ADVISORY CIRCULAR

SUBJECT:	DATE:	AC NUMBER:	VERSION:
UAS CARRYING DANGEROUS GOODS	2025-26-01	107-03	1.0

NOTE: THIS ADVISORY CIRCULAR IS PUBLISHED TO PROVIDE REGULATORY INFORMATION AND DESCRIBE ACCEPTABLE MEANS OF COMPLIANCE WITH THE GENERAL AUTHORITY OF CIVIL AVIATION REGULATIONS (GACAR).

CHAPTER 1 – INTRODUCTION

1.1 Purpose.

The purpose of this Advisory Circular (AC) is to provide information and instructions to persons seeking authorization for operations with unmanned aircraft carrying dangerous goods. This AC provides guidance by describing an acceptable means, but not the only means, of demonstrating compliance with UAS requirements for transporting dangerous goods (GACAR Part 107.123(b)(13) and Part 107.129(c)).

1.2 Applicability.

This AC is applicable to the Specific Category of Unmanned Aircraft Systems (UAS) operations, in accordance with GACAR Part 107 Subpart D, within the Kingdom of Saudi Arabia airspace.

1.3 Cancellation.

This is the first official version of this Advisory Circular and it cancels no other Advisory Circulars.

1.4 Related Regulatory Provisions.

GACAR Parts 48, 107, 109.

1.5 Related Reading Material.

GACA AC 107-01 Advanced Operations with Unmanned Aircraft Systems
GACA AC 107-02 Remote Pilot Certification

1.6 Definitions of Terms Used in this Advisory Circular.

GACAR Part 1 contains the main listing of defined terms and abbreviations used in the GACARs. Additional terms relevant for the Unmanned Aircraft Systems domain are defined in GACAR Part 107.

1.7 Approval.

This AC has been approved for publication by the Executive Vice President of the Aviation Safety and Environmental Sustainability Sector of the General Authority of Civil Aviation.

1.8 Glossary.

AC	Advisory Circular
OA	Operational Authorization
GACA	General Authority of Civil Aviation
GACAR	General Authority of Civil Aviation Regulation
ICAO	International Civil Aviation Organization
SARP	Standards and Recommended Practices
SDS	Safety Data Sheet
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
UOC	UAS Operator Certificate

CHAPTER 2 – GENERAL GUIDANCE

2.1 General remarks.

The following are examples of dangerous goods that could potentially be transported by unmanned aircraft:

a) compressed gases such as aerosols and gas cartridges;
b) flammable liquids, such as ethanol, ether;
c) sterilization materials such as ethylene oxide;
d) infectious substances such as samples for analysis;
e) toxic substances such as certain medicines;
f) first aid kits;
g) medical or clinical waste such as used needles and blood samples;
h) safety devices;
i) lithium batteries; and
j) dry ice.

Carriage of dangerous goods by unmanned aircraft, that does not result in high risk for third parties in case of accident, could potentially be for emergency support, agricultural, medical, or other services. Transport of dangerous goods is only possible after approval by the GACA. The approval must be listed on the Operational Authorization (OA) or UAS Operator Certificate (UOC) and requires:

a) procedures for the handling and transport of dangerous goods;
b) safety risk assessment.

UAS operators that intend to provide emergency support, agricultural, medical, or other services with goods that may be classified as dangerous goods should include in their operations manual:

a) policies and procedures for the identification of dangerous goods
b) reporting to the GACA any dangerous goods accidents and incidents.

The procedures may be brief depending on the nature and urgency of the operation and on the level of safety risk. At a minimum, the procedures for handling and transport of dangerous goods should include:

a) procedures for carrying out responsibilities, including measures to identify hazards and their potential consequences and ensure that the risk can be mitigated to an acceptable safety level;
b) a training policy including the level of competency achieved once training is complete;
c) instructions for communicating to relevant persons information related to the dangerous goods being transported, in case of an accident or incident;
d) action to be taken in the event of emergencies involving dangerous goods;
e) instructions for the collection of safety data related to dangerous goods incidents and accidents.

Note – The training policy referred to in b) should be based on Competency-Based Training & Assessment (CBTA). The training should include 1) general familiarization training, 2) function specific training and 3) safety training [10]. The competency framework for dangerous goods personnel should address the following generic competencies: Application of procedures and compliance with regulations; communication; leadership, teamwork and self-management; problem-solving and decision making; workload management [11]. Further guidance may be provided by GACA during the application process.

The safety risk assessment should include at least the:

a) identification of hazards associated with the dangerous goods;
b) type of operation;
c) containment characteristics of the unmanned aircraft;
d) packing and packaging;
e) quantity and type of dangerous goods to be transported;
f) level of competence of those handling the dangerous goods.

