SUBMISSION[1] TO THE
INTERNATIONAL ATOMIC ENERGY AGENCY
CONVENTION ON THE PHYSICAL PROTECTION OF NUCLEAR MATERIAL (CPPNM) – IAEA
INFCIRC/274 & INFCIRC/225/REV.4

IAEA REQUIREMENTS ON DESIGN BASIS THREAT ASSESSMENT

NON COMPLIANCE OF EUROFAB LTA SHIPMENT FROM US TO FRANCE ON UK VESSEL:
SECURITY AND PHYSICAL PROTECTION ISSUES

20 September 2004

INSTRUCTIONS

WISE-Paris[2] and Large & Associates[3] are instructed by Greenpeace International to investigate and report on the compliance and adequacy of the physical arrangements for security and physical protection of the awaited Eurofab plutonium dioxide (PuO_2) shipment from the United States to its destination at Cadarache in southeast France.

BACKGROUND

Both Large & Associates and WISE-Paris have undertaken studies and analyses of the current PuO_2 transports in France,[4,5] submitted evidence[6] to the US NRC hearing on the Eurofab transport and, most recently, prepared a joint response to the French nuclear technical support organisation, the *Institut de radioprotection et de sûreté nucléaire* (IRSN), on its approach to the development and testing of the PuO_2 carrying FS47 cask.[7]

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1 The source language of this submission is (UK) English.

2 Yves Marignac, Director, WISE-Paris, Paris, France.

3 John H Large, Consulting Nuclear Engineer, Large & Associates, Consulting Engineers, London, UK.

4 Large & Associates, Potential Radiological Impact and Consequences Arising from Incidents Involving a Consignment of Plutonium Dioxide under Transit from COGEMA La Hague to Marcoule/Cadarache, R3108-A6, 2 March 2004, http://www.greenpeace.org/international_en/multimedia/download/1/424600/0/Large_report.pdf.

5 Y. Marignac , X. Coeytaux, M. Schneider & al., Les transports de l'industrie du plutonium en France: une activité à haut risque, WISE-Paris, February 2003. English summary: http://www.wise-paris.org/english/reports/030219TransPuMAJ-Summary.pdf Report, in French only: http://www.wise-paris.org/francais/rapports/transportpu/030219TransPuRapport.pdf Appendices: http://www.wise-paris.org/francais/rapports/transportpu/030219TransPuRapport_Annexes.pdf.

6 Large J H, 1) Disposition of Surplus Weapons Plutonium Using Mixed Oxide Fuel – Comments on Opinion on the Applicability and Sufficiency of the Safety, Security and Environmental Requirements and Measures as these Apply to the Transatlantic Shipment, European Waters and France, 2) The Role of PNTL Ships in the Atlantic Transit Phases, United States of America Nuclear Regulatory Commission, 26 November 2003, 3) Summary of the Findings of the French-sourced Plutonium Dioxide Transportation, 23 March 2004 – US Nuclear Regulatory Commission Hearing, 2004.

7 Y. Marignac, Large J H, Safety and Security Concerns over the FS47 Transportation Cask, September 2004.

In addition to the regular domestic French-origin reactor-grade PuO_2 transports, there is an awaited one-off shipment of about 150kg of US-origin weapons-grade PuO_2 from the United States – this shipment is referred to as the Eurofab program.[8] Essentially, for the entire transport the consignment will be packaged in 9 FS47 casks,[9] overland road hauled from the Los Alamos Laboratory facility to the Port of Charleston where it is to be transferred to Pacific Transport Nuclear Ltd (PTNL) ships for sea transit to Cherbourg France, thereafter moving overland by road to the ATPu fabrication plant at Cadarache, southeast France.

REQUIREMENTS OF & COMPLIANCE WITH IAEA274 (225)

For the transportation arrangements of the shipment, including the security and physical protection of the PuO_2 consignment, the exporter or sending state (the US Department of Energy - DOE) relies upon the shipping state (UK) and the receiving state (France) to implement their own measures. All three states are signatories of the International Atomic Energy Agency *Convention on the Protection of Nuclear Material* (IAEA274)[10] for which they are committed to comply with the *Category I* materials requirements of INFCIRC/225/Rev.4 (IAEA225) on the *Physical Protection of Nuclear Material and Nuclear Facilities*.[11]

The demarcation of responsibility adopted by the US is confirmed by the US Department of Homeland Security response[12] to US Congressman, Ed Markey, which states that

> *". . . (10) . . . after departing U.S. waters the U.K. Constabulary will be responsible for the physical security of the material while it is in transit, and the French will be responsible for physical security while the material is in France. . . ."*

The letter, however, does not provide any detail of the US assessment of the physical security measures to be put in place separately by the UK and France and if, in fact, these two states have actually undertaken specific and realistic assessments of the security risks and hazards. Whatever these are, they do not seem to have been assessed by the US authorities (or at least openly reported upon) up to a month earlier to Congressman Markey receiving his assurance.[12] This is apparent from the statement of Congressman Jim Turner [13] following an inquiry to and briefing by the US Government Accountability Office:[14]

> *"It appears that NRC did not perform an independent review of the security measures, relying instead on assurances provided by executive branch agencies that security would meet standards established by the International Atomic Energy Agency (IAEA). The executive branch, in turn, appears to have relied upon assurances provided by the governments of the United Kingdom and France that security would meet IAEA standards. To what extent was independent oversight and review (…) conducted to ensure that security not only met IAEA standards, but also would be equivalent to security provided to special nuclear material transported by DOE within the United States? . . ."*

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8 Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement (Storage and Disposition PEIS) DOE/EIS-0229, December 1996) (DOE 1996a), b) Surplus Plutonium Disposition Environmental Impact Statement (SPD EIS), (DOE/EIS 0283, November 1999) (DOE 1999b).

9 The FS49 casks is designated Type B(U) under the IAEA TS-R-1 *Regulations for the Safe Transport of Radioactive Material*, Safety Standards Series No. ST-l Requirements, Edition, Vienna 1996.

10 IAEA, Convention on the Physical Protection of Nuclear Material, INFCIRC/274/Rev.1, May 1980.

11 IAEA, The Physical Protection of Nuclear Material, INFCIRC/225/Rev.4 (corrected), June 1999.

12 Letter of the U.S. Department of Homeland Security to Representative Edward Markey, House of Representatives, 8 September 2004.

13 Congressman Turner is a member of the Select Committee on Homeland Security.

14 Letter of Congressman Jim Turner, Ranking Member of the House Select Committee on Homeland Security, to Spencer Abraham, Secretary of Energy, U.S. Department of Energy, 12 August 2004.

