(Short important information on Project proposal For Rainmaking from Aircraft)

"Artificial rainmaking in large scale by using high power terawatt mobile Laser Which initiates endothermic reactions, as a similar natural lightning phenomenon, with natural seeding, onboard Aircraft as multiple lightning, occur in heavy rainfall in the atmosphere".

Innovative Rainmaking Research Association (IRRA Scientist), India.

IRRA Scientist Group propose laser system of specification: Femto-second mobile Laser 10^{12}watt, 800nm, 500mJ, 120fs and 10Hz for this research project". It's scientifically & practically proven in Laboratory clouds chamber as well as in the atmosphere up to 75m altitude, as "Laser induce condensation & water drops formation in Laboratory clouds chamber as well as in the atmosphere "

In this natural rainmaking technology, endothermic reactions, condensation, precipitation, water drops formation, natural seeding with heavy rainfall occur in nature. This method applicable for white warm clouds to converted black rainy clouds for rainmaking. Condensation is the basic need for water drops formation, natural seeding for heavy rainfall.

IRRA Scientists are ready for discussion any time on Novel Rainmaking Natural Technology. Always, well come to your scientific comments on rainmaking by Laser system

It works when more than 65% humidity is present in the atmosphere. It covers ~450 Km2, an area...& estimates cost 230 Cr./USA dollar 28.75 million for three years project for measuring & fixing atmospheric parameters, one time investment

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Please visit our YouTube Channel and search "Novel Technology for Artificial Rainmaking". Click here: - https://youtu.be/UYfuH9fAmUs_

More details can be found in Google Search: as "Artificial rainmaking by endothermic reactions" or S.K. Chopkar or on the website: http://www.irraindia.org

(Project proposal From Aircraft)

"Artificial rainmaking in large scale by using high power terawatt mobile Laser Which initiates endothermic reactions, as a similar natural lightning phenomenon, with natural seeding, onboard Aircraft as multiple lightning, occur in heavy rainfall in the atmosphere".

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Abstract:

In the atmosphere, after lightning, precipitation is formed and heavy rainfall occurs. This is a well-known process. This natural lighting phenomenon has been practically demonstrated in the laboratory cloud chamber, as ***"Laser-induced condensation & water drops formation"*** *and* ***"Water drops formation by each and every laser shot in the cloud chamber".*** *In this process, lightning/laser creates high temperature which breaks the bonds of N_2 and O_2 to form excited N* and excited O*. Total heat energy of lightning/laseris completely utilized for breaking the bonds of N_2 and O_2 (Chopkar, 1993). These excited N* and excited O* move to new place by wind and undergo reactions to form NO and O_3 which are endothermic reactions. Heat energy required for these reactions are taken from the surrounding atmospheric clouds. As a result of these reactions, temperature falls, condensation takes place, rain drops form, these raindrops act as natural seeding process, to form another sets of rain drops, seeds are created and rain occurs in analogous way similar to rains created in nature by lightning. In this process, white clouds convert into black rainy clouds for rainmaking in the atmosphere. This process has been practically proved in the laboratory as* ***"Production of ozone and nitrogen oxides by laser filamentation".*** *It is believed that "Laser photons photo-dissociate atmospheric compounds N_2 and O_2 form ozone (O_3) and nitrogen molecules (NO).* ***"Increase of O_3 and NO concentration after lightning has also been experimentally observed".*** *This lightning phenomenon created through artificial lightning by plasma laser pulse or laser system can produce rain in the atmosphere has been practically proved as* ***"Laser-induced water condensation in air".*** *Scientists have succeeded in obtaining raindrops from an altitude of 75m of the atmosphere by terawatt mobile laser.* ***"IRRA Scientist Group propose laser system of specification: 10^{12}watt, 800nm, 500mJ, 120fs and 10Hz for this research project".*** *The results could be of immense benefit to human being.*

Keywords: Artificial rain; Atmospheric cloud; Condensation; Endothermic reactions; Laser system; Precipitation; Raindrops; Rainfall; Natural Seeding**.**

1.0 Introduction:

Several attempts have been made by various researchers to create artificial rain by laser. Golde (1977) from a number of radar observations has reported that intense precipitation is not even present in the clouds before the first discharge but develops abruptly in the same region after discharge from which the lightning flashes originate. Carls and Brock (1987) heated the atmosphere by a laser pulse up to 1600 to 2800K and observed water droplet formation. They predicted that high temperature causes ionization of N_2 and O_2 and, when this ionized air is subjected to more radiation, avalanche breakdown of air can occur. Braun et al. (1995) have observed laser induced condensation and water drops formation by shooting self-channeling of high- peak power femtosecond laser pulses in the air. Yoshihara et al. (2007) have shown that the pulsed UV-laser irradiation of ambient air induces formation of water droplets or small ice particles in the laboratory. They also observed that [O] formed in this process quickly reacts with O_2 molecules to form O_3. Rohwetter et al. (2010) have shown that ionized filament, generated by ultra-short wave laser pulses induce water-cloud condensation in the sub-saturated atmosphere in the altitude region between 45m and 75m. A team, called terra-mobile-group (TMG), consisting of scientists from Switzerland, Germany and France, have been trying to create artificial rain by laser (Kasparian et al.2000; 2003; Mejean et al. 2006; Rohwetter al. 2010; Kasparian et al. 2012). They have done simulation experiment in laboratory cloud chamber and have observed condensation and water drops formation. They also succeeded in producing tiny water particles in moderately humid air in an altitude of 45 to 75m of the atmosphere by terawatt mobile laser. But the droplets were about a hundred times too small to fall as raindrop; instead, they remained suspended in the air. The team feels that it is feasible to get larger droplets if the power of laser is increased to petawatt (10^{15}watts) or exawatt**(**10^{18}watts). ***They further say that the effectiveness of this method is much easier to gauge than traditional cloud-seeding techniques and that it could provide to be a practical means of triggering rainfall****". (Search Google as 'Laser makes rain, heavily'2010).* A group of Scientists from Florida University also observed water drops formation by high power laser shooting experiment. It appears from the above that laser has not yet succeeded in producing artificial rain. In this paper, a novel method is describedto create artificial rain by laser.

