

THE FLYING COFFINS OF BOMBER COMMAND

by FREEMAN DYSON

Thousands of young men died in the Lancasters, the lives of many being needlessly squandered by the inflexible attitudes of Bomber Command's chiefs. This is the charge made by Freeman Dyson, of Princeton's Institute for Advanced Study, in an extract from his book 'Disturbing the Universe', to be published next month by Harper Row.

Wyton Air Force Base, during a desperate time in January, 1944, was the home of 83 Squadron, one of the original Pathfinder Squadrons — those which had been leading the night attacks on German cities since the Pathfinders began. I stood by the runway, facing into a cold, wet wind, and watched the 20 Lancasters of 83 Squadron head into blackness. They were heavily overloaded and took a long time to get airborne. Lancasters had a phenomenal capacity for carrying bombs. The permissible overload had been raised several times since Lancasters began operations in 1942. After the bombers took off, I went inside for a cup of tea.

Wyton was as ugly as a wartime military base can be. Puddles, barracks, warehouses full of bombs,⁽¹⁾ rusting wreckage of damaged equipment not worth repairing. For two months, 83 Squadron had been going out night after night — whenever the weather was not completely impossible — to bomb Berlin. On the average, it was losing an aircraft each time it went out. Each Lancaster carried a crew of seven. Bomber Command was putting its maximum effort into the repeated attacks on Berlin that winter, because that was the last chance to do decisive damage to the German war economy before the Western armies were to begin the invasion of Europe.

The boys who flew in the Lancasters were told that this Battle of Berlin was one of the decisive battles of the war and that they were winning it. I did not know how many of them believed what they were told. I knew only that what they were told was untrue. By January, 1944, the battle was lost. I had seen the bomb patterns, which showed bombs scattered over a disproportionately enormous area. The bomber losses were rising sharply. There was no chance that our continuing the offensive in this style could have any decisive effect on the war. It was true that Berlin contained a great variety of important war industries and administrative centres, but Bomber Command was not attempting to find and attack these objectives individually. The squadrons merely showered incendiary bombs over the city in as concentrated a fashion as possible, with a small fraction of high-explosive bombs⁽²⁾ to discourage the fire-fighters. Against this sort of attack, the defence could afford to be selective. Important factories were protected by fire-fighting teams who could deal quickly with incendiaries falling in vital areas. Civilian housing and shops could be left to burn. So it often happened that Bomber Command 'destroyed' a city, and photographic reconnaissance a

⁽¹⁾ Bombs were stored in the bomb-dump, as is well known, not in above-ground 'warehouses'.

⁽²⁾ Incorrect — the whole idea was to use Cookies and other high-explosive bombs to de-roof buildings, allowing incendiaries to ignite the exposed innards.

few weeks later showed factories producing as usual amid the rubble of burnt homes.

On just two occasions during the war, a Bomber Command incendiary attack was outstandingly successful. This happened first in Hamburg, in July, 1943. We started so many fires in a heavily built-up area that a fire storm developed — a hurricane of flame which killed 40,000 people and destroyed everything in its path. None of our other attacks produced effects that were a 10th as destructive as the effects of a fire storm. The only way we could have won a militarily meaningful victory in the Battle of Berlin would have been to raise one there. But I knew in January, 1944, that a fire storm could happen only when the bombers were able to bomb exceptionally accurately and without serious interference from the defences. Under our repeated battering, the defences of Berlin were getting stronger, and the scatter of the bombing was getting worse. Only once more — a year after my visit to Wyton, when Germany was invaded and about to be overrun — did we succeed in raising a fire storm. That was in February, 1945, in Dresden.

In January, 1944, I was a civilian scientist working at Bomber Command headquarters. I belonged to a group called the Operational Research Section, which gave scientific advice to the commander-in-chief. I was engaged in a statistical study to find out whether there was any correlation between the amount of a crew's experience and the chances of the crew's being shot down. The belief of Bomber Command, incessantly drummed into the crews during their training, and impressed on the public by the official propaganda machine, was that a crew's chance of surviving a mission increased with experience. Once you get through the first five or 10 missions, the crews were told, you will know the ropes and you will learn to spot the German night fighters sooner and you will stand a much better chance of coming home alive.

To believe this was undoubtedly good for the boys' morale. Squadron commanders, all of them survivors of many missions, sincerely believed that they owed their survival to their personal qualities of skill and determination rather than to pure chance. They were probably right. It had been true in the early years of the war that experienced crews survived better. Before I arrived at Bomber Command, the Operational Research Section had made a study that confirmed the official doctrine of survival through experience. The results of that study had been warmly accepted by everybody. Unfortunately, when I repeated the study with better statistics and more recent data I found that things had changed. My analysis was based on complete records, and it carefully excluded any spurious correlations caused by the fact that inexperienced crews were often given easier missions.

