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Basic civil engineering controls able to stop any pandemic and save lives

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Abstract: *Since February 2020 SARS-CoV-2 infected US and based on misinformation and politics, infection rates developed like a tsunami, affecting over 5% of US population, representing 20% of the world cases, US evolving astray from any reasonable "learning curve". This may have as result less than ½ of China's causalities, everything what US obtained over being in fact manslaughter of its own citizens. The US CDC protection instructions were flimsy, incomplete and badly explained while virus transmission explanations were an affront to common sense that motivated us to develop protective devices to allow sitting in the presence of a contagious person and be safe, suppressing virus transmission. The development considers the transmission through direct contact and aerosolized watery droplet respiratory transmission that accounts for more than 80% of the cases. The further study showed that masks and social distancing were not enough to suppress transmission, and systems that are more complex are needed. Three patent applications were filed concerning individual protection using air restauration technologies, later developed into synergistic protective systems, and a set of furniture to allow dining and seating in close proximity, being protected by several confinement layers based on aerodynamics and energetic radiation able to sterilize and refurbish the air, making it better to breathe.*

The patented knowledge come to mitigate the failures of society to protect itself in a smart manner, providing means to have the same social life and proximity as before 2020 and stay safe even in the presence of COVID-19 contagious specimens, without shutting down or disturbing the economy and social life. They will ***save ½ Million lives*** *and* ***prevent 50 Million people*** *from getting infected in the USA, at a cost of about* ***$50 Billion****, for a period of usage of* ***less than 2 months****. A smart society uses the synergistic protective systems for 3 weeks may suppress any pandemic, if uses cellphone GPS-Wi-Fi tracking, border control and medicine.*

Keywords: *SARS; Nano-Engineering, Bio-threat; Catalytic sterilizer, UV-C light; Aerodynamics; Filters, Protection controls, Pandemic, COVID,*

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I. Introduction

By the end of International War games in Wuhan, China in November 2019, a new virus appeared from the blue, taking the medical community[1,2] by surprise, having features which back in 1980's were attributed to novel bio-weapons, or as a tool for bio-terrorism in 2000. In fact, COVID-19 is a complex nano-structure containing over 200,000 bio-code instructions, and having a dimension of about 100 nm and holding few million atoms, and few hundred thousand amino acids. As transmission it goes well by aerosolized transmission, [3] penetrating into other bodies by breathing [4,5] and by diffusion through skin or other sensitive parts, as eye, nose and mouth [6]. The structure is robust with life expectancy determined by the surrounding environment and is destroyed by chemical interaction only. Once in the body, it hacks the cells and makes them reproduce it, leaving behind a lot of leftover material, that triggers various auto-immune reactions some lethal for the host body. For those in the area of nano-technology and bio-terrorism, immediately CDC released protection instructions become obvious that they were flawed [7] and attempted to inform local authorities and the people in command on the erroneous information.

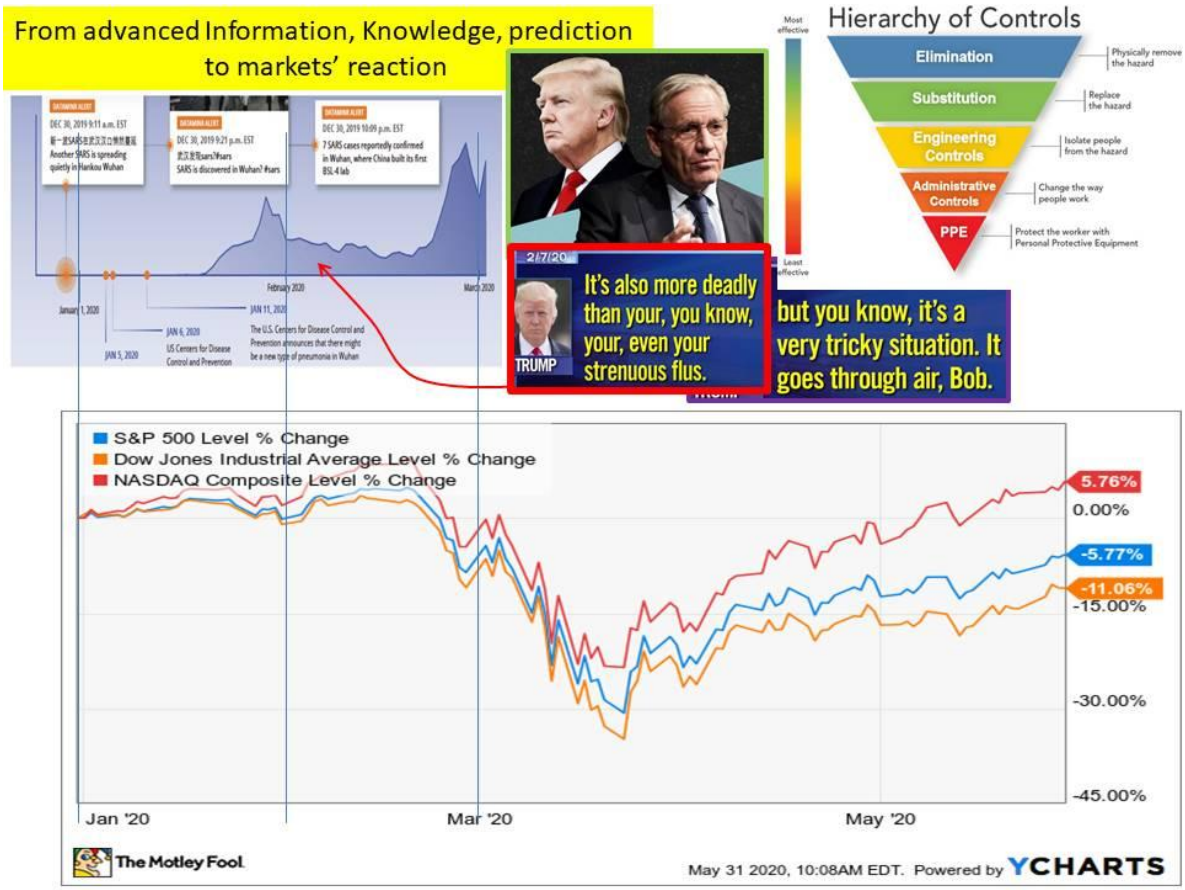


Fig. 1 History of early alerts in US, and protective means that have been ignored

1.1. Ignoring Early Information and Opposing to Follow a "Learning Curve"

By December 2019 China was fighting pandemic in Wuhan, realized at government level that it is a new type of virus, named SARS-CoV 2. Recently, this virus was discovered in Italy, in November 2019 [8,9] having about 6 strains of Covid-19, all present in the US and only "L" appeared in China, [10,11] being an indication that covid-19, also named "China-flu", originated in China similar to the Spanish flu originating in Spain. Leaving aside the disputed origins of the virus, it is clear that after Chinese announced with details of information the presence of a new strain, and a Dataminer company in NY [12] gave the NYSE all details, predicting the pandemic, 12 days before China claiming its first official victim on Jan. 10, and 7 days in advance to US government announcement. Except few traders, everybody ignored the information, even later when the President was informed, he preferred to conceal [13] the information and politically interfere over CDC, [14] in a destructive, criminal manner.

Meanwhile, NYSE trading went unperturbed, in the madness of an abundance of virtual money, resulted from tax cuts until second week of March, when tumbled in one week by 30%, [15] starting the economic crisis, as seen in Fig. 1 in the charts, showing how disconnected the stocks are from reality.

Graceful to 50 years of failed education, [16] oriented to form pawns and professionals good to follow directions, to believe what they are told, without using their brain, and used to acknowledge as no matter how miserably they perform, they are the best of the best, they simply rejected any extra knowledge. No measure was really taken based on information, e-mails simply ignored, and no life was possible to save, or prevent becoming ill, and patenting and publishing remained the only ways to promote the protective knowledge for the generations to come. It is known that COVID in US hit with two months delay from China, and a learning curve may have been in place meanwhile, and the expected results may have been better by at least a factor of 2 than in China. In fact, on Dec. 3, 2020 the statistics of causalities per 1 Million people [17] show a different result, as seen in Table 1.

Table 1 – Comparative results USA, China and world with respect to COVID-19 causalities

Basic data Dec. 3, 2020

# Rank	Country, Other	Total Cases	New Cases	Total Deaths	New Deaths	Total Recovered	Active Cases	Serious, Critical	Tot Cases/ 1M pop	Deaths/ 1M pop	Total Tests	Tests/ 1M pop	Population
12	USA	14,615,808	80,612	283,792	963	8,580,911	5,751,105	26,201	44,046	855	202,214,558	609,396	331,828,037
World		65,943,496	420,024	1,519,143	7,997	45,652,023	18,772,330	106,230	8,460	194.9			7,800,000,000
205	China	86,584	17	4,634		81,679	271	5	60	3	160,000,000	111,163	1,439,323,776

Relative results

Country,	Total Cases	New Cases	Total Deaths	New Deaths	Total Recovered	Active Cases	Serious, Critical	Tot Cases/ 1M pop	Deaths/ 1M pop	Population
USA	22.16%	19.192%	18.68%	12.04%	18.80%	30.64%	24.66%	520.64%	439%	4.25%
China	0.13%	0.004%	0.31%	0.0000%	0.18%	0.0014%	0.0047%	0.71%	1.54%	18.45%
US/Chin	168.8	4,741.9	61.2		105.1	21,221.8	5,240.20	734.1	285.0	0.2

As one can see, USA is among the top infectious countries, world average is about place 100 and China is among the least infectious on position 205. The upper table shows the raw data, as reported up to the date of access, while the lower table shows what these number represents relative to the world, for USA in red, and China in blue, relative to world showing the weight of each country in the world's cases, and US/China ratio shows how many times US outperforms China at COVID-19.

It is seen that at total death, the mortality rate in China was by a factor of 3 higher than in US, due to the learning curve in Hospitals and new medication developed meanwhile, where China was at the very beginning of pandemic, and was just developing medical knowledge on subject. It is observed that meanwhile rate of infections and new death in China was practically zero, while US has a spike, being among the worse in the world, in close rivalry with Brazil, India, Russia, etc.

1.2. Analysis of SARS-CoV-2 Pandemic control usage and consequences

In order to understand what happened we have to take a closer look at the hierarchy of controls applied for this pandemic briefly presented in Fig. 1, upper-right side, and how their application affected the results. Looking at Table 1, and Fig. 1 it seems that knowledge and advanced warning were greatly ignored in the USA, and the first, common sense protection measures and the possible hierarchy of controls have been forgotten, or deliberately minimized, when compared to China and other successful countries that succeeded to keep SARS-CoV-2 under control.

In Fig. 2 on the right side is presented a 1960s lunar module, with over 100 controls, that successfully landed on Moon starting from 1969, showing that if a man knows what is doing he may easily use successfully more than 100 controls, as was the case of Apollo missions, and many process control rooms whose successful operation passes unnoticed by media.

Under the "Eagle" picture there is drawn the "hierarchy of controls" that are used for protection based on NIOSH [18] there are well known as "hierarchy of controls, a foundational concept for solving OSH challenges that consists of five ways to mitigate or eliminate a hazard that are ranked in order of effectiveness and, therefore, preference" that seems to be fully omitted by CDC. These controls are presented briefly in the lower left corner of Fig. 2, and they are:

- **Elimination** (dark blue) that involves physically removing a hazard. It can eradicate viruses by denying access to host cells so the virus is unable to replicate. Most people think that denying access comes in the form of effective vaccinations and transmission prevention.
- **Substitution** (green) is the act of replacing a given hazard with something less hazardous, by administering a drug that interferes with the viruses' ability to replicate once a person is infected is, in effect, making a more lethal virus into a less lethal one.
- **Engineering Controls** (orange) involves isolating people from a hazard or placing a barrier between them, as a sneeze screen, appropriate ventilation, that take time to appropriately produce and deploy.
- **Administrative controls**, (brown-red) which involve changing the way people work or act, include changes in policy or procedures to reduce or minimize hazard exposure. Personal hygiene, isolation of people, limiting the size of gatherings and keeping a 6-foot separation between people are difficult to implement because human beings are rarely perfect at compliance, but is a temporary solution, bridging the gap until more effective controls can be put in place.
- **Personal Protective Equipment (PPE**) (red) such gloves, masks and protective clothing that put a barrier between the worker and the hazard is the least effective control, and training on the proper use and limitations is needed. Despite the fact that PPE is at the bottom of the hierarchy, it has been a major focus during

the COVID-19 pandemic because similar to administrative controls, PPE can be implemented quickly if it's available, but in US was not.
This basic knowledge was also greatly ignored in the US, but was well considered in China, Taiwan, etc.

1.3. Pandemic controls applied in the USA, China, versus ideal application.

In order to understand better what caused the differences in results presented in Table 1, we have identified about 21 basic Controls, that seems have been developed and used to control pandemic, in order to produce a comparative analysis between China and US that are presented in Fig. 2 in [17] comparing US, versus world and China.

