01 MPH (1977)



GEORGE NAOUM

Owner: Chester Kyle • Rider: Ron Skarin •
Speed: 38.87 MPH (1977)



GEORGE NAOUM

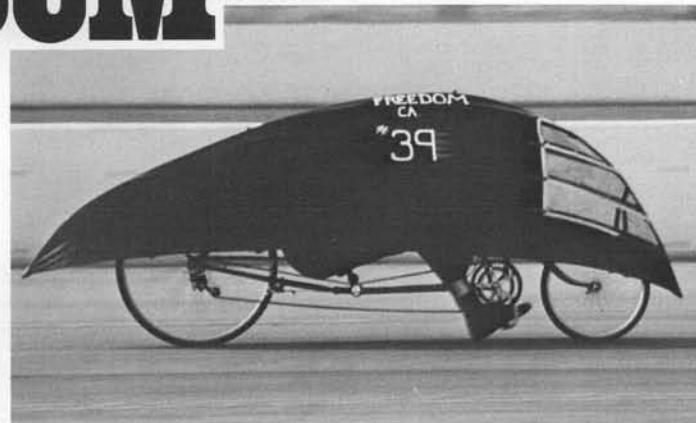
Owner: Alec Brooks • Rider: Alec Brooks •
Speed: 33.14 MPH (1977)

ALBUM



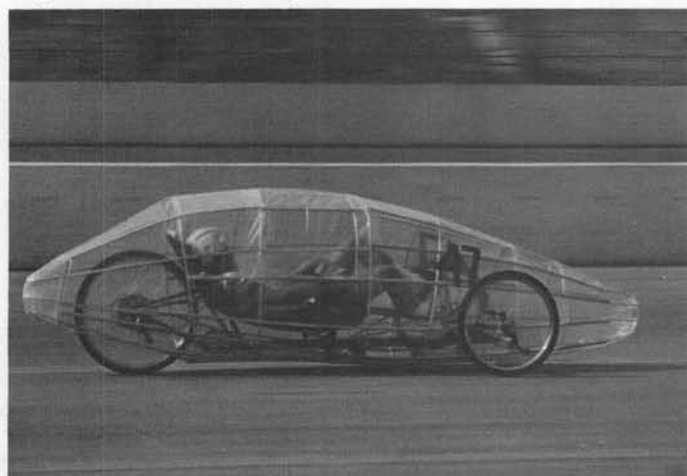
IHPVA PHOTO

Owner: Paul VanValkenburgh • Rider: "Foxy Grandpa" Delano •
Speed: 33.69 MPH (1977)

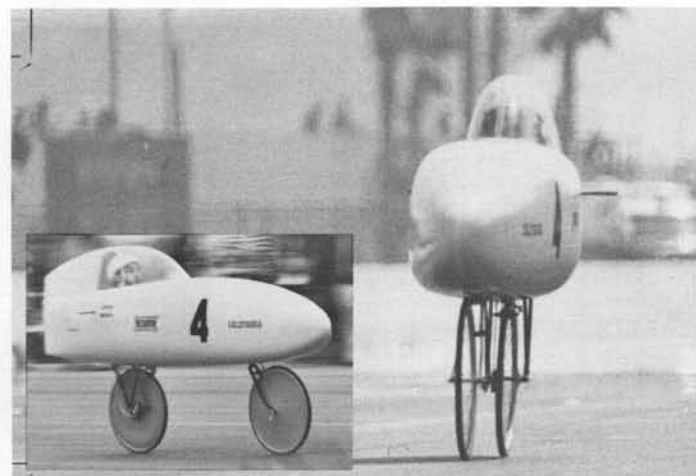


GEORGE NAOUM

Owner: Sandra Martin • Rider: Nathan Dean •
Speed: 31.53 MPH (1977)



Owner: Tetsuo Furuike • Rider: Joseph Mastropaolo •
Speed: 30.15 MPH (1977)