My conclusion was unambiguous: the decrease of loss-rate with experience which existed in 1942 had ceased to exist in 1944. There were still many individual cases of experienced crews by heroic efforts bringing home bombers so badly damaged that novice crews in the same situation would almost certainly have been lost. Such cases did not alter the fact that the total effect of the skill and dedication of the experienced crews was statistically undetectable. Experienced and inexperienced crews were mown down as impartially as the

boys who walked into the German machine-gun nests in the Battle of the Somme in 1916. The disappearance of the correlation between experience and loss-rate ought to have been recognised by our commander-in-chief as a warning signal, telling him that he was up against something new. In the Operational Research Section, we had a theory to explain why experience no longer saved bombers. We now know that our theory was correct. The theory was called 'upward-firing guns'. Each bomber had four crew members constantly searching the sky for fighters: the pilot and the bomb-aimer in front and the two gunners in the tail and mid-upper gun turrets. Straight underneath the bomber was a blind spot. Conventionally armed fighters would not have been able to approach the bomber from underneath and shoot it down without being seen, but increasing numbers of the German fighters were not conventionally armed: they had cannon pointing vertically upwards, with a simple periscope gunsight arranged so that the pilot could take careful aim as he flew quietly below the bomber. The main problem for the fighter pilot was to avoid being hit by any large pieces as the bomber disintegrated.

As an old Pathfinder Squadron, 83 Squadron had more than its share of experienced crews. The normal tour of duty for a crew in a regular squadron was 30 missions. The loss-rate during the middle years of the war averaged about 4 per cent. This meant that a crewman had three chances in 10 of completing a normal tour. The Pathfinder crews signed on for a double tour of 60 missions. They had about one chance in 11 of completing the double tour. During the winter of 1943-44, with the repeated attacks on Berlin, the losses were higher than average and the chances of survival smaller.

I had come to Wyton from Command Headquarters, in a forest 30 miles outside London, to see how various radar countermeasures against fighters were working. The radars worked all right, but they were not much use, because they could not distinguish fighters from bombers. I also hoped to pick up information at Wyton that would be helpful for my study of the effects of experience on loss-rates. I thought I might talk with some of the experienced crews, gather firsthand impressions, and get a feeling for what was really happening in the nightly battles over Berlin. But it soon became clear that serious conversations between crews and civilian outsiders were impossible. Above all, the subject of survival rates was taboo. The whole weight of Air Force tradition and authority was designed to discourage the individual airman from figuring the odds. Airmen who thought too much about the odds were likely to crack up mentally. Airmen who talked about such matters to their crewmates were a danger to the discipline of the squadron. Stringent precautions were taken to ensure that none of our Command Headquarters documents that discussed survival rates reached the squadrons. The old rule 'Theirs not to reason why, Theirs but to do and die' was still in force. The crewmen were not forbidden to talk to me. They could talk as much as they liked. But what could they say to me, or what could I say to them, across the gulf that separated us? They were mostly 20-year-old boys — the same age as I. They had faced flaming death perhaps 30 times and would face it perhaps 30 times more if they were lucky. I had not and would not. They knew, and I knew that they knew, that I was one of those college-educated kids who found

themselves cushy civilian jobs and kept out of harm's way. How could two 20-year-olds separated by such a barrier talk to each other about anything important? The one person at Wyton to whom I could talk freely was Wing Commander MacGowan, the chief medical officer of the Pathfinder Force. He was responsible for the mental as well as the physical health of the crews of the eight Pathfinder Squadrons. A tall, white-haired officer, he seemed to me very old, although he cannot have been much over 40. He was the ultimate authority who decided, when one of the boys began to show signs of mental crackup, whether the boy should be kept on operations or transferred out of the squadron. There was no easy way out for boys who cracked. The rules of Bomber Command were designed to ensure that crewmen should consider transfer a fate worse than death. When a boy was transferred for mental reasons, the cause of transfer was officially recorded as 'lack of moral fibre'. He was, in effect, officially declared to be a coward. In spite of the public disgrace and dishonour that they had to endure, however, the number of crewmen who cracked was not small. At Bomber Command Headquarters, we knew that the number transferred out of squadrons before the end of their tour was roughly equal to the number completing the full tour. We were not allowed to know how many of those transferred were mental cases. But MacGowan knew.

