LARGE PRINT GUIDE

Please return to the box for other visitors.

RAF Stories:
The First 100 Years 1918 – 2018

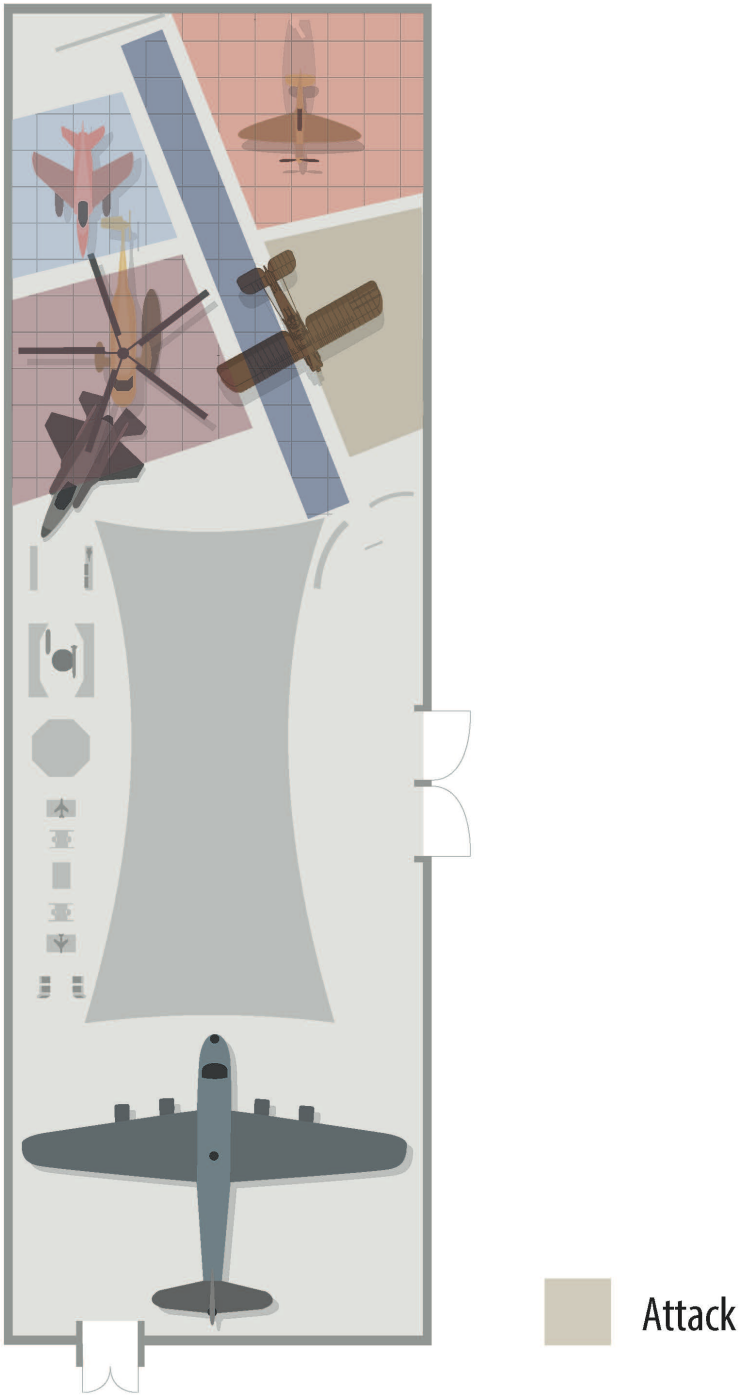
Attack

BAE SYSTEMS

Founding partner

HERITAGE FUND

Location of the Attack theme



Attack

Throughout its history the RAF has stood ready to deter aggression and, if called to do so, to strike with speed and precision.

The RAF has always been an attacking force. Over many campaigns and operations it has demonstrated the ability to take the fight to the heart of the enemy, despite sometimes suffering heavy losses.