For the export of nuclear materials, the US Nuclear Regulatory Commission (NRC) regulations[15] require that:

> *". . . physical security measures in recipient countries must provide protection at least comparable to the recommendations in the current version of IAEA publication INFCIRC/225/Rev. 4 . . [that the] Commission determinations on the adequacy of physical security measures are based on*
>
> *(1) Receipt of written assurances from recipient countries that physical security measures providing protection at least comparable to the recommendations set forth in INFCIRC/225/Rev.4 (corrected).*
>
> *(2) Information obtained through country visits, information exchanges, or other sources. Determinations are made on a country-wide basis and are subject to continuing review. . ."*

Actually, the NRC clearly expects additional measures to be put in place by specifying that *'protection at least comparable to the recommendations set forth in INFCIRC/225'* should be arranged. This is stated in its assessment of the risks and hazards of the US and Atlantic sea transport phases for the weapons-grade PuO_2 which it defines as *'strategic special nuclear material'*, requiring special transport and security methods that are in addition to and over the standards of IAEA225 – this overriding standard is its own *'Stored [nuclear] Weapons Standard'* that is referred to in SPD EIS[8] to be the *"high standards of security and accounting . . .[that] should be maintained . . . for weapons-usable fissile materials throughout dismantlement, storage and disposition."*.[16]

WISE-PARIS & LARGE & ASSOCIATES ASSESSMENT OF IAEA225 COMPLIANCE

Here we shall examine whether each of these three states (US, UK and France) has thoroughly reviewed and updated its approach to defending against acts of terrorism, as required by IAEA225:

> *"(4.1.4) . . . A design basis threat developed from an evaluation by the State of the threat of unauthorized removal of nuclear material and of sabotage of nuclear material and nuclear facilities is an essential element of a State's system of physical protection. The State should continuously review the threat, and evaluate the implications of any changes in that threat for the levels and the methods of physical protection. . . ."*

In this regard, IAEA225 is quite clear: Individual states have to maintain a rolling review of Design Basis Threats (DBTs), evaluating (and implementing) any changes in the physical protection measures necessary to safeguard against DBTs. Although drafted in 1999, the current Revision 4 of IAEA225 applies to the wave of international terrorism of post-September 11(2001), that is requiring not only revision in the aftermath of the World Trade Center and Pentagon attacks, but also and virtually continuously as the terrorists adopt new technology and switch tactics such as deployed at the railway bombings in Madrid, Spain in March 2004.[17]

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15 NRC Regulations, Title 10, Chapter 1, of the Code of Federal Regulations, Part 110, Export and Import of nuclear equipment and material, "Physical security standards" (10 C.F.R. § 110.44) pursuant to section 127 of the Atomic Energy Act (AEA), as amended by the Nuclear Non-Proliferation Act (NNPA).

16 G Bunn who claims to provide an authoritative outline of the US Stored Weapons Standard in the Appendix of US Standard for Protecting Weapons-Usable Fissile Material Compared to International Standards, Non-Proliferation Review/Fall 1998.

17 The Madrid bombing involved adoption of new technology with the use of cellular phone triggered detonators in the bombs and introduced the strategy change of terrorising in the run-up period to an election. The seaborne attack against the French oil tanker Limburg of October 2002 illustrates the range of modes of operandi of international terrorism.

More to the point, it is the responsibility of the individual state to define a range of individual DBTs that represent realistic and current threats in terms pertinent to its socio-economic, -religious and technocratic infrastructures. On the other hand, restricting the definition of a DBT to a particular state neglects the fact that certain consignments in transportation may attract terrorist attention because the consignment originates from another but politically (etc.) controversial state, in this case the United States of America.

UNITED STATES - OVERLAND TRANSPORT AND PORT HANDLING

The NRC has had regulations in place since the 1970s for protecting nuclear facilities against terrorist attack with a licensing requirement to include for defence against DBT evaluations (via Operational Safeguards Response Evaluation – OSRE). These earlier DBT profiles were not designed to match the current level of terrorist threat and there has been continuous update and review of these, such as in April 2003 when orders were issued by NRC to revise the threat to fixed nuclear plants and transportation of nuclear materials with, at about the same time, *force-on-force* testing of these updated DBTs being required.[18]

The US DOE assessment of the Eurofab transport operations overland from Los Alamos to Charleston and in US territorial waters includes for safeguards and actions aimed at countering undisclosed DBTs, with underlying conclusions[8] being that *"adequate safeguards are in place to meet such a [terrorist] threat"*, that *"the candidate ports analyzed in this SA are military ports that provide a heightened level of security"*, and that *"the chance of success [of a terrorist act] is judged to be very low, particularly in light of the transport methods to be deployed by DOE . . . which are specifically designed to afford security against sabotage or terrorism"*.

The Homeland Security letter to Congressman Markey[12] provides a detailed insight into the safeguards and protection in place whilst the PNTL ships are in US territorial waters:

> *"9. The two transport ships will be escorted in and out of U.S. waters by a combination of Coast Guard cutters, boats, aircraft and other local law enforcement and Navy assets. Additionally, temporary security zones (both fixed and moving) will be established to deny access to other vessels within a specified area around the ships. Consistent with established protocols, there will not be a Coast Guard escort while the ships are in international waters. . . ."*

These arrangements apply to the movement of the PNTL ships out of Charleston which is a major naval port with inherently high levels of security, hence the reasoning that *'adequate safeguards are in place'*.

18 The NRC has made a number of additions to its DBT list with, for example, following the 1993 car bomb attack on the World Trade Centre, the DBTs were enhance to include a 'four-wheel drive' bomb – see Lyman E S, Terrorism Threats and Nuclear Power, Rethinking Nuclear Energy and Democracy after September 11, 2001, IPPNW, Cambridge, MA 2004.

For the overland road transportation from Los Alamos to Charleston, a security feature that distinguishes the US movement to that of the current reactor-grade PuO_2 movements in France is that in the US only 3 FS47 casks are permitted to be carried in each custom-built *special secure transport* (SST) road vehicle, whereas in France up to 10 casks are carried in each vehicle piggy-backed with what seems to be a standard ISO container, typically running as a two-vehicle convoy. This US cask load limitation aims to reduce the radiological impact of both severe road accident and terrorist attack, particularly where the DBT involves a vehicle loaded with explosives (a truck bomb). Also, the maximum quantities of PuO_2 permitted in any one 'target' vehicle may have been swayed by the poor achievement of the US OSRE exercises at fixed nuclear plants at less than 50% successful in resisting terrorist attack.[19]

In Summary: Our examination of the approach to the security and physical protection of the United States for PuO_2 consignment movements in the United Sates confirms that it does take account of terrorist acts by continuously reviewing the threat situation and, moreover, there is a US regulatory requirement (NRC) for it to do so.

With its Eurofab transportation arrangements the US aims to reduce the opportunity for and limit the consequences of terrorist attack (by reducing the amount of PuO_2 in each single target), it implements additional safeguards (with the use of naval assets as escorts in its territorial waters), and it requires additional standards over and above the IAEA225 requirement (the *Stored (nuclear) Weapon Standard*).

We understand that the United States has and continues to press for the formulation of a 5th revision of IAEA225 (last revised 4th edition in June 1999),[20] it has done so since the September 11, 2001 attacks, promoting that the present recommendations were arguably inadequate prior to 9-11 and are now clearly obsolete, that is not reflecting what we have learnt about international terrorist interests in nuclear and radiological threats.