I was astonished when MacGowan told me, at our first meeting, that he was flying to Berlin that night. He said the crews loved to have him go along with them. It was well known in the squadron that the plane with the Doc on board always came home safely. He had already been to Berlin and back six times in the last two months. At first, I thought he must be crazy. Why should an elderly doctor with a full-time staff job risk his life repeatedly on these desperately dangerous missions? Afterward, I understood. It was the only way he could show those boys for whose bodies and souls he was responsible that he really cared about them. It was the only way he could face the boys who cracked and declare them 'lacking in moral fibre' without losing his self-respect.

While MacGowan and 20 times seven crewmen were on their way to Berlin, there was a beer party for the spare crews, who for one reason or another were not needed on this operation. The boys drank a great deal of beer and sang their squadron songs.

We take out bombs to Germany,

We don't bring them back.

they sang.

It was the saddest beer party I have ever attended. Early in the morning, we heard the Lancasters coming home. Only one was missing. It was not MacGowan's.

After my visit to Wyton, I decided that the only honourable thing to do was to quit my job at Command Headquarters and enlist as a crewman. Because of my mathematical training, I expected they would accept me as a navigator. But before taking any such drastic action I discussed the whole situation with my mother. My mother understood at once what was at stake. She saw that it would be useless to appeal directly to my cowardice. Instead, she appealed to my incompetence. 'You would be absolutely hopeless as a navigator,' she said. 'You

would get lost every time. Of course, I won't argue against your going and getting yourself killed if you think that that is the right thing to do. But it would be a terrible waste of an aeroplane.'

Her words had their intended effect. I gave up the idea of heroic self-sacrifice and went quietly back to work at Bomber Command.

During that winter, while we were attacking Berlin, the Germans would from time to time send a few bombers over London, where my family then lived. The German attacks were on a minuscule scale compared to ours, and they cannot have had any other purpose than to boost the morale of the Berliners. We had carried out similar token raids on Berlin in 1940, when London was under serious attack. So when the German planes came droning overhead on one night in February, 1944, I stayed in bed, and did not bother to go down to the cellar of our house. I thought of the German boys up there, risking their lives to provide morning copy for the writers in the Propaganda Ministry. I meditated upon the overwhelming irrelevance of this game of tit-for-tat bombing to the serious war that we were supposed to be engaged in. Then came a shattering explosion, and my bedroom windows lay in splinters on the floor. The Institut Francais, two houses away, on the corner of Queen's Gate and Prince Consort Road, had taken a direct hit. The Institut had been the cultural centre for the French community in London before the war.

It was said that the prewar French had not been happy when de Gaulle came over from France in 1940 and, without any legal authorisation, claimed for himself the leadership of the Free French forces. There had been sporadic feuding between the Institut people and de Gaulle all through the war. My mother and I went out into the street to watch the Institut burn. It made a glorious blaze in the winter night. Perhaps, after all, those boys up there were not German but French, sent by de Gaulle to pay off an old grudge. Whichever way you looked at it, it made no sense.

In the Operational Research Section, those of us who studied the causes of bomber losses thought we had a promising idea for reducing the losses. We wanted to rip two gun turrets, with all the associated machinery and ammunition, out of the bombers and reduce the crew from seven to five. The evidence that loss-rate did not decrease with experience confirmed our belief that gunners were of little use for defending bombers at night. The basic trouble with the bombers was that they were too slow and too heavily loaded. The gun turrets were heavy and aerodynamically awkward. We estimated that a bomber with the turrets ripped out and the holes covered by smooth fairings would fly 50 miles an hour faster and be much more manoeuvrable. Bomber losses varied dramatically from night to night. We knew that the main cause of the variation was the success or failure of the German fighter controllers in directing the fighters into the bomber stream before it reached the target. An extra 50 miles an hour might make an enormous difference. At the very least, we urged, Bomber Command could try the experiment of ripping the turrets out of a few squadrons. They would then soon see whether the gunless Lancasters were shot down more or less than the others. Privately, I had another reason for wanting to rip out the turrets: even

if the change did not result in saving a single bomber, it would at least save the lives of the gunners.

All our advice to the commander-in-chief was channelled through the career civil servants. The guiding principle of some of them was to tell the commander-in-chief only things that the commander-in-chief liked to hear. I still remember the shock I felt the first time I saw one of them in action. I happened to be in his office when a WAAF sergeant came in with a bomb plot of a recent attack on Frankfurt. As usual, the impact points decoded from flash photographs were plotted on a map of the city with a three-mile circle drawn around the aiming point. The plot was supposed to go to the commander-in-chief together with our analysis of the raid. Our civil servant looked glumly at it and then gave it back to the sergeant. 'Awfully few bombs inside the circle,' he said. 'You'd better change that to a five-mile circle before it goes in.'

