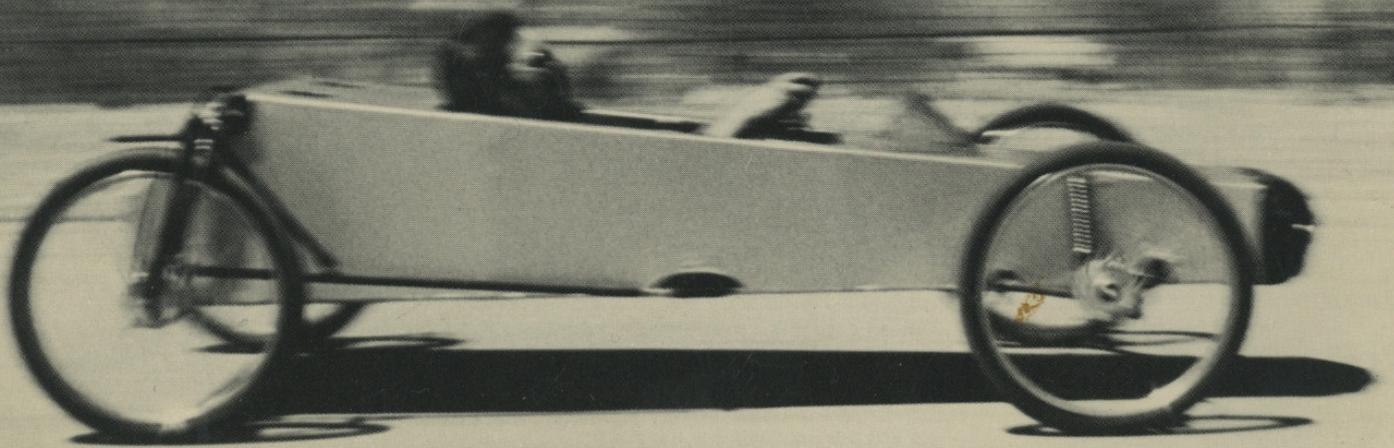
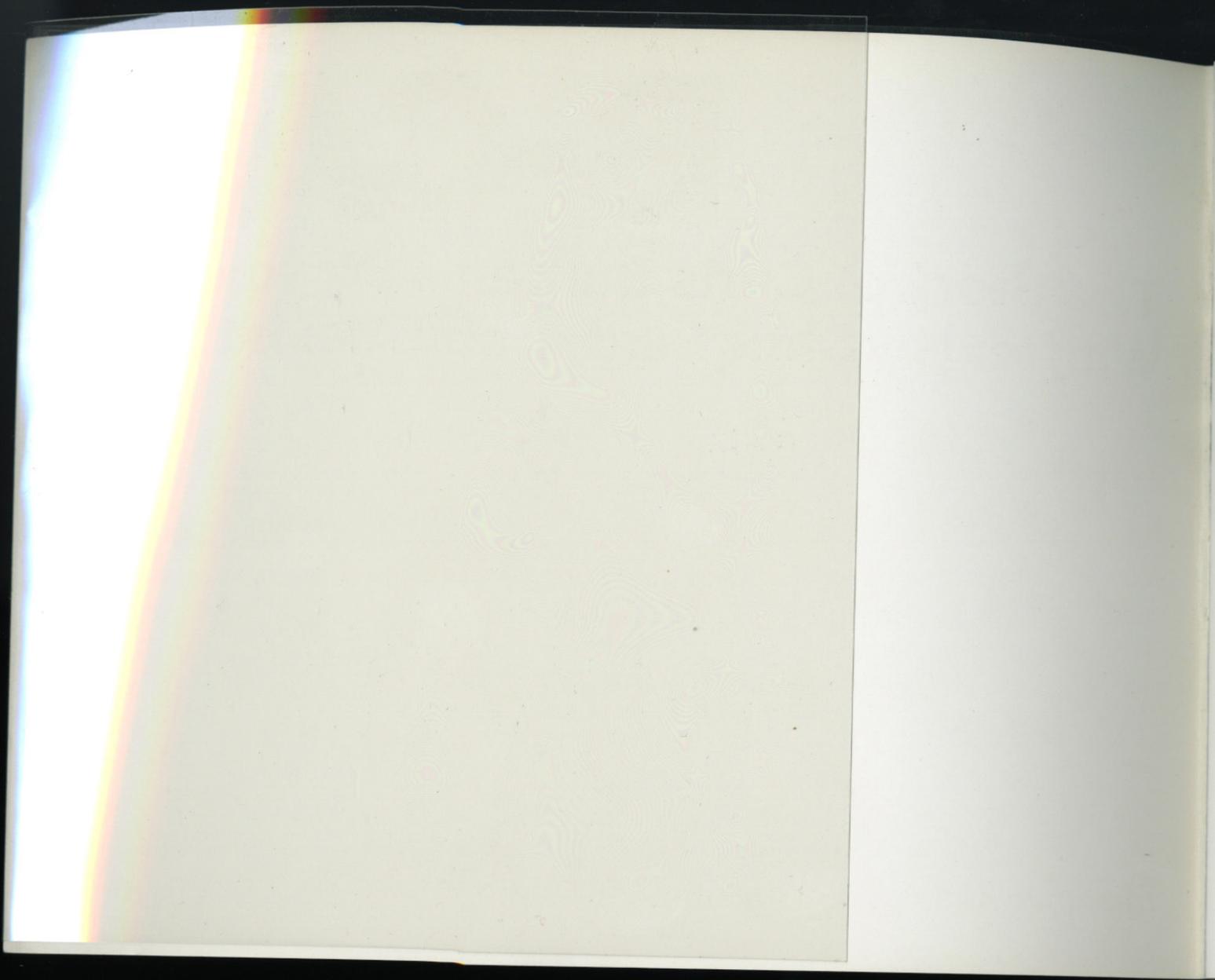


# B-CAR



**CHRIS BURDEN**

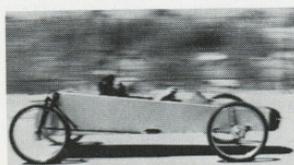


# B-CAR

**The Story of Chris Burden's Bicycle Car  
With text by Chris Burden and Alexis Smith**

© 1977

*Designed and Produced by Future Studio for CHOKE Publications*



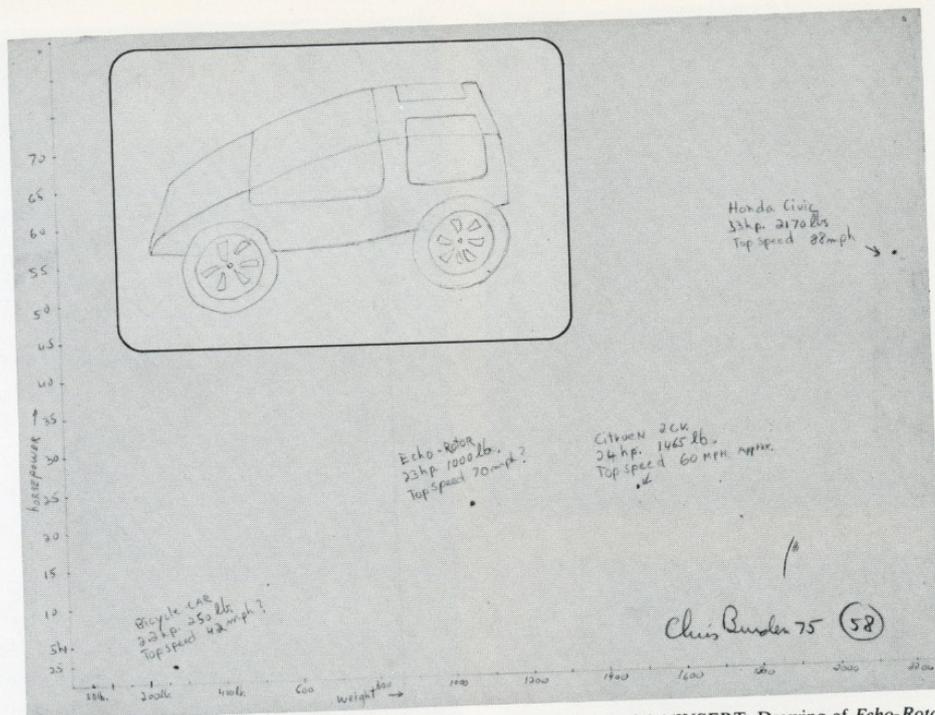
## **B-CAR INTRODUCTION**

During the two-month period between August 24 and October 16, 1975, I conceived, designed, and constructed a small one-passenger automobile. My goal was to design a fully operational four-wheel vehicle which would travel 100 miles per hour and achieve 100 miles per gallon. I imagined this vehicle as extremely lightweight, streamlined, and similar in structure to both a bicycle and an airplane.

Once the project was conceived, I was compelled to realize it. I set the goal of completing the car for two shows in Europe. I saw building the car as a means toward the end of driving it between galleries in Am-

sterdam and Paris as a performance. When I arrived in Amsterdam, I knew that the accomplishment of constructing the car had become for me the essential experience. I had already realized the most elaborate fantasy of my life. Driving the car as a performance was not important after the ordeal of bringing it into existence.

The car is not completely engineered; most of the parts are hand-made, and many of the decisions in design and construction were based on hunches. As I worked, I kept all the sketches and drawings as a record of the process. Displayed with the car, they become documentation of the construction. The car and drawings represent a vision — my fantasy as an artist of what a car should be.

