

Space-Air-Ground Integrated Forest and Grassland Fire Prevention and Extinguishing Equipment System



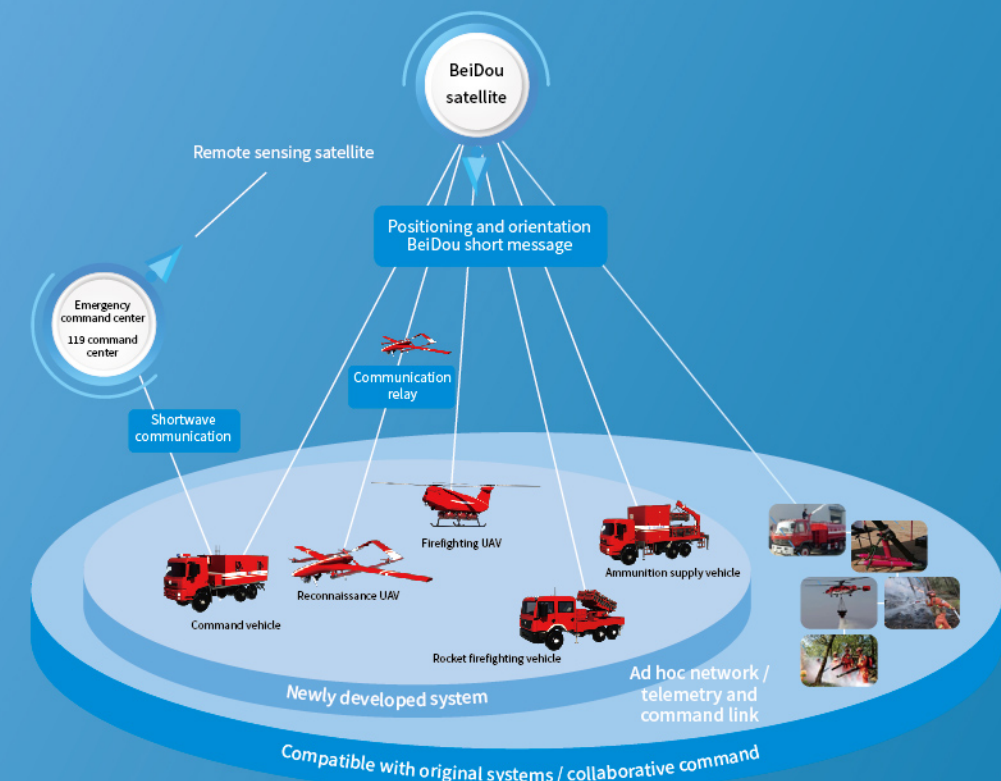
Pain points in forest and grassland fire protection

- **Inadequate early warning network**
Low coverage, low automation, late detection and slow reporting
- **Weak communication support capability**
Lack of multi-mode composite networked communication capability in complex environments,
Poor sharing of fire information and firefighting resources
- **Poor accessibility in forest areas**
Traditional firefighting equipment and personnel have difficulty approaching and extinguishing fires
- **Low firefighting efficiency of equipment**
Lack of advanced firefighting equipment capable of "early detection, early attack, and complete extinction"
- **Low level of intelligence**
Poor on-the-spot decision-making, low efficiency of collaborative command

Space-Air-Ground Intelligent Connectivity + Multi-mode Composite Communication Assurance

An emergency communication system based on a multi-mode composite of "5G public network + Mesh ad hoc network + BeiDou short messages" is established to achieve the goal: in complex mountainous/forested areas, "emergency communication remains reliable, and information sharing has no blind spots."

- **Networked communication system**
A communication guarantee system of "5G public network + ad hoc network + BeiDou short messages" is built – in the event of network disconnection, Mesh nodes can self-heal within 30 seconds, ensuring stable video and data backhaul.
- **Space-Air-Ground Early Warning**
Information sharing and fusion, "one-point detection, full-network awareness" – satellite warning within 2 seconds, drone verification within seconds, and coordinates pop up simultaneously on mobile terminals.
- **Efficient command**
Big data support, AI models, and intelligent pre-plans build a full "detection, command, attack, assessment" process – the command vehicle generates a firefighting pre-plan within 5 seconds, and safe evacuation routes are simultaneously marked in red.





