

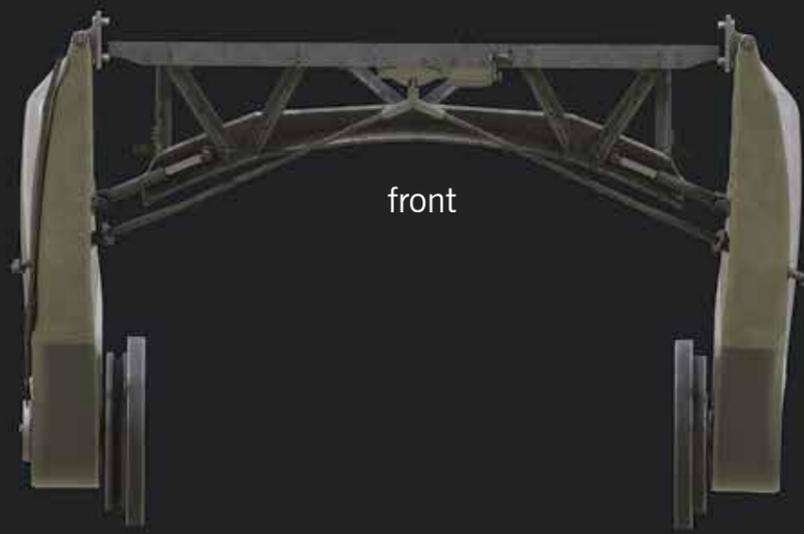


CARRYING UPKEEP

As the Upkeep bomb was not only a different shape to contemporary bombs but also had to be spun before release, Barnes Wallis and Vickers-Armstrongs had to come up with a purpose built mounting to be fitted to the Type 464 Lancasters. This section was the most significant and important of all the Type 464 modifications, yet due to its position, in shadow under the black painted belly of the Lancaster, it has never clearly been illustrated before.



