AIRLINE TRANSPORT PILOTS LICENSE HELICOPTER

(030 00 00 00 - FLIGHT PERFORMANCE AND PLANNING)

JAR-FCL REF NO	LEARNING OBJECTIVES	REMARKS
031 01 00 00	**INTRODUCTION TO MASS AND BALANCE**	
031 01 01 00	**Centre of Gravity**	
031 01 01 01	**Definition**	
	– Define the centre of gravity, as related to a helicopter	
031 01 01 02	**Importance for helicopter stability**	
	– Explain why the CG must be within the certified limits with regard to helicopter stability and stick travel limitations	
031 01 02 00	**Mass and Balance limits**	
031 01 02 01	**Consult helicopter flight manual:**	
	– Describe the effects of operating a helicopter at its mass and centre of gravity limits	
	– Find the certified centre of gravity limits for zero fuel mass, take off mass and landing mass from the helicopter operating manual	
031 01 02 02	**Maximum floor load**	
	– State that maximum floor/running loads have to be considered when loading heavy items.	
	– Calculate examples and extract the necessary data from a helicopter 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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	– Describe the limitations for the maximum traffic load.	
	– Calculate examples for determination of these masses	
031 01 02 05	**Factors determining centre of gravity limits**	
	– State the responsibility of the helicopter manufacturer for determination of CG limits and its documentation in the Flight Manual	
	– State that centre of gravity limits are determined by helicopter stability and manoeuvrability and describe the influence on helicopter operation	
	– Summarize all factors that affect the location of the centre of gravity during helicopter operation.	
031 02 00 00	**LOADING**	
031 02 01 00	**Terminology**	
	– Define take-off mass, landing mass and max. in-flight mass	
	– State where these masses can be found	
031 02 01 01	**Basic Empty Mass**	
	– Define ‘Basic Empty Mass’	
	– State where this mass can be found.	
031 02 01 02	**Dry Operating Mass**	
	– Define ‘Dry Operating Mass’ and ‘Operating Mass’ and calculate examples	
031 02 01 03	**Zero Fuel Mass**	
	– Define ‘Zero Fuel Mass’	

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	– Calculate examples for 'Zero Fuel Mass' by given components	
031 02 01 04	**Standard mass**	
	– State when to apply actual or standard masses for crew, passengers and baggage according to JAR-OPS3.	JAR-OPS3 given
	– 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	
031 02 01 05	**Useful load (Traffic load + Usable fuel)**	
	– Define 'traffic load' and 'useful load'.	
	– Calculate examples for traffic and useful load	
031 02 02 00	**<u>Helicopter Mass Check</u>**	
031 02 02 01	**Procedure**	
	– State where the results of a helicopter 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-OPS3, to be used at re-weighing	
031 02 02 02	**Requirements for re-weighing of helicopters**	
	– List the time intervals for the re-weighing of helicopters according to JAR-OPS3	
031 02 02 03	**Equipment lists**	
	– State that the equipment list is used to name which items are included in the re-weighing process	

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031 02 03 00	**Procedures for determining helicopters mass and balance documentation**	
031 02 03 01	**Determining dry operating mass**	
	– Extract the dry operating mass for specified crew, flight and service conditions from the helicopter operating manual	
031 02 03 02	**Intentionally left blank**	
031 02 03 03	**Add mass of passengers and cargo**	
	– 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**	
	– 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**	
	– Calculate takeoff mass, maximum takeoff mass, landing mass and maximum landing mass	
031 02 04 00	**Effects of Overloading**	
031 02 04 01	**- on take-off and safety speeds**	
	– Explain the influence of the helicopter mass on takeoff and safety speeds	
031 02 04 02	**- on take-off and landing distances**	
	– Explain the influence of the helicopter mass on takeoff and landing distances	
031 02 04 03	**- on rate of climb**	

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	– Explain the influence of the helicopter mass on the rate of climb.	
031 02 04 04	**- on range and endurance**	
	– Explain the influence of the helicopter mass on the range and endurance	
031 02 04 05	**- on flight performance capability in case of engine failure**	
	– Explain the influence of the helicopter mass on the one-engine out performance	
031 02 04 06	**Possible structural damage in extreme cases**	
	– Explain the potential risks when the helicopter mass limits are exceeded	
031 03 00 00		
031 03 01 00	**Basis of CG Calculations**	
031 03 01 01	**Datum**	
	– Explain the term datum.	
	– Find the datum position from the helicopter operating manual for calculation purposes.	
031 03 01 02	**Moment arm**	
	– Explain the moment arm and its algebraic sign.	
	– Extract moment arms for different loading positions from helicopter operating manual	
031 03 01 03	**Moment**	
	– Explain the term ‘moment’ and calculate basic examples with different arrangements of moment arms, loads and supporting points	

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031 03 02 00	**Calculation of longitudinal and lateral CG position**	**Important Annotation**: For helicopter balance considerations the longitudinal as well as the lateral component of CG position has to be taken into account
031 03 02 01	**Centre of gravity at Basic Empty Mass** – Calculate the helicopter centre of gravity from scale readings at weighing. – Find the centre of gravity at the dry operating mass from the helicopter manual.	
031 03 02 02	**Movement of CG with addition of fuel, load and ballast** – Calculate the effect of shifting loads or additional loads on the centre of gravity. – Describe the influence of fuel loading or consumption on the centre of gravity. – Extract the data for the influence of fuel on the centre of gravity from helicopter operating manual.	
031 03 02 03	**Practical methods of calculation** – 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 documentation	
031 03 02 04	**Intentional relocating of passengers or cargo to remain within CG limits** – Explain the effect of relocation of passenger on CG position	

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	– Calculate examples of relocation of passengers and/or loads to achieve certain CG positions	
031 03 03 00	**Securing of Load**	
031 03 03 01	**Importance of adequate tie-down**	
	– Describe the reasons why loads in cabin and cargo rooms have to be secured or tied down.	
031 03 03 02	**Effect of loadshift**	
	– See 031 03 02 02	
031 03 04 00	**<u>Area Load, Running Load, Supporting</u>**	
	– See 031 01 02 02	