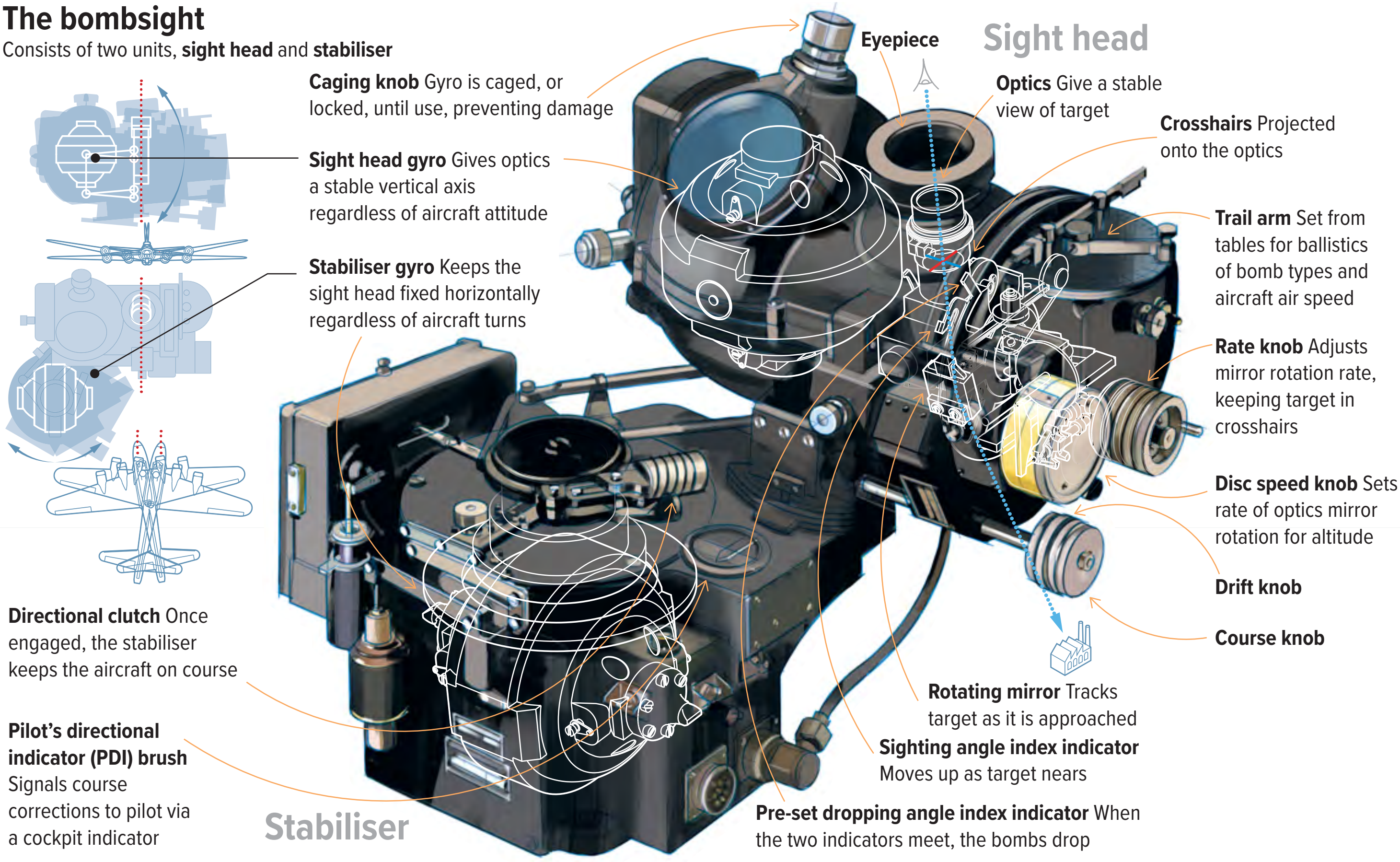
The bombsight

Consists of two units, **sight head** and **stabiliser**



NORDEN BOMBSIGHT

The accurate bombing of targets has always been prized by military commanders, initially to maximise the limited effect of bombs dropped by aircraft, and later to avoid what is euphemistically called collateral damage. In the 1930s, high-altitude bombing seemed likely to avoid defences, and thus accurate aiming from more than 20,000ft became a requirement.