starboard



front



port

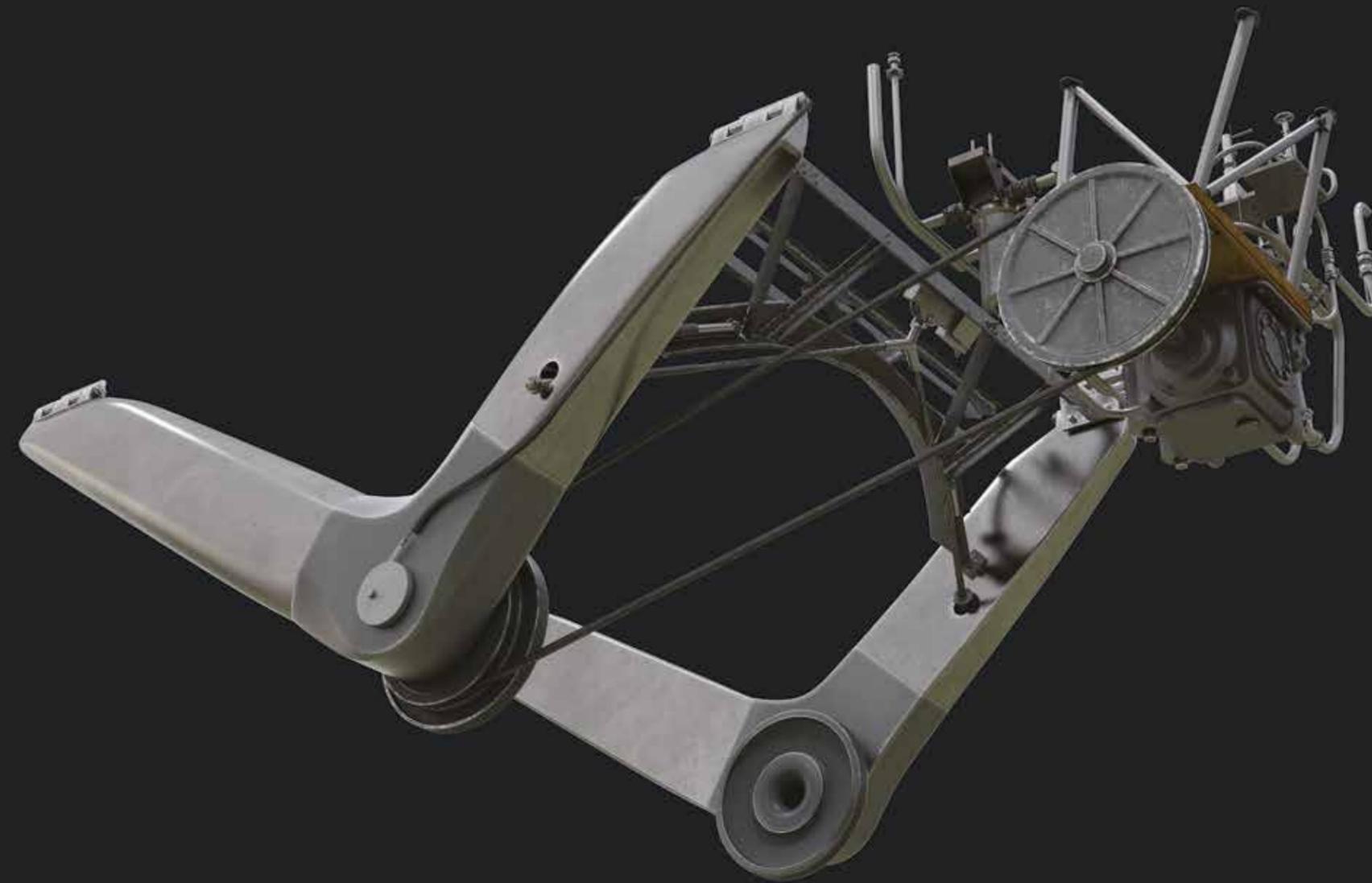
