International Forest Fire News (IFFN) No. 32 (January – June 2005, 72-76)

Modern Information Technologies and Prospects for Establishment of Regional Situation Centers for Monitoring and Control of Forest Fire (Regional Forest Fire Coordination Centers)

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Developed by the Federal State Unitary Enterprise Experimental Construction Bureau (KBOR FGUP), a Regional Forest Fire Coordination Center (RFFC) is a set of specially organized work places to carry out analytical work on an individual and team basis. The main objective of RFFC is to support strategic decision making through visualization and in-depth analysis of day-to-day information. Presenting situation in visualized images compresses information providing an overall insight into the developments. Acting on instructions from the State Forest Service of Russia's Ministry of Natural Resources, KBOR FGUP and *Avialesookhrana* FGU applied modern information technologies to develop a hierarchical structure for monitoring and management of resources and units to monitor, prevent and fight forest fires in Russia.

Figure 1 demonstrates the hierarchical structure for monitoring and management of resources and units.

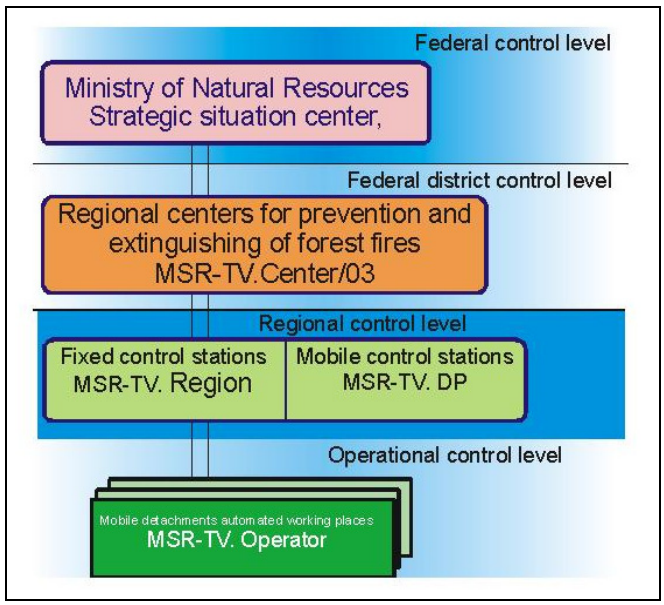

Figure 1. Hierarchical structure of monitoring and manpower and equipment control

The organizational arrangements of information coordination between the Khabarovsk Regional Forest Fire Center (RFFC) are based on the Main Functions and Decision Making Levels of government authorities, members of the Steering Committee.

The Far Eastern RFFC will directly manage a mobile fire fighting unit, provided with all the required resources and facilities.

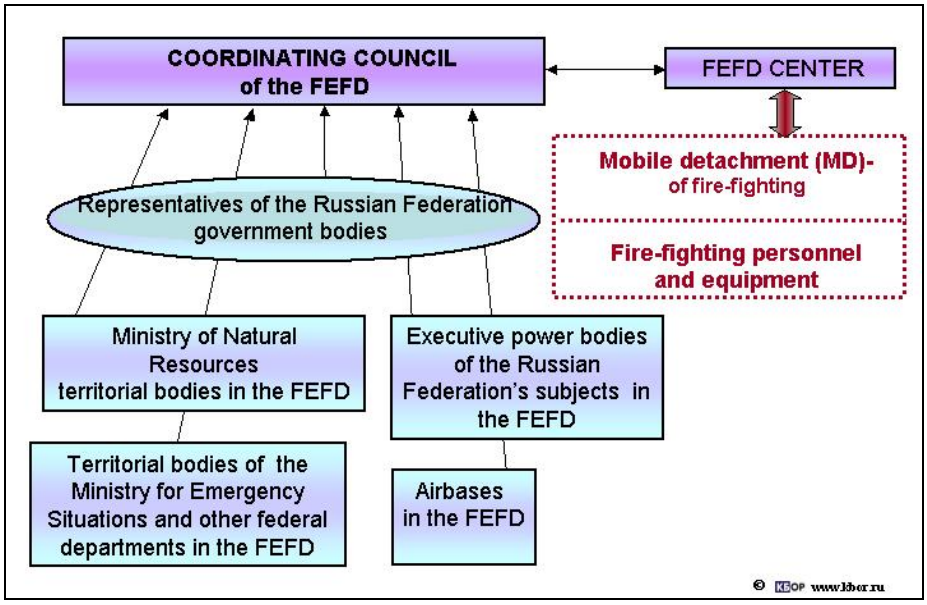

Figure 2. Information on the interaction structure of the Khabarovsk Regional Forest Fire Center (RFFC) with basic functions and different levels (regional, federal) of decision making in responding to fire incidents.