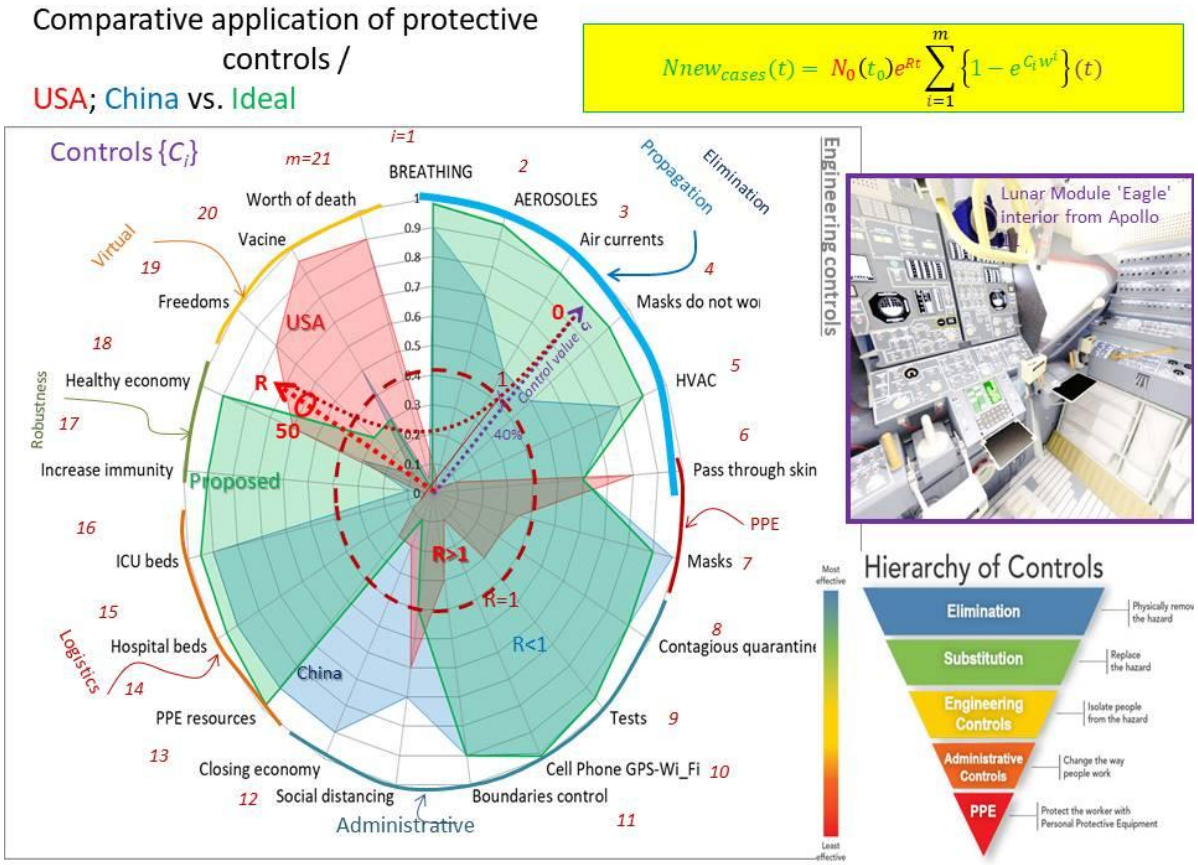


Fig. 2 –List of controls used in US versus China and Ideal, compared to a lunar module

The controls are summarizing the very few pieces of knowledge needed to understand the differences between the protection measures and procedures applied in the two countries engaged in a rivalry for the world's economic leadership.
Controls are grouped on types covering the functional and protective aspects. The first category of controls is about stopping propagation by **elimination and is involving engineered controls** (the light blue arch) and includes:

1. BREATHING, seems to be the FIRST BIG SECRET for the US: "Americans ARE BREATHING!", ALL OF THEM, when alive. And when they INHALE, they take inside what they have IN front of the mouth; and when they EXHALE, they bring OUT everything they have inside and share with "all the love". If there is COVID virioli COVID will be on the menu! Early on, China understood and used this piece of knowledge at about 90% while US greatly ignored it, setting it at about 10% in spite CDC, NIOSH had this knowledge since 1970s, but it is now known that they were muffled by the administration for political reasons. In order to develop an efficient protection one has to give very high importance to this fact, and accommodate the protection systems accordingly. The ideal value for this parameter is about 98%, a little bit above China's value.
2. AEROSOLES seems to be the SECOND BIG SECRET for the US. A normal exhalation produces about 10,000 particles/cc with dimension under 50 microns down to 0.1 microns (COVID virioli's dimension) that are airborne - and stay and go with air currents, like cigar smoke, ladies perfumes, other gases, living in air or like fog condensation on surfaces and it is waiting there to get transmitted for days to weeks. Virioli dies only

if it is chemically aggressed in bio-sterilization environments or if it is interacted using UV light or more energetic photons. US paid no attention to aerosols, 3%, while China learned at early stages about them and warned the WHO and the world, about their main role in transmission, 70%, but many leaders chosen to ignore this fact, having a terrible evolution. The ideal value for this is about 95% or higher.

3. Air currents represent another "BIG SECRET" for US, because open air currents and wind direction matters, which due to increased dilution gives 1 in 1,000 chances for transmission and this is probability becomes higher in crowded spaces. An ideal protection have it highly consider using this fact, 90%, while China discovered it after about 1 mo. into pandemic and used it, 50%, and US simply ignored it, setting it's value at about 3%.

4. Masks do not work, that is yet another "BIG SECRET" for CDC, where Masks N95; N100; MERV 20 HEPA Filters - ARE NOT ENOUGH TO PROTECT against EXHALED COVID, because they were never designed to do that! Of course, wearing a mask may prevent wearing a ventilator, but chances are 1 in 100 to get the virus if one gets exposed. The knowledge has been used to set in place other administrative protections or engineered protection. China used this at about 50%, while US ignored, 3%, while ideal is to use it near full capacity as 90%, without passing into full autonomous air PPE.

5. HVAC air conditioning and building heating, ventilation is PERFECT for COVID transmission, seems to be yet another one BIG SECRET for the US. China detected this since January 2020, [19] and put a special emphasis, 80%, on this type of protection, introducing UVc in the return ducts and special sterilization filter while US graciously ignored it, 3%, being recommended about 90%. This is the mechanism of transmission of the virioli inside buildings, cruise ships, airplanes, busses and offices.

These controls use **propagation knowledge** to develop engineered means to stop and eliminate the virioli. PPE (Personal Protective Equipment) as a control layer is also used in connection to appropriate knowledge of propagation, and includes:

6. "It passes through skin" – because a COVID virioli is 500 times smaller than a hair, and 100 times smaller than a skin pore while skin is hydrophilic - so if it is on skin it passes through with the same success as passing through a mask (1 in 100), because skin is a natural protection shield for the body. The problem is that a contaminated person has about 10 min. to wash in order to successfully stop it.

Washing hands measure recommended by CDC used as control of propagation in US and China at about 60%, is a common sense, measure, unfortunately not so effective in stopping this virus because it propagates 90% airborne. The ideal control may be set at about 60% up to 80%, because it is a useful hygiene action, and even it is not so efficient against covid, keeps in control other germs.

7. Wearing masks have been proven to be effective in China, 95%, and few other countries, delivering a reciprocal protection and the most reasonable use is similar to using light beams when driving a car. When alone on the street, ride with long range, high beams, similar to having long spit range by not wearing a mask, but when come in close proximity say 200 m, for light, and 2 m for spit, short range is on, by switching on short beams, to light up to 30 m, or by putting the mask on and reducing the spit to 0.3 m, as a mutual respect and protection measure. Unfortunately, in the US it became a political orientation statement, and made the wearing coefficient to be about 0.35, with disastrous results, while the ideal setting recommended is about 90%.

Administrative measures are also control levers, because the intensity of their application at social scale determines the output, and they include:

8. Contagious people quarantine, was not seriously applied in the US, 30%, just because contagious people have to be eliminated from socializing and spreading the virus, and concentrated safely under surveillance and medical assistance, until cured, but prevent them from spreading the virus to healthy people. China applied it intensively up to 90%, that is good enough.

9. Tests, in real time, are an important tool to identify and insulate the contagious people, and most important detect asymptomatic carriers. The US tests were not in real time when more accurate and they were with high errors when were faster, making a messy process, 30%, useful, while China applied less tests but in more efficient manner, 90%, being near the ideal value set on 95%.

10. Using cell Phone GPS-Wi-Fi is the another NO_GO for Americans, due to "Privacy concerns", ignoring the first rule to have this service provided that s to know who you are and where you are, information retrieved by towers with less than ¼ m accuracy using a Yale 1877 method called "Arm Protractor and Goniometer" Invented by Samuel L. Penfield, which was basically a triangulation method. More, the Wi-Fi may detects all cell phones in the surrounding area in a 100 m radius, and using the sensors on the phone, one can listen to sounds, see images, and know accelerations, temperature, humidity that can tell many details on user. All this data is at towers and service provider's propriety, and by consent is given to the user for his applications, which also have privacy issues. This cell-phone tracker method works much better than actual US contact tracking by 1000 times, having ½ ft, 1 second accuracy, it is real time, alerting the person about potential exposure, and also authorities to deal with potential support as quarantine, medication, food, access or trigger enforcement actions. US using this privacy bogus, fictitious argument and willing to make a healthy

profitable business out of covid declined its use while the tracking accounted for about 10% of control capability, while China used it at about 98%, as recommended also.

11. Boundaries control was enacted but too little too late, incoherently, and without the needed medical support and humanity, in the US at about 30%, while China was at 90% as recommended. One has to understand that keeping the interior clean, one has to control and keep clean the trespassing through boundaries too.

12. Social distancing, in a formal manner, was introduced as an administrative measure, but nobody told US people that in enclosures this does not work due to air currents and airborne virioli particulates lifetime, therefore this control was used at about 60% of capacity in US and 70% in China, while 80% is recommended. The inconsistency of its application in US was an ingredient for the disastrous result obtained.

13. Closing economy was an efficient administrative measure to increase social distancing, and worked well in China, where was applied in full, at 90%, and not so well in the US, at 20%, where federal economic support was flawed and amoral. It basically produces a GDP loss proportional with shutdown time and magnitude of closing. The usage of advanced protective system does not require economy shutdown or increased social distancing, but these were ignored in the US.

Logistics includes access to resources as Masks, gloves, gaunt, PPE, Hospital beds, etc. and includes:

14. PPE resources were scarce in the US, 20%, because US does not produces them, but abundant in China, 90%, while the instructions to wear or wear-not were very confusing in the US and very firm and clear in China and that was one of the pillars of their success. The recommendation is for 95% or 100% full population coverage with PPE in stock.

15. Hospital beds remained very few in the US, free hospital beds being at 5%, being one reason for the gradual deterioration of the medical treatment, introduction of "triage" and increase in rate of death. In China, as table 1 shows rate of death was higher than in US, because they were the first to experience the pandemic with no medical procedures in place, that have been later developed, in spite China produced in 2 weeks two hospitals, and kept available beds at a maximum 90%.

16. ICU beds were even more required, but even in the tsunami of COVID-19 profile, it become possible to arrange more ICU beds and ventilators, it turned very difficult to man them with the appropriate medical personnel, also affected by a so long pandemic. In the US, was a crisis of ventilators, available and manned ICU beds, keeping this resource on 5%, while China was at 90%, and 95% was recommended.

Measures to **increase robustness** in front of potential infection and pandemic include:

17. Increase immunity via alimentary supplements as Zn, Se, Mg, B, C etc. was not disclosed as being alternative preemptive medicine that may act as a passive protection layer, being advised to be at 90% while Nor US, 5%, or China, 10%, seriously considered it.

18. Healthy economy is a myth, and among the BIG SECRET for the US, because THERE IS NO HEALTHY ECONOMY WITH SICK or CRIPLED PEOPLE! Opening and closing the economy before stopping pandemic was a big mistake, driving to bigger losses of lives, and health of the economy in fact reached 60% in the US, while being at 90% in China as recommended.

Virtual or alternate reality, wishful thinking elements are also grouped as control levers, but their role is mainly to perturb the action of object oriented realistic controls include:

19. Freedoms application is yet another BIG SECRET in US because nobody dared to explain to dogmatic crowds that ALL Constitutional rights applies only when one is alive and have a meaning when is healthy - else they are pointless. US turned that into a political issue, which gravely affected the mask wearing and obedience to health orders, setting this on 80%, while China kept it at about 10% inside firm enforcements of protective measures as described before. Here the recommendation is not clear, it may be set at 30%, with the meaning that general human rights have to be respected if decoupled by the protective measures, that unavoidably affect some of the freedoms.

20. Vaccine is a fata-morgana because in the waiting for a rushed vaccine, they lost the sight from the near danger and real time protection, but being considered "big business" all other rational measures fade in front of it. US set all the hope and propaganda for Vaccine big business, as a solution from everything ignoring basic realities, that vaccine is more effective and useful for people who were NOT infected previously and set the control on 50%, while China set it on 20% near ideal value proposed, in spite autonomously developed 2 types of vaccines.

