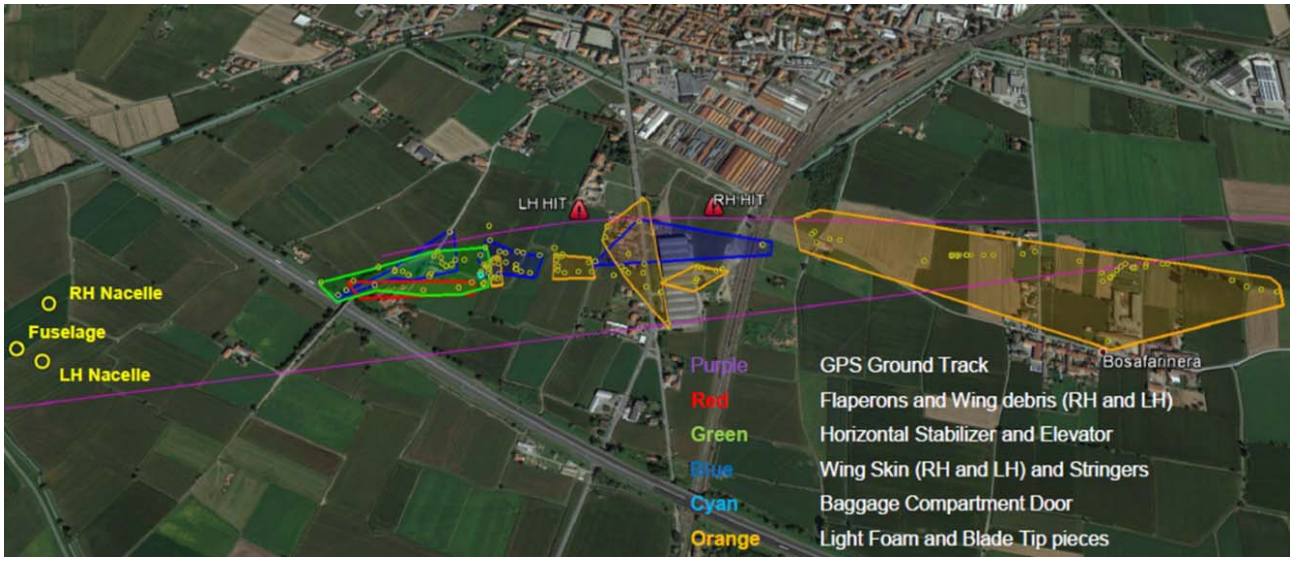
INTERIM STATEMENT

Accident occurred to AW609 registration marks N609AG, on 30th October 2015, in Tronzano Vercellese (VC), Italy.

1. Foreword.

On 30th October 2015, the experimental tiltrotor AW609 registration marks N609AG crashed on the ground nearby the city of Tronzano Vercellese (VC), Italy. The two test pilots on board lost their lives in the crash.
The Italian civil aviation safety investigation authority (ANSV) opened a safety investigation.

Right after the accident occurred, an investigation team by ANSV was sent to the crash site. The team mapped the debris distribution of the wreckage (picture 1).
Meanwhile it was also possible to collect testimonies from witnesses, to find the multi purpose flight recorder (MPFR, a combined CVR/FDR), which was on board the aircraft (photo 1) and to retrieve a copy of the file data package sent via telemetry to the ground station of Leonardo Helicopters (formerly AgustaWestland) in Cascina Costa (VA).



Picture 1: debris map.

Photo 1: MPFR (combined FDR/CVR) installed on board aircraft AW609 registration marks N609AG.

2. Data recorded.

Regarding the data recorded on board the aircraft, there were in addition to the MPFR:

- a data recorder which received all the data from the sensors installed on board for experimental purpose. This recorder collected all the data in an internal memory and some of these data were sent via telemetry to the ground station; this recorder, being a non-protected unit, was destroyed by the crash and the by fire developed after the impact (photo 2);

- a video recorder (DVR), which recorded the data form two cameras: one mounted in the cockpit and the other one mounted on the tail fin; this recorder collected the data in an internal memory device. This recorder, being a non-protected unit, was destroyed by the crash and by the fire developed after the impact (photo 3).

