

# Unit 32: Plan the Loading of Aircraft

<b>Unit code:</b>	<b>M/602/5683</b>
<b>QCF Level 3:</b>	<b>BTEC National</b>
<b>Credit value:</b>	<b>5</b>
<b>Guided learning hours:</b>	<b>45</b>

## ● Aim and purpose

The aim of this unit is for learners to gain knowledge and understanding of how to plan the loading of aircraft. They will gain an understanding of the importance of complying with associated regulations. Learners will also have the opportunity to demonstrate their knowledge of completing documentation to plan the loading of both wide- and narrow-bodied aircraft.

## ● Unit introduction

One of the most important documents used on an aircraft turnround is the load instruction report (LIR). This form instructs loaders where to load and position baggage and cargo on the aircraft in order for it to be safely within the weight and balance limits imposed for that particular aircraft type.

If the LIR is produced or followed incorrectly there could be serious safety implications for the aircraft, crew and passengers.

Once the load controller has calculated the weight and balance of the aircraft, based on the understanding that it will be loaded exactly as indicated, the captain will determine the take-off speeds and climb profiles. If the actual loading of the aircraft does not mirror the LIR, then all the calculations become invalid.

This unit looks at the importance of producing correct LIRs and how any deviations should be reported immediately to the relevant staff.

Learners will examine the procedures involved in planning the load of an aircraft in more detail, which plays a vital part in the safety of the aircraft's performance.

Learners will also explore why good load planning is essential for the efficient transfer of baggage and cargo, to and from aircraft, both at the departure and arrival phase of the flight.

## ● Learning outcomes

**On completion of this unit a learner should:**

- 1 Understand how to plan the loading of aircraft to comply with regulations
- 2 Be able to complete documentation in relation to planning the loading of wide bodied and narrow bodied aircraft.

# Unit content

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## 1 Understand how to plan the loading of aircraft to comply with regulations

Regulations:

- AAA (Authorisation and Accountability)
- Civil Aviation Authority (CAA)
- Department for Transport (DfT)
- International Air Transport Association (IATA) – Dangerous Goods Regulations (DGR)
- JAROPS (Joint Aviation Requirement for the Operation of Commercial Air Transport)/EUOPS
- International Civil Aviation Organization (ICAO)
- airline regulations
- load instruction report (LIR) sign off (loading supervisor, dispatcher, load controller)
- documents (hold declaration manifests, cargo/mail manifests, customs document)

Load planning process:

- aircraft type, e.g. narrow bodied, wide bodied, bulk loaded, containerised
- aircraft weight and balance
- flight envelope
- maximum allowable weights
- hold (volume, compartments, location of hold doors, actual hold weights)
- number of pieces
- special loads, e.g. dangerous goods (DG), live animals (AVI), human remains (HUM)
- incompatible loads

Coordinating load planning:

- coordination between personnel, e.g. load controller, cargo department, dispatcher, loading supervisor, loaders, flight deck crew
- considerations, e.g. airline regulations, passenger booked figures, passengers checked in, baggage checked in
- cargo types, e.g. mail, perishable, DG
- cabin configurations
- flight closure times
- computerised departure control system (DCS)
- manual documents

Significance of mass limitations in relation to load planning:

- aircraft type – maximum hold weights
- volume, e.g. narrow bodied, wide bodied, hold compartments, bulk hold, containerised hold (ULDs, pallets)

- wide-bodied aircraft 'complimentary fit', e.g. containers always in hold
- fuel calculations (maximum weights, zero fuel, take-off, landing, ramp, Regulated Take-off Weight (RTOW))

Significance of balance limitations in relation to load planning:

- centre of gravity
- aircraft configurations
- cabin (first, business, economy)
- aircraft trim (zero fuel, take-off, landing)
- aircraft out of trim (Mean Aerodynamic Cord (MAC), Tail Plane Setting (TPS))
- aircraft unbalanced
- unsafe flight envelope

