The Feet First Two Wheeler

1975–1985

A general information pack written and designed by Royce Creasey

Contents

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Care has been taken to ensure the accuracy of data in this pack, but we cannot answer for the consequences of your reading it.

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Introduction

A major problem in increasing the understanding of the Feet First two-wheeler (FF) is that mainstream motorcycle magazines are reluctant to give space to the subject in the detail, and at the length it deserves. This is largely due to the negative response of some readers who feel that the magazines should concentrate on "real motorcycles" instead of something that can reasonably be described as a two-wheeled car. Classic Mechanics, Motorcycle Sport and Bike Magazine have all attracted this response to the various features they have run on the FF.

At the same time it has become clear, both from more open minded response to magazine articles, and the number of people who have contacted us directly, that there is considerable interest in this new concept.

This information pack is intended to provide a comprehensive body of FF information for such people. The general reader should find a broad explanation of the performance claims made for these vehicles and the pack will be of direct use to anyone planning construction of an FF.

The contents are devoted exclusively to FF developments of the last ten years, 1975-1985. Several interesting designs were in fact produced before 1976, notably the pre-war Sheffield-Simplex "Neracar" and the NSU record-breakers of the mid-fifties. The Quasar, which appeared in the mid-seventies, was however a clean-sheet re-appraisal of the concept and modern development history is assumed to start with that vehicle.

Since the Quasar three generations are discernable and the most recent developments show several approaches to the layout. The advantages and problems of these approaches and the solutions chosen by various constructors are noted. Some safety notes, derived from real accidents, are also included.

The next ten years seem certain to see an expansion of interest and the number of vehicles in existence. We can also expect some of the component suppliers to be replaced by new ones. With this in mind the pack has been designed to allow easy amendment and expansion, and if there is sufficient interest updates will be produced when appropriate.

Royce Creasey 1986

Technical Advantages

Introduction.

The following summary is extracted from a presentation made to German motorcycle manufacturers in 1985. For this reason it assumes understanding of two-wheeler dynamics and chiefly compares the FF with the motorcycle.

The comparison remains valid but in order to make the summary more readily understood some additions have been made which are in italics in the text.

Technical Summary.

The FF two-wheeler is defined as a single track vehicle where the rider/s sit in tandem in the same attitude and at much the same height as car passengers. A seat is provided similar, and sometimes identical, to a car seat.

There is some necessary re-location of components but the front suspension is based on automotive practice rather than bicycle tradition.
The Quasar and other first generation FFs use bicycle-type forked systems and it is certainly an easy solution. Safety and performance will however be limited.

There are several basic technical advantages in using this layout which can be readily combined to provide an overwhelming superiority over motorcycles.

This superiority extends into all areas of two-wheel performance, including safety.

The major technical advantages are as follows.

1. The FF layout substantially lowers the Centre of Gravity (CG) of the vehicle and rider/s.
Principally by lowering the rider/s. Heavy components are also placed as low as possible, underseat fuel tanks are almost universal.

This eliminates excessive weight transfer during braking and acceleration.
Because the higher the CG the greater the tendency of the total weight, acting through the CG, to topple onto the front or rear wheels during braking or acceleration.

It allows direction changes to be made faster and with less effort.
Because the CG must move through an arc as the bike banks from side to side. The higher the CG the longer the arc, and the greater the effort required to move the total weight of bike and rider/s along it in a given time.

It reduces to a safer level the unloading of wheels during fast direction changes.
Because the arc has a vertical component. The CG rises and falls as the bike is banked from side to side. The higher the CG the greater the vertical movement. If the CG is high, enough upward momentum can be given to the total weight by a fast direction change to lift the rider out of the saddle and the wheels off the ground.

It permits reasonable suspension settings and ground clearance.
The elimination of excessive weight transfer greatly simplifies the task of the suspension which only has to deal with road irregularitites.

NB. Advantage 1 relates to how well the basic two-wheeler will work.

2. The FF layout provides the rider/s with a secure and comfortable support.

This prevents entirely accidents where the rider falls off a motorcycle.
FF riders are not balanced on top of the machine. They literally cannot fall off!

It provides a secure platform for rapid and precise control corrections. *Because the riders hands do not support the rider who can thus operate the controls without fear of losing balance.*

Comfort is sufficient to eliminate fatigue and cockpit heating is easy to arrange.

NB. Advantage 2 relates to how well the vehicle can be operated.

3. The front suspension is derived from the "double-wishbone" system where the steering is suspended. *This summary originally related to a High Tech design. As noted it is possible to use motorcycle systems; advantages 1 and 2 are certainly the most important.*

Motorcycles use systems where the suspension is steered.

Suspended steering systems give lower rotational inertia and better structural stiffness. This complements the fast and precise steering movements made possible by the FF layout. *This is why steered suspension limits safety and performance. Basically motorcycle systems are vague and liable to wobble.*

In addition it may be noted that steering quality is unaffected by suspension movement or brake operation.

There are a number of secondary benefits which flow from selection of the FF layout.

4. The frontal area of an FF is smaller than that of a motorcycle. The layout also provides for lower form drag and better stability. These basic advantages can be readily enhanced using suitable bodywork without intruding on other qualities. FF Two-Wheelers are currently the worlds most fuel efficient vehicles.

5. Any bodywork fitted can provide a degree of protection against cold and wet weather at least as good as open-topped cars. Outdoor clothing is normally sufficient for FF users.

6. The basic riding position and suitable bodywork can provide very good crash protection. This adds to the already excellent controlability of the layout and promises a reduction in rider casualities that has implications for governments as well as motorcycle manufacturers.

7. The physical size of an FF can be mainly defined by the users requirements. No-one will find the seat too high and the low CG makes for easy handling and low speed control.

8. The structural requirements of the FF layout are very simple. An FF frame will be lighter and cheaper than a similar motorcycle frame for a given stiffness.

9. Any manufacturer of motorcycles and possibly cars could make an FF. No new technology is needed.

10. The enclosure of the engine and transmission in bodywork provides a convenient way of meeting incoming noise regulations with exisiting power-trains.

End of Summary.

The above hopefully makes clear the main advantages of the layout. Designers may wish to concentrate on a specific package of these advantages but should avoid applying "Well known facts" derived from motorcycles.

Once the advantages outlined above are understood and accepted designers may proceed with confidence. Our experience is that a sound basic vehicle is easy to achieve. It's the details that cause trouble...

Development History
1975-1985

Introduction.

Vehicle development is a tail-chasing excercise where each new prototype increases theoretical understanding, which in turn calls for a more advanced prototype. In normal circumstances a halt is called at some saleable point and production begins around that stage of the design.