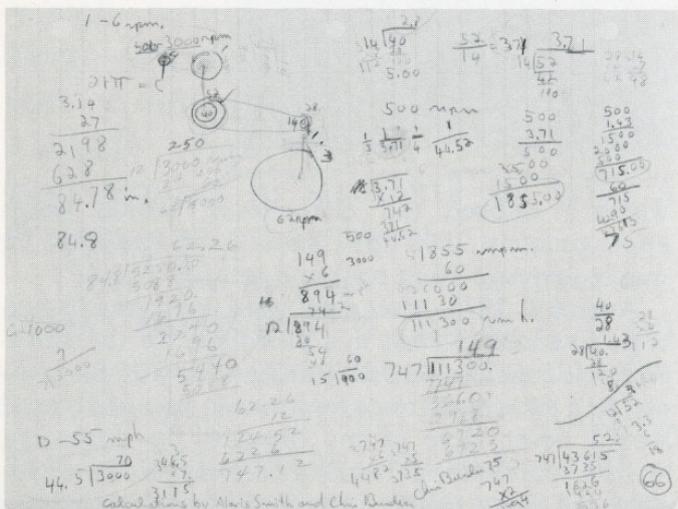
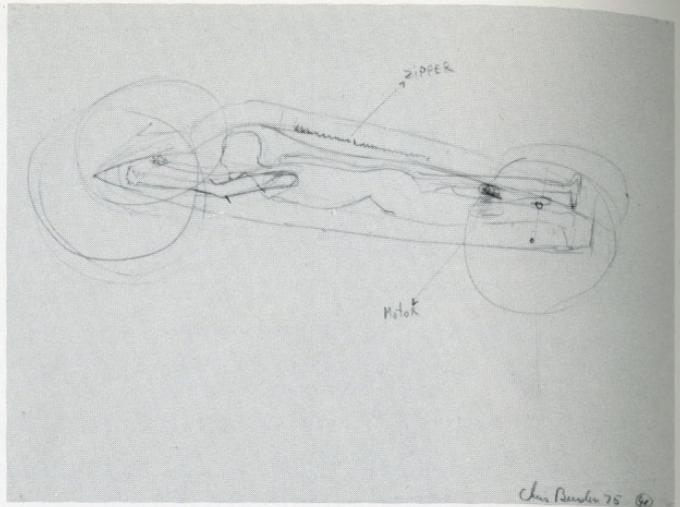
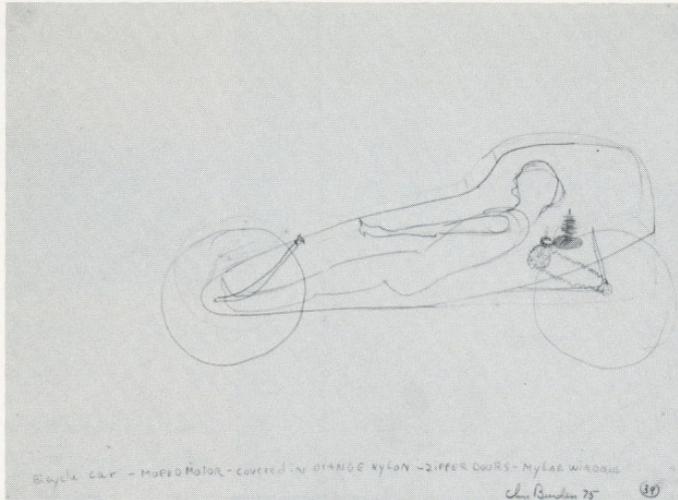


Graph showing relationship between horsepower and vehicle weight (INSERT: Drawing of *Echo-Rotor*)

**June, 1975.** As a car buff, one of my most cherished fantasies has always been to manufacture a car of my own — to add the name of Burden to the list of Ford, Honda, Bugatti, Citroen, etc. Prompted by the 1974 energy crisis and spiraling inflation which had brought the cost of the most basic economy car to almost \$4,000, I began to think seriously about designing and manufacturing a car. I conceived of an ultra-light two-seater, built with foam and fiberglass, and using a miniature 23 h.p. rotary engine. My car,

which I dubbed the *Echo-Rotor*, would weigh approximately 1000 lbs., have a top speed of 70 m.p.h., average 70 m.p.g., and sell for \$2,000.

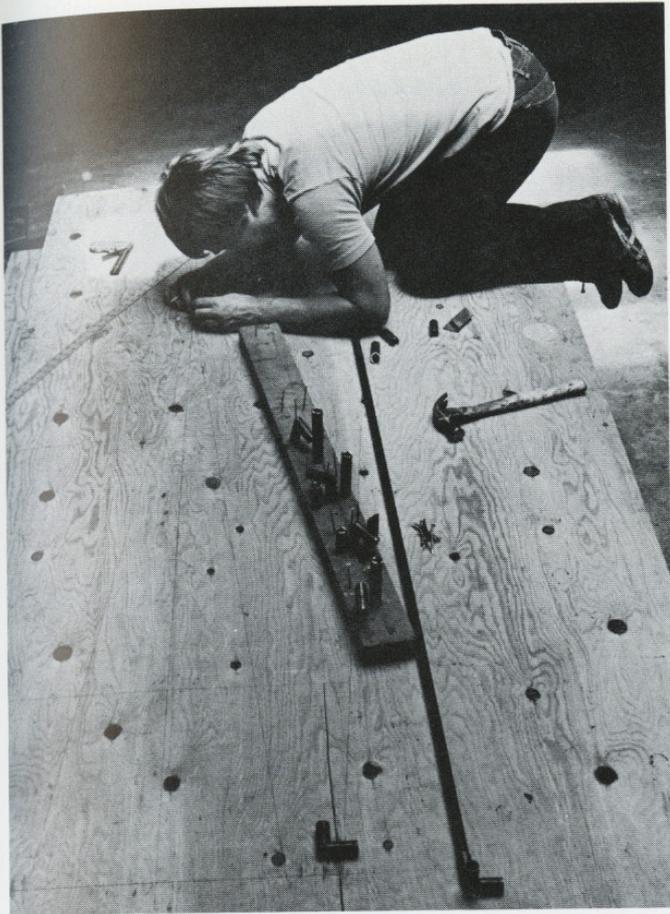
**August 1, 1975.** After eight weeks of trying to generate financial interest in a prototype for the *Echo-Rotor*, I began to sense the unfeasibility of this project. In a state of extreme frustration, I realized that I would never have at my disposal the engineers, stylists, and financial backing necessary to mass produce the *Echo-Rotor*. I decided instead to build a



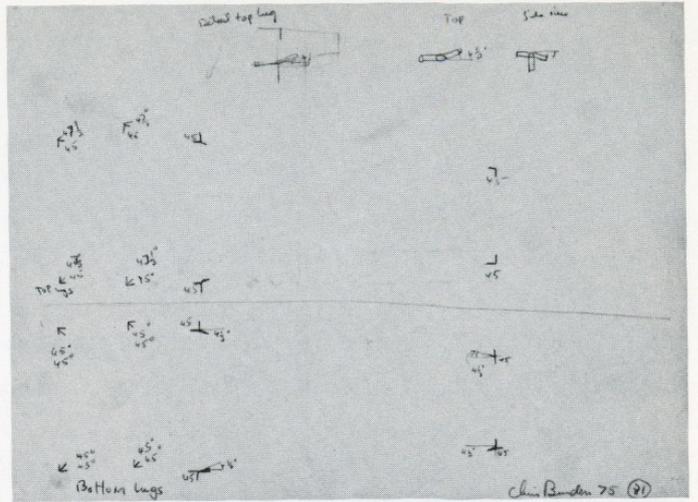
Calculations of bicycle gear ratios

one-person car out of bicycle parts, not as an answer to Detroit, but merely as a gesture. My idea was to incorporate some of my original ideas about speed, horsepower, and mileage efficiency into a car that I could design, build, and finance by myself.

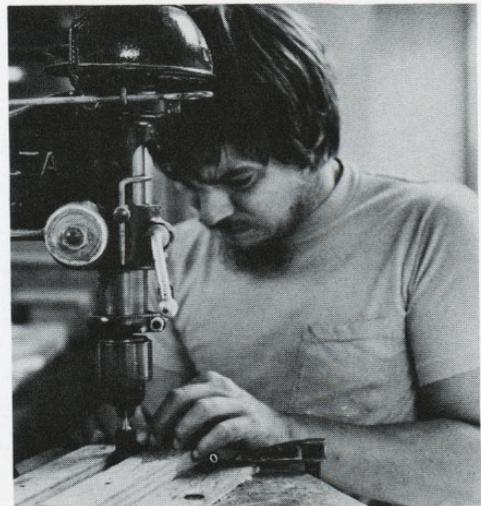
**August 10, 1975.** The original sketches show the driver of the bicycle-car lying on his stomach. This design proved to be too radical and potentially too uncomfortable for driving long distances. (In the back of my mind, I had the idea that I would take the car unassembled to Amsterdam where I was scheduled to do a performance in two months, put it together there, and drive it to Paris, a distance of 400 miles, as a second performance.) Through calculations, I was able to see that a ten-speed bicycle transmission did not offer the proper gear ratios, and I

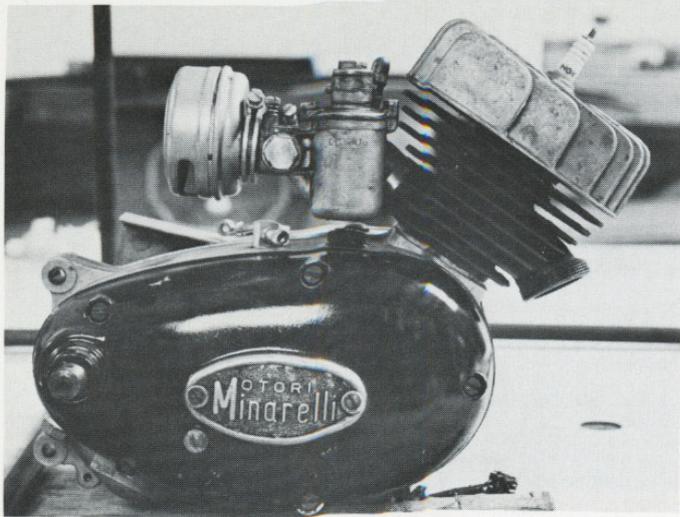


was forced to switch to a slightly heavier motorcycle engine-transmission package. After extensive research, I chose a 50 c.c. 5½ horsepower, 28 lb. Minarelli motorcycle engine.

