alpha, while recovery was very easy and entailed minimal loss of altitude.

Thus far, the MC had out-pointed its composite counterparts in every respect. However, I suspected that the plethora of rivets and also the wing struts would have a detrimental effect on the high-speed side of the speed envelope – and this proved to be the case. For any given power setting I'd say that the MC is about 10kts slower. That's not to say that its slow – more that composite airframes and cantilever wings are always going to produce less drag. A more impressive statistic in the LS's favour is that – although it only carries an extra 30 litres (30%) of fuel – it has practically twice the range. Nevertheless, the MC cruises very comfortably at 100kts, while bumping the power up to 5,000rpm (75%) gave an IAS of 105kts at 3,000ft for a fuel burn of about 16lit/hr.

After a brief stop at the Lake Placid airpark (so I could admire John's house), I headed back towards Sebring. As with other Flight Design machines, I found that the limiting speeds for the various flap settings are somewhat lower than I like, although it is not as much of an issue as with the slipperier fibreglass aircraft. Nevertheless, poor planning may still leave you with an embarrassment of speed and altitude, and no way to dissipate either except pull the power right back. Still, if you do have to make a coarse power reduction, at least you don't have to watch the CHTs, as the Rotax is liquid-cooled. However, I do think that the flap limiting speeds could be higher. For example, the Vfe with 35° of flap is 62kts, while a typical approach speed is 55kts. That's a spread of only seven knots! Flight Design is clearly aware of this limitation. Not only are the relevant speeds next to the selector, but the flap servo incorporates a load-limiting device, which automatically prevents the flaps being extended above their limiting speeds. Its operation is signified by the LED flap position indicator flashing, and then the integral over-current switch pops.

My last landing was made as the sun set, and we taxied back to Lockwood's ramp in the gathering gloom. In conclusion, I'd say the MC is a worthy addition to the Flight Design stable, and will particularly appeal to those aviators who feel that all flying machines should be made of metal. Every indication is that the Flight Design team have produced another winner.

BETTER BINNACLE

During the show John Hurst showed me an alternative instrument panel for the MC, which would be installed immediately after the show. The binnacle has been extensively redesigned, with a flatter top – I prefer it. Twin Garmin G3X PFD/MFD units have replaced the Dynons, and all the circuit breakers (except the flap's) are now in the panel to the right of the MFD. The centrally mounted avionics stack included a Garmin GNS530W GPS/Nav/Com unit, a GMA 240 audio panel and a GTX 330 transponder. The two large warning lights had been moved to the left side of the panel (above the PFD), but were still for the engine and alternator, not 'Master Warn' and 'Master Caution'. And the knobs for the carb heat and cabin heat were still the same shape, size and colour! However, Flight Design is a very pro-active company, and both Tim and Flight Design's Managing Director Matthias Betsch had emphasised that the machine I was testing was not a production aircraft. Consequently, just as we were going to press, Tim and Matthias emailed me to confirm that the circular carb heat knob would be changed to a rectangular shape, and that the instrument binnacle would be raised slightly.

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METAL MASTERPIECE!

Dave Unwin tests Flight Design's newest aircraft - the MC

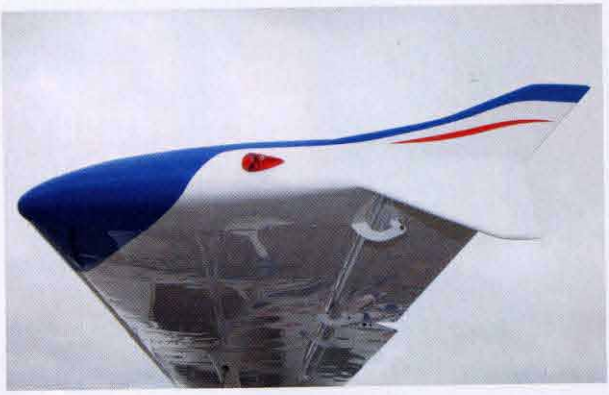
Just as I turned final, the tower reported the surface wind as "270 at 18, gusting 22!" As I was lining up with runway 18 this gave us a pretty good crosswind component, so the next couple of minutes could prove to be quite testing for any aircraft in the Light Sport category!