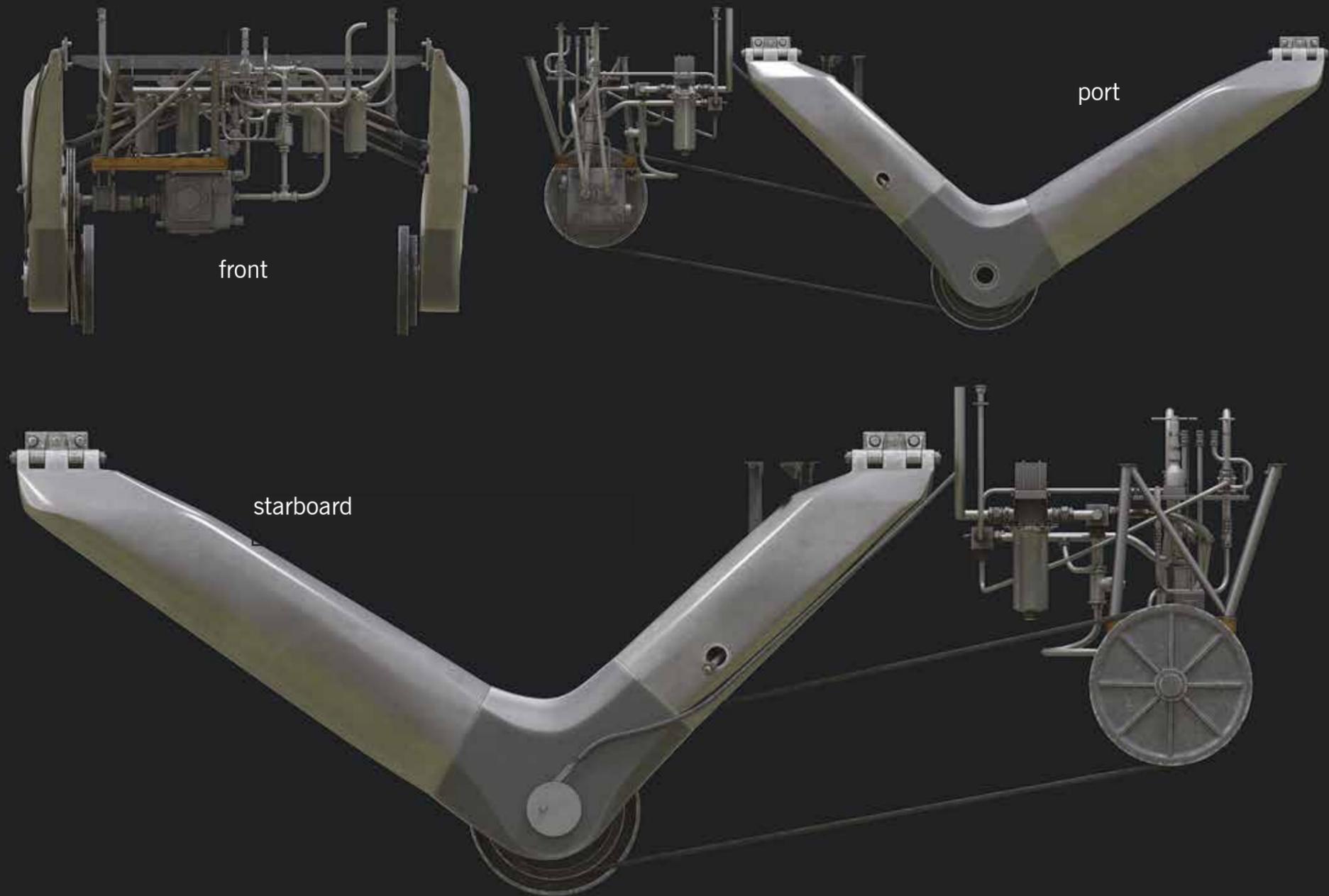


