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HiMAT technical description
GRAHA M WARWIC K reports from Los Angeles

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LIGHT-TEST results form the basis
of aircraft design. Empirical de-
sign relies on rules of thumb derived
from experience. HiMAT is a highly
manoeuvrable research vehicle built to calibrate the thumbs of those engineers designing the next wave of US fighters.
Built by Rockwell International, funded by Nasa and the US Air Force, HiMAT is a remotely piloted vehicle incorporating innovations aimed at increasing the manoeuvr-ability of future combat aircraft. As many advances as economically feasible are squeezed into an airframe little more than 20ft long. The aim— to outmanoeuvre the F-16 in the crucial transonic regime where most air combat takes place.

Maximum sustained turn perform-ance is reached when available thrust is matched by drag generated in the turn. The dominant component is drag due to lift—induced drag. Shock-

induced separation of airflow over a wing causes drag to rise before Mach 1 is reached. To improve tran-sonic turn performance it is necessary to delay separation and to operate at the lowest possible angle of attack. Few technology advances offer a significant performance increase in isolation. Test programmes centred on a single innovation often avoid the problems of integrating that advance into an operational aircraft. Incorporating many innovations in a full-size airframe can be costly and risky. HiMAT is designed to investi-gate high-risk technologies, and their interactions, at minimum cost and risk.

HiMAT is a scale model required to demonstrate the manoeuvring per-formance of a full-size 1990s fighter capable of a sustained 8g turn at Mach 0-9, 30,000ft. In similar condi-tions, the F-16 will pull 4J

2g and the
F-4E 33

4g. Constrained by the need to

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use an existing engine, Rockwell en-deavoured to match thrust-to-weight ratio and wing loading at the tran-sonic design point. The match was made with a 44 per cent scale model powered by a 5,0001b-thrust General Electric J85-21 afterburning turbojet. So a 17,0001b fighter became a 3,4001b model aircraft.

Rockwell identified 32 technology features suitable for the 1990s fighter design and, after trade-off studies, selected those which offered the biggest payoff at acceptable risk. Economics and time dictated that some of these prime technologies could not be incorporated in the scale model. Others could not be used to their full extent, but the eventual research vehicle is a close approxi-mation to the fighter.

Features selected for the fighter were: close coupled canard; blended wing/body; vortex strakes; Rockwell aerofoil; variable-camber wing; drag

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19 Steel landing legs and skids
31 Fuel shut-off valve

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33 Routing tunne l
34 Generato r
35 Batteries

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toow r
38 Throttl e actuator
39 General Electric J3S-2I engine: 5.0001b thrus t
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41 Routin g tunne l
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43 Fuel-level contro l valve
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48 Forward engine .suspension
49 Linear accelcromecer

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52 Engine oi l cooler
53 Oi l tan k
54 Scarcer-air adapter
55 Elevon servo-valves
56 Pressure switch
57 Emergency reservoir
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59 Fuel iei-purr.D
60 Demodulato r
61 L-band uplink antenna
62 Dum p valve
64 Elevator actuator
65 Elevator servo-valve
66 Elevon actuator

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69 Ailero n actuator

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71 Undercarriage up-lock
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73 Hydrauli c actuator lock

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75 Smoke generator
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81 Elevator (carbon-fibre): 20 up. 30 dow n
82 Elevon (carbon-fibre) 16 77 up, 25 16 dow n
83 Winglet: carbon-fibre laminates
84 Ailero n (carbon-fibre): 17 66 up. 17 66 dow n
85 Replaceable glassfibre leading edges
86 Titaniu m wing-to-tail-boo m structur e
87 Replaceable carbon-fibre leading edge
88 Canard flaps: 14 75 up. 14 75 dow n
89 Canard: carbon-fibre laminates

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94 Windshiel d shroud

96 Underwin g panel—inboar d