

THE OPINIONS EXPRESSED IN THIS DOCUMENT ARE MINE ALONE AND DO NOT REPRESENT OFFICIAL POLICY. DSTL WERE MOST EMPHATIC THAT THIS BE MADE CLEAR!

“THE EXPLODING KIND”

by

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Preface

We were stood at the bar at Kineton, the Army School of Ammunition, where bomb disposal men are trained prior to doing their dangerous job in any number of different theatres of war. Around me were the senior instructional staff at the EOD school and we were talking shop. The conversation had got around to the considerable attrition rate of people who applied to be bomb disposal men and never made it as they were weeded out by the selection and training process. On most occasions a good deal less than twenty five per cent stayed the course.

The OC of the School, an old chum, took a pull at his pint and pronounced half seriously.

“To some extent, it doesn’t seem to matter how we do the technical selection and how many psychometric tests we conduct on the candidates. From my experience there is only one seemingly infallible way of telling whether someone has what it takes to be a bomb disposal man. Watch them in the bar on the first night. You can always tell the people who will survive through the course and in this business. They are the ones with a very strange sense of humour.”

I have noticed that this was true not only of the military but also of my Civil Service colleagues who devised the bomb disposal techniques that the military used. On the other hand, I have also heard it said by some outside our strange calling that no one in their right minds went into bomb disposal and this accounted for the eccentrics who were attracted to the trade! Anyway, after nearly thirty five years in the business of devising bomb disposal techniques and other associated explosive activity, from whatever cause it has tended to provide me with an interesting set of colleagues and some amusing experiences. These stories, some directly about the gentle art of Bomb Disposal /Explosive Ordnance Disposal and some just about the people concerned with the business, hopefully demonstrate that they all share in common that strange sense of humour.

Chapter 1

It was late autumn in 1971. Northern Ireland had just turned from civil disobedience to armed insurrection with the commencement of a vicious bombing campaign. My chum Mike was attempting to convert a piece of equipment designed to knock apart limpet mines to something that would have an equivalent effect on improvised explosive devices, the posh name for terrorist bombs. The problem was that he did not have the faintest idea what a terrorist device looked like, contained or constituted. One bright morning, I strolled down to the Bomb Chambers at “an MOD establishment somewhere in Kent” I have been instructed to say, to see how he was getting on and somehow stayed to give him a hand. You could do that sort of thing before we were all organized

into Project Management teams and spent a good half of our available time satisfying the demands of accountants.

Our first inkling of what a terrorist device constituted came from the Army School of Ammunition at Kineton. Mike travelled there and obtained information on the types of devices that had been used by terrorists in Hong Kong and Cyprus. Armed with that information, Mike and I constructed similar devices back at our base, fitted them with the maximum charge of PE4 plastic explosive that we could fire in the Bomb Chambers and wired them up with a detonator. Each device had some form of anti-disturbance circuit built into it to make things interesting: pendulums, mouse-traps, micro-switches. Our one concession to safety (coupled with a Darwinian regard to self-preservation) was that we checked the circuit just prior to attaching the detonator. We used a safety ohm-meter, a specialist form of meter, as with a detonator in the circuit it is not a wise move to put too many milli-amps into a detonator let alone the half an amp or so that was provided by the firing circuit. Several times we found that the pendulum/anti-disturbance switch was touching somewhere it should not have been which did not do a lot for the safety ohm-meter but did at least keep us from attaching a detonator to a live circuit.

Using the exaggerated amount of power of the limpet mine disposal system we completely wrecked the explosive devices, and spread the components to the four corners of the bomb chamber. What was more important was that the disruptive system wrecked the battery, cut the wires, and displaced the detonator from the explosive charge. The other important aspect was that a simple visual examination of the scene afterwards showed that particular device would never function as a terrorist device again. This was basically the birth of the disrupter as a means of making terrorist devices safe.

We were suitably pleased with ourselves and reported to Cliff, our Section Leader that we thought we had something worthy of further study. Then we obtained our first operational information from Northern Ireland. The opposition were not using military explosives: they were stealing their explosive from mines and quarries. Hence we were facing explosives based upon the somewhat more volatile material, nitro-glycerine. Neither Mike nor I had any experience of such materials as they are considered unsuitable for military use. Still, armed with the knowledge that was what the bombs contained, we contacted ICI Nobels and obtained practically overnight a hundred pounds or so of 80% Special Gelatine, a standard material used by the mining industry with a fair amount of power.

We repeated our earlier experiments with the same power settings of the disrupter. Bang! The only thing that had changed was the sensitivity of the 80% Special Gelatine and every time we attacked the bomb it blew up. Somehow this seemed to defeat the object of the exercise. We tried tuning down the power by reducing the amount of propellant in the cartridge. Bang! Bang! Bang! This was getting monotonous. Besides an increasing feeling of despair that we would ever reach a setting that would not set off the nitro-glycerine explosive, we were also experiencing the joys of nitro-glycerine poisoning. NG is used to treat people with high blood pressure. Even small amounts depress blood pressure significantly. If your blood pressure is normal, then the immediate symptoms of NG ingestion are a very severe headache followed by vomiting and general collapse. NG is also very volatile in the true sense and is absorbed through the skin as well as through inhalation. Night after night, Mike and I would return to our respective homes, throw up, collapse into bed and then come back the next day to do it all again. Sigh!

Still we tried and eventually, with much diminished disruptive power, we managed to knock the devices containing the 80% Special Gelatine apart without setting them off. We again reported to

our leader that we were triumphant and could now deal with commercial explosives based upon nitro-glycerine. Wrong! We received a consignment of material recovered from a real terrorist cache from a failed bid to smuggle explosives onto one of the Cunard liners operating out of Southampton. There were a dozen or more samples of different commercial explosives, some of them distinctly looking the worse for wear: they were turning to liquid and generally looked far from happy. What untutored souls refer to as “sweating gelignite” but I am more inclined to think most of it is water absorption from the atmosphere. We gingerly incorporated them into our test devices and used the revised settings in our device to attack them. Bang! Bang! Bang! Even with the tuned down systems that had proved successful for the 80% Special Gelatine, the disruptive power was setting off these representative NG explosives from the cache.

We were beginning to wonder if there was actually going to be a solution from our approach. Cliff came down to see how things were going and read us the riot act in no uncertain terms. He ranted and raved that we were varying more than one aspect of the design at a time, we were playing hunches and were not approaching the matter as scientists. He threatened to cut off various parts of our anatomies that were dear to us unless we renounced flying by the seat of our pants and progressed in a more rational and studied manner. He insisted that the only way forward was to identify the variables that were important then vary only one of them at a time while we observed the effect. With repeat firings this rapidly developed into a matrix containing about a thousand entries. Even working 12 hour days and six days a week, which we were, there was the prospect of about a year’s work before we had even completed the matrix. There was, of course, no guarantee that we would be able to pick success from the matrix even then. With our ears burning, Cliff departed.

“What are we going to do?” I enquired.

“If we don’t complete his bloody matrix, he will have our balls!” lamented Mike.

“That is all very well, but the poor bastards in Ireland trying to make bombs safe are being killed at the rate of one every two weeks and that’s an awful lot of widows and orphans if we take a year to find a solution.”

We looked forlornly at one another and then Mike came up with the solution.

“We will fill out his bloody matrix in the morning and in the afternoon we will fly by the seat of our pants!”

Within two days we had a solution that allowed us to attack all of the new supply of commercial explosives, some even nastier homemade or improvised explosives and still defeat all the anti-disturbance circuits that had been used in the Hong Kong and Cyprus campaigns. That was all very well, but how did we know if we really had found the answer? We did not fancy telling Cliff that we had disobeyed his specific instructions and then find a week later that we had missed some important aspect and have everything collapse on us again.

What were we missing? What were we doing wrong or misinterpreting that would bring the whole appearance of success crashing about our ears again? The only thing I could think of was that we were making the bombs and hence knew where the vulnerable components were. Was there some bias from this that was increasing the chance of our making the devices safe? It should not be from the non-specific nature of our approach but how could we be sure? Suddenly I knew the answer.

“Sod off.”

“Pardon,” said Mike somewhat taken aback.

“Clear off. I am going to make an infernal machine the like of which no one has previously imagined. You are not going to know anything about it until you come into the bomb chamber and try and make it safe. That way there can be no criticism that we know where to hit the thing.”

And so it was. By this time we had made more than a hundred terrorist devices and were getting quite good at it. This time I really went to town and designed something so far in advance of what PIRA had thought of to date that I was really proud of it. It might even give me an alternative occupation if the Civil Service job did not pan out. Of course with greater complexity came more chances that it could go horribly wrong in the arming sequence. What we in the trade called with macabre pleasure when it happened to the opposition “an own goal”. I managed to blow away yet another safety ohm-meter before I got the beast quiescent enough to place the final detonator in position and invite Mike to have a go.

Mike approached sight unseen, set up the disrupter and, hey presto, was successful. In the aftermath I explained the various nasty tricks that I had built into the device to catch him out.

“You bastard! You were really trying to get me. Right. My turn. Sod off.”

Thus it went on for a week with each of us in turn trying to kill the other (try to do that now within the confines of the current Health and Safety Legislation!). At the end of the week we were both still alive and the disrupter was still working. We decided to own up to Cliff.

Initially there was a bang bigger than the devices that we had earlier failed to make safe but he soon calmed down when he heard the numbers of successes that we had under our belt. We were now pushing two or three hundred shots in the three week period and our success rate was impressive.

Perhaps some idea of the delicate balance built into the machine came from the closures we used to keep the material in the barrel of Pigstick. For our experimental shots we used sticky tape to keep the material in. But even our youthful enthusiasm could see that the rude and licentious soldiery would take a dim view of fiddling with tape in the dark and cold of Northern Ireland.

Mike was an amateur wine maker of note and came back from lunch with a variety of plastic closures that were then used to keep the vinegar fly out of really cheap plonk. There were three different designs with differing profiles. Only one of the designs did not produce detonations from the bombs we attacked. Even the slight differences in profile upset the careful optimisation we had achieved.

Right. We now needed lots more of that design. I leapt into my little car and hurtled down to the off-licence in the closest town. I approached the owner and explained that I needed to inspect the tops of his cheaper wine bottles to identify if any of them used the particular plastic top that I had. I told him that I worked at the neighbouring Ministry of Defence establishment but unfortunately could not tell him what I wanted the plastic tops for. The request was sufficiently strange for him to comply. I found the correct type of plastic top within a few minutes and noted down the address of the bottlers. Their address took me to a small plant underneath the railway arches near Waterloo station. I asked for the manager and showed him the plastic closure.

“Do you use these?”

“Yes, we do.”

“I need about a thousand. Can I buy them from you? I cannot say why except that it is important and is concerned with work that could potentially save an awful lot of lives.”

With that the gentleman, who I think was of the Jewish persuasion, wordlessly took a large cardboard box and scooped several thousand of these plastic closures into it. When I requested a price and an invoice he simply smiled and said that it was his contribution to the project. The specialist EOD units were supplied for about three years from the contents of that box! Bless him.

Our design completed, demonstrations to the Headquarters people followed and then it was proposed to show it to the operational users in the Province. Mike was the Project Officer so it fell to him to take the beast over to NI. It was still the substantial piece of equipment that was built to deal with limpet mines. It weighed 42 pounds and needed a course in weight lifting to handle. However, our up and down progress made us realise that there was a lot of magic distilled into the device. The last thing we were going to do at this stage was alter any damn thing!

Mike had a successful day in NI with the Senior Ammunition Technical Officer (SATO), the Major in charge of 321 EOD Company who were the military folk who dealt with terrorist bombs in the Province. They fired in a quarry out in the country and the disrupter dealt with everything the EOD men threw at it. As they were returning to Lisburn that afternoon, a tasking came on the squawk box. A device had been left in a large electrical warehouse in the outskirts of Belfast. On went the blue flashing light and away they went with Mike and all.

On arrival at the scene, the SATO investigated. The EOD team had already tried to shift the device but it was awkwardly placed. He came out to where Mike was observing the scene.

“Will your device deal with it?” he asked.

“The only way I can tell is to look at it,” said Mike.

The Major was not a happy bunny. Think of the paper work if he did not return the scientist in full working order. How did he explain if he got blown up?

“All right. Come with me but don’t touch anything.”

If the Major had but known, Mike and I had probably dealt with more live devices at this stage than any EOD man serving.

Mike looked at the device. It was about three times the size of anything we had tackled before and had a can of presumably petrol just behind it. We had not tried our experiments on anything like it before. He looked around the store and saw about one and a half million pounds of electrical equipment.

“Well, it’s not my warehouse,” said Michael. With that he set about arming two of our devices, positioned them, and we had never fired two simultaneously before, retired and fired them. It was a total success! That was the first operational use of the equipment that was later called Pigstick, fired in anger by one of the scientists responsible for its design. Mike was soon after gazetted for an unusual decoration for a civilian, an M.B.E. with oak leaf clusters, a gallantry award.

Since its operational debut Pigstick has changed dramatically externally but its internal furniture, effectively the magic that we built into the device, has not altered very much. It is still neutralising bombs effectively and its success rate is something approaching 99.97% over the 30 years that it has been in Service. The last time I had anything to do with EOD, and that is increasingly getting a long time ago, we had just passed 5,000 successful neutralisations in Northern Ireland alone. There are an awful lot of EOD men who owe their lives to that breakthrough. Not bad for a mad three weeks of effort by two lunatics in the late Autumn of 1971!

There was one other corollary to those mad days. Soon after the initial onslaught and Pigstick's unscheduled first appearance in Ireland we had a young RAOC Captain called Williams seconded to help us get the beast quickly into Service. He had been with us for about a week when he came to find Mike and me one afternoon. He looked a little sheepish and explained that he could not divulge why but could we tell him as much as we possibly could about how the device worked, what it would work on and what it would not? He was a pleasant lad and was obviously keeping some big secret that we were not to be party to. We set to with a will and showed him everything we knew about our new toy.

I went home that night wondering what was up. On the nine o'clock news was an announcement. Someone had threatened to blow up the liner Queen Elizabeth II and our gallant Captain had been flown out into the mid-Atlantic with an escort of some Marines from the Special Boat Squadron, and dropped by parachute into the ocean. Now I have already explained that Pigstick (it was not even called that then. It was termed Circuit Breaker) weighed 42 pounds. What with his other equipment, even shared out with his Marine colleagues, he had a lot of weight on board for jumping into an unfriendly ocean. We gathered that the Captain of the QEII did what he could to create some calmer water but it must have been less than fun. We also heard that he lost his automatic shotgun in the jump and the bastards made him pay for it!

Once on board it was something of an anticlimax as the call had been a hoax. Once the ship had been searched and declared free, Bob Williams enjoyed a few days cruising on the way back to Southampton. Bless Cunard because they appreciated what he had risked on their behalf and I believe they gave him and his girl friend a proper cruise afterwards. What was not generally known was that this was only Bob's second or third jump! That would teach him to get involved with lunatics like us.

Chapter 2

Having introduced Mike it is perhaps time to illustrate what I mean about the eccentricity of people who are involved with EOD. Mike is, admittedly, something of a special case as he is a good deal more eccentric than most but here goes.

It all seemed quite logical the way that Michael explained it one day over tea. Make a storage tank for a large volume of water, install a heat pump to extract the heat from the water and, hey presto, lots of (almost) free energy to heat his house. The first problem was therefore to build the storage tank. Now Michael's house is a modest semi-detached at the bottom of a steep hill from which the main road descends from the scarp face of the North Downs. His garden extends for perhaps twenty metres to the rear of the property and is about 5 metres across.

Mike did his sums and came up with a required volume to heat his house of some 225 cubic metres. That translated into a hole 5 metres square and 9 metres deep. Effectively it meant that half way down Michael's garden there was to be this enormous pit occupying the complete width of the garden but that did not deter the lad.

With the close proximity of the North Downs, scratch the surface and you find chalk. So Michael started to excavate using a handy trailer, which looked suspiciously to my untutored eyes like a disused security cabinet on wheels. I wonder where that came from? The County Council were building a new by pass not half a mile from his house so Mike tipped his load of chalk alongside the scar made by the new road. It did not take long before one of his neighbours tipped off the local

Parish Council that Mike was desecrating the countryside. He received a warning letter from the Parish Council telling him to pack it in or they would prosecute.

Any normal soul would have heeded the Gypsy's warning and stopped. Not Mike. He wrote to the County Council responsible for the road. He pointed out that he was providing, free of charge, a barrier to prevent Travellers from parking their vehicles by the road side, something that had taken the provision of a series of concrete posts linked by metal pipe along another stretch of road nearby. His solution was more environmentally friendly and was not costing the ratepayers a penny. He received a letter from the County Council, copy to the Parish Council, thanking him for his activity and giving him authority to continue!

The digging proceeded in fits and starts and finally came to completion. Now Mike is supposedly a chemist by training but somehow it had escaped him that chalk is a porous commodity. Therefore filling the large cavity in the chalk with water required some sort of lining material to be applied to the hole. Mike, of course, knew a man who had a load of gash wire reinforcing. I turned up one morning to travel with him to one of our ranges in Essex. He was not at home. I was just about to leave without him when his little car turned up with enormous piles of wire mesh reinforcing strapped over its roof. It was tied on with string and overlapped both front and rear by about two metres but what the hell!

So provided with the wire reinforcing, some shuttering made from wood acquired from some other source and a small electric cement mixer, Mike started to cement up the sides of his hole. He would come in to work and report another 25 cm height on a good weekend's work. This he found deeply frustrating as it was going to take a large number of weekends to top out his 9 metres depth.

He sat musing one teatime at work trying to figure a way of increasing progress. What he needed was more time. But where was it to come from? The Government required his presence from eight to five o'clock. He only lived five minutes from work but, having had his tea, there was scarcely an hour's light before it got dark. Floodlights would fix that he thought. And with floodlights he could go on into the evening. (You can imagine the joy of being one of Michael's neighbours!)

So he fixed up floodlights and continued with both weekend and evening work. But he was not satisfied. We would ask how the great project was progressing and he would shake his head.

"Slow. Slow", he would say sadly.

Time. He needed more time. One day he had a brainwave, or at least what passed for one for Michael. "Every night," he thought, "I presently waste eight hours of my life sleeping. Surely I do not need eight hours? Isn't a lot of this habit?" So Mike determined to try making do with a lot less sleep and use the extra time to concrete his hole. The chronology of the hole building with reduced sleep went something like this:

Day 1. Mike came in to work, went home at five o'clock and had his tea. He then worked through to three o'clock in the morning under the floodlights, chug chug went the cement mixer, crash bang went the loads of cement going down into the shuttering. (Again who would have him as a neighbour?)

Day 2. Mike appeared at work at the normal time and, again, went home at five o'clock to have his tea. Repeat performance with the floodlights and working through the night. To bed at three o'clock.

Day 3. Triumphant Michael announces that progress is picking up amazingly and that the project will be finished in ten days at this rate. Returned home at five o'clock and again works to three o'clock in the morning.

Day 4. No sign of Michael all day at work.

Day 5. Michael eventually wakes up just after midday having slept for just over thirty hours!

Having got the hole concreted, I do not believe Michael ever actually used it as a reservoir for a heat pump. He tried growing mushrooms down it which was probably just as well from the events a few months after the final concreting as it had a layer of horse manure at its bottom which..... but I anticipate. Mike did find one valuable use for the hole. It meant that his wife, a rather large and lovely lady called Jeanne, dare not venture across the hole in the middle of the garden across the narrow builder's plank that formed a precarious bridge over the gaping chasm.

Mike would wind poor Jeanne up to a high state of agitation and would then come flying out of the back door bounding rapidly over the chasm of the hole leaving the builder's plank oscillating wildly, and then seek sanctuary in his shed at the bottom of the garden. Jeanne would appear out of the back door in hot pursuit and skid to a halt at the edge of the hole, teetering at the brink so to speak and not daring to trust her considerable bulk to the narrow and still vibrating plank.

It was after such an escape that Michael was conducting some small experiment in his shed when he inadvertently set it on fire. He came dashing out, bounced over the plank bridge and yelled for Jeanne to call the fire brigade while he attempted to fill buckets with water to extinguish the flames. Out of the back door and across the plank, water over the flames and back again. Several repeat performances before the sound of sirens heralded the arrival of the gallant lads of the local fire service. The appliance pulled up in the road and a column of smoke indicated the location of the conflagration. A fireman dashed smartly around the side of the house and plummeted straight down the 9 metre hole.....

Fortunately the horse manure broke his fall but let us say there was a fair amount of rather choice language emanating from the hole as a result. I think his colleagues did eventually put the fire out after hauling their poor and somewhat evil smelling colleague out of the hole. But that is what you get when you deal with a genius like Michael.

Chapter 3

Some areas of work seem so divorced from what they eventually get used for when you start them that it is amazing looking back that there was ever a connection. Perhaps the connection is the person working on them but I have found several times in my thirty five years career that something I had done in one area of my work could be dusted off and used effectively somewhere else. Foam was a case in point. In 1969 I was given a "funny" to look at for a small proportion of my time while we were working on barrier research. A "funny" was the parlance for an unorthodox project approach to a particular problem that would probably be solved by a more conventional solution if the truth were known. But it made the final report look better to show that you had considered some daft ideas and rejected them.

Someone had the bright idea that it might be possible to use fire-fighting foam as a means of generating a sort of semi-permanent smoke screen. This might serve to obscure your own troops' nefarious activities but it might also add to an existing or improvised barrier to slow down the opposition.

There are different types of foam used for fighting fires. The stuff that was used to project over crashed aircraft had a high water content and its expansion ratio, the ratio of the volume of the original solution to the final volume of foam, was only about 10. At the other end of the spectrum was high expansion foams used to fight fires in warehouses. The expansion ratio of this was 1,000 or more. It was this type of foam that I was to investigate.

I acquired a generator and quickly discovered that I could produce about 200 cubic metres a minute of the white soap bubbles. With any sort of lateral support provided by a narrow street, a culvert or a tunnel it would build to several metres high in a few minutes. Knowing that the material was mostly air, I ventured into it one day holding my hands over my mouth. It had a most peculiarly disorientating effect as it obviously blotted out all vision but the multi-celled structure of the foam also provided almost total sound proofing too. Walking into foam was like walking into a sensory deprivation tank. I was most taken by the strange feeling and discovered that I could stay under the foam almost indefinitely provided I had something like an umbrella to stop the foam collapsing onto me. In fact walking backwards with an umbrella became my favourite way of walking through it. When the boss was around you could nip under the foam blanket for a crafty smoke and he was none the wiser.

I invited one of my colleagues to try foam walking but he was not keen. Once I had finally convinced him to try with a safety line around his middle he entered but came out again white faced with panic in only a few minutes. He said that it felt so appallingly claustrophobic that he had to get out. This set me thinking. The standard form of entertainment in Northern Ireland at that time was rioting. Say we came along to a nice riot and filled the street with high expansion aqueous foam? Part of the riotous behaviour came from a loss of inhibition in the rioters as they felt less like an individual and identified more with the mob. The effect of the foam would be to isolate them and make them individuals again. Perhaps they would decide that they would rather riot another day.

I suggested this and very quickly was introduced to a pleasant white haired gentleman called David. He rejoiced in the splendid title of the Scientific Advisor to the General Officer Commanding in Northern Ireland. I laid on a demonstration of the foam at Borden Camp, an army base in Hampshire, and showed how quickly we could fill a "street" between various military huts. One or two military aides were induced to walk into the foam bank and again came out white faced and distinctly unhappy about the experience.

Very rapidly we modified a 4 tonne truck and fitted two of the generators at the back and coupled them to a large tank of water fitted just behind the cab. A Coventry Climax fire pump completed the set. Expanded metal was fitted to prevent the odd stone or brick thrown by rioters from causing grief to the crew and we had a foam truck. Several more demonstrations were held at various locations in the UK before I was asked to travel to Northern Ireland to demonstrate it to the military staff at the Headquarters in Lisburn. This was some time in late 1969 and my first trip to the Province.

I took with me my assistant, a young man called Brian. Brian looked most unmilitary being a member of the hirsute leather clad brigade but he knew the magic to coax the pump to function which required a fair amount of physical activity as it needed to be activated with a starting handle a bit like an old Model T Ford. With all the water from the foam around to short out the electrics, this was occasionally a major undertaking. The day of the demonstration arrived and we backed towards rent-a-mob, some volunteer soldiers who had been invited to stone us, which they did rather too enthusiastically to our minds. We reversed towards them with half house bricks bouncing off the metal surround and projected our foam all over them which produced a good deal of ribaldry but

did stop them throwing stones as they could not see where we were. Just to add realism one enthusiast threw a couple of petrol bombs which did not amuse Brian and myself as there was no way out of our expanded metal box other than forwards into the foam. I directed the foam over the blazing petrol and fortunately showed that whatever else we had done did not interfere with its fire fighting capability.

That evening we returned to our hotel, a country club not far from the base in Lisburn. The campaign was still simmering in Northern Ireland and people could be billeted outside the protected enclave of the barracks. In the months ahead two off duty soldiers staying in our country club were induced by two young ladies to attend a party. Terrorists burst in and the soldiers were forced to lie down and were then machine gunned to death. Forever afterwards we stayed in the Mess.

The riot control foaming truck was only ever used once to my knowledge and it was not a success. Unfortunately the military using it had received no training from us and did not appreciate that the detergent used in the generators was a good deal different from washing up liquid. They had run out of the proper stuff and hence used Teepol, the military's general detergent cure all. The foam collapsed as fast as they tried to build it up.

The foam had been used on the edge of the Bogside in Londonderry. I was asked to go and see if I could work out why it had not worked as well as it had in our demonstrations. Clutching my briefcase and dressed in my best Burton's finery, I travelled to Belfast, was met by some of my future EOD chums from 321 in an unmarked car and was then transported at very high speed across the wild moors of the Sperrin to Shackleton Barracks in the middle of Londonderry. The shooting war had now started in earnest and no one ventured to the spot we were to inspect without full military escort.

The major who was to be my escort viewed me with amusement. I must have looked a very young boffin indeed.

"You had better put this on," he said throwing me a flak jacket that was rather a tight fit. I put it on over my Burton's finery and sat rather self-consciously awaiting whatever was to happen next. Everyone seemed to think I knew what the programme for the day was to be which came about because someone had sent a signal describing the programme to my base but too late for me to be aware of it. Everything therefore came as a glorious surprise.

The major reached into the drawer of his desk and pulled out a Browning automatic pistol and two magazines which he checked and then loaded one into the pistol. I could tell from this and the flak jacket that wherever we were off to the natives were unlikely to be too friendly.

"Right. We had better get this over with."

With that we walked out to find a Saracen armoured personnel carrier outside with our escort of half a dozen members of the Green Jackets. I was invited to take my seat in the back and the vehicle was closed down. The engine roared and we made our way out of the barracks and motored through the streets of Derry towards the Bogside, which at that time had declared UDI and hence was a no go area even for heavily armed military.

By craning forward I could catch glimpses of housewives shopping at familiar places like Boots and Woolworth's. It all seemed strange that I was going to war while there was all this appearance of normality around. We crossed the bridge over the Foyle and ran rapidly to our objective, a narrow street right on the edge of the Bogside area. The machine gunner in his turret swung the gun around

to face the likely direction of any attack. The driver slewed the big armoured vehicle across the street partially blocking it.

“Everybody out!” The Green Jackets leapt from the rear doors and immediately took up firing positions around each corner of the Saracen, crouching down to take maximum benefit from the cover. Two more dived into the gutter and lay there, guns trained towards the Bogside. My escorting major and I seemed to be the only ones left standing.

“Right. This was the place they used your kit.”

Off he went strolling along indicating the various features of basically a featureless narrow street of terraced houses while our escort stayed resolutely in the gutter or close to the Saracen. I could not help putting myself into the position of an IRA observer of this scene. Say I saw a number of British soldiers arrive in an armoured vehicle, followed by two idiots strolling up and down waving their arms around, one dressed in battle dress and the other in a blue suit and ill-fitting flak jacket. Now which one would I shoot first?

Fortunately all the terrorists were having tea or Guinness or something and we remounted and returned to the safety of the barracks. Even that was a relative term as a sentry was shot through the head the night after I had returned to the UK. I wrote my report saying that they would have a good deal more success if they used the right foaming agent but the war had started to blow hot by then and bullets were more likely to be coming your way than bricks.

There were two or three amusing corollaries to my excursion into riot control. The first came while I was trying to find chemicals to add to the foaming concentrate that would make the foam stiffer and stand up more easily. I found a potentially useful material referred to in a scientific treatise. It was essentially a very long chain polyether. I was mixing some in a bucket noting that it had a most peculiar effect when the white powder was mixed with water. It produced a sort of sticky mucus that looked rather like the contents of a bad bronchitic's lungs. I was musing about this when I inadvertently stepped on an area where the white powder had fallen onto the wet floor. My feet slipped away from under me. I experimented on a new area of floor and then on a patch of tarmac walkway outside. With just a few handfuls of the white powder on a wetted surface I could produce a fair representation of a skating rink.

David, the Scientific Advisor Gentleman, was coming to see me about foam. He was a very busy man and always reminded me of the White Rabbit in Alice in Wonderland. He was always rather conservatively dressed and was always seemingly late for his next appointment, looking constantly at his watch, a rather splendid gold hunter.

I showed him my “Instant Banana Peel” as it was to become known and he requested a couple of kilos to play with. I was about to tell him of the one major drawback that I had discovered but he just looked at his watch and rather absentmindedly thanked me and headed off at high speed.

“I don't know how to get rid of it,” I said to his rapidly departing back.

Apparently, David laid on a demonstration of my Instant Banana Peel outside the Headquarters Block in Lisburn. He chose the General's car parking space. The area was wetted, down went the white powder and some more water was applied. A young subaltern was ‘volunteered’ to venture onto the treated area. He immediately went arse over tit and had great difficulty in getting up again. Successful demonstration. A couple of squaddies were detailed to get rid of the mess. They tried brushes. They tried sand. They tried high-pressure hoses. Nothing would shift it. Even allowing it to

dry out only deferred the problem as the next time it rained, and that was never long in the Province, back came the skating rink.

I received a frantic phone call requesting the antidote but I had to admit that I did not have one. Collapse of stout party. Apparently the GOC had a sense of humour failure about the mess in his parking space but you cannot help bad luck.

The idea was shelved mainly as we could not counter it ourselves. Someone of ill intent acquiring the material could create absolute chaos and we would not have a counter. Shame. Apparently it was used at Long Kesh prison, where prisoners were inclined on occasions to sit on the sloping roofs and coating them with the material was meant to dissuade them and return them to the gutter from whence they came but I never heard of its success or failure. I would imagine it would gradually flow down the roofs and into the drains but what the hell.

It was about this time that I met Ron. He was a somewhat elderly (mind you I was only in my early twenties so anybody over forty was positively decrepit) Sapper half Colonel who spent most of his time as a freelance consultant on Chemistry but served his country as a sort of Consultant to the Territorial Army. He once showed me a newspaper article where he was described somewhat grandly as Deputy Director of Scientific Research for the Territorial Army. As a Territorial he had to do two weeks “camp” once a year and this was interpreted as him coming to spend that time with me. In fact, in those two weeks we would attempt to dream up some more amazing wickedness and drink lots of beer. He was a member of the Savage Club in London and I spent several memorable evenings consuming beer in Pewter tankards and staggering home on the last train.

Foam was not popular as a riot control agent. The politicians had got into the act as they are inclined to do and did not appreciate the idea of foam over head high in a street. What if an old man with asthma got in the foam? Would he be all right? What the hell he would be doing in a riot we did not know but the consequence was a political edict that there was to be no foam over head high. With foam up to your waist, it was like a glorified bubble bath and we could just imagine the ribaldry from the rioting community at that. With your head clear of the bubbles there really was no point. Ron and I retreated to our beers muttering and reconsidered.

What about filling the bubbles with CS? Ron had contacts in the Royal Engineer community and we acquired some CS candles that were rather like glorified fireworks but they produced the noxious smoke beloved of riot control enthusiasts. CS is not a gas, it is a smoke and acts as an irritant to the eyes and lungs. It also makes you feel very sick. We tried locally and showed that the CS smoke could be introduced into the foam at the generating stage.

We travelled to Porton Down where a number of specialists looked rather down their noses at our idea (possibly because we had had it first). We borrowed the foam truck and had fittings for gas masks. That was an interesting experience as the man in the test chamber looked at my beard and announced that the gas mask would not work as it would not seal properly. You try holding your breath for five minutes!

Out onto the test ground and then we made a large foam bank by throwing CS grenades into the duct that blew the air into the foam. It was great fun and we had a great wobbling mass of foam all filled with CS. The fact it was a smoke and not a gas meant that fairly quickly the particles migrated into the bubble walls but walking through the foam without a respirator was quite jolly. Break a bubble and you got a face full of CS in solution. Not a pleasant thing to happen I can assure you from personal experience.

We also tried a different type of CS that was Hydrophobic and hence lay as a layer of particles on top of our foam bank. I only discovered how delightful this was on the way home from Porton after the trial. I was driving along in my little Mini car when I brushed my hand over my eyebrow and dusted some of the CS into my eye. The pain was incredible and I had to pull over and walk up and down for about half an hour before I could continue my journey.

Strangely enough our mythical asthmatic old man rioter was again raised as an objection by the politicians and Ron and I retreated back to our beers muttering yet again.

What about a different tack? Say we had a means of marking someone who had been at a riot. Would it not be a relatively simple process to go around the area the day after and pick up all the rioters and invite them to help the Police with their enquiries? We tried adding dyes to the foam and found that we could produce practically any shade of foam you wanted. Red, green, blue. We made enquiries and found that the politicians even got into the act here. We could not use any dye that had political connotations. So no Green (Nationalist), Orange (Protestant) or Red (Protestant again from the Red hand of Ulster). We tried a number of other colours but they did not really stick too well to bodies.

I was an avid reader of Len Deighton novels and suddenly remembered that one of them mentioned a chemical that would react with skin tissue and form a bright blue colouration. It was stuff called Ninhydrin that the Police used to treat money or any other desirable item so that they could later identify a petty criminal who had stolen it. I acquired some of this material, incorporated it into the foam concentrate and discovered that it did not alter the colour of the foam at all: the same large wobbling masses of white bubbles. But step into the foam and twenty minutes later your skin turned bright blue. I tried the idea on myself and returned to my family looking like a trainee Smurf. What was more amusing was that the dye reacted with skin tissue and hence was so totally impregnated that it could not be washed off.

Consider a nice day for a riot. Along comes a strange vehicle and kicks a street full of white foam all over the place making sure that the foam did not transgress the over-head-high injunction from the Politicians. Lots of rioters then have a glorious time jumping around in the foam considering that the Brits have gone soft and, after a twenty minutes delay, all could volunteer as extras in the next Smurf movie. Ron and I thought that using ridicule as a means of fighting rioting was a marvellous idea. It would be very hard to be macho while drinking your Guinness at the end of a day's rioting when your skin was bright blue. Then again it was a relatively simple job to go around and pick up all the Blue Boys who had appeared in the neighbourhood and ask them to explain where they were on the day of the riot.

Politically unacceptable. The strange chemical might react with the tissue of the eyes and we would have lots of blue-eyed Irishmen.

Back again to our beers muttering. What else could we use to prove someone had been at a riot? Dogs. Mark the rioters with some chemical that a tracker dog could follow. Seemed a fair idea. What we needed was an expert on dogs and tracking. Into the Yellow Pages to find that the Metropolitan Police Dog Training School was not far away. So we rang up the Commandant and he was happy to talk to us.

Ron and I explained that what we wanted was something to put into our foam concentrate that would mark anyone foolish enough to go wandering around in the foam bank at a riot. That material should be something that a dog would follow 'til the ends of the earth. Was there such a substance?

“Oestrus,” said the Commandant. “Basically it is what a bitch produces when she is on heat.”

All of a sudden I had a wonderful mental picture. It is a sunny day in Ulster with a fair sized riot going on. Up turns a foam truck that dutifully fills the area with a shining bank of specially treated foam being careful that it does not get over head high. The Irish gentlemen wonder what is going on but playfully thrash around in the foam. Whereupon all the randy dogs in Belfast turn up and attempt to ravish the Irish rioters. Try holding a serious riot with a large slavering Alsatian clamped to your leg!

Guess what? Politically unacceptable. It is a great shame as I still think that using ridicule as a means of breaking up violent demonstrations is a valuable concept.

Chapter 4

Ron and I never did get our ideas accepted for riot control. Reluctantly I went back to my proper project and thought about what I would do if I was faced with a large bank of foam bubbles blocking my way if I was travelling west at high speed over the North West German plain singing the Volga Boatman or Kalinka. As a fully paid up explosive man I thought I would apply what is known in the trade as “white noise” which is the euphemism for PE4 plastic explosive (If I was a Russian I would probably use their equivalent but what the hell). I used to have a T shirt emblazoned with the slogan “There are few personal problems that cannot be solved by the suitable application of high explosives” and most explosive men would agree with that sentiment.

I therefore arranged to use one of our ranges down on the Essex marshes at Potton Island to conduct an experiment to see how effective explosive was to clear foam. Tim, the man in charge, was a little unhappy at the idea.

“What happens if you have a misfire?” he enquired.

“We wait twenty minutes then hose the foam away and start again,” I replied.

I could see he was not convinced but finally got authority to fire a modest charge of PE4, about half a pound, and produced a couple of metres depth of foam over the top of the charge which was lying on the ground.

“3,2,1 firing.” Nothing. Down came Tim verbally belabouring me about the ears saying that he had told me so. I checked the circuit and strangely enough it had gone open so theoretically the charge had fired.

We waited twenty minutes then the Potton Island fire brigade hosed away the foam. Where the charge had been was a hole in the ground. We tried the trick again and the same thing happened. I had found a silencer for explosives! What was more it did not affect what the explosive was in contact with so you could apply your charge, then foam around it and fire and still destroy whatever you wanted to without any noise or blast or at least with much reduced effects.

We had at that time a number of programmes extant looking at ways of diminishing the effects of terrorist bombs. A fair amount of the damage and most casualties were caused by blast emanating from the bomb breaking windows and projecting shards of glass. If the foam was as efficient at mopping up the blast as it was the noise then perhaps we had a solution. With very little attempt at optimisation, we laid on a trial at Foulness in a street made of target boards. In the street we placed 50 pounds of plastic explosive, a very substantial charge as military explosives are generally more powerful than most of the home made ones used by terrorists. Our riot control foam truck, now

returned from its trip to Ulster, was pressed into service as a means of filling the street and we fired the charge in front of a large group of spectators from various branches of the Ministry of Defence.

This time you most definitely could hear the bang but the wooden target boards were still there as a recognisable street. We repeated the experiment without any foam. Bits of target board flew in all directions. Even without any attempt at optimising the high expansion foam whose expansion ratio we had chosen almost at random, we could potentially reduce the window breakage from a hundred pound bomb in the middle of, say, Oxford Circus from something which extended out over two hundred metres radius to something that would not even break the windows in the offices surrounding the Circus.

While our colleagues at Foulness were given the job of improving the foam and finding the optimum expansion ratio, we at the Fort combined with our colleagues at Chertsey and worked on yet another vehicle borne system for two foam generators. Somehow we thought that the operators would rather be under armour when they were approaching a terrorist vehicle bomb so we added our two generators to the front of what was affectionately known as a Humber Armoured Pig, an armoured personnel carrier. We experimented and found a way of feeding the generators with water through hoses powered from pumps some way from the Foaming Pig, as it became known. I learnt about something called Dutch rolling which allowed rolled hoses to be unravelled without tying themselves in knots and we did some more tests down at Lydd where there was a simulated street used for teaching street fighting in Northern Ireland. By attaching two rolls of lay-flat plastic tubing to the front of the generators we could stand off nearly a hundred metres from the bomb and still produce foam directly over it. Improvised barriers made of plastic mesh on frames would hold the foam back and stop it flowing all over the place so that we could build the foam up over the top of the suspect device. With two generators on the front of the Foaming Pig we could kick out about 400 cubic metres a minute so we could fill a street in about five minutes flat.

Away went the Foaming Pig for operational trials in Ireland. It also had less than a successful career. The problem arose when you had foamed over a suspect vehicle. What did you do for an encore? If you were not careful you very quickly ended up with half of Belfast brought to a standstill with great wobbling blankets of foam all over the place. I have somewhere a cartoon from my EOD chums. It shows their cartoon representative, a cat called Felix (their call sign on the radio). He is dressed in a bone dome protective helmet, looks rather bemused and is obviously sat in a large bank of foam. The caption reads "Another ***** bright idea by RARDE (our name at the time)"

So change the tactics. Wait with the Foaming Pig in the wings until the gallant gentlemen of 321 EOD Squadron came along and set up their kit (supplied by us) for making the car bomb safe. Then you could foam over the top of everything and reduce the effect of the bomb if it went off. Here we were defeated by our own efficiency. Practically all of our equipment issued to make bombs safe did precisely that with a very high degree of certainty. Hence was it really worth waiting to put down a foam blanket that made the clear up operation a right pain in the backside when the chances were that the EOD equipment would make the bomb safe anyway? EOD is a very time dependent exercise and the opposition (and we) knew that minutes mattered when it came to making sure there was enough time to get people away from the device but insufficient for the EOD men to make the bomb safe. So the concept of absorbing blast with foam was put onto the back burner to be brought out if we ever got into a situation when we could not make bombs safe with EOD action. Or for very special reasons we could not afford for the bomb to blow up in its design mode.

The latter enigmatic statement grew from observations which came from another use for the foam, that of noise reduction. At the old Woolwich Arsenal I was the proud possessor of a structure called Soper's Cell. Dr Soper had been a very distinguished explosive scientist in the Second War as well as fitting in with my general description that anyone in our business was a trifle eccentric. Dr Soper occupied the furthest of a series of offices the access to which was a gate into the explosive area. To reach Dr Soper's office you had to pass the laboratory where lurked an enormous Experimental Worker who must at some time in his career been a fairground boxer if his cauliflower ear and broken nose indicated anything. Between the hours of 12 and 2 o'clock Dr Soper sat in his office with a copy of the Times draped over his distinguished features. Anyone, and that included senior management, with the temerity to attempt to interrupt his restorative doze would find themselves picked up by the lapels by the huge Experimental Worker and deposited outside the area with the words,

"Dr Soper does not wish to be disturbed."

Few attempted this feat twice.

Dr Soper had designed and had built this marvellous firing chamber. Its roof was made of railway lines to vent the blast in a controlled fashion and was mounted on shock absorbing cradles. Originally it had been designed to fire eight pounds of explosive, which I can assure you is more than enough to destroy most structures. Unfortunately some idiot had allowed an industrial estate to encroach nearer and nearer to the old Arsenal and there were complaints when anything more than three quarters of a pound, was fired in the cell. The whole reduction in explosive limit was a result of environmental pressure to stop us making too much noise.

I reasoned that the structure could still take eight pounds in air and probably a good deal more under foam. Therefore if I foamed the inside then there was no structural reason why I should not fire more than three quarters of a pound if I did not make any more noise than that amount. So I acquired a noise meter, set it up outside Dr Soper's old office and fired the maximum allowable charge. Having noted the noise level in dB(A) we progressively increased the charge with foam. I chickened out at 12 pounds even though the noise was still very much under what you get from three quarters of a pound fired in air. There was also the not surprising discovery that the foam was only effective when the shock wave was passing through it. We had just fired the 12 pound charge when our friends from the Arsenal Fire Brigade came around to ask what the **** we were doing. Apparently the ground shock, which was not attenuated by the foam, had made one of their light fittings fall down!

What with these experiments and some others at the firing cells at our Establishment, we noticed another interesting effect of the foam. It entrapped all the particulate material from the explosion in the foam and deposited it as a layer in the drainage water. If you got the expansion ratio right you could place your charge, fill the chamber with foam, fire and almost immediately go into the chamber as all the foam had gone taking with it all the noxious fumes that normally kept you out of the chamber until blowers had cleared it. Hence the enigmatic statement made earlier. If the bomb you were tackling was associated with a very noxious substance, say nerve gas, or a radioactive material, then covering it with foam was a very effective way of preventing the distribution of that material. I will not go into more detail for obvious operational reasons but it all grew from those early experiments on barriers and riot control. A long way from blue Irishmen!

Chapter 5

I stress that Bomb disposal research was not my main line at this time as I was really into explosive hazard determination but somehow the subject had got into my blood and I still dabbled with my foam research and the occasional excursion into various means of disposing of bombs almost as a hobby. Again the joys of not being over organized by politically motivated enthusiasts or having to account for every flaming minute of the working day, which is what happens now.

One of these excursions involved the possibility of using a shotgun as a means of disposing of bombs. This sounds almost insane but strangely enough an American gentleman called Robert Lenz had actually published a book that suggested you could knock bombs apart by placing a shotgun near them on a couple of sandbags and firing directly at the bomb. After all our problems with Pigstick and the sensitivity of certain types of explosive, I initially took this with a pinch of salt but thought it might be an idea to check out particularly as a shotgun was part of the equipment mounted on Wheelbarrow, the little robot vehicle produced by our colleagues at Chertsey to carry out EOD activity without the necessity of risking our precious EOD men. The shotgun was generally used as a means of getting access to the bombs by blasting open doors or windows but could have a secondary role in disruption.

The shotgun system worked quite well, sufficiently well for me to consider whether it might be possible to extend the range over which the shotgun could be used. Shotguns are meant to be close range weapons but various methods are used by gun makers to control the pattern of the shot. One of these is choking i.e. the degree that the barrel is constricted to prevent the spread of the shot after it leaves the barrel. By using a fully choked barrel, it was possible to tighten the group of the shot at range but you were still talking no more than twenty metres, which can be a little close if you are firing at a bomb.

I decided to try this out against replica terrorist devices and borrowed a range near Horsham in Sussex. This had housed our Pyrotechnics branch but they were transferring to our establishment so their range was being closed down. With the assistance of Larry, one of my engineer colleagues, we made a wall of sandbags with a small aperture for a firing position. I donned a flak jacket, steel helmet, ear defenders and goggles and nestled down behind the sandbag wall to shoot at representative terrorist bombs placed twenty metres away.

We tried various combinations of shot from SG to a home made system with lead shot crimped onto circles of piano wire so that we had a small scale version of the chain shot used by the navy in Nelson's time. My idea was that the lead shot would carry the piano wire through the target bomb cutting up the circuit in the same way that Nelson's sailors used it to cut up the enemy's rigging.

It was suspiciously effective with bomb after bomb in wooden boxes, which at that time was the opposition's favourite container, splintering to pieces and bits of gelignite bouncing around all over the place. Now I knew from our experiments with Pigstick that gelignite was horribly sensitive to impact. So was there something wrong with this particular batch that I could apparently knock apart with lead shot without causing it to explode?