Impacts of incompatible, abnormal and dangerous loads on load planning:

- incompatible loads, e.g. AVI and cryogenic, separating loads (using different holds), refusing loads
- abnormal, e.g. difficulty loading items (too long/wide for hold door), loads extending beyond normal bay limits (lashing required), exceeding hold floor weight limit (using pallets or spreaders)
- dangerous, e.g. chemical, compressed gas, cryogenic (ensuring DG regulations are followed)

## 2 Be able to complete documentation in relation to planning the loading of wide bodied and narrow bodied aircraft

Load planning documentation:

- load instruction report (LIR)
- departure control system (DCS) (computerised, manual loadsheet)
- aircraft operating weights
- aircraft prepared for service weights (APS)
- free text instruction on LIR
- aircraft hold layouts (pictorial)
- aircraft data charts (trim sheets, configurations, cabin, holds)

Complete load instruction reports (LIR) for wide-bodied and narrow-bodied aircraft:

- computerised and manual LIR, e.g. bulk loaded, containerised, unit load devices (ULDs), pallets, hold designation, compartments, hold doors, free text, diagrams

Complete loadsheet and balance charts:

- computerised and manual, e.g. aircraft type, configuration, maximum weights, dry operating weight, basic index, APS, passenger figures, breakdown, bag weights, mail, cargo, DG, underload, flight envelope, dropline, tail plane setting

Amend documentation in line with loading discrepancies:

- changes to load, including last-minute change (LMC)
- deviations from LIR, e.g. alterations to load, bulk out, late bags, late cargo, change of ULD position, offload baggage
- processes (sign off LIR, check AAA, legal requirements, underload available, produce new load sheet if change exceeds +/- 500 kgs)

## 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:
<b>P1</b> Describe the regulations associated with the loading of aircraft	<b>M1</b> Compare planning and loading procedures used for wide body and narrow-bodied aircraft	<b>D1</b> Discuss how robust load planning procedures contribute to the efficient loading and unloading of aircraft
<b>P2</b> Describe the load planning process		
<b>P3</b> Explain how load planning is co-ordinated		
<b>P4</b> Explain the significance of mass limitations in relation to load planning		
<b>P5</b> Explain the significance of balance limitations in relation to load planning		
<b>P6</b> Explain how incompatible, abnormal and dangerous loads impact on load planning		
<b>P7</b> Explain the use of different types of documentation when planning the loading of aircraft	<b>M2</b> Explain post-flight procedures with relation to loading documentation	
<b>P8</b> Complete load instruction reports for wide bodied and narrow bodied aircraft [SM]		
<b>P9</b> Complete loadsheet and balance charts [SM]		
<b>P10</b> Amend documentation in line with loading discrepancies [SM]		

**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.

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

# Essential guidance for tutors

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## Delivery

For those not employed directly within the aviation industry, delivery and assessment will be in the classroom, with tutors working closely with relevant industry personnel to ensure accurate and up-to-date coverage of the topics.

As with many other units that make up this qualification, airside visits to support learning in the classroom might be difficult. Occasionally, load control centres are located landside, so a visit may be possible to see the start of the load instruction report (LIR) process.

Within the classroom, examples of LIRs for narrow- and wide-bodied aircraft must be used, demonstrating how they are completed. Learners should be given the opportunity to create their own examples for different types of aircraft including those generated manually and those that are computerised so that comparisons can be made.

Learners must be made aware of the current regulations associated with aircraft loading, including health and safety, and how they must be considered in the planning stages of the LIR. It will be beneficial for learners to use and see the different formats used in producing the LIR, which could be of free text layout or pictorial.

The difference between bulk holds and containerised holds should be pointed out, along with the types of load they accommodate (loose load and unit load). Images of the different types of unit load device (ULD) can be shown.

Learners must fully understand the importance of the weight and balance limitations that are imposed on different types of aircraft, and how any discrepancies must be corrected as this is crucial for aircraft safety and optimum operational performance.