The first LSA I ever flew was a Flight Design machine – a CT-SW. I liked it a lot, but did think that it was a bit sensitive in pitch, and that the all composite construction could possibly alienate some sectors of the US market. Flight Design addressed my pitch stability concerns with the LS, and the composite question with its latest creation – the all-metal MC

The test aircraft had a three-blade fixed pitch composite propeller, turned by a100hp Rotax 912S. The undercarriage is of the tricycle type, and consists of three closely-spatted wheels, which are all the same size. All Duncan Cubitt

(Metal Concept). During my recent visit to the LSA Expo at Sebring, Florida, I met up Flight Design's Chief Engineer for flight test Tim-Peter Voß at Lockwood Aviation. I was eager to evaluate this very new machine (the test aircraft was S/N 0002) but the weather was distinctly unseasonable, with a strong, blustery wind and a very low cloud base. Flying was clearly not an option, so while we waited for things to improve we sat in the cockpit (to get out of the weather!) and Tim showed me round the instruments and controls. Anyone who has flown a CT-SW or -LS would feel immediately at home in the MC. Even ingress and egress are of the same high standard, as the struts are behind the big gull wing doors and the sills low. The doors are held open by gas struts and locked closed by a single lever. This actuates three locking pins, which ensures that the door is kept firmly shut with a positive seal. As there are no external handles, the door can only be opened by reaching through the DV panel, and I did wonder whether this is a good idea in an aircraft that is aimed primarily at the training market.

Probably the most notable aspect of the cockpit is its size. At the widest point the width is an amazing 1.31m- considerably wider than some four-seaters! Flight Design state that it can comfortably accommodate pilots ranging between 1.55 to 2.0 metres (5ft 1 to 6ft 6 in old money) - an impressive claim. This perception of a very roomy cockpit is enhanced by the big, tinted windscreen, generous skylight, doors that are about 50% Perspex and windows in the aft fuselage. The overall effect of having so many transparencies is to create a very airy,



well-lit cockpit. As mentioned earlier the pedals are fixed, but I found that the stick, throttle and all the secondary controls fell nicely to hand. The tall sticks feature a slight crank towards the top, and carry the PTT and autopilot disconnect buttons. However, these are slightly confusing as the PTT button is red, and looks more like the autopilot disconnect, while the autopilot disconnect is white and looks more like a PTT. Another ergonomic aberration - and one that I've complained about in the past - is that the co-located carburettor heat and cabin heat knobs are just too much alike. Different shapes and colours, please.

As with previous Flight Design cockpits, all the instruments and avionics are carried in a large, centrally mounted binnacle. From the base of the binnacle a centre console drops down to the floor and extends aft between the seats. The vertical portion carries the electrical services (mostly rocker switches for the various lights) as well as the circuit breakers for the battery and alternator, and the audio input socket and intercom. Also found here are the fuel valve, flap selector and co-located digital position indicator, a rotary knob for the instrument lighting and the rotary key-operated magneto/starter switch. A very clever safety feature is that the fuel shut-off handle is designed so that you cannot insert the key into the magneto/starter switch until the fuel is turned on. The horizontal section of the console carries a rocker switch for the electric pitch trim, and levers for the choke, throttle and wheel brake. Personally, I'd prefer the electric pitch trim and a bicycle-type lever for the brakes to be mounted on the stick top (or -even better - separate toe brakes). Further back is the parking brake (a simple, non-return valve) and a shallow tray. The red T-handle for the BRS is at the very back. Immediately behind the seats is a large baggage bay and parcel shelf. Up to 50kg can be carried back here, and it is accessible in flight. However, it is not so easy to load as the SW and LS, which feature doors on either side of the fuselage.

"It feels very solid and stable"

Unlike the composite CTs, the MC can only be trimmed in pitch. In my opinion, deleting the trim systems for roll and yaw is a good thing; as I have never felt the need to adjust either the rudder or aileron trim while flying any LSA.

As for the instruments, the presentation is almost entirely digital (a Dynon 100 EFIS and 120 EMS, Garmin 496 GPS, SL40 radio and GTX330 transponder), with the only analogue instruments - a standby ASI and metric altimeter - beneath the EFIS. I thought that the EFIS and EMS screens were set slightly too low in panel, which could also be slightly taller (see box). I also ◢

Cockpit access is excellent, as the struts are behind the big gull wing doors and the sills low.

Top Left The large tailplane carries a horn-balanced elevator.

Top Right Note the big ventral fin.

Above Left The trailing edges of the wings are dominated by large, single-slotted electrically actuated flaps.

Above Right The wings feature sophisticated winglets.

The MC feels very solid and stable.

