International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 02 Issue: 08 | Nov-2015 www.irjet.net p-ISSN: 2395-0072

Disrupting system designing which is installable in UAV

Mahmoud Samkan[1] , Sepideh Behrouzi far[2]

1 Assistant professor of SATTARI University, Tehran , Iran
2 Postgraduate student of Mathematics , Tehran ,Iran

Abstract - ***Weapon systems in each country include: early warning systems, artillery systems and missile systems, each of which is equipped with a radar detector. In fact, detector radars after receiving a command finding a target, from command and control center, set on the position of the target and destroy the desired target for security reasons after going through a process of identification and tracking.***

One of the safe missions is being unseen by radar tracking. In this way, with the help of an ECM equipment, it is tried to disturb the receiver radar, and thus is prevented from discovering it.

The benefits of having a disruptive system on UAV is disrupting the receiver radar and preventing rapid target location by the system and then disrupting in the provision of Command Center Information to cover a safe mission. Because an ideal disruptive, producing a noise which is very similar to the target thermal noise makes it impossible to detect target or signal by radar.

In this article at first we have tried to prepare a brief description of jamming or disturbing and then, according to the facilities, the requirements and according to summary of what we have mentioned propose a system that UAV can be kept covered from radar.

Key Words: *jammer, Intriguer, parasite maker*

1. INTRODUCTION:

Disrupting or jamming is sending continued, frequented, modulated, signals or noises which is done to weaken the valid receiver power of enemy's radar systems. These signals can be sent to tubules enemy's receiver, radar target hiding or fraud and etc. Disrupting ways can be divided into noise Disrupting and fraud disrupting which our target is to focus more on noise disrupting. All of Disrupting have a receiver to detect the general characteristics of radar signals. In fact this receiver acts as" Look Through" then a controlled isolator with VCO voltage, produces noise signals according to receiving voltage (by receiver) and generator .

In general to have a useful and affective disrupting these parameters must be regarded. These parameters are as below:

Suitable frequency covering: noise signal should cover all radar signal frequencies .it is obvious that if some part of radar signal remain without noise , recovering will be possible.

Good sensibility of receiver: an disruptive receiver must be able to uncover weak radar signals too, to be able to achieve its general characteristics.

Expanded dynamic ranges for receiver parameters: an disruptive should be able to create and send noise in deferent situations (such as pulse wide, frequent working, repetitive pulse frequency).

Suitable frequency covering: noise signal should cover all radar signal frequencies .it is obvious that if some part of radar signal remain without noise , recovering will be possible.

Good sensibility of receiver: an disruptive receiver must be able to uncover weak radar signals too, to be able to achieve its general characteristics.

Expanded dynamic ranges for receiver parameters: an disruptive should be able to create and send noise in deferent situations (such as pulse wide, frequent working, repetitive pulse frequency).

1.1 Deferent kinds of noise Disruptive

Spot Noise: this disruptive technique is sending noise signal with centralized power (multi megahertz) in systems frequency domain to reduce the target

uncovering range. Fig 1 shows a sample in frequency range. Fig 2 shows how enemy's radars can be reduced through applying a noise with appropriate power and so create a safe corridor.

Fig-1: displays a disturbing spot noise in the frequency domain.[1]

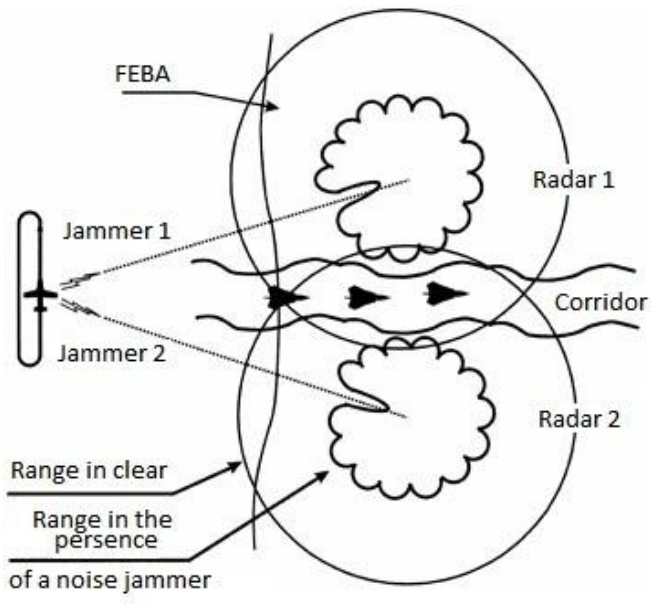

Fig -2: Creating a safe corridor with remote jamming[1]

