

AIRLINE TRANSPORT PILOTS LICENSE

(030 00 00 00 - FLIGHT PERFORMANCE AND PLANNING)

JAR-FCL REF NO	LEARNING OBJECTIVES	REMARKS
031 01 00 00	<u>INTRODUCTION TO MASS AND BALANCE</u>	
031 01 01 00	<u>Centre of Gravity</u>	
031 01 01 01	Definition	
	– Define the centre of gravity related to an aeroplane	
031 01 01 02	Importance for aircraft stability	
	– Explain why the C.G. must be within the certified limits with regard to aeroplane operations	
031 01 02 00	<u>Mass and Balance limits</u>	
031 01 02 01	Consult aeroplane flight manual:	
	– Describe the effects of operating an aeroplane at its mass and centre of gravity limits	
	– Find the certified centre of gravity limits for takeoff, landing and cruise configuration from the aeroplane operating manual AOM	
031 01 02 02	Maximum floor load	
	– State that maximum floor/running loads have to be considered when loading small heavy items.	
	– Calculate examples and extract the necessary data from an aeroplane operating manual.	
031 01 02 03	Maximum ramp and taxi mass	
	– Explain maximum ramp and taxi mass	
031 01 02 04	Factors determining maximum permissible mass	
	– Describe the limitations for the maximum permissible Takeoff and Landing mass.	

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031 01 02 05	<ul style="list-style-type: none"> – Describe the limitations for the maximum traffic load. – Calculate examples for these masses <p>Factors determining centre of gravity limits</p> <ul style="list-style-type: none"> – State that centre of gravity limits are determined by aircraft stability and manoeuvrability and describe the influence on aeroplane operation – Summarise all factors that affect the location of the centre of gravity during aeroplane operation. – Describe the effect of extending/retracting flaps on the pitching moment 	
031 02 00 00	<p><u>LOADING</u></p>	
031 02 01 00	<p><u>Terminology</u></p>	
031 02 01 01	<ul style="list-style-type: none"> – Define take-off mass, landing mass and max. inflight mass <p>Empty mass</p> <ul style="list-style-type: none"> – Define ‘empty mass’, ‘basic mass’ and ‘basic empty mass’. – State where these masses can be found. – Calculate an example for the basic empty mass 	
031 02 01 02	<p>Dry operating mass (empty mass + crew + operating items + unusable fuel)</p> <ul style="list-style-type: none"> – Define ‘dry operating mass’ and ‘operating mass’ and calculate examples 	
031 02 01 03	<p>Zero fuel mass</p> <ul style="list-style-type: none"> – Define ‘zero fuel’ and ‘maximum zero fuel mass’. 	

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031 02 01 04	<ul style="list-style-type: none"> – Describe the reason for limiting the zero fuel mass. – Calculate examples <p>Standard mass</p> <ul style="list-style-type: none"> – State when to apply actual or standard masses for crew, passengers, baggage and cargo according to JAR-OPS1. – Find the standard masses for different types of flights with reference to JAR-OPS1. – Calculate total traffic loads and total mass of crew – Describe the relation between volume, density and mass for fuel, oil and water and calculate examples 	JAR-OPS1 given
031 02 01 05	<p>Useful load (Traffic load + Usable fuel)</p> <ul style="list-style-type: none"> – Define ‘traffic load’ and ‘useful load’. – Calculate examples for traffic and useful load 	
031 02 02 00	<p><u>Aircraft Mass Check</u></p>	
031 02 02 01	<p>Procedure</p> <ul style="list-style-type: none"> – State where the results of an aircraft mass check are found. – State who is responsible for re-weighing and the issuing the correct dry operating mass. – List the practices, according to JAR-OPS1, to be used at re-weighing 	
031 02 02 02	<p>Requirements for re-weighing of aircraft</p> <ul style="list-style-type: none"> – List the time intervals for the re-weighing of aeroplanes according to JAR-OPS1 	

