



## Turbojet pulverizing complex

### Water Storm (WS).



The world's first jet water pulverizing machine was created in the USSR in 1966. The presence of enormous scientific and financial capabilities and diverse experience has given the opportunity to create and test more than thirty prototypes of machines and create a very efficient water aerosol generator delivered in the inert gas atmosphere to the fire or leak of poisonous gas. Over the past 50 years more than two hundred serial vehicles for reactive water pulverizing of different configurations and capacities were created.



Special squads of these machines put out more than a thousand fires in Russia and Ukraine and participated many times in the consequences liquidation of poisonous gases leaks and radioactive emissions from nuclear power plants.



Having vast experience in the production and exploitation of pulverizing jet water machines, New Impulse Technologies Company in year 2003 is involved in the projects of creation and modernization of the universal turbojet machine pulverizing gas-water mixture Water Storm (WS). Owing to the use of two powerful turbojet engines M-701 and AI-25 and special water supply system, the WS complex is the only system in the world capable of creating large volume sprayed water that equals a local analogue of a heavy rain over a period of several hours.

Water Storm complex which represents powerful generator of water pulverizer in the inert gas to the combustion performance of 12,000 kilograms of water per minute (200 kg/s), which can create an artificial rain cloud reaching 120-150m at length (in favorable weather conditions 200m) and about 60-70m in height (in favorable weather conditions, more than 100m). The precipitation at these conditions is 4-6 times greater on the average than a natural rain cloud.



This artificial cloud of raindrops envelops emission source of poisonous gas or radioactive substances or the fire as rain dome, creating conditions impossible for re-ignition and combustion conditions. It ties poisonous gases and radioactive substances dissolving them in water, including the air emissions generated during fires.



These poisonous gases and pollutants ejected from the object and dissolved in water are captured by the artificial rain dome, i.e. bound (dissolved) by water drops size of 400 microns in the volume of 13.5 million pieces/M<sup>3</sup> and are precipitated to the soil. The average density of an artificial rain: ~ 4-6 l/m<sup>2</sup> per minute.



The efficiency and the need for artificial rain to extinguish a forest fire is clearly seen on the example of a fire on Carmel mount, August 2, 2010. Fire extinguishing involved tens of planes from many countries, including large aircraft from the United States and Russia with a capacity of more than 40 tons of water. But the final quenching was performed only by pouring rain that started in the night on December 5.



Years of research and experience have shown that only rain or its imitation for a long time is able to extinguish forest fire guaranteed. Simulation of rain with a few planes dropping water over the seat of forest fire for a period of not less than five minutes is very effective and guaranteed means of fighting, but the technology isn't implemented anywhere in the world due to ultra-high cost. Water Storm installation is the only machine in the world capable of creating a simulation of rain on the open spaces remote from fire hydrants and natural water sources.



The unique method of spraying water via creation of a real rain cloud is also the most effective precipitation means of ammonia and other toxic gases from the atmosphere, as well as radioactive fallout. The enormous power of the gas and water flow composed of fine-dispersed and oxygen-impooverished water droplets can create protective shields on large industrial areas and cool areas of plants and industrial facilities.

#### Water Storm complex is designed for:

1. Precipitation of ammonia from the atmosphere and its neutralization as well as of other toxic gases.
2. Binding and precipitation of atmospheric fallout and harmful industrial pollutants during fires and industrial accidents.
3. Oil and gas fountains extinguishing ashore and afloat.
4. Extinguishing fires in tunnels, clearing the tunnels of smoke and poisonous gas fires and accidents.
5. Cooling constructions at large industrial enterprises during fires and accidents.
6. Neutralization of toxic substances ashore in case of accidents.
7. Creating of protective horizontal water screens to precipitate the gas and vertical screens in the atmosphere for protection against fire and thermal radiation.
8. Fighting forest fires.
9. Extinguishing of pipelines, pumping stations, ports and any other industrial facilities engaged in the production, handling and transportation of liquid natural gas (LNG).



## The recommended composition of the Water Storm complex.

Turbojet installation Water Storm for water pulverization on truck chassis type KRAZ 63221-044 or similar.