Barrage Noise or wide band: in advanced jammers, they create and send a noise in a wide band against some targets that have more than one working frequency. The density of jammer energy reduces highly because of wide range of band. Since jammers usually attack through side leafs, so they should have a high energy to have appropriate act. This limitation makes it difficult to create this noise in arm airplane, but creating this energy is easy and possible for warships. The only point to be added is that this wide band noise should not burn or saturate RF class (such as mixer). This noise can be tested both by software and hardware. Figure 3 shows a Barrage Noise or wide band.

Te advantage of its using it is in main loop is that it can use the antennas maximum interest for empowering the signal noise. At the same scale if it was side loop we should either increase the power to reduce the work limitation. Side loop jammers should be near the target to affect the radar.

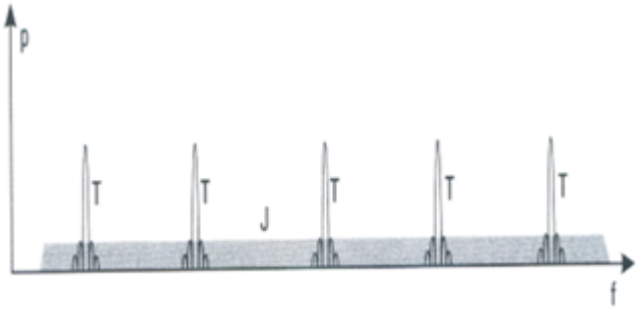

Fig -3: show disturbing noise barrage (broadband) in the frequency domain. [1]

CW Swept Noise: in this way, Disruptive concentrates its power around a frequency band which covers the radar's band receiver wide and sweeps the powerful wave on this band. This way is helpful in front of search radars for making them confused through creating a lot of false targets on PPI board , such that the uncover automatic system of radar becomes overload. The advantage of this noise is the focus power of disruptive like spot noise and the wild width of band of this disruptive, gives it the advantages of barrage noise. Figures 4 and 5, shows the way of working and affect of this noise. It is difficult to confront this noise and should reduce its power using some limiters. So this noise is important and it is difficult to confront it.

Fig -4: show disturbing noise, continuous wave swept on PPI Page[1]

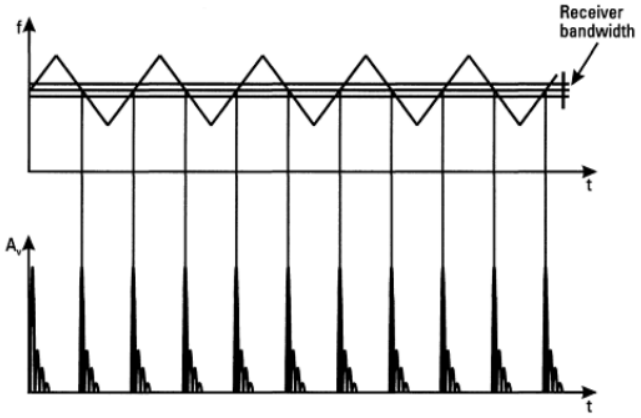

Fig -7: Noise with continuous wave swept in time domain[1]

Locked Swept Noise: the creator jammer of this Disruptive is one of sweep kind that ends searching when recognizing the signal and locks on recognized signal. Then jammers sender start working and sends spot intrigue in the recognized frequency. The hard task of this Disruptive is that ignores the new warning frequencies .if the frequency agility technique used to widen the spectrum (enemies radar) and jammer can extract the change rate or frequency mutation, will be able to send the rate of radar frequency change as spot or sweet . So rate of frequency change should be fast and unforeseeable as much as possible.

