

Building a Hillary Tractor

By John Callesen

After completing restoration of the Oliver Crawler tractor used to take skiers and luggage to the Ball Glacier ski field, my brother Denis, then General Manager of the Hermitage and Trustee of the Aoraki Mt Cook Museum Trust, said he would love to have a “Hillary Tractor” like the ones used during the Commonwealth Trans-Antarctic Expedition 1955–1958 (CTAE). I rashly said, “Well, I’ll just make one.” Having seen the tractor in Canterbury Museum I thought it seemed a straightforward project.

In December 2007 the Sir Edmund Hillary Alpine Centre (SEHAC) at the Hermitage Mt Cook opened, and John Davies, the Chairman of the Aoraki Mt Cook Alpine Village Ltd, asked me to give an estimate of the cost to build the tractor.

Growing up on a farm using Massey Ferguson tractors and being an experienced car restorer meant I had some affinity with this project. Some months were spent researching exactly what the tractor should look like. All three tractors that made the trip still exist: two in New Zealand at Canterbury Museum and MOTAT, Auckland, and one in the Massey Ferguson museum in France.

All three museums holding the CTAE tractors were visited and numerous photographs were taken. These photographs, combined with research, showed that the tractors had been altered during their lives with the CTAE. The goal was that visitors to SEHAC should see a tractor as the originals had looked when they had arrived at the South Pole. This would mean donating at least double the time originally estimated to build one.

The third tractor, named “Sue”, had been in original condition when it had been shipped to the Massey Ferguson Museum in Coventry, England. Unfortunately, about 15 years ago it was fully restored before being sent to the Massey Ferguson Museum in France. A friend, John Kennedy, a Kiwi living in the UK, drove to France and sent back to New Zealand 134 photos of the tractor. The restoration of Sue meant it now looked brand new with perfect panels, plastic lights, and a bungee cord holding historically incorrect canvas. Luckily, the frame and panels were correct, as was one set of tracks. Between the three tractors and original photographs, enough information was gathered to build an exact replica of a “Hillary Tractor” as it would have looked when arriving at the South Pole in 1958.

The original tractors were intended to be used to transport the 600 tonnes of stores from the ship *Endeavour*



On January 4 1958, driving trusty Ferguson TE20 ‘Fergie’ tractors, Sir Edmund Hillary and his team became the first overland explorers to reach the South Pole since Captain Scott’s expedition in 1912, and the first ever to do so using mechanised vehicles.

Photo courtesy AGCO Australia Ltd.

This image does not appear in the book *Something Different*.

to Scott Base. The three tractors, donated by Massey Ferguson (UK) duly arrived in New Zealand to be assembled by Norwoods of Palmerston North. The tracks were sent separately by Massey Ferguson (Scandinavia), who designed the track system for these TEA-model tractors. A modified electrical system was also installed. Luck featured in my finding out about the original vehicles. My mother sent a Christmas card to a family friend, Gordon Watkins, mentioning what I was working on. He wrote back to say that in 1956 he had been workshop foreman for LM Silver & Co, King Street, Palmerston North, who were Southern North Island distributors for Lucas parts. One day he had received a call from the service director of Lucas, Auckland to say that a case lot of special equipment would be arriving to be fitted to three Ferguson tractors for Hillary’s Antarctic expedition. Gordon remembered that the M418 heavy-duty replacement starters wouldn’t fit against the crankcase. He ended up over-centring the housings in a lathe and told me to look at the original tractors to see his handiwork.

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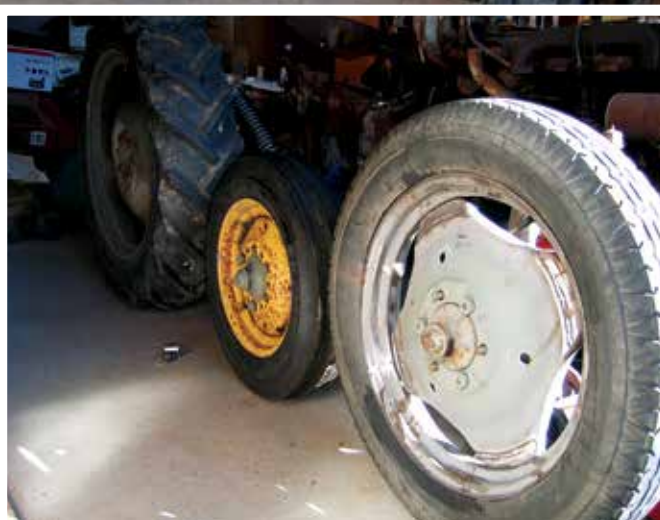


The original tractor before restoration.

Heavy-duty generators and silicon rubber wiring looms that don't freeze or crack were also fitted. Taylor and Andrews, a local engineering firm, had the job of converting the tractors from wheeled to tracked. Unfortunately, because the tracks were late in arriving they could not be trialled along with the rest of the equipment at Mt Cook before departure.

