Flight inspection procedures: Different cases to considerer affected by deterioration.

Author: Mr. José Luis Delpón Ramos

Aeronautical Engineer.- Flight Inspector Adviser.-
European Engineer, 12884ES registration number
Lead Auditor. Aeronautical Maintenance Quality
Major of Aeronautical Engineers Corps of the SAF, with more than 4.100 flight hours, being responsible of the Flight Inspection Department.
Technical Manager of the R & D program with the on board SIERRA-AFIS 8711 system
In Spain leads the training of inspectors of the Air Navigation System.
He has assisted as an expert in the new UNIFIS-3000 system for inspection of the SNA of the SAF.
He is an ICAO Air Navigation expert in programs under the United Nations Development Plan.
Director of Master in Aeronautical Competencies (Rey Juan Carlos University, Madrid-Spain)
Counselor of the Academic Council of the European Institute for Training and Accreditation Aeronautics (Rey Juan Carlos University, Madrid-Spain)
Aeronautical Adviser in the Special Mission Company Air-Med Group for different programs (One of them is the Flight Inspection Office)
E-mail: jluis.delpon@gmail.com

ABSTRACT

For the first time in the world, Spain put into operation in 1992, a totally autonomous flight inspection system. It was called Autonomous Flight Inspection System (AFIS).

As a result of the investment made by Spain in “Research & Development” from 1988 to 1992, the AFIS emerged, which was an R & D program developed in USA (1985 – 1992) with great Spanish investment and participation. In those years it was considered that it was worth seeking independence of the theodolite and of the weather conditions to develop flight inspection activity. Previously to that date, several systems that wanted to be called "autonomous" were tested: one based on signals reflected by mirrors on ground and the other one was initially a reading of bars code on the both runway thresholds. This second idea and after several tests, was modified to the use of a scanner / TV

INTRODUCTION

The second idea was the one that Spain opted for the research, development, manufacture and final certification. The company chosen was SIERRA RESEARCH of Buffalo, NY, USA. In 1992, it began to be adapted and used in Spain, with a total success, so that it made faster flights, better development of inspection procedures, it covered a larger program, it meet the dates set to 98 % and reduced operating costs ostensibly.

Finally, the system was decommissioned on November 24 / 2015, because it was not possible to upgrade the software and due to maintenance problems.

With this introduction and nostalgically remembering the past, the emergence of AFIS completely changed the industry in terms of equipping aircrafts with autonomous systems. It is very important that the manufacturers being more or less successful in developing software programs, addressed to perform flight inspection maneuvers, it implies the own interpretation of flight and its presentation on the screen Inspector as well as to present documentary records that, in case of accident or incident, would be an important evidence for the Accident Commission or Judge investigating the case.

We must also say that current manufacturers of automatic/autonomous systems, whether AFIS or any other, give the impression that they lack a point of accurate knowledge of what the inspection activity is from the point of view of flight. That is, the subjective reason that leads observation of the pilot on the flight inspection (flyability), as well as some misconception of the own flight inspection (for example, the TO/FROM indication) and, as a consequence, data presentation in front of an Accident Commission or Investigating Judge.

FLIGHT INSPECTION PROCEDURES

That said, we are going to focus on making a reflection about flight inspection procedures that we are submitting for consideration of the professionals conducting the inspection activity. This reflection is based on the AFIS information, no matter the manufacturer or system type on board, used on flights over congested air traffic areas or flight inspection by night or normal traffic areas.

First of all, I must say that *"flight inspection procedures of navaids and landing aids in night hours*" jointly require a service of air traffic control, a maintenance aids service to be used and certain elements related to all this. They also must have a regulation about and in force to work orderly and together.

Annex 10 and DOC 8071 from ICAO give guide to the requirements applicable to the flight inspection and ground of the conventional aids, in situations of operation that could be considered normal, but they give very generic recommendations for night inspection and involve to the States in the development of regulations and procedures.

