

Unit 17: Environmental Impacts of Aviation

Unit code:	D/504/2291
QCF Level 3:	BTEC Nationals
Credit value:	10
Guided learning hours:	60

● Aim and purpose

The aim of this unit is to give learners knowledge and understanding of environmental impacts caused by the aviation industry and how they can be managed.

● Unit introduction

Increasingly, environmental concerns become headline news whenever plans for expansion or development are discussed. This is particularly the case where airports are concerned. An example is the debate surrounding the allocation of runway capacity in the south east of England. There are arguments supporting the building of a third runway at Heathrow, with equally compelling arguments claiming this would be a disaster for communities in the surrounding area. Another suggestion is the creation of a new airport in the Thames Estuary – far from dense population centres. Campaigners for the environment argue that this would be ecologically damaging and should not even be considered.

Because it contributes significantly to the national economy, supports thousands of jobs and provides an efficient and convenient transport network, the UK aviation industry is seen by many as a vital part of our everyday life. Unfortunately, as with every undertaking that requires construction, redevelopment and the burning of fossil fuels to provide energy, there is an environmental – some would say unacceptable – cost. This unit aims to provide a balance between these two opposing views and demonstrate the lengths taken by the aviation industry, as a whole, to manage the environmental impact of what is a very successful part of our economy.

● Learning outcomes

On completion of this unit a learner should:

- 1 Understand the environmental impacts of aviation
- 2 Know methods of control and reduction of aviation pollution
- 3 Understand how environmental issues are considered in airport development planning processes.

Unit content

1 Understand the environmental impacts of aviation

Environmental effects of aviation:

- noise pollution, e.g. aircraft on ground, aircraft in flight, noise footprint, ground service equipment (GSE), sleep disruption, property values, diurnal variation
- air pollution, e.g. aircraft engine exhaust, diesel equipment exhaust, hydrocarbons, nitrogen dioxide (NO₂), carbon monoxide (CO), particulates, breathing problems, allergies
- surface water pollution, e.g. run-off from apron/runway, fuel, oil, de-icer, stream/river/lake pollution, damage to water life, flooding
- road congestion, e.g. arriving and departing passengers, local residents, delays, air quality
- construction, e.g. terminals, runways, aprons, roads, brownfield sites, greenfield sites, loss of natural habitat, alteration of soak-away
- visual pollution, e.g. lights, buildings, car parks, disruption of wildlife sleep patterns, devaluation of property
- areas affected, e.g. under flight path, near roads, down stream

Measuring pollution levels:

- noise, e.g. recording, track monitoring of arriving and departing aircraft, total noise, perceived noise
- atmosphere, e.g. routine sampling, nitrogen dioxide (NO₂), carbon monoxide (CO), carbon effect (carbon emissions) of long and short haul flights
- water, e.g. chemicals in run-off, de-icer, fuel, oil
- surface transport, e.g. use of private cars, use of public transport, peak time road congestion
- waste, e.g. tonnage of waste to landfill, recycled waste

2 Know methods of control and reduction of aviation pollution

Noise control and reduction:

- mandatory aircraft routes, e.g. standard instrument departures (SIDs), standard terminal arrival routes (STARs)
- runway allocation, e.g. preferential runways, parallel runways
- insulation for local residents/businesses, e.g. triple glazing, roof insulation
- flight restrictions, e.g. night curfew, noise quotas, total movement limits
- technology, e.g. new generation aircraft engines

Atmospheric pollution control and reduction:

- ground service equipment (GSE), e.g. reduce use of diesel equipment, increase use of electric equipment
- alternative energy sources, e.g. biofuel, renewable sources
- reduce energy consumption, e.g. insulation, use of natural light, natural ventilation
- public transport, e.g. promote use of public transport, discourage use of private vehicles

Surface water pollution control and reduction:

- spillage reduction, e.g. penalise offenders, rapid clean-up, recycle
- run-off management, e.g. separator tanks, balancing ponds, lagoons, reed beds, water purification

3 Understand how environmental issues are considered in airport development planning processes

Legislation and regulation relating to environmental impacts of airport development:

- environmental issues, e.g. pollution (noise, air, water), habitat disruption, extra traffic, loss of greenbelt land
- planning laws, e.g. Town and Country Planning Act 1990, current amendments
- local restrictions, e.g. bylaws, planning conditions
- national requirements, e.g. masterplan, Environmental Impact Assessment (EIA)
- government overview, e.g. aviation strategy, Secretary of State for Communities and Local Government
- European directives, e.g. EU Environmental Noise Directive, EU Emissions Trading
- international guidelines, e.g. International Civil Aviation Organization (ICAO) guidelines on noise and emissions