It took a year to find a Ferguson TEA from 1956, the last year the TEAs had been built. I wanted one as close to the original tractors' serial numbers as possible, hence the search for a 1956 model. Despite the replica tractor being destined for display I wanted it to be in running order, and it took a day to get the 1956 tractor, which hadn't been running for a number of years, operational again. All the fuel and oil were then removed to prevent leakages onto the SEHAC floor. As there was no drain plug on the steering box the tractor was taken apart to get it off and drained. The whole tractor was sandblasted to remove all the oil and rust, which involved tipping it upside down with my digger to do the underside. It was then put onto wheels suitable for tracks.

Originally, so the tracks would run over the front axle, 21 inch tractor rims were fitted instead of the factory-fitted



Beginning the restoration and adaptation of the front wheel rims.

TEA 19 inch ones. As none were available they had to be fabricated specially. This was done by taking four of the 19 inch rims and segmenting them to create 21 inch rims. The trick was to extend the hubs out to the now 21 inch rim and retain the four scalloped gaps like the originals. After many weekends of work they were within 2 mm diameter and looked the part.

Some of the museum tractors have standard three-rib tractor tyres on but expedition photographs showed that vintage car-type tyres had been used, which gave a more flattened surface for the tracks to run on. To achieve the

original look, worn 21 inch tyres were removed from an army 1927 Dodge Coupe (which then got new ones). Worn rear tyres with the correct tread type were finally found at Taranaki Tractor Dismantlers.

Much research went into the track system. Massey Ferguson agent Ron Fletcher had seen the remains of a centre idler wheel arrangement in Wanganui. There was enough left to work out the complete system and this was copied. Castings were made and the whole system replicated, including the spring-loaded shock absorbers, both outside and in. These units were a major undertaking. While building them I marvelled at how the tractors completed the journey south, as it was obvious that some of the components were pretty fragile.

The centre jockey rims presented the same problems as the front ones. New Holland hay press wheels were found to be the correct 15 inch diameter but needed to be cut down to a 4½ inch width. To be able to fit in the jockey wheel, Massey Ferguson had produced a reduction gearbox that extended the tractor by 5½ inches. After searching unsuccessfully for over a year to find a reduced gearbox I reproduced one from scratch, based on photographs. It was a large task to ensure every detail of the exterior was correct, including the levers and the serial number plate. The basic tractor was now complete and work began on the tracks.

A partial set of tracks with a set of rusty steel cleats still on the original rubber straps was found in the backblocks of Waitara. Half the cleats were usable for display purposes and the joiners were complete enough to use as patterns. Manawatu Hydraulics used their workshop to make the remaining 4 mm cleats.

Hillary had been so impressed at how the tractors performed that he wanted to use them to lay the depots. A trial run was made to Cape Crozier to ensure this plan would work. Even carrying only light loads, the petrol consumption averaged 4 miles/gallon, showing that with a 7.9 gallon tank easy access to the petrol cap was going to be needed! Additionally, the small windscreen and bonnet-to-seat-height canvas screen were insufficient to prevent cold affecting the driver. During the wintering-over period the tractors were modified to solve these issues, using on-site stores and equipment, including an oxyacetylene plant, an arc-welder and a sewing machine. All these winter-over changes needed to be replicated on the new "Hillary Tractor".

The expedition created a safety frame for the cab in case the tractor dropped into a crevasse. The base of the frame was ¾ of an inch thick and was bent to be attached under the rear guards. Magnifying photos of this area showed two separately bent ⅜ inch plates welded together. The cab was made out of Dexion shelving. Enough of the correct type was found left over from the construction of a hay sledge,

and the original Dexion bolts were usable after sandblasting. The size of the cab was ascertained using photos of the "French" tractor and counting the number of holes in the Dexion. This gave the exact sizes and angles of the entire cab, including the safety frame. Colour photographs provided the correct colour of canvas for the covering. Vintage car upholsterer Basil Shailer copied the cover, including the window hole construction, from photographs. All bolts that held the canvas were placed exactly as per photographs from the South Pole. Old oxidised aluminium was used on the front of the cab and to hold the radio. The windscreen was a challenge as it is unknown how Perspex was rolled into shape in the 1950s. We finally succeeded, and we then used rusty sheet metal to form the surround to make it look 50 years old.

Once, when a friend asked Sir Edmund Hillary what his greatest achievement was, his reply was not "Ascending Everest" but "Getting three farm tractors to the South Pole."

Expedition reports stated that angle iron was used to strengthen the front axle, and studies revealed the angle iron used was Waratah fencing standards. (It took some creativity to explain to the French curator of the tractor what these were.) Presumably they had been stocked at Scott Base to construct windbreaks for the dogs.

