Planning complex flight plans for drones using gvSIG

Cálculo de plans de vuelo complejos para aviones no tripulados

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gvSIG Association
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gisforchange
www.gis4change.org

DRONES – Unmanned Aerial Vehicles

- remotely controlled flying vehicles
- drones fly autonomously through software-controlled flight plans integrated in the system and communicating with the mounted GPS
- often associated with military use, but have many other applications:

environment monitoring	search & rescue	precision agriculture	forest fires	traffic monitoring

MONITORING WITH DRONES

- install a camera for aerial photography or videography
- install more than one camera or use of ground control points for generating point clouds (with elevation) from images (DSM+DTM)

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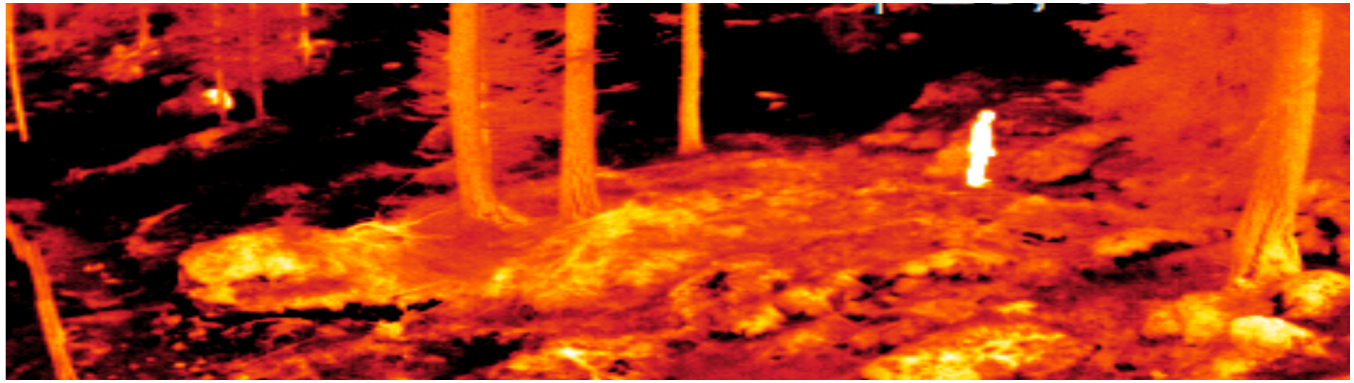
- install a thermal camera to discover objects – persons - animals in forests, solar panel surveys, loss of energy in buildings, fire-maps
- install special sensors (limited dimensions and weight):
  - LiDAR
  - magnetometer
  - special instruments to carry and distribute things

MONITORING WITH DRONES



REGULATION ON DRONES

- must stay within the operator's line of sight or at a maximum fixed distance (500 m)
- can not fly over a maximum height from the terrain (150 m)
- more than 5 km away from airports and air traffic
- prohibit to fly over defined areas (populated zones, zone with privacy restrictions, zone with particular emissions)

FLIGHT PLANS FOR DRONES

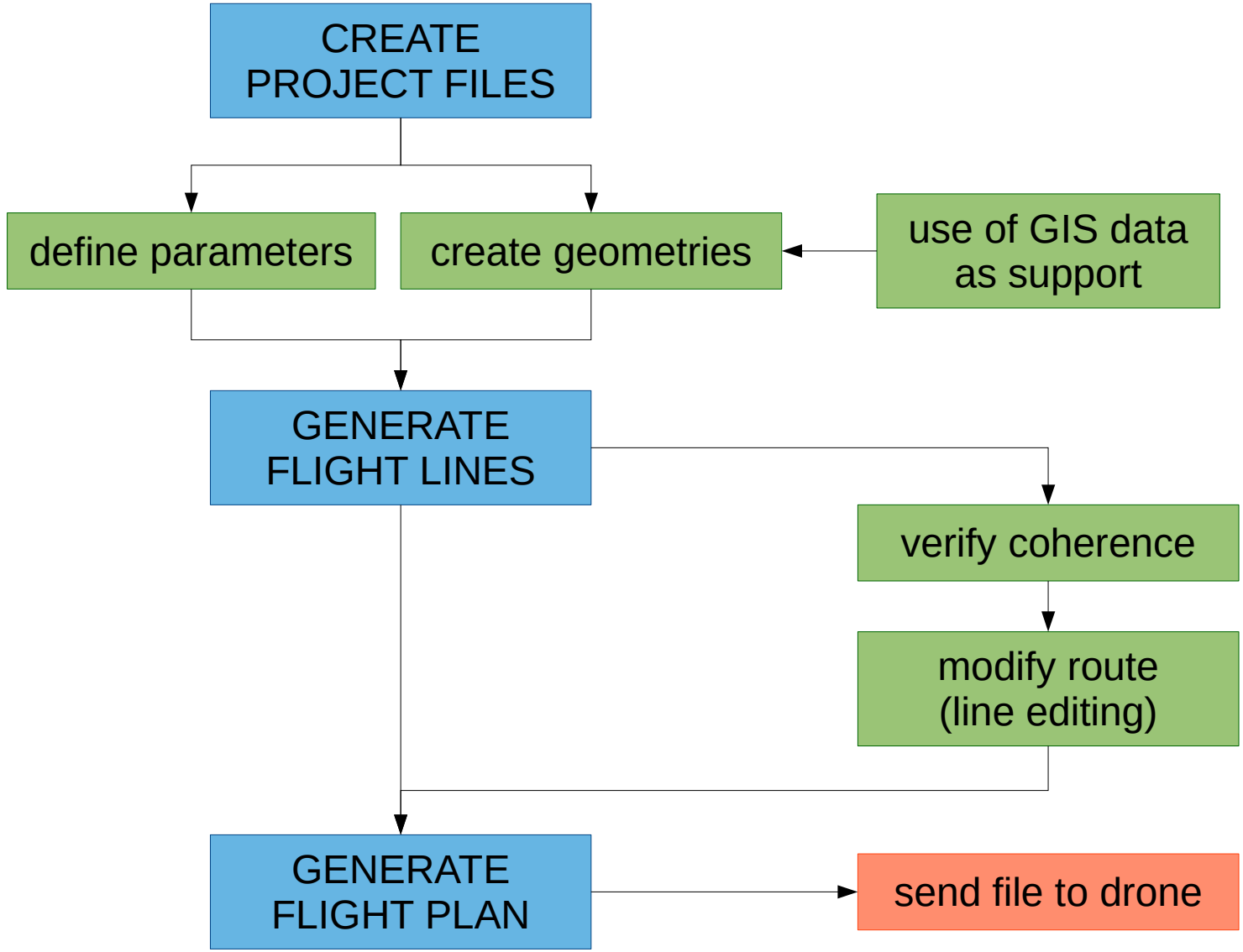
- the piloting control can be:
  - fully automatic
  - partially automatic
  - manual
- flight plans are generated with external software and must consider:
  - legislation rules
  - morphology of the terrain (slope)
  - presence of obstacles
  - specific sensors or survey needs

