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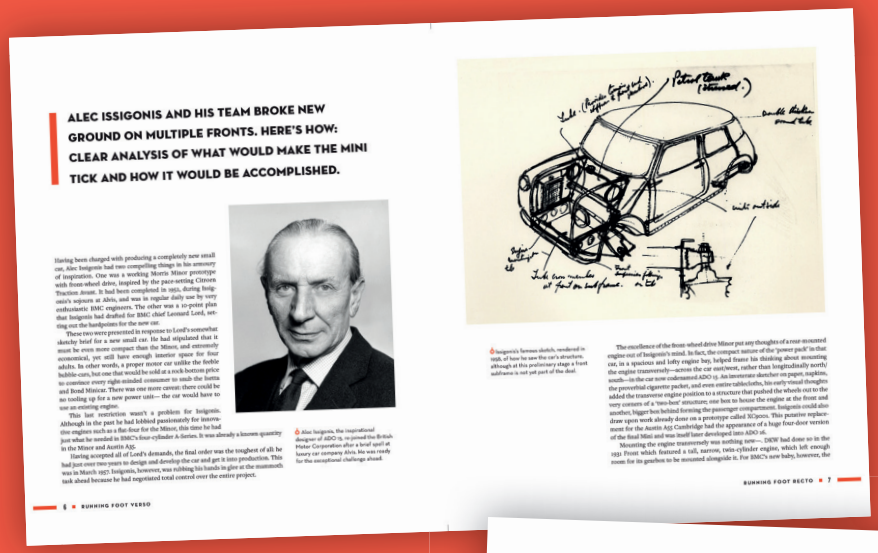

ALEC ISSIGONIS AND HIS TEAM BROKE NEW GROUND ON MULTIPLE FRONTS. HERE'S HOW: CLEAR ANALYSIS OF WHAT WOULD MAKE THE MINI TICK AND HOW IT WOULD BE ACCOMPLISHED.

Having been charged with producing a completely new small car, Alec Issigonis had two compelling things in his armoury of inspiration. One was a working Morris Minor prototype with front-wheel drive, inspired by the pace-setting Citroen Traction Avant. It had been completed in 1952, during Issigonis's sojourn at Alvis, and was in regular daily use by very enthusiastic BMC engineers. The other was a 10-point plan that Issigonis had drafted for BMC chief Leonard Lord, setting out the bandpoints for the new car.

These two were presented in response to Lord's somewhat sketchy brief for a new small car. He had stipulated that it must be even more compact than the Minor, and extremely economical, yet still have enough interior space for four adults. In other words, a proper motor car unlike the feeble bubble-cars, but one that would be sold at a rock-bottom price to convince every right-minded consumer to smash the Isetta and Bond Minicar. There was one more caveat: there could be no tooling up for a new power unit—the car would have to use an existing engine.

This last restriction wasn't a problem for Issigonis. Although in the past he had lobbied passionately for innovative engines such as a flat-four for the Minor, this time he had just what he needed in BMC's four-cylinder A-series. It was already a known quantity in the Minor and Austin A35.

Having accepted all of Lord's demands, the final order was the toughest of all: he had just over two years to design and develop the car and get it into production. This was in March 1957. Issigonis, however, was rubbing his hands in glee at the mammoth task ahead because he had negotiated total control over the entire project.

Alec Issigonis, the inspirational designer of ADO 15, no joined the British Motor Corporation after a brief spell at luxury car company Alvis. He was ready for the exceptional challenge ahead.

Issigonis's famous sketch, rendered in 1958, of how he saw the car's structure, although at this preliminary stage a front subframe is not yet part of the deal.

The excellence of the front-wheel-drive Minor put any thoughts of a rear-mounted engine out of Issigonis's mind. In fact, the compact nature of the "power pack" in that car, in a spacious and lofty engine bay, helped frame his thinking about mounting the engine transversely—across the car east/west, rather than longitudinally north/south—in the car now endorsed as ADO 15. An inveterate sketcher on paper, napkins, the proverbial cigarette packet, and even entire tablecloths, his early visual thoughts added the transverse engine position to a structure that pushed the wheels out to the very corners of a "two-box" structure; one box to house the engine at the front and another, bigger box behind forming the passenger compartment. Issigonis could also draw upon work already done on a prototype called XC9000. This putative replacement for the Austin A55 Cambridge had the appearance of a huge four-door version of the final Mini and was itself later developed into ADO 16.