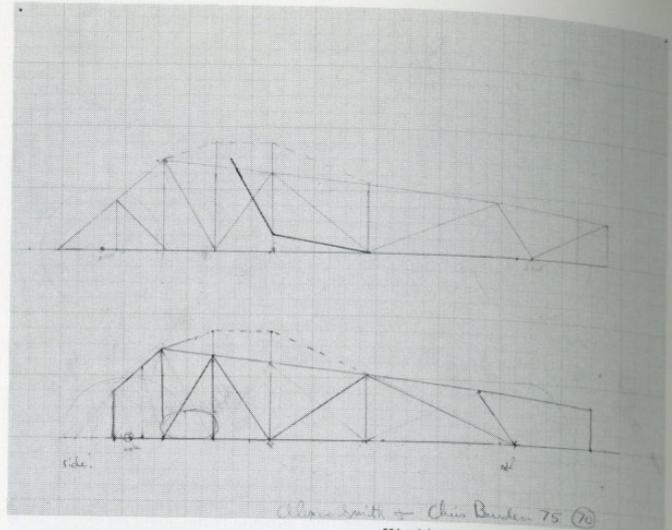


Positions and angles of frame lugs

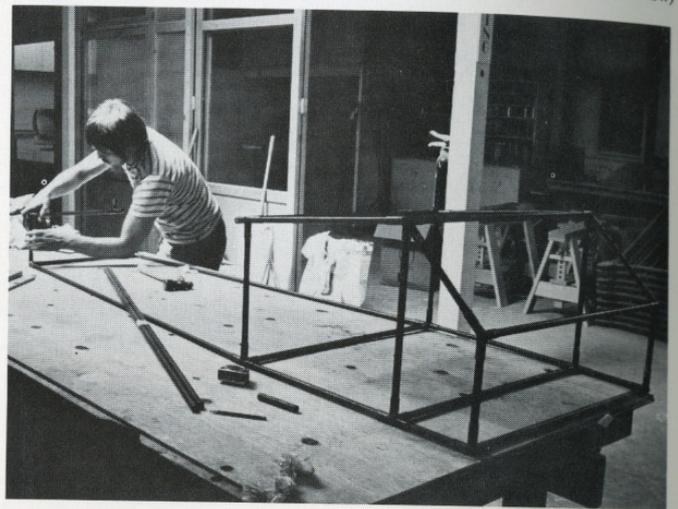


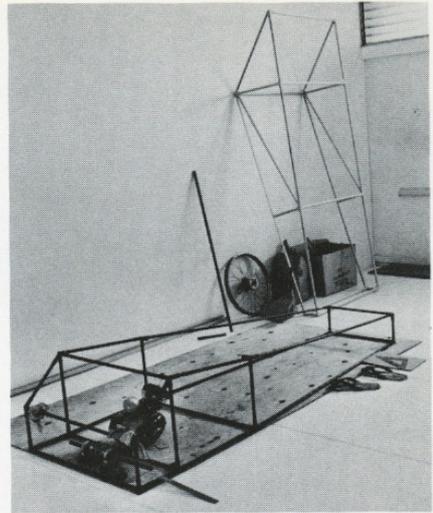
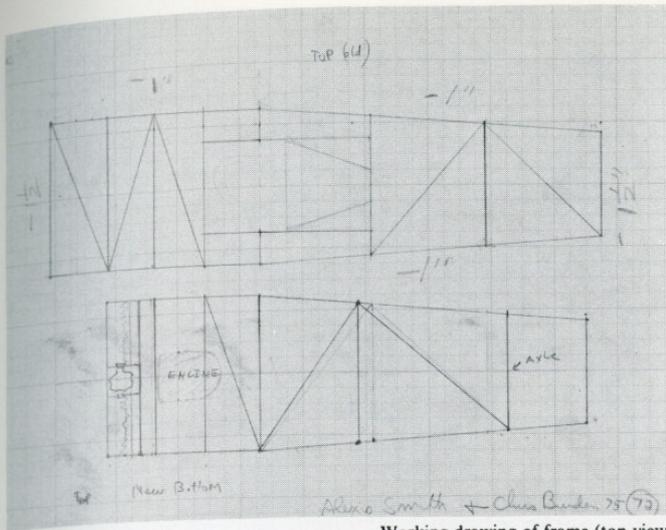


**August 24, 1975.** For the frame, I decided to use chrome-moly tubing, a very high quality, lightweight steel tubing used extensively in racing bicycles and small airplanes. Individual pieces of tubing could be put together with lugs, or sockets made from the next size larger tubing, and silver-soldered in place. This is the same technique used in making bicycle frames. I needed this tubing to build a space frame, a complex frame where the stress is evenly distributed throughout a network of straight pieces of tubing. This particular frame is very strong for its weight, but is seldom used by car manufacturers because of its complexity and consequent expense. I wanted to be able to take the frame completely apart by melting the silver in the lugs, so I could reduce the entire frame to a bundle of tubes.

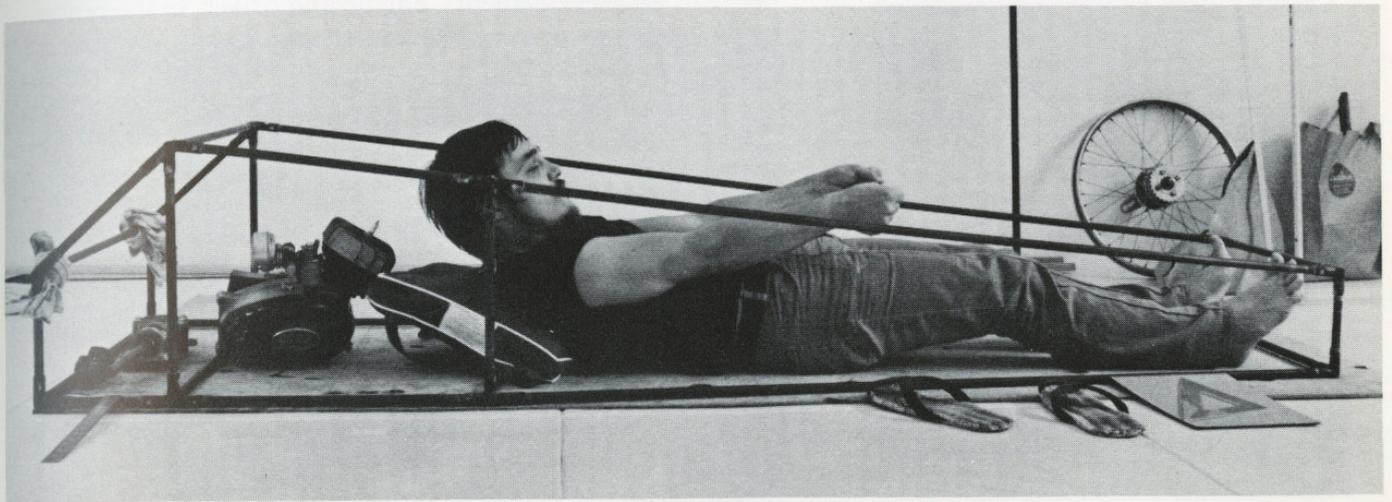


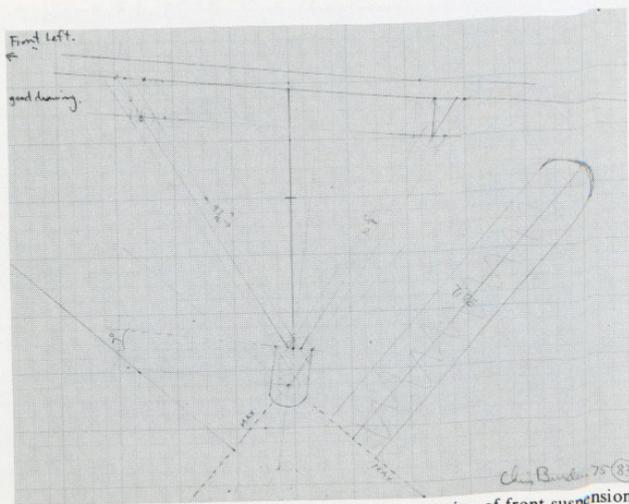
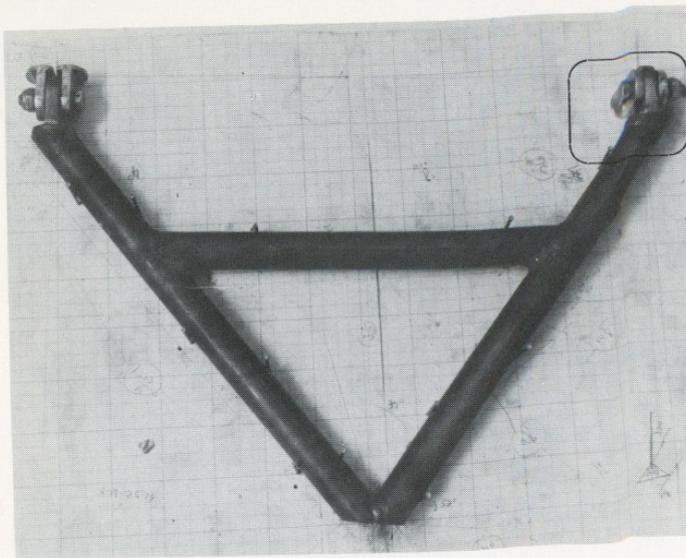
Working drawing of frame (side view)



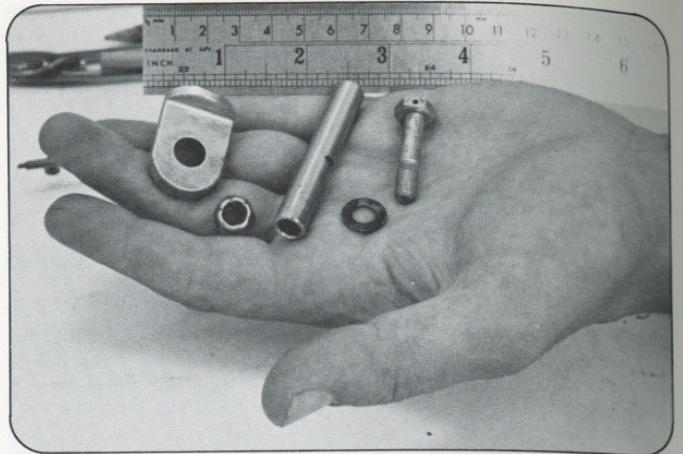


Working drawing of frame (top view)





Working drawing of front suspension



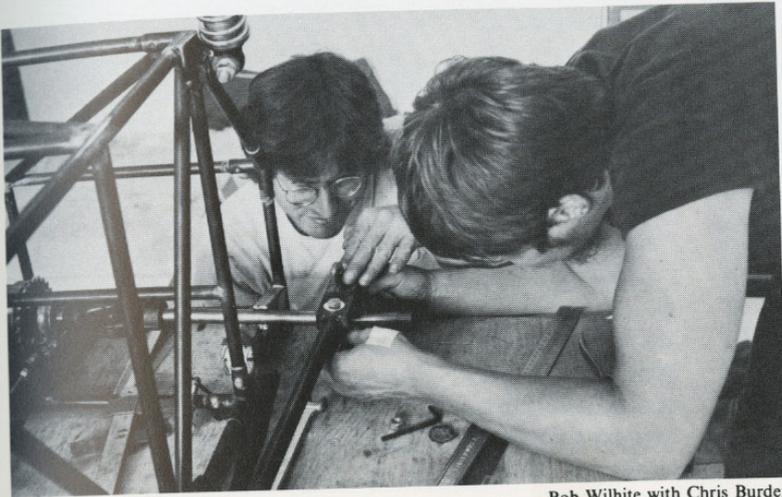
As in the most advanced sports cars, I settled on mid-engine placement which concentrates the two heaviest elements, engine and driver, in the center of the car. I was fortunate enough to find a miniature 2 lb. differential in keeping with the scale of the car.

