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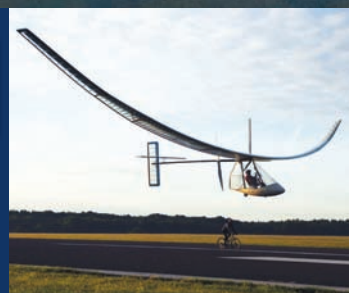
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TBM850**

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368mph at 26,000ft,
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PEDAL POWER
The human-powered
flight challenge



A seemingly casual invitation: “Would you like to travel back to Tarbes in the 850,” asked Dahler-Socata Director of Product Marketing Philippe de Segovia? He had made this offer at the Goodwood aviation expo one sunny Saturday in July – now it is the following Monday and, as forecast, there is cloud almost all the way down to the ground... and it is raining. Any dream of riding the slick, six-seat turboprop to the South of France has faded fast. For a start, the Socata boys had to reposition it from the muddy grass expo field to an aerodrome where it could be loaded up for the long flight home. *Fat chance of that, in this cruddy weather*, I thought. Having packed an overnight bag rather half-heartedly, I am resigned to another day in the office.

As midday approaches, the phone rings. It’s Northern and Eastern Europe director of sales and TBM850 pilot Mark Diaz: “Hi, Philip – we’re at Shoreham and aiming for departure at two o’clock local.” Grabbing bag and camera, I bid the office goodbye and head off with all possible speed to the south coast.

Arriving with barely fifteen minutes to spare, I find Mark digging in to an English fry-up in Shoreham’s café. “No sweat,” he says, as I apologise for the last-minute arrival. For a guy charged with getting a bizjet-size machine like the 850 out of a small grass field and then delivering it back to base 600 miles distant by the end of the day, he appears remarkably relaxed. “The strip at Goodwood was 800 metres long – I reckon I was off the ground in 250.” I am impressed: for all of its power, I’d never imagined the 850 to be *that* kind of short-field machine (and nor did the many Goodwood visitors whose main question to Mark had been “How on Earth did you get it in here?”).

Down at maintenance provider MCA Aviation’s hangar, the predictable grief in adding an extra passenger to the compliment tests Mark’s coolness. Customs and Excise are not answering the phone and MCA boss Malcolm Craft is drawn into an extended phone-around that finally takes us to someone in the Sussex police. However, once they have my passport details, that’s it: we are ready to go. No queue for security checks here...

Mark has established already that I am essentially a Cub pilot and, while I have flown complex types and had some instruction on the subject, I hold no instrument rating. Nevertheless, he directs me to the ‘gentlemen’s entrance’ – the pilot’s door up front – and bids me plant myself in the left-hand seat.



The first impression is of a professional, no nonsense cockpit, the grey-painted panel dominated by the dual electronic flight information screens and central multi-function display of the Garmin G1000 system now fitted as standard to the 850. The second impression is of how much room there is across the fuselage: Mark tells me that Socata had found ‘negative space’ between the fuselage stringers to extend elbow room. Certainly, no one is going to complain about being cramped in *this* cockpit.

Can I handle it?

Strapping in, I try to concentrate on his very clear briefing – Mark worked for many years as a flight instructor and the patter is both informative and reassuring – but the thought keeps on going through my mind: I’ve been put in the command seat of three-tonne, 850hp turboprop on a day when it’s raining and there’s a solid overcast, with the prospect of an instrument climb

through several thousand feet of cloud. What could go wrong?

For a start, there is starting an unfamiliar type of engine. In fact, the ignition system is automatic, but once you’ve hit the start switch and it begins to spool up, you do have to keep an eye on ITT (turbine temperature), which has maximum limits of 850C/870C for 20 seconds/1,000C for five seconds. You can hear the igniter tick-ticking away, before the propeller accelerates to its normal high idling speed. Of course, for the piston-pilot this ‘normality’ – involving the prop thrashing the air with all too obvious energy and the aeroplane straining against the brakes – takes a bit of getting used to.

However, once the latch is released and the T-shaped power lever is brought back to *TXI* (taxi) things settle down and the impression of being a slightly overwhelmed sorcerer’s apprentice goes away. For all its weight and size, the 850 is actually child’s play to taxi: keeping

your toes off the brakes, you simply steer with your feet and control the rate of progress with the power lever. The rod-operated nosewheel steering is very precise and putting one’s right knee over the yellow line centres the aircraft nicely on the taxiway. Should the speed build up, just ease the lever back, stopping short of beta (the auditory warning for which is the prop sounding a mild wub-wub-wub beat) and the aircraft slows obediently. Where you do need to use the toe brakes, their operation is nicely progressive. While the hand and foot actions are completely different, the whole business of taxiing the 850 has the same relaxed ease as driving a big automatic car.