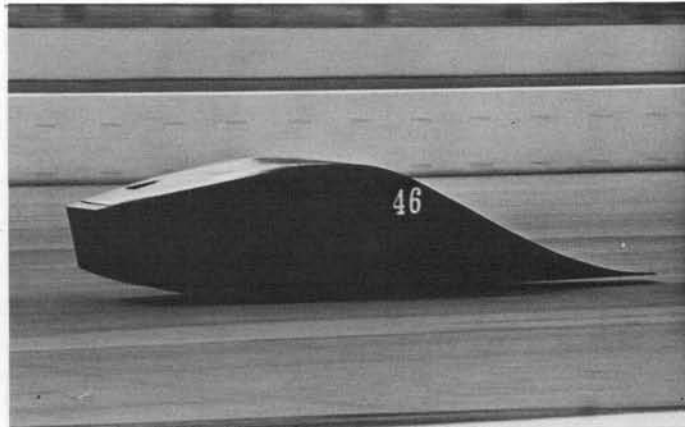
GEORGE NAOUM

Owner: Alec Brooks • Rider: Alec Brooks •
Speed: 29.99 MPH (1977)



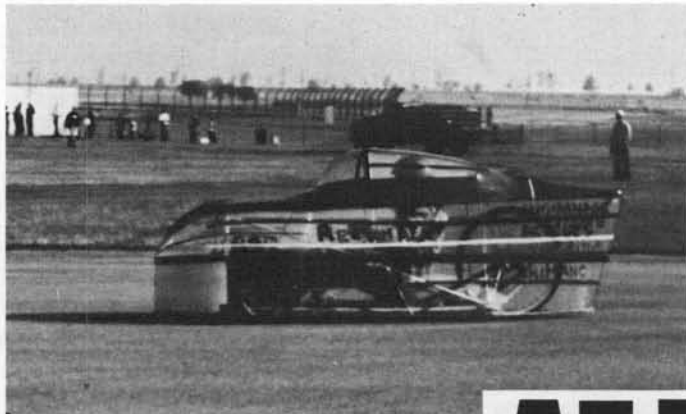
Owner: Willmot White • Rider: Willmot White • Speed: 28.48 MPH (1977)

IHPVA PHOTO



Owner: Donald Smith • Rider: Donald Smith • Speed: 28.14 MPH (1977)

GEORGE NAOUM



Owner: Ted Ancona • Rider: Ted Ancona • Speed: 25.35 MPH (1977)

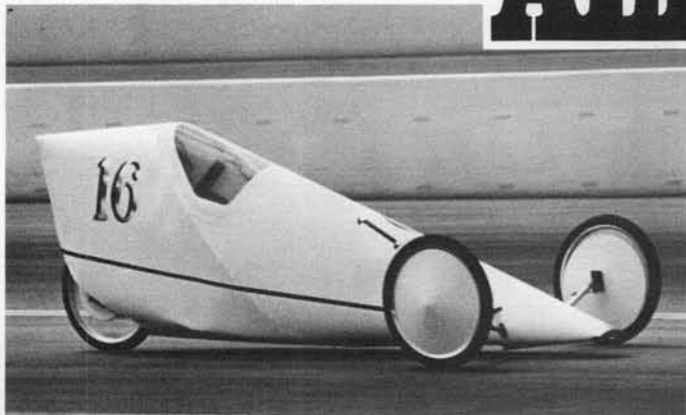
IHPVA PHOTO



Owner: Randy Danta • Rider: Randy Danta • Did Not Finish (1977)

IHPVA PHOTO

ALBUM



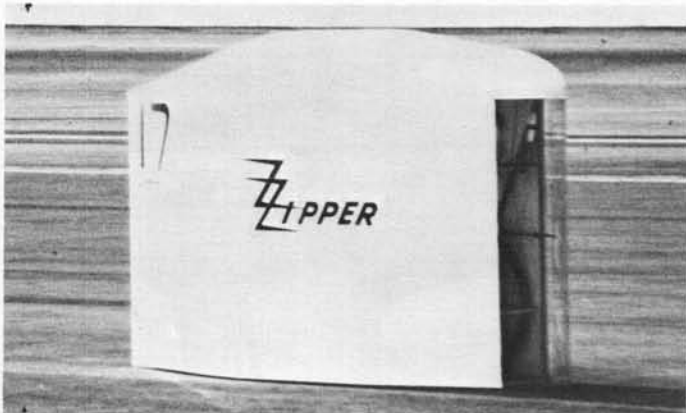
Owner: C. Rahm • Rider: C. Rahm • Speed: 19.99 MPH (1977)