I decided to try one more bomb, put two or three pounds of gelignite inside and retreated back to my sandbag wall. This time I used a self-loading rifle, at that time the Infantry's standard rifle, as the attack weapon. I snuggled down behind the wall, drew a bead on the target box and squeezed the trigger. There ensued an enormous bang and bits of wood and earth showered down on me. Nothing wrong with the gelignite anyway!

That experiment out of the way, we had one more idea to try. Larry had obtained some twelve bore rounds that contained a tracer. God knows who would need such a thing. Someone firing at pheasants at night perhaps? It had been suggested that these might be a means of setting fire to suspect vehicles remotely. Even that was a strange idea in retrospect as on most occasions the last thing you wanted to do with a suspect vehicle was to set it on fire. If there was a bomb on board then eventually it would cook off the detonator and detonate the rest of the explosive on board. But we did not know that then.

Langhurst had a range that was now to be demolished and converted into farmland again. The part we were using was in a long trench containing at one side a line of wooden frames containing single sheets of thick cardboard from fragment collecting packs. The idea apparently was to launch explosively driven projectiles down the range and to see whether the projectiles travelled in a straight line or toppled etc. With the permission of Graham, the range supervisor, we set a gallon can of petrol at the top end of the range on a patch of concrete.

I took the Self Loading rifle and put a round through the can to represent puncturing the petrol tank of a car. We then intended to see whether we could light the pool of petrol with the incendiary in the 12 bore tracers. I fired directly into the remains of the can. Nothing. I fired to smear the incendiary composition across the concrete. Nothing. We were just about to give up when a lucky shot did the business. Unfortunately we were on our third or fourth can of petrol by then and the contents of the unsuccessful ones had run down into the framework of target boards to one side of the range.

The flame gathered speed as it followed the trail of spilt petrol and we thoughtfully climbed out of the trench and sat on the bank watching our handiwork. The petrol trail set the wooden frames burning briskly. We lit our cigarettes as there did not seem any point in maintaining the normal ban on smoking on a range with our own private conflagration doing so well close at hand. Graham seemed quite put out for some reason but we pointed out that they were only going to bulldoze the whole place so what was the problem? The Langhurst fire brigade also seemed quite pleased to have something other than brasswork to polish so we felt that there was no real harm done.

There was a corollary to the use of shotguns in EOD. Apparently an Irish punter had seen Wheelbarrow trundle by with its 12 bore shotgun mounted upon it. One day some boyos came into his shop and left a bomb on his counter, telling him he had five minutes to get out before his livelihood disappeared up in smoke. Our gallant punter reasoned that he could deal with the problem himself. He took the bomb into his back yard, went into the house and retrieved the 12 bore he used to pot the occasional pigeon, stood about two yards from the bomb and gave it both barrels! When the EOD team turned up he proudly showed them his handiwork having achieved a perfect disruption. Mind you two yards range seems a trifle close for comfort.....

One of the joys of our work on Bomb Disposal was the immediacy of it. We would have a problem posed by our particular users and would, hopefully in a matter of days or weeks fix it. So sometimes we would see things on the Television and know that we had directly contributed to its solution. On other times Television provided information on a potential problem.

On this particular evening I was watching the nine o'clock news. The opposition had hijacked the Belfast to Dublin train and had loaded two bombs into the big diesel locomotive at its front and rear cab. The locomotive was decoupled from the train and isolated on a stretch of line out in the country. The commentator explained that the terrorists had installed a milk churn of explosive in the front cab of the loco and another in the rear cab. The two charges were connected by an orange wire that ran out of the front cab and along the locomotive to the rear cab. For reasons known only to the

EOD man responsible, the team attempted to cut the orange wire by sniping at it from some way away. Their reasoning was that this would separate the two charges that could then be dealt with in isolation.

The TV crew were directly behind the sniper who had a very difficult shot to cut this orange wire from a safe range. His first shot missed. So did his second shot. On his third shot the train erupted in an enormous explosion that showered debris over the surrounding countryside. This was described on the news as another successful EOD operation. I did not think so.

The next morning I was sat at my desk and received a 'phone call from a Colonel who was on the staff in Headquarters in Northern Ireland.

"We want you to conduct some experiments for us," he said in a rather splendid upper crust accent.

"Fine. How can we help?" I replied.

"We want you to conduct some experiments to determine the effect of firing 7.62mm ball ammunition at Geoflex," the Colonel said sounding as though he was reading from a crib sheet.

"Hang on. Geoflex would not happen to look like orange wire would it?" I asked.

"I believe so," said a quiet voice, after a pause.

"And is Geoflex not a wire but an explosive filled detonating cord?" I asked again.

"I believe it is", said the quiet voice again.

"Well, we do not need to do the experiments as I can assure you what will happen. There will be a bloody great big bang," I announced.

"Thank you for that." He rang off.

The bright souls had been firing at explosive filled detonating cord containing the most sensitive of secondary explosives! No wonder there had been a large bang.

Chapter 6

"We would like you to go to Louisiana to attend a conference on Nitromethane."

Fine. I am the sort of soul who would happily travel to Huddersfield if you gave me a ticket. I just enjoy travelling or rather I enjoy being in other places and wandering around. The actual physical process of travelling tends to be painful.

So off I set in the direction of Monroe, Louisiana, requiring a transition across the big pond by ancient RAF VC 10, a change in Washington to fly down to Monroe and finally a hire car to navigate myself to the conference, which was being held in the wonderfully named Holiday Inn Holidrome. God knows what one of those is when it is at home but it appeared to be the sort of place that you went when the weather was so unbearably hot or so unbearably cold that you did not want to venture out of your hotel. It had all sorts of indoor entertainment laid on, none of which really appealed to me in my shattered state having been travelling for 20 hours or so.

The next day, feeling slightly more human than the night before, I sat in one of the conference centres and looked around at the other delegates. Angus Chemicals, then the largest free world purveyor of nitromethane, a liquid explosive but also a useful chemical intermediary for a number of other products, had decided to give the possible military applications of their product a push. So they had invited all the people in the US defence hierarchy with a possible interest and

thrown out an invitation or two to allied countries to see what the net would bring in. A small investment in their time and a bit of money spent on entertainment might bring major purchases in future.

There was a token Canadian, a token Australian and I was the token Brit. The day was spent with lectures from Angus employees telling us what wonderful stuff nitromethane was with a fair amount of effort put into explaining away several enormous accidental explosions of quantities of the stuff. Several rail cars had disappeared in a series of spectacular bangs all of which were wonderfully explained away by a set of extremely unlikely circumstances coming together. The fact that the enormous explosions stopped when they stopped shipping the stuff in large, heavily reinforced railcars and started carting it around the countryside in flimsy 45 gallon drums seemed to have escaped them but what the hell.

At the end of the day we were to be entertained to a banquet. I was just getting myself into my gent's natty suiting when the telephone rang. Who the hell knows I am even in the US let alone at this conference? It was a chum of mine, a Scottish professor of Rock Mechanics at the University of Rolla, Missouri. He was managing a contract for the US Navy, which involved removing explosives from warheads using high-pressure water. I still do not know how he got through to me. Perhaps he rang my office and they redirected him. Anyway, the gist of his call was could I drop by at Rolla on my way home and look at some of their latest data?

I explained that this was not really possible. My bosses would go ape-shit if I wandered off to another destination without authority and anyway, I did not have any time before my return flight by RAF from Washington because of my commitments with the conference.

Well, could the Professor and his US Navy Project Manager come and see me at the conference?

I did not see why not. As long as they realised that any meetings would have to be in the margins of the conference as that was what I was over in the US to do. That settled, the Professor and the US Navy man agreed to turn up the next evening and I toddled off to the banquet.

It was a splendid affair: course after course accompanied by glass after glass of wine. Wonderful and I took advantage of every aspect of it. In the morning I wished I was dead. I had a hangover of gigantic proportions and it took several handfuls of headache pills and almost half an hour in one of those American showers that pummel the life out of you, or in this case into me, to make me presentable for the conference.

With the resilience of youth, I survived and took my notes and managed to make it through to the early afternoon. The rest of the day was to be spent with a trip up the local branch of the Missouri on a rear wheel paddle steamer along with a demonstration of nitromethane in a drag racer. I thought I could decently duck out of these excursions as I had visitors coming. I went and attempted to make my excuses to the Vice President of Angus.

I explained that I had a Professor and a senior US Navy Project Manager coming to talk to me. I could see his ears prick up.

“Bring them along. The more the merrier,” he boomed.

So I was able to tell my chums when I saw them that we were to hold our discussions gently sailing up the local river perhaps with a glass or two of something to aid our intellectual pursuits.

We were all packed into a fleet of coaches and dropped off at the levee. I have always wanted to wait on the levee, if not for the Robert E Lee, at least for something that would pass for her in poor light. The Monroe Queen was a modern replica of an old rear wheel paddle steamer but she looked the part, pricked out in red and white. The unruly rabble were marshalled onto the boat by a young New York public relations man hired for the occasion to ensure that all the visitors had a good time and that the firm created the right impression.

As we left the shore and headed upstream, so the entertainment switched in: a repeat performance with fine wines and spirits accompanied by groaning tables of food. My companions looked on in awe but I was still in a very jaundiced state. A repeat of mixing all the wines in creation and washing it down with the odd brandy or three did not appeal. Still, we had to be sociable.

A white-coated flunky asked, “What can I get you gentlemen? Champagne? Whisky? Fine wines?” “I would like a beer please.” I said. American beer was well described in one of the Monty Python films as being rather like making love in a canoe. It’s fucking close to water. Drinking that seemed to me to be a better way of spending the evening so that I did not end up with a thick head two days in a row.

My companions looked wistfully at the wonders on offer but decided to support me and so it was three beers. The waiter, who was really a senior manager from Angus, looked a little anxious but provided the three beers and we wandered off to the rail to watch the scenery go by.

Inevitably as talking is a thirsty business, we returned several times to replenish the beers. On the fourth occasion there was an anguished reply,

“I am sorry sir. We do not have any more beer. Would you not prefer a fine bourbon? A whisky? Champagne?”

“No thank you. I want a beer. Bloody fine party when they run out of beer....mutter, mutter, mutter.”

My dissenting voice caught the attention of the Vice President who was circulating to see if all the punters were happy. What was this? A discouraging word? But they are seldom heard. He investigated and there was a muffled conversation, snatches of which drifted over to us at the rail.

“We didn’t think anyone would want beer when there was all this fine wine and spirits on offer. How was I to know the Goddamn Limey would want beer?” This was followed by some heavy comments by the Vice President that if the Goddamn Limey wanted beer then beer he should have. A message was flashed by radio back to Monroe to buy several cases of beer and get them up to the Monroe Queen by fast launch as quickly as possible.

We continued to talk and watched the evening close in as we gently made our way back towards the city of Monroe having steamed some ten miles or so upstream in the course of our evening’s entertainment. After about half an hour there was a flurry of activity as a launch appeared and several cases of beer were unloaded. The Vice President himself brought the first of the replenished beers and we settled once more to our conversation suitably provided for.

It was a very merry party that staggered off the Monroe Queen and headed, gently zigzagging, to the waiting coaches. I sat with my two chums towards the rear of one of the coaches. The face of the New York public relations man appeared in the door of the coach, scarcely able to stand as he had been socialising all evening in his role of master of ceremonies.

“Where’s that Goddamn Limey?”

I waved and indicated my presence. He disappeared for a few minutes and returned carrying a complete case of about twenty beers. He fought his way down the aisle and deposited these in my lap.

“You may as well have these. They cost us enough to get”

“That is very kind. My friend here was drinking beer too.”

He beamed, swayed a bit and disappeared again, returning a moment later with twenty more beers, which he presented to the US Navy man.

“Is there anything else I can do for you?”

“Well, my Scottish friend here is rather partial to single malt scotch. Do you possibly have some of that?”

Off he went again, gently ricocheting his way down the seats like a pinball off the cushions. He returned beaming more than ever and handed over two bottles of 12 year old Glenlivet!

Ah! The wonders of the international trade in weapons and explosives.

Chapter 7

How do you blow up a super-tanker? This particular problem arose when the Amoco Cadiz, a large super-tanker carrying crude oil, had gone on to the rocks and there had been an awful lot of oil spilled over the beaches of Brittany. What we needed was some cunning plan for burning the crude in situ and stopping it slopping all over the surrounding countryside. The Torrey Canyon had shown that bombing was singularly useless particularly when half the bombs refused to function properly but that is another story. Our idea was to use explosives to rip open the tanks and allow air to them. There had to be two holes to each tank: one to draw the air in and the other for the burning oil to vent through.

First we needed more practically based information than we could get from talking to naval architects as they could not tell us the sort of thing we would need if we were to put forward a practical proposal for demolishing such enormous vessels. We went up to Scotland to view two 350,000 tonne displacement tankers that had just come out of Harland and Wolf's yards. They had yet to carry any oil so we could venture into the tanks to check their construction and work out a method for demolishing them. It was a freezing cold day in December, bright and clear but with snow on the hills around Loch Striven. We had a good look around and it was agreed that we needed pictures of the interior of one of the tanks to check the shape and location of the under deck structure. I am not too bothered by heights, or in this case depths, so volunteered to be lowered on a rope into one of the enormous tanks. Did I but know, it was the equivalent of being lowered from the top of the dome of St Paul's on a piece of string.

My colleagues gently let me down clutching a Maglite torch in one hand and a camera in the other. I was instructed to keep talking as the theory was that if I was talking then I was not asphyxiating. Bit like a canary in a coalmine really. Ah, the good old days before the Health and Safety Executive stopped you doing anything at all interesting. I sat a few metres beneath the underside of the deck, gently gyrating and describing what I could see and taking my pictures with the aid of the flashlight. Job done I swivelled the torch to look downward and that is when I realised I was hanging in a space equivalent to the height of the dome of St Paul's. Somewhat awe-inspiring.

With the pictures of the under deck structure in the can, the boss, Dave, noticed that the low angle sunshine was showing very clearly the position of the under deck reinforcing even from the topside of the deck. What we needed was a volunteer to climb the radar mast and take some more pictures. You have got it in one. I was the volunteer.

I slung the camera around my neck and started to climb up the vertical ladder wishing that I had remembered to bring some gloves as the metal rungs were extremely cold. I was about half way up when I realised that the sensation in my hands was rapidly diminishing as the cold seeped through into them. I accelerated the rate of climb so that I would reach the crow's nest before my hands grew so numb they would not know whether they were gripping or not.

I took my pictures and spent a merry five minutes blowing on my hands before I had enough feeling in them to venture back down again. The things I do for England!

We did some experiments in the firing cells and then progressed to firings on enormous flat plates representing decking. They were the devils to manoeuvre as they were an inch thick and literally weighed a tonne. It was about this time that we were introduced to Jumbo. Jumbo was a Naval Clearance Diver and a lieutenant to boot. He had gained a certain notoriety by blowing up a small coastal tanker called the Eleni V. His simple theory was that if he loaded the stricken ship with enough explosive, then the fireball would consume all the oil and none would reach the beaches. There is a small matter of the few milliseconds that the fireball in an explosion is extant and the practical impossibility of getting crude oil to burn until you have heated enough of it up to give you sufficient volatile components to sustain combustion but do not spoil a good theory with facts. Jumbo was fascinated with our experiments and asked to be kept abreast of developments. This was fine by us so we tipped him off when we intended to travel down to the ranges at Lydd near Hythe in Kent to conduct some large scale firings against big sheets of steel plate.

Lydd is an Army training range and is almost all stones: miles and miles of shingle over which it can get very wearing trudging back and forth after a long day. It also provides a rather spectacular effect when a large explosive charge goes off as it appears to rain pebbles for several minutes. It is always a good idea to stay under cover for a long, long time when you fire at Lydd!

On this occasion, the day before the trial I had received a phone call from some of my chums in the Royal Army Ordnance Corps asking if I would mind demolishing some old land mines that they had dug up on the beach at Deal recently. These were apparently beach mines and they had tried to get rid of one or two in situ but had broken windows and made themselves generally unpopular so had bowed to public opinion and had taken them away for later destruction. We happened to have the next available booking for the demolition range at Lydd so would we mind doing the honours?

We had diverted via Ashford to pick them up and my intention was to use some white noise (the jargon for plastic explosive) to get rid of them at the end of our day's experiments.

Our experiments with the deck cutting charges had gone well. The long linear charges with copper liners cut through the inch of steel but there were still some problems about corner turning and interference between the lattice of charges that we proposed to use. Jumbo potted around during and after the experiments and it was only later that I noticed that much of his interest seemed focussed on collecting the scrap copper. Maybe he had interests in recycling. What the hell!

All experiments completed, I went to the back of the powder wagon and took out the pair of the beach mines for demolition. The fuzes were out but looked rather corroded and unpleasant. I took them carefully or as carefully as you can go when you are crunching over shingle down to the demolition pit.

“What are they?” asked Jumbo as I passed by.

“B Type C mines or C Type B mines. Something like that. The Rag and Oil company dug them up at Deal and want me to get rid of them”, I said.

Jumbo became white faced and disappeared. Now what has got into him?

I trudged down to the demolition pit, feet sliding around on the loose shingle. Down carefully with the mines and at least a full stick of PE4 plastic on each of them to make sure that they would trouble no one again. Detonators in place and the long trudge back to the firing point.

A somewhat sheepish Jumbo appeared from behind the reinforced concrete wall of the firing point.

“What happened to you?” I asked.

“B Type C mines are bastards. There is a design fault in the fuze and clearing them after the war cost over 150 deaths amongst the clearance teams. It did not seem a good idea to tell you that while you were carrying the things down for demolition.”

Thanks a bundle Jumbo. I was very pleased to hit the firing button and hear the bang followed by the rain of stones. Another day, another dollar.

Chapter 8

I was again semi-officially back into the realms of EOD. Previous research had shown that blowing open a car was not as simple as one would have first thought. First and foremost, there was the basic problem that cars contained all sorts of flammable material and it did not take much in the way of hot particles or flame from an explosion to set them burning. At this time we were just beginning to notice that cars containing bombs would burn for a finite time and then there would be a shattering explosion.

I spent an amusing two weeks setting fire remotely to several pounds of every commercial explosive I could find and observing the effect. Even the most sensitive forms of gelignite burnt away quite quietly provided there was a means for them to vent the products of combustion away into the atmosphere. We then wondered if this held true for home made explosives as the IRA at that time were making their own from weed killer or fertiliser mixed with fuel. I very gingerly made a few pounds of a material called CO-OP mix as it had been first used to blow up the CO-OP in Belfast. It was most unpleasant as it was a mixture of chlorate weed killer mixed with an organic fuel. The fuel was highly toxic and had a heady smell of almonds. However, even this mixture failed to explode when I set it on fire remotely.

Maybe it was a matter of scale? So I repeated the experiments at 40 pounds (forgive the imperial but that is what we used in those far off days) and still found that even the most sensitive commercial and improvised explosives would burn quite quietly without explosion. Well something was making them go bang and then the penny dropped. Real bombs contained a detonator and the heat getting to the primary explosive in these would perhaps not be so kind. So I repeated the same series of experiments only this time inserted a shiny metal tube into each charge. The time to explosion, and there now was most definitely a shattering explosion, varied significantly depending upon the physical properties of the explosive and how well they insulated the detonator from the flames. But very soon I had figures for delay times remarkably similar to those we were observing in practice. Some of the explosions that resulted were much smaller than we would have expected

from the total charge but some seemed scarcely less than the total amount. Hence the loss of interest in setting fire to vehicles and our search for a means of blowing them up without starting a fire.

It was while I was testing the variation of explosives with a detonator included that I had an interesting experience. The test chambers at our establishment were converted magazines. They were necessarily large concrete structures approached down a series of steps that used to get covered with lichen and hence were somewhat treacherous in winter. They had been converted from their original use by separating the dangerous side where the explosive firing took place from the non-dangerous side, which contained the instrumentation we used to measure things. Part of the process of firing involved connecting the detonator to a length of yellow cable and passing it through from the dangerous side to the non-dangerous side. Between the two was a sliding door of armour plate.

I had placed the maximum sized charge of explosive on a metal tray, inserted a detonator and then poured a gallon of petrol over the whole assembly. I positioned two electrical igniters over the pool of petrol and connected them to the firing cable. I retreated to the safe side, retrieved the firing cable, closed the interconnecting armoured door and made the final connection before retreating up the lichen-covered steps to the firing tower. Various noises off with klaxons were followed by the low fut of the igniters and then a wait while the fire cooked the mixture of explosive and detonator for a period. Obviously there were occasions when nothing happened for reasons of the physics and chemistry of the experiment. To cater for this we had a misfire procedure that stopped us walking back into the chamber just as the charge was about to detonate. Past experience had shown that twenty minutes was a more than safe period to sit enjoying the sunshine or the rain depending on the vagaries of the British climate before gingerly approaching the device and disconnecting the firing cable and observing the experiment from the “safe” side of the firing chamber by shifting the armoured door. On this occasion I observed the 20 minute period, carefully checking that there was no sign of combustion visible from the firing tower and moved to open the armoured door. I looked through to see a small fire still burning around the remains of the explosive charge. I rapidly closed the armoured door and got about ten metres away before the charge detonated. Fortunately besides some ringing in the ears there were no harmful effects but it was one of my closest calls. I subsequently doubled the wait time before I ventured back into the chamber for future experiments of a similar nature.

I was not involved with the first set of experiments to find a satisfactory explosive means of opening cars, which I think were conducted by Terry, one of the more senior EOD scientists in both senses of the word. He started initially with a small charge used in a kit he had developed a few years before to create a foxhole explosively. The charge, of heavily aluminised explosive, looked rather like a candle so strangely enough was so named. These set cars on fire amazingly well, which was a trifle unfortunate as that was not the intention. Then someone, perhaps Terry or maybe Neill the bossman, had the idea of using the sort of explosive used in gassy coalmines. This was heavily doped with common salt that acted to reduce the flame temperature of the product gases. It also diluted the explosive effect quite significantly so we needed considerably more to achieve a satisfactory disruption. Hence came the birth of Maxi-Candle, which by this time looked nothing like a candle but more like a dumpy plastic hand grenade.

Maxi Candle was delivered to the suspect vehicle by Wheelbarrow, a remote vehicle developed by Chertsey, or by an EOD man in a heavy bomb suit doing a “leg in.” Its sole function was to open doors, shatter windows and allow access to the vehicle although on occasions it would act as a disrupter and knock apart the explosive device in the vehicle. This was bonus and not to be relied

upon. Normally a secondary attack was required with one of our other pieces of equipment to finalise the neutralisation of the device.

The problem posed was one of time again. Getting the Maxi-Candle to the vehicle, either by Wheelbarrow or by a suited EOD man took time particularly as it was a foolish and probably short lived EOD man who walked up to an explosive device just as it was going to go bang. So we needed a remote means of getting a Maxi-Candle sized charge to a vehicle quickly and from a remote position.

My Section Leader asked me to give a hand to one of our Majors who was conducting some research into such stand-off car bomb disrupters. Major Mike was a delightful man full of enthusiasm and with a particular wild gleam in his eye that often marks the interesting soul with whom to play EOD research games. He told me of his ideas to date over a pint in the Officer's Mess, which in reality was a couple of quarters converted into a bar and dining area. He explained about his progress while carefully sorting through the peanuts provided in the bar having an obsession with finding the whole ones which he claimed for some reason to taste better than the halves.

Major Mike was between jobs in his Army career and had applied aged 32 to join the Royal Marine Commandos as a Technical Specialist on Ammunition and EOD. For that to happen he had to pass the same stringent physical fitness criteria that the 18 and 19 year old lads had to. He set himself the task of toughening himself up in preparation for the selection process and for the weeks I worked with him we would drive around the countryside with a haversack of bricks in the boot of the car. Whenever we came to a really nice long hill, he would stop the motor, invite me to drive to the top while he ran up the hill wearing the haversack containing the bricks.

Major Mike had a cunning plan for delivering the Maxi-Candle sized charge to the vehicles. We needed a means of getting it to the suspect vehicle rapidly and whatever we used had to have the legs to carry the substantial charge the distance. The only semi-suitable system we had in UK Service at the time was the 84mm Carl Gustav, which was a sort of stubby bazooka. The conversion of the round from the carefully factory designed anti-tank projectile to one designed to carry Maxi-Candle took a matter of days. Mike chose a particular type of wood for the main body, Afrososa, I think it was called. I never did find out why he chose that material except that when the Maxi-Candle charge fired it did not produce anything other than two or three relatively benign wooden fragments. The fuzeing of the projectile was solved by modifying an existing 81mm mortar fuze and reducing the arming time by throwing out a number of components of the clutter mechanism. It sounds a bit cavalier but it was effective. Within a very short time Major Mike had produced a projectile which consisted of a modified mortar fuze, a metal mount for the fuze to screw into which also allowed the projectile to penetrate the skin of a car, the wooden body containing the salt loaded explosive and then another metal component to take the forces of firing. All of this was loaded on top of a reduced propellant charge in the cartridge, reduced as we wanted to bring down the velocity to avoid directly initiating some of the more sensitive commercial and improvised explosives.

We went to talk to the project team who had evaluated the Swedish designed weapon system and they were horrified at what we were proposing.

“You just can't change the weight, the length, the fuzeing and the balance of the projectile, then arbitrarily reduce the propellant charge and expect the whole system to continue to fly accurately and to retain its recoilless character”, they said.

We thanked them and continued on our sweet way.

The final design was put together, and there cannot be too many modern weapon systems that involved the best efforts of a carpenter (for the Aframosa wood!). After a bit of consideration we decided that we would rather not shoulder fire the Carl Gustav or Charlie G as it was affectionately known. A simple improvisation of a General Purpose Machine Gun fixed mount with a solenoid switch allowed us to point the weapon down range and us to retreat to a safe distance. I am not sure what we were expecting when we fired our home made round: the Charley G to do a back flip, I think from the warnings from the Project Management team. But she stoically sat there and scarcely seemed to do anything other than project the round down range in the manner we intended. What was more, we hit the large metal sheet we were aiming at!

We put several more down range before coming to the conclusion that the final score was Enthusiastic EOD men 5: Original Carl Gustav Project Management team 0. I am not entirely sure of the science but basically the recoilless principle seemed to be self-balancing. A certain mass of combustion products went to the rear at a specified velocity and the projectile went off in the other direction at a different velocity. Alter either the mass of the projectile or the mass of the propellant and you just changed the velocities accordingly. Providing you had not altered the radial symmetry of the projectile, it still flew in a straight line.

Major Mike eventually went off to the Marines. We heard that he passed the entrance fitness test with flying colours carrying not only his own 60 pound pack and rifle, but that of a nineteen year old who was flagging, semi-carrying the young lad a fair distance too. I stayed to help Larry and Andy who had become the new project team. Larry the engineer was not too taken with the Aframosa wood as the material to make the bodies as it was a natural product and hence variable in properties and also, we discovered, produced highly toxic dust during the machining process. So we substituted boring old plastic thus losing the opportunity of having ammunition that would take a high French Polish, a rare commodity these days.

The final tests were conducted at a range near the White Horse at Westbury in Wiltshire. Target vehicles were purchased locally by one of our support workers, Bob. He seemed to have a good relationship going with a local scrap dealer as he not only supplied our targets but had the gentleman agree to take away the wrecks. I remember at one time I was the proud possessor of about a hundred logbooks from all the vehicles that we despatched in one way or another.

The final round was another masterpiece of improvisation. It consisted of our modified mortar fuze screwed into a substantial piece of aluminium alloy, which acted as the battering ram to get our projectile into the vehicle we were attacking. To reduce fragmentation, the charge had become an annulus around a central metal rod connected to a second piece of aluminium, which provided the bearing surface for the propellant charge. The explosive element was covered with a spun glass fibre reinforced plastic cover that shattered into basically a single fragment and thus did not initiate any explosive device in the vehicle.

As for accuracy, over the 150 metres or so that was the designed range for the weapon, we could take out individual rivets on a large sheet of aluminium we used as a target. Even the factory designed inert practice rounds were not good enough to do that so we felt reasonably happy about hitting a car at that range.

We finally produced about two hundred of the rounds and they were stock piled. As happened with several of our products, the initial enthusiasm for a capability had died or the campaign had moved on so I do not think they were ever used in anger. I know that there was a reprise of interest a few years later in 1984. It was at a time that we were involved in the Lebanon and suicide bombers took

out the US Marine Corps headquarters with much loss of life. When they then tackled the US embassy in similar fashion we decided that something needed to be done.

Consider you have an enthusiast who is determined to die coming at you in a truck packed with explosive. Fire high velocity rounds at him and they will undoubtedly go through him, which may spoil his day but the rounds are just as likely to run straight into the explosive load causing that to explode and hence spoiling your day too. There was also the probability that the gentleman (could also be a lady, of course) has something like a dead man's switch, which would initiate the device even though the person driving was dead. Enter the Flying Maxi-candle. This had been designed to enter a car containing an explosive device and not set it off even if there was a booby trap switch inside. Hence fire one of these at our candidate for martyrdom and you would hopefully rearrange the cab and him but not set off the explosive payload.

With our forward base for the Lebanon being Cyprus, we did our tests there. They were reasonably successful or as successful as one could judge without the cooperation of a suicide bomber. The firings were done at a range near Dhekalia and were observed by some rather bored goats, who did not seem too impressed. I spent a few days wandering around the island in a little Ford Escort after the trial and before the flight home and came to appreciate the beauty of the island. It also produced one of the first of my journals that plague the shelves of our house. But again the authorities decided that discretion was the better part of valour and we left the suicide bombers the field.

Chapter 9

This is getting far too serious, something that is anathema to me whatever I am doing. I remember reading somewhere that there was a Hubbard's Law that stated "Do not take life too seriously. You will never get out of it alive". Sounds fair enough to me. So time for what my family refer to as some more Michael stories to lighten things up.

I have previously mentioned Michael's house at the bottom of the hill beneath our establishment. It originally was one of a pair of semi-detached properties, the other half of the pair being occupied by some poor unfortunate. One day Mike decided that it was time to redecorate the stairwell and hallway. This inevitably required the removal of long drops of wallpaper. Mike started with a scraper and some water, scoring the surface of the ancient wallpaper heavily impregnated with paint, then waiting for the paste to soften before attacking it with the scraper. Far too slow thought Mike. So he devised an advanced technique, which involved taking a bucket and a stirrup pump left over from the last war. This would project a considerable amount of water at the wallpaper allowing a larger area to be treated at any one time. Progress, thought Mike but he was still having to stop long enough to refill the bucket. So Mike investigated the contents of his garden shed and found a length of hosepipe. Connecting this to the bathroom taps allowed him unrestricted volumes of water to pour on the wall between his property and his neighbour next door. Things were almost literally going along swimmingly when Mike's work was interrupted by loud banging on the front door. With a sigh, he turned off the water and paddled gently down to the front door. There was his neighbour in a high state of agitation.

"What the hell are you doing? All the wallpaper has just fallen off my hall walls."

I have previously said who would be Mike's neighbours. Now you can see why.

On another occasion, Mike's wife Jeanne was getting increasingly fed up with motorists coming downhill from the top of the chalk downs zooming past their house which was

well inside the 40 mph speed limit. This was obviously a danger to both herself and her children. So she complained to the Police who duly mounted a radar trap outside their property. The first person caught in the trap was Michael!

There was a period many years later when Michael had a series of run ins with the law and, true to type, defended himself in court. On one occasion one of his sons was accused of speeding. Mike spent a serious amount of effort running timed trials at the same spot trying to prove that it was impossible to reach the speed that his son was accused of doing. While he was doing so he was nicked for speeding!

One of my favourite Michael stories involved Mike's ancient car. This Vauxhall Viva had seen better days but was kept on the road by Mike's careful attention. On this occasion the brakes needed some renovation and Mike had taken the brakes and the servo system apart and had the pieces laid out in a semi-circle in his driveway. It became apparent that he needed to replace some part of the servo system. Problem. The nearest parts emporium was in Orpington, which was about five miles away. This was another problem in that it was Saturday and the parts department would be closing soon. Mike only had the one vehicle so how did he get to Orpington in time to purchase the items that he needed in the limited time available? Well, Mike's solution was to drive there in the Vauxhall Viva. There was this one small problem that he did not have any brakes but judicious use of the gear change and the handbrake overcame that.

Mike arrived with minutes to spare before the parts department closed and parked on the frontage of the garage amongst the shiny new and second hand cars. In he went to the parts department leaving the car unlocked. Along came an employee of the garage wishing to clear away all the shiny motors for the weekend. Problem. Some idiot (Michael) had parked right in the way. Seeing that the car was open and that the keys were in the dashboard, the employee got into the car and let off the handbrake to roll Mike's car out of the way. Once clear of the area in question, he hit the foot brake pedal. Nothing. The car rolled on to strike one of the nice shiny cars rather forcibly.

The noise brought Michael running. The conversation apparently went something like this:

Irate Michael "What are you doing in my car?"

Stunned mechanic "Your car has got no brakes."

Irate Michael "What are you doing in my car?"

Etc, etc.

The resulting threatened legal action was interesting. The firm accused Mike of having caused the damage to their shiny vehicle by leaving his car on their property in an unsafe manner i.e. without adequate means of stopping it. Michael pointed out that their employee had illegally attempted to move his vehicle and had the key element that the firm could not prove that the brakes were not operative during the drive to the garage. It was just possible that Mike had disassembled the brakes having arrived at the parts department. Michael stuck to his guns and eventually did not have to pay any compensation and got the damage to his own car paid for by the garage!

Finally, for now at least, there is the story of the boundary dispute. Having been bitten by the law on several occasions, Michael was loath to get entangled with it again when a dispute arose with his neighbour about the position of the boundary fence between their two properties. For some reason known only to Mike, he considered that the fence had robbed him of

about six inches of property for the whole length of his garden. Anyone else would have thought that this was annoying but essentially not worth the bother but Mike determined to do something about it. Realising that possession was nine tenths of the law, Mike determined to do a clandestine move of the border as it were. He invented a variety of silent tools. This included a silent hammer, a means by which he could reattach the fence at intervals to the uprights. This worked amazingly well and Mike succeeded in shifting the line of posts and the attached wooden fence all in the dead of night. Unfortunately part of the border was occupied by an ancient Anderson Shelter made out of corrugated iron. It was the slow sawing of this in the dead of night that caused his undoing as the appalling creaking noise woke his neighbour. Now why are you not surprised that the ultimate resolution of the boundary dispute was when the neighbour moved away and Michael took over the whole pair of semis.

Chapter 10

It was now 1978 and Pigstick had been in Service for seven years. Bob, one of the engineers and a lovely man, had reduced the size and weight progressively to something weighing six and a half pounds. He had also investigated the internal ballistics and found that our original Ballistite propellant charge produced a somewhat wide range of variation in internal pressures and hence averaged out the charge that Mike and I had discovered in that frantic time in the Autumn of 1971. He developed a similar and less variable charge of something called Accurex, which even by its name you can tell that it produced less variability. Everything else about the “magic” we had designed was retained.

One of the important features that he retained was the bridgewire cap. This Mike had adopted for the original taken from an ejector seat cartridge. This was quite a deliberate decision although it was one neglected by many who followed on from us in designing cartridges for disrupters, wrongly in my view. Strangely enough with pilots’ lives so heavily dependent upon it, the testing of ejector seat cartridge bridgewire caps was extensive: their reliability approached that sought in the initiators for nuclear weapons. This made the caps very expensive, about £20 a time even then. I know it sounds farcical when someone’s life is at stake but there were many who decried the “high” cost. There is also the slight matter that a successful disruption saved the country something in excess of £100,000 even then in property compensation and general reduction in human misery so £20 was a small price to pay to my mind. The bridgewire caps were also resistant to most forms of spurious ignition as you can imagine a pilot being somewhat peeved if his ejector seat tended to fire under any condition other than the dire one of him wanting to get out of the aircraft in a hurry. Mike had reasoned that a pilot and a bomb disposal man both had a reasonable need for both reliability and resistance to spurious firing. If you had risked your life by “legging in” to a terrorist device and laying a disrupter next to it, the last thing you needed was to find that the frigging thing did not function as designed thereby requiring you to go back and do it all again. Equally if you were suited and booted and heading for such a device then the inadvertent functioning of it at the wrong moment could cause you more than discontent.

Our Australian chums did not learn this lesson. For many years after the production of Pigstick we resisted all attempts by even our closest allies to release the details of how and why the device worked. We considered that our bomb disposal men were daily risking their lives against an enemy who was more sophisticated than any in the world at that time. If we released the information on how Pigstick worked, then it would only be a matter of time before someone worked out how to defeat it. Our equivalents in other countries therefore had to work it all out for themselves, occasionally aided by papers that we produced describing the principles that we had used even if we

were not prepared to present them with the solution on a plate. I will come back to this for our Colonial cousins in the US so beware Chris C as I intend to spill the beans!

Many years after we had done all the work on the magic, (incidentally one of Michael's nicknames) Michael went to the US to a conference on bomb disposal. He went very much against my better judgment as I was the boss of the Section at that time but I was overruled by the Superintendent, dear Cliff, on the advisability of sending Mike. We will come back to why I was resisting in time. Mike was sitting in the audience when a young Australian scientist was in the middle of a presentation, which was basically all about breaking the code of why precisely it was that Pigstick worked. This was all in the 1980s so was well down the line from when we had originally done the work. Mike, bless him, stood up halfway through the presentation and said.

“Stop. You are delving into areas that a good 90% of the people in this room have no need to know. If you continue to reveal secrets as important as this in even this classified forum then you are risking the lives of countless EOD men in the future. I think you should stop your presentation now.” And, bless him, the young Australian did.

I was going to explain why the Australians got some things wrong before I rudely interrupted myself. They had made a copycat device of Pigstick but had used a cartridge based upon a 30mm DEFA aircraft cannon which equipped one of their French made aircraft. The cap in the aircraft cannon was based upon a completely different design to the bridgewire cap we had used, containing something called a conducting composition cap. One of its features was a low tolerance to spurious ignitions. One day an EOD man was advancing to disrupt a device carrying Racked, the Aussie disrupter, in his hand. Behind it and him trailed a long length of coaxial cable, another problem associated with the conducting composition cap in the cartridge as you could only use a coaxial cable to fire them. As he approached the bomb there was a loud bang and the disrupter fired fortunately wrenching itself free from his fingers. His EOD suit protected him from any harmful effects although it is not recorded if he needed a change of underwear. Trailing the coaxial cable through the grass on the way to the device had generated enough static electricity to fire the cap. That would not have happened with the bridgewire cap we had used.

Our reluctance to sell Pigstick did produce a rash of low grade look-alikes even in the UK. One of these was designed by an ex EOD man who had done his time in Ireland and put his own variant device onto the market. However, he had not used the same principles that we had in generating the internal ballistics. The Spaniards were having, as they are still, considerable problems with ETA, the Basque terrorist organization. They sought to buy Pigstick but were told politely by HMG that it was not for sale at that time. They therefore bought the design from the ex soldier. I was later rung up by a man from Defence Sales.

“Will Pigstick deal with X (an improvised mixture that I would be foolish to describe)?

“Yes it will.”

“Oh. That is a trifle unfortunate. I have just had an irate man from the Spanish Foreign Ministry on to me for some reason. He says that every time they fire their recently purchased UK disrupters at a bomb containing X there is a loud explosion.”

Despite its lack of success we were also interested to learn that a Spanish copy of the ex soldier's disrupter was on sale soon after in Madrid at half the price he was asking.

The fact that providing a foreign government with Pigstick and instructions on how it should be prepared effectively provided them with the key to our success was not lost on some other

governments. The Israelis asked to buy one Pigstick very early on and we again resisted thinking that similar alternatives might soon be available from Tel Aviv.

I had a short discussion with a man from Defence Sales who thought that selling Pigsticks would recoup the cost of developing the device. I countered by saying that it could far more easily compromise the device and lose us all the advantage we had gained over the terrorist. Again, if conservatively every device that we made safe with Pigstick and its successors saved the country £100,000 then selling them at even £1,000 a time would require an awful lot of sales to compensate you for a single bomb made safe. I even presented the idea to visiting Generals later when I led the EOD section that the cost of developing equipment could be couched in terms of compensation saved for a certain number of bombs. The whole cost of developing Pigstick through its various marks was the compensation cost of about one and a half bombs. A very sophisticated later system was about five bombs worth. Considering the thousands of bombs that Pigstick has neutralised, the sums in favour of keeping it secure are obvious. And that is not to mention all the lives saved.....

Another unfortunate aspect of our dealings with our esteemed military colleagues was that they sometimes had a less than logical attitude to the equipment that could potentially save their lives. We received one disrupter back for analysis as we were told that it did not work any more. The reason it did not work any more was that someone had used it as a hammer. There were multiple impact marks on the side, which had distorted the barrel and made it impossible to chamber the cartridge. What can you say under such circumstances?

Another very famous and highly decorated bomb disposal man went on UK national radio and described in great detail how Pigstick worked. Again, what could possibly be gained? Even in this essentially personal account, I am leaving out many aspects that I know are important as even computers have ears.

I am afraid we occasionally despaired of trying to keep their equipments working to save their lives although perhaps we should have taken their attitude as a compliment that our military chums trusted us to come up with new solutions if the old ones were compromised. If only it were that easy.

Chapter 11

The opposition had found a way of defeating Pigstick: they wrapped the explosive charge in many layers of polythene. I personally think they were doing this to circumvent the sniffer dogs and other equipment that relied on vapour but it dramatically increased the requirement for disruption. Pigstick could get in all right but it did not have the legs to blow the device apart physically.

So there was a new GSR(OE) General Staff Requirement (Operational Emergency) 3748 to find a replacement or augmentation to overcome the problem. It was to be a threefold attack with three separate means of overcoming the problem and with me allocated one of them. Mine, called Annular Wax Disc, was based upon a supplementary charge of a matrix of epoxy resin and shot blasting shot, which was fired by the same firing pulse as the propellant cartridge in Pigstick. As the shot matrix was fired explosively it produced a cloud of fast moving grit and shot (try saying that at a presentation and transliterate you are in trouble!). The fast moving grit cloud arrived at the target surface before the propellant had had a chance of functioning, explosives working at least one order of magnitude faster than propellants. In fact, it was a clumsy solution to the problem even though I did all the necessary project work and did it quickly. Scaling up the Pigstick and modifying the

ballistics was a more sensible approach but it took longer to do so I pipped it to the post. (It came along later as Hot Rod).

What was useful about Annular Wax Disc or AWD was that it gave me the opportunity of devising a complete disrupter package in one go from start to finish and hence to define the way that all other disrupters should be developed in future. It was also a rare commodity in that I wrote it all up and published it admittedly as a classified report but it was to be many, many years before Michael got around to publishing the background of Pigstick. In fact I do not think he ever did. I put out a joint version of the report for a conference in the US, which was used as the foundation of the US PAN disrupter as one of the few people allowed to see the paper at the time was Chris C who later attempted to patent the PAN despite not being the originator of the principles by a long chalk.

My small team took a little over a month to get AWD optimised and it did go into limited service overcoming the problems that Pigstick was having at the time. I shall allow myself a little description of the system just for the sake of posterity. (What a silly name for a Grandchild!) We would cast a mixture of epoxy resin and shot blasting shot, basically white cast iron, into moulds made in an injection moulding machine. The moulds were shaped to produce an annulus of the matrix that slipped over a metal collar that in itself slipped over the Pigstick. Once in the moulds, we would vibrate the matrix to take out the air bubbles and then leave it for 24 hours to cure. The discs were then tidied up and backed with a single layer of SX2 sheet explosive initiated by an L2A1 demolition detonator.

The Annular Wax Disc (the Wax bit was historical as Dave T had originally used Wax as the matrix instead of epoxy resin) was a disposable one shot add on. The firing of the sheet explosive driver charge caused a lot of noise and did not do a lot for Wheelbarrow on occasions but generally it was so far to the front of the machine and most of the damage signature went forward that Wheelbarrow survived.

It worked on the principle that the first explosive charge cut through the outer layers of the target device and further weakened it all of which it did in a fraction of a millisecond allowing the follow through effect of Pigstick to complete the disruption. As all of the energy of Pigstick was now available for disruption it could deal with pretty much the limit of a man portable device or at least one carried by a normal sized Irishman. I built into the device the ability to fire directly into all the most sensitive of the explosive components of terrorist devices. Part of that ability came from firing into large beds of compacted Plasticene modelling clay (all right Dave T, it was your idea!) as every subtlety of the arrival pattern could be seen. Any concentrations of energy could be ironed out by redesign and very soon we could equate the depth of penetration with the likelihood of detonating our most virulent explosive target compositions.

It is probably as well to point out that not only were we the design authority who sorted out all the problems of the equipment but we were also the manufacturing plant that produced the equipment. So much of the design was simple that we could switch over to a cottage industry to supply the EOD operators in Ireland. Although it was simple it was exactly the same as Pigstick: get any one of the design principles wrong and the device no longer did what you intended i.e. it either blew up the bomb you were attacking or scarcely dented it. We produced several hundred Annular Wax Discs over the coming months and they served as additional punch for the boys of 321 EOD Company until Bob got Hot Rod sorted.

Chapter 12

It was scarcely a convenient time. I was posted to spend a short tour with the Scientific Advisor to the General Officer Commanding in Northern Ireland (the direct line descendant of David, the White Rabbit of an earlier tale) despite the fact Rosemary had just produced our youngest son, Tim. But when you have got to go, you have got to go. So I went. It is as well to acknowledge the role that wives play in supporting their husbands in playing silly games like this. Rosemary never complained when I had to dash off to do something silly although she was not always able to be aware of what I was doing or where. Or whether I would be coming home in one piece.

It was a peculiar life in the Headquarters block. The barracks were in the outskirts of Lisburn, a hard Protestant area. I was to learn very early on that it was possible to determine the religion of the native population of any particular area of Northern Ireland very simply. This was either from the graffiti painted on the buildings or even the road surfaces or the flags: Union Flags for the Protestants and Irish Tricolours for the Republicans.

It seems almost beyond comprehension to us secular mainlanders that the souls in Northern Ireland are so passionately interested in each other's and even a visitor's religious background. I doubt I would know and certainly would not care if my next door neighbours were Buddhists let alone Catholics. I rapidly got used to the fact that everyone who was a native of Northern Ireland endeavoured to discover my religious background (in fact lapsed C of E) within minutes of meeting me.

The Scientific Advisor's department was small, about four bodies. We worked in the main block and did operational analysis amongst other things, my particular project concerning an analysis of all the terrorist devices that had been neutralised in a particular six month period. The idea was to see what factors influenced whether or not the team got there in time and managed to make the device safe. I was a little leery at first that there was any merit in this approach but later used the data to formulate what I called Hubbard's Laws of Bomb Disposal. There were three laws and they worked exactly the same way as Isaac Asimov's Laws of Robotics. Law 1 was paramount. Law 2 was more important than Law 3 but could be broken if it meant Law 1 could not be fulfilled. And Law 3 trailed a poor third to Laws 1 and 2.