21. Worth of death is a notion developed by US, 90%, which seems to have discovered that death of a senior, or person with preexisting conditions may save by cost avoidance more than $1 Million in 10 years for social security and Medicare, and may be a tool to balance the budget and political orientation distribution on map. This was not considered by China, <3%, as being inhumane. The problem in the US is that from the political gibberish and interference over medicine and protection science is hard to decipher how important this criterion was for political leaders, who basically ignored the collateral damage brought to lives of those infected, using political propaganda as a reason to defy the very few scientific protection measures.

These so-called "secrets" are known to us and CDC since 1980s, and I wonder why they do not come forward and tell all truths and make appropriate protective measures. More information is piling up on interference and manipulation of CDC, by the White House dimming its role in pandemic control.

1.4. The Cost of Defying Science and Common Sense

From the modeling point of view, there are several factors playing a role in the evolution of the infection and death rate, qualified as the most visible outcomes of the pandemic:

- The evolution of pandemic inside an unprepared system drives to an exponential evolution simply characterized by the equation $N(t)=N(t0)e^{-Rt/\tau}$, where R is the multiplication rate and τ is the incubation time, where the "activity is given by the ratio R/τ. This kind of evolution is seen at the beginning of pandemic, inside the reaction time. At about 40% amplitude of controls R=1 the propagation becomes critical, decreasing with increase of real control amplitude, and with decrease of virtual controls.

In the center of Radar curve is plotted a sketch of the equilateral hyperbola (R-m) $<C_i> = k$, that gives the criticality of the pandemic, as a function of multiplication rate R and τ the specific reaction period.- As seen on Daily cases chart, on the bottom of Fig. 3 in China (blue curve) reaction time was of about 5 weeks and in 1½ months the curve was flattened, reaction was complete and in about 2 mo. they terminated the pandemic, remaining with few under 20 cases per day, especially at borders and entry points.

- In the US (red curve) the initial reaction took about 2 mo., was undecided, a lot of back and forth, therefore after a small dim in daily cases the infection rate grew again in June, July, and again in October-December, with a doubling period of about 1 week in December. This tsunami profile is in good correlation with incompetence in response, and wrong handling of the pandemic controls.
- If a smart attitude will be enforced and controls set in the right position, the exponential sign will be reversed, and the green evolution line might be obtained terminating pandemic in less than 3 weeks.

In Fig. 2 is a "radar" chart that shows the approximate controls settings C_i choices made by China (in blue) US (in red) versus ideal ones (in green). It seems that setting the controls on 40% cancels the exponential index and virus multiplication rate R=1, maintaining constant the number of new cases.

It is obvious that the things of value for the US are different of those China selected, that are more near to the right choices. In reality, to have a good image, more parameters have to be considered, but from all of them we selected a few 21 control options in order to make the difference clear. For example, the US put emphasis on unrealistic elements such as "freedoms", used to minimize the "use of masks" and administrative measures as social distancing by closing economy, they totally ignored the aerosolized propagation and the fact that masks offer a limited insufficient protection, statistically observed that drives to an infection rate of about 1% for those wearing various configurations of PPE.

The surface ratio between the green polygon and the red and blue polygon in Fig. 2 shows the level of competence of the Chinese versus American authorities in charge and the smartness level of their populations and is observed that China reaches 85% while US reaches 15%, similar to what the table 1 showed in the ratio between the results in US/China. Where the blue or red polygons are outside the green polygon means that is an overestimation or a wrong direction as in the case of US which puts value on "factious constitutional freedoms, control "19", death over life, control "21", future promised vaccine, control "20", and "healthy economy" control 18", with the consequence of not shutting it down, as Chinese did, control "13", that resulted in tsunami profile. From reading this, it is clear that US is by a factor of 6 less competent and prepared for facing a national pandemic threat than China is, and it becomes clear that US is the big looser in the race for planetary leadership. The cost paid by US for these series of blunders is shown in Fig. 3 in the central plot, at total infection cases, that represents 20% of the world's causalities where the actual no. of death in US, where 1 in 27 people is infected from which 1 in 45 dies is double than the number of total infected in China.

Fig. 3 Outcomes of control application in China versus US and proposed ideal response

The evolution of COVID-19 in the US was unexpected, because it had a grace period of two months, when the Chinese were fighting the pandemic, and a learning curve was expected to appear traced in Fig. 3 by the light-blue dashed curve, that basically said that will be possible to have by a factor of 2 less infections and causalities than in China, which has 5 times larger population than US, ending up with less than 30, 000 people infected and less than 2,000 people dead due to this pandemic. Everything above these values are due to criminal incompetence of the leaders from that time, that basically slaughtered the ignorant, arrogant who minimized the virus danger, or older and weak, with pre-existing conditions population, while first responders and essential workers become collateral causalities, same as children in schools, amplifying the disaster. "Trump and COVID disclosed the real face of America" [13], by the policies he enacted, set in the lime light, the tribalism and "cannibalism" of American society, lack of empathy, of moral compass, honesty and decency, and above all impossibility of thinking and learning, and these are the hidden parameters that are the roots of this social disaster, but are very difficult to quantize, and add at the range of "disruptions to pandemic controls", along with fictitious controls.

The weight coefficients w_i are complex functions of time and external parameters, that may vary with geographic location, economics and politics, and may be taken in such a manner as to reverse the function of virtual controls transfer into the R values.

The picture of Lunar module "Eagle" rom Apollo 11 shows that on July 1969 was no problem for Neil Armstrong to accurately handle more than 21 controls to land on moon, but by 2020 our authorities crashed at COVID-19 controls, and that may be due to US failed but highly praised education system, that become more and more a business, extending from colleges down to kindergarten. Over the last 4 years the U.S. has been somewhere on an alternative universe for many reasons, too many issues have gone drifting to in other directions, this COVID happens to be currently the worst by far; from here, what should be done, and can be done is presented. A simple explanation for the US disastrous results is based on incompetence of the society, its incapacity to deal with such challenges, rooted in its failed education [16,21].

II. SARS-COV-2 PROPAGATION AND PROTECTION

During the R&D phases, of our research various virus propagation means were studied and solutions based on the hierarchy of pandemic controls, were provided, analyzed and compared to the existent technologies, already developed based on a SWOT (Strengths, Weaknesses, Opportunities and Threats)

approach. The knowledge used is coming from engineering, aerodynamics, photon interaction with biological matter, nano-engineering and bio-terrorism defense.

2.1. SARS-CoV-2 propagation

The US president stated by March 2020, in an interview with Bob Woodward (on February 7) that "he had recently spoken to Chinese President Xi Jinping about the virus, calling it a "tricky situation." The president said the coronavirus was "more deadly" than "even your strenuous flus," and difficult to address because "it goes through air."", unfortunately, he publicly downplayed the dangers of the coronavirus as it silently spread around the world, hoping to avoid a panic even as he recognized how "deadly the virus could be" [13].

This is a short history of year 2020 to which one needs to add this info on vaping deaths [3]: "It could be the largest public health scandal in American history. In a little over two months a cluster of mysterious pulmonary illnesses metastasized into a national health emergency with over 1,300 fallen sick, and as of October 10th, twenty-nine deaths. CDC released protection instructions were flawed [20] because COVID-19 is mainly transmitted via small aerosols emitted while breathing which can travel, long distances in HVAC systems [19], contaminate indoor areas and buildings and remain viable for more than a day.

Secondary transmission is via direct skin contact by touch larger, short range aerosols, on surfaces, or condensate of airborne aerosols on open skin.

Masks are somehow protective, N95, N100 provides a better protection than other home-made protection, like bandana and others which are less effective [20, 22].

Outside air exchange can greatly reduce the virus loading, of the thousands of documented super spreader events, only one was outside, due to higher aerosol dilution.

The new high frequency UVc can kill COVID-19 in the return ducts of HVAC systems and has far less adverse health impacts on humans.

As previously shown, in Fig. 4 COVID -19 propagates over 90% using aerosolized watery droplets, and less than 10% by skin contact, where over 99% of spreading takes place inside facilitated by the actual HVAC and air circulation systems, while less than 1% is the result of outside spreading.

As it is shown in Fig. 4 "A", SARS-CoV-2 propagates mainly through aerosolized watery droplets containing the virus inside, with a concentration dependent of the level of contagiousness, [23] that is variable in time and by person to person, therefore for evaluation purposes we supposed that there is at least 1 COVID-19 entity in each watery droplet. In the chart "B" it is shown the dimensional distribution of exhalation aerosols for various aerodynamic regimes of operation of the respiratory system. In normal breathing conditions, the watery particle magnitude (PM) distribution is shown by the brown-solid curve, reported on the left ordinate "***dN/d(logPM(DP))",*** with a maximum at 0.6 μm. When speaking normally to this curve some resonances appear between, 4 - 8 μm [5,6].

Coughing gives a different distribution, plotted by the solid brown-red curve with circular measurement dots, with a high maximum between 8-12 μm, ending at about 50 μm, and having some resonances between 1- 6 μm. These distributions are changing from patient to patient, and are given for orientation purposes and qualitative evaluation only.

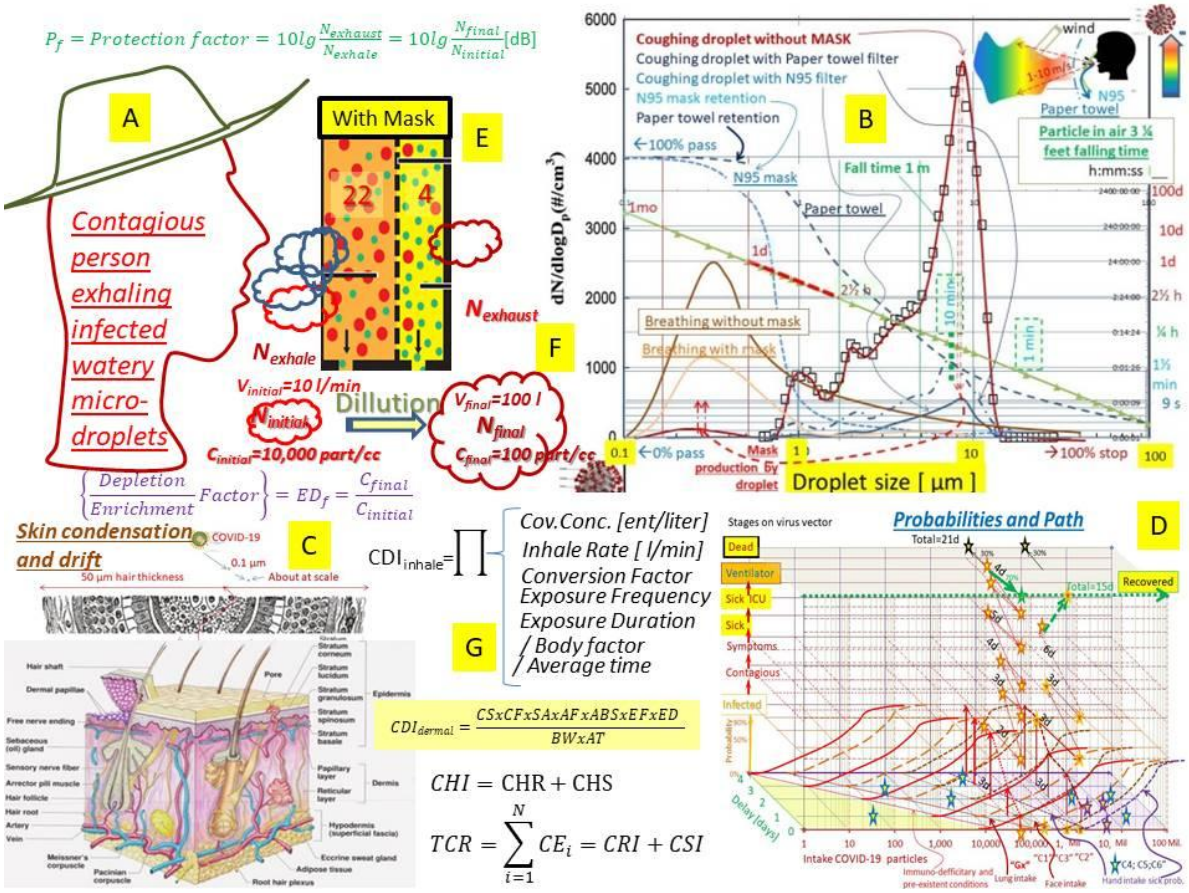


Fig. 4 Means of virus transmission, modeling of infection rate and sickness evolution

2.2. Mask role in protection against SARS-CoV-2, virus propagation, modeling, and sickness evolution

As recommended finally by CDC [24,25] wearing a mask changes things, but one has to understand that a mask is basically a dry filter, made of some fabric with various affinity levels to water, and as any filter does, it produces a variation in concentration of the targeted element before and after it, as shown in "A" and "E". Respiration is a periodic regime in about 4 strokes: inhalation; internal gas exchange; exhalation, pause, varying in frequency from 2-20 cycles per minute, and moving between 5 l/min at women up to 10 l/min at men in near rest activities. During physical effort, the volume increases. As chart "B" shows during each normal exhalation about 10,000 droplets/cc are released, making about 100 million droplets for a man in 1 min.[26,27] These droplets may content virioli that may be delivered this way.

