An example of three different Reviewing styles:

1) Quick, 2) Accurate, 3) Helpful and detailed

Reviewer: 1 - ***Comments to the Author***

These comments apply:

1) Probably originated by GESTRA studies at FHR, the ms. should show more representative examples to fully assess the usefulness/viability of the proposed processing. For example, the used (Sect. V a) Costas waveforms represent a very special case to be complemented with the cases of (a) LFM (linear chirp), (b) low-Range- sidelobes (- 45 dB) NLFM and (c) Low-sidelobes (weighted spectrum) Noise Radar waveforms. Parameters shall be more significant, e.g. in Table II the value of 2 GHz for transmitted frequancy appears as a nonsense.

2) Moreover, the processing load (multiplications, FFT's..) in typiical applicatons (e.g. Gestra) should be computed and compared with more traditional processing.

3) References shall be more complete (e.g. on Noise Radar) and all of them shall include (for the ease of retrieval) the DOI or a working link.

Reviewer: 2 - ***Comments to the Author***

The paper characterizes itself as an extension of previous work. While it generalizes the waveform and adds a "Cruise-and-Go" approximation, the shift from linear to quadratic motion compensation is a well-trodden area in radar literature, such as the Fractional Fourier Transform or specialized Keystone transforms.

The major concern in this article is the lack of clearly stated novelty. The authors are required to clearly state the novelty of this article.

The "Cruise-and-Go" approximation assumes constant velocity within a pulse. For very long pulses or extreme accelerations, this leads to residual errors that the paper acknowledges but does not solve, only predicts via a metric.

While the authors claim "practical computational efficiency" compared to time-domain matched filtering, the method still requires pulse-wise FFTs and potentially iterative searches over acceleration a_0 and velocity v_0 cells. The dimensionality of the search space for RDA estimation remains a significant hurdle for real-time applications.

The solution for Doppler ambiguity relies heavily on using Doppler-intolerant waveforms, like Costas codes and high SNR. This limits the method's robustness in low SNR environments or with traditional LFM-based systems. Can the author comment on that?

Much of the comparative analysis, particularly in Figure 3 and the Doppler ambiguity section, uses "noise-free" simulations. To be journal-quality, the paper must evaluate performance, RMSE, against the CRLB across various SNR levels.

The paper focuses on a single point target. An analysis of how the method handles multiple targets with different dynamics, including sidelobe masking and computational scaling, is missing.

The paper compares itself to "classical" methods and the Keystone Transform. It should be benchmarked against more recent state-of-the-art RDA algorithms, such as those that use the Radon-Fractional Fourier Transform or the Discrete Polynomial Phase Transform.

The processing flow in equations (19)-(24) is missing.

The method requires up-sampling and interpolation to evaluate the RDA output on a uniform grid. The paper should explicitly discuss the required oversampling factor and the associated computational overhead of the interpolation step.

Reviewer: 3 - *Comments to the Author*

An interesting and well-written contribution to the subject, although I don't think it is a complete solution since it still involves a search through possible velocities and accelerations. I suppose there is no 'perfect' solution.

You might mention the technique sometimes used in 'CW' systems like passive radars using communications emitters of splitting the signal into short enough segments for each to be Doppler tolerant (length < approx 1/(4 x Doppler shift)) and then stitching the segments together in the Doppler processing. I guess this will not work in your applications since this technique limits the maximum indicated range to probably much less than the range to your targets - or you might think that mentioning this is unnecessary.

The one addition I think you need to make to the paper is a discussion of the computational complexity. For example with 0.6sec CPI you can (must) distinguish Doppler shifts down to about 1.5Hz resolution. At 1.5GHz a radial speed of 500m/s corresponds to a Doppler shift of (I think) 5kHz, so if you have no idea a priori of the target's speed you must search about +/- 3000 velocities. Similarly, an acceleration of 300m/s/s would be 3kHz/sec, or about 2kHz over 0.6sec so you might have to search of the order of +/- 1000 accelerations. Although your algorithm has avoided direct correlations, allowing you to only use fast Fourier transforms, there could be a lot of these! Of course, once you have an initial estimate of the state of the target, subsequent processing need only search around the previous state. It would, I think, be worth adding some words about this.

It might be worth adding some comments to figure 5 giving some idea of where typical targets might sit on it - for example I think that with the parameters you use the null at Upsilon = 1 is somewhere around 1000g, with may be said to be characteristic of the acceleration of a shell fired from a gun.

Incidentally, I think equation (26) ought to be more widely known, as similar equations indicating the maximum integration time for accelerating targets appear in many applications (for example automotive radar) but each author has to introduce them ab initio!

I would note that LFM ceases to be Doppler tolerant for high speeds, high bandwidths and long dwells - the Doppler shift at one end of the chirp is sensibly different from what it is at the other. I think that is what [8] might be getting at, but I'm not sure this comment is so relevant to your paper.

I don't think you discuss the intermediate case where the processing within the pulse can be treated as Doppler-tolerant but there is significant range walk from pulse to pulse, so the Doppler FFT is replaced by a series of DFT's where the range cell used for each DFT element varies from pulse to pulse since if we know for each sample of the DFT output what speed we are looking for so we can compensate for the range walk that would cause. Does that make sense? Of course this technique can't cope with Doppler shift or range walk within the pulse, but it might be worth mentioning to 'get it out of the way.' If you have mentioned this case and I've missed it, then I apologise.

You say that your approach gives 'unbiased' estimates, but I do not think you justify that statement.

I suppose that this is correct, but it might be worth adding a few words to explain why the method cannot introduce biases.

My other comments are 'textual' and may be addressed in any case by the IET's prood editors:

a) *I think that for a UK-based publication you should use British spellings? - e.g. 'behaviour' and others.*

b) *technically it's incorrect that 'every' pulsed radar's signal processing involves Doppler estimation - incoherent marine radar's don't. Maybe find a word or phrase to qualify 'every'?*

c) *in section IIA I would delete the word 'hypersonic.' To be pedantic, accelerations can't be 'hypersonic' and I think it's.a slightly vague term even when applied to velocities - if it's retained it ought really to be defined. If it's defined as > Mach 5, for example, then your illustrations using a speed of 500m/s (about Mach 1.5) are not hypersonic (I agree that you can't really have Mach numbers in the vacuum of space, but I guess you see what I mean!)*

d) *in equation 19 I would try to make it clearer to the eye that the last line is within the integral. I realise that the position of the final 'd Delta t' means that this must be the case. I would indent the last line so it is all to the right of the integral sign in the line above and enclose everything between 'xm' and the exponential term on line 4, i. e. everything before 'd Delta t', in curly brackets, but, if you agree that the equation would benefit from clarification of course you or the copy editor might think of other ways of achieving this.*

e) *between equations (20) and (21) you have 'calculates.' This is, I think, normally a transitive verb, so something like 'is calculated as' or even 'yields' might be better.*

f) *p6, col 1 line 10: 'achieved' might better be 'required'*

g) *p6, col1 , four lines from the bottom: is the phrase 'and hypersonic airborne platforms' really appropriate?*