EUROPEAN UNION – ROLE OF THE EUROPEAN COMMISSION

On its own territory the United States now applies (as demonstrated by the Eurofab arrangements) security and physical protection requirements and measures that are superior to IAEA225 (4th revision) and it expects,[21] under the US-Euratom agreement:[22]

> *". . .The transfer of the plutonium oxide would take place in accordance with the U.S.-EURATOM Agreement for Cooperation. . . . The French Government would determine the physical protection measures to be implemented while the material is in France, in compliance with IAEA recommendations, including INFCIRC/225/Rev. 4, . . . DOE emphasizes that the measures used by France will be comparable to the measures used in the U.S. to transport and process this type of radiological material. . . ."*

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19 No OSRE data is available for transportation of radioactive materials and the data s for fixed nuclear plants in the United States, see Large, J H, The Implications of 11 September for the Nuclear Industry, United Nations for Disarmament Research, Disarmament Forum, 2003 No 2, pp29-38, http://www.unidir.ch/bdd/fiche-article.php?ref_article=1910.

20 American Nuclear Society meeting in New Orleans, LA in November 2003, Richard Stratford, Director of the Office of Nuclear Energy Affairs at the US State Department, said (that he favored the development and adoption of a fifth revision of INFCIRC/225, particularly with respect to transportation security – see Lyman, E S *Declaration in Support of Petitioners' Hearing Request*, US Department of Energy, Docket 110.540, NRC, 26 November, 2003 - http://www.greenpeace.org/international_en/multimedia/download/1/364452/0/LymanonLTAPu1103.PDF.

21 US NRC Memorandum and Order of 15 June 2004, CLI-04-17.

22 U.S.-Euratom Agreement for Co-operation, 7 November 1995 - Agreement for cooperation in the peaceful uses of nuclear energy between the European Atomic Energy Community and the United States of America - Agreed Minute - Declaration on non-proliferation policy Official Journal L 120 , 20/05/1996 p. 0001 – 0036 as required under U.S. NRC Memorandum and Order of 15 June 2004, CLI-04-17.

It is the US expectation (requirement) that the *"measures used by France will be comparable to the measures used in the U.S."*. However, we are of the opinion that in the present post 9-11 climate it would be appropriate for the physical protection standards applied in France and on-board the British registered PNTL ships, to be more stringent because the Eurofab PuO_2 consignment, being US-sourced, is more likely to be identified as an attractive target by any one of a number of international terrorist groups.

The European Union effectively acts as an intermediary between its Member States and the US to 'guarantee' the security, although it has no effective means to do so in the field of physical protection (contrary to safeguards), apart from implementing a legislative framework that binds Member States to comply with IAEA225, Euratom being a signatory of the IAEA274 and IAEA225. The US-Euratom Agreement specifically refers to the IAEA225 guidelines for physical protection:

> *"Article 11 - Physical protection*
>
> *1. Nuclear material transferred pursuant to this Agreement and special fissionable material used in or produced through the use of non-nuclear material, nuclear material or equipment so transferred shall be subject to adequate measures of physical protection.*
>
> *2. Such physical protection measures shall be at levels which shall satisfy the criteria set out in Annex C to IAEA document INFCIRC 254/REV 1/Part 1 (Guidelines for nuclear transfers) as it may be revised and accepted by the Parties and the Member States of the Community. As a supplement to this document, the Member States of the Community, the Commission of the European Communities (as appropriate), and the United States of America will refer, when applying these measures, to the recommendations of IAEA document INFCIRC 225/REV 3 on the Physical Protection of Nuclear Material, as it may be revised and accepted by the Parties and the Member States of the Community. 3. International transport of nuclear material subject to this Agreement shall be subject to the provisions of the International Convention on the Physical Protection of Nuclear Material (INFCIRC 274/REV 1), as it may be revised and accepted by the Parties and the Member States of the Community. . . ."*

In this way, the European Commission assumed responsibility on the compliance of French (but possibly not the British) security measures, as acknowledged by the US NRC.[23]

UNITED KINGDOM & FRANCE – ATTITUDE TOWARDS IAEA INFCIRC/225.REV 4

As previously noted, both the UK and France, being signatory states of IAEA274, are required to meet the terms of the security and physical protection measures of IAEA225, although it seems that these two states are reluctant to commit to a higher standard of security and physical protection beyond IAEA225.

Indeed, these two states acting within colloquium of six members (the *Group of Six*) in the IAEA 1999-2000 Expert Group rejected the IAEA Secretariat's proposed amendments (based on a US draft) which, amongst other things, provided additional safeguards for the increasing amount of fissile material becoming available for peaceful uses as a result of the agreed reductions in nuclear weapon arsenals (i.e. the US-Russian plutonium disposition program).[24] Essentially, the Six

23 NRC Memorandum and Order of 15 June 2004 states *"The Commission [NRC] also received confirmation from the European Commission, by way of the U.S. Department of State, that the proposed export would take place pursuant to the U.S.-EURATOM Agreement for Nuclear Cooperation."* and *"France, through the U.S.-EURATOM Agreement as well as the case-specific EURATOM assurance letter of December 15, 2003, has unquestionably committed to meeting the standards embodied in INFCIRC/225/Rev. 4."*

24 The UK and France were of a group of five, including Germany, Sweden and Belgium, all possesors of significant amounts of 'civil' plutonium over which the propose US standards would apply if incorporated into the proposed revision of IAEA225 – subsequently called the Group of Six when joined by Spain in 2001.

preferred to retain the *performance-based* over the so-called *compliance-based* approach proposed by the United States, arguing on the basis that this allowed greater flexibility with each state tailoring its security and protection regimes to suit its particular technology, organisations and management systems, and the type and strength of threat that any particular nation might face at any one time.[25] This is interpreted to mean that DBTs are themselves specific to local factors, viz.

> *"Since the objectives of the protection against theft or unauthorised removal or against sabotage may be different for different nuclear facilities and transport, . . . there are different sets of threats. . . ."*

And it remains so today: Different states are permitted to exercise different interpretations of the requirements of IAEA225 and how these are to be applied in any one state. One state (here the US) might apply a superior standard but, within the terms of IAEA225 Revision 4, it has no governance of how another state, here either the shipping or receiving state (UK and France), might apply its interpretation of IAEA225 over the same nuclear material being carried in the same basic package (FS47 cask).

UNITED KINGDOM - OCEAN TRANSPORT

The United Kingdom government has an active role in providing security for PNTL ships that are to carry the PuO_2 consignment: It acts as the Competent Authority as required by IAEA225; it provides members of its own constabulary from the United Kingdom Atomic Energy Agency (UKAEA);[26] and the PNTL ships are British owned,[27] British registered and British crewed. Yet, in the past where the same two PNTL ships have been used to ship reactor-grade PuO_2 to Japan the UK government[28] has stated quite categorically that *"[t]he vessels are civilian vessels engaged in commercial cargo operations. They have no special status."*.

On this basis, UK government involvement is limited to licensing the PuO_2 consignment whilst on board by the Department for Transport via its *Radioactive Material Transport Division* (RMTD) which includes evaluation of the emergency response plan RADSAFE held at the ready by British Nuclear Fuels (BNFL); assessment and approval of the shipment by the Department of Trade and Industry's *Office of Civil Nuclear Safety* (OCNS – the IAEA *Designated National Authority* for the UK) and which only applies beyond UK territorial waters on UK flagged vessels[29] and, relating to the role of the 42 or so UKAEA police officers accompanying[30] the PuO_2 consignment, there must be agreement between the

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25 Wager K et al, The fundamental principles of the physical protection The Group of Six point of view, Seminar 5, Eurosafe 2001, http://www.eurosafe-forum.org/down2001/semb5_1.doc.

