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Chair

The Honourable Maxime Bernier

Standing Committee on National Defence

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● (1530)

[*Translation*]

The Chair (Hon. Maxime Bernier (Beauce, CPC)): Welcome to the Standing Committee on National Defence.

[*English*]

This is our meeting number 37. Welcome, members.

[*Translation*]

Pursuant to Standing Order 108(2), we are continuing our study of the next generation of fighter aircraft.

[*English*]

We have with us as a witness from the Lockheed Martin Aeronautics Company, Mr. Burbage, executive vice-president and general manager.

We're very pleased to have you with us. I'll give you 10 minutes for your opening remarks, and after that the members of each party will be able to ask you questions.

Thank you, Mr. Burbage.

Mr. Tom Burbage (Executive Vice-President and General Manager, F-35 Joint Strike Fighter Program Integration, Lockheed Martin Aeronautics Company): Thank you very much, Mr. Chairman. It's a great pleasure to be here.

By way of introduction, I've been on the F-35 program for a little over 10 years now. I'd like to read my prepared remarks for the record, and then I look forward to taking your questions.

Let me first thank the committee for allowing me to participate in this hearing. I was hoping to host members of this committee at our facility in Fort Worth earlier this week for you to see it in person. I hope we can reschedule that visit at your committee's convenience, sir

This is a very critical program for all the nations that are involved. I use the word “critical” because it is critical to the United States and our close allies. As we move to affordably recapitalize our tactical air forces and our defence and aerospace industries, it important that we think of both of these together.

Before I get into specifics, it is worth a moment to reflect on the realities of the world today. The challenges we face as a global community are unprecedented. We operate as a coalition of nations with a common interest in preserving the ideals and way of life that are challenged on several fronts. No nation faces this threat alone, and none of us has operated either as isolationists or as a solitary force in any sustained conflict over the last several decades.

For many years, the sovereign nations of the world have operated similar front-line fighter aircraft, primarily those based on pre-eminent U.S. technology. This is evidenced by the CF-18 fighters that your air force operates today. Those aircraft have served us both well, but they are aging rapidly and they are not capable of remaining effective in the advanced threat environments of the future.

It's an important factor to consider as we make decisions that will affect our children and grandchildren. My five grandsons will be called on to defend my country at some point in the future, and my personal resolve in this program is to give them the best capability we can to assure their effectiveness, both in peacekeeping and, if required, in combat operations. Most importantly, we are focused on ensuring their ability to come home safely from any encounter.

In the early 1990s, the United States decided that the multiple modernization programs that each of our services were independently launching were unaffordable and not representative of the new world we found ourselves in. We're now in a world that demands joint service, coalition-based projection of air-power capability.

The joint strike fighter program was launched to develop a family of three airplanes, each uniquely tailored for the very different operational environments the three services face: conventional runway operations for the air force; small ships and expeditionary fields for the U.S. Marine Corps; and large catapult and arresting gear equipped aircraft carriers for the U.S. Navy.

Beyond that tailoring, the airplanes are identical, with the same engine, same mission system sensors, and common cockpits. When you sit in the cockpit of any of the three airplanes, you don't know which one you're in. This feature is very important to ensure real interoperability and dramatically reduced costs of procurement, ownership, and long-term operations by capturing the true economies of scale.

On October 26, 2001, Lockheed Martin was awarded the contract to develop the joint strike fighter following a highly contested and very expensive competitive process. That process included all the major prime contractors in the United States, and it involved building and flying prototype demonstrator airplanes. Canada was one of several observer nations during the competition. There is a reason the competition did not include other nations' candidate airplanes at the time; that is, there is simply no competing technology among any of the other fighter airplanes in operation today.

At that time, the United States and the United Kingdom were the only formal participating nations in this endeavour. Following the competitive contract award, close allies who were flying the U.S. front-line fighters were offered the opportunity to recapitalize their air forces as full partners in the endeavour.

Canada was the first nation to join the partnership—in February of 2002—and six other nations joined the project over the next eight months. The list of incentives offered to participating nations was unprecedented in the history of U.S. Department of Defense programs. It included industrial participation during the system development and demonstration phase of the program.

Participating nations were categorized by their level of financial contribution, with Canada being in the lowest tier, at about $150 million U.S. spread over 10 years. This contribution was a fixed cost, and it has been leveraged over a development program that is now approximately $50 billion U.S. Canada's costs have not increased despite significant additional U.S. development dollars that have been required over time. In return, the prime contractor, my company, Lockheed Martin, was asked to ensure that partner nations were allowed to participate on a best-value basis in the development of the F-35.

In December 2006, the Canadian deputy minister of defence, Ward Elcock, signed a multilateral agreement between all nine participating nations that advanced the partnership from the system development and demonstration phase into the follow-on phase for production, sustainment, and follow-on development. That new agreement dissolved the earlier one and put all participating nations on an equal footing.

● (1535)

Throughout the years of Canada's participation in the joint strike fighter program, the government—Liberal and Conservative alike—has supported continued participation. Each government evaluation recognized the benefits of participation and committed to the next phase. Through programs such as Technology Partnerships Canada and the strategic aerospace and defence initiative, the Government of Canada has recognized the national benefit in supporting industry to modernize its facilities to compete in the global market. That government support has positioned Canadian industry well to capitalize on the benefits the JSF program is offering.

Let me briefly describe those industrial benefits. All industrial opportunities from the F-35 are founded on competitive best-value principles, since all participation consists of direct work on all F-35 partner aircraft, including the United States', and not solely on the airplanes being procured by any individual country. That requirement assures long-term high-quality aerospace and defence work, provided industry can deliver on its commitments to provide competitive cost, quality, and schedule performance.

