

exposure

August 2020

The combined magazine for the nuclear community

P04 Introducing the Victor

A personal look at time spent with the last V-bomber to enter RAF Service

P13 Stolen Documents

A report from the NCCF Trustee Board

P14 End of an Era for the NCCF

Jeff Liddiatt reflects on his time serving the Nuclear Community

P23 Ionising Radiation and Tissue Effects Part 2

We discuss examples of late tissue effects which can take place several years after exposure

P30 We are at War

This is a war that we can neither see nor smell nor hear

Next issue copy
deadline for all
editorial sections:
1st November 2020

Contact Us

For advertising or any
other enquiries:

editor@exposure.press

Exposure
PO Box 8244
Castle Donington
DE74 2BY

Exposure Online

See the magazine website at:

www.exposure.press

Come along and get involved
- you can even sign up for
breaking news alerts and
features direct to you inbox.

Each Editorial section of Exposure is provided by the editorials parent organisation. They accept sole responsibility for the content, source and accuracy of their section including any liabilities arising therefrom. All copyright and attribution are as stated. No liability for libellous comment, error, omission or breach of copyright is accepted by the producers of exposure magazine for any item within an editorial section. In the non-editorial sections, all material is copyright to BH Associates unless otherwise stated.

If you are affected by copyright or other potential litigious issues from material within this publication you must take it up with the relevant editorial body in the first instance.



Foreword

From the beginning of this year, the world has been in the grip of the COVID19 Corona-virus.

For most of us all over the world this has meant being locked-down in our homes for 3 months with only essential visits to shops, exercise or work being allowed. We have all missed being with our friends and family, seeing each other at weddings and get-togethers and for some tragically, funerals.

In the UK we are now starting to enter a way of life that is to become the new “normal”, we still have to be sensible and careful about the way we go about our daily lives to protect ourselves and others.

We are now relying on science to get us past the final hurdle, by providing the world with a vaccine that will enable us to go about our lives in a way that we did previously. There is hope that this may be ready in the next 6 to 9 months.

As we move forwards the NCCF are hoping to help as many people as we can and to forge stronger ties with other organisations whose common goal is to help the nuclear survivor community. As the old strapline said “moving forwards together” has never had as much pertinence as it does now.

We hope you enjoy reading this issue of exposure and until the next edition, please stay safe.

You can also visit the Exposure Online Magazine at
www.exposure.press

exposure

August 2020

The combined magazine for the nuclear community



Exposure

Introducing the Victor

A personal look at time spent with the last V-bomber to enter RAF Service

P04



The NCCF

Stolen Documents

A report from the NCCF Board of Trustees

P13



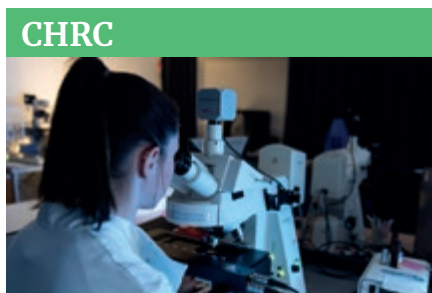
The NCCF

End of an era at the NCCF

Jeff Liddiatt reflects on his time serving the Nuclear Community

P14

exposure



CHRC

Radiation Exposed Populations

Research into radiation exposure and its relevance to veterans

P23



International

We are at War

This is a war that we can neither see nor smell nor hear

P30



Exposure Online

See the magazine website at: www.exposure.press



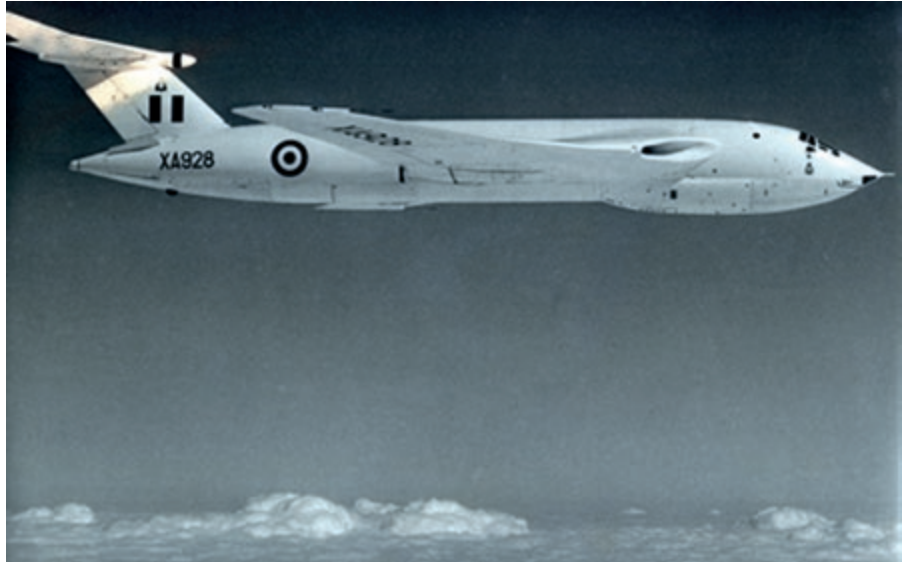
Introducing the Victor

A personal look at time spent with the last V-bomber to enter RAF Service

I had been a Royal Air Force Canberra pilot for a good many years when, in the late 1950s, I learned that I was about to become a captain on the first squadron to have the new Handley Page Victor, then soon to enter service. The Victor was the last of the three bomber types, Valiant, Vulcan and now Victor, set to complete the 'V-Force' and thus to form the full strike arm of our nuclear deterrent.

In 1958 I went to RAF Gaydon, in Warwickshire, to start my Victor conversion. We were now to be 5 in the cockpit, and I picked my crew from the among the other aspirants. I had manoeuvred to retain my Canberra navigator who had already flown with me for some 6 years and, coupled with his good judgement, I found our co-pilot, our radar navigator and our air electronics officer (AEO). My co-pilot was himself an experienced flying instructor, our radar navigator was highly regarded and our AEO was a well-qualified ex-NCO radar fitter. In the years we flew together each one proved himself to be the very best! We were very much in on the ground floor since we were one of the three crews on the very first course to be trained on the Victor. Once qualified we went to the newly reformed No. 10 Squadron, at RAF Cottesmore in Rutland.

The early Victor B Mk. 1 was a massive advance in technology - what a difference now in the bomber's capability. Radar dictated the bomb run in any weather and made navigation easier.



The Victor B Mk.1

Complex electronics made for safety and stealth, and the aircraft had a huge capacity to carry a variety of weapons to distant targets.

To begin with the early Victor did have a few minor shortcomings. A very large (54 foot diameter) brake parachute was used on landing to slow the aircraft down and if, as it sometimes did, this failed to deploy then one could expect the wheelbrake discs to overheat and ultimately, to catch fire. The immediate remedy was simple, one stopped the aircraft and dropped the AEO from the door armed with a fire extinguisher. This always caused consternation on the airfield but usually no great harm was done and, at least, it gave our firefighting crews some practise. The problem was solved on the later marks of Victor by fitting ceramic brake discs that better absorbed the heat.

Another problem was that, amazingly, no provision in this long-range strategic aircraft had been made for an autopilot. Whatever the mission, all flying had to be done manually by either of the two pilots.

Furthermore, one initial disadvantage of our early aircraft was that we could start only one engine at a time - an unacceptable delay when an alert sounded. To overcome this a ground device (called 'Simstart') which could be plugged in to start all 4 engines simultaneously, was in the pipeline but had still to come. Early on, my crew was tasked to see if we could shorten the aircraft response time to an alert. We found that we could safely do this; by changing the checklist procedure we were able to ready the aircraft for take off while starting two of the engines in turn, and then to start the other two engines while taxiing out from dispersal. This became standard alert procedure until 'Simstart' was introduced.

XA 928 was one of the first aircraft to be delivered to the Squadron and it was allocated, together with its superlative crew chief, to me and my crew. A word about our V-Force crew chiefs – they were always experienced chief ground technicians and each was dedicated to look after one specific aircraft (in which they had the greatest pride).

This was an excellent system for, regardless of what work was done to their ‘bird’ or by whom, they oversaw and co-ordinated every technical task. They were an adjunct to the aircrew for they flew with them, whatever the mission, whenever their aircraft was due to land elsewhere.

Demonstrations apart, as the first squadron to operate the Victor, our early months at Cottesmore were largely spent in developing techniques and in evaluating equipment new, both to us and to the aircraft. Once we had gained experience we found that we could more than hold our own with the Vulcans and Valiants and indeed, with our contemporaries in the

USAF Strategic Air Command (SAC) – as the annual bombing competition proved. This competition involved selected crews from every V-Force squadron together with the top SAC B-52 bomber crews who came over from the States with their aircraft. Some 50 or so crews in total vied in the tests which covered precise navigation, timing and radar bombing accuracy, and the battle for the winning trophy was hard fought.

I was justifiably proud of my crew’s ability and we took part in the ‘Annual BombComp’ every year we were together on the squadron. As part of our ‘crew’, our crew chief took the greatest interest in our competition results and made for us a cunning device to improve our radar bombing.



The First Victor Squadron – No.10 Squadron on display

He moulded a strong magnifying glass onto a mounting which would fit over my compass display in the cockpit – and this helped me steer a more accurate heading. Without an autopilot to help, the compass heading one flew manually dictated the line accuracy of the bomb release point, and even minor wanderings off-heading would increase our bombing error. Our device was a closely guarded crew secret and we never let on – particularly since it might have been regarded as an unauthorised modification!

