

A New Dimension

NOT LEAST AMONG THE effects of the Australian Revolution was the sudden modernization of the art of warfare. In 1880 there were already in existence many weapons, or potential weapons, which, thanks to the conservatism of the admirals, generals and politicians, were either derided or completely ignored. There was, for example, the steam-operated Gatling cannon, with its rate of fire far higher than that of the hand-operated models. There was the Andrews Airship, a dirigible that flew successfully, with a crew of four, over New York in 1865. Quite fantastically its inventor, Dr. Solomon Andrews, was unable to obtain the backing of either military or commercial interests. (Today's readers, of course, will be familiar with the Andies, the small, unpowered airships that are now used only for sport and pleasure.)

It was the Andrews Airship that added an extra dimension to warfare.

Nonetheless it cannot be denied that chance played a great part in the history of our infant nation. Had it not been for the severe injuries sustained by Ned Kelly at the Second Battle of Glenrowan, as a result of which his days as a horseman were finished, it is unlikely that, even though he was an innovator, he would have taken the interest that he did in what many of his lieutenants referred to as "new-fangled contraptions."

As it was, however, he took personal command of the first of the armored trains—although it is said that he wept openly when his quick-firing Gatling guns mowed down Colonel Sturrock's cavalry in the action just south of Wangaratta. He never took kindly to the painfully slow, armored traction engines, effective war vehicles though they were.

But Francis Bannerman's salesman, representing both his employer and Solomon Andrews II (the son of the inventor), had no great difficulty in interesting him in the Aereon. One attractive feature was that the ship—or ships—could be manufactured locally. The gas cells would be made from varnished linen. There was plenty of light wood—or even bamboo—for the basket. The necessary cordage could soon be obtained from the Port Melbourne ship chandlers.

With every ship constructed, however, a substantial royalty would have to be paid to Mr. Solomon Andrews in Perth Amboy. It is said that this factor almost persuaded Kelly not to go ahead with the deal, notwithstanding the substantial monetary contributions pouring in from Kelly sympathizers in the United States and elsewhere.

The salesman played his trump card. If the deal were made regarding the Andrews Airship, then the Army of the Revolution could have, for no charge whatsoever, the complete specifications of Professor Lowe's mobile hydrogen gas generator, the device used for inflating the Northern observation balloons during the War Between the States.

"What about an instructor?" asked Kelly, on the point of signing on the dotted line.

"Surely you've a balloonist or two in your country, General," countered the salesman. "And don't forget that I'll be supplying all of old Dr. Andrews' records. Why, once you get the hang of it it'll be as easy as riding a horse!"

For a moment—if we are to believe Kelly's own records of the war—it was touch and go. That reference to horses hit him where it hurt. And yet ... like riding a horse? Would it be like riding a horse? There would be skill required, great skill not unlike the skills of horsemanship. There would be speed, and the sensation of speed, and the wind in his hair and his beard.

He signed.

In essential details those early Andrews dirigibles differed little from today's racing models, although, of course, they were much larger. Positive buoyancy, however, was attained by the dumping of ballast; for negative buoyancy it was necessary to valve gas. Helium, as a lifting medium, was not yet dreamed of—but, apart from its flammability, hydrogen is superior. The battery-driven compressor, by means of which, in the modern Andy, lift is reduced, was still many years in the future.

But there was the double "hull", the two side-by-side sausages. There was the intricate network of

cordage from which depended the almost canoe-like basket. There was the rudder, mounted abaft the gasbags, with the control lines from it to a simple tiller. Just forward of the tiller and to one side was the inclinometer, no more than a pendulum and a graduated scale.

In those days, however, there were no easily handled cylinders of helium gas. Instead there was the lead-lined wooden tank on wheels, in which were the shelves upon which the iron filings were spread. There were the carboys of undiluted sulphuric acid and the barrels of water and, from the tank itself, the pipe running first to the box-like purifier (in which a lime solution removed undesirable taints from the hydrogen), then to the cooler (in which the gas was bubbled through water), then to the slowly swelling balloons.

It was a "Professor" Duval who became General Kelly's Chief Aeronaut.