My laws of Bomb Disposal for any bombing incident were:

Law 1 Saving the lives of the general public was paramount.

Law 2 No bomb disposal man should deliberately put his life at risk merely to make a bomb safe unless Law 1 applied.

Law 3 The objective of the Bomb Disposal operator was to neutralise the device with the minimum of collateral damage and to return the area around the device to normality in the shortest possible time. He should also maximise the amount of forensic information obtained from the device.

If you think about them, these laws seem to be completely against the popular view of bomb disposal but they were my observation of the rules that governed how all bombs were disposed of in the UK and by UK forces operating abroad. It was both humane and understandable that the authorities were not prepared to risk the lives of our specialists simply to save property. Once there

was no risk of the bomb killing people then any Government would be foolish and inhumane (listen US) to ask even a specialist to risk his life excessively to make the device safe. The “laws” were important to my group because the principles guiding the operator at an incident influenced his choice of EOD equipment

So how did the laws apply in practice? Let us imagine a bombing incident. A bomb is left in a city street inside a car and notification is made to the Samaritans that it will explode in, say, forty minutes. Once notification has come through and certain validations are made as to its authenticity, then the first and most important step is to move all the general public away from the area of the device and keep them away. This is known as forming a safety cordon. No EOD action is possible until the cordon has gone down and hopefully this happens while the EOD team are in transit from their base. As soon as the cordon is set then Law 1 is fulfilled and the most important of the laws of bomb disposal has been achieved. But that automatically means that Law 2 becomes paramount and therefore it is impossible (and very unwise) for an EOD man to walk up to the device and start taking it apart. Therefore the only way that Law 2 can be fulfilled is for the bomb to be neutralised remotely i.e. without risking the operator. Hence the reliance on Wheelbarrow, the little robot vehicle that carried our EOD weapons to the target and the advent of stand-off weapons that allowed the device to be neutralised from a distance. If it was not possible to deal with the device remotely then a random soak time was instituted that was generally longer than any delay known to be used by the opposition. At the expiry of the soak time, then and only then would the operator do a leg in and use a disrupter delivered by hand. He would minimise the time he was at the device and he would still not attempt to make the device safe while he was present so if anything went wrong he would survive.

All of these laws did not alter one iota the simple and self-evident fact that performing Explosive Ordnance Disposal was a dangerous process. Unfortunately no matter how good the equipment and how good the training, we still lost EOD men in action but as I will explain later, a good deal fewer than we might have by the expediency of combining the laws of bomb disposal with new equipments developed over the years.

In between spending my hours in Ulster looking up data and drawing up graphs and charts, I would contribute to the work of the rest of the Scientific Advisor’s Unit. One of the junior members of the team was John, a friend from our establishment. John and I had worked on Lilliput, the first means of identifying that the device you were dealing with was radio controlled. My contribution had been that of trials officer so I can make no claims to the cracking of the problem. All I can remember was walking around the old Arsenal with a small box with an aerial attached operating the switch which would have fired the bomb and smiling sweetly at anyone I met in case they asked me what the hell I was doing. In spite of walking through numerous laboratories and offices, no one did ask me who the hell I was which is an interesting observation in itself. It was while we were conducting the first trials of the equipment that word came that the first radio-controlled device had appeared in Ulster. The equipment went from prototype to front line equipment overnight.

All of that had been in the early 1970s and John had moved on. John, although a wiggly amps and ohms man, most certainly was possessed of that strange sense of humour associated with EOD men identified earlier. On one occasion he invited me to go with him in an unmarked car to the scene of a bombing incident. The location was a border village called Clady not far from Londonderry. We were a little hazy of the exact location and spent some time motoring around a potentially somewhat hostile neighbourhood. I can recall doing a three-point turn in the middle of Clady as we had

discovered that the border with the Republic was right in the centre of the town. Lots of curtains twitched as we rather ostentatiously showed that we had no intention of crossing over the unmanned border. Having stirred up the entire population John then drove slowly out of the town along a country road. As we passed a parked car on an isolated road he remarked that it was rather strange that it had an aerial wire trailing out of the driver's compartment. I enquired what kind of incident it was that we were investigating.

“Oh. A radio controlled vehicle bomb that caught a security force patrol.” I had great difficulty in restraining him from backing up and investigating on foot!

On another occasion I was informed by Peter, the then SCIAD (Scientific Adviser to the General Officer Commanding) that the Army was blowing up a disused limekiln on National Trust property on the North Antrim coast. He gathered that some pros from the UK were acting as advisers and as one of my roles was demolitions (I was Demolition Focus Officer for the UK at the time and represented the country at TTCP, a four nation exchange forum) would I like to go along and witness the bang?

We were somewhat late away from the Headquarters and were looking rather anxiously at our watches in case the bang went before we had got there. But fortunately we arrived in time and positioned ourselves on a hill overlooking the limekiln. It was a two-storey structure that someone had decreed was an eyesore and the Army had volunteered to get rid of it. As there was a good deal of media attention, the Army had brought over two specialists from the mainland, boffins like myself, to advise them. I did not know at this stage who they had acquired but it was a small world and it was likely that I knew the souls concerned. But more of that anon.

At the appointed time there was a flash, a cloud of smoke and dust and, several seconds later, a good resounding boom. The smoke and dust cleared slowly away revealing the structure still standing there apparently undamaged and certainly unbowed. After an explosion, particularly one which does not do what it was supposed to do, you do not dash down to see what has happened. We left the specialists to do an initial examination but were then called forward. Can you imagine the joy of the two specialists to find that just as I had not known that they were doing this job in Ireland, they did not know that I was in the Province doing an attachment? And at this moment, just as they were looking perplexed and wondering why their calculations had gone rather spectacularly astray practically the last person in the world that they wanted to turn up was me.

“Hello Arthur. Hello Charlie.” The look on their faces was a picture and one I cherish to this day. We investigated and discovered that they had made two errors. The first was to run one part of the ring main, a sort of circular train made up of explosive filled cord that connected the individual charges, up the balustrade of the steps connecting the lower to the upper floors of the lime kiln. One of the first charges to detonate had demolished the hand rail which had collapsed breaking the connection to the upper charges. The other error was to rely on initiating plastic explosive charges with double thumb knots of detonating cord, one of my pet hates. The military demolition manual maintained that it was possible to initiate plastic explosive by tying several knots in the end of the detonating cord train and packing plastic explosive around it. From my experience, it only took a less than perfect packing of the explosive or some particularly solid and non plastic PE4 for the force of the exploding detonating cord to scatter the demolition charge rather than initiate it. I had been fighting a campaign to use metal booster tubes filled with the same type of explosive found in the detonating cord. These could be slipped over the ends of the detonating cord, crimped on like a detonator and inserted into the demolition charges. The advantage of them was that they did not contain any primary explosives and hence connecting them into a large ring main did not lead to a

proliferation of initiators. Their explosive output, augmented by the metal in the tubes gave a reliable means of initiating the main charges. When we investigated we found that a good 50% of the lower ring main had failed to function. So it was not surprising that the limekiln had not come down. Only one in four of the charges had gone!

I left my colleagues to their explanations to the military and went back to the Headquarters.

There is a corollary to the story. Many moons later, I received intelligence that some of my EOD chums at the school called DEODS, and work that out for yourself, were teaching that the way to set up a multiple disposal was to connect detonating cord to flash receptive detonators. Flash receptive detonators are designed to be set off by inserting a length of safety fuze into the detonator and crimping it. My esteemed colleagues were teaching that a ring main should be set up by establishing a circular charge of detonating cord and then inserting individual spur charges of detonating cord into the flash receptive detonators. To determine that contact was made, the instruction was to insert the detonating cord into the flash receptive detonator and turn it several times. Then the operator was to retrieve the detonating cord and see whether there was a sign of the red dye on the end of the explosive filled cord.

Red dye? The originator of the detonators did not supply a red dye. What the punters were observing was the contact with lead styphnate, a primary explosive, which was red/yellow. What these idiots were blithely advising was to grind the end of a cord containing explosive with a primary composition in a metal tube. If anything went wrong with this ill-advised activity, then the whole train went off communicating itself to every other site of the demolition connected to the explosive ring main. Not clever.

Chapter 13

Soon after my return to our establishment (if you are getting fed up with this term it is what I have been told to use instead of its name!), I was made head of the EOD section (early 1980 for the record). All right, there were selection boards and such stuff that the modern organization seems to eschew but the net result was to install me as the governor. One of the pieces of strategic thinking I did early on was to decide that we should expand our interests. I could see that the disposal of terrorist devices was a good line for us but by this time we had been engaged upon it for nine years and soon we would be in danger of having saturated the market. Where else could we use our dubious skills?

I could see several potential areas for expansion. One of these concerned support for what are euphemistically called Special Forces. Our skills with improvised explosives led us to come into contact with the gentlemen from Hereford, affectionately known as the Hooligans, 22 SAS. They had all sorts of requirements for the demolition of various objects mostly belonging to other people. In fact at this time with a general and progressive collapse of government explosive work in the UK, research and development work on demolitions had ceased for the Army in general. This had followed a collapse and the closure of work on detonators and a variety of other explosive related subjects. There was just not enough money being provided by the Ministry of Defence for the UK to have specialists in all these areas. So work just stopped on them. Wonderful. However the Hooligans had money even if they did have the habit of going out into the market place with it and buying shiny things with little regard to whether or not they actually did what the inventor claimed.

There had been a progressive rise in terrorism in general in the late seventies and early eighties. I had been drawn into having interests in such areas as I had by now acquired a reasonable

understanding of how to make bombs and other infernal machines: to have a working knowledge of counter terrorism I had had to have acquired the skills of a good terrorist. With that had come a more general interest in things associated with terrorism such as guns and rockets.

One of the problem areas that had turned up overseas but fortunately not yet in the UK was the snatching of hostages and their use as political pawns in a game of international blackmail. Working on the general principle that you should never give in to blackmail as it rarely does you any good in the long or short term, we started to work towards ways of countering this threat. Terry and Ron, two of my lads, built up a relationship with the Hooligans and participated in a number of exercises with them. We also started to take an interest in getting through walls and doors explosively. This subject caused all sorts of fun and games as the Hooligans' interests in this respect were not too dissimilar to an EOD problem.

Consider a load of hostages in a room. The bad guys are likely to be heavily armed and strangely enough are likely to be covering the main points of access such as doors and windows. So the Directing Staff (DS) solution is to come through the wall. Coming through walls was an art form used by the military from the invention of gunpowder. But it tended to be something not associated with finesse. If there were just bad guys behind the wall then coming through with so much panache that they were splattered all over the interior was not a problem: it was possibly something you might even prefer if they were waiting there with shooters. But coming through a wall with that level of violence when there were hostages on that side of the wall could cause harm to come to them and cause the mission to rescue them to be a failure right at the start of the attempt. So just as delivering too much violence to a bomb during a disposal attempt could cause failure, explosive methods of entry had an upper limit of violence too. We needed just enough explosive effect to get through the target, the wall, but not so much as to have massive behind target effects to harm the hostages. There were other requirements too such as low signatures for the smoke and dust generation as the Hooligans would want to go in shooting and needed to see who they were shooting at. And the Hooligans were scarcely likely to be very far from the explosive charge making the entry hole as they would want to be in like Flynn very soon after the blast. So everything had to be done with the minimum of explosive charge or there were going to be some very deaf or explosively modified Hooligans after the event.

Various solutions were put forward using our background skills and some rapid trialling against walls and doors various. There are some humorous stories about those too but they are likely to bring the risk of prosecution for criminal damage down upon us so I will keep mum. Anyway for the sake of my particular tale, we soon had a good relationship with the Hooligans and had participated in a number of exercises involving hostage retrieval with them. Then came Princes Gate.

With our participation in support to Hereford in this field had come a commitment to provide knowledge and guidance in the event of a real event. Strangely enough our first team to do this was the team who had conducted most of the research and had the most practical experience. So our first team was Terry and Ron. I was their immediate boss and had participated in some of the trialling. I was also a practical explosive man with lots of hands on experience. The third team in terms of who went to such events was my Boss who was basically a theoretician with limited hands on experience. At this time I think his only hands on experience with explosives was helping a farmer friend blow tree stumps in Australia.

As Sod's law dictates the call to arms came on a Bank Holiday Monday. The bad guys had taken over the Iranian Embassy in Princes Gate, London. The place had been surrounded and B Squadron,

the special unit from Hereford, activated by code word. With the activation had come requests to our establishment for support. Unfortunately the first team, Ron and Terry, were away sailing as it was a holiday. I was away with my family visiting relatives near Walmer. I am not sure to this day that my wife is really sure why I was frantically throwing her and the children into the car and telling them that we needed to go home. I gather that we had a Police team in a Landrover knocking at our door but, of course, we were not there. Hence it was that my Boss, Peter, who got the call and went to the scene. It is one of the few regrets of my career that I missed it.

Once there Peter found himself as part of the support team. The bad guys had started to kill the hostages and one had already been shot and placed outside the Embassy. This had been the trigger for intervention. A lot of preparation went into the Hooligans' assault. Part of the reconnaissance had identified that there was a deep central well in the four or five storey embassy building. At the bottom of this was a glass roof over a staircase that led from one floor to another. Intelligence suggested that most of the bad guys were at the bottom of that staircase and most of the hostages at the top. Hence it was decided that explosives would be positioned on the glass roof that would be activated when the assault went in. The explosion would project glass and debris down into the stair well dissuading any of the bad guys from rushing up the stairs to kill the hostages. The original estimate for the charge to do this was made by the Hooligans and estimated on their usual P for plenty basis at seven pounds of plastic explosive.

Peter, my boss and Eric, another specialist friend from another organization, decided that this sounded excessive so reduced it. And wisely they decided on an insurance policy of having the two and a half pound charge divided into two and initiated separately. For some reason this was done as a pound charge and a pound and a half charge. Now it is never satisfactory for safety reasons to place detonators into explosive charges until the very last minute so it was decided to initiate the two charges of plastic with our old friend detonating cord. So sufficient lengths were cut to allow the plastic explosive charges to be let down into the well on their respective lengths of detonating cord and double thumb knots made in the ends and the two charges of plastic moulded around them. Can you see where this story is going? Very quietly the two charges of plastic were lowered down the central well and positioned on the glass roof. At the given signal the charges were fired, there was a resounding crash and down went the glass in the planned manner.

It was only in the post assault phase that someone came across a quantity of white material scattered in the stair well. This was identified as the remains of the pound and a half charge that had scattered when the knotted detonating cord had failed to initiate it. Fortunately the pound charge had gone and proved to be exactly the right amount to cause the level of damage required. However, I often wonder what would have happened if either both charges had failed or, probably worse, the original estimate of seven pounds had been used. Plastic explosive is incredibly powerful stuff and it is more than possible that seven pounds of it down at the bottom of that central stair well could have brought the whole building down. This would have been a trifle inconvenient for the hostages in the upper floors, and for the abseiling Hooligans attacking from the roof. So much of these events depend on that elusive factor luck. Still, as someone said "Who Dares Wins."

Incidentally the most famous image of the assault, the two black suited figures on the balcony, is using one of our frame charges to gain access. It was one we had made for training. The threat to the operation of appearing on live television just as the assault was going in made us suggest that future operational kit should include a heavily insulated axe to go through the power cables to the television companies but that was only our somewhat jaundiced view of the media.

One of the other stories that came out of the successful assault concerned the follow up debriefing. The boys of B Squadron were relaxing at one of their alternative locations in London and were still somewhat high from their success. Who should turn up to congratulate them but the redoubtable Maggie Thatcher. She was effusive in her praise as she should have been, there being considerable political kudos generated by such events. And one of the brave lads pinched her bottom! There is real bravery for you.

A final story on the Princes Gate assault concerned a visit I made to their Headquarters in Duke of York's barracks in Chelsea some time later. We had finished our business and it was suggested that we might like a drink. The Hooligans did not have a bar but a sort of hostess trolley was available for such occasions in one of the rooms. As we waited for this to be found, I examined the fascinating array of photographs and memorabilia displayed on the walls. One, in pride of place, consisted of a hand written note from an old age pensioner addressed to Maggie Thatcher, in her role as the Prime Minister. In it, the old lady (the OAP not Maggie) said that she thought the lads of Hereford had done a brilliant job at Princes Gate and therefore would they please accept this 50 pence Woolworth's voucher in token of her esteem? At the bottom of the letter was scribbled a note to the then CO of 22 SAS, Colonel Rose, from Maggie.

"I believe this is yours."

And it had found its home on the walls of their Headquarters. Wonderful.

Chapter 14

A second new area of work sort of found us. Three of us were invited to a meeting in London under somewhat mysterious circumstances. We met some folk who asked us all sorts of questions about our knowledge of terrorist devices and bomb disposal. As the conversation went on it became apparent that most of these folk came from Aldermaston. It also became apparent that they were concerned with some malcontent making an Improvised Nuclear Device. At this stage none of us had any idea about what constituted a nuclear weapon other than what we had learnt from reading historical accounts of the Manhattan Project and related material. I also knew that strangely enough the British equivalent to the Manhattan Project had started at our establishment and not at Aldermaston. There is a plaque on one of the buildings saying that the team, under the gentleman who later became Lord Penney, did most of the initial work there long before Aldermaston was anything other than a disused RAF airfield.

After a week or so I was invited to write a paper on some of the guiding principles that had gone into our approach to the disposal of terrorist devices and how they might apply to the disposal of a terrorist nuclear device. It later transpired that the problem of some terrorist, either state backed or a lone nutter, threatening to blow such a device had been considered in the relatively recent past first by the US then by the UK. Aldermaston not unnaturally had used their strengths to build up a search, diagnostic and assessment capability based upon the specialists that they already had available from the nuclear weapon programmes. The concept seemed to be that they had a nascent ability to look for a terrorist device if the country was threatened with such a thing. Once they had found it then they had the beginnings of a capability to see whether or not the bad guys had sufficient knowledge and sufficient Special Nuclear Material (SNM) for it to go nuclear. If the answer was "Yes, it is a nuclear weapon capable of yield" then the rationale seemed to be that you paid him the money or otherwise gave in to his demands as there was damn all you could do to stop it functioning. All of this was based on the not unreasonable assumption that anyone with the

intelligence to construct such a device would have the intelligence and wherewithal to protect it so you could not just reach into the box James Bond style and cut the wires.

For all the reasons given with the hostage retrieval problem, this seemed equally flawed. Giving in to blackmail only demonstrated that you were helpless and why should the terrorist not push up the ante and demand even more? For all sorts of technical reasons that I would be foolish to discuss here, if the problem of dealing with a normal terrorist device was difficult, the problems of dealing with an Improvised Nuclear Device were damn near impossible. There would also be a somewhat more dramatic result from failure. However there were some things we thought we could do to some types of IND even at that stage and we could see what we needed to be able to do even if we could not do it yet for the neutralisation of some of the other types. On that basis I wrote the discussion paper.

The paper generated some interest as it finally raised the fact that there might be what came to be called “Disablement” options for a terrorist Improvised Nuclear Device. However there was a degree of consumer resistance from Aldermaston to let us in on their patch. Traditionally there had been a good deal of rivalry between our establishment and Aldermaston explosive communities which was not going to go away simply because we were dealing with a type of terrorism that could potentially kill thousands or even several million of our civilian population.

Eventually there was the go ahead given for us to conduct a sort of proving exercise. We were asked to demonstrate that we might be able to disable a terrorist nuclear device. There was one catch: no one would tell us how to make a nuclear device to disable as we did not have the necessary clearances. To be let into the nuclear “club” you needed to be “positively vetted” which sounds ominously like what a cat doctor performs on a reluctant moggie but really involves a close inspection of your habits, background and friends to see if you have any major character weakness that would make you vulnerable or unreliable.

So within a matter of weeks we were headed to the wilds of Northumberland, to a range at Otterburn. Amongst our bags and baggage were a couple of modified 4.5 inch naval gun barrels, a large amount of plastic explosive and some chunks of tungsten to represent the Special Nuclear Material. We had chosen to make the simplest type of device, a gun gadget, the type of nuclear weapon that had devastated Hiroshima in 1945. Again the stipulation was that we would only use public access information for our design.

Our design was simple but then so was the design of the original device. It was considered so simple that the Los Alamos scientists did not even bother to test the design beforehand as they did with the Nagasaki device. Basically making a nuclear device in its simplest form involves bringing together sub critical masses of special nuclear material and holding them together long enough to establish a chain reaction. Most of the really clever bit of weapon design is concerned with stopping it happening accidentally and making it reliable and efficient. To my mind what our Aldermaston and later our American friends did not take sufficient account of is that a terrorist is not constrained by all the safety rules that govern a responsible government’s manufacture of nuclear weapons. A terrorist would be happy to get a few hundred tonnes of yield to make his point instead of the thousands of even the crude Hiroshima and Nagasaki devices and he would not worry too much if the device went nuclear if you dropped it. But more of the philosophy of nuclear terrorism later.

The trial at Otterburn was on a site called Bellshiel. It is one of the highest parts of the range and one of the most exposed to the elements. We had some other work to do while we were there and with one difficulty and another time became pressing. We tried the first experiment that was basically to prove our design. Peter, the theoretician, had done most of the calculating that had

formed the design but we had all thrown in our bit. After the bang we inspected the pieces of tungsten alloy and found them welded together satisfactorily. It looked promising as far as we were concerned but we would have to wait until our friends at Aldermaston had commented.

Now the real killer and whether we would be invited to play the disablement role: could we do anything about stopping it functioning even if we triggered the event on the way into the package? We had manoeuvred the heavy barrel section into a crater and had packed it with two charges of plastic explosive weighing several tens of kilograms. Just as we were thinking of getting the detonators out of their protective packaging, there appeared black clouds over the Cheviot hills to the north and the mother and father of electrical storms started to brew. It is a fundamental tenet of explosive man's lore that you do not play with detonators when there is a thunderstorm around. This is not just because they go bang when struck by lightning (most things tend to suffer under those circumstances) but because thunderstorms are associated with a massive amount of electrostatic charging of the ground and clouds. It is the difference in potential between clouds and the earth that causes the formation of lightning. It is this increased electrostatic risk that makes handling detonators foolhardy and bloody dangerous.

As the storm was brewing we started to get shocks off any metal object on the hill: the doors of the Landrovers, the doors of the Powder Wagon that contained our explosives (slightly worrying!). I also noticed that my hair was standing on end, a further indication that the whole hillside was charging up. (I had hair then) We agreed that the detonators should stay in the Powder Wagon and we should wait for the storm to go away. Time was getting on and I decided to dash off the range and get some sandwiches for the troops so we could work straight through and get the important firing off as soon after lunch as we could, storm allowing. When I returned I found to my consternation that it was pouring with rain and most of the crew were sheltering in the Powder Wagon, practically the only shelter on the exposed hillside. Somehow this did not seem too sensible so I drove them all out and into a somewhat dilapidated gun tunnel cut into the hillside. The rain was lashing down outside the entrance as we looked out from the relative dry of the old tunnel. The voice of one of my lieutenants called from the rear of the tunnel where he had been exploring.

"Pete, look at this," said Ron.

I walked back into the gloom and saw to my horror that some previous user of the range had dumped quantities of detonating cord and what appeared to be detonators in the back of the tunnel. It was a public access range at the weekends so any child could have found the kit and caused harm to themselves and others. I was so incensed that I reached down to a bunch of what I took to be detonators (they were actually ISFEs (Igniter Safety Fuse Electric)) to check on them. Wrong! As my fingers got to within a few millimetres of the suspect detonators a visible spark jumped from my fingers to the wires. I flipped.

"Everybody out". I led my gallant team down the hill through the rain. Apparently I vaulted a barbed wire fence in a single bound without stopping to check that I could clear it! Goon show fans will recall a comment about the Barbed Wire vaulting champion until his unfortunate accident! We were headed for the only other building within miles: the firing point blockhouse. The entire team of eight or nine could just about squeeze into the tiny concrete blockhouse. It was a tight fit but we were soon glad that we were away from the top of the hill as lightning strikes started to hit the ground around us with a frequency of one every minute or so. Although we were inside a solidly built concrete building there was one major drawback: the immensely thick armoured door. The team tried to move as far away from the door as they could, not appreciating the potential attractiveness of the metal to a lightning strike. At the other end of the small room was an old

fashioned wind up telephone which was how we communicated with Range Control to request clearance to fire. As the lightning got closer so showers of sparks would come out of the phone and it would ring. We were beginning to get the feeling that we would not like to know who might be on the line and what his message was going to be! Come in number 9, your time is up! With the musical telephone at one end and the metal door at the other we were soon hunched together in the middle of the blockhouse. After an hour or so the sound of the thunder started to move away to the south and the time between the lightning strikes and the thunder was getting longer.

Eventually Peter, our tame theoretician, and I decided that we could not leave the charge packed in the gun barrel. Equally we really did want to complete the experiment and see whether our cunning plan for stopping it functioning at the critical moment would succeed. There were still odd rumbles in the distance as just the two of us walked the four hundred metres back up to the top of the hill. Everywhere was sodden but we decided to go for it. We opened the door of the Powder Wagon and carefully extracted the detonators. Carrying these very carefully we crossed to the crater and picked our way down through the sticky mud to the waiting gun barrel with its enormous charge of plastic explosive. It might not be a real atomic device but it was still a very lethal piece of explosive machinery capable of throwing high speed metal over an enormous area. We had just started to connect the detonators when “Bang. Rumble. Rumble.” The bloody electrical storm was coming back again!

We were faced with a dilemma. Technically we should stop and break it all down again. But that would take longer than making the final connections and blowing it. So we went that route. Heart in mouth we made the connections and semi crouched as we walked rapidly down the hill (Never run away. You might slip and injure yourself).

We rang the range control on the now quiescent telephone.

“Bellshiel. Do we have permission to fire?”

“Yes”

We hit the button and the hill erupted. Phew! After a suitable pause we investigated and found that everything had gone as we had anticipated. Never did the first beer of the evening taste as sweet as that night! It took several weeks of reconstruction but it later transpired that in the first experiment we had got the necessary simultaneity and other factors to make an atom bomb. And the look on the faces of the Aldermaston crew at the debriefing gave away the fact that it would have made a very large hole in the ground. What was just as satisfying was that our disablement scheme had also worked, just in time to save the day. We were soon invited to join the nuclear club with our credentials proven and I was appointed the newly established Disablement Team Leader.

Chapter 15

Another potential area of work for my EOD section came out of some work that I had been doing over the previous two years. Through the vagaries of the British military system, different branches of the military had different responsibilities for EOD. By this time most of the glamour, if glamour can be said to attach itself to such a job, was with the RAOC, the Royal Army Ordnance Corps, known affectionately in the trade as the Rag and Oil Company. The soldiers who dealt with large iron bombs were the Sappers or Royal Engineers. They felt somewhat affronted that there were all these new pieces of equipment extant for dealing with terrorist devices when all of

their equipment was developed by scientists similar to myself back in the dark days of the Second World War.

Dealing with a large iron bomb either freshly dropped from a great height or after tens of years in the ground is mainly a matter of digging a big hole and stopping it falling in on you while you find the bomb and then neutralise it. Hence the lead taken by the Sappers whose bread and butter job was to build things including holes in the ground. Once you had found the bomb then strangely enough you wished to make sure that the damn thing did not cause you to come to harm. So the standard technique involved first neutralising the fuze that contained the detonator and triggering assembly. Once that was effectively inert then the disposal of the main charge was relatively safe needing a couple of holes to be cut through the metal case and high pressure steam applied to melt the mainly TNT based filling.

The brave souls in the Second World War had gone into action with little idea of what to expect when the Luftwaffe started to drop their lethal cargoes over British cities. Effectively the first people to find bombs had to wrench the fuzes from the bomb cases by brute force and get them back to scientists at Woolwich Arsenal. Once the scientists had fathomed how they worked, they were able to suggest techniques for neutralising them. As each part of EOD seems to have specific words for such neutralising techniques I will introduce the correct term here, which is "immunization." Fuze immunization techniques grew as the war progressed and new techniques were devised as the Germans threw more and more complicated and lethal devices at the Sapper and even Naval EOD teams. The Navy got into the act because one of the more lethal developments during the war was the use of parachute mines. These were really mines for destroying ships that were dropped over land (the mines not the ships). The protection in the fuze designed to tell the mine to blow up if it was inadvertently dropped anywhere other than water was what caused it to go bang as a very high capacity blast bomb capable of devastating several city blocks.

By the end of the war there were about six or seven different main types of fuze immunization technique with their associated equipment. Dealing with a bomb therefore went something like this: first you had to identify that a bomb had dropped in a particular location and not gone off. That came mainly from locals who had heard the bomb drop but not heard it function. Then a team of Sappers would turn up and dig down to uncover the bomb. There were all sorts of complications associated with what the bomb was threatening so that a bomb in a petrol dump or a hospital would be category A and the category and the degree of risk that the bomb disposal men had to take were associated in somewhat similar ways to those described in my Bomb Disposal laws. Once the bomb had been uncovered then a single soul, the Bomb Disposal Officer, generally the officer in charge but it could be a senior NCO, went forward and attempted to identify the type of fuze. This was assisted with German bomb fuzes as the Teutonic mind labelled everything. On the head of the fuze was a number. If the number ended in a 5 or a 6 then the fuze was a direct impact/short delay fuze. If the number ended in a 7 then it was a long delay fuze. And finally, just to play the game straight, if the fuze number ended in a zero then it was an anti-disturbance fuze. So the dear Germans told the EOD man when they were specifically out to get him, which was very decent of them. All this decency got a little strained later in the war when they introduced the "Y" fuze that was out specifically to kill EOD men and effectively masqueraded as a direct impact/short delay when it was really a very nasty anti-disturbance fuze.

Once the fuze was recognised, and handbooks were printed which had all the known fuzes listed, then the appropriate immunization technique was applied. The fuze was then effectively inerted and the rest of the crew came back in to haul the bomb to the surface where it

was either put on the back of a lorry in wartime and carted off to a graveyard for dealing with immunized bombs or it was trepanned and steamed out in situ.

I have gone into a good deal of detail here to demonstrate some fundamental differences between what we called Conventional EOD and Improvised Explosive Device EOD. For a start Conventional EOD dealt with items of ordnance that were produced in government sponsored factories. They were carried to their targets in Government sponsored vehicles.....bombers, guns or rockets. They were made to specific designs and had some sort of quality control associated with them otherwise the gentlemen carrying them to their targets complained. None of the above applies to Improvised Explosive Device manufacture. They can be made of anything, use any type of explosive most of which are home made and hence can be pretty dreadful. They can be triggered by any type of fuzing system and tended to be designed and built by someone other than the person actually laying the bomb. I suppose that is true of conventional ordnance too but the designers of terrorist devices are not so concerned with safety as they might be (would be bomb layers consider this!). Hence our novel techniques for disposing of them had to work no matter what type of case the bomb was in, no matter how horrendously sensitive the home made explosive filling was or how complicated and tortuous the fuzing system was. And there was a small element called time that came into the calculation that was never enough to spend at the device gathering information upon which to base your neutralization. Everything had to work whether you knew what you were dealing with or not. Now you can perhaps see why Pigstick and its other related equipments were somewhat special.

So the Sappers wanted some new toys. I was given the job of assessing the existing techniques and identifying what we could do with the passage of 50 odd years since the techniques had been devised. Working on the basis that the wartime scientists who devised the techniques must have had very specific reasons for so doing, I went back to source. Fortunately all of the documentation associated with the work was gathered together at an information centre funded jointly by the NATO allies and fortunately for me was located not far from our Establishment at Chattenden just outside Rochester in Kent. Also fortunate for me was the fact that the information centre was manned by two retired EOD men with a wealth of experience that I could draw upon. I spent a long time poring over the ancient documents recording the twists and turns of the campaign and got to know the names of the Scientists and Service men responsible for providing the correct equipment in the same sort of 'operational emergency' timescales that we had been working to over the life of the Northern Ireland campaign. Most of the work was done during the winter and I froze. NATO's munificence obviously did not run to heating the rooms excessively! I would escape for my hour's lunch to the Pier Head, a pub near TS Arethusa on the Medway, and warm my hands by their fire before returning for several more hours poring over old reports. The other problem I found was that the repository contained all sorts of wonderful information that had absolutely nothing to do with my quest. So inviting was this that I had to ration myself: 9 to 4 o' clock was spent researching fuze immunization; 4 to half past was spent browsing along the shelves. I found the original German documentation on Barnes Wallis's bouncing bombs, which was published just weeks after the Dam Busting raid. I found designs for exploding pigeons, a cunning scheme for destroying Russian tanks based upon strapping a charge to a poor benighted pigeon and sending it off to land on the opposition's tanks. Have the German's never heard that pigeons home? All wonderful stuff.

I soon became fascinated with the workings of the Unexploded Bomb Committee, a wartime gathering of learned men who assessed each new requirement and then oversaw the introduction of the necessary counter-measures. It soon became clear that the present techniques

being used by the Sappers had been very carefully researched and had been proved on hundreds if not thousands of operational occasions. It also became clear that although the original requirements had been driven by the arrival of a new type of fuze eventually the techniques became generic with their being specific counters devised to the way that energy was delivered to the triggering mechanism to fire the fuze and detonate the bomb. There are only a finite number of ways of delivering that energy: discharging a charged capacitor, completing a circuit containing a battery, releasing the stored energy in a spring loaded system. There were also mechanisms for releasing the energy after a required time delay such as clocks and these also had neutralization techniques devised for them.

I found the original working papers for each of the techniques and carefully copied them. Now I had to establish if the techniques as used currently differed in any way to those originally devised and researched and find out why they had changed. To do this I joined the relevant course at the Defence EOD school and sat through the same lectures that the various military men did who were training to be EOD men. This showed some interesting diversions from the original techniques as laid down in the literature. Sometimes there seemed to be the same syndrome that existed when teams of monks copied ancient manuscripts as the only way of reproducing the printed word. Once an error had been introduced in one instructor's notes, it was perpetrated down through the ages. One or two of these errors were somewhat alarming. One technique required the fuze to be pressurized after the introduction of a particular fluid. The original work had shown that there was a maximum safe pressure before the trembler switches would operate. Somehow over the years this **maximum** safe pressure had got changed to the **minimum** safe pressure. Fortunately for the EOD men trained in this way all of the German fuzes that this particular technique were devised for were long dead anyway but it could have caused embarrassment if the technique was used against modern systems based upon the same triggering mechanism.

I wrote up all of my findings and came to the conclusion that besides getting one or two such errors removed from the syllabus at the school and from the handbooks, there was nothing wrong with the techniques that the Sappers had for their current peacetime job. The techniques had been specifically devised to counter German World War II bombs, they had a proven track record against them and came with a pedigree backed by many thousands of operations. There was also the fact that most German bomb fuzes had effectively self-neutralised after the passage of fifty years as no capacitor could hold its charge over that time or battery survive. The one variety that could cause major problems was the clockwork long delay fuze, the 17 series, which could have stopped at any point in their programmed delay and delivered the firing energy through the use of a spring loaded striker. These were most certainly still lethal.

There was one additional concern and that was deterioration caused by the passage of time. The Germans had used a particular explosive in most of their fuze trains called Picric Acid. As its name implies it is an acid and consequently would attack corrosively metals and bases and would produce salts. Unfortunately the salts of Picric acid, picrates, were many times more sensitive than the original material. Just to add joy, the Germans had housed the Picric Acid in a steel booster tube and the gaine (the booster charge at the base of the fuze) in a steel housing bringing it directly into contact with the topmost annular ring of the Picric Acid. There was also the joy that German bomb fuzes were high technology items for their time but they did not include any sort of mechanical shuttering in their design. British fuzes required two independent mechanisms to make a fuze active and generally one of the ways this was achieved was to keep the firing

mechanism and the detonator out of alignment until the arming process had been achieved. German fuzes were in-line all of the time.

I suggested that we should examine recovered fuzes from those German bombs being neutralised at the then present time. This was accepted but produced a number of problems. First there were relatively few such bombs recovered nowadays, something like a dozen a year. Some of these would be far away but fortunately the Luftwaffe had concentrated its attentions on the South East and London so many would be not far from our base. Distance was important because we needed to get to the bomb almost as quickly as the Sappers as they would destroy the evidence we needed in the neutralisation process. We acquired a nice fast reaction vehicle with a blue flashing lights and a two tone horn to get us to the incident as quickly as possible and obtained agreement with the Sappers that they would attempt to recover the fuzes rather than just immunize them and blow them in situ. We also arranged to be called as soon as they were no matter the time of the day or night.

We soon realised something that most Bomb Disposal Sappers must be aware of. Most bombs are “found” late on a Friday night. This strange law probably arises because building projects are expensive and the delay imposed by an unexploded bomb costs money. Therefore it is much more convenient to report the device at the end of the working week and have the military deal with it over the weekend. This observation had us hurtling off to various parts of the south east to join our Sapper chums in various muddy fields, generally on a Friday night. This type of bomb disposal is not a hurried affair so it often required many hours of sitting around before we could carry away our prize, the bomb fuze, in a special armoured box in our response vehicle.

On one memorable occasion we were summoned to a bomb in Epping Forest. A historic aircraft investigation club had been digging at the site of a crashed Junkers 88. They had eventually uncovered the remains of the bomber and were happily sorting through the heap of tangled wreckage when they came to some large cylindrical objects looking suspiciously like bombs: probably because that is what they were. In came the gallant lads of 33 Engineer Regiment and we too were activated. It was one of the first that we had gone out to and our reception was a little frosty. The job had been given to a Territorial Army Company and all of the lads were part timers: no one had thought to tell them who we were or that we might roll along. However, once we had explained that we were not there to intrude or get in the way, we settled down around the camp fire to wait for them to get the bombs uncovered sufficiently for them to extract the fuzes.

At something like two o'clock in the morning I was called forward to meet a beaming Bomb Disposal officer who happily handed me an extracted bomb fuze. Unfortunately in extracting the fuze he had also extracted the top Picric Acid pellet with it. Therefore I had an in line fuze, a live detonator, a metal gaine and about eight ozs of fifty year old Picric Acid to contend with. Now I desperately wanted to get the fuze back to the Fort for examination and knew that if we threw it back at the military after all their efforts we would never get any more. On the other hand the reason that the perforated Picric Acid pellet had come out with the fuze was the very corrosion and formation of Picrates that I was interested in. There was no way that I was prepared to motor even in the early hours of the morning through the streets of London with such an unknown quantity in the back of our wagon: it would certainly not be contained safely by the detonator tank we had in the back. There was only one solution. Telling Ron to walk away I strolled into the darkness, took a firm grasp of the pellet of Picric Acid and the body of the fuze and repeated a little mantra to myself based upon the literature search I had conducted about Picrates.

“The Figure of Insensitiveness of Hydrated Ferric Picrate is 56. So I should be able to do this”. With that I gave the pellet a hefty turn and it came away from the fuze. Breathing easily again, I went back to the circle of lights and handed the unwanted Picric Acid pellet back to the Bomb Disposal officer and we carried our prized fuze away in the detonator tank.

At another bomb disposal operation near Horsham in Sussex we saw the lighter side. This particular job was out in the countryside and was being conducted by one of the Squadron Commanders of 33 Engineer Regiment, a certain Major B. He had a reputation of enjoying the limelight and had foolishly let it be known to a reporter that he sat on the bomb while extracting the fuzes as he did not want to be injured if anything went wrong: failure would result in instant oblivion. He therefore was labelled by others in the EOD game as “I sit on Bombs B....” On this occasion the bomb was down about six feet and a small crater had been excavated to allow access to the bomb. Major B was down the hole and a reporter had been allowed forward presumably to get a good story. It was coming on for evening and the light level was already low. Major B bent down to examine some aspect of the bomb fuze when the reporter took it into his mind to record the scene. He therefore took out his camera with integral flash and took his picture. Unfortunately Major B was unaware of this and the first thing he saw was a brilliant white burst of light. Strangely enough this is not a welcome sight when you are standing next to a 500kg bomb. An unsuccessful EOD event was known in the trade as “the Great White Light”. The air was blue for several minutes as the reporter was told in no uncertain terms that he should not take pictures without asking permission first! Strangely enough we all thought it tremendous fun.

On another of our excursions our Sapper chums had uncovered a 250kg bomb from the early part of the Blitz. It had two fuzes, which was not uncommon, one a 17 time fuze and the other a 50 anti-disturbance. The 50 was as dead as a Dodo as it was a capacitor discharge fuze and hence no longer constituted a threat, no capacitor having charge on it after 50 years. However the 17 was a different proposition. At the early stages in the war, the 17 was dealt with by using a massive electro-magnetic clock stopper. This was applied to the top of the bomb fuze, and actuated. As the damn thing weighed about a hundred pounds, placing it ever so carefully on top of a fuze that might be two ticks away from final countdown was less than fun. As the war progressed, so the optimum way of dealing with clockwork long delay fuzes changed to a variant of something called the S set and later bombs were dealt with by injecting them with a particular solution. However I had read in my literature survey that there were concerns that the early marks of the 17 were actually rather well sealed. They were not supposed to be amenable to the later technique and all the laboratory tests had shown that they were impervious to the S set technique that was then and now in common practice.

My Sapper chums immunized the 17 fuze using the S set and started to set up the trepanning and steaming equipment: there were at this time large numbers of Sappers milling around the bomb. I noticed that no one was monitoring the bomb fuze something that my notes said was a good idea. A microphone stethoscope had been devised in the war. It consisted of a similar device to that which a doctor uses to listen to your chest except this one was coupled to a microphone capable of monitoring the sound of the bomb fuse from either close up or preferably a long way away. I pointed this out to the Bomb Disposal Officer in charge who did ask someone to monitor the device, probably just to humour the boffin. I did not think it worth telling him that these early marks of 17 were supposed to be impervious to S set treatment. I thought it might be pushing my luck. Fortunately we all survived the experience.

At another of these events just north of the entrance to the Dartford tunnel on the new stretch of the M25 I was accosted by what I first thought was a somewhat elderly Lieutenant. It was only when he walked into the light that it became clear he was a Lt Colonel and the CO of the Regiment. Colonel Bob was most interested in what we were attempting to do and it was through his good offices that we got most of the cooperation that followed. He was also the Chairman of a NATO group that met to discuss commonality of approach to Bomb Disposal and he asked me to write a paper for inclusion at the next meeting. This I was glad to do not the least because it got me to Brussels.

The gist of my paper was a distillation of my thoughts on where the major capability gaps were in Conventional EOD. Although I had been set off down the route to replace or modify fuze immunization techniques it did not seem to me that that was where the problem lay. In those days we were still very much geared up for the Cold War with the prospect of large numbers of Warsaw Pact forces coming streaming over the North West German plain. If it was assumed that they would come unannounced and come fast then we would not have time to fight the EOD war in the same way that it had been fought in the Second World War. In other words we could not sit at our establishment, the modern descendant of Woolwich Arsenal, waiting for fuzes to be provided for us to examine, decisions to be made on which of the fuze immunization techniques should be used and for us to publish the manuals to instruct the troops on the ground. All of that would take time that we did not have. What we needed would be rough and ready techniques which would work for any type of bomb, mine, sub-munition no matter that the first time that you had seen it was now. These battlefield clearance techniques could even accept lower levels of certainty about their success as long as we provided techniques that did not risk the EOD operator. Effectively I was suggesting that we could use the same approach as we had to deal with terrorist devices, non-specific techniques that were fast, exposed the EOD man to the minimum risk and allowed him to deal with a succession of tasks very quickly, get rid of the problem and get on with the war.

The paper I presented at Brussels was basically a page and a half. I listed some of the ideas that I had for getting rid of unexploded ordnance rapidly. Strangely enough we could not use Pigstick on a large iron bomb: it would just bounce off. But I thought we might be able to get rid of some of the problems by shooting at some of the unexploded devices. Much of the priority thought those days was directed at the defence of airfields. An attack on those would most likely be a mixture of variable time delay large iron bombs mixed in with a whole sea of scatterable sub-munitions some with delay fuzing randomly exploding and some with anti-disturbance fuzing. It was not too difficult to imagine that was what the Russians would do to us as that was what we were intending to do to them. I could foresee a problem immediately after the attack. Coming out of the shelter you would be faced with a mass of sub-munitions going bang at random intervals or when you tripped over them. Amongst the sub-munitions would be large iron bombs probably on or near the surface as they would have been dropped by fast flying low altitude aircraft: bombs tend to skip and bounce from such attacks rather than dig in. Each large iron bomb on the surface would have a lethal radius of several hundred metres. Therefore they would protect an awful lot of sub-munitions. You could not get to the large iron bombs to neutralise those because of the menace of the sub-munitions. Catch 22. So I initially proposed to shoot at the large iron bombs, accept that they would detonate but be prepared for that to happen and have to fill in the holes if it allowed you to then operate against the sub-munitions. On an airfield the EOD teams would be in support of teams of specialists concerned with airfield damage repair who wanted to fill in the holes in the aircraft operating strips and get the high priced sky jockeys into the air as rapidly as possible. But nothing could happen until the EOD problem was solved.

When I gave my paper at Brussels there was a polite display of interest but no instant response. However there was a result. In the audience was a young Luftwaffe Major called Hubert. He not only listened but went back to his base and instructed his men to lay on a trial at one of their ranges. (Good people for getting things done rapidly the Germans). He then took one of the local air defence 20 mm Rhinemetall cannons and shot at a variety of 500lb bombs. He took video of the events and stills of the remains and strangely enough there were remains, bloody great big bits of the bombs left after the strikes. There were also large bits of unexploded filling left after the projectile strikes.

At the next meeting, he presented his results. I was very excited by what I saw as I could understand what was happening. In the early part of my career I had studied non-detonative behaviour of secondary high explosives. Basically I had discovered that the vast majority of accidental events involving munitions did not involve detonation, the design mode way that explosives functioned, but deflagration, which was just a posh way of saying burning. However, a deflagrating explosive which was confined by a munition case could still produce a vigorous bang quite capable of shattering a gun tube in the case of a prematurely exploding shell or shatter a bomb case struck by a high speed projectile, which was what was happening in Hubert's experiments. Unlike detonations, which were largely confinement independent, deflagrations required the confining effects of the case to drive them. In other words the reaction would continue to accelerate as long as the case was intact and the internal pressure was climbing. Rupture the case and the driving force for the reaction was removed as the gas vented to the atmosphere and the reaction went out, scattering unreacted explosive to the four winds. Between us we had found the answer to dealing rapidly with unexploded Conventional ordnance on a battlefield: induce internal deflagrations in the fillings and let the resultant fast reaction disrupt the munitions. It was a different route to using Pigstick and the other disrupters that supplied all of the disruptive energy themselves. Here we provided the stimulus for disruption from the outside and used controlled stimulation of the chemical energy of the explosive filling to disrupt the ordnance. Clever eh? That observation provided a whole series of joint trials with our NATO chums and resulted in techniques that are now common practice all over the world.