Due to the general absence of production facilities for FF vehicles there has been no reason to halt prototype development. Additionally several constructors are experienced prototype engineers. As a result there has been considerable interest in continuing basic development. Substantial progress has been made.

It may also be appreciated that this history has the advantage of hindsight. Several early vehicles were produced without the understanding of the concept assumed here. Finally this is the authors view of the last ten years, the next ten years may well alter that view.

History.

The Quasar, designed by Malcolm Newell and Ken Leaman, and produced in Bristol, was a revelation. Although grossly heavy, equipped with a very slow gearchange and limited by massive fork-type steering, it possessed a combination of comfort and handling at speed beyond anything that could be experienced on a motorcycle.

Examination of the Quasar showed that more power would produce very high speeds, less weight would dramatically improve low speed handling and general agility, and finally reduction in cost would make the concept more accessible. These three directions have been energetically pursued, amongst general agreement that fork-type steered suspension systems are at best barely adequate.

Two Second Generation machines succeeded the Quasar. One of these, the result of collaboration between Difazio Motorcycles and the author, was an attempt to produce a lighter more agile machine. The other, from Malcolm Newell, was a direct attempt to increase power to the maximum available and used a Z1300 Kawasaki as a basis.

Both these vehicles used suspended steering systems, the Creasey/Difazio naturally ran a Difazio Centre-Hub, and the Z1300 used a similar system designed by Bob Tait for Malcolms' company Design Revolution.

The Kawasaki introduced the Phasar name and Design Revolution have produced a number of basically similar machines based on large motorcycles. Difazio Motorcycles made two machines and then withdrew from production.

These machines demonstrated that the basic advantages of the FF layout could be readily harnessed using simple techniques and available components. It was also clear that selecting a motorcycle for conversion placed limitations on the quality and effectiveness of the resulting FF.

In an attempt to further explore the idea of a balanced FF vehicle, without reference to motorcycles, two Third Generation machines have been built. One of these was designed by the author specifically for demonstration to potential manufactures. Both machines were built using components selected purely for suitability, regardless of origin, and are the smallest and most agile FFs yet built. They provide an effective demonstration of the irrelevance of most motorcycle design.

Meanwhile Design Revolution were looking for solutions to three problems encountered with their high-powered Phasars. First it was apparent that 100+BHP outputs required more weight on the rear wheel to achieve sufficient traction. Secondly aerodynamics would be improved if the seat height could be reduced - but the front engine layout requires the transmission to pass under the seat. Finally, embedding the engine in the front of the chassis makes universal frame kits difficult and increases costs.

These problems apply equally to very high performance cars and it is perhaps not suprising that a rear engine layout was chosen as a solution. This probably represents the final break with motorcycle tradition and it is interesting that NSU used a similar layout for their record-breakers. This Fourth Generation machine from Design Revolution is intended for extreme high speeds rather than utility use, but makes it clear that designers are free to fit any convienient engine in any convienient location.

The third direction of progress from the Quasar is the reduction of cost. This has proved very difficult without sacrificing the quality of execution and performance. However the BSA FF produced by John Bruce shows that provided a lightweight motorcycle is chosen, the most basic conversion to FF will still work better than the motorcycle.

More recently Design Revolution have produced a similarly basic, low-cost, conversion of a Yamaha LC250, although steering is provided by a system separate from the forks and connected directly to the wheel spindle. They have called this the "Twin Head Steer" system.

It is the authors view that such basic conversions can only be justified by their low cost and the poor performance of comparable motorcycles. However if the limitations inherent in motorcycle chassis and front suspension can be accepted this is certainly the easiest and cheapest route to an FF.

It is clear from study of the FFs built to date that providing the first three advantages are incorporated, and combined with a reasonably stiff chassis, very good performance will result. Apart from exploration of the lightweight end of the concept and developing racing and off-road versions, major improvments will now result principally from attention to ergonomic design and the development of better components.

Solutions to Common Constructional Problems

Introduction.

It is assumed here that a potential constructor has reached the point of a basic layout drawing. Several points on that drawing will have been defined by the physical dimensions of the engine, suspension and wheels. Overall dimensions will have been defined by the size and number of people the machine is to carry.

At this point various basic problems are apparent to do with unfamiliar component relationships and the need for some new systems. This sheet covers the most common problems and details solutions chosen by various constructors.

You should not be suprised that I favour my own solutions over most others, but designers should make their own choice according to their specific requirements and individual judgement.

Front Suspension/Steering.

If a suspended steering system is required the choice at the moment is somewhat limited, there being only two double-wishbone systems available. The Difazio system is the lightest and its wire wheel allows experimentation, but steering lock is limited to approximatly 20 degrees a side. The Design Revolution unit is a tidier, more modern unit with sufficient steering lock, but it is designed principally for heavyweight machines.

It should be borne in mind that over 150 Difazio units have been produced for motorcycle use. These can often be found by classified adverts and should not cost more than half the new price.

There is likely to be an expansion of interest in suspended steering systems due to interest from both FF and motorcycle constructors. I understand that Design Revolution are working on a new lightweight design, and they are unlikely to be alone.

If a motorcycle front end is used it should be made as stiff as possible by fitting a brace and shortening the fork legs. Rotational inertia can be reduced somewhat by removing lights and mudguards from the steered assembly.

/Steering.

Once a front end is chosen it will be seen that there is a gap between it and the riders hands. There is a need for a connective system.

Both the Difazio and Design Revolution systems use steering arms and drag links to connect the steering to the chassis and it is easy to duplicate this system and fit another steering arm under the hand control.

Difazio uses twin drag links, making the system into a couple. This reduces loads on the mountings and increases steering stiffness. It also requires a large number of ball joints which are prone to stiction. Sticky steering causes the bike to do a slow roll from side to side at 20-30mph.

Design Revolution use a larger and stronger single drag link. Single drag links use less ball joints but require stiffer mounting for the steering arm pivots and do not fail-safe.

The High Tech design reduces the number of ball joints to the minimum by using a steering column. A universal joint is fitted to the front steering arms, permitting an ergonomic axis for the steering control. This system takes up the minimum space.

Transmission (front engine).

Chain drive systems will require some extension of the chain run. This has been successfully achieved simply by using a very long chain run. Some designs additionally fit an idler to control the slack run. Such units are common on motocross motorcycles.

Apart from the question of reliability posed by very long chain runs, such systems take up a lot of space when full rear suspension movement is allowed for and this basic solution can be improved.