Gated Noise: in this way, noise pulses are created with suitable delay near the target and with suitable width in a way which covers the target. This way of connected noise is more complex, because here a circuit for foreseeing the leaving noise time should be present to be sancron with radars PRF whether fixed or varied. Using this way, variety of targets based on time deviation can be intrigue. In this way, the gated noise even can be created before real eco target and so overcome radar which use following front edge.

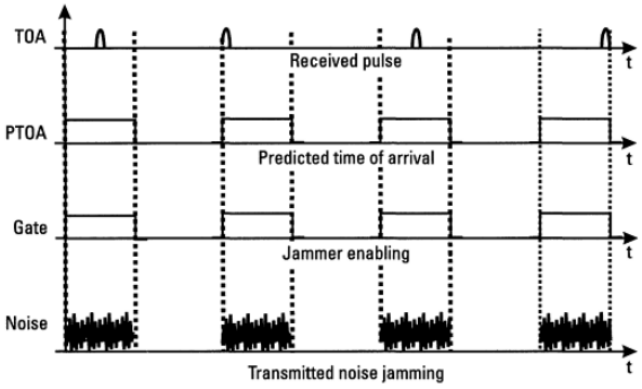

Fig -6: shows a kind gated noise[1]

1.2 Self-screen jammer

Suppose radar with gain G, wave length λ, hole A, band width B, waste coefficient L , maximum power Pt , interrupted face $^{\delta}$ (sigma) , range R , in that case its radar equation is as follow:

(1)

$$P_r = \frac{P_t G^2 \lambda^2 \sigma}{(4\pi)^3 R^4 L}$$

In this case the power of receiver at the same range is:

(2)

$$P_{SSJ} = \frac{P_J G_J}{4\pi R^2} \frac{AB}{B_J L_J}$$

As Pj is the maximum power, Gj antenna gain, BJ active band width, and Lj is the same waste coefficient. Since the amount of B/BJ , is less than unit, to compensate this problem the band width is greater than the active band width and it is usually design in radars which their band width are different . So its equation becomes in this form:

(3)

$$\frac{S}{S_{SSJ}} = \frac{P_t G \sigma B_J L_J}{4\pi P_J G_J R^2 B L}$$

Jammer's power is based on one side transition while the returned eco is from a bilateral target, so the power of jammer is usually greater than the power of target signal. This means that $\frac{S}{S_{SSJ}}$, Is less than unit. The nearer target to the radar, the above fraction is nearer to one. Then for calculating the restriction, we suppose fraction crosses equal one and shape it according range.

$$\frac{S}{S_{SSJ}} = \frac{P_t G^2 R_J{}^2 \sigma B_J L_J}{4\pi P_J G_J G' R^4 BL} \tag{4}$$

Because it's original form was as bellow:

$$(R_{CO})_{SSJ} = (\frac{P_t G \sigma B_J L_J}{4\pi P_J G_J BL})^{\frac{1}{2}} \tag{5}$$

$$P_{SOJ} = \frac{P_J G_J}{4\pi R^2{}_J} \frac{\lambda^2 G'}{4\pi} \frac{B}{B_J L_J} \tag{6}$$

Following implantation of this equal is presented using MATLAB software by supposed amounts.

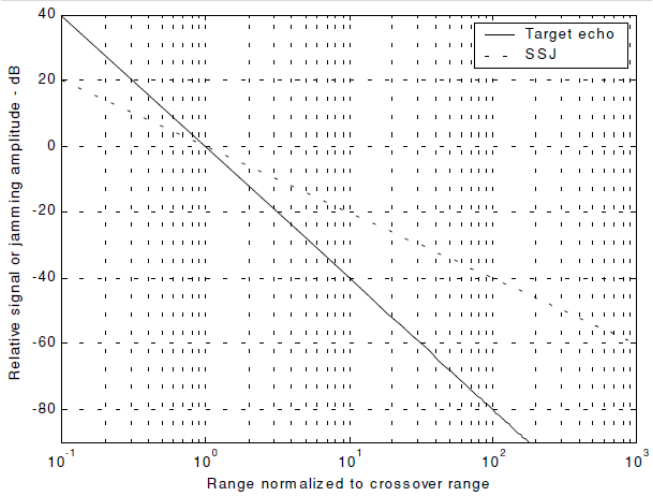

Fig -7 [6]