The planning process relating to environmental issues:

- consultation, e.g. local residents, local businesses, airlines
- expert environmental input, e.g. wildlife protection, habitat protection, waterway protection, sustainable development
- expert business input, e.g. creation of jobs, economic benefit, inward investment, improve local transport (road, rail)
- pre-empt objections, e.g. anticipate objections, promote solutions
- compliance with national strategy to meet demand, e.g. location of new airports, building of new runways, sustainable aviation policies

Methods of consultation:

- use of media, e.g. TV, radio, newspaper, internet, social media
- face to face, e.g. community meetings, roadshows, local events
- public enquiries
- feedback

Consequences of consultation:

- negative consequences, e.g. delays planning process, cost
- positive consequences, e.g. reassures public, gains public support, reduces conflict, allows objector's voice to be heard, provides balanced approach to development, commercial awareness of benefits

Environmental benefits of planning conditions:

- imposition of beneficial conditions, e.g. use of local suppliers, local labour, materials from sustainable sources, efficient building methods, mandatory protection/re-siting of habitats

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 Explain how the aviation industry impacts on the environment	M1 Explain how methods used to measure and control pollution help to reduce the environmental impacts in and around airports	D1 Assess how unrestricted expansion of the aviation sector could affect the quality of life for local residents, wildlife and natural habitats
P2 Describe methods of measuring pollution in and around the airport		
P3 Describe the methods used to control and reduce aviation-related noise pollution		
P4 Describe the methods used to control and reduce aviation-related atmospheric pollution		
P5 Describe the methods used to control and reduce aviation-related surface water pollution		
P6 Review current legislation and regulation relating to the environmental issues of airport development [IE]	M2 Analyse how the planning process has improved environmental awareness in airport development	
P7 Describe the airport planning process in relation to environmental issues		
P8 Explain the consequences of the consultation process on proposed airport development [EP]		
P9 Explain the environmental benefits of enforced planning conditions as applied to airport development [EP]		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

This unit is designed to be classroom based but, where possible, visits to airports should be included. As airport visits are not always easy to organise, it may be possible to see similar features elsewhere. Examples of some of the topics discussed can also be found at other major commercial developments (for example shopping centres, office buildings, multi-storey car parks). Where similarities exist, these can be used. For those already working in the aviation industry, observation of methods of impact assessment and management, together with personal experience, will be a great asset.

Many learners will be aware of noise associated with airports but, without repeated exposure to it, aircraft noise may not seem to present a particular problem. Together with the other forms of environmental impact in the unit content, it is essential that the scale of the issues being explored is made clear. For example: Where is the impact greatest? How many people are affected? How does it affect natural habitat and local residents? It is expected that each topic will be delivered separately to ensure that the scope is well understood – however, the outcomes of the environmental impacts may on occasions be similar (for example property devalued, damage to habitats, health issues). Use of actual examples from local airports would add reality to the input. Local newspapers are a good source of information regarding environmental concerns at airports (for example Manchester Airport second runway, Heathrow Terminal 5).

Once it is accepted that there are environmental concerns that need to be investigated, learners should be introduced to the ways in which the problem is quantified – how it is measured. Most major airport web pages include sections devoted to environmental control. These are worth exploring but it must be remembered that they are published by the airport and tend to avoid some of the more controversial areas. For example the following websites:

- <http://www.manchesterairport.co.uk/manweb.nsf/Content/Environment> and
- <http://www.birminghamairport.co.uk/meta/about-us/environment.aspx>

Delivery can continue with an investigation into how the planning process is designed to prevent unregulated expansion, specifically the peculiar requirements of the aviation industry and how they are managed by regulation and legislation. This will start with the planning application (at the time of writing, this legislation is being revised and tutors should ensure current laws are included). Learners will discover how a combination of planning legislation, public consultation and operational regulatory frameworks combine to provide high levels of environmental protection without stifling sustainable development.