Through careful planning, the gathering and analysis of intelligence and the development and deployment of new technologies, the RAF is able to deliver attacks wherever and whenever they are needed.

Bombing

Bombing is a core RAF role, enabling it both to strike the enemy's forces directly and to reach beyond the front line to economic and industrial targets.

Just the threat of aerial attack can be a strong deterrent. The RAF demonstrated this strategy in the policing of British colonies between the First and Second World Wars and the carrying of nuclear weapons during the Cold War.

However, whether through the area bombing raids of the Second World War or the precision delivery of modern weapons, the RAF can deliver devastating force when required. The impact of such action can affect both military personnel and civilians.

De Havilland DH9A 1918–1931

Known affectionately as the 'Ninak', the DH9A entered service in June 1918 and proved highly effective as a long-range strategic bomber. Developed from the DH9, the 9A had a major redesign of the fuselage and wings with nearly 900 produced by the close of 1918. In addition to home-based Auxiliary squadrons such as No. 601, whose home was here at RAF Hendon for a time, DH9A's were used after the First World War by the RAF's post-war bombing force in British colonies. They were finally withdrawn in 1931.

This DH9A was brought down during a bombing raid on Kaiserslautern, Germany, in October 1918.

Dimensions
Span: 14m / 46ft
Length: 9.1m / 30ft

Use
Two-seat
day bomber

Engine
400hp Liberty V-12

Top Speed
114mph at 10,000ft / 183km/h at 3,048m

Maximum Altitude
Service ceiling 5,029m / 16,500ft

Armament
Forward firing: One Vickers 0.303in. machine gun
Aft Firing: One Lewis machine gun
Bomb load: up to 450lb

Where Used
UK
Western Front Russia
Egypt
India
Iraq Palestine

[Touch]

Note the blunt nose of the DH9A – which contains the radiator of its powerful liquid-cooled engine.

Policing an Empire 1918–1939

Between the First and Second World Wars RAF aircraft maintained control around the British Empire through bombing, dropping warning leaflets or simply through demonstration flights.
Order had previously been enforced by expensive military expeditions and garrisons. As a way of saving money, and to give the new RAF a purpose following the First World War, a small number of squadrons were stationed around what was then the British Empire, notably in Iraq and India.

While policing the Empire by air was usually effective, there were objections to the bombing of civilians and one senior RAF officer even resigned his post in protest.

‘The air force is a preventative against risings more than a means of putting them down.’
Marshal of the Royal Air Force Lord Trenchard, 1921

Paveway II about 1979 1

This laser-guided bomb first saw action during the Falklands Conflict and has been widely-used since. A later, enhanced, version added Global Positioning System guidance.

ALARM 1990 2

This missile is used to destroy or deny the use of enemy radars. When launched it climbs to height then slowly descends by parachute. If a radar is detected the parachute is detached and the missile dives onto the target.

[Image captions]

The RAF used local recruits to guard airfields.

© RAF Museum X006-6768

Ground crew attach bombs to a Vickers Vincent.

© RAF Museum PC98/173/5634/15

The RAF Bomber Offensive 1939–1945

During the Second World War, the RAF carried out an extensive strategic area bombing campaign against targets throughout Europe.

Heavy losses in early daylight raids forced the RAF to concentrate on bombing by night. Finding targets in darkness, however, proved difficult with the equipment and methods available. The Pathfinder Force, formed in 1942, pinpointed targets and marked them with flares, greatly increasing the accuracy of the bombers.

From 1942 with the rapidly expanding US Army Air Force bombing by day, RAF Bomber Command continued its night offensive, combining new technology and techniques to deliver improved weapons with increasingly destructive effect. By 1945, much of Germany lay in ruins.

‘The aim of the bomber offensive is the progressive destruction and dislocation of the enemy’s war, industrial and economic system and the undermining of his morale to a point where his capacity for armed resistance is fatally weakened.’

