Quiz on 10/07/2019:
Reduce the airplane problem to the Star Wars problem. Each airplane will become a transmission interval. Plane i with arrival time t_i and flight limit d_i will become interval [t_i, t_i + d_i], or more correctly: (t_i + d_i)/2 +/- d_i / 2. Each time at which you can land an airplane will become a reception time: x_i = 3i. The reduction is linear time.

Now we prove that there is a transmission match if and only if we can land every airplane. If there is a transmission match, then we can place each x_i into some interval t_j +/- epsilon_j. That means landing time x_i falls into the interval [t_j, t_j + d_j] in which plane j will be at our airport and able to land. So every plane gets a landing time. For the other direction, assume there is a way to land every plane. That means for each plane j, we landed it at some time X, and X must be between when the plane arrived at the airport t_j and when it ran out of fuel t_j + d_j. Therefore, we matched transmission X/3 uniquely with interval [t_j, t_j + d_j]

Quiz on 10/14/2019:
Given G, create G' by taking G and adding three new vertices. New vertex a is connected to some arbitrary vertex v of G. New vertex b is connected to every neighbor of v in G, and new vertex z is connected to b. We set K to n+2 and ask if there is a path of n+2 edges in G'. The reduction is clearly linear time since we add three vertices and at most n edges.

(->) Assume G has a Hamiltonian cycle, then G' has a path from a to v, the cycle will return to v from some vertex u, but u is connected to b and then b to z. That gives a path from a to z that is 1 edge (a,v), n-1 edges (v to u), and 2 edges (u to b to z).

(<-) Assume G' has a path of n+2 vertices. Since there are only n+3 vertices in G', the path must hit every vertex, and since a and z are degree 1, the path must start at a and end at z. Therefore, there is a path from a to v to some vertex u to b to z, and we know v to u hits every vertex and there is an edge from u to v. Adding that edge gives us a cycle of n vertices in the original G.