Overview of core advantages of the space-air-ground integrated forest and grassland fire prevention and extinguishing equipment system

This system provides a comprehensive, intelligent solution for forest fire prevention and control:



- **ZERO** blind spot in early warning
Using remote sensing satellite images, drone image AI fire recognition, and fixed forest monitoring networks, the false alarm rate for fire points is kept below 0.3%, with warnings pushed within 5 seconds.
- **ZERO** communication isolation
The 1.5GHz Mesh network provides stable infrastructure-free ad hoc communication, and BeiDou-3 short messages ensure emergency communication. A stable and reliable multi-mode composite communication network of 5G public network + Mesh ad hoc network + BeiDou short messages is built.
- **ZERO** data barriers
Intelligent learning algorithms perform fire scene situational information fusion and accurate prediction, assessing fire spread trends within 5 seconds, providing a scientific decision-making basis for firefighting and rescue resource allocation and collaborative command.
- **ZERO** access limitation
The preferred KSV60 small UAV, equipped with an electro-optical intelligent fire early warning mission payload, has a continuous cruise time ≥ 2 hours, speed ≥ 100 km/h, and can achieve 100% forest coverage.
- **ZERO** delay in prevention and control
Airborne firefighting UAVs integrate detection and attack. The cluster rocket fire extinguishing system can optionally provide beyond-visual-range coverage.
- **ZERO** threshold for command
The command system generates a firefighting pre-plan within 5 seconds, is compatible with both new and old equipment, and features plug-and-play operation, improving command efficiency.
- **ZERO** manual post-assessment
A 3D fire scene model is automatically generated within 5 minutes, providing data support for insurance claims and ecological compensation.



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1.1 Performance parameters

Parameter	Reference value
Multi-source fire warning	Remote sensing satellites, reconnaissance UAVs, ground-based electro-optical detection, and personnel alarms
Composite communication support	5G + ad hoc network + BeiDou-3 short message multi-mode composite
Number of ad hoc network nodes	>128
Command capability	Heterogeneous equipment types >10, quantity >128
First fire disposal rate	<1% (avoidable with continuous detection)
Fire pre-plan generation time	<5 s
Task distribution time	<4 s
Aerial fire extinguishing	Intelligent burst height control; single unit can contain a 1000 m ² crown fire
Long-range fire extinguishing	Extinguishing distance 0.5–25 km; single vehicle 40-round continuous fire, containing 10000 m ²



1.2 Technical highlights

- High mobility, fast speed, good effect of early detection, early attack, and complete extinction
- 5G + ad hoc network + BeiDou-3 short message composite communication guarantee, unimpeded information flow
- Space-air-ground networked, reliable automatic early warning with second-level response
- Global situational awareness, dynamic optimization of prediction, safe and economical
- Efficient collaboration of multi-domain heterogeneous equipment, high fire extinguishing efficiency
- Good compatibility; new and old firefighting equipment can be used immediately upon access
- Superior performance, simple operation, good effectiveness

1.3 Actual installation effects

- | | |
|-----------------------------|-------------------------------|
| ■ Equipment informatization | ■ Communication networking |
| ■ Automatic early warning | ■ Intelligent decision-making |
| ■ Remote fire extinguishing | ■ Unmanned operation |



Intelligent Command Vehicle

2.1 Performance Parameters

Parameter	Reference Value
Overall length	8.30 m
Overall width	2.50 m
Overall height	3.60 m
Minimum turning radius	9.00 m
Curb weight	5.5 t
Maximum speed	80 km/h
Maximum climbing angle	35°
Fire pre-plan generation time	≤5 s
Task distribution time	≤4 s
Composite communication support	5G + ad hoc network + BeiDou-3 short message
Maximum number of command nodes	128 devices

2.2 Technical Highlights

- Good scalability, ready for combat upon access
- Networked early warning: one-point detection, full-network awareness, second-level response
- Spatio-temporal registration, information fusion, unified situational awareness
- Big data and AI support, automatic prediction of fire situation and resource demand
- Intelligent pre-plan generation, online assessment, multi-domain collaborative control
- Automatically complete post-action assessment and recovery plan, update database

2.3 Actual Installation Effects

- Intelligent decision-making, scientific command, safe and economical, highly efficient collaboration



Cluster Rocket Firefighting Vehicle

3.1 Performance Parameters

Parameter	Reference Value
Overall length	7.60 m
Overall width	2.50 m
Overall height	3.10 m
Rotation angle of direction mechanism	±160°
Curb weight	9.2 t
Maximum speed	80 km/h
Composite communication support	5G + ad hoc network + BeiDou-3 short message
Elevation angle of elevating mechanism	0-65°
40-round continuous firing	≤10s
Launch capability	20 tubes × 2
Single vehicle containment area	≥10000m ²
Range	0.5-25 km
Ultrafine dry powder fire extinguishing bomb type	Unguided, guided