Paper circulated to the Chiefs of Staff, 30 October 1942

[Image caption]
A WAAF driver delivers loaded bomb trolleys to waiting aircraft.
© RAF Museum PC98/174/5K5

Bomber Command – no medal, no memorial

After the end of the Second World War, Winston Churchill quickly distanced himself from the wartime bombing offensive, despite having authorised it. Contrary to expectations, no campaign medal was awarded after the war. The British Government offered no memorial to the sacrifice of those who served in Bomber Command – of 125,000 bomber crew, over half became casualties. 55,573 died, with an average age of 23.

This was the greatest loss of any British and Commonwealth unit in the war. Bomber Command Association veterans felt deeply that their comrades' sacrifice should be honoured publicly. In 2012, following a sustained campaign, sufficient support finally led to the creation of a permanent national memorial in Green Park, London, and the awarding of a bronze clasp.

'Thank God there is something now to recognise the sacrifice that all those blokes made.'

Les Munro, No. 617 Squadron (Dam Busters), 2012

[Image caption]

The crew of Lancaster S-Sugar prepare for another sortie.

© RAF Museum P000249

Britain's Nuclear Deterrent

The first atomic weapons were dropped on Japan in 1945. Following the end of the Second World War, a Cold War developed between the Soviet Union and western democracies. Along with the USA, the UK developed thermonuclear weapons to counter the Soviet threat. Three medium bombers, known as the V-Force, were designed to carry these weapons. The Vickers Valiant, Handley Page Victor and Avro Vulcan were capable of flying further, higher and faster than previous RAF bombers. Blue Steel, a missile with a thermonuclear warhead, could fly 100 miles beyond its launch aircraft. As V-Bombers became vulnerable to air interception and destruction on their airfields, the UK nuclear deterrent passed to the submarines of the Royal Navy in 1969.

'Bomber Command … had at least 110 strategic bombers available to go to war within 12 hours.'
Wing Commander Andrew Brookes, V-Force Operational Deployment and Readiness, Royal Air Force Historical Society, Journal 26, 2001

[Image caption]

A crew scramble on quick action alert.

Blue Steel

An air-launched nuclear missile with a destructive force 70 times more powerful than the device dropped on Hiroshima, Blue Steel was the British nuclear deterrent during the 1960s.

Launched from a Vulcan or Victor aircraft, the Blue Steel's Stentor rocket motor would accelerate the missile to one and a half times the speed of sound. When close to the target its speed would increase before the 1.1 megaton warhead detonated in an air burst.

When Blue Steel entered service in 1963, both an improved version and its proposed successor, the American built Skybolt missile had been cancelled. By 1970 when Blue Steel was retired, the Nuclear Deterrent had passed to the Polaris missile-equipped submarines of the Royal Navy.

The Blue Steel on display here (3) is shown with its Red Snow warhead on the separate trolley to the rear (4).

[Image caption]

A Blue Steel carried on an AEC Mandator.

Precision

The UK government and the armed forces are committed to the pursuit of zero civilian casualties.

The introduction of laser-guided bombs during the 1970s enhanced accuracy and changed the way the RAF conducted operations. First used during the Falklands Conflict, it would be the 1991 Gulf War that highlighted the capabilities of these precision-guided weapons. By 2001, the addition of a Global Positioning System added an all-weather capability.

‘Two direct hits on pinpoint targets … served notice on the Argentinians that we now had a weapon of extreme accuracy.’
Air Chief Marshal Sir Peter Squire GCB DFC AFC, ‘Through Eyes of Blue’, Wing Commander AE Ross DFC, 2002

[Image caption]
A Paveway II laser-guided bomb attached to a Typhoon.

Rise of the Remotely Piloted Airborne System (RPAS)

The Reaper MQ-9A RPAS was acquired by the RAF in 2007 to provide all-weather, persistent Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR). Within six months it was also being used to strike against targets.

Using Reaper to attack targets has been widely criticised for creating distance between the operator and the conflict, making it easier to strike. However, RAF Reaper crews are bound by the same rules of engagement as those in manned aircraft and use the same precision weapons.

