ABSTRACT. A structural description is given of the separable $C^*$-algebras that are contractible in KK-theory or E-theory. Subsequently it is shown that two separable $C^*$-algebras, $A$ and $B$, are KK-equivalent if and only if there is a bundle of separable $C^*$-algebras over $[0, 1]$ which is piecewise trivial with no more than six points of non-triviality such that the kernel of each fiber map is KK-contractible, all fiber maps are semi-split and such that the fibers at the endpoints of the interval are $A$ and $B$.