In the Far Eastern Federal Okrug (FEFO), the RFFC will control 6,215,900 km^2 (36.4% of Russia's territory). Figure 3 presents targets of monitoring, interaction and management, as well as basic information about the Far Eastern Federal Okrug.

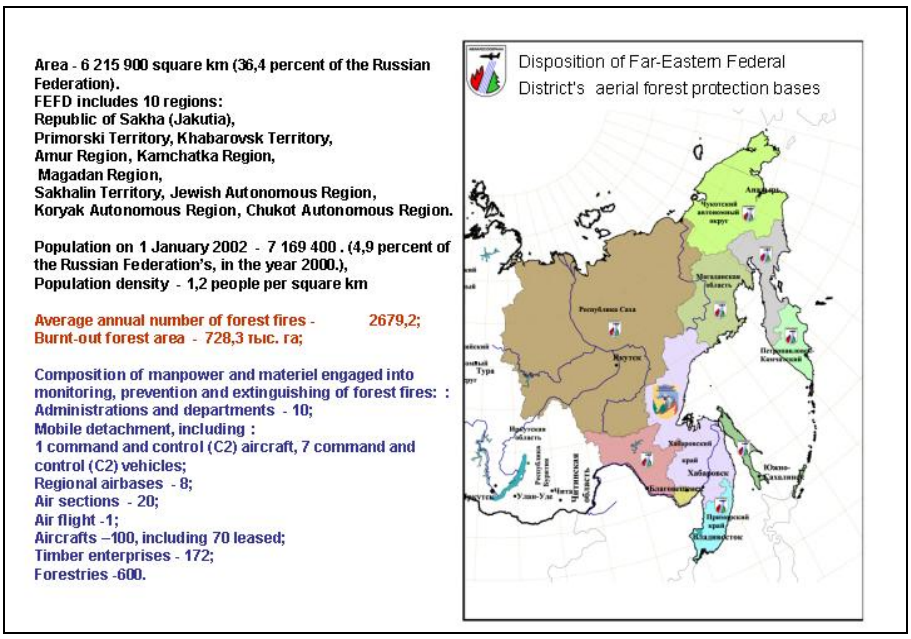

Figure 3. Area of responsibility and basic data of institutions involved in forest fire management in the Far-Eastern Federal District (FEFD).

The Center structure will ensure ongoing interaction with 17 federal objects, management coordination with 27 objects and control over 872 lower level objects. Figure 4 presents the information coordination arrangements of a regional forest fire coordination center.