- PFS pump-fire hose station based on a car and PFST pump-fire hose station based on the trailer.
- The complex consists of two stations: PFS (one is on the chassis of KAMAZ, the second is on the chassis of the trailer) enables an efficient and normal operation of WSG turbojet installation away from water sources at a distance of up to 2,000 meters and the highest possible performance at a distance from water sources which can be up to 1000 meters.



- WATER STORM turbojet plant is able to operate independently, without the PFS stations at distances of up to 1000 meters from the fire hydrants.

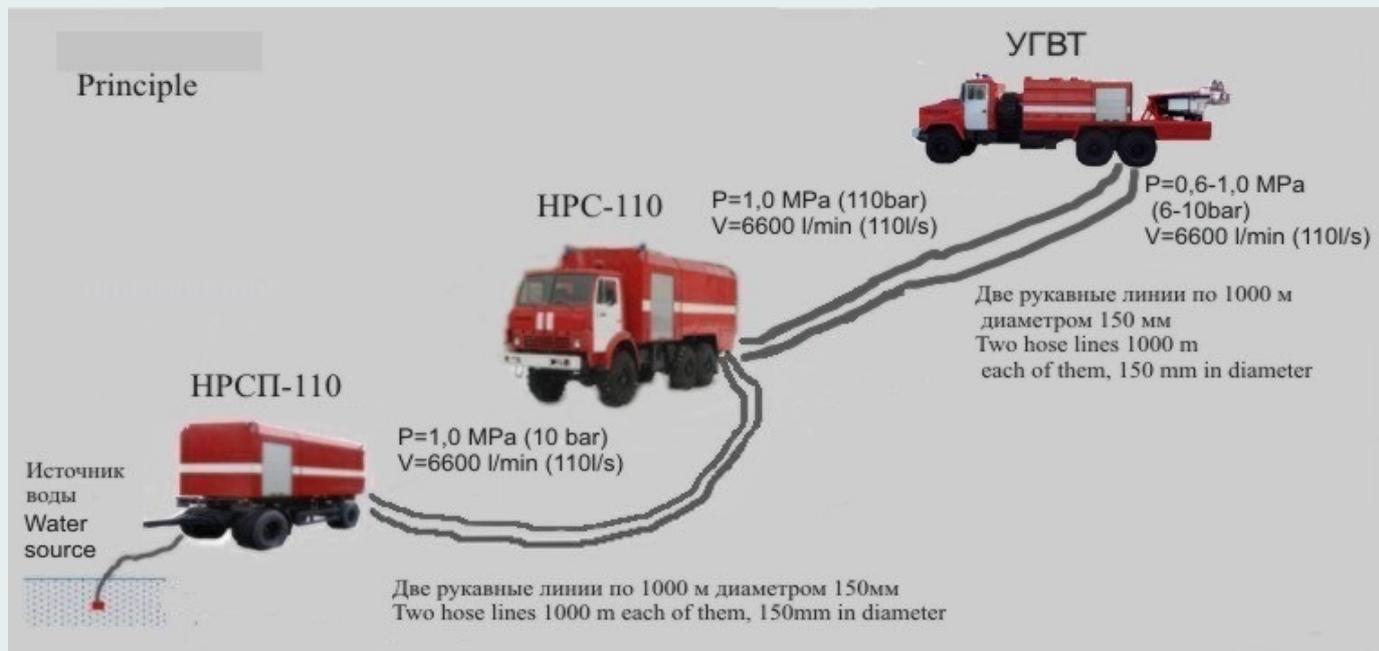
## The main parameters of the WS complex:

1. Range of feed for gas-water mixture reaches 150 - 200 meters.
2. The area covered with water is unlimited.
3. The number of gas-water mixture supplied is more than 250 kilograms per second.
4. Quantity of water sprayed per second is 220 litres.
5. The number of water sprayed per minute is 12,000 kg.
6. The distance to the nearest source of water in the nominal operation mode:
  - a. a river, a sea, an artificial pond in up to 2,000 meters.
  - b. stationary fire hydrants of urban water supply network in up to 3,000 meters.
7. The distance to the nearest source of water in the most intensive operation mode:
  - c. a river, a sea, an artificial pond in up to 1,000 meters.

The water supply system, which allows getting a completely uniform flow of the exhaust gas and fine-dispersed water drops was developed and applied to the WSJ module. The homogeneity of the flow is not lost with distance and thus the maximum effect of dissolution and absorption of poisonous gases.