JGRASSTOOLS: DRONEPLANNER

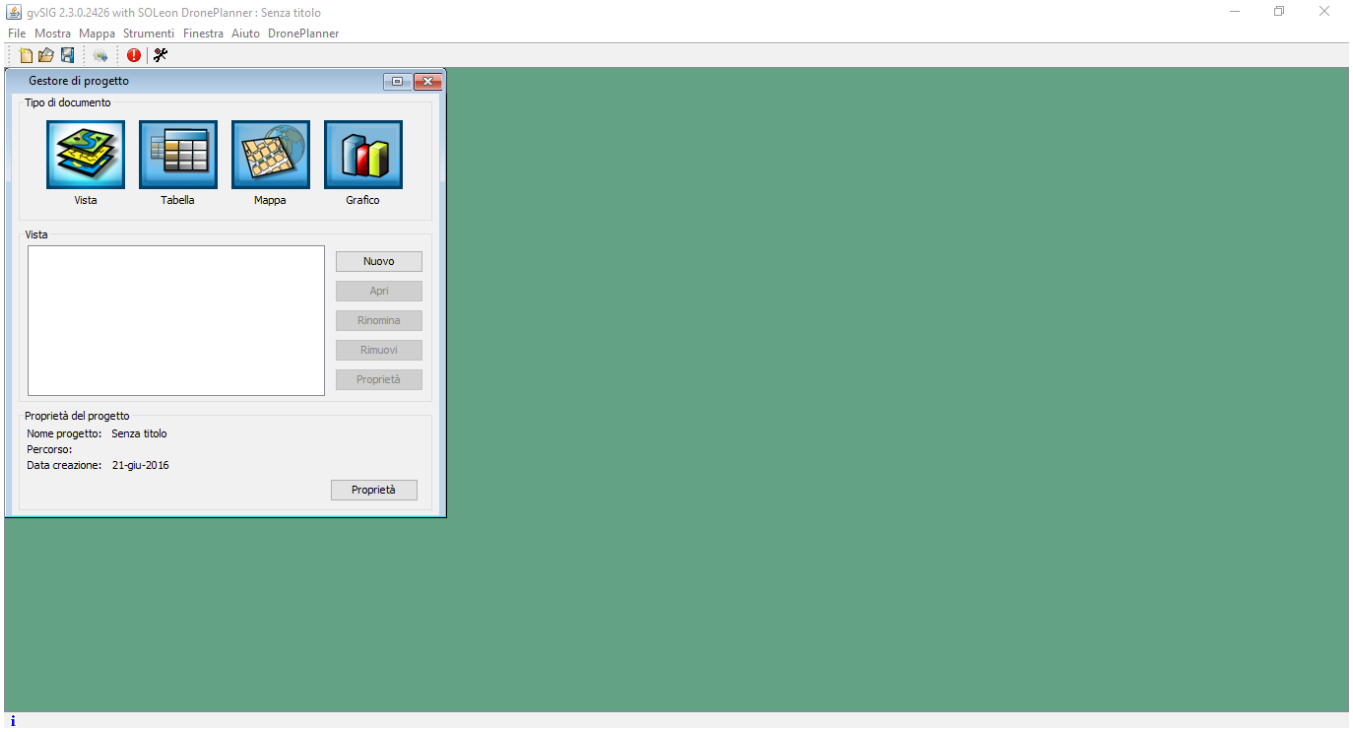
- GIS tools to generate flight plans for drones
  - photogrammetry and magnetism
- GUI is integrated in gvSIG2.3
  - use of geospatial supported data types
  - possibility to edit and define elements
  - interaction between the tools and the layers loaded in the view
  - results are automatically visualized in the map, possibility to check and verify them
  - generate the flight plan ready to be sent to the drone (file format)

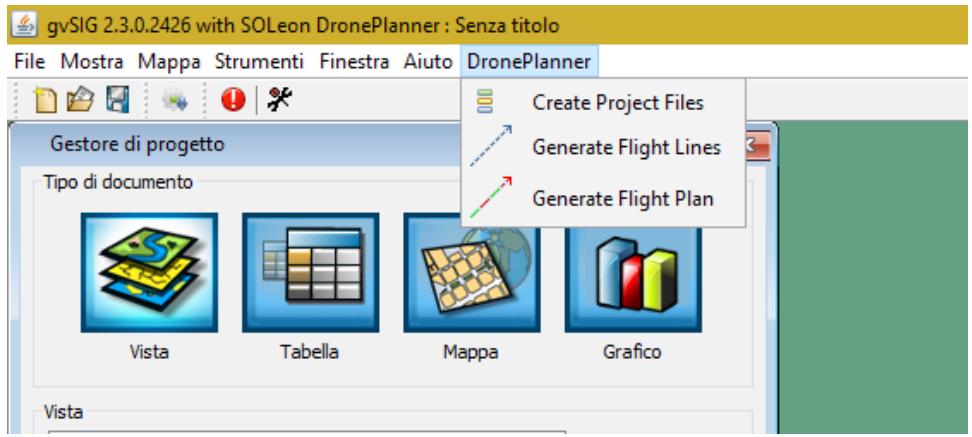
JGRASSTOOLS: DRONEPLANNER

WORKFLOW



JGRASSTOOLS: DRONEPLANNER



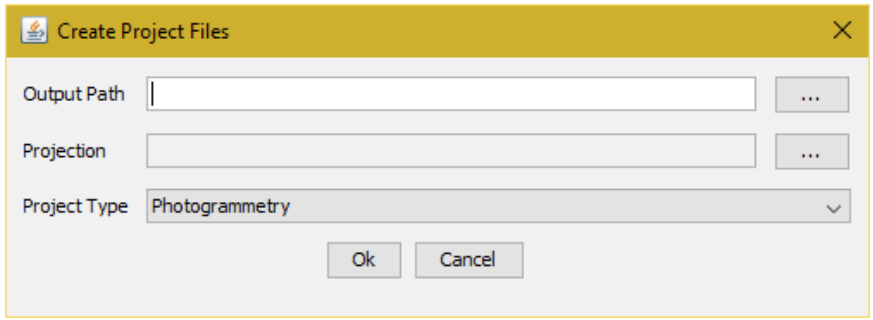


DronePlanner: CREATE PROJECT FILES

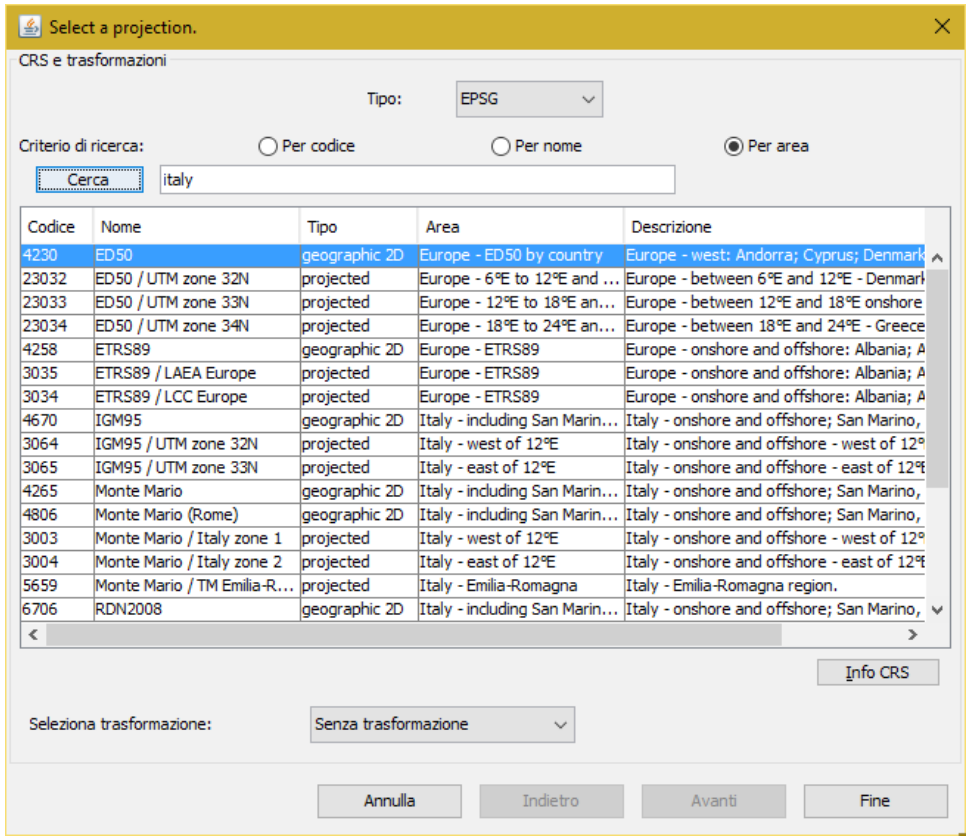
- create a new project and a new view for the data
- create and save spatial layers with specific geometries and attributes
- 5 step procedure:

JGRASSTOOLS FOR DRONES

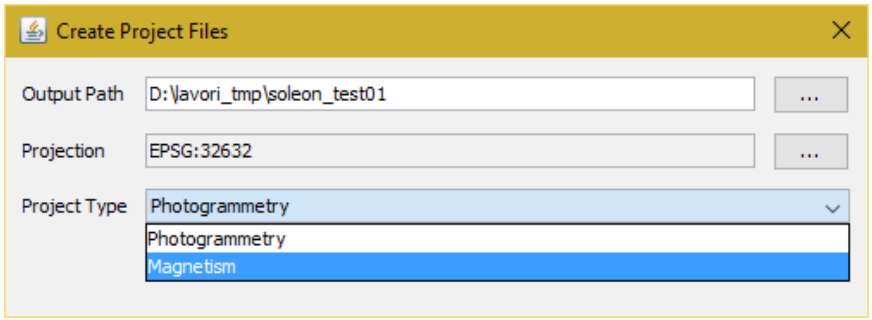
1)define the path where to store the data



2)define the spatial projection

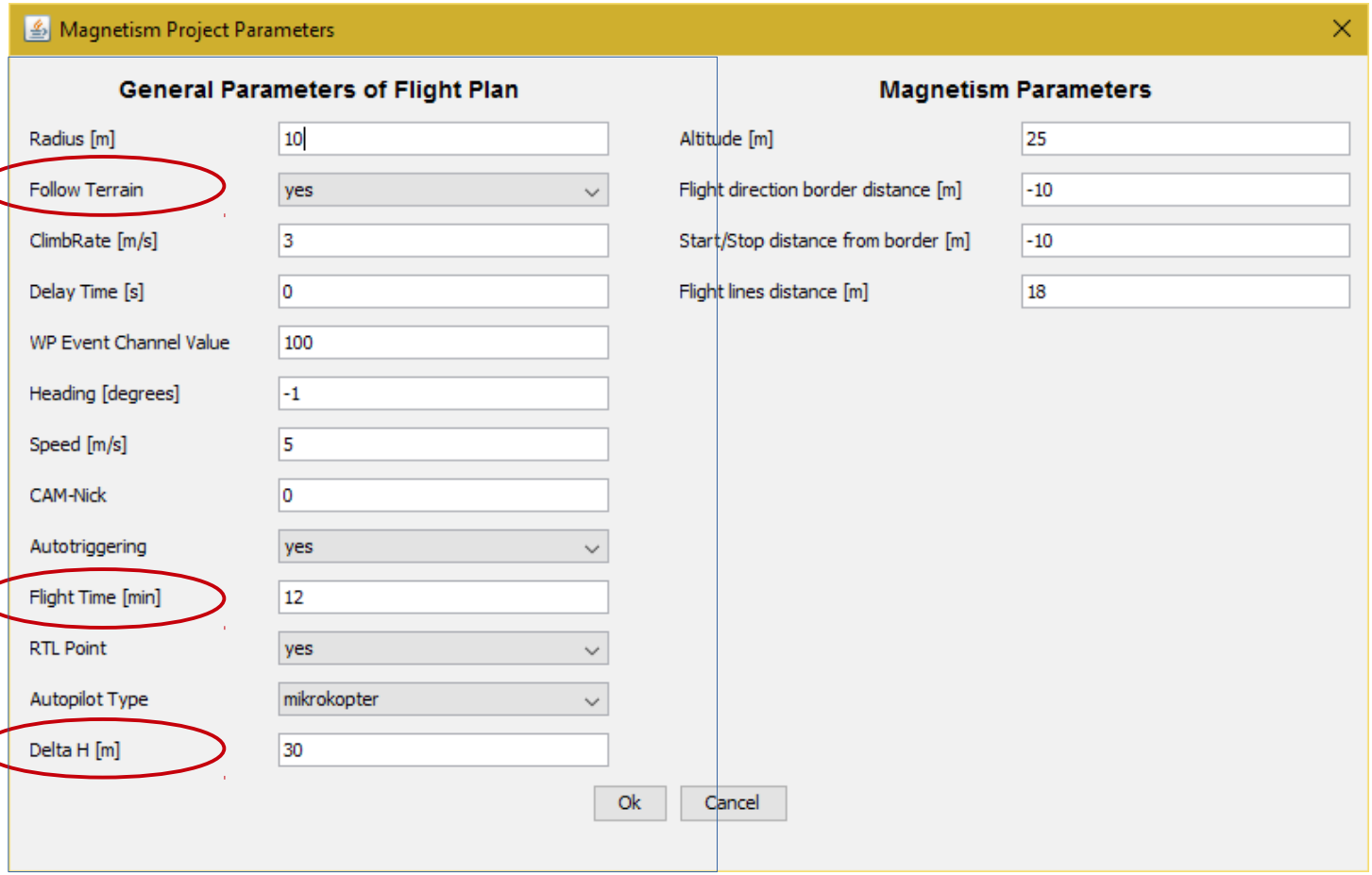


3)select project type



