TECHNICAL INFORMATION

TACTICAL GLIDING PARACHUTE SYSTEM

INTRODUCTION

The objective of Para-Flite's Project MT-1Z was to double the offset distance capability of the MT-1X type canopy without sacrificing handling docility and tight drop zone landing capabilities. The goal was to increase the present offset capability from the 20± km range to the 40± km range, and it has been achieved.

The MT-1Z system provides the user far greater offset capability than what the current in-service equipment delivers, and by using the full capabilities of the MT1Z system, a doubling of mission offset distances is possible with an increase in load carrying capability (MT-1Z 370 ft^2 all up load carrying capacity is 450 lbs.).

THE CANOPY

The canopy is available in two different sizes to meet varying AUW (All Up Weight) requirements:

1. 308 ft^2 - 360 lb. (main or reserve canopy)
2. 370 ft^2 - 450 lb. (main canopy only)

The unique features of the MT-1Z canopy that are responsible for the increased glide performance, in order of importance are:

A. Modified ram air intake based on patented* modification of the leading edge. This leading edge modification is applied to both the upper and lower surfaces, however, the lower surface modification, the lip, is more readily visible.

B. Materials, specifically the use of zero porosity coated fabric on the top surface.

* US Patent No. 4,406,433

C. Non-Rectangular Planform.

Additionally, the MT-1Z in the standard slider reefed freefall mode enjoys soft to moderate opening shock as a result of a patented** special "lipped" slider.

DEPLOYMENT METHODS

The MT-1Z canopy can be deployed in one of two ways depending on the mission driven requirements of the user.

A. **Standard Freefall Mode**
The MT-1Z canopy can be packed into and deployed from any harness and container currently in use with the MT-1X type canopy in the freefall mode. Deployed in the standard freefall configuration the MT-1Z canopy generally opens slower than the MT-1X/MC-4/MC-5 canopy, and it is suitable for use in both HAHO and HALO modes up to an altitude of 30,000 ft. MSL

B. **MT-1Z Static Line Mode**
To deploy a ram air parachute via static line from military transport aircraft is difficult. When deployment is initiated and sequenced in the same manner as conventional parachutes, ram air parachutes become unreliable, unpredictable and generate excessive opening forces

The reason for ram air parachute deployment problems via static line activation is due to the much shorter suspension lines that are inherently used with ram air parachutes and due to the much faster opening characteristics. The significantly shorter suspension lines cause deployment to take place in close proximity to the transport aircraft while the fast opening characteristics result in possible deployment during the transition from the jumper-aircraft alignment to the relative-wind alignment. In the case of military transport aircraft, namely, high speed, this angular transition is not significantly less than 180°. During this transition, because the short length of the suspension lines, the canopy travels between the jumper and the aircraft totally uncontrolled and dangerously close.

To overcome this problem the New Zealand Air Force Parachute Training and Support Unit (PTSU) conceived a system, which was then developed by Para-Flite, that allows the deployment to be controlled at all times and provides for much greater jumper and aircraft separation during the process. Basically, the jumper and aircraft separation is increased by the addition of a long bridle, that is approximately equal to the length of the suspension lines, and the transition problem is solved by not transitioning the exposed canopy but transitioning a pilotchute and bridle assembly with the canopy still retained in a deployment bag.

** US Patent No. 5,005,785

This concept was developed by Para-Flite with considerable help from U.S. Navy, U.S. Marine Corp. and New Zealand Air Force personnel, and has been in service as part of the U.S. Navy MT-1XSL system, as well as the type classified MC-5 parachute system.

OPERATIONAL USE

The MT-1Z canopy may be used operationally in a variety of ways to facilitate the user's needs and budget as follows:

A. The MT-1Z with standard deployment bag and pilotchute may be used to replace existing MT-1X type main canopies in the parachute systems that are currently in service.

   This allows the user to benefit from the advantages of the MT-1Z in terms of handling and landing as well as a 50% improvement in offset distances.

   From another perspective, this implementation of the MT-1Z main canopy will allow the user to obtain the *same offset distances from 17,500 ft. MSL* that the currently in-service canopies produce from 25,000 ft. MSL. Additionally, because of the lower exit altitude, *no oxygen pre-breathing is required* to achieve these offset distances.