Duval, with free ballooning experience in both Europe and the USA, had come to Australia some weeks prior to the First Battle of Glenrowan (still referred to by the English as the Glenrowan Massacre), hoping to make money for himself by exhibition flights. With the outbreak of the Revolution, however, there was no great demand for such entertainment. The Francis Bannerman salesman knew of him, however, found him in his squalid lodgings in Melbourne, and persuaded him to enlist under the banner of the Harp and Southern Cross.

His expertise was of great value in the construction of the first Aereon. He was inclined to sulk because there was no silk available for making the gasbags, but, said Kelly, if varnished linen had been good enough for Dr. Andrews it should be good enough for him. He refused, too, to have anything to do with Lowe's mobile hydrogen gas generator.

"I'm an aeronaut, General!" he exclaimed, "not a chemist!"

"How did ye fill yer balloons, then?" asked Kelly.

"Even in Australia," said Duval, "almost every town has its gasworks."

"An' am I to fight my battles, Mr. Duval, only in places where there's a gasworks handy?" Kelly asked rhetorically.

"But ... but, General, do you mean to *fight* in that thing?"

"What else?"

"But I thought it was just for observation."

"Who wants to observe when he can be doing something useful?"

So it was a Mr. Brown, erstwhile chemist's assistant, who became what was, in effect, Chief of the Ground Staff. The men detailed to assist him hated the work.

But Brown drilled them, and drilled them, and by the time that the first dirigible was completed the chemist was confident that, using two generators, inflation could be carried out in less than six hours.

Actually it was nearer to seven.

Work was commenced at sunrise, at about 5:30 AM, and at 12:30 the double gasbag was taut-skinned, the sunlight reflected from the shiny brown surface. The bottom of the car, however, was resting on the ground, Duval having seen to it that a considerable weight of stones had been loaded into it. Fortunately there was no wind; the ground crew had yet to gain experience in handling an airship prior to lift-off in all conditions.

Kelly emerged from the tent in which he had been lunching with his officers. He looked, Joe Byrne said later, as though he were dressed for a wedding. He was wearing a well-tailored green uniform, high-collared, double-breasted, with brightly gleaming brass buttons. There was more gold at his collar and on his sleeves, and the golden harp badge shone brightly on the band of his wide-brimmed green hat. His flared breeches were thrust into highly polished black boots.

"All that was missing," said Byrne, "was a pair of golden spurs.... " But he was limping badly, lurching, almost. It must have spoiled the effect.

Duval, too, was in uniform, one of his own design, based on that of a Hungarian Hussar officer. (It was the rig that he had always worn as a showman when making his free balloon ascents. He looked, said Byrne, like an organ grinder's monkey.) He was a little man, dwarfed by the giant, bearded Kelly.

According to all accounts, despite the bravely upthrusting points of his waxed moustache, he looked

scared. "But Ned," (Byrne again), "he looked like a boy on his way to tumble some fair colleen.... "

While Brown, in his shabby, acid-spotted clothing, fussed around like an anxious mother hen, the two men clambered into the car—first Duval, then the General. Duval—who, after all, was an experienced balloonist—negotiated the network of suspension lines without great difficulty. The much larger Kelly had trouble. But he got through at last.

Then an argument started, audible to all around the dirigible. Kelly, it was obvious, was insisting that he was in command for this maiden flight.

"But, General," Duval was expostulating, "you're not a balloonist. I am. Am I not your Chief Aeronaut?"

"Have ye ever flown one o' these things, before, Mr. Duval? Tell me the truth."

"No, but.... "

"Then just do as ye're told. Start heavin' out the rocks!"

The little man obeyed while General Kelly stood in the after part of the car, his big right hand grasping the tiller. Brown was looking more and more worried. According to his calculations—and to those of Duval—there was enough lift in those two-hundred-foot-long sausages to carry five men of Kelly's weight aloft, all being well....

Then the forward end of the car was lifting from the ground. There was a ragged cheer as men saw that the dirigible was gliding ahead, was lifting. She was airborne, gliding upwards at a shallow angle, with General Kelly standing tall and proud at the tiller. She was increasing speed through the air as she lifted. Something green fell from the car, fluttered slowly earthwards. It was the General's hat.

