PROTOCOL MANUAL

For pilots and air traffic controllers

AeroAlert Project

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INTRODUCTION

This manual has been prepared with the purpose of providing a reference, both for pilots and air traffic controllers, that will allow them to act satisfactorily given the functionalities of the ICERS system in the corresponding in-flight emergency situations covered by the aforementioned system.
The respective cases reached by ICERS and, as a consequence, with sufficient usefulness to be mentioned and analyzed in this document, are:

- CASES OF HYPOXIA
- CASES OF INTENTIONAL ACCIDENTS
- CASES OF SOMNOLENCE
- CASES OF PILOT'S DEATH
- CASES OF CREW CHANGES
- CASES OF REGULATORY REST
- CASES OF SYSTEM FAILURE
- CASES OF MANUAL ACTIVATION
- CASES OF NOT WEARING A WRISTBAND

Recommendations

Both pilots and air traffic controllers must rationally take into account the dimension of the situation that it presents, understand their responsibilities and competencies, as well as the consequences of their actions.

Strict adherence to the protocols set forth in this document is strongly recommended to ensure satisfactory emergency operations, thus avoiding potential undesirable consequences.

PROTOCOLS FOR PILOTS

In this section, we proceed to define the action protocols corresponding to pilots in cases covered by the ICERS system.
As previously mentioned, it is strongly recommended to strictly follow the procedures described in this document, in order to guarantee their effectiveness, as well as a satisfactory resolution to certain in-flight emergency situations.

Hypoxia Cases

Hypoxia events warrant both manual activation (if symptoms are noticeable) and automatic activation (via the wrist device). It is recommended to reserve manual activation for situations in which the system is not able to protect.

By definition, in the event that the bracelet registers a blood oxygen saturation of less than 90% in the pilot and copilot, an alert will be provided in the cockpit, as well as to the A.T.C.

When this condition is met, pilots must put on their oxygen masks and continue establishing contact with the corresponding A.T.C.

In the event that pilots feel that they are unable to continue the flight optimally due to the effects of hypoxia, they may activate the ICERS system manually or automatically with the bracelet, after due contact with the A.T.C., whether such activation is transient (pending recovery of their capabilities) or permanent under the condition that the effects suffered are such that the pilots are unable to continue the flight.

Cases of fraudulent claims

After an event of this category, the only way to generate an emergency response is for the A.T.C. to become aware of the situation and thus activate the Automatic Emergency System.
If the incident is caused by a crew member(s), contact the ground as soon as possible.

In case the attack is perpetuated by a passenger (or group of them), pilots may communicate with the A.T.C., and wait for an activation of the Automatic Emergency System, or place the hijack code on the Transponder, in order to activate the same system.

The recommended procedure is, first of all, to place the hijack code in the Transponder, and then to establish communication with the A.T.C. so that it can be established.

Cases of Sleepiness

The initial response to cases of this nature, if it is only one pilot, will be the activation of a light in the cockpit, so that the pilot and/or third parties in question recognize the pilot's Sleepiness. After this, the pilot, by his own or third party means, will have to wake up and press the reaction button.

In case both pilots are in the same situation, the amber light in the cockpit and an alarm will be activated and a warning will be sent to the A.T.C. A maximum reaction time of 30 seconds will be contemplated for this specific situation, after which, if the reaction button has not been pressed, both pilots will be considered in a state of unconsciousness.
If the drowsy condition affects only one of the pilots, there is no emergency, it is an alert.

Cases of pilot death

Upon the death of a pilot the A.E.S. will detect it, and an amber light will be lit in the cockpit and the A.T.C. will be notified of the event.

In the event that both pilots are lifeless, the system will alert the A.T.C., and will turn on an amber light in the cockpit with a specific audible alert.

Crew change cases

If the crew change protocol is required during a flight, the buttons on the bracelet must be held down to execute the change.

After the procedure has been enabled, a 40-second period will be allowed for the changeover, at which time the previous crew must transfer their wristbands to the new crew.

Statutory rest cases

On occasions in which the pilot wishes to use his regulatory rest, he should press the button to set his bracelet in rest mode, so as not to have any inconvenience.
If his rest is authorized, the pilot will have a period of 20 minutes in which his bracelet will not detect his low cardiac activity as a case of Sleepiness, although the bracelet will remain functional.
After 20 minutes, the system will resume its functions normally, and the pilot will have to wait a few minutes to be able to make another request within the same aircraft. It should be noted that only one pilot at a time will be able to activate this mode of operation, and only once per flight.

It is recommended to use 15 of the 20 minutes of the process for rest, allocating the remaining 5 minutes to the recovery of the capabilities, thus preventing the bracelet from taking erroneous and/or unwanted measurements.

System failure cases

In case of obvious failures in the ICERS system, either due to erroneous measurements of the wristbands or communication problems with the A.T.C., it is strongly recommended to deactivate the system, thus avoiding erroneous messages to the A.T.C.
If you notice that your wristband is malfunctioning, you may notify the A.T.C. of such situation, after which it is recommended to proceed with its deactivation.

System failures can be determined in flight if there is an alert in the cockpit that has no correlation with the events taking place in the cockpit, or if the warning flag is activated. The first case mentioned will determine that the failure is in the bracelet and/or its data reading system. The second case will indicate another type of technical failure, related to the power supply of the equipment, or in case of being out of range of any C.T.A.
To deactivate the system, the corresponding key must be connected to the override switch of the Automatic Emergency System.