All new aircraft types have a publicity value and the Victor was no exception. Some of our early time was spent in ‘showing off’ the aircraft and its capabilities. I recall the Royal flypast we were involved in and the ‘photo below (taken by the ‘chase’ aircraft) shows three of us in wide formation, low level over East Anglia practising for that occasion.



As I recall – we were the one in the foreground!

One unforgettable memory was of the first public display of the new Victor force for the media. The Prime Minister and NATO dignitaries were to come and a very well-known BBC commentator was due to present the 30 minute live TV programme covering the event. There was much new equipment on show and, because of the security aspects, a draft script for him had first to be prepared and approved.

For some reason I was tasked to prepare this script. The TV crew arrived the day before the broadcast, along with the celebrity presenter – who glanced casually through my script for a few minutes. He heaped praise and glory on my efforts, and promptly went off without me to lunch with all the dignitaries and those in the know.

The day of the broadcast saw me sitting alongside the presenter in the commentary caravan, each connected by an earpiece to the producer. Within seconds of the live broadcast start, our worthy presenter tossed my script aside and ad-libbed his way magnificently through each event. He was far too experienced to overstep the mark, and had obviously worked out just what he would say from his discussions at lunch the previous day. I sat there having kittens, but unable to interrupt him on a live TV show.

There was however one moment of relief to my agony. In that era the presumption was of a '4-minute warning' of any missile attack on the UK. To simulate a response for the show, the Prime Minister that day was due to press a button at the start of the runway to initiate the scramble of the four Victors lined up alongside. The PM did his bit, the camera panned onto the crews running hell-for-leather to their aircraft, and the shot settled on one athletic pilot ahead of the field.

My celebrity colleague meant to say "There goes the copilot, running like a stag at bay with his finger extended to hit the starter button". What actually came out was "There goes the copilot running like a stag at bay with his tit extended to press the finger." A moment of stunned silence, then the voice of the producer in our headsets "Oh really ***** , did you have to?" With complete aplomb the presenter carried on and finished a very polished performance, but I did hear later that the said gentleman was known affectionately in some TV and motor racing circles for a while as 'Tit' *****! Who said there was no such thing as justice?

Another moment of angst happened when we were sent to the United States on a routine visit to the Strategic Air Command (SAC) base at Offutt, in Nebraska. Over the US East coast my Victor suffered an engine problem that reduced us to flying on 3 engines, which meant we couldn't maintain the height assigned to us by Air Traffic Control. I daren't declare an emergency for fear that I would be ordered to land at the nearest airfield which, because of the equipment on board, I was not authorized to do.

We struggled across US airspace proclaiming our height and making sure that we were under good radar surveillance; but we changed radio frequency to another regional controller any time that our height was challenged. By the time we reached our destination we had some 17 airspace violations filed against us. To top it all we had brake parachute failure and a resulting brake fire on landing, and couldn't taxi clear of the runway. Offutt was a SAC alert base and the commander gave me on the radio one hour to get my aircraft clear of his runway, or he would bulldoze the aircraft off. We made it in time.

I still had a lot of explaining to do, but the same USAF commander understood the reason for my dilemma, and backed me with their civil air traffic people. All in all not a happy trip particularly since, under guidance from our excellent crew chief, we had to change the faulty engine parts ourselves so as to return home.

My copilot and I witnessed a most unusual phenomenon from the cockpit one evening. We were heading West at high altitude over Blackpool when I spotted a bright light in the area of the setting sun. It seemed to be coming towards us at about our height so I queried the presence of another aircraft with air traffic radar control. They assured me that there was nothing else in the vicinity but, as we watched, this light streaked past on one side at tremendous speed. How close we couldn't judge but the speed was much greater than anything else I'd ever seen in the air. We reported the incident formally after landing but nothing more was ever said. I'd never before believed in the UFO theory but I've always wondered since.

Life on a V-Force squadron was varied. We planned long missions, flew operational exercises and training sorties and sometimes competed professionally with our peers. Above all else, we maintained a constant alert and readiness posture with a nucleus of crews and aircraft primed and ready at all times. This dictated virtually living as a crew for days on end, with cockpit alert duty at intervals and the ever-present chance of the alert siren day or night.

If one is honest, it did get wearing at times. One diversion was our operational deployment to a dispersal base, where we lived in alert caravans next to our aircraft. In the beginning, some bases were exercised before all the facilities had been completed.

On our first such deployment the lights around the aeroplanes were still absent and when the alert hooter blared, we stumbled around in the dark with torches. As the story went, one stalwart climbed up the ladder to his aircraft, someone trod on his fingers and a voice from the blackness above said "S*d off, we've got five in here already - go and find your own bird!" Alert cockpit readiness duty for hours at a time was an uncomfortable chore. Once we had readied the aircraft for instant take-off, all we pilots could do was to sit strapped in tight to our ejection seats, to remain alert and to listen out in case a scramble message came through. It was during this era that most Victor pilots became adept at cards, chess and liar dice etc. - all played as dealt on our behalf by a rear crew member on a board set on the fuel control tray between the front seats. Strangely enough whatever distraction one tried to relieve the aches and the cramps, half one's mind was always on the qui vive at the prospect of having to leap into the ether on an operational mission.

A word or two about our ejection seats may be appropriate here. Both pilots had to be tightly 'welded' to them so that, on an ejection, one minimised the danger of spine or other damage. On long flights, one's buttocks would first 'go to sleep' under the pressure from the straps, then at a later stage, would 'wake' to give one cramp in one's rear end - uncomfortable and sometimes a touch painful! Even though the crew members in the rear (no pun intended) didn't have the facility of ejection, they could at least move around in the cockpit. Also, wearing a tight 'bonedome' for long was hard on the ears so, as the 'photo above shows, it was decreed that the pilot who was actually flying the aircraft could remove his hard-hat in routine flight. I suppose my crew had a little more variety in our flying than some others.



The Fuel Control Tray cum Card Table

We became the Victor display team responsible for demonstrating the aircraft at airshows and other places. Hard work it was, involving regular practise and often several displays on the same day, especially during the summer season. Sometimes the flying display also involved meeting dignitaries on the ground at the show. On the first such occasion, my other four crew members were standing to attention in front of our Victor for me to introduce them to an Air Marshal. When I got to my radar navigator, my well known ability to forget names reared its head. In desperation I improvised with ".....And Sir, this is Flight Lieutenant er. ...Smith." 'Er. ...Smith' himself didn't bat an eyelid, but for weeks afterwards the chaps made me pay for that moment.

Two particular flying displays stick in my memory. We were required to do a demonstration over the River Tagus at Lisbon, the Portuguese capital, in conjunction with the Red Arrows. They of course got to stay there for a day or two: we, on the other hand were expected to fly down, do the show and to fly straight home without landing. To mark the occasion for the press, we were to attempt a record time from Lisbon back to Farnborough.

We made it back in 1 hour 43 minutes and I often wonder whether that record still stands.

On another occasion, we were to do a show at the Naval Air Station Culdrose in the West country. I flew down in our workhorse Anson the day before to check out the arrangements and the Navy, true to form, set me up. After the briefing we sat to have coffee in the Commander (Air)'s office in the control tower while local rehearsals for the show went on outside. A Wren cycled past slowly outside the window and returned shortly after from the opposite direction. I thought nothing of it at first then it suddenly dawned on me that our office was on the first floor. To roars of laughter I shot to the window to see the lady and her bicycle suspended below a RN helicopter. One up to the Fleet Air Arm.

Every year each Victor squadron went to Akrotiri in Cyprus to practise dropping bombs on the live ranges there. To maintain the alert posture crews and aircraft were rotated in turn and all of us, both air and ground crews, looked forward immensely to this break in the sun. It was also an excuse for a series of squadron parties, designed both for our hardworking ground crew and to thank our hosts.

When my turn was due one year, we got a cryptic message from Cyprus that an urgent barrel of beer would be appreciated. The crew discussed the possibility of taking this on board the Victor and came to the conclusion that it would be all right in the pressurized cockpit if it were a metal barrel. I sought local permission for the venture. When the item was delivered our crew chief, a careful soul, eased the bung slightly in case the pressure differential was too much for the barrel.

You've guessed what happened; on the climb the bung blew out and beer under pressure emerged. We hastily replaced the bung, abandoned the sortie and returned with questionable electrics and a cockpit reeking of ale. What made it worse was that we had to orbit for a couple of hours to burn off fuel until we were down to safe landing weight. After we'd explained our return and suffered the slings and arrows of outraged authority, we sanitised the aircraft and retired hurt. With just retribution we missed our slot that year to Cyprus and received scant sympathy from all concerned. The aeroplane itself checked out without fault; so at least someone was on our side.

Speaking of Akrotiri, I remember that it was on an earlier visit there that I first tried my hand (head-feet-backside and belly flop) at water skiing. I should have known better than to try it in front of my crew, who sat on the beach and laughed themselves silly at my antics to stay upright! I also remember that on the same visit, one of the RAF aerobatic teams was working up in the ideal weather there with their Hunter aircraft, for their European display season. One of the highlights for me was to fly several times in their two-seat Hunter with various members of their team.

On one of these sorties, I recall, I had my first taste of supersonic flight. For their team practise, I occasionally flew in the photographic chase aircraft and, even as a passenger, flying in

very close company with nine other Hunters doing formation aerobatics was an experience not to be missed.

Once, on coming back to Cottesmore tired after a long sortie one night, we had just started our instrument approach when my radar nav remarked "It's a bit misty in the cockpit back here, could it be smoke?" That got our attention and my AEO (himself an ex-radar technician) crawled back behind the electronics racks with a torch. He couldn't see the source but the smoke, for that's what it was, became more and more dense. I declared an emergency, we vented the cockpit as best we could and slid down the glidepath – hoping like hell that we could put the machine on the ground before anything actually burst into flame. We landed fine, stopped on the runway and vacated the Victor. The crash crews could find nothing wrong nor later could the engineering staff. Once it had been checked and cleared we flew that aircraft again on the next sortie and all was well.