If one calculates the speed resulting from the application of Stokes force, $v = \rho$[g/cc]r^2[cm]g[cm/s^2]$/8\eta$ [cm^2/s] , where:

F is the drag force, balanced by droplet weight, r is the radius of the sphere, η is fluid viscosity, and v is the velocity of the sphere, ρ is the density, and uses that to calculate the time such a sphere falls 1 m, will get the grey-green line with red dots on it, referenced on right ordinate that gives time in conventional units ***[h:min:sec]*** and in convenient ones on its right. It is observed that COVID-19 virioli (virus before infection), [28] dry, with or with little water, falls in about 1 month, while for a 30 µm cough drop takes about 1½ min to fall, being basically airborne. Particles larger than 100 µm fall in about 3 sec., while the minimum time to fall is 0.45 s.

Basically, when a human exhales, a plume is generated outside of his/her mouth that travels with local air currents.

The exhaled plume comes out at 37^{o}C, usually, in an atmosphere of about 20^{o}C, having a buoyancy that makes it rise until it cools down. [29] While rising, larger particles evaporate becoming smaller and increasing their flotation. Meanwhile, diffusion takes place and the contaminated volume increases while its virioli concentration decreases spreading like smoke. If the plume is exhausted low, or directed, it may meet human uncovered skin and may condensate on it, depending also of skin hydrophobic status. The virioli contained inside watery droplets that are deposited on skin and from there they fall inside the pores reaching the blood veins, driving them inside circulatory system at heart, lungs and allover inside the body becoming active viruses. On the drift way through the skin, that is a protective membrane, a significant amount of virioli is incapacitated

or killed by the direct contact with skin's secretions, but few survive, as "C" drawing shows. The virioli may also deposit on other surfaces, having a long survival time, in days to weeks range, and hand touching these surfaces may bring the virioli in contact with patient skin. Washing hands is a good common sense instruction, but in this case, one has less than 10 min. from the contamination event to wash hands in order to be an effective protective action, and this condition is not met [30].

To protect against exhalation plumes, US took about 6 months to understand the role of masks, as a very efficient collective protection tool, by shortening the "spit range", from about 2 m down to ¼ m, by 8 times, and accordingly, reducing the contaminated surface, by 30 times and contaminated air volume, by 60 times. These values are relative and depend on mask's fabric's mesh density. N95 masks and N100 masks are most praised, and they also offers individual protection features, by depleting the watery droplet concentration as shown in chart "B", in average by a factor of 10 to 100 depending on PM [31]. Micro-nano-fluidic effects combined between air and fluid and fiber may also drive to particle atomization, where large droplets are split in much more smaller droplets, shown by the red dashed line and 2 arrows at o.3 μm, that are more dangerous than the bigger initial droplets because they increase the presence in space, being more available for infection.

2.3. Protection factor and dB scale usage

I think it comes clear that a mask is basically a filter or a porous membrane that modifies the concentration of a component passing through it, and in order to quantitatively characterize it we need to define its separative efficiency, defined as enrichment/depletion factor, just above "C" as a ratio between final and initial concentrations [32]. In practice these values are large functions being quasi-exponential and using logarithms may simplify the issues, therefore, we defined a Protection factor Pf as the logarithm in base 10 of the ratio between the final concentrations or number of virioli, with result in "Bell" units. For practical use of such shielding powers is the use of dB (decibel) scale by multiplying with 10 the lg. value, as seen in Fig. 1. With this tool now we may measure the protection factor of various masks, as in our example $\boldsymbol{P_f} = 10\ lg(4/22) = -1.8dB$, or for the N95 filter with retention power plotted over the chart "B", for which we obtain about -20 dB, and for paper towel fabric we may obtain about -12 dB, but be careful, these $\boldsymbol{P_f}$ depend on the dimensional distribution of the filtered particles. We may extend the concept of $\boldsymbol{P_f}$ to dilutions as exhaled plumes encounter in air and in the case of the 10 l cloud plume exhaled by person in "A" that expanded at 100 l we may obtain $\boldsymbol{P_f}$=-10 dB, in order to use in future protection calculations. The question is now if one stays a time in an environment of 100 million particles, exhaled in 1 min. by a person, is one virioli inhaled enough to make him sick? The most probable answer is "Yes!", and in order to inhale 1 virioli from 10^8 one needs a $\boldsymbol{P_f}$=-80 dB. How long one can be safe in a virioli corpuscular environment is given by Poisson distribution application, and for 1 particle/min that gives about 30% of the time. In order to be safer we need to increase the protection factor by at least 2 orders of magnitude, reaching -100 dB, and for this value the Risk factor, $\boldsymbol{R_f = 1 - P_f}$ becomes less than 1 %. Because failures in shielding systems frequently happens, we need to further increase the $\boldsymbol{P_f}$ up to -120 dB, which is a huge value and becomes obvious that may not be reached by wearing an ordinary N95, N100, or surgical mask only [33], and using a stack of 4 masks of -30 dB each will barely give – 40 dB but a huge pressure drop at the limit of -0.2 bar vacuum, an ordinary human lung may produce.

2.4. SARS-CoV-2 risk factor, intake dose and sickness

The question related to how many virioli exposure one needs to get sick and how the illness may evolve as function of that is a more complex one, that in area "G" of Fig. 4 is briefly given a flavor of it, without the intention of entering in more details. It is shown that CDI – COVID dose intake is a sum between inhalation and skin drift, and each is a product of many independent factors normalized to body features, as shown in the accolade and below it on yellow background. These are just a few of the factors one needs to consider to do a calculation to obtain the total COVID risk factor TCR, that combined with protection factor and exposure time to give an estimation of the initial infection dose.

Chart "D", is a simplified 3d chart that characterizes the disease evolution. It has the x axis showing the number of virioli – virus entities penetrating a body, y axis shows the delay in the incubation and next disease stage occurrence and on z axis, various stages of the disease are represented, as healthy, infected, contagious, symptoms, sick, very sick in ICU, lung damaged on ventilator, death or recovery, each as a function of everything it happens meanwhile,(medical treatment path, alimentation, etc.) gives the duration on each stage up to transitioning in the new stage. At the end of this cycle statistics come and for US, in mid-November 2020, they show that 1 in 30 is sick and 1 in 45 from the sick people is dead, while overloading the medical system and the death ratio increases towards 1 in 40, in various states.

III. An Individual Air Refurbishhment System, Summary

It was clear from the very beginning that the most exposed surfaces to contaminated air plume is the exposed face-neck skin surfaces, as well as hands and open view legs, and a soft comfortable confinement barrier has to be added, that to be easier to wear than a full body PPE [34].

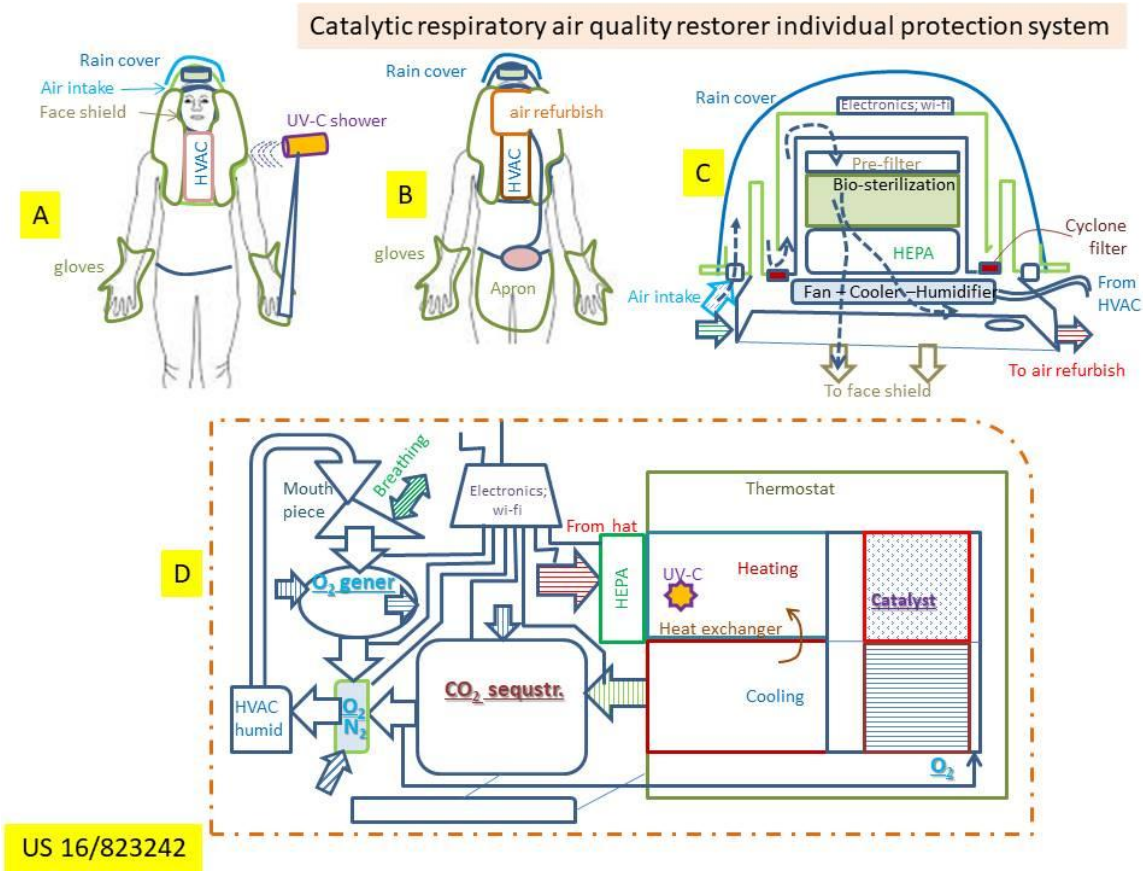


Fig. 5 – Individual protective system with air refurbishment and UVc decontamination

3.1. Protective gaunt with integrated face shield

A cheap version of face shield has been developed and tested [35] and it was immediately observed that it presents some inconveniences- because it accumulates inside the exhaled air, it has significant increase in relative humidity and temperature behind it and a fresh air continuous flow is required as one can see in Fig. 5 at "A" and "B" that are front and back views. It is seen that the person is wearing on the head a modified helmet that has a rain protection and cover, and a set of filters inside that are detailed in "C". The reason the air intake is above the head relies on the fact that in spite plume's buoyancy, the probability of entering in a plume at upper level is smaller than that one may encounter at lower levels, where valves masks are also used and leakage from surgical masks occur most frequently.

3.2. Helmet air processing unit

Test revealed that an upside down airflow is required inside the face shield to maintain it comfortable, and that may be achieved using a combined filter unit, that has a salty cover on the inside of the rain cover, makes air rotate inside and pass through a cyclone filter with high PM particulate retention, that deals with rain and dust. Further, it passes through a pre-filter that stops mainly all particles with PM larger than 1 μm, and enters into a bio-sterilization filter made of various anti-septic layers of fabrics impregnated in salts as NaCl, KCl, KBr, NaI, that uses the advantage that virioli are transported in watery droplets, touching the salt micro-grains, melts them producing a ionic solution that most often destroys the virioli's spikes, or even its DNA inside, incapacitating it. More, when water evaporates, salt recrystallizes trapping the virus inside a micro-grain easy to be retained by the next HEPA filter. Other chemical combinations as iodopovidone, iodine tincture, or photo-catalysts as Ni, Pd, Pt, etc and UV-C may also be used inside.

A HEPA filter, MERV>14 is used to further purify the air, and may also desiccate it. In a hot climate, a light heat exchanger may be added with an US (Ultra sound) nebulizer in order to improve the quality of respiration. A fan is also required to make a continuous flow, and an electronics box may be added with data

acquisition system for bio-parameters, as temperature, oxygen level and pulse rate of the bearer, as well as environment parameters, as pressure, temperature, humidity, noise level, etc. Speaking from inside is impaired by direct attenuation and reflection in the face shield and an audio system with microphone inside and loud speakers outside may be added, of course, powered from the same battery as UV-C light and fan.

3.3. Air refurbishing portable set for loaded atmosphere

As complex as it appears the system exhibits a Pf lower than -60 dB, and for most of configurations it is not enough for a real protection inside a COVID-19 virioli exposure. Statistics showed that using actual PPE professional equipment in that atmosphere delivers a risk factor between 4% and 1%, explained by the fact that many failures happened diming its protection factor as well during undressing contaminated equipment is the most dangerous phase. That is why a UV-C shower lamp was introduced, in order to sterilize the surfaces of the gaunt before undressing, seen in "A" zone.

A loaded air zone may be considered in a hospital, in a mine, with explosive organic compounds, or in places where a bio-chemical terrorism attack happened, and intervention inside that zone is required. In this case, the electronics will be upgraded with multi-gas analyzer, LEL/LTL (Lower Explosion / Toxicity Limit) detection, and IR spectral sensors for targeted gas plumes.

In this case, the helmet will not deliver directly respiratory gas inside the face shield but via a hose to a backpack containing all the air processing units, in a modular structure used as needed, as area "D" shows.