Methods of controlling and reducing the impacts of aviation can now be introduced. Having established that there are environmental concerns to be addressed and explored planning and operational regulation, learners can investigate the practicalities of controlling and reducing the impacts of aviation-related activities. The headings in the unit content must be covered but specific examples may be chosen by the tutor to suit findings from local airports.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way of planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Introduction to the unit. This should include contextualising the unit to specific airports (for example a local regional and a major international airport) that can be used for research throughout the unit.
Classroom exercise – suggest pollution types that result from aviation activities. Consider causes and effects (on humans, wildlife and the natural environment), then suggest how far the problems are felt from the airport.
Tutor input followed by class research – discover methods used to measure pollution. This must include noise, air and water, surface transport and waste.
Class discussion on methods of controlling and reducing pollution and its effects. Noise air and water must be included.
Class discussion and research – discover how chosen airports have identified and measured pollution then taken action to control and reduce the problem. An airport visit or visiting speaker would help link the first three segments.
Preparation for assignment
Assignment 1: Environmental Impacts (P1, P2, P3, P4, P5, M1)
Feedback on assignment
Tutor input and research – investigate the current regulations that relate to the environmental impacts of aviation. This must include: planning; local and national requirements; European and global guidelines.
Tutor input and research – discuss the typical planning process for airport development including: the application; consultation (including types used); expert witnesses (for and against); anticipating objections. Reference could be made to recent airport expansions, much of which is reported in local and national press.
Class discussion – suggest the consequences (both positive and negative) of the consultation phase. This should be approached from the airport and the objector's viewpoint. Local newspapers would be a good source of information.
Tutor input and research followed by class discussion – suggest how restrictions and limitations imposed as part of planning consent can help to protect the environment. Some airports include the concessions they have made in order to develop their facilities within the 'Environment' pages on their website.
Class discussion, research and use of actual examples – ways in which the planning process has improved environmental awareness in airport development. Recent expansions at major and regional airports can be examined to discover how environmental concerns have been addressed (e.g. managing traffic, controlling aircraft noise, re-siting habitats). These thoughts can be extended by projecting what the results of unrestricted expansion of airports might be.
Preparation for assignment
Assignment 2: Planning Process (P6, P7, P8, P9, M2, D1)
Feedback on assignment

Assessment

An interesting approach to the assessment of this unit could be a portfolio covering all the criteria forming a submission to an airport developer providing an overview of the complex nature of environmental impact assessment, legislation and management. Within the portfolio a mixture of case studies, group research and observation could be used to provide evidence for formal reports, presentations and information displays. Alternatively, an article for a local newspaper could form the basis for P1, P2, P3, P4 and P5 with the remaining criteria forming a report for a developer.

P1 – P2 – P3 – P4 – P5 – M1

To achieve P1, learners must explain how the aviation industry impacts on the environment. At least two causes and effects of each type of pollution listed in the unit content should be covered within the explanation. For example, for noise pollution learners could cover aircraft noise on the ground and aircraft noise from take-off and landing. Learners could explain how this noise impacts on local residents by disturbing their sleep and affecting property values.

To achieve P2, learners must describe how pollution is measured in and around the airport. This would include what is being measured and how measurements are taken. The examples provided should cover all of the unit content – noise, atmosphere, water, waste and surface transport.

To achieve P3, P4 and P5, learners must describe the methods used to control and reduce the environmental impacts of aviation. Learners must cover aviation-related noise pollution for P3, aviation-related atmospheric pollution for P4 and aviation-related surface water pollution for P5. Learners could present this collectively and can provide their evidence in a written format or as a presentation supported by photographs, videos or diagrams.

To achieve M1, learners must explain how by measuring and taking action to control and/or reduce pollution, the resultant adverse effects to the environment are reduced. Expanding on understanding gained in P1, P2, P3, P4 and P5 this should include specific examples from airports. Two examples in total should be given from noise, air or water.

P6 – P7 – P8 – P9 – M2 – D1

To achieve P6, learners should review current legislation and regulations relating to environmental protection for the development of airports. This should start with planning laws, continue with local regulations and include EU and global rules, covering all items in the unit content.

To achieve P7, learners should describe the airport planning process that is used to reduce the environmental impact of airport development. This must include ways of encouraging sustainable development, preventing uncontrolled development, engaging with the national transport strategy and involving the local community.

To achieve P8, learners must explain the consequences of following public consultation procedures during the airport planning process. This should include communication methods used during consultation as listed in the unit content and a review of both negative and positive aspects of the process.

To achieve P9, learners must explain the environmental benefits that can come from restrictions and conditions being imposed as part of planning consent. Suggestions are included in the unit content, but these can be substituted by more appropriate local benefits if required.