Photo 2: data recorder which received the data from the sensors installed for experimental purpose.

Photo 3: video recorder (DVR) which recorded the data from two cameras.

The MPFR, although was significantly damaged, was brought in the ANSV laboratories to be analyzed; the investigators retrieved the flight data and the audio tracks. The analysis of these data was really profitable for the safety investigation and validated most of the parameters recorded via telemetry when the two set of data were in common. However, a considerable number of parameters was not recorded from the MPFR; among these missing parameters, were some fundamental ones as, for example, latitude, longitude, groundspeed, etc.

Nevertheless, the analysis of the MPFR and telemetry data showed that the Pilot in Command (PIC) felt the onset of oscillations on the roll axis of the aircraft. In fact, he tried to counteract that motion by maneuvering the aircraft on the roll axis. This is the way that is assumed correct according to the normal flying technique. However, the flight control laws of the aircraft are currently designed in a way that this kind of maneuvering input on roll axis is in fact also generating a control on the yaw axis to compensate for expected aerodynamic effect of flaperon control surface motion on yaw axis, thus forming a phenomenon described during the investigation as “like an augmented dutch roll”.

The analysis of the previous flight data regarding the two AW609 prototypes (N609AG and N609TR) showed that both aircraft have experienced a slight positively damped lateral-directional augmented mode (oscillations in roll and yaw) well before the accident flight; moreover, in that flight (test n° 664) the aircraft reached for the first time an extreme maximum dive speed of 293 KIAS - required for the certification process - with the new configuration of the rear fuselage and tail fin modifications. Previous build-up tests with the new configuration reached a dive speed of 285 KIAS. During the accident flight two dives to maximum dive speed of 293 KIAS were executed; during the execution of the third one, the accident happened.

The tiltrotor is a peculiar type of aircraft and its aerodynamic appears to be significantly complex taking in consideration the interaction of the rotors in the different flight modes: helicopter mode and airplane mode, low speed and high speed. The safety investigation showed that the aircraft behavior at high speed was not completely predicted by the Manufacturer; in fact, the project simulator (SimRX), used for the building and development of the aircraft flight control laws, was

not able to reproduce the phenomenon that happened in the accident flight, neither trying to replicate the pilot actions nor amplifying them. The only way to obtain a reliable representation of the accident flight was, during the safety investigation, to input unrealistic geometric and aerodynamic parameters in the SimRX.

3. Crew members.
Both the pilot (age 53) and the copilot (age 52) held a valid flight licence and passed the last medical checks. Both were also authorized to perform Experimental testing for R&D (research and development) and Crew Training on the AW609 aircraft and on other AW models.

The PIC (US nationality) had logged a total of 1.268:45 FHs since January 2010, 357:40 of which on AW609.
Prior to 2010, he had accumulated a total of 4.100 FHs of flying experience on over 35 different A/C models including Rotary Wing, Fixed Wing, Powered Lift, Jet and Turboprops.

The copilot (Italian nationality) had logged a total of 5.563:05 FHs since January 2010, 315:35 of which on AW609.
Prior to 2010, he had accumulated a total of 7.400 FHs of flying experience on over 50 different A/C models including Rotary Wing, Fixed Wing, Powered Lift, Jet and Turboprops.

The following table reports the most recent crew members total flying experience:

	PIC	COPILOT
Last 28 days	36:50 FHs (09.20 FHs on AW609)	30:35 FHs (09:20 FHs on AW609)
Last 90 days	98:65 FHs	76:95 FHs

4. Safety Recommendations.
Based on the information gathered up to now, ANSV considers necessary to issue the following safety recommendations: two safety recommendations to the FAA/EASA, one safety recommendation to the ICAO.