Over the past nine years, we've had a very close relationship with your JSF team from the Department of National Defence and Industry Canada. They've been true leaders and team builders among the F-35 participating nations. Together, we have identified key companies across Canada and matched them with development and production opportunities. When this activity is combined with the excellent work of our propulsion system contractors—who, just as an aside, are under a separate contract and not part of our contract—the potential total industrial return from the F-35 is unprecedented in the history of Canadian military procurement.

The F-35's consolidated industrial participation plan reflects the true benefit of the best-value economic model. It also offers secondary opportunities in a global market as your industry becomes more competitive and leverages relationships born through collaboration on the JSF program.

Let me give you a few specifics. We placed our first Canadian F-35 contract with Honeywell Canada in Mississauga, Ontario, in late 2001. When our factory began F-35 operations, our advanced tooling concepts included innovations from Handling Specialty, an excellent Canadian company. When the F-35 made its first flight in December 2006, Canadian parts were on board and contributed to making that flight successful.

To date, we have placed $319 million U.S. in contracts with Canadian industry, not including our propulsion brothers. Today, we project Canada's industrial plan for the production portion of the program to substantially exceed the cost of Canada's procurement of the F-35, which is the basis for traditional industrial regional benefit expectations.

As Canada begins early preparation for the arrival of the F-35, our teams are now beginning to focus on delivery of sustainment. Next week we are conducting a Canadian industry summit in Fort Worth to help industries from across Canada better understand their capabilities to perform maintenance and repair work on the F-35. The autonomic logistics global sustainment strategy will provide substantial cost savings in through-life cost while delivering full operational capability here in Canada.

To conclude my prepared remarks, Mr. Chairman, it may be worth taking a closer look at the program through the lens of the Canadian value proposition. Canadian requirements are the responsibility of the Canadian Chief of the Air Staff, but from the perspective of the F-35 program, they're both national and coalition based. The F-35 introduces the integration of revolutionary new technologies of stealth, integrated avionics, advanced sustainment, and interoperability, capabilities that don't exist today in legacy fleets.

The inherent intelligence, surveillance, and reconnaissance capabilities of this next generation of sensors will contribute to Canada's national sovereignty and defence objectives over the vast expanses of Canada and will provide a critical node on the security internet of Canada's integrated defence infrastructure. The multi-national development of the F-35 also allows Canadian Forces to seamlessly operate within coalitions if and when required. There is simply no other airplane today that offers these capabilities.

The development of the F-35 has been a monumental challenge and has experienced both successes and setbacks, all of which have been widely publicized. Canada is buying only one of the three variants and is not sharing the technical or cost risks associated with the system's development and the demonstration of this revolutionary capability. The significance of these facts should not be discounted, as there are no unique Canadian development risks or costs, which often have been negative attributes of other acquisition programs.

● (1540)

The U.S. Air Force variant of the F-35, which is also the Canadian variant, has proven to be very productive and reliable during its initial flight testing. This has increased our confidence that the F-35 will achieve its ultimate goal of fulfilling your national requirements and ensuring seamless integration in the coalition air power capability if required.

Today, all three variants of the airplane are in production and flight testing, a substantial factor in achieving the affordability objectives of the program. We recently signed a production contract for our fourth production lot of 32 F-35 airplanes. Lockheed Martin accepted the associated risk in assuming that contract under fixed-price conditions two years earlier than the F-35 acquisition plan. We believe this is a good faith demonstration of Lockheed Martin's commitment to affordability in the procurement cost of the airplane.

Our production backlog now stands at 63, with airplanes destined for five services in three countries. Canadian industry is participating in the manufacturing of key parts for all of those airplanes and is on track to capture program opportunities that far exceed the procurement cost projected for your eventual purchase. The industrial opportunities are real and are happening today, years ahead of a contract to actually buy the airplane. There has never been a program offered to coalition allies that recapitalized the front-line military fighter fleets while simultaneously recapitalizing the critical high-technology aerospace and defence industries that define leading-edge technology across the globe.

Ladies and gentlemen, thank you for this opportunity. I would now be pleased to answer your questions.

The Chair: Thank you very much.

I will now give the floor to Mr. Wilfert for seven minutes.

Hon. Bryon Wilfert (Richmond Hill, Lib.): Thank you, Mr. Chairman.

Thank you, Mr. Burbage. We appreciate your attendance.

I want to point out first of all that the official opposition supports the replacement of the current CF-18s, and we obviously have some very specific questions, which I will put to you as succinctly as possible. If your answers could be succinct as well, it would be helpful.

Recent news articles have cited U.S. Pentagon reports that Canada would receive only $3.9 billion worth of work on the joint strike fighter if it purchases the plane. Are you prepared to contractually guarantee Canadian industry benefits equal to 100% of program costs over something less than you projected over the life of the program, equalling 50 years?

● (1545)

Mr. Tom Burbage: Sir, I'm not aware of any Pentagon report that references any of the industrial values of any of our partner countries. But I repeat the best-value model: we don't give up-front guaranteed contracts, but we involve industry much earlier than has historically been done. When you extrapolate the benefits of the work already under contract for Canada, and you add to it the strategically sourced work that we've already identified for Canada, this is all work that is Canada's today but is Canada's to hold on to and perform to, and the value of that work is at the value of the procurement contract for the airplanes. When you add into that, the additional opportunities that we've forecasted for Canadian industry, that amount doubles.

Hon. Bryon Wilfert: We can certainly follow up with you on that.

Given the dynamic nature of your program, may I ask you, sir, how can you reliably quote an aircraft unit price today given that the Canadian JSF contract is not planned until the 2013 timeframe at the earliest?

