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Let G be a Kac-Peterson group associated to a symmetrizable generalized Cartan matrix. Let (b, d) be a pair of positive braids associated to the root system. We define the decorated double Bott-Samelson cell $\text{Conf}_d^b(\mathcal{A})$ to be the moduli space of configurations of decorated flags satisfying certain relative position condition. We prove they are affine varieties and their coordinate rings are cluster algebras. We construct the Donaldson-Thomas transformation on their undecorated counterparts $\text{Conf}_d^b(\mathcal{B})$ and show that it is a cluster transformation. In the cases where G is semisimple and the positive braids satisfy a certain condition, we also prove the periodicity of the Donaldson-Thomas transformation. This is joint work with Linhui Shen. (Received January 24, 2019)