That is until the radar array packed up. On a subsequent bench test when a critical black box was dismantled, they found a tiny relay burnt out and a mess of melted plastic.

All assumed that this must have caused our trouble, and we felt justified for we'd begun to have doubts about the whole incident.

In my last year on the squadron I became the training officer, and it was my task to see that every crew fulfilled its training requirements and did its utmost to qualify for the Bomber Command Classification Scheme – the yardstick by which our abilities and experience were measured.

A new crew would need to qualify to the minimum standards to achieve 'Combat' status. With more experience they could hope to qualify as a 'Select' crew and finally, to achieve 'Select Star' status. I think I got the job only because we were the first crew from the several Victor squadrons now, to become 'Select Star'. As the new training officer, one of my first tasks was with my crew, to do the trials on the newly developed autopilot. At last the Victor would have 'George' (as the autopilot has always been called) to take the load off on the long flights. Every V-force crew had to take part in a full scale escape and evasion ('E & E') exercise once in their tour. Prior to ours I researched just what I might need for real if we were ever to end up in enemy territory.



The 'First of the Few'

I resolved to do my own survival practise beforehand, so I tried a solo night out in the winter, in woods close to the station. My loyal wife came out early next morning to collect me, which meant her tramping the last bit to where I was. There were we both when my boss walked by with his dog - two muddy people, one in flying kit, dishevelled and covered in camouflage cream; the other desperately trying to hide the fact that she was there at all. "Good morning both of you!" he called and he strode on without another word. To his great credit he never ever mentioned the incident to either of us, nor I believe, to anyone else.

Held in the Derbyshire hills, an E & E exercise lasted some four days. Each crew would be dropped, one at a time, some 40 miles away from the start. Across country and on foot, each had to make a series of checkpoints within a specified time. We were strictly forbidden contact with the civilian population. Forces were mobilised to hunt us down and when caught, individuals would be taken to the interrogation centre. If still free after a day or two; one was cold, hungry and very, very tired. If caught, one was subjected to very unpleasant interrogation by professional teams. Before interrogation would start, one was deliberately stressed further almost to the point of collapse.

I won't dwell on the interrogation aspect, suffice to say that no crew was allowed to fly for seven days after returning from the exercise. Perhaps all this was necessary to teach us our limitations, but one ended up with an abiding hatred for his interrogators and a firm resolve never again to do another E & E.

My co-pilot now left us to take on a crew of his own, and I took on a new young Pilot Officer, on his first tour after training. He was a good lad and we were settling down as a team again when tragedy happened. 'Bill' as he was named, was killed on his motor bike coming back to Cottesmore early one Monday morning after a weekend at home. We went to his funeral at his family's request and I came to realise the full extent of their grief; his elder brother had also lost his life on a motor cycle a few years back. Does lightning never strike twice? Authority decided not to re-constitute my crew and, with their valuable experience at a premium, sent my remaining crew members off to train others. I took over temporarily another crew whose captain had gone 'long-term sick'.

Some of the instances I've described illustrate the lighter side of our life, and I should hate to leave the impression that we were an irresponsible lot. What we did in the V-Force and the way we did it were far too serious for that - we were all, in fact, highly dedicated to our job and mindful of the trust that being part of the nuclear deterrent imposed on each one of us. After three years the word was about that I would soon be leaving and sure enough, I found myself posted to the Central Flying School in order to become a flying instructor. "What now, I thought?" Part way through the course it all became clear. I was promoted and told that, if and when I graduated, I would assume command of the Victor Training Squadron at RAF Gaydon. So..... back to the 'beast I knew well!'

Once again at Gaydon, but this time with eight Victors, a posse of flying instructors and over 250 technical staff to look after - a package worth many millions of pounds and with some very valuable people. At age 28 this was daunting to me but as I was to learn, if one keeps one's head and a sense of proportion, one grows quickly into a position of command.

Leadership problems apart, my main concern was that I was a brand new flying instructor stuffed only with theory, and all my peers were vastly experienced in teaching Victor pilots and crews. I needn't have worried: being the sages they were they took the 'new boy' under their respective wings and brought him along quite nicely. In retrospect they clearly gave liberally of their expertise while I was able to offer them some of my operational background. It proved to be a good leavening of the bread, and once again I admired the acumen of those who decide about command and control.

With my new job I was entitled to a married quarter so my family came with me from the start. We moved in on a Saturday in high summer. On the Sunday afternoon my then four year old daughter took herself for a walk while we were still unpacking. She found this nice big house, where a large number of people were taking their tea on the lawn. She invited herself in, partook of tea and cakes, chatted to all and sundry and came home well satisfied - except that she didn't mention it to us. At my first station commander's morning briefing next day, I squirmed as he described the young lady who had come to visit him at home yesterday while he was entertaining VIP guests. More than that, our dog bit his dog soon after. Still, how long can a red face last?

I found that I thoroughly enjoyed teaching. Part of my flying task as squadron commander was to test each student captain and crew as they advanced through the Victor conversion. Each crew had to be able to cope with emergencies in the air. An instructor would simulate one or two problems on each sortie so that when my check ride became due for them, I was able to test most of the major emergencies they would hopefully never have to meet for real.

A simulated problem lacks the adrenalin of the real crisis and when I wrote up my final assessments, I often wondered how that crew would actually react if things went badly wrong. All, that is, except for one particular crew who during their course, had such a succession of real technical failures that I was certain that they would cope with anything. When they graduated no judgment was needed and I wrote their report hand on heart.

This leads me to say that the Victor suffered in its training role at Gaydon. It was a complex electrical and electronic aircraft designed to fly long sorties at height, and to do a single approach and landing thereafter. It was never designed for the constant grind of teaching pilots and crews to qualify on the type. My aircraft had begun to show their age, and finding enough aeroplanes serviceable each day to fulfil our tasks became my daily nightmare. Three solutions became necessary; firstly that I would receive two more aircraft. Secondly, that my technical staff would be divided into three shifts so that we could do our maintenance for 18 hours out of each 24, 7 days a week; and lastly, that I would attend each student crew technical debrief to ensure that correct fault diagnosis saved us time. By the time I left the squadron these measures were taking effect, but the need to be on hand for some eighteen hours every day took its toll of me.

Around the time President Kennedy died, we had a major tragedy at Gaydon. One of my instructors took off one very dark night with three student crew members on board, to teach the new copilot. Just after take-off they had major engine, electrical and other fault indications which were most difficult to source. The captain immediately shut down the affected engine but because the aircraft was full of fuel and therefore still too heavy to land safely, he was happy to orbit locally while we put all our heads together on the ground to pin down

the problem. Shortly after this another aircraft landed and saw in its lights pieces of debris alongside the runway. We identified these as pieces of our Victor which obviously had been shed from the aircraft – and the priority was clearly then to get him back on the ground as soon as possible! Before he could land it was vital to check visually from the ground that his undercarriage was still intact. He did a low pass and all seemed OK but as he climbed away to start his landing circuit, the remaining engines' fuel pumps failed and all power was lost. The crash and the resulting fireball killed all but the copilot who had ejected safely at low level.

That night I shall never forget, nor the anguish of the wives and families when my wife and I went together to break the tragic news. The investigation showed that, following massive engine damage, an obscure electrical failure occurred which had never been envisaged in the system design, and which had certainly never been simulated nor tested. The tragic irony was that although the aircraft was still heavy with fuel, the engines had failed through fuel starvation when the fuel pumps lost their power supply. Thinking back I know that I could have done no better than the Captain who met his death that night: ironic perhaps, but that trip should have been mine to do until he asked me if he could take it instead.

It is difficult to convey to those not in the Service the actual gloom that descends on a station in peacetime when a tragic and fatal accident occurs. Whilst on a sombre note, I'm reminded of another sad saga whilst at Gaydon. One of my technical shift leaders, a Warrant Officer, fell sick and was eventually diagnosed with cancer. He was hospitalised near London and for the two years he was there before he died, my squadron rallied round him and his family.

Every week without fail one of us, officer, NCO or airman would drive his family down to see him some 100 miles away in his own MG car of which he was so proud. The lads maintained his car in perfect condition and every driver insisted that he himself pay for the journey. I was very proud of my chaps. When he died I did something of which I'm sure my superiors would not have approved. He so loved his aircraft that at the behest of his wife, in the wee small hours I quietly scattered his ashes by a Victor dispersal when no one was about.

In lighter vein, one function of a unit commander is to respond when one of his people needs help. I had a corporal armourer, a first class man with a dry sense of humour but one who had a problem when it came to holding on to his money. His wife was no better and between them, his creditors mounted until it came to my notice. I had him in, sat him down and tried to get to the root of his dilemma. It became clear that he would need aid, and he agreed to let me appoint an officer to help manage his money matters for a while. Of course, the problem of his present debts still had to be overcome and in desperation I asked him "Don't you have anything you can dispose of now to raise cash?" He looked at me, let the slow smile spread across his face and said "I don't suppose Sir, that you'd like to buy a camera?" Odd, the things that stick in one's memory.

Talking of memory sparks me to an incident I know happened while we were at Gaydon. A much older officer there had been ill for a while, he died and was cremated. His ashes were duly delivered to his married quarter since his wife intended to inter these back where he had been born and raised. Meanwhile they were in the house, and the lady had discreetly stored them in their urn under her bed.