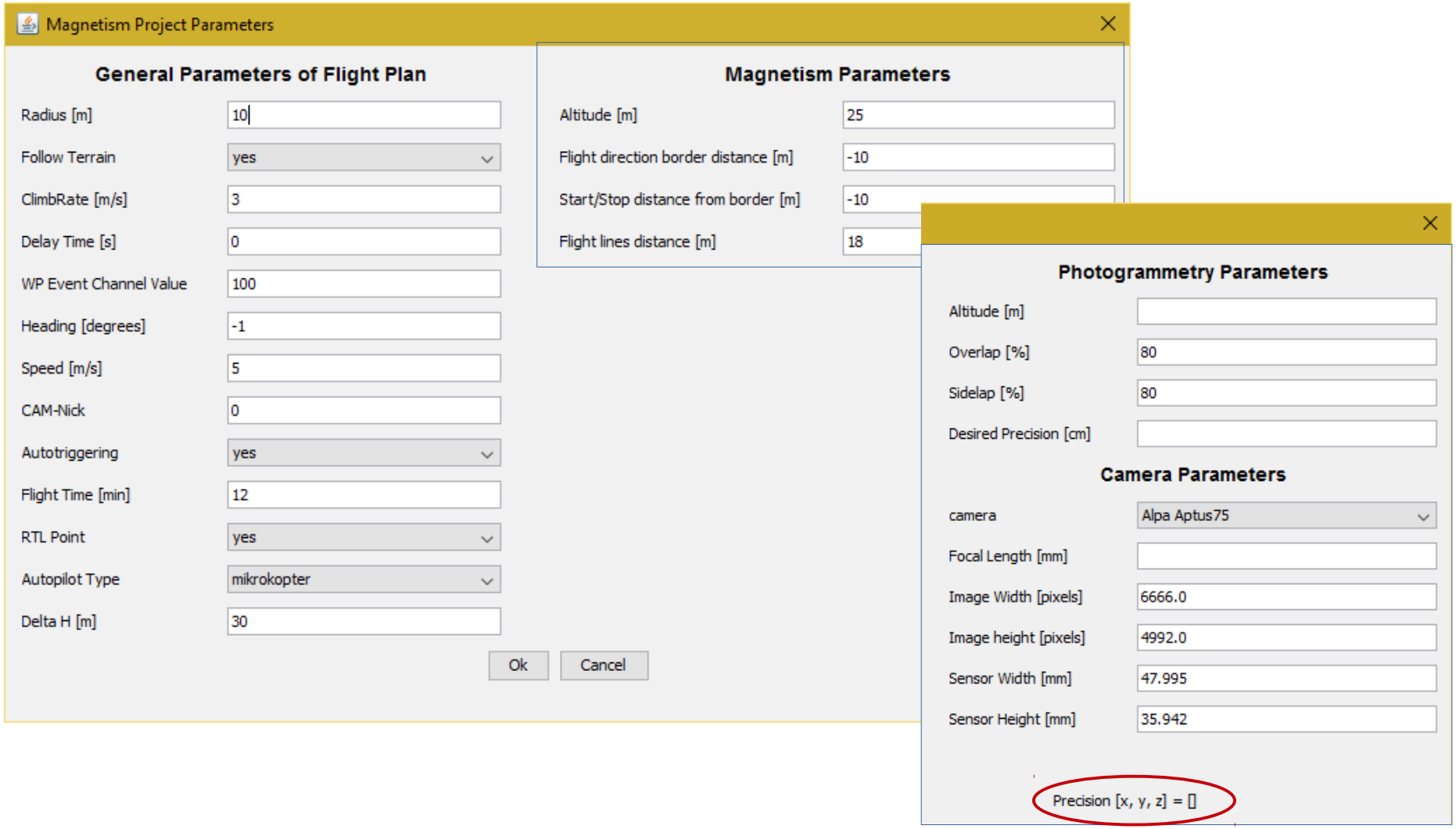
DronePlanner: CREATE PROJECT FILES

4)define general parameters for the flight

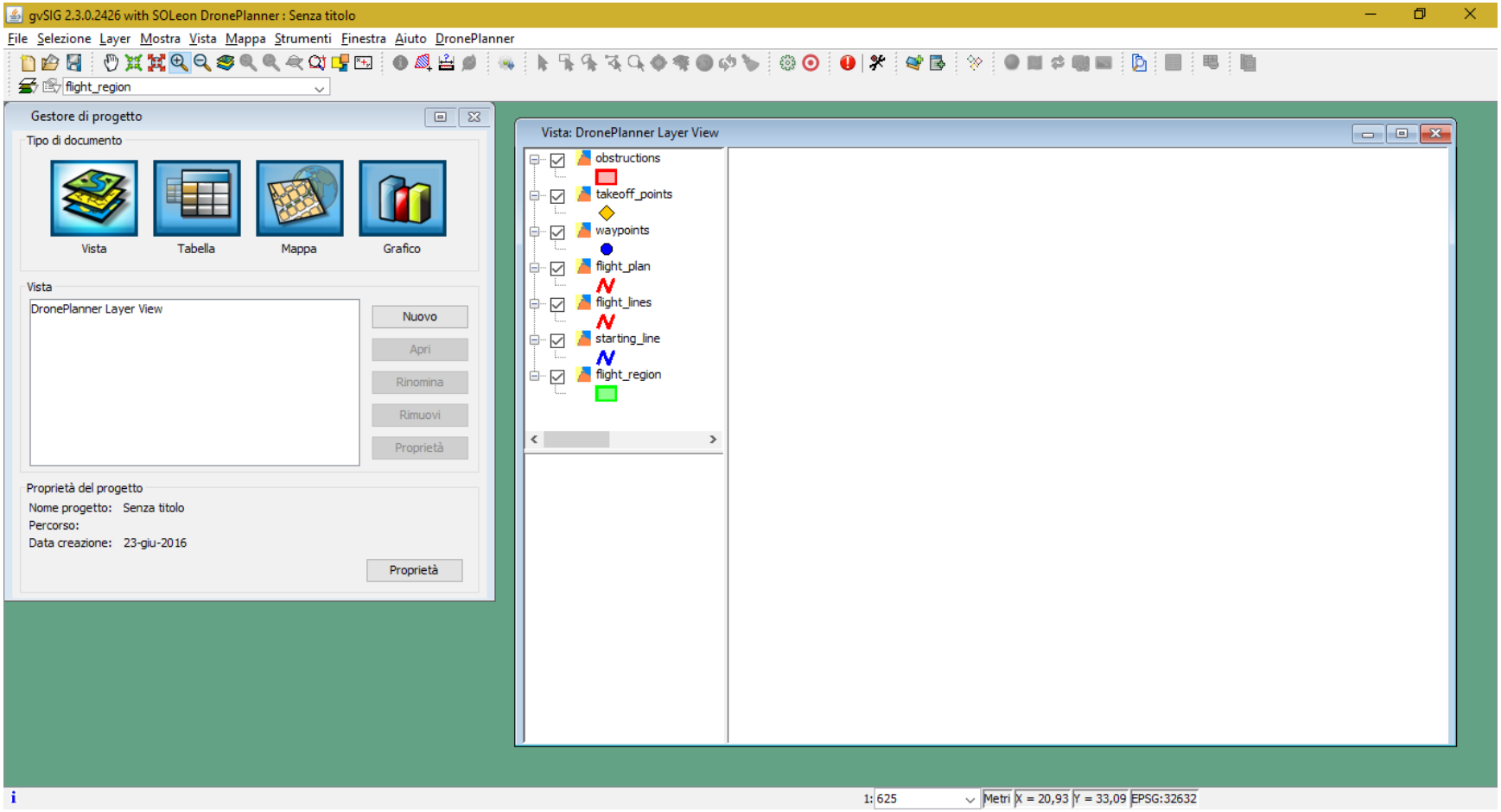


DronePlanner: CREATE PROJECT FILES

5)define specific parameters for the project type