In groups, learners can suggest loads that might be incompatible and solutions for transporting them on the same aircraft. This activity would mirror the problem-solving actions of a load control unit at a busy airport.

There are many documents that must be completed and verified during the load planning phase. These should be explored with learners to ensure their content and purpose are understood. Of primary importance is the completion of the LIR and the load/balance chart. Learners must be given the opportunity to create a simple version of an LIR for a narrow-bodied plane and a wide-bodied plane. Using information from the LIR, learners should continue to create a load/balance sheet for the narrow-bodied aircraft, including additional information supplied by the tutor.

The sequence of events involved in creating, following procedures and verifying the LIR and loadsheet must be made clear. Although not assessed, learners could be asked to predict the problems that may result if such checks were not made and the consequences of an error not being detected.

The importance of advising any changes to the loading of the aircraft to the appropriate person without delay must be made clear and also how the relevant documents must be amended. Last-minute changes (LMC) must reflect the actual changes made.

Learners must be able to identify why changes are made in order for the documents to reflect the aircraft's performance data and profiles, which must be fully accurate for the flight deck crew to set their instruments.

## 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 an overview of how loading takes place and why it is vital that it is planned and executed correctly. Once this is understood, learners can be introduced to a selection of rules and regulations governing the safe loading of aircraft.
Group discussion – what might be the best way to load different aircraft? Planning avoids chaos at the aircraft side. Learners could suggest appropriate loading sequences for a variety of load types. Assessment could take the form of an annotated timeline.
To ensure loading takes place the way it has been planned, learners must explore the coordination processes that exist between companies, departments and individuals.
<b>Preparation for assignment</b>
<b>Assignment 1: Part A – Plan the Loading of Aircraft</b> (P1, P2, P3)
<b>Feedback on assignment</b>
Learners will discover key reasons why load planning and subsequent accurate loading are so important. In this assessment, issues relating to mass limitations will be discussed. The group could suggest possible consequences of overloading an aircraft. (This assessment can be linked with P5.)
Whilst considering the problems of mass limitation (above) the group can also explore issues relating to aircraft balance. Using models, it is easy to illustrate how an unbalanced aircraft is unlikely to fly as well as one that has its load distributed correctly. Again, the group could suggest possible consequences of miss-loading an aircraft. (This assessment can be linked with P4.)
Learners will easily be able to envisage suitcases and conventional boxes being loaded onto aircraft. They must now be introduced to the planning issues associated with non-standard loads (e.g. perishable cargo, live animals, human remains, oversized cargo and dangerous goods). Some are permitted on passenger aircraft, whilst others are not (e.g. explosives). Some are permitted in the same hold (e.g. live animals and flammables) whilst others must be separated (e.g. foodstuffs and toxins). This creates a particular problem for the load planner. Learners could suggest solutions to a variety of load mixes.
Having explored the fundamentals of load planning, learners should now be able to compare loading procedures between narrow- and wide-bodied aircraft. This should include the planning and loading phases, highlighting the differences between the two aircraft types.
<b>Preparation for assignment</b>
<b>Assignment 1: Part B – Plan the Loading of Aircraft</b> (P4, P5, P6, M1)
<b>Feedback on assignment</b>
Throughout the planning and loading phases, various documents are used. These are essentially standard throughout the industry, although local variations exist. Learners should discover how and why the documents (some computer generated, others manual) are used.
In this practical assessment, learners should discover how to complete two types of loading instruction report (LIR). Assessment will be based on the successful production of accurate LIRs.
Using information gathered during the LIR production, learners will now discover how this is transferred onto the loadsheet. Assessment is based on the successful production of an accurate load and balance chart.

## Topic and suggested assignments/activities and/assessment

Inevitably, loading does not always go according to plan. A group discussion can be used to suggest reason why this may be (e.g. last minute additions to cargo, oversized cargo will not fit in the hold, passengers and baggage offloaded). It is important that learners appreciate the procedures involved in coping with and recording these changes.