In those days most families had a batwoman to help in the house, including the lady in question. Being thorough, the batwoman had manoeuvred the Hoover nozzle unseen under the bed, had toppled the urn – and the ashes were sucked up into the cleaner and subsequently emptied into the bin! After the dust had settled (no pun intended) the poor wife took the empty urn home and surreptitiously upended it into position so that the grieving relatives couldn't see the lack of ashes. I'm well aware that this subject has been a music-hall joke for many years – but this actually did happen!

One of the Victor flight emergencies taught at Gaydon was that of a rapid cabin depressurisation at high altitude – or explosive decompression as it was called. Each instructor demonstrated one of these early on with a student crew but, since most of my flying was doing the check rides, I did one of these on almost every trip. On the last one I did, the regular abuse to my system coupled with a virus I had picked up, caused my ears to rupture and damaged some of my head passages. I was whipped into hospital and, over many months, underwent operations on both ears many times. All was well in the end and I was able to regain my medical category to fly again – but it was a long hard fight which I almost lost.

At my lowest point, the consultant RAF surgeon wanted to open my cranium to find the seat of the infection. I protested since that would end my flying career, and asked for a second opinion. They sent me to a London teaching hospital to see the resident and eminent professor, who really was a marvellous old boy. He examined me carefully, then asked me to hold my nose and blow so that he could see the effect on my tortured eardrums. By that stage I was more than conversant with my ear problems and I asked which ear he wanted me to select first.

“No, no, no” he said “The tubes at the back of the nose are common to both ears and the effect of your blowing must also be common to both!” This nettled me since for some months I had been able by manipulating my jaw while blowing, to save myself pain in both ears, when the effect on only one eardrum was needed. I told him this and, in disbelief, he called over a student and bade him look in one ear while he himself took the other. Now blow” he said, and it became a pantomime. It degenerated into “Mine went, did yours do the same?” “No Professor, nothing happened here” “Are you quite certain?” “Well, I didn't see anything my side” “Let's do it again” – and so forth. In the end he was convinced of my claim and after a long chat, suggested that we leave further surgery for a few months to give the ears time to settle by themselves. I shall always be grateful to the old boy and his parting remark to me was “You know, its the first time in years that I've seen anything new in this business.” He was a grand chap.

When I was in hospital yet another of those odd coincidences happened to me. I had left my squadron in the charge of my deputy – my senior instructor and a thoroughly sensible and reliable character. In my hospital bed recovering from an operation, I had a visit from the doctor in charge of the Neuropsychiatric Centre there, who told me that someone I knew had just been admitted – and he asked me to go and have a chat with him when I was able. The ‘someone’ was my deputy. He had apparently gone to visit friends whose house had a steep slope down to their garage. My colleague had parked his car on the slope and had gone round the front towards the door when his handbrake slipped and his own car pinned him by the legs to the garage.

One leg was broken but the real problem was that a sliver of bone matter from the wound had gone round his internal system and had lodged in his brain. The doctor wanted me to give an impartial ‘before and after’ assessment of his mental outlook, since I obviously knew him well. When I did get to see him, tragically I found him a totally changed man. I was much distressed that the positive, logical, humorous person I had once known was now anything but. His leg healed but his other treatment went on for some years. I lost touch with him eventually but I heard that he'd been invalided from the Service and was likely to remain a ‘vegetable’ for the rest of his life. A tragedy which shocked us all and a total waste!

Although I returned to Gaydon between rounds with the hospital, I was denied the chance to regain continuity with my squadron. I did however get to fly a couple of times more in the back of a Victor before I left my post, each time with our station medical officer peering at me to see what effect the height was having on my ears. It was his report to the medical hierarchy, bless him, that I believe swung their decision in my favour and eventually gave me back my flying category. It was obvious that my hearing system needed a break from flying, and I was not sorry to take up the place allotted to me at the RAF Staff College.

A great pity really, that I couldn't end my time with the Victor on a higher note.

The right of Patrick Peters to be identified as the author of this work has been asserted by him in accordance with the Copyright, Designs and Patents Act 1988.



The Nuclear Community Charity Fund

Stolen Documents

A report from the NCCF Trustee Board

P13

End of an era for the NCCF

Jeff Liddiatt reflects on his time serving the Nuclear Community

P14

CWI Fund News

Catch up on the latest news on the CWI Fund

P18

Former Chair and Treasurer Jeff Liddiatt reflects on his time serving the Nuclear Community

I joined the BNTVA in the late 1980's as a result of a piece written in our local paper. I was only an ordinary member until I volunteered to edit the newsletter.

A copy of which was sent to me by the then vice chairman Peter Fletcher MBE. I reformatted it and sent the final copy to Sheila Grey for printing. Having no control over the content of the copy I was not really an editor. This went on until my health deteriorated and I was unable to continue.

The next event I was able to attend was the dedication of the new BNTVA National Standard in 2003. My wife Annette and I travelled to Chichester by train from Bristol as I was still using my wheelchair. The dedication took place in Chichester Cathedral, and was carried out by the Dean, the Very Reverend Nicholas Frayling BA LLD, BNTVA Chaplain. The colour was carried from the Cathedral by Derek Heaps who was to become a very close friend over time. This was the first time I was able to put faces to the voices I was familiar with. John Lowe was the Chairman at that time (2000 to 2010) with Derek Redfern as his vice chairman. Again a bout of ill health took over.

The magazine /newsletter which it now became was edited by the Reverend John Walden who decided that he wanted to give up so I was asked to take over by John Lowe. This time as editor I had full control over the magazine and we took it from being a church newsletter/tabloid type publication to a full colour magazine.



Pictured above from left to right Jeff Liddiatt, John Lowe, Derek Twigg MP, and Doug Hern (BNTVA Archivist)

During my time as editor I became like an ADC to John Lowe working with him on letters, statements, and especially going to meetings at the MOD with the then Veterans Minister, a sort of apprenticeship which served me well in the coming years negotiations.

Also during this time, the executive committee asked me to look into the BNTVA becoming a Registered Charity, the application and submission took me a few years. The proposal was put to the members with a postal vote in 2009 and the result was a staggering 98% in favour.

The BNTVA had to find a new venue for the AGM due to Blackpool council deciding to withdraw the funding which had been in place for many years. I negotiated a special price with the council for the 2009 AGM, but after that a new venue needed to be found. I took over as secretary after the AGM in 2009. We stayed in Blackpool for the 2010 AGM using the Norbreck Castle Hotel conference facilities. The board decided that we should locate the AGM around the country in future.

John Lowe stood down as Chairman in early 2010 and Nigel Heaps was asked to take on the role.

The Next major event was the Miles & Green Health Audit in 2011, the complete membership was contacted, many attended group meetings around the country. The results were accepted by the MOD and referenced for the future.

During this time the future direction of the BNTVA was developed and “Going Forward Together” was launched, without this distinct shift in the direction and activities of the charity I do not think it would have survived until today.

Another significant event which took place in October 2011 was the laying up of the BNTVA National Standard in Portsmouth Cathedral. The laying up took place during Choral Evensong. In the colour party was again my friend Derek Heaps in what was to be his final duty for the BNTVA before he passed away.

I wrote these words for the service

“

“Reverend Sir, I ask you to receive the National Standard of the British Nuclear Test Veterans’ Association for safe lodging in this house of God until such time as it shall pass to dust like those whose courage and devotion are enshrined in its history”.

The Dean replies

“

“We receive this Standard into the safe keeping of God’s house, here to hang for all time as a reminder to those who pass by of our duty to God, and of the men and women of the Association whose memory is enshrined in the Standard”.

We took our campaign for recognition and funding to Parliament with the help of John Baron MP the BNTVA Patron. On Wednesday 2nd July 2014 our recognition Campaign took a historic step forward when, in response to a PMQ from our Patron John Baron, David Cameron became the first British Prime Minister to say this from the dispatch box “First I pay tribute to my Hon Friend, who has campaigned consistently on this issue in the House and outside it. He and I have discussed the matter. I am Happy to tell the House that the Government recognise and are extremely grateful to all service personnel who participated in the nuclear testing programme. We should be in no doubt that their selfless contribution helped to equip the United Kingdom with the deterrent it needs” John Baron MP continued with the claim for funding in the House of Commons. Eventually the Aged Veterans Fund was announced with £25 million to be used across all veterans.

After a number of meetings with the chancellor and at number 10, John Baron and I were invited to the cabinet office for a meeting where the details of the funding was confirmed. I negotiated the broader political scope for the wider nuclear community, which has enabled the fund to help all the nuclear family. Hence the name Nuclear Community Charity Fund (NCCF).

Nigel and I worked on the first application for £1 million to start the first phase of the Research by Rhona Anderson at Brunel University, also our project with Combat Stress together with the NCCF Care and Wellbeing fund for our community.

I first met Rhona at the cross party inquiry lead by John Baron and Ian Gibson in Parliament in 2008. It became both our aims to promote further research into the nuclear veterans’ community.



Dr Rhona Anderson, Brunel University London



Nigel had resigned as a trustee to prevent a potential conflict of interest and I was invited by the trustees to become Chairman, a role I undertook for the following year. During this time we were introduced to Alan Owen, At the Stoke Rochford Hall AGM he agreed to shadow me for one year and then to become Chairman. It turned out to be somewhat of a disappointment.



Stoke Rochford Hall AGM, May 2016



Jeff Liddiatt, rekindling the flame at the tomb of the unknown soldier - Paris 2016



Jeff Liddiatt at the BNTVA Gateshead AGM and conference May 2016

© BH Associates

An even more important event was held in 2016. I had been invited to join Jean-Luc Sans, President of AVEN, to join him on the 2nd July at the Arc de Triomphe in Paris to help re-ignite the eternal flame at the tomb of the unknown soldier. The invitation was made by the Committee of the Flame. This was a very poignant thing for me, not only representing the British Nuclear Veterans, but also the fact that my Grandfather was killed in action on the Somme in August 1916 almost 100 years to date when I would carry out the rekindling of the flame.