2.0Condensation is the Basic Need for Water Drops Formation:

IRRA Scientist Group has been successful experiments in laboratory, for 'Condensation is the basic need for water drop formation'. That condensation is the basic need for water drop formation can be understood by taking two glasses, one filled with normal water and another with ice pieces. After sometime one can observe water droplets on the outer surface of the glass which contains ice but not in the other. This is due to the condensation process that occurs around the ice glass. So, IRRA Scientist Group, proposed a laser system for this research project, to create artificial lightning by initiation of endothermic reactions, similar to natural lightning phenomena, for artificial rainmaking. As a result of these reactions, temperature falls, condensation takes place, seeding occurs and it rains in an analogous way similar to rains created by lightning. This process has been practically proved in the laboratory and atmosphere as "production of ozone and nitrogen oxides by laser filamentation". A number of scientific and practical tests have been conducted in cloud chambers and in the atmosphere to prove this hypothesis, as "Laser induce condensation and water drops formation by Laser shooting in the laboratory cloud chambers as well as in the atmosphere".

Now the question arises that what are the conditions required for ***condensation.*** ***This means that, only and only, endothermic reactions are responsible for condensations,*** *which also produces NO (Nitrogen Oxides) and O_3 (Ozone) after shooting laser beams triggering endothermic reactions, condensation and precipitation. These tiny water drops act as a natural seeding process, due to acceleration and tribulation by wind force in the atmosphere, to form another set of raindrops with heavy rainfall as lightning rain. Endothermic reactions are responsible for condensation. Condensation is the basic need for water drop formation as above laboratory experiment, "Condensation is the Basic Need for Water Drops Formation".*

This novel Rainmaking Technology can be used for white, warm clouds too which get converted into black rainy clouds for rain enhancement. ***As well as, water drops formation by high power Laser shooting, "Laser makes rain".***

The IRRA scientist Group has already demonstrated "Innovative Rainmaking Technology" in the Laboratory cloud's chamber successfully, and results have been published in "Indian Journal of Science & Technology", http://indjst.org, vol.1, No.6 (2008).

Now, the project proposal, the design of the laser system, the Budget estimate, and the work plan are ready with IRRA Scientist Group, India. IRRA Scientist is ready for demonstration and collaboration with the Government for funding purposes for project proposal on "An Innovative Rainmaking Technology using Laser system from Aircraft to form raindrops acting as the natural seeding process due to initiation of Endothermic Reactions, for rain enhancement in large scale in the atmosphere".

In this experiment, femto-second–terawatt laser creates artificial lightning in the atmospheric cloud's regions by Air craft. These white warm clouds are converted into black rainy clouds with natural seeding for rain enhancement in the atmosphere.

A laser pulse will be sent to the cloud to initiate endothermic reactions which will create lightning phenomena, as in nature, mentioned above. For example, a German-French group has used a femtosecond–terawatt laser to obtain "Laser-assisted water condensations in the atmosphere''. They have succeeded in obtaining raindrops from an altitude of 45m to 75m of the atmosphere. This novel Rainmaking Technology can be used for white, warm clouds too which get converted into black rainy clouds for rain enhancement.

**As well as, water drops formation by high power Laser shooting.*

"Laser makes rain" by Florida University, Scientist experimentally observed.

**As per report, a group of European scientists working on artificial rain said in 2010, "Firing extremely powerful laser pulses through humid air can stimulate the formation of clouds, according to a team of European scientists. They say that the effectiveness of this method is much easier to gauge than traditional cloud-seeding techniques and that it could provide to be a practical means of triggering rainfall". (Search Google as 'Laser makes rain, heavily'2010).*

In Indian ancient tradition, there is a mention in Vedshastra that "Fire arrows are sent towards the atmospheric clouds which is responsible for immediate rainfall "Our system could be a terawatt femtosecond Ti: sapphire pulse laser. Its fundamental wavelength could be ~800nm. The pulse will have energy of ~500mJ, 120fs and repetition frequency of 10Hz. The laser pulses has to propagate with almost high peak intensity in atmospheric clouds. It works when more than 65% humidity is present in the atmosphere. Our findings could be used by scientists and engineers to create artificial rain through a new method. The results could be of immense benefit to human being.

3.0 How will laser create artificial rain? Theory:

For creation of rain, according to well established meteorology theory (can be found in any textbook of meteorology), steps are the following:

First (i) creation of low temperature →then (ii) condensation then (iii) seed (CCN) formation →then (iv) tiny water drops formation and rain occur in the atmosphere.

