



TRANSPORT OF RADIOACTIVE SOURCES IN AFRICA: THE NIGERIAN EXPERIENCE



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on the
Packaging and Transport of Radioactive Materials (PATRAM 2010),
4th-8th October 2010 London, UK



USES OF RADIATION SOURCES IN AFRICA



- Diagnostic Radiology
- Nuclear Medicine
- Radiotherapy
- Industrial Radiography
- Nuclear Well-Logging
- Nuclear Gauging
- Uranium Mining and Milling
- Nuclear Reactors



SOURCES OF RADIOACTIVE MATERIALS IN THE REGION



- Radioactive Sources are generally imported mainly from **South Africa**, Europe, Canada, USA, Republic of Korea
- Used in Industrial Radiography and Nuclear Well-Logging, which are itinerant
- **Air Transportation** for the importation and export
- **Land and Marine Transportation** during use and



SAFETY AND SECURITY IMPLICATIONS



- Exposure of Workers in all
- Exposure of Patients in Medical Applications
- Exposure of the Public
- **Security of Radioactive Sources during use, storage and transport**
- Disposal of Radioactive Waste
- Physical Protection of Nuclear Reactors



INTERNATIONAL INSTRUMENTS

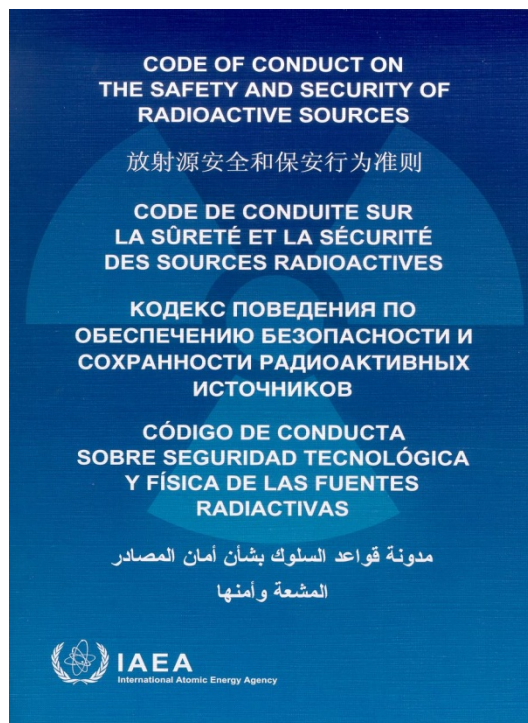


CPPNM & INFIRC 225

Code of Conduct on the Safety and Security of Radioactive Sources

The Regulations:

BSS, TS-R-1, etc



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SECURITY OF RADIOACTIVE SOURCES

Physical Protection Objectives & Fundamentals Principles



1. State responsibility
2. Responsibilities during transport
3. Legislative / regulatory framework
4. Competent authority
5. Responsibility of license holder
6. Security culture
7. Threat based
8. Graded approach
9. Defense in depth
10. Quality assurance
11. Contingency plans
12. Confidentiality

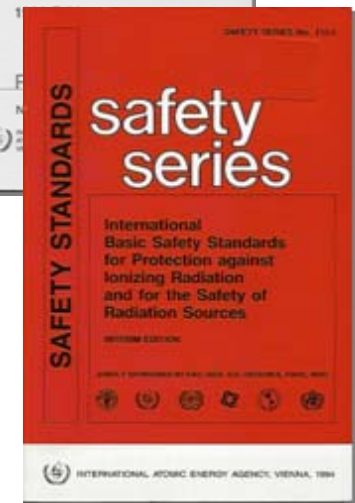
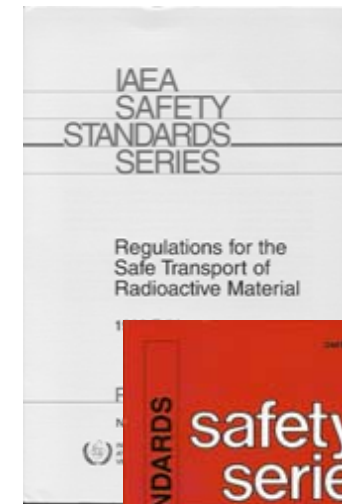