DronePlanner: CREATE PROJECT FILES



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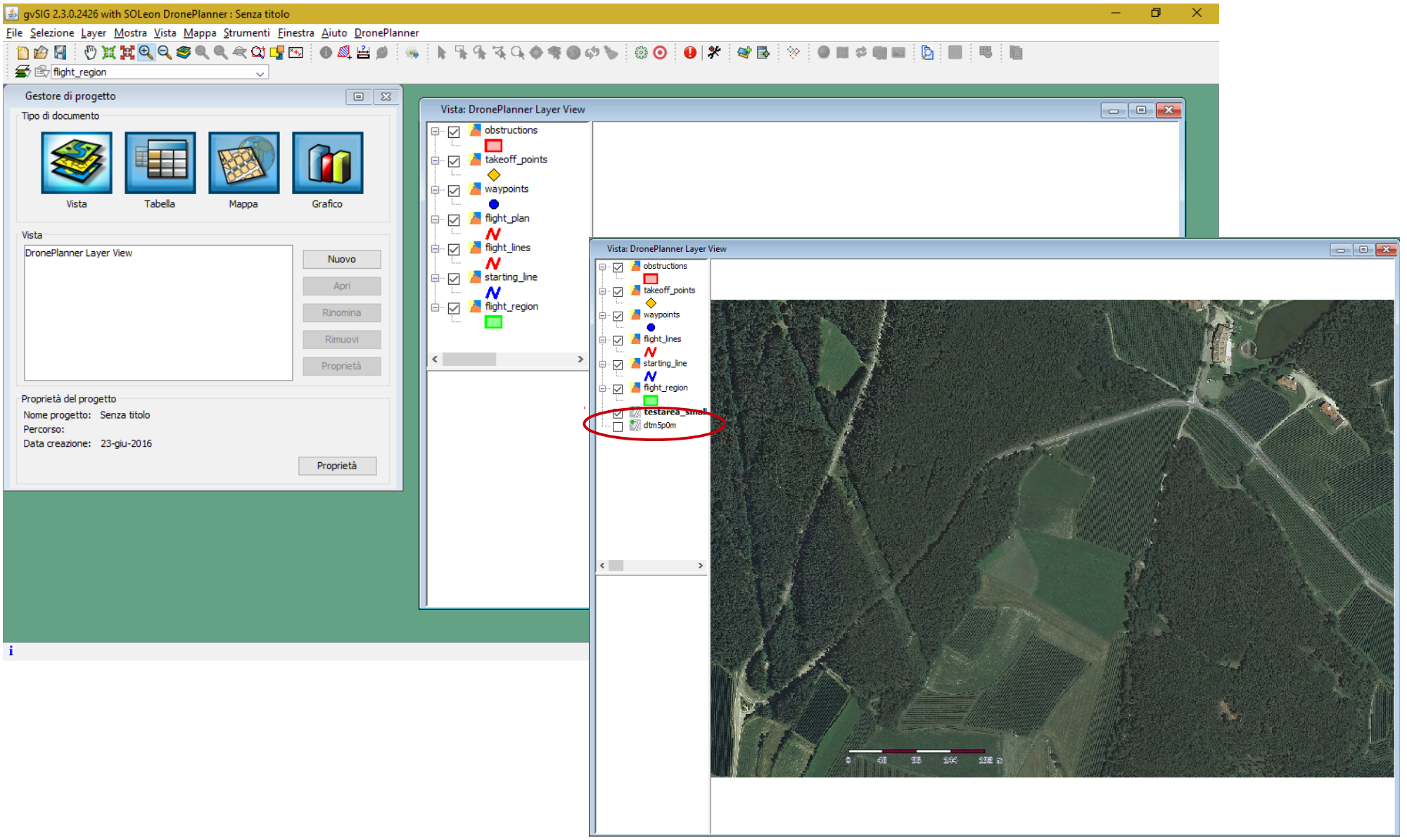
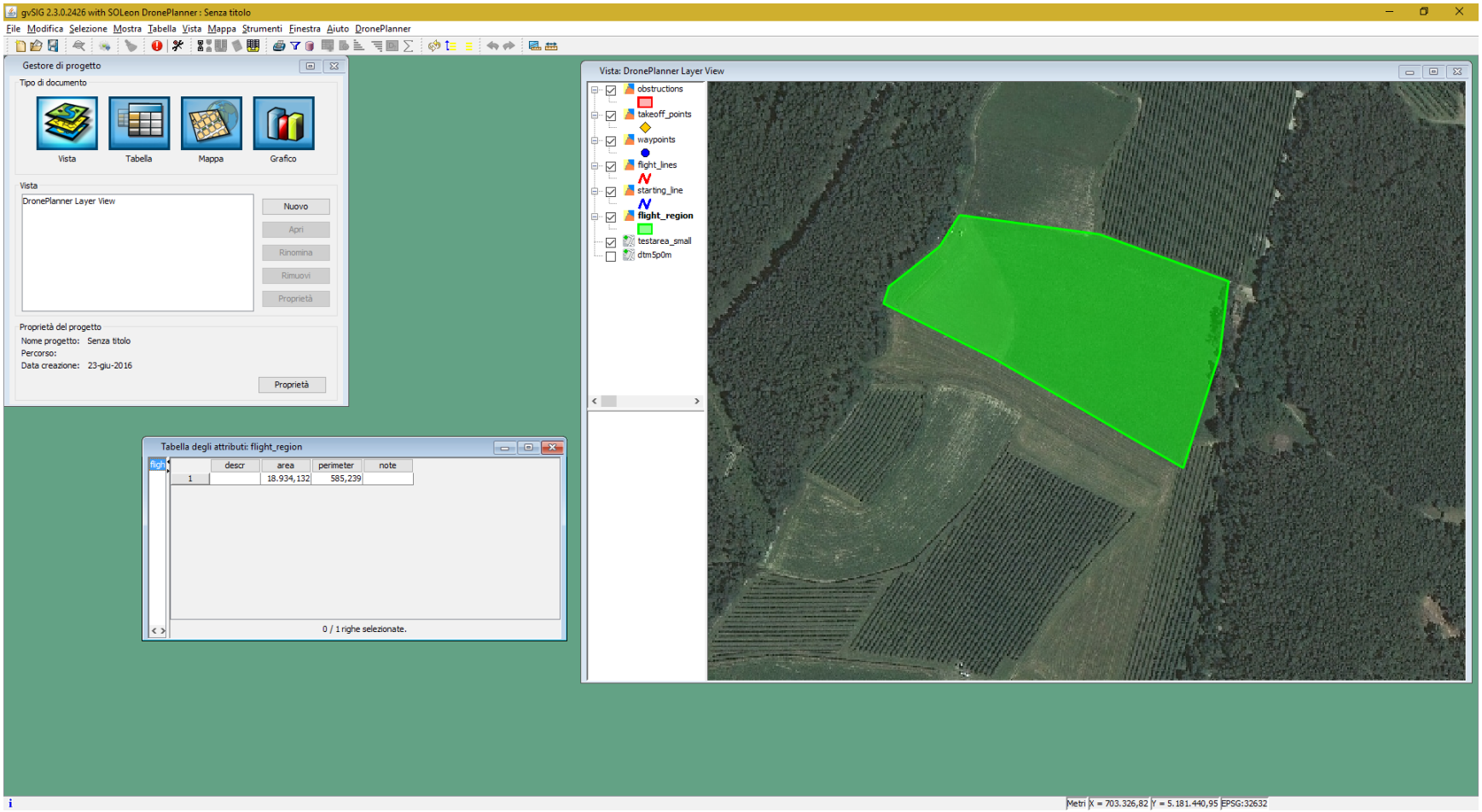
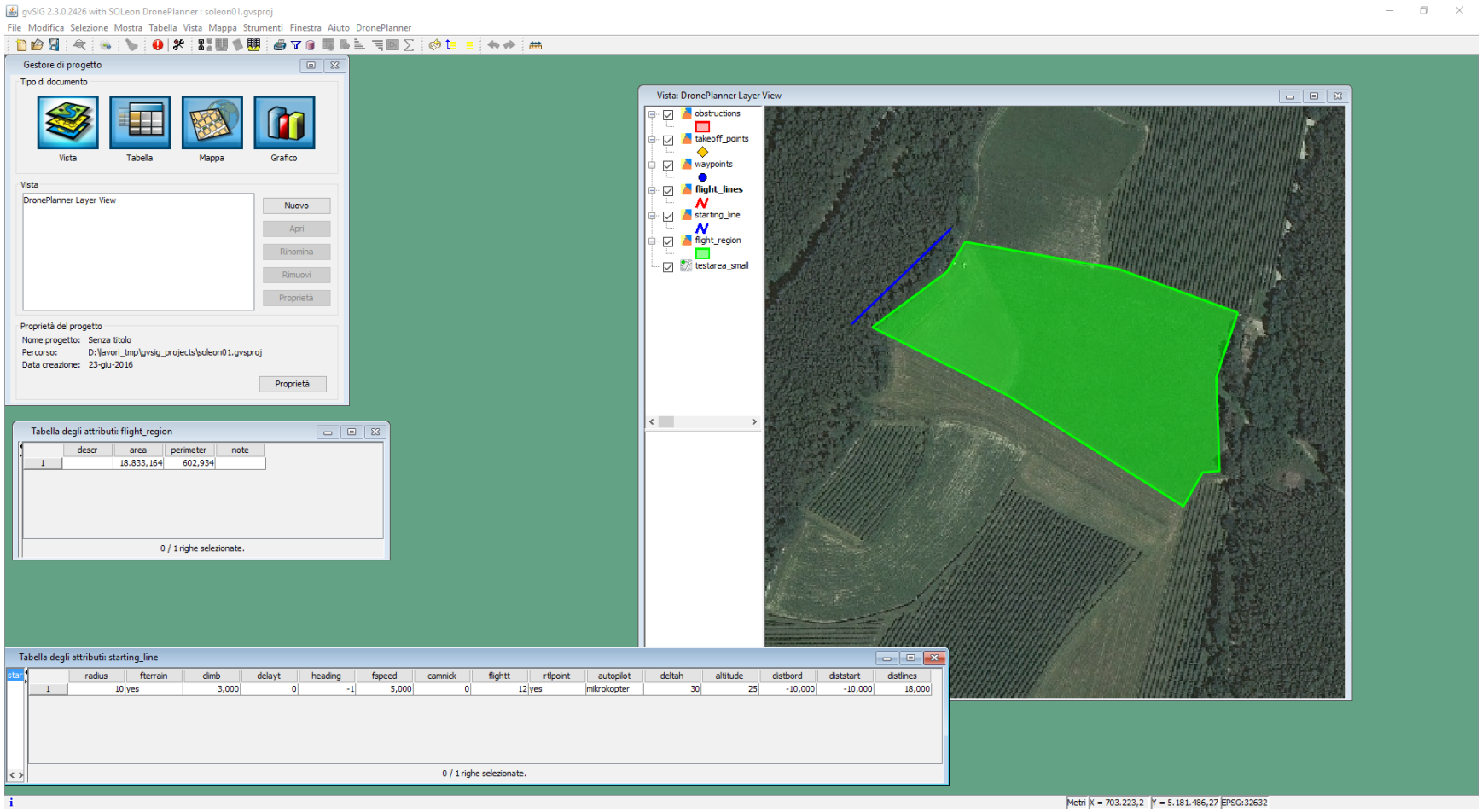