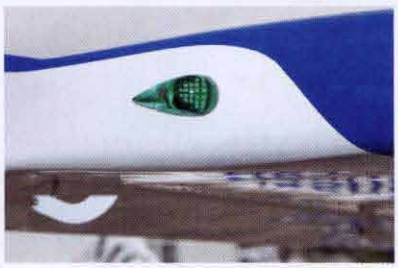
still think that the two red 'alarm' lights above the EMS (one for the engine, the other for the alternator) should be changed for an amber 'master caution' and a red 'master warning'.

The fuel quantity can be visually checked by looking at the sight tubes in the wingroots.

As the sky was now perceptibly lightening, I slipped out of the cockpit and commenced the pre-flight. Thus far, the MC hadn't really struck me as being noticeably different from the SW and LS. However, externally it is very different. Firstly – and unlike the SW and LS – which are primarily of composite construction, the MC is predominantly made of metal. Indeed, the airframe is produced from conventional steel and aluminium, using traditional construction techniques and solid rivets. Furthermore, the high-mounted constant-chord wings are braced by struts (the composite aircraft use cantilever wings) and – finally – the MC simply looks – and is – bigger and more substantial. Nevertheless, clever design has enabled the company to produce a machine that meets the LSA MAUW of 600kg and still offers a good useful load. (However, the empty weight is greater, so consequently it has slightly less useful load than the LS).

The test aircraft was powered by the ubiquitous 100hp Rotax 912S, which turns a three-blade fixed pitch composite propeller. The 80hp Rotax 912 is an option, as is a two-blade prop.

The top half of the cowling is quite easy to remove, and there is a small hatch on the left side for checking the oil and coolant levels. If a more thorough inspection of the engine bay is required the top half of the cowling can easily be taken off, and even removing the bottom half is quite easy. There is a powerful LED landing light built into the cowling, below the spinner. The undercarriage is of the tricycle type, and consists of three closely-spatted wheels, which are all the same size (6.00 x 4). This is an excellent feature for any training school, as it means that only one size of tyre and tube needs to be carried in the spares inventory. The mains are suspended from slightly forward-swept fully faired undercarriage legs made from composite material,



Right The winglets are fitted with LED position lights.

Right (Middle) There is a powerful LED landing light built into the cowling, below the spinner.

As with many LSAs, the brake discs are drilled.

while the nosewheel leg features urethane polymer shock absorbers. In common with many LSAs, the brake discs are drilled.

The wings are well made, and feature extremely sophisticated-looking winglets, fitted with LED position lights. The aerofoil is a semi-symmetrical section created by Flight Design, and I noticed with interest that - unlike the composite aircraft - there are no stall strips fitted. Tim explained that flight testing had revealed that the metal wing produces adequate aerodynamic pre-stall buffet - possibly because the rivet heads generate turbulent flow,

"Control harmony is perfectly satisfactory"

which partially separates before the stall is fully developed.

All the fuel (100 litres) is carried in a pair of tanks located in the wings. The trailing edges of the wings are dominated by large, single-slotted electrically actuated flaps, which have an impressive range of travel - from -12° to +35°. I noted that - unlike the composite aircraft - the small fences between the fuselage and flaps had been deleted. However, Tim pointed out that as this aircraft was 'MC No.2' it was far from definitive, and that production aircraft would have the fences. These are primarily for drag

The MC cruises very comfortably at 100kts.

reduction - when the flaps are negative they close the gap between flaps and fuselage. I also suspect that - in conjunction with the large winglets - they constrain span-wise airflow. The ailerons are actuated by pushrods.

The empennage tapers quite sharply before flaring elegantly into the tail. This consists of a stylishly swept-back fin and rudder, a large fixed tailplane and separate horn-balanced elevator, plus a big ventral fin. The ventral is exactly the same as the one fitted to the LS, which is why it is wired for a position light, even though this early MC has its light in the fin. Production aircraft will have the light in the ventral.

Pushrods drive the elevator, while the rudder is cable actuated. Pitch trim is provided by a large tab on the trailing edge of the elevator.

With my seat set (the rudder pedals are fixed but the seats adjust longitudinally and vertically, and incorporate pneumatic cushion and lumbar supports), I strapped myself down with the four-point harness. Quite a few of the other LSAs I've flown only have three-point harnesses, so top marks to Flight Design here. Incidentally, the cockpit structure is also very crash-worthy, as it is a welded steel-tube cage. This 'safety cell' incorporates crumple-zones, while the engine mount features additional bracing from the primary fuselage structure. This greatly reduces the chances of the engine intruding into the cockpit in the case of an accident. Other good safety features are the wing-mounted fuel tanks and the integral BRS.