Mr. Tom Burbage: The cost of the airplane is a complex factor, because you need to look at the cost of building infrastructure and the cost of sustainment. We're just talking about the costs of the airplane. They tend to come down a cost curve, which reduces with time and with volume.

Today, all nine nations have given us firm planning figures for their production ramp rates and for the production volumes we're going to experience over the next few years. So we know what our costs are projected to be and the timeframe in which Canada will be buying the airplane. When we extrapolate our costs out, Canada's procurement is actually at the lowest point of the cost curve. This item will be called a future low-rate initial production lot. At that point, the airplane will be at its lowest cost and beyond its average cost.

Today, the airplanes are more expensive. We're buying far fewer of them. As we increase the volume and increase the annual quantities, the cost comes down. We know where the costs are today; we just took a fixed-price contract. We can extrapolate that out using the quantities we've been given to plan against and project what the cost of the Canadian airplanes will be.

Hon. Bryon Wilfert: Through the chairman to you, sir, if we look at the expected delivery date of 2016, I understand that some of Canada's F-35s will be part of what's called a low-rate initial production, phase 4, while others won't.

Could you describe to the committee the difference between an LRIP, the low-rate initial production, airplane and those that will be produced during the full production phase? Does this mean that the earlier models will need future modifications and will they be at the same operational level as the others?

Mr. Tom Burbage: That's a very good question, sir.

Now, the period of time when there is a risk of modification is during the flight tests, when we're still discovering things with the airplane. That will be long past by the time Canada takes delivery of her airplanes.

We talk about low-rate initial production. It's an acquisition term used in the United States that says the United States is not permitted, by acquisition law, to go to a multi-year procurement until completion of operational tests. So at the time the operational test is completed, at that point, the United States will be able to buy airplanes in either three-year or five-year increments instead of annual increments. So during the years when we're buying the airplanes one year at a time, that's referred to as low-rate initial production.

I'd like to make one last comment, sir. In the year that Canada is buying, we are building over 200 airplanes that year. It's not “low rate” by anybody's definition in terms of the dictionary, but it's still termed low rate because we're not in the multi-year yet.

Hon. Bryon Wilfert: Thank you for that.

I have a quick question, sir. If the Canadian government decided to hold a procurement competition to determine who would receive the contract to replace Canada's current fighter jets, should we expect the F-35 program to participate in such a competition?

Mr. Tom Burbage: That is a government-to-government issue. Lockheed Martin does not contract directly for these airplanes. It's all done through a government consolidated buy. One of the great buying powers of being part of the project is that when Canada buys two airplanes or four airplanes they're buying them in a total procurement annual buy of several hundred, so you have the leveraging power of that. But it's not up to Lockheed Martin as to whether the F-35 is allowed to compete in a competition. That's a government-to-government issue.

Hon. Bryon Wilfert: There is an issue that has come up. For our air bases, particularly In the north of the country, the weather in those regions is sometimes difficult to extreme. In terms of educating us, can you tell us whether the F-35 is suited for operating in the extreme weather conditions of the north?

Mr. Tom Burbage: The engineering requirements, which are part of our contract, are written around the most austere operating environments—both hot and cold—in the world. They were written specifically by the three U.S. services that have to operate aircraft in those environments, and the requirements of the partner nations were integrated into that. Long before you take delivery of it, we will test the airplane down to temperatures that are both well above and well below what you'll see in operational service.

● (1550)

Hon. Bryon Wilfert: There's another issue that comes to mind here. Can you give some clarification on the procurement by the Israeli government? The media have reported that Israel has purchased 20 F-35s and will be receiving guaranteed work for the equivalent of 150% of their acquisition, which seems quite significant, even though Israel is not a financial participant in the MOU.

Mr. Tom Burbage: Yes, sir. Israel is the first country to come through a different channel, which is the foreign military sales process. They had been a monitor and a participant in the program, but not in the same category as the partner nations, for the last several years—since 2003, in fact. By coming through that channel, Israel now exercises a different method to procure the airplane. There are no guarantees in the Israeli work.

The only article I saw on this was in the *Defence News* . It misquoted the program and was later retracted. Israel's industry gets to compete just like everybody else's does. There is no work that has been identified for Israel that was in any of the partner industrial plans.

Hon. Bryon Wilfert: There's no guarantee of up to 150%?

Mr. Tom Burbage: No, absolutely not.

Hon. Bryon Wilfert: Thank you, Mr. Chairman.

The Chair: Thank you very much. That's it.

Now I will give the floor to Monsieur Bachand.

[*Translation*]

Mr. Claude Bachand (Saint-Jean, BQ): Thank you, Mr. Chairman.

I'd like to welcome Mr. Burbage to the committee.

Can you hear me, Mr. Burbage?

[*English*]

Mr. Tom Burbage: I can hear you.

[*Translation*]

Mr. Claude Bachand: First of all, Mr. Burbage, I would like you to know that we, the members of the Standing Committee on National Defence, are very disappointed that we were unable to travel to and visit your facility in Fort Worth. I hope that your invitation still stands for a later date.

As a matter of fact, Mr. Chairman, I think we should discuss that again. I think the committee should visit that facility, and that as many members as possible can be part of that visit, because this is important.

I have two questions for you, Mr. Burbage, and they have to do with high technology and Canadian content.

Are you prepared to share with Canada the property rights and copyright associated with this advanced technology? Will Canadians have access to complete information or the entire high tech package?

Can you answer those questions?

[*English*]

Mr. Tom Burbage: The F-35 is designed to be operated in Canada and sustained almost exclusively by Canadian industry. There may be some areas where some assistance would be required from the U.S. and from Lockheed Martin as a prime contractor.