'… the likelihood of you striking a wrong target or causing collateral damage is … greatly reduced simply because you have so much more information.'
Anon, Reaper Pilot, Interview with Chris Cole, Drone Wars UK, May 2017

[Image caption]
Intelligence such as traffic analysis is used by the ISTAR force.

Bombing Technology 1918–2018

The technologies, tactics and techniques of aerial bombing are constantly evolving. Listed here are some of the innovations that have met the ever-changing requirements of the RAF's bombing force.

1918 Course Setting Bomb Sight

The finest but most complex bomb sight designed during the First World War. Versions of the course setting bomb sight continued in service until the 1940s.

1934 Power Operated Turrets

Slow-moving bomber aircraft relied on guns to defend themselves. The introduction of enclosed powered gun turrets protected the gunner and allowed multiple guns of heavier weights to be fitted.

1941 RDX

Mixtures containing this explosive compound began to replace the Amatol filling in bombs, greatly increasing their destructive power.

1942 Gee

The Gee was a radio navigation device which received signals from multiple transmitters to pinpoint an aircraft's position, enabling accurate navigation at night or over the sea.

1942 Mk XIV Bomb Sight

The Mk XIV was a gyro-stabilised bomb sight which used an analogue computer to calculate the impact point, improving accuracy and reducing the bomb aimers' work load.

1942 Electronic Counter Measures

Electronic Counter Measures were introduced during the 1940s. They ranged from powerful transmitters used to swamp enemy radio transmissions to simple strips of foil dropped to give false radar returns.

1943 H2S

A ground-mapping radar fitted to aircraft which enabled aircrews to attack targets in complete darkness or through cloud.

1953 Blue Danube

This 16 kiloton device was carried by V-bombers. In 1956 it became the first live nuclear weapon to be dropped from an RAF aircraft.

1951 Canberra

The Canberra was the RAF's first jet bomber. It relied on its height and speed to avoid interception.

1964 Low-Level Flying

By the 1960s, radar guided surface-to-air missiles were becoming a serious threat to the once impregnable high flying bombers. The answer was to fly low below the radar coverage.

1975 LRMTS

Laser Ranger and Marked Target Seekers provide accurate ranging and targeting information which greatly improves a low-flying aircraft's ability to strike off the first pass.

1979 Laser-Guided Bombs

The seeker head of a laser-guided bomb uses the reflected energy of a laser beam to guide the bomb to the target.

2007 RPAS

Remotely piloted airborne systems (drones), like the Reaper MQ-9A, can stay over a target area, collecting information and choosing the best time to strike. They can use Hellfire missiles or Paveway IV laser-guided bombs.

2018 F-35B Lightning II

This multi-role combat aircraft combines stealth technology with a short take-off and vertical landing capability, enabling the F-35 to operate from short runways and aircraft carriers.

Suspended behind you, from the back, left to right

Message Streamer 1939–1945

Sometimes the easiest way to communicate from the air to ground forces was to drop a message. Some Army co-operation aircraft were fitted with hooks so that they could also pick up messages.

Cooper 20lb Bomb, 112lb RL Bomb 1916 and 1914

Both the Cooper and 112lb RL were bombs introduced during the First World War which continued to be used by the RAF into the 1930s.

Leaflets

Leaflets have been used throughout the RAF's history to warn, inform or threaten those below. No matter what the content of the leaflet is, there is usually also an unwritten message: if the RAF can successfully drop leaflets on you, next time it could be bombs!

40lb GP Bomb 1937

The General Purpose (GP) series of bombs was developed during the 1920s in a number of weights from 20lb to 4,000lb. They were widely used throughout the Second World War.

20lb Fragmentation Bomb 1940s–1950s

This American-designed bomb was originally used in RAF service as a sub-munition for a cluster bomb. It could be fitted with a parachute for low-level release.