The engine started instantly, and with Tim in the other seat I was soon taxiing purposefully out towards Sebring's runway 18. The nosewheel steers through the rudder pedals and is very nicely geared, while the hydraulic wheel brakes are smooth and progressive. The suspension supplied by the composite main undercarriage is much better than the spring aluminium arrangement of the SW. All checks complete and 0° of flap set, I rolled out onto the runway, lined up with the centreline and smoothly opened the throttle. With no baggage and approximately 80 litres of fuel we were well below the 600kg MAUW, while the ambient conditions were a density altitude of about 20ft AMSL and a strong, blustery crosswind from the right. Almost as soon as we were airborne I became aware that the MC flies - and feels - like a much heavier aircraft. Indeed, by the second circuit I can honestly say that if I'd been flying an SW I wouldn't have enjoyed it at all. The cloudbase was little more than the 800ft circuit altitude, and as I turned downwind I could clearly see some rather threatening-looking weather approaching from the north. Due to the strong crosswind I elected to leave the flaps at '0' for take-off, and set them to -12 when downwind, as this slightly improves the view over the nose. Although the rather boisterous conditions meant that I was working harder than I like to during a first flight on type, it is a testimony to the MC's easy handling that I felt perfectly comfortable. Cockpit visibility is good, although as

"Students and instructors will enjoy flying the MC"

The large tinted windscreen provides good visibility.

Above All the instruments and avionics are carried in a large, centrally mounted binnacle. The test aircraft was almost entirely digital, and was fitted with a Dynon 100 EFIS and 120 EMS, Garmin 496 GPS, SL40 radio and GTX330 transponder. The only analogue instruments – a standby ASI and metric altimeter – are beneath the EFIS.

no-one else was daft enough to be flying we had the circuit to ourselves. Any changes in pitch trim due to flap selection and power adjustments were small and easily trimmed out. This is a very pleasant machine to fly, and despite the turbulent conditions the ride quality was surprisingly good. I used 55-60kts turning final, with a Vref of 50. While we'd been 'bashing the circuit' I'd been keeping a wary eye on what looked like a 'wall of water' approaching from the north, and when I made the standard 'downwind' call the controller informed us that nearby Avon Park airfield was reporting extremely bad conditions. I replied that we were watching the approaching squall line closely – and that this landing would be to a 'full stop'. Turning final I noticed that it was becoming increasingly hard to track the centreline, and the controller confirmed my suspicions by reporting that the surface wind was now "270 at 18, gusting 22". Nevertheless the landing was very straightforward, although we'd barely got the MC in the hangar before the squall hit the field and it absolutely hissed down! Although my first flight had been somewhat curtailed, flying in such lively conditions had nevertheless been a very impressive demonstration of the MC's capabilities. There aren't many LSAs that I'd care to tackle a 90° 22kt crosswind in!

A few days later I got the opportunity to fly the MC again, in much calmer conditions. This flight was to allow me to evaluate the MC properly, and also fly some formation work for the air-to-airs. This time I took Lockwood Aviation's John Hurst along (he's flown the camera ship for *Today's Pilot* on many occasions, and has always wanted to be on the front cover) while Philip Lockwood flew photographer Duncan in a CT-LS. Phil had removed the right door, which makes the strut-less CT-LS a great camera ship. This time I thought I'd try using the take-off setting of 15° of flap, even though

FLIGHT DESIGN MC

As tested. Aircraft is also available with an 80hp Rotax 912 and/or a two-blade prop.

◢ DIMENSIONS		
LENGTH	6.52m	21ft 5in
HEIGHT	2.58m	8ft 8in
WING SPAN	9.5m	31ft 2in
WING AREA	11.3m²	121.6sq ft
◢ WEIGHTS AND LOADINGS		
EMPTY WEIGHT	360kg	794lb
MAX AUW	600kg	1,322lb
USEFUL LOAD	240kg	528lb
WING LOADING	53.09kg/m²	10.87lb/sq ft
POWER LOADING	8.04kg/kW	13.22lb/hp
FUEL CAPACITY	100 lit	22 Imp gal
BAGGAGE CAPACITY	50kg	110lb
◢ PERFORMANCE		
VNE	135kts	250km/h
CRUISE	105kts	195km/h
STALL	38kts	63km/h
CLIMB RATE	800ft/min	4m/sec
SERVICE CEILING	14,000ft	4,270m