Chapter 16

I still have two areas of work to describe that were added to my growing empire. No wonder at this stage in my career that I likened my existence to the cabaret act that involved spinning an ever-growing number of plates on sticks! As soon as I set up another spinning plate I had to dash back to spin one of the originals again as it teetered towards collapse. This one grew from having a single individual in my organization and came from his amazing skills for working out how pieces of ordnance worked. Tony had collected ammunition since his teens, an interesting hobby particularly as he apparently kept his collection under his bed. Anyway his hobby turned into his career. People would bring him unknown bits of ordnance and ask his opinion on what it was designed to do and how it worked. In particular his ability to fathom out how fuzes functioned and safety and arming systems worked was nothing short of miraculous as far as I was concerned. He could look at a series of radiographs and trace the workings of a fuze, tell its state of arming and give a good estimate of what it was intended to be used for. He could also recognise when something was wrong as far as the safety of an item was concerned and work out how to disassemble it without losing an eye or a limb.

Very soon it became clear that Tony's particular skills were a marketable commodity, not the least to the Defence Intelligence community who occasionally came across items of foreign ordnance that they wished to know more about. We will pass swiftly over how we came by some of these items as that heads down the murky route to intelligence gathering, which is not an area for public gaze but it soon became clear that I needed an understudy for Tony and that was where dear Andy came in. Andy used to work in the now defunct detonator section, had gone off into the big wide world and then realised that his true forte was associated with horrible weapons of war and had come back to the fold. He, like Michael, is a true eccentric and has nearly as many stories associated with him, some at least will form part of this account.

I will mention the last area of work now and develop the work of the Foreign Ammunition Exploitation Cell a little later. This last area of work came from another connection with the intelligence world, this time the Security Service. For several years I had been a member of a group that met at one of the Security Service's London outposts to discuss passive defence against terrorist attacks. Basically the committee, which was called FAWG, Forcible Attack Working Group, consisted of a group of civil and structural engineers working for the then Property Services Agency and a group of explosive and ballistics specialists all under the chairmanship of a man from the Security Service. The Civil and Structural Engineers had responsibilities for designing or advising on the designs of buildings that housed initially Ministry of Defence personnel and other facilities or personnel that were of vital national importance that might be vulnerable to terrorist attack. Later as the potential targets of terrorists widened to Politicians, the Police and finally to commerce so the types of action taken by the committee expanded until we were providing guidance to the whole community on what to do to minimise the effect of a bombing incident on their employees.

When I joined the committee was only four or five people. It met at an address in London's West End and I used to enjoy the rather cloak and dagger business of going to the meetings. The Security Service is avowed now but all of its workings were deeply shrouded in mystery then to the extent of me having to keep where I was going a secret even from my colleagues. On FAWG committee days as far as my Section was concerned I was going to a meeting at MOD London, a gloriously vague title that covered a multitude of sins. This occasionally caused some semi-farcical situations when it came to claims for travel and subsistence as inquisitive souls had to be fended off with downright lies.

The particular location in London was disguised. I had to enter the building in which this establishment existed under an assumed name, turn right soon after the entrance, pass through the cloakroom, and was then suddenly confronted with enormous Ministry of Defence Policemen who asked me who the hell I was and who I wanted to see. More Len Deighton than James Bond but still rather stimulating.

Once I was firmly entrenched as a member of FAWG, I began to notice certain topics appearing on the agenda month after month. They were primarily concerned with the effects that explosives had on a variety of what the Civil and Structural Engineers described as "cladding materials". At that time most buildings used by the Ministry of Defence consisted of a steel frame on which were hung a variety of different materials to make the finished structure: concrete panels, glazed panels, brickwork etc. Our problem was that little data existed on how many of the newer materials reacted to blast. Simple, you might think. Go and get the data by doing experiments. But it was not that simple. There are only a few places in the tiny island of the United Kingdom where you can let off substantial amounts of explosive and they tend to be busy with military souls

training or scientists conducting experiments. For you to build a structure, let any element of it which contained concrete cure as concrete does not reach its ultimate strength for several months then you were effectively neutralising a good sized section of a range. And through the ever-increasing influence of the bean counters, that meant that you had to pay for that range for all that time. FAWG somehow existed without funds and even my involvement was lost amongst the other work that I did. Somehow I thought it important enough to keep going even without funds.

One day the question of blast interaction with cladding materials came up again.

“Why do we not just go and do these experiments?” I asked innocently.

“Because no range will accept a structure for three to six months neutralising one of its firing areas and because we have no funding to conduct the tests”, came the predictable reply.

“Find me a patch of ground that nobody is using and I will provide the team to conduct the experiment,” I promised.

For someone to offer to do something for nothing spurred one of the PSA men to investigate his resources further. He offered the use of a disused airfield called Hemswell in the wilds of Lincolnshire. It was not a range. At this stage in its career it was not even used as an airfield. It was just an enormous flat area still with its runways intact and miles from anywhere. I think one of the things that it was used for was storing the EC grain mountain but I am not sure. Certainly some of the hangars seemed full of grain. Anyway a disused airfield was perfect as far as conducting these types of explosive experiment were concerned.

I had got used to conducting firing trials on Army Training Ranges like Otterburn. These required a high degree of self sufficiency as the Military owners of the range were not interested in supporting us and allowed us onto what were effectively areas for the training of military personnel under sufferance. However they were the only places where we were in charge of events and could conduct a series of experiments with everything under our control. Where we were supposed to conduct our experiments were Proof and Experimental Establishments like Shoeburyness. However, these were controlled by serving or ex-military range officers who required all of the particular trial to be conducted to be identified beforehand and written down to the last instruction. The scientist sponsoring the trial was allowed to come along to observe under sufferance. I had tried this before with interactive research oriented trials. When we had conducted one element of the trial we had more information. With that information it was often sensible to change what you did next. Could you do that on a P & EE trial? Could you hell. There was also the wonderful fact that the people who owned the range somehow expected us to pay for its entire upkeep. Ranges are expensive places and very soon the bean counters were saying “It costs £1 million to keep the range going for a year. Therefore anyone wanting to use it must pay £1 million divided by the fraction of time that they require to use the range.” Even a day at Shoeburyness would cost £15,000. Too much for my tiny budgets. And the real stupidity was that the range was there whether someone was using it or not. I will never understand the costing mentality of such things that are a national resource.

The PSA man and I met at Hemswell and surveyed the scene. We agreed where he would build four boxes of reinforced concrete around a central point where I would put a 60 pound weight charge of plastic explosive. Each one of the boxes had an open face into which would be built a different cladding material and the distance from the centre of each clad structure to the ground zero was different by a metre. So in a series of experiments we could subject the same materials to different levels of blast loading. Building commenced and we waited for the concrete to

cure. I then had to consider how I was going to conduct a hefty firing on a range that was not a range but a disused airfield.

The first thing to do was go and see the local police at Gainsborough. They seemed quite happy to assist and agreed that they would come along and stop traffic on an adjacent road to prevent some poor soul from driving off the road from “driver startle”. That also took care of any telephone calls to the police from locals complaining that a terrorist group was lurking on the range. However it did nothing to allay the fears of the local inhabitants and I did not want claims coming in that someone had dropped their prize tea service as a result of an unexpected bang. So I sent one of my lieutenants to do a tour of the local villages with notices for the Parish Councils telling them that on a particular day at 12 o’clock exactly there would be a single bang and they were not to worry about it.

A further reconnaissance showed that there was a school in close proximity to the airfield so we made a visit and explained what we intended to do to the Headmaster. He said that he would inform the children and suggested that he would have them lined up behind a large panoramic window overlooking the range so that they had a grandstand view. This I did not think was a good idea. The prediction of window breakage is an inexact science or at least was at this time as it was what we moved onto once we had completed trials on the cladding materials. Windows break at even extreme range with all sorts of conditions providing amplification of effect. Every calculation we made suggested there was not the slightest chance of their windows breaking and showering the children with glass but it still did not seem a good idea to have them observing through the window. I suggested that I send one of the armoured vehicles that we used as mobile splinter proofs around to the school with a team equipped with noise measuring equipment. The children could ask questions and see the armoured vehicle and would be in the open and away from any risk of window breakage. This was agreed.

The day of the trial dawned and my team prepared for the midday bang. I set my watch by the talking clock to be able to fire at exactly 12 o’clock. We had sentries posted at each entrance to the airfield and close observation of the whole area during the final moments before the firing. Everything went off according to plan and there were no casualties and no complaints. The gentlemen from PSA were very pleased with the results and eagerly photographed and assessed the effects of the blast on the cladding materials. This was the start of a whole series of FAWG trials that effectively provided information on the behaviour of every structural material in common usage. I was amused to find “novel” cladding materials such as nine inch brick walls appearing on the test schedules in later shots. In all of the ten or eleven times that we visited Hemswell, we never had any problems. Except for one occasion.

My boss, the same one who went to Princes Gate, was always very jumpy about our operating on a non-standard range. No matter how much I assured him that we were very careful, had the full cooperation of the local police (we even used to go and play them at snooker in their canteen on our visits) and were always very careful to keep the local population fully informed, he always expected the worst. On this particular occasion we were staying as usual at the Monck’s Arms, a less than perfect pub but about the only place with accommodation for the whole crew in the neighbourhood. We had completed our firing on schedule, had gathered all the data and tidied everything away. Hence we were back in the pub at just about three o’clock. Fortunately in those days when such things mattered, we were residents and could therefore get a well-earned drink even at that late hour. As I ordered for the crew a solitary figure at the bar turned to me and said,

“You bastards!”

I was very taken aback, the more so because the poor fellow was in obvious distress and was fighting to keep tears from his eyes.

“What is the matter? How have we offended?”

“My little budgie. Full of the joys of Spring. He was sitting happily on his perch. Bang goes your bloody charge and he has a heart attack and falls off his perch. Bastards!”

Rapid remedial action was required and, ever resourceful, we bought the poor soul a drink to console him and in the course of conversation and abject apologies got out of our friend the sex and colour of his ex bird (I nearly wrote Parrot but that is someone else’s gag). Off went one of the crew to Lincoln with sufficient funds to buy a replacement and we finally had a somewhat less disgruntled local on our hands by the time a new bird was provided and he went happily back home with his new friend.

Back at our establishment with face carefully composed, I went in to see my Boss next morning.

“How did things go at Hemswell? he enquired.

“I am afraid I have to report a fatality,” I replied.

The look on his face was a picture! Strangely enough I had to run away rapidly as he was throwing things at me when I told him the nature of the fatality. Some people have no sense of humour.

Chapter 17

Right. Back to the spinning plate that was our work for Northern Ireland. Our responsibility at this time was for EOD weapons and the responsibility for the vehicle to get our weapons to the bomb was with our sister establishment at Chertsey. Hopefully it is clear from my earlier description of the Laws of Bomb Disposal that it was vitally important that the EOD weapons did travel to their target remotely as it was impossible to send an EOD man in on foot to tackle a bomb within its active lifetime. Therefore we had a strongly vested interest in the viability of Wheelbarrow, the little tracked vehicle that carried our weapons. Unfortunately Wheelbarrow was having a rough patch and Chertsey was developing another version, the Mk 8 which was having major developmental problems. We found that time after time Wheelbarrow would run out of battery power or otherwise die which meant that the mission was aborted. It also meant that one of our precious EOD men had to do a leg in which was anathema to us.

By this time we had developed a disruptive weapons system for practically every type of explosive device that the opposition had in their shot locker. This coverage was shown by a dramatic drop in the number of casualties suffered by our EOD men. From 1971 when the campaign started in earnest to 1975 we lost 15 bomb disposal men killed in action in Ireland alone. That would have been a lot worse if we had not had Pigstick in Service as quickly as we did but each twist and turn of the campaign required us to react by developing a new disruptive counter to whatever PIRA was throwing at us next: bombs in milk churns, bombs in beer kegs, bombs in cars. Each required the development of new equipment and while that was being developed the poor EOD men had to go back to hand entry or improvised techniques that were less than perfect. While so doing they took casualties.

One of my last jobs in this area before becoming the boss was to head a group trying to identify where the opposition were going next. Frankly that was nearly impossible with the vagaries of the terrorist mind but while considering it I did come up with another suggestion that was slightly more tractable. We might not be able to guess where the campaign was going next but we could identify our own capability gaps because we had devised the equipments. We knew what the kit would do and equally we knew what it could not do. So it seemed logical to me to develop equipment that would in fill those gaps even if there were no requirement for the equipment at that particular moment. When the opposition came up with that particular problem, then we would simply issue the developed equipment and hey presto!

I know there are a lot of other factors such as better training, better selection procedures but there does seem to be a correlation with this change from our developing EOD equipment reactively to developing it pro-actively with a dramatic drop in the number of EOD men being killed on active duty. As I mentioned earlier, we lost 15 in the first 4 years of the campaign. After the change we have lost 4 in the last 29 years. Still 4 too many but still an improvement.

So back to our attempts at filling capability gaps. One of the most obvious concerned the reach of our weapons. Wheelbarrow had a top hamper, which was basically an A frame on which could be mounted either a solid boom of fixed length or a telescopic boom. One of my scientists, Andrew, came up with a marvellous kit of parts that allowed an almost infinite variability in the way the top hamper was arranged. Each of the pieces was a module and fitted together with simple clips. The reach of the weapons could be rapidly modified and an articulated arm allowed them to swivel in practically any direction to engage their target. This Modular Weapon Mounting System (MWMS) was tested extensively at the training exercises that the Army School of Ammunition ran at Melton Mowbray. These exercises were essentially the final test for the trainee EOD men before they qualified and rejoiced under the Code name of Cold Pie. (Those able to spot why this was appropriate for Melton Mowbray tell the remainder). Andrew would go along with his latest ideas and watch as the particular trainee EOD man tackled his given task. Now some of these tasks were amenable to attack with weapons mounted on the existing framework of Wheelbarrow and some of them were not. Andrew got many of his best ideas by watching the ones that could not be reached by the existing equipment and by subsequently providing that capability. He sold it effectively to the military directing staff at the next exercise by demonstrating that now a further range of bombs could be dealt with remotely.

Strangely enough Chertsey resented the MWMS. As far as they were concerned we were trespassing on their responsibility but fortunately the User had the last say and he appreciated that it was a major addition to his capability. One of the prime movers for the development of Wheelbarrow was another EOD phenomenon called Lofty. He was a big man, tall with deeply hooded eyes. He was an engineer of the old school and had been involved with Wheelbarrow since its earliest inception. Lofty was deeply committed to EOD in general and the lads who used his kit in particular. He spent many days actually in Ireland demonstrating how to get the best out of Wheelbarrow and overcoming problems with it. He even donned battledress and operated the vehicle in difficult jobs as every subtlety and nuance of the machine was second nature to him. I believe there was a time when Lofty had neutralised more devices than any official EOD man: another case of a civilian scientist doing something more than drink tea and carry an umbrella. I had no problem with Lofty except when it came to clashes over the interface with his machine and our weapons. Where we felt we had something better to offer or where there was some deficiency in Wheelbarrow that was stopping us getting at more bombs, then strangely enough we were particularly vocal. This tended to produce some rather acrimonious meetings with blood all over the

carpet on occasions. I will publicly state however that I never doubted that Lofty's fighting of his corner was based upon his loyalty and dedication to his EOD customer and his interpretation of what was best even if my fighting of our corner was based upon similar motivation but differing views of how this could best be achieved. No matter what our differences were in debate, Lofty, his boss Mike and I could most times have a beer afterwards and generally parted amicably.

I will illustrate one of the on-going sagas. I have mentioned that Chertsey provided a telescopic boom for Wheelbarrow. The junction between this and our weapons was a threaded bolt that held generally at this stage two Pigsticks ready to fire at the end of the boom. Our problem was that nearly every time we, or the Users, fired one of the Pigsticks the threaded bolt undid which made firing the second Pigstick impossible. We pointed this out but Lofty resolutely declared that it did not and could not happen. So often did this item turn up in the Project Manager's meeting for Wheelbarrow that Paddy, the Project Manager at the time, would let out an audible sigh as he prepared for yet another round of accusation that it happened and counters that it did not. At one meeting in London the same item on the agenda arrived. Paddy steeled himself for the same old arguments but I suddenly announced that the problem had gone away.

"How is this possible after all these months?" asked Paddy.

"Because we have got fed up waiting for Chertsey to solve the problem and have solved it ourselves by making this" and I place a modified bolt on the table rather firmly.

Uproar, as we had transgressed the agreed interface. However, we had tested the modified bolt at Cold Pie and it had been shown to solve the problem. And the User's representatives spoke up and said they were not interested in our establishment and Chertsey's differences: they needed kit that worked and this modification did. So end of message. We were not popular.

I can recall another meeting at our establishment which had been particularly acrimonious. As we had all got up to leave, the Assistant Project Manager for Wheelbarrow attempted to restore calm by raising two fingers in mock Papal blessing and said "Peace on you"

Quick as a flash I replied. "And Piss on you too!"

Chapter 18

Meanwhile, back with the Conventional EOD research. Ron and Terry were split away from the rest of the group to conduct research specifically on the disposal of conventional ordnance but using the new key, which was basically to use deflagration in all its many forms. In these days of the vote system for funding our research we had so little money that we had to resort to all sorts of underhand activity to get items for our experiments. I seem to recall that I had something like £5,000 annually for the acquisition of all of the stores for this work. Now strangely enough that would not buy me even a single 1,000 lb General Purpose bomb. So we had to find other ways of getting them. The other resource based problem was that, however active and efficient they were, my two gentlemen and a couple of support workers were never going to be able to conduct trials on very large items of ordnance that were capable of projecting fragments over an extended area on their own. Every time I watch a film, and they scroll to credits, I marvel at the hundreds of people involved. I then think of the two or three individuals that I had at my disposal to do things that could potentially win or lose wars or change political situations. So we needed some more hands. Where to find them? Well strangely enough the poor souls whose job it was to dispose of conventional ordnance in both peace and war had a vested interest in generating new and safer

techniques. So we invented “bring a bomb” parties and invited our military cousins to participate. Through the connection into the NATO EOD Working Group, which after all was a cooperation programme, we had access to a good few other similar souls. At the risk of getting someone prosecuted, not the least me, I will describe some of the ways that we devised to get our hands on ordnance on which to conduct our experiments.

Ron and Terry discovered who owned the account for 1,000 lb GP bombs for the RAF. This gentleman was a retired officer who worked in some rather boring office in Harrogate. One day two strange looking souls sidled into his office and suggested that he might like to come along with them. Terry and Ron took this elderly gentleman to the wilds of Otterburn and showed him some of the experiments they were conducting. They let him fire at bombs, they let him attack them with a variety of different techniques that were progressively showing promise for the rapid destruction of unexploded conventional ordnance. They then took him back to his boring existence at Harrogate. Prior to saying goodbye they pointed out that

- a) none of this was possible if we did not have any bombs to work with.
- b) he would be very welcome to come along again on a future occasion if he managed to find us some bombs to attack.

Result: we got some more bombs.

It was about this time that the RAF EOD men had a stroke of luck. There was something called “add back money” which again materialized because of the vagaries of the vote system. At the end of the year there was some money left in one of the pots that was going begging so suddenly the EOD men had some brand new Scimitar armoured vehicles. These were a very welcome addition in a post strike environment as they gave armoured protection to the crews and mobility to get around the airfields. However the Scimitar was equipped with a 30mm RARDEN cannon, a rather bigger weapon system than we really wanted to shoot at the surface laid ordnance in the manner shown to work by the Luftwaffe experiments. The RARDEN cannon had a range of several thousand metres and was really designed to knock out enemy armoured personnel carriers. It just did not seem likely that we could use it to shoot at unexploded large iron bombs and still produce deflagrations in the same way that the Germans had initially and we were now beginning to do with a 0.5 inch Browning. We, and the RAF staff in the Ministry of Defence that had responsibility for their EOD capability, were therefore faced with a dilemma. Should we regun the Scimitars or would the 30 mm RARDEN still do the job? As the Scimitars were destined for our forward bases in Germany, it would be better for an airfield defence role to leave them with their big gun. But was it just too much energy for EOD purposes? The only way to find out seemed to be to try it. But then we were faced with another dilemma. If we combined the safety trace for the RARDEN with the safety trace for a 1,000lb bomb (a circle 3,000 metre radius) then we could not fit that on any range we knew about in the United Kingdom. So we needed a much larger area.

Every other year there was a meeting of EOD specialists from the US, the UK, Canada and the United Kingdom called ABCA-5. At one of these meetings I had met the head of the US Naval EOD school, a certain Captain Dunbar. He had seemed helpful and interested so I rang him up and asked him if he knew of a range in the US where we might conduct some experiments. He said that he thought he might and would ring me back. Soon afterwards he did so saying that one of his friends was the commandant of the Marine Combat Air Proving Ground range at 29 Palms in California. It was an enormous chunk of desert used as a bombing range and the Commandant would be delighted to assist us in conducting our experiments. So suddenly we had a range. My next problem was to find some GP bombs as I did not think the RAF would be too happy about

carrying all the equipment and vehicles we would need to conduct the experiments and enough bombs to make it worthwhile. So I looked again into my little black book and rang another friend in the US. This was the gentleman I had met when I had been invited to give a lecture at the University of Rolla Missouri on the demilitarisation of ordnance and who was mentioned when we went up the Missouri on a paddle steamer. He worked at Crane Indiana at an enormous ordnance factory amongst whose products were large iron bombs. He also controlled the demilitarisation account. The conversation on the 'phone went something like this:

"Hello Jim. This is Peter"

"Hi Peter."

"Jim. I need some 500lb General Purpose bombs for some experiments."

"How many do you want?"

"About 35 to 40"

"Where do you want them?"

"Some place called 29 Palms in California"

"When have they got to be there?"

"First week in December."

"Yeah. What's the weather like in the UK?"

So with two phone calls we suddenly had a range for conducting the experiments and a large number of bombs to shoot at. All I had to do now was convince the RAF to get my troops and the equipment to 29 Palms in California. So far no one had mentioned anything about money, which was just as well as I did not have any.

At that time being a mainly land based Ministry of Defence establishment if I wanted a car or a truck for a journey I filled out an Army requisition form and sent it into the military system. In due course, someone provided me with a car or a truck. I reasoned that there must exist a similar form for an aircraft. There was. So I sat down and completed it.

Aircraft required: Hercules Transport Aircraft.

Origin of flight: Brize Norton in Oxfordshire seemed a sensible place to start.

Destination: That too was easy as we wanted to go to 29 Palms in California.

Cargo: One Scimitar Armoured Vehicle, One Saracen Armoured Vehicle and a Ford Transit Van. The Scimitar was obvious. The other two vehicles were to protect my staff and house the instrumentation.

Passengers: Two scientists, Two support staff and Two RAF EOD specialists.

Dates: 7th December returning on the 21st December.

Right. That was the easy part. I signed it myself and sent it off to the RAF movements people at Chessington.

About a week later I got the expected 'phone call.

"Is that Mr Hubbard?"

"Yes, it is".

“You have not filled one of these forms in before, have you?”

I admitted that I had not.

A note of incredulity had entered the man’s voice as he went through the cargo manifest again.

“A Scimitar Armoured Car, a Saracen Armoured Personnel Carrier and a Ford Transit Van! You will never get all of these in a single Hercules. You need two Hercules.”

I thanked him for his guidance and asked if I had to resubmit another form.

“No, I will change it this time. But do remember there is a limit to the weight and bulk that can be carried by our aircraft.” With that he rang off.

Everything went ahead and still no one had asked me for any money.

It came to the day when the lads were due to go. The flight crews were all enthusiastic as the route would take them to the US via Iceland and their projected course would allow them to fly in formation down the Grand Canyon. Suddenly someone noticed that there was something missing from the flight plans and planning documentation Where was the vote number to cover the fuel? They asked everyone around who kindly informed them that the responsibility for setting this whole deal in motion was with a Mr Hubbard, a Section Leader at our establishment.

“Would I please supply a vote number to cover the considerable amount of money for the fuel for the two Hercules?”

“I am afraid I do not have one. But I do have a range provided free by the Americans, I have 35 500 lb GP bombs provided free by the Americans and we now have two Hercules with flight plans logged, fully loaded and ready to go. Seems an awful shame to cancel it all now.”

“This is most irregular.” Somehow a number was found and they went. The trial was a major success. We tried all of the different types of ammunition that RARDEN fired and found that some of them did produce detonations but nowhere near even 50%. I am working from memory but it was something like 2/10 detonations for the APDS (Armour Piercing Discarding Sabot), something similar for the APSE (Armour Piercing Special Effect) but the best results and the most satisfactory deflagrations were produced by Practice Ammunition. When we looked at some of the unsuccessful firings it seemed that the very high velocity projectiles were simply passing right through the bomb case and the explosive filling without transferring enough energy into the explosive to initiate either detonation or deflagration. The practice ammunition was aluminium alloy and this deformed as it penetrated making a sort of dum dum effect which did then dump energy into the explosive and gave us our deflagrations. The Mk 82 bombs we were shooting at were low drag bombs with a considerably greater length than their diameter. Hitting one of these away from the boosters (we were using unfuzed bombs at this stage as we did not want the complication of fuzes to start with) produced about four or five major fragments and scattered unreacted explosive over a few hundred metres. There was no crater and it only took as long to do as it took to line up the cross wires of the sight on the bomb carcass and fire.

There was some hiccup for the return and it looked as though the boys would have to spend Christmas away from home. After all the hard work I thought this a little unfair. Give the RARDE hierarchy their due, they thought so too and we managed to arrange for civil air tickets for the troops’ return journey. At the late stage of booking, the poor souls had to have Club class. Apparently they turned up at Los Angeles still dressed in their somewhat battered range gear and assumed their seats in the Club section, calling loudly for free alcohol. An officious member of the

British Airways cabin staff bustled up to send them packing and was somewhat taken aback to find they were legitimate.

The US personnel at the range had been very cooperative and I wrote thanking the commandant for his help. Apparently they were amazed at what had been achieved and fed the results back into their own system. The US equivalence to my organization was at Indian Head in Maryland. They had a very large team of scientists and technical writers working away on producing volumes and volumes of EOD technical publications. Their policy was still one of identification, followed by the production of detailed and very specific dismantling techniques, which were then written up in a whole series of technical documents that controlled what their EOD men could and could not do. This also meant that they had to go to war with a mobile library. That has changed with the advent of better IT but still does mean that someone has to have encountered an item of ordnance before the rest who follow can deal with it. That was still not the direction I wished to follow.

Chapter 19

I suppose as it is the twentieth anniversary of the Falklands campaign, there is some additional incentive to recall our small contribution to that campaign as chronologically it falls about now. I can remember that I had a US gentleman as a visitor on the day that the Argentine forces invaded. He seemed to think it a sort of Gilbert and Sullivan comic opera sort of happening and seemed mildly surprised when I said that we would go down to the South Atlantic and throw them off again. There were even calls for volunteers amongst the military scientific community to accompany the task force. I put my name forward and I am sick on the Woolwich Free Ferry but I felt strongly that we did need to go to defend the liberty of the Falkland Islanders. There may be only a couple of thousand of them but if they wanted to remain associated with the UK and not Argentina then that was their choice. No one and but no one should impose an alternative on them.

EOD conducted by the UK armed forces was still controlled by a very much union closed shop attitude. Different arms of the forces had different responsibilities and woe betide anyone foolish enough to step out of line where these responsibilities were concerned. Basically the four EOD arms had the following terms of reference:

Royal Army Ordnance Corps: Responsible for the disposal of terrorist devices, and of unexploded ammunition.

Royal Engineers: Responsible for the disposal of large aerially delivered ordnance of foreign design, and for the disposal of mines.

Royal Navy: Responsible for all aspects of EOD on HM ships and HM Dockyards and all aspects of EOD below the high water mark.

Royal Air Force: Responsible for the disposal of UK originated bombs, bombs on crashed aircraft and all forms of EOD on RAF airfields.

There is a probably apocryphal tale of the UK EOD hierarchy at an ABCA-5 EOD conference walking along the seashore near Portsmouth where the conference was being held. Suddenly one of the party saw an item of unexploded ordnance lying in the sand.

“This is obviously a naval responsibility as it is lying below the high water mark,” said the senior Naval representative.

“Nonsense,” said the senior Sapper. “It is a beach mine above the high water mark and therefore is a Sapper responsibility.”

“You are both wrong,” said the RAOC man. “It is an unexploded shell above high water mark and therefore is an RAOC responsibility.”

“Sorry chaps. You are all wrong,” piped up the RAF man. “It is a UK flare from an aircraft and so is an RAF responsibility.”

They argued for several minutes each one claiming the right for his arm to deal with the unexploded item. Finally in a fit of pique, the Navy man reached down, picked up the item and threw it with all his might down the beach.

“There,” he said. “There can now be no doubt it is below the high water mark and therefore is a Naval responsibility!”

Now put together a scratch force to liberate the Falklands, put them onto a load of boats and head them off to the South Atlantic. Initially only send some of the EOD arms, mix them all up and then send an enemy air force at them. Just to mess things up even more, make the enemy use UK originated large iron bombs and fuses. Can you see where I am headed? With these rigidly fought over lines of responsibility all the poor bloody infantry of EOD, the actual poor Joes who had to risk their lives, only received adequate training and equipment on those areas which were designated as their responsibility. We therefore had the situation of Sappers trying manfully to deal with unexploded Argentine 1,000lb GP bombs that were really UK origin 1,000lb GP bombs on board Naval vessels. They were therefore not trained and equipped because the bombs they were dealing with were not foreign but British, and they were operating in the alien environment of a ship.

My boss Peter wrote a note after the war saying that basically this rigid demarcation was wrong and that there should be a joint responsibility for EOD with everybody trained to deal with everything, but he was universally shat upon by all four EOD arms and nothing changed.

The other way of dealing with the unexploded Argentine bombs was illustrated by the naval EOD contingent, who were operating in their proper environment. I heard that one senior Chief Petty Officer used to play the violin to compose himself before going on to a ship to deal with an unexploded bomb lodged in its guts. He would sort the fuze then two or three strapping stokers would manoeuvre the bomb up on deck and then “apply the flotation test”. This was basically throwing it over the side and seeing if it floated. Few did.

The war was over and there was the need for a considerable clear up operation. The Argentines had scattered a considerable number of mines over the island and getting rid of these was a major problem. Actually getting rid of them, the EOD, was not a problem. But finding the damn things was. They were made of plastic and most had only one or two very small metallic components. They were the devil to find particularly amongst sand or the tussock grass that grew over much of the Falklands.

Tony, the exploitation man in the organization, had done a major job on each of the plastic mines found. When there was a request for technical assistance after the war, he was an obvious man to send. There were also other more general EOD problems extant so I agreed to send Terry with his Conventional EOD experience.

The journey to the south Atlantic was an arduous one at the best of times. First came the flight to Ascension Island by VC10. The two scientists were then loaded onto a Hercules transport aircraft and they set off on the 13 hour journey south. At that time the only airfield on the Falklands that would take the Hercules was at Stanley: unfortunately if the wind changed more than a few degrees off the two directions of the main runway, then the aircraft could not land. To reach the Falklands the Hercules had to be refuelled twice. The first occasion was by another Hercules which was not too bad a job as both aircraft were similar and could formate relatively easily. The second refuelling was by Victor tanker. This flew faster than the Hercules and the only way they could formate was for the Victor to throttle back and the Hercules to dive rather rapidly towards the sea. This also meant that the Hercules had to sit in the maelstrom of slipstream of the Victor bouncing violently. Terry and Tony got to within an hour of Stanley when the wind changed. They therefore had to return all the way to Ascension, rendezvousing with another Victor and another Hercules before they finally arrived back after 24 hours in the air. They fell out of the aircraft and almost immediately collapsed into sleep. An hour later they were shaken awake and put on another Hercules heading south. The wind had changed yet again! This time they did get in after 13 hours in the air: so much for the idea that Civil Servants spend their time drinking tea and shuffling paper. They had an interesting visit and assisted the gentlemen clearing up but that was a long and complicated job that took several years to complete.

Chapter 20

One of the benefits of my trip to spend time with SCIAD was an increased closeness with the two elements of the RAOC which were most important to us: 321 EOD Company in Northern Ireland (the operational souls who used most of our kit in action) and the Army School of Ammunition who trained the troops before they went to Ireland. The latter came about particularly at this point as the Major in charge of 321 when I was at Headquarters became the Major in charge of the EOD training wing at the School after his tour. David was a lovely man with whom I got on extremely well. I can remember that he survived his nine month tour without a scratch, came back to Headquarters NI for a final wing ding that I also had an invitation to attend and, late in the evening and just possibly alcoholically assisted, he inadvertently walked through a plate glass window in the mess. His successor had to sober up very rapidly to get him down to the hospital to be sewn up! His wife gave him hell.

I had put to David that I would value the opportunity to lecture to the Pre-Ops course and try to put over to them how and why their kit worked. Understanding the fundamental principles would hopefully provide them with a better understanding of the capabilities and limitations of their kit and stop them trying to make it do things that it was never designed to do. He accepted this with alacrity and it became an important part of my life to lecture to the Pre-Ops boys before they went to Ireland. From my side of the rostrum they were always a sea of eager young faces but it also served to introduce the fact that there were scientists there to back them up and we were more than happy and willing to do so. But we needed to be tasked. This lecture also got my name into the minds of some of the lads with consequences that will be apparent as this tale unfolds.

I was always keen to foster the closest relationships between my team of scientists and the operational users. I found that it provided us with the very best information on which to base our designs, and incidentally provided the ultimate in motivation as my boys identified with their users very closely as they knew them individually. You get rather attached to people whose lives depend on how well you have done your job to provide them with kit. Getting my troops into battle dress

and out with the users in Ireland and on exercise in the UK was always a very sound investment. It also got rid of the barriers to the flow of information that could all too easily get between us and the people who used our equipment. Time after time we would discover some vital piece of information from one of the lads in the front line that allowed us to modify and improve our kit. This had to be approved and passed into the Army's proper procurement cycle but very little can happen if you do not know there is a problem. Too often the Gentlemen of 321 would make do and improvise when a simple request or comment that something was not working as well as it should would have brought improvement.

Every three months or so I would travel to Ireland to see how things were going. This resulted in some memorable experiences too. Generally I would visit one of the sections in a town or city and one in the countryside as the types of task that they did were often very different. On one occasion I accompanied my boss Peter. With our normal military escorts, we were travelling down the Lower Falls Road in a Humber Armoured Pig battened down with Peter sitting in the front and me at the rear. Two thirds of the way down that rather hostile road and while we were travelling at nearly 30 mph, a small boy of about eight shied a sizable stone through the lifted front visors narrowly missing my boss's head. A wonderful piece of marksmanship from one so young but somewhat lost on my boss! Fortunately he was wearing a bone dome and visor but he kept that stone mounted on a little wooden plaque on his desk for years

On another occasion Major Mike, who has been mentioned earlier in this account, was the resident CO of 321. When I turned up to see him and suggested the usual town and country visit he announced that we were going to drive to Bessbrook Mill. Now Bessbrook was their base in southern Armagh and was well and truly in bandit country. On every previous visit the only way to visit Bessbrook was by helicopter so my eyebrows were raised about the prospect of going in by road.

"How long have you been driving to Bessbrook?" I enquired.

"Well, we went last week and it was all right," he said.

I was not entirely convinced. We headed south in an unmarked car and finally turned off the main road and headed down the winding lane that only went to Bessbrook village and the converted mill that was a heavily defended Security Force base. All along one side of the route in was a dry stone wall and I could imagine that coming at us rather rapidly all the way down to the fortified gateway. We waited in a rather exposed position while our credentials were checked and the gates opened and we were in.

As we wandered around the mill I noticed small internal walls running through the corridors. When I enquired about these on a previous visit I was told that they were designed as protection if mortars came in as the structure was somewhat flimsy. If you heard a bang then it was wise to throw yourself down alongside one of these small walls to get some protection from flying shrapnel. Encouraging.

We completed our business and it was time to go.

"Mike. You have proved the point and got us in here by car. However, surely anyone who has seen us come in down the only road there is knows that we have to come out by the same way?" I enquired.

"Thought of that," said Mike.

Once the gates were thrown open, Mike's driver gunned the engine and we shot out.

“Turn left,” said Mike. The driver did and then Mike followed up with a series of sharp orders to turn to the left or right. We had gone away from the normal route in and were headed to the village and the border. However we turned before we reached that politically sensitive line and soon were bumping along what appeared to be a farm track.

“All right.” I said after some ten minutes or so of this sort of journey. “I give in. Where the hell are we?”

“I don’t know,” said Mike. “And if I don’t know where we are, then they don’t know where we are either!”

There was some strange logic attached to this view and finally we did bump out onto a road his driver and he recognised and we made it back safely.

On another occasion, and it was again with Mike and his driver, we were headed back from Londonderry towards evening time. We were moving along rather fast through the Sperrin Mountains, a wild and somewhat untamed area. It was also potentially rather a hostile area. Again we were in an unmarked car and were all in civilian clothes. I was naturally sitting in the back with Mike in the front passenger seat and his normal driver strangely enough driving. We breasted a rise and then began a high speed descent to a bridge across a small river that acted as a natural bottleneck. Which fact someone else had realised as there was a car half blocking the road and someone standing waving a torch back and forth in front of it.

Problem. If it was a Police Vehicle Check Point (VCP) then there was really no problem as we had identification. But occasionally the opposition set up illegal VCPs and they might not be so friendly when they found who they had in their net.

Mike’s driver slowed the car gradually and we could see through the gathering gloom that the figure in front with the torch was wearing a raincoat against the mizzling rain but was not wearing a peaked cap, which he should have been if he was a policeman. The car blocking the road did not bear any signs of being an RUC vehicle and there was a man on the other side of it and he seemed to have an M1 carbine trained at us. Fair enough the RUC used M1s. But so did PIRA. Nothing was said from the front seat but Mike shifted slightly.

We stopped and the man with the torch came around to the side of the car carefully keeping out of the line of fire of his colleague.

Mike wound down the window and announced.

“Good evening officer.” Mike had spotted the green trousers of the RUC under the raincoat. He then showed his military ID.

“By the way,” said Mike. “In future, wear your hat.” Mike lifted the newspaper on his lap to reveal his pistol pointing up at the policeman. If the VCP had been unfriendly then Mike would have shot the man at the window then attempted to take out the guy with the M1 through the windscreen while his driver hit the gas and we tried to get away. There had most definitely been the potential for what is known in military circles as “blue on blue” or the potential for casualties from your own side. And all because of the lack of a hat.

Another interesting visit to the Province occurred because the opposition started to make their own detonators. For reasons that are hopefully not obvious, this could potentially have caused us grief and I was very interested to know more of the characteristics of these new additions to the EOD problem. Making the initiatory composition to go into detonators is an easy business chemically but

one fraught with danger. Initiators are notoriously sensitive and get any element wrong in the chemistry and the whole mix is likely to blow up on you, which can be less than amusing and terminal. PIRA explosive scientists were making home made mercury fulminate and packing it in 15 mm copper piping from plumbing shops. Their PIRA Mk 1 detonators were therefore about 15cm long and 15 mm in diameter. You can get an awful lot of mercury fulminate in a tube that long.

Some idea of the potential hazard that could arise from one of these was illustrated by the fate of one of the forensic scientists at the Northern Ireland Forensic Science Laboratory (NIFSL), in the one of the suburbs of Belfast. A PIRA Mk 1 detonator was found as part of an explosive device that was neutralised by Pigstick. Initially it was separated from the device, placed in an ammunition box and passed to the relevant Scenes of Crime officer in the RUC. From him it was passed down the carefully controlled forensic trail to end up at NIFSL. Some weeks later, it was lifted from the ammunition box in which it was contained and it went bang taking off most of the hand of the forensic scientist.

I needed to know some information about the functioning characteristics of these detonators. My problem was that with the background of the above, there was no way that they could be sent across the water to us at our establishment. Therefore we would have to go and do our experiments in the Province. I recruited one of the young scientists that still had some knowledge of detonators despite the Government's determination that we no longer needed such people. Steve was happy to accompany me to do the necessary tests. It seemed likely that we would need to get rather close to these monster improvised detonators so I took a major interest in the protective capabilities of the EOD Bomb Suit.

The Bomb Suit was researched by our colleagues at Colchester and consisted of a heavy protective suit based upon Kevlar, a form of ballistic nylon, used in bullet proof waistcoats. It also had a very heavy protective helmet and visor that was more than 20 mm thick. None of this helped you in the slightest if the bomb decided to blow up as you were over the top of it but it did provide protection on the way in and out. Bombs were like omnipotent rulers and were approached and retreated from without turning your back as most of the protection was in the front of the bomb suit.

My concern was chiefly with my hands. The bomb suit did have heavy Kevlar gloves but a simple test showed that these did nothing to save the hand if the PIRA Mk 1 decided to blow. What the hell, we would just have to be careful.

We arrived in the Province to find that the accumulated wealth of the recovered PIRA Mk 1s was in a place called Grand Central in the middle of Belfast. Grand Central had once been a major hotel but had been partially bombed out and was now one of the Security Force bases in the middle of the city. Steve and I were accompanied by Nelson, the latest in a long line of RAOC Majors that were attached to our Section to act as liaison officers on occasions like this. Nelson was another rather fine chap built on what is generally described as generous lines: sort of brick outhouse dimensions. We found the detonators we had come to assess in the basement of Grand Central. They were in an ammunition box sitting in a puddle on the floor so were in obviously pristine condition.

We needed somewhere to fire the detonators to get the data we required and strangely enough I was loath to travel too far with them. We were therefore told that we could use the roof of Grand Central for our experiments. 321 had provided us with their Senior Warrant Officer to help and fortunately for us it was he who would do most of the handling of the detonators. He showed us the sandbag enclosure that he had prepared on the flat roof of the old hotel. The view was rather fine as I looked

around at the surrounding hills. One or two high rise buildings towered directly over us on our roof top.

“What is that?” I enquired, pointing at a nearby tower block.

“Divis Flats,” came the reply.

Oh great. One of PIRA’s strongholds and it was overlooking the area where we would be conducting our experiments. What the hell!

We set up our equipment and our tame Warrant Officer pulled on the upper section of the Bomb Suit. Nelson decided that he would guard the one set of access stairs to the roof as we did not wish to be disturbed. Grand Central was also an accommodation block for off-duty soldiers who were patrolling the city centre at that time.

“Bang” went the first of the detonators with a resounding crack that seemed to echo off the hills. We looked at the data and decided that we had the set up about right. The Warrant Officer acquired the next detonator for testing and we continued. After the second bang there seemed to be some voices off at the bottom of the stairs. The voices started very angrily and then were answered by the measured tones of Nelson. Whimpering seemed to follow.

“Is there a problem, Nelson?” I called down the stair well.

“No problem,” said Nelson. “Continue.”

Apparently no one had told the poor souls trying to get some rest that we would be operating on their roof and creating a fair representation of a PIRA attack. One poor unfortunate squaddie had woken up, gone storming up the stairs to investigate only to meet the considerable bulk of Nelson, a full bloodied Major, blocking his way. Hence the whimpering at the end of the conversation.

We got our data and everyone went away from the experiment with all the fingers and thumbs that they started with which was a considerable bonus.

Very soon afterwards the PIRA Mk1 detonators disappeared from the scene for a good while and we did not know why. Many years later I heard that the manufacturer, a gentleman in the south, had been found one day in his laboratory with half his head blown away. A batch of mercury fulminate had obviously been more temperamental than normal. There is an old proverbial expression called “hoist with your own petard.” A petard was a crude explosive device and hoist is a reasonable description for blown up. Somehow I did not shed any tears over the passing of the gentleman.

Another interesting instance occurred one day as I sat in my office at our establishment. The telephone rang.

“Hello, this is Staff Sergeant X. I have been tasked to a Police Station near Lincoln. I was told that some schoolboy had been making nitroglycerine and that his mother had brought it to the police station when she found it in his bedroom. Well, I have just got here and there are two quarts of it. Any ideas how I get rid of it?”

Jesus Christ! Two quarts of home made nitro. Keeping my voice as calm as possible, I advised the young Staff Sergeant to wait until I had consulted with some colleagues. I obtained the telephone number of the police station from him and suggested that he should not do anything until I had rung back.

Now strangely enough there is not an immediate textbook solution to a problem like this. The young man obviously did not know a safe way of dealing with that amount of unstable home made

nitroglycerine so had turned to me having seen me at the Army School of Ammunition. My first port of call was the Establishment Safety Officer on the basis that he must have encountered something similar in his past.

“My God. Don’t tell him anything. If it all goes horribly wrong, we will be held liable,” was his helpful reply.

That did not seem very satisfactory to me. If a Staff Sergeant in his mid twenties could not turn to our establishment when faced with a problem like this then I considered we should just shut the gates and go home.

I devised a plan and checked it with two or three colleagues whose opinion I trusted. They agreed the approach and I rang back to the Police Station in Lincolnshire.

“Right Staff. Got a pencil and paper? Shopping list for you. First go and acquire a plastic washing up bowl. Got that? Right, then you need to buy at least two rolls of cotton wool, the large rolls that are about a foot long. OK? You will also need some lengths of cotton rag and some methylated spirits. Read all that back.”

He did so.

“OK. What you are going to do is to unravel all the cotton wool and lay it in the bottom of the plastic washing up bowl. Then very, very carefully with the absolute minimum drop, decant the nitro onto the cotton wool making sure that it soaks in nicely. Then carry the washing up bowl out into the yard very carefully and place it as far away from any buildings as possible. Once it is on the ground, soak the length of cotton rags in methylated spirits and lay that as a fuze gently on top of the nitro soaked cotton wool. Then, with everyone else a long way away, light the end of the meths soaked cotton rags and retire immediately if not quicker. Read all that back.”

Again he did so.

“Good luck,” and I put the phone down. I did not hear anything more that afternoon and it was with some temerity that I switched on the six o’clock news when I got home to try to discover if there had been an enormous explosion in a police station in Lincolnshire. There was no such news item. I never heard again from the young Staff Sergeant and why should I have? He had had a problem that he had referred to the technical authority at our establishment. The solution did solve the problem and the nitro all burnt away gently without explosion. What we were there for. End of message.

Chapter 21

Time to revisit the work we were doing to provide a capability to neutralise an Improvised Nuclear Device. We set out to refine the work we did on the hillside in Northumberland and to build a whole new capability to give ourselves a chance of dealing with the other main type of IND, an implosion device.

Basically there are four different types of IND that we might encounter. The first and most likely was a hoax. If that was the case then our colleagues in Diagnostics would tell us that the device with which we were threatened would never function as a nuclear device and it would then be treated as a common or garden hoax Improvised Explosive Device.