26 A Force of 42 members of the UKAEA constabulary were on board the PNTL Pacific Pintail and Pacific Teal for the return of the defective MOX fuel from Japan in 2002 - The UKAEA police force is a government police force with the same powers of arrest, etc., as the Metropolitan (London) and County Polices forces (ie it is not a private security agency). Members of the UKAEA Police Authority (its governing Board) include the Director General of the OCNS and a member of the DTI Nuclear Industries Directorate and it operates under the auspices of the HM Government DTI.

27 BNFL owns approximately 65% of the issued shares of PNTL, 25% is held a consortium of Japanese nuclear power station operators, and the remainder is held by COGEMA of France (as of 1996). BNFL is a wholly owned company with its single share being under the control of the UK Government Secretary of State for Trade and Industry – at sea both ships, the Pacific Teal and Pacific Pintail are operated and crewed by British registered company (James Fisher & Sons).

28 United Kingdom Minister of State for Energy and Industry, John Battle, letter of 27th July 1999 to David Chaytor MP.

29 UK Parliamentary Question from Mr Llew Smith, 16 July 2004 to Mr Timms, DTI Minister, who replied "The Office for Civil Nuclear Security (OCNS) already has the power to regulate the security of nuclear material carried on board UK-flagged vessels anywhere in the world. Where nuclear material is exported from UK ports on foreign-flagged vessels, OCNS's regulatory powers cannot extend beyond UK territorial waters. Once in international waters, sole responsibility for the security of the nuclear material rests with the government of the carrier concerned.."

30 *The State of Security in the Civil Nuclear Industry and the Effectiveness of Security Regulations*, Report to the Secretary of State for Trade and Industry, Director of Civil Nuclear Security, March 2002.

UKAEA and the masters of both ships since the UKAEA officers are under the ultimate control of the ship's master(s).[31]

The reason that two ships are used, one of which is unlikely to be carrying any part of the PuO_2 consignment, is that the level of physical protection called for by IAEA225 requires the transportation to maintain constant surveillance by escorts under conditions which assure close communication with appropriate response forces. So the second PNTL ship, either *Pacific Pintail* or *Teal* (whichever is not loaded), acts as escort and provides the appropriate response force if required – in IAEA terminology, this means the second ship is an escort independent of cargo and not an armed carrier (if it carried any part of the PuO_2 consignment) and, being manned by the UKAEA constabulary, the persons or guard forming the escort has *'a prior trustworthiness sufficient to be entrusted with the surveillance'*.[32]

For long (*protected*) sea voyages IAEA225 calls for *"one or more escorts"* and that *"whereas it is recommended that shipments of Category I material by sea should be accompanied by one or more escorts, experience suggests that as voyages tend to last protracted periods, sufficient escorts should be provided to ensure that at least one (and preferably more than one) escort is on duty at all times in order to maintain communications with response forces and keep surveillance on the cargo hold and surrounding seas."*. However, BNFL and the UK government seem to believe that additional armed escorts are not necessary once that the PNTL ships are on the high seas because it has never indicated that these PNTL ships, when transporting *Category I* MOX fuel in the past, have been escorted by a Royal Navy warship, thereby tacitly acknowledging that any DBT envisaged on the high seas could be sufficiently resisted by the accompanying lone PNTL escort ship.

This is quite different to the assurance given to Congressman Markey[12] where, when in US territorial waters, the PNTL ships are to be escorted by all manner of vessels, including *'navy assets'*, thereby suggesting the presence of terrorist threat or that a specific DBT had been recognised and countered.

In the UK, the concept of Design Basis Threat (DBT) has been developed since 2002 and the procedures for this are given in an OCNS classified document *Design Basis Threats* of 2003 or thereabouts. The UK approach to DBTs is based on *"intelligence about the motives, intentions and capabilities of potential adversaries"* and includes for nuclear material in transit, but it excludes possible security threats and methods of attack that are judged not to be relevant to the civil nuclear industry in the United Kingdom (and UK flagged vessels). Essentially, the classified *Design Basis Threats* is a planning tool that draws principally on assessments produced by the Security Services (MI5, MI6 etc) and the Joint Terrorism Analysis Centre (JTAC) of which OCNS is a member. OCNS also issues specific threat assessments and alerts to the operating companies, received from the central security authorities and the police, to enable tailored, additional measures to be activated or reduced in response to prevailing circumstances.

In a number of important respects, the UK approach to DBTs markedly differs from that of the United States: The UK does not have a prescribed list of DBT actions, nor does it operate regular force-on-force exercises and Operational Safeguards Response Evaluations (OSREs); and its

31 The *M/V Pacific Pintail* and M/*V Pacific Teal* are both armed with 30 mm cannons and each has members of the United Kingdom Atomic Energy Authority Constabulary (UKAEAC) on board. The United Kingdom Minister of State for Energy and Industry, John Battle, has stated in a letter of 27th July 1999 to David Chaytor MP that 'normally, the two armed PNTL vessels act as escorts to each other'. Mr Battle also stated that the Master is responsible for the safe operation of the ship and the UKAEAC escort commander is subject to his authority, and that *"[a]ny decision to use armed force to counter an armed terrorist attack would be governed by the Rules of Engagement agreed by the government, under which any such decision would rest from the ship's Master, who would be advised by the UKAEAC escort Commander."*.

32 SURVEILLANCE: Close surveillance to be achieved by observers, and/or photo electric, closed-circuit television, sonic detectors, electronic, photographic or other means - SECURITY SURVEY: A critical examination made by competent officers, in order to evaluate, approve and specify physical protection measures.
http://www.iaea.org/worldatom/program/protection/infcirc225/infcr233.html#sur.

nuclear safety regulator, the Nuclear Installations Inspectorate, is not directly involved in security issues, although it does have a memorandum of understanding (demarking it role) with OCNS.

The UK's lack of having a definitive list of DBTs seems to be in contravention of the spirit of IAEA225 that:

> *"4.2.4.1. The State should define a design basis threat as a common basis for physical protection planning by the operator and its approval by the competent authority. In the event of any change to the design basis threat, the State's competent authority should ensure that the change is sufficiently reflected in the regulations and by the operator's protective measures. . . "*

Indeed, there is generally a resistance in the UK to plan specifically for terrorist acts. The situation is confused insofar that Government ministers consider the DBT to be based on *'intelligence about the motives, intentions and capabilities of potential adversaries'*,[33] which seems to imply that there is sufficient confidence to detect the intent of terrorist act before such is carried through. In fact, the UK nuclear safety regulator, the Nuclear Installations Inspectorate of the Health & Safety Executive, has concocted the quite absurd reasoning for why it is unnecessary to include assessment of terrorist attack on the basis that:

> *". . .that if a threat to the plant [or transport] is judged by the operators, to fall below the limit of reasonable foreseeability then it does not need to be included in its[risk and hazard] submission to HSE. Given that there is no substantive evidence that a terrorist threat to a specific plant [or transport mode] and in a specific manner that is reasonably foreseeable, HSE considers that it is quite correct that the reports of assessment do not need to consider this."*.[34]

In Summary: For previous IAEA225 *Category I* transports of plutonium in the form of MOX fuel assemblies the UK government has claimed these to be 'commercial' voyages and not plying 'UK government business', even though the vessels carried armed UKAEA police officers and that the shipping security and physical protection plans had been approved by a government agency. For the Eurofab shipment, again UK police officers are involved and the shipping plans have been approved by the government agency the OCNS, but the UK government has not stated, one way or other, if the PNTL ships are on government business – in this respect it cannot be confirmed if the European Commission has assumed responsibility for the security of the PuO_2 consignment whilst in transit on the high seas.