INTERNATIONAL REGULATIONS



These include:

- TS-R-1 Regulations
- Basic Safety Standards
- TS-G-1.1 Advisory Material
- TS-G-1.2 Emergency Response
- SS-112 Compliance Assurance
- SS-113 Quality Assurance
- Modal Regulations for Dangerous Goods Transport - Class 7

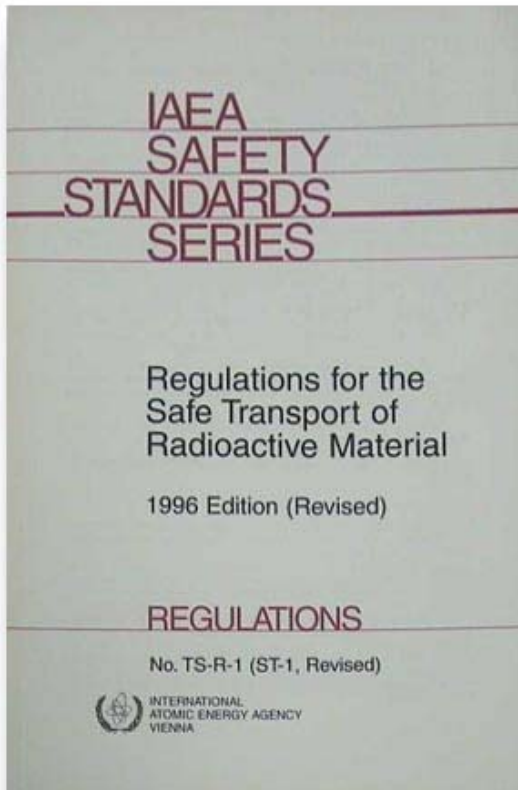




TRANSPORT REGULATIONS



- Provides for a Competent authority which shall mean a national or international regulatory body or authority designated or otherwise recognized as such for *any purpose* in connection with these Regulations
- Responsible for regulations
 - transport of **radioactive materials**
 - **Nuclear safety**
 - **Radiation protection**
 - **Customs & excise**
 - **Emergency services**





PETROLEUM INDUSTRY



- Industrial Radiography
- Nuclear Well-Logging
- Nuclear Gauging

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NATIONAL LEGISLATIVE AND REGULATORY FRAMEWORK



- **Nuclear Safety and Radiation Protection Act 19 of 1995**
- **Nigerian Nuclear Regulatory Authority 2001**
- **Nigeria Basic Ionizing Radiation Regulations (NiBIRR) 2003**



NUCLEAR SAFETY AND RADIATION PROTECTION ACT



- Nine parts and 49 sections
- A 14-member Board of Governors
 - Established

NIGERIAN NUCLEAR REGULATORY AUTHORITY (NNRA) in 2001

“with the responsibility for nuclear safety and radiological protection regulation in Nigeria”



NUCLEAR SAFETY AND RADIATION PROTECTION ACT



- **NNRA Responsibilities** include
 - Regulating the possession and application of radioactive substances and devices emitting ionizing radiation;
 - ensuring protection of life, health, property and the environment from the harmful effects of ionizing radiation, while allowing beneficial practices involving exposure to ionizing radiation;



NUCLEAR SAFETY AND RADIATION PROTECTION ACT



Responsibilities Cont.

- advising the Federal Government on nuclear security, safety and radiation protection matters;
- performing all necessary functions to enable Nigeria meet its national and international safeguards and safety obligations in the application of nuclear energy and ionizing radiation



FNRBA

NUCLEAR SAFETY AND RADIATION PROTECTION ACT



- **Powers** include according to Section 6
 - ❖ Categorization and licensing all activities involving exposure to ionizing radiation, in particular, the possession, production, processing, manufacture, purchase, sale, **import**, **export**, handling, use, transformation, transfer, trading, assignment, **transport**, **storage** and disposal of any radioactive material, nuclear material, radioactive waste, prescribed substance and any apparatus emitting ionizing radiation



POWERS



- ❖ establish appropriate register for each category of sources or practices involving ionizing radiation;
- ❖ Issue codes of practice which shall be binding on all users of radioactive and prescribed substances, and of sources of ionizing radiation;
- ❖ Review and approve safety standards and documentation;



POWERS



- ❖ Provide training, information and guidance on nuclear safety and radiation protection;
- ❖ Establish in co-operation with other competent national authorities, plans and procedures which shall be periodically tested and assessed for coping with any radiation emergency and abnormal occurrence involving nuclear materials and radiation sources;
- ❖ do everything necessary to ensure that all concerned persons and bodies comply with laid down regulations under the Act.



