STANDARDS RELATED DOCUMENT

AFSP-1.3.1

RECOMMENDED NATO STANDARD OPERATING PROCEDURE FOR SAFETY INVESTIGATION OF ACCIDENTS/SERIOUS INCIDENTS INVOLVING MILITARY AIRCRAFT, MISSILES, AND/OR UAS

Edition A, version 1

MAY 2021

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED FLIGHT SAFETY PUBLICATION

Published by the
NATO STANDARDIZATION OFFICE (NSO)

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

NATO STANDARDIZATION OFFICE (NSO)

NATO LETTER OF PROMULGATION

31 May 2021

1. The enclosed Standards Related Document, AFSP-1.3.1, Edition A, version 1, RECOMMENDED NATO STANDARD OPERATING PROCEDURE FOR SAFETY INVESTIGATION OF ACCIDENTS/SERIOUS INCIDENTS INVOLVING MILITARY AIRCRAFT, MISSILES, AND/OR UAS, which has been approved in conjunction with AFSP-1.3 by the nations in the MCASB, is promulgated herewith.

2. AFSP-1.3.1, Edition A, version 1, is effective upon receipt.

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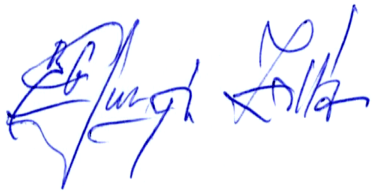
4. This publication shall be handled in accordance with C-M(2002)60.



Zoltán GULYÁS
Brigadier General, HUNAF
Director, NATO Standardization Office

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CHAPTER 1 - CONTENTS

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CHAPTER 1 - FORMAT FOR INITIAL OCCURRENCE NOTIFICATION

This report contains factual information related to a NATO aviation safety investigation. Information shall not be released to the public in whole or in part except under the authority of the Nation of Occurrence and the Operating Nation(s) aviation safety authorities.

INITIAL AIRCRAFT ACCIDENT NOTIFICATION

OPERATING AIR FORCE-AIRCRAFT TYPE- DD MMM YYYY (L) OF ACCIDENT

1. Date/time of occurrence (L):

2. Nation of Occurrence:

3. Location of accident: Indicate location in plain language and by either Lat and Long or MGS

4. Description: Short free text describing factually what happened

5. Aircraft Information: (If more than one aircraft, list each aircraft as A., B., etc. as required)

   a. Operating Nation, aircraft type, registration number, number of crew, number of pax

   b. Operating Nation, aircraft type, registration number, number of crew, number of pax

   6. Aircraft Damages: Short free text describing physical damages to the aircraft

   a. Aircraft A

   b. Aircraft B

7. Personnel Injuries: Short free text describing in general extent of the injuries ie minor, serious, fatal etc. suffered by crew, passengers and other pax.

8. Remarks: Any pertinent remarks related to other damages, environment, hazardous cargo, protection of evidence, immediate action taken, recommendations, disposition of flight recorders, physical characteristics of the accident site, security of site, type of weapons, etc.Nation of Occurrence Point of Contact on Site: Provide name, rank, position, numbers/e-mail address to ensure rapid coordination between nations.

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CHAPTER 2 - ASIB PRESIDENT FUNCTION

1. The functions of the President include (but are not limited to):

   a. Organize and conduct the investigation.

   b. Ensure that the wreckage of the aircraft involved in the accident are not moved, changed or removed without his authorization unless it is necessary or ordered by National Authorities (AFSP 1.3 para 3.13 and 5.8, SRD AFSP-1.3.2).

   c. Ensure that each Investigation Group is properly familiarized with their respective functions.

   d. Ensure collection and preservation of all evidence until proper disposition.

   e. Coordinate and control the activities of the Investigation Groups.

   f. Preside over, at frequent intervals during the Investigation, meetings with the Investigation Groups in order to examine the progress made and to facilitate the exchange of information and ideas between Groups.

   g. Verify the investigation equipment available to the Investigation Groups meets the requirements for a thorough investigation.

   h. Determine and negotiate the help of those entities whose contribution will facilitate the work of ASIB.

   i. Communicate, that all information, as per para 3.7, related to the accident will be disseminated by the Public Relations Organization of the Nation in charge of the Investigation.

   j. Determine, in case the circumstances do not permit that the aircraft involved in the accident can remain in the place of the events for an extended period of time, the tasks that must be carried out prior to its removal (photographs, samples, plans of the distribution of the wreckage, etc.). Coordinate with the Nation of Occurrence and the Operating Nation to determine the place where the aircraft is to be moved.