◢ ENGINE

Rotax 912S liquid-cooled flat-four, producing 100hp (74.57kW) at 5,800rpm

◢ PROPELLER

Composite three-blade fixed pitch

◢ MANUFACTURER

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Email: ct@pmaviation.co.uk, Web: www.pmaviation.co.uk

Below This is the alternative instrument panel that I saw at the show. The binnacle has been redesigned, twin Garmin G3X PFD/MFD units are fitted and all the circuit breakers (except the flap's) are now in the panel to the right of the MFD. The centrally mounted avionics stack includes a Garmin GNS530W GPS/Nav/Com unit, a GMA 240 audio panel and a GTX 330 transponder. The two large warning lights had been moved to the left side of the panel, and the analogue standby instruments are now to the left of the PFD.

Above The general handling is very good. Note how the empennage tapers quite sharply before flaring elegantly into the tail.

Above Right The comfortable seats adjust longitudinally and vertically, and incorporate pneumatic cushion and lumbar supports.

runway 36 is almost 1,600m long.

The ambient conditions were much more amenable, with a gentle zephyr blowing straight down the centreline. With two biggish boys and full fuel we quite close to the MAUW, yet the acceleration was still excellent. I rotated at 50kts and we were airborne after a ground roll of around 200m. The Vy is 61kts with the flaps at '0', but as this produces quite a steep deck angle I trimmed for 80 and set the flaps to -12°. The MC seems to settle slightly as the flaps move into a negative setting but no height is lost.

Incidentally, whenever the flaps are at a positive setting you must be careful not to exceed the various limiting speeds, which are displayed next to the flap selector.

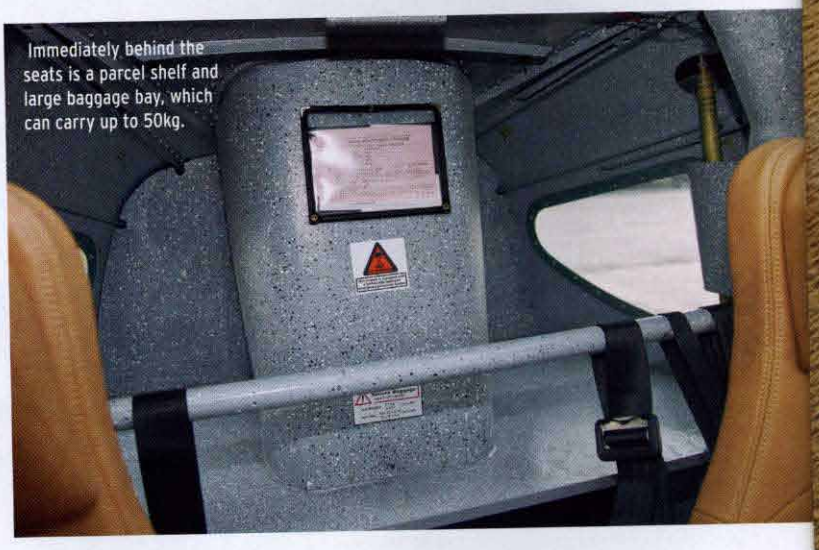
With the photo session completed, I took advantage of the very smooth air to assess the stick-free stability, and also examine the general handling in greater detail. The overwhelming impression on the previous flight had been how solid and stable the MC felt - and these initial impressions were soon confirmed. Longitudinal stability is strong - a 10kt displacement from a trimmed speed of 90kt produced a long wavelength low amplitude phugoid that damped itself out after a couple of oscillations. As I'd expected, the fixed tailplane and separate elevator means that the MC is better damped in pitch than its composite cousins, which have all-flying tails.

Lateral stability is neutral and directional stability positive. The general handling is also good, with light ailerons, an efficacious elevator and an authoritative rudder. Only small amounts of rudder are required for co-ordinated flight, as there is very little adverse yaw. Control harmony is perfectly satisfactory and breakout forces low. I think that both students and instructors will enjoy flying this aircraft.

"It was a great demonstration of it's capabilities"

An examination of the slow-speed handling and stall characteristics was equally satisfactory, with adequate aerodynamic pre-stall buffet. The ailerons continued to work even after the mainplane had exceeded its critical

Right The centre console extends down from the base of the binnacle and extends aft between the seats. Note that when the fuel valve is in the 'off' position it covers the magneto/ starter switch. The horizontal section of the console carries a rocker switch for the electric pitch trim, and levers for the choke, throttle and wheel brake.



Immediately behind the seats is a parcel shelf and large baggage bay, which can carry up to 50kg.