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Linear and non-linear 1-intersecting pencils of conics

In a Desarguesian projective plane of odd order, the sets of conics through three points, tangent to three lines, and in which a fixed triangle is self-polar all form a bundle of conics; the circumscribed, inscribed and self-polar bundles respectively. The pencil of conics in the first and third that contain a fixed point are a linearly parameterized pencil. The corresponding pencil in the second is non-linearly parameterized. Let ϕ and χ be two non-degenerate conics which intersect at a single point and are not tangent there. The bundles described show they appear together in exactly one linear pencil and together in a non-linear pencil. The linear pencil can be embedded in two different bundles and the non-linear pencil in at least one. We prove that a similar result holds in projective planes of even order. We discuss the stabilizer subgroups of these pencils.