We will be operating under a performance-based environment, which means that my company, as the prime contractor, will be responsible for guaranteeing delivery of availability to the Canadian Air Force. We will be monitoring and managing where we need to, but the intent is that maintenance, repair, overhaul, and those kinds of things will all done by the Canadian Forces or Canadian industry.

[*Translation*]

Mr. Claude Bachand: If I'm not mistaken, the contract will not make reference to the International Traffic in Arms Regulations.

[*English*]

Mr. Tom Burbage: Lockheed Martin doesn't control ITAR; the U.S. government does. Everything that we're doing inside the sustainment plan for Canada and for all the partner countries is done under the constraints of ITAR. There's not an issue there.

[*Translation*]

Mr. Claude Bachand: What guarantee can you give us that the content will be Canadian? I have some concerns in that regard.

For example, a very large company in Quebec by the name of Héroux-Devtek, I believe, has opened a production plant in Texas. Am I right to be concerned that, if a contract were to be awarded to that company, it might decide subsequently to transfer its parts production to Texas?

Are my concerns warranted in that respect? That may apply not only to this particular case, but to the other companies that have plants in the United States. If there not a risk that, if you sign a contract with Héroux-Devtek, production could be transferred to the United States?

● (1555)

[*English*]

Mr. Tom Burbage: I know Héroux-Devtek well and they do very important work for us on the F-35. One of their facilities is in Texas, but they have additional facilities here in Canada that are actively engaged in the program right now.

We have a very definitized industrial plan. It has 206 different projects in it today, with more to come. They are identified by company and by time. We review that plan once per quarter with the Ministry of Industry here to show how we're tracking that plan. There is no plan to take work that's been identified for Canada from Canada and move it anywhere else. If a Canadian industry has difficulty meeting the best-value objectives, we will look to place that work in Canada with another supplier, always as a first choice. Only if industry can't perform the work would we have to move it somewhere else. That's the only reason.

[*Translation*]

Mr. Claude Bachand: We are constantly being told that Canada has to abandon its industrial regional benefits policy, in exchange for which we will have access to the complete Lockheed Martin assembly line. The figure that's often mentioned is 12 billion dollars. Is that amount based on projections of 3,000, 4,000 or 5,000 platforms? How can the government say there will be 12 billion dollars in spinoffs? Do you acknowledge that under the memorandum of understanding, the regional industrial benefits policy will not apply?

[*English*]

Mr. Tom Burbage: The industrial plan for the F-35 was dictated by the nine nations, including Canada, to not be an offset program. In our terms, offset and IRBs are the same. It was required to be a best-value program, but it was also required that industries in all the partner countries be allowed to compete to build the U.S. airplanes. That was a fundamental requirement and that was the trade.

Our estimates today project the value of the industrial plan for Lockheed Martin's portion of the airplane to be about $9.5 billion U. S. The engine contractors and sustainment are not included in that. I know—I just talked to the Pratt & Whitney guys within the last day or so—that their value takes this to well over $10 billion and close to $10.5 billion.

There's quite a bit more coming with sustainment, but we haven't defined the sustainment plan yet. Canada's requirements have not been made known to us yet. As airplanes come into service here, the infrastructure to maintain, support, and overhaul them will also come with that.

[*Translation*]

Mr. Claude Bachand: We were talking about Israel a little earlier. I have a statement here by the Prime Minister of Israel, Ehud Barak, where he reports that Israel will purchase 20 aircraft at a cost of $2.7 billion, resulting in 4 billion dollars worth of economic spinoffs.

I know that this isn't connected to the memorandum of understanding, but I asked Lieutenant General Deschamps whether it would have been preferable for Canada not to sign the memorandum of understanding and simply do what Israel has done—namely, pay $2.5 billion for 20 aircraft and receive the equivalent of $4 billion worth of spinoffs.

You seemed to be saying that this article might not be accurate. Do you think we're talking about the same article?

[*English*]

Mr. Tom Burbage: We're talking about a misunderstanding or a misrepresentation by the media on the Israeli program. The Israeli program is much bigger than the first phase. It's a three-phase program, or possibly a four-phase program. The first phase is for the 20 airplanes you're referring to, but the industrial package that we've been working with Israel on covers the entire program, which is many more airplanes than 20.

None of the work that we've talked to Israel about had any destination for any of the partner countries. It's work that's being saved for the countries that come on behind that.

Now, I'd like to comment just for a moment on why it's not in the best interests of Canada to buy airplanes through that route and it's better to be a partner. There are only a limited number of countries that were allowed to become part of the partnership. One year from the time the contract was awarded, the partnership closed. Australia was the last country to join, making it nine nations.

Some of the benefits are that each country gets to have representatives in the joint program office. Each country gets to integrate their requirements into the U.S. The countries only pay a pro rata share based on number of airplanes for tooling and for future upgrades to the program. That's a very significant issue, because you're paying 65 divided by 3,200 airplanes' worth to take the airplane to another configuration in the future. The partners who are contributing to the development of the program get a rebate. They get to collect money back from countries like Israel that come in after the fact because they have to repay part of that development cost. If you go through the foreign military sales channel, you get a foreign military sales premium that comes with the airplane and makes it more expensive than the U.S.

There are a number of benefits associated with being a partner country that are not there if you go through the foreign military sales channel. The foreign military sales channel also does not allow any industrial participation in advance of the contract. Canada has been involved in this program industrially since 2001 and the contract won't occur till 2014.

● (1600)

The Chair: Thank you very much.

Merci, monsieur Bachand.

Now I will give the floor to Mr. Harris.

Mr. Jack Harris (St. John's East, NDP): Thank you, Chair.

