

Hollywood versus Reality - the Consequences of an RDD

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ABSTRACT:

Our society is highly affected by the various media bombarding our citizens. Characterized as *Hollywood*, this media atmosphere can be educational, entertaining, or grossly misleading. Usually the consequences are not particularly noteworthy. But occasionally they can seriously alter public opinion and national policy. Nowhere is this more evident than in the arena of nuclear energy and radioactivity. Even though it is safer to work at a nuclear facility than in a department store, the public overwhelmingly thinks the opposite. Unfortunately, the real weapon in a terrorist attack involving a radiological dispersion device, or dirty bomb, is not the radioactivity, but the panic and economic hardship that will result, almost all of which could be avoided or mitigated by even a minor understanding of the subject. It is important to note that while Hollywood generally takes care to be politically correct on many issues, with good reason, scientific or technical issues do not get the same degree of concern, to the detriment of our society. Therefore, the public generally knows that littering is bad and that certain derogatory references to ethnicity is unacceptable, yet the public accepts over 200,000 deaths per year from iatrogenic means (unintentional medical cause) while being outraged over the 2 deaths per year in the nuclear industry. This misperception underscores the importance of Hollywood in our policy and our security. In general, most of Hollywood depictions of radioactivity, nuclear issues and particularly dirty bombs are inaccurate in the extreme. Even those that are technically correct with respect to the device, its dispersal, and the response, are incorrect with respect to the danger of the radiation and on what the public should and can do. It is the responsibility of the scientific community to correct this and to help Hollywood portray this issue appropriately. Two examples of Hollywood dirty bomb productions are compared, *Dirty War* and *Right at Your Door*, the first a good example of a well-researched portrayal, and the latter a poor one.

INTRODUCTION

Hollywood, for the purposes of this paper is defined as any video, film, television, or commercial production that is produced in any country for the primary purpose of entertainment regardless of the physical location of the production company. Even documentaries can fall into the trap of dramatizing facts in the service of education. Unfortunately, fictional entertainment is often mixed with fact in such a way that the viewer has difficulty in separating fact from fiction.

Hollywood continues to produce movies and shows depicting terrorists dispersing radioactive materials with improvised explosion devices (IED). Hollywood has also released film and television programs where terrorists penetrate the security at nuclear power facilities, steal nuclear waste and radioactive materials, and smuggle suitcase nukes into the United States. Since public panic is the real weapon in a “dirty bomb” or radiological dispersion device (RDD) attack, how the entertainment media portrays this issue is particularly important and may actually determine the potency of the weapon. Our society, in large part, takes its cues and its behaviors from the media, so this is no academic concern. *Dirty War*, probably the best fictional RDD representation as of this writing, is a BBC/HBO/PBS movie about a dirty bomb attack on London. The consequences of the exploded dirty bomb are represented to be extremely significant. Is it accurate? *Right at Your Door* (a Lionsgate production to be released this winter) is a movie about a dirty bomb that is detonated in Los Angeles that spreads a toxic cloud over a huge area. Does this movie misrepresent the true risks of an RDD? TV shows such as *Numb3rs* have depicted WIPP nuclear waste shipments as RDDs and greatly exaggerated the health effects to the public, even absurdly representing the truck drivers as developing melanomas along their spine in as little as three days of driving waste. PBS produced a reasonable documentary on the subject but lacked discussion of basic science and did not go far enough in discussing how to educate or guard against misinformation. In the sixth season of Fox’s *24*, a suitcase bomb is exploded in the greater Los Angeles area. Were the consequences accurately depicted?