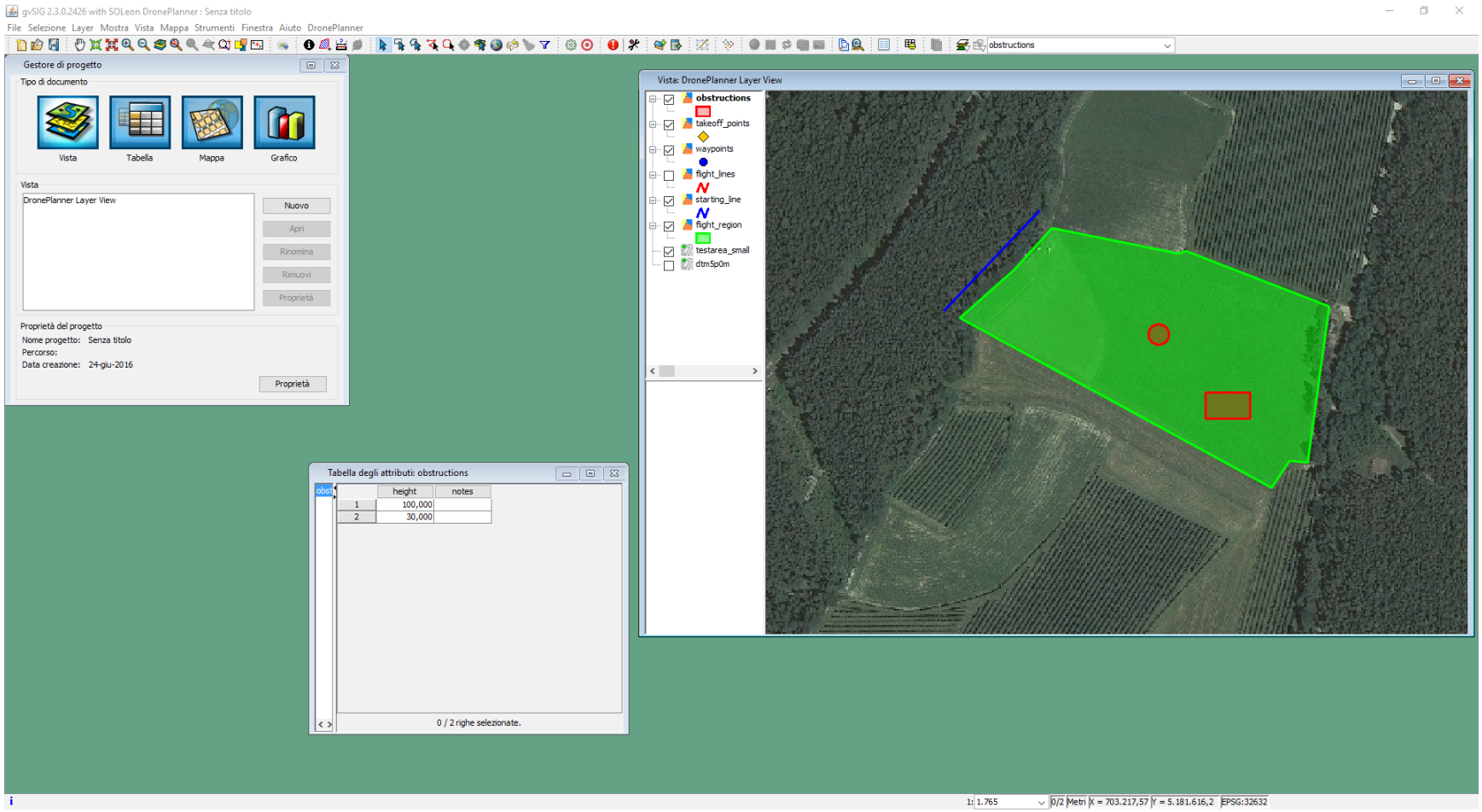
CreateProjectFiles: FLIGHT_REGION



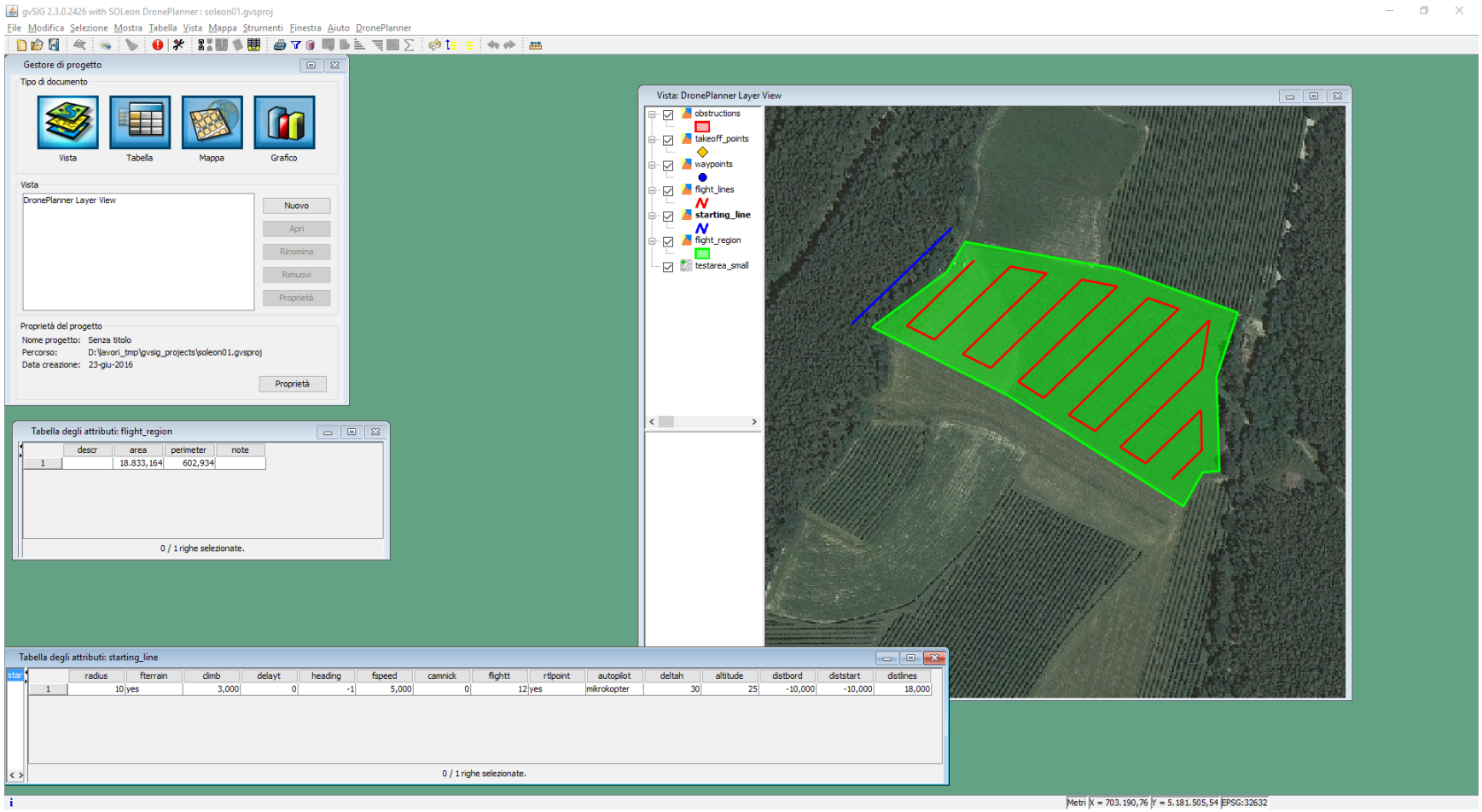
CreateProjectFiles: STARTING_LINE



CreateProjectFiles: OBSTRUCTIONS



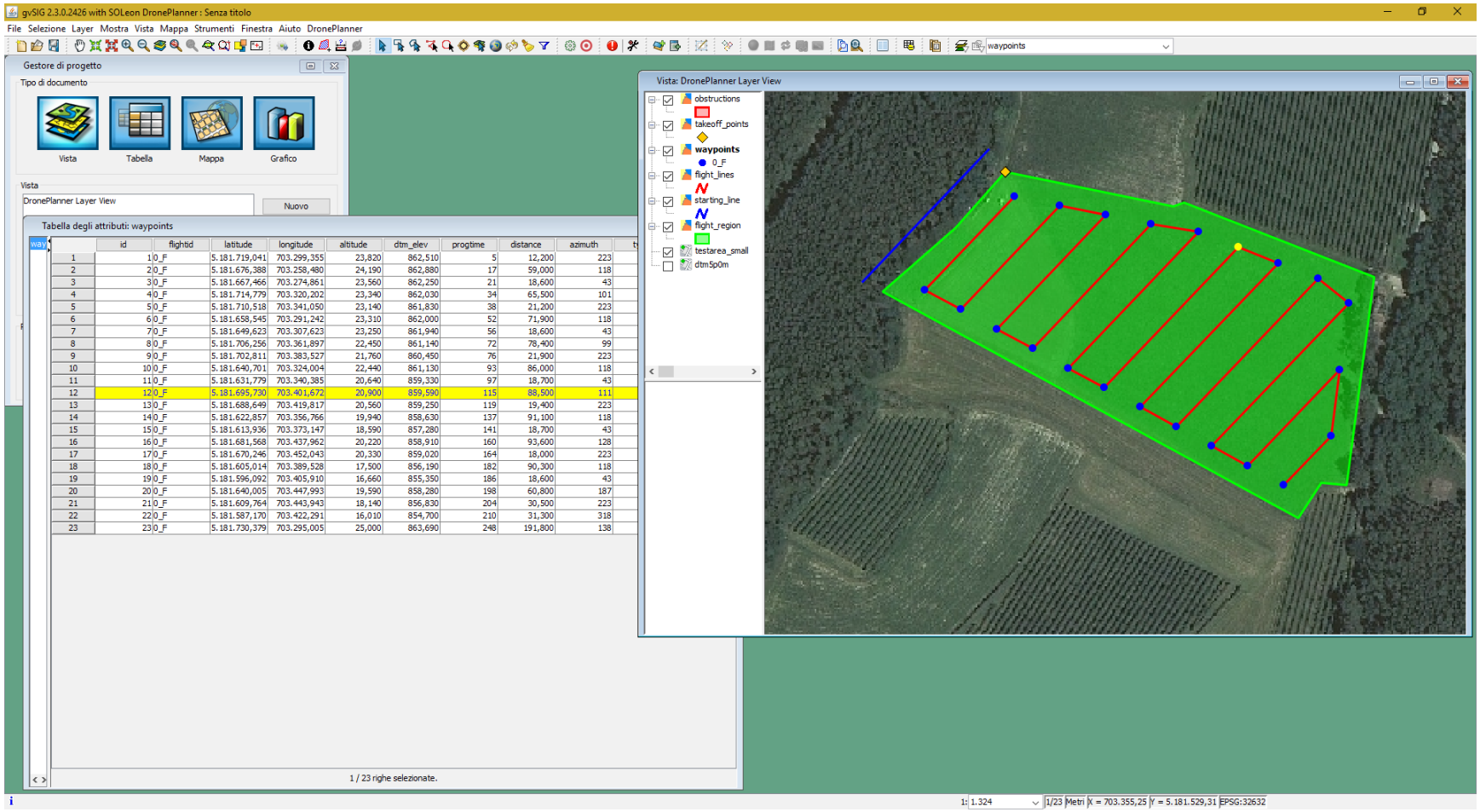
DronePlanner: GENERATE FLIGHT LINE



DronePlanner: GENERATE FLIGHT PLANS

- modify starting line and flight line before generating the flight plans
- takeoff_points:
  - if no takeoff points are specified in the layer → unique takeoff point for all the flights at the first point of the flight line
  - if one or more takeoff points are specified in the layer → for each takeoff point the program generates two flights in the two opposite directions from the points on the flight line

DronePlanner: GENERATE FLIGHT PLANS



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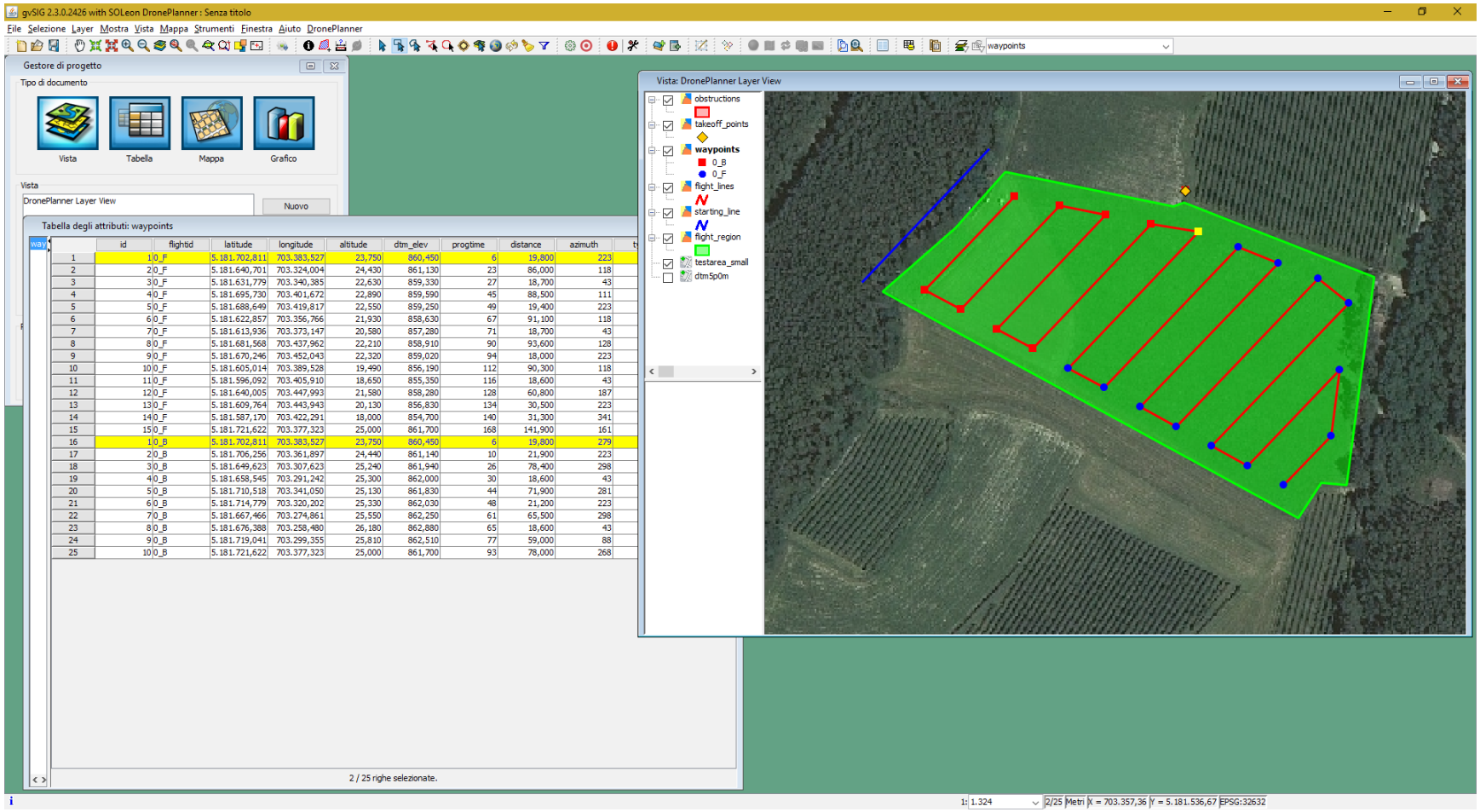