There is an element of dichotomy in that whilst the PNTL vessels are in US territorial waters they are to be escorted by coast guard vessels and *'naval assets'*, which clearly means at least one United States warship in close attendance. However, once the PNTL vessels have left US waters, the UK government has deemed that the relatively lightly armed single 'escort' vessel (either *Pacific Pintail* or *Teal* depending on the final loading at Charleston) is entirely sufficient to fulfil the escort role for which IAEA225 recommends *'preferably more than one escort'* to maintain communications, and to watch over the cargo and the surrounding seas.

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33 a) Letter, Sunil Parekh, APS to John Denham, Home Office Minister to Large & Associates, 10 May 2002, b) Letter, Mike Smith, Manager Nuclear Security, Department of Trade and Industry to Large & Associates, 28 February 2003, c) The Office of Civil Nuclear Security 1st Annual Report, October to March 2002, d) E-mail Graham Holder, HSE to Large & Associates, 26 February 2003.

34 Large J H, A Review of Local Authority Off-Site Emergency Planning under the Radiation (Emergency Preparedness & Public Information) Regulations, Greenpeace UK, December 2002.

The UK government's approach to application and trial by design basis threat (DBT) is not publicly availably being classified 'SECRET'. What is known, however, is that the UK prefers the so-called *performance-based approach*; that it strongly believes and, apparently, greatly relies upon its ability to gather '*intelligence about the motives, intentions and capabilities of potential adversaries'*; and that since *'there is no substantive evidence that a terrorist threat . . . is reasonably foreseeable'*, it is neither practicable or necessary to plan (i.e. establish a realistic DBT in the IAEA225 sense) for such events.

FRANCE - PORT HANDLING AND OVERLAND ROAD TRANSPORT

Although France is opposed to any revision of the Convention IAEA274 that would broaden its application, it claims it *"has taken a very active part in the revision of IAEA recommendations on the physical protection of nuclear materials and facilities, gathered in the document INFCIRC225/Rev.4"*.[35] Moreover, the French Government considers the plutonium transports in France as *"presenting the highest level of security: all the standards required by the International Atomic Energy Agency are met and even surpassed"*.[36]

However, there is not a requirement for terrorism to be formally accounted for in the arrangements for the Eurofab PuO_2 consignments because, as stated[37] by the *Institut de Radioprotection et de Sûreté Nucléaire* (IRSN - the national technical safety organisation), it is *"not explicitly required in the French regulations [that] the security of the casks must be studied in the context of potential loads resulting from terrorism."* and that, furthermore, *"there is no legal framework allowing the competent authority to require that the transporters or designers of packages perform the assessments of the casks behaviour in such situations."*[38] Whilst in the case of fixed nuclear facilities, *"the competent authority asks the operators to perform analyses for their own facilities and provide them with the threats to be considered"*, there appears to be no specific assessment of DBTs to apply to the transports of nuclear materials. Instead, the IRSN initiated, only a few years ago, a programme where it transposes threats *"chosen in order to be consistent with those used for the facilities"* only *"to determine the level of aggression against which the [FS47] cask is protected."*

Very little of the French approach to security and physical protection of nuclear materials in transit (of fixed nuclear installations) is available in the public domain, although some rare insights have been provided in the recent years by authoritative seminar papers[39,40,41] from the French technical support

35 Declaration of France to the Conférence des Parties chargée de l'examen du Traité sur la non-prolifération des armes nucléaires (TNP), qui se tiendra en l'an 2000, Comité 3, M. Hubert de La Fortelle (Représentant de la France auprès de la Conférence du Désarmement), 27 April 2000. http://www.diplomatie.gouv.fr/actual/dossiers/TNP/tnp6.html

36 Minister of Industry, written answer of 18 May 2004 to A Thien Ah Koon, Member of the French Parliament, *Journal Officiel, Assemblée Nationale, Questions écrites*, p. 3684.

37 B. Autrusson, D. Brochard (IRSN), *"The French approach concerning the protection of shipping casks against terrorism"*, paper from a presentation given in ASME Pressure Vessels and piping, Cleveland (USA), 21-24 July 2003 - http://www.irsn.fr/net-science/liblocal/docs/docs_DEND/frenchapproach.pdf.

38 This seems contrary to the existing French legislation and regulatory system governing the physical protection of fixed nuclear facilities and (it is assumed) nuclear materials derives from two sources of legislation. The first is a parliamentary law specifically relates to the detection and prevention of loss, theft or diversion of nuclear material suited to the fabrication of a nuclear explosive device of July 1980, which is supplemented by decrees, orders and ministerial instructions giving detailed requirements overseen by a state appointed competent body for nuclear material holders. The second legislation sets out the safeguards to sensitive nuclear installations (Ordinance 58.1371 of December 1958) which is also supplemented by a ministerial instruction HFD 50 of May 2000.

39 Cornu P, et al *Protection of Nuclear Facilities and Nuclear Materials Against Malevolent Actions*, EUROSAFE 2001 Nuclear Risk Management, Seminar 5 Nuclear Material Security.
http://www.eurosafe-forum.org/down2001/semb5_3.doc.

40 Vernot R, et al, *Physical Protection, Accountancy and Control Systems Vulnerability Assessments*, EUROSAFE 2002, Seminar 5 Nuclear Material Security.
http://www.eurosafe-forum.org/ipsn/pdf/euro2_5_5_physical_protection.pdf.

41 Aurelle J, et al, *Short and Medium Term Consequences of the 11th September Attacks on Physical Protection Activities in France*, EUROSAFE 2002, Seminar 5 Nuclear Material Security.
http://www.eurosafe-forum.org/ipsn/pdf/euro2_5_2_consequences_france.pdf.

organisation, the *Institut de Radioprotection et de Sûreté Nucléaire* (IRSN),[42] particularly with respect to the definition and application of DBTs.

Contrary to the US preferred approach, *"the French regulatory system lays down a performance-based approach rather than a compliance-based approach"*.[40] The approach is generally described as *"oriented towards the detection and prevention"*, and the assessment of physical protection is based on a combination of a *vulnerability* assessment, known as 'security study', and a *sensitivity* analysis.