But would she clear those tall eucalyptus trees? Men heard, faintly, Kelly roaring orders to Duval. More rocks were jettisoned and then the little man scampered aft to trim the ship further by the stern. She cleared the treetops with feet to spare.

She was turning then, coming around in a great, lazy arc, still rising. When she returned over the camp she was all of a thousand feet high. "It ain't natural!" somebody was shouting. "It ain't natural! It's the Devil's own work!"

"God made the laws of nature." said Brown, who, it seems, had his pious moments. "God made the laws of nature, and we're doing no more than to use what He gave us.... "

The airship was no more than a speck in the northern sky, almost invisible in the glare of the sun, when she turned again. She was losing altitude slowly, gliding in at a shallow angle. Before long those with keen eyesight could see that Duval was now at the tiller and that Kelly was in the middle of the car, leaning outwards. He was holding something in his hands.

In spite of Brown's protests somebody had lit a cooking fire, although it was some distance from the gas generators. Over it was a tripod, and hanging from this a cauldron in which was cooking a mutton stew for an evening meal for some of the men. The falling rock struck one leg of the tripod, which collapsed. Contents of the cauldron were scattered over the grass and into the fire.

Everybody, except the men whose meal had been ruined, thought that it was very funny.

Then, slowly, the ship settled, almost in exactly the same place from which she had lifted. Brown and his men took hold of the edges of the car and the suspension network, while others hurried to the scene with more rocks. It would not do to waste too much hydrogen to compensate for the loss of weight when the two aeronauts disembarked.

Joe Byrne lounged up.

"And so ye're goin' ter drop rocks on the English bastards, Ned?"

"Not rocks, Joe," said the General. "Not rocks.... "

At that time the only military explosive in general use was gunpowder. The bombshell, fired from muzzle-loading cannon, was a hollow ball filled with black powder and with a fuse ignited by the discharge. Nonetheless dynamite was in existence, although used only in mining operations. Fulminate of mercury and guncotton were both available.

Until the Australian Revolution, Francis Bannerman in New York had dealt only in second-hand arms. Among his employees, however, were those who were sympathetic to the Australian rebels (as he

was himself) and who, like Ned Kelly, were innovators. It could be argued, of course, that Kelly's use of body armor during his early career was a backward rather than a forward step—but had it not been for this protection it is probable that he would not have survived to become the founding father of the Australian Republic.

There are fragmentary records of a meeting held between Francis Bannerman and his more imaginative salesmen in the offices of the Army & Navy Surplus Stores on Broadway, New York.

One of the salesmen said, "The trouble with you, Frankie, is that you're selling the weapons of yesterday's war to fight today's battles."

"As long as the customers pay, cash on the nail, why should *I* worry, Mick?"

"Sure, Frankie, they're paying. But that's not the way for us to make *real* money."

"Show me a better one."

"Sell the customers the weapons of tomorrow's war to fight today's battles. We've a marvelous proving ground Down Under. There'll be observers from all the major powers. We'll buy the rights to construct the Andrews Airship from old Dr. Solomon Andrews' son. We'll encourage Dr. Gatling to do what he's always talking about—make a machine gun worked by a little steam engine instead of some poor bastard sweating his guts out turning a handle. We'll.... "

"That airship," said Bannerman thoughtfully. "Would it carry guns? Could it lift one of those new-fangled Gatlings you're talking about, complete with ammunition *and* the steam engine *and* the coal to boil the boiler ...?"

"The Steam Gatling," said the salesman, "will be an ideal weapon to fit aboard steamships and armored trains. But not aboard an airship. Apart from anything else there's the fire hazard.... "

"So what'll your bold aeronauts be using, Mick? Bows and arrows?"

"No, Frankie. Bombs."

"Then, taking the words from your own mouth, what about the fire hazard? Somebody'll have to strike a match to light the bomb fuses before droppin 'em."

"I've a man, Frankie, who's a mining engineer. He's used to working with dynamite. He's told me how a dynamite bomb could be made. There'll be the main charge and, sitting inside it in its own little cannister, what he calls the primer. Guncotton he's thinking of using. And inside of the primer there'll be the detonator —fulminate of mercury. I don't need to tell you that *that's* very touchy stuff. So—you drop the bomb. It hits, hard. The fulminate goes off. The guncotton goes off. Then the dynamite. I, for one, wouldn't want to be around when the Big Bang happens."

