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Weather-enabled future onboard surveillance and navigation systems

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With the increasing traffic and the development of business trajectories, there is a widespread need to anticipate any adverse weather conditions that could impact the performance of the flight or to use of atmospheric parameters to optimize trajectories. Current sensors onboard air transport are challenged to provide the required service, while new products for business jets and general aviation open the door to innovative assimilation of weather information in onboard surveillance and navigation.
The paper aims at surveying current technology available to air transport aircraft and pointing out their shortcomings in view of the modernization proposed in SESAR and NextGen implementation plans. Foreseen innovations are then illustrated via results of ongoing research like FLYSAFE or standardization efforts, in particular meteorological datalink services and impact on Human-Machine Interface. The paper covers the operational need to avoid adverse weather like thunderstorm, icing, turbulence, windshear and volcanic ash, but also the requirement to control in 4D the trajectory through the integration of wind and temperature grids in the flight management. The former will lead to enhanced surveillance systems onboard the aircraft with new displays and new alerting schemes, ranging from targeted information supporting better re-planning to auto-escape strategies. The latter will be standard in next generation flight management systems. Finally both will rely on ATM products that will also assimilate weather information so that situational awareness is shared and decision is collaborative.