REGULATORY CONTROL PROGRAMME



- Regulations and Guidance
- Authorization
- Oversight Functions
- Emergency Planning and Response
- Ancillary Functions



REGULATIONS AND GUIDANCE



- Nigerian Basic Ionizing Radiation Regulations (**NiBIRR**) 2003
- **14 Practice-Specific Regulations**
 - Nigerian Regulations for the Transportation of Radioactive Sources 2006
 - Nigerian Regulations for the Safety and Security of Radioactive Sources 2006



AUTHORIZATION



- **Registration**
- **Permit**
- **Certificate**
- **Licence**



OVERSIGHT FUNCTIONS



- **Inspection**
 - 5 types of inspection
- **Performance Assessment**
 - Peer review
 - Auditing
- **Investigation**
 - Non-compliance
- **Enforcement**



EMERGENCY PLANNING AND RESPONSE



- **Planning**
- **Preparedness**
- **Response**
- **Recovery**
- **Radiation and Contamination**
- **Medical Considerations**
- **Personal Dosimetry**



ANCILLARY FUNCTIONS



- **Training Courses**
 - Biennial training courses on land and marine
- **Workshops and Conferences**
 - Annual workshops for First Responders
- **Public Awareness Campaign**
 - Television and radio jingles
 - The Nuclear Regulator – quarterly
 - www.nnra.gov.ng
- **National Institute of Radiation Protection and Research**



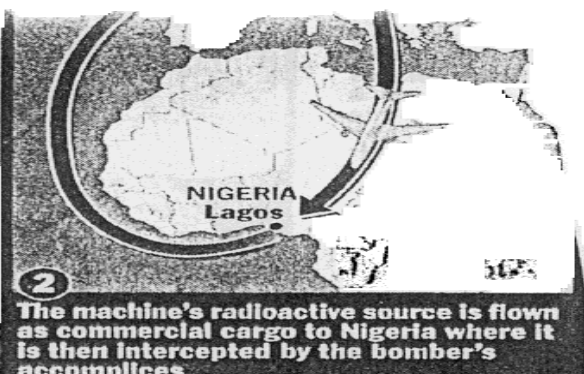
RADIOLOGICAL INCIDENTS IN TRANSPORT



- The Sunday Times of London on, 6th October 2002, **“Revealed: radioactive material for dirty bomb is just a phone call away”** by Justin Sparks and Peter Conradi
- The 2002 case of Halliburton Energy Services Nigeria Limited
- The 2004 SGS Inspection Services Nigeria (SGSN) Ltd. and Greenwich Maritime Agencies NIG Ltd (GMAL)



1
A would-be 'dirty bomber' buys a cancer radiotherapy machine from its manufacturer in the Czech republic claiming it is to be shipped to a hospital in Africa



2
The machine's radioactive source is flown as commercial cargo to Nigeria where it is then intercepted by the bomber's accomplices

Sunday Times, London; 6 Oct. 2002

Revealed: radioactive material for dirty bomb is just a phone call away

HIGHLY radioactive material that could be used by terrorists to make a "dirty bomb" can be bought on the open market in Europe and shipped across international borders, a Sunday Times investigation has revealed.

Reporters posing as representatives of a bogus British company identified only as CMI reached agreement with a Czech manufacturer to buy a cancer radiotherapy machine containing 70 grams of radioactive cobalt-60. Packed into a 500kg bomb, the material could contaminate up to a square mile of any city, experts say.

The undercover reporters said they wanted to send the machine to Nigeria under an aid project. They were assured both by Skoda-UJP, its manufacturer, and by Czech nuclear authorities that they would face no problems in obtaining export clearance.

