NextGen Air Transportation System Progress Reports Ignore Climate Change

Evidence shows that, under the Bush administration, the Federal Aviation Administration is failing to consider global warming in planning for a three-fold expansion of U.S. aviation.

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Introduction and Recommendations

U.S. air traffic and its accompanying greenhouse gas emissions are growing. If they continue to grow unconstrained by a policy to limit global warming, aviation will account for an increasing share of total emissions. The U.S. government is engaged in a long-term, multi-agency planning and development effort, led by the Federal Aviation Administration, that is intended to enable up to a tripling of U.S. aviation during the next few decades.

Under the current administration, the leadership of this Next Generation Air Transportation System, known as NextGen, appears to be engaging in a deliberate effort to disconnect aviation planning from the global warming problem. The 2005 and 2006 NextGen annual progress reports, while covering a multitude of development issues, include no discussion of either aviation's greenhouse-gas emissions or global warming as a potential constraint on the development of aviation.

We believe that this approach is shortsighted and evasive. If allowed to continue, it will mark a failure of national preparedness on the most significant environmental challenge facing the future of aviation. Furthermore, by overlooking the potential economic consequences of future global warming mitigation policy on the aviation industry, it may jeopardize the long-term health of a major contributor to the U.S. economy.

We call for the following:

1. The NextGen leadership should be directed to address global warming explicitly as a strategic planning and development issue for aviation. While some research remains to be done on overall greenhouse-gas emissions from aviation, carbon dioxide emissions can be quantified now. The implications for increasing or decreasing CO_2 emissions should be addressed in each aspect of NextGen planning for technology, infrastructure, and aviation management systems.
2. Congress should include a focus on aviation and climate change in its oversight activity and NextGen funding decisions, and consider how aviation emissions can most appropriately be incorporated into legislation under consideration for mitigating the global warming problem.
3. The news media should look into this problem and question administration officials, in particular the head of the Federal Aviation Administration, the leaders of NextGen, and those responsible for the environmental aspects of NextGen planning.
4. The NextGen planning and development process should be made more transparent and broadened to include advisory representatives of stakeholder interests in addition to those of the airline and aircraft manufacturing industries, including scientists and environmental and other public interest groups.

This White Paper report summarizes key points and is intended to serve as a vehicle for stimulating discussion and consideration of this problem.

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Executive Summary

On June 14, 2007, the European Commission unveiled a plan to make aviation part of a continent-wide carbon trading scheme. If this plan is adopted, beginning on January 1, 2012, airlines will have carbon allocations based on aircraft weight and distance covered. Any companies that exceed their cap will have to buy additional credits.

Although some airlines and manufacturers have protested this measure, others have embraced it as a new – and necessary – step forward. Airbus, the European aircraft manufacturing company, envisages at least a 30% reduction in its consumption of energy by 2020, along with a 50% reduction in its emissions of carbon dioxide. Believing that "the industry must do all that it can" to combat climate change, Airbus proposed that the owners of engine companies, subcontractors and aircraft manufacturers meet "over the next few months" to tackle the industry's environmental challenges.[1]

These commitments are at the forefront of a growing movement to address and mitigate aviation's carbon footprint. Air transportation already contributes 2-3% of today's greenhouse gas emissions. As other sectors reduce their overall emissions, this percentage will grow, representing a progressively larger share of a given country's carbon allotment. A 2004 report to Congress sponsored by the Federal Aviation Administration (FAA) stated that climate change "may be the most serious long-term environmental issue" facing the aviation industry.[2]

Accordingly, it seems appropriate that strategic planning for the future of American aviation would fully address climate change. However, this appears not to be the case. The Next Generation Air Transportation System (NextGen) – a multi-agency initiative to update and improve America's air transportation, making way for an anticipated three-fold increase in air traffic – lacks any serious assessment of the implications of global warming policy for the future of aviation. Although environmental constraints may impose "the fundamental limit on the growth" of American aviation,[3] neither the 2005 nor the 2006 NextGen Progress Reports have a *single mention* of climate change.[4]

Federal aviation planning appears to be another arena in which the Bush administration is combining evasiveness on global warming with a failure of preparedness. As the administration seeks additional funding for NextGen, Congress should take note of – and respond to – this evasion. By failing to deal effectively with the greenhouse gas emissions of aviation, the designers of NextGen place risks on our economy, our transportation mobility, and the future of U.S. aviation.