The second variety was something called a Radiation Dispersal Device. One of those was threatened recently in the US and basically it is an Improvised Explosive Device associated with a package of radioactive material. It would not produce nuclear yield but it would take an awful lot of

clearing up if it actuated in its design manner and would undoubtedly create all sorts of panic and alarm from the dispersal of radioactive material. As I intimated earlier, this would be a high profile IED with some mechanism to prevent the dispersal of the radioactive material added as a precaution (Good old foam!)

The next type, and I am dealing with them in increasing order of difficulty as far as we were concerned, was the gun gadget. As I mentioned earlier, these tended to be associated with some sort of heavy metal confinement and to contain two or more sub-critical lumps of Special Nuclear Material (usually Uranium 235) that were brought together at the moment of functioning. As had been demonstrated at Otterburn, we had some ideas about attacking these and that capability was to be refined and added to.

Finally came the most technically challenging type of IND, the implosion device. This was the type that was so complicated that the US scientists in the Manhattan Project had had to test it first in the deserts of New Mexico before the first one was dropped on Nagasaki. I am not letting out any secrets when I say that it consisted of a very large lump of explosive in a spherical configuration, which caused a sub-critical mass of plutonium to collapse in on itself. To do this symmetrically required a very fine degree of control. I will leave it at that but, for various technical reasons, interfering with the functioning of an implosion IND was fraught with difficulties.

Alan, one of my scientists, had some ideas, which were developed from some work done for us some years earlier by an outside contractor. Basically this outside contractor had written in to the Ministry of Defence with some ideas that he had for making bombs, ordinary bombs, safe. For reasons various it was considered that he should be kept at arms length and he conducted all of his research at a commercial explosive testing facility, reporting in writing his observations and experiments. His claims for this work were remarkable and it was down to Alan to check whether his claims were accurate. They were not by an order of magnitude. But they did contain the germ of an idea that was worth pursuing. We will come back to this gentleman later as his career and mine have touched on several occasions.

Our nascent ideas needed time for us to produce the experimental data on which to base an operational capability. It was clear from the start that dealing with an IND of practically any variety would never be the matter of routine that dealing with IEDs had become. Because of the technical difficulties, dealing with every IND would effectively be an experiment in itself. We would have to gather the information from the device, make the best judgement that we could with the available information that we had, compare that with the best options from our experiments. It would obviously be a time dependent operation and the consequences of failure would be rather dramatic. As we were the folk doing the experiments day by day, we were also the folk who had to conduct the experiment of actually neutralising or to use the term I introduced earlier “disable” the IND.

There were about eight or nine of us scientists in the Disablement team. About half came from my organization and the remainder from scientists who worked with explosives from Aldermaston and Foulness, Aldermaston’s then range facility on the Essex marshes. As I had mentioned earlier, there had been a good deal of rivalry between these subsets and it would be a major achievement to get some sort of harmony from the team based upon their origins. As the Team Leader, it was my job to make sure we did work in harmony. One of the things I had going for me was that we all appreciated the importance of what we were trying to do. Very early on it became clear that we would probably have to work close up to the suspect device and well within its lethal radius. Strangely enough that did not worry me too much and I know it did not worry my colleagues: they would have voted with their feet if it did. It is debatable whether it is worse to work close to a live

hand grenade that can kill you or an IND capable of producing several thousand tonnes of yield. At the end, if you made a mistake, it all came to the same.

One of the things the above did prompt was for me to review my life insurance: I did not want to leave Rosemary with a young family if I disappeared in a puff of radioactive smoke. It is interesting to consider that in the UK we were responsible for paying for our own cover, which, reluctantly the Government undertook to underwrite as it was quite likely that our insurance companies would renege on the policy if they found out what we had been doing. I had discussed with the dear old Prudential cover when I occasionally went to Ireland and had a written undertaking from them that I was still covered for that sort of activity. However, I was not allowed to tell them I took nukes apart as a hobby. Every member of the US team who did a similar job to us was automatically given life cover of \$1 million with no premiums to pay: slight difference.

The Aldermaston controllers of the whole IND counter force needed to check that our capability was real and the only way that they could do that was to exercise it. My budding Disablement Team would therefore appear at a number of locations around the country and go through a sort of play the script of which would unfold as we gathered information. On the larger exercises, we would devise our disablement scheme from the available information and it would be played out to the final resolution, the scheme would be implemented and we would know from the post exercise wash up whether or not we had been successful.

From the earliest exercises, some of the Disablement team came from the RAOC and were serving bomb disposal men. This provided many strengths as these gentlemen had faced danger before and the people we dealt with were the crème de la crème, the officers and senior Warrant Officers of 11 Ordnance Battalion, the UK based EOD organization. But it also introduced another load upon the Scientific Disablement team as any military man does not stay in his job for anything more than 2 years maximum. Therefore we, the scientists, had to train them in a constantly updating specialist field, and then exercise our joint capability when we went to war so to speak.

By this time we had all jumped through the hoops of getting security clearances as strangely enough knowing how to deal with an IND meant that you had to have sufficient information to make one of the damn things. The powers that be rather wanted to know the background and stability of anyone in that sort of position of power. Fortunately as we gathered more information it became apparent that making such a device that would produce yield would be no mean feat and would probably be beyond any individual. That would not stop some state-sponsored terrorist having a serious go though.

Our first exercises were mainly paper ones and then we graduated to some real mock up devices. Strangely enough there was never any coming together of explosives and special nuclear material in an exercise. We would have two devices, one with the nuclear bit in for diagnostic purposes and one where that bit was replaced with inert and the explosive bits reinstalled. However, fairly quickly, i.e. in the first year we did go through the complete exercise against a live armed simulated IND and much to our own surprise as much as anyone else's we were successful in making it safe.

Exercises were somewhat surreal as the mere act of putting ourselves into the position of a team trying to make an Improvised Nuclear Device safe, even an exercise one, made the adrenaline flow. The exercises were also real time and would go on for several days so they were exhausting as well as exciting. They also showed that we and the other exercise staff were human as they would throw up tensions and personality problems all of which would happen for real anyway. They were also a real intellectual challenge as getting into the mind of the man who had made the IND, even if he was a fellow scientist, was as important as trying to understand the information with which we were

provided from diagnostics and assessment. There were some remarkable people in that whole team and although we played it for laughs on occasions to ease the tensions, there was an underlying sense of the importance of what we were trying to do.

Our and the military role in tackling an IND was what was called Military Aid to the Civil Power or MACP: this was the manner that the RAOC did bomb disposal in Ireland and the mainland UK anyway. What it meant was that the whole operation was controlled by the Home Office and ultimately a real event would be locally commanded by a senior policeman but we would get our political direction from the Cabinet Office Briefing Room, COBRA, the Government's means of dealing with emergencies. Fairly soon a truth occurred to me as we introduced the Police element into the organization. **For nearly every conceivable instance that an IND might occur there would be no intention of telling the civilian population that we were working on an IND in their midst.** Fair enough a police cordon would provide us with space to work around the device but no one would announce that some lunatic had made a nuclear bomb and had it in the middle of London for example. The panic would undoubtedly kill a large number of people and at a stage that we would probably not be certain that the device would actually produce yield. Such an announcement would also produce so much chaos that the team trying to make it safe would be impeded in their efforts. So as Disablement Team Leader, the person ultimately responsible for putting forward the plan to neutralise the device, I found myself with the responsibility not just for my team but for all the people around the device while we attempted to make it safe. If we failed there was the possibility of an awful lot of people being killed.

This was brought home to me forcibly on one particular exercise at Lippits Hill in Essex. It was one of the first times that we had a police commander and eventually, after about three days of exercise, I announced to him that we had our disablement scheme in place and were about to leave the device and pull back five kilometres to implement it, notionally leaving the civilian population outside the cordon but still very much at risk.

"Permission to leave the location denied," came back the instruction from the police commander.

"We just left," was my response.

The silly man had not realised that we were the only resource available for this sort of thing. Admittedly there was some argument that we should put our money where our mouth was and why should we be privileged when the general population were not? But I would suggest that knowing that an event could happen and not knowing was a good deal different. There was also the chance that this particular IND was one of a string and, however flawed our capability might be, we were the best (and only team) there was in the country and should be available to tackle another if it should turn up. There was also the chance that our scheme could have been partially successful and there would need to be some sort of follow up operation almost as soon as we had implemented the first scheme. Anyway, martial law or no martial law, no policeman was going to tell me that I could not evacuate my team when I thought they should go.

I lay awake at nights wondering how to cope with the responsibility for a million lives and finally came to a rationalisation of my position. It went something like this. For reasons various, my training, my background and my knowledge, someone thinks I have what it takes to do this job. There are a lot of unknowns and there are definitely some types of device that may well be too technically difficult for us, or anyone to deal with. But we are willing to try and make the devices safe and we will do the very best we can to do so. Frankly no one has the right to ask us to do more than that. If we try and fail then it is unlikely that anyone else would have done any better. You

need a form of technical arrogance to put yourself forward to do such a job. It was a technical challenge with high stakes but we thought we could do it.

On another occasion, in fact the exercise involving the policeman with whom I disagreed, we went through the exercise and derived our Disablement scheme on paper. That was exercise Betula, I think: they were all named after trees for some reason. When it was discussed in wash up, various souls in the audience seemed to think for some reason that our proposed scheme would not work as it sounded rather unlikely. It was a sod of a device with most of the vulnerable elements buried inside a mass of explosive. Some kind soul leaned over to me after I had just given a presentation on what we intended to do to make the device safe.

“Congratulations. You have just killed a million people.” Just what I needed to boost my self-confidence.

It took a long time to arrange but we eventually did implement our Disablement scheme against the device in all its glory. And we won hands down! So fish hooks to the gentleman who said I had killed a million people. When I quit as Disablement Team Leader after eleven years we had exercised against 35 devices. Out of that lot we had won as a team outright on 32 occasions with our scheme producing no nuclear and no explosive yield. On two occasions we prevented nuclear yield but there was explosive yield (foam containment could cope with that). Eventually the exercise organizers got fed up with our continued success and so fed us a device that was beyond our capabilities and we failed. But even our failure involved pulling the yield of a 4 kilotonne device down to 30 tonnes. I know which I would have preferred.

Chapter 22

Where shall we go from here? It is perhaps a time to recall another Michael story associated with our work for Improvised Explosive Device Disposal. Mike was working on a device for the disposal of IEDs in beer kegs that were carried to their target in vehicles. Its origins were interesting. We considered ourselves world leaders in our field, rather arrogantly. However, we did have the mixed blessing of one of the World's best terrorist organizations to compete against. Our feeling of superiority did not extend to failing to consider anyone else's EOD activities as being of interest. At that time the white colonists in Rhodesia were battling against their native population in a guerrilla war. It had come to our attention that their EOD men had derived a means of dealing with car bombs, which seemed to work. This system was called Full Cap and was based upon the unlikely coming together of a Volkswagen hubcap backed with a coil of detonating cord with a bag of water in front of it. The idea of a Rhodesian EOD man travelling around the capital of the then Rhodesia, Bulawayo, stealing hubcaps to implement his schemes rather appealed!

After the Rhodesian internal war was over, we acted as hosts to a delegation from the new Zimbabwean EOD community. They were a rather mixed bunch made up from one gentleman from the old White dominated EOD community surrounded by several of his new ex-Guerrilla friends. While everyone was happily being entertained, we rapidly copied the slides of the Zimbabwean presentation for later evaluation.

We then reproduced the Rhodesian device to the best of our ability and were disappointed. The effect was not as we would have wished and would certainly not deal with the level of sophistication with which we were then concerned. Mike set out on one of his voyages of exploration and very rapidly came up with something better. Its code name was Paw-Paw. I do not know how these code names are derived. Facetiously at one stage as we considered whether or not

we could use the Rhodesian work as a foundation I said that it came about by having two containers for water, back and front of our driving charge. When the explosive was in place it was a case of filling the containers. This was done in two processes. Pour. Pour. All right, I will go and bury my head.

I will not describe Michael's device but let me say that it worked extremely well and was developed with his usual attention to detail. At one stage, concerned that firing the device almost inevitably meant coming straight through the fuel tank of the vehicle, he was worried that so doing would initiate a tremendous fire. So Michael fired against vehicles with full fuel tanks, part empty fuel tanks, completely empty fuel tanks. He also fired against vehicles that he filled with petrol internally. He even managed to fire against vehicles where petrol was spread all over the road and, I gather, himself. It was typical of the man that he did consider every practical angle and he produced a piece of kit that would work.

By now, as you might have gathered, we were also concerned that Wheelbarrow would actually be capable of delivering our EOD kit. Technically, Chertsey should have had responsibility for deploying Paw Paw. However, Lofty and chums were given the chance of so doing and provided an absolute abortion as the means of deploying the device. Michael, at my instigation, provided a better solution. This was a time when the Mk 8 was still under development and Mike's solution very sensibly used a component used in Mk 8 to deploy Paw Paw.

One bright morning, Michael came into my office with a problem.

"Pete. You know that we have given an undertaking to deliver Paw Paw to the User in the New Year. Well, I have encountered a snag which compromises that timescale."

"OK. I'll buy it. What's the problem?"

"The American supplier of the actuator I am using to deploy Paw Paw is making a major design change. I got wind of it yesterday and I need to go to the US to discuss what they are intending to do and how it will affect the deployment system."

This was about two weeks before Christmas. Now the idea of Michael tramping around in the US did not fill me with happiness. You will have gathered that his activities bordered upon genius but his unconventionality occasionally provided problems.

"Are you sure they will talk to you and provide the information you require?"

"Yes. I have their assurances that they are happy to provide the information. I need to go to their plant in Beloit, Illinois the day after tomorrow."

"My God. You are pushing it a bit. How are we going to get authority for you to travel that quickly? Have you got a visa?"

"Oh, I haven't got a passport," came Mike's relaxed reply.

Strangely enough, it was often such mundane problems as getting my staff authority to travel half way around the world within 48 hours when they had no passport, visa, tickets or money that kept me suitably occupied. By moving the usual heaven and earth, Michael was provided with the necessary in a day: new passport, valid visa, sheaf of air tickets and sufficient ready cash to accomplish his mission. I had stipulated very early on one particular point: I wanted to see a signal confirming that the firm would actually provide him with the information we needed if he turned up on their door step. That Michael had acquired.

Now the idea of Michael inflicted on one of our closest allies did not fill me with enthusiasm: we did not need World War III with the US if it could be avoided. I therefore plotted with our man at the Embassy in Washington to minimize Michael's impact on the American scene. Mike was to fly to Washington on the usual RAF VC10 flight out of Brize Norton. I then had arranged for him to be transported to Chicago by civil airliner and then by another commuter airline to Beloit. From there he could taxi to his hotel and to the firm. At no time would Mike be unleashed upon the unsuspecting US public in a vehicle that he personally guided. Fine. I provided Mike with a distillation of my experiences of travelling in the US to aid his mission and retired to a darkened room and cold compress to recover.

Mike continued with his preparations late into the night and discovered, very late on in the proceedings, that the factory in which the US firm were producing the actuator was not at Beloit as first determined, it was at another plant about seventy miles out of Chicago. The Beloit plant was their design department but Mike really needed to see the nuts and bolts folk who were at the different factory. Mike rang our man in Washington, who because of the time difference was still at his office. All hire cars had to be authorised at that time by the Embassy staff so Mike got authority for the change in arrangements and a car to take him from Chicago to the new factory location. Oh dear.

Mike got to the factory on a very wintry December day. He got all the information he needed and was very pleased with the success of his mission. In fact he was so pleased, and being a generous and outward going soul, he wanted to say thank you to his US hosts. He therefore invited them to a celebratory session in a local restaurant located in one of those enormous shopping malls that the US love. The evening went well. In fact the evening went extremely well. Mike was the centre of attention and entertained his hosts well. His accent and general demeanour attracted the attention of others in the restaurant and it was a very merry and happy Michael that staggered out of the restaurant late in the evening. Problem. Where had he left the hire car to take him back to his motel?

Because of the late change in the arrangements, Mike had kept his motel at Beloit. He therefore was some 70 miles away from his bed and it was nearly midnight. Since entering the Mall restaurant area, it had snowed. Mike came out of the restaurant to find a winter wonderland that was totally unrecognisable as far as he was concerned. Where the hell was the car? And what the hell did it look like even without the covering of snow? He wandered around searching for his vehicle and eventually, almost by default, he located it. Several attempts with the key in lock later he was in. Good. Just a couple of hours journey along the Interstate and he would be in his bed with a job well done. He started the motor and switched on the heater. Everything was fine. A few deep breaths and he was off around the enormous car parking lot seeking a way onto the Interstate highway and his temporary hotel home.

The layout of the Mall car park was confusing to say the least. Michael drove around and around trying to find the entry onto the Interstate that he could all too plainly see running along one edge of the snow covered car park. Every attempt he made to get onto the dual carriageway ended in defeat. Round and around again. Where the hell was the way on?

Eventually he got fed up with his circuits and found himself faced with what he thought was an entry ramp onto the Interstate controlled with a red light. He sat for several minutes with the heater running waiting for the red light to change. Nothing. This was ridiculous. It was nearly one o'clock in the morning. There was very little traffic on the Interstate. He was a long way from home and his biological clock said that it was six o'clock in the morning and what the hell was he playing at as he had not been to sleep?

To hell with it. The red light was still red but Mike determined that there was no one about and he could see the road ahead. He gently edged past the red light and settled on the Interstate highway. Fine. An hour or so on the road and he would be in his nice warm bed and the job would have been done.

There were these blue flashing lights in his rear view mirror. Shit. Michael pulled into the side of the road and the following black and white pulled in behind him. Mike leapt out of the car and took a few deep breaths. The single officer in the police car beckoned him to come and sit in his car. Mike did so.

The US Highway Patrolman was already writing the ticket.

“Why are you trying to commit suicide?” drawled the policeman, continuing to write.

“Sorry. I don’t understand. I am trying to get back to my hotel. I am over here on business from England. Why do you say I am trying to commit suicide?” Mike wheedled.

“You are English? Do they have red lights in England?” said the officer, still writing.

“Yes we do. But they do change to green periodically which was more than the one I was faced with did,” said Michael.

“Well,” said the copper, “In the US we have permanent red signs to stop people driving the wrong way onto an Interstate highway. You were driving on the left along a dual carriageway towards oncoming traffic for which there is a statutory \$100 fine.”

“My God! Thank you,” said Michael.

“Thank you! For a \$100 fine?” said the policeman in shock.

“Thank you for saving my life,” said Michael. “I am over here for the first time in the US. I got confused with the Interstate junction and you stopped me before there was a terrible accident. \$100 is a small price to pay. Thank God you were around to prevent it”

The policeman was taken aback by Michael’s candour. He turned to him and sniffed.

“Have you been drinking?” he accused.

“Just a social glass or two with my US contacts,” said Michael a little from the truth.

The US policeman thought for a moment. He then ripped the ticket into shreds and, after enquiring Mike’s destination, told Mike to go back to his car and that he was to follow him. He then led the way across the central reservation and on to the other carriageway. Mike got a close police escort back to his hotel for the whole 70 miles and got away Scot free!

Mike had a restorative night’s sleep and awoke refreshed. All was well with the world. He was due to fly out of Chicago O’Hare at midday to get back to Washington Dulles International airport to find the RAF VC10 flight home. However, he had listened to my briefing of life in the fast lane in the US and one aspect had intrigued him.

“Full price air tickets are regarded as negotiable currency in the US. If you do not fancy travelling on your particular flight, speak to the airline and they will change it to a later or earlier time. In fact, you can use it on a competing airline which will be very happy to take the business from their rivals.”

Good, thought Michael. While I am in the US it seems a shame not to see something of the place. Pete says that the ticket can be changed. I will change it. But first I will see a bit of Chicago.

Mike drove into Chicago and inadvertently found himself in a hard black area. He found a suitable place to park his hire car and was happily locking it when he found himself almost instantly surrounded by half a dozen of the black brethren, menacing in black leather and bandanas.

“Good morning,” says Michael. “How can I help you?”

One of the young men pulled a large ghetto blaster from under his coat and offered to sell it to Michael for a small consideration.

Michael looked at the large piece of electrical apparatus, still surrounded by the local mafia.

“Well it is very tempting, I am sure. However, I think it will not go down too well with the British customs to arrive with this machine without adequate proof of ownership,” said Mike affably.

“You’re English,” said one of the young hoods. “I’ve never met an Englishman before. Could you speak some more English for us?”

So there, in the middle of the Chicago equivalent of Harlem, was dear Michael, conversing with a US street gang leaving them with handshakes all round and wishes that he have a nice day!

Mike bought some presents for his wife and kids and eventually, about three o’clock reported to the airline desk at Chicago O’Hare. The lady behind the computer took his ticket and said,

“I am sorry Sir. Your flight left at midday.”

“I know all about that stuff. Just put me on the next plane to Washington Dulles.”

The girl played with the computer and said.

“I see you are taking a plane out of Washington Dulles at 1900hrs. Unfortunately there are no flights out of Chicago O’Hare to Washington Dulles that will make that connection. If you are really quick I can get you to Washington National but you will have to run”

Mike had forgotten that there was a time zone difference between Washington and Chicago which was to his disadvantage when travelling East. His missing of the midday flight made it impossible to make the flight directly to Washington’s International airport that is some 30 miles out of town. Still, Washington National was at least Washington and he remembered from my briefing that there was a frequent bus service between the two airports. He dashed for the flight to National and caught the plane.

Mike arrived at National and sought the Washington Flyer, the bus service to the out of town airport at Dulles. I had told him that tickets could be purchased on the bus, which they could the last time I had passed through. Mike lodged his bag in the cavernous storage bay and tried to mount the bus.

“Where is your ticket?” said the officious driver.

“I have not got one. How much?” said Michael.

“Tickets can only be purchased at the Washington Flyer office but I am leaving now. Please remove your bag from the bus and catch the next one.”

“When is that?” asked Michael.

“In one hour’s time.”

Mike realised that there was no way possible with his late departure from Chicago that he was going to make the connection with the RAF flight if he waited an hour.

“Sorry. No can do. The luggage stays. At least that might make the flight,” said Mike.

There was then a considerable altercation with the driver demanding that Mike remove his bag and Michael resolutely refusing to do so. This was only resolved when the driver agreed that he would wait despite his schedule while Mike hot footed to the Washington Flyer office and acquired a ticket.

Mike looked at his watch and calculated the transit time to the airport. I had told him the distance and likely traffic delays and it was going to be tight. Mike hauled his bag out of the luggage hold and headed for the check in for the RAF flight with minutes to spare.

“I am sorry sir. By Federal law you are designated as the passenger for a total baggage search,” said the US employed security man.

Mike sighed and replied.

“I might have known. My flight is going in fifteen minutes. Can’t you waive the baggage search this time?”

“I am sorry sir. Federal law is Federal law.”

“Bloody hell. I haven’t even got my duty frees,” said Mike.

The security man’s demeanour changed instantly.

“What! No duty free. Here sir, you cut along to the shop and I will see your baggage onto the plane. Have a nice day!”

Mike caught the plane.

Chapter 23

As I mentioned in the last chapter, while still keeping a very personal interest in the technical achievements of my Section, increasingly it was the administration that occupied my time. This was frustrating but occasionally it was apparent that nothing technical could be achieved unless Jo Muggins was prepared to fight the system for it. A particular manifestation of this occurred about now. The creaking and archaic vote system, whereby separate pots of gold were set aside a year in advance for specific areas of work, was not exactly ideal for our sort of game where we were trying to react to the vagaries of a war fought by an opponent who was anything but predictable. However, for no apparent reason and with no notice, the whole Ministry of Defence Vote system suddenly ran out of money. Orders initially came down on high that all work that involved buying things and travelling expenses was to cease until further notice. Somehow that knocked out pretty well everything that we did in EOD. It knocked out pretty much everybody else’s activities too and that included the Army, Navy and Air Force so everything came to a grinding halt.

After a day or two while we all considered what kind of political lunacy allowed hundreds of thousands of Government Servants and military men to sit on their hands when there was a war going on, the upper echelons relented slightly. It was announced that a few, a very few special cases would be considered on a strictly priority based system. For anyone in our organization to get their hands on this limited pot of gold in our case would require the authority of the Director of RARDE himself. Now strangely enough a Section Leader could not write a case and send it straight to the Director. There was a proper chain of command for such things and, with everyone aware of the horrors of precedence, every level of command would have to be negotiated along the way. For me that meant my case for doing a job would have first to go to my

Superintendent, then to the Divisional Head, then to the Deputy Director and finally to the great man himself.

Undaunted by this and with the vague idea that an organization dedicated to solving EOD problems posed by the campaign in Northern Ireland should have some priority, I sat down and penned a case. This was to allow a team engaged upon an Operational Emergency task with X priority, the highest of the three levels of OE work that we did, to go about their business. I walked it through the system, sitting in outer offices and accompanying my written case to each of the gentlemen concerned. Each acknowledged that we needed to go and do the job, each initialled my case and I found myself in the office of the Director. He also agreed that we could do the business and so, with a morning gone, we finally had authority to proceed.

Right. That indicated to me at least that OE tasks with an X priority were likely to get authority for us to go back to work. Fine. I sorted another couple of cases with that level of priority and we had a proportion of the Section working again. However that did not tell me where the barrier to work was so I then selected an OE task with Y priority, wrote a heart rending account of why it was important to get this moving and walked that through the system. Up through the corridors of power and I achieved another success with authority granted by the Director to proceed.

Feeling that I was beginning to understand the rules of this new game, I then selected a Z priority OE task, not so startlingly important but still an Operational Emergency. I wrote a carefully worded case and set off on my travels again. Yet again I returned to the waiting and underemployed scientists and engineers with authority for them to proceed. Good. Everything we did for Northern Ireland was an OE and had X, Y or Z priority. We were back in business as far as that side of the Section was concerned. However that still left the Conventional EOD folk twiddling their thumbs. Over tea one day Ron commented almost in passing that it was a great shame we could not get authority to use the Army's training ranges as normally we had such low priority that we could only get onto them the week before Christmas or in the middle of winter generally when no one else wanted them. With the Moratorium extending to the Army as well as ourselves, they were all locked up in barracks so the Training ranges were completely empty.

Working on the principle that nothing ventured, nothing gained, I sat down after tea and penned a case to send the lads up to Otterburn for a month. I pointed out that this was an opportunity to advance our Conventional EOD research in a manner that would otherwise take three or four years to achieve. I acknowledged that it was not Operational Emergency and did not have any formal priority. But the current lack of cash all round meant that we could gain immensely if we moved fast. Frankly I expected a flea in my ear but each of the bosses listened and agreed with my reasoning. So back I came with authority to send a field crew to Otterburn for a month!

Having established that the only criteria seemed to be that if I could write a convincing case we could go about our business as normal, that set the pattern for the month to six weeks that the Moratorium was extant. I spent nearly all my time writing cases but the lads were busy and the work was getting done.

At the end of the first month I received a telephone call from the gentleman in charge of finance.

“Is that Mr Hubbard,” enquired the chief bean counter.

“Yes, it is,” I replied.

“Mr Hubbard. Would you please explain why your section is currently spending two thirds of the entire travel and subsistence/stores budget of the establishment?” he said with a veiled hint of menace in his voice.

“Certainly I can explain. It is because it would appear I am about the only Section Leader in this place who is not prepared just to sit on his hands for the duration of the Moratorium. All of that expenditure has been sanctioned by the Director. Good Morning.” I then put the phone down and I heard no more.

Another slightly smaller but nonetheless satisfying triumph came a few weeks later. Dear Michael came into my office with a sheaf of travel claims. I looked through these and noticed that they covered journeys over the previous six months. MOD regulations stated that any claims submitted over three months from the journey would not be accepted.

“Mike. They are going to throw these back at you. Why the hell have you waited this long to submit these?” I said.

“I have been a bit busy with Paw Paw. They are all kosher. I spent the entire morning getting the dates out of the official diary,” he replied.

“All right. I will sign. But do not be surprised if they bounce.” With a sigh, I signed the forms provided and despatched them.

Within a week I got the forms back with a covering letter from the people at Bath who handled our claims. Basically it pointed out that Para 0132 of the MOD Manual which covered Travel Regulations stated that any claims submitted outside of the three months limit were invalid.

I could have crowed, “I told you so,” but with another sigh I wrote a letter to Bath.

Dear Sir,

RETURN OF MR CLAIMS

When I received your note returning Mr X’s claims, I passed them on to him with a note stating that I was not at all surprised. I can fully understand your ire and para 0132 is quite clear on the time limit for claims. While I appreciate that there is no appeal as far as the strict interpretation of the regulations, and while I as his manager have reached my advanced state of baldness by perpetually tearing out my hair because Mr X’s apparent inability to fill in any form whatsoever, could I enter a plea of mitigation on his behalf?

First, I should state that whatever else are his faults, dishonesty is not one of them. The current RARDE system for the authorisation of travel before the trip ensures that the journeys are necessary and conducted in the most cost/effective manner. I am therefore satisfied that his claim is valid. I would not have signed it otherwise.

Secondly Mr X is a dedicated scientist working in the field of bomb disposal. He is totally absorbed by his task and has often exceeded the urgent operational requirements many times over by his application. When he has the bit between his teeth then nothing matters to him except solving the problem in hand. In the last few months he has been working on a new equipment. The prototype went from idea to concept in a matter of weeks. On demonstration to the User, it went from concept to “In Service” with all that entails in two weeks. The new equipment fills a capability gap ---a gap that contributed to the last operator fatality. This equipment is just one of many that Mr X has been involved with. In the past six months that equipment has, conservatively, saved Her Majesty’s

Government 4 to 5 million pounds in property compensation. Over the whole time that Mr X has been “in the business” the value is close to 400 million. As far as Mr X is concerned, I am sure he considers this part of the job, just as using the equipment in action to demonstrate how it works, which earned him an M.B.E., is just part of the job.

Could I ask that you look again at his claim? I appreciate that he is a pain. I often wonder whether disembowelment or hanging, drawing and quartering is a more suitable treatment for him. But he deserves special treatment. That is why I put up with him.”

I received a letter back from Bath. It took nearly a month but stated.

TRAVEL AND SUBSISTENCE CLAIM FOR MR X

1. It is comparatively rare to receive such an eloquent plea on behalf of a member of staff and your letter made a refreshing change from the more usual stuttering protestations.
2. Therefore, presented with this patch of purple prose, I feel it would be somewhat churlish to refuse payment for a first offence.
3. Thus Mr X should be advised that he is indebted to you for the reimbursement of his claims on this occasion but should this problem recur then the submission will have to be a contender for the Nobel Prize for Literature before it gains sway.

Mike got his money, some £600, which does not seem a lot now but was then particularly as all of it had come out of his pocket without advances. From the last sentence from the surprisingly human official at Bath you can see why I have such an inflated opinion of my writing abilities!

Chapter 24

Our Dutch air force chums had a range. Now strangely enough ranges are expensive and the only way that we could afford to get onto the large amounts of real estate necessary to conduct experiments on the disposal of large explosive objects was by such trickery and machinations that made our success rate about one in ten. The only force multiplier we had was that anyone in our NATO community that did, by some chance, get lucky would instantly flash out a signal to the rest of the EOD fraternity and we would all start stealing, borrowing or otherwise purloining ordnance on which to conduct the experiments.

This range was a little different. It was an island, Vlieland, off the Dutch coast in that string of islands named after cows called the Friesians (or is it the other way around?). A quick inspection showed that Vlieland had major advantages as far as we were concerned: it was flat, it was empty and nobody minded us blowing up things on it. In fact the local town seemed quite chuffed that we had all turned up and made quite a thing about it: speeches by the Mayor and even the town band. You could tell they had never had our bunch of reprobates there before.

The Dutch EOD guys had also excelled themselves by importing a delectable young lady singer with her backing band to entertain us. She was quite a dish and later represented Holland in the Eurovision Song Contest so that places her importance in the general scheme of things.

We quickly settled into a routine. Our particular patch of the range was quaintly termed the Cavalry Shooting range. Whether the Cavalry at one time shot there or someone shot the Cavalry there was

not quite clear. Anyway, we had three armoured vehicles in a semi-circle to protect the mixed array of punters who had managed to convince their respective bosses that taking part in the exercise was a cost effective way of conducting research into conventional ordnance disposal. The main reason that so many of our NATO chums had been successful was that it was a cost effective way of conducting conventional ordnance disposal research. Even a single large iron bomb is an expensive commodity. To find an effective means of getting rid of it quickly and with the minimum of collateral damage and still be around to enjoy the post event beer up was our joint aim. To have a large number of people whose lives depended upon finding effective means of quickly getting rid of it all gathered together in one place meant we had a lot of ideas available and could instantly modify techniques that were not quite right.

The next load of bombs and ordnance were being made ready on the sand about two hundred metres from our three armoured vehicles. The motley crew of NATO specialists were having an exercise break and were wandering around talking. A German Luftwaffe Tornado appeared above our heads and swung in a gentle arc to align itself on some distant target hulks of armoured vehicles many miles away across the flat expanse of sand: Vlieland was an aerial bombing range as well as host to our lovely selves. We watched as the jet dipped into a shallow dive and rockets slid noiselessly down lines of bright light to explode amongst the target hulks. Seconds later the noise of the attack reached us. Well done the Dutch: this was good: entertainment thrown in during the tea breaks.

Everyone turned to the direction of the targets and watched as the Tornado completed the circuit and again dipped into a shallow dive towards the target vehicles. This time there was a series of twinkling lights beneath the fuselage of the big jet and the sand around the vehicles danced under the impact of cannon shell delivered at high rate. Seconds later a sound of ripping silk came to us over the mile or so of flat sand.

The Tornado again went around the circuit and we waited to see what load of devastation was to be delivered on this occasion. However, instead of aligning himself on the target hulks way across the flat expanse of sand, he modified his circuit and aligned himself with our three vehicles. Oh yes, another wind up perpetrated as part of the strange sense of humour which keeps EOD men sane in an insane world. No one moved or twitched a muscle. The Tornado dipped into a shallow dive towards us. Very good, taking it right to the limit. We then saw the bomb leave the aircraft and head in our direction. Everyone suddenly decided that being inside the armoured vehicles was a better idea than standing around outside the armoured vehicles. Strangely enough thirty people all trying to get into three armoured vehicles at once does create something of a traffic jam and there were an awful lot of feet pushed into faces and swearing before we all got at least partially out of harm's way. I could hear the radio man frantically on the net attempting to inform the Luftwaffe pilot of his error and requesting, please, that he go away and play somewhere else. It was not quite as polite as that but you get the drift.

The whistle of the bomb, fortunately for us a practice bomb but still not a pleasant object to have thrown at you, got louder and louder and eventually went off shaking the vehicle in which we sat. Silence and we were still in one piece. The equivalent of the all clear was sounded and assurances received that the Luftwaffe man was terribly sorry and he would not do it again.

Thirty people descended from the cramped space of the armoured vehicles dusting themselves off and looking somewhat sheepish. I looked around and checked that all was well. The Luftwaffe man had missed us by a good margin. Out of the corner of my eye I saw Al, my Squadron Leader, red in the face and headed at high speed towards Manfred, the senior Luftwaffe bomb disposal man in the

party. I quickly moved into intercept mode as did several others in the party not wishing to see an ugly incident.

I arrived just as Al was grabbing Manfred by the lapels.

“This is the third fucking time that this has happened,” said Al with his face a fraction away from the startled Manfred.

“Zer third time?” said a bemused Manfred.

“1914/18, 1939/45,.....”

Everyone collapsed with laughter and we got on with the trial.

Chapter 25

We had a strange relationship with our NATO allies, in some ways a reflection of our current position in Europe. At most of our trials we had representatives from nearly all of the NATO community but the people who drove on the research and actually did something initially were the Brits, the Dutch and the Germans. The others picked our brains and came along for the ride but almost always there were reasons why they did not have a range, did not have any bombs, had resource problems, etc, etc. It did get better later and the Norwegians and the US played a bigger and bigger part, I hasten to add as they would be put out if I did not acknowledge it. Sometimes it was a single individual who realised what we were trying to do on a shoestring and decided to join in the game and I will mention one or two of them later as destiny seems to have thrown them again and again across my path. Initially though it was us, the Dutch and the Germans. This was interesting as our role on most occasions seemed to be stopping the Dutch and the Germans from killing one another, a certain natural enmity coming to the fore all too easily. Even one generation on from the war there were deep feelings lying scarcely dormant under the surface.

I remember one occasion when I visited our German friends. I had contributed to an otherwise exclusively German gathering in Cologne and inevitably the German EOD community represented by Hubert Heuer from the Luftwaffe and some of his colleagues, a German Korvetten Capitan from the German Navy with a square head and a micro-hair cut who only need to reverse his peaked cap and look through a periscope to appear in any one of a hundred U-boat films, and some souls from the German MOD were strolling from bar to bar in Cologne city. We had had a good meeting, we had started to understand what the hell was going on and I think there was a genuine sense that together we were greater than the sum of our parts.

At one point, after many beers, the Korvetten-Capitan asked me if I had ever been to Cologne before.

“No. I have never had that pleasure. But there is a family connection. My father visited Cologne several times.” I said innocently (who am I kidding?).

“Oh. When was this?” said my German chum.

“About 1941 actually. He was bombing the hell out of the place!”

I have always maintained that you can get away with anything if you have a smile on your face and that proved true as I am here to tell the tale. Who says the Germans have no sense of humour? Practically everybody is the traditional reply but it is not true. I sorely tested it that night.

At another occasion a little later, when we had reached the maudlin drunk stage, the same Korvetten Capitan leaned over the empty glasses littering the table and said confidentially,

“Peter, we get on well with you Brits and together we have done some good things. Why, however much we try, do we have problems with our other NATO allies?” he said swaying gently as I was, slightly out of sync.

In my normal diplomatic way I replied.

“Perhaps it is because we did not have the pleasure of your company in the last war?” Fighting is one thing, to be invaded and occupied is another.

I am not anti-German. I have a lot of respect for their ability, based upon observation in my own special sphere, to get on and do things and achieve results. But I did have a family history of having my father and mother fight them in the last war and my father was shot down and nearly killed when he was only 21. Leaves a few scars.

On another occasion, I was acting as host to a young Dutch Air Force Flight Lieutenant, Jan W. With him there was a true meeting of minds and we had a very pleasant evening strolling through my own home town of Tunbridge Wells. Again we had reached the state of the evening when alcohol had broken down all barriers and we were comparing roles. I was walking him back to his hotel across the common and we were discussing the role that the boss plays in any organization that spends its time taking apart unexploded ordnance. There is a punitive element in modern health and safety laws that takes no note of people in our position who have by definition to take risks, and also when you are responsible for other people, to take risks on their behalf. All is fine and everyone in the management tree applauds your progress and keeps quiet when all is well but heaven help you if something goes wrong and someone gets hurt.

The exact details escape me but we had reached some revelatory stage of our conversation. Suddenly a drunk (another drunk?) broke into our conversation out of the darkness in an almost surreal manner as we strolled through the night and indicated that the objective of our quest was reason enough to continue. I cannot explain it any other way but it felt as though there was some indication from a higher authority that we should continue no matter the consequences. But we were pissed at the time.

About a year later, Hubert and his team were conducting trials against sub-munitions. They had done the trials against unarmed sub-munitions and were about to try similar tests against armed ones. Three of them were walking down the range and Hubert’s assistant had three armed sub-munitions cradled in his arm. He tripped. He attempted to catch the sub-munition, which he had dropped before it hit the ground but compounded the felony by dropping the other two. He was killed and Hubert and the other man were wounded. EOD is a dangerous business and we should never forget it. Even EOD research can be a dangerous business, and there are a lot of clever bastards who are more than happy to take you to the cleaners when something like Hubert’s team’s accident occurred.

To lighten things up again, here is another allied story associated with our NATO trials. Our photographer, Roy, attended each of our endeavours and I should give him the credits as being present to record our experiments when Mike and I were attempting to kill one another in the early days. He was a truculent, bad tempered, (sorry Roy but it is true!) individualist who was also a perfectionist who always produced us photographs of the finest quality. He had not the slightest concern for authority and wore with pride his Home Guard patches from his old uniform on his trials gear. On one occasion Hubert introduced Roy to a German Luftwaffe General who had come

along to one of the EOD trials we were conducting. As something of a character, Roy was introduced to the General.

Roy indicated his Home Guard patches and announced blithely,

“I was ready for you lot in 1940!” Just the thing to promote NATO cooperation!

At the trial in Vlieland, Roy’s passion for bird watching had been brought home forcibly to our Dutch allies. It was the morning after a night’s entertainment, as each EOD contingent carried large quantities of alcoholic beverage to such events so you could wander along in the evenings when all the explosive was tidied away and drink Grolsch with the Dutch, Budweiser with the Yanks or Fullers London Pride from the keg with the British. A miniature Cook’s tour of the breweries! At the trial’s site, Roy was asked for an opinion on a strange bird cavorting in the field of view of the whole contingent. The Dutch had hit a pheasant on the way to the range and its interior had been removed and replaced with white noise. It was strung on a series of strings that had it cavorting exotically in our field of view.

“Mr Coles. Can you identify this bird?”

Roy focussed his binoculars and looked through a haze of last night’s beer fumes at the cavorting bird.

“Yes. It’s a cock pheasant. But I have never seen a courtship display like this before.” He replied.

At this point the wily Dutch touched off the considerable charge of plastic explosive packed into the pheasant. Roy went into orbit! The experience seemed to make him flip and he regressed to some incident on the Reperbahn in Hamburg that we will not go into further but everybody else fell about laughing. Rough games.

On one occasion it was our turn to play host and we had invited everyone to conduct experiments at Otterburn, the Northumbrian range we used for most of our big EOD trails. Greeting our friends was fun. In a typical case a large American truck would turn up. I would pull up the canvas and see about twenty Mk 82 500lb bombs stacked neatly. This was the American contingent’s entry ticket and, if the truth were told, most of them had been stolen to allow us to do our experiments.

“Hi, BZ. How are the wife and kids?” Pass friend.

Knowing our colleagues’ interests, the RAF EOD unit with whom we worked closely had made arrangements with Scottish and Newcastle Breweries to make a visit. This was a thinly disguised excuse to canter around the brewery and end up in the tasting area where the idea was to get as much down your throat in the time allowed. Knowing our chums, the firm’s profits would be in for a rough time.

We loaded everyone on to a coach and set off for Newcastle. The coach pulled up outside the brewery and Al, the RAF Squadron Leader, went in with Ron, one of my lieutenants. There was a considerable pause and finally Ron climbed back onto the coach with the most enormous grin on his face. There was a problem with the arrangements and Ron was enjoying the RAF EOD contingent’s discomfort.

“I have always wanted to be able to say this and now I can. The RAF EOD guys couldn’t organize a piss up in a brewery!”

Fortunately the brewery relented and our thirsty punters were allowed their visit.

The next story is domestic rather than international. On one of the trials when I sent my team up to Otterburn, I managed to wangle a visit in the middle to see how they were progressing. Dear Cliff did not want me to go and I had to threaten that I was not willing to sign my life away that they were competent to conduct the experiments if I did not have the right to attend for a proportion of the time to demonstrate to myself that they were. I also fronted for the team at presentations and overseas gatherings and needed first hand knowledge of the experiments that I was directing.

The trial had the team away from home for at least two weeks. The trials site was miles from anywhere and at this time Northumbria was a very depressed area indeed. So much so that out of season, our crew had negotiated with a very swish hotel out in the sticks for accommodation at very favourable rates. Our subsistence, the money the Government paid to support my bunch of reprobates for 24 hours away from home, was a fixed rate. But it was meant to cover visits to any part of the country and the area my crew was visiting was very downmarket. Hence they appeared to the local economy as very rich dudes indeed.

I turned up and spent the day with the lads out on the moors. Long hours carrying heavy loads, walking long distances back and forth across the heather and watching bangs various is quite exhausting to someone who at this time spent most of his life behind a desk. We returned to our luxury hotel and I enjoyed a good long soak in the bath and looked forward to a few beers. I got downstairs about six o'clock which seemed to me to be a suitable hour to have a couple of beers before sitting down to a pleasant meal in the restaurant with the rest of the crew.

Fresh from my bath and smelling sweetly, I perched myself on a bar stool and had my first beer of the day. No one else was about so I congratulated myself on my swift session in the bath and even swifter access to the beer. After about twenty minutes, my beer had disappeared but no other member of the team had appeared. Had someone not told me, the boss, of the correct rendezvous? Had I offended in some way? Another beer to fill in the time and console myself.

I extended this to three beers and I was still drinking alone and beginning to feel distinctly in need of some more solid sustenance and where the hell were the other ten or so souls who made up the team? I capitulated and ordered some of the delicious food from the menu and had the meal perched in the bar rather than in the splendid restaurant. I have mentioned that the place was very swish and they had a more than competent chef and the food was excellent.

I enjoyed the meal immensely on a strictly gourmet basis but was still somewhat chagrined that I was spending the evening alone. I consoled myself in the only way possible and had another beer. It was now nine o'clock at night and I was definitely sinking rapidly in the west with my day of heavy physical exertion and now large meal and four beers.

Soon after nine the first of my crew turned up fresh faced and obviously newly out of the shower. I bought them drinks but stretched my now fourth pint as I was in danger of over doing things with another day of the same to follow. As more of my crew turned up, I could not help but notice the arrival of a number of young and not so young ladies in the bar, most of whom seemed to be acquainted with my crew. In fact they seemed to know them very well. All of my crew seemed to have a particular favourite amongst the gathering clan of local ladies and I was introduced to several before I decided that my day had been quite full enough and I needed my bed. I bid adieu to the assembled multitude and headed for my room.

During the night I was vaguely aware of noises off. There seemed to be a tremendous party going on somewhere and there were high pitched shrieks from the swimming pool and raucous noises of

people having a marvellous time. I rolled over and tried to blot this out of my consciousness and to get some much needed rest.

I was up early and showered and was down at breakfast soon after seven. I was again alone. At seven fifteen the first of a series of shattered wrecks made their appearance. They stoically ate their cooked breakfasts and we mounted up the vehicles and went about our business during the day.

It was only when the evening alone repeated itself the next night that I realised what was going on. The boys would work all day and come back to the hotel and collapse, going straight to bed. After about four hours sleep they would get up, shower and change into their glad rags. Soon after this they would meet the local ladies attracted by their strange accents, readily available money and inclination to party to all hours. The party would continue until the early hours and they would get to bed between two and three o'clock, sometimes alone and sometimes not. They would then sleep until the alarm roused them at seven and go down to breakfast and do it all again.

I reasoned that the arrival of my team of reprobates in this corner of the North East was a little like the arrival of the American troops in England in the Second World War. Suddenly after years of hard commons and general deprivation of fun, a load of men turned up in a neighbourhood with strange accents, lots of money and an inclination to party given the slightest excuse. Perhaps it was not surprising that the local ladies found this attractive. In fact over the years I lost three of the team to relationships which were generated on those trials and some of the "lads" were in their 50s when this change came about their lives. Ah, the innocence of mankind. Not really with my lot but an interesting social phenomenon.