rear



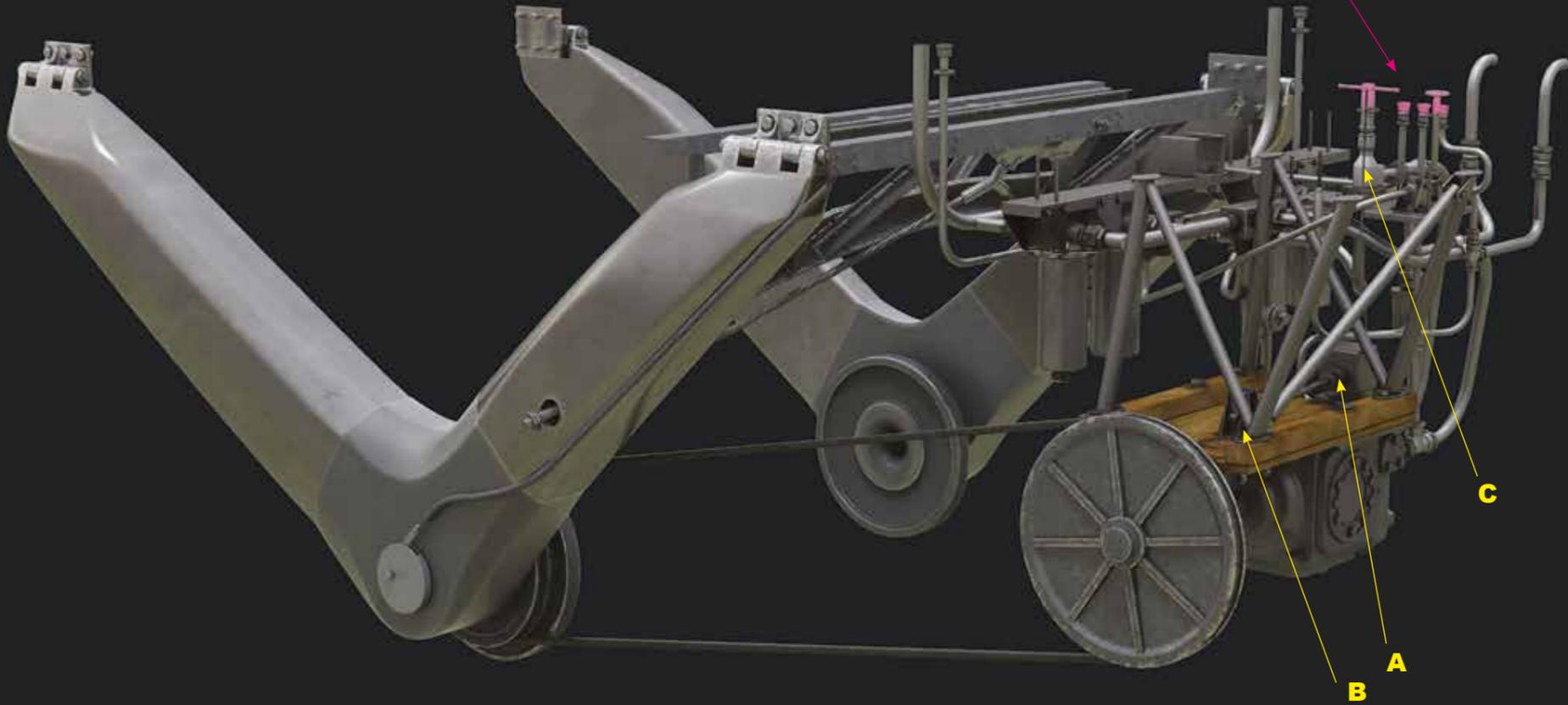
the calliper arms

The four calliper arms were made of cast aluminium with the connecting piece at the apex made of machined steel. Each apex piece contained a circular hub upon which the Upkeep would be suspended. The four arms were attached to the fuselage by heavy duty brackets which allowed the arms to rotate freely outwards to allow a clean release of the bomb. To load the Upkeep, the arms were closed onto it and retained in that position by means of a heavy-duty cable in an inverted 'Y' shaped form, with each of the V shaped lengths being connected to one of the front calliper arms, while the stem was attached to a standard 4000lb 'Type F' bomb release unit. After the arms were closed, the threaded ends of the cables were fitted through eyelets in the front calliper arms, and retained in position by large bolts, which also allowed for some adjustment and tensioning.



spinning the Upkeep

To enable the Upkeep to be spun, A Vickers Variable Speed Gear (VSG) unit was installed forward of the calliper arms and securely bolted to the roof of the bomb bay. On the starboard side of the unit a 17" drive wheel was mounted which was then connected to the starboard calliper disc by a thick rubber drive belt. On the first three trials aircraft, the drive wheel was a simple plain disc, but this was strengthened by adding six spokes for the remaining Type 464s.



Items highlighted in pink are the handles and valves that appear above the floor in the images opposite.