**September 15, 1975.** For a comfortable ride and easy handling, I wanted my car, by now the *B-Car*, to have independent suspension on all four wheels. Independent suspension means that a wheel can move up and down independently of the others. The front suspension is an A-arm type; the rear is a swinging axle with a U-joint (as in a Volkswagen). I used aircraft surplus parts for the bearings and mounting points with motorcycle shocks and springs.

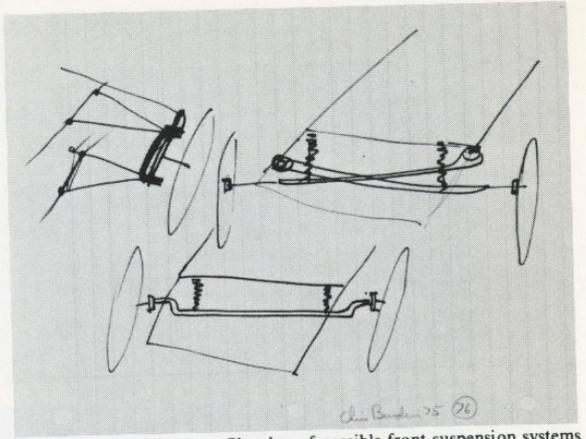
When I began designing the car, I had more than a rudimentary knowledge of how components such as the suspension worked. But building a working system from scratch was extremely difficult and required



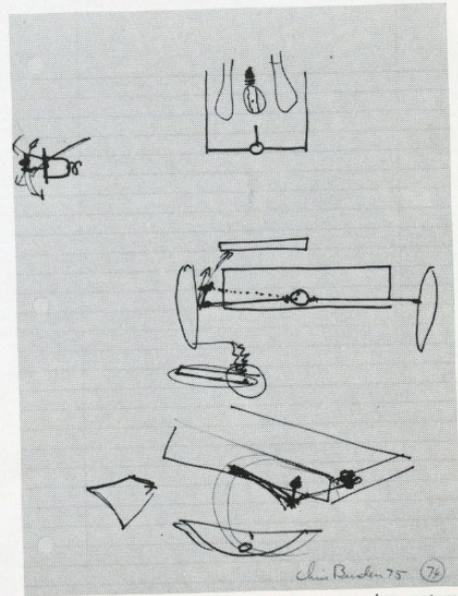
Frank Murphy with Chris Burden



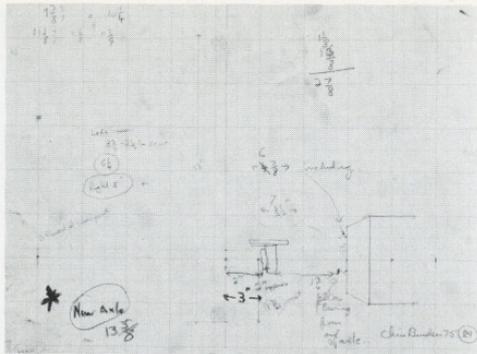
Bob Wilhite with Chris Burden



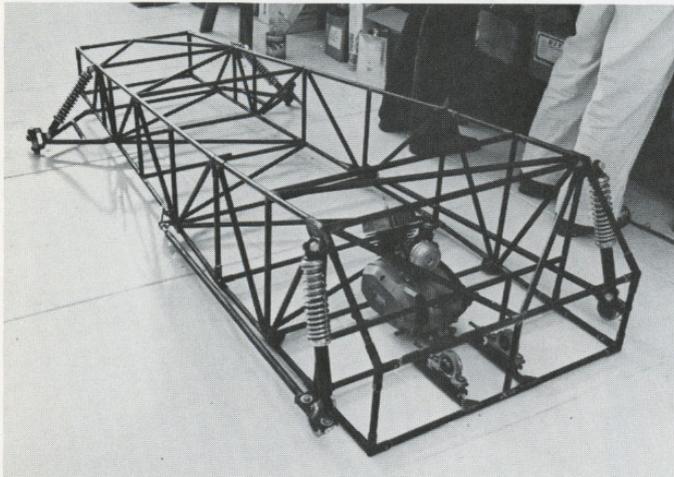
Sketches of possible front suspension systems



Sketches of possible rear suspension systems

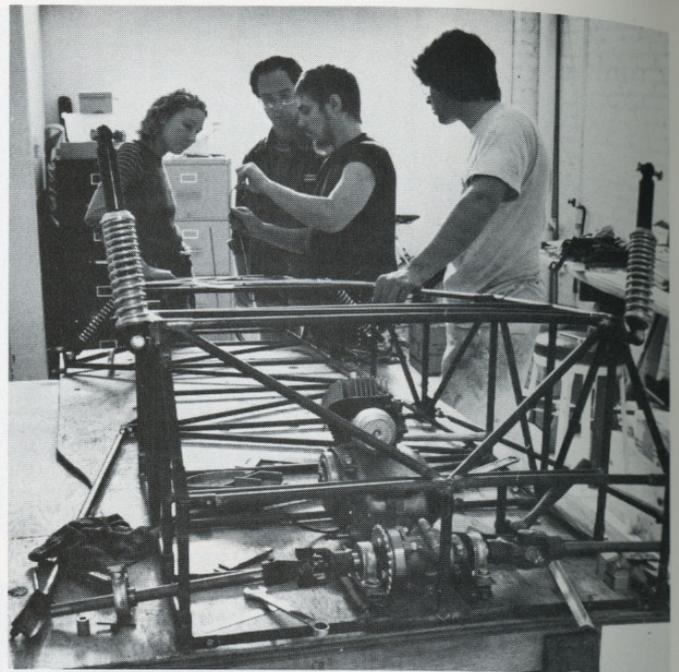


Working drawing of rear swinging axle



hours of studying car books, making diagrams, looking for appropriate parts, fabricating, testing, and redesigning.

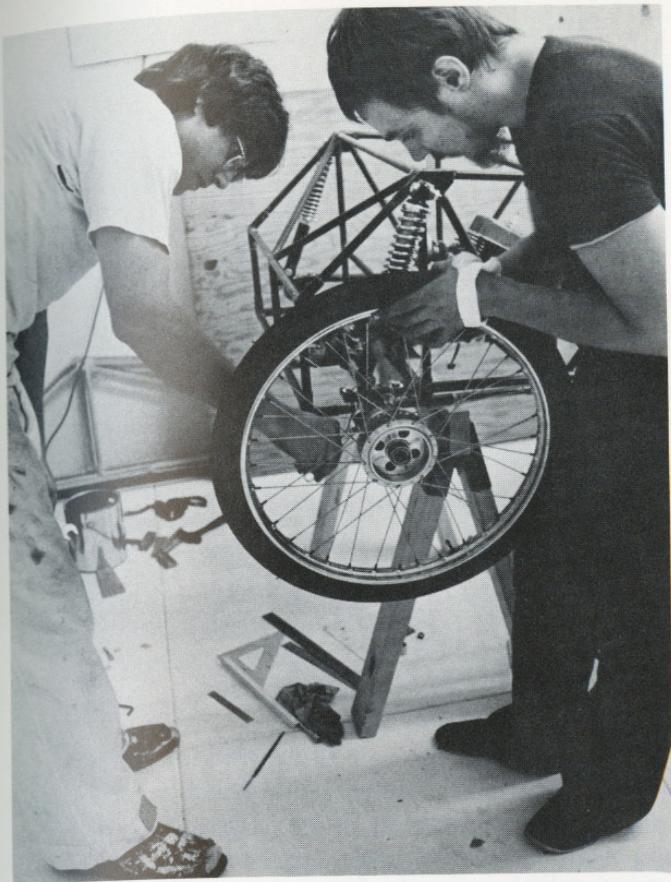
The mounting brackets for the suspension were welded rather than silver-soldered onto the frame for



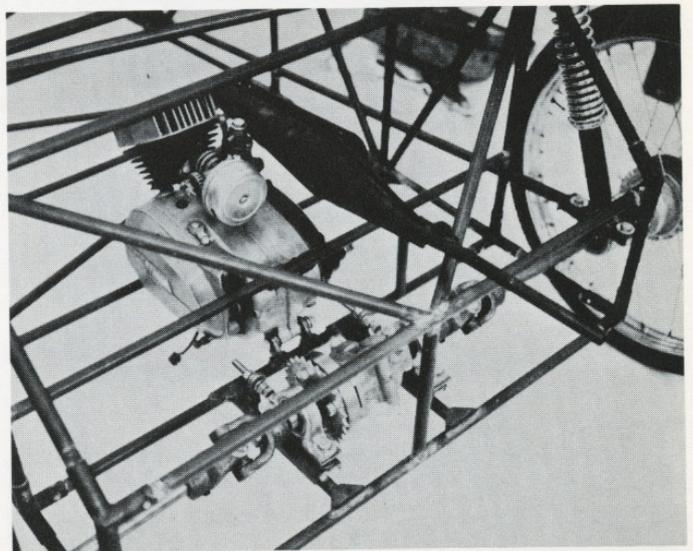
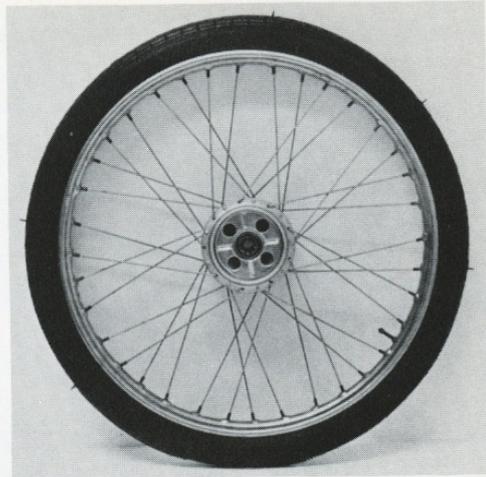
Left to right: Alexis Smith, Michael Brewster, Chris Burden and Bob Wilhite

added strength. As the frame became more and more complex and with the addition of several welded parts, it became apparent that the frame was a unit that could not be disassembled as originally planned.