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CHAPTER 3 - ASIB ADMINISTRATOR FUNCTIONS

1. The functions of the Administrator include (but are not limited to):

   a. Consolidate the different reports produced by the Group leads and input into the accident investigation report.

   b. Carry out the tasks assigned by the ASIB President

   c. Coordinate office resources and facilities in support of the different Groups.

   d. Carry out records management of the ASIB, including the records produced by the different Groups.

   e. Draft the minutes of meetings conducted by the President of the ASIB.

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CHAPTER 4 - OPERATIONS INVESTIGATION GROUP RESPONSIBILITIES

1. The functions of the Operations Investigation Group may include (but are not limited to):

a. Formulate and analyze the history of the crew, among other things, with regard to the following aspects:

(1) Role in the accident sequence,

(2) Initial training and specialized instruction,

(3) General and specific experience on the aircraft that had the accident,

(4) Total flight time in the last quarter, month, week and last 48 hours,

(5) Training in the flight simulator,

(6) Examine files with respect to the aircraft engineering, the operation of its systems and the emergency procedures,

(7) Verifications of inflight competence, and

(8) Experience with respect to the flight route or to the airfield where the accident occurred;

b. In coordination with the Medical/Human Factors Investigation Group, analyze the crew's medical history and activities of the crew prior to the accident, during the accident and after it;

c. Analyze the flight plan submitted by the crew in order to determine the intentions of the crew and the fulfilment of the plan with respect to:

(1) Routes, cruising altitude and flight time, tactics, activities undertaken or planned., and

(2) Technical stopovers and refueling;

d. Analyze all the aspects related to pre-flight planning, briefing and ground handling including the weight and balance of the aircraft as well as the parameters, operations and performance;

e. Analyze all the meteorological information that the crew requested or that was given to the crew, prior to and during the flight;

f. Analyze the meteorological conditions along the route and at the time and place of the accident, based on various data, such as:

(1) Meteorological radar reports,

(2) Meteorological observations of surface, radiosonde and radiowind observations,

(3) Recording of precipitation, barometric pressure and wind,

(4) Synoptic, pressure, wind and height temperature charts,

(5) Photographs of the clouds taken by satellite,

(6) Recording of cloud height indicators,

(7) Recording of runway visual range,

(8) Natural light conditions.

(9) Sunrise and sunset, and

(10) Other conditions.

g. Determine whether the meteorological conditions agreed with the forecast. If not, provide explanation of the reasons for the discrepancy.

h. Establish the chronological pattern of the flight starting with the planning, examining the functions carried out by the Air Transit Services: Control of Movements on Land, Control of Departure, Control of Approach and Control of the Airfield up to the phase where the accident occurred.

i. Investigate the effectiveness of the air traffic control services in the following areas:

(1) Location of the control tower and visibility from it

(2) Air traffic control personnel; appropriate number, training, licence validity and personnel supervision.

(3) Work and rest periods for personnel

(4) Suitability of work procedures

(5) Sufficiency of equipment, including radar

j. Obtain and analyze the transcripts of the recording of the radiotelephonic communications, independently or simultaneously with the information obtained from the flight recorders, in order to determine with the greatest degree of accuracy possible the sequence of the events, especially at the moment when the accident occurred.

k. Obtain and analyze the reading of the flight data recorder and the voice recorder in the cockpit.

l. Develop the appropriate actions for land and flight verification of the navigational aids used by the aircraft, especially those involved at the moment when the accident occurred. In addition, evaluate their positioning, periodic technical revisions and recent verifications.

m. Obtain, if feasible, the recording of the panoramic radar images of the Area Control Centres (ATC) in order to have more elements of judgment during the reconstruction of the flight sequence.

n. Obtain information with respect to the availability of maps and charts that the pilot had for the flight; analyze their suitability with respect to the navigation activities that the flight required.

o. Examine, according to the circumstances, the operating conditions of the principal runway or the runway in use, taxiing runways, aircraft parking platforms, as well as the runway lighting systems and the fire extinguishing and rescue services.

p. Ensure the adequate supply of information from witness statements.

q. Carry out the reconstruction and evaluate the interrelationships of the last phase of the flight through as complete a description as possible of the chronological order of the events.

r. Evaluate aircrew standardization and aircraft operations, crew training and experience.

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CHAPTER 5 - TECHNICAL INVESTIGATION GROUP RESPONSIBILITIES

1. The functions of the Technical Investigation Group may include (but are not limited to):

a. Preparation of one large master wreckage diagram and a small wreckage diagram for each of the other group leaders as soon as possible.

b. Ensure that complete photographic coverage of the occurrence scene is accomplished as soon as possible, including specific items as required by each individual group lead to include:

(1) The mortal remains of the victims before proceeding to remove the bodies.

