

**QUESTIONNAIRE ON MAKE PROJECT:
DEVELOPMENT OF RADAR WARNING RECEIVER (RWR) AND ADVANCED
SELF PROTECTION JAMMER (ASPJ) PODS FOR FIGHTER AIRCRAFT**

General Aspects

1. Whether the company/Association of Persons (AoP) is eligible as per provisions of DPP 2016? (Eligibility of Participation: Indian vendors only).
2. Whether the vendor can provide an assessment of its capability (Financial and Technical)? If so provide the necessary documentation for verification.
3. Whether 40% Indigenous Composition (IC) can be ensured?
4. Does the vendor envisage the feasibility of achieving future exports?
5. Whether the vendor's proposal would be eligible for Make-I or Make-II subcategory of Chapter III of DPP 2016?
6. Whether R&D or ToT through foreign collaboration is proposed by the vendor?
7. Estimated cost of development in case indigenous R&D is proposed.
8. Estimated tentative time period of completion of R&D or ToT.
9. Rough Order of Magnitude (ROM) Cost of 100 RWR and ASPJ units to be manufactured in India.

Technical Aspects of Radar Warning Receiver

10. System should be able to detect and find direction of illuminating radar of ground based, ship based and airborne systems with pulse, quasi-CW and CW emitter type. The use of RF cables from individual antenna to central processing unit should be minimized to avoid losses.
11. System should be able to detect pulse repetition frequency, pulse width, type of illumination and operating mode of illuminating radar. System should be able to differentiate between different signatures of the emitters based on variation of one of the parameters of the signal (normally employed by the emitter as ECM measure).
12. System should be able to measure carrier frequency of illuminating radar input signal.
13. System should be able to evaluate distance to illuminating radar using the power of received signal from the emitter.

14. System should be able to identify the type of detected radar/s and type of system they belong to. These parameters should be recorded in FDR and in system.
15. System should be able to rank the detected emitter signals based on category of radar and the threat perceived. The detected emitter information should be displayed to the pilot in the cockpit through existing multi function display.
16. System should be able interact with aircraft avionics equipment and other EW systems in the aircraft using predefined interface protocol.
17. System should be able to maintain database of previously fed emitter parameters for reference during operation in air. These parameters will be fed into the system through the Mission Planning System of the aircraft after programming the Pre Flight Messages (PFMs).
18. The probability of correctly identifying the emitter type is expected to be 0.9 of the general types of signals received by the system during operation.
19. System should be able to receive the signals in 1-40 GHz frequency range. The coarse and fine direction finding capability over this range needs to be specified by the vendor.
20. The coarse direction finding accuracy (resolution) of 10° and fine direction finding accuracy (resolution) of up to 2° is expected from the system. Number of antennae for this purpose and type of measurement technique needs to be specified by the vendor.
21. System should cover 360° in azimuth and preferably $\pm 40^{\circ}$ in elevation.
22. System should have the dynamic range of 60 dB.
23. Sensitivity in regions of difference frequency sub bands needs to be specified for the system by the vendor for both coarse and fine direction finding.
24. Range of pulse width and pulse repetition interval measurements and their resolution also needs to be specified by the vendor.
25. Frequency measurement accuracy in coarse and fine direction finding mode needs to be separately mentioned.
26. System should not consume more than 500W DC power.
27. System should not weigh more than 50 Kg. Cooling requirements other than existing equipment cooling of the aircraft needs to be specified by the vendor.
28. The O level and I level testing philosophy should be specified by the vendor. The D level facility in IAF unit (BRD) also should be specified.
29. Reliability, MTBF, service life and shelf life of the system need to be specified by the vendor.

Technical Aspects of Advanced Self Protection Jammer Pods

30. The system should be divided in two pods, which will be mounted on wing stations of the aircraft.
31. System should be fully automatic, capable of intercepting, analyzing, categorizing, prioritizing and initiating optimum counter offensive using active jamming techniques against multiple threats in a dense EW environment. System should interface with the aircraft through predefined software interface logic.
32. The system should be controllable through the cockpit controls (for power on and selection of specific mode of operation).
33. The system should accept pre flight messages through Mission Planning System of the aircraft and also record operating parameters in FDR during operation.
34. The system should be interfaced with RWR and MAWS (if available in future).
35. The transmitter and receiver should be able to operate in frequency range of 2-18 GHz. The system should be able to operate in SPJ as well as EJ mode in this range of operation.
36. The system should cover front and rear sectors in $\pm 60^\circ$ in Az and $\pm 60^\circ$ in elevation.
37. Type of Radar signals that the system should be able to handle (detect and jam) are CW, quasi-CW, pulse-doppler, pulse including intra pulse frequency modulation (LFM, PCM), with frequency /PRF agility, stable, jittered/stagger PRI and TWS.
38. System should be able to measure frequency, pulse width, PRI, amplitude, bearing and availability of internal pulse modulation in the signal.
39. The accuracy and range of measurement of each of these parameters needs to be specified by the vendor.
40. System should be able to handle multiple threats at the same time by using multiple DRFM channels. These details need to be specified by the vendor.
41. System response time from the moment of detection of the signal, sensitivity of the system, dynamic range (overall and instantaneous), input protection level, maximum input level etc need to be specified by the vendor.
42. The jammer should be able to operate in 2-18 GHz frequency range in both EJ as well as SPJ mode. The effective radiating power of the system should be adequate to defend the fighterclass of aircraft.
43. The DRFM channels of the system should be able to generate independent, simultaneous jamming signals for multiple emitters in the same band. The channel should be able to jam CW as well as pulse radar signals.

44. The receiver of the system should operate in 2-18 GHz frequency range. Other parameters of the receiver need to be specified by the vendor taking into account the range of transmitter.
45. Different modern jamming techniques need to be deployed by the system in EJ as well as ASPJ mode. The same need to be specified with details of each mode by the vendor. The system should allow selection of one or more jamming technique simultaneously.
46. The system should have such dimensions such that it does not impose any envelope restriction on aircraft operation while carrying the system.
47. The cooling requirements of the system should not exceed existing cooling facility in the aircraft. In case of extra cooling requirements, the system should be able to cater for the same in the pod itself. Operating temperature range of the pods needs to be specified by the vendor.
48. The power supply consumption of the system should not exceed that of the existing jammer pods of the aircraft.
49. System should use GaN and SiC technology for transmitter and reception circuits and should use AESA technology for antennae.
50. The BIT on the aircraft should be able to detect and record at least 95% of the failures in the system and should O level tester should be able to indicate exact failure on the aircraft.
51. I level test equipment should be able to detect and rectify all SRU level cards in the system.
52. The removal and fitment of the pods on the aircraft should not take more than one hour.
53. Reliability, MTBF, service life and shelf life of the pods need to be specified by the vendor.
54. Pods should be able to operate in same environmental and operating conditions as the fighter aircraft.
55. Vendor should also propose D level facility for the pods in IAF units (BRD).
56. The pods should satisfy the EMI/EMC requirements of the aircraft in present form in order to ensure interference free operation of other RF systems in aircraft (e.g Radar, RWR, IFF, TACAN etc).
57. The pods should weigh less than 190 Kg each (Tx and Rx) so that the effect on the wing stations is minimal and envelope restrictions on the aircraft are avoided.

Vendors' Response expected by: 30 Nov 17