Scene from “Right at Your Door”

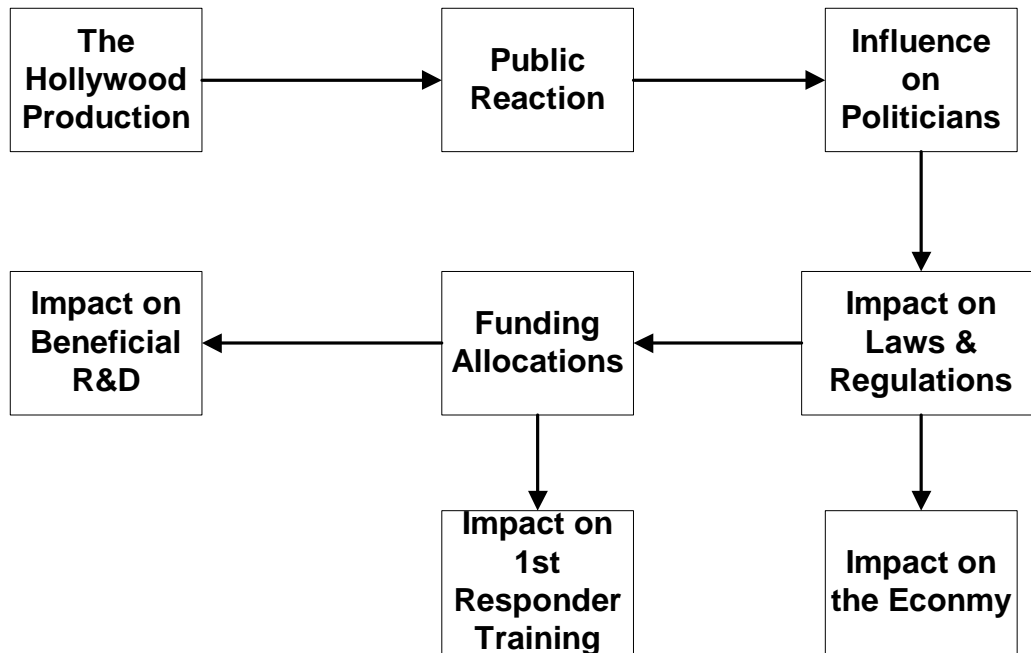
The China Syndrome came out just prior to the accidental release of negligible amounts of radioactivity at the Three Mile Island Nuclear Plant in 1979. *The China Syndrome* had a greater public impact on the perception of health effects from radioactivity than the entire scientific community and our understanding from 60 years of experience. The confidence in the nuclear community by the general public has yet to be restored after 28

years. It is interesting to note that Hollywood recently produced *Meltdown*, the nuclear terrorist equivalent to *The China Syndrome*.



THE IMPACT

Why do we care? It is just entertainment. However, the vote for congressional representatives of the uninformed or misinformed carries the same influence or weight as the vote of the informed scientist: each person gets only one vote. There are many more uninformed or misinformed voters than informed voters on the subjects of radiation health effects and the technical/economic feasibility of infrastructure decontamination. Some of the uninformed or misinformed voters also hold public office. Therefore, the level of understanding of the facts by each voter is important. If a Hollywood production leads people to believe that a dirty bomb results in mass death and widespread contamination making their homes permanently uninhabitable, the voters may influence their representative to redirect funding from more efficient use of taxpayer earnings to less efficient use. Further, laws and regulations could be passed that have a significant economic impact on the nation and could actually make any effects worse.



For example, former Vice President Al Gore's *An Inconvenient Truth* has influenced the general public as it relates to man-made global warming, which has influenced voters to demand Congress to pass laws that will affect us all and has helped convince President Bush to acknowledge global warming in the State of the Union Address to Congress. In this instance, a noted politician successfully used Hollywood to reach a substantial number of voters on a technical issue not generally of interest to the viewing public.

THE VARIABLES

The consequence of a successfully deployed radiological dispersion device is a function of many variables.

$f(c) = (C_i, I, F, Y, W, d, c_m, t_r)$ where

C_i = Curie content (activity)

I = isotope or isotopes selected

F = the selected form of the material (powder, metal, etc.)

Y = yield of the conventional explosive

W = weather effects (wind velocity, rain or other forms of precipitation, temperature)

d = population density

c_m = construction material and the surrounding infrastructure

t_r = level of training of the first responders

Work at Sandia National Labs, the Energetic Materials Research and Testing Center at New Mexico Tech, New Mexico State University CEMRC, and experience from the Fire Service on plume dynamics during fires have addressed various aspects of this function, but the lack of precedent makes most predictions highly uncertain.