(2) The points where the survivors were found.

(3) The general area of the accident from the north, south, east and west axes.

(4) The trajectory that the wreckage is spread out over, up to the first point of impact of the aircraft.

(5) The indication of the instruments.

(6) The position of the control panel in the cabin.

(7) The position of the fuel valves, flaps and landing gear.

(8) The tuning frequencies of the radio stations indicated on the equipment.

(9) The positions of the control surfaces.

(10) The position of the propeller/fan blades, as well as the compressor and turbine slats.

(11) The position of the engine controls located in the cabin as well as of the connections with the engine.

(12) Damage due to fire.

(13) The marks or signs produced by the crash against the ground.

(14) The position of the cabin switches.

(15) The autopilot setting.

(16) Any unusual breakage and bending.

c. Prepare with feasible accuracy, the plan of the distribution of the wreckage.

d. Formulate by examining the traces and wreckage, specific concepts related to:

(1) Direction, angle and speed of descent.

(2) If the descent was controlled by the pilot or it descended without guidance.

(3) Attitude, angle and speed of the aircraft at the moment of impact.

(4) If the aircraft structure was intact at the point at which the first impact occurred.

(5) Part of the aircraft that received the first impact.

e. Reconstruct, if required, the wreckage of the aircraft, whether in the place of the accident or away from it.

f. Reconstruct the wreckage of the aircraft by applying a suitable technique for identification of the parts, their correct layout prior to the fault, the detailed examination of the damage to each one of the parts and the establishment of the relationship between this damage and the damage to other adjacent or associated parts.

g. Establish whether there was a structural breakage prior to impact.

h. Determine whether any breakage in flight or the detachment of parts was caused by:

(1) Load bearing deficiency.

(2) Excessive loads in the aircraft due to exceeding load and/or speed limits.

(3) Metal fatigue.

i. Analyze the external damage of the engine(s) and establish its relationship with the intensity of the impact.

j. Establish whether the engine(s) were functioning when they hit the ground.

k. Determine, as accurately as possible, the power of the engine(s) at the moment of impact.

l. Analyze the fuel and oil used in order to establish:

(1) Compliance with the prescriptions of use indicated in the aircraft manual, as well as with the technical specifications of such products.

(2) Its degree of contamination.

m. Analyze samples of hydraulic and fuel from different sectors in order to establish:

(1) Compliance with the prescriptions of use indicated in the aircraft manual, as well as with the technical specifications of that product.

(2) Its degree of contamination.

n. Examine the hydraulic system, among others, in the following areas:

(1) The main and auxiliary hydraulic pumps with respect to the integrity of their propulsion couplings, lubrication, wear, excessive play and overheating.

(2) The hydraulic accumulators for leaks and/or indications of explosive rupture.

(3) The pressure regulators and safety valves with respect to their sticking in an open or closed position, as well as their adjustment.

(4) The pressure multiples and modules to verify the positions of the selector valves that could be in them.

(5) The selector valves to verify the position of integrity of the command articulators.

(6) The hydraulic and pneumatic components to verify the functioning of the retention, safety, shut-off valves and the leak regimes.

o. Examine the electrical system among others, in the following areas:

(1) The generators, alternators and inverters to determine whether there are indications of the formation or arcs, burns, defective brushes, wires or cables incorrectly connected and overheating. In addition, verify the state of lubrication, wear, roughness of the bearings and capacity of supply of electricity both at full charge and without any charge.

(2) The batteries or accumulators to determine the state of the charge at the moment of the crash.

(3) The tension regulators, frequency and control panel regulators or for the protection of generators to determine the positions of their controls when the accident occurred, as well as indications of defective functioning.

(4) The current distributor bars and connection boxes to determine indications of the formation or arcs between terminals, overheating and burns.

(5) The circuit protectors to see whether they were disconnected or had burned out previously without having the opportunity to react if there was a short circuit.

(6) The relays to see whether they are burned and damaged. In addition, examine the solenoids to see whether they had overheated or had interruptions in the coiling.

(7) The electric engines to verify whether there are indications of an electrical breakdown, excessive consumption of current, as well as whether they were functioning at the time of the crash.

(8) The cables and electrical wires for indications of overheating or burns due to electrical malfunction or that originated externally.