The air from helmet, see red arrow, air to refurbish is entering a countercurrent heat exchanger, that warms air up to 200 oC, directly by heat exchange from the already hot air exiting, or by electric assistance, embedded inside the catalytic felt, that also stabilizes the temperature. An UV-C sterilization light may be added in the input, to further ionize the organic matter, helping the catalyst to burn completely. In the final stages of the catalyst some Oxygen or air may be introduced to assure a complete burnout CO free. After being processed, the air is cooled down as much as possible in the heat exchanger and it is added to a CO_2 sequestration unit that mainly is an alkaline filter. This feature is important in hydrocarbon and organic chemicals atmospheres. Further, in high oxygen depletion, an oxygen filter may be added, delivering up to few liters of 90% O_2, used to enrich the respiratory air, and a cooling down at the right temperature and humidification may make the gas better for breathing.

The system may be also used in a rebreather regime, using a medical grade Oxygen bottle, and may be also used to deliver additional gases and aromatic elements for bronchi-dilatation, etc., using a mouth piece, that returns the air, and refurbishes it, similar to existent scuba-diving rebreather equipment. The problem is that it becomes heavier and more complex than a simple PPE with autonomous compressed air bottle, and instead of being a portable 20 kg unit it may become a transportable unit to load gas bottles to be used, that seems to be lighter and simpler to use. For these last systems the Pf is higher than -120 dB but undressing remains an issue and this process is prone for contamination.

IV. SYNERGISTIC AREA PROTECTION SYSTEM, SUMMARY

As previously observed experimentally and calculated, it is difficult to use a single set of filters and obtain the desired safety level. More, to use same filters in cascade, it does little to none improvement, as one may see in Fig. 3"B", the droplets released through a mask – light brown curve, and light-blue solid curve under "cough" and "10 min" airborne time, filtered once may not be filter twice and pass with little depletion through another person's mask who inhales that air, giving a total Pf lower than -50 dB, that is not enough as seen from statistics [32].

The novel system developed come to mitigate in part failures to correctly wear all the time the protective equipment and it is designed to quasi-fail-safe, meaning that the protection is dim but remains negative during failure, and takes a coincidence among independent factors to obtain a total or major failure, being mainly independent of a single user or participant in the process.

The system as seen in Fig. 4 provides 4 tier of protection that are showed in:

- "A" zone, red triangle, that refers to a specific enclosure system that delivers protection, by recirculating downwards the air and sterilizing it,
- "B" zone, blue triangle, that refers to a so called "collective protection" offered by the other participants, by wearing a mask and sterilizing and placing low near the ground their exhaled gas;
- "C" zone, grey borders, light-green filled triangle, where the protective equipment has its own filtration and air purification, sterilization system;
- "D" zone, grey line, yellow filled triangle where supplementary a vacuumed drain tube is installed to capture the exhalation of stationary participants, as students in a class, travelers in a bus or plane, etc.

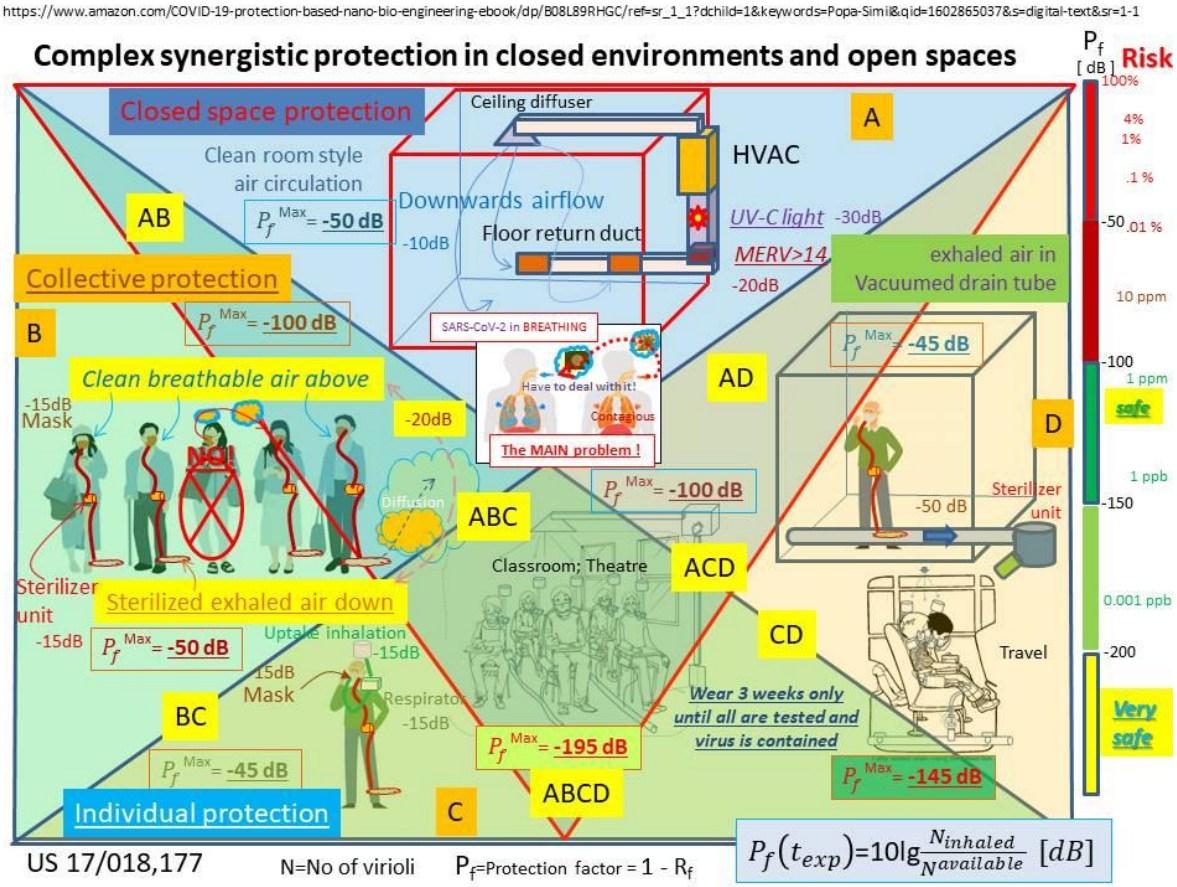


Fig. 6 -

In center, in a red polygon is presented the problem it addresses: the aerosolized transmission of SARS-CoV-2 inside watery micro-droplets, from an infected person with "red lungs" who exhales the air with all he has inside to a healthy person, with "blue lungs" that inhales that air and gets infected, and that air is what we have to deal with.

The figure uses the right side to qualitatively present the protection factor in [dB] and the risk factor in [%], [ppm], and [ppb]in order to highlight the theoretical safety delivered by each combination of elements.

4.1. Closed space protection

This protection is a consequence of the fact that a contagious person exhaling in a closed space leaves behind an important contaminated volume of air that has to be sterilized. Fig. 4 "A" shows a modified HVAC system that has the return ducts placed near the ground and the air inlet duct on the ceiling, producing a descending air current and taking down any exhalation plume, released at the head level. Inside the return duct an air sterilizing unit is placed containing air filters and UV-C light, able to kill up to 99.9% of germs in a single path, that means a -30 dB at UV and -20 dB at chemical and HEPA filter, and another -10 dB inside the room due to airflow orientation. This airflow direction may accidentally be lost when opening door and/or window, therefore about -50 dB remains as certain protection factor. In order to operate usually a HVAC unit is design to pass through the volume of an enclosure in few hours, and with each air recirculation passage the threat level is decreased by about 40-50 dB, being safe to renter unprotected after 4 periods. Another way to speed-up the process is to have a holistic UV-C illumination of the enclosure when it is empty, few hours at the right power cuts in half sterilization time

4.2. Collective protection

It was amply discussed the role of masks, the spray range was measured multiple times, and up to now it is unclear the protection factor offered by various face coveralls in spite many classifications, probably due to political interference with science that is affecting US [26]. The most effective public protection may be achieved by motto: "stay tall and breathe up, while exhaling down" showed in area "B". There are represented a group of 5 people wearing a novel type of mask, which is thin, transparent, has an intake one-way valve, and an exhalation valve. The exhalation valve drives the air into a sterilization filter, that may contain salts, chemicals,

and/or UV light, and a fan working during exhalation period in order to produce a negative pressure in the mask to improve exhalation, and compensate for the sterilization canister dynamic pressure drop. From the sterilization canister that is bound at waist, a flexible hose is driving the exhaled air down near the foot, where it is released. In order to cancel its buoyancy the canister will have a thin metal wall, cooling down the exhaled air, such as only near ground air currents may take it back up or the expansion via diffusion process. An exhalation without mask at mouth level is prohibited as by plume gas expansion it may expose the nearby person at a Pf of only -3 to -10 dB, good enough to get her infected. The exhalation via a mask gives an exposure under a protection factor Pf of about -23 to -30 dB that drives to a probability of about <1% of getting infected.

4.3. Individual protection

This protection is achieved acting on air inhaling path, as shown in Fig. 4 "C" area that shows a person in a green suit that wears an aspiration filter above the head, something similar to what was described in Fig. 2 area "C", followed by an air regeneration unit that further eliminates CO_2, scents and humidity, cools the air and re-humidifies it, possibly introducing some other scents and medication. A fan is present and during the inhalation process, it increases the pressure in the mask with ¼ m of water to make inhaling more efficient. In fact, wearing the entire individual respirator system with the push-pull assisted breathing, one person at 1,000 m altitude inhales air as being at 500 m over sea level and exhales as being at 2,000 m, which corroborated with cold air at about 10-15 ^{o}C gives an oxygen boost of about 10% while wearing the system [28]. The inhaling system also provides a total protection factor of about -45 dB distributed as it is shown in area "C". The assisted breathing is made using a pressure sensor in the mask and a mono-stable circuit timer, or a thorax expansion bio-medical parameter measurement system that detects lung cycles and adjusts pressure in the mask accordingly. There are limits for mask pressure given by the strength of the head ribbons, and the supportable pressure in sealing on the face bur ¼ to ½ m water column is doable. The transparent mask also has a hole with a plug for using a straw to drink fluids, and also associated electronics. The bio-medical data acquisition may be complementary to the respirator functions, measuring continuously body pressures, oxygen rate, pulse rate, temperature, breathing rate, oxygen vs. carbon dioxide content and more used to interpret the continuously the health status of the bearer.

4.4. Vacuumed drain tube for exhaled air

There are cases when the users are steady in various locations, and for those circumstances it becomes a bonus to collect the exhaled air in a vacuumed drain tube, simply by plugging in a hose adaptor the exhaust expelled air tube, as shown in Fig. 3, "D" area. The system is simple and efficient, it is a kind of shop-vacuum having port where the exhaled gas is connected. The advantage is that compared to building modified HVAC system as described in "A" area, the system is insensitive to window and/or door opening, and deals with a much smaller air volume than for the entire enclosure, drastically reducing the contamination risk of the enclosure. For example a man in 1 h releases ½ m3 of contaminated air, and if in a plane, bus or train, 40 people release about 20 m3 of air to be treated, that reduces the risk factor and consumption in case of a recirculation system. In fact, after a supplementary sterilization, the air may be flushed in environment via an air/air heat exchanger, as to preserve the energy because and produce a saving of 20 [m3] x 1 [kJ/m3] x 20 [oC] = 400 kJ/h = 1/9 [kWh] (about 1 cent/h), giving a ROI (Return of Investment) = 4-10 years. In other words, dumping the exhaled air for a full buss or amphitheater in environment may be done without a big loss directly without air-air heat exchanger, but that device is useful for the pressure balance inside the closed enclosure, and the protection factor induced by such a system is better than -50 dB. Failures may occur when the user disconnects and moves inside the enclosure putting the exhalation near the floor.

4.5. Combined solutions

This is in fact the essence of the development and synergy, where this equipment may be used together in various combinations, that are figured out by the overlapping of the zones, creating boundary zones where any solution S belongs to combinations of A-D each rated to provide a protection factor of about -50 dB if all elements inside are considered, taken by 2; generating the series {AB; AC; AD; BC; BD; CD} giving protection factors around -100 dB, and of 3 generating solutions for protection as {ABC; ABD; BCD; CDA} enhancing the protection factor at about -150 dB range and all together generating solution {ABCD} with Pf of about -200 dB. It is observed that the future of safe classes and meetings in person relies on "ABCD" solution, that fails safe in "ABC" solution when somebody moves around or inside-outside that changes the limits from "very safe "to" safe". Gym rooms also match "ABCD" case.

On the right side of the image there is a scale with a level of protection in [dB] color code on the left side and risk factor expressed in [%] or [ppm; ppb] with qualitative classification of the safety level according to the 4 stages of 50 dB each. It may become obvious that the actual protection factors according to CDC recommendations are under -50 dB, with a risk factor in [%] aggravated by public noncompliance, that are a

direct cause of the actual tsunami like pandemic propagation. The analysis also shows which are the major improvements for buildings, transport systems and amphitheaters one need to take to stay safe.