The presence of special nozzles must let configure the gas-water flow depending on the task. The possibility of creating flat water screens on large areas in the vertical and horizontal planes was realized.

All requirements of the European Union on health, technological and environmental safety are obeyed.



### Water Storm system know-how.

All existing machines in the world that use gas-water reactive system pulverize using the water pipes, which are located above the gas stream or near to it.

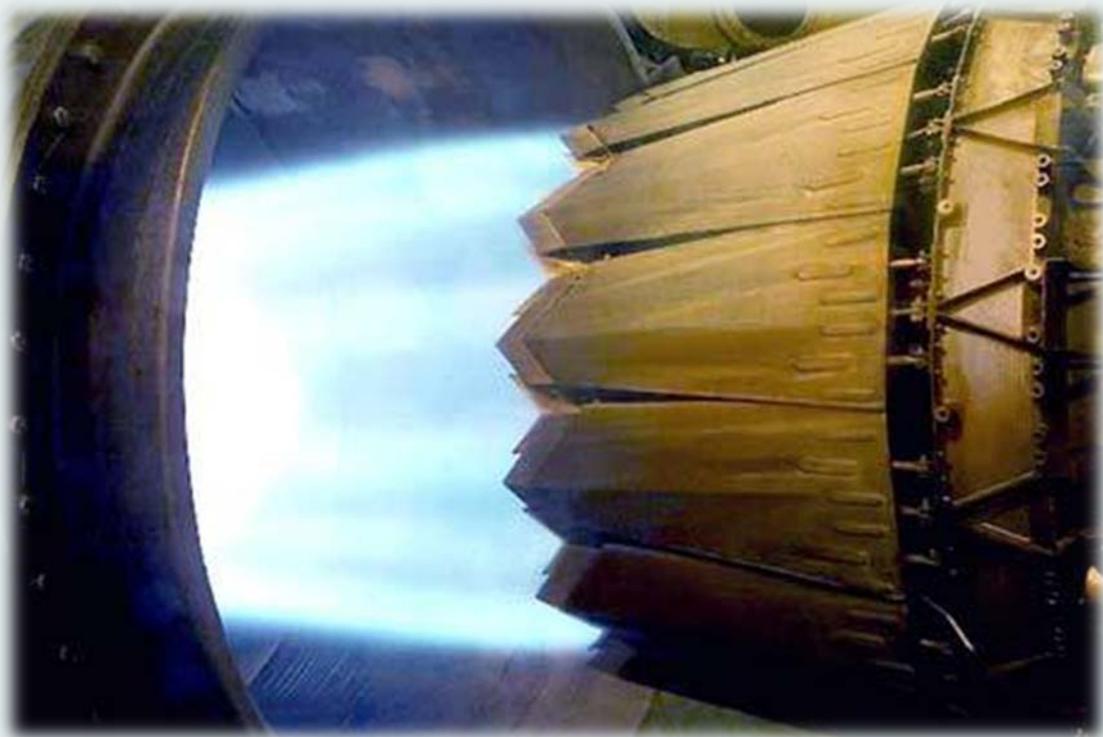


Because it is impossible to make a homogeneous gas-water flow and flame emissions from the engine are possible, these conditions may cause fire and makes reactive machine dangerous.

Gas output temperature from any reactive machine is at least 700 degrees Celsius.



The Water Storm system uses the principle mixing water and gas directly into the engine exhaust nozzle.



This know-how gives the following absolute advantages:

1. The engine is cold gas stream and spray water can not be the appearance of the flame. Cold flow of gas-water aerosol that comes out of the engine makes fire impossible.
2. Due to high mixing speed of water and gas inside the engine, the flow of gas-water mixture becomes completely homogeneous across the whole distance and area of pulverization. This feature greatly increases the effectiveness of fire extinguishing and precipitation of poisonous gas.
3. As gas-water flow is cold and homogeneous, the pulverized distance and covered area is increased by at least 50 %.
4. The engine noise due soundproofing properties of water is decreases by at least 30%.

The increased level of security of the system allows its use in flammable gas, the increased level of security is needed to extinguish the natural gas and for precipitation of ammonia, which can be ignited by any source of fire.



## Control System

Manipulation and control of turbojet engines, as well as the processes of extinguishing or precipitation of poisonous gases is carried out of the car cab or remotely using two remote controls.