After this experience, I was not surprised to learn that our superiors took a dim view of our suggestion that bombers might survive better without gun turrets. This was not, they thought, the kind of suggestion that the commander-in-chief liked to hear, and therefore they did not like it, either. To push the idea of ripping out gun turrets, against the official mythology of the gallant gunner defending his crewmates, and against the massive bureaucratic inertia of Bomber Command, would have involved them in a major political battle. Perhaps it was a battle they could not have hoped to win. In any case, the instincts of career civil servants told them to avoid such battles. The gun turrets remained in the bombers, and the gunners continued to die uselessly, until the end of the war.

I shared an office at Command Headquarters with a half-Irish boy of my own age called Mike O'Laughlin. He had been a soldier in the Army, had developed epilepsy, and had been given a medical discharge. He knew less mathematics than I did, but he knew more about the real world. When we looked around us at the brutalities and stupidities of Bomber Command, I got depressed and Mike got angry. Anger is creative; depression is useless.

One of the things that Mike was angry about was escape hatches. Every bomber had a trapdoor in the floor through which the crewmen were supposed to jump when the captain gave the order to bail out. The official propaganda gave the crewmen the impression that they had an excellent chance of escaping by parachute if their plane should be so unlucky as to be shot down. They were generally more worried about being lynched by infuriated German civilians than about being trapped in a burning aircraft. In reality, lynching by civilians never happened, and only a small number of airmen were shot by the Gestapo after being captured.⁽¹⁾ A far larger number died because they were inadequately prepared for the job of squeezing through a small hole while wearing a bulky flying suit and parachute harness, in the dark, in a hurry, in an aeroplane rapidly going out of control. The mechanics of bailing out was another taboo subject, which right-thinking crewmen were not encouraged to discuss.

⁽¹⁾ Lynching by civilians did happen, and I have eye-witness reports on file which prove this. The Gestapo – and others - went in for a lot more than shooting shot-down airmen. No matter how 'small' the number, even one is far too many. Also, he has clearly forgotten the fifty shot after 'The Great Escape'!

The actual fraction of survivors among the crews of shot-down planes was a secret kept from the squadrons even more strictly than the odds against their completing an operational tour. If the boys had found out how small was the fraction of those who succeeded in bailing out after their planes were hit, some of them might have been tempted to jump too soon.

Mike was no respecter of official taboos. He managed to collect fairly complete information concerning the numbers of crewmen, from missing aircraft of various types, who turned up as prisoners of war. The numbers that he found were startling. From American bombers shot down in daylight, about 50 per cent escaped. From the older types of British night bomber, the Halifax and the Stirling, about 25 per cent. From Lancasters, 15 per cent. The Lancaster was our newest bomber and was superior in every other respect to the Halifax and the Stirling. The older bombers were being phased out, and the squadrons were being rapidly converted to Lancasters.⁽¹⁾

Mike was the only person in the entire Command who worried about what this would do to the boys who were shot down. It was easy to argue that the difference in the escape rate between the American bombers and the Halifaxes and Stirlings was attributable to the difference in circumstances between day and night bombing. The Americans may have had more warning before they were hit and more time to organise their departure. It was obviously easier to find the way out by daylight than in the dark. No such excuses could account for the difference between the Halifaxes and the Lancasters. Mike quickly discovered an explanation for the low escape rate from the Lancasters. The Lancaster hatch was in various ways more awkward, harder to squeeze through. The awkwardness probably cost the lives of several thousand boys.

Mike spent two years in a lonely struggle to force the Command to modify the Lancaster hatch. Ultimately, he failed. It was an unequal battle of will power against bureaucracy — one epileptic boy confronting the entrenched inertia of the military establishment. Mike did make progress, but it was maddeningly slow. After he had collected the information on escape rates, it took many months for Bomber Command to admit officially that a problem existed. After the problem had been officially recognised, it took many months to persuade the companies that built the Lancaster that they ought to do something about it. After the companies started to work on the problem, it took many months for a better hatch to be designed. And so the war ended before the hatch could be put into production.

When the total casualty figures for Bomber Command were added up at the end of the war, the results were as follows.

Killed on operations: 47,130.

Bailed out and survived: 12,790, including 138 who died as prisoners of war.