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031 02 02 03	Equipment lists <ul style="list-style-type: none">– State that the equipment list is used to name which items are included in the re-weighing process	
031 02 03 00	<u>Procedures for determining aeroplanes mass and balance documentation</u>	
031 02 03 01	Determining dry operating mass <ul style="list-style-type: none">– Aircraft mass and balance data.– Extract the dry operating mass DOM, dry operating index DOI for specified crew, trip and service conditions from the aeroplane operating manual AOM	
031 02 03 02	Intentionally left blank	
031 02 03 03	Add mass of passengers and cargo <ul style="list-style-type: none">– Calculate the maximum allowable traffic load, the zero fuel mass and maximum cargo loads for different conditions	
031 02 03 04	Add mass of fuel <ul style="list-style-type: none">– Calculate the maximum allowable fuel load, the maximum extra fuel and the useful load	
031 02 03 05	Check that applicable maximum gross mass limits are not exceeded <ul style="list-style-type: none">– Calculate takeoff mass, maximum takeoff mass, landing mass and maximum landing mass	
031 02 04 00	<u>Effects of Overloading</u>	
031 02 04 01	Higher take-off and safety speeds <ul style="list-style-type: none">– Explain the influence of the aeroplane mass on takeoff and safety speeds	

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031 02 04 02	Longer take-off and landing distances <ul style="list-style-type: none">- Explain the influence of the aeroplane mass on takeoff and landing distances	
031 02 04 03	Lower rate of climb <ul style="list-style-type: none">- Explain the influence of the aeroplane mass on the rate of climb.	
031 02 04 04	Influence on range and endurance <ul style="list-style-type: none">- Explain the influence of the aeroplane mass on the range and endurance	
031 02 04 05	Decreased engine-out performance <ul style="list-style-type: none">- Explain the influence of the aeroplane mass on the one-engine out performance	
031 02 04 06	Possible structural damage in extreme cases <ul style="list-style-type: none">- Explain the potential risks during a landing when the aeroplane mass limits are greatly exceeded	
031 03 00 00	<u>CENTRE OF GRAVITY (C.G)</u>	
031 03 01 00	<u>Basis of C.G. Calculations</u>	
031 03 01 01	Datum <ul style="list-style-type: none">- Explain the term datum.- Find the datum position from an aeroplane operating manual for calculation purposes.	
031 03 01 02	Moment arm	

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031 03 01 03	<ul style="list-style-type: none"> – Explain the moment arm and its algebraic sign. – Extract moment arms for different loading positions from aeroplane operating manual <p>Moment</p>	
031 03 01 04	<ul style="list-style-type: none"> – Explain the term ‘moment’ and calculate examples. – Explain the term ‘index’ and interpret an example of an index formula. – Calculate the index with given weight, centre of gravity and index formula and vice versa <p>Expression in percentage of mean aerodynamic chord (% MAC)</p>	
031 03 02 00	<ul style="list-style-type: none"> – Explain the general equation for the centre of gravity. – Illustrate the advantage of using % MAC as an expression for the centre of gravity location. – Calculate centre of gravity positions and express them in % MAC <p><u>Calculation of C.G.</u></p>	
031 03 02 01	<p>Centre of gravity at empty mass</p> <ul style="list-style-type: none"> – Calculate the aeroplane centre of gravity from scale readings at weighing. – Find the centre of gravity at the dry operating mass from the aeroplane manual. 	
031 03 02 02	<p>Movement of C.G with addition of fuel, load and ballast</p> <ul style="list-style-type: none"> – Calculate the effect of shifting loads or additional loads on the centre of gravity. – Describe the influence of fuel loading or usage on the centre of gravity. – Extract the data for the influence of fuel on the centre of gravity from an aeroplane operating manual. 	

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031 03 02 03	Practical methods of calculation <ul style="list-style-type: none">- Calculate zero fuel, takeoff and landing masses, the respective moments and centre of gravity positions with the aid of various types of mass and balance documentations- Explain the differences between operational and certified limits for the centre of gravity.- State where the certified and where the operational limits can be found and extract them	Mass and balance documents of various Aircraft types.
031 03 03 00	<u>Securing of Load</u>	
031 03 03 01	Importance of adequate tie-down <ul style="list-style-type: none">- Describe the reasons why loads in cabin and cargo rooms have to be secured or tied down.- State that cargo aeroplanes use pallets or containers to secure the load	
031 03 03 02	Effect of loadshift <ul style="list-style-type: none">- Effect of Loadshift- See 031 03 02 02	
031 03 04 00	<u>Area Load, Running Load, Supporting</u> <ul style="list-style-type: none">- See 031 01 02 02	