Actual Car Bomb

The consequences from an exploded RDD fall into two general categories. The first category includes acute and long term health effects. The second category involves economic impact. Hollywood is guilty of not always correlating the magnitude of the consequence directly with the technical variables. Hollywood is a business; they want to generate sales. The public responds by paying for, or investing in, shows that provide one or all of the following emotional characteristics:

- Excitement
- Fear
- Shock
- Horror
- Comedy

- Adventure
- Sex
- Violence
- Iconoclasm

To profit from a production on the subject of an RDD or IED event, Hollywood often feels the need to exaggerate the consequences of the event to tap into one of the above characteristics. Unfortunately, the subject is sufficiently complex and actually horrifying enough that the exaggeration is not needed and a simple pre-production script review by a competent scientist would stop the most egregious misrepresentations from entering the public's nuclear mythology.



Kiefer Sutherland as Jack Bauer in "24"

THE EVIDENCE-

- Dirty War- A BBC/HBO Production, 2005*



The movie starts out with the following announcement:

“The events portrayed in this film are based on extensive factual research.”

The announcement is followed by a June, 2003 quote by E. Manningham Buller; Head of MI5:

“It is only a matter of time before a crude chemical, biological or radiological (CBRN) attack is launched on a major western city.”

The plot of the movie is that Islamic terrorists collect radioactive materials in Pakistan, ship them to Bulgaria and then ultimately on to London. In London, they make three car bombs; one is successfully detonated in a high-population density business district. Six lead canisters containing a γ -emitting powder are placed one in each of what appear to be 200 liter drums. The canisters appear to be roughly 20 cm in outside diameter and perhaps one meter long. The lead canisters are bubble-wrapped, surrounded with, and labeled as, cooking oil and shipped. The driver of the truck that transported the canisters from Pakistan to Bulgaria ultimately dies of acute radiation syndrome shortly after delivery. In London, the γ -emitter is mixed with an α -emitter and surrounded with plastic explosives and attached to a detonator.

The one van that was detonated, containing $1/3^{\text{rd}}$ of the total transported radioactive material, was large enough to contaminate over 3.5 square miles of downtown London, presumably for 30 years. Though *Dirty War* never stated what isotopes were used, the assumption is that the γ -emitter was Cesium-137 as the cesium chloride powder and the α -emitter was either polonium-210 or americium, also in a powdered form. Is it feasible that enough Cs-137 as CsCl could be in each canister to make the London district uninhabitable (assuming no decontamination) after 30 years of decay (one half-life for Cs-137) over 3.5 square miles?

If we use 5 Rem/year as the maximum personnel exposure acceptable for occupants of the London business district, then roughly a 0.57 mR/hr dose rate is the maximum acceptable for person that stays there 24/7/365. At 86.6 Ci/g with a MeV of 0.662 it takes precious little material (in the range of $\mu\text{g}/\text{m}^2$) to exceed the maximum acceptable dose rate. The canister dimensions above suggest about 200 cm^3 of CsCl, or about 70,000 Ci. It is, therefore, probable that 3-1/2 square miles of downtown London could be made uninhabitable by current standards.

Not mentioned, however, is that the contaminated area can be decontaminated to an inhabitable level if response actions are applied quickly using current technologies. It is not a foregone conclusion that the business district of London will look like the communities surrounding Chernobyl as depicted below where over 90,000,000 Ci was released in a plume at high temperature.



Uninhabitable city near Chernobyl Nuclear Plant

In the movie, male first responders were limited by policy to 100 mS (10 R) exposure before they were requested to be removed from direct life saving activities. The protagonist in the movie ultimately received 250 mS (25 R) and was hospitalized as a result. Mild acute radiation sickness starts at around 200 R. A heart catheterization patient receives roughly 45 R. *Dirty War* producers, therefore, exaggerated the effect of the radiation dose received by the first responders.