Thank you, Mr. Burbage, for joining us today.

Maybe Mr. Bachand has me confused here. The $9.5 billion U.S., plus engines, plus sustainment, what program is that for? Is that the Israeli program or is that our program?

Mr. Tom Burbage: It's the Canadian F-35 industrial projection.

Mr. Jack Harris: Industrial projection?

Mr. Tom Burbage: Correct.

Mr. Jack Harris: That's based on your figures.

Mr. Tom Burbage: It's based on figures that are coordinated with the Ministry of Industry and reviewed once a quarter.

Mr. Jack Harris: So that's the projection of work.

I read a report that was produced by the U.S. defence department in 2003. In it, they mentioned the fact that Canada is regarded as a domestic supplier under U.S. defence contracts. Is this program an exception to that particular rule? In other words, Canada would not be considered a domestic supplier.

Mr. Tom Burbage: I'm not sure what the definition of a "domestic supplier" is in that term, sir.

Mr. Jack Harris: Well, that allows Canadian defence contractors to participate on the same level as U.S. defence contractors.

Mr. Tom Burbage: Canadian defence industry is participating right alongside U.S. suppliers.

Mr. Jack Harris: I'm talking about the pre-existing rule that allows...this program is participating, because we're a part of the MOU, right?

Mr. Tom Burbage: That, and because your intentions are to eventually procure the airplane, yes.

Mr. Jack Harris: Yes. But the MOU and the participation up to now...you said there won't be a contract till 2014. But that participation is based on the MOU?

Mr. Tom Burbage: That's correct.

Mr. Jack Harris: Yes, and we've seen the benefits of that so far.

I guess the question I have to ask is this. If Canada delayed a decision to purchase the F-35 for another year or two or three, at what point would Canadian contractors cease to be able to participate in this program?

Mr. Tom Burbage: Well, the program was founded under good faith principles. There are industrial benefits that are being enjoyed by all the partners and the assumption is that there's going to be participation in the program. If at some point Canada decides not to participate, that's a Canadian decision. That's completely Canada's.

At that point in time, we would look for nations that are interested in buying the airplane, because we obviously have to use the industrial work towards building the airplane with parties who are interested in flying it.

Mr. Jack Harris: Why is that?

Mr. Tom Burbage: Because that's the way all programs are constructed.

Mr. Jack Harris: Tell me, then. You gave us an example of your best-value contracting principles. If a Canadian contractor was unable to deliver in accordance with the expectations that had been set out, if they had a contract and they couldn't follow through, you said that if that were to happen, you would look elsewhere in Canada to replace that contract before you went anywhere else. Why would you do that in particular, if all countries are entitled to bid on any of the contracts?

Mr. Tom Burbage: We have detailed plans. The one I mentioned for Canada has 206 projects identified today. Today, under contract, we have 54 companies and about $320-million worth of business with Lockheed Martin. That grows substantially as we get into the production rate of the program because they're making parts for airplanes.

As we go from building 12 airplanes last year to building 200 airplanes in four years, that increase in quantity comes to these companies in terms of orders. That's how the dollar value starts escalating as we go out to the future. We have a detailed project-by-project plan with each of the eight partner countries.

● (1605)

Mr. Jack Harris: How does that differ from an industrial benefits plan? If you're saying you have an agreement with the Canadian industry or the Canadian government that Canada's benefits will be as follows, and that if this particular company can't follow through, you'll find another company in Canada—

Mr. Tom Burbage: The first choice—

Mr. Jack Harris: Why would you make that the first choice? I'm not unhappy about that. I'm jut asking you. There's no legal obligation for you to do that—

Mr. Tom Burbage: There's no legal—

Mr. Jack Harris: —and so on what basis would you do that? Couldn't other countries complain that they didn't have a crack at that particular aspect of the contract?

Mr. Tom Burbage: We feel that we have an obligation to the partner countries to execute the industrial plans we've laid out for every country. In the eyes of most of the people watching the program, that's based on the total value as opposed to a specific project.

You have multiple companies here that can do different kinds of work, and in many cases here in Canada, they've competed among each other for the work. If you have a supplier that suddenly can't deliver what he needs to deliver, it's the lowest risk to us to keep that work in Canada with somebody that's close by and not moving it to another country. It's best for us and best for you to keep that value in Canada. That's what we would attempt to do, okay? If we couldn't do that, then we would be forced to move it somewhere else.

Mr. Jack Harris: One of the selling points of this contract—and I'm not going to go into this plane versus other planes, this particular contract, is that Canada is putting up a certain number of dollars to buy the planes, and $6.9 billion has been suggested. You're saying and industry in Canada has said that they expect to be able to participate with up to $12-billion worth of work in Canada.

I'm wondering how that affects the partnership. Wouldn't Australia or anybody else that is participating insist on having a percentage of the work equivalent to what they're spending? Or wouldn't they feel that somehow they're being hard done by, whether it be the United States, the U.K., or some other country?

Mr. Tom Burbage: Every country calculates a business case that they take forward to their decision-making bodies like this one. They have to justify the outlay of taxpayer dollars to buy the airplane, and they can only do that through an economic industrial value that comes along with the program.

Smaller companies will not buy any other equipment, or very little, during the years they're buying F-35s, so the only source of funding for their defence industry comes through the F-35 contract. That's why the industrial participation element of the program is so important to all the nations that are part of it.

The ground rules for industrial participation were adjudicated by the partner countries. It was insisted upon by the partner countries that we have this in the MOU; otherwise, they wouldn't sign the MOU. So every partner country is very intimately involved with the construct of the best-value model; it's not something Lockheed dreamed up.

