

Alex Caccia, co-founder and CEO of Animal Dynamics, speaks to Richard Thomas about his company's involvement in creating a dragonfly-styled micro UAV for the UK government.

Enter the dragonfly

Nature has a way of finding, over the course of a great deal of time, the right balance between design and intended function, and so it makes sense that industry can gain much inspiration for its own creations from this, be it land, water or air.

Into this developing sector comes Animal Dynamics, a UK-based SME that has been charged by the UK MoD and DSTL to create a system capable for military use in potentially difficult climatic conditions.

Natural inspiration

Having recently been awarded a £1.5 million (\$1.9 million) grant to pursue the creation of a lightweight but capable nano-drone by the UK government, Animal Dynamics is mid-way through Phase 2 of the programme for its Skeeter UAS. The result will be the Skeeter UAS, which is designed around the flight ability and aesthetic of a dragonfly.

'It came out of a relationship my co-founder, Adrian Thomas, had with DSTL in looking at how bird flight applies to aviation. He had done some work with DSTL and the USAF to research into that and the discussions came out of a problem the MoD is trying to solve in getting small UAS to operate in harsh conditions,' explained Caccia.

'We approached them and asked if this was something of interest and they said yes. We negotiated a budget and did a feasibility study and spent just about a year until June of 2016 to really understand [the requirements] from a physics and engineering point of view.'

Phase 2 of the development cycle will see the construction of the first model and

Caccia says that this is 'about a third of the way through' this latest stage, and could be completed by mid-2018. The difficulties in designing and machining the components to such a small scale has also presented its own challenges.

'It is a challenge in the sense that even though the system is very small, the process is analogous to developing any aircraft in that you have to build the subsystems first and then you put it all together.

'What is unusual about it is that we have had to develop absolutely everything. There isn't an off-the-shelf motor you can use, there isn't an off-the-shelf wing system we can use, there isn't an off-the-shelf control system we can use – we have had to develop all of those.'

For the Skeeter, a 'militarily useful' endurance of 20-25 minutes is the target, although computer models show the system capable of more than this, but the proof will be in the testing, according to Caccia. A flight speed of around 19kt is also planned.

'The overall design concept is similar to a dragonfly, it is a really good insect to choose from and in some ways the obvious one. It has four wings which means it can glide – in fact, dead dragonflies will glide. We have made models using our design and we can throw them and they glide beautifully.

'One of the nice things about flapping wings is that they don't have a whole lot of inertia locked in, which means if they hit something they won't break, and it is good for the subject it might impact.'

There was also an expectation that there will be a range of components designed for



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the programme that will be equally applicable to other robotics concepts, not necessarily just for UAS.

'One of the interesting things about this has been the research and development process that will develop technologies that can be used elsewhere, such as the actuators we have made for Skeeter, [which] could have all sorts of applications for micro robotics.'

Caccia concluded that some of the smaller suppliers can become trapped in chasing one grant after the next and that it was important to find different sources of income to create a sustainable operation.

'The reality is that if you do that as a small business for more than a few years you will never raise money because you will then end up looking like a consulting business.

'Funding is a very difficult thing to get right because you have to manage your company in such a way that you don't get trapped in the grant and finance backwash. From my perspective we need to use that [financial backing] to break out as quickly as possible and bring non-MoD investment behind us.' ■