B. The MT-1Z main canopy including its high speed/high altitude deployment system can be installed in any existing static line operable harness/container.

   This mode of use will allow operational use of the MT-1Z main canopy up to 25,000 ft. MSL. The limitation is based on the limitations of the reserve canopy and the harness/container. From 25,000 ft. MSL the MT-1Z canopy performance will allow for offset distances that are approximately 50% to 70% greater than existing parachutes in service.

C. As part of the MT-1Z system with identical main and reserve canopies.

DESCRIPTION

The harness/container is similar to that of the MC-5. The system includes parts and subassemblies that allow it to be assembled as a freefall system and/or as a static line operated system.

The reserve parachute assembly remains the same whether the system is assembled for freefall use or static line operated use.

The main parachute assembly when assembled for freefall use will be deployed with a special patented sail slider reefing system packed into a deployment bag, which is extracted by a spring launched pilotchute via a bridle.

The main parachute assembly, when assembled for static line activation, is deployed with the aid of two deployment bags, a static line, and a sail slider reefing that is aided by a springless pilotchute. The static line deployment sequence is as follows:

1. The static line opens the main parachute compartment and extracts the main parachute assembly. The outer deployment bag is fixed to the end of the static line.

2. As the jumper falls away, the suspension lines are unstowed from the outer deployment bag with the last stow releasing the inner deployment bag.

3. As the jumper continues falling away, the main parachute, contained in its inner deployment bag, is extracted from the outer deployment bag. The drogue/slider control line is also extracted with the drogue parachute, which is the last thing that is pulled from the outer deployment bag.

4. The alignment of the system at this point is from jumper towards the aircraft. Then the main parachute locked in its inner deployment bag together with the drogue/slider control line and the drogue parachute, transitions to the new alignment with the relative wind. Once aligned with the relative wind the drogue parachute inflates and generates sufficient drag to unlock the inner deployment bag.

5. With the inner deployment bag unlocked the main canopy is extracted and deployment takes place with the sail slider's reefing being aided by the drogue parachute acting through the drogue slider control line.

6. Once the main canopy is fully deployed and the slider is pushed down the length of the suspension lines to the connector links, the drogue slider control line, which is connected to the slider, and which slides freely through the canopy through grommets, pulls the drogue parachute onto the top surface of the canopy.

Static line deployment from high speed military transport aircraft is made possible by the containment of the main canopy during the transition from alignment with the aircraft to alignment with the relative wind and through the extra time and altitude separation provided by the additional length of the reefing bridle.

HISTORY

The MT-1Z main canopy in its present format evolved over a period of four years of research, development and testing. Several hundred live jumps have been accumulated on the MT-1Z main canopy ranging from near zero speed deployments to full terminal deployment by rucksack equipped personnel. Live jump deployment altitudes ranged from 3,000 ft. AGL to 30,000 ft. MSL. However, the 30,000 ft. MSL jumps were limited to only a few, and were done without rucksacks. Numerous live jumps in both HALO and HAHO modes were made from 15,000 ft. MSL, and a few live jumps from 17,500 ft., 18,000 ft. MSL, and 25,000 ft. MSL. The MT-1Z (308 ft^2) canopy has been structurally tested in the freefall deployment mode as well as the static line deployment mode with 432 lbs. suspended load at an indicated air speed of 200 MPH at near sea level density altitude.

The MT-1Z received safety certification from the U.S. Army for live jump utilization with altitude and weight restrictions. The MT-1Z has undergone FAA TSO certification tests successfully with the exception of deployment times, which, of course, are longer for military parachutes intended for high altitude deployment.

SUMMARY

The MT-1Z family of canopies provides for glide performance which is approximately 50% better than the MT-1X/MC-4/MC-5 canopy. This improved glide performance exhibits itself mostly through a slower rate of descent which translates to additional performance benefits in the form of softer landings under all circumstances. Even though the glide performance of the MT-1Z is significantly greater than existing parachutes in service, this was not obtained through an increase in aspect ratio, which could have further improved glide performance but at the expense of handling docility and accuracy capabilities.

The use of zero porosity fabric on the top surface has permitted a greater load carrying capability without increasing the size and bulk of the canopy. In the instance of the 370 ft^2 version, a 25 percent increase in the load carrying capacity has been attained over the systems presently in use (MT1-X, MC-4, MC-5, etc.).