Once the flight has departed, certain procedures must be followed to ensure that accurate records are maintained. These comply with both statutory and commercial requirements (e.g. storage of documents, transmission of information). Learners must be able to describe the procedures and explain their purpose.

### Preparation for assignment

**Assignment 2: Part A – Aircraft Loading Documentation** (P7, P8, P9, P10, M2)

### Feedback on assignment

Without good planning, the loading process could descend into chaos very easily. Learners must be able to look at the planning system, assess how it links directly not only to loading activities at the point of departure, but also unloading at the arrival airport. The report should illustrate why good planning ensures efficient loading/unloading and also suggest examples of the consequences of poor planning.

### Preparation for assignment

**Assignment 2: Part B – Aircraft Loading Documentation** (D1)

### Feedback on assignment

## Assessment

Assessment for this unit is likely to be in written format supported by charts and diagrams and completed documentation. Where appropriate, learners should use aviation examples in their descriptions and explanations.

### P1 – P2 – P3

To achieve P1, learners must describe AAA (Authorisation and Accountability) Regulations, IATA Dangerous Goods Regulations (DGR), the Department for Transport regulations (DfT) and at least one other regulation that has to be complied with when loading an aircraft.

To achieve P2, learners must describe the load planning process, covering the range identified in the unit content for two different types of aircraft, one wide bodied and one narrow bodied.

To achieve P3, learners must explain how load planning is coordinated, indicating the key staff and types of information involved as if they were the load controller or the dispatcher.

### P4 – P5 – P6 – M1

To meet P4, learners must explain the significance of mass limitations in relation to load planning of aircraft, addressing all the unit content within their explanation. Particular attention should be paid to the effect that increasing mass has on aircraft performance. Learners should support their explanations with illustrations and/or examples. Learners can integrate the evidence for P4 with P5 and P6.

To achieve P5, learners must explain the significance of balance limitations in relation to load planning of aircraft, addressing all the unit content within their explanation. Learners should support their explanations with illustrations and/or examples. Learners can integrate the evidence for P5 with P4 and P6.

To achieve P6, learners must explain how incompatible, abnormal and dangerous loads impact on load planning, covering all the unit content within their explanation. Learners must support their evidence with examples of situations where incompatible, abnormal and dangerous loads have impacted on the load planning process. Evidence for P6 can be integrated with P4 and P5.

To achieve M1, learners must compare loading methods employed by narrow- and wide-bodied aircraft. This should include both the planning and loading phases, highlighting similarities and differences between the two aircraft types.

### **P7 – P8 – P9 – P10 – M2**

To achieve P7, learners must explain the use of documentation when planning the loading of aircraft. Learners should include examples of completed documentation to support their explanations.

To achieve P8, learners must complete manual or computerised (if available) load instruction reports (LIR) for one wide-bodied aircraft and one narrow-bodied aircraft from given information.

To achieve P9, learners must complete a basic loadsheet and balance chart from given information and differentiate between manual and computerised versions, addressing all the unit content.

To achieve P10, learners must amend documentation in line with at least four loading discrepancies taken from the listed unit content.

To achieve M2, learners must explain post-flight procedures and why they are required in relation to loading documentation. This should include both statutory and commercial requirements.

### **D1**

To achieve D1, learners must take a holistic view of the loading process and illustrate how good planning contributes to safe and efficient loading (at the point of departure) and unloading (at the arrival 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	Assignment 1: Part A – Plan the Loading of Aircraft	As a ground handling agent, you are required to create a training package for new loading staff.	Training booklet
P4, P5, P6, M1	Assignment 1: Part B – Plan the Loading of Aircraft	As a ground handling agent, you are required to create a training package for new loading staff.	Presentation
P7, P8, P9, P10	Assignment 2: Part A – Aircraft Loading Documentation	As new loading staff, you are required to demonstrate your competence.	Report Produce completed documents
M2, D1	Assignment 2: Part B – Aircraft Loading Documentation	As a new loading supervisor, you are required to demonstrate your understanding of the importance of planning and recording.	Report

## 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.

### Key

\* indicates unit from the *Edexcel BTEC Level 3 Certificate in Aviation Operations on the Ground (Knowledge) (QCF)* qualification.

