This thesis is primarily concerned with specific types of spreads of three-dimensional and five-dimensional projective geometries over finite fields. Spreads are a partition of a projective geometry, and are used to construct translation planes through the Andre/Bruck-Bose construction. This thesis uses the Bruck-Bose model, which is more geometric in nature. The types of spreads examined include the following: spreads of five-dimensional projective geometries for three dimensional flag-transitive affine planes, polarity-paired spreads of three-dimensional projective geometries, and spreads of five-dimensional projective geometries constructed from a three-dimensional circle geometry.

In the introduction to the thesis, a short historical account is given of some aspects of modern incidence geometry. Specifically, a partial history of the theory of projective and affine planes that leads to the study of translation planes. In Chapters Two and Three the definitions of a projective plane and translation plane are given, along with properties of these objects that will be useful in their study. Also the classical (Desarguesian) projective plane and the classical projective geometries are defined. It is these higher-dimensional Desarguesian geometries that are needed for the Bruck-Bose model of translation planes. The Andre/Bruck-Bose construction is explained in Chapter Four. This includes a discussion of the Miquelian inversive plane, which can be used to model a fundamental family of spreads called “regular”.

In Chapter Five spreads of five-dimensional projective geometries are used to construct odd order three-dimensional flag-transitive affine planes. This involves examining the way that planes in the spread intersect a partition of a five-dimensional geometry. Chapter Six is concerned with polarities of three-dimensional geometries applied to spreads of that geometry, leading to the concept of polarity-paired spreads. The symplectic polarity-paired spreads are used to construct a certain class of ovoids of a specific generalized quadrangle. In Chapter Seven a three-dimensional circle geometry is used to construct spreads of five-dimensional projective geometries. This circle geometry and spreads constructed from a regular spread mirror the concept of the Miquelian inversive plane and its relationship to subregular spreads from a regular spread of a three-dimensional projective geometry. Finally, the possibility of further work is discussed in Chapter Eight.