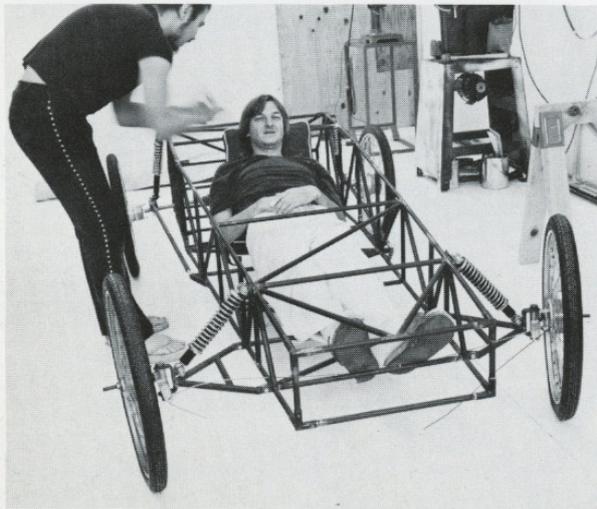
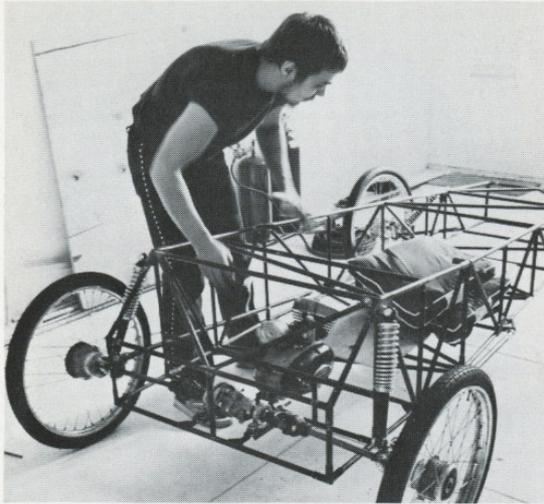
**September 25, 1975.** After the suspension was in place, the next problem was to mount the engine and differential, and line them up accurately. I had considerable difficulty trying to figure out how to drive the differential, and the connections between the engine and differential had to be rebuilt several times. In the finished car, both the engine and differential are



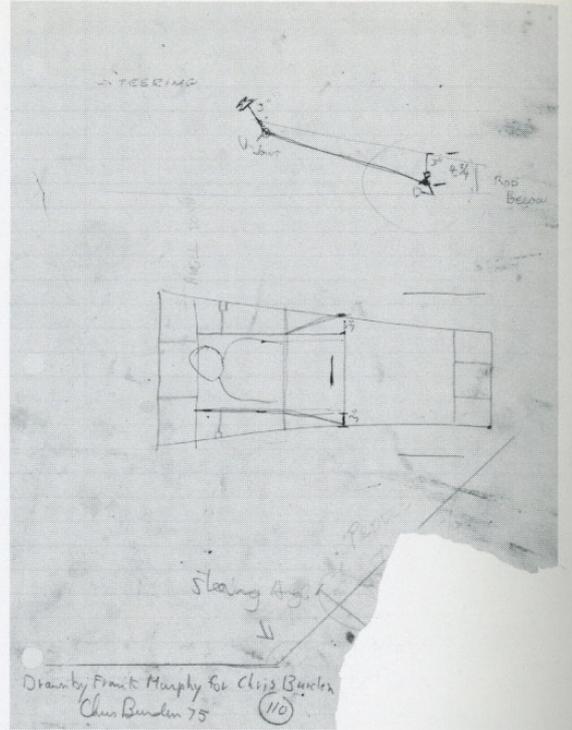
rubber-mounted, and the differential is adjustable fore and aft to take up the slack in the chain. Next came the wheels which were from an Italian 50 c.c. motorcycle. Special hubs had to be machined to adapt them to the axles.



Engine, differential, and exhaust, in place

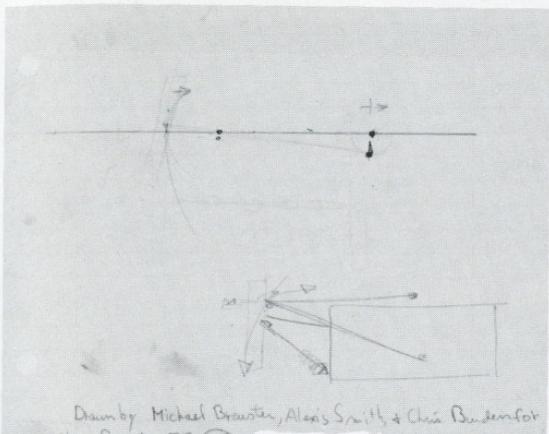


Tom Wudl with Chris Burden



Initial placement of steering column

**October 1, 1975.** The car was now on its wheels, but with no steering system. There were several problems in engineering a steering system for the *B-Car*. There was very little printed information available on steering systems and how they worked, so I was forced to use a trial-and-error method. In total, we built five separate steering mechanisms before we achieved a degree of success. The first was based on an initial misconception. I thought since the car was so light-

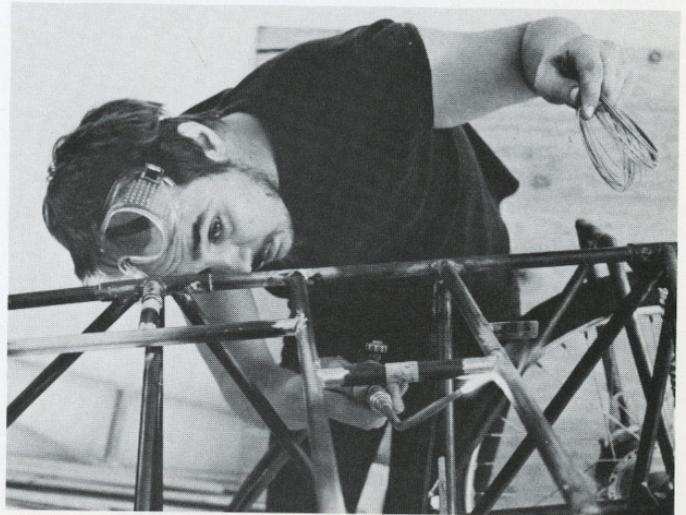
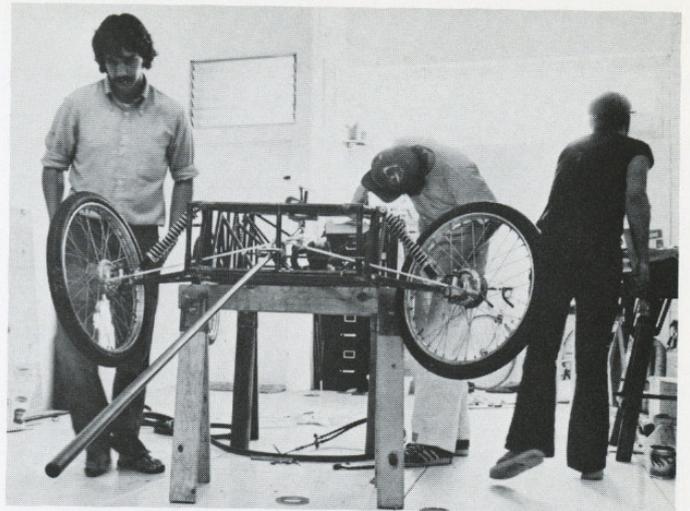


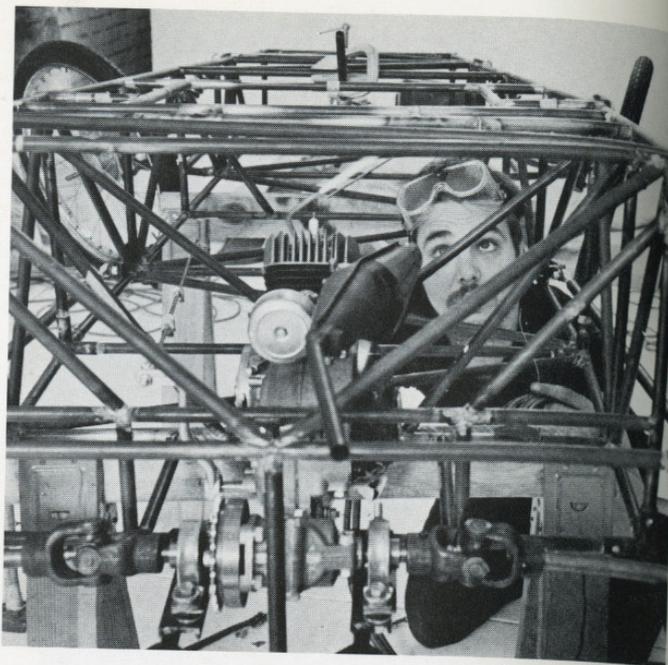
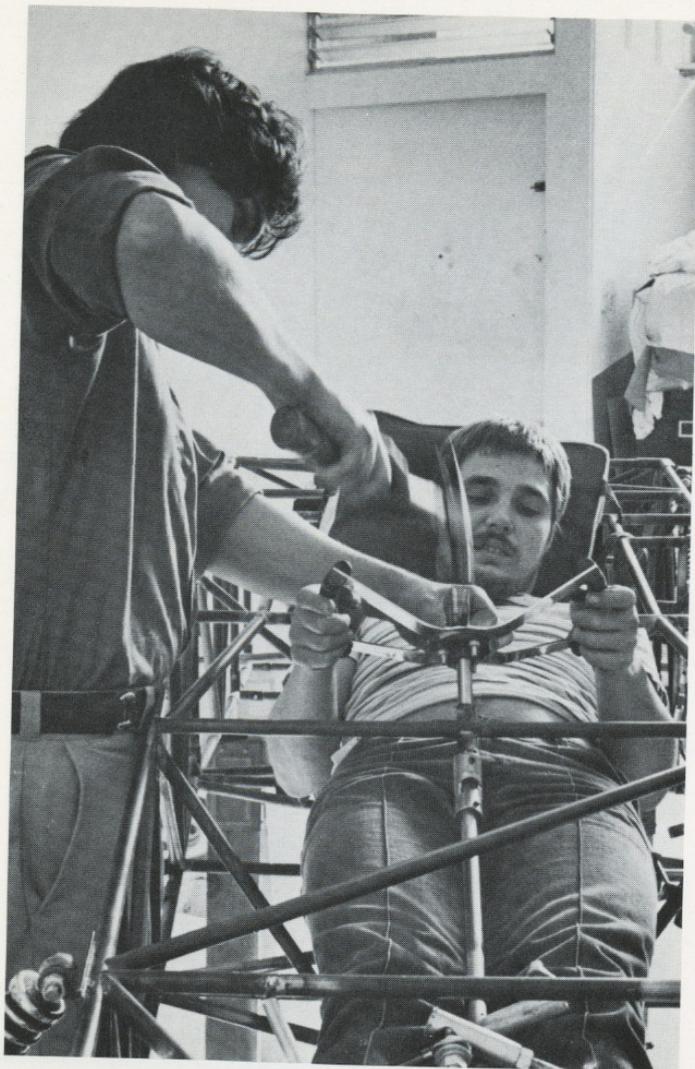
Drawn by Michael Brewster, Alexis Smith & Chris Barden for  
Chris Barden 75 (115)

