Every Problem Has A Solution

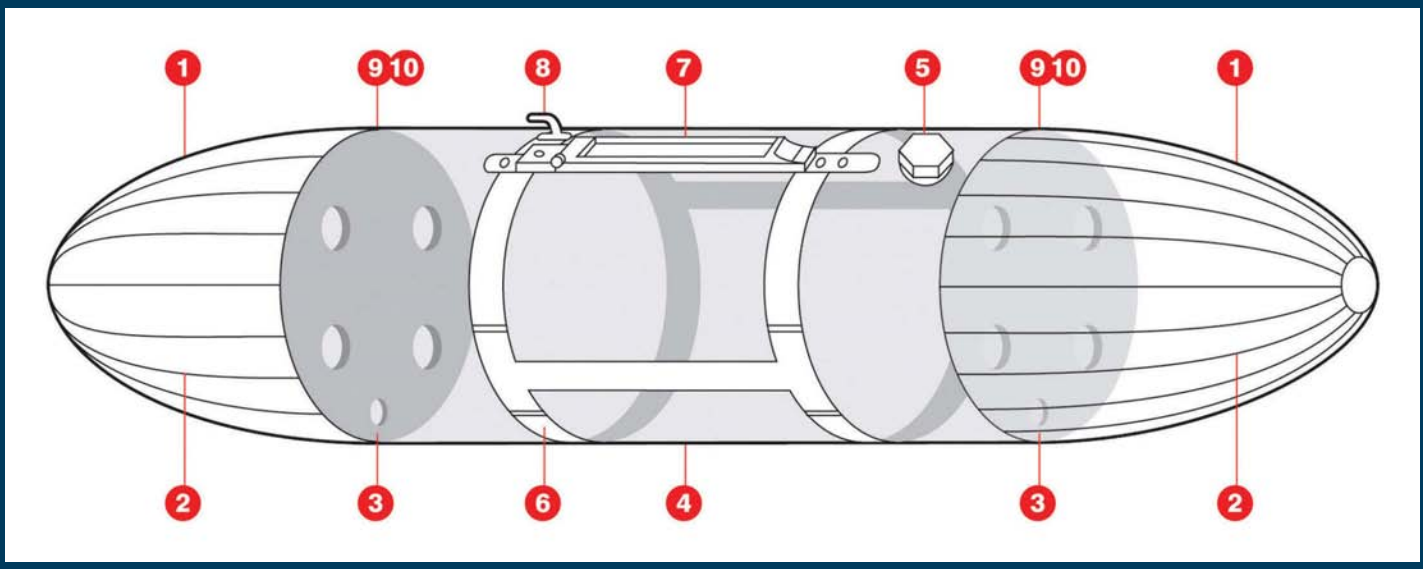
MAIN PICTURE: **USAAF personnel unpacking fibreboard drop tanks at an airbase in the UK.** (WW2IMAGES)

THE AMERICAN Air Force believed that its heavily-armed B17 and B24 bombers, flown in tight formations where their guns could be self-supporting, would contend with the German fighters. This soon proved not to be the case and the USAAF suffered heavy losses on long-range sorties over Germany. If these terrible casualty rates were to be reduced some method had to be found to enable fighter escorts to travel the great distances into eastern Germany. Somehow, the means by which the fighters could carry extra fuel had to be found.

The problem with this obvious solution was that fuel was very heavy and the extra amounts required for flights over Germany could not be carried in the existing tanks of the fighter aircraft. External drop tanks would have to be fitted and these would have to be manufactured in metal, and all metals were in great demand for war production.

In an effort to find an alternative to metal drop tanks the War Department put together a task force to consider the options that might be available. Amongst those invited to join this team was William "Bill" Lane, the author's father, an acknowledged expert in the manufacture of cardboard containers.

Reputedly, when *Reichmarschall* Hermann Göring saw Allied bombers over Berlin being escorted by North American P-51 Mustang fighters, he declared that he knew the war was lost. The Mustangs were only able to fly into the heart of Germany, and seal the fate of the Third Reich, thanks to pieces of cardboard. John Lane explains.



ABOVE: A diagram of one of the designs of fibreboard drop tank. The key is as follows: (1) laminated paper formed cone; (2) birchwood flat strips glued to the interior of the cone; (3) combined plywood formers/battles to stop fluid surge; (4) straight wound Kraft paper tube; (5) fuel filler cap; (6) canvas support straps; (7) wing attachment and tank jettison mechanism; (8) vent; (9) glued taper or step attachment between end cap and straight wound tube, with (10) joint reinforced with cloth or canvas adhesive tape.

CARDBOARD SHELL CONTAINERS

Bill Lane had already had dealings with the War Department a few years earlier. Sometime around 1938 he was asked to be part of a small team tasked with solving one particular and very serious problem. This was the rusting of ammunition when in storage. This especially referred to 3.7-inch cased ammunition for the Vickers designed and built anti-aircraft gun which was the main heavy weapon available to British forces for aerial defence.