It is important because all the countries also want to keep the price of the airplane under control and down, and that's how you do it with best value. If you don't, you would pay a premium for insufficient or poor work. And that's been our history with offset programs, because a premium is paid by the gaining country for the work that's exchanged in an offset program for the airplanes that are being built for that country. In this case, the industry is participating in the build of all the airplanes for all the countries.

Mr. Jack Harris: In terms of costs, you mentioned—

The Chair: Mr. Harris, keep it short, because—

Mr. Jack Harris: Yes.

On the costs, last March there was a Pentagon report saying the cost may double. Robert Gates fired their planner.

Your company said you didn't know where the Pentagon was getting its figures on doubling the cost. How can the Pentagon come up with statements like that if they're the ones actually paying for the program?

Mr. Tom Burbage: The Pentagon looks at the program through the eyes of the U.S. buy. It's a multinational buy, but the dollars that come through the partnership are different dollars. Your infrastructure to operate your airplanes and stand up your bases is different. The amount of training squadrons you need is different. The total amount of money being invested in the development of the program is different: Canada is at $150 million and the U.S. is at $50 billion.

Those numbers are all added into those numbers that were publicized widely in the June timeframe, so they weren't comparable with what Canada will pay for the airplane. These are not the numbers that were advertised in the June timeframe. They were done under a different set of budget rules. If you look closely, they're not the cost of the airplane; they're the cost of the airplane plus a considerable number of additional infrastructure or development costs.

The Chair: Thank you very much.

Now I will give the floor to Mr. Hawn.

Hon. Laurie Hawn (Edmonton Centre, CPC): Thank you, Mr. Chair.

My thanks to our witness for being here.

I just want to nail down a couple of things that were touched on over there.

First of all, there is no guarantee to Israel for industrial benefits. Correct?

● (1610)

Mr. Tom Burbage: That's correct.

Hon. Laurie Hawn: Thank you.

We've talked about industrial participation for Canada. Again, just to make sure we're clear on that, the current contracts we have, assuming the Canadian companies that have those contracts continue to perform, will be worth $9 billion at the end of the day.

Mr. Tom Burbage: That's correct. Can I elaborate on that just a bit?

Hon. Laurie Hawn: Sure.

Mr. Tom Burbage: The industrial participation comes in a couple of different categories. One is the category of work that's already under contract, extrapolated out through the production program.

The second category is work that has yet to be started but that we call “strategically sourced”. Those are large sub-assemblies, and there are very few companies in the world that can do them. They're specialized companies, and we match those companies up with those capabilities. In this case, we have two of them in Canada, the horizontal tail and the outboard wing for the navy airplane, and those will be done at Magellan. That's the second category of funding.

The third category is opportunities that will become available over the next...the lifetime of the production program and that Canadian industry will be allowed to compete for. Then there's a fourth and fifth, which is the propulsion and sustainment, which we haven't started quantifying yet.

But if you look at the breakdown within those categories, the amount of work that is Canada's to deliver could be vulnerable if Canadian companies don't perform because it's based on best value. But it's Canada's to deliver. It's approximately equal today to the purchase price of the airplane.

Hon. Laurie Hawn: Okay. The $12 billion that we're talking about, the number that gets tossed out there...so that's $9 billion of that $12 billion. That $12 billion does not include the $7 billion of in-service support. Is that correct?

Mr. Tom Burbage: We're not talking about any sustainment costs at this point, and I'm not adding the propulsion industrial plan in there, and I know that's about $700 million over the production program.

Hon. Laurie Hawn: So the in-service support is in fact...as you say, most of that will be done in Canada by Canadian companies. That's in addition to the $12 billion that we're predicting?

Mr. Tom Burbage: Correct. The requirements haven't been specified by Canada yet, so the sustainment infrastructure hasn't been identified yet.

Hon. Laurie Hawn: We're miles ahead of dollar-for-dollar.

Mr. Tom Burbage: Yes, sir.

Hon. Laurie Hawn: As to the concern about the $12 billion making other people sort of jealous, this is close to a $400-billion program, so I don't think $12 billion is an inordinate share for Canada. And as you've said, it's liable to be more.

I have one other thing on in-service support while I'm at it. To do in-service support in Canada, we need access to the intellectual property that is only available as a partner in the MOU. Is that correct?

Mr. Tom Burbage: That's correct. All of these agreements are done government to government. When other countries come in through another channel, there'll be agreements made, government to government, at that time. The partners have access to the information today. It's the intent of the U.S. government that the Canadian military would be able to operate the airplane just like the U.S. military would.

Hon. Laurie Hawn: Unless we're buying under the MOU, within that partnership, we would potentially not have access to the intellectual property we would need to do in-service support in Canada. Is that a true statement as well?

Mr. Tom Burbage: I'd have to defer that to the crown and the government, because we're not directly involved in it. It's up to the governments.

Hon. Laurie Hawn: Fair enough.

There's a lot of confusion here about MOUs and what they mean, what they allow and what they don't allow and so on. Can you talk about the difference between the MOU we signed in 2002 and the one we signed in 2006?

Mr. Tom Burbage: Yes, sir. In 2002 the program was just beginning to go under contract. In October 2001, the contract was awarded. The U.S. opened the door for any nations that wanted to participate in the development of the airplane. There was no commitment at that time to buy the airplane; it was just participate in the development.

Canada was the first to join in February of 2002 and Australia was the last to join in October of 2002. There were nine countries altogether. That set the framework for all the benefits of being a partner: participation in the joint program office, the recoupment fee, and the waiver of FMS. All those requirements I described earlier were set out in that MOU.