Group drawing which solved the problem of the third steering  
system digging into the front suspension

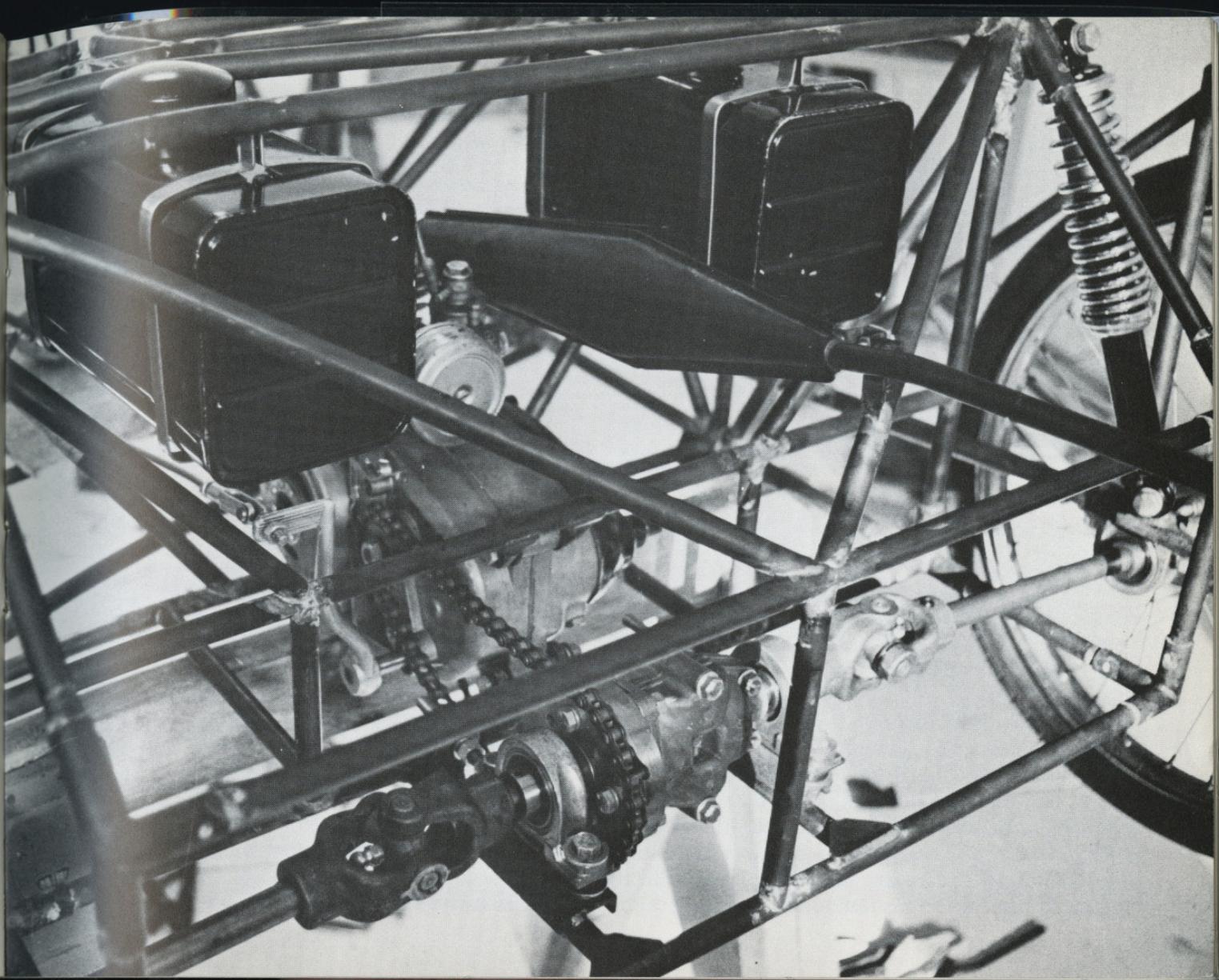
weight, that a very fundamental and relatively flimsy system would suffice. I used the same tubing for the steering column as in the frame, with no supporting bearings. There was too much torque, and the whole system proved to be inadequate.

The second solution was the same idea, but using larger, sturdier parts. But with both front wheels able to move up and down independently of one another, the rods had a tendency to interfere either with the





frame members or with my legs. The third system, modified to clear my legs and the frame, caused the front wheels to spread outwards and the car to plow into the springs, bringing it to a halt. The next idea we tried was placing the steering rods underneath the frame. This solution had none of the above problems, but had its own novel drawbacks — when you turned the steering wheel to the right, the car turned to the left. The final steering system, number five, involved the addition of a set of gears to reverse the direction of the steering, but because of time pressures was never fully tested until the car was in Europe.



Custom  
 Lights city- better  
 Battery  
 connections)?  
 - cables?  
 - gas tanks  
 - shift levers

my 6/24  
 Chris Benden 75

Sid. Speeds -  
 - Shock bolt? speeds  
 - exhaust  
 - statement of origin  
 - cables.  
 - Shift lever - racing  
 - (return shocks)  
 (get new one)  
 - Shift lever?  
 - Bigger cylinder head?

Order Tubing  
 Paula Sweet  
 Chris Benden 75 (10)

Shopping lists for parts

5	
40.00	4.56
20.00	70.92
26.00	4.41
44.00	91.60
29.00	63.69
70.00	42.56
30.00	7.50
20.00	86.85
50.00	
34.00	
31.00	
24.00	
34.00	
100.00	
118.00	
23.00	
24.00	1536.44
100.00	1281.07
15.00	255.55
22.00	
36.00	
547.00	
17.56	
707.2	
44.1	
91.60	
63.69	
42.56	
7.50	
816.9	
1281.67	

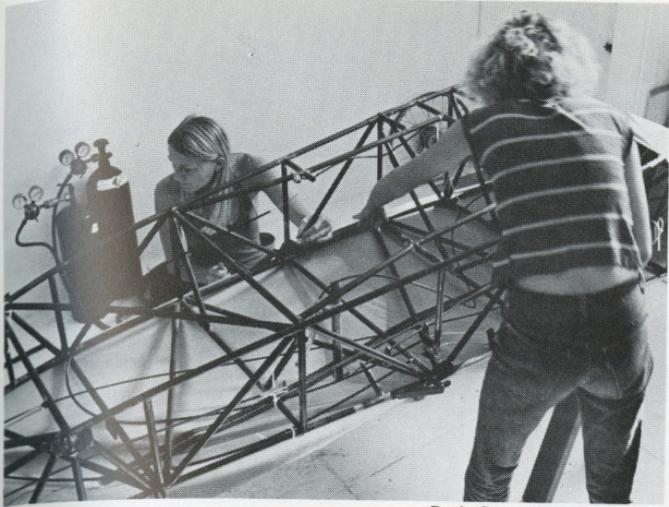
Drawn by Alexis Smith for Chris Benden  
 Chris Benden 75 (114)

Total money spent on B-Car during one week

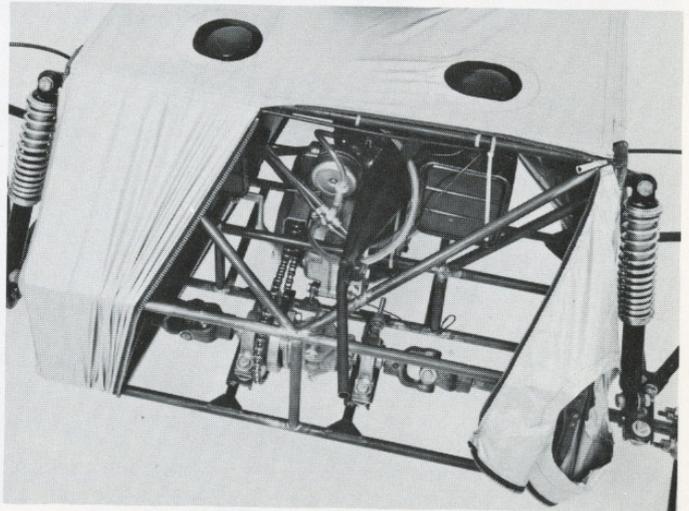
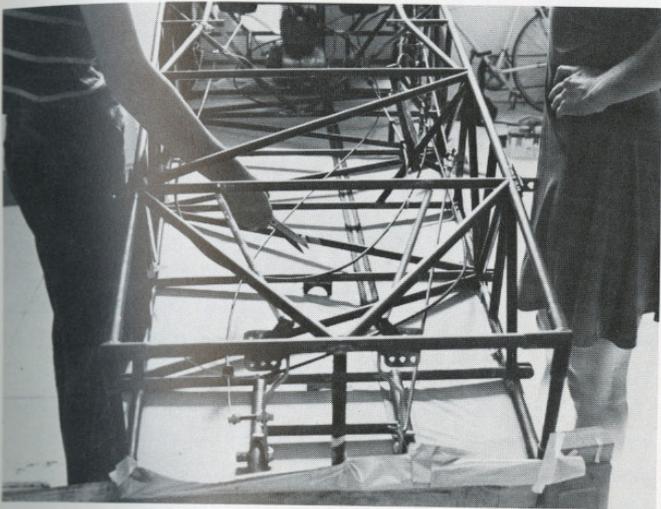
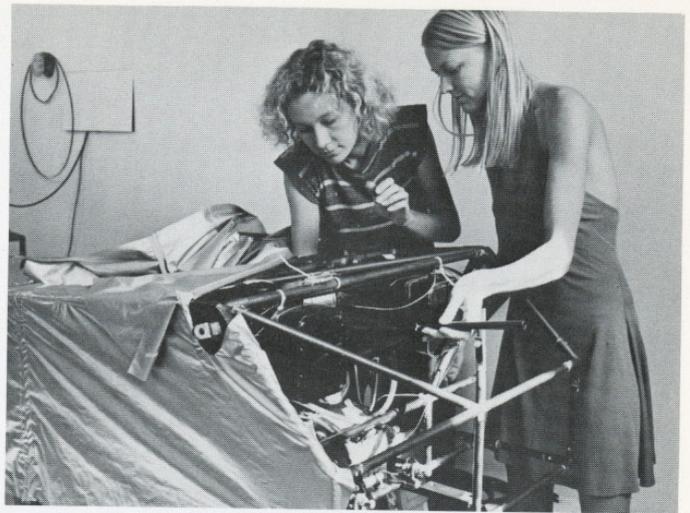
**October 9, 1975.** At this point, there was only a week left until I was scheduled to leave for Europe, and it looked like the B-Car might not be finished in time. I had four people helping me. Bob Wilhite and Frank Murphy were fabricating and hooking up the brakes, clutch, and shift; I was putting the finish- ing touches on the gas tanks, and installing the ex- engine, mounting the