The Third Generation Velocette FF, built by Graham Fryer of Bristol, takes advantage of the separate Velocette gearbox and moves that unit to the rear. This provides for extension of the constant tension primary chain. This system works well but takes up much of the space available under the seat.

The High Tech design uses two constant tension chains running on a double sprocket unit rotating on the swing-arm spindle. The unit mounts a cam to drive the mechanical fuel pump. This system also works well, promising low maintenance and good chain life. It uses the minimum space under the seat.

Shaft Drive.

Shaft drive systems will also need extending and some care is required. The easy solution is to take a standard shaft, fitted with a universal joint, and extend its nose a suitable amount using round bar. This extension must be supported in a bearing housing.

If the housing, or the frame it is attatched to, flex at all the front shaft connection will run out of line and wear rapidly. There may also be heavy vibration. The Creasey/Difazio initially suffered from this problem which was cured by fitting a universal joint at both ends of the shaft extension and supporting it in two bearings.

Shaft drive loadings can be dangerous if the shaft is not properly aligned or controlled. It takes rather more than a chain guard to stop a flailing shaft. Engineering work, especially welding, should be to professional standards.

Fuel System.

A low-mounted fuel tank will require some system for carrying fuel up to the carburettor. A car system, where a pump delivers direct will flood the carburettor, no motorcycle units so far tried can take car pump output pressure without at least running rich.

The popular solution is to use an SU float chamber, which can be readily separated from the carburettor. This can take pump output pressure and deliver fuel at gravity to the motorcycle carburettor.

The High Tech design uses a mechanical pump which stops when the bike is at a standstill. To allow for this the top of the SU chamber, containing the float-valve, is fitted into a small header tank which supplies the carburettor through a tap.

The Creasey/Difazio has recently taken the logical step of fitting a complete SU carburettor and this excellent unit may be used on any multi-cylinder engine.

Float-valves fail occasionally and an overflow line, back to the tank or overboard, should be an integral part of the design.

There is a choice between mechanical and electrical fuel pumps. The AC Delco mechanical unit is the cheapest, lightest and most reliable, but can only be used if there is a suitable drive. The SU electrical pump comes in two versions, a 'long suck-short blow' unit for mounting above fuel level, and a 'short suck-long blow' unit for mounting below fuel level. It is important to use the right type.

Seat.

The seat is the most important part of the vehicle and correct design is a complex matter. Fortunately all this has been done over the decades by car designers whose products reach a standard of performance and finish unlikely to be achieved by individuals.

Solutions to Common Constructional Problems.
Contimued from previous sheet.

Lumbar Support and Rake adjustments are available and very useful, as is an ability to tip the seat back forwards. Large machines may also make use of the seat 'fore and aft' adjustment. Seat controls should be on the left hand side of the vehicle.

Car seat bases are not immediately suitable and a new base is normally needed. This may copy the original car design or use motorcycle techniques. Car-type, fully sprung, seat bases provide excellent comfort and support.

Units from Volvo, BMW and SAAB are especially impressive and a seat should be selected which has a head retraint suitable for use as a handle to hold the bike at a standstill.

Bodywork.

The actual production of bodywork will involve the working of GRP and plastic foam materials. Although the techniques are simple, and adequate skill can be aquired quickly, these materials are notably toxic. Careful consideration should be given to the hazards and suitable protection used.

It should be noted that Design Revolution have been involved in virtually all the FF bodywork produced so far. It is possible that they, or a similar specialist will carry out GRP work to customer order.

From the design point of view there are aerodynamic effects which are very important at high speed. It is essential for stability that the centre of air pressure (CP) is behind the centre of gravity(CG), in both cases including the rider/s. In general a shape which is flat and without side area at the front, and virtually all side at the rear will work fine. This is the classic 'Toothpaste Tube' shape.

Care must be taken to minimise lift, although it is not advisable to provide large downloads which can easily upset stability in turbulent air. Stability is assisted if any download effects are provided by the body underside rather than its upper surfaces.

The definitive aerodynamic shape for this new vehicle type is currently unknown. No wind tunnel time has yet been aquired and present knowledge is based on observation, experiment and the application of basic aerodynamic theory. However it is clear that a clean shape with minimal download and sufficient rear fin area will be stable and vice-free.

It should also be appreciated that any FF will work perfectly satisfactorily as a vehicle with no bodywork at all (but will you?).

Conclusion.

All the solutions detailed here are being run on FFs right now. None of them are particularly ingenious or difficult to embody. Most involve the use of cheap and plentiful parts from the automotive world.

It will be a great help to appreciate how good automotive parts are. For example the ball joints used on racing cars and performance motorcycles cost at least £15 each and are vulnerable to water and dirt. Car ball joints, which are sealed and have more movement available, usually cost less than £5 per pair.

Nearly all solutions and the necessary components can be found in car scrapyards. Any FF vehicle constructor or designer should spend time studying in such places.

Further Reading.

Articles concerning FFs published by the motorcycle press

This list represents a wide diversity of articles, from the entirely subjective to the relatively technical, which provide interesting backbound to the last ten years. The road tests in particular are instructive in that they are almost all first impressions of an FF. The need for attention to ergonomic factors is clear.

Subject.	**Magazine.**	**Date.**
Quasar Road Test	Bike	June 1977
Quasar, Isle of Man	Bike	August 1977
Creasey/Difazio, Road Test	Bike	May 1981
" Isle of Man	Bike	September 1981
" General	Motorcycle Sport	March 1983
"	"	August 1984
"	"	January 1985
"	"	July 1985
"	On Your Bike (published by Michael Cavendish)	Part No. 21
"	Insight Magazine (Published by M..chael Cavendish)	Part No. 58
Z1300 Phasar, General.	Motorcycle Weekly	7th. June 1981
BSA FF, General	Classic Mechanics	Summer 1985
Velocette FF, General	"	Summer 1984
Ducati FF, Road Test	"	Autumn 1985
"	Motorcycle Sport	January 1986
Ducati FF, General	Motorrad (German)	December 1985
High Tech FF, Series	Bike	August 1979 to March 1980 inc.
Suspension/Steering, series	Classic Mechanics	Spring,Summer, Autumn 1985
Building a Special, series	"	Dec/Jan,Feb/Mar and Apr/May 1986
Editorial	Motorcycle Sport	December 1985

List of Component Suppliers

This list does not attempt to be exhaustive but concentrates on those suppliers who are easy to find locally or who are sole suppliers of useful parts.