The one thing that does seem a bit brutal is the way the propeller control is tested by hauling it back to reduce prop revs in a way that would have your piston-engine instructor drumming you out of the Brownies. This is standard PT6 practice and of course, it ain’t going to hurt the

motor because there is no direct connection between the power turbine that drives the prop and the rest of the rotating machinery: when the ‘engine’ appears to bog down, it’s just the propeller loading up, and not the works being brought to a near halt.

OK, Mr Cub pilot; you now have to cope on takeoff with an engine delivering not far short of early Rolls-Royce Merlin power. Material here for a good line shoot, you might have thought, but in reality... no problem. Yes, we have a wedge of right rudder trim set and yes, it nevertheless takes a firm push on the right pedal to keep the fast-accelerating TBM running straight – but I’ve actually had to work harder keeping 100hp Rotax-engine VLAs on the runway than I do for this takeoff.

With cloud base at around 1,000ft and an initial climb-rate of over 1,800fpm, there is little time to reflect on how easy it has been to get airborne. The landing gear, which has to be retracted before you reach

128kt, takes around twelve seconds to cycle. You don’t need to be quite so mindful of the flaps: V_{FE} in *TO* (takeoff) setting is 178kt and, being controlled by a lever that zig-zags through a series of detents, they can be operated by feel.

To obtain full power for the climb-out, you bring back the lever to 100% Ng (‘power’, rather confusingly for non-turbinistes, is measured in percentage torque, Ng) and move the flap lever beyond the *UP* position to 850. For a moment this puzzles me, and I ask Mark if moving the lever one stage further does some trick like reflexing the flaps. In fact, it has no actual effect on flap position: rather, it un-gates the power lever, allowing up to 121.4% Ng and making an extra 150hp available. This boosts the rate of climb to 2,200fpm. “So you don’t get all 850hp for takeoff,” I ask Mark? “You simply don’t need it!” he replies.

Eyes back on the flight director while I try to get the feel for pitch sensitivity. As ever in these situations, accurate trimming eases the workload, and here the location of duplicate elevator and rudder trim switches on the left yoke horn – where they can be blipped readily with one’s thumb – really helps.

While acknowledging Mark’s expertise as a coach, it is a tribute to the 850 and its excellent G1000 instrument suite that the real challenge for this non-instrument rated pilot in climbing through several thousand feet of cloud in solid IMC is not one of keeping the aircraft under control – far from it – but finessing the flight path and power setting. So clear is the Garmin display and smooth the aeroplane’s response to my increasingly tuned input that the 850 allows me to give a good impression of actually knowing what I am doing.

Remarkable climb-rate

Having a turbine engine, the 850 sustains a remarkable rate of climb as altitude increases. We settle for a cruise-climb power setting of 115%/1,500fpm. Socata claims the aircraft can climb from sea level to 26,000ft in fifteen minutes and reach its certified service ceiling of 31,000ft in twenty: certainly, I have never seen the hands of the altimeter spinning so fast in any other single-engine aeroplane I’ve flown, and we level off at FL270 only eighteen minutes or so after releasing the brakes.

Sacrificing economy for a reasonably fast run down to Tarbes, Mark has me settle the aircraft into an indicated cruise of 195kt – a figure that makes no great impression on me until I glance at the Garmin’s calculated true air speed; 310kt. *Blimey – I am within a couple of thousand feet of airliner cruising altitude and tooling* ➡



Above: letting the autopilot take the strain at FL270. France appears upside down in the track-up nav map

Right: no faking it – this superbly cabable and comfortable aeroplane is actually very relaxing to fly

along as fast as a *Spitfire*. Indeed, as the French landscape in miniature becomes visible through breaks in the cloud, the sensation is very much one of riding in a jet airliner – albeit with the magnificent all-round view only those on the flight deck ever see. At the same time, the general level of comfort is superb. Never mind the -36°C outside air temperature: we are in shirtsleeves and the cabin temperature and pressurisation systems are doing their stuff so well we might as well be travelling down a motorway in a luxury saloon (only the ride at 27,000ft is far smoother). The 850's systems are set up to reduce the pilot

workload to the sensible minimum. For example, I had noticed the rotary fuel tank selector switching from one side to the other during the climb-out: this was not because Mark had been operating some unseen switch, but because the fuel feed was set to *auto*. Not only does the system switch between tanks every ten minutes, balancing the fuel level in the wings, but a servo drives the selector, giving the pilot a visual cue. A couple of button presses bring up a fuel system schematic on the multifunction display, overlaying the diagram with contents indication and selector position: this beats the hell out of wobbly old gauges and indicator lights.