The experts will realize the synchronous wear of the equipment by the entire community, for about 3 weeks with the Pf in the range over -100 dB is able to stop any virus propagation into pandemic, no matter if it is a corona or a classical flu or Ebola, or something else transmitted via airborne particulate. It has to be clear that usage of this system without the skin protection will leave a risk factor of about 1% for the disease transmission via skin diffusion, creating a subset of symptoms and sickness evolution. This alone may totally eliminate a virus like COVID-19 in about 6 weeks, but if an efficient contact tracing and quarantine of exposed people is made, with appropriate treatment of sick people, 3 weeks of wearing the protection is sufficient.

4.6. Efficient contact tracing

The actual contact tracing performed in western states is a massive failure, simply because an infected person has no recollection in whose vicinity was and, most often, the infected persons are strangers exposed randomly to the proximity and exhaled gases of a contagious person. A system that proved efficient was in China where cellphone tracking was used giving an accuracy better than ¼ m and exposure time accuracy at the second level, except in metal buildings, subways and other partially covered spaces where Wi-Fi connectivity may be used [15]. The advantage is that the cellphone tower, identifies the people involved and may give their location at any moment for quarantine purposes, as well may contact them easily by text or phone explaining what they have to do to be safe and get under medical observation. There is no privacy loss or gain issue, because when subscribing, a major condition of providing cell-phone service is to know who you are and where you are, the tower being free to collect or not the geo-location data, and use it for good or bad. Compared to other systems, the cellphone service may corroborate the proximity with time and wind direction, weather factors and atmospheric pollution, giving a much accurate estimation of the probability of infection, eliminating most of false positives, and saving time, money and avoiding quarantine discomfort.

V. Solutions For Indoor Social Situations, Summary

Eating, drinking in restaurants and bars were nominated among the highest pandemic risk places, together with conference rooms, church amphitheaters, and stadiums where people prefer not to wear a mask or the entire protective gear .

A protective solution was developed [37] in order to have these places up and running, presented in Fig. 5 based on the combination of few elements observed in nature in rare occasions and briefly presented in area "A". Similar to air traffic control, each person has to have defined and assigned an aerial space, firstly used in cellphone tracking, which to have boundaries defined by the risk factor. For our practical use, we defined an aerial private space at a radius of about ½ m around the body, and the spatial distribution of the risk factor looking like a 3d cardioid used to characterize sound, or EM emitters (antenna). We defined a rectangular box around the person, and considering the fact that exhalation cough represent the primary aggression or danger to an opponent, we introduced a set of technologies to mitigate that and stop the virioli inside the assigned air-box, and dealing with them.

The idea is to apply an air flow that captures mouth exhalations and drives them inside a sterilization unit.

5.1. Effects and processes used inside individual airspace

In order to make pleasant wind downwards over a sitting person's head one has to cool the air at right temperature and add the appropriate humidity, inside the comfort level. Bringing the air at a little bit higher temperature and adding water droplets as fog produced by an ultrasonic nebulizer, it will produce air cooling by droplets evaporation, amplifying the down current and producing a vortex, similar to virga effect"2" produced in nature during rains over desert. This down current, like an up-down breeze trains the watery droplets exhaled, and drives them in an air collector under the person. The US nebulizer may also contain a light saline solution as ocean water that may be more efficient in inoculating the virioli. In the under-seat air collector several air sterilization processes may be applied, in order to produce a high protection factor in the range of -100 dB.

The air coming down is warmed up at about 200 ^{o}C, and evacuated through an air-spike nozzle all along the boundaries of the airspace, forming a hot air curtain "3". The volume flow for the hot air is bigger by 5/3 than that for cold air due to gas expansion, and it is collected above the space. If mass flow is equal, the atmospheric boxing effect "1" is obtained and this has the role of aerodynamically sealing the volume. More, the larger PM watery droplets entering the hot air flow evaporates increasing their buoyancy and being trained by the hot air. Above the space air is sterilized again and evacuated or recycled [19,38].

As a supplementary protection measure an UV-C light "4" is applied from a trough parallel to the aero-spike nozzles and has the role to sterilize any germ getting lost from the hot air flow. The risk is not so high as long around table there is a double flow, one from the customer and one from his/her partners, having UV

radiation in between. Some electronic monitored table may have automatic sneeze detection and two poof guns "5" are firing at an angle producing an air pressure wave that stops the fast moving droplets and reintroduces them into downwards flow, in order to be collected and sterilized. Exiting gas flow may be collected above sterilized and flushed outside or may be restored and recirculated retaining a part of the heat is a thermal pump is used"6". Supplementary to these feature aerosol therapy "7" may be applied, using supplementary gas bottles or other substances with medical and therapeutic effect.

5.2. Schematic block diagram

In the area "B" of Fig. 4 is presented schematically the distribution of the technological elements that perform the functions described above. The intake air is first filtered for solid particles using a HEPA filter, then is sterilized using UV-C radiation and applied to a HVAC system. An US nebulizer is used to produce water droplets to add into air to create virga like effect, and the air exhaust nozzles are profiled to initiate a vortex down movement, surrounding the customer's body and collecting his/her gas exhausts, driving them as shown by the blue arrows. Under the customer's seat is a collecting port with fins directed to maintain the vortex movement. Underneath air may be sterilized using UV-C and chemical filters, and CO_2 may be retained in a alkaline filter as NaOH, $Ca(OH)_2$, etc. The air is warmed up and passed through a catalytic burner and from there inside the aero-spike nozzles forming the hot air curtain, shown by the red arrows. On the ceiling there is a counter-nozzle that absorbed the up-coming gas, sterilizes it again and flushes it out or refurbishes it and recirculates it in part with fresh air from outside. All the boundaries are also protected by a UV-C curtain and electronically monitored for safety purposes. A sniff, cough detection system may optionally add, and pair of compressed air poof guns is used to stop the fast going droplets inside air-space boundaries. The table is painted with photo-sensitive catalyst coating that helps UV sterilization between customers. For tables, as an increased safety manner a robotic carousel waiter is delivering the foods and drinks that also contain self-sterilization capabilities.

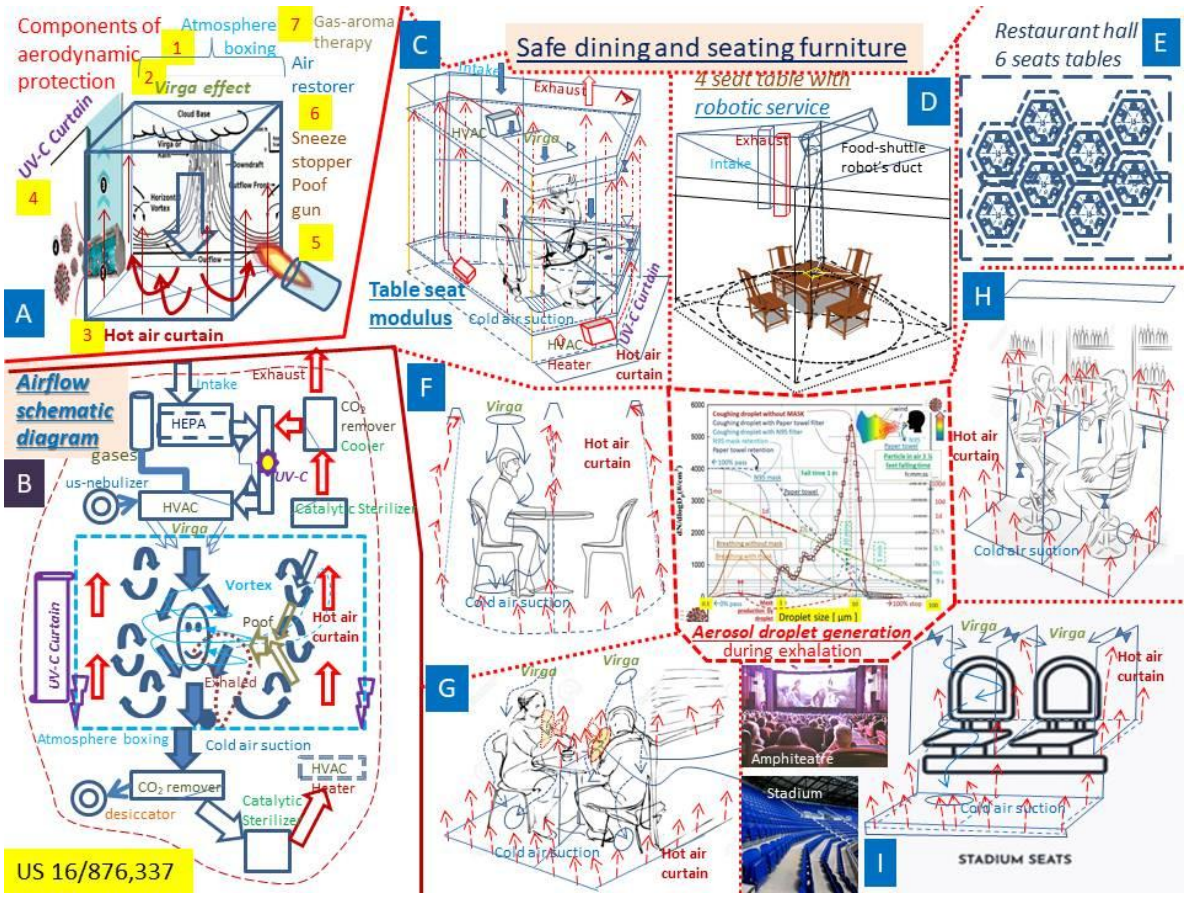


Fig. 6 Modular, safe furniture for proximity seating with embedded protection

5.3 Modular Table and its assembly

A four decks prismatic construction is made having technologic spaces between the two decks near the floor and those placed above as seen in "C" area, which holds all the necessary equipment. The prism angle is cut at 90 or 60 degrees in order to form a table for 4 people as shown in area "D" or for 6 people as an assembly

of such tables is shown in area "E". The table is also a fraction and has connecting clips around for fast connectivity. The table modulus in area "C" has a customer sitting at his part of table, and cold air from above is surrounding him trapping all exhalation and carrying it under the floor in the technologic compartment. All the modulus is surrounded by an UV-C curtain, and has sensors for boundary infringement, that stops both UV and hot air on that area, while alerting the customer that some confinement protection barriers have been infringed. The table is delivering about -50 dB in protection factor, that adds to nearby segment and together it drives to about 100 dB that is at the very beginning of the very low risk structure. The same knowledge may be applied in round tables for cafeteria as shown in area "F" with a single occupancy, or area "G" with double occupancy where physically consistent shields are alternated with aerodynamic shields.

The table in area "D" is made of 4 modules with 90o angle, joined together, that has in center room for the robotic waiter carousel that delivers foods and drinks directly from kitchen inside an antiseptic atmosphere.

5.4. Active pulsed aerodynamics cough range suppression

The central part is occupied by a chart showing dimensional distribution of aerosol particulates exhaled, as the main object of the development. It is important to observe the large particle peak, and the fact that after being ejected at about 10 m/s during coughing they constantly slowdown in about 8 m range, and a ½ [m/s] down breeze will deflect them downwards into the hot air jet that will burn and evaporate them carrying them upwards in the upper collector, preventing from crossing the table separation boundary, and reaching the other partner. The poof gun is issuing an interference pressure wave that pushes these particles back, stopping them at the mid path, without disturbing the flow for too long. This is the active aerodynamics based shield.

5.5. Bar safe sitting

In area "H" is presented a version for bar sitting and drinking and eventually, for eating. In order to assure a reasonable protection of about -40 dB in close proximity a solid transparent glass shield was introduced in between handling cold and hot air. To have a source of cold sterilized "fresh" air, air jet nozzles will blow over the head and mouth of the customers from above, like on an airplane. In rest, about the same structure as for the table where the hot and UV is overlapped to an optical barrier that temporary blocks the hot air and UV to allow glass toasts and cup contact "cin-cin" mode to keep customers happy and safe and at the same time, preventing them from virus sharing and from burns from hot air and UV. The embedded protection steps forward, detecting the moment the virioli propagation barrier is trespassed by a customer, and flashes an warning, and stops the hot airflow and UV in the affected area, in order to produce minimum harm to customer.

5.6. Stadium and conference room like safe seating

Stadiums and amphitheater sitting presented in a rea "I" are also difficult places to provide safety, if no mask requirement is imposed, due to singing and shouting habits the public wants to perform there. In these conditions a -40 dB may be obtained with hot air barriers all around the sitting that goes up in the air. The problem is the power consumption that becomes much higher by a factor of 10 and the strong ventilation system able to provide a flow of about 10 m^3/h/seat at 200 ^oC (½ kWh/seat/h) at a minimum.

In closed spaces as amphitheaters, the heat accumulates at the ceiling and has to be removed and that requires a dedicated ventilation system. The system is presented here because it is technologically possible, but it is not economically justified, and instead we propose wearing a full transparent mask with vacuumed drain system for exhaled air, that may allow gentle shouting and pushes the safety up and a protection factor at about -150 dB, as presented in Fig. 3 as a "BCD" version of synergistic protection.