Chapter 26

Maurice was most definitely one of the Exploding Kind although he was not a scientist at all. He was, and probably all his life was, a sailor through and through: even when he worked for me as an Engineer. He was the same age as my father and yet he was my friend. He had had an interesting war although it was rare to get him to talk about it. It came out bit by bit over many beers that he had started his war as a young matelot and somehow found himself on Crete. He was on Maleme aerodrome in Crete when the elite of the German paratrooper force dropped on them, trying to take the airfield.

"I killed my first man, there," he said one day simply over a beer.

The Cretan campaign ended in disaster and Maurice was evacuated on HMS Kelly. Heard of it? It was Mountbatten's ship, and was dive-bombed and sunk off Crete. Maurice survived that, and before you say "Oh, yes. And who says all this is true." I have investigated. And it all is.

Maurice's next posting was HMS Illustrious, his favourite ship and one he mentioned with love over and over again. He was with her on her famous Malta run into Valletta. The Luftwaffe threw everything at her and she was hit by six 500kg armour piercing bombs: enough to kill most ships: read the accounts of Midway. Maurice described the attacks from high-level bombers and Stukas. The commentary would come over the tannoy providing all the members of the crew with information on the live action.

"Stukas are coming at us from above." Maurice, as part of the support to the Swordfish Torpedo Bombers, was not needed when an attack was coming in. So when the Stukas were coming down from the top, he headed as far below decks as he could.

“Now we are under attack from Heinkel 111s.” They were high-level bombers, so Maurice headed for the decks to avoid being caught by the bombs below decks. *Illustrious* staggered into *Valetta* with over 1,200 casualties and it was amazing that she still floated.

He then spent some time supporting his *Swordfish* in the deserts of Libya. It was time to rejoin a major unit and he was transferred to a new Carrier preparing for war and working up. She was *HMS Formidable*. She was transferred to the Pacific war and was involved with Kamikaze attacks off Okinawa. Need I say more?

As I mentioned at the beginning, Maurice had had an interesting war. He joined me as a PTO IV, the lowest of the low as far as Engineers were concerned. But Maurice had a value over and above his lowly status. He was a character. He had done things we would hopefully never experience and survived. His war record, although he kept it to himself most of the time, travelled ahead of him. He was one of the vital spirits in the Section and many people looked up to him, including me.

I had had another one of my brilliant ideas. A young man had turned up one day from one of the Naval Research Establishments. There was a mix up about his level and my Divisional Head originally considered that he was receiving an equivalent level gentleman but when we saw the relatively young Post-Doctorate, it was apparent he was more my level than the Divisional Head's. So I got to take him to lunch. The young Post-Doc was concerned with decoy systems and had a problem. Somehow he had heard about our work with foam and wondered if there was a chance it might work for him. The aspect of foam that appealed was its ability to produce vast amounts of apparent volume in a very short time. He needed to produce something that was the apparent size of a ship in the time that it took a missile to lock on. The missile would be looking for something called Contrast IR. Unlike an IR seeking missile going for an aircraft, which was a point source seeker, a contrast IR seeker differentiated between the relative coolth of the sea against the relative warmth of the ship's hull. Therefore any decoy had to reproduce the right wavelengths in the 8 to 14 micron wavelengths and also look as big as a ship. Not the easiest thing to do in the few seconds that elapsed before a missile had you in its sights and then flew to hit you! But, as I have explained, foam from standard commercial generators could be produced at something like 200 cubic metres a minute. Therefore a bank of two or three of them could produce something of tremendous volume in a very short time. But how did we get the right wavelength? It seemed a basic and easy concept to try to make the foam out of hot water. We did the tests and, guess what? There was the right spectrum smack bang in the middle of the 8 to 14 micron band!

Yes, but could it be done on the back of a ship? As I think I have already explained, I am seasick on the *Woolwich Free Ferry*. However, this was my idea and I was damned if anyone else was going to get in on the act. So I initially took Alan, who has worked with me on all sorts of damn silly ideas, and is a solid soul not inclined to get upset when the chips are down. We went to see if we could make foam on *HMS Jupiter*, a *Leander Class Frigate*. *Jupiter* was nice to us. We went on board at *Portland*. We put our generators on board at the stern. We went around towards the bottom end of the *Portland peninsular* and we attempted to run at high speed towards the shore where various pieces of measuring equipment sat on the cliff. We did these manoeuvres in something called the *Portland Races*, which is apparently a very rough area of water off *Portland Bill*. Our chums from *Admiralty Research Establishment* took measurements and established that what we were chucking out at the rear of *Jupiter* did look amazingly like a more attractive contrast IR decoy than the ship.

Stage 2: Trials with a helicopter and us on *HMS Exeter*. These gentlemen were a third rate frigate according to my book on such things. That is a technical term describing its size and ability but let us just say as far as we were concerned as guests, *HMS Exeter* was a third rate frigate. The crew did

not want us, the CO tried to kill us as we came into port by manoeuvring at high speed while insisting that we remove all of our gear from his rear end before entering port. Try handling heavy pumps and generators when the ship suddenly heels over through thirty degrees and see what I mean. Our chums from ARE were in a helicopter pretending to be a missile heading towards us and, guess what? Again the signature from the foam we produced looked more attractive to the sensor systems than the ship's hull.

Stage 3. Trials with HMS Hermione. She was another Leander Class frigate and another good one. She was also a Flotilla Leader. Here our experiment was fundamental and again, something I had contributed to. My reasoning went something like this. If a bank of white foam made with hot water produces the correct contrast IR signature, then how much better would a bank of black foam be? White is the worst radiating colour there is. Black body radiation provides the standard maximum. So what we needed was black foam. I tried and failed. I could produce any colour you liked, but not black. In fact we experimented with some fluorescein based dyes and found we could produce reds, yellows, blues and greens. OK. Simplistic but what if we tried with those? They were not white but surely they would be better radiators than white foam. And which colour would be best? So we set out on poor Hermione with a load of different fluorescein dyes impregnated into five gallon containers of foaming agent. Back and forth we went off Portsmouth sending out red foam slicks, blue foam slicks, green foam slicks and even yellow foam slicks. They looked like a Neapolitan ice-cream.

Back and forth went the helicopter, with our chums from ARE taking their measurements. It is all immaterial to this tale but there was an improvement of about ten per cent from using coloured foam.

It was time to go. We had made rather a mess at the rear end of Hermione but had tidied up as best we could. However we could not disguise the fact that a fair amount of dye had got impregnated into the paintwork at the rear of the ship. And as we had tried all the colours in our range, there were streaks of red, green, blue and yellow over her nice grey paintwork. Hermione did not deserve our treatment of her that night. She was Flotilla leader of a night exercise. Having lost the boffins, it was back to her proper job of hunting for submarines. But every time on exercise that she "spoke" to her consorts with a signal lamp and they talked back, something strange happened. The whole of her stern fluoresced in reds, greens, blues and yellows. Signal lamps, big powerful signal lamps used by the Navy to talk to one another, have a fair amount of UV component. Therefore shine them on a fluorescent paint and that paint glows. Hence the stern of Hermione looked rather like the back end of a baboon! The comments from her consorts were not complimentary.

With remarkable self-restraint, I was asked politely what Hermione should do about the colourful addition to her stern. I apologised on behalf of the trials team and suggested painting over the dyes. This they did but the fluorescein dyes migrated through the Admiralty grey paint and the whole thing happened again on a later exercise. I was very sorry but other than burning the paint down to the metal and starting again there was little I could suggest. At every Naval function I attended thereafter, I was always careful to enquire whether any of the gentlemen about me came from Hermione. And if they did I would quietly steal away before my connection with the ship was discovered!

All of this has taken us a long way away from Maurice who started this tale, but he now makes a reappearance. Stage 4 was to try the idea in sea state 5. The sea off Portland had been a bit rough, but only a bit. Exeter had tried to kill us by throwing itself around but the sea had been relatively calm. Hermione had suffered from our colourful interlude but the sea had been quite reasonable.

But what if there was half a gale blowing? Foam is pretty insubstantial stuff and it is no use having a decoy system if the damn stuff blows away as fast as you produce it. So we were to look deliberately for rough water and rougher weather and try it out. Now I have previously mentioned my lack of enthusiasm for any form of rough weather but, stubborn sod that I am, I had seen it through three sea trials and wanted to be in at the kill as it were. Just to make sure that the equipment did not die just from me hanging over the side of the ship throwing my heart up, I decided to change the crew doing the trial and take Andy, who has graced these tales before. Andy is reasonably solidly built and not phased by very much and I also decided to take Maurice. I figured that anyone with Maurice's war record would regard sea state 5 as a doddle. The fact that he was nearly 60, smoked like a trooper and liked a drop of ale, was neither here nor there. If any of my crew would be in their element, it would be Maurice. He was all for it.

Then, with our previous experience with the three ships to date in mind, we should have been wary when we found that we were to conduct the trial on HMS Dundas, a sister ship of Exeter, and hence another third rate 1,400 tonne frigate. No stabilisers. Nothing.

Everything had to be got ready and then we had to react on a bad weather forecast. We did and I found myself travelling down with Andy and Maurice to Pompey. There was a storm brewing in the English Channel and we got our gear on board in the evening with the trial on the following day. We came out of Portsmouth harbour and there was sea state 5 in Spithead in the lee of the Isle of Wight! We motored up and down a bit and tried some test foam runs. Andy and Maurice beavered around with a good deal of problems being generated by the amount of water coming over the side and the fact that I was totally sea-sick and non-compos mentis. They tied me to a stanchion with some rope and left me to wave my arms about vaguely trying to take some interest in the trial although frankly I just wanted to go home to my Mum. Being into historical accounts, and with a lot more drama than I deserve, I likened myself to Admiral Brueys, at the Battle of the Nile. He was the bossman at the action as far as the French were concerned and lost both legs. He was placed in a barrel with sawdust to direct the rest of the battle before his ship blew up. A gallant gentleman. But I digress. Long afterwards, my crew discovered that I had been horribly sick into the tool box and all the tools had to be thrown away!

We tried to raise the crew from ARE who were to fly to meet us in a helicopter from HMS Daedalus at Lea on Solent. However the wind was so bad that the helicopter was being blown backwards! The CO of Dundas tried to take us down Spithead and through the Solent to rendezvous with the helicopter somewhere in Lyme Bay. As we passed the Needles, a gust of wind clocked over a hundred mph. As it was so rough, and by now half the crew of Dundas were being ill, we were advised to leave the equipment at the rear until it was time for the trial and come and have something to eat in the Wardroom. I was green before this so strangely enough someone suggesting lunch did not appeal. I made some muffled apology and headed for the heads.

I am not sure what the technical term is for the gyrations that the ship was making at this stage. Let us just say that I found the most convenient position was to sit with my arms around the bowl of the loo, which I found prevented my head from coming quite so violently into contact with the bowl every time the ship made a particularly harsh lurch. So when I heard over the tannoy "Would Mr Hubbard please come to the Wardroom?" I said something unprintable and stayed where I was. In the following half hour the requests for Mr Hubbard to come to the Wardroom became more and more pressing. But Mr Hubbard was going nowhere.

It was Maurice who found me as I had left the door unlocked as at least some concession to being found. He described later that he had found me "Making love to a loo bowl". He was technically

inaccurate as I was incapable of doing any such thing in my state but I knew what he meant! I was carted off to sickbay and spent the rest of the time there until we put into Portland. I might add, if Peter R is reading this and as he features in the next part of the tale, that I was not alone as he was similarly incapacitated and was also in the sick bay. And he was an ARE man!

I believe Andy was a little discommoded but Maurice was in his element. He regaled the Chief's Mess with some of his exploits and ate steak sandwiches, drank Pusser's rum and generally relived his early career. Bless him!

To finish their part of the story, we left Dundas at Portland and Andy and Maurice had to finish the job. I will leave it at that as there are still some classified aspects to the tale. Peter R and I tottered ashore more dead than alive and booked into the Wardroom at Portland, just grateful that the world was no longer going up and down, and round and round.

Still feeling very weak and discommoded, we decided to go for an evening constitutional before settling for the night, aware that we had not exactly covered ourselves with glory during the day. So we tottered out from the Wardroom, walked out of the front gate and up towards the Prison. Having walked about a half a mile alongside the Dockyard wall, there seemed little point in retracing our steps when we came to another entrance. We had official MOD passes, although these were our normal establishment ones but they had photographs on them and crowns and should have been identifiable as meaning we were kosher. We enquired at the gate and, yes, we could come back into the Dockyard area and walk back to the Wardroom and an early night.

It was getting a bit gloomy as evening drew in. As we walked along through the usual buildings one finds in a dockyard, if there are any left after the Government has closed most of them down, we noticed some figures scurrying around ahead of us. What was this? Were we to be mugged to add to our wonderful day's cruising? We still moved forward safe in the knowledge that we were official, that we had asked permission and we were resident in the Wardroom with Officer status. Suddenly there rang out a challenge.

"Hands up!" When a dozen men with blackened faces, steel helmets and SLR rifles say that, you do it.

"You're in a restricted area. Who are you?" said a commanding voice.

"We are MOD Scientists participating in trials on HMS Dundas. We are staying in the Wardroom. Our contact is Lt Commander XXXX." All factually correct.

"Break out some ID!" barked the same voice.

"We have ID but can we move our hands?" Somehow the idea of matelots armed with SLRs did not fill me with enthusiasm.

"Down on your hands" said the same voice reinforced with a gun butt between the shoulder blades.

I staggered but refused to lie down. This was the only damn suit I had with me and I was damned if I was going to ruin it playing silly games.

Icily, I restated who we were and who was our contact.

A different voice now interrupted.

"One, two, three, four. I have just thrown a grenade and you are all dead." A Chief Petty Officer in charge of the Trainee Shore Patrol came out and took charge. He pointed out what they were doing

wrong, looked at our passes and then, without any apology or any explanation, let us go. The end of a perfect day!

Maurice finally retired. He was a lonely man in many ways as his wife had divorced him and left him rather adrift, to use the naval analogy. She had left for pastures new in Australia. Maurice retired and found a home with June. She was a lovely lady who worked for me briefly as a Quality Assurance Adviser. I am still not sure what that meant. She and Maurice hit it off. She had a loving family and somehow her grandchildren were adopted by Maurice and him by them. Maurice acquired them as a sort of honorary Grandfather. I could not wish better for him.

We kept in contact after his retirement. I was not there when he died which I regret. I was doing something else in my busy existence. However, I record Maurice as a soul. Apparently he died from a conglomeration of the effects of various things that had affected his life. His last words as reported, I remember.

He came around from a coma and spoke to June, a lady who had given him consolation in his latter years.

“Have you got the condoms?” said Maurice. I have tears in my eyes as I record his last words. But I am a silly sod.

Chapter 27

Another line materialised about now, partly from my background and partly from the connection with the Security Service through membership of FAWG (the Forcible Attack Working Group). Periodically someone wanted a threat assessment done on a particular vulnerable facility or item and I was the nearest thing that Security Service had to hand to a tame terrorist. In the case of a facility, I would be allowed access, generally with one of my Security Service colleagues in tow, and we would wander around asking awkward questions and looking behind doors and going under, over and around the potential target. If it was an item I had the more boring task of pouring over blueprints and plans. I would then write an account of where I would hit them and with what, that would be moderated by an assessment from the Security Service man of how likely my attack method would be in the light of previous practice by any of the potential threatening groups and then it was up to the owner of the target to do something about it if we had alarmed them sufficiently.

The threat part of the document was not my concern but I knew from my own background most of the capabilities of our Irish friends and, through reading the accounts of the activities of overseas terrorist groups, theirs too. Hence what I was suggesting was never out of the question. I quickly learned that the threat assessment from the Security Service was almost inevitably based upon “has it happened before, and if it has, how often?” This is fine except for those occasions like September 11th when the terrorist makes an attack based upon something he has never done before. My assessments always were flavoured with opportunism having seen the facility or item that would be attacked: if I thought they were vulnerable to some idiot attacking them with a hang glider packed with explosive for example, then it went into my report.

I am not going to identify all of the places that I have examined as I have no desire to be kidnapped and questioned closely about how to attack the facilities but it got me into some interesting places. I will identify one of them because it was the Channel Tunnel.

My involvement came earlier than the Tunnel as the first time I was asked along to discuss possibilities we were still at the stage of considering three options: tunnel i.e. a deep tunnel, a bridge, or a cut and cover tunnel. The last option came through the technology used to make some of the London Underground. The proposal suggested that a trench was to be cut across the bottom of the Channel, a concrete tube inserted, pumped out and voila, you had the tunnel. This was considered a viable option in the early days mainly because it was cheap. Spoil would be piled back on top of the metre thick concrete tube top but basically it was to run just a few feet away from the sea bottom. The considerations for a terrorist attack included such matters as how much explosive, how many men to deploy the explosives and how long would it take them to prepare their charge? I wrote my report and included attack methods for contact charges, bulk charges not in contact and some novel ideas based upon some work I had been monitoring by a chum of mine. I then discovered that whatever went forward to the final deciding committee and the politicians had to be agreed by the French experts as well as the UK experts: otherwise national honour would not be satisfied. Fine by me and I was prepared to defend my figures with precedent and experimentation if needed.

We had our first meeting with our French counterparts in London and within a certain margin of error managed to agree figures for the contact charges and bulk. However the French engineers refused to accept my figure for the novel charge.

“Ce n’est pas possible!” they resolutely declared. I showed them some photographs and described the novel way that it was all too unfortunately possible but it was not invented there so it could not happen. They dug their heels in and I dug in mine. Impasse. (Note the cunning way I am making this tale bilingual as that was a feature of the discussions!)

This technical difference assumed monumental and politically embarrassing proportions. I maintained that a single individual with only a backpack of explosives and one magic ingredient which I would be foolish to describe too fully could blow away the metre thick concrete roof of the cut and cover tunnel in as short a time as it took to drop the charge on the floor (the floor mark you!) and run away as far as he could. One of the attractions of the cut and cover tunnel would have been that you could have driven straight through it and it did not rely on putting your car on a train. Hence our punter with a very fast car could imagine he might outrun any deluge pouring in to the concrete tube from the hole he had produced. When we presented this scenario to the project team proposing the scheme they said that a metre sized hole in the roof of the tunnel through which the Channel was making an appearance would not present a problem as drivers would do a three point turn in the tunnel and return the way they came!

It was decided that the only way to resolve the technical difficulty was to run a trial. The French had a range for explosive work at Captieux, an extensive tract of sandy heathland a short car ride away from Bordeaux. They agreed to provide a third scale replica of the tube wall and I agreed to bring along my magic ingredient x in my bag and use French military explosive with it to attack the target. My Security Service minder and I headed to Bordeaux on the train having crossed the Channel by staid old Ferry (we did a threat assessment on those too at one time but one of my chums got the free trip across the water). The French military which ran the range were there to pick us up at the station and we were whisked away to Captieux. My minder was becoming progressively more nervous that what I had in my bag was not going to deliver and there would be a considerable amount of national humble pie to be consumed. I told him that I had complete faith (more than I was telling myself at this juncture!)

With little time for pleasantries, we were ushered onto the range and first there had to be a demonstration of French methods. They had chosen to show the effect of an RPG 7, a favourite Soviet rocket launcher often seen in newsreels being brandished by terrorists. Quite how they were going to attack the cut and cover tunnel roof with this escaped me but the French engineers wanted to fire a couple at representative chunks of concrete. The soldier doing the demonstration only had two fingers on his left hand when he held up the explosive filled rocket so I edged behind a chunky looking Colonel. I like my explosive specialists to have a full complement of fingers as I somehow feel that it demonstrates a certain natural competence in the subject.

It was then my turn to shine so in my best school boy French I described what I was going to do and we set up the magic ingredient x backed by about ten pounds of French Plastique. The full-scale thing would have needed about thirty pounds but I considered a reasonably fit individual could have carried that to the target without too much trouble. We retired to a concrete bunker and there was a good resounding bang. Out we came to observe the effect. There was a considerable hole punched through the concrete despite the fact that the wily French had put in reinforcing bars which the real thing would lack. No matter, my charge had hacked its way through concrete, reinforcing bars and all and there was a good sized hole all the way through.

“Zoot alors” and similar French expressions. Point made, now where are the vineyards?

We went through the whole business again when the decision, possibly influenced by the security considerations, came down in favour of the deep tunnel. I did my sums again and this time we travelled to Paris and had our meeting to agree with our French counterparts the amounts of explosive needed to destroy the tunnel. Fortunately this time we readily agreed, possibly now backed by the fact that they might think I wanted to prove my theories with a tunnel that they would have to supply if they did not agree! Would have been fun.

Being built through the contiguous layers of chalk deep under the Channel, it would take a very large amount of explosive to do unpleasant things to the Channel Tunnel as proposed. At this time, the largest charge we had experienced from Mainland terrorist attacks was less than 100 pounds. I am not going to comment other than to suggest that it would take a lot more than that to breach the Tunnel. But that was a long time before St Mary Axe and Bishopsgate. There is also the thought that even a hand grenade in the Tunnel has a psychological impact. I was involved in calculating the effects of various size charges on vehicles and the Shuttle travelling through the Tunnel. There are lots of security considerations but security and the ease of use of a transport system are a carefully balanced structure with economic considerations very much to the fore. You can only be so careful before you strangle a system like the Channel Tunnel.

Having been concerned with the security considerations, once the decision was made to build the thing, for the third time as far as the Brits were concerned (the first was in the late nineteenth century, the second in the 1970s, and the final and successful time was in the mid eighties), I agitated to be allowed to see the actual digging of the tunnel to check my feeling of the security. This was allowed and one morning in 1986 I travelled down to Dover to view the Tunnel at a point it was one third of the distance and advancing.

We accessed the tunnel down an inclined plane called Adit 1 which drilled down to the workings at what is now Samphire Hoe. We completed our safety checks and started to trudge the two or three miles that constituted the tunnel at this time. I noted the original tunnel workings dating back to the late nineteenth century, then the transition to the abortive 1970s working. Finally we trudged along in the wake of the modern boring machines. One the English side these had been going great guns as the chalk was prime and unfaulted. In fact they had been getting so cocky that

they had neglected to put the protective shuttering up behind the tunnel boring machine and the day after we visited it all fell down! I cannot say that I learnt anything spectacularly new when I visited the face. Just that any undertaking of this type was a massive financial commitment which could be thrown by an accident.....or a small terrorist device. Oh yes. And in answer to anyone who wishes to know if I travel through the Tunnel knowing the risks and vulnerabilities, I have on several occasions.

Chapter 28

The saga of the pipe-mines started back in the days when it looked as though Hitler would invade any day. In those days of great anxiety, it was decided that the last thing we wanted was for our advanced airfields to fall into the hands of the Germans. Therefore a dangerous plan was put into place on the English side. 34 airfields that lay close to or even within parachutist range of the south and east coasts would be mined. These mines had to be particular as it was essential that the airfields remained usable by our aircraft until the last moment, but as soon as it looked as though they might fall into the hands of the enemy. Bang! This was complicated by the fact that a fighter airfield in those days did not just launch its aircraft off from the runways. Any stretch of flat grass would serve. Therefore it was essential that the whole usable area of the airfield had to be destroyed.

Hydraulic rams were brought in and long metal pipes were driven at a slight downward angle into the ground. A lattice of pipes was formed so that they lay for 150 feet under the ground, at one end about three feet down and at the other perhaps at six feet. The metal tubes were 3 inches in diameter at the bottoms and 2 inches at the tops. Once these had been positioned about twelve feet apart, they were filled with cartridges of the most readily and cheapest explosive available, nitroglycerine based blasting gelignite. Each of the pipes was primed with detonating cord and then awaited the Nazi onslaught. It would be the work of a few minutes to connect the tails of the Detonating Cord and set the whole series of charges off. The airfield would have disappeared into so much ploughed mess.

As we are all aware, the invasion did not occur. Therefore sometime towards the end of the war the decision was made to remove the pipe-mines. I do not know what the pilots who had been merrily using the airfields for active duty themselves thought of constantly flying on fields under which there were several hundred pounds of explosive, but maybe nobody told them which is the usual way. A Canadian Sapper Unit was given the job of clearing the pipe-mines and told that they could only go home once the job was done. Strangely enough the job was completed in quick time and the various clearance certificates logged for each of the 34 airfields.

Cut the scene now to some forty years later to a solitary figure excavating a hole on Lympe airfield in Kent, one of the 34 airfields originally mined. The solitary figure is Ukrainian, and one of the Legion of the Lost attached to the British Army for range clearance duties. At the end of the Second World War, a whole Ukrainian SS Unit was drafted into the British Army as the alternative was to send them to their homes where they would be summarily executed by the Communist authorities. Their fate was not exactly brilliant as the job they were given was to go around clearing unexploded ordnance left over after the hostilities. But it was better than certain death. The Ukrainians served as civilians, worked under the direction of British Sappers, and most religiously sent home a proportion of their pay to their homelands, which is an interesting thought all through the Cold War.

Our solitary individual had found a long metal tube in the ground and proceeded to investigate it with the aid of a hammer. The resulting explosion unfortunately killed him. The subsequent court of enquiry uncovered the facts about the pipe-mine saga of which he was unaware and introduced into everyone's mind the fact that the Canadian Sappers might not have been quite so thorough as had been first thought. A programme of additional searching was put in hand but it was acknowledged at the start that this could take some time. Simultaneously my group was tasked with assisting initially the RAF EOD teams as all forms of EOD on RAF property were an RAF responsibility.

The initial studies were conducted at Tangmere in Sussex. I remember Ron telling me that he was stood at the bottom end of one of the tubes while water was gently washed down its length. Very glutinous looking sausages of forty year old Polar Ammon Gelignite were slowly plopping out of the end of the tube and Ron was catching them one at a time. In between this process he happened to glance down at the considerable puddle he was standing in, the water table at Tangmere being only inches below the surface. He noticed a peculiar oily sheen to the water surface. He was standing in a pond the top surface of which was a layer of nitroglycerine!

A method of dealing with the problem that kept most of the operation remote was devised jointly by my troops (Terry and Ron) and the RAF EOD boys. Basically it consisted of using a remote control Hy-Mac, a hydraulic digger, to excavate down to the buried pipes. Once uncovered the pipes would have small charges of linear cutting charge attached to them at intervals. These would be designed to weaken the pipes without actually penetrating them completely so should not have set off the explosive contents. Once weakened, the remote control equipment would again be used to break the pipes into sections. Low pressure water would then be used to ease the ancient explosive cartridges out of the tubes. The explosive would then be burned under precautions.

Now this all sounds reasonably sensible and it was. But there were complications. Commercial nitroglycerine based explosives are designed to be used weeks or at most months after manufacture. They are not designed to sit in metal pipes under the ground for more than forty years. Consequently some of the NG based material was now a horrible mush of God knows what composition. Surprisingly not all of it was supersensitive. One solution tried in the early days was to put countermining charges on the pipes when they were discovered and just blow them. On nearly every occasion the explosive reaction faded out quickly and left us with scattered unreacted explosive. But as Ron (and the Ukrainian gentleman) had discovered, on some occasions there were pockets of nitroglycerine that had become disassociated from its normal desensitising matrix. Then things got more exciting.

This is more or less where I came on the scene personally. Some, in fact many, of the wartime airfields were no longer under the control of the RAF. Therefore the responsibility for clearing them passed over to the Sappers (remember the complicated turf war associated with all forms of EOD!) As a further complication, some were not even airfields anymore. Some were factory sites and at least one was a large housing estate. We will deal with how these were tackled later.

The Sappers needed someone to give them guidance on what could be considered safe working distances for dealing with the pipe-mines. That someone was me. If I had wanted to be really pedantic, I could have stuck to the normal 1,000 yards radius that most use as the safe radius for confined explosives up to the sort of scale we were thinking of. But there were additional considerations such as the age of the material: by this time we knew that it was unlikely to all detonate in one go from our various experiments. It was also underground to the extent of at least 3 feet and hence the distance that a detonating pipe-mine could throw metal was restricted. I did some sums and came up with 500 metres as the safety distance. However, life is never simple and there

were several occasions that I was invited to attend a site meeting to discuss particular aspects of an airfield clearance that could only be considered by viewing the problem first hand.

The first of these was at HMS Daedalus, a Fleet Air Arm aerodrome near Lee on Solent. There the complication was several high priced dwellings with enormous picture windows overlooking the Solent right on the perimeter of the airfield. The effects of blast on large areas of unsupported glass is hard to predict even at ranges normally considered safe (remember the Headmaster and his little darlings at Hemswell!). It only affected work on a proportion of the pipes but while that was going on, I suggested that the houses within an extended safety trace be evacuated. That was reinforced during the clearance operation by a particularly vigorous bang during one of the clearances, which broke a window or two in the Control Tower. This caused no casualties as it had been evacuated but proved that some of the charges in the pipes still had some zing in them.

Another interesting series of dilemmas arose when Eastleigh came to be cleared. By this time my military chums had got used to the idea of 500 metre safety traces and had produced a plan of the site with nice circles drawn around the pipe-mines that had been identified. Even that is not simple as the pipe-mines were linear features and ran in a far from regular pattern despite the original intention of the installers. On this occasion I found that the safety traces took some decidedly strange variations when it came to one particular perimeter.

“What has happened here?” I enquired.

“Oh, that is the London to Southampton main line railway,” replied the Major.

“What! And why the big kink here?” indicating another deviation from the 500 metre trace.

“Oh, that is the M3/M27. We obviously can’t shut down the M3/M27 and the mainline railway. Just as we can’t shut down Ford’s factory, which is in the airfield area.”

“Have I got news for you!” came my brisk reply.

There was much weeping and wailing and gnashing of teeth but I refused to have my name associated with the safety plan until they agreed to close the railway line, the M3/M27 and Ford’s factory. There was a relatively painless way of doing it which involved working over the weekend and shutting the factory when there were only maintenance men there anyway. The closure of the railway and the motorways was an inconvenience to many I am sure but less so at the weekend. But not such an inconvenience as having large amounts of metal or great clods of earth flying at users of them!

I suppose I should mention my brush with the Palace too. We knew that Detling, long since disused as an airfield, had pipe-mines under the surface but as these were not to be disturbed, the clearance awaited resources some way down the line. However, parts of what had been the airfield were to be used by the Kent County Showground and Her Majesty the Queen was to open the Kent Show. Some bright spark had mentioned to the Palace that we suspected there were unexploded pipe-mines under the area that was to be traversed by the Queen. I was asked to assure the Palace that there was absolutely no chance of one of the pipe-mines detonating while she passed over them. Now being a scientist, I could not give this assurance as there is no such thing in risk analysis as zero risk if there is even the faintest chance of something happening. I could make assessments of millions to one against but I could not give assurance of zero risk. The pressure I was put under to bend the rules! But I didn’t. I think they eventually rerouted the Royal Party so that she came nowhere near the buried nastiness.

Risk is a funny business. People driving to the Kent Show were subjecting themselves to infinitely higher levels of risk from injury or death from road accidents than they were from dormant pipe-mines buried under the surface of the showground. So was Her Majesty. But it was out of the ordinary so needed separate consideration.

The last of the pipe-mine saga that I was concerned with personally was at Gravesend. This was the airfield that now was a large housing estate. I again attended a site meeting after the Sappers had been in and sought the remaining pipe-mines with their special magnetic anomaly detectors. There was another carefully drawn map with all sorts of deviations from the 500 metre safety traces, most of the deviations occurring when the safety traces cut across the hundreds of houses in the estate.

“What is this?” I queried.

“Well, we cannot throw out hundreds of people from the estate. Where will they go? It will be a logistic nightmare!”

“Get them out!”

The solution was not mine, only the prompt that it was necessary. On day one of the five days set aside for the clearance of Gravesend, a fleet of coaches turned up. Roll up! Roll up for the magical mystery tour! The clearance was to be conducted from Monday to Friday from 9am to 5 pm. Hence a fair proportion of the potential evacuees had already gone to work. The mothers, children under school age and old age pensioners were mainly quite happy to be taken out for the day at the Government's expense. One or two of the older souls who had not been inclined to move when Hitler bombed them expressed an obstructive view to having to move for the removal of some explosive unpleasantness associated with the war against him. It so happened that one of the pipe-mines dealt with on the first day had a quite large chunk of active ingredient associated with it. It objected to the removal process, which made quite a good sized bang. Everyone was on the coach the next morning!

The Sapper gentlemen worked solidly through the week and actually finished the job by Thursday. There was a near riot on the Friday morning when it was announced that the expected coach trip was cancelled as there was no need! Ah the power of lateral thinking when it comes to solving human related problems!

Chapter 29

Time to introduce Bertie. I will leave it at that as he was a very senior gentleman who was my boss two levels above me and was not named Bertie at all. But as will be revealed, he was the sort of character who had somehow climbed to his exalted position over the bodies of others.

I am not sure how the appointment arrived but one day someone told me that I was to be the UK TTCP Focus for Demolitions. TTCP was the Tetra-partite Technical Cooperation Programme, basically an exchange programme set up by the UK, US, Australia and Canada with New Zealand somewhere in the background. A Focus Officer had the job of co-ordinating the effort of the country on a particular subject and reporting progress to the other member nations. He also had the task of picking up anything of interest to his nation from the others and making sure that the person in his own country most responsible was aware of the work. Some of the task could be accommodated by mail but the good bit was that there was part of the mandate which involved meeting your equivalent souls once every couple of years and comparing notes. Now I have never

been backward in coming forward about overseas visits, and consequently found being TTCP Focus Officer for demolitions not a bad thing at all even though I led a busy life and this just made it busier.

My first meeting was in Canada and occurred scarcely two days after I had returned from a bomb disposal oriented visit to Australia. So I went from one extreme time zone to another. The meeting was to be at Suffield, an isolated establishment in the middle of Alberta, where the Canadians had a research station. The nearest sign of civilisation was Medicine Hat, an isolated town miles from anywhere in the middle of the prairies. It was high summer, we were based in a hotel in the town and made our way to the meeting each day in our hire cars.

The Canadian hosts had decided that it would be a good idea to have a workshop associated with the meeting. This meant that we could report the progress on demolitions at one part of the meeting and then move on to discuss a topic that was of interest to all our nations afterwards. This strengthened the reason why our respective nations should send us half way around the world and was a sensible use of the available expertise congregated together. The topic chosen was mouse-holing. This has actually nothing to do with mice but is concerned with fighting in built up areas. The whole process of getting from one house to another under combat conditions is very expensive in men and one way that the expense can be mitigated is to tunnel through the buildings internally, creating passageways that did not exist before. Hence, the term mouse-holing but for rather large mice.

My reason for being created UK representative was our activities for the Special Forces. As I have complained before, the progressive withdrawal of the UK from matters explosive for reasons of Government cut backs, had meant that we had no experts on demolition in the conventional sense. The only area that was still actively funded was a very small proportion of my time that supported the Hooligans from Hereford, mainly in the field of counter terrorism. Getting people out of hostage situations was one of the prime drivers, as has been described in the section on the Iranian Embassy siege.

I did some research on mouse-holing by talking to the Sappers and found out how they did it at the moment. It seemed somewhat crude and lacking in finesse but what the hell. At the meeting in Suffield we compared notes and I acquired some useful information on getting through walls rapidly. However, no one had any bright ideas about getting through reinforced concrete in a hurry. Using explosive generally removed the concrete but did little to the heavy steel reinforcing which was embedded in the concrete. This required a second bite of the cherry which could be a bit of a pain if you really wanted to get through the wall in one go. Hostage retrieval? One of the other Focus officers had got wind of a splendid piece of equipment which sounded totally insane but which did actually work. It was an attachment to the end of the barrel of an assault rifle which had a sort of deep groove in it. The idea was to lock the groove over a piece of reinforcing bar and fire a round from the assault rifle. My instinct was that there would be an enormous bang and bits of metal would cascade back from the impact of the round with the reinforcing bar causing grief to the firer. However, one assumed that the manufacturers, Diehl, who are a not inconsiderable force in Germany, would have checked that out. I later acquired one and my macho Major of the time did some tests which proved that the concept worked: real macho stuff to fire half a magazine while working your way around a lattice of reinforcing bars. But it still took time.

We all came away with more information than we had to start with but everyone obviously wanted a one shot way of getting through reinforced concrete. We in the UK had been faced with another siege, this time at the Libyan embassy but there was little chance of getting in

because of this problem of reinforced concrete even leaving aside the problems of protocols. Consequently two years after the Suffield meeting the Focus Officers were summoned to another meeting, this time in Fort Shafter in Hawaii. The US Focus officer had convinced his masters to lay on a series of reinforced walls for the combined might of the TTCP Demolition Focus Officers to trial new ideas for breaching reinforced concrete walls in one hit. Naturally I was somewhat chuffed at the prospect of getting to Hawaii and Ron and I thought long and hard for solutions to the problem. Inevitably there was a sense of competition associated with the trial and we wanted to win.

I received the papers telling me of the meeting from Cliff with a cryptic note along the lines of "Lucky bugger!" Ron and I next considered how our explosive charges were to get to Hawaii, a not inconsiderable problem as you do not just stroll on to an airplane with a suitcase full of explosives: unless the RAF just happened to be going to the destination of your choice, then basically hard luck. We then had a wizard wheeze. The RAF did fly explosives to Australia reasonably frequently as there were test establishments and ranges there. Therefore if we got our charges to Australia perhaps our Aussie chums would do the decent thing and carry them with their charges to Hawaii that was almost in their backyard, so to speak.

A few 'phone calls and signals and everything was arranged. Our charges went winging off to Australia after an enormous amount of effort to get the paperwork done and we had assurances that Phil, the Oz Focus officer, who conveniently had worked for me for a year on attachment, would bring our charges to the party.

A month before the meeting and workshop in Hawaii, I put in the application for Ron and myself to go to the meeting. I felt justified in taking Ron as well as any firing involves all sorts of safety considerations and having a fellow countryman along meant that you had someone to watch your back. Anyway, Ron had worked hard on the design of the charges and on the paperwork to get the charges to Australia. Any application for overseas visits had to go first to Cliff as my Superintendent and then to Bertie. I discovered that my carefully worded case went forward to Bertie with a covering note from Cliff saying "Don't send them". Cliff denied knowing anything about the meeting and workshop despite having sent me the calling papers with "Lucky bugger" written on them. He accused me of setting up the meeting simply to get to Hawaii. Basically it was sour grapes. Neither of them had been to Hawaii so why should we go?

I was flaming. All of that work and we would not be there to get the data. The dates of the meeting came and went. We waited and true to form, our Australian chum reported back to us the results of the tests. All of the other Focus Officers were there and we were conspicuous by our absence. Just to rub it in, our charges had performed best of all! Insult added to injury but we did at least have some nice slides of the walls that showed the success of our system.

For reasons various, I had established a slot on the visits schedule of quite a lot of high ranking punters who came to have a day at the Fort. Perhaps it was because I had an interesting subject in Bomb Disposal. Perhaps I was fairly good at presenting the information. Anyway, I received warning that the Director of Special Forces was coming to our establishment. Would I please put together a half hour presentation for him on such and such a date? Certainly and I had just the subject.

I waited in our Conference room with pictures from the trial in Hawaii. Strangely enough the SAS in particular was interested in getting into buildings rapidly and we now had at least a toe hold on how this might be achieved through reinforced concrete with a one shot device. The General came in escorted by the senior military man from the Fort. Neither Cliff nor Bertie were present.

I described what we were trying to do and showed a series of slides of the walls with the backdrop of Hawaii. I paused and then said loudly and slowly.

“But don’t mention Hawaii”.

I continued and showed the various attempts made by the other nations which resulted in failure. Again I repeated my mantra with increased emphasis.

“But don’t mention Hawaii”.

Finally I showed our successful charges before and after with a reasonable breach achieved through the reinforced wall. Again I repeated my phrase.

“But don’t mention Fucking Hawaii!”

Any questions?

“Why shouldn’t I mention Hawaii?” asked the General, intrigued. So I told him.

Later that morning I was included in the luncheon party with the General down at the Senior Officers Mess. Bertie was in the chair and Cliff was in attendance. During the meal, Bertie asked the General if he had had a good morning.

“Yes. Excellent,” he said, then glancing down the table at me with a twinkle in his eye added, “But don’t mention Hawaii!”

Chapter 30

It was apparent after even the first interaction with our Colonial cousins in the Nuclear business, that we were considerably ahead of them in developing potential solutions to the complex problem of dealing with Improvised Nuclear Devices. I suppose it is rather cavalier to say so but I think even they might agree and, after all, we were coming at the problem with a background of more than a decade of the problems of terrorism in Northern Ireland, something they were lucky enough to have avoided.

One of the benefits of our sharing information was that it was a game where you desperately needed peer review. Although the science of what we were trying to do was difficult and it was good to get another view upon it, the philosophy of what we were trying to do was just as important. And where could we discuss that except with people facing the same problems as we were?

Therefore I was pleased to hear from Jerry, my opposite number who led the US disablement team, that they were to conduct a major exercise at the Nevada Test Site in December of 1986 and that he wanted me along as an observer. The time of the exercise approached and nothing was said by my own hierarchy about my attending, the reason being that I believe dear Bertie had hijacked my invitation and taken it himself! Unfortunately for Bertie, I spoke to Jerry quite frequently and happened to let slip that I had heard nothing and was mildly surprised as the exercise was only a week away. Jerry at that time was (and I hope still is) a very large and muscular man who used to spend his spare time at Los Alamos during the winter season skiing over the surrounding area rescuing souls who had managed to get themselves lost. He was of a size where he could throw them over his shoulder and ski home and probably did. He is about six foot something and very broad and managed his team by his physical presence as well as his intellect. Not a man to mess with was Jerry! There was therefore a very personal invitation directed at me which even Bertie could not ignore and I found myself a late addition to the UK team flying first to a briefing in

Washington before shipping out to the wastes of Nevada for the exercise which was called Mighty Derringer.

One of the UK team from the military side was Guy, a gentleman I had met on several previous occasions in various muddy fields. Guy was a Sapper Major and would be a player in both humanitarian de-mining and the clear up operation after Operation Desert Storm, which will feature later in this account. He and I teamed up during the visit to Washington and spent a day wandering around the sights before the briefing at the Department of Energy and the move to Las Vegas and the switch to the Nevada Test Site. I particularly remember a visit to the Vietnam Memorial. We came to the long black wall with its list of names in the order that they had died. No ranks: just the names and sometimes the nicknames of the poor souls. While we were there, a Vietnam Vet came along to find the names of his friends who had died. He had his young son with him. He spoke to one of the attendants and sounded like the young man in the pop song called 19 which was around at the time.

“I really didn’t know what was going on.”

In our hearing he described being engaged by the Viet Cong and fighting back only to be restrained by his own officers as the opposition disappeared into the jungle. Apparently they could not shoot as the trees belonged to someone and they might damage them.

He walked away with tears in his eyes and tears in mine: a man walking along holding the hand of his son. A small and simple thing but something that so many young men had been denied.

Nevada Test Site, NTS, is a large area about an hour and a half away from the fleshpots of Las Vegas. On the way to the exercise we were whisked through the airport and out to Mercury, an administration centre on the Test Site with a name which was a veiled reference to early mining attempts. We had a briefing but were directed to our accommodation some seventy miles away at a place rather poetically called Parumph. Just the sort of name for somewhere adjacent to the US nuclear test site! However, it is apparently an Indian name that pre-dates the inception of NTS.

Each day we got up at some appallingly early hour and motored over the desert to NTS. On the way we would pass a sign indicating the directions to places called Mabel’s and the Cherry Patch. The significance of these emporia was lost on me but I learnt about them later.

The exercise was very complex and we had the advantage over the participants of being able to talk to the “terrorist” about his design, so we knew what they were tackling and when they were going horribly wrong. The scientist responsible for the design was a gentleman from one of the weapons laboratories and hence he had all the technical knowledge to make a credible device. Not surprisingly, as he wanted the device to be a threat over a considerable period, he had booby-trapped it. The bomb was based upon an implosion design, and entering it from any direction other than one particular one triggered the whole shooting match. Hence from a straightforward north, south, east, west way into the device, only one of the four ways in won you a coconut. He had also disguised his trigger so that it was not apparent from the radiographs. There were more complications than that but I am trying to be discrete and not give a potential terrorist information that would be useful to him.

I wandered around watching how the US team got on. There were considerably more of them than I had in my team as the US has three major weapons laboratories: Livermore in California, Los Alamos and Sandia in New Mexico. They also had a number of high technology companies associated with the business too. Several of the US team were already my friends and it was a fascinating experience watching the development of their plan to deal with the device.

I was there to look at the Disablement aspects but the rest of the UK observers watched their counterparts in Diagnostic, Access and Assessment and we compared notes periodically.

It finally came to the denouement. The US scientific community were supported, as were we in the UK, by a military component. These gentlemen had been cooped up on NTS with no beer or alcohol of any kind, no access to the female gender and no access to what is generally regarded as fun for two weeks. They were therefore somewhat sharp set.

The final attempt at making the device safe was implemented and they were successful. Everyone went into euphoria phase having been hyper for two weeks. We were invited to the wash-up session and listened while the various souls in charge said the equivalent of “You’ve all done very well.”

For some strange reason which I have observed on several occasions the Americans have this ability to pat themselves on the back in public while holding their hands over their hearts. Most of the souls in our business would squirm if anyone mentioned patriotism and serving their country but the US seem to enjoy pointing out to anyone who will listen that they were there to save the world. So after all this self-congratulation, the head of the UK party got up and delicately shot them to pieces. He did so with the most downbeat presentation based upon something called facts. You could have heard a pin drop! Our job as observers was to observe and comment constructively on where they had gone wrong. So we did. Basically they had misdiagnosed the device and had only got away with it from a one in four chance.

We were not the flavour of the month. However, unless you tell the truth there is no point in being there.

Everyone packed up and went their separate ways. Most of the ways led back to Las Vegas, surprisingly. I have mentioned Mabel’s and the Cherry Patch before. These were licensed Brothels, Nevada having an “enlightened” view of such things. One of the military brought in the menu, I suppose you would call it: enlightening at least to me who was totally innocent of such things.

I am not sure I will ever get the chance to tell the tale at any other location, but there was a reprise of this exercise run in the UK. It was conducted at somewhere a good deal less exciting than Las Vegas: Rochester in Kent. While the rude and licentious US soldiery were staying at a hotel in Rochester, they asked the attendant on the desk where the local whore houses were? Anyone being able to point out the equivalent to Mabel’s and the Cherry Patch in Rochester, please inform me out of curiosity.

Back in the USA on this occasion, we hit town and had a wander around the casinos. Our hotel was full of young men from the military component who were now unleashed upon the unsuspecting inhabitants of Las Vegas. We had returned to the Hotel, the Somerset, a very 1930s emporia just off the Strip and found some well juiced up military just about to head out for another attack.