<i>Dirty War</i>	Accuracy
Construction and aspects of the RDD	Accurate
Magnitude of contamination	Accurate
Health effects to first responders	Inaccurate/Exaggerated
First responder preparedness	Accurate
Body count from RDD event	Unclear/Implied Inaccuracies
Ability to decontaminate	Inaccurate/unmentioned
Depiction of crowd panic and control	Accurate
Economic impact	Accurate

The theme or message presented by *Dirty War* is that first responders are unprepared to respond to an RDD in a highly populated area. The movie begins with an exercise that

simulates a dirty bomb attack. The exercise revealed serious flaws in the readiness of first responders to deal with such an event. In the film, politicians have under-funded the training for first responders, have under-stocked appropriate PPE, and have too few personnel decontamination stations ready to deploy. Further, the government believes it is more important to reassure the public that the government is prepared to respond to such an event rather than actually being prepared. Interestingly enough, the firefighters all had alarming dosimeters and were able to measure the dose rate of 26 mS/h at 130 m. The fire marshal set up the incident control center 500 m from ground zero and initially would not allow first responders to help ground zero surviving victims with life threatening injuries or fight the out-of-control fires. Hospitals had to call police to control the crowds of panicked civilians trying to determine the impact of the contamination on their health.

In general, *Dirty War* accurately depicts most of the aspects of a dirty bomb attack with relatively minor exaggerations compared to any other Hollywood production. CDC has even posted a web site entitled “What We Learn About Radiation Threats from Movies? Fact or Fiction” in response to the television drama, *Dirty War*.

B. *Right at your Door*- Lionsgate Production

Unreleased at the time of this writing, *Right at your Door* presents a scenario, whereby, multiple dirty bombs are detonated that result in the release of a large cloud of radioactivity in the greater Los Angeles area. The movie has been released to movie critics and reviewed by a number of critics.



The cloud of contamination is alleged to spread life-threatening levels of radioactivity over a large area. Uninformed people fear that victims close to ground zero are dangerously contaminated and that their contamination makes them a threat to other less contaminated people. Marshall Law is declared to deal with the panicked crowd.

Perimeters are established to contain the spread of contamination and keep dangerously contaminated victims from contaminating others. Untrained in radioactivity and radiation health effects, police shoot victims trying to break through the contamination zone whereby additional panic is created. This is in direct contradiction to all response personnel training in the United States that clearly directs responders to rank immediate medical attention over radiological risk and to allow people to self-evacuate with the proviso of stripping off outer garments (gross decon) and go home to take a shower.

Uninformed civilians seal themselves inside their homes and do not allow loved ones into their home for fear their contamination will ultimately result in the death of the people sealed in the home. Lack of information and the spread of bad information fuel the public panic and exacerbate riots.

<i>Right at Your Door</i>	Accuracy
Construction and aspects of the RDD	Unclear
Magnitude of contamination	Inaccurate
Health effects	Inaccurate/Exaggerated
First responder preparedness	Inaccurate
Body count from RDD event	Unclear/Implied Inaccuracies
Ability to decontaminate	Inaccurate/unmentioned
Depiction of crowd panic and control	Exaggerated
Imposing Marshall Law	Highly unlikely and inaccurate

Conclusion:

In general, only one Hollywood depiction of a dirty bomb has been even close to being accurate, and that is the BBC production *Dirty War*. As of this writing, no film or show on dirty bombs or radiological dispersion devices has resonated with the general public to cause unnecessary regulation or stimulate a large and inappropriate misdirection of public funds. To date, no dirty bomb film has had the impact that *The China Syndrome* had in 1979. Having said that, no RDD event has occurred anywhere in the world, although some failed attempts have occurred. If and when the first RDD event occurs, these films may be touted as warnings ignored by the nuclear industry and western governments when they had a chance to better prepare for the events. It would show foresight by the nuclear industry to respond to media misrepresentation of the technical facts, which could create panic and riots if an RDD event ever does occur. Some pre-recorded messages and dialogs have been attempted but have not been promoted so they could be available and effective when needed. At the same time, a few appearances by a technically competent guest on Jay Leno, MTV and Oprah would go far to dispelling misinformation and disarming the most potent aspect of this class of weapons, i.e., the terror that comes from ignorance.