VI. Solutions For Medical Facilities

Medical practitioners, beauty shops and dental shops are at high risk for virus transmission, due to proximity of the patient that allows a contagious patient or customer to infect the practitioner in less than 1 min. because the hot exhalation goes up directly in the face of practitioner who inhales it through his/her mask [39].

An aerodynamic system was developed based on directed air currents that blows a mild wing less than 1 m/s between the practitioner above and the customer/patient making patient exhalation deflect towards a vacuum absorber, and never reach the practitioner's head, as seen in Fig. 6.

6.1. Super-spreaders

In area "A" is showed a beauty shop example, that also matches hair salons, nails, eye and vision, dental, clinical practice, etc. that requires close contact or near proximity with the customer. In the case shown in the picture, during a "Botox" injection is shown that an exhalation of 2 liters at a concentration of 10,000 droplets/cm^3 rises diffusing and diluting in 20 s into a 6 liters of about 3,000 droplets/cm^3 and reaches and surrounds the head of practitioner at a volume of 10 liters and a concentration of 1,000 droplets /c m^3 from which she inhales 2 liters, having inside about 2 million virus entities, enough to get her contagious in about 3-5

days, for up to 10 days when she gets symptoms and sick medical care may infect 2 customers/h for about 5 days giving a total of 90 people. She will learn that she is positive towards the end of next week, meanwhile she may stay home at her initiative due to main symptom of fatigue and lack of Oxygen, or may infect another bunch of people, but tracing is possible, at her office, unfortunately customers are not so reliable and about 1,000 people may be infected in 2 weeks from which those without cellphone GPS-Wi-Fi tracking 500 will be lost as secondary spreaders, and a pandemic will appear in that area. The actual manual tracking, will take another week to contact the contaminated customers, and meanwhile they will learn from their symptoms that they are infected, before being told by the tracking system, and probably they will also spread the virus.

6.2. Aerodynamic protection systems

This scenario may be easily avoided if an air current at a speed less than 1 m/s flow perpendicular on their eye contact direction, as shown in area "B", where a dentist is treating a patient. A 2 fan box is used to produce the clean, cold air wind along the patient, from head down, towards an absorption funnel that takes the air and sterilizes it throwing it outside or recirculating in the room. This system is able to provide about -30 to -50 dB in protection factor, to which the mask and respiratory system adds making the protection factor better than -80 dB. If a continuous airflow from a safe source is used, the protection factor is over -100 allowing a practitioner to treat any patient and remain safe and sound.

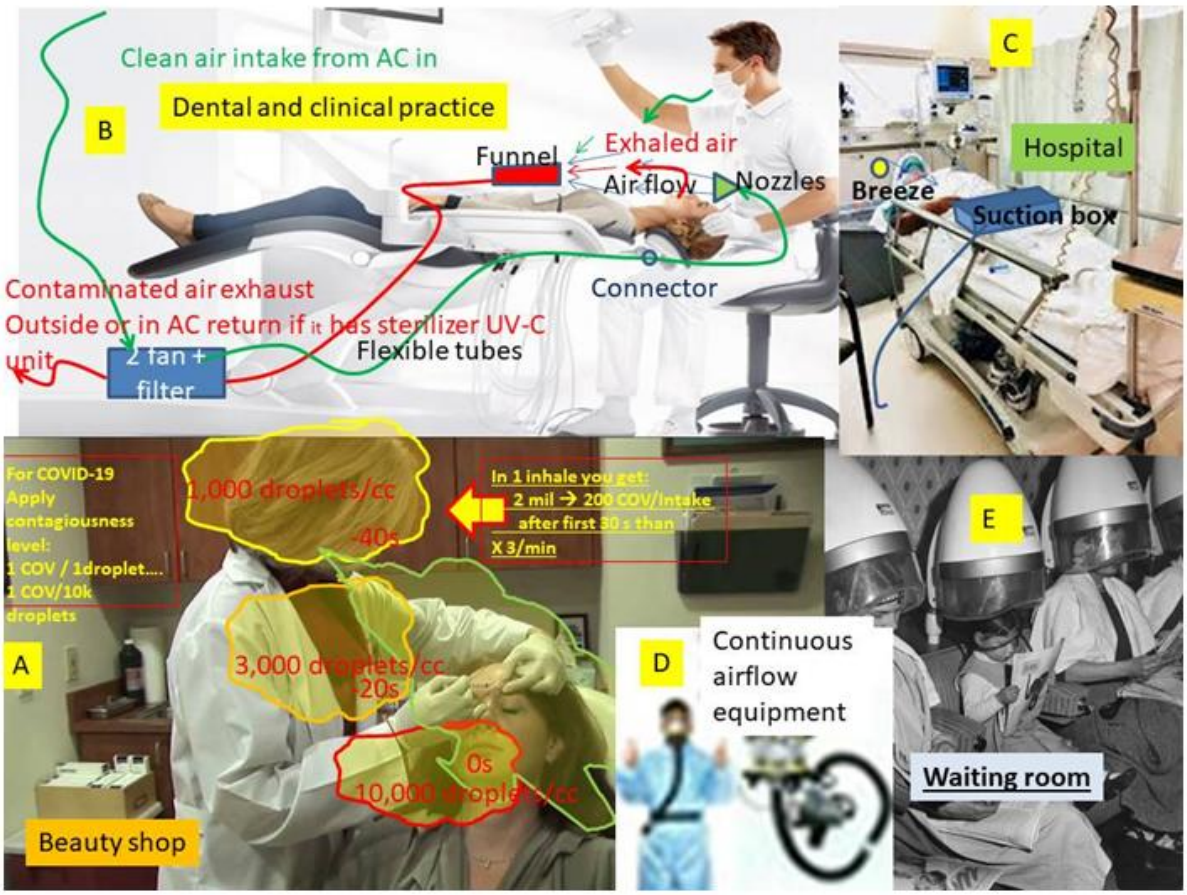


Fig. 7 – Protection systems for medical and dental practice, beauty salons, barber shops and more

This system may also be used in hospitals, as area "C" shows, and may be portable associated to the bed.

Waiting rooms and moving on the hallways is another problem inside potentially contaminated area, and one comfortable idea is to use large funnels as area "E" shows to absorb exhalation air, getting out through a -20 dB surgical mask, with lots of leakages, or uses the synergistic solution in the class "BCD".

On the hallways, one may use a continuous flow mask, if and only if he may know where safe to inhale air is, for which are little chances to get it right, therefore will place in a protection factor under -50 dB, as his respiratory system may provide, as area "D" shows, or use a "ABC" synergistic solution as shown in Fig. 4, that for sure will provide a protection factor better than -120 dB.

6.3. Physiological Prevention

Nutrition and other things people can do cheaply to much reduce the symptoms etc. because the medical profession is just not yet into prevention except vaccines, and what is complementary needed is prevention to mitigation.

The engineering is up front tool in mitigation of the real situation society is confronted with, until vaccines, which are not 100%, have side effects, take time to be effective, so not a panacea, but hopefully better, different situation after vaccination. As statistics show far more people are asymptomatic, to very low level of symptoms, than are becoming seriously sick. Firstly, many seriously sick are old and the immune system degenerates with age, therefore they might need to boost immune system, without disturbing it.

There are basic common sense recommendations like: get more sleep, exercise far more in order to have a low cholesterol, blood and diet, because COVID-19 enters through cholesterol fat. Stay hydrated, high liquid intake, including green tea, eating foods, taking supplements that thin the blood, have a high blood level of vitamin D3, use vitamin C to reduce congestion in the lungs, in some cases may take NAC (N-Acetyl-Cysteine) that helps the body synthesize Glutathione, to prevent premature aging of cells.

Sulfur containing foods, as, broccoli, foods, supplements that produce NO which is massively healing, including beet root juice and arugula salad, also may take in adequate, zinc, selenium, magnesium, and low sugar fruits, vegetables, especially those with quercetin as apples, honey, raspberries, onions, red grapes, cherries, citrus fruits, and green leafy vegetables, and onions.

There is unclear how the above mentioned nutrition may impact a particular COVID-19 infection response, being aware of many mutations appeared in SARS-CoV-2 with 5 classes and almost 50 types of virioli, with various aggression intensity and body symptoms distributions but it may have all sorts of other health related benefits. This is not a medical advice, the knowledge above was mentioned because in the future, this may become an effective control to complement the protective measures, and minimize impact of a contamination in case of protection failure.

6.4 Lung-lavage system

As known from statistics, lungs are among first organs attacked by COVID-19, and by much other respiratory disease, and suffer deterioration due to air pollution [40]. Lung lavage comes as a practical solution for fast lung refurbishment and medical treatment if it will be done with less patient invasion [41,42] that requires patient anesthesia and connection on various life support machines. More, the present technology uses salty water, that is not properly extracted from lungs and much of it remains to be eliminated via circulatory system.

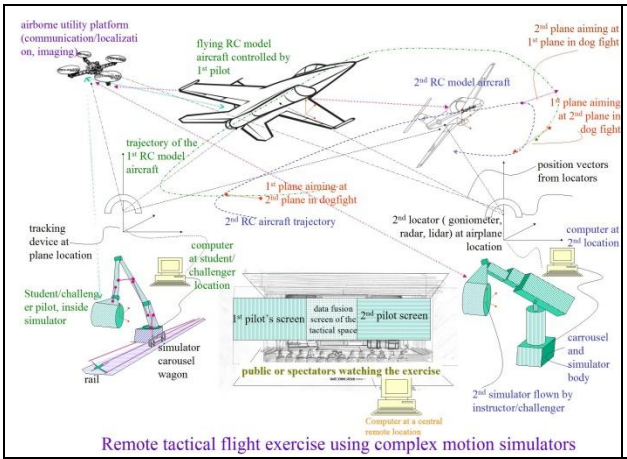


Fig. 8A – Simulator for airplane remote control

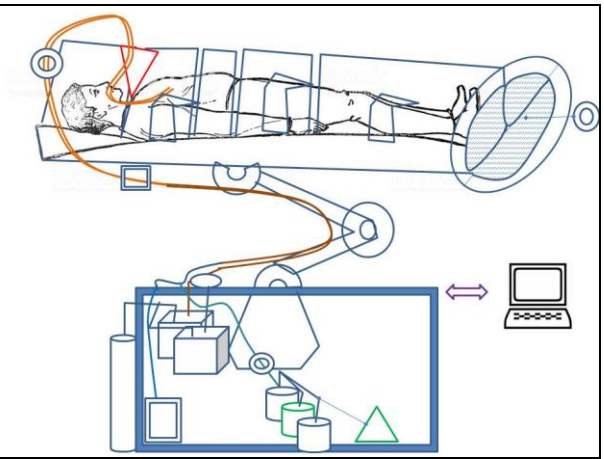


Fig. 8B – Advanced lung lavage system

The proposed solution, is derivate from a flight system inertial simulator [43] shown in Fig. 7, where cockpit is rotating in all directions.

It was observed that the features of cockpit may be easily used to improve the lung lavage procedure, if installing a patient bed in the cockpit and renouncing to 3d acceleration simulation, remaining only with gravitational component as main force.

The device shown in Fig. 8 does not bring any new medical procedure, but creates the possibility for medical staff to develop innovative treatments, able to lavage the lungs, treat the disease and restore the lungs as they were before incident or better [40].

The idea is to partially fill the alveoli with liquid in a 4 stages session, first to clean the lungs from mucus and other sediments, then, to rinse as to assure the perfect cleanup, apply medication to heal the lungs

and apply lung therapy to improve the overall performance, everything being done under quality assurance protocols.

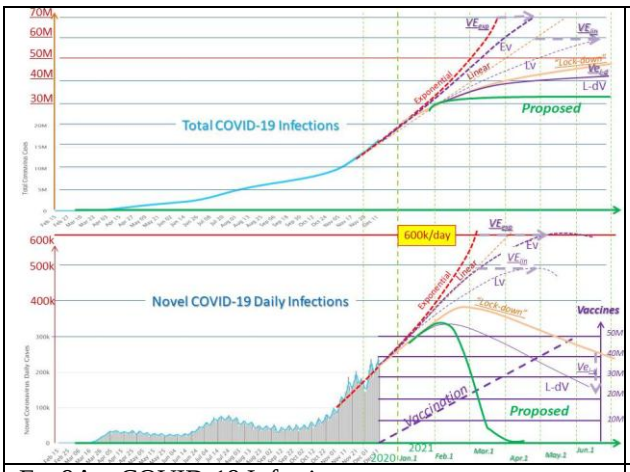
The procedure is designed to use a reduced amount of liquid, about 10% or less than the lung's lobe volume in order to reduce the stretching in the alveoli walls due to liquid's weight, and to rotate the patient's body such as the liquid to drain gravitationally out of any alveolar space inside the drainage tubules, carrying with them the insoluble fractions of lung deposits and residues. US, vibration and sound are used to shake-up the walls and increase the agitation in order to improve the washing and rinsing processes. Gas and liquids therapy is supposed to be applied and before and after lung gas exchange efficiency is measured in order to certify the treatment. New drugs and substances have to be developed in order to make this procedure the most efficient to treat any pneumonia like case or to heal and restore lungs in old or exposed people.