“We are all headed to Splash. Come along.”

Las Vegas has a whole series of spectacular shows and Splash was just such an event. We thought it might be fun so had dinner in one of the restaurants provided by the Casinos, enormous quantities of food at ridiculously low prices all subsidised by the gamblers and then snuck in at the back of Splash. As we anticipated that the military component might by now be somewhat alcoholically stimulated we went early to Splash and hid ourselves at the rear of the auditorium. In came our friends all weaving around and in high spirits. One walked straight off the edge of a stage and plummeted to the floor. He was fortunately sufficiently relaxed that his friends merely replaced the bottle in his hand and he staggered onward apparently none the worse for the drop. Some money

must have changed hands because the group of about forty or fifty young military men were ducted to the front. Soon it became obvious that their interaction with the show would become part of the evening's entertainment.

The music struck up and a series of scantily clad lovelies appeared on the stage. A low growl emitted from the brutal and licentious soldiery who rose as a wave and attempted to assault the stage: they were restrained by several security men who appeared from the wings with clubs. And so it went on. With our chums attempting to take part in the entertainment and being physically restrained, sometimes projected physically from the stage: all good sport for us observing from the rear. What can you expect when you coop a gang of healthy young men on an exercise for two weeks and then unleash them into Las Vegas, that great whore of a city? Bible readings and trips to museums? I think not.

So on that memorable high spot, the British delegation made its way back to the hotel and hence returned in stages to the UK.

I cannot think of another place to put this story although I know we went back to Nevada Test Site again with another exercise later. One of my chums in the US Nuclear team was concerned with the technology associated with the testing of Nuclear Weapons. He told me this story. When the Nuclear Test Ban treaty came into being, a full blown Soviet Test Ban Team came to Nevada to check that the US side were obeying the rules as far as the Treaty defined.

The Soviet Team consisted of a number of technical gentlemen but also, rather obviously, a number of gentlemen in Trench coats who came from the KGB. The idea was that the team should inspect the tunnels that the US used to test their nuclear weapons. Full of suspicion that whatever they were shown would be a Capitalist trick, the Soviet team turned up at NTS.

“We wish to see the tunnels.”

Fine. They were conducted to each of the locations they were allowed to see under the terms of the Nuclear Test Ban treaty. Every location was carefully examined and recorded. The week of the inspection drew to a close and all the work of the Soviet inspection team was completed. The job was done, the Soviets were due to return home in a couple of days. The US technical side was accompanied by some politicians from the State Department. So what would be more natural than to entertain your guests with an evening out in Las Vegas, the closest city down the road from NTS? The US offered to entertain their guests, the US technical members of the team looking forward to a night out on the Government.

“What would you like to do in Las Vegas, courtesy of the US Government?” said the man from the State Department.

The Soviet team went into a huddle along with their political advisors and came up with an answer.

“We would like to see how the average American lives.”

Bum, thought the US souls. So how do you show a visiting Soviet team how the average American lives? Someone thought a trip to the local supermarket would be a boring but typical thing to do. So they piled all the Soviets into a series of cars and took them to a large Safeway store in the suburbs of Las Vegas.

The Soviet gentlemen were led out and conducted around the large store busy with Americans doing their weekly shop. It took all of ten minutes but they soon gathered into a huddle with their political advisors and a spokesman declared:

“Very clever. We do not believe this is typical of how the average American lives. You have laid this on for us especially as a Capitalist plot.”

Pardon? The US side were perplexed but someone sharper than the others came up with a solution.

“OK. Everybody back in the cars. Which direction do you want to go? North, south, east or west?”

There was consternation in the Soviet ranks but a decision was made. East. So the convoy went east. Another decision point. North, south, east or west? Again a decision was made. This went on until one of the US team spotted another Safeway store and in they went.

The Soviet side went around the store in awe and again went into a huddle soon after.

Their spokesman said, “We don’t know how you managed it, but we still believe that this is a Capitalist plot and that this is not how the average American lives.”

So the whole process was repeated. Back into the cars. Decisions made on the direction of travel by the Soviet guests and finally yet another suburban Safeway store. In the meantime one of the State Department men had been in contact with his masters.

“Could I have authority for about \$100 worth of expenditure for each of the Soviet guests?” This was most uncharacteristically granted.

At the next Safeway store, each Soviet scientist and KGB man was provided with a shopping trolley and told that they could fill it up courtesy of Uncle Sam. They looked bewildered at this but soon were wandering around collecting all the goodies in a wonderland the like of which they had never seen in their home stores. Off they went back to the Soviet Union with suitcases bulging and that was the end of that Test Ban treaty inspection.

Six months later the US technical specialists went to Siberia and examined the Soviet test areas. Not quite the same entertainment value but they met up with many of the souls who had visited the US and there was some interplay between them

A year went by and the Soviet team, some the same as the previous visit and some new men, appeared at NTS.

“Right, gentlemen. We assume that you wish to inspect the test tunnels as last time?”
“Sod the test tunnels”, came the cry, “take us to Safeway!”

In our cups some time later, my friends and I hypothesised that a new form of Maginot line could have been used during the Cold War. Instead of large fortified centres, bristling with guns, to defend democracy against the ravages of Communism, put a defence in depth of massive hypermarkets. Provide each with large numbers of free shopping trolleys. Intersperse these with whore-houses stocked with well-subsidised ladies. Your enemy would not make twenty miles!

Chapter 31

Time for Mike to make a reappearance. There was to be another ABCA-5 meeting in San Diego and we needed to send a representative: I do not know why I did not go, perhaps I was busy. Much against my better judgement, Mike was put in the frame by Cliff. I mentioned my unease after Mike's last experience in the US but was over-ruled.

"Mike is very experienced and should be given the chance to expand his interpersonal and presentational skills," said Cliff.

I still had this niggling fear of an outbreak of World War Three with the US brought about by a well-meaning misguided missile called Michael.

The conference was held on the Naval base at San Diego and, in consequence was a very dry affair in more ways than one. This went against the grain for Mike and for the Australian representative. So a farewell party was arranged at a nearby bar. The Aussie chap was a solidly built Naval clearance diver who clearly felt that there was some element of national pride attached to a final drinking session. One solitary Canadian and a single member of the US delegation joined the party and they steadily assaulted a series of bottles of Budweiser and similar. One by one, the contestants fell sideways leaving only Michael and the Australian in the frame. Finally even the Aussie called it a day and said his goodbyes to Mike, his now declared bosom companion.

Mike decided to head back to his motel. So he got out the car keys (yes, he will never learn!) and headed off up the Interstate. Now where have I heard this sort of story before? He remembered vaguely the junction that he needed but was not absolutely certain. He could also remember that you could see the motel from the Interstate. So he drove carefully along looking out for the desired junction and the even more desired motel. He had just passed a junction he vaguely recognised when he saw the motel passing by on the right. Damn!

No problem. It was simply a case of getting off at the next ramp and passing underneath the Interstate to rejoin the highway heading south. Mike looked for the turn off, found one, dived underneath the road in one of those complicated cloverleaf affairs which seemed to go in every direction except for the one that he wanted and headed for what he hopefully assumed was the direction which would return him from whence he came. He found himself in someone's front garden.

Smiling sweetly to avoid a confrontation, Mike did a nineteen point turn in the, to him, large US motor and tried again. The junction seemed to go in every direction with roads leading off at all angles: none was clearly marked for the Interstate south. Eventually he was faced with a red light on to a ramp that to his befuddled mind seemed to be in the direction he required. The red light did not seem to want to change (all those who can see where this is going keep quiet and do not spoil it for the rest). So after about five minutes, Mike pulled cautiously past the red light and ascended the ramp. Almost immediately he was aware of blue flashing lights in his rear view mirror. History was repeating itself!

The Interstate Trooper was writing the ticket. Mike had been riding down the left lane on a dual carriageway towards the on-coming traffic etc, etc.

"Damn," said Mike. "You'll never believe this but exactly the same thing happened on my last trip to the US!"

"You make a habit of doing this" said the Interstate trooper in amazement. "Where are you going?"

“Well, actually,” said Mike in his best English accent, “I can see the place from here. It is that motel over there”. He pointed across the complex junction to the aerial sign that was, in fact, visible from their location.

“Do not move. I need back up,” said the State Trooper still in shock. With that he got on to his Headquarters and soon there arrived black and whites in profusion. They effectively shut down the entire Interstate Highway junction so that Mike could take a direct route across the carriageway over the centre reservation and down the ramp that took him directly to his motel.

Not only had Mike caused total chaos to the US transportation system once more, yet again he had escaped Scot free when it had all gone horribly wrong!

The conference was over and Mike had one more visit to make. He was to travel to Livermore, roughly fifty miles inland from San Francisco, one of the key US Department of Energy Laboratories specialising in, amongst other things, robotic vehicles. You can see why this might be of interest to us. Now, we poor mortals, had assumed that Mike would return his car to the airport, would fly to San Francisco and then use another hire car to travel out to the labs. Mike did not like simple solutions. He reasoned that bastard Hubbard had been very reluctant to let him go to the States again for some reason. Hence this was quite likely to be his last trip over this side of the pond. Hence it was incumbent upon Mike to get the most out of the trip and see as much as he could. Obviously you can see very little from an aeroplane: ergo Mike would drive. There was this small matter that the journey was a mere 600 miles but distance seems shortened over in the States and anyway, he had a whole day set aside for the journey so why not? Then Mike’s wonderful logic cut in. He had already had one brush with the law. The US seemed to drive all over the place and they had this strange insistence on driving on the wrong side of the road, which was very off-putting. Hence Mike would drive at night when it would be quieter.

I know. Make the decision to drive because you wanted to see the scenery and then drive at night but Mike is Mike and there is no arguing with the man when he has made his mind up.

So Mike set off north up Highway 101 driving along happily seeing the road signs of passing towns and the lights but seeing very little else. Mile followed mile and hour followed hour. This was the time of the 55 mph speed limit all over the US and a six hundred mile journey was going to take at least ten hours even by the most basic mathematics. Mike was beginning to nod when he had been going for six hours and there was still a tremendous distance still to go. He was aware of his tendency to go to sleep so wound down the window. That did not help much as the warm desert air was scarcely designed to keep you awake. He turned up the air conditioning and blasted the cold air on to his face. Onward with the highway signs looming out of the darkness and disappearing behind him. The strains of Hotel California came into his brain and played over and over again, “On a dark desert highway, cool wind in my hair”.

Mike found himself dropping off into micro-sleeps. This was not good. He decided that he needed to frighten himself to keep awake so decided to speed up. His logic was that if he went very fast he would be frightened and the adrenaline would keep him awake. Not a logic I would subscribe to but what the hell! After a time of this the effect wore off so Mike decided that the only solution was to pull off at the next town and get his head down for a couple of hours.

A small town was indicated off to the right so Mike pulled off, found a dark alley away from the street lights, pulled out a beer and settled down for a couple of hours sleep.

He was awakened by someone banging on the window. Befuddled by sleep, he wound down the window faced by a large individual in a helmet pointing a flashlight directly into his eyes.

“Excuse me sir. What are you doing here?” said a dark brown voice.

Mike fought his way back to consciousness.

“I was driving up the Interstate but felt tired so decided that it would be safer if I pulled off the road, found somewhere to sleep for a couple of hours before continuing on my journey,” said Mike truthfully.

“That is very commendable sir. However, do you know where you are?” said the dark brown voice.

“I am afraid I did not notice the name of the town,” said Mike carefully.

“You are parked in the Police yard sir.”

Dear Michael. Ever capable of making the right decision. As always, he talked himself out of this situation too and eventually made his way to Livermore, completed his business and got back to the UK. To those interested in such things, yes I did let him out of the country one last time and there is yet another tale of Mike and the Americas to come.

Chapter 32

There was to be a conference on terrorism at Quantico, the FBI academy south of Washington. It was the first time that the US had agreed to host this conference, which was normally hosted by the UK at the RAOC base at Deepcut. Directly afterwards there was to be a meeting of a strange organization called the International Association of Bomb Technicians and Investigators, IABTI. A chum of mine was a senior member of the IABTI hierarchy and had inveigled me an invitation to speak at the conference. This presented something of a problem to me as the whole way that the US organized EOD was different to the way it was organized in the UK.

In the UK all counter terrorist EOD is conducted either by the military or, solely in the London area, by Metropolitan Police Explosive Officers who are all ex-Military EOD men. To conduct any form of EOD you needed to be licensed and there are all sorts of controls to ensure that people are competent, mentally fitted to the task and are aware of the latest developments in technology. As everyone involved with EOD is either military or ex-military, they all understand about the sensitivity of classified information. Giving a presentation to them on the latest of our toys was therefore not a problem.

None of this was true in the States. Improvised Explosive EOD was not a national responsibility but was conducted on an indiscriminate basis by the local Police, Fire Department or anyone else who cared to put up a sign saying they were an EOD man. Some were very good with the highest degree of dedication and commitment. But some were not. There was at that time no national standard, no compulsory training and no nationally acknowledged EOD authority. About the only common theme was their professional body, the IABTI. Their conferences for some reason which would become apparent when we arrived were generally in some major holiday destination and this one was no exception: Orlando in Florida in a luxurious holiday hotel, the Sheraton World.

I am afraid the IABTI did not have a good name in our domestic community. The organization did not have any full time employees except for the editor of their journal, the Detonator. This caused

us all sorts of grief as it was a source of such useful tips as how to make a bomb which was triggered by an X ray set. Anyone who was prepared to pay the subscription to join the IABTI obtained the Detonator. It was an International organization and anyone, or even any Government organization like ourselves, with \$40 could join. It did not seem a good idea to us to send out such information in a completely unclassified publication to such an unrestricted audience. It was the National and even International equivalent of shooting yourself in the foot on purpose.

An invitation to speak to the IABTI presented me with a problem. I could not give them classified information as it was an unclassified conference. With no classification what could I discuss except the weather? I thought long and hard and decided the one thing that I could discuss with them was the safety of the various mixtures used by terrorists. Surely they would have a Darwinian self-interest in the safety of the mixtures that they might come across? In addition, for the specialists like myself in the audience, if there were such creatures, knowledge of the sensitiveness of the mixtures was actually a fundamental aspect required for anyone designing EOD equipment, so this was actually being as helpful as I could be. Even so I was very careful to have my paper written in its entirety beforehand and had it peer reviewed and finally cleared by the appropriate authority as an unclassified paper.

I travelled over to Washington on the RAF VC10 flight from Brize Norton. Hence I arrived late Friday, after a slow westward crossing and booked into my usual hotel in Alexandria. Flying Crabair had various disadvantages, such as no booze on the flight at this stage, but it did mean that we had the weekend in Washington to get used to the time zone. I therefore set about my usual excursions to visit museums and art galleries in the city. What with jet lag and general indolence, I was half asleep outside the Corcoran Art Gallery in Washington on the Sunday morning, waiting for it to open. I was dozing in the sunshine to be awakened by a dark brown Ulster accent saying my name, "Peter Hubbard." My subconscious leapt into panic mode. The opposition had found me! I sprang into life expecting my last moment had come. There was the smiling face of Gerry, a Forensic Scientist I had met many times in my trips to Northern Ireland beaming down at me. He had travelled to Washington for the same conference but via British Airways. His taste was similar to mine and he too sought the Corcoran and its pictures. And who should he find asleep outside but his old mate Peter Hubbard. I could have killed him for giving me such a start!

The conference at Quantico was interesting as usual. The same conference had been run in the UK for many years and was hosted effectively by the Security Service hiding behind the front of the RAOC. As it was by invitation only, the Security Service man in charge, a man of immense knowledge of the world of terrorism and with many contacts worldwide, could control who came. As the UK was the host it was a marvellous means of getting a biennial window on the world of terrorism: information on every major terrorist event in the world was presented at that conference generally by the senior officer in charge of that specific event. Therefore everyone with an interest in counter terrorism in the UK could get the most up to date information and the opportunity to talk to the people concerned in the margins. In addition an awful lot of useful work was done in the bars and contacts made and information obtained. Through total stupidity the UK later threw away the opportunity to host the conference on the basis of cost! Bloody bean counters again so ultimately we lost out on all of that information, became blind to what was going on in the world and all to save about £50K a year! God knows how much it cost us in lost intelligence and loss of information but that obviously came out of a different pot of gold.

One of the "events" at the Quantico Conference was a stage-managed arrival of an injured US EOD man. He, no doubt, was a worthy soul but was paraded on to the stage to patriotic music and

everybody standing and clapping. He had been blinded dealing with a bomb in the old fashioned way, taking it apart with his bare hands. The bomb had gone up, he had lost his sight and a good deal of his hands: general applause for a brave man injured in the line of duty even if there were much better ways of dealing with the problem. Another of the presentations was from a man from the FBI showing a police team dealing with a bomb at some location in the US. The bomb was a very simple criminal device not at all in the same league as the things that the Provisionals were throwing at us. The film showed about six of the US bomb team standing around as one of their number attached a line to the bomb, and lowered it into a bomb bin, a totally pointless US invention, the bomb getting snagged on the side of the bin and someone reaching over and shifting it with his bare hands. Total madness!

At the Quantico conference there was also talk of an alarming trend appearing. The US had always been more inclined to litigation than we are in the UK. With a much lower incidence of bombs, nearly all of which were simple criminally motivated devices not at all as sophisticated as those encountered in the UK, the US were losing a considerably larger number of EOD men injured and killed in the line of duty. The survivors or their heirs were therefore suing all and sundry for millions of dollars in compensation. Just two or three incidents had clocked up about 8 million dollars. One of the lines pursued by their lawyers was that the people doing the job were inadequately trained, inadequately equipped and were sent into the field with more concern for property than personal safety. From what I knew of the US scene, I could fully sympathise with that line of reasoning.

The authorities who took a Federal view, the Army, the FBI and the BATF, decided that there should be some attempt to correct this trend towards litigation. At the same time, there should be a concerted US National attempt to set standards for training, equipment and levels of competence for all EOD men for their own good. Therefore there was the suggestion made by the Federal authorities that anyone being accepted for training at the Army's EOD school at Huntsville, Alabama (and this was not a compulsory item in the armoury of a US EOD man) should have a written undertaking from their employer, whoever or whatever they were, that the person undertaking training should be supplied with:

A bomb suit

A disrupter (not specified)

A demolition kit

Now I innocently thought that the IABTI as the US EOD man's professional body would have welcomed this with open arms. The standards were pitiful by the standards of the souls who practiced EOD in the UK but they were a start. Did the IABTI support this move? Did they hell. As far as most of the old stagers were concerned this was Federal interference in what should be a State, County, or City matter. There seemed to be a feeling that disrupters and modern technology somehow took away from the macho image of the profession. Who the hell were the Government to tell them how to take bombs apart?

I arrived in Orlando after an appalling journey through thunderstorms and high winds. I eventually made it to the hotel, more dead than alive to find that Rosemary, my wife, had arrived safely from the UK. As this was an unclassified conference, a rare commodity in my line of work, this was the

first opportunity for Rosemary to join me at an overseas conference. Our three boys had been deposited on to relatives and we had dragged together the funds to get Rosemary over the big pond for the first time.

The Hotel was very pleasant with beautiful gardens, swimming pools in profusion and access to all the delights of Orlando with Disneyworld, Universal Studios, Seaworld and other attractions to hand. God knows what the other inhabitants of the hotel thought was going on at their hotel as the car park was stacked full of trucks from all over the US with Bomb Disposal signs all over them. In the UK we tend to be rather reticent about advertising the nature of the profession but in the US, without terrorist threats at that time, much more kudos was generated by having the boldest and brassiest signs advertising the status of the occupants.

My paper was to appear in the middle of the week but I dutifully attended the other sessions while Rosemary sun bathed and enjoyed the facilities of the hotel. The conference was held in one the conference suites. At most of the talks, the hall was reasonably full but the only time that it really filled up was during the breaks. At these there were raffles but raffles of a type I had never seen before at an English conference. Anyone who was interested put their name on a dollar bill and it went into the hat. The prizes were such things as .357 magnum handguns, thirteen shot automatics, 50 rounds of ammunition, hunting knives, etc. Just the thing to take home to mummy or the UK customs. Strangely enough I declined to join in: there was not much point as I could not take them back even if I was inclined to do so.

Rosemary and I enjoyed our time in the hotel being mistaken for a honeymoon couple by the waitress in one of the restaurants: she got a big tip! On the evening before giving my paper we patronised a Red Lobster, a normally excellent chain of seafood restaurants. Something disagreed with me and I spent most of the night being very ill. Feeling distinctly more dead than alive, I staggered rather woodenly on to the stage, was fitted with a microphone and started my talk. I had decided to stick exactly to the script that was cleared but could not resist adding two or three lines before the start.

“I have been interested to hear the debate about the proposal for all employers of EOD men to sign an undertaking to supply minimum standards of equipment to all those attending training at the Huntsville School. Frankly by UK standards the level of equipment proposed is barely adequate and I am amazed at the concerted IABTI resistance to this move. If the majority of the US EOD community still consider that it is somehow more macho to take bombs apart with their bare hands then they are dinosaurs. And we all know what happened to the dinosaurs.”

I finished my talk and could see that the vast majority of the audience were eye-glazed and totally disconnected with what I was trying to say. They did not see the relevance and, I admit, I was not at my sparkling best. For whatever reason, I was never invited back to speak again.

Chapter 33

Time for Michael and the whale. Cheers from Mike's supporters as this story is one of their favourites and was recounted at his retirement do. In fact he was presented with a little plaque on which was mounted a small but definitely identifiable whale.

Mike and his usual crew of reprobates were off to Yantlet, an Army range on the Thames estuary that we occasionally used as it was relatively close and cheap, i.e. it cost our project money nothing if we could get on there on a day when the Engineers were not using it for training. When they

arrived there was a large and very dead whale washed up on the beach. Beach! Tidal mud really. Mike walked all around the dead beast and decided it was his environmental duty to do something about this festering heap of blubber forgetting entirely that he had gone to do an entirely different job.

For once in his life, he sought some authority for his actions. He rang up the Port of London Authority which may sound strange but their authority does stretch almost to Southend. Mike offered, with absolutely no authority himself of course, to get rid of the dead whale. Once the official had discovered that it was not going to cost them anything, Mike got permission readily enough.

Now Mike is a good explosive man and knows that explosives act far more efficiently when they are placed inside the target. Therefore he needed some way of inserting his charge inside the very dead whale. Not having a large filleting knife or harpoon with him, he had to improvise so wandered off to a length of barbed wire fence and cut free a six foot length of angle iron. Armed with this he stalked back to the whale and gave it a tentative prod. The rather blunt angle iron merely bounced off. In for a penny thought Mike and threw the angle iron harpoon at the whale with all his might.

Sploop! An enormous outrush of rancid, evil smelling whale innards spurted out of the gash in the whale's side all over Mike. The rest of the team hooted with laughter, the way that they do when something unfortunate happens to the boss and backed away as he smelled none too sweet.

However, Mike was not to be put off and worked away enlarging his incision getting more than liberally covered in the most evil smelling mess imaginable. Eventually he had a workable breach in the defences and placed about twenty pounds of plastic explosive inside. Now strangely enough there is nothing in the Military Handbook of demolitions about filleting whales. Therefore Mike used the usual Military formula that is used when there is any doubt which entails using P for Plenty. So in went another twenty pounds.

Everybody then went back a considerable distance but stood outside the bunker to observe the effect as you do not see forty pounds of explosive going off inside a putrifying whale every day of the week. Bang went the charge, distributing large quantities of smelly whale over the surrounding countryside but leaving almost a complete half left on the skeleton. Whale filleting big scale! Mike, never one to leave a job half done, returned to the carcass and applied another forty pounds getting himself even more liberally covered in the terrible goo. As he said at the time, once you have got so far you cannot really quit.

The second bang did the business and the whale was reduced to a pile of shattered bones and an area that would have competed with a sewage farm on a sunny day. I think by general consent Mike travelled home alone and must have got rock all from his wife when he arrived. Somehow not the sort of thing I can imagine happening these days with our over specified lives, bless him!

Chapter 34

The next tale is multifaceted, which is a clever way of saying it is very complicated. It starts back in the 70s with a gentleman who has featured several times on the periphery of my career. This gentleman, and I will call him Dr X, wrote a letter to the Prime Minister suggesting some ideas that he had for making bombs safe. Normally such letters from well-meaning souls are a pain in the proverbial as they generally do not provide anything that we had not thought of or are so ludicrous

that answering them, which we are required to do, only detracts from the task in hand. I am put in mind of the dear old lady who suggested in the Second World War, that anti-aircraft guns should be mounted on clouds then they would have a better chance of shooting down Doodle Bugs, but I digress.

Dr X's ideas had some merit however, but there were overtones that suggested that he needed to be kept at arm's length as far as official secrets were concerned. For example, many of the explosive experiments reported appeared to have been performed in the garage of his rented accommodation. Another member of the Exploding Kind with rather strange ideas of normality! Therefore it was considered expedient to set Dr X up with legitimate explosive facilities at a firm that worked with Pyrotechnics and small explosive devices. Contract meetings were interesting as my Section Leader instructed me that no information on our programmes was to pass to Dr X while we monitored what he was doing using our Contract money.

Dr X was an interesting man, very short and wiry, with a mass of white hair, a facial twitch that took off when he was talking in an animated fashion, which was almost always. Dr X wheedled and cajoled trying to find out as much as he could about EOD on the inside but we managed to keep our secrets mostly away from his commercial gaze.

Eventually we came to the end of the contract and we received a report on the experiments that he had conducted for us. Amongst these were the very first beginnings of what came to be one of the more important corner stones of our capability against Improvised Nuclear Devices. However, as has been explained previously, Alan, the scientist responsible for checking his claims, found that they were exaggerated by an order of magnitude and it required a lot of careful experimental work to change the Model T Ford we had inherited from Dr X's contract to the Lamborgini that we ultimately used to prepare ourselves for the dreadful day of judgement when we might have to take apart a terrorist nuke.

Dr X existed on the periphery of our classified existence, making a living from explosives in the commercial world. He was always suspicious because we had never followed up the original contract with further employment for him and he grew to suspect that we had used his research to produce equipment that was being used in Northern Ireland, which, of course, we had not. He became fixated with the view that his work had saved the country millions of pounds and hence he was owed thousands of pounds as a reward. He wrote to his MP saying that he was being deprived of his dues and an investigation was instigated by the Patents Office to see whether we were contravening any of his patents. Although it was clear that we were not using any of his ideas for Northern Ireland, we had to admit that the devices we had developed for use against Improvised Nuclear Devices did owe their inception to his original concept. As he had been clever enough to put in his report "Based upon an idea that I had prior to this contract" he owned the Intellectual Property Rights to the concept. However, monetary reward is usually based on how many of the devices based upon that idea or concept are used and we had never, fortunately, had to use any of the devices in anger. To be fair to Dr X, his original work (for which he had been paid) had saved us about a year's work by a Higher Scientific Officer, about the level of a recent Post Doctorate recruit. So we compromised and paid him the equivalent of the cost of that year of HSO's effort, about £50,000. This made me smile because Mike, Terry, and a host of other souls including myself working in the field had saved the country hundreds if not thousands of millions of pounds let alone tens if not hundreds of lives and no one had thought to give us £50,000 for our ideas. But that was different, apparently.

Now cut to another aspect of the tale. It was usual to use Universities as sources of research of the unclassified aspects of some of our work. We could generally do this quite safely by divorcing the application from the phenomena under investigation. The research would provide us with a better understanding of how some of our ideas and equipments worked, allowed us to improve them and develop other concepts from them. The work also financed some young postgraduate's Doctorate so everybody won. Finding Universities that could conduct experiments with explosives was not easy but we did manage to establish a productive relationship with my old University at Sheffield. The experiments were conducted at Buxton, in the grounds of an establishment that also housed organizations concerned with research into the behaviour of hazardous materials so not too much different to our own interests.

In the mid 1980s we gave Sheffield the task of examining some of Alan's charges and they did a good job of discovering some of the important aspects that made them able to do what we required. To do this they used all sorts of high-speed cameras and instrumentation to measure and record the events which strangely enough tend to happen rather rapidly when you use explosives to do things. We therefore received an application from Dr Alan, (too many Alan's in this tale but this gentleman was the supervising Scientist in charge of the work and the Senior Lecturer at Sheffield concerned with the work) who wanted to publish a lecture at a Conference to be held at the Royal Military College of Science at Shrivenham. The lecture was to concentrate on the high-speed instrumentation part of the contract work but we did not consider that the details that would come out about our charges would be a problem provided there was no link to what we used them for

A few days before the conference, we discovered that lurking in the audience would be one Dr X. Panic! Everyone else in the audience would listen and learn something about high speed instrumentation. Dr X would potentially learn all about how to change a Model T Ford into a Lamborgini. We decided to pull the lecture as the only way to prevent knowledge of our national capability filtering through into the commercial sphere through a gentleman over whom we had no control.

Weeks passed and suddenly I was summoned to higher authority. Dr X had written to the Prime Minister, at that time Maggie Thatcher, to say that there was a conspiracy to prevent him from obtaining his true reward for services to the Crown (see above). The net result was a Prime Ministerial Enquiry. This is not a lot of fun for the poor unfortunate under investigation (me on this occasion). A senior Civil Servant was appointed to investigate the claim. All files relating to the case were removed by him and I was questioned about my involvement with Dr X.

It went something like this. The investigating senior officer would come along and say.

"There was a meeting in November of 1975 involving Y, yourself and Dr X. What was discussed and agreed?"

Now this was 1987 and a lot of water had flowed under the bridge in the meantime. Can you remember what happened at meetings twelve years before without access to the file? I tried to remember what had happened to the best of my ability and recounted not just my memories but the rationale behind our stance.

The Senior Officer would never give any indication whether he was satisfied with the answer or not. He just made notes and went away to return with more questions later.

As the Prime Ministerial Enquiry continued, so I got more and more despondent. I discussed things with dear Cliff, still my Superintendent. His advice was clear.

“Don’t tell them anything! Anything you say will be used against you. Tell them absolutely nothing. Plead the Fifth Amendment.”

I had the somewhat innocent view that I felt I had acted in good faith, had not intended to do down the learned Doctor and had been protecting information vital to the Country’s interests. Still, it did not look good.

At this lowest of nadirs, I came home one evening. On the mat awaiting my perusal was a letter marked “Urgent. Prime Minister. Personal.”

My God! Maggie wanted to see me and rip my balls off personally. I ripped open the envelope, which interestingly had the imprint of a size ten boot upon it, perhaps giving some indication of the postal service’s opinion of the Prime Minister.

“Dear Mr Hubbard. Would you like an O.B.E.?”

One of my sons had the unusual spectacle of his father leaping into the air, whooping. I discovered that Rosemary was at our Dutch neighbour’s house so hurried around to her and, sweeping her into my arms, told her the news, thus breaking the first injunction contained in the letter that no one should be told of the citation.

Not only was the honour much appreciated as an indication that all my effort put into bomb disposal research was acknowledged, and I later learned that the nomination had, unusually, been triggered by my august users not by my employers, but it also declared that Dr X had not won. I thought that there was no way that the Establishment would reward me with an O.B.E. one minute and hit me with a disciplinary hearing the next. (From recent events (2003) perhaps this is naïve as the Establishment’s ability to shoot itself in the foot or not know what the right and left hand are doing is increasingly apparent).

With the news of my appointment to the ranks of the Excellent Order of the British Empire bubbling in my brain, I was faced with another dilemma. My Father was ill and receiving treatment. At the time we did not know how ill as both the Doctors and he kept it from us but, in fact, he had cancer. If I stayed strictly within the terms of the letter from the Prime Minister’s Office, I should not tell even my parents that their first born was to be honoured in the New Year’s Honours list to come. But the idea that he might die never knowing was too much and so we went over to see them and let the cat out of the bag. I hope he was pleased but it was never easy to tell with my old man. I think he was.

Then it was just a case of waiting for the New Year, having to bite my tongue when I met friends that I was dying to tell about the honour. Somehow I expected the announcement, or whatever happened as I had no idea, would be made on New Year’s Day. But for some strange reason the honours appear on the day before. Therefore it was when Rosemary had wandered down stairs to get the tea that she returned with the papers with an announcement

“Here it is!”

I also expected large numbers of congratulatory phone calls but not a sausage. However something did start to happen. The whole family went for a walk down to the town. On the way up the hill to our house, we were stopped by a nodding acquaintance.

“Is it you in the papers?”

His wife had spotted the name. Work was not due to start until three or four days had gone by. I walked in at the usual start time of 0815 hrs to our tea room, the centre of the known Universe.

Again, not a flicker. I brought out a magnum of bubbles. Some small signs of interest in my booze oriented crew. One of the brighter souls in the organization, Andy, had spotted the announcement and had come armed with a tape of my beloved Goons.

“Please find enclosed three O.B.E.s. Try and get shot of the other two!” Andy and Hans, another of the crew, walked around with cardboard medals saying they were N.B.E.s

The next nice thing was the letters: letters from my friends and colleagues saying how pleased they were for me. There were also letters from senior officials who presumably tell their PAs to “send this bum the cockroach letter” or the equivalent.

The letter announcing the presentation offered me two options: either I could travel to London on allowances and they were offering second class returns for myself and one guest, or I could travel to the Palace in our car. Now the prospect of travelling up to London in rush hour, dressed in my hired finery of Morning Dress, surrounded by all the commuting public, did not for some reason appeal. Get real. So I decided that we would drive to the Palace. The next problem was that we were to report to a specific gate at the Palace at a specified time. Fine. But which gate was it?

Working on the military principle that reconnaissance is seldom wasted, I went up to town after a meeting and headed down the Mall. It was pouring with rain and my new floppy fedora was suffering from the downpour. I approached the gentlemen on the gates of the Palace, told them of my dilemma and they very kindly pointed out the gate that we should approach on the day.

The next problem was a domestic one. The letter inviting me to the Palace said that I was allowed to take my wife and two offspring or my wife and one guest. Now with three sons choosing two of them and leaving one out did not seem fair. And with both parents alive, taking one but not the other was also a problem. I eventually decided that there was no way that I could take only two of my sons, who were young and did not know what the hell it was all about anyway, so it had to be Rosemary and one or other of my parents. But which one? I capitulated and told my folks that I could not decide so would they please do so for me?

The result was that they decided that my mother would come to the Palace and father would stay behind. In fact, nobody stayed behind totally as the other element of the day, where to go after the Palace, came to the fore.

If your Monarch is going to give you a medal or badge which is the technical term, then it seems a reasonable thing to celebrate. If to appear before your Monarch you need to get yourself up in all sorts of fancy dress, i.e. Morning Dress, then that does somewhat restrict the number of locations that you can reasonably appear afterwards. Somehow turning up at MacDonalds dressed in Morning Gear and sporting a medal, did not seem appropriate.

I examined the options and decided that Simpson’s on the Strand was a suitable location for the post presentation festivities. I rang them up and made a booking. Just before the off I received a rather plaintive call from them saying effectively “You do intend to turn up tomorrow with your party of ten, don’t you?” I assured them that I did.

So, all things arranged, we set off for the Palace. I am a stickler for time and hence we arrived in the Mall with time to spare. As we drew into the curb, other souls dressed in Morning Dress and obviously prepared for the big day, were in evidence. Good.

At the appropriate time we moved down to the Palace Gate and showed our letter and invitations to the smiling policewoman. Everyone smiled that day which was lovely. We parked the car under police supervision and were told to stay with the car, releasing bonnet and boot catches. A

policeman in natty blue overalls with POLICE on them checked the car carefully. Clutching my hat, I said goodbye to Rosemary and Mother as they headed for signs for guests.

I followed signs for recipients. Up the red carpet to be greeted by a very old soldier who checked my letter: I was then in a marble hall with a very high ceiling. Next I was guided politely but firmly to the gentlemen's cloakroom to leave my hat in return for a plastic tag. Now for a final visit to the Gent's loo, a splendid affair with a full complement of hair and shoe brushes. A final check on appearance was made and then out, round the corner and up the wide staircase. Not that I have any experience, but it was as close as I could imagine to the ascent into heaven based upon such films as "A Matter of Life and Death". I passed Life Guards standing absolutely motionless. Further members of staff, everyone still smiling, passed me on. Finally a discrete enquiry "O.B.E. or M.B.E., sir?"

Having given the correct password, I was ushered to the left. For the first time I had my name checked off a list. The room was long and with a high ceiling not unlike the galleries in the National. The similarity was enhanced by the pictures on the walls. There was a full length portrait of Charles I on horseback and many others from the Queen's collection that I recognised.

On at least two other occasions, our names and the order we were queuing were checked. An Equerry then ran through what was to happen, how to bow and how to address Her Majesty. Then we were led through to the edge of the Small Ballroom where an orchestra was playing light classics and show tunes. The instruction was to wait at the side of the room when your turn came until your name was called. A Group Captain was stood there as a sort of marker, stiff as a ramrod and staring off into the distance. I walked up to him, smiled and wished him "Good Morning". His face cracked into a grin and he responded likewise.

Then my name was read out and I marched as smartly as I could until I was level with the podium, turned through ninety degrees, bowed and walked the four steps forward to bring me level with Her Majesty. She was standing on a raised dais and I still was looking down as she is really quite tiny. She leaned forward and dropped the O.B.E onto a sort of picture hanging hook that had been fixed in my lapel. Behind her another Equerry was obviously tipping her off about why the person receiving the award had got it. For me there was no citation as it was classified. She therefore asked "What do you do?"

"Bomb disposal, Ma'am. My Section is responsible for designing the equipment for the soldiers in Northern Ireland."

With that she nodded and I was dismissed. Mission accomplished, only an orderly retreat required. Walk backwards for four paces, bow and then turn and walk off. The music playing for this appearance in front of my Monarch and my family was appropriately "Fiddler on the Roof"!

As I walked off the centre stage, so I was assaulted by a Palace gorilla who removed the medal so recently given me by the Queen, removed the picture hanging hook and then gave me the medal back in a shiny box with O.B.E. on the outside. It seemed a bit of a shame as I really wanted to wear the damn thing. Still, what the hell!

Eventually the whole magnificent proceedings came to an end and we were allowed out to find our hats and gloves and then for me to find my ladies. When I got my gong pictures and video were not allowed which was a great shame. A chum has recently got his O.B.E. and received, after paying a good deal of money, a personalised video of the event, which is a lovely memento of an amazing experience. Photographs in my time were taken only by an official photographer in the Palace yard. His instructions were simple.

“Go and stand on that drain.” I protested that I did not want a drain cover in my photograph but was assured that it would not show. Every time I look at the picture, I see the drain cover!

I wanted to show my waiting family the medal and they were all standing looking through the railings at the edge of the parade square in front of Buck House. I asked special permission to approach and a smiling policeman said yes.

Then it was away time and lunch at Simpson’s. A splendid day and one to remember all my life. Thank you, Your Majesty.

Chapter 35

There is an unfortunate tendency these days to consider that everything can be done without risk. This is arrant nonsense particularly where energetic materials are concerned but the stranglehold now held by Health and Safety Legislation on current research is paramount. I am reminded of the balance of risk by a story from the Foreign Ammunition part of my empire.

Periodically items of ordnance would drop off the back of lorries in various parts of the world or more accurately be gathered by strange characters in markets or off various battle fields. It was obviously of use to us to know how these items functioned, how effective they were and how to deal with them if we found them in an unexploded state on the battlefield.

On this particular occasion, an item of ordnance consisting of an anti-armour warhead was collected. There was considerable interest as it was a new piece of Soviet equipment, our Colonial friends had not got one yet and hence the value of a first example was magnified. In this game, someone with the first example not only got the kudos of finding out about it but also could use the information to trade with partners in the game for something else they wanted. Sort of like collecting cigarette cards.

The courier arrived with the item not quite wrapped in brown paper and labelled accordingly but nearly. Strangely enough when handling unexploded items of ordnance, particularly of a foreign origin, the first thing one did was to stick it into an extremely expensive piece of radiographic equipment to look inside and see what state it was in. I had developed paranoia over the years, partly from my reading of the literature about similar such operations in the Second World War. On at least one occasion the Germans managed to kill a large number of boffins in the sheds at Portsmouth by including what is known in the trade as “Prevent Stripping Equipment”. The poor souls on this occasion were investigating a new type of parachute mine and were all clustered around a new acquisition when they discovered a little late that it contained a photo-electric cell. My paranoia was heightened later to include precautions against the inclusion of even poison gas and biological agents but I digress.

Our courier was curious about the contents of his package so had stayed to have a cup of tea and to view the radiographs. We used an 8MeV linear accelerator for the initial evaluation which is a not inconsiderable piece of equipment and was manned by specialists used to our line of work. Either Andy or Tony positioned the item of ordnance in the armoured area at the business end of the Linac and retired. The radiographs were taken and I take my hat off to the specialists who did this work for us as they nearly always produced magnificent pictures for us.

These were good. Unfortunately they showed that our courier had just carried an item containing more than a kilogram of highly energetic explosives across about four thousand

miles with the weapon armed and the striker impinging on the detonator. What this meant in layman's terms was that a slight knock in the wrong direction would result in instant oblivion.

Now it is one thing to carry an item of unknown ordnance into an expensive complex in ignorance and it is a completely different set of conditions to take it out again knowing that it was liable to blow up, given the slightest wrong kind of stimulus. We would have been quite within our rights to place a counter-mining charge on the item and blow it up in situ. In fact with the idiocies of the current Health and Safety Policy extant at the Fort, that is what is probably what would happen now. This would have:

- a) Lost us all the information on the item under investigation.
- b) Lost us all the trading information it would have gained from our allies.
- c) Caused considerable damage to an installation of strategic importance costing millions of pounds.

So we did not do that. We sat and had a council of war. Tony and Andy, my specialists in this field, smoked several cigarettes and discussed options. Eventually they came up with a plan. First it was apparent that anything we did would be done better out of hours. This removed all the non-essential personnel from the site and, with liaison from the MOD Police, meant we could control the area around the device when we moved it. The next problem was actually getting it from where it was, sat in the linear accelerator, to where we could do something, anything, with it. Technically again we should take it to the range and blow it up. But maybe not.

Andy could handle Wheelbarrow very well. Our little remote vehicle was generally used to take EOD equipment to a bomb but it had remote cameras and a variety of manipulators. With modification, we got our Wheelbarrow ready and set out to the Linear Accelerator. Getting it out from the Linac was part of the problem but we then had to take it somewhere for the next step. We had thought of that. A tube was strapped to the front end of one of our Humber Armoured Pigs so that it was oriented vertically. The idea was to place carefully the unexploded warhead downwards in the tube. The driver of the Pig would have armoured protection, any untoward firing of the warhead with its shaped charge capable of slicing through a metre of armour plate would go rapidly into the ground and all would be well.

The first stage went well. The Wheelbarrow acquired the item from the Linac, it was taken carefully outside and positioned in the vertical tube. There was another pause for cups of restorative coffee and more cigarettes for those that needed them. The next stage was more difficult. We could now convey the item to the range and blow it up, saving the Linac from damage but losing our item. Examination of one of our facilities used for disassembly suggested an alternative. We had a special lathe that could be controlled remotely. The only problem with that was getting the item into the lathe without risk to personnel knowing the unfortunate state of the fuzing. So we bored a hole through eighteen inches of concrete and modified a chuck key to operate from the outside of the building.

Deft work with the Wheelbarrow got the item into the remote handling building, and operation of the remote chuck key got the item locked into the disassembly lathe. The item was then carefully subjected to low revolutionary torque and it came apart safely.

The resulting report on the item did earn us considerable Brownie points from our Colonial cousins. I think the courier had to go and lie down in a darkened room for some time and we did make

recommendations about examinations closer to the source of origin from a qualified expert which bore fruit in future. But we won through. I am not sure that we would these days.

Chapter 36

Christmas was coming. Traditionally the Section would seek out a suitable hostelry for our Christmas party, preferably miles out in the countryside, because in those far off days there were closing times at awkward hours just as the party was getting going. A discrete landlord of a country pub miles from the nearest Police Station could be encouraged to be more lenient about last orders: some of our Christmas celebrations started at midday and the last punter went home about midnight.

We shifted allegiance from year to year partly for security reasons but for a considerable time we went to the Harrow at Ightham. We had fond memories of some of our celebrations there and so, when Tony and Andy proposed a private return for a pre-Christmas drink: I was all for it. The landlord of the Harrow was an amiable eccentric, having at one time put down turf in the bar for some unknown reason. We were welcomed as long lost friends and had a jolly time of it. Conversation came around to a splendid punt gun that hung on one wall of the pub. I casually mentioned that I had always admired it and would love to have been present when such a wonderful infernal machine was fired.

“That is no problem,” said our host. “Let us fire it!”

Perhaps you do not know what a punt gun is. Well, imagine a shotgun about ten feet long and with a bore about an inch and a half across. It was loaded with an enormous charge of black powder and shot and then fired horizontally with the recoil being taken by the structure of a punt. The horizontal shot pattern was directed, rather un-sportingly, at sitting ducks, of which, if you were lucky, it killed a large number at one go.

Frankly I did not see how we were to fire the damn thing in a pub. However, I had not accounted for the landlord who looked suspiciously as though he may have been celebrating Christmas a little early and his enthusiasm for punt guns was getting the better of him. Not having a punt to take the recoil, he determined to use the central pillar of the fireplace which rose between the former public and saloon bars. He proceeded to wrap a stout rope around this several times locking the end of the rope into the notch on the butt end of the punt gun. There was a small matter that the fire was well alight in the grate and the only thing preventing it from heating up the punt gun which was thrust through the hole in the chimney above the fire was a large piece of marine 9 ply wood that the landlord had found in the yard and had casually placed on the flames. When the landlord got out a can of black powder and started to shovel a considerable quantity down the bore, I decided that we really had a professional interest in looking after the safety side of this endeavour. Looking roughly along the proposed line of firing I decided that an old age pensioner making love to half of Guinness would perhaps be more comfortable in the Saloon side away from the target area. We also decided that music lovers all, we might move the piano.

Humming gently to himself, the landlord was now ramming a good hand full of shot down the bore. My God! He really is serious. I was only anticipating him firing the damn thing blank. This was going to be interesting. Finally, with the area in front of the gun definitely clear and an improvised lanyard obtained, we were all set up behind the gun and the percussion cap was inserted on the nipple. There was a decided anti-climax when the lanyard was pulled and nothing happened. Not to be outdone, the landlord replaced the cap and tried again. A rolling boom

occurred which rattled the windows and pieces flew from the wood panelling at the end of the bar. Cheers rang out and the smoke gradually cleared giving a heady smell of sulphur lingering in the bar. We had survived. Not content with doing it once, the landlord wanted another go. I was a little chary of this but was over-ruled by a member of our team from Defence Intelligence. He was an Australian, which is as much of an explanation as is necessary. And for some reason he wanted his official Government bag to be included as the target.