On the basis of a single fax from CMI, a senior civil servant in the Nigerian health ministr-

showed how easily terrorists could get their hands on the components of a dirty bomb.

"I'm shocked," said Gordon Linsley, an expert on nuclear safety at the IAEA, which is affiliated to the United Nations. "The message of September 11 has clearly not filtered through enough to these sorts of commercial companies to convince them to change their practices."

Nuclear experts said a bomb made from the cobalt-60 of a single radiotherapy machine could render a significant area of central London uninhabitable.

John Eldridge, a former British army specialist on measures to counter weapons of mass destruction, said: "In dust form it would be enough to contaminate the whole of Oxford Street and other adjacent streets if that was the centre of the blast."

Security experts said Al-Qaeda, which is believed to have its own ships, would have little trouble in transporting such a device by sea from

Justin Sparks and Peter Conrad

airport of Jose Padilla, an American alleged to have links with Al Qaeda, on suspicion of planning an attack. Padilla has denied the charge.

A reporter from The Sunday Times first approached Skoda-UJP soon after Padilla's arrest. Posing as a representative of

A bomb made from the cobalt-60 of a single machine could render a square mile uninhabitable

CMI, he said the company was interested in buying machines

machine contains a source of cobalt-60 that generates 8,000 curies, a few minutes' exposure to which could cause cancer or death. The company has no connection with the car maker of the same name.

In a fax dated July 11 and addressed to the London office of CMI, Zdenek Bezdek, head of Skoda-UJP's sales department, said his company had exported machines to a number of countries including Hungary, Moldova, Kazakhstan and Belarus.

"There would be no obstacle for us to get this permission for one machine," Bezdek wrote. "We have experienced in this sense no bureaucracy from the part of the Czech Office for Nuclear Safety."

The Office for Nuclear Safety, a Czech government body that regulates sales of radioactive materials, foresaw no obstacles when approached directly by CMI. "They [Skoda-UJP] have a licence to distribute, produce and export their

Revealed: how to buy a dirty bomb

Justin Sparks and Peter Conrad

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Packed into a 500kg bomb, the material could contaminate up to a square mile of any city, experts say.

The reporters said they wanted to send the machine to Nigeria under an aid project. They were assured both by Skoda-UJP, its manufacturer, and by Czech nuclear authorities that they would face no problems in obtaining export clearance.

On the basis of a single fax from CMI, a senior civil servant in the Nigerian health ministry promised to help with the "acquisition of documents" necessary to import the machine into the country.

The International Atomic Energy Agency (IAEA), which monitors the spread of nuclear materials, said the investigation showed how easily terrorists could get their hands on the components of a dirty bomb.

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Nuclear experts said a bomb made from the cobalt-60 of a single radiotherapy machine could render an area of up to one square mile in the heart of London uninhabitable.

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Despite the arrest of dirty-bomb suspect Padilla, left, Bezdek, right, sells radiotherapy machines

Britain or any targeted country.

Concerns about the risks of a dirty bomb were raised in June after American authorities announced the arrest at Chicago airport of Jose Padilla, an American alleged to have links with Al-Qaeda, on suspicion of planning an attack. Padilla has denied the charge.

A reporter from The Sunday Times first approached Skoda-UJP soon after Padilla's arrest. Posing as a representative of CMI, he said the company was interested in buying machines for Medihelp Africa, a fake aid project, to supply medical equipment to Africa. He claimed funding from a fictitious ministry, the Department of Overseas Development,

Skoda-UJP, based in Zbraslav, near Prague, proposed a model known as Teragam, costing between £240,000 and £270,000. Each machine contains a source of cobalt-60 that generates 8,000 curies, a few minutes' exposure to which could cause cancer or death. The company has no connection with the car maker of

part of the Czech Office for Nuclear Safety."

The Office for Nuclear Safety, a Czech government body that regulates sales of radioactive materials, foresaw no obstacles when approached directly by CMI. "They [Skoda-UJP] have a licence to distrib-

machines," said Otta Kodl, head of the organisation's licensing department. "As long as you come to an agreement with them, that's okay."