"And if these bombs work," said Bannerman thoughtfully, "we'll be in on the ground floor. If the airships work, that is.... All right, Mick, you just carry on unloading the second-hand stuff on to Hanrahan so that the next shipload of Irish Volunteers is armed as well as the Union Army was at Gettysburg. And I'll be seeing Mr. Solomon Andrews in Perth Amboy and Dr. Gatling at Hartford...."

"I'll say this for you—you're a salesman. I like the way you put it—fighting today's war with the weapons of the next one. Now all you have to do is convince the man Kelly and his American backers. I hope you do—if only to wipe the grin off the faces of the lousy British!"

The eventual success of the Australian Revolution owed much to the inventive genius of two men—Solomon Andrews and Richard Gatling. Both were prolific inventors. Both were more than merely competent physicians—and yet they owe their fame to the killing machines that they produced. The British and pro-British forces fighting in Australia were, of course, equipped with Gatling guns but, once the supply of arms from the USA was in full swing, only the Australian Army and Navy had at their disposal the steam-operated weapons with their bigger caliber and far higher rate of fire. It is on record that both Francis Bannerman and Dr. Gatling tried to interest the British military establishment in these weapons. One elderly General is supposed to have said, "Damn it, sir! Warfare is for soldiers, not engineers!"

Similarly, neither the War Office nor the Admiralty wanted anything to do with Dr. Solomon Andrews' Aereon. High-ranking bureaucrats, admirals, and generals were quite unanimous: "If God had meant us to fly, He'd have given us wings."

British sympathizers must have seen the test flights of the first of the Andrews airships —*Pride of Erin*. Word must have reached Imperial Army Headquarters in Sydney of the thing that flew against the wind, swooping and soaring, circling. But neither for the first time in history nor the last were eyewitness reports disbelieved and derided.

So the rebels had a balloon. So what? Observation balloons were nothing new. They had their uses but, in the long run, they were rather more trouble than they were worth. A balloonist could watch a cavalry charge but he couldn't do anything to stop it.

Meanwhile the first consignment of dynamite bombs arrived in Adelaide—then still in Imperial hands —packed in cases which, according to the ship's manifest, contained canned meats. By an overland route they found their way first to Melbourne and then to General Kelly's headquarters at Glenrowan.

The arrival of the train with the new bombs was the only good news that day. The pro-British forces were making a determined thrust south from the New South Wales border, with horse, foot and artillery. General Kelly had sent one of his armored trains, under Colonel Hart, north to stem the advance. In an earlier action, near Wangaratta, the Imperial cavalry had attempted to charge one of these monsters but had been mown down—but even the cavalry commanders of those days were capable of learning by experience.

This time there was a pretended retreat, a withdrawal before the deadly 11/2-inch Gatling cannon, firing cannister, could be brought to bear. A small party of brave men, hidden in the bushes at the side of the track, remained behind. It was their duty to jerk the wires that would initiate the detonation of the mines buried under the permanent way.

It was a Lieutenant Coverley of the Royal Artillery who was in charge. Had he survived the engagement it is probable that he would have reached high rank in the military profession. He allowed the two leading cars, which were forward of the locomotive, to pass over the explosive charges, giving the order to fire only when the engine was almost at the danger point.

According to contemporary accounts the locomotive rose bodily into the air in a cloud of smoke and steam, disintegrating as it did so. When it came down there was another explosion— this time the boiler. Colonel Hart, the driver, Angus McPhail, and the two firemen, Peter Wherret and Isaac Sangster, were all killed.

But, fantastically, none of the cars was overturned although those behind the engine, four of them, were all derailed. In one of these were six horses. Captain McVicar ordered these disembarked and then sent Sergeant Murphy and Private Kennedy galloping to Wangaratta, which was in Rebel hands, so that an urgent telegram, with news of the disaster, could be despatched to Glenrowan.