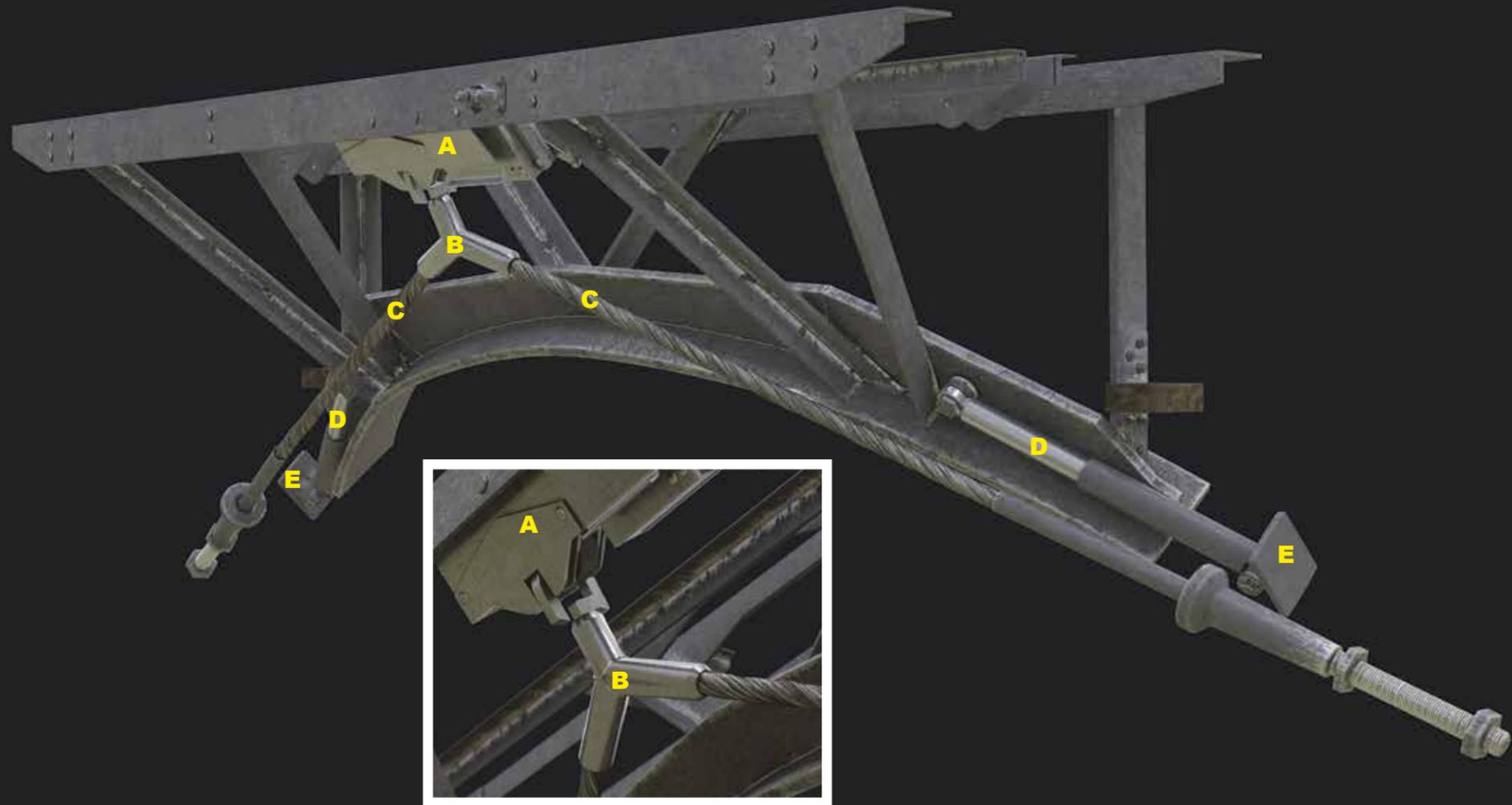
controlling the spin

To allow the speed of rotation to be controlled, the driveshaft was connected to a gearing mechanism (A) mounted directly above it by a flexible belt (B). This in turn was connected to a speed gauge through a flexible cable which ran upwards, through a hole in the bomb bay roof, into the wireless operator's position. The wireless operator could control the speed of the motor by opening or closing a large 'T' shaped valve key, which was fitted in the floor of his compartment, under the table. The valve key was connected to the motor mounted directly below it in the bomb bay, with the speed adjusted simply by turning the key anticlockwise to increase it, or clockwise to decrease it.



