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Evaluating Go-Routes in Man Coverage

Winning football games is heavily impacted by explosive plays. The first thought when hearing “explosive play” is when the quarterback launches the ball 40+ yards in the air into the hands of a receiver perfectly for a touchdown. When successful, these plays additionally have a high EPA (expected points added), either strictly because of the large yardage gain, or additionally if the receiver continues towards the endzone for a touchdown after the completion. But who are the best quarterbacks at throwing the deep ball? Which receivers generate the most space on these deep routes? To explore these questions, we developed two metrics which tell us which quarterbacks and receivers are the best on these deep plays.

For our metrics, we kept it limited to only receivers running go-routes and the defense being in man coverage. Go-routes will show us that separation must be dependent on receiver speed, so which receivers are able to use their speed to generate the most space, and this is reliant on the quarterback throwing the ball far. Only looking at man coverage will show us the true skill of both the quarterback and receiver, as in zone coverage there could be a missed zone and this could be an easy play for both the quarterback and receiver, which does not show any indicator of true skill. Or, a receiver could beat their man one-on-one, but a deep safety in zone could bail out the defense. We are looking to isolate the effectiveness of quarterbacks and receivers on these one-one-one plays.

Something to keep in mind for our metrics is that the data we used does not include any plays where defensive (or offensive) pass interference occurred. Defensive pass interference occurs often in deep routes, especially go-routes where the defender plays catch up to the receiver. The best deep route runners and pass throwers will assuredly draw their fair share of pass interferences throughout the season, so it is unfortunate we were not able to take this into account.

For receivers, the metric we made to rank the best receivers getting open on go-routes is average mean separation with the defender. We also calculated stats like average minimum separation, average maximum separation, and average separation at throw. These were based off all go-routes ran against man coverage, even if they were not targeted. Something to note is the sample size here for all receivers is small, and the main reason for that is because of only using data against man coverage. Zone coverage is more commonly used in today's NFL, so there simply is not as much data out there against man defense.

In terms of average mean separation, Dionte Johnson leads the league. This is something that comes to a huge surprise, as Dionte Johnson is known for being great on quick routes rather than slants. Perhaps teams should have been looking to throw the deep ball at him more, or defense may have just been so caught off guard when he was going for a deep pass rather than a short pass. This metric is explaining to us that Johnson may have been misused throughout the years, and his teams did not allow him to reach his full potential by limiting him to shorter routes. On the other hand, Puka Nacua, who is one of the best receivers in the league, had the third lowest average mean separation of players who ran go-routes 7+ times against man defense. Although Nacua is so good, this is not much of a surprise, as Nacua, like Johnson, is known for being elite at shorter running routes like slants. Except the difference between the two is that

Johnson is still great at deep running routes, while Nacua is not. We can pick up all sorts of conclusions like this from the results found from average mean separation.

Next, we built a model for quarterbacks to compute the probability of a specific quarterback completing a pass based on the quarterback himself, the separation when ball is thrown, mean separation of route ran, and max separation of route ran. This interactive model gives us a strong estimate of when each quarterback should or should not be unloading it deep depending on the situation. The model is available for every single quarterback which attempted at least 1 throw to a receiver running a go-route on man coverage, but of course the model will be much stronger in giving a more accurate probability to the quarterbacks that started most if not all the season, in comparison to the backups that only had a few of these attempts.

As well as the interactive model, we also built a metric called completed over expected (COE). For each throw attempted to a go-route on man coverage, a model was run to predict if the throw would be completed or not. This model slightly differs from the model mentioned before, as this model does not factor in who the QB himself is, but the model is determining if a catch is expected or not based on the average NFL QB. This metric is very telling at who the best is at throwing the deep ball accurately. The best QBs at throwing the deep ball are the ones completing passes which are not expected to be completed based on separation when ball is thrown, mean separation, and max separation between the intended receiver and the defender. Something interesting to note here is that we also tried to build this metric using speed of receiver as a predictor, but that model did not have as strong of a predictive fit. The model with speed included had an AUC of .55, while our model only based on separation when ball is thrown, mean separation, and max separation had an AUC of .73, making the prior model built a stronger one to use for prediction.