Mounting the engine transversely was nothing new—DKW had done so in the 1931 Front which featured a tall, narrow, twin-cylinder engine, which left enough room for its gearbox to be mounted alongside it. For BMC's new baby, however, the

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in-line four-cylinder A-series was too long for that: when mounted across the car, filling all the space between the front wheels. This led Issigonis to conceive an innovative position for the gearbox: below the engine and inside the oil sump, or rather under the crankshaft in what became an extended oil sump, with the final drive unit behind it.

He had already decided that the car's length would be no more than 10ft, and so naturally the packaging of the whole vehicle came in for close attention. Its footprint devoted 80% to passenger and cargo space. As there was no separate 'trunk' volume overhanging at the back, this would naturally make for limited baggage accommodation, but Issigonis planned to utilise every last bit of space inside the car for storage.

Early prototypes had difficulty coping with the strains put on their monocoque structure by the front wheel drive drivetrain. So the decision was taken to mount the main components in separate subframes front and back.

Power was transmitted to the front wheels via constant-velocity joints of a type created by Czech engineer Hans Ruppin in the 1920s and adopted from a ball joint already in use in submarine conning towers. They consisted of a ball bearing surrounded by three cages, two of which were connected, respectively, with the incoming and outgoing driveshafts, and a simpler flexible coupling for the inner end. This, in turn, allowed a sufficient steering angle without distortion or undue articulation, minimising kickback in the steering.

(above) Another of Issigonis's pen portraits for the new economy car clearly shows the exhaust pipe running down its center channel—a key element of the car's torsional rigidity.

(opposite) The second of the XC 9000 prototypes to be completed, with the engine in its initial position with its inlet and exhaust at the front, and a bonnet opening down to bumper level.

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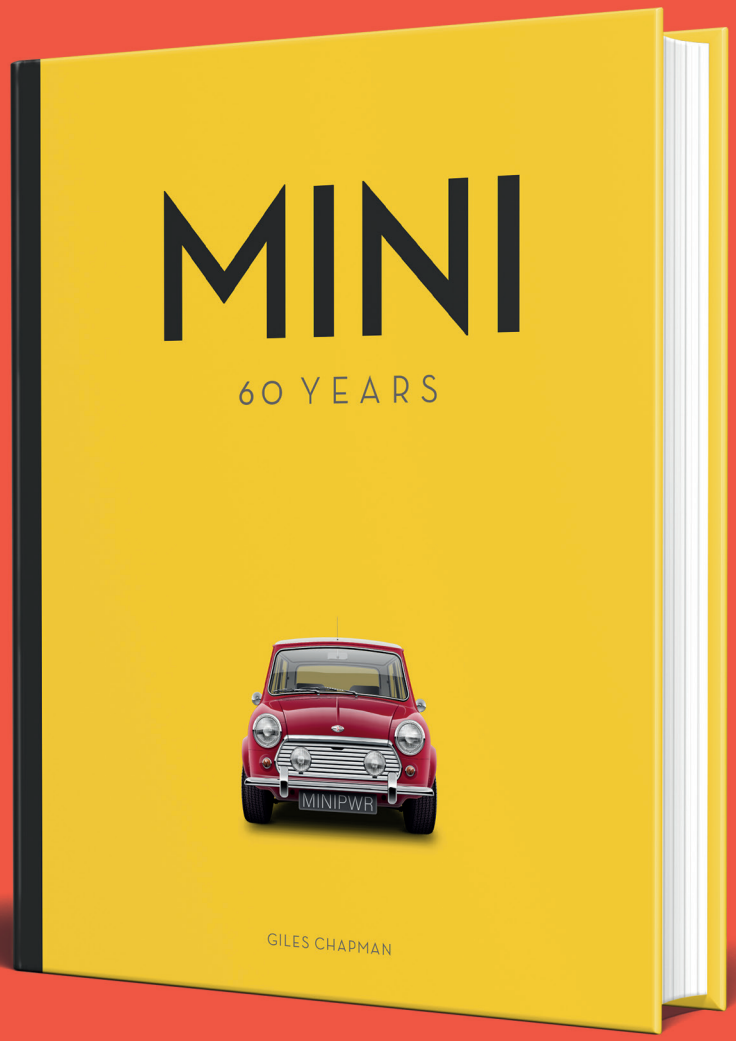

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