Dunlop Ltd. Polymer Engineering Division Evington Valley Leicester LE5 5LY	Metalastic bushes for rubber mounts, suspension pivots etc.
Trist Draper Ltd. 816-818 Bath Road Bristol (See yellow pages for local branch)	Aeroquip fluid line components 'O' clips, Dowty Seals and other fluid line equipment. Recommended.
Quinton Hazell Partco Europe (Bristol 12 Avonside Ind.Est. Feeder Road, Local Branch,) (See your Yellow Pages for local branch)	Very cheap automotive parts.
Edmunds Walker Argyle House Joel St. Northwood Hills Middlesex (See your yellow pages for local branch)	Automotive parts, repair kits commercial vehicle parts.
Strand Glassfibre Ltd. Williams Way Wollaston Northamptonshire (See your yellow pages for local branch)	GRP products, Polyurethane foam, tools and protective clothing.
AP Autela P.O. Box 45 Beaumont Road Banbury Oxon (See your yeloow pages for local branch)	Brake line components, good for obscure and obsolete fittings.
Hardy Spicer Ltd. GKN Driveline Chester Road Erdington Birmingham (See your yellow pages for local branch)	Universal joints for power and steering systems.
Renolds Ltd. 505 Garrets Green Lane Birmingham	Sprockets to order.

Rod Ends & Spherical Bearings Ltd. Spar House 15-17 Worple Road Wimbledon London	And also weatherproof seals for these items.
Difazio Motorcycles St. Catherines St. Frome Somerset	Centre-Hub steering systems, and rebuilds on existing systems.
Design Revolution Field Cottage Heddington Nr. Calne Wilts	Complete FF two-wheelers to order. Various front suspension and steering systems, GRP work and vehicle finishing.
AP Racing Automotive Products Ltd. Leamington Spa Warwickshire	AP Motorcycle brake equipment. Good advice, excellent equipment.
Avon Tyres Bath Road Melksham Wilts	Good understanding of FF tyre requirements due to involvment since 1976 when Quasar used the first Avon tubeless tyres.

Individuals living away from large towns may find they have no local branch of some of the large companies listed above. A letter to head office will reveal their nearest branch, or they may deal with you direct. Apart from your local scrapyards you will find many smaller suppliers of automotive parts and services in your locality by studying Yellow Pages and asking in local garages.

Safety Notes
for Constructors and Designers

Introduction.

These notes are offered for guidance only. Although based on real accident experience those accidents do not necessarily represent the most common or the most dangerous accidents road vehicles may suffer. It is the responsibility of the designers, constructors and users of specific road vehicles to ensure an adequate standard of safety.

Attention to the points noted here may however help avoid recurrance of some specific accidents and injuries. Any significant information which comes to light as a result of continuing development will be included in updates of these safety notes.

Foot and leg space.

The vehicle should be shaped so that no part of the rider/s touch the ground when the machine is laid on its side. In particular the riders legs should not be trapped if the vehicle falls over at a standstill, when the riders legs are normally alongside the machine and there must be enough room to place the feet on the ground when the machine is in the narrowest gap it will enter.

Visibility with a roof.

The Quasars and one of the Z1300 Phasars are the only FFs so far fitted with a roof and this feature may dissappear. Fitting a roof tends to obscure vision, especially when turning into ascending corners. The leading edge of the roof should be as far back as possible.

The pillars supporting a roof also obscure vision and at moderate angles of lean pedestrians and narrow objects may be obscured. This problem is minimised by ensuring that the pillars are narrower than the distance between the riders eyes.

Suspension.

Accidents have occured when motorcyclists have not realised that the FF they are developing has over-hard front suspension. It is not easy to evaluate the front suspension whilst riding an FF and it can be traumatic if the front wheel bounces off the ground at the wrong moment.

Visually inspect the front suspension at normal loads to ensure that it is substantially depressed. It is much better to begin with suspension that is too soft rather than too hard.

Fire Risk.

Enclosing a motorcycle engine in plastic bodywork and fitting a relatively complex fuel system inevitably increases the risk of fire. This can be minimised by attention to the collection and drainage of overflows, spillage and venting. It is also sensible to locate fuel system components well away from hot parts. Attention should be given to the consequences of any fuel system failure.

Features of post-crash performance.

As the rider/s stay with the machine after an accident the performance of the vehicle during this phase is of interest. Good design will provide considerable protection and raises the possibility of recovering the vehicle from the horizontal.

Slide.

The best protection is obtained if the vehicle takes up a stable keel-first attitude during a slide on one side. In particular a situation should be avoided where the front of the vehicle falls away into the slide. The vehicle may then continue to rotate until it is top-first and the riders will be the first to encounter any obstacle.

This nose dive can be avoided if the rear wheel is lifted by grounding at the same time, or just before, the front wheel. A keel-first attitude will be maintained if the ground contact points are well to the front and rear of the vehicle. The CG of the machine and riders should be approximately central between those points.

If the contact points are strong enough, friction material fitted to them will usefully reduce the duration of the slide and may cause the vehicle to roll back towards the upright attitude. If the wheels can be made to re-contact the ground this way there is general agreement that a full recovery to upright is possible.

Impact.

Most slides have been terminated by collisions with the road side or other vehicles. In a keel-first attitude it is the keel which will suffer the impact and most damage. Although the concentration of machinery and structural elements in this area will minimise damage the location of the fuel tank here renders it vulnerable. Design should allow for protection of exposed parts of the fuel tank. Anti-spill features should be incorporated in the tank design and electrical power sources should be at least fused.

Cockpit design.

The safety requirements of the cockpit are similar to those of a car. Sharp protrusions should be avoided and the steering should not impale the rider. Rider space should be maintained to the point of chassis collapse. The rider technique of 'putting your head down and holding tight' works well and provision for this tucked-in defensive attitude should be incorporated in the cockpit design.