Details on the procedures and safety risk assessment are in Appendices C and D respectively. The UAS operator is required to comply with GACAR Part 109 *Transportation of Dangerous Goods by Air*.

2.2 Dangerous Goods: Understanding the Risks and the Responsibilities.

Introduction

Unmanned Aircraft (UA) are being used to transport goods. Some of these goods have one or more inherent hazards and are therefore classified as dangerous goods. ICAO develops international Standards and Recommended Practices (SARPs) which govern the safe transport of dangerous goods on civil aircraft (see ICAO Annex 18 and ICAO Doc 9284, which are explained further below). There may be circumstances when full compliance with these SARPs is inappropriate or unnecessary for UA operations. Conversely, there may be hazards unique to UA operations that are not addressed by these SARPs. It should be ensured that both are taken into account before approving transport operations involving the carriage of dangerous goods on UA. Appendix B provides examples of dangerous goods that may, potentially, be carried by unmanned aircraft in the KSA.

Scope

This guidance applies to circumstances when the GACA has determined that the use of unmanned aircraft to transport dangerous goods is appropriate. If delivery of dangerous goods to or from the location of the unmanned aircraft by other modes of transport is necessary, all appropriate provisions of the national or international regulations by those modes of transport apply.

Regulatory Requirements for the International Transport of Dangerous Goods by Air on Civil Aircraft

The broad principles governing the international transport of dangerous goods by air are contained in Annex 18 to the Convention on International Civil Aviation — *The Safe Transport of Dangerous Goods by Air*. These broad provisions are amplified by detailed specifications contained in the ICAO *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (*Technical Instructions*, ICAO Doc 9284). The GACA is obliged to take the necessary measures to achieve compliance with these documents for international civil aircraft operations and is encouraged to do the same for domestic civil aircraft operations.

Dangerous Goods — Description

Dangerous goods are articles or substances that are capable of posing a hazard to health, safety, property or the environment and which are shown in the list of dangerous goods provided in the ICAO Technical Instructions or which are classified according to the ICAO Technical Instructions. Dangerous goods are classified according to nine classes based on their potential consequences. Some classes are further divided into divisions. Dangerous goods can have two or more potential consequences. Identifying dangerous goods is the first step towards safely transporting them. Based on this, the safety risks posed can be reduced through proper packaging, communication, handling, and stowage. The scope of dangerous goods needed for carriage aboard unmanned aircraft may be limited to specific items and classes. The operator should identify these items and classes in their safety risk assessment. Dangerous goods classes and divisions are outlined in Appendix A.

Transport of Dangerous Goods on UA

The UAS operator must comply with GACAR Part 107.123(b)(13) and Part 107.129(c). GACAR Part 109 refers to the ICAO Technical Instructions as the basis for transporting dangerous goods on Unmanned Aircraft. However, the GACA recognizes that there may be circumstances when the full provisions of the ICAO Technical Instructions are not appropriate or necessary, due to the nature of UA operations. When appropriate, the GACA may grant an approval to permit the carriage of dangerous goods without complying with the requirements of the ICAO Technical Instructions, provided they are satisfied with the operator's safety risk assessment and that the operator has made reasonable effort to identify all hazards and that the safety risks associated with the foreseeable consequences have been mitigated to an acceptable level. There may be hazards unique to UA operations that are not addressed in the Technical Instructions. The GACA should ensure these hazards are also addressed through the operator's safety risk assessment.

Dangerous Goods Standard Operating Procedures

The GACA, when granting an operator approval for carriage of dangerous goods, will ensure that the UAS operator establish and document procedures for the safe transport of dangerous goods on the UA, and will ensure that the UAS operator conducts safety risk assessment. The extent of the procedures will depend on the size of the organization, the nature of the operation and on the level of safety risk.

At a minimum, the procedures should include:

a) how to conduct a safety risk assessment; procedures to identify hazards, determine their potential consequences and ensure the risk can be managed to an acceptable level;
b) a training program and the level of competency achieved once training is completed; providing adequate instruction ensures that individuals handling dangerous goods are competent to perform the function commensurate with their responsibilities taking into account the level of safety risk;
c) instructions for communicating information to relevant persons related to the dangerous goods being transported in case of an accident or incident;
d) action to be taken in the event of emergencies involving dangerous goods; and
e) instructions for the collection of safety data related to dangerous goods accidents and dangerous goods incidents.

Appendix C provides further guidance on elements that should be included in the procedures.

The safety risk assessment should include at least the:

a) identification of hazards associated with the dangerous goods;
b) type of operation;
c) containment characteristics of the UA;
d) packing and packaging;
e) quantity and type of dangerous goods to be transported; and
f) level of competence of those handling the dangerous goods.

Appendix D provides further guidance on elements that should be considered as part of a safety risk assessment for the carriage of dangerous goods by UA.