Escape rate: 21.3 per cent.

I always believed that we could have come close to the American escape rate of 50 per cent if our commanders had been seriously concerned about the problem.

⁽¹⁾ Partly incorrect — some squadrons never had Lancasters, as in the case of No. 4 Group, which was re-equipped with successive marks of the Halifax.

We killed, altogether, about 400,000 Germans, one-third of them in the two fire storms, in Hamburg and Dresden. The Dresden fire storm was the worse one. But from our point of view it was only a fluke. We attacked Berlin 16 times with the same kind of force that attacked Dresden once. We were trying every time to raise a fire storm.

There was nothing special about Dresden except that for once every thing worked as we intended. It was like a hole-in-one in a game of golf. Unfortunately, Dresden had little military importance,⁽¹⁾ and anyway the slaughter came too late to have any serious effect on the war. Kurt Vonnegut, Jnr, wrote a book, called 'Slaughterhouse-Five; or, The Children's Crusade', about the Dresden raid. For many years, I intended to write a book on the bombing. Now I do not need to write it, because Vonnegut has written it much better than I could. He was in Dresden at the time and saw what happened. Not only is his book good literature; it is also truthful. The only omission I am aware of is that it does not say that the night attack that produced the holocaust was a British affair. The Americans only came the following day to plough over the rubble. Vonnegut, being American, did not want to write his account in such a way that the whole thing could be blamed on the British. Apart from that, everything he says is true. One of the most truthful things in the book is the subtitle, 'The Children's Crusade'. Vonnegut explains in his introductory chapter how the wife of one of his friends got angry and made him use that subtitle. She was right. A children's crusade is what the whole bloody shambles was.

Bomber Command might have been invented by some mad sociologist as an example to exhibit as clearly as possible the evil aspects of science and technology. The Lancaster, in itself a magnificent flying machine, made into a death trap for the boys who flew it. A huge organisation dedicated to the purpose of burning cities and killing people, and doing the job badly. A bureaucratic accounting system that failed utterly to distinguish between ends and means, measuring the success of squadrons by the number of sorties flown, no matter why, and by the tonnage of bombs dropped, no matter where. Secrecy pervaded the hierarchy from top to bottom, directed not so much against the Germans as against the possibility that the failures and falsehoods of Bomber Command would become known either to the political authorities in London or to the boys in the squadrons. An Operational Research Section that was supposed to give the commander-in-chief independent scientific advice but was too timid to challenge any essential element of policy. A collection of staff officers at Bomber Command headquarters who, in some cases, reminded me, when, occasionally, I was invited to go and have a drink with them at the officers' mess, of the Oxford dons that the historian Edward Gibbon described nearly 200 years ago in his autobiography:

'Their dull and deep potations excused the brisk intemperance of youth.'

Many of these evils existed in military establishments long before warfare became technological. Our commander-in-chief was a typical example of a pre-scientific military man. He was unimaginative, but at least he was human and he

⁽¹⁾ Dresden was home to a number of important factories engaged on war work. Also, it was a major rail centre for troops going east to meet the Russians. This is a matter of historical fact.

was willing to take responsibility for what he did. In himself, he was not worse than General Sherman, who also did harm in a just cause. He was only carrying out, with greater enthusiasm than the situation demanded,⁽¹⁾ the policy laid down by his government. His personality was not the root of the evil at Bomber Command. The root of the evil was the doctrine of strategic bombing, which had guided the evolution of Bomber Command from its beginning, in 1936.

The doctrine of strategic bombing declared that the only way to win wars or to prevent wars was to rain down death and destruction upon enemy countries from the sky. This doctrine was attractive to political and military leaders in the 1930s, for two reasons. First, it promised them escape from their worst nightmare — a repetition of the frightful trench warfare of the First World War, through which they had all lived. Secondly, it offered them a hope that war could be avoided altogether, by the operation of the principle that later came to be known as deterrence. The doctrine held that all governments would be deterred from starting wars if they knew that the certain consequence would be ruinous bombardment. As far as the war against Germany was concerned, history proved the theory wrong on both counts. Strategic bombing neither deterred the war nor won it. There has never yet been a war that strategic bombing by itself won. In spite of the clear evidence of history, the strategic-bombing doctrine flourished in Bomber Command throughout the Second World War. And it flourishes still, in bigger countries, with bigger bombs.