The present methodology is to send laser pulse to the cloud region of the atmosphere to create high temperature. This high temperature will break the bonds of O_2 and N_2 as follows:

$N_2 \rightarrow N \equiv N \rightarrow N^* + N$ ---- *(1)*

$O_2 \rightarrow O = O \rightarrow O^* + O$------- *(2)*

In this processing N and O in excited state (N, O*) will be created. These excited N* and O* are very unstable and immediately come to the ground state through following reactions.*

$N^* + O_2 \rightarrow NO + O$ ΔH *(43.2 kcal/ mole)*..... *(3)*

$O^* + O_2 + M \rightarrow O_3 + M$ ΔH *(67.7 kcal/mole)* …… *(4)*

The occurrence of reactions 3 and 4 and formation of NO and O_3 have confirmation from NASA laboratory experiments [Sanders et al. 2003]. Formation of O_3 and NO, after laser shot, has been observed in laser experiment in atmosphere (Petit et al. 2010). The reactions 3 and 4 are endothermic and therefore, they need heat energy (amount mentioned in brackets) which is

absorbed from the cloud region. As a result, temperature of the cloud region falls (first step of rain formation is achieved and then other steps follow), condensation takes place, seeds (CCN) will be formed, and tiny water drops will be created. These tiny water drops may act as natural seeds to form another sets of rain drops. This chain process will result in rainfall. Ozone and Nitric oxide, O_3 and NO (formed in reactions 3 and 4) will undergo further reaction to form HNO_3 particles other nitrogen compounds, which will bind water molecules together to create water droplets. These water droplets again will act as natural seeds to form another sets of rain drops. In the atmosphere, due to turbulence, small water drops coalesce and form big rain drops. In addition, ions N_2^+ and O_2^+ and electrons formed by cosmic rays can create complex hydrated heavy positive and negative ions... $HNO_3 (H_2O)_n$ (where the value of n could be as large as 50) which can also act as seed to create rain.

In short, to create artificial rain by laser, endothermic reactions are to be generated in the cloud region. It has-been shown earlier how much heat energy is absorbed by endothermic reactions from atmospheric clouds (Chopkar 1993a, b; Chopkar and Chakrabarty 2008; Chakrabarty et al. 2010; Chopkar et al. 2010). The energy required to break bonds of 1 molecule of N_2 and 1 molecule of O_2, = 2.25×10^{-18} Joule. A laser pulse of energy 500mJ can dissociate a column of N_2 and O_2 containing ($\sim 0.5/2.25^{-18}$) ~ 10^{17} molecules which is much higher than the density in the atmosphere.

Laser can be operated from the ground as well as from an aircraft. In former case, laser pulse has to propagate to a height of ~1km (cloud height) from the ground. There will be attenuation of energy in this propagation. Kasparian et al. (2012) experimented with terawatt laser from the ground and observed tiny raindrops in an altitude of 45m to 75m of the atmosphere. To create large water droplets at higher altitudes, the group feels that laser power has to be peta-watt (10^{15}watt) or hexa-watt (10^{18}watt). If laser is operated from aircraft, then attenuation of energy will be less. In that case, laser power can reach the cloud region without much attenuation. It can also cover large area and can move to any place. Turbulence created by the aircraft in the atmosphere can also create small water drops which would collide with each other and form big rain drops.

Challenging research activities by IRRA Scientists have developed an "Innovative Rainmaking Technology '' which is scientifically and practically proven in Laboratory cloud chambers and the atmosphere up to 75m altitude as Ref. "Laser induces condensation and water drops formation in laboratory clouds chamber". Now, IRRA scientists have prepared a new project proposal with

a design, budget & estimate, work plan etc. on "Artificial rainmaking by laser system which initiate endothermic reactions, as similar natural lightning phenomenon, onboard Aircraft in the atmosphere" which is helpful for demonstrations in the atmosphere, enclosed here! IRRA Scientists would like to collaborate/partner with any Government of the country, Environment Science and Technology Department / Science and technology Institution/Foundation /Company etc. for a Demonstration of "Innovative rainmaking Technology used for Artificial Rain on large scale by Laser systems as similar natural Lightning phenomena in the atmosphere" for three years, measuring & fixing atmospheric parameters as ex.- temperature, pressure, humidity etc. for maximum rainmaking in the atmosphere with project proposal estimates cost 230 Cr./USA dollar 28.75 million.

4.0 Methodology for Artificial Rainmaking by Laser system, on board Aircraft:

We propose a laser system of following specification: 10^{12}watt, 800nm, 500mJ, 120fs and 10Hz for this research project on board aircraft (Fig.1).

In aircraft, as shown in Fig. 2, there are two floors. In the 1st Floor of height 9', the parts shown as (1), (2) and (3) are where laser system is installed, and in the 2nd Floor of height 7' 6" parts shown in (A), (B), (C) and (D) with stair case are where power supply unit is installed. There is railing for open space shown as square dots. In the aircraft, seven Laser instruments shall be installed, 3 on right side, 3 on left side (as shown in part-1) and one on back side. Aircraft will release seven high power laser pulse in the atmospheric clouds. They will cover more than 200Km^2 area. Speed of aircraft will be ~100km/hr. In aircraft there shall be instruments by which we have to measure atmospheric parameters such as humidity, temperature, pressure, wind velocity, wind direction, etc. on ground level as well as in the upper level of atmosphere. When the upper atmosphere is cloudy and more than 65% humidity is present in the atmosphere, the experiment can be started. After the completion of the experiment, all data are analyzed.

In this experiment, femto-second–terawatt laser creates artificial lighting in the atmosphere up to 1.2 Km to 3.2 Km altitude in the white warm cloud's regions. These white warm clouds are converted into black rainy clouds with natural seeding for rain enhancement in the atmosphere. A laser pulse will be release from Aircraft as multiple lightning creates in to the upper atmospheric cloud to initiate endothermic reactions which will create lightning phenomena, as in nature, mentioned above. The laser technology for this purpose, though not fully developed, yet exists. For example, a German-French group has used a femtosecond–terawatt

laser to obtain "Laser-assisted water condensations in the atmosphere''. They have succeeded in obtaining raindrops from an altitude of 45m to 75m of the atmosphere.

This novel Rainmaking Technology can be used for white, warm clouds too which get converted into black rainy clouds for rain enhancement. *As well as, water drops formation by high power Laser shooting. "Laser makes rain" by Florida University, Scientist experimentally observed.