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[1] http://www.lemonde.fr/web/article/0,1-0,36-923335,0.html
[2] http://web.mit.edu/aeroastro/partner/reports/congrept_aviation_envirn.pdf
[3] http://web.mit.edu/aeroastro/partner/reports/congrept_aviation_envirn.pdf
[4] http://www.jpdo.aero/pdf/ngats-np_progress-report-2005.pdf; http://www.jpdo.aero/pdf/2006_Progress_Report.pdf

Aviation and Global Warming

Aviation Emissions and Atmospheric Warming

The impact of aviation on the environment, especially climate change, has been internationally recognized since the Intergovernmental Panel on Climate Change (IPCC) 1999 assessment report, *Aviation and the Global Atmosphere*.[5] Aviation affects atmospheric warming in several ways:

- First, there is the direct effect of fossil fuel consumption; carbon dioxide is emitted into the atmosphere. However, these emissions (if measured at ground level) are only "a fraction" of an aircraft's total contribution to climate change.[6]
- In addition to carbon dioxide, airplanes also emit water vapor, which adds to atmospheric warming when emitted at high altitude.
- Finally, they release nitrogen oxide (which causes ozone formation in the upper troposphere), discharge water vapor and soot that lead to the formation of contrails (a variety of cloud that is associated with atmospheric warming) and emit particulates that can lead to an increase in clouds, including high cirrus, which also have a warming impact.

Aviation's Growing Contribution

Current estimates of aviation's contribution to total emissions of greenhouse gases range from 2-3%, but these figures may be conservative. Such data consider only the direct effects of aircraft on fossil fuel emissions. Due to the uncertain state of scientific understanding, they do not include quantification of the "secondary" impact of contrail formation and cirrus cloud cover. In addition, aviation is increasing rapidly. Airbus predicts that global passenger traffic will rise approximately 5.3% per year between 2004 and 2023. Boeing, Airbus' American counterpart, puts that number at 5.2%. Overall, the number of passengers could triple by 2023, and these added flights will greatly enhance the aviation sector's contribution to climate change.

Although the United States has yet to set a concrete goal for carbon dioxide emissions cuts, an emissions cap or carbon tax will likely be a central feature of future U.S. climate change policy. A number of bills that would require major emissions reductions, often on the order of 60-80%, have already been introduced in the current Congress.[7] As other sectors decrease their carbon footprint, aviation will take up an increasing percentage of the country's allotted emissions. In the case of Great Britain, for example, an independent study by the UK Tyndall Center[8] found that, if former Prime Minister Blair's plan for an 80% reduction in carbon dioxide emissions is implemented and, meanwhile, "business-as-usual" growth in aviation continues unconstrained, aviation could consume "close to 100% of (Britain's) total carbon budget" by 2050.[9] This

[5] http://www.ipcc.ch/pub/av(E).pdf

[6] Bows, Alice, Kevin Anderson and Paul Uphan. Contraction and Convergence: UK carbon emissions and the implications for UK air traffic. Tyndall Centre for Climate Change Research. February 2006 – Technical Report 40 http://www.tyndall.ac.uk/research/theme2/final_reports/t3_23.pdf

[7] http://thomas.loc.gov/cgi-bin/thomas

[8] ibid.

[9] Bows, Alice, Kevin Anderson and Paul Uphan. Contraction and Convergence: UK carbon emissions and the implications for UK air traffic. Tyndall Centre for Climate Change Research. February 2006 – Technical Report 40 http://www.tyndall.ac.uk/research/theme2/final_reports/t3_23.pdf

would leave *no emissions* for *any other* sector, including cars and trucks, power plants, industry, and residential and commercial buildings.

No similar study has been conducted for the United States. Since the IPCC's *Aviation and the Global Atmosphere* report,[10] the United States has not done any comprehensive analysis of the relationship between aviation and global warming. A NextGen-sponsored June 2006 workshop on the Impacts of Aviation on Climate Change[11] took a step in that direction; however, much research remains to be done.