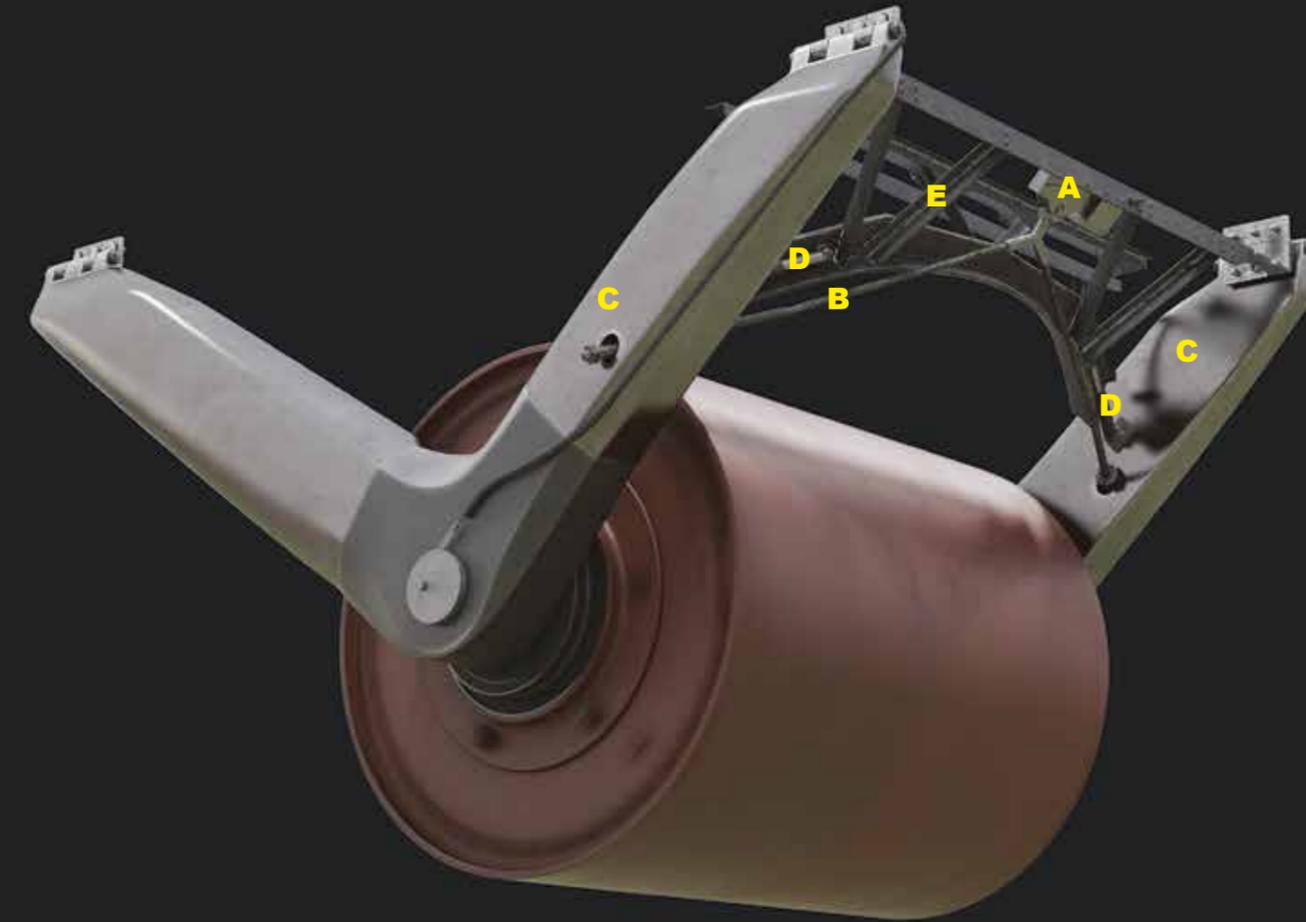
Contrary to what has been published before, the VSG motor was run off its own dedicated closed hydraulic circuit named as 'Main System'. The procedure during Operation Chastise was for the wireless operator to open the main system hydraulics about 10 minutes before the bomb run and turn the T-bar handle until the motor was spinning at 500rpm. Once the bomb was released, he would turn the T-bar handle the opposite way to stop the motor and then shut off the Main System hydraulics.