3.2 Technical Highlights

- Long-range beyond-visual-range fire extinguishing, zero personnel contact, good safety
- Short continuous firing time, large containment area, high fire extinguishing efficiency
- Automatic firing direction calculation and gun adjustment, low training cost
- Multiple vehicles can coordinate firing, with automatic safety detection of firing direction
- Built-in BIT (Built-In Test) detection, simple maintenance and support
- Simple ammunition loading, short resupply time
- Built-in outriggers, strong adaptability for field operations

3.3 Actual Installation Effects

- Remote containment, rapid attack, suffocation fire extinguishing



Integrated Supply Vehicle

4.1 Performance Parameters

Parameter	Reference Value
Overall length	9.20 m
Overall width	2.50 m
Overall height	4.20 m
Minimum turning radius	9.00 m
Curb weight	13 t
Maximum speed	80 km/h
Composite communication support	5G + ad hoc network + BeiDou-3 short message
Maximum climbing angle	35°
UAV electrical energy resupply	8 kW generator power supply in field, continuous charging
Vehicle fuel resupply	400 L fuel resupply
Fire Suppression Munition Supply	4 boxes (80 rounds total) of rocket fire bombs, 16 rounds of 50 kg-class airdrop fire bombs
Helium Supply	200L High-Pressure Helium

4.2 Technical Highlights

- Responds to commands, autonomous navigation, status reporting
- Integrated resupply of electrical energy, fuel, and ammunition
- Built-in lifting gear, boxed bomb resupply is easy and fast

4.3 Actual Installation Effects

- Orders executed reliably, on-site resupply, robust support capability



Firefighting UAV

5.1 Performance Parameters

Parameter	Reference Value
Maximum takeoff weight	≥650 kg
Maximum payload	≥300 kg (excluding fuel)
Service ceiling	≥6500 m
Endurance	≥2 h
Composite communication support	5G + ad hoc network + BeiDou-3 short message
Cruise speed	100 km/h
Protection rating	≥IP54
Wind resistance	Level 6 (takeoff/landing) / Level 8 (cruise)
Operating temperature	-40°C to +55°C
UAV type	Tandem-rotor UAV
UAV power type	Diesel
Fire extinguishing bomb type	Water-based / dry powder / inert gas, intelligent burst height control

5.2 Technical Highlights

- Integrated detection and attack, facilitating the goal of early detection, early attack, and complete extinction
- Operational radius: ≥100 km
- Strong bomb-carrying capacity: can carry six 50 kg-class airdrop fire bombs
- Single-unit fire containment area: ≥1000 m²
- Automatically measures mountain forest height, precisely controls the burst height of fire bombs
- Automatically corrects crosswind influence online, precisely controls airdrop parameters
- Capable of multi-UAV networking and collaborative operation
- Autonomous mission parsing, automatic route planning, automatic obstacle avoidance

5.3 Actual Installation Effects

- Integrated detection and attack, control upon detection, early attack on small fires



Reconnaissance UAV

6.1 Performance Parameters

Parameter	Reference Value
Maximum takeoff weight	≥30 kg
Maximum payload	≥15 kg (excluding battery)
Service ceiling	≥5000 m
Endurance	≥2 h
Composite communication support	5G + ad hoc network + BeiDou-3 short message
Cruise speed	≥100 km/h
Protection rating	≥IP54
Wind resistance	Level 6 (takeoff/landing) / Level 7 (cruise)
Operating temperature	-40°C to +55°C
UAV type	Compound-wing UAV
UAV power type	Electric

6.2 Technical Highlights

- Infrared + visible + laser three-in-one payload pod, high detection accuracy
- Long endurance, fast cruise, long range, high efficiency for forest patrol
- Integrated with space-based and ground early warning networks, automatic early warning, fast and reliable
- Intelligent automatic smoke and fire recognition function during patrol flight
- Fixed-point hover detection, real-time transmission of fire scene images and fire prediction
- Autonomous mission parsing, automatic route planning, automatic obstacle avoidance

6.3 Actual Installation Effects

- Day/night perception, long-endurance cruise, rapid response

Features & Advantages

Directly connected to emergency command center, 119 command center, multi-domain collaboration of heterogeneous equipment



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