The big difference between night and day inspections is in the inspector pilot and his subjective evaluation (flyability) on the release of obstacles, to be the maneuvers safe. Today technology, is not able to certify whether these distances to obstacles are safe for air operation because perception as human factors is involved.

Therefore, I repeat that the role of the inspector is essential and irreplaceable, for the moment.

However, given the increase of air traffic in some areas resulting in a level of high congestion, for emergency reasons or in case of need at a given time or just by commercial interests of airports, there is the need to maintain the same airspace safety in normal operation, than in another which is considered congested, performing the flight inspection but with the lowest rate of impact on user operations, leading to at least one NO increase in operating costs and avoid delays because of flight check. This can be achieved by carrying out inspection flights in the peak hours of sunlight visibility, which usually the hours with less sunlight are coincident with a marked decline in air traffic.

TYPE OF SPECIFIC INSPECTION.

This type of specific inspection is fully programmed and must follow a procedure developed specifically for these situations, which must be approved by the Aeronautical Authority. The inspection will be adapted to the current regulations, both on flight inspection regulations and on maintenance of facilities, and it is the concern of both the flight crew and the ground maintenance technicians. Doc. 8071, Chapter I, paragraph 1.16, gives very general recommendations on conducting flight checks at night, being a common recommendation of that document and Annex 10 development by States of a regulation for all issues related to civil aviation.

To understand the procedures and complete them successfully, we must first know and impress what is the philosophy of a flight inspection pilot, who would perform maneuvers to assess and classify a navaid, for the benefit of users to maintain confidence in the radiated signal and who are making use of it daily. We speak specifically of the pilot because he is in a flight inspection by night, especially an ILS, where this professional should apply the perception of flyability in a most questionable way. We will explain with the example of a GS safety approach.

When we fly the inspection maneuvers of a glide slope (GS), the most questionable maneuver to be evaluated by night is the "safety low approach". As professionals of this activity, we know that making the low approach, either at a reading of 180 uA or 150 uA, we must note that the indication of the needle in the CDI instrument is "fly up" throughout the trajectory. Even though fulfilling this, the pilot inspector should observe the subjective evaluation of the direct view of the obstacles outside the aircraft, that is to say, if they are safely saved in distance and perception (human factors) from the cockpit. All the above-mentioned is part of the concept of flyability.

THE CONCEPT OF FLYABILITY.

If this is performed by night, the *"subjective evaluation of the direct view of the obstacles*" is not possible to be done with security and certainty. We know that fighter pilots have night training because in these conditions, pilot perception changes greatly, both in the visual measurement of distances and in the interpretation of reflections of lights in the cabin, for example. Courses for crews about Human Factors provide information about that in the medical section. In summary, the safety approach in the inspection of a GS in low or no visibility should not be performed with the standard procedure.

The aforementioned can be analyzed and applied for all standard maneuvers, but performed by night. For example, in other inspection maneuvers you can overfly inhabited areas or cities making our perspective different and noise produced is different to daytime flight. Perhaps we need to perform our maneuver 1000 ft. higher, leading data collection something different. So, what is the solution proposed as a replacement? Maintenance staff is part of the solution. Coordination with them and accepting joint procedures are part of the solution.

Systems in general and navaids in particular are benefiting from high technology and reliability. Therefore, we must agree with the maintenance team leader reading a number of parameters on ground, to ensure external stability when they are within tolerances. Otherwise, the inspection aircraft is required. However, it is possible to proceed to make a daytime safety approach by the tranquility itself, for example, once every three flights by night, that is, to take into account intervals between nighttime checks, interspersed between daytime checks, so we can be sure of our procedure and that of ground equipment.

AIR TRAFFIC CONGESTED AREAS

In case performing flight inspections of air traffic congested areas, it will also be necessary to design a specific procedure, so that they can perform control parameters maneuvers varying periods.

For example, on a ILS CAT III at an airport of a high density air traffic: Instead of performing an inspection every four months, with an autonomous flight inspection system (AFIS), the inspections can be performed only with respect to approaches every 15 days, sectors every two months, coverage every two years, etc. All these periods named are as an example, not real. The important thing to consider is the philosophy of flight inspection and it must be reflected in a procedure approved by the Aeronautical Authority of the country.