In 2006 the program was moving to the next phase. The first production lots were beginning to be executed and we needed to know, as a prime contractor, who was going to buy airplanes and on what timeline so we could plan the infrastructure for the industry to respond to that. All of our partner countries were involved in that, because the expansion of that capacity is very critical to the industrial benefits coming online.

So in 2006, a second MOU was signed. This one was multilateral; all nine nations signed the same MOU. At that point, all the nations became equal in that partnership, whereas before it was a series of bilateral agreements. That new MOU superseded or dissolved the first one. At that time, production profiles were provided to us, and we used those production profiles to plan the capacity expansion of industry, and that forms the backbone of our industrial plans with all the partners.

● (1615)

Hon. Laurie Hawn: So the MOU that was signed by Mr. Allan Williams in 2002 is no longer in existence.

Mr. Tom Burbage: That's correct.

Hon. Laurie Hawn: The MOU that was signed, that we're operating under, came after his tenure.

Mr. Tom Burbage: Yes. The current agreement between the partner nations is the second MOU, not the first.

Hon. Laurie Hawn: Thank you.

On the cost figures we talked about—and again, this has been a critical issue for a bunch of people—your confidence in projecting.... We're talking about $70 million to $75 million per aircraft. Can you talk about the cost curve, where the aircraft is performing now on the cost curve, and where we're at? Are we above the line or below the line? Just where are we at?

Mr. Tom Burbage: The cost curve for a sophisticated product like this, any defence product, comes down with time as volume increases and learning occurs, but primarily because volume increases. We're building the airplanes at small production rates. Initially, we only had two airplanes in our first production lot. So we absorbed all the fixed costs of the infrastructure on those two airplanes. As we get to 200 airplanes a year, the incremental cost element of that infrastructure is shortened by that much.

So the cost comes down on a fairly steep curve. In the first three production lots, our price came down 50%, and primarily because the number of units going through was increasing.

We now have four production lots under contract, with the last one fixed price. Our cost curve is fairly well defined. Assuming the quantities stay about the same as they're planned to now, we'll continue down that cost curve, and we can project out in time the point at which Canada buys their airplanes. We know within a band...there's still a confidence band that we have to establish, but that confidence band is getting tighter. We do know that we are in the vicinity of what we're saying the airplane is going to cost and I think you've budgeted very adequately for the airplane.

The Chair: Thank you very much.

I will give the floor to Monsieur LeBlanc.

Hon. Dominic LeBlanc (Beauséjour, Lib.): *Merci beaucoup, monsieur le président.*

Mr. Burbage, thank you for being here. I'll save you the earpiece: my mother was an anglophone and my father was a francophone, so I'll ask the questions in English for you.

Thank you for your answers. They've been very thorough, frankly, and rather detailed and I appreciate that very much.

My colleague had a number of questions, and I think other colleagues have asked questions that perhaps we were thinking of asking as well. Let me try a few other areas of concern that we had.

I am by no means an expert in different fighter aircraft or the sustainment mechanisms, but one of the things we've heard is that the F-35 that Canada is looking at buying doesn't have a refuelling system that is compatible with Canada's current air-to-air refuelling tankers. So either Canada would have to buy new air-to-air refuelling tankers, presumably...or can modifications be made to the F-35 we're looking at purchasing that would in fact limit or reduce the cost of that kind of compatibility issue?

Mr. Tom Burbage: That's another very excellent question. That's the beauty of having a family of three airplanes: the three airplanes are the same in the fuselage area. The main difference is that the wing on the navy airplane is bigger. The navy airplane and the Marine Corps airplane both use Canadian refuelling systems—probe and drogue. The air force version of the airplane, because the U.S. Air Force dominates that requirement, is an air force boom tanker requirement.

We're actually doing a study right now for Canada and a number of the other partners who fly C-130 tankers primarily to see whether.... I mean, there's no problem: the space is in the airplane. The other two airplanes have that system in them and we've reserved the space to put that system in the air force airplane. The question is, do you want to have both systems or do you want to do the engineering to take the air force system out?

There is some very interesting flexibility advantages to having both systems in the airplane, because now you can use any tanker in the world anywhere. We are looking at that as a study right now. It is not a big deal for the airplane. The space is there. The system is in the other two airplanes and it's operating today. The other two are both fully qualified for inflight refuelling today.

Hon. Dominic LeBlanc: That's an interesting answer. On the surface of it, then, there wouldn't necessarily be a cost to Canada of having to change its air-to-air tankers.

Mr. Tom Burbage: No.

Hon. Dominic LeBlanc: That would be a separate decision the government may make, but it wouldn't have to make it in anticipation of the delivery of the F-35.

Mr. Tom Burbage: That's correct.

Hon. Dominic LeBlanc: Thank you.

I have another question I thought I'd ask. Again, we're going on a lot of media reports, and we've learned something today that is perhaps shocking to us as elected people: that the media don't always get it right. But some media reports have talked about some rather dramatic increases in terms of the maintenance costs per flight or per flight-hour for the navy version, the F-35 sea variant.

Can you explain why this should or shouldn't concern Canada, which is acquiring a different variant of that airplane? Are you confident that the maintenance costs will in fact be much more reliable than they may have been or have reportedly been with respect to that navy aircraft?

● (1620)

Mr. Tom Burbage: That's another excellent question.

This program was founded in the very beginning as...half of our contractual requirements are written around sustainment of the airplane and that has never happened before in any acquisition program in the U.S. on the airplane side of the house. Sustainment is something we figured out later, after we built the airplane.

In this case, we have designed in reliability and maintainability features in this airplane that we've never had on airplanes before, because the maintainers wanted a bigger role and because everybody was complaining about the cost of operating these sophisticated airplanes. So we have the features built into the airplane. We actually have a contractual requirement that they be twice as reliable as the airplanes they're replacing and take half the time to fix. That calculates out to fewer maintenance man-hours, fewer personnel required, and all those kinds of things.