Bezdek said the machine's radioactive source would be transported on a normal commercial flight, with the rest of the machine shipped by sea. Asked if he was concerned about the risks of transporting such radioactive material to Third World countries without special security, he replied: "It is so dangerous that nobody would dare to do anything with it."

No attempt appears to have been made to establish the bona fides of "CMI", whose letterhead bore a fictitious London address.

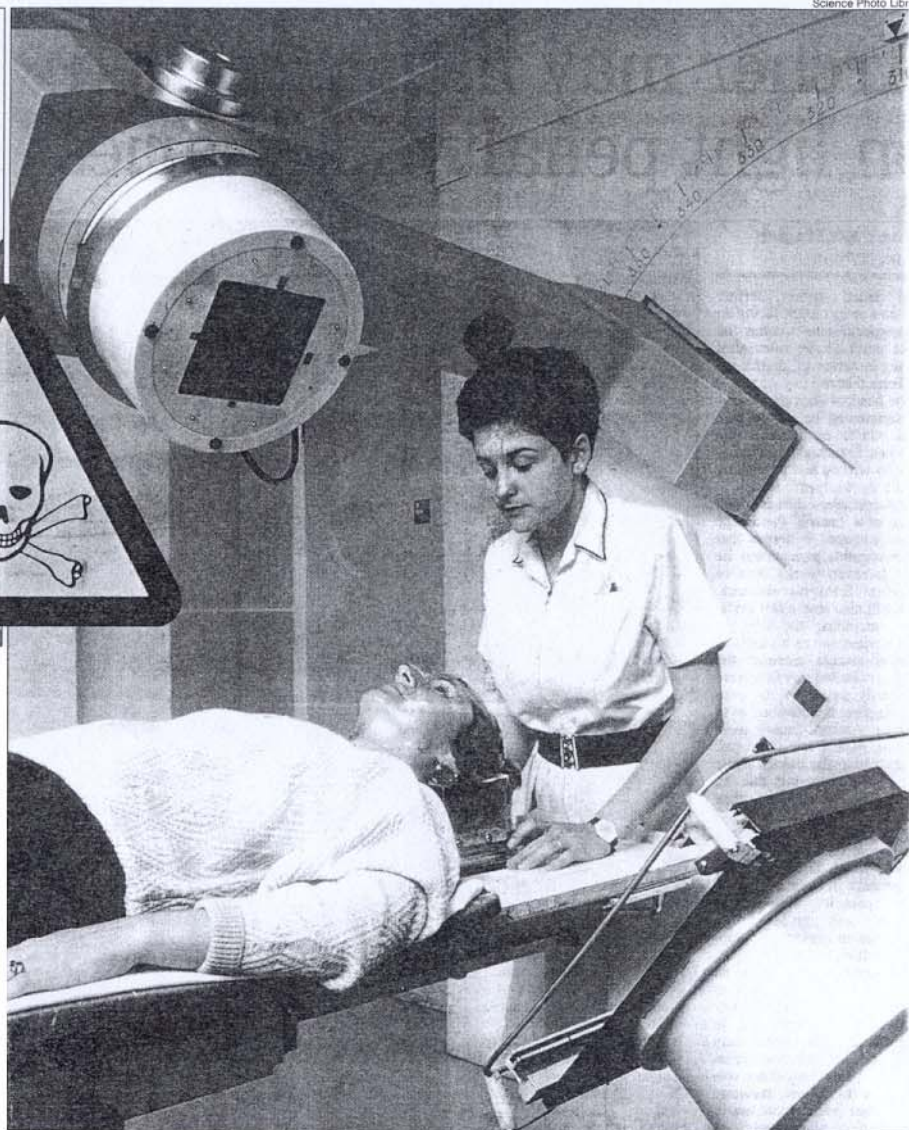
Initial inquiries in Nigeria suggested importing the machine could be fraught with bureaucratic problems. Officials from the nuclear energy ministry said they would need to inspect the hospital where it would be installed.

However, a single fax on CMI headed notepaper was sent

to the ministry, promised help with "the acquisition of documents, which are consid-

ered as necessary for the machine to be used in the hospital."