GEORGE NAOUM



Owner: Kurt Zickerman • Rider: Kurt Zickerman • Did Not Finish (1977)

IHPVA PHOTO



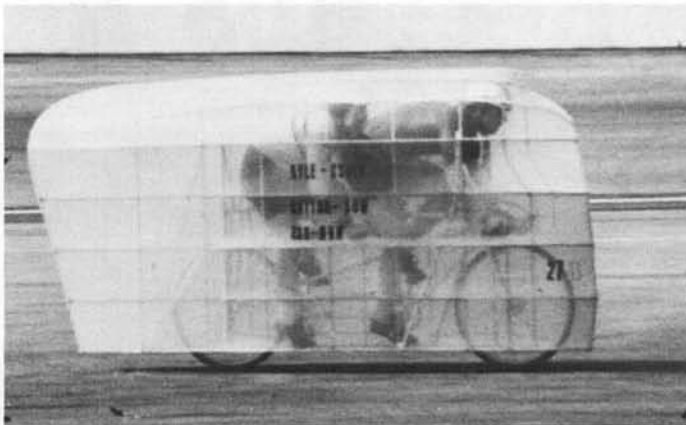
Owner: Glen Brown • Rider: Kevin Lutz • Did Not Finish (1977)

IHPVA PHOTO



Owner: Timothy W. Dick • Rider: T.W. Dick • Did Not Finish (1977)

IHPVA PHOTO



IHPVA PHOTO

Owner: Chester Kyle, CSULB • Riders: Jerry Ash, Gibby Hatton • Speed: 49.93 MPH (1977)



IHPVA PHOTO

Owner: Bud's Bike Shop • Riders: Darryl LeVesque, Dave Keffer, Mark Orr • Speed: 48.11 MPH (1977)



IHPVA PHOTO

Northrup University SAE • Riders: Holleman, Russell • Speed: 47.90 MPH (1977)



IHPVA PHOTO

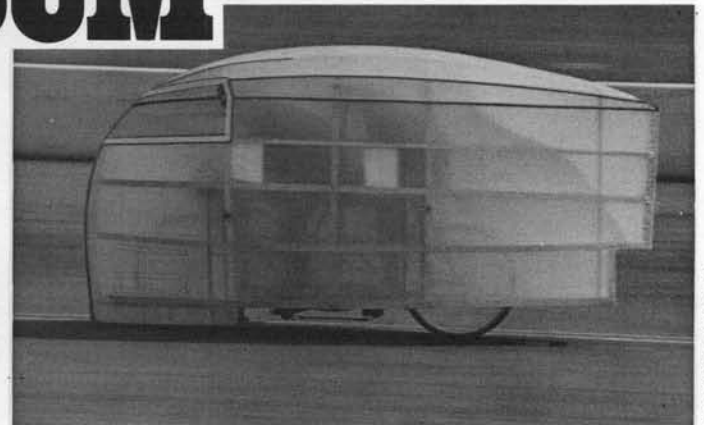
Bud's Bike Shop • Riders: Nysether, Hembree • Speed: 44.21 MPH (1977)

ALBUM



IHPVA PHOTO

Owner: Phil Norton • Riders: Phil Norton, Chris Deeton • Speed: 43.56 MPH (1977)



GEORGE NAOUM

Owner: Robert Trout, CSLUB • Riders: Robert Trout, Jay Webster • Speed: 34.39 MPH (1977)



IHPVA PHOTO

Owner: Jack Lambie • Riders: Jack Lambie, Unknown • Did Not Finish (1977)



GEORGE NAOUM

Owner: Carson High School • Riders: Jeff Narney, Henry Rodriguez • Speed: 23.13 MPH (1977)