****As per report, a group of European scientists working on artificial rain said in 2010, "Firing extremely powerful laser pulses through humid air can stimulate the formation of clouds, according to a team of European scientists. They say that the effectiveness of this method is much easier to gauge than traditional cloud-seeding techniques and that it could provide to be a practical means of triggering rainfall". (Search Google as 'Laser makes rain, heavily'2010). In Indian ancient tradition, there is a mention in Vedshastra that "Fire arrows are sent towards the atmospheric clouds which is responsible for prompt rainfall"***

Our system could be a terawatt femtosecond Ti:sapphire pulse laser. Its fundamental wavelength could be ~800nm. The pulse will have energy of ~500mJ, 120fs and repetition frequency of 10Hz. The laser pulse has to propagate with almost high peak intensity over a distance of ~1km. It works when more than 65% humidity is present in the atmosphere. Our findings could be used by scientists and engineers to create artificial rain through a new method. The results could be of immense benefit to human being.

It will *initiate endothermic reactions which will create lightning phenomena and rain as in nature.*

These white warm clouds will be converted in to black rainy clouds with natural seeding for rain enhancement in the atmosphere.

When the upper atmosphere is cloudy and more than 65% humidity is present in the atmosphere, the experiment can be started in the field of the farmer. We will measure atmospheric parameters such as humidity, temperature, pressure, wind velocity, wind direction, etc. on ground level as well as in the upper level. For this purpose, a separate unit/department must be established as "Measuring & Maintains Department". After the success of experiment, all related data, must be put it in software computer, for analysis and conclusion, with fixed perfect Laser design for maximum rainmaking / rainfall in the atmosphere.

In this way, we will use Laser system as Femto-second terawatt Laser 10^{12}watt power, on board Aircraft.

Similarly, Laser power has to be peta-watt (10^{15}watt) or hexa-watt (10^{18}watt) should be used for creating artificial lightning in the atmosphere for rainmaking from ground level which is send as Laser pulses length 2.5m to 5.0m in repetition process in upper cloud regions.

Demonstration on project proposal of Innovative Rainmaking Technology by Laser system on board Aircraft for Rain enhancement in the Atmosphere by IRRA Scientist Group.

"Artificial Rainmaking Methodology by Laser system on board Aircraft", it's most useful for "Green revolution in the whole world for all human beings".

5.0 Discussion:

Innovative Rainmaking Technology is scientifically and practically proven as "Laser induces condensation and water drops formation in Laboratory cloud's chamber as well as in the atmosphere

However, according to Kasparian group, a laser pulse shot in the atmosphere ionizes N_2 and O_2

$$N_2 + h\nu \rightarrow N_2^+ + e^- \quad \text{(7)}$$

$$O_2 + h\nu \rightarrow O_2^+ + e^- \quad \text{(8)}$$

They have observed lightning phenomenon in the laboratory cloud chamber as "Laser induced condensation and water drops formation in the laboratory cloud chamber by Femtosecond –Terawatt mobile laser system". Kasparian (2012) group says that it is the ionized species N_2^+ and O_2^+ which produce rain. But these two species are of micro size which cannot act as seeding agents. Also, N_2^+ and O_2^+ radicals are not observed by Kasparian group in laser filamentation experiments but production of O_3 and NO has been observed by them in laser filamentation experiments. Experiments of Kasparian group finds condensation and water drop formation and they say in them ionization theory that N_2^+ and O_2^+ act as seeding agent. They also say "Mechanism of laser–induced condensation involves photo dissociation, in which photons break down atmospheric compounds in the atmosphere". This process produces Ozone and Nitrogen oxides, which lead to the formation of Nitric acid particles that bind water molecules together to create water droplets." But there is no seeding and condensation and water drop formation

is not due to seeding. Small water drops formed by laser in the laboratory cloud chamber are due only to endothermic reactions (cooling) and this is obvious. In the atmosphere, due to acceleration and turbulence, these small sized water drops coalesce to form big rain drops. These rain drops act as a natural seeding process to form different sets of rain drops; this chain process continues with heavy rainfall.

Calculation for the energy required for dissociation is almost half of that required for ionization

The energy of a laser beam of wavelength λ is hν (ν = 1/λ and h is Planck's constant). We will shoot laser pulse in the atmosphere and dissociate (break bonds of) N_2 and O_2 as follows:

$N_2 + h\nu \rightarrow N^* + N$ …… (1)

$O_2 + h\nu \rightarrow O^* + O$ …… (2)

Bond energy of N_2 = 226 kcal/mole.

1 cal = 4.184 Joule, Avogadro number = $6x10^{23}$

Therefore, energy required to break 1 molecule of

$N_2 = 226x10^3x4.184/ (6x10^{23}) = 1.58x10^{-18}$ Jou

Bond energy of O_2 = 96 kcal/mole.

Therefore, energy required to break 1 molecule of

$O_2 = 96x10^3x4.184/ (6x10^{23}) = 0.67x10^{-18}$ Joul

So, the total energy required for breaking 1 molecule of N_2 and 1 molecule of O_2 will be $(1.58x10^{-18} + 0.67x10^{-18}) =$ $2.25x10^{-18}$ Joule.

When a laser pulse is shot in the atmosphere, it may ionize N_2 and O_2 as follows:

$N2 + h\nu \rightarrow N_2^+ + e$……..(3)

$O2 + h\nu \rightarrow O_2^+ + e$…….(4)

Ionizing potential of N_2 = 15.58 ev = $2.49x10^{-18}$Joule

Ionizing potential of O_2 = 12.2 ev = $1.95x10^{-18}$Joule

So the total energy required ionizing 1 molecule of N_2 and 1 molecule of O_2 is $2.49x10^{-18}$ Joule +$1.95x10^{-18}$Joule = $4.44x10^{-18}$ Joule.