MANUFACTURERS OF ON-BOARD SYSTEMS.

Manufacturers of consoles used for flight inspection, installed on board an aircraft, have two specific fields of interest: one is technical and the other is bussiness.

In general, the technical field requires a high qualification. However, with a more or less successful design, when applying the point of view of interpreting flight concepts, this qualification needs to be not so high. There are important interpretive errors in flight profiles, especially forgotten or unknown. This is the main purpose of this activity: the safety of airspace and confidence in the radiated signal.

In addition, backed by the high technology, they indicate to the customer all the benefits that can be made with the on boarded system, which do not always coincide with the flight inspection procedures “recommended” by ICAO.
As a consequence of the above, the field of business emerges: The customer is able to buy not only what he can do with the software, but also “advanced” procedures, not always backed-up by ICAO’s recommendations.

At this point, my opinion is that a flight inspection system manufacturer should only tell the customer how the system that he has purchased works, but never indicate maneuvers and data collection to apply to

the flight inspection. This is a mistake, which has made known procedures that are not acceptable in their development, since they show a lack of knowledge of important basic concepts

Therefore and to avoid this type of error, it is convenient and even necessary that the professionals of the certification of the airspace, have an official accreditation, so that the education has a unique source.

USING DRONES (UAV)

Following in the line of high technology, the modern one is the use of drones (UAV) for many activities of the normal life: from children's games, until military missions.

An unmanned aerial vehicle (UAV), commonly known as a drone, is an aircraft without a human pilot aboard. UAVs are a component of an unmanned aircraft system (UAS); which include a UAV, a ground-based controller, and a system of communications between the two. The flight of UAVs may operate with various degrees of autonomy: either under remote control by a human operator or autonomously by onboard computers

Having said this by way of introduction, we will focus on the use that UAV manufacturers are beginning to make in the flight inspection activity. The market offer is to make the flight inspection cheaper, with a new business field and, in principle, very wide.

Arriving at this point, I say categorically that I am not against new technologies, which make our society have open horizons that can improve the quality of life. What seems to me dangerous is that the technique is not followed by a regulation that is developed at the same time as the technology.

If for a moment, we compare the same activity, carried out with different tool (aircraft and dron), previously arise emerge differences that must be studied seriously and then normalized.

A difference is in the application of the concept of flyability, that is, all those parameters in which the subjective evaluation of the human being intervenes, it is essential to normalize them, after performing a theoretical and practical study, which will be regulated at the same time.

Another difference, as another example, is in the work of the Air Traffic Controllers and flight levels to be defined for a dron in the flight inspection activity.

After a brief statement, it is necessary to maintain the level of safety as an important action, regardless of the tool used in the flight inspection activity. To this end, ICAO should set the guidelines for accepting this technological step, the results of expert working groups on flight inspection. That is, DOC 8071 must have another volume dedicated to this type of flights.

CONCLUSIONS

The Flight Inspection is a *program*, usually annual, that ensures user confidence in the quality of the radiated signal, which verifies that the functions of navaids and flight procedures associated comply with the relevant regulations for all its service volume published and are safe. Such a *program* must always exist.

To this end, we propose to professional activity flight inspection that they do not think it is so easy to perform night flights without adequate subjective training. This training will serve to evaluate why we do this type of work and from what point of view, where the culture of safety is taught, as well as the essence of the concepts by which we fly. And last but not least important, express in procedures the way of doing those assessments by night.

In addition, make it clearer, if possible, that certification of the operational classification of a navaid, should go with the signature of a professional of the State, as it is a direct application of the Chicago Convention. It is also important to take into

account the need to require training of professionals in the flight inspection activity, but not coming from the systems manufacturers, it must come from qualified academic institutions and official.

Regulatory compliance is also made by adapting the standard procedures to different situations, but in this adaptation we must take into account the maintenance personnel on ground.