SINGLE RIDER CLASS

Place	No.	Owner	Rider	Type of Vehicle	MPH
1.	2	Paul VanValkenburgh	Ralph Therrio	Prone Recumbent Streamlined Quadracycle.	49.38
2.	3	Alan Abbott	Alan Abbott	Prone Recumbent Streamlined Bicycle	48.52
3.	42	Jerry Wiegert	Cliff Halsey	Streamlined Standard Racing Bicycle	46.03
4.	15	Bill Watson	Bill Watson	Supine Recumbent Streamlined Bicycle	44.74
5.	13	Alec Brooks	Mark Capron	Supine Recumbent Streamlined Bicycle	43.78
(tie) 6.	10	Gardner Martin	Norman Gall	Prone Recumbent Streamlined Bicycle	42.65
6.	45	Schwinn Paramount CC	Butch Stinton	Streamlined Standard Racing Bicycle	42.65
8.	11	Bill Watson	Bill Watson	Streamlined Standard Racing Bicycle	42.33
9.	34	Tom Slocum	Tom Slocum	Supine Recumbent Streamlined Tricycle	39.73
10.	41	David Saks	David Saks	Supine Recumbent Streamlined Bicycle	39.01
11.	1	Chester Kyle	Ron Skarin	Supine Recumbent Streamlined Tricycle	38.87
12.	29	Paul VanValkenburgh	"Foxy Grandpa" Delano	Streamlined Standard Racing Bicycle	33.69
13.	32	Alec Brooks	Alec Brooks	Partially Streamlined Standard Bicycle	33.14
14.	39	Sandra Martin	Nathan Dean	Supine Recumbent Partially Streamlined Bicycle	31.53
15.	47	Tetsuo Furuike	Joseph Mastropaolo	Supine Recumbent Streamlined Tricycle	30.15
16.	4	Alec Brooks	Alec Brooks	Supine Recumbent Streamlined Bicycle	29.99
17.	31	James Brahler	Mike Brahler	Prone Recumbent Streamlined Bicycle	29.71
18.	9	Willmot White	Willmot White	Streamlined Standard Bicycle	28.48
19.	46	Donald Smith	Donald Smith	Supine Recumbent Streamlined Tricycle	28.14
20.	12	Sandra Martin	Nathan Dean	Semi Supine Recumbent Streamlined Bicycle	25.55
21.	14	Ted Ancona	Ted Ancona	Supine Recumbent Streamlined Rowing Quadracycle	25.35
22.	16	C. Rahm	C. Rahm	Recumbent Supine Streamlined Bicycle	19.99
23.	51	Bud's Bike Shop	Chris Irving	Recumbent Supine Quadracycle	18.55

MULTIPLE RIDER CLASS

1.	27	Chester Kyle, CSULB	Jerry Ash, Gibby Hatton	Streamlined Standard Racing Tandem Bicycle	49.93
2.	21	Bud's Bike Shop	Darryl LeVesque, Dave Keffer, Mark Orr	Streamlined Triplex Bicycle	48.11
3.	8	Northrup University SAE	J.P. Holleman, Jan Russell	Supine Recumbent Streamlined Tricycle Tandem	47.90
4.	19	Bud's Bike Shop	Tom Nysether, Scott Hembree	Streamlined Standard Tandem Bicycle	44.21
5.	18	Phil Norton	Phil Norton, Chris Deeton	Streamlined Standard Tandem Bicycle	43.56
6.	35	David Larson	David Larson, Mark Lecklider	Streamlined Prone-Forward, Supine-Rear, Recumbent Tandem Bicycle	43.27
7.	20	Bud's Bike Shop	Bob Broadley, Dick Lewis	Partially Streamlined Tandem Bicycle	34.49
8.	26	Robert Trout, CSLUB	Robert Trout, Jay Webster	Streamlined Tandem Bicycle	34.39
9.	44	Jack Lambie	Jack Lambie, Dave Blanding	Partially Streamlined Tandem Bicycle	30.60
10.	30	Carson High School	Jeff Narney, Henry Rodriguez	Streamlined Prone-Front, Supine-Rear Recumbent Bicycle with two training wheels	23.13
11.	24	Ronald Guell	Ronald Guell, Susan Guell	Streamlined Tricycle	17.19