The most moving part, which I learned at the end of the ceremony, was in relation to the only British people to have rekindled the flame, they were Her Majesty the Queen and four British Prime Ministers. I am very honoured to be in such company.

Later in the year the board considered the proposal to split the BNTVA and the NCCF, and this was put to the membership at the AGM in Gateshead, which was carried unanimously.

The BNTVA and the NCCF became independent Charities (Charitable Incorporated Organisation (CIO) in their own right.

I remained as Chairman of the NCCF, with a board of trustees made up of old and new members. The time came for the application to be made for stage 2 of the AVF funding. Nigel and I put the case together with the support of the board, for £5 million to fund the phase 2 research at Brunel University and our other projects and to provide an endowment fund for the NCCF to invest for the future, to provide the CW&I fund for the next 15 years.

A restricted fund grant was awarded to the NCCF in 2017. The project to be known as Nuclear Community Charity Fund – Making That Difference. The funds were invested with Blackrock.

Rhona Anderson invited me to become the Chairman of the Advisory Board to the research being carried out at Brunel University. The NCCF partly funds the Centre for Health Effects of Radiological and Chemical Agents (CHRC) with Brunel University

The NCCF publishes its own magazine called Exposure with contributions from individuals, Brunel University (CHRC) and the editorial staff of the NCCF. This is published three times a year.

Exposure magazine, published by the NCCF



National Atomic Veterans Awareness Day (NAVAD) 2018.

On the 3rd October over 100 members of the nuclear community gathered at the BNTVA Memorial in the National Memorial Arboretum Alrewas to remember those who has passed as a result of the British Nuclear Testing Programme. This was a very special NAVAD as the new BNTVA memorial was unveiled.

Bob Smith a long standing activist within the nuclear community had embarked on a campaign to erect a memorial to all British Nuclear Test Veterans following the passing of his great friend Peter Williams. Bob, together with Mrs Gron Williams, Peter's widow, unveiled the first memorial in 2006. Due to the ravages of time the memorial began to crumble and had to be replaced. On the 3rd October 2012 Bob was asked to unveil the new memorial to carry the heritage forward. Bob said after unveiling the stone "I wanted to make sure there is a permanent reminder of our lives and struggles, they can't just airbrush us from history"

The new stones unveiled in 2018 were to replace the old benches which had been removed. The plaques from the benches were added to the rear of the new stones. The new stones were unveiled by Derek Hickman, Royal Engineers, and Terry Washington, Royal Navy, during a moving dedication ceremony carried out by the Very Reverend Nicholas Frayling BNTVA Chaplain. Again I was unable to attend due to ill health. Bob was also unable to attend due to poor health.

I stood down as Chairman of the NCCF in December 2018 and Tony Jeffery took over. I continued as treasurer until the annual meeting in December 2019. I continued as a trustee until June this year when I retired completely.

I shall miss my daily contacts with my colleagues and friends. I have on the whole enjoyed my time both in the BNTVA and the NCCF.



Bob Smith at the new BNTVA memorial stone

“

I wanted to make sure there is a permanent reminder of our lives and struggles, they can't just airbrush us from history.

Bob Smith

© BH Associates



Terry Washington and Derek Hickman unveil the new stones on the memorial 3rd October 2018



The new stones either side of the memorial

© BH Associates

© BH Associates

I wish to express my delight in being made Honorary life President of the NCCF, in recognition of my long service to the Nuclear Community. **Jeff Liddiatt**

Care Wellbeing and Inclusion Fund News

COVID 19 impact and new Risk Assessment

Following the success of our last edition getting much-needed government advice out to our vulnerable beneficiaries we have had to adapt our operations further to the Covid19 situation.

We have completed a Covid19 Risk Assessment across all our areas of activity to ensure we can continue to function as fully as possible whilst maximising the safety of Beneficiaries, Trustees, Contractors and Volunteers.

Unless Government advice changes from the 1st of August we will be recommencing Independent Living Assessments for potential beneficiaries. This will involve a Case Worker entering into peoples properties but the strict set of measures we have developed will minimise the risk of infection as far as is reasonably practicable.

We have ensured that contractors are aware of our Risk Assessment and that they have implemented practices that comply with our standards as a minimum.

Greater use of video conferencing is being made within the organisation which also helps reduce personal contact. We will continue to review activities inline with Government guidance and the evolving situation.

On line grant panel system a great success

During 2019 we made several enhancements to the Grant Panel process, streamlining the process, simplifying application forms and using alternative methods of discussing and reviewing applications.

This work culminated in a workshop discussion during December where the final touches were made addressing what we saw as the final pitfalls of our systems.

We are now pleased to announce that the new systems are fully rolled out and waiting for your applications!

If you would like to make an application for support or for an Independent Living Review to see what assistance could be provided please contact us:

Email: care@thenccf.org
Call: **0115 8883442**

Or write to:
NCCF Care
PO Box 8244
Castle Donington
DE74 2BY

Independent Living Assessments

We have made a number of changes to our assessment process. We found that we were paying for far too much additional information with the Occupational Therapy reports we commissioned for some potential beneficiaries. All we need to know is what independent living adaptations and or social inclusion measures would benefit them.

We have now launched our Independent Living Assessment system where a trained assessor will visit and work with you to identify all measures and adaptations that could be provided to reduce your suffering and increase your wellbeing.

Being targeted on the charity's provisions, these ILA's are more specific and more economic, allowing us to offer them out to many more potential beneficiaries. Because the ILA Case Worker is contracted directly to the NCCF they can discuss your application for support in-depth and ensure all the details required by the Grant Panel to make their decision are correct. This will reduce confusion and stress in beneficiaries and increase the ability of the NCCF to provide a holistic response to your needs.

Approved Contractor Team

Over the years running the Care Wellbeing and Inclusion Fund we have often encountered issues identifying suitable local contractors to undertake work we are funding on behalf of beneficiaries. On some occasions, this has led to additional stress for beneficiaries and on one particular provision, we had to engage a further contractor to conduct significant remedial work.

This is not a situation we wish to encounter, we believe our provision of goods and services should be professional and proficient. To try and reduce the potential of these issues developing in the future we have identified the key work areas where we have encountered problems in the past and have recruited specific contractors so we can be sure of their work standards.

This service launched just as 'lockdown' began but we have already used our new teams on a number of outdoor provisions. The feedback from the beneficiaries has been excellent and we look forward to increasing this style of provision in the future.

All contractors are inducted into the NCCF CWI Fund so they are aware of the needs and issues of our community. They are checked under the Vetting and Barring Scheme and like our Case Workers are issued with a unique NCCF Photographic Identity Card.

NCCF Identity Cards

As part of our commitment to Safeguarding Vulnerable Persons, we have introduced photographic identity cards which will be carried by all our Trustees, Contractors and Care Workers.



These cards have a picture of the holder, their name and status detail. Also on the card is a unique ID number which can be verified either through the internet or over the phone. When an appointment is made you will receive either a letter or email advising of the person's unique ID number and name. You will be able to check this with them when they visit.

Closer Working with other charities

The NCCF continues its drive to work more closely with other charities within the Nuclear Survivor Community. The use of SSAFA Support Workers and Age-UK's befriending service continue to add value to our solutions for beneficiaries. We are working hard on this matter and hope to make announcements of a number of new initiatives to launch in 2021.

The British Nuclear Test Veteran: Nuclear Weapons, National Service, and the Soldier's Body

The British Nuclear Test Veteran: Nuclear Weapons, National Service, and the Soldier's Body is a PhD research project conducted by Fiona Bowler at the University of Southampton.

The project investigates the experiences of British nuclear test veterans involved in atmospheric nuclear tests, perceptions of radiation risk, and the impact of these experiences upon servicemen. It also examines the evolution of a community of British nuclear test veterans.

As part of this project, Fiona Bowler is looking to conduct oral history interviews with British nuclear test veterans and their family members. The data will feature within her doctoral thesis, which will be made available to participants upon completion. You are invited to participate in these interviews, and if interested, please contact:

Fiona Bowler

via email: f.bowler@soton.ac.uk
or via telephone: **07824 777 005**

UNIVERSITY OF
Southampton

ERGO ID 47273



Fiona Bowler
PhD researcher
University of Southampton

Trustee Retirements

The NCCF Board of Trustees announces the retirement of two of their founder members; Jeff Liddiatt and Bob Ireland.

Jeff and Bob have given long service to the British Nuclear Survivor Community in positions within both the BNTVA and the NCCF.

The Board has voted unanimously to make both of them Honorary Life Members and we will cover their investiture in the next magazine. We are sure that the followers of the NCCF will join with us in thanking Jeff and Bob for their unwavering service and wish them peaceful retirements.



Jeff Liddiatt



Bob Ireland

Letters from our Readers

We have received a few letters of thanks from a beneficiaries to the NCCF, we will publish more of these as we receive them. We always keep beneficiaries identities confidential, even our Grant Panel is unaware of the identities of those they help.

Dear Editor

I would like to say a very big thank you to the NCCF for the last edition of Exposure.

My wife and I are in our 80's we have got the internet but I only use it for email. The essential Government and National Health Service information contained in Exposure was just what we needed. I don't know where else we would have get the information if it was not for the NCCF.

Thank you for thinking of us and realising there are many of us out here who do not live in the internet.

Dear NCCF

You provided my husband with a mobility scooter and special hoist so I can easily get it out of our car boot. I just want to say what a fantastic difference this has made to our lives. Before the lockdown we were able to go out together shopping, visiting friends and some of the nice parks around where we live.