The sequence was repeated and the bag perforated. Having decided that repeated bangs, even in country pubs miles from anywhere, were ultimately going to attract attention, we decided that was enough excitement for one day and went back to work.

There was a corollary to this day's work. Orpington Station was the local one used by punters from the Fort making their way to and from meetings in London. One day soon after this particular Christmas, a young Australian scientist, Phil, who was working on detachment in my Section, happened to notice a gentleman carrying an official briefcase with strange modifications waiting for a train. Not having been present at the Harrow but having heard the story, Phil approached his fellow countryman and accosted him with the words.

“Hello mate. I know where you got those holes in your briefcase.” The poor fellow nearly died on the spot! Happy Days.

Chapter 38

The nuclear team was coming together nicely. As I have mentioned before, welding a team from members of the explosive communities of Aldermaston, Foulness and our establishment into a single entity able to work under considerable pressure on something which was both physically and mentally taxing and incredibly important, was not easy. This endeavour was however helped by the quality of the individuals which made up the team. There were some right characters and having people about with a sense of humour when the chips were down definitely helped: sort of the philosophy behind the Exploding Kind in the big league.

The importance of our joint dealings with the Americans who did a similar job cannot be overstated. These were covered by something neatly called “The 1958 Agreement”. After the Second World War, with the US the only member of the nuclear club, there was a general reticence to provide any other country, even the UK, with information on nuclear matters. So we did it all ourselves under the august direction of Lord Penney, as mentioned earlier. Having established that we did know how to make the damn things go bang, the US decided that they might as well talk to us and share information. Thus were set up a number of Joint Working Groups, known as JOWOGs and Sub-Working Groups, called SUBWOGS to facilitate such exchanges. As you might guess, this happened in 1958.

The JOWOG and SUBWOGs concerned with Improvised Nuclear Devices were called JOWOG 29 and SUBWOG 29. Every couple of years, we would hold a meeting and exchange details of progress on our research thus allowing us to force multiply and to discuss results and what these meant as far as extending our capability was concerned. It was during these meetings that it became increasingly apparent that there were fundamental differences in approach between the UK and US Disablement teams. To understand how that difference arose requires some knowledge of the different backgrounds of the teams. Most of the US came from the so-called Weapons Laboratories.

These laboratories: Lawrence Livermore National Lab, Los Alamos National Lab and SANDIA National lab had as their main raison d'être the design and evaluation of the US nuclear arsenal. For years the kings of these places were the hydro-dynamicists who controlled the codes for the designs and the really clever work went into ensuring that not only did you get the maximum amount of yield out of your bomb but that it was as safe as you possibly could make it. Most of that safety came from ensuring that no matter how roughly you treated the explosive element of the bomb, and there is generally a lot of highly energetic material associated with a nuclear weapon, you do not get nuclear yield. Nuclear accidents used to be a closely guarded secret but I recently saw a programme on Discovery channel which gave all the same information that we had twenty years ago under wraps.. There have been quite a large number of accidental explosions involving nuclear weapons: lots of them have been accidentally dropped, involved in aircraft crashes or otherwise been treated in such a manner that the explosive element has detonated. This makes an awfully expensive mess but does not create a nuclear bang.

The US members of the Disablement team therefore came to the party with the fixed view that you could initiate the explosive element of the Improvised Nuclear Device and still prevent nuclear yield, which was ultimately the main aim. The UK team, or at least the our establishment element of it, came from a different background, that of Explosive Ordnance Disposal for terrorist weapons. We held the view that success could only be considered complete if we prevented both nuclear and explosive yield. As I have mentioned before, I also held the view that a terrorist organization would not be constrained by safety in the same way that a responsible national government would. There was not the slightest reason that we could safely assume that the same design principles had been applied to an improvised nuclear device that had gone into a properly designed weapon.

This difference in approach came to a head at our meetings and many would be the arguments about the validity of each national philosophy. As time went by, it seemed to me that we should try and discover who was right, if there was such a definite difference in approach. To do this I proposed that we exercise against identical test devices with exactly the same information being provided separately to both teams. The exercise would be run in real time, independently judged by the Team Leaders Jerry and me, and run to a final test to check the validity of the proposed Disablement Schemes.

The first of these was run at Los Alamos and proved fascinating. Having pointed out that there was this National difference, for practically the first time the US team abandoned their controlled initiation of the explosive element approach and were successful in preventing both nuclear and explosive yield. As a matter of National pride, so did the UK team.

It was an intellectually stimulating environment and the US NEST (Nuclear Emergency Search Team) members who made up their Disablement Team soon became friends that we would eagerly look forward to seeing at such meetings.

They too had characters amongst their number. Inevitably our meetings on either side of the pond had a social side and we soon found ourselves engaged in a sort of culinary guerrilla warfare. One of our number, Ken, loved curries and had the sort of florid appearance I associate with Colonels from the Indian Army so he looked the part. When the US were over in the UK, Ken would take them to yet another Indian curry house he had found that produced a Phal or some other horrendously hot curry and subject them to it. Several of the US came from the establishments in New Mexico, SANDIA and Los Alamos, so thought they could handle the odd bit of chilli. In revenge, they would seek out Mexican restaurants when we were over there and subject us to the hottest kind of Jalapeno or Habenos chillies. This went on for more than ten years until,

one day at a meeting held at our establishment, Paul, one of the wittiest Americans I have ever met in my life, came into the meeting early one morning after a particularly hot curry the night before. He requested a moment before the meeting proper started then brought out a small white flag and a pot of ice-cream.

“Could we please stop this before we kill each other?”

Another member of the US Disablement Team that I had a great deal of time for was Hap. Hap was the Senior Technical Director of one of the Prime Contractors to the US Government on Nuclear Matters. He was also an active and effective member of the team, working the long hours and playing the rough games that went with the trade. It was only when we were discussing life, the Universe and everything over about the fifth or sixth beer one evening that he let slip that he flew Mustangs in the last war! Hap must have been edging 70 then but he lived life to the full and certainly had no time for PC approaches. On the last time I saw him, he entertained me in one of the expensive VIP suites at Las Vegas airport. We had both downed a couple of swift ones before I made my way to the departure gates. As we said our goodbyes he mentioned that he really must get around to paying the subscription to this place!

I have mentioned Jerry before. He was the Disablement Leader for much of the time that I fulfilled the same job for the UK. He was a bit older than me and was physically very large. But he was a gentleman in every sense. On one occasion, he and a few of his band were attending one of the Detonation Conferences that provide a meeting place for our fraternity to discuss matters explosive. I was also accompanied by a colleague in the team from Foulness and one from Aldermaston so we had a quorum. We were sailing down the Columbia river, as you do. Jerry asked if I wanted a drink and when I suggested a Dry Martini, he went off in search of one. He returned with a considerable sized glass clinking with ice. I took a hefty swig. I was damned if I could detect any Martini in the drink.

“Oh, I think there are enough random molecules of Martini in the atmosphere to flavour a really dry Martini!” said Jerry. I was drinking neat Gin.

Although it is out of sequence, I cannot resist telling a story about Paul. Paul is a quiet man, with a wicked sense of humour. He is also a considerable authority on explosives and has written several books on the subject. After the First Gulf War, he was co-opted to be an investigator for the United Nations team investigating whether or not Saddam and his merry men had been making nuclear weapons. Paul’s particular speciality was nuclear fire-sets and instrumentation so he was browsing around test facilities looking for suspicious signs of such activity. He was travelling anonymously on a UN passport and everything had been done to keep all the identities of the UN team a closely guarded secret. To “aid” their activities, they had seconded to them an Iraqi Colonel who was charm itself but seldom spoke except through an interpreter.

Paul was looking through some papers on a desk when he spotted something of great interest. He was just sliding the notebook into his pocket when a cultured voice, redolent of Sandhurst, said “Now. Now. Mr Cooper. The subject of that document is outside the UN mandate. Put it back!” The Iraqi Colonel was something other than just a minder and knew precisely who Paul was.

The US Team members were never too bothered normally about letting people know that they were in NEST. I had great problems in cocktail parties and such trying to get over to them that our membership or even existence was considered classified at that time although it has been avowed now.

Having mentioned Ken earlier, it would be as well to tell a tale about him as he was another gentleman with an Exploding Kind sense of humour. Ken told jokes well with a dry wit and dead pan expression. On one occasion at one of the exercises called MINX, which was the name we gave to the training we gave to the Military members of the Disablement team, we were studiously carrying out an important part of the training, which entailed all getting rat-arsed together. I reasoned that there was initially a reserve between the Military men and these strange boffin characters which was most easily reduced by them finding out that we liked beer, and having fun. If we did have to operate at a moment's notice to take an Improvised Nuclear Device apart, then better we knew them and they knew us as human beings beforehand.

Ken had taken us to a social club of which he was a member in Southend. At a suitably late part of the evening's celebrations, Ken started to tell the Canary joke. This we had heard several times before but the newer members of the military contingent had not. A gentleman who was not of our party got up to leave.

"Excuse me," said Ken. "I am sorry but you cannot leave while I am telling the Canary joke."

Without a word the poor soul sat down and listened as Ken told his tale!

Chapter 39

What with the normal promotions and career moves, it was perhaps inevitable that occasionally I needed to recruit new members to the nuclear team. Now strangely enough the existing members of the team had a vested interest in who else joined the club. If you are delicately stepping around a nuclear device booby-trapped up to the nines, then you did need to be careful. I was not amused when Cliff insisted that the man for the job was Michael! Now I think Mike is a genius. He has a spark of whatever it takes to find a solution to the most intransigent problem. It is just that he is accident prone, if you see what I mean, from the stories I have told about him.

I placed my reservations on record but consoled myself with the thought that Mike would first have to get clearances, the normal way of ensuring that the applicant was a sane, rational being unlikely to run amok with either the information or the experience. Surely the system would decide that his nature was not suited to this kind of existence? What do I know?

One of the requirements for a PV, or DV as it is now known, is referees. You have to identify at least two individuals who will vouch for you. There is a catch: they have to have known you for a specified period of several years and they must not be related to you or be colleagues from work. When Mike came to fill out the extensive form, he had a problem. He could not think of anyone who filled that role without the caveats. So he named his two cats!

He explained that they were the only creatures of his acquaintance who had known him for the specified period who were not blood relations! I would have thought that would have screwed his application, but no. Weeks went by and to our total astonishment, Mike got his clearance and we had a new member of the team. Oh boy!

It was time for one of our exchange meetings with our Colonial colleagues. Fine, I picked my team and we wrote papers to present at the discussions. Mike was promoted into the ranks of my stalwarts so would appear with the other lads. For once, I was allowed to take a good proportion of the team and we headed out initially to Washington by RAF VC10 and then to Livermore in California.

On the flight over Mike showed his mettle by convincing the flight attendants, seasoned RAF Air Quartermasters that we were in imminent danger of collapse if not provided with alcoholic refreshment. Hence we had several small bottles of wine to keep us amused as we flew, somewhat slowly as the VC10 is a good aircraft but not exactly rapid by modern standards, west across the Atlantic. I had chosen the Ramada hotel in Old Town Alexandria as our hotel, from past experience. Hence, soon after our arrival, we walked the mile or so from the hotel by the Potomac to Old Town seeking an evening meal and some refreshment. We found ourselves in a bar called the Horsefeathers and found ourselves involved in a conversation with an attractive Black lass as we sought alcoholic refreshment.

“Ten Special Brews, please” said Michael optimistically. Strangely enough the young lady had not come across this particular falling down liquid. Just as we were settling and deciding what we might eat to accompany the usual weak American beer, the lights all went out. An occurrence quite frequent in the US had occurred. Power is supplied by any number of small local companies and their system does not take kindly to power surges. Hence a complete block had lost power in Old Town Alexandria. We reluctantly left the Horsefeathers as we were assured that they could not provide for our needs. We walked up King Street until we came to a restaurant that still had power. It proved to be a Vietnamese place and we all piled in. Mike had to be sat on half way through the meal as he was heard to be complaining loudly about the cheese in his spicy soup.

“Tastes like sick”, he said.

We eventually staggered back to our hotel and our rest. The next day I had decreed that every one could do their own thing as we had a free day before heading out to San Francisco on the Sunday. I went to see my pictures in the National Gallery. The citizens of the US erroneously think they own them but I know that they merely look after them for me in between times that I can escape over the Atlantic to view them.

Mike had only been to Washington on the one occasion before and had not seen anything of the city. Therefore, when he came down in the lift at the Ramada with some foreign souls he was pleased to accept their invitation to accompany them to a party. Mike therefore found himself with a group of Iranians with whom he spent the day! Oh boy, as I have said before.

The Sunday found all the troops assembled and our flight across America to San Francisco. On arrival we split into groups for the various hire cars and made our way to Livermore, which is where the meeting was to be held. Mike was accompanied by an enormous cabin trunk, almost big enough for him to sit inside. God knows what he had brought with him but the damn thing occupied most of the back seat of one of the hire cars and would not fit in the trunk (boot to the uninitiated). We arrived at our usual hotel in Livermore, a truck stop for itinerant truckers on the outskirts of town but cheap and with certain advantages to us souls on fixed subsistence rates. We were there for a week, therefore the rate was something in the region of 35 dollars a day. The Government gave us \$112 a day, the hotel was over a parade of shops that had a cheap Chinese restaurant and a liquor store. What else could you want? Do not answer that: this is a family show!

We were all somewhat sharp set so I, as team leader, suggested that everyone meet in ten minutes downstairs and we would decide on our evening's entertainment. At the appointed time everyone was there, except for Michael. Now I had decided that, if there was one thing I was certain of, it was that Mike was going to have to learn to toe the party line. Therefore there was little in the way of tolerance if he did not wish to comply with instructions. Therefore, with the rendezvous time set and ignored, we decided that we would all go to the Chinese and off we went.

As you might have gathered, Mike does not go with corporate decisions. Therefore some time later he strolled downstairs to find no one there. Now where have the lads gone, he thought? If he had looked he would have seen that all the cars were still parked outside the motel but he did not. They have obviously gone into town, he thought. So he set off along the dual carriageway Interstate Highway to look for us. On foot.

Cars flashed by in the gathering gloom. Mike trudged along in the general direction of Livermore totally oblivious to the fact that this was not a very clever thing to do. He walked about a mile then decided that he had not the faintest idea where he was headed. He then spotted a sign for the Holiday Inn with its sign now illuminated and not far from the motel. Ah, that is where they have gone!

He headed for the light and found his way from the Interstate blocked by a six foot high fence topped with barbed wire. Not very hospitable, thought Mike. So he climbed it! Down the other side and into the bar, catching his coat on the barbed wire. Strangely enough, still no sign of us. With this he retired hurt and went back to the motel! All of this he recounted to us the next day when we met!

The exchange meeting went well and we learned some new stuff and so did our American colleagues. At the end of the week, it was time to pack up and motor the 50 miles back into San Francisco to catch our 'plane at the International Airport. Mike was supposed to be travelling with me and one other of the team. There was again a problem with his damn great cabin trunk as it would not fit with the other luggage in the trunk. We could get Mike in the car or his luggage! Therefore Mike was to ride with our Military representative Terry, the CO of 11 Ordnance Battalion.

With everyone else ready and us listening to the radio to get the state of the bridges across the Bay which we knew from past experience clogged up every rush hour, we waited for Mike to make his appearance. As usual! He seemed to be the only one who had not paid off his motel bill the night before. Rather than just hang around for him, I motored over to the adjacent gas station to top up with gas as we were rather low and I did not want to run out half way to the airport. Mike came out, panicked when he could not find us, jumped into Terry's car and headed off to the airport, in hot pursuit he thought of us and his case.

We saw the departing back of the Colonel's motor and that was that. Having heard that the Golden Gate bridge was blocked, we chose the San Mateo and headed there. The journey took about an hour and we arrived at the car rental firm expecting to find Mike waiting for us.....and his case. No Michael. Had they gone via the Golden Gate and got stopped in the traffic? With much muttering, we waited for him a while but the time of our flight was approaching. So with even more muttering, we loaded his enormous cabin trunk into the car rental bus and went to the terminal leaving a message with the desk staff to hurry our errant colleague after us.

We waited, and waited but still no sign of Mike. It had reached criticality time as we really did have to get on our 'plane to Washington or miss it and the subsequent flight connection to UK with the RAF. There was nothing for it but to attempt to talk our way onto the flight with Mike's luggage, something technically we should not have been allowed to do as it is against all the principles of air security to do so. Wondering where the hell he had got to but assuming that, like a bad penny he would turn up, we went through into the departure lounge and waited for the flight.

Time for departure. Where the hell was he? With the aircraft fully loaded and ready to leave, suddenly there was a familiar figure at the door of the aircraft. Michael! He was escorted by a very

suspicious security man. Mike saw us and sighed with relief. He had left his tickets and his passport in his cabin trunk and we had disappeared off with them to the airport as far as he was concerned. Without his tickets and passport, and what sane traveller gets himself separated from those most vital of documents, he could not remember with which airline we were travelling. So in company with the Colonel, who was travelling independently anyway, he hot footed it straight to the one we had come out with, US Air and demanded to know where a party of Brits was. They, of course, did not know anything about us as we were returning with United. Mike had eventually worked his way through all the airline companies until he eventually found United and a list of our names. He then managed to talk his way past security and get to us just before we departed with all his documents! Things just happen to Michael!

Chapter 40

Saddam Hussein had invaded Kuwait. For the first few months while Desert Shield was being prepared, it did not have a direct effect on the normal running of things in the Section. We did continue with our endeavours to find new battlefield clearance techniques for conventional ordnance but we were still very much in the research phase with small amounts of money and very limited resources. It would be as well to mention something called the Development Cycle here which has nothing to do with bicycles but everything to do with how to introduce a new piece of equipment into Service.

Basically someone in Military Operations decides that it would be nice to have a new item to achieve something they could not do before. They therefore set down what this thing should do and draft a Research Objective. This identifies the sort of research that is needed and was where we were with Conventional EOD research. From the research, various options are identified and demonstrated as feasible. We had got this far and had a number of techniques ready for further work. In fact the nature of EOD meant that we had tested these techniques quite a lot against a range of items of ordnance. However, in the nature of things and because no one would give us any serious money, most of the techniques were tested against redundant ammunition of our own or our allies. That is where the NATO trials came in. The major problem with this is that we had no feeling whether they would work against an enemy's ordnance. Now there are commonalities between all modern weapon systems and one of the important roles of our Foreign Ammunition Exploitation programme was to look at potential problems for EOD. But there was not the comforting statistics of large numbers of experiments resulting in safely neutralised items.

What should happen next is development starting with something called a General Staff Requirement. This is a written description stating exactly what the equipment should do. Using the GSR, the organization doing the developing sets out a plan to achieve the goal, costs it, gets those costs approved and then sets out to develop the item. On the way comes all the trialling, the production of documentation to support the equipment, training manuals, liaison with schools, and consultation with the Ordnance Board to ensure the item is safe. For a conventional piece of equipment, the whole Development Cycle from inception to going into Service, takes about ten years. I know it seems a long time but there are a tremendous number of things to do and generally speaking there are no short cuts. Having said that, of course, when there is a war on or in our case you are dealing with terrorism, then there are short cuts. Then the whole cycle is dramatically shortened but the same stages are gone through. These are then termed General Staff Requirements (Operational Emergency).

What all this tortuous explanation is leading up to is that we were a long way, perhaps years in the proper scheme of things, from being in a position to offer our new Battlefield Clearance Techniques to the Military. They were still very much research items trialled against our own stocks of ordnance. Then I received a phone call from the CO of 33 Engineer Regiment and the Chairman of the NATO Working Party on EOD.

“Peter. The Regiment is leaving for Saudi next Tuesday. I know you have been developing new techniques for the disposal of conventional ordnance on the battlefield through your papers to the Working Group. Is there anything you could provide to help the boys do their job better and more safely?”

My first inclination was to say no. They were still research items, we had not yet started the development cycle and it was Thursday. But I said I would think about it. I went and talked to Terry and Ron and asked their opinion.

We talked and reviewed the techniques that we had researched. One of the most promising that Terry and Ron had been trialling recently was called Baldrick. This was a means of inducing a similar level of deflagration to that produced by stand off by projectile attack but from close in. It was the equivalent of a disrupter for an Improvised Explosive Device but used the cunning plan of inducing just enough stimulation of the explosive filling to achieve the disruption for you. It used a small copper disc, a cross between a shaped charge and a self-forging fragment, driven by a hand stemmed charge of plastic explosive. Varying the amount of plastic varied the amount of energy that the disc was given and allowed a range of energies to be punched into the item under attack. It also had the major advantage of our IED EOD weapons that you were not there at the moment when your attempt to make the item safe occurred. It also could be fired from a short stand off so you did not even have to touch the item you were attacking.

People afterwards enquired about the name Baldrick. Most thought it was derived from the Ballistic Disc but no. It was named for the little fellow in Blackadder who nearly always got the sticky end of the jobs!

However, we had no handbooks, and only limited stocks of the Baldrick discs. I decided with a sigh that we should go for it. I rang back to the CO, told him that we would knock out as many of the Baldricks as we could that weekend and that, if at all possible, could I talk to the boys before they went to salve my conscience that we had told them as much as we possibly could about the new techniques? He said I could have them on Monday. This was getting serious.

That weekend I sat down in front of my domestic computer and drafted the first manual on deflagration techniques. Manual was a bit of a grand name for the five or six sheets of A4 that it constituted but I did try to distil down the essence of the philosophy behind what we were trying to do and emphasised the interactive element of how to use the techniques. The idea was to approach each new type of UXO afresh. Once a decision had been made on the best way to attack it, then do so with all due precautions for your own personal safety. If there is a thunderous roar, reduce the amount of energy you are punching into the device and try again with the next one you find. If the item you are attacking just sits there and looks at you with a dent in the case, push the energy envelope back up. As soon as you get the right level of energy, get on the net with a description of what you have just clobbered successfully and how so that your colleagues can treat all similar items with the same technique. It was simple but meant that a lot was down to the ability of the individual EOD operator to know what a deflagration was, how it differed from a detonation and how to use that difference to his advantage. As a lot of the US explosive hierarchy still did not

seem to understand what I was talking about, expecting the rude and licentious soldiery at Sapper level to understand was a long shot. But I had faith in our soldiers and our ideas. So there.

The support staff in the Section had worked all the hours God sent over the weekend and we had several hundred Baldrick discs ready to go. The Xerox machine was also running red hot by the time that our group of about thirty young men turned up from the Regiment. I sat them down in our Conference Room and talked. I showed them the videos of the experiments. I explained as best I could how deflagration differed from detonation. At the end of the afternoon, I handed out the Xeroxed sheets and with practically no voice left, wished them well.

Frankly, sending young men off to war with half developed techniques was not something I did lightly and I wondered how many would be coming back.

In the weeks that followed we received requests for more Baldricks so something was happening to them. Not much else filtered back as there was a war on but I was amazed to find that some of the re-supply destinations included our RAF contingent, who had not been briefed, and even a USAF contingent from Ramstein. BZ and his merry men who had originally helped us in 29 Palms and who had later contributed to the NATO trials had got into the act so not only were we supplying the UK Sappers and RAF boys but the USAF as well!

Initially the Baldricks were used for the clearance of duds. But I later heard from BZ, many years later, that he had used a Baldrick on an unexploded 2,000lb GP bomb lodged awkwardly in one of the Kuwaiti Royal family palaces. And it worked a treat!

Anyway, the corollary to the story about sending the young men off to war was that they all came back. As far as we could determine, the new techniques did work and the risk of sending them out with the kit had been worth it.

Ten years later a friend of mine passed me something he had picked up on the Internet. It described how a young lady in Laos, many miles away, was responsible for the disposal of some of the enormous amount of unexploded ordnance that littered her country after the Vietnam War. The piece described how the reporter went out with her while she carried her little black bag to a bomb some peasant had found in the countryside. The text then said she took a Baldrick out of the bag, set it up and disposed of the bomb. Now how the hell did our Baldricks get from Kuwait to Laos? But I was glad for the young lady's sake, and for the peasant farmer, that it had.

Oh yes. There was one final corollary. When the war was finally over, there was a tremendous amount of tidying up to do. Minefields had to be cleared and all sorts of crap sorted out. More of that anon. However, it meant that a new Squadron was to be formed within 33 Engineer Regiment. Rosemary and I were asked along to the ceremony to present it with its pennant as a thank you. A great honour and one I appreciated.

Chapter 41

Well, there is nothing like a war to improve our sort of business and that certainly was the case on this occasion. With a war came a direct need for as much intelligence as we could get on the sort of weapons systems that the Iraqis were using. Hence the first of my stalwart band to go to the front was Andy.

“Pete, I have a shopping list of things I want”. Fair enough. Wandering around a battlefield, even with a military minder, I thought Andy needed some new kit too. Besides the job

he did for me, Andy was also a territorial so he had the necessary military training to keep himself out of trouble. Come to think of it and knowing some of the scrapes he gets himself into, perhaps not!

So off he went to Saudi accompanying a special mission to investigate the weapons systems that would turn up. As the advance into Kuwait occurred, Andy continued with it. He did a tremendous job wandering around the battlefields finding out about the equipment that the Iraqis were using and advising the Defence Intelligence community. This strangely enough was quite an exhausting exercise somewhat fraught on the nerves. Andy is used to such a life but was always grateful to have survived his day and return back to base, which at this time was in the outskirts of Kuwait City. Andy's minder was a gentleman from Hereford. After a particularly long and arduous day, they returned late and collapsed into their bivouac. At an extraordinarily early hour the mosque next door started to call the faithful to prayer. Now I know it is not kosher but after a few attempts at blotting this out and failing, the Hooligan went outside and fired two magazines into the loud-speaker systems, effectively silencing them! How to get on with the natives!

Andy came back in one piece and it was now April with the war over a couple of months. I received a call. Apparently the war had produced a vast amount of unexploded ordnance of every type from the Iraqi invaders and the various branches of the coalition. When the war ended a clearance operation was initiated. This had been resolutely piling the ammunition into a number of major dumps. There was a problem. The temperature in Kuwait even in April was considerable. There was therefore a risk of these dumps becoming unstable and blowing up. Would I please become a member of a joint team, otherwise consisting of two gentlemen from Royal Ordnance, to look at the ordnance dumps and advise the Kuwaiti authorities on the correct course of action? There was inevitably some urgency about this as every day that went by the temperature was getting more extreme and the ammunition had been cooking longer. I agreed to go. It is not every day you get a chance to wander around a battlefield and after all, it was my specialisation and what I had been trained for. I immediately went to find Andy.

“Andy. When you went to Saudi and Kuwait, I signed for a load of light-weight desert camouflage gear, light-weight body armour and helmet. Please can I borrow them?” So at least I had the right gear, even if a little ill-fitting as Andy is a much bigger gentleman than I am. I found this to be more than the gentlemen from Royal Ordnance had as RO's munificence extended to boiler suits! Fortunately, as a serving member of the Ministry of Defence, I was entitled to wear combat gear as long as it did not bear badges of rank. Royal Ordnance, as a private company, could not.

The next few days were not a lot of fun as I had to have all the necessary injections for going to Kuwait. With all the fuss about Gulf War syndrome and my subsequent collapse of health recently, I often wonder. But what the hell! We were due to travel out on the Tuesday and I went up to Chorley to meet my two Royal Ordnance colleagues. One was an old friend, Paddy, who used to be the Project Manager for Wheelbarrow and has already appeared in these stories as a long suffering referee in our battles with Chertsey. He had now left the Army and was a senior man in Royal Ordnance's explosive hierarchy. The other gentleman, Arthur, was a senior manager from one of the explosive factories.

Paddy briefed us. Basically the problem was more complicated than just a technical one. The Kuwaitis were somewhat put out at having their country made into a battlefield and were still suffering from the devastation caused by the retreating Iraqis setting fire to their oil fields. Someone in their Ministry of Defence had had the bright idea that all this unexploded ammunition

scattered around their country could be re-boxed, given a lick of paint and sold. Somehow we had to convince them that ammunition that was in an unknown state to start with which had been sat in radiant energy levels far beyond that which it had been designed for was unlikely to be in any state for resale. In fact it probably needed disposing of as quickly and safely as possible. Royal Ordnance as a private company now (another piece of Government insanity) was interested in the task of doing the tidying up. Another part of the briefing suggested that we would be examining approximately 2,000 tonnes of unexploded ordnance in three major ordnance depots.

With my marching orders to hand, we received some rather alarming information just before the off. Approximately 4,500 tonnes of unexploded ordnance in the southern depot of Jellair had exploded on the Friday! So we were now aware that whatever else was certain, the deterioration which had been predicted had taken place. And we were going to be walking right into the rest of it! Oh yes. And if we were to examine 2,000 tonnes in total, how come 4,500 tonnes had just taken off in just one depot? This was going to be interesting.

We flew into Kuwait City with Emirates. As we approached, I looked out of the window and could see the clouds of smoke rising from the burning oil fields. Saddam and his army had a lot to answer for. We were met at the airport by Henry, an ex-Ammunition Technical Officer, now working for Royal Ordnance. Soon I was reintroduced to Guy who was also there as a member of the clearance team: sort of cannot get away from people from my past in this business. We were billeted rather splendidly in about the only hotel that had escaped destruction or sacking by the retreating Iraqis, the Holiday Inn. Even that had the odd bullet hole in the glass frontage and a burnt patch on the marble stairs in the lobby.

Henry had been present at the explosion at Jellair and briefed us on the event. He also showed us some hand held video that he had taken. He and a colleague had turned up and watched in awe as the whole horizon seemed to be lit up by a series of bangs and explosions, fires and smoke. The depot housing the ammunition extended over an area of about six kilometres by four. While watching the video, the camera suddenly made a jiggle. A few seconds later it made another violent movement. Henry explained that rockets were coming out from the holocaust and were passing over his head and exploding behind him! He and his colleague retreated rapidly back another six kilometres and a similar, somewhat more distant view, continued. Then, the same jiggle occurred with the same ducking and weaving. The damn rockets were still coming out of the fire and passing over or near them and exploding!

Paddy suggested that we needed more practical information on the extent of the problem and that the best way of getting this initially would be by helicopter. Arrangements were made with a mad American pilot of a cas-evac helicopter used by Royal Ordnance. Paddy explained that he wanted the pilot to fly to a number of different locations where there were many thousands of tonnes of explosive stores gently heating in the sunshine. He then wanted to hover over the areas involved taking photographs and trying to assess the scale of the problem. Any normal soul would have told us to get stuffed but the Yank smiled and said he would be happy to assist. I think he got a couple of nice brass shell cases that we collected at one location as a thank you present.

The flight was truly amazing. It involved travelling over the area so recently devastated first by the war and then by the appalling environmental disaster caused by Saddam torching the Kuwaiti oilfields. We flew over burning lakes of oil, large areas of desert heavily impregnated with oil and the well heads which were associated with burning seas of fire. Every now and then there was evidence of burnt out tanks and long lines of trenches cut through the desert. Then we were at the first of the dumps. Whow!

What an ordnance dump should look like is a well-ordered area of discreet storage houses and each discreet storage location set apart by a safe distance from the next. In a hot climate such as Kuwait, you also needed to provide a roof to prevent direct solar radiation impinging on the stores and also some form of air-conditioning to keep them cool. What we had was an area which had once been an ammunition dump into which truck load after truck load of unexploded ordnance had been fly-tipped. Just to add joy, each of the dumps had been heavily bombed and hence there were some holes in the ground where some sheds had been and large craters impinging on the areas of some others. But the sheer cluttered mess of thousands and thousands of tonnes of boxes and loose ammunition piled higgledy piggledy in the desert was amazing. And worrying!

There were three major depots, two in the north and one down south at Jellair. We flew over all of them. The approach to Jellair was also amazing. There was a scar on the desert six by four kilometres. Wreckage was strewn all over of all sorts of rockets, shells and boxes of flares. Most had exploded or burnt but there was obviously still a lot there. We would see on the ground later.

We returned and then set out on a ground reconnaissance. We were in an air-conditioned Discovery fitted with a strange device: the Dashboard Duck. This was intended to indicate when you were exceeding the speed limit and emitted a high pitched quack every time you went over the designated speed. As the speed over the limit increased, so the Dashboard Duck went progressively more berserk. It seemed a suitably mad accompaniment to wandering around a devastated war zone to have this damn thing quacking away in the background!

Henry drove us around explaining that one of the more important things was to have a Union Jack on the vehicle. The Americans were not popular and the locals had taken to shooting at any vehicle bearing an American flag. And these were the Kuwaitis not the Iraqis! Shades of the present (2004/5) events in Iraq.

The first place we went was not a dump in the normal sense at all. It was right alongside the international airport at which we had arrived. In a cleared area not far from the runway there was a general dumping ground. I can remember seeing a plastic dustbin into which someone had put about twenty RPG 7 rocket grenades rather like an umbrella stand. There were boxes of grenades, piles of shells, guns, ammunition and long belts of cartridges. Nothing was guarded and anyone could just stroll in and pick the stuff up. Henry warned that some of the places we would go were booby-trapped so we were very careful not to touch anything directly or pick things up. Cameras were to the fore and I still have some amazing pictures of the scenes.

Then off again into the desert. At one point we came to what looked like a large, black lake. Well, it was, but of oil not water. In the distance, a horizontal fire emanated from a destroyed well-head and projected flame for about two hundred metres: Dante's inferno come to life. It was not just the sight of this enormous outpouring of energy; it was the sound I will always remember.

At one point we came to an airfield. The protective hangars for the aircraft had been hit repeatedly by allied bombing and had enormous holes in the roofs. The storage areas for ammunition had also been well stonked and the ground we were walking over was covered in small arms and slightly bigger stuff, partly exploded, and live all mixed up together.

In one of the northern depots we drove into the area where the fly-tipping was occurring. No-one was there to stop us. As we walked around the areas noting tank ammunition and shells lying in the sun with surface temperatures that we measured as 50 degrees Celsius, a large truck turned up and

lifted its back in the way that is done to drop a load of sand or hardcore. Off the back slithered about ten tonnes of assorted unexploded ammunition! Considering there was a vast amount of desert available, the people doing the tipping were not using the space. As the dumping was going on uncontrolled, the drivers just dropped their load where everyone else had. Therefore there was an almost continuous pile of ammunition. A problem occurring in one location would result in its being transmitted along an almost unbroken line of unexploded stuff. And the scale! Even in the first of the main depots we saw even a quick back of envelope calculation showed we were talking thousands and thousands of tonnes of materiel.

I will provide a brief explanation of why all this was going to result in an explosion sooner or later. Explosives are remarkably resilient materials as far as temperature is concerned. You can cook TNT, for example, until it melts at about 81 degrees Celsius, which is the usual way that you fill explosive filled stores. However, propellant, which is generally a mixture of nitroglycerine and nitrocellulose, does not like elevated temperatures. Very rapidly it runs out of stabiliser which is put there to prevent a build up of acid. Once the stabiliser has gone, then additional self-heating occurs and eventually the propellant gets so hot that it bursts into flames. Explosive filled stores associated with propellant are therefore kept in cool, temperature controlled magazines but the ammunition still has a specific shelf life. We tested the stocks that we held periodically to ensure that the stabiliser levels were still within limits and this self-destructive tendency was not being approached. Picture, if you will, what happens when you take all this ammunition and put it into radiant energy levels far beyond that for which it was designed. Not surprisingly the normal designed life of the store, which at 20 degrees Celsius might be twenty or thirty years or even more, is exceeded in a matter of months. And that was the state the ammunition had reached now.

That was bad but the fly-tipping made it worse. Ammunition is categorised carefully to ensure that different types are stored separately. Ammunition containing propellant is kept away from ammunition containing explosives as much as is possible. Ammunition containing explosives with fuzes attached is also kept separate. Finally, it is essential to limit the amount of explosive that you put in one place and calculations are done which ensure that an explosive event in one stack cannot transmit by blast or the projection of fragments from one stack to another. When you are storing explosives long term, then you build protective walls around the storage areas which provide additional protection and help to reduce horizontal fragment throw. This further limits the size of any accidental event.

The nightmare scenario was now that somewhere in the ammunition we were gaily wandering around the stabiliser was running out. Then there would be the start of a fire, the fire would communicate to anything combustible and there were lots of ammunition boxes about. The fire would be boosted by any more propellant it found and would soon become a roaring inferno. Then warheads would start cooking off and any with fuzes would quite likely detonate. We would then have the equivalent of a detonator in a demolition charge. The whole damn lot could go. At Jellair, what had happened was a series of events causing local explosions and lots of fires. Occasionally the flames would launch the rockets and hence Henry and his chum had been ducking and weaving even 14 kilometres away. Imagine the joy of one of the explosive warheads hitting a large stack of ammunition even that distance away! We were talking the potential for Armageddon here.

After assessing all the dumps on the ground and taking lots of photographs, we returned. Every time we stepped out of the air conditioned Discovery we would drink half a one and a half litre bottle of water. We would limit the time we stayed in the sunshine as the ambient shade temperature, only there wasn't any, was forty five Celsius! After about ten minutes or quarter of an hour, we would

return to the Discovery, drink the rest of the one and a half litre bottle of water and then sit in the air conditioning. We would do this all day and not need to pee once!

Some of the dumps were interesting for other things. At one there was a complete multi-barrelled air defence system complete with long belts of ammunition. The owners had legged it and left the thing pointing at the sky. In others were boxes clearly marked Department of Planning, Amman. In one place a fine wire had been placed across the entrance to a dugout containing a mixture of ammunition and weapons. Someone had set up a booby trap to a grenade to protect the place.

We came to Jellair. We motored past the guard post at the beginning of the storage area. The guards were somewhat gung ho as the explosion had removed much of the reason for their existence. We motored further into the area. We stopped early as the out throw was considerable. On foot, we approached the area of six kilometres by four. I walked slowly, assessing where my feet were going at each step. As I walked into the zone, I noticed something interesting to an explosive man: practically every fragment showed deflagration characteristics. The fractures were straight sided. The fragments were large. In fact, as I wandered in this area of destruction, I only found one fragment showing the tell-tale signs of 45 degree shear fractures associated with detonation. Very little had actually detonated which accounted for the lack of mass detonation. Something my earlier research on accidental events supported but what the hell having tried for years to get the US and others to understand the concept.

We conducted our survey over about three days, returning each evening from this strange world of instant death to the luxury of the Holiday Inn. I would swap my daytime garb of lightweight combat fatigues and lightweight body armour for a lightweight suit. Then the next day, out we would go again. I wrote a journal and an official report every night, leaving them prominently with my effects as frankly each day there was a finite chance of not coming back again.

There is a bit in one of the Len Deighton novels that explained that a good infantryman decides early on in combat that he is dead. He then lives every second subsequently on a heightened plain as it is a bonus. That is how I viewed this experience.

But it was fascinating: the ultimate in the career of a bomb disposal man to see so much unexploded material. I was itching to have a go at getting rid of it. What a trials site! I could keep the boys happy for years!

We had a meeting with the British Ambassador as the situation had got very political. We briefed him and reinforced the fact that matters were getting critical and something needed to be done very quickly if we were not to have a major disaster on our hands. Later that day we had a meeting with a senior representative from the Kuwaiti Ministry of Defence.

I got my gent's natty suiting out of the cupboard and found something in the pockets. It was a copy of the Rubaiyat of Omar Khayyam put there by Rosemary. Now, that is the closest thing this non-believer has to a prayer book. Thank you, my love.

The Kuwaiti MOD man was not pleased when we told him that not only was the large amount of ammunition not re-saleable, but that it was in a highly critical state and was likely to blow up at any minute. What it needed was a concerted and well-planned campaign of destruction. And now! Initially there was some reluctance to believe us but we had lots of photographic evidence. There was also the experience of Jellair to reinforce the fact that we were not kidding when we said that it was all coming to a critical state. Perhaps my presence as an impartial UK Ministry of Defence observer without the taint of commercialism swayed the day. I like to think so.

The job was effectively done with the briefing. We had done what we had come for. We had another meeting with Guy. He was concerned with the clearance of the southern belt of landmines that the Iraqi forces had built to protect themselves when the build up before Desert Storm was being prepared. Would I, as an interested observer of such things, and Guy had known me for some time as he had been a Squadron Commander in 33 Engineer Regiment, like a guided tour and perhaps make some suggestions about clearance techniques? Why not? Again, what an opportunity for an explosive man.

We set out south the next day. As we progressed we came across areas of the road where there were scars from scattered sub-munitions dropped by A10s and from the high speed cannons from which their armour piercing shells poured. Several ammunition carriers were blown up shells by the road from their attacks. We passed through several areas where the visibility was down to metres because of the burning oil fields. Eventually we reached the southern minefields. We were passed over to a gentleman who had been a Regimental Sergeant Major for 33 Engineer Regiment but now worked for Royal Ordnance. This is common practice in our strange game: once into EOD it is hard to get it out of your blood. He viewed me with suspicion as a boffin.

We motored along a track which showed from its tracks that only two vehicles had passed this way before us. I noted an empty Rockeye pod and then another. Rockeye was a US scatterable sub-munition with an unfortunate reputation. Only a small percentage of the sub-munitions actually went bang particularly when they were dropped onto sand. The rest just stayed unexploded and they had a piezo-electric fuzing system. We had learnt from our own experience in the Falklands with the BL755 that a piezo-electric fuzing system was double edged. A piezo crystal provides the firing pulse when it is crushed i.e. when it hits its target. But if it does not explode for whatever reason, then the piezo crystal can remain under compression or just remain active ad infinitum. If a piezo crystal is released from compression, it also sparks. Hence a lot of the Argentines clearing unexploded BL755s and two of our own chums had been killed. I was somewhat chary of driving over unexploded Rockeyes for the same reason.

The RSM motored on with just the comment that I should look out for unexploded ordnance and sing out if I saw any. As we were motoring at about 30 mph and any singing I would do would be too late and probably somewhat high pitched, I took off my lightweight flak jacket, folded it and sat on it. Time to protect the crown jewels!

We stopped alongside the mine fields at several locations. At some they had obviously used Kuwaiti mines as they were UK sourced bar mines. However they had laid them on the surface which was never the intention. The mines in their plastic containers were already bowing in the considerable heat. Not nice. In others the sand had blown around and covered the regimented lines of mines laid, as we were told, according to British Mining principles. In others, the single line of wire marking the minefield had been breached and a wandering camel had come to grief on the mines. At another location patterns of mines were observable connected by tripwires. These were bounding mines that leapt into the air and scattered hundreds of ball-bearings around: fun items. All in all it would be a considerable job to get rid of the minefield belts and we motored alongside about 75 km of mines that day.

We had another visit to the beach mines near Kuwait City. Here the mines were a particularly nasty Chinese variety looking rather like an old fashioned tin of tobacco. These had an unfortunate habit of going unstable: simply turn them upside down and they went bang. We heard an account of one of the flail drivers imported from Afghanistan. He had flailed up the beach, then back down the beach. He had flailed across the cleared area in a series of zig-zags. He then, job done, stepped out

his cab. Bang! At another beach near the town, the beach had been declared free of mines. A young lad had kicked a football over the now declared free area. Bang! Never forget that minefield clearance is normally done for the purposes of getting military gentlemen across a barrier. It is not normally done to remove every possible mine. Unfortunately that is what is required when you wish to declare an area truly cleared. A dangerous business.

We heard how Royal Ordnance reckoned on clearing their part of the minefield. Basically it meant using Third Country Nationals, TCNs as they were casually referred to, mainly from places such as Thailand, India and Cambodia. These souls, generally seeking what was to them lucrative employment far from home, were provided with a flak jacket and a protective helmet. They then were encouraged to lift the mines by hand, gently probing with a probe to find the things. This was all in temperatures of 45 Celsius. Not surprisingly, many did not last long. God knows how many died and were injured and not just the TCNs. Subsequently we heard of several UK ex-ATOs and Sappers injured or killed in the clearance operations. There were better ways of doing the job and I suggested some of them in my report, gratis to Royal Ordnance. But labour and life were cheap compared to the returns for contracts for minefield clearance. I will leave it at that.

I am not sure how I got there but on one of our trips out we went north of Kuwait city along the Basra road. Here an enormous column of retreating Iraqis, many driving away looted Kuwaiti vehicles, had been stopped by a US Marine battalion. With their forward progress halted, helicopter gun-ships then came in and wiped them away. By the time I got there most of the bodies had been taken away. However, the smell of death permeated the place. And what was just as disturbing was the graffiti. Daubed on the tanks and buses were messages from the visiting allies. "I love you Deb", "For Mum and Pop", "For Gary, Pete, and Sam, love Dad" All of this on what was effectively a war grave. Incidentally as I walked carefully around the debris I found unexploded ammunition still lying amidst the wreckage. When I got back from Kuwait people asked me why the coalition forces had stopped and not just rolled on to Baghdad? I think it was just that they were sick of the killing by then.

I sat on the 'plane home and wrote a last extract in my journal.

"Like a good combat soldier, Deighton says, you have to start from the baseline that you are dead. Everything after that assumes an unreality, a feeling of somehow possessing heightened awareness of reality at the same time as being an observer rather than a participant. I can honestly say that I enjoyed all of it. It was exciting, fascinating and a unique experience. There was risk, but it was measured risk, within the compass of my experience and within acceptable levels. Now it was over, for this time."

Epilogue

If an Angel of the Lord came now and said, "That is it. Your allotted time is up. Time to go." and I had a few minutes to look back and consider whether it had all been worthwhile, I would think back to a summer's evening in 1991. Rosemary and I had been invited to a Beating of the Retreat at Vauxhall Barracks, the home of the UK mainland's EOD Regiment, 11 Ordnance Battalion. That evening, which passed pleasantly with the odd gin and music, I had met a lot of my military friends that I had dealt with over the twenty years that I had been concerned with EOD. The military, with their customary facility for such things, had provided us with attentive hosts, had cosseted us and the whole atmosphere was pleasant and supportive. It was time to go. We walked through the rose garden, our last duty being to return to the children that we had left behind with Madeleine,

Rosemary's sister. As we walked through the garden, a young man aged about twenty seven, spotted me and walked directly towards me. He strolled straight up to me. What the hell was going on as I did not recognise him from Adam?

"Peter Hubbard?"

"Yes." I said cautiously, on the basis that I may have inadvertently insulted him, his wife or whatever.

"I want to thank you for saving my life. Twice."

Unsolicited. In front of my wife who has put up with a lot without a murmur, in the life of someone who periodically had to say,

"I am going off to do something strange. I hope to be back in one piece. Sometime."

The young man explained that he had just returned from a tour in Ireland. He had been one of a sea of faces that I had lectured to at the Army School of Ammunition on the Pre-Ops Course, before we sent these young men to face a four month tour of bombs and mayhem. Something I had said, something my Section had done had stuck. He had faced death twice and come through and was grateful.

I would then go without a murmur.