Safety Recommendation ANSV-9/3173-15/1/A/16.
Motivation: in the accident flight, during the execution of high speed test maneuvering in symmetric configuration, the aircraft AW609 encountered lateral-directional oscillation (picture 2, attached "A" to this statement, roll depicted in yellow and yaw rate in purple, data from the MPFR). The safety investigation showed that this phenomenon was present to a lesser degree also in previous flights. It was considered to be slight and not dangerous, being assessed as self-damping.
Recipients: FAA, EASA.
Safety Recommendation: the ANSV recommends, in the framework of the certification process, to verify that the aerodynamic behavior of the aircraft at high-speed conditions will be reviewed, if necessary making use of wind tunnels tests in addition to updated models and simulations that can be representative of the complex flight conditions of this peculiar aircraft.

Safety Recommendation ANSV-10/3173-15/2/A/16.
Motivation: in the accident flight, during the development of the aerodynamic oscillation, the PIC tried to maintain the aircraft control (picture 2, input on the roll depicted in green and input on the yaw in blue, data from MPFR). The oscillation that started on the roll axis was corrected by the PIC acting on the roll control, as normally expected. The AW609 flight control laws however are designed in such a way that input on roll axis is generating also a coupling on the yaw axis.
Recipients: FAA, EASA.
Recommendation: the ANSV recommends, in the framework of the certification process, to verify that the control laws of the aircraft will be reviewed in the management of the extreme flight conditions in which the aircraft could possibly fly. That verification should be addressed to ensure the effectiveness of the flight controls inputs given by the pilot avoiding the possibility of unexpected and un-commanded coupling effects.

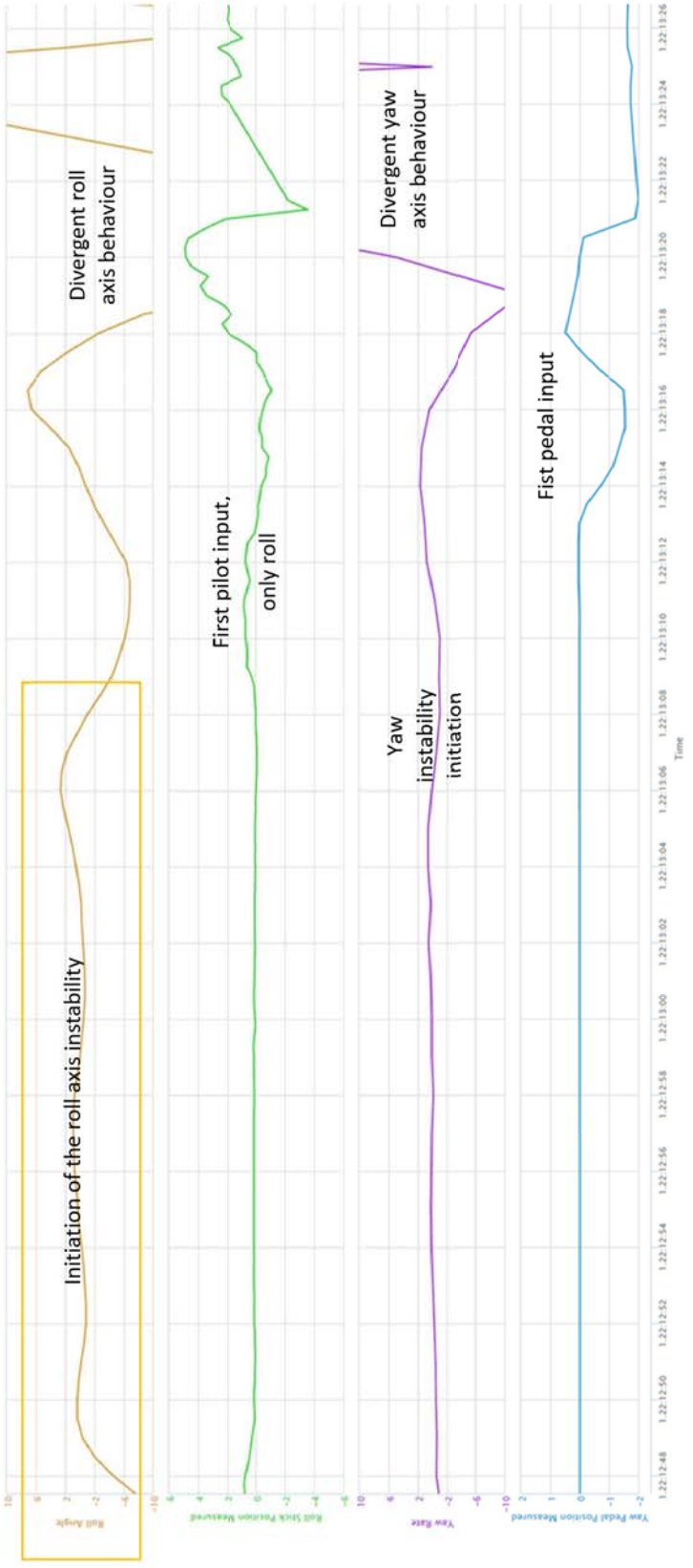
Safety Recommendation ANSV-11/3173-15/3/A/16.
Motivation: the safety investigation was based in many aspects on data recorded in flight. During the safety investigation it was possible to ascertain that.