Level 2	Level 3	Level 4
Unit 31: Airport Baggage Processing	Unit 15: Air Cargo Ground Handling* Unit 20: Ramp Handling Unit 21: Aircraft Dispatch	n/a

## Essential resources

Learners must have access to library and research facilities, and current trade publications. Learners should have access to accurate and up-to-date industry case studies, table of LIR codes and information on the Carriage of Dangerous Goods (DG) by Air Regulations, including types and classes of DG.

Learners should be provided with examples of:

- load instruction reports (LIR) – bulk, container, wide bodied and narrow bodied and free text (blank and completed)
- loadsheets – weight and balance charts (blank and completed).

## Employer engagement and vocational contexts

Industry visits and visits guest speakers from the industry are recommended.

## Indicative reading for learners

### Publication

IATA – *Airport Handling Manual (AHM)* (annual publication)

### Websites

[www.baworldcargo.com/configs/BAWCconfigurations.pdf](http://www.baworldcargo.com/configs/BAWCconfigurations.pdf)

Description of ULDs

[www.iata.org](http://www.iata.org)

International Air Transport Association

[www.skybrary.aero/index.php/Aircraft\\_Load\\_and\\_Trim#Loading\\_Procedures](http://www.skybrary.aero/index.php/Aircraft_Load_and_Trim#Loading_Procedures)

Description of loading procedures

[www.smartcockpit.com/data/pdfs/flightops/aerodynamics/Getting\\_To\\_Grips\\_With\\_Weight\\_and\\_Balance.pdf](http://www.smartcockpit.com/data/pdfs/flightops/aerodynamics/Getting_To_Grips_With_Weight_and_Balance.pdf)

Information on weight and balance that could support any loading unit (PDF)

[www.vrr-aviation.com/](http://www.vrr-aviation.com/)

ULD manufacturer for special loads

## 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 ...
Self-managers	organising time and resources to independently complete load instruction reports, loadsheet and balance charts and amend documentation in line with loading discrepancies.

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 the importance of correctly planning and loading of aircraft
Team workers	discussing the loading sequences and how to coordinate between companies, departments and individuals in groups
Self-managers	managing their workload of the unit.

## ● Functional Skills — Level 2

Skill	When learners are ...
<b>ICT — Use ICT systems</b>	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	researching regulations associated with the loading of aircraft
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	planning and presenting aircraft loading information accurately and clearly
Manage information storage to enable efficient retrieval	storing notes, researching findings and assignments in a logical order in folders
Follow and understand the need for safety and security practices	using passwords and trusted internet sites
Troubleshoot	as required.
<b>ICT — Find and select information</b>	
Select and use a variety of sources of information independently for a complex task	sourcing and completing aircraft loading documentation
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	using appropriate search criteria to investigate regulations.
<b>ICT — Develop, present and communicate information</b>	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> <li>• text and tables</li> <li>• images</li> <li>• numbers</li> <li>• records</li> </ul>	entering loading information and developing text and images to explain the planning processes
Bring together information to suit content and purpose	completing aircraft loading documentation
Present information in ways that are fit for purpose and audience	
Evaluate the selection and use of ICT tools and facilities used to present information	choosing the most appropriate ICT tool to present complete documentation.

Skill	When learners are ...
<b>Mathematics</b>	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	completing aircraft loading documentation
Identify the situation or problem and the mathematical methods needed to tackle it	explaining how incompatible, abnormal and dangerous loads impact on load planning
Select and apply a range of skills to find solutions	completing aircraft loading documentation.
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
<b>English</b>	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	working in groups to discuss loading documentation
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading loading documentation to interpret information
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	completing aircraft loading documentation.