This high-angled gun with a well trained crew could put up a rapid barrage of fuzed (later proximity) rounds up to a maximum height of 30,000 feet. In view of the high rate of fire this gun was capable of, the gunners wanted to take the rounds straight from their storage containers to the gun without having to clean off the rust first. This problem was solved by producing a straight-wound (about 10mm wall thickness) paperboard tube which was impregnated with light bitumen and fitted with a thick cardboard cap at one end and a quick release cap at the other. This container protected the shell so well that they could be stored outside in all weathers and subsequently many thousands of these cheap and effective shell holders were produced.

It was against this backdrop that Bill Lane joined the team of experts from the aircraft and paper industries which had been given the objective of designing a drop tank made out of "non-strategic" materials. Though wood was considered, the design eventually adopted was one that combined paper fibreboard and wood. The design was similar to the fuselage of a stressed skinned aircraft and consisted of a thick straight wound laminated paper tube with a moulded solid paperboard cap at each end and stressed inside with birch wood stringers and round plywood bulkheads. The bulkheads not only gave lateral strength to the tube but also stopped the sloshing of the fuel from end to end of the tank which would have resulted in some very peculiar flying characteristics especially when carrying a ninety imperial gallon (108 US gallon) tank under each wing which were out of synchronisation.

The first problem the team encountered was the lack of suitable paper to make the straight-wound tube. Usually paper for tube winding was made from recycled waste paper and cardboard and therefore mostly consisted of short fibres with poor tensile and bursting strength. What was needed was the long fibre "Kraft" paper made from virgin wood pulp (Kraft being the Swedish word for strength). Needless to say, during the war this material was difficult to obtain. However, a regular supply was eventually obtained with, it is believed, much of the paper being specially shipped in from Canada.

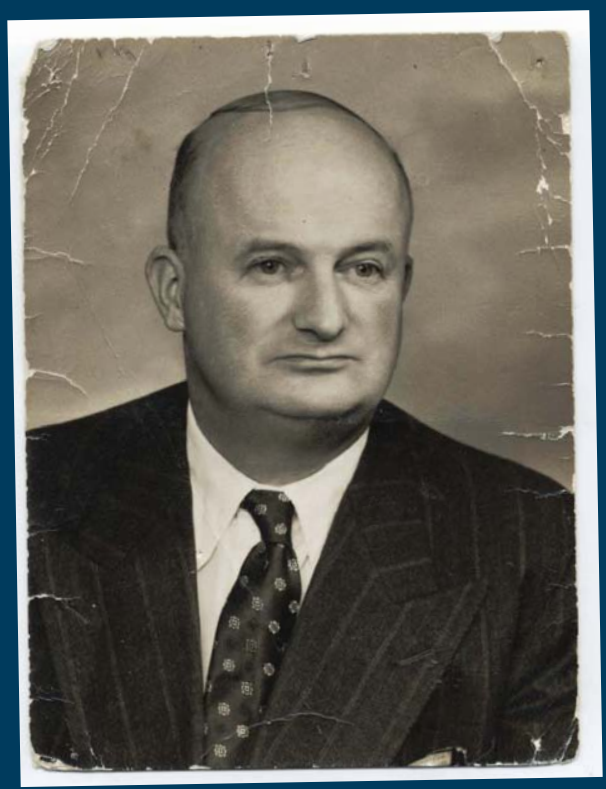
FLYING TRIALS

Having obtained the right materials, a number of ninety imperial gallon tanks were made ready for testing. These trials were undertaken at Boscombe Down and various locations on the South Coast including near Dungeness close to the airfield at Lydd.

With the tanks securely attached to the aircraft with woven canvas straps, flying tests were carried out. These were very successful and after some small modifications, the tank design, in several sizes, was cleared for production. It was at this point, though, that a serious problem emerged – one that had not shown up during the tests.