A bomb dropped from 20,000ft must be released approximately two-and-a-half miles before reaching the target. Although the theoretical path and destination of the bomb were calculable, the speed and path of the aircraft significantly affected the drop; an aircraft banking, or in a turn, or with crossed controls compromised simple 'iron' sights. Furthermore, differing wind speeds and directions between the aircraft — itself also subject to drift — and the target would influence the path of the bomb. Other factors included humidity, gravity variations and, crucially, whether the target was in motion, such as a ship or a tank formation.

The Norden sight was an exceptional inter-war invention to solve these problems. In 1921 the US Navy's Bureau of Ordnance tasked engineer Carl L. Norden to develop a viable, accurate sight. A couple of years later another engineer, Theodore H. Barth, joined him. He moderated Norden's uncompromising workaholic tendencies to ensure the project — and the dedicated Norden company — survived.

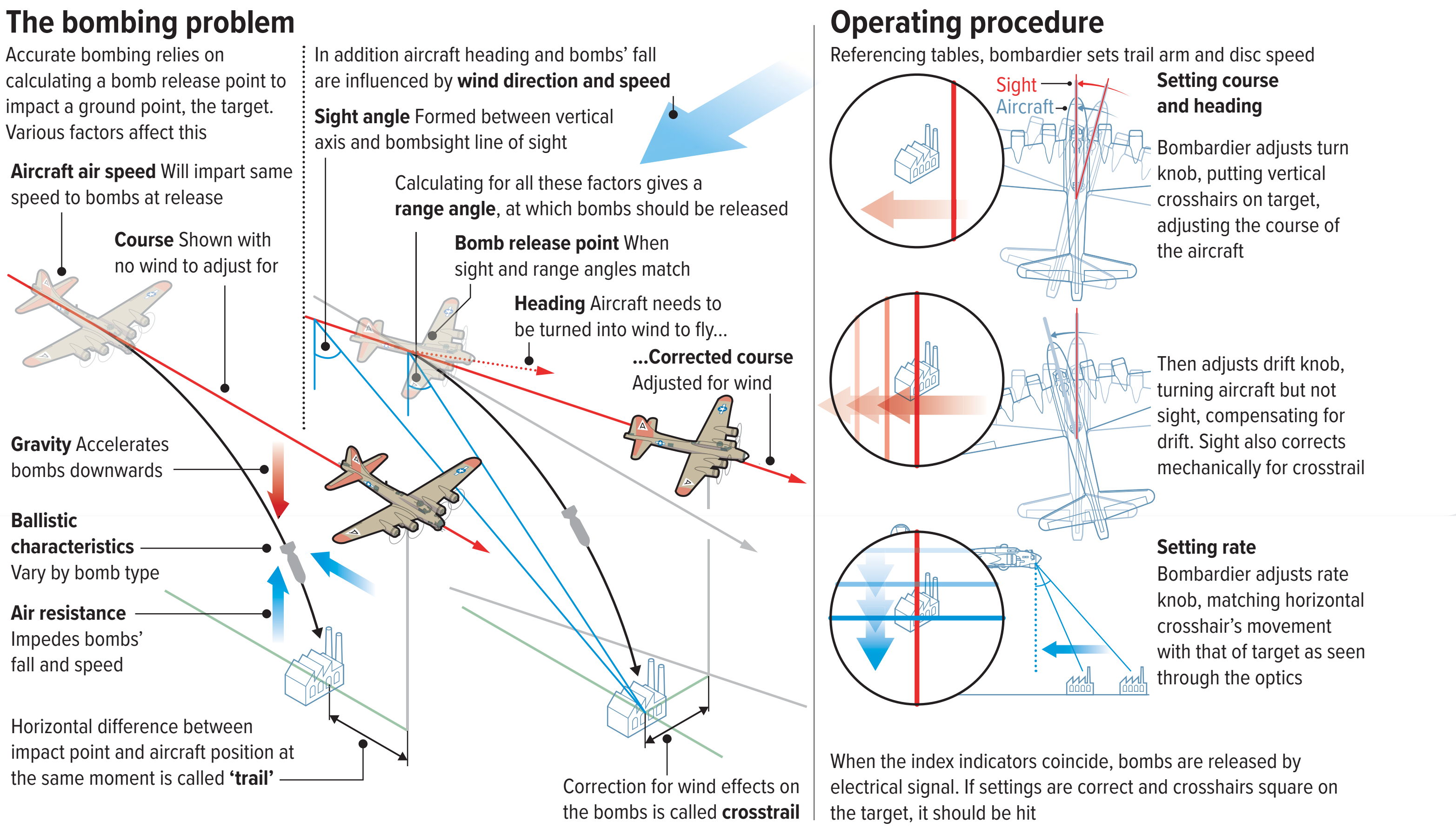
Demonstrations augured well. On 7 October 1931, a MkXV sight was tested by the navy on the stationary USS *Pittsburgh*, 50 per cent of the bombs hitting it. By 1939, in a demonstration to the British air attaché, a Boeing B-17 using a much later version of the Norden sight dropped an entire stick of bombs on a 'battleship' painted on land before being spotted flying at 12,000ft by observers.