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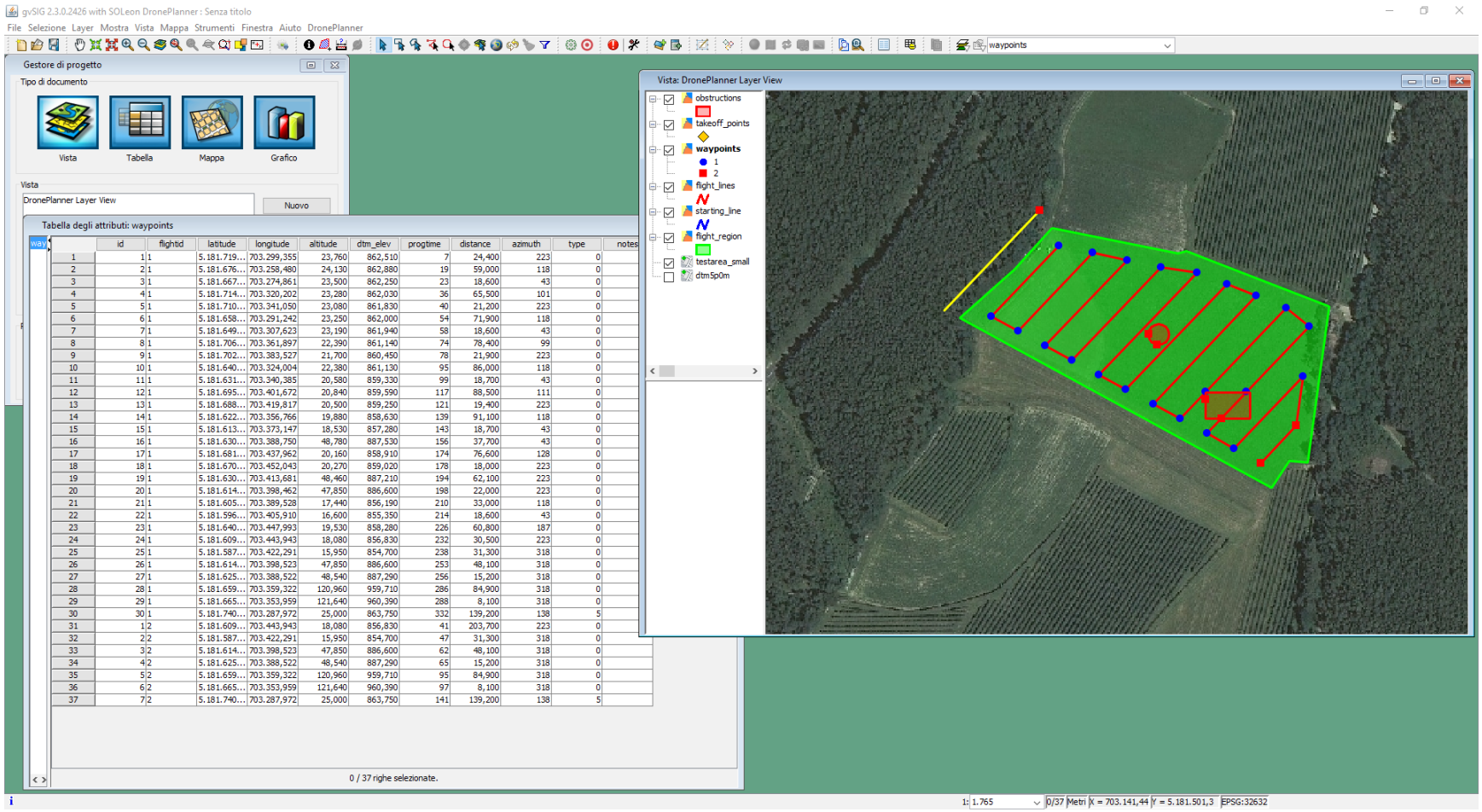
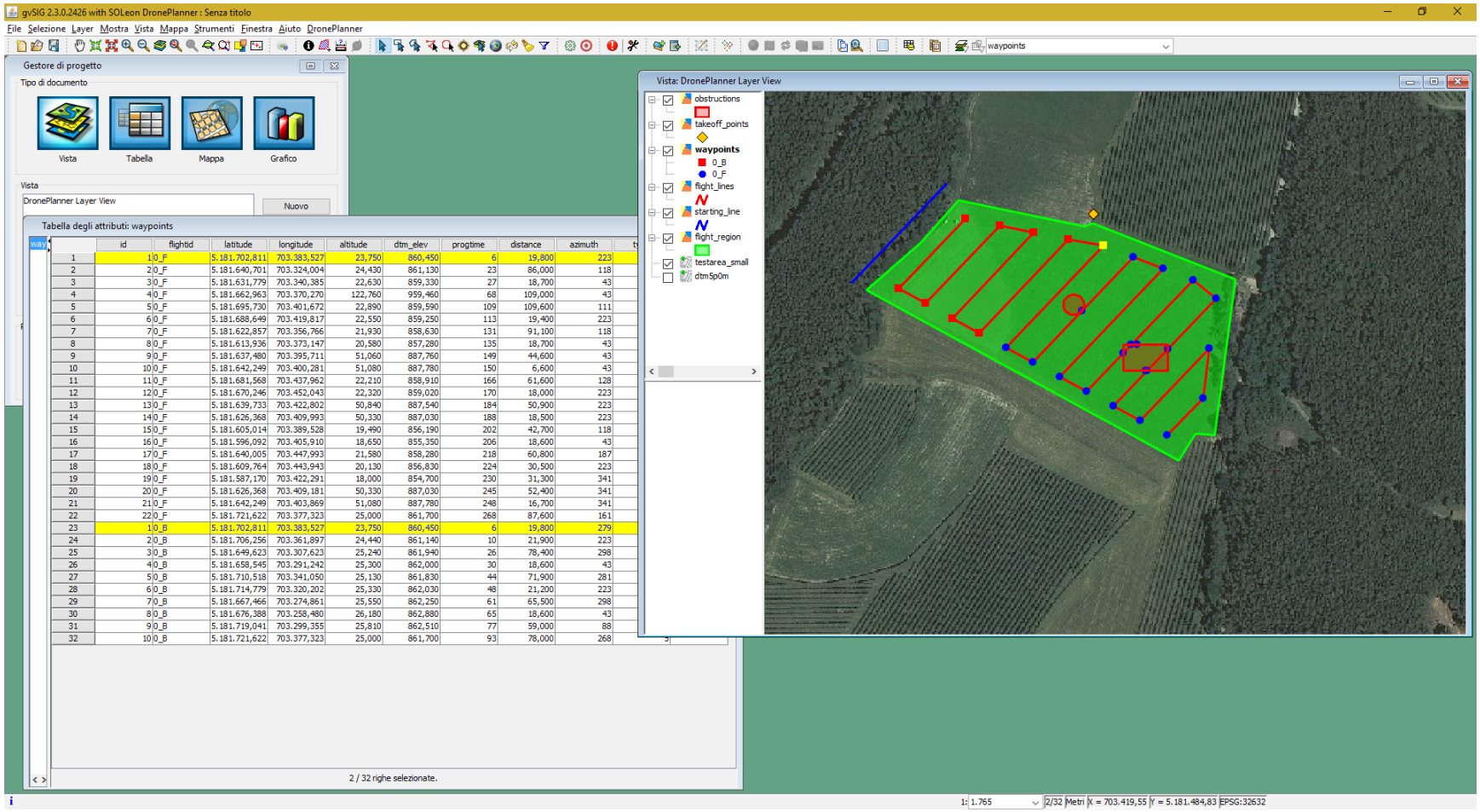


DronePlanner: GENERATE FLIGHT PLANS



JGRASSTOOLS FOR DRONES

- the waypoints layer contain the points of:
  - change direction
  - change elevation for terrain morphology or obstacles
  - if specified also the triggering points
- the tool automatically creates also a ***WPL*** file for each flight ready to be sent to the drone

THANKS FOR THE ATTENTION!

Homepage: http://www.jgrasstools.org

Need help? **Join the Mailinglist**.
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