RECORDS '76

SINGLE RIDER CLASS

Place	No.	Owner	Rider	Type of Vehicle	MPH
1.	3	Alan Abbott	Alan Abbot	Prone Recumbent Streamlined Bicycle	47.80
2.	15	Paul VanValkenburgh	Ralph Therrio	Streamlined Racing Bicycle	46.51
3.	23	Schwinn Paramount CC	Butch Stinton	Streamlined Racing Bicycle	45.98
4.	13	Alec Brooks	Marc Capron	Supine Recumbent Streamlined Bicycle	44.08
5.	1	Chester Kyle	Ron Skarin	Streamlined Racing Bicycle	43.65
6.	11	Bill Watson	Bill Watson	Streamlined Touring Bicycle	41.27
7.	2	Byron Rexwinkle	Mario Palombo	Supine Recumbent Streamlined Tricycle	40.93
8.	6	Kurt Zickerman	Kurt Zickerman	Streamlined Racing Bicycle	40.09
9.	4	Alec Brooks	Marc Capron	Supine Streamlined Bicycle	38.57
10.	33	Velocity Plus	Cliff Halsey	Partially Streamlined Racing Bicycle	37.47
11.	25	Carson High School	Edward McClure	Streamlined Racing Bicycle	36.28
12.	28	Ben Dysart	Ben Dysart	Streamlined Racing Bicycle	34.00
13.	7	Dennis Saiki	Ernest Williams	Supine Streamlined Tricycle	33.97
14.	5	Randy Danta	Randy Danta	Supine Streamlined Tricycle	33.79
15.	17	Glen Brown	Glen Brown	Supine Streamlined Bicycle	32.37
16.	9	Willmot White	Ben Dysart	Streamlined Racing Bicycle	31.35
17.	10	Gardner Martin	(a) Bill Muench (b) Nathan Dean	Prone Recumbent Streamlined Bicycle	30.71
18.	30	Recreation Imports	Scott Hitchman	Supine Tricycle	26.68
19.	14	Ted Ancona	Ted Ancona	Rowing Action Tricycle	25.80
20.	34	Thomas Slocum	Thomas Sneddon	Supine Streamlined Tricycle	DNF
21.	31	James Stephenson	James Stephenson	Prone Recumbent Streamlined Bicycle	DNF

MULTIPLE RIDER CLASS

1.	21	Darryl LeVesque	Alan Stephens, Darryl LeVesque, Mark Orr	Streamlined Triplex Bicycle	48.95
2.	18	Phil Norton	Phil Norton, Allan Fenyves	Streamlined Tandem Bicycle	46.27
3.	20	Darryl LeVesque	Russ Harper, Dave Keffer	Streamlined Tandem Bicycle	42.94
4.	19	Bud's Bike Shop	Tom Nysether, Todd Huckins	Streamlined Tandem Bicycle	35.14
5.	24	Ronald R. Guell	Ronald Guell, Susan Guell	Tandem Tricycle	28.42

RECORDS '75

SINGLE RIDER CLASS

Place	Owner	Rider	Type of Vehicle	MPH
1.	Chester Kyle	Ron Skarin	Streamlined Racing Bicycle	44.69
2.	Jack Lambie	Gibby Hatton	Streamlined Racing Bicycle	43.39
3.	Byron Rexwinkle	Mario Palombo	Supine Recumbent Streamlined Tricycle	41.81
4.	Mark Capron	Alec Brooks	Supine Recumbent Streamlined Bicycle	39.91
5.	Allan Abbot	Allan Abbot	Prone Recumbent Streamlined Bicycle	38.87
(tie) 6.	Jack Lambie	Ben Dysart	Streamlined Racing Bicycle	37.53
6.	Randy Danta	Randy Danta	Prone Recumbent Streamlined Tricycle	37.53
8.	Glen Brown	Glen Brown	Supine Recumbent Bicycle (Unstreamlined)	33.89