Vehicle Data Sheet

Name

Quasar

Built (date)
1975-1981

By

Quasar
Motorcycles Ltd.
(Not trading)
Romarsh
Electronics Ltd.
(Not trading)

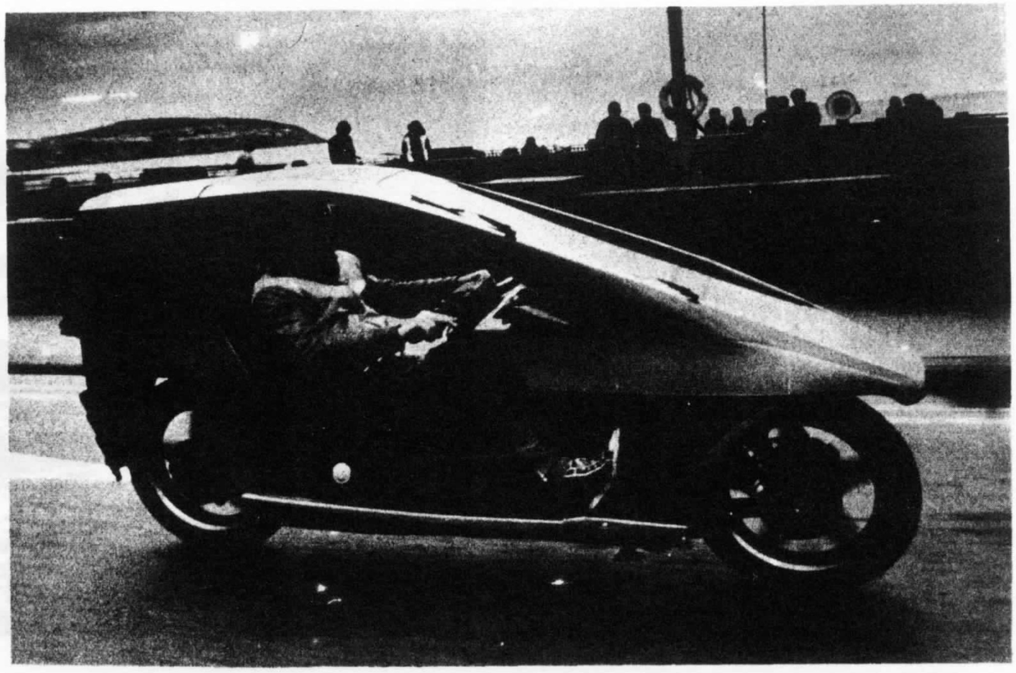

Photo by Bike Magazine 1978

Specification

Chassis
Steel tube 'peripheral frame'
F. Suspension
'Earls Fork'

R. Suspension
Swing-arm
Engine
850cc Reliant
Transmission
Reliant with special
final drive unit
Brakes
3 10"AP discs
Tyres F. 4.25x18
R. 4.25x18
Fuel System
Standard Reliant system
Tank Capacity 3 gallons
Lights
2x5"Cibie headlights
Special rearlight
Bodywork
GRP mouldings

Dimensions

Wheelbase	77"
Overall Width	28"
Overall Length	101"
Seat Height	18"
Weight	680lbs
Passenger?	Yes

Claimed Performance

Av. Fuel Consumption	65mpg
Cruising Speed	100mph
Top Speed	100mph

Road Tests

Magazine	Date
Bike Magazine	June 1977

Replicas available

No longer available

History and comment

11 vehicles were made by Quasar Motorcycles Ltd, including 5 prototypes which survived to become customer machines under various circumstances. Romarsh built a further 10 machines before their parent company ceased trading.

These machines have proved virtually indestructable and we can expect to see them for many years.

Vehicle Data Sheet

Name
GPZ Rear-Engine FF
"Sports Quasar"

Built (date)
1986

By
Design Revolution Ltd.
Field Cottage
Heddington
Nr. Calne
Wilts.

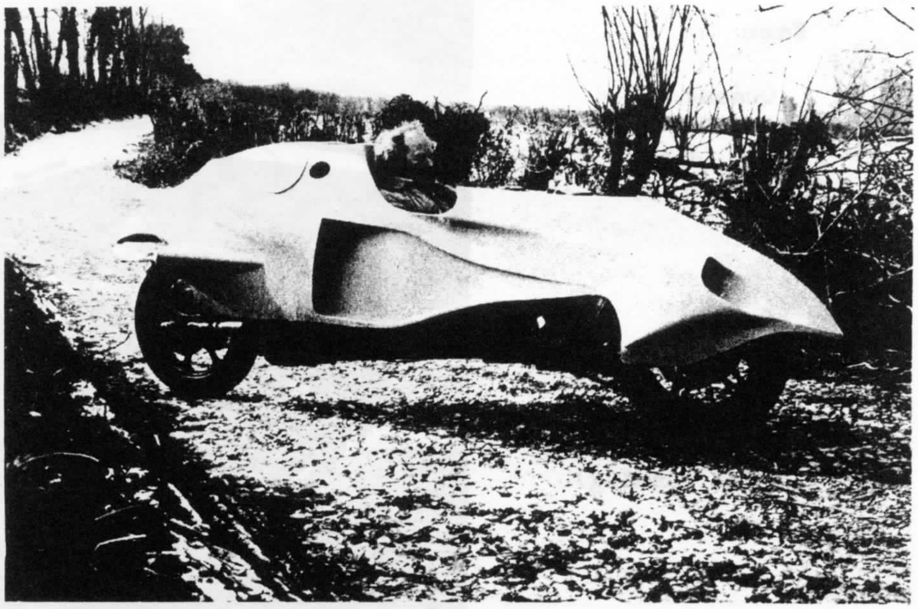

Photo by Royce Creasey 1986

Specification

Chassis
Steel Tube

F. Suspension
Design Revolution
centre-hub

R. Suspension
Swing-arm

Engine
Kawasaki GPZ1100

Transmission
Std. Kawasaki

Brakes
2 AP calipers at front.

Tyres F 4.50x18
R. 4.50x18

Fuel System
Std. Kawasaki
Tank Capacity 6 gallons

Lights
2x5" Cibie headlights
Motorcycle rearlight

Bodywork
GRP mouldings

Dimensions

Wheelbase	88"
Overall Width	28"
Overall Length	128"
Seat Height	8"
Passenger?	No

Claimed Performance

Av. Fuel Consumption	25mpg
Cruising Speed	150mph
Top Speed	not discovered

Road Tests

Magazine	Date
None by March 1986	

Replicas available

Yes

£4,000+motorcycle
9 months delivery

History and comment

First of type (since NSU)
Intended to be worlds first 200mph road two-wheeler.

Will be first of series of rear-engined Quasar Sports, and there will probably be versions of this layout from other contructors.

This bike first ran in January 1986.