The news reached Kelly while Brown—now Major Brown—the pharmacist turned military engineer, was supervising the unpacking of the dynamite bombs. They had been shipped unassembled—the bombs themselves, plain metal cylinders with open tubes running through them longitudinally, the primers, smaller cylinders that would fit inside the tubes, and the "pistols", each with a nipple containing fulminate of mercury that, when the bomb was armed, would fit snugly into the can of guncotton. Each item, of course, was in its own packing case and the detonators were nested in cotton wool.

Major Brown became aware that Kelly was bellowing orders.

"Duval—I want the *Pride of Erin* airborne! Yes, now! Never mind the leak —just daub it with tar or something! Brown! Where the hell are ye? Get that generator o' yours workin'! An' how many riflemen can the *Pride* carry?"

Brown walked to where Kelly was still roaring orders. "What's wrong, General?"

"What's wrong, ye ask? The bastard British have got Steve and his train, that's what. At Byawalla. The only way that we can get help to them in time is by air.... "

"With four riflemen in an airship, General?"

"How else, damn ye?"

"But the bombs have come."

"The bombs... ," repeated Kelly. "The bombs.... " Then, "Are ye sure they'll work?"

"The thing that scares me," said Brown, "is that they might work too soon!"

Fortunately his men were capable of operating the hydrogen gas generator without his supervision, and while he was assembling the bombs—priming but not arming them—the *Pride of Erin*, the wrinkles smoothing out from her starboard gasbag (the one with the slow leak), was straining at the mooring lines that secured her to the ground. Duval—according to Joe Byrne—looked as though he were about to shit himself as he watched. Kelly had decided that the Chief Aeronaut would be the pilot and that he, himself, would be the bombardier. Apart from anything else, he was one of the few men in the camp capable of lifting one of the dynamite cannisters by himself.

Brown had four of the bombs loaded into the car and ballast thrown out to compensate. Using a fifth bomb he gave Kelly hasty instructions. "When the bombs are primed, General, they're still fairly safe—but once you shove home the 'pistol,' the detonator, like *so*, the slightest jar is apt to set them off. Here are the four 'pistols' for the bombs that you'll be carrying....

"Arm the bombs now!" ordered Kelly.

"But, General.... "

"When I carry a weapon, *Major* Brown, I want it ready for use at once, not after ten minutes or so fartin' about!" So Brown armed the four bombs in the airship's car.

At three o'clock on the afternoon of a fine summer's day, with the wind blowing from the north at about five knots, the *Pride of Erin* lifted sluggishly from the Kelly headquarters. Many history books give this date, December 14, 1883, as that of the first bombing raid in history. This is not correct. In 1849 the Austrians attempted to bomb Venice from unmanned Montgolfier balloons. Nonetheless the Battle of Byawalla was the first occasion when bombs were dropped from a manned aircraft.

Despite the head wind the *Pride of Erin* made good time. The hastily applied patch on the envelope of the starboard gasbag—a square of linen stitched on with coarse thread and smeared with hot beeswax—seemed to be holding. Ballast—there was not much of it to play with—was dumped, and the dirigible glided skywards at a shallow angle. At about 2000 feet Duval, increasingly worried about the untested repairs, valved hydrogen and made a downwards swoop. It was a shallow dive; of necessity he was sacrificing speed for the conservation of lift and ballast.

There was an altercation between the General and his Chief Balloonist, but Kelly finally saw reason—or Duval's version of it—and allowed the aeronaut to do things his way. (It has been suggested that Duval was afraid that too steep an ascent or descent might cause the primed and armed dynamite bombs to roll, to come into violent contact with each other, thus jarring the unstable fulminate of mercury into premature detonation.)

The Aereon passed over Wangaratta, where people in the streets of the little town stared upwards, pointed, and waved. She followed the railway line to the north-east. Duval climbed again in preparation for the final swoop. The armored train was within sight. Its crew was still holding out. They were protected by the armored sides of the cars and, very fortunately as it turned out, Colonel Hart had insisted that rifles and ammunition for the entire crew be carried. Somebody had managed to convert one of the Gatlings to manual operation, but its fire was slow and hesitant.

On both sides of the track were the Imperial forces, pouring volley after disciplined volley into the crippled train. Perhaps they were not—as yet—doing much damage, but their supply of ammunition was not likely to run out.