Suspended in front of you, from the back, left to right

4,000lb HC Bomb, 4lb Incendiary 1942–1945

The High Capacity (HC) blast bomb was used to attack built-up areas alongside incendiary bombs. The damage created by the blast would provide opportunities for the incendiaries to start fires. Once the fires took hold they could then spread to destroy a wide area.

1,000lb MC Bomb with retarded tail 1956

The retarded tail was designed to slow the descent of the bomb and allow it to be dropped at low level without damaging the aircraft.

Window Strips 1943

Aluminium strips, known as Window, were used to disrupt enemy radar by creating false signals. For a while, during the Second World War, both Allied and Axis forces were aware of the benefits of using this simple device but were wary of using it for fear that the other side may use it against them.

Type 1 Cluster Bomblet and 6,000lb BL755 bomb 1973

After release, the BL755 opens and a gas cartridge ejects 147 bomblets over the target. The hollow charge of the bomblet is effective against armour while the fragments released are effective against unarmoured targets.

500lb MC Bomb 1942

The Medium Capacity (MC) bomb range was introduced in 1942 with higher explosive content than the earlier General Purpose range.

1,000lb Target Indicator Bomb 1943–1945

Target Indicator bombs were used by specialist crews to guide other bombers to a target, improving the accuracy of bombing raids at night. The bomb would open as it dropped, releasing a cascade of coloured flares above the aiming point.

Brimstone Missile 2005

Originally a radar-guided fire and forget anti-armour missile, the Dual Mode Brimstone introduced laser guidance. Its small warhead and accuracy has led to it being used when minimal collateral damage is required.

68mm SNEB Rocket1965

The SNEB replaced the 3 inch rocket during the 1960s. A Matra pod carried 18 of these folding-fin free-flight rockets.

3in. 60lb Bomb 1943

First used in the anti-shipping role, the 3 inch rocket became best known as an anti-armour and close air support weapon. This unguided weapon was aimed through the attacking aircraft's gunsight and was used in many conflicts into the late 1960s.

[Cut out figure]

Squadron Leader Philip Louis Ulric Cross DSO, DFC

Joined the RAF in 1941

Ulric Cross, originally from Trinidad, became a navigator with No. 139 (Jamaica) Squadron. This unit was part of the Pathfinder Force which had the difficult and dangerous task of identifying and marking targets for bombing raids during the Second World War. Cross completed 80 operations, twice refusing to be rested. In June 1944, he was awarded the Distinguished Flying Cross and, in November, the Distinguished Service Order, for his devotion to duty and outstanding navigational ability.

'The world was drowning in fascism … so I decided to do something about it and volunteered to fight in the RAF.'

'The Daily Telegraph', 8 October 2013

[Image caption]

A de Havilland Mosquito BXVI similar to the type flown by No. 139 (Jamaica) Squadron. Its aircraft were paid for by the people of Jamaica.

Intelligence

Observing the enemy was the first role of pioneer aviators during the First World War.

It remains essential, with a dedicated Intelligence, Surveillance, Target Acquisition and Reconnaissance Force (ISTAR) representing 10% of the RAF's personnel in 2018.

Since the early days of direct aerial observation and the analysis of photographs, the RAF has developed its reconnaissance technology to include radar mapping and intercepting electronic transmissions. In the 21st century, the RAF is part of a network of global allies that carry out reconnaissance and share intelligence.

[Cut out figure]

Marshal of the Royal Air Force Baron Tedder of Glenguin GCB

Transferred to the RAF in 1918

Arthur Tedder commanded a squadron of DH9A aircraft during the early 1920s. During the Second World War, he led RAF forces in the Middle East and the Mediterranean before becoming overall commander of Allied air forces during the invasion of Europe in 1944.

Tedder served as Chief of the Air Staff between 1946 and 1951, overseeing the RAF during the beginning of the Cold War, and the critical time of the Berlin Airlift.

‘Tedder … had a common touch … broad vision, long sight, complete professionalism – such were the ingredients of Tedder’s undoubted greatness.’