The above calculation shows that the energy required dissociating 1 molecule of N_2 and 1molecule of O_2 is about half of that required to ionize them.

The energy required for dissociation is almost half of that required for ionization.

That means energy is first used up for dissociation, then the remaining energy (Which may not be sufficient for ionization of N_2 and O_2) is delivered for ionization of N_2 and O_2. Hence dissociation takes place and not ionization. The Kasparian group does not talk about dissociation. It is not only near the IR laser system, ***Yoshihara, et al. (2007),*** *have discussed in their paper the possibility of creating artificial rain by using UV lasers. Our methodology is to send laser pulses to cloud regions to break bonds of O_2 and N_2 (by reactions 1 and 2), create endothermic reactions and condensation (by reactions 3 and 4) and produce rain in the similar way as in lightning. There is attenuation of energy in operating the laser through Aircraft. Kasparian's group suggests an increase of laser power to petawatt (10^{15}watt) or exawatt (10^{18} watt) to create large water droplets. We will operate from an aircraft in the same way as spraying chemicals from Aircraft. A laser pulses of energy 500mJ is capable of dissociating a column of N_2 and O_2 containing ($\sim 0.5/2.25^{-18}$) ~ 10^{17} molecules which is much higher than the density in the atmosphere.*

6.0 Additional Uses:

This method can be used for rain harvesting by "rain drain". When huge clouds are present above a lake or dam, a laser beam can be shot into the cloud region; then with blast of clouds heavy rainfall will occur to fill the lake or dam for future use of water. This method can also be used to reduce pollution of the atmosphere by spraying artificial rain on the polluted city. Another use of this method is to stop excess rainfall. Low intensity laser pulse shot into the cloud region will evaporate the clouds from the excess rainfall area. This method can also be used to drive away the rain cloud from the region where rain is not needed.

7.0 Acknowledgement:

We express our sincere thanks to scientists: Prof Mamata R. Lanjewar (RTM University Nagpur), Prof A. P. Deshpande (Principal, Science College), Prof. Padmanabhan Murthy (J.N. University, New Delhi), Prof Umesh Kulshetra (J.N. University, New Delhi), Prof K. S. Korgaokar (Pune University, Pune), Dr. A.L. Agarwal (NEERI Nagpur), Dr. Nitin Saraf (B.D. EngineeringCollege, Sewagram), Dr. K. M. Kharate, (GM Engineering College & Research Centre, Sheogao),

Dr. Mrs. Sumanlatha Pandey, Mr. Shyam Ujjaninkar (Engineer), Mr. Rajesh Iyengar (P. N. College, Nanded) for their valuable suggestions and guidance for project proposal.

8.0 *Conclusion:*

It is shown in this project proposal that by initiating endothermic reactions in the cloud region of the atmosphere by high power laser, artificial rain can be created. Laser may have the following specification: 10^{12}watt, 800nm, 500mJ, 120fs and 10Hz for operation onboard Aircraft. This method is economical (one time investment), harmless, eco-friendly and can be switched on and off when desired. It can be used at any place and at any time. It can also be used to fill lake or dam for storing rain water for future use (rain harvesting), to reduce pollution by spraying artificial rain on the polluted city, to stop rain in the region where it is not wanted or where rainfall is in abundance. It may not be out of place to state here that in theholy Hindu book "Mahabharata", there is a mention that by firing arrows in the atmosphere, rain was created by Arjun to quench the thirst of God "Bisham".

Artificial rain making methods help to increase the green life and oxygen and decreasing the pollution. Thus, these methods play major role in reducing drought and increasing the quantity of drinking water in future.

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Please visit our YouTube Channel search as "Novel Technology for Artificial Rainmaking". Click here https://youtu.be/UYfuH9fAmUs
**Please search on Google as S.K. Chopkar or "Rain Enhancement by Endothermic reactions" or visit our web site* http://www.irraindia.org

10.0 *Figure:*

Demonstration on Innovative Rainmaking Technology by Laser system onboard Aircraft

Fig. No. 1

Fig. No. 1 - For Rainmaking by Laser using Aircraft in the atmosphere.

Figure No.2: "Inner Deign of Aircraft with Laser system and *Position of Laser system in Aircraft"*