To achieve M2, learners must analyse how the whole planning process, from initial application, through consultation to commissioning, has improved environmental awareness of airport developers. Examples of environmental considerations from recent airport developments should be included in learner evidence.

To achieve D1, learners must assess how unrestricted expansion of the aviation industry could affect the quality of life of local residents, and affect the wildlife and natural habitats. This should involve projecting theoretical growth models onto an existing airport.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, P4, P5, M1	Assignment 1: Environmental Impacts	Working for an airport operator you are asked to conduct research for the press office into the environmental impacts of aviation, the methods of controlling and reducing pollution.	Presentation Newspaper article Report
P6, P7, P8, P9, M2, D1	Assignment 2: The Planning Process	Prepare a report for the airport operator to help inform decision making on planning an additional terminal at the airport.	Information booklet Report or presentation

Links to other BTEC units

This unit forms part of the BTEC aviation sector suite. This unit has particular links with the following unit titles in the aviation suite.

Level 2	Level 3	Level 4
n/a	Unit 15: Passenger Terminal Management Within the Aviation Industry Unit 27: Airfield Operations Unit 28: Bird and Wildlife Control on Airports and Airfields	Unit 18: Researching Current Issues in Aviation

Essential resources

Learners must have access to library and internet facilities. Much of the research material can be found in trade journals, newspapers and local authority/government reports – all of which can be accessed online.

Employer engagement and vocational contexts

Visits to airports (or similar major construction projects) will illustrate many of the impact areas discussed throughout the unit. Case studies would be useful to emphasise the vocational context.

Indicative reading for learners

Journals

Airports International – Key Publishing Ltd

Flight International – Reed Business Publishing

Websites

www.birminghamairport.co.uk/meta/about-us/environment.aspx

www.defra.gov.uk/environment

www.dft.gov.uk/aviation

www.exeter-airport.co.uk/masterplan

www.flightglobal.com

www.heathrowairport.com/about-us/community-and-environment/sustainability/environment

www.londoncityairport.com/aboutandcorporate/page/airportmasterplan

www.manchesterairport.co.uk/manweb.nsf/Content/Environment

www.menmedia.co.uk/manchestereveningnews/news/s/1136823_multimillion_claim_over_airport_hell

Birmingham Airport – Environment

Department for Environment, Food and Rural Affairs (Defra) – Environment

Department for Transport (DfT) – Aviation

Exeter International Airport – Airport Masterplan

Flightglobal

Heathrow Airport – Sustainability

London City Airport – Airport Masterplan

Manchester Airport – Environment

Manchester Evening News – Article

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	planning and carrying out research into current legislation and regulation relating to the environmental issues of airport development
Effective participators	discussing the positive and negative consequences of the consultation process and the environmental benefits of enforced planning conditions on proposed airport development.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	investigating environmental impacts of the aviation industry and the airport planning process in relation to environmental issues
Team workers	contributing to class discussions relating to the environmental impacts of aviation, considering different opinions and showing fairness to others
Self-managers	managing the workload of the unit assessment.

● Functional Skills — Level 2

Skill	When learners are ...
ICT — Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using a variety of websites to research and present work on the environmental impacts of aviation
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	planning and carrying out research using appropriate search criteria
Manage information storage to enable efficient retrieval	organising work into folders to enable retrieval and development
Follow and understand the need for safety and security practices	logging in to a variety of systems securely and visiting trusted websites
Troubleshoot	as required
ICT — Find and select information	
Select and use a variety of sources of information independently for a complex task	investigating the environmental impact of aviation and the methods of control and reduction of pollution using a range of internet sources
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	using appropriate search criteria in order to review current legislation and regulation relating to the environmental issues of airport development
ICT — Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	entering and developing images, diagrams and text to describe the environmental impacts of aviation
Bring together information to suit content and purpose	collating notes and research findings to review current legislation and regulation relating to the environmental issues of airport development
Present information in ways that are fit for purpose and audience	presenting information about the consideration of environmental issues in the airport development process clearly and accurately to management staff
Evaluate the selection and use of ICT tools and facilities used to present information	select the most appropriate ICT tools to produce presentations and reports throughout the unit

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	exploring methods used to measure, control and reduce aviation-related atmospheric pollution
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing the consequences of the consultation process on proposed airport development
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading research into environmental impact of aviation
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing a report that communicates the positive and negative consequences of consultation and the benefits of planning conditions in the airport development process.