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On Entropy Trail SAEED FAROKHI, RAY TAGHAVI, SHAWN KESHMIRI, University of Kansas — Stealth technology is developed for military aircraft to minimize their signatures. The primary attention was focused on radar signature, followed by the thermal and noise signatures of the vehicle. For radar evasion, advanced configuration designs, extensive use of carbon composites and radar-absorbing material, are developed. On thermal signature, mainly in the infrared (IR) bandwidth, the solution was found in blended rectangular nozzles of high aspect ratio that are shielded from ground detectors. For noise, quiet and calm jets are integrated into vehicles with low-turbulence configuration design. However, these technologies are totally incapable of detecting new generation of revolutionary aircraft. These shall use all electric, distributed, propulsion system that are thermally transparent. In addition, composite skin and non-emitting sensors onboard the aircraft will lead to low signature. However, based on the second-law of thermodynamics, there is no air vehicle that can escape from leaving an entropy trail. Entropy is thus the only inevitable signature of any system, that once measured, can detect the source. By characterizing the entropy field based on its statistical properties, the source may be recognized, akin to face recognition technology. Direct measurement of entropy is cumbersome, however as a *derived property*, it can be easily measured. The measurement accuracy depends on the probe design and the sensors onboard. One novel air data sensor suite is introduced with promising potential to capture the entropy trail.

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