(continued next page)

(from preceding page)

SINGLE RIDER CLASS

9.	Gardner Martin	Norman Gall	Prone Recumbent Streamlined Bicycle	31.89
10.	Dennis Salki	Dennis Salki	Supine Recumbent Streamlined Tricycle	30.73
11.	Victor Vincente	Victor Vincente	Supine Recumbent Streamlined Tricycle	30.21

MULTIPLE RIDER CLASS

1.	Phil Norton	Phil Norton, Chris Deeton	Streamlined Tandem Racing Bicycle	44.87
2.	Jack Lambie	Jeff Spencer, Tom McIntyre	Streamlined Tandem Racing Bicycle	43.95
3.	Mount Baldy CC	Darryl LeVesque Allan Armstrong Alan Stevens	Unstreamlined Triplex Bicycle	40.45
4.	Bass and Miller	Bass and Miller	Unstreamlined Tandem Bicycle	31.82

RECORDS

Sequence of
Human Powered
Land Vehicle Records

200 METERS – SINGLE RIDER

Date	Rider	Designer-Bullder	Type of Vehicle	Location	MPH
9/28/62	Antonio Maspes		Unstreamlined racing bicycle	Milan, Italy	42.20
11/11/74	Ron Skarin	Chet Kyle	Streamlined racing bicycle	Los Alamitos, Ca.	43.02
4/ 5/75	Ron Skarin	Chet Kyle	Streamlined racing bicycle	Irwindale, Ca.	44.69
4/24/76	Alan Abbott	Alan Abbott	Streamlined prone bicycle	Irwindale, Ca.	47.80
4/30/77	Ralph Therrio	Paul VanValkenburgh	Streamlined prone quadracycle	Ontario, Ca.	49.38

500 METERS – SINGLE RIDER

1968			Unstreamlined racing bicycle	Mexico City	40.16
11/11/74	Ron Skarin	Chet Kyle	Streamlined racing bicycle	Los Alamitos, Ca.	42.62
4/30/77	Ralph Therrio	Paul VanValkenburgh	Streamlined prone quadracycle	Ontario, Ca.	47.96

1000 METERS – SINGLE RIDER

1968			Unstreamlined racing bicycle	Mexico City	35.83
11/11/74	Ron Skarin	Chet Kyle	Streamlined racing bicycle	Los Alamitos, Ca.	41.20

1 MILE – SINGLE RIDER

1958	Nim Carline	Oscar Egg	Streamlined racing bicycle	Manchester, Engl.	37.27
11/11/74	Ron Skarin	Chet Kyle	Streamlined racing bicycle	Los Alamitos, Ca.	40.63

200 METERS – MULTIPLE RIDER

4/05/75	Phil Norton, Chris Deeton	Phil Norton	Streamlined tandem	Irwindale, Ca.	44.87
4/24/76	LeVesque, Stephens, Orr	Doug Connor	Streamlined triplex	Irwindale, Ca.	48.95
4/30/77	Jerry Ash, Gibby Hatton	Chet Kyle	Streamlined tandem	Ontario, Ca.	49.93

(Cover, con't from page 6)

they worked, although Ralph blew out two standard 27-inch rear tires during record attempts.

So we set a new record. But that won't be the end of it, because Kyle has done it again. He passed on the comment that our body "looked like it was put together by blind men in boxing gloves." Sure, it's true — but wait till next year. I'm going to apply for a patent on the hand crank/steer mechanism, and try to build a body like Abbott's to go over it all.

Speaking of next year, I feel that we may be able to put on a better show for the spectators in the future. After all, they are supporting our organization, and in spite of the crowd we had, there ought to be ten times as many bicyclists who would be interested. All we have to do is apply standard practices from auto and motorcycle race promoters. For one thing, I believe we need more head-to-head competition. We need runoffs like the year before to provide a little excitement. We could also provide more "people action," like having a LeMans start and a dismount finish for the road race.