Name
Creasey/Difazio FF
"The Flying Banana"

Built (date)
1981

By

Difazio Motorcycles
St. Catherine St.
Frome
Somerset

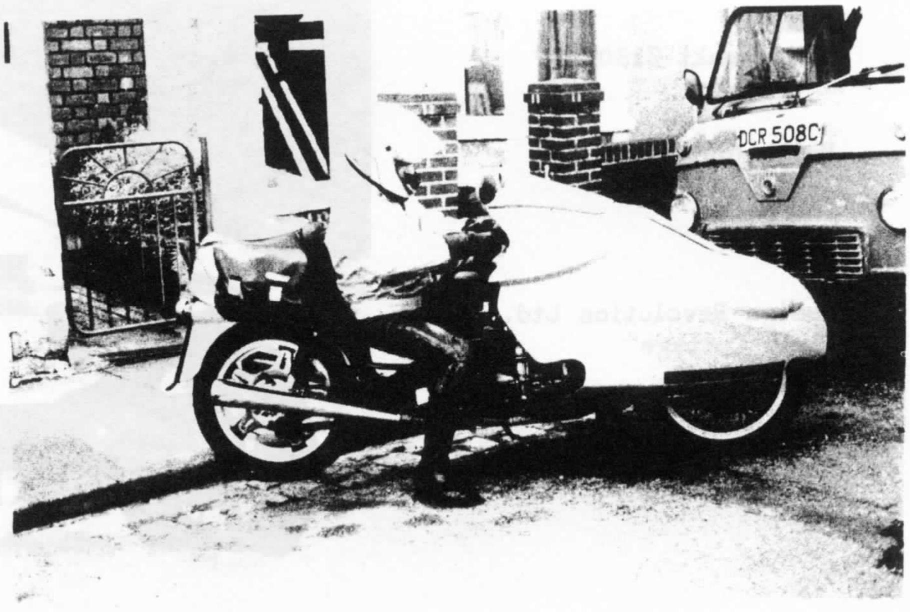

Photo by Ingrid Oesten 1981

Specification

Chassis
Heavily modified CX Honda
F. Suspension
Difazio centre-hub
R. Suspension
CX swing-arm
Engine
Honda CX500E
Transmission
Extended shaft, 2 UJs
Bearing housing
Brakes
2 10"AP discs, Honda Drum
Tyres F 4.10x18
R. 4.10x18
Fuel System
SU pump and carburettor
Tank Capacity 3 gallons
Lights
7" Cibie headlight
Motorcycle rearlight
Bodywork
Fabricated GRP sections

Dimensions

Wheelbase	67"
Overall Width	29"
Seat Height	18"
Weight	490lbs
Passenger?	Yes

Claimed Performance

Av. Fuel Consumption	45mpg
Cruising Speed	80-90mph
Top Speed	106mph

Road Tests

Magazine	Date
Bike Magazine	May 1981
Motorcycle Sport	March 1983

Replicas available

One other basically similar machine built in 1982, but Difazio does not intend to make any more.

History and comment

Built for test and evaluation and suffered a hard life being cut, shut and crashed into walls. Since being built it has been turned into a two seater and fitted with a 2 into 1 exhaust and an SU carburettor. The first of the 'lightweight' FFs with suspended steering, its performance showed that a simple and practical FF was possible.

Vehicle Data Sheet

Name
Kawasaki Z1300 FF
"Phasar"

Built (date)
1982

By

Design Revolution Ltd.
Field Cottage
Heddington
Nr. Calne
Wilts.

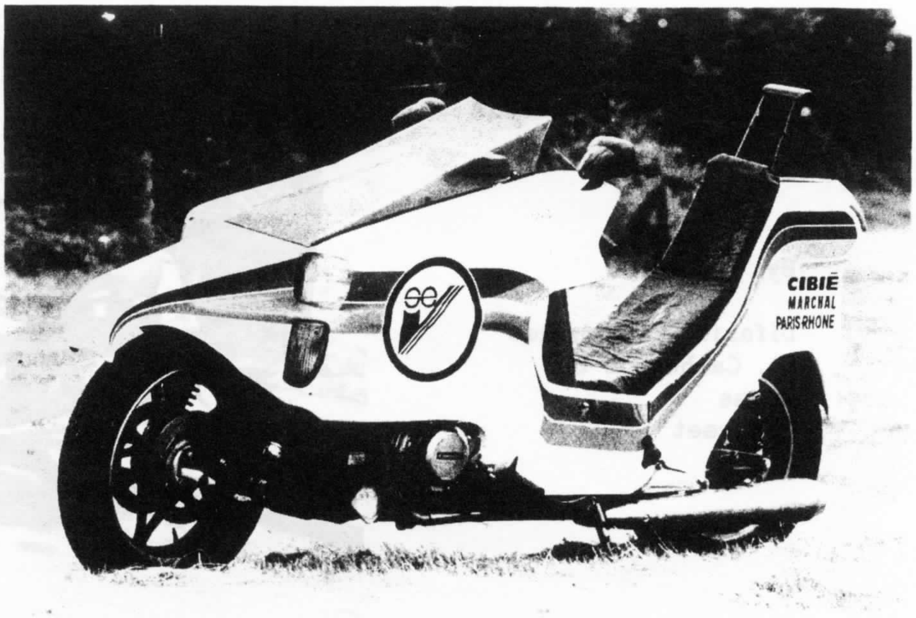

Photo by Patrick Gosling 1985

Specification
Chassis
Steel tube
F. Suspension
Design Revolution
centre-hub
R. Suspension
Swing-arm
Engine
Kawasaki Z1300
Transmission
Extended shaft with
support bearing
Brakes
AP calipers on std. discs
Tyres F 4.50x18
R. 4.50x18
Fuel System
SU pump and float chamber
Tank Capacity 8 gallons
Lights
2x5"Cibie headlights
Kawasaki rearlight
Bodywork
GRP mouldings

Dimensions

Wheelbase	68"
Overall Width	28"
Overall Length	90"
Seat Height	15"
Passenger?	No

Claimed Performance

Av. Fuel Consumption	30mpg
Cruising Speed	140mph
Top Speed (MIRA)	160.1mph

Road Tests

Magazine	Date
Motorcycle Weekly	7.June 1981

Replicas available

Yes

£2950+motorcycle.
9 months delivery

History and comment

Arriving shortly after the Creasey/Difazio this machine was Malcolms cure for normal life. In 1981 this was the highest speed recorded on a road going motorcycle.
Originally commissioned by S.E.V.Cibie and used by them for publicity purposes. Sold to a private owner in 1985.
Several similar machines have been built, based on Honda, Kawasaki and Moto Guzzi motorcycles.