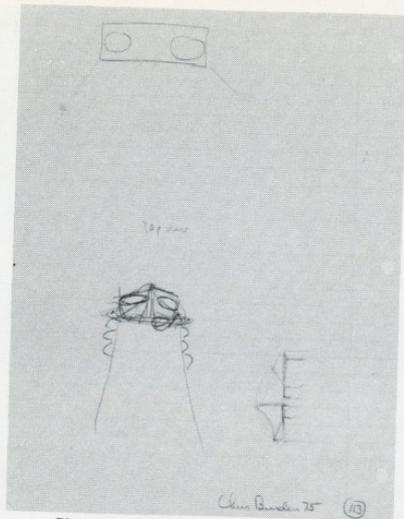
haust; Paula Sweet and Alexis Smith were fitting a flexible fabric skin of silver vinyl-coated ripstop nylon. The skin slipped on like a sock with a long zipper down the bottom center and another over the top rear for engine access.

**October 14, 1975.** To cool the air-cooled engine, which was now totally encased inside the skin, we devised a system of air scoops which fed air to the en-

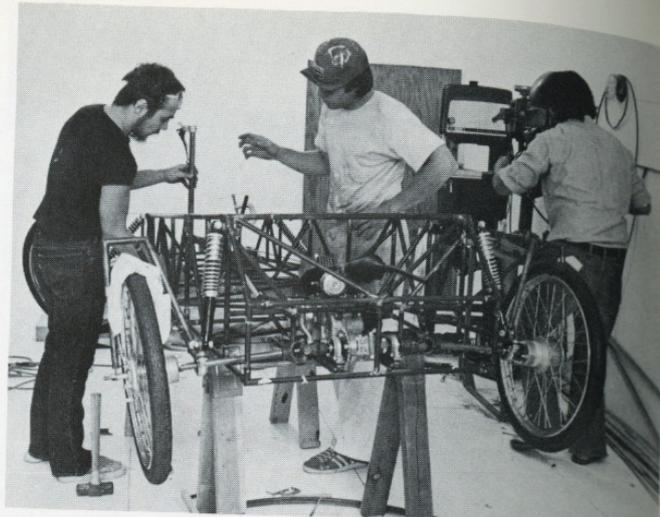


Paula Sweet and Alexis Smith

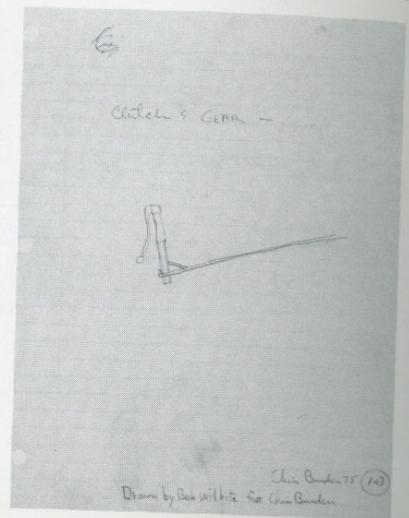
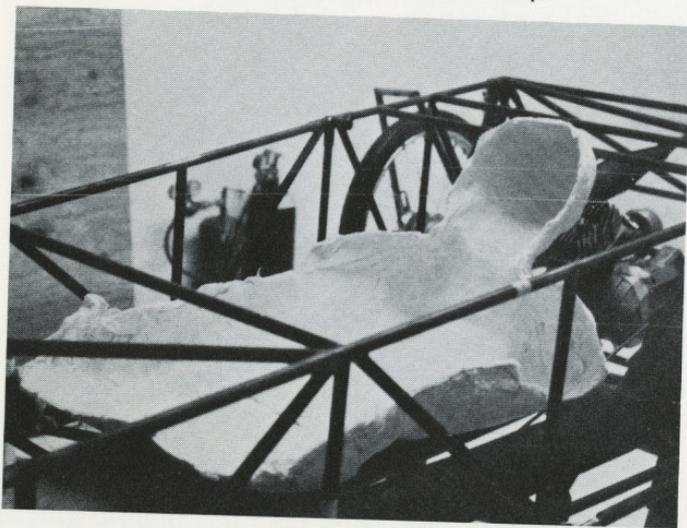




Sketches for fiberglass nose with air scoops

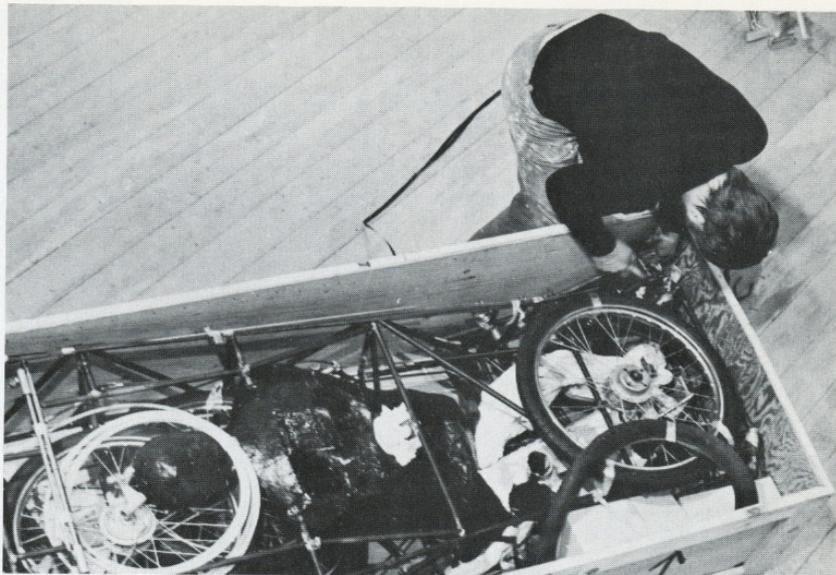


Installation of clutch and gearshift lever



Flight schedules for shipping crate to Amsterdam

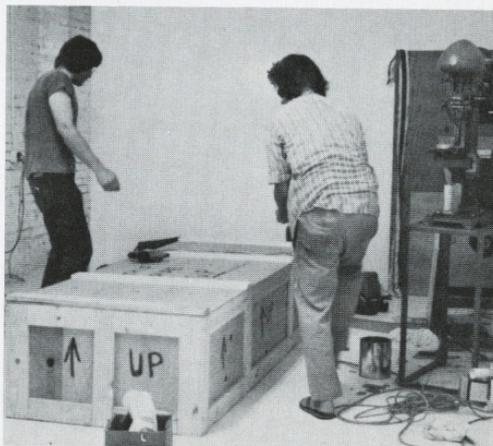
104- 8 days  
 104- 11:15 6:10  
 11:00  
 5710 Avion  
 South east Flyer  
 451- 9:05 Friday 6:35  
 205  
 609  
 4072  
 030  
 0670  
 431 415- 8:35  
 4120-10:25  
 121



Flight schedules for shipping crate to Amsterdam

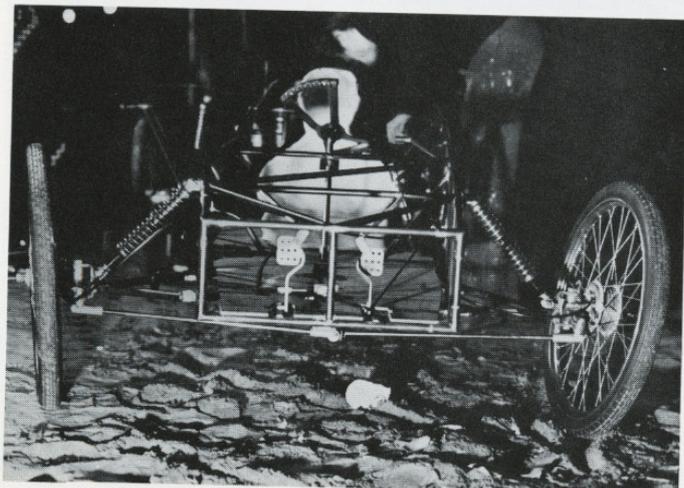
engine via flexible tubes. The scoops were part of a fiberglass nose piece which also contained the headlights; the connecting tubes were 3½" diameter aircraft surplus ducting, and ran backwards along the sides of the frame to the engine. For the seat, we made a fiberglass body cast of my body, supporting me in the radical position (almost lying down) from which I would drive the *B-Car*. Both the nose and the body cast were fiberglassed the very day the car was shipped to Amsterdam. The car was now basically complete, but there was no time left to road test it.

**October 16, 1975.** At 10:00 o'clock in the evening, the car, with the skin, suspension and wheels removed, was crated for air freighting to Amsterdam.





