Reviewer #1: Review for ORNITH-APP-24-135  
The manuscript describes flight height data from American woodcocks during spring and fall migration, demonstrating that this species flies lower on average and spends more time in the 'collision zone' than other migratory birds.

I appreciated that the error on the flight height data was corrected using ancillary information about when the birds were most likely to be flying (migration period at night). I would advise to highlight that aspect in the abstract. But unfortunately that information was ridden with errors. There was no way to 100% ascertain that the birds were flying or not. So I am not sure the approach was successful (some more details and consequences under point 4 below).  
  
I also appreciated that a mixture model was used to estimate the probability of flying during the migration period at night. Again, I advise emphasizing that in the abstract. Also again, that model was still fitted based the propagation of the error associated with the clearly false assumption that the birds never flew during the day and outside of the migration period.

All in all, I advise first to perform a sensibility analysis to the violation of the model assumptions (brief outline in point 4 below) and second to down-tone the conclusions and use the adverb "tentatively" more.

Thank you for your comments; we found them constructive and addressing them has allowed us to substantially improve this paper. We’ve addressed these concerns in detail below. We’ve also revised the abstract to more closely reflect our methodology.

Main comments  
1) From the abstract onwards the authors put too much emphasis on the average flight height, and not enough emphasis on the variance and overall variability. Both the mean and variance contribute to the probability to fly in the collision zone (Péron et al 2020 Animal Biotelemetry). For example, Table 1 absolutely needs to present the variance and maybe the skewness, not just the mean and median which are not informative enough in this context.

We have added information on flight altitude variance to the abstract, and variance and skewness to Table 1 of the results.

2) The study locations are not provided. The text just says "across the eastern portion of their range". Please add the study locations.  
  
3) Please explain how you determined whether "birds had a known migratory or non-migratory state". Does it mean that you removed the first few days and last few days of each migratory journey, as these would be the ones with the most uncertainty? In which case how much data was dropped? Please be specific.  
  
4) "we assumed all diurnal and non-migratory points were known ground locations". This sounds like a very strong assumption. Please discuss the consequences of its violation for your inference. The birds are inevitably going to sometimes be flying when you don't want them to. Eg, circadian movement between roosts and foraging grounds outside of the migration period, disturbances etc. The estimated sampling error rate of the flight height is going to be inflated, thereby leading to a potentially large downward bias on the process variance in flight height, and associated bias on the estimated probability to fly in the collision zone. I would request some sensibility analysis. One approach would be to introduce a probability that the bird was flying when you initially considered it was not flying, and look at the change in the results when this probability varies.

Woodcock are somewhat unique among birds in that flight during diurnal hours is rare. Rabe et al. (1983) estimated that woodcock spend 2% of their diurnal time budget engaged in flight. Vander Haegen (1992) was more conservative, estimating that the true percentage was closer to 1%. When these flights do occur, they tend to be low altitude. While the height of these flights is not well documented, our personal observations suggest that woodcock typically make short flights a few meters above ground. When flushed they will occasionally climb to just above canopy height, after which their trajectory levels out (McAuley et al. 2020). Thus, we feel confident that 1) any flight locations which occur in the known ground subset of the data are rare, and 2) that these observations are of low altitude, and have limited capacity to bias the dataset. We have added a brief version of this clarifying information to the *Data collection and preprocessing* section of the methods.

As requested, we’ve also conducted a sensitivity analysis to determine the extent to which the presence of flight locations in the known ground subset of the dataset might bias our results. We randomly selected 2% of the data in this subset and added their preexisting altitude measurements (assumed to be attributable solely to GPS error; Equation 2) to a randomly generated diurnal flight altitude. We sampled these diurnal flight altitudes from a uniform distribution between 0 and 21.5m, with the upper limit determined by adding 5m to the average canopy height among all points in the dataset (extracted from LANDFIRE 2023). We then ran the model as normal and compared the new flight altitude metrics to those derived from our original model (Table R1).

**Table R1.** Flight altitude metrics derived from the original model, and a sensitivity analysis model in which 2% of known ground locations are actually recorded in flight.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Original model | | Sensitivity analysis | |
| Metric | Estimate | 95% Credible Interval | Estimate | 95% Credible Interval |
| Median Flight Altitude | 224m | 148–295m | 225m | 152–301m |
| Mean Flight Altitude | 361m | 285–444m | 363m | 283–454m |
| Standard Deviation | 449m | 294–686m | 450m | 297–694m |
| Skewness | 5.1 | 2.7–10.7 | 5.1 | 2.7–10.6 |

5) Eq. 1: from experience that distribution is in reality very far from Gaussian (Péron et al 2017 J Applied Ecology). Please provide empirical evidence from your data that the distribution of the error can be approximated with a Gaussian. Or maybe, also based on Péron et al 2017, suggest that correcting for non Gaussian features is not always necessary because the bias when not correcting was small in some cases.

Thank you for pointing us towards Péron et al 2017. We conducted posterior predictive checks on our observation error using both Gaussian and Student-T distributions and found that the Student-T more accurately describes the heavy tails of the distribution. We have therefore switched our parameterization of observation error to use a Student-T distribution and added a description of this process to the methods.

6) Eq. 3. Again, please provide some justification for the Gamma distribution of true flight heights. It seems arbitrary to me.  
  
  
Minor  
L89 I don't think you can make the case that woodcocks are less maneuverable. Indeed, round wings, lack of flocking reflex, comparatively slow flight and good night vision make them more maneuverable than other shorebirds and possibly passerines. And you don't need that argument.

We have removed this text from the discussion.

L94 "identified" -> suggested or proposed  
L102: What brought you to this hypothesis? If there is no reasoning or if it's a post-hoc hypothesis maybe say "postulated".  
L143: Can I ask that my paper is not put in the same basket as Poessel et al please? I know it's a bit out of line but I would appreciate.  
  
I hope my review was balanced and in any case it was meant to be constructive.  
  
--signed: Guillaume Péron (CNRS, Lyon, France)

Additional references:

Vander Haegen, W. M. (1992). Bioenergetics of American Woodcock during the breeding season on Moosehorn National Wildlife Refuge, Maine. Dissertation. University of Maine, Orono, ME, USA.