Vehicle Data Sheet

Name
Velocette Venom

Built (date)
Winter 1983/4

By

Graham Fryer

Bristol

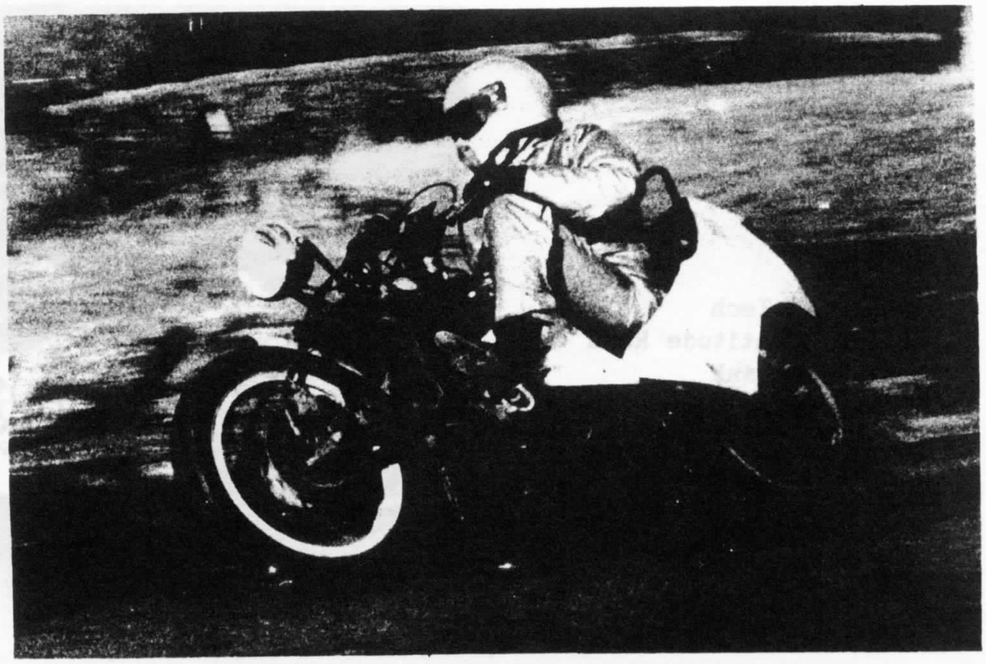

Photo by Royce Creasey 1983

Specification

Chassis
Steel square tube

F. Suspension
Difazio centre-hub

R. Suspension
Swing-arm

Engine
Velocette Venom

Transmission
Separate gearbox moved back to allow single rear chain

Brakes
3 10" AP discs

Tyres F. 4.10x18
R. 4.25x18

Fuel System
SU pump and float chamber
Tank Capacity 2 gallons

Lights
2x5"Cibie QH headlights
Motorcycle rear unit

Bodywork
Vestigal sheet GRP fabrication.

Dimensions

Wheelbase	60"
Overall Width	26"
Overall Length	86"
Seat Height	21"
Weight	374lbs
Passenger?	No

Claimed Performance

Av. Fuel Consumption	50mpg
Cruising Speed	70mph
Top Speed	95mph

Road Tests

Magazine	Date
Classic Mechanics	Summer 1984

Replicas available

NO

History and comment

Basic FF with minimal motorcycle parts. This vehicle was made for "Utility/Sports" use and is considered highly sucessful by its owner. Dimensions are very similar to the Ducati FF and these two vehicles were taken from the same layout drawing.
This clean-sheet construction took 18 months to build.

Vehicle Data Sheet

Name
Ducati 450 FF
"High Techati"

Built (date)
1985

By

High Tech
31 Gratitude Road
Greenbank
Bristol

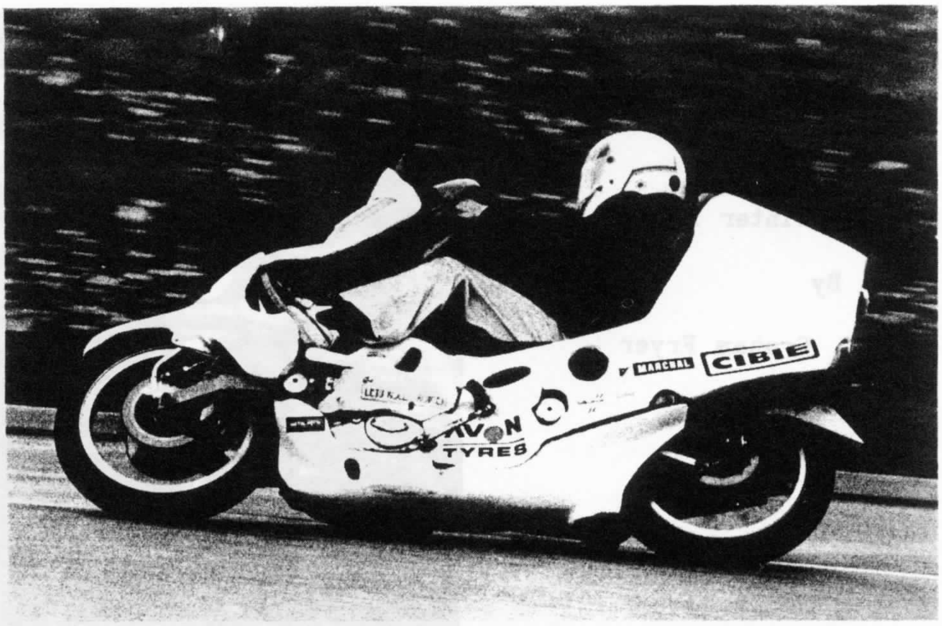

Photo by Patrick Gosling 1985

Specification

Chassis
Steel square tube

F. Suspension
Difazio centre-hub

R. Suspension
Swing-arm

Engine
Mk111 450 Ducati

Transmission
Two chains, counter-sprocket on swing-arm spindle

Brakes
3 10" AP discs

Tyres F. 3.60x18
R. 3.60x18

Fuel System
AC Delco mechanical pump
SU float in header tank
Tank Capacity 2.25gallons

Lights
2x5" Cibie headlights, the rest is Renault 5

Bodywork
Polyurethane foam sections with GRP Skin

Dimensions

Wheelbase	58.5"
Overall Width	24"
Overall Length	82.5"
Seat Height	18"
Weight	450lbs
Passenger?	Not yet

Claimed Performance

Av. Fuel Consumption	80mpg
Cruising Speed	80mph
Top Speed	95mph

Road Tests

Magazine	Date
Classic Mechanics	Autumn 1985
Motorcycle Sport	Dec. 1985

Replicas available

NO

History and comment

Designed for similar use to the Velocette FF, with the added need to be suitable for demonstration to manufacturers.
It has been shown to BMW and Krauser to date and such events are likely to continue in 1986.

This machine will also be used for bodywork development and may not retain its present appearance.

Vehicle Data Sheet

Name
Yamaha 250LC
"Twin Head Steer"

Built (date)
1985

By

Design Revolution
Field Cottage
Heddington
Nr. Calne
Wilts.

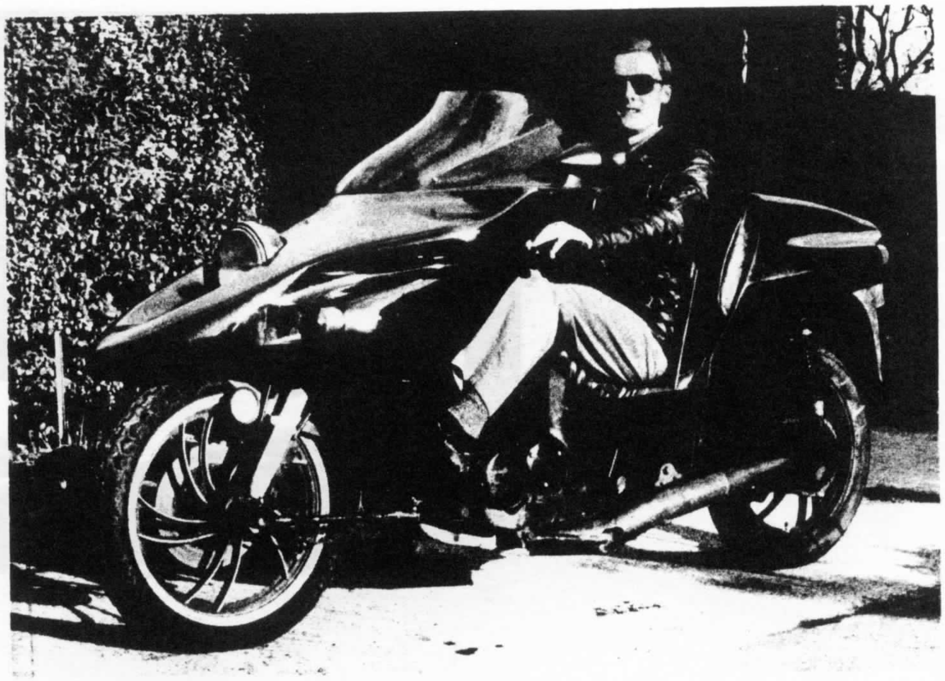

Photo by Steve Scruton 1986

Specification

Chassis
Steel tube and sheet

F. Suspension
Yamaha forks steered separately at wheel spindle

R. Suspension
Swing-arm

Engine
Standard LC250 Yamaha

Transmission
Single long chain with tensioning idler

Brakes
Standard Yamaha LC

Tyres F 3.00x18
R. 3.60x18

Fuel System
SU pump and float chamber
Tank Capacity 3.5 gallons

Lights
Standard LC

Bodywork
GRP sheet sections

Dimensions

Wheelbase	72"
Seat Height	18"
Passengers?	yes.

Claimed Performance

Av. Fuel Consumption	50mpg
Cruising Speed	80-90mph
Top Speed	112mph

Road Tests

Magazine	Date
Motor Cycle Sport	Nov.1985

Replicas available YES

Cost
£1,000-£1400 + motorcycle
Current Jan.1985.

History and comment

First of what is intended to be a range of low cost machines.

The new owner is certainly pleased with performance and there are already other examples of this layout.

Vehicle Data Sheet

Name
BSA A50 FF
"Coda"
Built (date)
1981
By

John Bruce,
Bristol

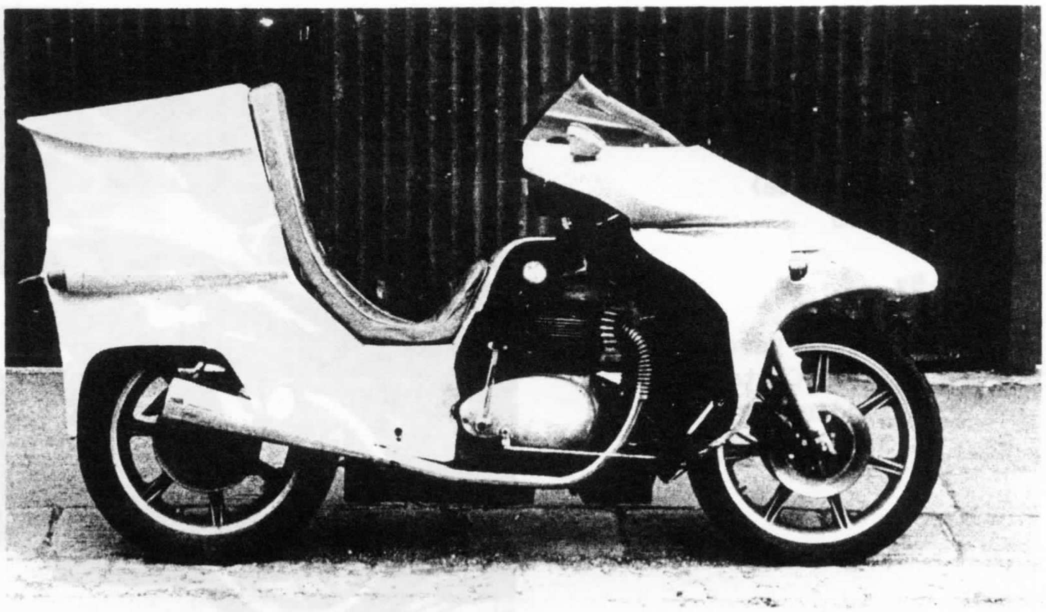

Photo by Classic Mechanics,1985

Specification

Chassis
Modified BSA frame
F. Suspension
XS750 Yamaha forks

R. Suspension
Extended swing-arm
Engine
Std. BSA A50
Transmission
Single long chain
Brakes
Yamaha discs, BSA rear drum
Tyres F. 4.10x19
R. 4.25x18
Fuel System
SU electric pump direct to
Amal Monbloc
Tank Capacity 2 gallons
Lights.
Mixture of motorcycle
light units
Bodywork
Design Revolution, ex Phasar
sections

Dimensions

Wheelbase	59"
Seat Height	19"
Weight	380lbs
Passenger?	No

Claimed Performance

Av. Fuel Consumption	55mpg
Cruising Speed	70mph
Top Speed	90mph

Road Tests

Magazine.	Date
Classic Mechanics	Summer 1985

Replicas available

NO

History and comment

At £300 and seven months to build this is the cheapest and quickest FF yet.

In general urban use for over two years now and regarded as a sucessful conversion.

The easy route to staying warm, dry and comfortable.