‘The Right of the Line’, John Terraine, 1985

[Image caption]

Tedder (centre of front row) when in command of No. 207 Squadron with a DH9A in the background. He led the squadron during the Chanak Crisis of 1922 when Turkish troops marched against British forces.

© RAF Museum PC72/93/4

Reverse image: © RAF Museum PC94/131/29

[Intelligence showcase labels]

Flight Officer Constance Babington Smith MBE

Joined the Women's Auxiliary Air Force in 1940

Constance Babington Smith was a Photographic Interpreter whose task was to examine photographs taken by RAF reconnaissance aircraft during the Second World War.

In November 1943, she and her team at RAF Medmenham confirmed the existence of the German V-1 flying bomb. This discovery led to an Allied bombing campaign against the V-weapons' sites which delayed Germany's flying bomb programme by several months.

Although Constance assisted in many intelligence discoveries through photographic interpretation, she remained modest about her own contribution to the war effort.

'Babington Smith had found Germany's secret weapon, the flying bomb … one of the great Photographic Interpretation achievements of the war.'

'Spies in the Sky', by Taylor Downing, 2017

Photographic Reconnaissance

Gathering intelligence through photographic imagery has been a key role for the RAF since its formation. Photographic reconnaissance provides information which can be used in monitoring enemy movements, planning future missions and assessing the success of operations. Over the last century camera technology has evolved from glass plate negative to film and, more recently, digital formats to enable live moving imagery to be viewed in real time.

Camera Type LB 1918 1

This aerial camera could take a series of 18 photographs on glass plate negatives housed in a wooden magazine. A small windmill could be fitted to the aircraft carrying the Type LB to provide the mechanical power for the camera to be operated automatically.

Camera Type F52 1942 2

Based on the same mechanism as the F24, the F52 used a larger film format and longer focal length lenses to provide detailed reconnaissance photographs taken from high altitude.

Camera Type F24 1925 3

Used for vertical as well as oblique photography, this was the standard camera fitted to RAF aircraft from the 1920s to the 1950s. It could be fitted with a variety of lenses and its magazine contained enough film for 250 photographs.

Vicon 18-601 Reconnaissance Pod 1990s Look Up

This was the last wet film camera pod – used in the 1990s by squadrons flying Jaguars. It was replaced by a similar digital pod during the 2000s.

Intelligence

Photographic imagery is not the only way of gathering useful intelligence. Intercepting enemy signals can reveal information about their forces and pinpoint their location, while airborne radar enable the mapping of targets by electronic means.

Today the gathering of electronic data continues to play a vital role within the RAF's Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) force.

Topographical Model Arnhem Approaches 1944 4

The intelligence gathered from photographs could be used to produce scale models of areas of interest. These would prove useful in planning operations or during briefings.

Stereo Viewer and Stereoscope About 1945 5 and 6

Using a stereo viewer, a series of overlapping photographs can be made to appear three dimensional. This can be a great help in photographic interpretation and damage assessment. The stereoscope was used to present any particularly noteworthy results.

Type 162 Indicator Unit with Camera Jigsaw Puzzle,

H2S Display 1943–1945 7 and 8

With the introduction of ground mapping radar it became possible to photograph target areas by mounting a 35mm camera in front of the scope. Here the image recorded on the H2s Indicator Unit has been turned into a jigsaw to make learning about the target area a more entertaining experience.

Electronic Intelligence

Raw data requires analysis to turn it into useful intelligence such as threat assessment, targeting information and damage assessment. The RAF relies on skilled personnel, including imagery and skills analysts, linguists and cyber specialists to provide this.

Camera Type R88 1960s–1980s 9

This 35mm camera recorded the radar scope images on Vulcan and Victor aircraft. During the bomb run it would automatically take a photograph every 7½ seconds.

Camera Type F97 Aerial Cartridge Dispenser 1950s–1970s 10 and 11

Fitted to the Canberra aircraft, the F97 camera was used for low level night photography. Lighting was provided by the dispenser which released photoflashes every two seconds allowing the F97 to take overlapping images.