More impressive still is the navigation display, the G1000 offering such extensive information and so many functions, including heading to nearest alternative and



airfield plates, that it merits a flight test in its own right (as we have indeed done – see *Pilot*, October 2011). I was confused for a moment by a 'south coast' that didn't look quite right, until it dawned on me that Mark had set the display track up and I was looking at an inverted French coastline. Now, cycling through the options, he shows me the calculated range: with the fuel remaining and current power setting – and with wind correction applied – the arc running across the map indicates that we could continue all the way to southern Spain, if we wanted. (Later on, I laid the range indication transparency over the

Left: customer support manager François Blumé and Mark Diaz shelter under the door at a drizzly Shoreham

Below: quelle contrast – the view while descending towards a sunny Lourdes Pyrénées (Tarbes) airport





Above: up at airliner altitude the view is majestic – and the aircraft handles like a dream

Left: 1hr 48min after departing Shoreham, we are basking in the sunshine at Tarbes

indicating a whopping 4,000fpm descent: a very useful capability when you wish to stay at efficient cruising altitude as long as possible or need, for some other reason, to get down in a hurry.

The flaps and gear can be extended at relatively high speed – you can deploy the first stage of flap and drop the wheels at 178kt, the limiting speed for landing flap being 122kt. With no traffic at Tarbes, we make a straight-in approach. Visual cue for the hold-off is the bump on the cowl, just behind the spinner. Mark tells me that lining this up with the top of the glareshield, rifle-sight fashion, should have us touch down nicely. “There is a tendency to balloon before touching down – Bonanza and taildragger pilots usually nail the landing, but Cirrus pilots seem to find it more difficult,” says Mark with a grin.

Making a good job of landing a new type is always something of a challenge but I find the 850 again flatters my efforts. Pitch control – so vital in maintaining speed accurately – feels good at approach speed and, satisfying taildragger pilot honour, I do not balloon, although my touch-down is a *little* more positive than I’d have liked. The ground roll can be curtailed with beta, the POH cautioning you not to use it at speeds of less than 40kt less you Hoover up excessive debris, which is not good for that magnificent Pratt & Whitney Canada motor.

We taxi in through the gate that separates Socata’s plant from the rest of the airfield and park in front of the maintenance and dispatch hangar. Opening the door after



Left: fitting out a freshly-painted standard-build fuselage in the main assembly hall at Tarbes

Below, left: prior to receiving wings and power unit, fuselage assemblies are moved from stage to stage on a jury undercarriage

Below, right: milled from a single piece of alloy, the optional pilot’s door adds \$90k to the price, but it is a complex bit of kit that makes egress far easier

Bottom: at the end of the line, completed aircraft are readied for flight and, bearing a temporary F-registration, towed out for testing



shut-down, I am greeted with a pleasant wave of warm summer air (remember that?). One hour and 48 minutes ago, I’d been stood among the puddles surveying a low overcast, now I am sitting in the south of France under blue skies feeling like I have arrived in heaven.

A chance to reflect

A couple of hours later, setting outside in the warm evening air at a bistro in the Place de Verdun, I had a chance to reflect on the magical way I had been spirited to the south of France. It is not often that we aviation journalists get to fly an aircraft ➔



map in Socata’s handsome hard-bound presentation brochure. Starting with full tanks and a 900lb payload, in zero wind the 850 will go all the way south to Marrakech or Tripoli, leaving a 45 minute reserve. To the East, it will make Odessa in one leg.)

While we are not challenged by any turbulence today, the aircraft displays a most pleasing combination of control

In zero wind, the 850 will go all the way south to Marrakech, east to Odessa

response and stability. There’s no temptation to essay any of the formal stability tests, nor any real need: the aeroplane feels just right and it is very easy to hold altitude and heading by hand. It is only to demonstrate the system that we engage the autopilot as we continue southwards.

One thing you do have to keep an eye out for is airframe icing: the first sign of it appears on the leading edges of the tailplane, clearly seen by glancing back through the generously-sized side

windows. If there is any build up, it is dealt with by good old-fashioned pneumatic boots. For the sake of completeness on what is a CAVOK day (developing into CAVUL as we travel further south) Mark powers up the weather radar, which is mounted in the pod you see on the port wing. It requires 120 seconds to warm up – fair enough, since the radar head has been sat outside in the -36°C chill for the last hour or so. Alongside the radar, there is also a Stormscope (no activity to report today, but a valuable bit of kit when you need it).

Having at last been given a direct routeing to Lourdes Pyrénées (Tarbes) it is time to start planning the descent. When demonstrating the aircraft, Mark likes to have his potential customer hand-fly this part of the flight profile: he has noted a tendency to over-control and recommends this as a way of getting the feel of the aircraft before arriving in the circuit. One great advantage enjoyed by the 850 – an aircraft designed from the start as a turboprop – is that it has a relatively high V_{MO} (maximum operating speed) of 266kt and is thus capable of steeper descents than one or two of its competitors that were originally designed for piston engines and adapted for turbine power.

