THE CAT'S WHISKERS

Description

Built initially to try out cat's whiskers as spars, this was a lightweight conventional design with a semi-stiff foam tail. To minimize weight, the cabane was lower than usual so that the conrod/throw ratio was unusually low. That increased the cyclic tail roll, so this seemed a good model for assessing any potential for tail thrust, too.

The foam tail was replaced with a larger-span carbon-spar(to conserve whiskers)-&-membrane tandem wing. The wing and tandem membranes are of fragile Ultrafilm, so their TE margins are painted with dilute PVA to reduce the risk of tearing. (They have survived dozens of launches so far.) The crank has adjustable throw for optimal matching to the motor size, although it has not yet been varied. There is a "muzzle" to obviate the mechanism's ingesting carpet fibres.

Constructional details

The crank is of 0.2mm wire and the bearings and conrods are of 0.13mm. The wing pins are of carbon, continuations of the oblique ribs. At the TE the ribs are retained between "fingers" by a Lycra band. The motor stick is of 0.5mm carbon fibre, while the bamboo upper body member is redundant and will be removed. The three-loop wire coupler for a hand-held winder will be reduced to 0.13mm or less. Tail incidence is adjusted by sliding the tie along the motor stick. The stay can be lightened, now that the tie is extended to the TE. For practical home flying, the muzzle will be much enlarged upwards, to provide a handle for retrieval while flapping up against the skirting, and another handle will be added at the rear.

Performance

Originally flown on a loop of 0.28mm rubber, the structure is evidently unduly robust for the single-strand motor used currently, thus there is scope for further weight reduction. The cat's whiskers flex considerably so that there is a large washout/in. That appears to provide good thrust, while the whiskers have proved durable and resistant to handling damage.

With the foam tail and single-strand motor, the model would climb briefly from 750 turns and descend slowly over many circuits. With the thrusting tandem, the model would climb from 300 turns, so will now climb for 10 seconds from 750 before descending. However, that improvement was not all due to the thrust augmentation because the tandem was lighter than the earlier tail, so that some nose ballast could be removed. The OA weight reduction might have been about 5%. None the less, the possibility of providing tail thrust, where cyclic body roll is present, seemed to be confirmed.

Best duration so far, with rather poor trim and tight spiralling, was timed (2^{nd} August, 2003) at 29.25s (plus groping for the dangling stopwatch and finding the start button).

Measurements (with tandem)

OAL:	57mm
Span:	100mm (it was a precision cat)
Root chord:	20mm
Wing Area:	$14.75Cm^2$
(Static) amplitude:	$+32^0$ to $-24^0 = 56^0$
Flight weight:	92mg
Wing Loading:	$12.2Pa = 4.1oz/ft^2$ (ignoring any tandem loading)
Tandem span:	60mm
Tandem root chord:	15mm
Tandem Area:	$7.0Cm^2$
Conrod/crank ratio:	9.7:2.4 = 4 (single crank pin)
(Static) body/tandem roll:	$\pm 14^0 = 28^0$
Motor:	0.028 x 1.0 x 57mm single strand; 21mg
Average flapping frequency:	c 22.5Hz (inc. some climb but mostly slow descent)
Average flight speed:	c 0.75m/s (for level flight)

John Mack,
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