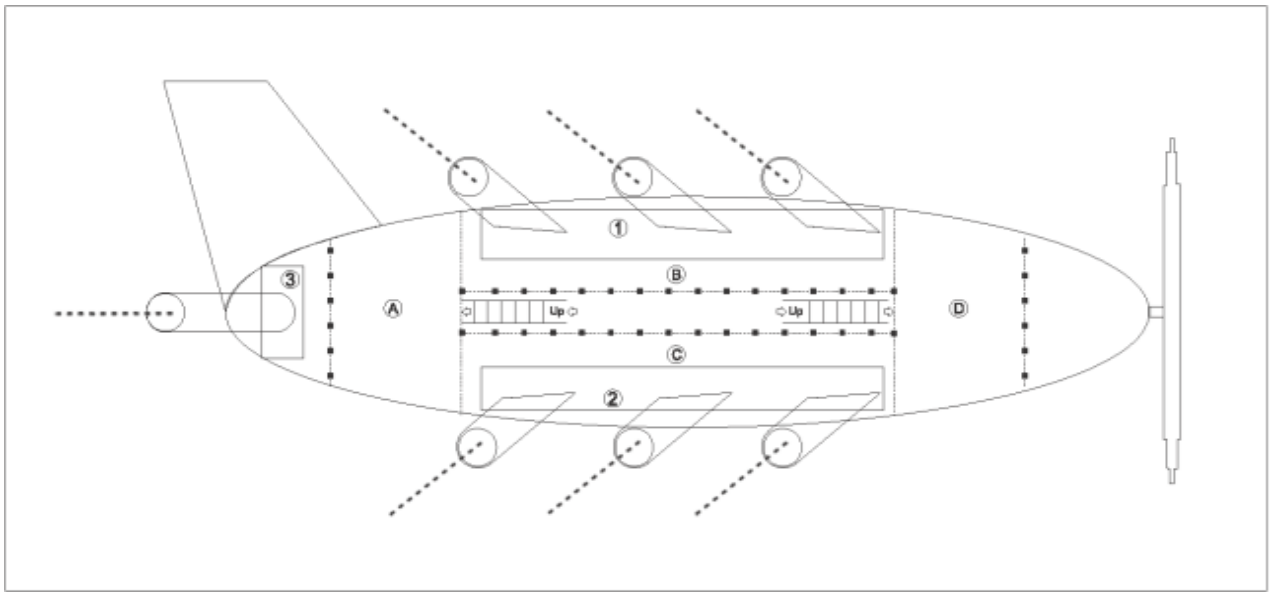

Fig.No.2: "Position of Laser system in Aircraft"

Note: * In figure No. 2, on first floor, height 9', shown parts (1), (2) and (3) are high power Laser release system which creates multiple artificial Lightning in the upper atmospheric clouds directly by Laser system ……

**** In figureNo.2, on second floor, height 7' 6", shown parts (A),(B),(C) and (D) with stair case are high power generation system for high power Laser system, with railing for open space as shown square dots .....***

11.0 Budget for Rainmaking Project Proposal for three Years in the Atmosphere:

"Artificial rainmaking by using high power laser which initiate endothermic reactions, as in natural lightning phenomenon, onboard Aircraft in the atmosphere"

Grand Total Estimate for Rainmaking Project proposal

(A+B+C+D+E+F+G) - 230 Cr in Indian Rs/ USA 28.75 million Dollar)

Challenging research activities by IRRA Scientists have developed an "Innovative Rainmaking Technology '' which is scientifically and practically proven in Laboratory cloud chambers and the atmosphere up to 75m altitude as Ref. "Laser induces condensation and water drops formation in laboratory clouds chamber". Now, IRRA scientists have prepared a new project proposal with a design, budget & estimate, work plan etc. on "Artificial rainmaking by laser system which initiate endothermic reactions, as similar natural lightning phenomenon, onboard Aircraft in the atmosphere" which is helpful for demonstrations in the atmosphere, enclosed here! IRRA Scientists would like to collaborate/partner with any Government of the country, Environment Science and Technology Department / Science and technology Institution/Foundation /Company etc. for a Demonstration of "Innovative rainmaking Technology used for Artificial Rain on large scale by Laser systems as similar natural Lightning phenomena in the atmosphere" for three years, measuring & fixing atmospheric parameters as ex.- temperature, pressure, humidity etc. for maximum rainmaking in the atmosphere with project proposal estimates cost 230 Cr./USA dollar 28.75 million.

IRRA Scientist Group is successful in the above rainmaking technology, scientifically & practically in a Laboratory cloud chamber as well as in an atmosphere up to 75M altitude, (As per demonstration on laboratory cloud chamber by IRRA scientist Group and References) we will demonstrate/experiment from special design Aircraft (Shown in Fig.No.2) in the atmosphere for large scale for three years, project proposal estimates cost 230 Cr./USA dollar 28.75 million.

Demonstration on project proposal of Innovative Rainmaking Technology by high power Laser system for Rain enhancement in the Atmosphere by IRRA Scientist Group.

"Artificial rainmaking by using high power laser which initiate endothermic reactions, as in natural lightning phenomenon, onboard Aircraft in the atmosphere"

Sr.	Items	Budget for Rainmaking Project			
		1st Year	2nd Year	3rd Year	Total
A	Salary of Staff	02,03,76,000	02,31,50,000	02,54,96,000	**6,90,22,000**

B	**Equipment's purchasing and maintains per years**	155,79,00,000	10,00,00,000	10,00,00,000	**(155,79,00,000/- +20,00,00,000) = 175,79,00,000**
C	**Consumable Items**	03,05,00,000	03,05,00,000	03,05,00,000	**9,15,00,000**
D	**Travel Expenses**	05,00,00,000	04,0000,000	04,00,00,000	**13,00,00,000**
E	*Patent Filling Expenses*	01,20,00,000	01,20,00,000	01,20,00,000	**3,60,00,000**
F	**Contingencies**	04,10,00,000	04,10,00,000	04,10,00,000	**12,30,00,000**
G	**Overhead Expenses**	03,10,00,000	03,10,00,000	03,10,00,000	**9,30,00,000**
	Total	**174,17,76,000**	**27,66,50,000**	**27,89,96,000**	**230,02,22,000**

IRRA Scientist Group is successful in the above rainmaking technology, scientifically & practically in a Laboratory cloud chamber as well as in an atmosphere up to 75M altitude, (As per demonstration on laboratory cloud chamber by IRRA scientist Group and References) we will demonstrate/experiment from special design Aircraft (Shown in Fig.No.2) in the atmosphere for large scale for three years, project proposal estimates cost 230 Cr./USA dollar 28.75 million.

Demonstration on project proposal of Innovative Rainmaking Technology by high power Laser system for Rain enhancement in the Atmosphere by IRRA Scientist Group.

"Artificial rainmaking by using high power laser which initiate endothermic reactions, as in natural lightning phenomenon, onboard Aircraft in the atmosphere.