CHAPTER 3 – FOR FURTHER INFORMATION

3.1 Responsible Department(s).

The Unmanned Aircraft Systems (UAS) Department of the GACA Aviation Safety and Environmental Sustainability Sector is responsible for authorizing UAS operations in the Kingdom of Saudi Arabia.

3.2 Contact Details.

The Unmanned Aircraft Systems Department can be contacted at the following coordinates:

In person or by mail:

General Authority of Civil Aviation (GACA)

Unmanned Aircraft Systems Department

Aviation Safety & Environmental Sustainability Sector

GACA Headquarters – Building 1

Riyadh 13443

By email:

uas-ops@gaca.gov.sa.

Appendix A Classes and Divisions of Dangerous Goods

The following classes and divisions are used to identify hazards associated with the transport of articles and substances based on the product's specific chemical and physical properties. They are named in accordance with the United Nations Recommendations on the Transport of Dangerous Goods (Model Regulations) [6]. The classification of an article or substance for transport by air needs to be done by competently-trained individuals in accordance with the ICAO Technical Instructions. A good starting point for determining if your product might be dangerous is by obtaining a Safety Data Sheet (SDS) from the manufacturer and checking the "Transportation Information." This can provide valuable information on the transport risks related to materials.

The numerical order of the classes and divisions is not that of the degree of danger.

Class 1: Explosives

- Division 1.1: Substances and articles which have a mass explosion hazard
- Division 1.2: Substances and articles which have a projection hazard but not a mass explosion hazard
- Division 1.3: Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard
- Division 1.4: Substances and articles which present no significant hazard
- Division 1.5: Very insensitive substances which have a mass explosion hazard
- Division 1.6: Extremely insensitive articles which do not have a mass explosion hazard

Class 2: Gases

- Division 2.1: Flammable gases
- Division 2.2: Non-flammable, non-toxic gases
- Division 2.3: Toxic gases

Class 3: Flammable liquids

Class 4: Flammable solids; substances liable to spontaneous combustion; substances which, on contact with water, emit flammable gases

- Division 4.1: Flammable solids, self-reactive and related substances and solid desensitized explosives and polymerizing substances
- Division 4.2: Substances liable to spontaneous combustion

Division 4.3: Substances which, in contact with water, emit flammable gases

Class 5: Oxidizing substances and organic peroxides

Division 5.1: Oxidizing substances

Division 5.2: Organic peroxides

Class 6: Toxic and infectious substances

Division 6.1: Toxic substances

Division 6.2: Infectious substances

Class 7: Radioactive material

Class 8: Corrosive substances

Class 9: Miscellaneous dangerous substances and articles, including environmentally hazardous substances

Appendix B Dangerous Goods to be potentially carried by unmanned aircraft

The following are examples of dangerous goods that may be transported by unmanned aircraft:

a) compressed gases such as aerosols and gas cartridges;
b) flammable liquids, such as ethanol, ether;
c) sterilization materials such as ethylene oxide;
d) infectious substances such as samples for analysis;
e) toxic substances such as certain medicines;
f) first aid kits;
g) medical or clinical waste such as used needles and blood samples;
h) safety devices;
i) lithium batteries; and
j) dry ice.

This list is not exhaustive. Provisions for identifying and classifying dangerous goods are contained in the ICAO Technical Instructions.

Note that, in addition to GACAR Part 107.123(13) and Part 107.129(c), UAS operators may need to comply with additional KSA regulations on the use of dangerous goods. Further guidance may be provided by GACA during the application process.

Appendix C UAS Operator's Dangerous Goods Procedures for Safe Transport

This guidance provides recommended elements to be included in the Operations Manual of the UAS operators, regarding the procedures for the transport of dangerous goods.

Policy for the Safe Transport of Dangerous Goods on UA

The operator should establish a policy for the safe transport of dangerous goods on UA. The policy should include the practice of conducting a safety risk assessment.

Procedures for Carrying Out Responsibilities Including Mitigation Measures to Proactively Manage Risks

The procedures should include measures taken and an indication of how these measures mitigate the potential consequences of identified hazards to an acceptable level. Procedures to mitigate hazards unique to unmanned aircraft operations should also be included to ensure the dangerous goods are capable of withstanding the normal conditions of transport involving the type of unmanned aircraft being used.

Training Program

A training program should be established based on the functions performed by persons who handle dangerous goods. The program should be clear as to the competency level achieved once training is completed. A record reflecting the training and the competence level attained for each person should be maintained.

Instructions for Communicating Information Related to the Dangerous Goods Carried by the UA in the Case of an Incident or Accident

The ICAO Technical Instructions include provisions for communicating hazards of dangerous goods through marking and labelling of the package and documentation, which are well-known to those involved in their transport. Individuals who are exposed to unmanned aircraft involved in an incident or accident may not be aware of these hazard communication methods.