Global Response

The European Response

Aviation's effects on climate change have recently gained worldwide attention, with Europe in the forefront. While U.S. environmental considerations have largely been limited to local air quality and noise impacts, the European Union has identified climate change as "the most significant adverse impact of aviation."[12] With some environmental groups, such as Friends of the Earth, going so far as to denounce aviation as the world's new "rogue industry," exerting an "out of control" environmental impact, the EU is considering a number of industry regulations.[13]

In June 2007, the European Commission unveiled a plan that would include aviation in a continent-wide carbon trading scheme. If this plan is adopted, beginning January 2012, airlines would have carbon allocations based on aircraft weight and distance covered; if they exceed their allotment, they will have to buy credits from other industries. While the plan still requires approval by the European Parliament, some European manufacturers are already responding. Airbus, the continent's largest aircraft manufacturer, has committed to a 30% reduction in its consumption of energy by 2020, and a 50% reduction in its emissions of carbon dioxide. Furthermore, it has proposed that the owners of engine companies, subcontractors, and aircraft manufacturers meet "over the next few months" to tackle the industry's environmental challenges. As Louis Callois, Airbus' president, stated recently, "the industry must do all that it can so that aviation transport's contribution to worldwide carbon dioxide emissions doesn't increase from 2 to 3%, as is predicted."[14]

The American Response

Congress enacted the Vision 100—Century of Aviation Reauthorization Act (P.L. 108-176) in 2003, which created the mandate for the multi-agency Next Generation Air Transportation System (NextGen). NextGen involves the Departments of Transportation (with the FAA as the lead planning agency), Homeland Security, Defense, and Commerce, along with NASA and the White House Office of Science and Technology

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[10] http://www.ipcc.ch/pub/av(E).pdf

[11] *A Report of Findings and Recommendations, Workshop on the Impacts of Aviation on Climate Change*, June 7-9, 2006, Boston, MA. http://climate.volpe.dot.gov/docs/aviationclimwkshp.pdf

[12] Waitz, Ian, Jessica Townsend, Joel Cutcher-Gershenfeld, Edward Greitzer and Jack Kerrebrock. *Report to the United States Congress: Aviation and the environment: A National Vision Statement, Framework for Goals and Recommended Actions*. Partnership for AiR Transportation Noise and Emissions Reduction: An FAA/NASA/ Transport Canada-sponsored Center of Excellence. December 2004

13 http://www.foe.co.uk/resource/press_releases/government_must_act_on_avi_21092005.html

[14] http://www.lemonde.fr/web/article/0,1-0,36-923335,0.html

Policy. Overseen by the Joint Planning and Development Office (JPDO), NextGen takes a "curb-to-curb" approach to transform the American aviation system.[15] In anticipation of a three-fold increase in air traffic, it addresses issues from in-terminal passenger baggage security screening to taxi-time on airport runways. In the process, it seeks input from a variety of federal and non-federal stakeholders, including airlines, aircraft manufacturers and air traffic controllers.

Initially, it appeared that NextGen would make the environment a significant consideration. Recognizing that "if they are not addressed, environmental constraints may impose the fundamental limit on the growth of our air transportation system" in the 21st century, the JPDO established an environmental unit.[16] Originally called the Environmental Integrated Product Team (now renamed the Environmental Working Group), this multi-agency entity is responsible for "developing environmental protection that allows sustained aviation growth."[17]

This federal strategic planning and development effort could be a vehicle for seriously addressing aviation's impact on climate change, as well as looking at how policies to limit greenhouse gas emissions could potentially constrain the expansion of aviation. A 2004 report to Congress, *Aviation and the Environment*,[18] concluded that global warming "may be the most serious long-term environmental issue" facing the aviation industry. A 2006 workshop on the Impacts of Aviation on Climate Change reaffirmed this view.[19]

Climate Change and the NextGen System

However, these signs of early progress were misleading. Three years after the 2004 report to Congress, NextGen continues to marginalize aviation's effects on climate change. In fact, the issue seems to be *diminishing* in importance. In the NextGen 2005 and 2006 progress reports by the JPDO,[20] there was *no mention* of climate change. Although very briefly mentioning the environmental issues of aircraft noise and local air quality, global warming and carbon dioxide emissions were *completely ignored.*

