CLAIMS

1. Thrust unit (300) for a propulsion device (10), comprising:
- a thrust engine (302), arranged to generate a thrust stream (F1), comprising a nozzle (302n) defining a fluid ejection outlet (302b),
- a deflector assembly (304) comprising a pair of deflector elements (306a, 306b) movably mounted downstream of the fluid ejection outlet in the thrust stream (F1) to deflect all or part of the latter, said deflector elements (306a, 306b) being arranged to be moved towards and away from each other between a closed configuration in which the deflector elements are in contact with each other in the thrust stream path, and an open configuration in which the deflector elements are away from each other and out of the thrust stream path,
- actuators (310) arranged to cause asynchronously the respective displacements (r) of said deflector elements (306a, 306b),
- a frame (308) cooperating with:
  o the thrust engine (302) in an embedded link to surround the fluid ejection nozzle, and
  o each of the deflector elements (306a, 306b) according to respective pivot links;
said thrust unit being characterized in that the frame is arranged to position said pivot links, in order to minimize the power of the actuators (310) to cause displacement (r) of the deflector elements (306a, 306b) towards and away from each other between the closed configuration and the open configuration, in which:
  - said deflector assembly contains link arms (3081aa, 3081ab), wherein each link arm cooperates respectively and integrally with one of the deflector elements (306a, 306b) according to a suitable mechanical link,

- said frame (308) cooperating integrally with the thrust engine (302) according to the embedded link and with each of the deflector elements (306a, 306b) via the link arms (3081aa, 3081ab) according to the respective pivot links by means of link pins (308paa, 308pab),
- each actuator (310) arranged to cause a rotational movement of one of the deflector elements (306a, 306b) contains a rudder bar,
- the thrust unit (300) contains connecting rods (312a, 312b) cooperating respectively and integrally at a first end with the deflector elements (306a, 306b) and at a second end with the rudder bars of the actuators (310), wherein each of the connecting rods defines a thrust action point (312ap) and is arranged to transmit the rotational movement from the rudder bar to the deflector element (306a, 306b) cooperating with the latter via one of the connecting rods,
- the relative positioning of the link pins (308paa, 308pab) in relation to the fluid ejection outlet (302b) is determined by distances D2 and D5 projected in a transverse plane (PT) of the thrust unit (300) separating it symmetrically into two halves along the direction of the thrust stream, where D2 consists of the vertical distance, when the thrust stream is oriented towards the ground, between one of the link pins (308paa, 308pab) and a force point (P) of the resultant vector of the thrust force when the deflector element concerned is in the closed configuration, and D5 consists of the horizontal distance between said link pin (308paa, 308pab) and the force point (P), the distances D2 and D5 themselves being determined such that:
- $D2 = \frac{\frac{R1}{2}}{\tan \alpha 1} = \frac{Dn\frac{b}{2}}{\tan(\alpha' - \alpha)}$ where Dn consists of the diameter of the ejection nozzle (302n), b consists of a predetermined

factor comprised between 1 and 1.3, α1 consists of the maximum angular difference between the angle of attack α' of the deflector element (306a, 306b) in relation to an axis (314) substantially parallel in the transverse plane (PT) to the fluid ejection direction in the open configuration and the angle of attack α of the deflector element (306a, 306b) in relation to the axis (314) substantially parallel in the transverse plane (PT) to the fluid ejection direction in the closed configuration,

- $D5 = \frac{C4}{F1} = \frac{C3-C1}{F1} = \frac{(F1 \cdot D2) - \left(\frac{C2}{D3}\right) \cdot D4}{F1}$ where C4 consists of the counter torque sought, i.e. the difference between the closing torque at the link pin (308paa, 308pab) and the torque of the mechanical system, F1 consists of the magnitude of the resultant horizontal vector of the thrust, C1 consists of the torque of the mechanical system at the point of the link pin, C2 consists of the predetermined servo-motor torque of the actuator (310), D3 consists of the predetermined length of the rudder bar, D4 consists of the distance between the link pin (308paa, 308pab) and the thrust action point (312ap), C3 consists of the closing torque at the link pin (308paa, 308pab), and
- wherein said distances D2 and D5 are chosen to minimize the value of the counter torque C4.

2. The thrust unit (300) according to claim 1, in which each deflector element (306a, 306b) respectively defines a substantially curvilinear and inclined surface with a substantially semi-circular cross section.

3. The thrust unit (300) according to any one of the preceding claims, in which:

- each deflector element (306a, 306b) has a first portion, called “leading”, (306aa, 306ba) containing a leading edge (BA) for penetrating said thrust stream generated by the thrust engine (302); and
- each deflector element (306a, 306b) has a second portion, called “stationary”, (306at, 306bt) in the extension of the first portion, wherein the second portion has a substantially flat internal surface, arranged to allow the creation of a depression in the deflector element and promoting a laminar flow of the ejected fluid within said deflector element (306a, 306b).

4. The thrust unit (300) according to claim 3, in which each deflector element (306a, 306b) has a third portion, called “counter thrust or reverse thrust”, (306ar, 306br) in the extension of the second portion, having a reverse thrust angle β, so that the resultant vector of the fluid flow in the deflector element, when the latter is in the closed configuration, defines, in relation to the axis (314) substantially parallel to the fluid ejection direction, an opposite direction to that of the vector of the thrust force.

5. The thrust unit (300) according to any one of the preceding claims, in which the relative positioning between the deflector elements (306a, 306b) and the fluid ejection outlet (302b) is predetermined by means of a distance D1, wherein the distance D1 consists of the distance between the bottom end of the ejection nozzle (302n) defining the fluid outlet of the thrust unit and the respective leading edges (BA) of the deflector elements (306a, 306b) and is substantially equal to the diameter (Dn) of the ejection nozzle (302n).

6. The thrust unit (300) according to claim 5, in which, when the thrust engine (302) has a thrust force substantially equal

to forty kilograms and the deflector elements define an angle of attack α substantially equal to forty-five degrees, the relative positioning of the link pins (308paa, 308pab) in relation to the fluid ejection outlet or region (302b) in the transverse plane (PT) is determined by the distances D2 and D5 projected in the transverse plane (PT), such that:

- the distance D2 is substantially comprised between one hundred and twenty and one hundred and sixty millimetres, preferably one hundred and forty millimetres, and
- the distance D5 is substantially comprised between eighty and one hundred and twenty millimetres.

7. The thrust unit (300) according to any one of the preceding claims, in which the thrust engine comprises a turbojet and/or a turboprop engine.

8. A propulsion device (10), containing a platform (11), a thrust unit (300,12), support means (14) cooperating integrally with the platform (11) and arranged to hold and support said thrust unit (300,12), characterized in that said thrust unit (300,12) is according to any one of the preceding claims.