TRANSVERSAL EJECTION-COLLISION ORBITS FOR THE RESTRICTED THREE-BODY PROBLEM

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Abstract. The main goal of this paper is to show that the restricted three-body problem has transversal ejection-collision orbits when the mass parameter μ is small enough and the Jacobian constant C is greater than two.

1. Introduction.

The circular planar restricted three-body problem (usually called restricted three-body problem) is defined in synodic coordinates by the Hamiltonian function

$$H = \frac{1}{2}(p_1^2 + p_2^2) + q_2 p_1 - q_1 p_2 - \frac{1}{r_1} + \mu(q_1 + \frac{1}{r_1} - \frac{1}{r_2}) \tag{1}$$

where (q_1, q_2) are position coordinates and (p_1, p_2) the conjugate momenta. In this frame r_1 and r_2 are the distances of the third body of negligible mass to the primaries of masses $1 - \mu$ and μ which are located at the origin and at the point $(1,0)$, respectively. Here, $\mu \in [0, 1/2]$ is the mass parameter.

It is clear that $C = -2H$ is a first integral of the Hamiltonian system associated to Hamiltonian function (1), called the Jacobian integral.

The existence of two transversal ejection-collision orbits in the restricted three-body problem has been proved in [**2**] when the value of the Jacobian constant C is large enough and the value of the mass parameter μ is small enough. In [**1**] it has been proved the existence of four transversal ejection-collision orbits for all $\mu \in [0, 1/2]$ and C sufficiently large.

In this paper we prove the existence of two transversal ejection-collision orbits in the restricted three-body problem when μ is small enough and C takes any value greater than two.

2. Equations of Motion.

The binary collision of the third body with the primary of mass $1 - \mu$ can be regularized by using the ideas of McGehee [**4**] . Now we summarize the changes of variables and resulting equations.