We also calculate the cost of the F-35 annually with a large group of people that includes representatives from Canada. They come down to our facility in Fort Worth for a week or so and we lay out every potential cost you could ever possibly incur on the program, including what it's going to cost to upgrade your information computers 20 years from now. We rack all those costs up so that everybody has wide-open eyes: “this is what it's going to cost to maintain the airplane”. There is no legacy airplane today that can collect any of those costs. They don't track them. They don't collect them in those categories. So there's no direct comparison, but this is what it's going to take to fly and operate this airplane.

We also have very powerful economies of commonality and scale. We're going to be maintaining the airplane around the globe in nine nations. We're going to have common spare parts. If you operate in a coalition operation, the airplanes will be maintained by a common logistics stream.

There are many other features that will feed into the cost of ownership and operation in the future. We're highly confident that the airplane is going to turn out to be a reliable, maintainable, and reasonable airplane to operate in terms of the cost of ownership.

The analysis that's going on right now, way in advance of the airplane actually getting into operational service, uses legacy cost models. Legacy cost models, when you compare them to legacy airplanes, don't include many of the cost elements we're talking about.

If you asked our government, I think they would tell you that there is more known about what this airplane is going to cost to own and operate than has been known about any airplane at this point in its development—and it will unfold as it goes. A large part of that ultimate cost to Canada is what Canada wants to do in Canada in terms of training centres, overhaul systems, and all that kind of stuff.

Hon. Dominic LeBlanc: Thank you.

The Chair: Thank you very much.

Now I will give the floor to Ms. Gallant.

Mrs. Cheryl Gallant (Renfrew—Nipissing—Pembroke, CPC): Thank you, Mr. Chairman.

There's been quite a bit of talk in the news about this purchase. I sent out a survey to all my constituents so that they'd understand what it was about. I asked them whether Canadians should leave our air defence and aerospace jobs to another country, to the Americans. Not only did I receive responses, but one gentleman gave me a four-page letter. He has given me permission to refer to it.

Kevin Andrews, of Renfrew, Ontario, wanted to first state that he's ex-air force and was raised in an army family. He says, “I've studied our governments over a very long time in my life and this is the first time that I can hold my head high and stick my chest out in the purchase of the F-35!”

First and foremost with respect to the purchase is the concern about the safety and security of our nation and having this done with the safety of our airmen and airwomen in mind. In addition to that, as we've heard, there's also the industrial benefit aspect. Can you explain Lockheed Martin's industrial participation plan concept?

Mr. Tom Burbage: Sure. The plan is to allow all of the partner countries—there are nine nations together, the U.S. and eight other partners—to participate from the very beginning, without the commitment to buy the airplane initially, in the design, development, test, and build of the airplane. To date, there are 54 companies in Canada that actually have contracts on the F-35, going back as far as 2001. If you look at the actual contract to buy the airplane in 2014, that's 13 years ahead of the contract award that we have been working with the Canadian industry on this project.

I will tell you that when I talk to the other partner nations I often use the model of Canadian industry as a great example of a government-industry partnership going forward. Not many other countries do that, by the way. The ability of your industry to work with your government programs to actually make them more competitive, to compete and win work on the program, has paid off.

I think it's a very robust plan. We have taken the plan all the way out through the known production period of the program, which today is 2036.

● (1625)

Mrs. Cheryl Gallant: Even further than the contracts, there are the subcontracts. Would your company know, of all the subcontractors as well as the principal contractors, who is doing that work in Canada?

Mr. Tom Burbage: It's very hard to track work below second, third, and fourth tier. We give a contract to Héroux-Devtek or to Magellan and they have suppliers. That has the trickle-down effect, where they build the components that go into their parts. We track the dollar value that we've given to the primary company. We just don't have the resources, and it's hard for Canada to track it and get back to us, but there are clearly second, third, and fourth tiers of small and medium enterprises that provide parts and services for all the contracts we have, but that we don't carry as part of our list.

Mrs. Cheryl Gallant: So the multiplier could be even greater.

What is your opinion on the Canadian aerospace industry with regard to bidding on future contracts for the F-35?

Mr. Tom Burbage: Canada has proven already that they are very competitive. I don't think there is any issue at all with Canada continuing to win and hold the work they've had. Canada is very much like the U.S. We have a lot of U.S.-Canada relationships that have actually built the aerospace industry here over the years. I don't know if you're familiar with this, but Lockheed Martin has been providing airplanes here for 65 years, first as Lockheed, and a large part of the industry that has grown up around those programs has become the core aerospace industry here.

Mrs. Cheryl Gallant: What contracts have Canadian industries received to this date? How many companies are involved that you are aware of? Are you able to state the names of these first, second, third, fourth...?

Mr. Tom Burbage: I can state some of them. I don't work this program exclusively, but I can tell you that there are 54 companies in Canada that have contracts today.

We have some 200-plus projects that we've identified over the course of the production program. Not all are under contract yet. We have a couple of major assembly projects—the horizontal tail for the air force airplane and the outer wing for the navy airplane—that are under contract but haven't started yet because we're just coming up the production curve right now.

I'm looking at my map here. We have a couple of companies in British Columbia and Manitoba. We have a number of companies in Ontario and certainly a number in Quebec, and we have one in Nova Scotia, Composites Atlantic, which is doing a lot of good composite work for us.

We have gone across the breadth of Canada and tried to find excellent small and medium enterprises, and they have been very competitive on the global market in winning this work.

Mrs. