Article originally published in
The Moultoneer, January 2006.

Published article included some photos.
For more information and photos of the tandem, please visit:
http://www.coulouris.net/biking/moultons/APBtandem

An APB-based Tandem

Ask any tandem-riding couple for their pros and cons of tandem riding and the following will figure strongly in their answer:

- Rides are more fun because both riders arrive together instead of the common experience of many solo-riding couples:– a sequence of separate rides punctuated by waits for one rider and solitary catching up for the other.
- Decision-making is more harmonious and things seen along the way are better appreciated when they can be discussed on the move.
- Transport to the start of a ride can be a major problem: many train lines impose a ban on tandems and putting the tandem on the roof of a car is often the only option.
- Any pair of riders of average fitness should be able to ride a tandem, but the height of the top tubes can be a problem for some when mounting and dismounting and the position of the stoker on an unsuspended tandem often means they get a particularly uncomfortable ride.

We had used Moulton AMs and APBs for virtually all our cycling for more than 15 years – except on our regular and very enjoyable tandem touring holidays. After several such holidays, we concluded that our enjoyment would be greater if we could use a tandem that was more comfortable and easier to transport than our Dawes Galaxy Twin. The Moulton space-frame design and suspension in their APB form seemed to offer a very good basis for a comfortable and rigid tandem that could be separated for ease of transport, especially on the many UK train lines where conventional tandems are now banned. Other small-wheel and separable tandems such as the Bike Twosday didn't seem to offer all of these benefits.

This idea was stimulated by reports of an Australian project in the early ‘90s that had resulted in several successful tandems based on ATBs. These used a specially-constructed frame insert that fits between the two halves of the separable ATB frame. But could we do the same trick with an APB and how would the resulting bike perform and stand up to the extra stresses imposed on a tandem? These stresses were certainly a concern; we had little information to go on other than the positive reports of the Australian ATB-based tandems in use, together with the fact that the APB is very similar in structure to the ATB (with one significant difference). Both bikes were designed for off- as well as on-road use and are clearly a lot more substantial than the AM. Based on that rather limited assessment, we decided to proceed. Experience to date has justified that decision; of course we can’t predict the bike’s future reliability, but we are now happy to rely on it as our sole transport on 2-3 week tours. In the section labelled *Safety and Durability* we attempt a post-facto analysis of the potential points of failure.

After appealing on the Yahoo Moultonbicycle group for a suitable APB on which to base the project, we purchased Mark West’s early but well-maintained APB 12 at a very reasonable price in February 2005. Other list members were helpful with parts and information, one even giving us the kingpin portion from a damaged APB. Michael Kater, a Moulton dealer in Australia and the owner of one of the ATB-based tandems very kindly provided us with a set of detailed photos of its construction and these gave us our first clear idea of what the project would involve.

The next step was to find a frame builder willing to take on this unusual one-off project. After making unsuccessful approaches to several builders, John Bartlett suggested Doug Pinkerton (*aka* Pinkerton Cycle Restorations) and it proved to be an inspired suggestion.

Design

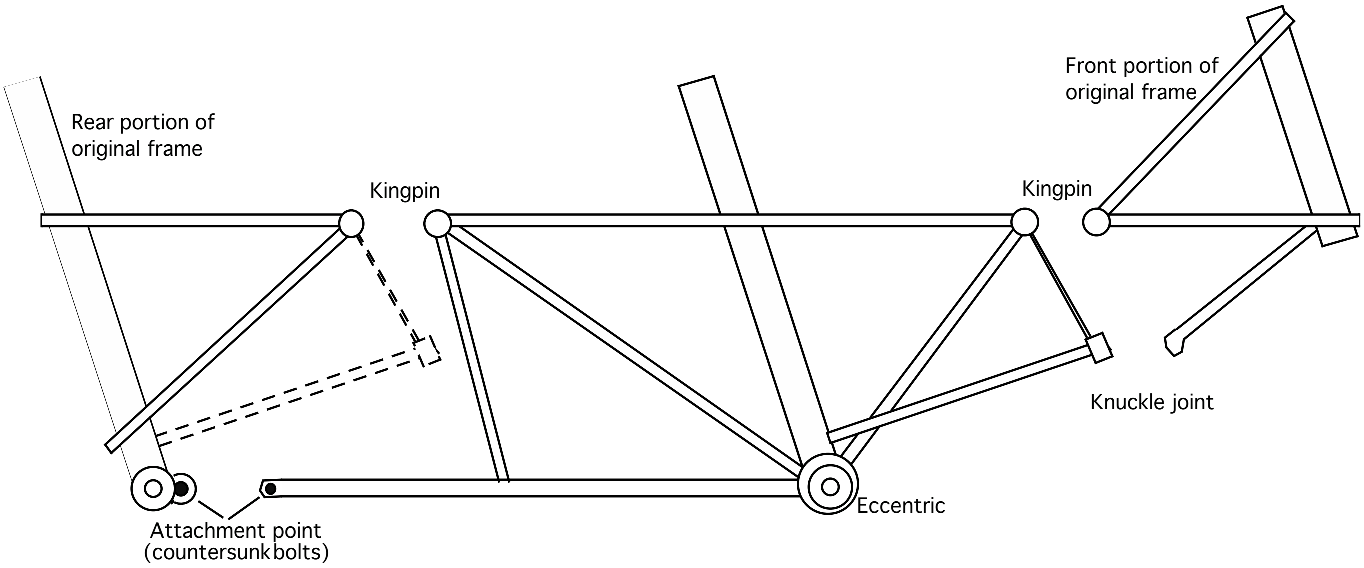
Strength, safety and comfort were our primary considerations.

Doug Pinkerton designed and constructed a very strong frame insert. All of the tubes he used in the insert are slightly larger in diameter than their counterparts on the solo frame.

We were determined to include a disk brake in the design. A third drum or disk brake is normally included in touring tandems that are intended for use in hilly terrain to reduce the heat generated in the rims, which can cause tyre blowouts. On small-wheel tandems the problem is even greater, as recent reports in the Tandem Club Journal indicate. This was achieved by mounting a cable-operated Shimano disk brake on the rear triangle and using a 36-spoke Shimano Deore disk-compatible rear hub.

For comfort, the top-tube lengths (i.e. distances between the two seat tubes and front seat to stem) are an important factor for both riders. With the insert-based design, we were free to specify these dimensions and we did so on the basis of our experience with other tandems.

The significant difference between the ATB frame and the APB frame is that the former has a single ‘downtube’ that is removed when the frame is separated whereas the latter uses a conventional Moulton knuckle joint. The drawing shows how we have handled the knuckle joint on the APB-based tandem. A consequence of this is that the bike can no longer be used as a solo. If we had wished, it might have been possible to retain the rear half of the knuckle joint and fit another on the front seat tube, but the result would have been uglier and heavier.



A schematic view of the frame when separated.
The dotted section was removed from the rear portion of the solo frame and fitted in the corresponding position on the front seat tube.

Specification

Base/donor bicycle:	Pashley Moulton APB 12 (Frame number 13).	*The early models were significantly heavier than Pashley's current products, though perhaps stronger.*
Tandem insert:	Designed and constructed by Doug Pinkerton based on photos of an Australian ATB-based example.	*The quality of Doug's work is excellent.*
Separability;	Two king-pin separation points plus two bolts attaching twin bottom tubes to rear bottom bracket.	*Separated package is approx. 100 x 90 x 45 cm (reducing to 100 x 65 x 45 cm with both seat pins removed)*
Chainset & gears:	Stronglight Escape tandem triple chainset with 30 42 54 chainrings giving ratios from 19 to 94 inches.	*The front BB is mounted in an eccentric drum in the standard tandem fashion.*
Brakes:	A Shimano 515 cable-operated disk brake is fitted at the rear in addition to the existing V-brakes. Rear disk and front V-brake are operated by the captain. Rear V-brake is operated by the stoker.	*The disk brake gives powerful and progressive braking in all conditions, rendering the rear V-brake redundant except as a back-up in case of failure.*
Suspension:	No modifications have been made to the suspension. The front suspension height is set with the leading links roughly horizontal and it has not bottomed, even on unpaved tracks.	*With riders + luggage totalling about 340 lbs, the suspension performs very well, with a similar feel to a heavily-loaded solo APB.*
Weight:	Approx 50 lbs with pedals, saddles and mudguards but without racks.	*The use of a later-model APB as the base/ donor would have reduced this.*
Cost:	Just over £1000 excluding the cost of the APB on which it is based.	
Builder:	Doug Pinkerton	*3 Well Meadow, Rednal, Birmingham B45 9NE. Phone 07778 429313*

The Build

Doug spent quite a long time working out the design for the insert, ordering material and making jigs to ensure that the insert would come out straight. But In mid-May we were able to visit Doug's workshop for a trial ride of the tandem in a 'prototype' state. This first 25 mile ride was a revelation! We were immediately happy on the bike and found it a more pleasant ride than our Dawes. Only minor tweaks, braze-ons and a powder-coat job were needed to finish the bike. Doug completed those in mid-June, just in time to get the bike set up for our planned French touring holiday.

Performance

We have used the bike on two touring holidays and covered about 1000 miles with outstanding success. We are very happy with the performance of the tandem, both for long-distance touring and for day rides. The frame seems exceptionally stiff and the small wheels, suspension and better luggage positioning result in significantly better handling than our Dawes Galaxy.

Safety and Durability

As mentioned above, we endeavoured to design the tandem for safety, but we undertook the project with no firm engineering data on potential weaknesses or safety issues. Martyn Aldis and others have suggested that it would be helpful to include a safety analysis in this article so that others considering a similar project will be aware of the assumptions we have made. The table below is an attempt to do so.

Component	**Special issues**	**Discussion/*assumptions***
Front stirrup (small fork)	Vertical forces arising from extra riders' weight.	The suspension spring does not bottom in our experience, suggesting that it and the stirrup can handle the stresses. *Little cause for concern.*
Front main fork	Braking force from V-brakes. (ATB has caliper brakes mounted higher and hence better supported). Horizontal shocks due to hitting bumps.	Use of a rear disk brake alleviates the problem. The fork is massively constructed. *Little cause for concern.*
Custom tandem frame insert	Must be constructed with tandem use in mind.	Designed to have similar strength to a conventional tandem; tubing is stronger than that used in the APB frame. *No cause for concern.*
Rear suspension monosphere	More stress and compression due to additional weight.	Needs to be monitored for damage, catastrophic failure unlikely, but *lifetime might be shortened*.
Rear suspension pivot	Additional stress.	*Lifetime might be shortened.*
Rear triangle	Additional stresses in all tubes.	No information available other than positive experience with Australian ATB tandems. *A quantitative analysis would be useful.*
Wheels & tyres	The wheels are not tandem-specific.	36-spoke 20-inch wheels should have similar strength to 48-spoke 700c's. *No cause for concern.*
	Tyre blowouts due to overheating of the rims under heavy braking have been reported on other 20-inch wheel tandems.	*This concern is removed by the inclusion of a disk brake, which we consider an essential feature.*