In a recent speech about NextGen, FAA Administrator Marion C. Blakey appeared to denigrate the climate change problem.[21] She criticized the European push for environmental responsibility in aviation as "factions working to curtail aviation growth regardless of the benefits we offer to the economy and quality of life." Directly thereafter, she went on to accuse the E.U. of "trying to force a European solution on the world given the different aviation sectors, economic circumstances and environmental issues of

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[15] Dilingham, Gerald L. Ph.D. Next Generation Air Transportation System
Preliminary Analysis of the Joint Planning and Development Office's Planning, Progress and Challenges. Testimony before the Subcommittee on Space and Aeronautics, Committee on Science, House of Representatives. United States Government Accountability Office.
16 Waitz, et al., December 2004 http://web.mit.edu/aeroastro/partner/reports/congrept_aviation_envirn.pdf
[17] Joint Planning and Development Office. Next Generation Air Transportation System Integrated Plan. December 12, 2004 http://www.jpdo.aero/NGATS_v1_1204.pdf
[18] http://web.mit.edu/aeroastro/partner/reports/congrept_aviation_envirn.pdf
[19] http://climate.volpe.dot.gov/docs/aviationclimwkshp.pdf
[20] http://www.jpdo.aero/pdf/ngats-np_progress-report-2005.pdf;
http://www.jpdo.aero/pdf/2006_Progress_Report.pdf
[21] http://www.faa.gov/news/speeches/news_story.cfm?newsId=8787

countries." In closing, she stated that this approach is "unworkable, not to mention illegal" – a reference to what could become a World Trade Organization suit, on behalf of American air carriers, against the inclusion of American aircraft in Europe's proposed aviation tax plan. Blakey evaded responsibility for dealing with the aviation industry's contribution to climate change, while claiming that NextGen is acting progressively on environmental issues. Emphasizing some advances in performance-based navigation systems and fuel technology, which are marginally increasing fuel efficiency, she tried to project the image that NextGen is climate friendly.

Blakey's attitude is the standard in the Bush administration and federal aviation planning – not the exception. An examination of the NextGen System shows that it has never taken climate change seriously. The Senior Policy Committee, although having members from eight federal agencies, lacks any representatives from the Department of Energy or anyone environment-related. The JPDO Board and the JPDO Division Directors also lack any environmental representatives.

Only at the level of JPDO Working Groups does an environmental representative emerge; however, the interagency Environmental Integrated Product Team/ Environmental Working Group appears to be marginalized. Underscoring concern that the decision-making apparatus of the JPDO NextGen System isn't (in the words of a recent Government Accountability Office report) "clearly defined," it's not apparent how much power the EIPT/ EWG has over the NextGen initiative.[22] Considering that neither JPDO's 2005 nor 2006 Progress Reports made any mention of global warming, either the EIPT/ EWG members honestly haven't seen climate as an issue or their voices have been somehow muffled. In any case, the known potential climate constraint on NextGen capacity has not even been reported to Congress, demonstrating that EIPT/EWG is ineffective in its role of environmental protection.

Furthermore, few of the NextGen Environmental Working Group members seem to have climate change as a high priority. Although the Environmental Protection Agency has the specific mandate (under the Clean Air Act) to regulate aviation emissions, the representative from the EPA has apparently done little to make emissions standards an issue. Moreover, none of the NASA scientists on the committee have any expertise in climate science; in the working group, there is no representative from NASA Headquarters.

Explaining the Climate Change Omission

Several factors may help explain NextGen's failure to deal with the relationship between aviation and climate change as a planning and development issue.

[22] U.S. Government Accountability Office. *Next Generation Air Transportation System: Preliminary Analysis of the Joint Planning and Development Office's Planning, Progress and Challenges*. Testimony before the Subcommittee on Space and Aeronautics, Committee on Science, House of Representatives: Statement of Gerald L. Dillingham, Ph.D. (Director, Physical Infrastructure Issues) http://www.gao.gov/new.items/d06574t.pdf

The "Uncertainty" Defense

The JPDO seems to be using an "uncertainty" defense. In nearly every official report and document, including the 2004 report to Congress that called aviation perhaps the "most serious long-term issue" facing the environment, aviation's impact on climate is portrayed as sufficiently uncertain that no action can reasonably be taken. There is scientific uncertainty about certain aspects of the aviation-global warming relationship; aviation's total impact on climate change, especially contrail and cirrus cloud formation, is as yet unquantifiable. Nevertheless, the finding that we lack the knowledge to act today is incorrect, not to mention out of touch with the current state of climate science.