A) Budget for Salaries of Staff:

SN	Designation	Pay Scale	Monthly	Staff	Budget for Salaries of Staff

					1st Year	2nd year	3rd Year	Total
1	Senior Scientist	Class 1	160000	2	3840000	4320000	4780000	**1,29,40,000**
2	Assistant Scientist	Class 2	120000	3	4320000	4780000	5160000	**1,42,60,000**
3	Senior Pilot	Class 2	180000	2	4320000	4780000	5160000	**1,42,60,000**
4	Junior Scientist	Class 3	80000	4	3840000	4320000	4640000	**1,28,00,000**
5	Lab Helper	Class 4	35000	3	1260000	1540000	1860000	**46,60,000**
6	Skilled Labor	Class 4	25000	5	1500000	1770000	2000000	**52,70,000**
7	Non- Skilled Labor	Class-4	18000	6	1296000	1640000	1896000	**48,32,000**
	Total				**20376000**	**23150000**	**25496000**	**6,90,22,000**

B) Budget of Equipment Purchase:

SN	Particular	Model	Make	Estimate Cost (In Lakhs)
1	High power laser Instrument with Transportation (Femto-second high power Laser Instrument)	For Seven Numbers with multiple High power laser release instruments. (87 Lakhs/per x 7 Nos)	Imported	06,09
2	Cost of special Aircraft Design as per requirement as shown in Fig. No.2	Special design as shown in Fig.No.2	Imported	87,00
3	High power supply point /Fuel Materials for high power Laser system in Aircraft instruments.	Special design as shown in Fig.No.2	Indigenous	30,00
4	Precipitation & Atmospheric parameters measuring instrument.		Indigenous	14,00
5	Natural Lighting Protector Unit, as Conductor with earthling for Laser Instrument & Air Craft		Imported	02,20
6	Construction cost for Equipment & Camp/Mobile Van Two Numbers		Indigenous	16,50

	Total			**155,79,00,000**

C) Budget for Consumable Item:

Budget of Consumable Item					
Sr.	**Consumable Items**	**1st Year**	**2nd Year**	**3rd Year**	**Total (Lakhs)**
1	**high power supply unit for laser system**	00,50	00,50	00,50	**01,50**
2	**Fuel materials**	00,75	00,75	00,75	**02,25**
3	**Stationary & another misalliance material**	00,60	00,60	00,60	**01,80**
4	**Small instruments / Equipment for Laboratory uses and other purpose.**	00,80	00,80	00,80	**02,40**
5	**Chemicals for testing or Analysis purpose for laboratory**	00,40	00,40	00,40	**01,20**
	Total	**03,05**	**03,05**	**03,05**	**09,15**

D) Budget for Travel Expenses:

Budget of Travel Expenses					
SN	**Description**	**1st Year**	**2nd Year**	**3rd Year**	**Total (Lakhs)**
1	***Conference for advance technology for discussion and suggestion for inviter***	***02,20***	***02,20***	***02,20***	***06,60***
2	***Visit of top scientists to project for various Suggestion for T.A.&D.A.***	***01,00***	***01,30***	***01,30***	***03,90***
3	***Vehicle purchase for transport Two van and two motor cycles and Maintenance***	***01,80***	***00,50***	***00,50***	***02,80***
	Total	***0500***	***0400***	***0400***	***13,00***

E) Budget for Patent Filling Expenses

Budget of Patent Filling Expenses					
SN	**Description**	**1st Year**	**2nd Year**	**3rd Year**	**Total (Lakhs)**
1	***National & International Patent file expenditure***	***00,40***	***00,40***	***00,40***	***01,45***
2	***Consultant fees / Expert guidance Service charges***	***00,80***	***00,80***	***00,80***	***02,40***
	Total	***01,20***	***01,20***	***01,20***	***03,60***

F) Budget for Contagions

Budget for contagions					
SN	**Description**	**1st Year**	**2nd Year**	**3rd Year**	**Total (Lakhs)**
1	**Contagions**	***04,10***	***04,10***	***04,10***	***1230***
	Total	***04,10***	***04,10***	***04,10***	***12,30***

G) Budget for Over Head:

Budget for Over Head					
SN	**Description**	**1st Year**	**2nd Year**	**3rd Year**	**Total (Lakhs)**
1	***Over Head***	***03,10***	***03,10***	***03,10***	***09,30***
	Total	***03,10***	***03,10***	***03,10***	***09,30***

10.0 Work-Plan:

"Artificial rainmaking by using high power laser which initiate endothermic reactions, as in natural lightning phenomenon, onboard Aircraft in the atmosphere"

Three Years Work Planning

First Year		
1-4 Months	**5-8 Months**	**9-12 Months**
Appointment of scientists, piolet, skilled and non-skilled workers. Select and confirm project active team for project demonstration.	*Inviting experts from the concerned area for table discussion on the demo of the project with consultant expert scientist etc.*	*Demand for different instruments to different tenders for special aircraft, high power Laser instruments, & others…..*
Select Airport site for special Aircraft design for accessories, assembly erection with laser instruments in special Aircraft	*Organization of two days national & international conference on the demo of the project with discussion to varies expert scientist, specialisations*	*Comparative statements of received quotations for the different instruments &work order to reputed company etc*
All facilities provide for scientists, gusts & workers on project for demonstration arranged on site as temporary base as boarding etc.	*As per expert suggestion, comments fallow their important direction in project technology as per IRRA Scientists decision……*	*Purchase work order of proper instrument to proper manufacturing company & suppliers etc. …..*
Second Year		
1-4 Months	**5-8 Months**	**9-12 Months**
All instrument & required accessories collected on project site for erecting special Aircraft with high power laser instruments.	*carrying experiments on the selected site and recording the observations as per the direction given by the experts*	*Repetition experiment in atmospheric clouds with improving technology & records observation & Interpretation of the data with comparison….*
Accessories of high-power laser instruments connected with supply high power in special Aircraft completed as per Fig. No.2 shows etc. ……..	*Inviting experts from the concerned areas for table discussion on the observations taken……*	*Compilation of the data in computer software and commercialization of the same for the benefit of society.*
Trial for testing all connection for high power supply for high power laser instruments	*Analysis of the observations taken in demonstration of rainmaking project. And improved in technology …..*	*Publication of the result in the reputed national and international journals*
Third Year		
1-4 Months	**5-8 Months**	**9-12 Months**
Analysis of the observations & confirm proper solution for maximum rainfall	*Rainmaking technology use for commercial to benefit society for all human being in whole world*	*Filing the patent for the artificial rainmaking system* *Analysis of the observations*
Interpretation of the data in software computer for future beneficial to society	*IRRA scientists aim fulfil as "Green revolution in the whole world for all human beings "*	*Appeal to the Indian government and other countries to utilize this project for the benefit of Humankind.*
Innovative rainmaking technology use in education syllabus for research study	*In press conference, recommended "Innovative rainmaking technology "for research study for beneficial to all society …….*	*Research study most useful for provides as water and food for all human beings in whole world as "Green revolution "…….*