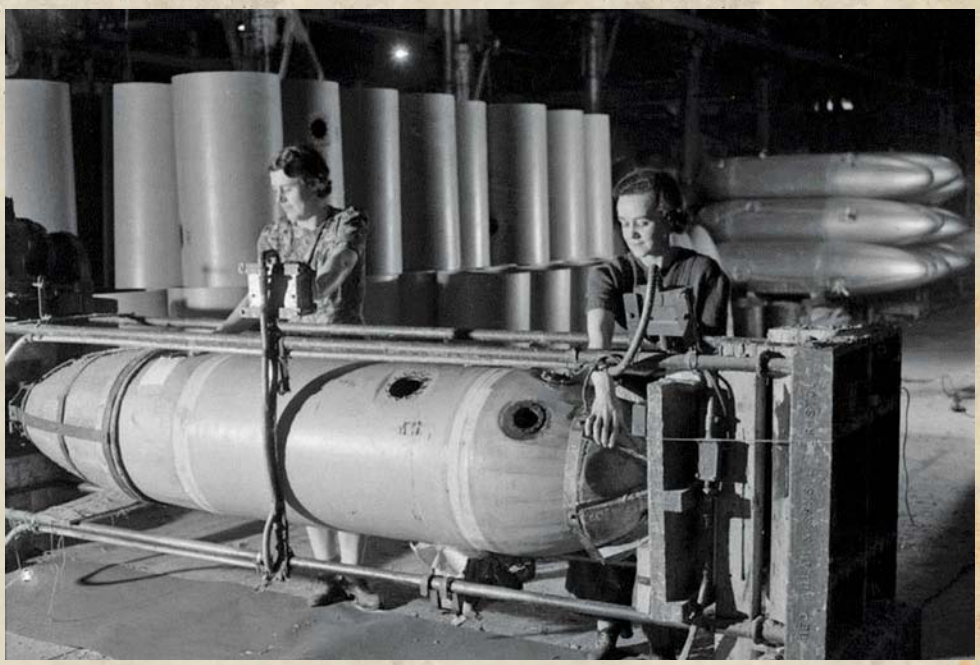
The test flights were all of short duration and the tanks still containing fuel were jettisoned before landing. However, on long flights it was found that after a few hours the tanks leaked as the fuel permeated through the interior coating and paper wall of the tube. This problem delayed the project as different types of interior sealants were tried – but all failed to stop the leaks.

Finally Bill Lane, more out of desperation than anything else, coated the inside with animal glue and, to his and his co-workers surprise, this worked. Though the fuel would eventually find its way through the tanks, they would hold long enough for the duration of flights over Germany. After that they could be jettisoned. ➤➤



BELOW: One of the team involved in the design of the successful fibreboard drop tanks – the author's father, Bill Lane. The author recalls that his father spent many hours working on the project, frequently working until the late hours every day of the week. (AUTHOR)

"NEWSPAPER, GLUE AND BRITISH INGENUITY"



AT A factory producing jettison petrol tanks for the Allied air forces, Miss Ethel Prett (left) and Miss Nellie Robery work at a large press which forces the two spigotted ends onto the body of the tank. Behind them, a large stack of tanks can be seen. The original Ministry of Information caption for this photograph reads:
"Newspaper, glue and British ingenuity were vital in carrying the USAAF-RAF 1943-44 bomber offensive into deepest Germany and beyond. They created lightweight jettison tanks which, attached to the wings or belly of a fighter aircraft, enable it to carry enough gasoline to escort bombers 700 to 1,000 miles.
"Reporting on Lend Lease Operations to the Congress of the United States on November 24, 1944, President Roosevelt said: 'Operational needs of our Air Force for these detachable tanks increased so far early last spring that for a few weeks tanks that were delivered from factories one day would be in use over Berlin or some other German city the next day. Since then there have been plenty of them. By June 30, 137,000 had been delivered. Now deliveries are approaching the 300,000 mark.
"These paper tanks have been made in over a score of small plants scattered throughout Britain, plants that used to turn out such products as ice-cream containers. To find enough labour to meet our needs the British went out and recruited women, men in their fifties and sixties, and boys in their early teens to get production up to the required levels. By their devoted efforts this pick-up force, working principally with old newspapers and glue, has contributed much to bringing destruction to the heart of the German war industry, to shortening the war, and to saving the lives of American bomber crews.'" (IMPERIAL WAR MUSEUM; D23460)

THE END OF THE THIRD REICH

In time, many thousands of these silver painted tanks in several sizes were produced by companies such as MPCP, John Dickinson & Co., and Bowaters. They were used for one mission only and because they had only a few hours' life, they were only filled and fitted onto the aircraft immediately before taking off on a mission.

As one USAAF veteran, Bob Sands, recalled: "Planes were never landed with the paper tanks still aboard. Sometimes a mission was scrubbed soon after the group [55th Fighter Group] was airborne, and all forty-odd P51s would swoop in single file over a dump on the field, releasing their tanks like a low-level bombing mission. They would burst in a cloud of vapour, but by a miracle, none exploded. Here was 8,000 gallons of precious fuel being wasted. However, the tanks were too fragile to risk landing with, so it had to be done."

The droptanks designed by Bill Lane and his colleagues were not only used on North American P-51 Mustangs, but such diverse aircraft as the Hawker Hurricane, Hawker Typhoon, Westland Lysander, Republic P-47 Thunderbolt, de Havilland Mosquito and the Lockheed P-38 Lighting. It was with the P-51, though, which the cardboard tanks are most usually associated.

With a ninety imperial gallon tank under each wing, an Allied fighter had an endurance of more than eight or nine hours, longer even than the reasonable endurance expected of any pilot. This meant that the fighter escorts could accompany the bombers of the USAAF all the way to Berlin and, as Göring correctly observed, it helped spell the end for Germany.

BELOW: A large store of drop tanks awaiting use at Andrews Field (also known as RAF Andrewsfield or RAF Great Saling) in Essex. (WW2IMAGES)