VII. Vaccines – A Fake Overpraised "Silver Bullet", Over The Border Of Mass Deception

As becomes visible from Chapter 1 and 2 after ignoring the basics of COVID's propagation and protection against pandemic with world class incompetence, a new fast savior entity was invented and praised, at the limit of masses brainwash. In the US, there is a systematic deceptive word abuse because what was called "warp speed" [44], was a little bit slower than normal speeds in China, which developed two types of vaccines, and Russia that used a fast tracking approval procedure by test phases overlapping. In fact, in the world more than 170 vaccines are in development, and only two are discussed by media only in positives terms, because those belong to big pharma controlling the USA market.

According to statistics, from about 331 Million people, 5% have been already "vaccinated" by COVID itself, producing 16 Million infected people from which 0.3 Million deaths. The infection rate is 0,25 Million people per day, and vaccination started, delivering about 3 Million vaccines in one month to the most exposed and/or connected people, that will make an equivalent 5% of susceptible population immunized. In these conditions, 90+% of the population remain as active COVID customers.

Because of celebrations and anti-democratic protests, the infection rate in December will increase from 250k /day to about 300 k/day by the end of 2020, the most likely evolution of the rate of infections will be exponential. If change in administration does not happen peacefully, by the beginning of March a milestone of 600, 000 infections per day may be "achieved", as shown in Fig. 10A, lower chart, brown-dashed curve "Exponential".



Fg. 9A – COVID-19 Infections

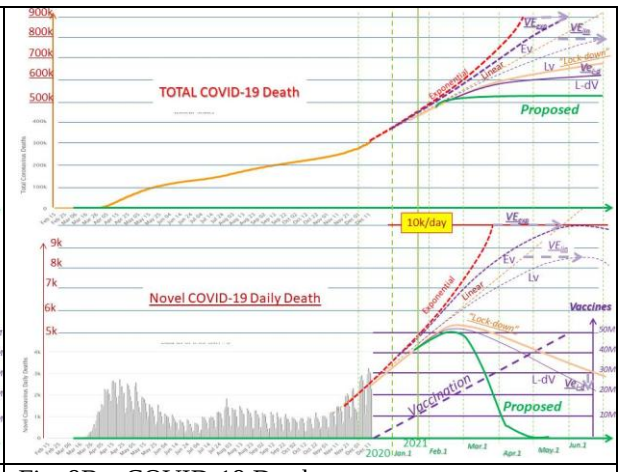


Fig. 9B – COVID-19 Deaths

Vaccinations started on Dec. 14, and it is hoped that about 3 Million vaccines to be applied up to the end of year, representing 1% of US population, but among those the first responders who have an infection rate of about 1%-2%, that will trigger a reduction in infection rate by a little, as shown by the violet curve Ev (Exponential with Vaccine), which in fact will be a two months delay until the 600k rate is achieved. This infection rate draws a mortality rate that appears as a trailing wave with 3 weeks to 1 mo. delay, and a benchmark of 10,000 deaths/day will be achieved by April and delayed by vaccination to first week of June, as one may see in Fig. 10 B lower chart. The vaccination curve is presented in both charts on the right side, being optimistic and supposing that until June 50 Million people will be vaccinated. In fact, about the same number of people will be "vaccinated" by COVID-19 itself, with a collateral damage estimated at about 1 Million people dead meanwhile, and those who recovered form a new post-COVID social group, called "long haulers" [45]. Near 100 post-COVID symptoms have been identified [46] that makes the recovery difficult and behavior unpredictable in post-COVID life. With respect to collateral effects of the overpraised vaccines, there is no

information, and that is what we have to find out during the next 10 years. For sure the "long haulers" effect might be reduced at vaccine, but other issues as intolerance rush or overlapping vaccine effects with body functional cellular operations might be observed. In the alternative of an ignoring population which does forgot the basics of protection based on engineering methods, with devices made locally by small business, and corporations, this is the best tradeoff, and it is in line with corporate philosophy, being a multi-billion business, coming like a glove for this type of behavior.

In the upper charts of the total cases, one may see that in the next 6 mo. vaccination has little effect on the rate of infection as well on the rate of death, that increases, due to hospital overloading, and the understaffing, due to their personal being infected by COVID.

In Fig. 9A one can see that in the "Exponential" infection propagation by the end of March, early April a milestone of 70 Million people infected may be reached, having as effect that in early May, 1 Million death may be recorded too, and the COVID propagating faster than vaccination. It is also visible from the associated curves EV (Exponential with Vaccination) that the vaccination effect on COVID spreading rate is minimal during the first 6 mo. to 1 year, because of remaining of a large pool of healthy people, about 90% of population, susceptible of being infected or vaccinated. In this case, the vaccine may act as a delaying factor, in reaching that grim milestone, by about 1½ mo. in the case of exponential propagation. Unfortunately, vaccination rate is about linear, due to limitations in vaccine numbers, personnel and locations where vaccine may be applied safely.

There is a possibility that the evolution to become milder due to random administrative safety measures introduced independently by each state, and that will have as effect a delay in the millstones reaching, and a little increase in vaccination effect on numbers. For example, total infection rate will be delayed by 1 mo. until April, when it will reach 600 k/day, and the milestone of 70 Million infected will be reached by late May 2021. In this case, the effect of vaccination is a little higher, and makes that only 55 M to be infected at that date, with an infection rate of only 470k/day. As a consequence, a month later, by the end of June, a deaths total of 1 Million Americans might be recorded, with a death rate of 10 k/day by the end of June. The vaccination campaign will modify these figures introducing a 3 mo. delay for reaching of these grim milestones, or performing a little bit better, as in the case of LV (Linear wit Vaccination), platooning at a lower value and gradually reducing towards the end of 2021.

The third scenario, is based on economy lock down by February, for about 1 mo., with an economic loss of about $2Trillions, but meant to save lives, as seen in Figs. 10 "lock-down" curves in solid light brown, and the vaccination effect is seen in curve L-dV, solid violet. The lock-down makes a difference, reducing the infection rate under 400 k/day, having the chance that by June to be as low as 200 k/day, and counting a little bit over 40 Million infections, which means a reduction of more than 50% in total COVID infections from exponential curve and 20% from Linear curve, saving about 20 M people from being infected. The death rate will be reduced from a maximum of 5 k/day by March down to 2 k/day by June. The total death by June will be a little over 500 k, reduced by 200 k from the linear version, saving about 250 k lives. The total cost may be of about $3 Trillion, for preventing ¼ M death and 20 M infections, being less than $12 M per saved life, and less than $150 k per sick person prevention. More, a saved from death person, which usually has "preexisting conditions", or in 90% of the cases older than 55 years, is consuming from Medicare and Social security another $1-2 Millions. These are some calculations that made this operation unacceptable for some politicians, and was incompletely done, maintaining COVID at a survival rate, and crippling the economy even more by cascading effects.

More, if economy is shut down, "stimulus" packages are needed to compensate for loss to support infrastructure and help population affected by the economy shut-down. This expense, corroborated with the loss from reduced economy will inevitably drive to inflation and US currency devaluation. This will directly impact the fortunes of $1\%^{tiers}$ defended by most of the politicians. These complex but unethical calculations were also included in the "worth of life" control that disturbed the common sense in application of the hierarchy or real and effective controls. In fact, states' "leaders" bouncing between reality of losing economic output due to pandemic, and loosing from the fortunes due to inflation made almost all capitalist countries, so called by themselves "democratic states" to use partial measures for combating pandemic that drove to disastrous results, being unable to stop pandemic nor the economy fall-out producing a double/multiple dip recession, and high human harm, putting in lime light the real leaders and their values.

"In the case of SARS-CoV-2, these mutations are accumulating at a rate of around one to two mutations per month globally, according to the COG-UK genetics specialists" [47].The mutations include changes to the important "spike" protein that the SARS-CoV-2 coronavirus uses to infect human cells, while the majority of the mutations seen so far have had no apparent effect on the virus, and only a minority are likely to change the virus in any significant way - for example, making it more able to infect people, more likely to cause severe illness, or less sensitive to natural or vaccine-induced immune defenses. This will complicate the application of various vaccines over time, reducing their efficiencies, and protection factor that is already

overpraised, over the limits of deception, requiring continuous studies and continuous adaptation to the new viruses' structures.

In all these attempts, the hierarchy of pandemic protection controls was mainly forgotten, and the proposed engineered protective systems proposed are designed to completely stop pandemic, reducing the infection rate to zero in 1 mo., flattening the total cases curve at about 33 Million, reducing to zero the death rate by May, and limiting the total death cases to a little bit over 500,000.

This method is able to save more than 400,000 lives and prevent the infection of more than 50 M, without stopping the economy, but building the protective system that may cost up to $100/person, a total cost of about $4Billion invested in protective infrastructure. This investment may have a strategic impact too because it stops all viruses present in that period without discrimination and may be stored used multiple times with minor customizations or various purposes from pollution, to biological or chemical contamination.

VIII. Conclusions

The technologic developments based on nano-bio technologies alone may assure the smooth society operation and is suppressing any type of aerial and contact virus transmission, eliminating pandemic in about 2-3 weeks, with medical cooperation.

Learning curve was not followed by the USA and many other states, while the unrealistic, biased and partial application of measures to curtail pandemic, drove to multiple dip economic recession and immense human harm.

Acting alone the pandemic may be totally terminated in about 6-8 weeks of wearing the protective gear, giving time to infected people to get symptoms and cure themselves without infecting others.

The use of respiratory system may also bring benefits by using the push-pull breathing, and get various therapies while staying safe and active.

The system is more complicated than an actual mask and bandana and requires a smart community to use it.

Common elements of these solution spaces, projected utilization impacts rely on use of aerodynamics, energetic photons as UVc light, chemical and catalytic sterilization and close interoperation of the systems involved, having the threat elimination as main goal.

The system we proposed based on engineered protections may save ½ Million lives and 50 M people from getting infected, if applied in the US by March 2021.

It may take vaccination about 1 year to stop a pandemic, while this system may take about 1 mo. to do just that.

Until vaccination campaign in US will vaccinate ½ pf population, COVID-19 will infect ¼ of population, by the beginning of 2022.

The cost of implementing the system is less than $5Billions, which is absorbed by the local economy, and has a strategic importance due to its use for a plurality of events, having a life time of about 10 years while a vaccine may be valid for about 1 year.

The system may have also therapeutic effect because it may be simultaneously used for respiratory system therapy, added to its basic filtration functions.

There are few modes to pass through a pandemic like SARS-VoV-2:

- The Failing mode or USA way, that had the compass set in an alternate reality, taking half measures, and showing an exceptional lack of competence and preparedness due to the fact the in the last 40 years it was focused on militaristic developments, that brought a large scale misery to others from Indian to Atlantic Ocean, becoming the world's "kraken" ignoring its internal development for science, energy, education and health, and pandemic exploited at maximum this mall-orientation from the humanity and nature rules, making them self-inflict about same level of causalities and death, they inflicted others over the time. Up to the end of pandemic there will be about 1 Million death, 100 Million "long haulers", $4Trillion economic loss and a 30-50% Inflation.
- The costly but successful mode, also known as China, Taiwan, New Zeeland way, that paid the price up front, by using PPE and locking down their economies, eliminating the pandemic internally and controlling their borders' infection transit, recording under 80,000 Infections, 10,000 deaths and 10% of GDP for the 2 months they have frozen their economies, that allowed them to restore the normal life and have a healthy vaccination period.
- The middle way followed by the most of World's countries, characterized by half measures, disrespect towards personal protection that preserved the virus and made pandemic thrive, recording both economic and population loses, some looking for ill posed concept of "heard immunity".
- The smart way, incompatible with world's populations and level of understanding and discipline, described above based on increased protection factors assured by the synergy between multiple elements of physical protection described above, that may drive to virus propagation and pandemic suppression, in about 3 weeks, with an extra 3 weeks for quality assurance, for complete healthy society, free of any virus, at a cost of about $100/ person, without disturbing the normal life. In the unrealistic hypothesis that this was applied to US,

also supported by following a learning curve by watching China's 2 mo. earlier actions, it may have resulted in less than 10,000 infections, and less than 1,000 deaths and an investment in economy of $50 Billion, representing less than 1% from the actual losses, US recorded.

The pandemic also showed the failure and deception in education system, that was oriented in forming a population of pawns that follow the rules, good to serve, incapable of thinking "out of box", and using their brains to connect the dots, some living in alternate reality universes, rejecting any information that contradicts their believes and comes from outside of their "chain of command". Teaching such a population the protection rules is like teaching "wolf awareness to a herd of cows", with leaders looking in other directions, and betting on their freedoms and "herd immunity". In such society, science and knowledge is highly disregarded being prone to pay a heavy price. They are basically unable to adapt to challenges of the future survive and thrive.

LIST OF ABBREVIATIONS

SAARS-CoV-2 = COVID-19

$\mu m = 10^{-6}$ m; dB = 10 lg(End Value/Initial Value);

CONFLICT OF INTEREST

There is no conflict of interest, work was voluntary and test materials costs entirely have been supported by LAVM LLC and LAAS and we are very grateful for that.

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