The Environmental Working Group *does* have a climate metric that can be employed immediately: the carbon dioxide that the NextGen fleet will emit. As for the uncertain variables, the quantity of their impact may be uncertain, but the net *direction* of their impact can be predicted based on current scientific understanding. On average, they are expected to increase the global warming attributable to carbon dioxide. While there is a growing realization among policymakers and the public that ongoing research must be accompanied by a stronger mitigation strategy to reduce emissions of greenhouse gases, NextGen continues to hide behind an exaggerated sense of scientific uncertainty.

The Influence of American Air Carriers

Second, NextGen is dominated by American air carriers – few of whom have a serious commitment to emissions reductions. In a recent survey by an airlines services consultancy, it was found that United States airline companies were much less likely to view environmental issues as a prominent concern than their global counterparts. While 31 out of 72 airline executives in Europe, the Middle East, and Africa saw environmental concerns as a significant challenge, only 3 out of 62 North American airlines did. According to a Sabre official, U.S. airlines are more focused on "survival and rebuilding their balance sheets."[23]

A recent European initiative to impose a cap and trade system, which would give airlines "a financial incentive to switch to cleaner technology, or cut back routes and sell unused carbon permits," was met with vehement protests by U.S. airlines.[24] U.S. officials have claimed that such a program "would likely break international aviation rules if it insists on including non-European airlines in the program – even though the EU insists the system would be legal."[25]

No Other Options?

Third, NextGen/JPDO makes little commitment to alternative options – besides "improved management increases and marginal increases in fuel efficiency" – for airline companies.[26] Aviation is going to be dependent on carbon-based fuels for quite some time, barring a major breakthrough. Accordingly, industry officials argue that climate

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[23] U.N. holds conference to look at cutting aircraft emissions. Greenwire: May 15, 2007

[24] White, Aoife. "EU: Airlines Should Join Carbon-Cap Plan." Associated Press: June 8, 2007 http://www.forbes.com/feeds/ap/2007/06/08/ap3802324.html

[25] White, Aoife. "EU: Airlines Should Join Carbon-Cap Plan." Associated Press: June 8, 2007 http://www.forbes.com/feeds/ap/2007/06/08/ap3802324.html

[26] ibid.

change concerns should be deflected to the electric utility, industry, buildings, and automobile sectors, which account for a much larger percentage of current carbon dioxide emissions.

There *are* potential alternatives for the aviation industry. Experiments with alternative fuels – including biodiesel, biokerosene and hydrogen – are currently underway, along with new engine and airframe designs. Breakthroughs would be needed to implement these technologies; however, further research could prove fruitful. There is also some potential for reduced emissions due to improvements in aviation operations, including load factors (reducing the amount of fuel spent per passenger by loading airplanes to capacity), airport and air traffic management improvements (doing more direct flights, as opposed to lay-over flights) and setting high fuel efficiency targets. However, NextGen/JPDO does not appear to have a strategy that would pursue changes designed to offset the projected growth of aviation's carbon footprint.

Another alternative, of course, is to expand and modernize American railways. According to Michael Blitz of the *Financial Times*, the reluctance of America to take aviation's climate impacts seriously may be because "United States-based travelers do not have the option to take a train like most Europeans."[27]

Whether or not particular new technologies and management practices will be successful in limiting emissions is uncertain – much research needs to be done. This, however, is the very reason why the combined strengths of a climate change mitigation policy and a market-based approach to solutions are needed. Under an emissions cap-and-trade system, for example, such as the one that Europe is considering, the private sector would be motivated to develop innovative solutions to the problem. With financial incentives to improve environmental standards, airline companies would be drawn into a "race to the top" of fuel efficiency and emissions reductions. Kicking the climate problem under the rug, however, as NextGen/JPDO is currently doing, will stifle U.S. innovation by institutionalizing a climate-unfriendly design for the future of American aviation. Moreover, it may encourage the belief that the government plans to shield the American aviation industry from any responsibility to mitigate climate change.