(9) The emergency lights to determine whether there was electricity or not at the time of the crash, to establish whether when the accident occurred a certain warning light was or was not lit up, as well as to observe any other indication of defective functioning.

p. Examine the Pressurization and Air Conditioning System, among others, in the following areas:

(1) The compressors and boosters to see if they show indications of uncoupling or defects in transmission, if they are properly lubricated and if there are indications of defects or overheating of the bearings.

(2) The air canals to observe whether they have smoke or oil deposits, as indication of the presence of vapors or carbon monoxide in the cabin.

(3) The state and position of the shut-off regulators for the air conditioning in relation to the positions of the respective instruments in the cockpit.

(4) The pressurization regulation and safety valves with respect to their state and position, integrity of the mechanical joints and electrical connectors, as well as for indications of defective operation.

q. Examine the Instrument System of the aircraft, among other things, in the following areas:

(1) The pitot tubes and the static pressure to determine if there are indications of obstruction, as well as for signs of breakage or loose couplings.

(2) The altimeters with respect to the recording of barometric pressure, indication of the needles and the functioning of the adjustment mechanism.

(3) The speed indicators with respect to any indications and setting indexes and their relationship with the course that the aircraft was taking instants before the accident.

(4) The attitude indicators of the aircraft with respect to its indications of pitching and balance.

(5) The engine instruments with respect to their state and indications.

r. Examine the radio and electronic navigation equipment with respect to the presentation of frequencies and their relationship with existing radio installations in the area; their condition and indications of defective operation.

s. Examine the energy control units of the aircraft controls for leaks, inadequate electrical connections and defective couplings. In addition, determine whether the autopilot was functioning or not when the accident occurred.

t. Examine the Fire Detection and Extinguishing System to establish whether the discharge was intentional or thermal as well as indications of defective functioning.

u. Examine the Oxygen Supply System to see whether there are indications of defective pipes due to an excess of pressure and whether the regulator valves have been eroded by the rapid passing of flows under great pressure. In addition, examine the oxygen cylinders to ensure that none of them exploded before the accident.

v. Examine the history of the aircraft, among other things, in the following areas:

(1) Utilization time of the cell and engines as well as flight hours.

(2) Previous accidents, defects or irregular utilization reported, corrective measures taken, etc.

(3) Modifications made to the aircraft and compliance with technical orders.

(4) Compliance with maintenance schedule.

CHAPTER 6 - MEDICAL/HUMAN FACTORS INVESTIGATION GROUP RESPONSIBILITIES

1. The Medical/Human Factors Investigation Group will be responsible for effecting liaison with appropriate medical authorities concerning casualties and for the investigation and analysis of all medical and human factor aspects of the investigation, including psychological conditions, pathological conditions, physiological conditions, human engineering, instrumentation and control functions; crash forces and crashworthiness, compartments, seats, restraining devices and protective headgear; escape and survival equipment procedures (in conjunction with the escape systems specialist and aircrew life support equipment member), personal equipment and emergency response procedures. The functions of the Medical/Human Factors Investigation Group may include (but are not limited to):

a. Evaluate the nature and cause of the injuries of the persons and when they occurred.

b. Ensure conduct of the pathology analyses with respect to the cause, sequence and effect of the accident, through the examination of the flight crew, auxiliary personnel and passengers.

c. Coordinate with the Operation Investigation Group the formulation and analysis of the medical history of the crew to determine if prior to the accident there were any conditions that might make his mission difficult in the circumstances under which the accident occurred.

d. Analyze, in coordination with the Operation Investigation Group, the activities of the crew prior to, during and after the accident.

e. Establish whether there are indications of deficient performance on the part of the crew due to the ingestion of alcohol, drugs or environmental contaminants such as carbon monoxide.

f. Examine the background of the crew with respect to their motivation for the flight, intelligence, emotional stability, workload, character and behaviour in general.

g. Establish the suitability or lack thereof, of the seat belts, corridors, exits, survival equipment of the aircraft and the risk posed by protuberances on the controls, instruments and other structures installed in the cockpit.

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CHAPTER 7 - WITNESS INVESTIGATION GROUP RESPONSIBILITIES

1. The Witness Investigation Group will be responsible for:

   a. Locating all witnesses.

   b. Obtaining initial statement.

   c. Assessing credibility of witness.

   d. Arranging for Group Heads and/or conducting interviews based on President's direction.

   e. Maintaining a list of all witnesses who provided written statements or verbal interviews.