transverse frame

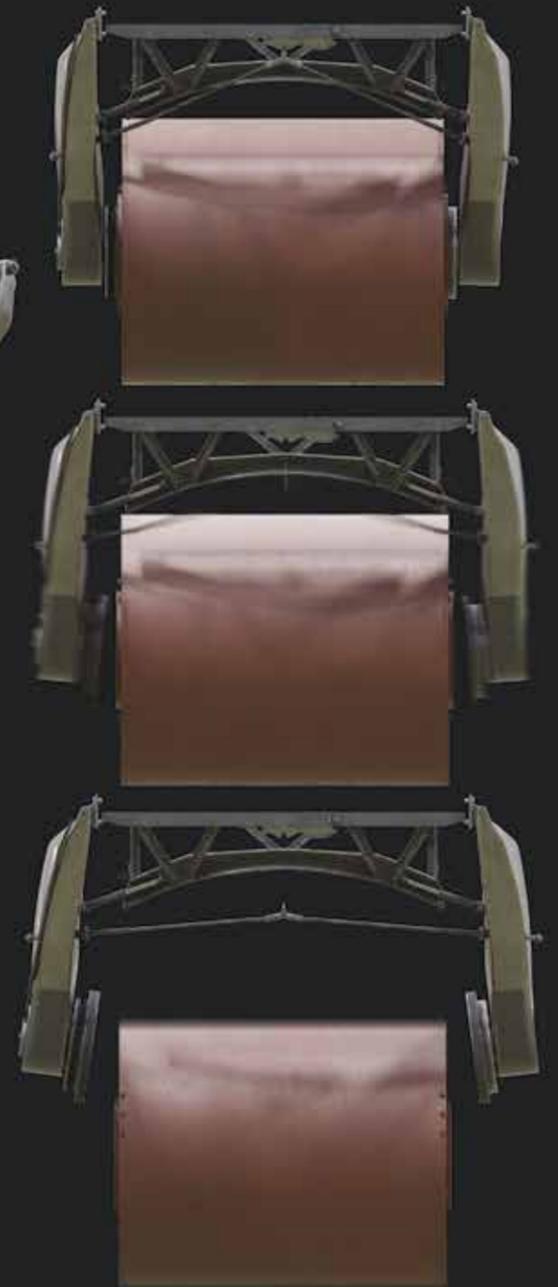
Mounted between the calliper arms was the transverse beam and frame. This welded steel structure held the bomb release mechanism (A) which was a standard 'Type F' 4,000lb bomb slip, mounted sideways instead of the usual lengthways. Inserted into this was the 'Y' shaped bracket (B) that held the heavy duty cable (C) that was used to pull the calliper arms inwards when loading the Upkeep. The transverse frame also mounted the powerful springs (D) which were attached to the calliper arms by brackets (E). These were compressed when the arms were pulled inwards by pulling the cable up to fit into the bomb release and consequently forced the arms outwards when the cable was released.