The security studies are those by which *"the operator has to prove that his arrangements satisfy the objectives specified by the authority"*. These objectives derive from the application to the specific case of the DBT, based on a list of 600 or so real events that have occurred at French nuclear facilities. The DBT is only described in very general terms that include:

- *"Internal threats involving actions taken by insiders acting alone or not"*
- *"External threats involving actions by small group of attackers."*

with two assumptions, being *"a small team of attackers with limited resources"*, and *"a larger team with more sophisticated resources"*.[43]

That said, there is nothing to indicate a specific DBT-based security study has ever been undertaken to assess the protection of the PuO_2 transports in France (both French-origin reactor-grade or Eurofab and, indeed, the transportation of nuclear material in general). To the contrary, it seems that even in the aftermath of the 9-11 attacks, this approach was not developed when *"the French Government launched a comprehensive review of the security of the main industrial facilities . . . . For the French industry, this work covers the assessment of nuclear sites and installations, specific inspections of all nuclear sites, the implementation of new measures to strengthen the physical protection and a review of the Design Basis Threat"*, though still defined as *"the threat against which the licensee must be able to protect its facility"*.[44]

The sensitivity part of the assessment is based on safety studies, with the *"analysis of the sensitivity involves using safety analyses to identify potential accident sequences"* being performed *"mainly by using a standard incident or accident list taken into consideration at the facility design stage"*.[41] An essential consequence of this is that, regarding the objective of physical protection:

> *"Acceptable consequences are taken as being those leading to levels of radioactive releases less than, or equal to, those taken into account in the facility safety case. . . ."*[45]

In other words, according to this authoritative paper, the most severely damaging terrorist attack (to a fixed nuclear installation) will not result in a level consequences, which are assumedly taken to be tolerable to the public, to that resulting from the credible, reference or design-basis accident assumed in the plant design. Put another way, the French approach to determining the adequacy of the security and physical protection measures seemingly ignores any rational development of

42 Before March 2002 the Institut de Protection et de Sûreté Nucléaire (IPSN).

43 Aurelle et al (IRSN), op. cit. For the vulnerability studies of the nuclear facilities, "various scenarios of attacks have been considered, such as: intentional aircraft crash . . ., suicidal attack by aggressors carrying on explosives, attack by terrorist groups (commando), suicidal attack by truck or car loaded with explosives (kamikaze bomb truck)", etc. No such approach has been developed regarding the transports.

44 Aurelle et al (IRSN), op. cit. Moreover, the IRSN indicated in this paper that "an improved regulation is under way . . . [which] will be more precise in the allocation of responsabilities of the actors involved in the protection of nuclear sites and facilities against malicious actions and sabotage", therefore seemingly not implementing security requirements for transports.

45 As stated by IRSN, *op.cit.*, *"for the nuclear facilities, the French regulations state that the consequences of aggressions aiming at generating a safety hazard and/or radiological releases in the environment must be assessed* [and] *have to be evaluated in terms of safety, of pollution in the environment and of radiological consequences for the population"*.

the DBT test, falling back on the probabilistically derived accident safety case that is now assumed to also cover a determined terrorist attack.[46]

Contrary to the vulnerability assessment, the sensitivity studies are applied to transports, for the *"target identification, [which] is an evaluation of what to protect, a priori, without consideration of the threat or the difficulty of providing physical protection . . . . The approach comprises analysis of the sensitivity of a facility or a transport, using safety analysis . . ."*.[47] The safety assessment of the PuO_2 transport, in particular the claimed robustness of the FS47 carrying cask, is therefore the underlying basis or mainframe of the physical protection assessment.

FS47 Flask Performance: In its defence of the PuO_2 carrying cask, the FS47, IRSN concentrates on the margins between the (TS-R-1) regulatory safety requirements and what it claims to be the real limits of the FS47 mechanical and thermal resistance. For this reference is made assessments of the FS47 safety performance undertaken between 1994 and 2002. According to the findings of this programme, the FS47 design is claimed able to resist much more severe conditions than those required by the French (TS-R-1) regulations:

- *"it has been demonstrated that in case of impact under realistic accidental conditions (at 70 km/h on a range of metal targets and, impact at 113 km/h on reinforced concrete surface), there was not any plutonium oxide release";*
- *"it has been determined by calculations that, for a drop height of 50 meter, the cask damage is comparable to those resulting from a 9 meter drop on an unyielding surface";*
- *"depending on two types of sealing gasket material used, subject to a 800°C the surety lasts 5 h 30 min and around 10 hours, and for a 1,000°C fire 4 and 7 hours.".*

From these statements, IRSN arrives at the absolute conclusion *"that a transport accident cannot produce a breach in the cask"* and that *"the release of plutonium oxide in such an accident could only come from the loss of the sealing efficiency in the case of a long lasting fire, together with the degradation of one of the three inner containment barriers"*. The IRSN reasoning for this is that only a fraction of the small quantity of plutonium powder that might escape into the cask cavity would aerosolise and release if the cavity depressurised when the sealing gasket failed due to fire - IRSN evaluates this fraction at 0.07 g and nominates a worst case road accident scenario that could possibly result in this level of release, namely *"the crash of a FS47carrying truck with a fuel tanker truck and a long lasting fire"*.

However, a little further examination of the past FS47 1994-2002 development/test programme shows IRSN's reasoning to be flawed because:-

- The thermal studies reported in the IRSN programme[48] comprise, apart from a single (actual) thermal test at 800°C for 3 hours 25 minutes conducted in 1993, entirely numerical simulations.

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46 Unlike an accident a terrorist attack is intentional and intelligently driven and because intent and intelligence elements dominate a priori probabilistic forecasting is not applicable, also a terrorist will seek out the vulnerabilities of the system, possibly exploiting these in such ways to maximise the impact of the radioactive release.

47 Brousse C, et al, *IRSN Activities in Physical Protection in Support of the IAEA: The Insider Threats Approach*, EUROSAFE 2003, Seminar 5 Nuclear Material Security. http://www.eurosafe-forum.org/forum2003/seminaires/5_9Paper.pdf.

48 The research programs on mechanical and thermal performance of FS47 that are the basis to the IRSN statement are respectively described and commented in R. Vallée, L. Piot, "Simulations du comportement mécanique de colis de transport de matières radioactives sur cibles réelles", in *apport scientifique et technique IRSN, 2002*, IRSN, December 2002, pp. 102-108. http://www.irsn.org/net-science/liblocal/docs/docs_DIR/RST2002/Chap03_art1.pdf , F. Chalon, M. Héritier, B. Duret, "Numerical Study of the Thermal Behaviour of Packages Subjected to Fires of Long Duration", in *Proceedings, PATRAM'98, 12th International Conference on the Packaging and Transportation of Radioactive Materials, Paris, 10-15 May 1998*, vol. 4, pp. 1773-1780. Additionnal information can be found in S Felix, F. Chalon & al, "Safety margins for radioactive material transport packages subject

- Thus, the IRSN conclusions on the FS47 thermal behaviour at higher temperature and longer fire duration have been extrapolated from a single test at less severe conditions – a methodology that is accompanied by great deal of inherent uncertainty.