The Consequences of Inaction…

What are the consequences of this inaction? Besides contributing to the scale and scope of climate change, NextGen's failure to deal with global warming concerns in strategic planning for the future of U.S. aviation may have adverse consequences for both the economy and our convenience.

For the Economy…

Europe is already developing environmentally cleaner aircraft technologies and encouraging private sector investments in emissions reduction. In the short-term, these policies may impose some financial constraints – in the longer-term, however, Europe could develop a comparative advantage on clean aviation. American companies could fall behind, and U.S. technology may become increasingly outdated. As the 2004 Aviation and the Environment report warned: "The lack of a significant research program to assess

[27] U.N. holds conference to look at cutting aircraft emissions. Greenwire: May 15, 2007

the potential impacts of aviation on climate…may put the United States at a disadvantage in evaluating technological, operational and policy options, and in negotiating appropriate regulations and standards with other nations."[28]

For the Private Sector…

Furthermore, America is missing a key opportunity to vitalize its private sector. The aviation industry commands a substantial portion of the U.S. economy, generating 5.4% of the GDP – and more than 9% when aviation-related industries are also included. This figure encompasses 11 million jobs and $640 billion in revenues.[29] If the government were to support a drive for cleaner, climate-friendly technologies, this could stimulate a massive upswing in private sector participation. Unlike things like "flat taxes on passengers or flat taxes on aircraft movements, aviation fuel taxes" (which are directly intended to "reduce the amount of flying we do but don't provide any incentives to make flying more efficient"), emissions caps could spark an economically energizing influx of private investment.[30]

If, however, NextGen is not directed to take effective action, airline companies down the road may be faced with the option (under a global warming emissions-reduction policy requirement) of substantially reducing their overall number of flights. Such a downsizing could have a highly negative impact on the U.S. economy.

For Our Convenience…

Such a downsizing would also have a negative impact on our convenience. If flights were reduced in number, railways could potentially provide an alternative form of affordable, high-speed transportation. However, this would require that research, development, and deployment of alternatives be carried out effectively. The greatest threat to the mobility of Americans isn't action on climate change; with timely research and investments, such access could be maintained. The greatest threat to our convenience is a *lack of action*, which could mean substantial (and ill-prepared for) sacrifices in the future.

Looking Ahead

The Next Generation Air Transportation System is a blueprint for aviation's future – and that future must take climate change into consideration. Recent IPCC projections demonstrate that climate change caused by human emissions will likely subject the world to significant societal and environmental stresses even before NextGen's long-range planning comes to fruition. If the Joint Planning and Development Office continues to ignore this issue by relegating global warming to a minor or nonexistent role in strategic planning and development, it will put both our convenience and the future of American aviation in jeopardy.

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[28] Waitz, et al. December 2004 http://web.mit.edu/aeroastro/partner/reports/congrept_aviation_envirn.pdf

[29] Joint Planning and Development Office, *Making the NextGen Vision a Reality: 2006 Progress Report to the Next Generation Air Transportation System Integrated Plan* http://www.faa.gov/regulations_policies/reauthorization/media/nextgen_progress_report.pdf

[30] http://www.forbes.com/feeds/ap/2007/06/08/ap3802324.html

FAA Administrator Blakey warned in her Phoenix speech that the shift in European consciousness about aviation's impact on climate change "happened overnight." Accordingly, she said, "we should not be so foolish as to presume that it can't happen here."

In this, if in nothing else, let's hope that Ms. Blakey is correct.

Climate Science Watch

Climate Science Watch is a nonprofit public interest education and advocacy project dedicated to holding public officials accountable for the integrity and effectiveness with which they use climate science and related research in government policymaking, toward the goal of enabling society to respond effectively to the challenges posed by global warming and climate change. More information about Climate Science Watch is available online at www.climatesciencewatch.org. Climate Science Watch is a program of the Government Accountability Project.

Government Accountability Project

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