Again, something to note here is that the sample sizes are not enormous for the quarterbacks, but with all having more than 10 attempts this can still definitely be telling. Justin Herbert had the largest COE in the league in 2023, which is not a huge surprise. Herbert is known to be one of the most talented QBs in the NFL, and his go-to deep target is Quentin Johnston, whose biggest threat is his deep route skills. Maybe this is more of a nod to Johnston making incredible catches, but we would like to give benefit of the doubt to Herbert on this one.

Something that stands out about the results for QBs is that Patrick Mahomes and Joe Burrow both have a negative COE, meaning they completed less passes than expected by the model. These two QBs are commonly regarded as top 5 QBs in the NFL, so it is a bit of a surprise to see them here. In 2023, Mahomes did not have great receivers and his go to target was tight end Travis Kelce, who does not run go-routes as a TE. Maybe Mahomes' throws were accurate but just were not caught by the receiver, which could explain the negative COE. As for Burrow, this is even more surprising since the Bengals have one of the best receiving cores in the NFL, including arguably the best WR in the league, Ja'Marr Chase. Although Chase is an incredible receiver, his best attribute is not necessarily the deep ball. This can be backed up as he was in the middle of the pack for average mean separation amongst WRs. Nonetheless, we are surprised Burrow has a negative COE as he is known for his precise accuracy. Maybe this is telling us that Burrow is a bit overrated and may be carried by his great receivers that can effectively gain yards after the catch.

Something to also touch on is that Jalen Hurts had a negative COE, despite his WR A.J. Brown having the second-best average mean separation in the league. This can explain to us that for one, Hurts is not a great passer. This has been known; he has always been a bigger threat running the ball. This also explains to us that A.J. Brown may have even better stats with a QB

that can throw the ball deep with more precision, like Justin Herbert. A combination of Brown and Herbert would never happen, but it is fun to imagine the impact they could make as a duo.

These two metrics of average mean separation and COE are incredibly useful for coaches and GMs. WRs with the best average mean separation are the ones who should always be running the go-routes, rather than the WRs who specialize in shorter routes, like Puka Nacua. This can be particularly useful in terms of game planning. Similar can be said using COE, as someone like Justin Herbert should be encouraged to throw the deep ball even more than he does already. With such a high COE, this can make explosive plays even more likely for the Chargers, and even if they cannot complete the pass, there is always the chance of a defensive pass interference. Also, knowing these two metrics could be extremely helpful in team building for GMs. It would be very smart for GMs to acquire WRs with a high average mean separation if their QB has a high COE. This means not only is the WR getting open, but the QB is more likely to accurately throw the ball to the target successfully with some extra space. This leads to more explosive plays, which leads to winning more football games. An example of this would have been for the Chargers to go out and trade for Jerry Jeudy. Jeudy was on the trade market last season in 2024 and would have been a great target for Justin Herbert to throw to. Jeudy had the third highest average mean separation in the league in 2023, so he is proven to be good at getting open down the field. Jeudy has always shown flashes of talent but has yet to turn into the superstar he has potential to be. Maybe all he needs is a quarterback like Herbert throwing him the ball.

Overall, our evaluation of go-routes in man coverage highlights how much untapped insight lies within route-level separation data and completion-probability modeling. By pairing receiver separation metrics with quarterback COE, we can isolate true deep-ball skill from

surrounding noise, revealing both unexpected standouts and inefficiencies in how certain players are deployed. Despite limitations in sample size and the absence of pass-interference data, these metrics provide coaches and front offices with actionable tools for game-planning, player development, and roster construction. Deep shots remain one of the most valuable sources of explosive offense in football, and understanding who creates space and who converts tight-window throws allows teams to maximize those high-leverage opportunities. As the league continues to lean on data-driven decision-making, metrics like average mean separation and COE offer a clearer lens into deep-ball effectiveness.