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CHAPTER 8 - FORMAT ASIB REPORT

1. FACTUAL INFORMATION:
   - 1.1. HISTORY OF THE FLIGHT
   - 1.2. INJURY TO PERSONNEL
   - 1.3. DAMAGE TO AIRCRAFT
   - 1.4. COLLATERAL DAMAGE
   - 1.5. PERSONNEL INFORMATION
   - 1.6. AIRCRAFT INFORMATION
   - 1.7. METEOROLOGICAL INFORMATION
   - 1.8. AIDS TO NAVIGATION
   - 1.9. COMMUNICATIONS
   - 1.10. AERODROME INFORMATION
   - 1.11. FLIGHT RECORDERS
   - 1.12. WRECKAGE AND IMPACT INFORMATION
   - 1.13. MEDICAL
   - 1.14. FIRE, EXPLOSIVES DEVICES, AND MUNITIONS
   - 1.15. SURVIVAL ASPECTS
   - 1.16. TEST AND RESEARCH ACTIVITIES
   - 1.17. ORGANIZATIONAL AND MANAGEMENT INFORMATION
   - 1.18. ADDITIONAL INFORMATION
   - 1.19. USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES
2. ANALYSIS
   - 2.1. GENERAL
   - 2.2. MANAGEMENT
   - 2.3. TECHNICAL
   - 2.4. OPERATIONAL
   - 2.5. P1/P2 MEDICAL CONDITION
   - 2.6. AVIATION LIFE SUPPORT EQUIPMENT
3. CONCLUSIONS
   - 3.1. FINDINGS
   - 3.2. CAUSE(S)
4. PREVENTIVE MEASURES
   - 4.1. PREVENTIVE MEASURES TAKEN
   - 4.2. PREVENTIVE MEASURES RECOMMENDED
   - 4.3. OTHER SAFETY MEASURES RECOMMENDED
   - 4.4. ASIB PRESIDENT REMARKS

ANNEX A – TITLE (AS REQUIRED)
ANNEX B – TITLE (AS REQUIRED)
ANNEX C - ABBREVIATIONS
ANNEX D - LIST OF TABLES AND FIGURES.

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CHAPTER 9 - ASIB OBSERVER STATUS FORM

ASIB ACCIDENT INVESTIGATION OBSERVER

ACCIDENT INVESTIGATION AIRCRAFT TYPE, REGISTRATION NUMBER, NATION

1. By this form, you are granted the status of an observer to this occurrence and may, under the supervision of a flight safety investigator:

   a. visit the occurrence site;

   b. examine the aircraft, its component parts and contents;

   c. unless otherwise prohibited by law, examine relevant documents and relevant evidence pertaining to:

      (1) the transportation activity during which the occurrence took place;

      (2) the operating crew members involved in the operation of the aircraft;

      (3) the aircraft, its component parts and contents; and

   d. attend laboratory tests or analyses.

2. Your attendance as an observer is subject to the following conditions:

   a. You shall limit your activities at the accident site to those outlined by the President thereafter;

   b. You shall ensure that your activities do not restrict or otherwise interfere with the duties of the assigned investigators; and

   c. You shall ensure that the information you gain as a result of your observer status will be protected. As an observer, you may **only** communicate or use, or permit to be communicated or used, any information obtained during the investigation if the communication or use of that information is permitted under national/international laws or STANAGs **and** the ASIB President authorizes the communication or use in the interests of aviation safety.

   d. The ASIB President may remove an observer from an investigation if the observer contravenes a condition imposed by this agreement or the ASIB President or if, in the ASIB President's opinion, the observer's participation is likely to create a situation of conflict of interest that will impede the conduct of the investigation.

3. Failure to comply with any of the above responsibilities could result in the immediate revocation of your observer status. You should also understand that the privileges of an observer will be exercised at your own risk. You should also realize the potential hazards associated with transportation to and from an occurrence site, with attending at the site, including the presence at the site of carbon fibres, other hazardous material, unexploded ordnance, wreckage and debris, with examination of aircraft and aircraft components, and with laboratory testing and analyses.

I, _____(Name, Title, Organization represented) understand and accept the conditions outlined above with respect to my attendance as an observer at the subject ASIB subject investigation.

I also understand that the privileges of an observer will be exercised at my own risk, and I hereby agree to indemnify and save harmless the States participating in this investigation for any damage or injuries I may suffer as a result of my attending the investigation as an observer.
I hereby acknowledge and understand that the ASIB is intended for the sole use of the involved nations for the prevention of future accidents.
As a condition of being allowed access to a Flight Safety Investigation, the undersigned hereby undertakes to respect all the conditions listed in this form.

_____ (place)	_____ (date)
_____ (Observer's written name)	_____ (Witness' written name)
_____ Organization	_____ ASIB title

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