*B-Car* arrives in Amsterdam



Amsterdam road test



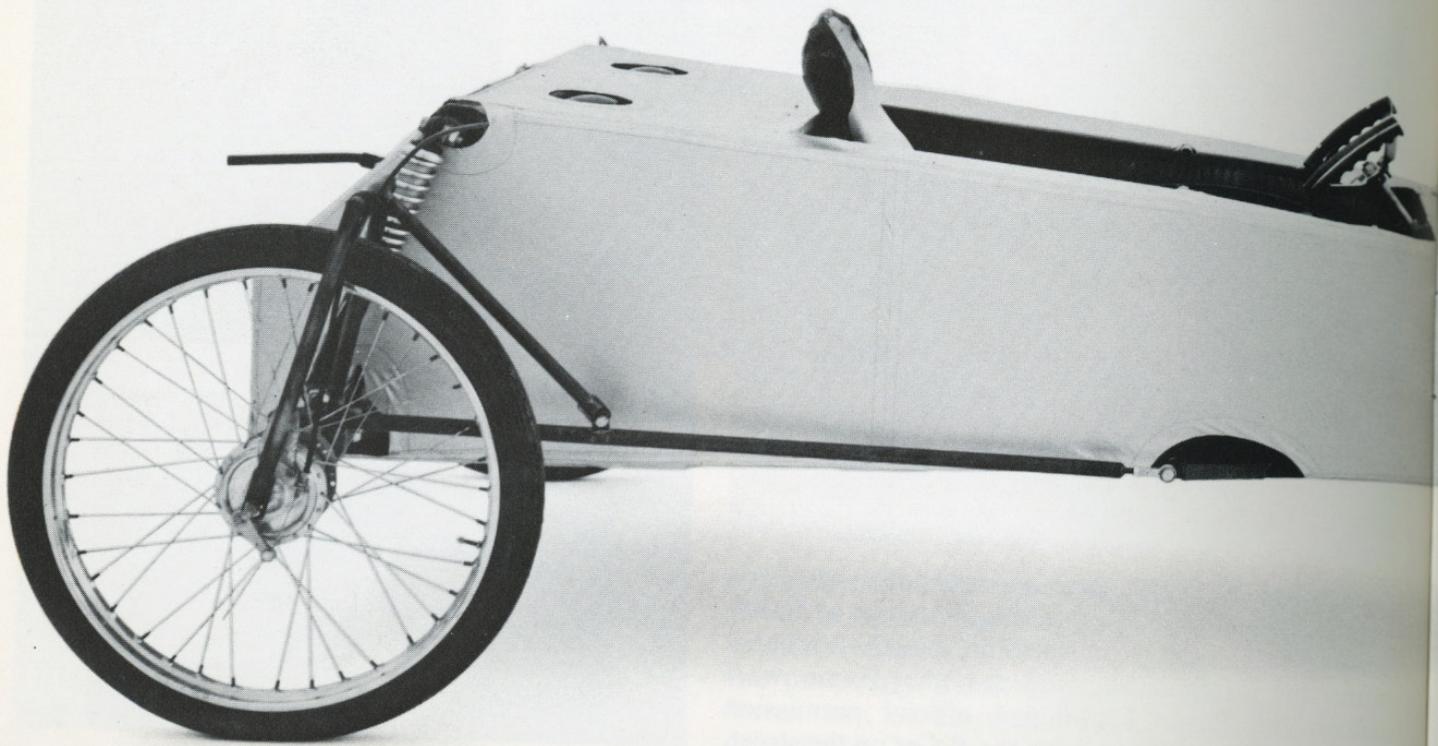
**October 19, 1975.** I uncrated and reassembled the *B-Car* in Amsterdam at the Gallery de Appel, and I was finally able to road test the finished car including the previously untested steering system. But unfortunately, no license could be obtained for me to drive the *B-Car* across the border into France.



*B-Car* arrives in Paris

**October 24, 1975.** The car was taken to Paris and displayed with the working drawings at Galerie Stadler. It arrived on schedule, exactly 2 months after the original sketches for the frame were drawn. In Paris, I obtained official permission from the Mayor to test drive the *B-Car* on the street.





Sidecar, 1914  
Designed by C. J. ...

## B-CAR Specifications

**Length:** 8' 10"

**Height:** 31"

**Weight:** 200 lbs.

**Wheelbase:** 6'  $\frac{3}{4}$ "

**Track front:** 4'

**rear:** 4'

**Minimum ground clearance:** 7  $\frac{3}{4}$ "

**Frame:** Pure space frame of 4130 chrome moly tubing, 5/8" O.D., .035 wall thickness, silver soldered and welded

**Suspension:** Independent on all four wheels

**Body:** Fabric, ripstop nylon with silver vinyl coating

**Tire:** 2" x 19"

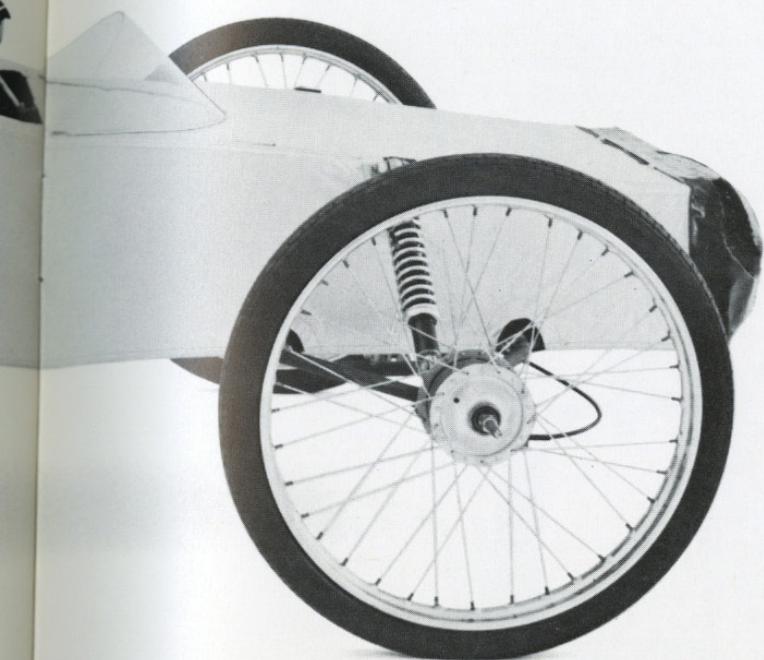
**Brakes:** 4" x 1" drum, on all four wheels, mechanically operated

**Fuel capacity:** Twin 1 gallon tanks

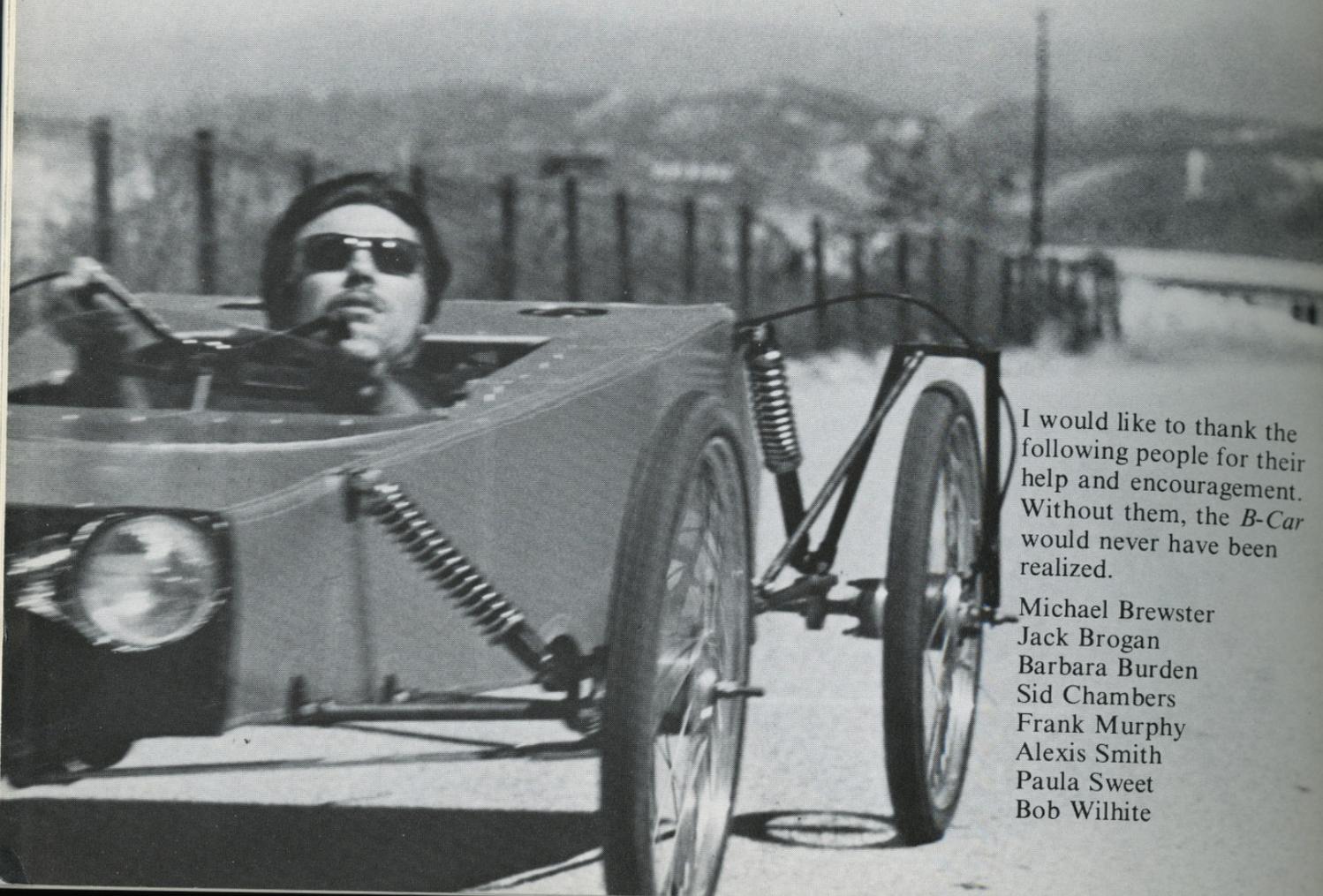
**Engine and Drive Train:** P4 Minarelli 2 stroke 50 cc. air-cooled motorcycle engine  
: 4-speed transmission, clutch, and magneto in integral case with engine

**Top Speed:** 50 m.p.h.

**Fuel Consumption:** Approximately 150 m.p.g.



Saugus, California, Road Test  
June 30, 1976



I would like to thank the following people for their help and encouragement. Without them, the *B-Car* would never have been realized.

Michael Brewster  
Jack Brogan  
Barbara Burden  
Sid Chambers  
Frank Murphy  
Alexis Smith  
Paula Sweet  
Bob Wilhite

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eir  
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S  
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ngskata  
enberg 2  
basel  
9 10

**100 M.P.H.**  
**100 M.P.G.**