The MT-1Z high altitude/high speed static line deployment system eliminates the limitation of freefall qualified users only, provides precise control of deployment altitude, and exceptional reliability. This unique deployment system also has the benefit of being connected to the jumper *only via the main risers*, thereby making emergency handling procedures *exactly the same* as they are for existing parachute systems. The MT-1Z canopy can be deployed like existing main parachutes from existing harness/container systems, which results in offset distance capability equal to existing parachutes, but from an altitude that is low enough to eliminate the need to pre-breathe oxygen, or significantly greater offset distance from the same altitude.

The MT-1Z main canopy with its unique static line activated deployment system can be installed in any static line operable harness/container system in service now, thereby extending the offset glide capability by 50% to 70% with minimal expense and little or no additional training of users.

MT-1Z (308) Parachute System Specifications

Assembly Part Number	820455 (Main/Reserve Canopy)
Parachute Type	Ram Air, 11 Cell
Canopy Aspect Ratio	2.19
Canopy Construction	Chordwise
Canopy Fabric	Top Surface: Zero Porosity Coated Nylon Ripstop Bottom Surface: Nylon Ripstop, 0-3 SCFM, MIL-C-44378
Canopy Span	26.25 ft.
Canopy Chord	12 ft.
Actual Canopy Area	308 ft^2
Number of Lines	48 (continuous) + control lines (2)
Line Strength and Type	Spectra 600 lb.
Parachute System Basic Weight	45 lbs.
Parachute System All-Up Weight (AAD & PHAOS)	60lbs.
Deployment Altitude Maximum	25,000 ft. MSL
Lift/Drag Ratio, Full Glide	3.5-4:1
Rate of Descent @ 200 lbs.	11 fps
Rate of Descent @ 350 lbs.	12 - 15 fps
¼ Brake @ 200 lbs.	10 fps
½ Brake @ 200 lbs.	9 fps
¾ Brake @ 200 lbs.	9 fps
Turn rate, 180º Turn	1.5 - 2 seconds
Turn rate, 360º Turn	2 - 4 seconds
Forward Speed @ 200 lbs.	42 fps
Forward Speed @ 300 lbs.	55 fps
Color of Harness and Pack	Customer's Option
Color of Canopies	Customer's Option
Additional Features	Trim Tabs, Patented Lipped Slider

MT-1Z (370) PARACHUTE SYSTEM SPECIFICATIONS

Assembly Part Number	820305 (Main) / 820805 (Reserve)
Parachute Type	Ram Air, 11 Cell
Canopy Aspect Ratio	2.5
Canopy Construction	Chordwise
Canopy Fabric	Top Surface: Zero Porosity Coated Nylon Ripstop Bottom Surface: Nylon Ripstop, 0-3 SCFM, MIL-C-44378
Canopy Span	30.8 ft.
Canopy Chord	12 ft.
Actual Canopy Area	370 ft^2
Number of Lines	48 (continuous) + control lines (2)
Line Strength and Type	Spectra 600 lb.
Parachute System Basic Weight	47 lbs.
Parachute System All-Up Weight (AAD & PHAOS)	62 lbs.
Deployment Altitude Maximum	30,000 ft. MSL
Lift/Drag Ratio, Full Glide	4-4.5:1
Rate of Descent @ 200 lbs.	8 fps
Rate of Descent @ 350 lbs.	10 - 12 fps
¼ Brake @ 200 lbs	8 fps
½ Brake @ 200 lbs.	7 fps
¾ Brake @ 200 lbs.	7 fps
Turn rate, 180º Turn	1.5 - 2 seconds
Turn rate, 360º Turn	2 - 4 seconds
Forward Speed @ 200 lbs.	42 fps
Forward Speed @ 300 lbs.	55 fps
Color of Harness and Pack	Customer's Option
Color of Canopies	Customer's Option
Additional Features	Trim Tabs, Patented Lipped Slider

PROPERTY OF:
Para-Flite Inc.
5800 Magnolia Avenue, Pennsauken, NJ 08109-1399, U.S.A.
Tel: (1) (856) 663-1275 E-Mail: Marketing @paraflite.com