[Sensory display at the end of the Intelligence showcase]

[Touch object - model of Object 4 in the Intelligence showcase]
This map reveals the shape and features of the land enabling RAF personnel to visualise and plan missions.

[Smell]
A cup of hot sweet milky tea was welcomed by aircrew when they returned after long, and often difficult, missions.

[Sound]
Richard Dimbleby commenting on board a Lancaster during a bombing raid on Kleve near the German border, in February 1945, towards the end of the Second World War. He was the BBC's first war correspondent.

[Cut out figure]

Flight Lieutenant Stuart Quinn

Joined the RAF in 1999

Stuart Quinn is a Qualified Weapons Instructor and an expert in Intelligence, Surveillance and Reconnaissance (ISR). His role supports the effective use of ISR during operations. Quinn is unique as the only RAF Engineering Officer (Communications Electronics) who holds both Qualified Weapons Instructor ISR and Joint Tactical Air Controller qualifications. He previously worked with the RAF Regiment in Afghanistan, calling in air strikes and medical evacuations for his ground unit when they came into contact with the enemy.

‘The rapid development of new technologies in the Air and Space domains … has seen massive changes in the world of Intelligence, Surveillance and Reconnaissance across the world. It is important that the RAF stays abreast of developments, both to understand new and growing threats and to harness state-of-the-art technologies … to be successful in modern operations.’
Flight Lieutenant Stuart Quinn, 2018

[Image caption]

Flight Lieutenant Stuart Quinn assisting in developing the next generation of ISR technologies with No. 56(R) Squadron, RAF Waddington.

rafm.tours/quinn

[Cut out figure]

Marshal of the Royal Air Force Sir Arthur Harris

1st Baronet, GCB, OBE AFC

Joined the RAF in 1918

Arthur Harris took charge of Bomber Command in 1942 with instructions to destroy Germany's industry and civilian morale by area bombing its cities.

'Bomber' Harris inspired the Command with a new sense of purpose, ordering his squadrons against industrial and, later, communications and fuel targets in Nazi Germany.

While Harris's inflexible commitment to area bombing has been heavily criticised, his reputation as an honest, tough and determined leader endures. This bombing campaign may have shortened the Second World War, but it remains controversial as it caused the deaths of some 350,000 civilians and over 55,000 airmen.

‘There are a lot of people who say that bombing cannot win a war. My reply to that is that it has never been tried … and we shall see.’
Air Chief Marshal Sir Arthur Harris, newsreel interview, June 1942

[Image caption]
Harris and his senior staff officers, Air Vice-Marshals Ronald Graham (left) and Robert Saundby, studying a map at Bomber Command HQ, High Wycombe, about 1942.
© RAF Museum PC94/131/147
Reverse image: © RAF Museum PC98/173/5867/15

The Effects of Bombing

[Introduction to the animated film]

For a century aerial attack has been a feature of warfare.

While the development of precision bombing has seen the UK government move to zero civilian casualty rules of engagement, this has not always been the case. In the Second World War, the RAF introduced a strategic bombing campaign in retaliation to German attacks. Bombing targeted industrial and urban centres and led to learge numbers of civilian deaths and casualties. It remains controversial today.

This short animaged film explores the effects of bombing on both civilians and airmen.

Have Your Say . . .

Please share your reflections after watching The Effects of Bombing film.

‘The Bombers alone provide the means of victory.’
Winston Churchill, July 1940

‘If the British Air Force drops two, three or four thousand kilos, then we will drop 150,000 …180,000 … 230,000 … 400,000 kilos in one night.’
Adolf Hitler, September 1940

‘It seems to me that the moment has come when the question of the bombing of German cities simply for the sake of increasing the terror, though under other pretexts, should be reviewed.’
Winston Churchill, after the bombing of Dresden, February 1945

Do you believe the ends can justify the means?