Bomber Command was an early example of the new evil that science and technology have added to the old evils of soldiering: they have made evil anonymous. Through science and technology, evil is organised bureaucratically so that no individual below the very top is responsible for what happens. Neither the boy in the Lancaster aiming his bombs at an ill-defined splodge on his radar screen nor the operations officer shuffling papers at squadron headquarters nor I, sitting in my little office in the Operational Research Section and calculating probabilities, had any feeling of personal responsibility. None of us ever saw the people we killed. None of us particularly cared where we killed them.

The last spring of the war was the most desolate. Even after Dresden, through March and April of 1945, the bombing of cities continued. The German night fighters fought to the end, and shot down hundreds of Lancasters⁽²⁾ in these final weeks. I began to look backwards and to ask myself how it had happened that I let myself become involved in this crazy game of murder. I had been retreating step by step from one moral position to another, until at the end I had no moral position at all.

At the beginning of the war, I believed fiercely in the brotherhood of man, called myself a follower of Gandhi, and was morally opposed to all violence. After a year of war, I retreated, and said: Unfortunately, nonviolent resistance against

⁽¹⁾ Personally, I find this statement somewhat objectionable. Sir Arthur Harris carried out his duties as befitted the senior career Air Force officer he was. Nothing more, nothing less. I can say this; he was certainly over-enthusiastic when it came to minimising, to the limit that he was able, the casualties in his Command.

⁽²⁾ No Halifaxes, Mosquitos, Fortresses or Liberators?

Hitler is impracticable, but I am still morally opposed to bombing. A couple of years later, I said: Unfortunately, it seems that bombing is necessary in order to win the war, and so I am willing to go to work for Bomber Command, but I am still morally opposed to bombing cities indiscriminately.

After I arrived at Bomber Command, I said: Unfortunately, it turns out that we are, after all, bombing cities indiscriminately, but this is morally justified, as it is helping to win the war. A year later, I said: Unfortunately, it seems that our bombing is not really helping to win the war, but at least I am morally justified in working to save the lives of the bomber crews. In the last spring of the war, I could no longer find any excuses.

Mike had fought single-handed the battle of the escape hatches. I had not helped him. I had surrendered one moral principle after another, and in the end it was all for nothing. In that last spring, I watched the woods come to life outside the window of my office at Command Headquarters. I had the poems of Gerard Manley Hopkins on my desk. His last, desperate sonnets spoke to my despair.

See, banks and brakes

Now, leaved how thick! Laced they are again

With fretful chervil, look, and fresh wind shakes

Them; birds build — but not I build; no, but strain,

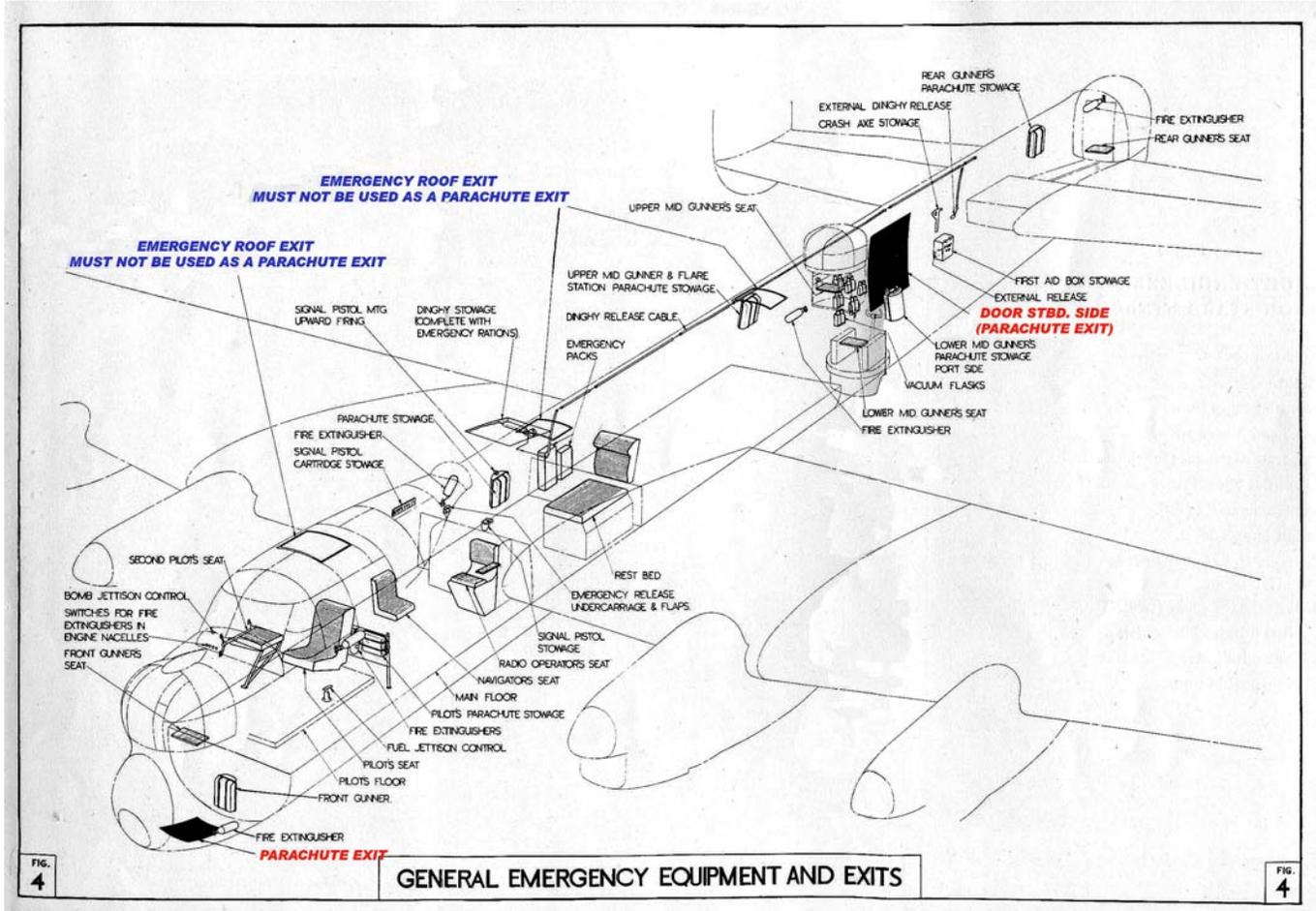
Time 's eunuch, and not breed one work that wakes.