But again we suppose it equal one and arranged it according to range, as G` is antenna's gain in jammer's direction and usually assumed as side loop. If want to calculate limitation cross, we have:

$$(R_{CO})_{SOJ} = (\frac{P_t G^2 R_J{}^2 \sigma B_J L_J}{4\pi P_J G_J G' BL})^{\frac{1}{2}} \tag{7}$$

So, the distinct range is:

$$R_D = \frac{(R_{CO})_{SOJ}}{\sqrt[4]{(\frac{S}{S_{SOJ}})_{\min}}} \tag{8}$$

When $\frac{S}{S_{SOJ}}$, Reaches to the minimum, the target will be distinct.

1.3 Stand-off jammer

Stand-off jammer expands signal in the restriction more than defense capacity. Its equal is as follow:

1.4 system design and implementation way

Since complete implementation of an disruption system, needs information achievement from environment and jumping into related frequency to create an intrigue signal. A tuner should be present to clarify the environment signal. Proposed block diagram of the system has shown in figure 8.

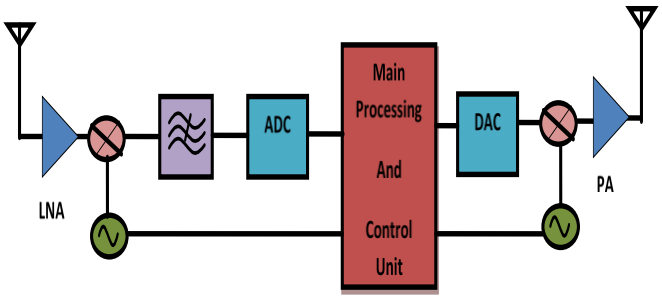

Fig -8

Receiver and tuner: the duty of this part is to empower and down convert present signals in environment for clarify. Tuner arranges the central frequency of local isolator based on the order which earns from operator part and transfers related band signals to basic band. In case of signal distinction in this frequency, one of target frequencies has found, and it is possible to intrigue in relate band. Operator: this part controls the tuner and sends appropriate orders to sweep the central frequency of local isolator, clarifies the received signal, and makes decision based on environment information. Appropriate noise in basic band based on arranged scenario is produced for the system and be sent to be send to the other class. This sub part also is programming and implementing responsible for all program which are fixed for system. Medullar and power invigorator: this part adjusts its central frequency based on received orders from systems main operator and prepares entrance signal noise which is fixed in band. In this part we can use modulator or up convertor based on the need f the system. Receiver and sender antenna part: used antenna should have the intrigue ability based on presented needs on all polarizations. That is why it is proposed that the line polarized antenna be 45 degree. Noted that in high frequencies because of, antennas dimensions become smaller based on small size of wave length, antennas dimensions become small so using of micro stripy becomes useful in this band, while in design mongering part all of these problems should be solved according projects limitations.

2. CONCLUSIONS

Generally it can be said that using digital jammer systems which one kind of it has mentioned in this article, advanced without crew aircrafts can be built that have many advantages over other with crew aircrafts .using tier multi way intrigue and complexion in a system can have different applications in this aircrafts, and reduce the application costs. Finally through different circuits application for making jammers, making software and hardware techniques will be domestic, and this an important advantage because its detection by enemy and its acting against it will be impossible.

REFERENCES

[1] PHiliponry, “Defense system application” , translation by Mohsen Saeisi, Mabd GHaffari, volume 1, 1996.
[2] Frater&Rayan, electronic war for digital war board. translation by Ahmad Afifi, Morteza Karimzadeh Mohammad bagher Nezafati, , defenses industry education and searching institute, ultra origination design of armed forces FAV, 2006.
[3] Dr. Malekzadeh,Keramet, “ an introduction to UAV and its design basics” ,2011.
[4] G. estemsen, “airborne radar,” , 2008.
[5] Dr ghorbani, Ayaz, “radar systems basic,” , 2010.
[6] Bassem R. Mahafza, “Radar Systems Analysis And Design Using Matlab,”, ..COLSA Corporation.Huntsville, Alabama, 2000.