11.0 "Work Plan with Scientific & Practical Evidence for Project Proposal on Innovative Rainmaking Technology in two steps for Demonstrations"

Dear Sachidananad Pandurang HriOm (God's!)

IRRA Scientists, India has developed an "Innovative Rainmaking Technology useful for Artificial Rain in the atmosphere" which is already proven scientifically and practically in Laboratory Cloud's chamber, as well as in the atmosphere up to 75m altitudes.

Practical Result shows it's positive to "Innovative Rainmaking Technology" scientifically & practically proven as …

1. ***"Laser induces condensation and water drops formation in the cloud's chamber" By J. Kasparian and*** A team, called terra-mobile-group (TMG), consisting of scientists from Switzerland, Germany and France, have been trying to create artificial rain by laser ***(results published in international journal…….)***

2. ***"Laser induce condensation and water drops formation in the atmosphere up to 75m altitudes":*** *This process has been practically proved in the laboratory as* ***"Production of ozone and nitrogen oxides by laser filamentation".*** *It is believed that "Laser photons photo-dissociate atmospheric compounds* N_2 *and* O_2 *form ozone* (O_3) *and nitrogen molecules (NO).* ***"Increase of*** O_3 ***and*** NO ***concentration after lightning has also been experimentally observed".*** *This lightning phenomenon created through artificial lightning bya plasma laser pulse or laser system can produce rain in the atmosphere has been practically proved as* ***"Laser-induced water condensation in the air".*** *Scientists have succeeded in obtaining raindrops from an altitude of 75m of the atmosphere by terawatt mobile laser.*

We well know, NO and O_3 ***are endothermic reactions, lot of heat energy is required for these reactions which is subtracted from surrounding clouds…..condensations take place…..condensation is the basic need for water rain drops formations (IRRA Scientists practically proved in Lab).These rain drops act as natural seeding process by wind forces due to acceleration & turbulences to form another sets of rain drops for enhancing rainfall.***

3. ***"Laser makes rain" by Florida University Scientists practically observes …. Ref. (Google search). They further say that the effectiveness of this method is much easier to gauge than traditional cloud-seeding techniques and that it could provide to be a practical means of triggering rainfall".*** By European Scientists (*Search Google as 'Laser makes rain, heavily'2010)*

4. ***Several attempts have been made by various researchers to create artificial rain by laser. Golde (1977) from a number of radar observations has reported that intenseprecipitation is not even present in the clouds before the first discharge but develops abruptly in the same region after release from which the lightning flashes originate.***

"Innovative Rainmaking Technology" is a natural phenomenon similar to natural lightning phenomena……

5. *"Artificial Rainmaking System in a way natural phenomenon" research paper published in journal search on http://www.indist.org,vol.1No.6(Nov. 2008), In this research paper, IRRA Scientists has been published the practical result in a laboratory chamber ….*

6. *In Indian philosophy, there is mention in 84 Sukkot "Agni ban Badal me Chhodake , parjany vurishti kihi" says Veda Shastra. Veda Shastra's thoughts are true facts in Adhayatm. Means ….as "Fire Rocket launch in the atmosphere for rainfall" …..*

7. *Now, IRRA Scientists would like to demonstrate "Innovative Rainmaking Technology" on a large scale in the atmosphere, for that's ….."IRRA Scientist Group propose laser system of specification: 10^{12}watt, 800nm, 500mJ, 120fs and 10Hz for this research project". The results could be of immense benefit to human beings.*

Our first step plan:

In a Laboratory cloud chamber to measure & fixed atmospheric parameters for maximum rainmaking drops also in the actual atmosphere in the cloudy area on top of the mountain as (ex. Pachhamedi, M.P. State, India) from Ground ….

"Project proposal for Demonstration on Rainmaking Technology use for artificial rain by Femto-second mobile Laser system in atmospheric cloudy on Mountain area as (In India, Pachhamedi, M.P. State)". The project proposal file is attached here…

Project proposal with design, Scientific & technical data, Methodology for rainmaking, Work plan, etc. Available with IRRA Scientists……

Demonstrated/experiment in Laboratory Cloud Chamber and in the atmosphere in cloudy area on Mountain from ground level for three years, project proposal estimates cost 9.02 Cr./USA dollar 0.72 million.

Our Second Step plan:

After successful in Our first step plan, then start Our Second Step plan, "Artificial rainmaking by using high power laser which initiates endothermic reactions, as similar natural lightning phenomena, onboard Aircraft in atmosphere" Project proposal file attached here.

Project proposal with design, Scientific & technical data, Methodology for rainmaking, Work plan, etc. Available with IRRA Scientists……

IRRA Scientists will demonstrate/experiment from special design Aircraft in the atmosphere for large scale (150 Km2 to 250 Km2) for three years, project proposal estimates cost 230 Cr./USA dollar 28.75 million.