It is so easy for me to get his scooter in and out of the car. I was frightened trying to manage his old one so we had to stop going out together. I would also like to thank the company who fitted the hoist, they were polite, did not make any mess and were very quick.

Dear Sirs

Just a quick note to express my gratitude to the very professional and helpful people you sent to help me. They looked at everything I do in my home and even how I get about shopping and meeting friends. All the things they have provided me with are making my life so much easier. I just did not realise how many things there are to help with day to day living. I was getting very depressed until you came and helped me.





Exposure Editorial Summer 2020

A round up of what's been happening at the CHRC

P22

Ionising Radiation and Tissue Effects Part 2

We discuss examples of late tissue effects, i.e. effects which can take place several years after exposure such as cardiovascular disease and cataracts.

P23

Exposure Editorial Summer 2020



Who could have predicted the world we now find ourselves in. Just a few short months ago we were updating you on our progress and letting you know about the University re-opening dates after the Easter holiday period.

As you may know, the University campus and our labs had to close well before Easter and to date, remain closed. What this means is that the good progress we had been making with the processing and analysis of donated blood samples for the whole genome sequence and cytogenetic analysis work has been and remains on-hold.

The signs for a measured and staged return to campus however are brighter with senior management at the University designing and implementing covid-secure working practices and procedures. At the forefront of this is getting lab-based research moving again. We are very much part of this and are busy putting plans in place for a safe return to work for all our researchers and students that will give us the best chance of building back up to our previous levels of capacity. Previously we had been confident that we were on course to complete analysis on key parts of this study by the end of this year. We will be able to review this once we are back and working within the new system however, be rest assured that we will endeavour to work as hard as possible to minimise any further delays.

Indeed, work has continued throughout on many elements of our projects that do not involve the lab by the wonders of technology and remote working. We have been progressing our systematic review of the published literature examining the question of 'radiation effects in non-exposed children', data collection is complete for the 'Exposure Worry' study and analysis of the results of the surveys

and transcripts of the interviews is underway. Associated with this work, I am pleased to let you know that a narrative review written by doctoral researcher George Collett titled 'The psychological consequences of (perceived) ionizing radiation exposure: a review on its role in radiation-induced cognitive dysfunction' has just been accepted after peer-review for publication in the International Journal of Radiation Biology (Collett et al 2020). A summary and link to this manuscript will be available on www.chrc4veterans.uk once published. Similarly, data collection from two rounds of in-depth interviews is also complete for the 'Wellbeing' study and is currently being written in a creative non-fiction style to represent the findings in a way that is both novel and accessible to all. I would like to add that all of our doctoral students have continued to work remotely on their respective projects through what has been quite challenging times, for which I commend them.

Our series of articles encompassing 'radiation and health' continues with Part 2 of 'Ionising Radiation and Tissue Effects'. In Part 1 (published in *Exposure* April 2020) we discussed 'tissue effects', i.e. how ionising radiation can damage cells, tissues and organs with an emphasis on early tissue effects such as radiation sickness and sterility. In Part 2 we discuss examples of late tissue effects, i.e. effects which can take place several years after exposure such as cardiovascular disease and cataracts.

We also want to highlight our 'Basic Facts' which we have

renamed 'Basic Information' as we feel the series covers emerging research and understanding in addition to established facts. In the last edition of *Exposure* we introduced you to this educational resource. Since then we have added new topics 'radiation and health', radiation and tissue' and 'radiation and cancer' all of which complement our articles published in *Exposure* by providing more content and further reading opportunities.

We are also updating our Knowledge Hub with lay summaries of selected peer-reviewed publications. Why and how the research was undertaken and what the principle findings of the research were, are described. Our aim is to make science that has a relevance and interest for members of the nuclear test community accessible. In this way, you will have the opportunity to see the breadth of research undertaken internationally, build your understanding based on published evidence and, gain insight into how consensus views are drawn from bodies of work.

I would like to finish by thanking everyone who has volunteered and contributed to all of our projects. CHRC staff remain working and are contactable via email at CHRC@brunel.ac.uk. During this period there may be a delay in replying. But please get in touch if you have any queries and please all keep well.

Dr Rhona Anderson, Director, CHRC

Ionising Radiation and Tissue Effects

Part 2

This is the second part of a two-part article. In Part 1 (published in Exposure April 2020) we discussed 'tissue effects', i.e. how ionising radiation can damage cells, tissues and organs with an emphasis on early tissue effects such as radiation sickness and sterility. In Part 2 we discuss examples of late tissue effects, i.e. effects which can take place several years after exposure such as cardiovascular disease and cataracts.

Cardiovascular Diseases

Cardiovascular disease (also called circulatory disease) refers to a group of medical conditions which affect the normal flow of blood within the body. Cardiovascular conditions are the leading causes of death worldwide and approximately 18 million people died in 2016, with most of these deaths due to heart attacks or strokes¹.

Many factors which increase the risk of these conditions are preventable and include smoking, poor diet, lack of exercise, high cholesterol, high blood pressure and excessive consumption of alcohol². Scientists have found that exposure to radiation also increases the risk of cardiovascular disease in proportion to the dose received^{3, 4}. Small increased risks (< 2%) were first observed in cancer patients who had undergone radiotherapy⁴.

The medical staff who perform radiotherapy localise the dose to the tissues which contain cancer cells.

Radiotherapy Facts⁵

- Radiotherapy uses ionising radiation to kill cancer cells.
- Large partial body doses are given to treat cancer, e.g. 40 – 50 Gy.
- The dose is given in fractions, e.g. 25 doses of 2 Gy over 5 weeks.
- Approximately 50% of cancer patients in the UK receive radiotherapy.
- In the UK, approximately 90% of patients have survived for 5 years after diagnosis due to radiotherapy.

Reference: Cancer Research UK,

<https://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/radiotherapy/about>

However, healthy tissue close to the cancer tissue can also be exposed. For example, the heart is located near the left breast (Figure 1) and receives a portion of the treatment dose (typically about 10%) during radiotherapy for breast cancer.

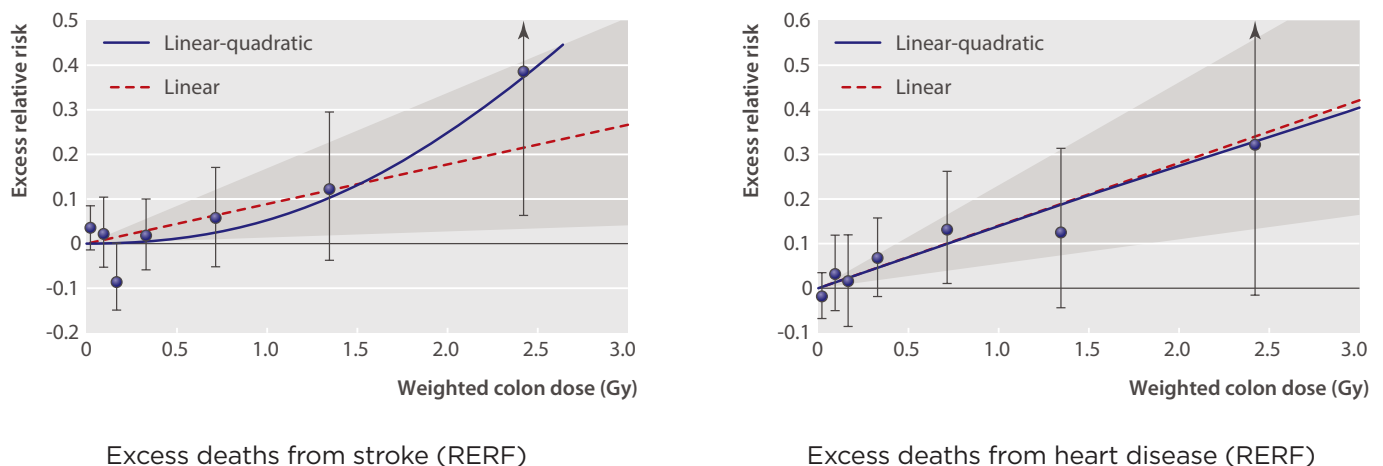


Figure 1. Heart location in the body (Pinterest).

Cardiovascular disease can occur several years after exposure, so studies have been done with women who have received radiotherapy for breast cancer over 20-30 years ago to assess the long-term effects^{6, 7, 8}. For example, suppose we have 50-year-old women who does not smoke and she receives a dose of 4 Gy (in multiple smaller fractions) to her heart as a consequence of her radiotherapy. The study results suggest that her risk of death from coronary heart disease before she reaches the age of 80 will have been increased by 0.3%⁸. Clinicians would regard this risk as being small compared to the significant benefits of the woman surviving breast cancer and this is why radiotherapy is still recommended for most breast cancer patients.

Nevertheless, scientists are currently investigating different ways of reducing the dose that the heart receives during radiotherapy to minimise this risk of cardiovascular disease. One of these approaches is called the deep inspiration breath hold⁹. The patient breathes in and holds their breath, which causes the heart and the breasts to move further apart during their treatment. The patient can be assisted in this task by an instrument called an active breathing control device.

The Radiation Effects Research Foundation (RERF) are researching the effects of ionising radiation on the survivors of the atomic bombing of Japan over the course of their lifetimes in the Life Span Study. RERF have found that radiation doses lower than those used in radiotherapy can cause cardiovascular disease¹⁰. For example, doses of 0.5 Gy were sufficient to produce small increases in deaths from both heart disease and stroke amongst the survivors compared to a control group of Japanese people who were not exposed to ionising radiation (Figure 2). The graphs show that this increased risk of death increased with dose.