Mine, O thou lord of life, send my roots rain.

Thirty years later, I stood with my wife and our children in the air-raid shelter in the garden of my wife's uncle's home in East Germany. My wife's uncle had built the shelter solidly, of brick and steel. Several bomb craters could still be traced in the ground nearby. After 30 years, the roof of the shelter was sound and the floor dry. The house stands in a village south-west of Berlin. During the years I was at Bomber Command, my wife lived in that house. She was still a child. The nights when the bombers came over she spent in the shelter. No doubt she was there the night Wing Commander MacGowan came over, when I was drinking beer with the boys at Wyton. We tried without much success to explain all this to the children. 'You mean Mummy was down here because Daddy's friends were dropping the bombs on the garden?' You really cannot explain things like that to a seven-year-old.

This material first appeared in the New Yorker and is taken from 'Disturbing the Universe' by Freeman Dyson, to be published by Harper & Row on 15 November 1979.

From: AP 2062C Pilot's Notes For Lancaster III (only).



As can be seen, there are only two prescribed parachute exits – through the nose and the fuselage access/exit door. The canopy and roof hatches are 'forbidden' as escape routes, although many hundreds saved their lives by going out through these exits, despite the risk of hitting the tailplane in some instances. The Rear Gunner's usual method of escape – rotate the turret on the beam and go out backwards through the doors – is not even mentioned. Study of the above diagram does give considerable credence to Freeman Dyson's statements and opinions, and Operational Research Section (Bomber Command) did produce a paper which conclusively illustrated the fact that the survival rate among baling out Halifax crews was considerably higher than those of the Lancaster. Dyson's figures, obviously, are derived from that paper. For myself, I find that I am left with a feeling of sincere admiration for Mike O'Laughlin and his efforts to have the Lancaster's nose escape hatch enlarged. Of course, he was asking for a re-tooling operation which would have incurred some costs, and it is unlikely that the companies involved would wish to embark on any such disruption of the production process – or their profits. I feel certain that, had Harris known that concentric aiming point circles were being expanded from 3 miles to 5 on bomb plots to give the impression that the

attack had been more accurate than it in fact was, then he would have been furious. Harris, perforce, had to take his information as it was, and would almost certainly not have tolerated any dilution of the facts, no matter how hard they were. I feel that passage reflects more on the civil servant than it does on the AOC-in-C.....

It can be imagined how the then heretical idea of ripping out gun turrets must have gone down with Bomber Command! However, it should be remembered that mid-upper turrets had been removed from early marks of the Halifax in order to help clean up the airframe and improve speed. For most of its life the Halifax never had a front turret, and that of the Lancaster was, to all intents and purposes, unmanned. Also, certain squadrons are known to have removed their front turrets – 7 Squadron being among them – and it is well known that 617 removed theirs from Lancasters which carried the *Tallboy* and *Grand Slam* bombs.