IAEA officials welcomed the investigation for exposing the relative ease with which radioactive materials could be obtained.



Life and death: the radiotherapy machine was made to save lives, but in dust form its cobalt-60 could kill

In his reply, dated August 26, Shehu Suleiman, permanent secretary at the ministry, promised help with "the acquisition of documents, which are consid-

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material — much of it used in medicine — that could be placed in a dirty bomb. British authorities have also been concerned about the threat

or fissile materials at several British ports.

Questioned by The Sunday Times, Bezdek denied Skoda-UJP had been negligent in fail-

Miami Herald

Science Photo Libr



THE SUNDAY TIMES

OCTOBER 6, 2002.



Revealed: how to buy a dirty bomb

By **Justin Sparks** and **Peter Conradi**

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- The reporters said they wanted to send the machine to Nigeria under an aid project. They were assured both by Skoda-UJP, its manufacturer, and by Czech nuclear authorities that they would face no problems in obtaining export clearance.
- On the basis of a single fax from CMI a senior civil servant in the Nigerian health ministry promised to help with the "acquisition of documents" necessary to import the machine into the country because "the Nigerian nuclear authorities is bureaucratic and difficult".



FORUM OF NUCLEAR REGULATORY BODIES IN AFRICA



33 IAEA Member African Nuclear Regulatory Bodies

Algeria	Angola	Botswana	Burkina Fasso
Cameroon	Chad	CoteD'Ivoir	DRC
Egypt	Ethiopia	Gabon	Ghana
Kenya	Libya	Madagascar	Malawi
Mali	Mauritania	Morocco	Mozambique
Namibia	Niger	Nigeria	Senegal
Seychelles	Sierra Leone	South Africa	Sudan
Tanzania	Tunisia	Uganda	Zambia
Zimbabwe			

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FNRBA CHARTER



Membership

Membership of the FNRBA is open to all national nuclear regulatory bodies in Africa on a voluntary basis.

Organs of the FNRBA

The FNRBA shall function through the following organs –

- The Plenary;
- The Steering Committee; and
- The Technical Working Groups.



FNRBA

TECHNICAL WORKING GROUPS



• TWG	ACTIVITY	COORDINATOR
• TWG1	Upgrading Legislative and Regulatory Infrastructure	Ethiopia
• TWG2	Regulatory Framework for Licensing of NPP	South Africa
• TWG3	Upgrading of Radiation Safety in Uranium Mining and Milling	Namibia
• TWG4	Upgrading of Radiation Safety in Radiotherapy	Tunisia
• TWG5	Upgrading of Nuclear Safety in Research Reactor	Ghana
• TWG6	Upgrading Security of RS and Waste Safety Mgmt Infrac.	Tanzania
• TWG7	Education and Training, and Knowledge Management	Nigeria
• TWG8	Transportation Safety	Zimbabwe
• TWG9	Emergency Planning and Response	South Africa



FNRBA PROGRESS



- » Strategic Plan Direction Defined
 - » Round Table Discussion December 2009
 - » Launched the five-year Strategic Plan December 2009
- » Collaboration with US NRC
 - » Nuclear Executive Workshop - Abuja, Nigeria, March 2010
 - » Siting Workshop - Centurion, South Africa, October 2010
- » 2nd Plenary Meeting held in Nairobi, Kenya in May 2010
- » Signed an MOU between KINS and FNRBA 23rd Sept 2010
- » Leverage on IAEA Technical Cooperation Project
 - » Support workshops & meetings
 - » Self-assessment of regulatory infrastructures



ON-GOING ACTIVITIES



- Self-assessment of safety in the Nine Technical Areas
- Campaign for the signing, ratification and application of the package of Treaties and Conventions
- Implementation of the Pelindaba Treaty
- Networking with other Regional Networks and Professional organizations



CONCLUSION



- **Land and Marine Transport** of radioactive sources is widely practiced in Africa
- **Transport is the weakest** link in the chain of import- store - transport – use- transport – store and export chain
- 22 African Countries embarking on **NPP**
- FNRBA through **partnership** is vigorously pursuing the emplacement of a sustainable legislative and regulatory infrastructure for nuclear **safety and security**



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