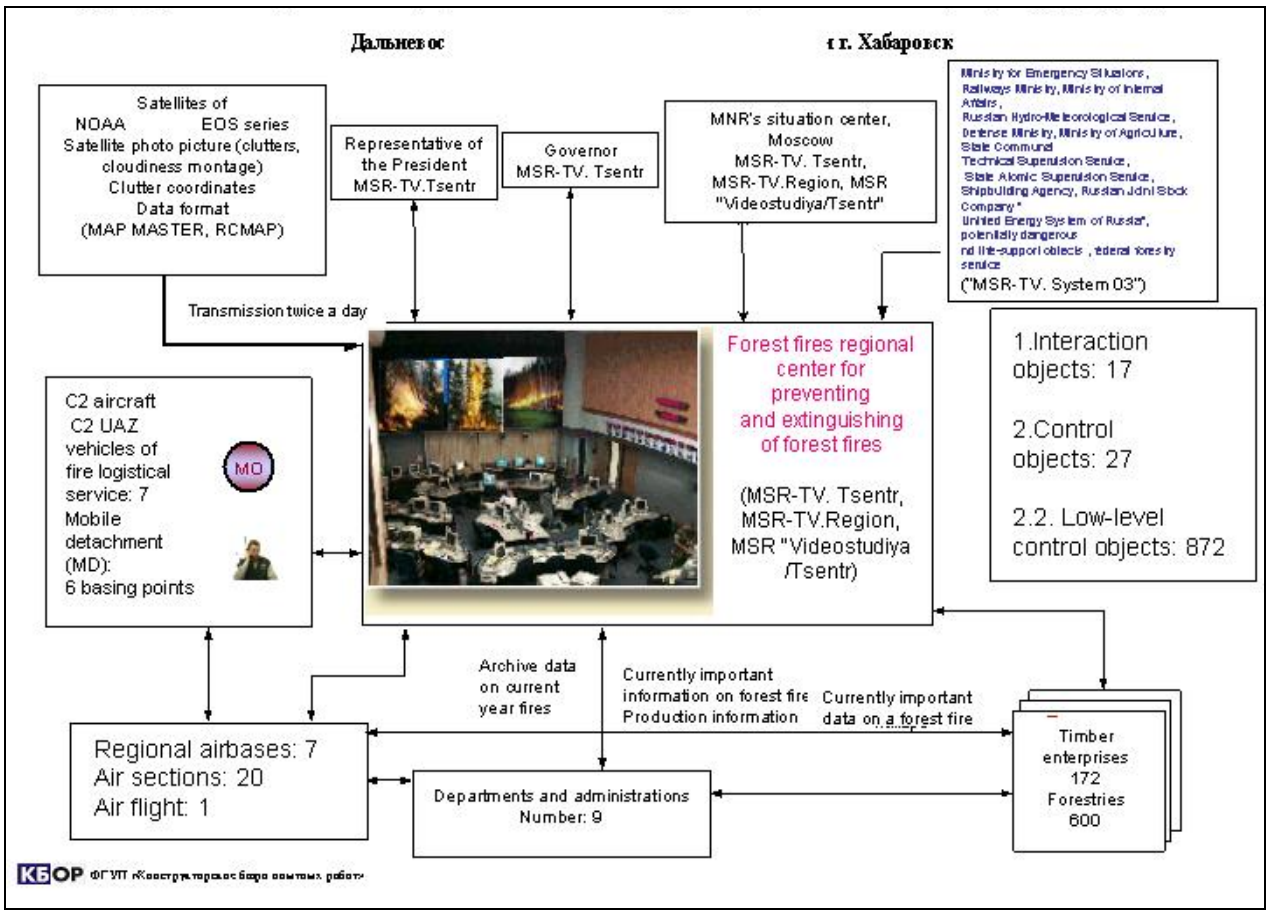

Figure 4. Interaction and control structure of the forest fires regional center for preventing and extinguishing of forest fires of the Far-Eastern Federal District of the Ministry of Natural Resources (MNR) of Russia, Khabarovsk.

Day-to-day situation is currently monitored at the Khabarovsk RFFC through the NOAA and EOS-TA Terra satellites. The advantage of the EOS TA is a MODIS device with 2 channels. It has a resolution of 250m and allows the identification of a fire source with an area of 100 m^2 with T=1000K, and a smouldering area of up to 900 m^2 with T-600K.

Fire forecasting allows for the establishment of fire hazards by five classes (FEFO fire forecast for July-August, September).

The Ministry of Natural Resources system of remote sounding from space allows the identification of probable forest fire sources.

In the Okrug, day-to-day collection and processing of information on the available fire sources is carried out by the MSR-TV.M/DC (Multiple-Function Registration System -TV Mobile Dispatch Center), aircraft and command vehicles (MSR-TV.M/DC).

Flying over a fire and using MCP-TB. M/DC, a pilot-observer fixes the GPS-based coordinates of the fire line, documents fire hazardous areas, builds for the operator colour photo plans linked to the date and coordinates, and submits them to RFFC as a Forest Fire Report.

In the fire area, the MCP-TB.M/DC Operator, who is a member of the mobile unit, collects and processes the information about the current fire behaviour and activities of the fire fighting team by photo and video filming. He then sends it on real-time radio channels to either the aircraft or directly to RFFC.

Using the computer-based MCP-TB/DC regional system, RFFC processes the “coordinates + photo plan + IK-photo + video + text + voice” information clusters integrating them into the existing “GIS Forest Fires” regional level management system. This is followed by analysis and decision making.

The proposed superimposed lower-bit rate digital network for a 9.6 kbit/s data transfer will receive and transfer an MCP-Cluster (text + photo plan + e-map) with a resolution of 600x800 dpi and a size of 50 KByte within 60 seconds from any point in this country.

Frame by frame video monitoring (1 CIF) is implemented through a modem at a rate of over 12 kbit/s.

MCP-TB.Com (4 CIF) videoconference operation requires 256 kbit channel.

Figure 5 presents the telecommunications arrangements a large fire situation.