Reference, Shimizu, 2010, <https://www.bmj.com/content/340/bmj.b5349.long>

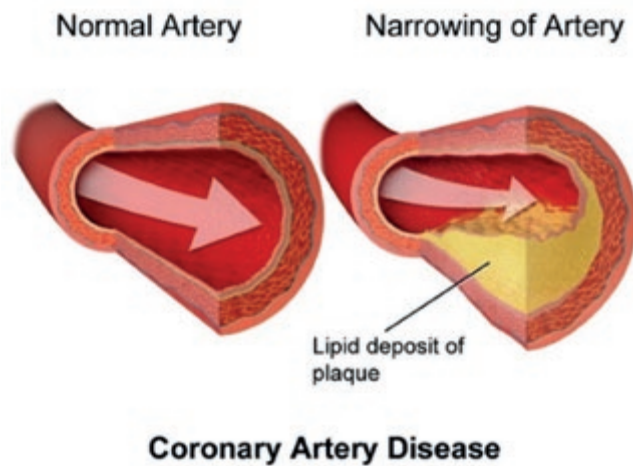
Figure 2. Excess cardiovascular disease amongst the survivors of the atomic bombings of Japan.

Scientists analysing the data investigated whether the data fitted a linear model (shown by red dotted lines in the graphs) or a linear-quadratic model (shown by the solid blue line). A linear model is one in which doubling the radiation dose doubles the excess risk. A linear quadratic model is more complicated than the linear model, i.e. doubling the dose will at least quadruple the excess risk. The heart disease data best fits the linear model and the stroke data best fits the linear quadratic model.

Approximately 19,000 of the atomic bomb survivors have died of cardiovascular disease since 1945. About 200 of these deaths (~ 1%) are in excess to controls and estimated to be due to radiation.

Epidemiology studies (studies which record the occurrence of disease within a defined group of people) have been performed with people from a number of different occupations in which radiation exposure is possible including miners, medical radiation workers and Chernobyl emergency service personnel^{11, 12}. The ICRP estimate of the threshold dose for cardiovascular disease of 0.5 Gy is based on the findings of these studies³. As discussed in Part 1, this means that 1% of a defined group of people exposed to 0.5 Gy of radiation will get cardiovascular disease in their lifetimes. This incidence of radiation-induced cardiovascular disease is low compared to the 30%-50% of the public in developed countries like the UK who will get cardiovascular disease from other causes³.

The mechanisms by which radiation exposure results in cardiovascular disease are not fully understood and this is an important area of current research. It is known that blocking arteries with fatty substances and inflammation of the artery walls (a process called atherosclerosis) can cause strokes and heart attacks. Some researchers have suggested that atherosclerosis (shown in Figure 3) is a possible consequence of radiation exposure^{4,13}. However, further evidence is required to prove this.



Reference: Blausen.com staff (2014). "Medical gallery of Blausen Medical 2014". *WikiJournal of Medicine* 1 (2). DOI:10.15347/wjm/2014.010. ISSN

Figure 3. Blockage of the coronary artery leading to the heart

Cataracts

A cataract is a clouding of the lens of the eye leading to blurred vision and in severe cases vision loss, indeed cataracts are the world's leading cause of blindness and accounted for 20 million cases of sight loss in 2010¹⁴. Most cataracts are related to the ageing process, but they can also be induced by radiation, often several years after exposure¹⁵.

There are three major types of cataract which form in different locations in the eye that are called nuclear, cortical and posterior sub-capsular¹⁵. Nuclear cataracts are the most common and occur in the central part of the eye lens - they are not currently known to be induced by radiation. Cortical cataracts form on the outside edge of the eye lens - they are commonly found in diabetics, though they can be formed in response to radiation. Posterior sub-capsular cataracts are found at the back of the eye lens and this type of cataract in particular is known to arise from exposure to ionising radiation (Figure 4).

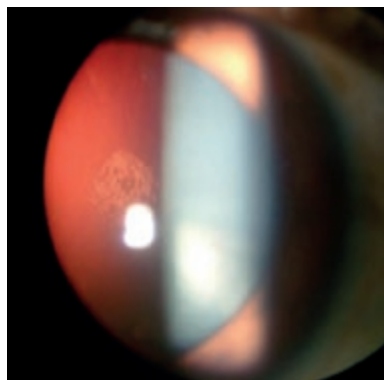


Figure 4. A Posterior Sub-Capsular Cataract. (image by Imrankabirhossain, licensed under CC-BY-SA-4.0)

For many years radiation scientists considered cataracts to be a deterministic effect with a high threshold dose and this was reflected in ICRP guidelines (Table 1)³.

Table 14. Former ICRP Guidelines for Eye Exposure.

Cataract threshold	Annual Exposure Limit
2 Gy (acute), 8 Gy (chronic)	0.15 Sv

Reference: ICRP, <https://www.icrp.org/publication.asp?id=ICRP%20Publication%20118>

The ICRP had recommended that a single, brief dose to the eye lens should not exceed 2 Gy and that the dose to the eye delivered over a long period should not exceed 8 Gy. Indeed, the annual exposure limit of 0.15 Sv was set to ensure that workers do not receive 8 Gy over the course of their working lives.

Equivalent Radiation Dose

Radiation protection experts, who set annual radiation exposure limits for different professions, often use the equivalent radiation dose measured in Sieverts (Sv).

The equivalent radiation dose takes into account that the effects of radiation depend not only on the absorbed dose of radiation but also upon the type (s) of radiation received.

The UK measured the equivalent dose in rem in the 1950s and 1960s.
1 Sv = 100 rem

The evidence of cataracts being a deterministic effect having a threshold dose was based upon investigations into the health of the survivors of the atomic bombings of Japan. However, more recent studies with these survivors have suggested that cataracts can be formed at lower doses than was previously observed and that there may not be a threshold dose. Furthermore, there have been other studies including with American radiation technologists and workers who performed clean-up work after the Chernobyl accident which also have provided evidence that cataracts have a lower threshold dose^{12, 16, 17}.

This evidence has persuaded the ICRP to modify their guidelines (Table 2)³. In particular the annual exposure limit has been reduced to 0.02 Sv, though exposure up to 0.05 Sv is allowed for one year provided that the total dose for five consecutive years does not exceed 0.1 Sv.

Table 2. New ICRP Guidelines for Eye Exposure.

Cataract threshold	Annual Exposure Limit
0.5 Gy	0.02 Sv normally 0.05 Sv allowed for 1 year if 5-year dose < 0.1 Sv

Reference: ICRP, <https://www.icrp.org/publication.asp?id=ICRP%20Publication%20118>

At the current time, based on the evidence, it is not clear whether cataracts are a deterministic effect. There is some evidence that cataracts are a stochastic effect^{16, 17}. Stochastic effects are defined as those which may take place as a result of radiation exposure and are caused by DNA mutation rather than cell death². This has not been conclusively proven and is currently being investigated further.

Summary

In this article we have discussed the late tissue effects produced by ionising radiation such as cardiovascular disease and cataracts. In all of these examples the health effects depend upon the dose received and so it has been described how the ICRP and others working in radiation protection minimise exposure to protect health. The article shows that tissue effects continue to be an important area of research for the international scientific community.

We at the CHRC do hope you have found this article informative and references are included for further reading. Please also refer to the Basic Information page which can be found on the CHRC website: www.chrc4veterans.uk under the Knowledge Hub tab.

