

Airborne detection of minefields:

General information (2)

Selected areas for airborne detection of minefields in Mozambique.

For the selection of the test areas the following considerations have played a role:

1. The priority listing of the provincial government of e.g. Tete province. Areas have been selected which have a high priority for demining. This to ensure that the field validation programme of NPA is not hampered.
2. The areas selected represent different climatic, geographic zones, etc. There are two test areas in the coastal zone (Buzi and Bandua), an area in the flat, low elevated plains (Mameme) and an area marking the transition between the plains and the mountains with very diverse terrain characteristics (Songo). Climatologically the areas are also different e.g. which is reflected by different types and densities of vegetation.
3. The areas selected have different conflict characteristics and therefore differ with regard to metal contamination, presence or absence of UXO's. All areas consist mainly or completely of minefields with anti-personnel mines. In general there are few anti-tank mines in Mozambique.
4. Access to the areas. The areas selected are relatively close to an airport / landing strip and not too far from major airports for the necessary aviation facilities. Also the access by road for field validation during the airborne campaign / marking and (D)GPS set-up close to the minefield has been considered.
5. NPA is active in the central part of the country (3 provinces). In order not to involve more NGO's for field validation the test areas are selected within the NPA assigned provinces.
6. Basic facilities during the field campaign are available, either by NPA (base camp) or in the villages/towns near the minefield.
7. The areas selected are expected to have high anti-personnel mines densities.
8. Through the co-operation with NPA other facilities are available to the consortium, e.g. office working space, transportation, medic and de-miners for field verification, etc.

Minefield Indicators through Airborne Surveys.

Identification of potential minefields can be derived through direct observation of mines or using indirect ways through the relationship of minefields with objects, which can be recognized on images recorded by an airborne survey. Below a listing is given indicating the places where mines could have been placed. Most of the objects, elements can be detected (incorporating local or field knowledge) using airborne data.

General indicators (for area reduction):

- around villages defensive minefields (circle shaped)
- defensive minefields around key points: approaches to houses used as headquarters, military base camp, dams, pylons, wells, river fording points, water and life stock sipping tanks, electricity (sub)stations, along rivers, bridges and surrounding bridge heads, edges of airfield, football fields,

- market places, police station, ware houses, railway station, cross roads, train wrecks along railways
- paths and access routes to villages
- defensive minefield surrounding a cattle field
- detour along road / track and new road sections adjacent the old road
- shops in villages
- mines in and along trenches
- patterns of minefields: zigzag, strip, circle, square (half open, two sides e.g. along rivers) reflected in vegetation and land use patterns by e.g. a circle shaped strip of vegetation outside the village with some access routes through the strip to reach the agricultural areas further away
- check points along roads
- inferred positions of military equipment, e.g. anti aircraft battery, radio station
- entrances of main roads into the bush
- quarry sites
- some distance from roads in order to prevent attacks on transport passing
- mining along fruit plantations
- mapping of used transition zones by military groups and identification of crossing points with roads
- strategic elevated locations, plateau or hill top which might be used as temporary base
- presence of vehicle wrecks and unused roads
- double or single wire fences
- shores of lakes, lagoons and ponds to deny access
- schools, churches which might have been used as temporary base camps or shelter during the conflict and prevention of re-use
- patterns commonly encountered when mining military camps or headquarters
- major river adjacent to road or railway line adjacent to road
- border area between countries
- branches laid over mines or other indicators placed by the local population if mines have been identified
- known military supply routes from across the border

Detailed potential indicators:

- gabion like structures to prevent gully erosion through minefields
- slit trenches / foxholes and other man made holes / ditches
- man made embankments, camp remnants - equipment
- fencing remnants
- (remnants of) military command posts
- parallel alignment of roads with in between undisturbed vegetated areas

- no mines expected in thin top soil, indicated by e.g. high percentage of gravel / erosion phenomena on steep sloping terrain
- changes in agricultural pattern / use: small connected strip of unused potential arable land
- terrain topography: if minefield should be stable (not affected by erosion) it is likely to follow contours
- only few tracks / paths through the minefield which are marked with (white painted) stones / poles or other markings
- continuation of linear stretch of undisturbed "semi-natural" vegetated land
- minefield not aligned perpendicular to rivers / main streams, rather parallel and adjacent those terrain features



Manual mine detection using a metal detector.

Minefield Indicators through Change Detection Analysis



Through change detection using satellite image historical records



Cleared anti-personnel mines, waiting to be destroyed

from the 70's onward evaluating amongst others potential minefield indicators and area reduction techniques, such as:

- agricultural areas not being used after military intervention and the area gradually transforms into bush
- bridges, roads not being used after military intervention and become overgrown by vegetation
- by passes of road sections after military intervention
- shifting of agricultural areas after military intervention
- villages being deserted
- construction of military camps during the conflict
- identification of key infrastructure elements likely to be mined, e.g. hydro-power plant / dam, industry, airports
- agricultural areas in production during / after the conflict for area reduction



Colour infrared aerial photograph (original scale 1:500), showing the shadow of the aircraft over the minefield (→ : minefield limit)

References:

Final Project Proposal:
Pilot project for airborne minefield detection (May 1997).

or

<http://www.itc.nl/ags/conference>
<http://www.itc.nl/ags/projects>

For more information:

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