The concept of a gyroscopically stabilised base unit, ensuring that the aiming point set in the upper unit was correctly aimed, was excellent. However, early versions of the sight, while remarkably accurate, were far too complex to use — even in peacetime conditions. That meant a convoluted development programme by the US Navy and Army until the final production version was reached.

As illustrated above, when the bomber approaches the target, the bombardier enters wind direction, air speed and altitude data into the bombsight's analogue computer. This calculates and provides the correct aiming point with even greater accuracy when coupled to the Sperry C-1 autopilot.

Ultimately, while the Norden was developed into a reliable, functional unit, the expectation of accuracy was never achieved under combat conditions. The hoped-for impunity to anti-aircraft fire was negated by better guns, while enemy fighters proved more effective than hoped. The 'combat box' formation adopted as a defensive measure against these fighters, an innovation by Col Curtis LeMay, was critical (see Briefing File, *Aeroplane* May 2019) and resulted in the formation's bombardiers dropping on the signal from the lead aircraft. This meant a formation's targeting accuracy was only as accurate as the lead bomb-aimer, and the unit's bomb pattern covered the

The Second World War's best-known targeting method, as much for propaganda reasons as anything else



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ARTWORK: IAN BOTT

same area as the formation was flying. Furthermore, a visually aimed bombsight needed the target to be unobscured by cloud at any level, or by smoke raised as a defensive measure.

While the bombsight was a great technical achievement, its biggest success was in propaganda claims of its accuracy. The legend of the Norden 'putting a bomb in a pickle barrel from 20,000ft' was pushed relentlessly by the company — ever more stridently as the device became more public — and was always unrealistic. And despite the incredible degree of secrecy surrounding it, the design had been pirated pre-war by German agent Herman W. Lang, who hand-copied the blueprints. The Germans evaluated it but decided their simpler Lotfernrohr 7 (or Lotfe 7) sight was good enough. The tight security relating to the sight and its use also compromised assessments of its accuracy, in part because the air arm and government needed the American public to believe such accuracy was standard.

The reality was very different. On the infamous raid against the Schweinfurt ball-bearing factories in October 1943, the 8th Air Force's 250-plus B-17s only managed to land one of every 10 bombs within 500ft of their target. As a result, the raid failed to destroy the factories, and further attacks were needed.

While level altitude bombing was widely used by most combatant nations, and in the greatest volume by the US, high-altitude pinpoint bombsights never achieved the 'pickle barrel' accuracy claimed by propaganda. A

A 1930 image of Carl Norden with another invention, the FB-1 guided 'flying bomb' — an early pilotless aircraft. Development of its guidance system later helped inform the Norden bombsight.