Procedures should be established by the operator that explains the instructions for effectively communicating hazards to those not familiar with dangerous goods marking and labelling and how the instructions should be attached to the shipment. Contact information and instructions for informing appropriate authorities, including public health authorities, should also be included in the procedures.

Action to be Taken in the Event of Emergencies Involving Dangerous Goods

Procedures should be established for an emergency response plan for dangerous goods incidents or dangerous goods accidents. A current list of contacts indicating whom should be notified if

either event occurs, should be maintained.

Instructions for Collection of Safety Data

Procedures should include instructions for collecting safety data related to dangerous goods accidents and dangerous goods incidents. The format for submitting this data is specified in the GACAR Part 109.

Appendix D Elements for the UAS Operator Safety Risk Management Procedures

A safety risk assessment should be performed to address potential consequences of identified hazards and associated mitigations should an unintentional release occur. The following are elements that should be included, at a minimum, in the safety risk assessment.

Risks Associated With Dangerous Goods

Risks associated with the dangerous goods to be transported should be considered in relation to the consequence of their effect if they are released.

- Infectious substances that are capable of causing permanent disability, life-threatening or fatal disease for which no vaccine or cure is available have the highest consequences. They could potentially affect multiple persons or animals.
- Infectious pathogens that are spread by ingestion, for which prophylactic treatment or a cure is available will have moderate consequences.
- Non-communicable pathogens for which prophylactic treatment or a cure is available will have a low consequence.
- Chemicals with high toxicity to human, animal and aquatic life will have the highest consequences, and may affect multiple persons or animals.
- Chemicals that are highly corrosive will have a high consequence to package handlers or receivers.

Type of Operation

The safety risk assessment should consider the potential consequences related to the transport over populated areas, remote areas or environmentally sensitive land and waters. Other normal flight risks such as those associated with operating routes, obstacles, altitudes, or take-off and landing areas should also be considered. Dropping of the dangerous goods from the unmanned aircraft also brings with it additional potential consequences for consideration.

Containment Characteristics of the unmanned aircraft (e.g. inside or outside the UA)

The carriage of the dangerous goods inside or outside the unmanned aircraft needs assessing. The securing of the dangerous goods within the unmanned aircraft, by attachment directly to the unmanned aircraft or slung from the unmanned aircraft, will have varying levels of risk.

Packing and Packaging

Packaging methods used to contain dangerous goods may affect the likelihood of damage, leakages, spills or unintentional release of contents. In considering the packing and packaging requirements for dangerous goods, the provisions of the ICAO Technical Instructions should be followed to the extent possible.

If the provisions of the ICAO Technical Instructions cannot be followed, an equivalent or greater level of safety should be established in accordance with the level of risk. At a minimum, the following should be taken into account:

a) The type of packaging should take into account the containment characteristics of the unmanned aircraft and damage that could be caused by exposure to airflow and weather such as rain or snow. The effects of temperature and pressure variations and vibrations which may be encountered during transport should be taken into account.

b) Generally, dangerous goods should be packed in the lowest volume container necessary for the intended purpose.

c) Measures to prevent leakage of liquid dangerous goods need to be taken into consideration. At a minimum, the packaging should include a leak proof liner or bag containing the dangerous goods surrounded by absorbent material and placed into a receptacle in a rigid outer packaging. Inner packaging should be packed so that the closures are upward within the package. Closures on inner packaging must be leak proof and secured against loosening. Stoppers, corks or other such friction closures must be held in place by positive means.

d) The contents of the packages should be documented and easily accessible in case of an incident or accident requiring emergency response. At a minimum, the UN number, container type, volume and number of items should be documented. In the case of biological substances, pathogen data sheets or information about the hazards to infectious substances, including deactivation and waste disposal, should be made available.

e) If the dangerous goods are to be dropped by the unmanned aircraft, additional consideration of the effects on the dangerous goods and packaging materials should be considered due to the forces and shocks encountered.

Quantity and Distribution of Dangerous Goods to be Transported

The volume of dangerous goods to be carried coupled with packaging methods used may affect the likelihood of damage, leakages, spills or unintentional release of contents. For certain dangerous goods, the quantities may influence the severity of the identified consequence of a hazard. The potential for incompatible dangerous goods or non-dangerous goods to react dangerously when mixed needs to be taken into account.

Level of Competence of Those Handling the Dangerous Goods

The level of competence of those handling the dangerous goods needs to be taken into account in relation to the level of responsibility and risk. Without appropriately qualified personnel, there is the potential of insufficiently implementing mitigating strategies or potentially introducing additional hazards or unintended consequences.

Appendix E References

1. General Authority of Civil Aviation (GACA) Regulation (GACAR). Transportation of Dangerous Goods by Air, Part 109.
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