According to reports from the expedition, the tracks kept coming off the tractor during the initial trip from the ship to Scott Base. This seemed to be because the front wheel wasn't adjustable to centre the tracks. To fix it, they used a hacksaw to cut a slot through ¾ inch plate used to fasten the front steering so it could be adjusted. For authenticity these slots were recreated on the front axle steering fasteners. The expedition team also found that the centre jockey wheel wasn't putting enough downwards pressure on the tracks. This was because the spring loaded units had been originally made for tractors fitted with half tracks. A few half-track tractors had been used in New Zealand, as they gave more traction but could still be steered normally. These units relied on the pressure of the tracks around the jockey wheel forcing it backwards against the spring units. On the fully tracked expedition tractors the jockey wheel was just floating on the tracks, therefore Hillary's team had to increase the angle of the shock-absorber units to create more downwards pressure. To achieve this they used spare linkages and grafted them into the top shock absorber mounts. On our discovering this, the replica tracks had to

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be changed in the same way, after they had already been made based on the half-track version.

The tractor could be steered only with the brakes, and in New Zealand levers were placed outside the piece of canvas wind protection, to be operated by hand when the driver was sitting down. For Antarctic conditions these were changed to be inside the canvas and welded to the brake-actuating arms. To get more traction a triangular piece was cut out of ¼ inch flat steel and welded to each side of the hump in the track cleats. Half the winter must have been spent doing this job, as it took us ages to cut and weld on with an arc welder 128 of them in the same way the expedition team had. To stop the track cleats hitting and jamming against the rear guards, ¼ inch flat plate was welded to a piece of channel and fixed just inside the rear of the guards.

Originally the cleats had been attached to chains, but by the time the ship was unloaded the cleats had broken multiple times, so the team came up with the idea of mounting them on 1½ inch x 3 inch rubber belting. Welding and assembling the tracks took my helpers and me 170 hours!

The rear half of the tractor's bonnet was cut off so that the battery, which had been originally placed in an exposed position by the diff, could be mounted up by the engine. As the expedition had only oxyacetylene to cut steel I recreated all the scorch marks this would have left on the bonnet. The expedition welded a piece of angle iron with slots in it to the rear of the bonnet, which was held closed with No 8 wire. This allowed easier access to the petrol cap for regular refuelling. Originally, the bonnet grill had radiator shutters to keep the engine the correct temperature but this system was extremely frustrating and was discarded for a piece of canvas. This was fastened and made adjustable by welding three 5/16 inch washers on each side of the bonnet, slotting the canvas and holding it once again with No 8 wire.

All the modifications performed at Scott Base have been recreated in this replica and painted matt black so they can be seen and won't rust. The team at Scott Base had had no tractor paint, so all the steel used was in its natural state, which in photos looked black.

During the CTAE there was no canvas on top of the cab while the tractors were being driven, to allow escape if the occupants fell into a crevasse. There was a rolled up canvas flap that could be pulled over to keep the snow out when they slept.

From photographs it seemed that the most likely option to tie this back had been a leather boot lace, which was luckily obtained from John Hastilow, a vintage car club friend, during the trip to deliver the tractor to the Sir Edmund Hillary Alpine Centre. The canvas screen was not windproof and hence, on the CTAE, the drivers swapped over regularly due to the cold.

During the journey to the Pole the tractors had had "A" frames attached to the front axle so they could be towed. There was not enough room in the Alpine Centre for this, so a piece of flat steel was welded on to indicate where it would have been attached, which was then cut off as had been done to "Sue".

At the rear of the CTAE tractors was a drop-down hook used for towing cargo sledges. This was challenging to make based on the surviving tractors and original photographs. An equipment-lifting rail was attached to the hydraulic arms.

The ammeter on the tractors was original to the TEA model, but these didn't have temperature gauges so an after-market one was installed on all three tractors. For the replica these were reproduced in New Plymouth.

The final paint colour was very difficult to get right. All the museum tractors had been repainted, and colour photographs taken on the Ice had different shades of red or orange-red. Massey Ferguson TEAs were always painted grey, and today's Massey Ferguson agents couldn't come up with any reds for 1956. Some articles say the tractors were painted once in Antarctica for visibility, but this was not the case, as they were working as soon as the ship arrived and photos show them already red. Eventually an orangey red was created that was "flattened" right back to look old. The Ferguson name on the bonnet was reproduced by Capture Signs in Palmerston North to match the same size, font and colour as seen in the photos.

In December 2009, two years after my initial conversation with John Davies, the "Hillary Tractor" was completed. It now sits proudly at the Sir Edmund Hillary Alpine Centre at the Hermitage Mt Cook. Like the CTAE team I had completed my mission and had recreated a Hillary tractor including all details and alterations. 🚧

Edited extract from the book *Something Different* published by the Sir Edmund Hillary Alpine Centre www.hillarycentre.co.nz. All images courtesy John Callesen.



Close up showing the shock absorber system.



The finished "Hillary tractor" in pride of place on display.



Image showing original windscreen from rear of tractor.



The restored tractor faithfully replicates the waratah standard which was added during the CTAE to strengthen the front wheel.



The tractor showing the bar on the hydraulic arm at the rear of the tractor.