Manual activation cases

Manual activation is understood as a protocol of last resort. Therefore, it is recommended only when the equipment does not have enough tools to give an alert by its own means, or if it is unable to generate alerts due to a failure.
Should such a situation occur, proceed by pressing the manual activation button, after which the Automatic Emergency System will be activated immediately.

Cases of non-wearing of bracelets

In case pilots are not wearing their bracelets, or are not wearing them correctly, they will be alerted with an amber light in the cockpit, warning of the lack of connection/incorrect connection of the bracelet.
The notice will be generated from the corresponding T.C.A.

Alert indicators

In the aircraft cockpit, alerts will be displayed by means of light indicators under the following coding:

- Red color: indicates hypoxia conditions, manual activation and C.T.A. activation.
- Amber color: indicates unconsciousness, Sleepiness, death, not wearing a bracelet and high or low pulse rate.

PROTOCOLS FOR AIR TRAFFIC CONTROLLERS

In this section, the emergency action protocols corresponding to air traffic controllers are defined, given the emergency cases covered by the ICERS system.
As previously mentioned, it is strongly recommended to strictly follow the procedures described in this document, in order to guarantee their effectiveness, as well as a satisfactory resolution to certain in-flight emergency situations.

Hypoxia Cases

When a case of cabin hypoxia occurs, an emergency alarm will be activated and a red light will be illuminated in the air traffic control office. The A.T.C. shall immediately contact the aircraft by radio. In principle, it should be corroborated that the measurement given is real.

After the A.T.C. contact with the crew, the pilots will return an answer or not according to the state of consciousness in which they are due to the effects of hypoxia. In case of answering, the veracity of the measurements will be corroborated. If this condition is met, an emergency landing will be made.
In case the pilots do not answer the A.T.C.'s query, it will be declared that they are not in optimal conditions to fly the aircraft after 3 unsuccessful attempts. Subsequently, a general unconsciousness alarm will be activated, and an emergency landing will be made, activating the automatic emergency system from the control tower.

Cases of fraudulent claims

In cases of this nature, the air traffic controller must contact the aircraft immediately upon any indication that the aircraft is damaged, or in such process, if such suspicion is affirmed (either through the Transponder system, or via direct communication with the pilot), the Automatic Emergency System is activated remotely and, consequently, an emergency landing begins to be organized.
In cases of manual activation, system deactivation, death of one or both pilots, route deviations, deactivation of the Transponder and/or other communication systems and calls by the crew, the aircraft must always be marked as a possible hijack suspect, after which all its movements must be monitored.

Cases of Sleepiness

In the event of Sleepiness, the air traffic controller will receive an audible alert and an amber light will turn on if both pilots are drowsy.
After such a stimulus, the A.T.C. shall contact the aircraft and wait for the pilots to wake up, giving a maximum response time of 40 seconds. In the affirmative case, the protocol will not entail any further action, but the aircraft should be monitored given the potential fatigue of the pilots. In the negative case, an audible alarm and a red light will be activated at the air traffic office.
In the event that one of the pilots does not wake up, he/she will be classified as unconscious, after which the air traffic controller will contact his/her partner on board to make an emergency landing.

If no response is received from any of the pilots, the ICERS system itself will request commands to the A.T.C. to perform the emergency landing.

It is recommended to try to communicate with the aircraft in any case, mainly for safety reasons.

Cases of pilot death

In the event of a pilot's death, notification will be given by activation of an audible alarm and a warning light to notify.
The aircraft should be contacted immediately, in principle to verify the information received. If so, proceed with the execution of an emergency landing.

In case of death of both pilots, a red light and an audible alarm will be activated. In this case, the aircraft must be contacted and an emergency landing must be made.

System failure cases

In the event of system failures, the A.T.C. may be in a position to receive erroneous values and alerts for a given flight. For this reason, in any case, the A.T.C. must communicate with the aircraft in conflict to verify the veracity of the information received.
In the event that the information provided constitutes a system error, the air traffic controller may authorize the deactivation of the ICERS system taking into account the magnitude and severity of the errors present.

Manual activation cases

When an aircraft manually activates the Automatic Emergency System, the air traffic controller in question will be notified by the lighting of a red indicator light in his control tower. In these cases, it is of utmost importance to contact the aircraft involved, in order to obtain details and reasons for the event.

Cases of non-wearing of bracelets

In case of detecting the non-wearing (or incorrect wearing) of the corresponding bracelet, the air traffic control will be notified through the lighting of an amber light indicator in its office.
After such notice, the aircraft must be notified of the incorrect wristband.

Alert indicators

In the control tower, the following arrangement of indicators is available to facilitate and optimize the understanding of the situation and its subsequent resolution:

- Red color: for emergencies
- Amber color: for alerts and warnings

GENERAL PROTOCOL: EMERGENCY LANDING

When an air traffic controller receives an alert from an aircraft, which corresponds to the cases previously seen, quick and effective measures must be taken to ensure a safe emergency landing. Once the veracity of the alert has been verified, the air traffic controller should approach the C.T.R.T. and send commands to the aircraft's Automatic Emergency System for the aircraft to perform the necessary maneuvers.

It is important to note that the aircraft's A.E.S. will be in charge of sending the landing parameters sent from the CTRT to the aircraft's flight computer.

In order to send accurate commands to the A.E.S., the C.T.R.T. must take several factors into account. First, the model of the aircraft in question must be known, since each model has its own characteristics and flight requirements. It must also consider nearby airports that may be suitable for an emergency landing and the maneuvers necessary to reach them safely, taking into account the surrounding air traffic, as this affects the aircraft's ability to maneuver safely.