Manipulation and control of turbojet engines is conducted using electronic digital system. Control sensors are only installed according to the European standard.

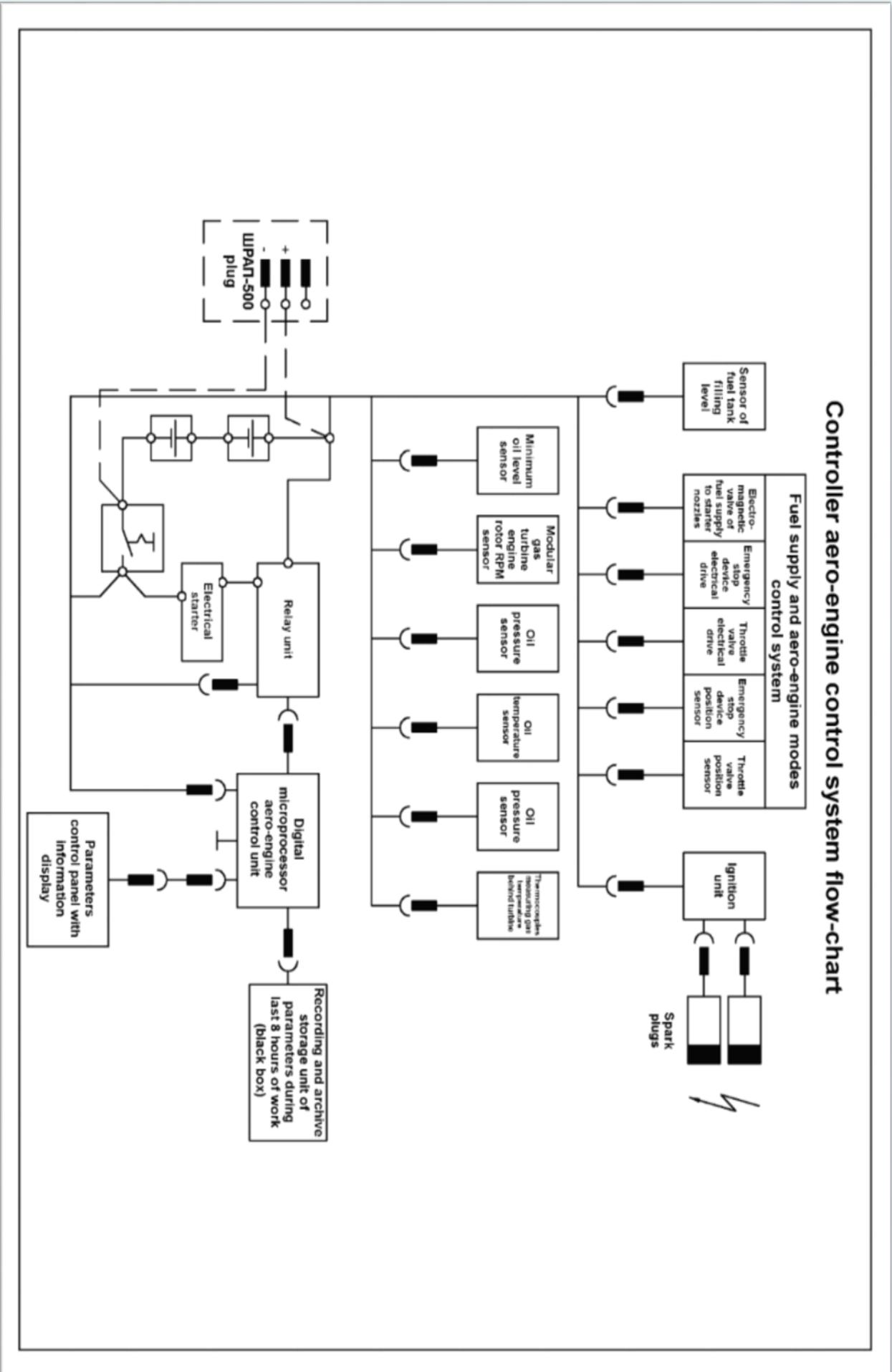
The control system of the gas sectors, the engine rotations, water volume and physical parameters of the gas-water flow is fully digital and automatic with manual and semi-automatic control using the remote control.