- Similarly, for the impact performance assessment of a FS47 falling from 16 m, in slanting position, onto a second FS47 in vertical position, the IRSN 2002 publication[49] notes that *"the upper part of the closure system is impacted, but the computer model used is not precise enough to allow for assessing the damage and determining a potential loss of structural containment"*.[50]

The general theme of past IRSN test and modelling programmes clearly relates to handling mishaps, particularly during craneage, and not to any DBT-contrived terrorist attack in which the force circumstance are likely to be more complex and of higher magnitude. Also, a significant omission in the performance assessment of the IRSN programme is where an impact damaged FS47 is engulfed in fire. Although the IAEA Type B(U) compliance requires the thermal test to follow the 9m free drop impact test, IRSN skirts around this issue when claiming the FS47 cask is able to withstand more severe conditions, particularly mechanical damage and/or displacement of the inner thermal heat sinks and insulation, which is then engulfed in fire. As IRSN results demonstrate *"the thermal insulation effect brought by the compound and plaster protecting the content is significant"*,[51] which may be lost because of impact damage. In other words, the apparent impact fragility of the internal heat insulation system (gypsum plaster) may render such a damaged cask unsuited for subsequent fire engulfment of any significant duration, thus the severe impact-fire road accident and terrorism scenarios identified by WISE-Paris and Large & Associates would present a serious threat to the surety of the FS47.[52]

It is IRSN's resolution and stand on the 0.07g release fraction that is so unsubstantiated. The plainly obvious deficit of IRSN reasoning is why, when the plutonium is transported in batches of 9 or 10 casks in each vehicle, only one cask would fail thereby limiting the release its predetermined 0.07g fraction. IRSN provides no explanation in its published test programme as to how the tests and numerical simulations on a single FS47 cask can be extrapolated to reason that a rack of 9 or 10 casks would sustain only one, albeit minor, cask failure. The single cask failure fraction of 3.5% adopted by the US DOE analysis[8] is x8,500 larger than the IRSN 0.07g postulated release which it applies irrespective of whether a single or batch of 9 FS47 casks is involved in the incident.

However, it now transpires that the *"French approach concerning the protection of shipping casks against terrorism"* (made public only a few months past),[53] had involved tests and trials that *"though not explicitly required in the French regulations, the security of the casks must be studied in the context of potential loads resulting from terrorism"*. This research *"in 1996, IRSN has initiated a program concerning [the] FS47, used for the shipment of PuO_2 powder loaded by the detonation of a large amount of explosive"* comprised some earlier IRSN reduced-scale tests on the explosive impact of explosive charges placed against the FS47 outer shell and, more recently, a series of numerical simulations.

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to fire: experimental work-development of numerical simulation tools", in *Rapport scientifique et technique IRSN, 2000*, IRSN, December 2000, pp. 87-93. http://www.irsn.fr/vf/09_int/09_int_3_lib/pdf/rst2000/087-93.PDF.

49 IRSN, *Risques de rejet radioactif lors du transport routier de poudre d'oxyde de plutonium en colis FS47*, not dated (March/April 2004). http://www.irsn.fr/vf/05_inf/05_inf_1dossiers/05_inf_35_pu/05_inf_35_pu.shtm.

50 R. Vallée, L. Piot, *op. cit.* Translated from French by WISE-Paris.

51 F. Chalon, M. Héritier, B. Duret, *op. cit.*.

52 Another omission in the thermal testing that would, if accounted for, be more representative of real incidents is that the thermal tests and numerical simulations do not (apparently) account for radiant heat input from nearby surfaces (emissivity). This factor is important when the engulfing fire is located in a confined space such a tunnel (and which equally applies to the ISO-like container of the plutonium truck) where temperatures can elevate very significantly above the hydrocarbon flame temperature (~800°C). Such elevated fire temperatures will also contribute significantly to plume lofting and the extent and area of the dispersion fall-out of the release fraction of plutonium.

53 B. Autrusson, D. Brochard, *op. cit.* Although this paper may have been available to the 2003 Chicago conference delegates as of January 2004, it was definitely placed in public access through the IRSN web site on or about 23 February 2004.

At best, these explosive trials represent an explosive pack being placed on the outside surface of a free-standing FS47 cask, whereas in a real shipment each cask would be restrained by the vehicle rack frame, with the absence of this cask restraint attracting criticism because it *"would likely increase the equivalent plastic deformation of the inner tube locally to beyond its ductility threshold, bringing it to failure",*[54] which, to an extent, IRSN acknowledges in that *"two additional tests have been scheduled to investigate the behaviour of the cask plug and the influence of the shipment configuration"*, although a seemingly unrepentant, IRSN concludes *"the central stainless-steel cylinder would not rupture"*, as under the conditions of experiments and tests *"the maximum equivalent plastic deformation does not exceed 14% whereas the ductility threshold is close to 32%"*.

In a second series of tests, IRSN deployed a conically-shaped charge to simulate a rocket propelled munitions *"some years ago, IRSN has carried out tests on two FS47 casks filled with sand to simulate the PuO_2 powder, with a conical shaped charge (called CSC1) chosen on the basis of the availability, for the terrorists, of weapons with similar characteristics"* and, more recently, *"IRSN has undertaken the development of numerical models to identify and understand the physical phenomena involved in the interaction between the jet and the cask . . . also to estimate the consequences with a more efficient weapon called CSC2".*[55] There is far too little detail in the IRSN paper about the assumptions establishing the CSC2 munitions and no results whatsoever are given of the numerical modelling other than the comment *"these tests showed that the CSC1 passes through the first cask and slightly damages the second one without reaching its inner cylinder. An estimation of the quantity of nuclear material dragged out of the experimental device has been obtained . . . calculations with CSC2 have shown the increase of damage to the casks (mainly the second one) and justify the need for dedicated experiments"*.

The outcome of the numerical simulation of CSC2 clearly indicate that this advanced conical-shaped charge projected against the cask perpendicular to its axis would penetrate the outer and intermediate shells, with the jetting passing through the inner cylinder and passing out the backside of the cask, therefore removing a volume of the plutonium oxide powder. Nevertheless, the IRSN paper introduces the caveat that *"the diameter of penetration is underestimated and the removal of nuclear material is overestimated by the calculation (the latter being related with the fact that the nuclear material removed from the inner cylinder may reach the outside)"*. So, according to IRSN logic, a larger breach in the side of the inner container results in less scavenging of plutonium dioxide from within.

The potential failure of the FS47 cask under terrorist attack, as demonstrated by IRSN with the simulated CSC2 round, illustrates a non-compliance of France with the IAEA225 emergency preparedness requirement. Despite misplaced confidence that the maximum emergency to be taken into account during road transport of PuO_2 in FS47 casks is generated by a maximum release of 0.07g, the IRSN demonstration that the cask would not withstand a rocket propelled grenade, requires the operator to prepare an appropriate emergency plan (para 4.2.5.3) to effectively counter such a DBT. In this respect, Large & Associates show the present French system of *'reflex distances'* to be totally inappropriate for such a DBT triggered release of PuO_2 from a fragmented or puncture cask.

In summary: Although the French have referred to a system of DBTs for fixed nuclear installations, there seems to have been little application of these to the transportation of radioactive materials in France. Specifically, there is no indication whatsoever that the transportation arrangements of the French-origin reactor grade PuO_2 (which is regularly transferred between la Hague and Marcoule, southeast France) has been trialled to DBT transportation scenarios and if, in fact, such DBTs have been compiled by IRSN.

54 J. H. Large, 2nd Supplemental Declaration of 23 March 2004 of John H. Large in Support of Petitioners' Hearing Request and Petition to Intervene, Declaration before the NRC, 23 March 2004.

55 IRSN do not indicate how CSC2 compares to a modern RP munitions but according to available specifications, modern missile launchers would hit fixed or mobile targets, within a few hundred meters range (the M–47 Dragon, for instance, has a shooting range of 800 m for 70 km/h vehicles) with missiles of 100 mm diameter or more at a speed above 200 m/s. These are able to penetrate 900 mm of armor.