And there was the artillery that had been brought up, two six-pounders. The guns had not yet been brought into action but they were being deployed, the crews manhandling them to a position on a low hill to the east of the railway track. The gunners, in their blue and scarlet uniforms, must have been sweating like pigs in the hot afternoon sun but they were working with calm efficiency, hauling up the ammunition carts with balls and powder, the water tubs, and the sponges on their long handles.

Nobody, either aboard the train or on the ground, looked up as the *Pride of Erin* swept overhead.

It was General Kelly's intention to turn and to bomb the six-pounder battery on the return run to the southward. The wind, however, was now somewhat west of north and increasing, and the dirigible was blown off course. Duval did his best to cope with the changing circumstances, but on her final,

downswopping run the airship was coming from almost directly behind the gunners, who were in a direct line with the crippled armored train. And those cannon were now loaded, were being laid and trained.

Kelly, grunting with the effort, lifted the first of the dynamite bombs, held it out over the side of the car. He dropped it. He turned and stooped, picked up the second one, then the third, then the fourth. The *Pride of Erin* was rising steeply now, almost out of control. Looking down and astern Kelly saw the first bomb hit, saw the flash, and heard the ear-shattering roar. It was not quite a direct hit, but the two guns were knocked off their wheeled carriages. There was a secondary explosion as the ammunition cart went up. He saw the second and third bombs strike—falling, as he had intended, among the infantrymen.

The fourth bomb, he was to admit afterwards, he should never have dropped. He should have realized that with the rapidly increasing altitude of the airship its trajectory was extended. It scored a direct hit on that car of the armored train in which the bulk of the Gatling ammunition had been stored.

But that, at the moment, was the least of his worries.

The hastily applied patch had blown and the airship was losing altitude. Fortunately, with all his faults, Duval had developed into a superb airshipman and the *Pride of Erin*, with the following wind assisting her, almost made it back to Glenrowan, finally touching down on the railway lines with everything possible jettisoned, even to the uniforms of the two men, in the fight for buoyancy.

"'Tis a pity, Ned," said Joe Byrne, "that ye had to get *our train* as well as the British guns.... Sort of throwing out the baby with the bath water.... "

"Such is life," the General is supposed to have growled.

AUTHOR'S NOTE:

Dr. Solomon Andrews (1806-1872) was both a physician and a remarkably prolific inventor. His "Aereon" was patented in 1864, after its first successful flights. Quite fantastically, he was unable to gain support from either military or commercial interests and, even more fantastically, he is not represented in the Lighter Than Air Gallery of the National Air and Space Museum in Washington, D. C. Nonetheless, I have to thank Mr. Philip D. Edwards, one of NASM's Technical Information Specialists, for finally unearthing for me the patent taken out by Dr. Andrews.

Professor Lowe was the Union Army's Chief Balloonist during the War Between The States. He invented the mobile hydrogen gas generator, which was used for the inflation of observation balloons. I must thank Miss Brenda Beasley, of the National Archives, Washington, D.C., for helping me to find the specifications and operating instructions for this device.

Francis Bannerman set up as a second-hand arms merchant shortly after the conclusion of the War Between the States, purchasing both Union and Confederate weaponry and selling it to anybody as long as it was "cash on the nail." He is reputed to have armed just about every South American revolution during the late 1800's. I am indebted to Mr. Goins, curator of the Division of Military History, Smithsonian Institution, Washington, D.C., for valuable information regarding Bannerman and his activities.

Dr. Richard Gatling invented the machine gun that bears his name, patenting it in 1862. Perhaps the steam-operated Gatling is my invention—although Gatling himself must have toyed with the idea. Nonetheless he did produce an electrically-operated gun, with a very high rate of fire, in 1890. So far as I know there were no buyers. The electrically operated Vulcan machine gun, however, used by today's American air forces, is a direct descendant of the Gatling.

With respect to the dynamite bombs used in this story, I admit that they are modeled very closely on the depth charges that were among my toys during World War Two, although with these the "Pistol" was fired hydrostatically and not by impact. In actual history the first use of modern high explosive in warfare was during the Russo-Japanese War (1904-1905).

Finally, as we know from comparatively recent history, civil wars are ideal opportunities for helpful outsiders to try out new and hitherto untested weapons.