Connection of the intellectual system of ongoing monitoring of the surrounding area using infrared cameras to estimate the situation before deciding on the startup script of the jet engine and its operation modes is possible.

### Fully automatic operation of the module is available, it includes:

1. Ongoing monitoring of the environment.
2. Automatic preservation of the jet engine in case of an extended outage.
3. Automatic re-entry of the jet engine before starting.
4. Automatically start of the engine and the water supply system.
5. Automatic determination of the engine script and the parameters of its rotation in the horizontal and vertical planes.
6. Start-up and operation of the engine according to the script.
7. Automatic stop of the engine in case of failure of any of the main or auxiliary systems, water supply is stopped, etc.
8. Developing and showing on the monitors recommendations to restore normal operation of the engine in case of an emergency stop.

The block diagram of the control system of turbojet engines



## Turbojet engines:

**M-701C** turbojet engine designed and built by Walter Aircraft Engines (Czechia) for the military jet trainer aircraft Aero L-29 Delfín (English: Dolphin, NATO reporting name: Maya).



### General characteristics:

- Type: Single shaft centrifugal turbojet engine
- Length: 2,067 mm (81.38 in)
- Diameter: 896 mm (35.28 in) (Max width): Max height 928 mm (36.53 in)
- Dry weight: 330 kg (728 lb)

### Components:

- Compressor: Single-stage centrifugal
- Combustors: 7 straight flow combustion chambers
- Turbine: Single-stage axial-flow with 61 blades

### Performance:

- Maximum thrust: 8.75 kN (1,962 lbf) (Take-off power -15,500 rpm), 7.87 kN (1,764 lbf) (Rated power - 14,950 rpm)
- Overall pressure ratio: 4.3:1
- Specific fuel consumption: 1.14 (at rated power)

### The main advantages of the engine:

- High reliability
- Unlimited resource of work in the complex.
- High reserve of gas-dynamic stability
- Simple design
- Simplicity and technological effectiveness of maintenance.

M-701 engine that is used in the technology is produced in Czech Republic and certified by European standards. It is distinguished by high reliability and quiet operation, the noise level in the vicinity of the engine does not exceed 80 decibels. Owing to military purpose of the engine it has the ability of ultrafast transition from the slowest operating mode to maximum take-off mode, which is very important for quick change of the water flow parameters when the characteristics and conditions of fire or the poisonous gas cloud change.

M-701 engine uses new resourceful engine. This means that the life time of the engine in the mechanical structure of the jet engine installation is unlimited. Up to now, more than 50 ground-based jet installations using the M-701 engine has been built, the installation works more than 25 years. There was not a single case of a user's call with complaints on the engine operation or the engine repair request in the conditions of a factory. Service and periodical repair of engine can be performed on the territory of the client.

The preparation of the engine for ground use, its maintenance, repair and training of personnel is performed by special Russian aviation company that maintains the ground jet technics for the Ministry of Emergency Situations of Russia, and has many years of experience with complex jet technics designed to eliminate large fires.

The initial and main training of the customer representatives is performed by highly qualified specialists in Moscow. Immediate dispatch of Russian specialists for fast repairs and solving other problems to the users (clients) country is possible.

Initial training includes training maintenance procedures with the replacement engine parts and components needed, so that the subsequent repair can be carried out on the territory of the client without the participation of Russian specialists.

The installation kit is supplied together with the necessary spare parts.

Before manufacturing the main installation for the user, New Impulse Technologies Company builds the base installation and invites the customer representatives to the preliminary tests and presentation. During the tests, we specify with the customer the following:

- Characteristics of the engine, the control system and engines control
- Parameters of horizontal and vertical filters of the gas-water flow
- Parameters of the gas-water flows, required distance and the height of the water feed
- The characteristics of water sources that are to be used by the customer during the exploitation.
- Other local conditions for the future work of Water Storm at the Customers territory.

After preliminary testing and approval of the necessary technical parameters of the installation manufacturing, testing and delivery is performed to the customer of Water Storm system.

New Impulse Technologies company  
Russia, 119049, Moscow,  
Kaluzhskaya ploshchad, 1, office 271

Company number: (OGRN) 1037789068129  
Taxation number: (INN/KPP) 7701517110/770601001

Telephone/fax +7-495-771-69-24/771-69-54  
[www.impulse-storm.com](http://www.impulse-storm.com)

