

Model and Method for Detecting Request Signals in Identification Friend or Foe Systems

Iryna Svyd, Ivan Obod, Oleksandr Maltsev, Inna Shtykh
Department of Microprocessor Technologies and Systems
Kharkiv National University of Radio Electronics
Kharkiv, Ukraine
iryna.svyd@nure.ua

Ganna Zavolodko
Department of Information Systems
National Technical University «Kharkiv Polytechnical Institute»
Kharkiv, Ukraine
ann.zavolodko@gmail.com

Abstract—This paper suggests a new model and method for detecting request signals in an Identification Friend or Foe (IFF) aircraft responder. It is proposed to separately accumulate the detected components of a request signal coming from the spaced antennas of an aircraft responder and then decrypt these accumulated components. The comparative analysis of request signal detection shows that the proposed model and method can improve the quality of detection as compared to that achievable with the currently used model and method based on the decryption of request signals received from the spaced antennas of an aircraft responder.

Keywords—IFF, ATC, aircraft responder, request signal, detection probability, false alarm probability, Neumann-Pearson criterion, likelihood ratio.

REFERENCES

- [1] A. Farina and F. Studer, *Cifrovaja obrabotka radiolokacionnoj informacii* [Digital processing of radar information]. Moscow, Russia: Radio i svyaz, 1993. (In Russian).
- [2] I. Obod, O. Strelnytskyi and V. Andrusyevych, *Informatsiyana mrezhka system sposterezhennya povitryanoho prostoru: monohrafiya*. [Information network of airspace surveillance systems: monograph]. Kharkiv: KhNURE, 2014. (In Ukrainian).
- [3] Stevens, Brian L., Frank L. Lewis, and Eric N. Johnson. *Aircraft control and simulation: dynamics, controls design, and autonomous systems*. John Wiley & Sons, 2015.
- [4] A. Maliarenko, *Sistemy radiolokacii dlia upravleniya vozduzhnym dvizheniem i gosudarstvennogo radiolokacionnogo opoznavania* [Radiolocation systems for air traffic control and state-monitored radar-based identification]. Kharkov: KhUPS, 2007. (In Russian).
- [5] I. Svyd, I. Obod, G. Zavolodko and O. Maltsev, *Interference immunity of aircraft responders in secondary surveillance radars*, 2018 14th International Conference on advanced Trends in Radioelectronics, Telecommunications and Computer Engineering (TCSET), 2018. DOI: 10.1109/TCSET.2018.8336404.
- [6] J. Pollack and P. Ranganathan, "Aviation Navigation Systems Security: ADS-B, GPS, IFF", in *International Conference on Security & Management, SAM'18*, International Conference on Security & Management, SAM'18, Las Vegas, Nevada, USA, 2018, pp. 129-135.
- [7] Y. Ahmadi, K. Mohamedpour and M. Ahmadi, "Deinterleaving of Interfering Radars Signals in Identification Friend or Foe Systems", in *Proc. of 18th Telecommunications forum TELFOR*, Telecommunications Society - Belgrade, ETF School of EE, University in Belgrade, IEEE Serbia & Montenegro COM CHAPTER, pp. 729-733, 2010.
- [8] A. Filippov, S. Sysuev and A. Shuvatov, "Analysis of the onboard system of identification of ground targets in noisy environments", *Counter-terrorism technical devices*, vol. 16, no. 87-88, pp. 87-94, 2015.
- [9] Ray P.S.: A novel pulse TOA analysis technique for radar identifications, *IEEE Transactions on Aerospace And Electronic systems*, vol.34, No.3, 1998, 716-721.
- [10] E. Kim and K. Sivits, "Blended secondary surveillance radar solutions to improve air traffic surveillance", *Aerospace Science and Technology*, vol. 45, pp. 203-208, 2015. DOI: 10.1016/j.ast.2015.05.018.
- [11] R. Bouwman, *Fundamentals of ground radar for air traffic control engineers and technicians*. Raleigh: SciTech, 2009. DOI: 10.1049/SBRA008E.
- [12] R. Carson, M. Meyer and D. Peters, "Fusion of IFF and radar data", *16th DASC. AIAA/IEEE Digital Avionics Systems Conference. Reflections to the Future. Proceedings*. DOI: 10.1109/dasc.1997.635094.
- [13] C. Huang, and L. He, "IFF MK XIIIA Analysis", *Telecommunications Technology*, vol. 47, no. 4, pp. 66-71, 2007.
- [14] L. Huan, Z. Feng, L. Bai and W. Jian, "One Joint Demodulation and Despreading Algorithm for MOD5", *The Open Automation and Control Systems Journal*, vol. 7, no. 1, pp. 386-397, 2015. DOI: 10.2174/1874444301507010386.

DOI: [10.1109/CADSM.2019.8779322](https://doi.org/10.1109/CADSM.2019.8779322)

<https://ieeexplore.ieee.org/document/8779322>