- The release of the *Special Airworthiness Certificate* of the AW609AG registration marks N609AG (*category Experimental, Purpose research and Development*) by the FAA was effective with various limitations, listed in the letter of 15th July 2015 by the FAA. Among these limitations, there was no indication about the presence of an FDR on board the aircraft. The MPFR installed on board the AW609 registration marks N609AG was installed on board the aircraft exclusively on the initiative of the Manufacturer. The *Special Airworthiness Certificate* specifies, in section D, that the aircraft AW609 registration marks N609AG is not compliant with the airworthiness requirement enshrined by ICAO Annex 8.
- The *Permit to fly*, released by the Italian civil aviation authority (ENAC) on the 20th July 2015, was released to allow the flight of the aircraft in Italian airspace and it has retained substantially the limitations listed in the FAA letter of 15th July 2015.
- The AW609 is a tiltrotor, which possesses the flight features of an airplane and at the same time the ones of a helicopter. The aircraft is equipped with two turboshaft engines, has a MTOM of 7600 kg, has a crew of two pilots. Once the certification process will be completed, it will carry up to 9 passengers. For commercial aviation airplanes in the same MTOM range, the ICAO Annex 6, part 1, paragraph 6.3, prescribes as mandatory an FDR type II and a CVR capable of recording at least 2 hours. For commercial aviation helicopters in the same MTOM range, the ICAO Annex 6, part 3, paragraph 4.3.1, prescribes as mandatory an FDR type IV A and a CVR capable of recording at least 2 hours (if the airworthiness certificate is released after 1st January 2016).
- There is no mention on the Annex 6 for experimental aircraft, those therefore without an airworthiness certificate consistent with the requirements on ICAO Annex 8.
- However, the experimental aircraft are nowadays often developed by manufacturers whose factories are located in different nations, and conduct test flights in different nations as in the case of the AW609. Experimental aircraft, although they are flown mostly in controlled and reserved airspace, often need to be flown in uncontrolled airspace during the repositioning. In the case of an accident, they might cause damage to third parties on the ground.

- The setting of the MPFR was not such as to ensure the recording of some fundamental parameters for the reconstruction of the flight (as for example latitude, longitude, groundspeed, drift angle). The reconstruction of the flight during the safety investigation was completed thanks to the availability of the data from telemetry.
- The telemetry does not allow a complete and reliable protection of the data in case of an accident, because: the devices used for the recording are not built to be crash-resistant (non-protected units); the telemetry may undergo interruption in recording or records invalid data in correspondence to particular conditions of the data transmission itself.
- The telemetry could not ensure a total transmission coverage during repositioning flights.

Recipients: ICAO.

Recommendation: the ANSV recommends institute as mandatory requirement for experimental aircraft the installation of flight data recorders (FDR and CVR) which, according to MTOM and use, should be anyway equipped with such devices at the completion of the certification process. The number and the list of the minimum required recorded parameters for the experimental aircraft should be the same as the ones required for the equivalent certified aircraft, according to the MTOM and the use. In the case of the tiltrotor, the most conservative solution shall be adopted amongst the requirements for an airplane and a helicopter.



Picture 2: FDR data - roll axis (yellow), PIC input on roll axis (green), yaw rate (purple), PIC input on yaw axis (blue).