Demonstrating this, we come down quite happily with 25% torque and the VSI



Above: while it is slower than a bizjet, the TBM 850 makes up the time lost with fewer fuel stops

Right: it's impressive to think that you can carry five passengers at WWII fighter plane speed

Below, left: topping up the tanks, which hold 291.6 US gal (1,104 lit) usable fuel

Below, right: November 850 Victor Mike is the actual aircraft the Editor flew down to Tarbes



COMPARISON

| | TBM 850 | SPITFIRE MK Vc |
|---|---------------------|---------------------|
| ■ WEIGHTS & LOADINGS | | |
| Empty weight | 2,081kg | 2,059kg |
| Max takeoff weight | 3,353kg | 2,799kg |
| ■ PERFORMANCE | | |
| V _{MO} | 266kt | not stated |
| Max speed | 320kt @ 26,000ft | 322kt @ 15,000ft |
| Rate of climb | 2,143fpm @ 15,000ft | 3,250fpm @ 15,000ft |
| Max range | 1,585nm* | 986nm** |
| *45min reserve **Ferry range, no reserves | | |



PHOTO: PETER R MARCH



like the TBM850 on its intended mission. This trip set personal benchmarks for how high and fast I have flown as a pilot, and the elapsed time in getting from a small airport in England to a holiday destination on the Continent. (For the record, while Ryanair's on-time return flight might have delivered me to Stansted in less than an hour and a half, by the time I had gone through all the usual airport checks and taken the train down to Shoreham, the total time taken was over five hours.)

Perhaps more impressively, the TBM sets a further benchmark in how easy it is to fly, for all its headline performance. Yes, there are many systems to monitor

and high-altitude IFR operations do require the appropriate training and discipline – but the aeroplane's basic handling is really as easy as a PA-28, C172 or SR22, and the high degree of well-considered automation reduces pilot workload to a very sensible minimum. It is the well-heeled touring pilot's ideal machine, offering something decently close to airline speed and range with all the convenience of GA operations: you could even base it at a grass field, if you really wanted to (I am told there's one based at White Waltham!)

If I was ever to make Premier League footballer money (unlikely, I would concede) or ever won the National Lottery, ➡





Above: nice to be able to share the fun with five of your friends – or the family – or even business clients



Left: club seating, with a neat fold-out table (stowed here) is but one of the interior options

Right: Socata North and Eastern Europe sales director and TBM850 pilot Mark Diaz

I would not waste money on useless toys like Bugatti Veyrons: without a moment's hesitation, I would pick up the phone and order a TBM850 – a dream machine and a genuinely practical means of travelling in style. 📺



FRANCO-AMERICAN PEDIGREE

Dahler-Socata's 850,000 square feet of offices and sprawling manufacturing plant share space with a nature reserve on the company's 128-acre site at Tarbes. The company employs 1,200, spreading their activities between the TBM line, parts manufacture and support for the discontinued TB series of light aircraft and their Morane-Saulnier Rallye predecessors, and diverse sub-contract manufacture for Airbus, Dassault and Eurocopter.

Socata's roots lie in the manufacturing facility set up by Morane Saulnier in 1941 at Tarbes, where the company started development on the secret MS 460 fighter prototype on which the post-war MS 470 Vanneau advanced trainer was based.

The company pioneered the bizjet in the 1950s with the MS 760 Paris, a four-seater that only achieved limited success. Much more popular and successful was the Rallye, 3,300 of which were built. With the retirement of Raymond Saulnier and Robert Morane, the company came under the control of Sud Aviation (now EADS) and was renamed the Société de Construction d'Avions de Tourisme et d'Affaires (less glamorously in English, the touring and business aircraft manufacturing company) known as Socata.

Socata was responsible for the advanced but less-expensive-to-manufacture TB (for Tarbes) series produced from 1979. The line that led to the 850 started with the TBM700 project, a

cooperation between Socata and the then French-owned US company Mooney (the 'M' part of the designation). The world's first pressurised single-engine turboprop, the six-seat 700 was certified in 1990.

Now solely a Daher-Socata product, TBM850s are currently being built at a rate of 38 a year. While some parts are built on the kind of sophisticated machinery and presses you expect to find in a facility that makes parts for the Falcon 7X, A380 and A350, much of the assembly is done by hand. Alongside the hall where fuselages are mated with wings and landing gear, you will find a large, well-lit room in which men and women are building up wiring harnesses. In another corner, seats are being trimmed in fine leather.

\$3m may sound a high price tag for a private aeroplane, but when you see the intricacies of the aircraft, the hugely expensive machinery and jigs upon which it is produced, the quality of the materials used and the skilled labour that goes into assembling it, you begin to see what value you are getting for the money. This is a very fine, bespoke product for a demanding and exclusive market – and it's never going to be cheap. Given the level of development and certification cost that has to be spread over a such a relatively low production run, the miracle is that you can get it at all for the price.