So, perhaps not so heretical after all.

It is unlikely that a Scientist of such prominence – he is still with us - would publish such a chapter were it not an accurate account of his time with ORS(BC), and does throw an alternative light on certain preconceived/received ideas of how certain things were approached.

Although he does not mention it, because at that stage he could not, I cannot help but wonder if he was privy to the *Ultra* secret, and, equally, if he was aware that Bomber Command was not in receipt of the information it provided.

On a final note, I certainly do not agree with any of his remarks regarding Dresden.

A WYKEHAMIST AT PRINCETON

by Nigel Hawkes



Freeman Dyson is a physicist with a well-developed taste for public affairs. At many points his life has touched the great issues of the 20th century; in this extract from his book 'Disturbing the Universe' he describes the frustrations of trying to behave like a scientist within RAF Bomber Command during the war, but he has also been involved with the design of nuclear plants and space rockets, the drafting of disarmament treaties and the building of new theories of the structure of matter.

He occupies in American science a role something like that of the late Jacob Bronowski, as a man who can vault the cultural divide. His book, from which we have taken the extract on Bomber Command, is 'an attempt to describe to people who are not scientists the way the human situation looks to somebody who is a scientist'. Given the history of science this century, it is no surprise that the dilemmas of conscience and political action faced by individual scientists make up most of the book.

Freeman Dyson was born in England. His father was a distinguished teacher of music, composer and conductor who became Director of the Royal College of Music, his mother a lawyer. As a young man he fell in love with mathematics, teaching himself advanced theories from a text book so that he could understand Einstein better.

Then came the war, and the years with Bomber Command as a young and apparently ignored scientist. In 1947 he went to America with a scholarship as a graduate student - at Cornell, where he met many of the best physicists of the day, some of whom had spent the war down in New Mexico building the bomb. Among them were Hans Bethe, Richard Feynman and Philip Morrison, who recently gave the Dimbleby Lecture on BBC TV.

Dyson was a phenomenally quick learner and within a year had impressed J. Robert Oppenheimer sufficiently to be offered a place at the Institute for Advanced Study at Princeton, where Oppenheimer was Director. He has been there ever since.

The institute is an intellectual hothouse where scholars are paid to sit and think without distractions, on the perhaps fallacious assumption that great intellects are at their most productive in an atmosphere of contemplative quiet (In fact, like most academic institutions the place is riven by the odd dispute, proving that even in an ideal world people will find something to argue about.)

As with All Souls, Oxford, few people turn down a chance to Join the institute; Einstein spent his last few years there, and T.S. Eliot made a long visit in 1948 at the invitation of Oppenheimer. (According to Dyson, the Director was none too pleased with the

results of his invitation: 'I invited Eliot here in the hope that he would produce another master piece, and all he did was to work on 'The Cocktail Party', the worst thing he ever wrote.')

Dyson's field of study to begin with was quantum electro-dynamics, the study of the behaviour of the electron within the constraints of quantum theory. But, somewhat to Oppenheimer's disappointment, Dyson chose to range wide rather than digging deep, and shifted into pure mathematics, nuclear engineering, space technology and astronomy. He says that he has always been a problem-solver rather than a creator of ideas, and he cannot sit for years with his mind concentrated on one deep question.

He has always been a tremendous enthusiast. As a schoolboy he adopted Gandian pacifism, followed by a self-invented religion he called Cosmic Unity; as an adult his enthusiasms have been equally whole-hearted. In the 1950s he spent some time designing a space rocket which would have propelled itself across the universe by exploding nuclear weapons behind it, a concept which now makes him cringe. It would have been, he admits, a filthy creature, leaving its radioactive mess behind it wherever it went. Today he is enthusiastic about the idea of colonising space, calculating that it could be done for no more, in real terms, than it cost the settlers who sailed on the Mayflower.

He is, he admits, a peculiar scientist, obsessively interested in the future. This interest began when he was a schoolboy at Winchester, a town where everybody else was in love with the past. He reacted fiercely against this reverence for the

past, dreaming of space ships and alien civilisations while those around him talked of Chaucer.

Today he is a naturalised American, a decision forced on him when a British Foreign Office official told him that his children did not qualify for British citizenship. The whole family forthwith became American, though I suspect that in his heart Dyson had been an American already for many years. His enthusiasm, openness and uncrushable idealism are qualities more valued there than here.