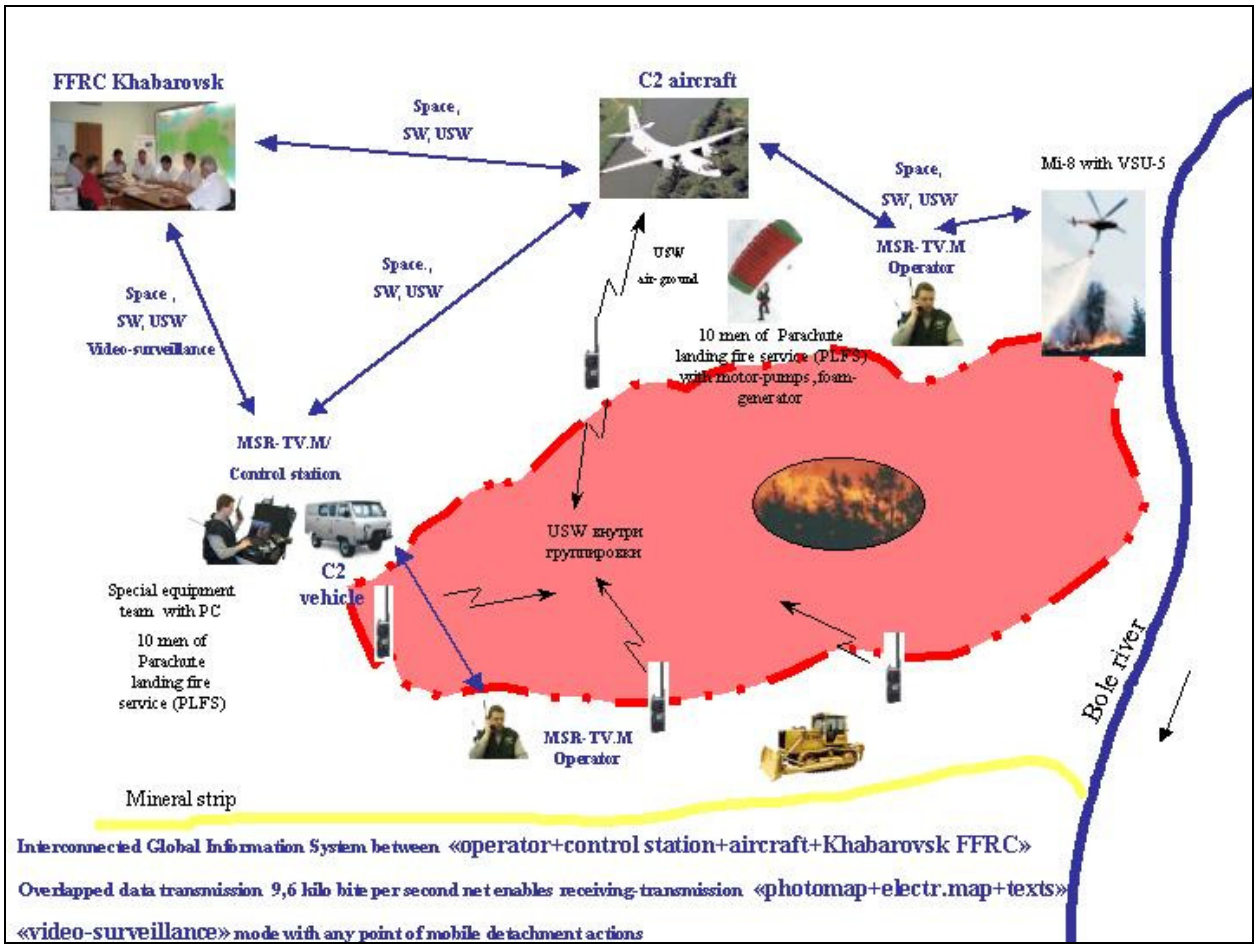

Figure 5. Communications system structure during extinguishing of a large forest fire

Hands-on cooperation of ground and aviation resources is based on prompt deployment (3-4 min.) of mobile units. These could operate under high humidity and in the context of high dust content. RFFC controls and assesses the results of fire fighting by using aviation- and ground-based methods, including artificial rains.

The system allows for operational manoeuvring of the mobile units to fight fires within the region. Establishment of such centers in the Siberian, Urals, Central and North Western Federal Okrugs will

allow manoeuvring of the mobile resources and units across the country depending on the fire situation. The system provides automatic submission to the authorities and the public of end-to-end information concerning forest fire management.

The Center will implementation of the Steering Committee decisions, contract specialists from various organizations for analytical, expert and other works, including the application of IK facilities.

Basic Operating Principles of MCP-TB System

- Modelling of processes is based on visual adjustment of linkages between the elements
- The User can build a configuration of his processes on the bases of the newly established reference materials, documents and other elements that are linked between each other
- The User can draft any documents, associated with the activity of the Ministry;
- The data can be both imported from other programs and manually entered into the system ensuring a totality of the information
- The User is not involved in programming of the software functions but is capable of configuring them without applying to programming skills
- Any documents are drafted and printed in MS Excel or MS Word format, with the relevant information entering the database of the system and changing the database
- Full integration with MS Word
- Simple solution of complex problems where possible

The Situation Center is a management information system based on many provisions of the ISO 9000 and CALS technologies and will be able to:

- integrate any data (of different nature and even from different programs);
- see a real-time development in a user-friendly qualitative and quantitative context;
- identify areas requiring urgent response.