In the development program of the FS47 cask, which comprises a series of tests and numerical simulations beyond the requirements of IAEA TS-R1, none of the test and simulation input parameters seem to have been dictated by the extraordinary conditions expected of a DBT scenario. The test conditions are no more than extensions of accident conditions – a greater drop test, a longer fire engulfment simulation in the absence of an enclosed space (i.e. a tunnel), but no trials of, say, thermic lance cutting, a crushing, impact of a group of casks, etc.. In the actual and simulated explosives trials, the equivalent of a modern, armour piercing round is only numerically simulated which, although this is shown to penetrate the inner PuO_2 canisters thus providing a direct path for ejection of the PuO_2 the amount thus forcibly released is downplayed.

In fact, the only seemingly positive action taken by the French authorities to bolster the safeguarding of PuO_2 transports (be these French- or US-origin consignments) on the public roads of France is for them to apply a decree[56] censoring the holding and release of any information concerning the conditions of storage, manipulation, or transport of nuclear materials. A liberalised version was enacted in January 2004,[57] with this being accompanied by a less than explanatory circular.[58] However, this state secrecy has been regularly breached by Greenpeace (France) by its extraction of publicly available information and mainly by on-the-ground observation of the routes and days of transports, this environmental organisation has and continues to reveal serious flaws in the security arrangements of the plutonium convoys. So much so, that Greenpeace is able to predict dates, times and routes being used by the plutonium convoy, some of which could be readily obtained from publicly available sources.[59]

There is no evidence to demonstrate that France has prepared any extraordinary security and physical protection measures for the awaited Eurofab PuO_2 consignments from the United States.

The expectation is that the US consignment will be transported in much the same way as the French-origin, that is in the absence of any local, national or international consideration of the terrorist threats that such a unique (US) shipment might attract. If this is correct, it is quite obvious that France is in contravention with IAEA225 para 4.1.4, requiring it to continuously review and act in response to threats that should be identified in the form of DBTs.

If, instead, the French provide special measures to safeguard the transit of the Eurofab consignment then this, surely, can only be considered as a double standard if it continues to neglect the security and physical protection of its own French-origin transports of reactor-grade PuO_2.

56 Arrêté du 24 juillet 2003 relatif à la protection du secret de la défense nationale dans le domaine de la protection et du contrôle des matières nucléaires, *Journal Officiel*, n° 183, 9 August 2003, p. 13859.h http://www.legifrance.gouv.fr/WAspad/UnTexteDeJorf?numjo=INDI0301765A.

57 Arrêté du 26 janvier 2004 relatif à la protection du secret de la défense nationale dans le domaine de la protection et du contrôle des matières nucléaires pris pour l'application du décret n° 98-608 du 17 juillet 1998 relatif à la protection des secrets de la défense nationale, *Journal Officiel*, N° 24, 29 January 2004, p. 2092. http://www.legifrance.gouv.fr/WAspad/UnTexteDeJorf?numjo=INDI0402369A.

58 Circulaire du 26 janvier 2004 prise pour l'application de l'arrêté du 26 janvier 2004 relatif à la protection du secret de la défense nationale dans le domaine de la protection et du contrôle des matières nucléaires, *Journal Officiel*, n° 24, 29 January 2004, p. 2098 - author, the Haut-fonctionnaire de défense (high civil servant for defence matters) of the Ministry of industry, Didier Lallemand.. http://www.legifrance.gouv.fr/WAspad/UnTexteDeJorf?numjo=INDI0402369C.

59 See: http://www.stop-plutonium.org - On one occasion, on 19 February 2003 Greenpeace activists intercepted and immobilised for a few hours a truck transporting about 150kg of plutonium in the town centre of Chalon-sur-Saône. – also, Greenpeace France recently published the routes and the registration number plates of the road tractor (truck) units deployed for the plutonium oxide shipments from COGEMA La Hague, going so far as to adapt a complete convoy-like vehicle and run this along the route in a hail of publicity.

We cannot accept, indeed we entirely reject the French government's claim that plutonium transports in France are *"presenting the highest level of security: all the standards required by the International Atomic Energy Agency are met and even surpassed"*.

In Conclusion: In our brief review of the Eurofab compliance with IAEA225, we have identified considerable differences in the approach and practicable implementation of security and physical protection measures by the three states involved.

a) It is quite obvious to us that neither the French or British adopt the US force-on-force and OSRE trials that are geared to respond to quite specific DBT scenarios. On its part, the UK exhibits almost anathema to practical trials, instead preferring to rely upon intelligence in advance; whereas the French just do not seem to have developed a systematic DBT approach for transport of *Category I* nuclear materials.

b) We find the stance and approach of the United States most disturbing in two respects:

   First, the NRC Hearing for the granting of an export license for the Eurofab venture was well underway, indeed, if not virtually concluded by the time that the UK and France had, respectively, commenced any preparations for the security and safety cases for their legs of the transport – such was the haste to proceed in the absence of UK and French submissions that, it seems to us, that the outcome to grant the export license was a forgone conclusion.

   Second, we consider that Eurofab promotes double standards of security, physical surety and public protection. With respect to security against the proliferation risk, it is to permit the British to ship this highly fissile, nuclear weapons-ready cargo across the Atlantic with only what might be best described as a meekly armed escort in the form of a converted cargo vessel, and in the absence of a naval ship. In terms of physical protection, the FS47 casks, apparently compliant with IAEA TS-R1 (although there is doubt about the thermal performance), are to be provided the extra safeguard of being carried by a special secure transport (SST) whilst on US territory, whereas in France these same casks are likely to be carried in what seem to be nothing more than regular commercial vehicles. For public protection in the event of the consignment being released in a severely damaging accident or terrorist attack, the US analyses assumes a potential to release 595 g of each cask so damaged, whereas the French limit this release to 0.07 g, gearing their emergency response and countermeasures on this.

   On this second point, we note that all three states involved with Eurofab have not chosen to issue advanced notification to and/or consult with other states that might be affected by an incident besetting the consignment when on the high seas - this particularly applies to the Republic of Ireland with the sea convoy likely to pass close by its shores.

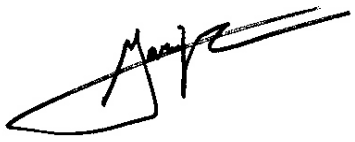
Finally, we note that IAEA225 observes that:

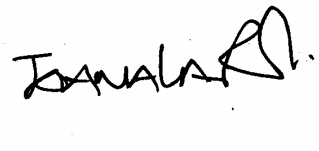
> *". . .the transport of nuclear material is probably the operation most vulnerable to an attempted act of unauthorized removal of nuclear material or sabotage. Therefore, taking into account the State's design basis threat, the physical protection provided should be "in depth" and particular attention should be given to the recovery of missing nuclear material. Emergency procedures should be prepared to counter effectively the State's design basis threat. . . . "*

In respect of this quite clear IAEA requirement, we find that the arrangements put in place for Eurofab, particularly, by France and the United Kingdom to be woefully inadequate, and we are equally critical of the United States for allowing this highly fissile consignment of PuO_2 overseas with such an apparent lack of concern for its security and physical protection.

These three states, we suggest, consider the transportation of this highly fissile material to be a poor relation to their treatment of the security, protection and safety of fixed nuclear facilities.

Signed:





YVES MARIGNAC **JOHN H LARGE**

20 September 2004