I would also like to promote the idea of better "product identification," which attracts sponsors and lets the spectators identify with brands. Every NASCAR race car is essentially identical except for the engine and the exterior sheet metal, but everyone roots for "their" Dodge, or Chevy, or Mercury. I suggest that we add a "Production Class," which require standard upright bicycle frames. These are the bread-and-butter manufacturer vehicles, and yet they are no longer competitive for outright top speeds. Use of production frames would apply our research to everyday cycling, reduce the engineering required, and perhaps attract more sponsors. But, regardless of the rules or classes, the top awards will still go to those builders and riders who put out the most effort *before* the race day.

(Publicity, con't from page 7)

52. Los Angeles Times, San Gabriel Valley Edition, April 28, 1977.
53. California Living (Los Angeles Herald Examiner) April 24, 1977.
54. Competitive Cycling, July 1977.
55. Velo News, May 1977.
56. Parade Magazine, June 19, 1977.
57. America Illustrated, (Russian), May 1977.
58. Topic Magazine, No. 103 (USIS publication).
59. Radmarkt (German), July 1977.
60. L.A.W. Bulletin, August 1977.
61. Popular Mechanics, September 1977.
62. Young Athlete, October 1977.
63. Bicycling Magazine, October 1977.
64. Bicycling Magazine, November 1977.

However, it is impossible for reporters to learn everything about the race, the machines, and the people involved in one hectic morning. Occasionally, they end up publishing incomplete or erroneous information. As winner cycle builder Van Valkenburgh says, "Just being fastest won't necessarily produce the exposure. It helps to give reporters the information on a platter. A number of the stories written about the 1977 race took statements verbatim from a one-page, Xeroxed "Press Release" that my team handed out at the race."

For good exposure, second best to winning is having an attractive, colorful, unusual, photogenic machine. Certain racing vehicles such as Alec Brook's "Pressodyne" and Don Smith's "Aardvark" have often appeared in magazines, even though they have never finished in the top five places.

Successful promoters let their sponsors know what the potential audience is. Based on the circulation of only a few periodicals, it is fair to say that photographs of some vehicles have been exposed to millions of people! The advertising on a winning or exotic machine will probably reach many times more people, with a much better image, than all the expensive paid ads you can buy.

(Background, con't from page 10)

in prizes to the winners. Safety helmets were donated by Bell.

The next Speed Championships should see the end of the 50 MPH barrier, thus hopefully fulfilling the 1974 published predictions of Kyle and Lambie. There are further barriers to be broken on land, with the \$2500 Abbott Prize for any human powered vehicle that can break the USA National Speed Limit of 55 MPH. Hopefully, similar intriguing goals will be established by the IHPVA so that the creative thrust will continue on all fronts, including human powered air and water vehicles.

BULLETIN



Wolfgang Gronen, our Director in Germany, awards the Honorary Chairmanship of the IHPVA Board of Directors to Eddy Merckx — the world's most renowned bicycle racer — St. Vith, Belgium, 1976.

Europe's first Speed Championships — "EURO REKORD '78" — will be held this year on April 9th. Organized by Mr. Gronen, sponsored by RAD magazine and Cycles PEUGEOT, "Euro Rekord '78" will be sending the THREE fastest European vehicles and riders to the United States to compete in the IHPVA's 4th International Human Powered Speed Championships to be held at Ontario Motor Speedway, May 6, 1978. Don't miss this first truly International event!

IHPVA MEMBERSHIP

Join the IHPVA. Membership dues include a subscription to the news bulletin, *HUMAN POWER* (including future commemorative issues), reduced entry fees to the Speed Championships — \$5.00 for members, \$15.00 for non-members; reduced admission fees to all IHPVA events; member I.D. card and certificate.

The bulletin will contain announcements of world-wide events of interest, race results, reports on the latest in human-powered vehicle technology, and general association news.

Dues are \$10.00 per calendar year in U.S.A. To compensate for additional postage and handling for mailing outside U.S.A and its outlying areas, please remit: for Canada, \$11.00; all other countries, \$12.00.

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