References

1. World Health Organisation, Cardiovascular diseases, World Health Organisation, viewed 31 January 2020, <https://www.who.int/health-topics/cardiovascular-diseases/#tab=tab_1>. Cardiovascular disease.
2. NHS, Cardiovascular disease, NHS, viewed 20 February 2020, <<https://www.nhs.uk/conditions/Cardiovascular-disease/>>. Cardiovascular disease.
3. International Commission on Radiological Protection (ICRP) (2012) ICRP Publication 118, ICRP Statement on Tissue Reactions / Early and Late Effects of Radiation in Normal Tissues and Organs – Threshold Doses for Tissue Reactions in a Radiation Protection Context, ICRP, viewed 26 February 2020, <<http://www.icrp.org/publication.asp?id=ICRP%20Publication%20118>>. Tissue effects including discussions of the eye and the heart.
4. Donnellan, E. et al (2016) Radiation-induced heart disease: A practical guide to diagnosis and management, Cleveland Clinic Journal of Medicine, 83 (12), pp. 914-922, doi: https://pdfs.semanticscholar.org/851d/a864c716bd952ac6b77824c97bae9f4366c3.pdf?_ga=2.28041077.851927943.1580744782-799377034.1580744782. Radiation-induced heart disease.
5. Cancer Research UK, Radiotherapy, Cancer Research UK, viewed 26 February 2020, <<https://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/radiotherapy/about>>. Information about radiotherapy and cancer.
6. Darby, S.C. et al (2011) Incidence of heart disease in 35,000 women treated with radiotherapy for breast cancer in Denmark and Sweden, Radiotherapy and Oncology, 100, pp. 167-175, doi: [https://www.thegreenjournal.com/article/S0167-8140\(11\)00327-6/pdf](https://www.thegreenjournal.com/article/S0167-8140(11)00327-6/pdf). Radiotherapy and breast cancer.
7. Darby, S.C. et al (2013) Risk of Ischemic Heart Disease in Women after Radiotherapy for Breast Cancer, New England Journal of Medicine, 368 (11), pp. 987-998, doi: https://www.nejm.org/doi/10.1056/NEJMoa1209825?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%3dwww.ncbi.nlm.nih.gov. Radiotherapy and breast cancer.
8. Taylor, C. et al. (2017) Estimating the Risks of Breast Cancer Radiotherapy: Evidence from Modern Radiation Doses to the Lungs and Heart and from Previous Randomised Trials, Journal of Clinical Oncology, 35 (15), pp. 1641-1649, doi: <https://ascopubs.org/doi/pdf/10.1200/JCO.2016.72.0722>. Radiotherapy and breast cancer.
9. Bergom, C. et al (2018) Deep Inspiration Breath Hold: Techniques and Advantages for Cardiac Sparing during Breast Cancer Irradiation, Frontiers in Oncology, 8, p.87, doi: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5893752/>. Radiotherapy and breast cancer.
10. Shimizu, Y. et al (2010) Radiation exposure and circulatory disease risk: Hiroshima and Nagasaki atomic bomb survivor data, 1950-2003, British Medical Journal, 340: b5349, doi: <https://www.bmj.com/content/340/bmj.b5349.long>. Study about heart disease and stroke.
11. Little, M.P. (2012) Systematic Review and Meta-analysis of Circulatory Disease from Exposure to Low-Level Ionising Radiation and Estimates of Potential Population Mortality Risks, Environmental Health Perspectives, 120 (11), pp. 1503-1511, doi: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3556625/>. Assessment of multiple epidemiology studies about radiation and circulatory disease.
12. Little, M.P. (2013) A review of non-cancer effects, especially circulatory and ocular diseases, Radiation Environmental Biophysics, 52 (4), pp. 435-449, doi: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4074546/>. Assessment of epidemiology studies about radiation, circulatory disease and the eye.
13. Baselet, B. et al (2016) Cardiovascular diseases related to ionising radiation: The risk of low-dose exposure (Review), International Journal of Molecular Medicine, 38 (6), pp. 1623-1641, doi: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5117755/>. Discussion of possible mechanisms.
14. World Health Organisation, Blindness and vision impairment prevention, Priority Eye Diseases, Cataract, World Health Organisation, viewed 24th January 2020, <<https://www.who.int/blindness/causes/priority/en/index1.html>>. Information about cataracts.
15. International Atomic Energy Agency (IAEA), Radiation protection of medical staff from cataract, IAEA, viewed 11 February 2020, <<https://www.iaea.org/resources/rpop/health-professionals/radiology/ataract/staff>>. Information about cataracts and radiation.
16. Shore, R.E. (2016) Radiation and cataract risk: Impact of recent epidemiological studies on ICRP judgements, Mutation Research, 770, pp. 231-237, doi: <https://www.sciencedirect.com/science/article/pii/S138357421630059X>. Discussion of various epidemiological studies about radiation and cataracts.
17. Hamada, N. et al (2020) Advances in Radiation Biology – Highlights from 16th ICRR Special Feature: Review Article, An update on effects of ionizing radiation exposure on the eye, British Journal of Radiology, 93: 20190829, doi: <https://www.birpublications.org/doi/pdf/10.1259/bjr.20190829>. An overview of radiation-induced cataracts.

Meet the Team

Justin Dankwa is a doctoral student with a fulltime scholarship in the CHRC at Brunel University London. His research focuses on the impact of mixed radiation and chemicals exposure on neuronal toxicity and cellular ageing.



Justin Dankwa

Justin holds an Honours BSc in Biochemistry and MSc in Bioinformatics from the University of Leicester. Prior to joining the CHRC, Justin worked for a year with the Neuro, Emergency and Trauma (NET) Clinical Research Team at Imperial College NHS Trust investigating Sepsis.

Justin is a keen sportsman and enjoys playing football and coaching in his spare time. Aside that, his interests lay in music playing the acoustic and bass guitar as part of his church's worship team.

Justin joined the team in April 2020 and is being supervised by Dr Rhona Anderson and Dr Cristina Sisu on a project titled 'The impact of mixed radiation and chemicals exposure on neuronal cytotoxicity, ageing and transcription'.

What is the aim of this study?

The aim of Justin's project is to explore the adverse effects of radiation and chemical exposures on normal human brain functioning. In recent years, information relating to the biological response following exposure and possible risk-factors for cognitive impairment, have been emerging. To build on this growing body of knowledge Justin's project will use publicly-available large-scale next generation DNA sequencing brain datasets to identify and study changes in genome sequence, function and activity of brain cells. This will improve our understanding of the impact of radiation and chemical exposures on the brain, particularly after low-moderate doses. It may also enable us to identify new mutations and genetic biomarkers associated with adverse effect.

Why we are doing this?

As humans, we are continuously exposed to varying levels of radiation and chemical pollutants from the environment, during medical procedures and as a consequence of some occupations. Exposure could possibly result in an increased risk of damage to our cells and to our DNA.

In recent years, evidence has been emerging showing ionising radiation as a possible risk-factor for cognitive impairment. Cognitive impairment includes deficits in learning, memory, and information processing ability.

For instance, some studies show that prenatal exposures may affect brain development and cognitive functioning however there is much more uncertainty about its effects when individuals are exposed as adolescents and adults. This is particularly the case for low-moderate dose exposures commonly seen in medical and occupational settings and highlights the need to increase our understanding on the biological processes and pathways surrounding the adverse effects of radiation on neural cells. For a review on the topic please see Collett et al 2020.

Why this study is important?

The outcomes of this study will contribute to the growing body of knowledge surrounding exposure to radiation and chemicals as sole agents or as mixtures and their effect on the brain. Our findings should elucidate on biological responses and the adverse pathways that can lead to cognitive impairments and contribute to a deeper understanding on potential health risks of such exposures.

What does it involve?

This is a data-driven project. Publicly-available large-scale next generation DNA sequencing brain datasets will be analysed using a combination of bioinformatic and statistical tools. In the first instance, genes that are mutated or have a differential expression pattern in radiation exposed subjects compared to healthy individuals will be identified. This will inform on particular biological pathways of interest which will then be explored further.



International News

We are at War

History's similarities, by
Jean-Louis Camuzat

P30

A gallery of previous trips to see our French brothers

We can't visit the French veterans this year so we've shared some images
from previous trips

P31

We are at War

Jean-Louis Camuzat

The period of time we have just gone through has been exceptional and as President Macron put it: "We are at war"!!! This is a war that we can neither see nor smell nor hear.

How strange! It reminds me of the words we use when we are talking about the struggle of all our veterans who are also fighting a war that we experienced on the testing sites of Sahara and French Polynesia from 1960 to 1998.



Jean-Louis Camuzat

This war was not called "COVID 19", but "Nuclear testing 60/98".

Since March 15th our country has been under lockdown, professional activity (with the exception of health staff to whom I would like to pay tribute here), political activity and the activities of the associations came to stop and our economy has collapsed!!

Faced with this exceptional situation, we had to make an exceptional decision for our association: we had to cancel our General Annual Meeting that was scheduled for October in Troyes.

Over the whole period of lockdown we remained on alert and our struggle went on. Thanks to a collective action, we could have our senators ban article 13, an article that would have removed the consultative commission in charge of the expansion of the list of recognized illnesses.

Then we were able to once more question our MPs and senators after the proposal of an amendment had been deliberately slipped into a debate on Covid 19. This amendment would have prevented the modification of article 232 of the law of December 28th 2018 that made it more difficult for veterans to retroactively be eligible for compensation.

Following those various attempts to undermine the rights of our veterans, we issued a press release to express our discontent.

The award of a medal is still a topical and recurring issue. The decree of application is still stuck on second reading, which is why we wrote a letter to the MOD lately in a bid to speed up the process.

I am particularly determined to call for a straightforward and frank recognition of our widows and our offspring. This is a matter of dignity.

This is an ambitious, but concrete project. How should widows who have shared the suffering of a husband, suffered the loss of their loved one and had to raise the children alone under serious financial difficulties not be recognized ?

Jean-Louis CAMUZAT - AVEN President

We share some past memories of visits to see our French brothers



Top Row: Vichy 2016
 Second Row: Paris 2017
 Third Row: Montauban 2018
 Bottom: Paris 2019

We hope to see you all again next year.

exposure

The combined magazine for the nuclear community

Next issue copy deadline for all editorial sections:
1st November 2020

Contributions for Exposure magazine should go to the relevant section editor:

NCCF

office@thencf.org
PO Box 8244
Castle Donington
DE74 2BY

CHRC

chrc@brunel.ac.uk
CHRC
Brunel University London
Uxbridge
UB8 3PH

Exposure

For advertising or any other enquiries
editor@exposure.press

Exposure
PO Box 8244
Castle Donington
DE74 2BY

NCCF Board of Trustees



Chairman
Tony Jeffery

✉ chairman@thencf.org



Secretary
Tracey Morris

✉ secretary@thencf.org



Trustee
Treasurer

✉ ihall@thencf.org



Trustee
Don James

✉ djames@thencf.org



Trustee
Martin Blackburn

✉ mblackburn@thencf.org



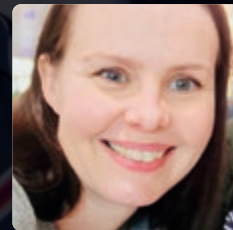
Trustee
Katy Morris

✉ kmorris@thencf.org



Trustee
William Long

✉ wlong@thencf.org



Trustee
Victoria James

✉ vjames@thencf.org



Trustee
Andrew Kirk

✉ akirk@thencf.org

Become an NCCF Trustee

Join our friendly active board for a rewarding experience and help make that difference.

For further information contact:

office@thencf.org

Or write to

The NCCF
PO Box 8244
Castle Donington
DE74 2BY

Advisors

Projects Manager
Nigel Heaps

✉ nheaps@thencf.org
✉ office@thencf.org

Projects Manager
Stephen Bexon

✉ sbexon@thencf.org
✉ office@thencf.org