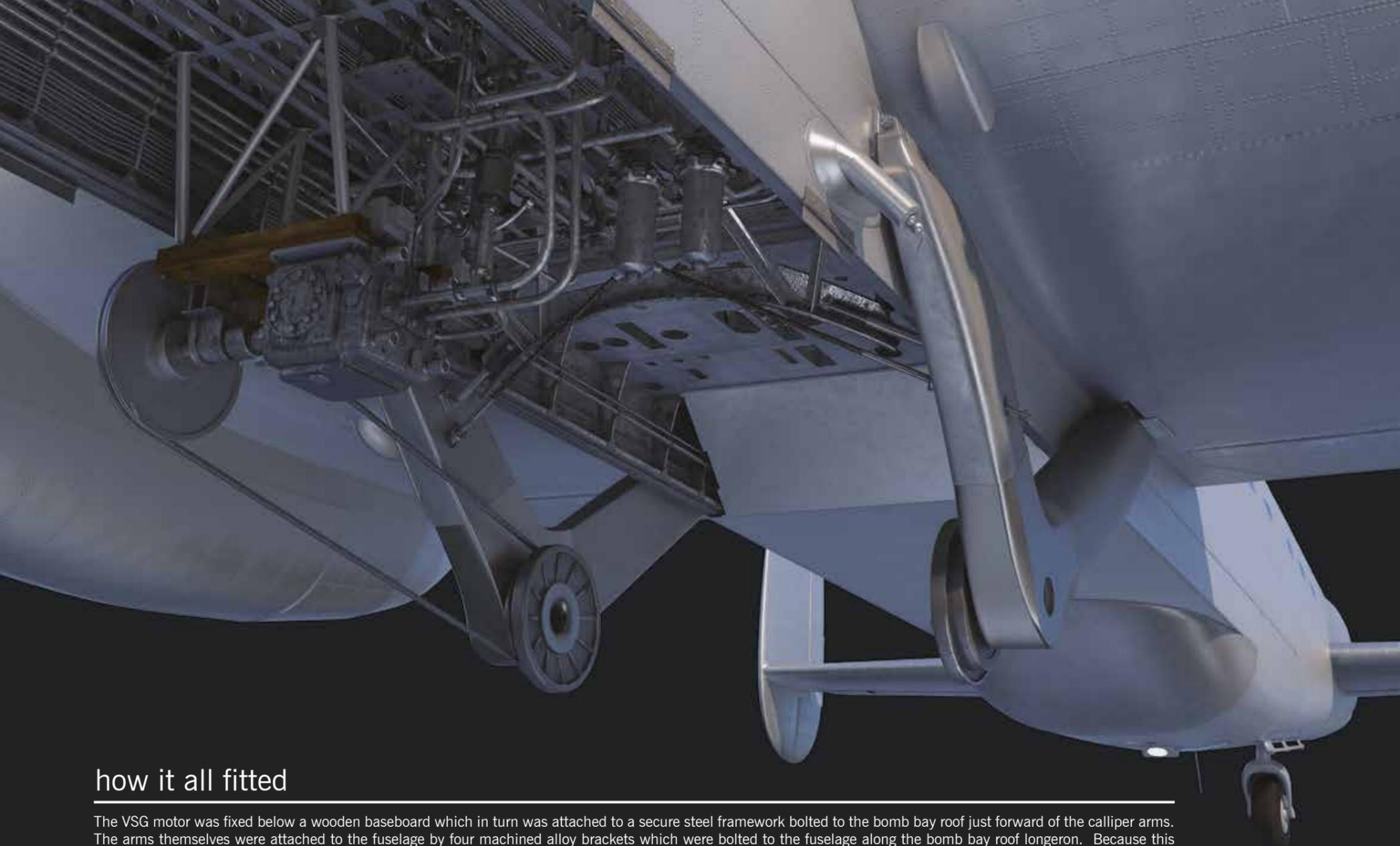


dropping the Upkeep

To drop the Upkeep, the bomb aimer would push his electrical release button, which would open the jaws of the bomb release unit (A), freeing the cable (B), which allowed the calliper arms (C) to swing outwards (by just a few inches each side). To ensure that the arms would open immediately, both of the front arms were attached to powerful springs (D), mounted upon the transverse frame (E) fitted between the two arms. These springs would force the arms outwards at the moment of release, leaving the weapon unsupported and free to drop.

In an emergency, the pilot could also release the Upkeep either with his electrical release button situated on the top left of his control yoke (which was on the same electrical circuit) or by the manual release handle located next to his seat.





how it all fitted

The VSG motor was fixed below a wooden baseboard which in turn was attached to a secure steel framework bolted to the bomb bay roof just forward of the calliper arms. The arms themselves were attached to the fuselage by four machined alloy brackets which were bolted to the fuselage along the bomb bay roof longeron. Because this longeron ran inside the wing space at the trailing edge, the rear brackets were mounted in a cut out section at the wing root. The arms were therefore free to swing outwards, being constrained only by the bomb release cable attached between them.

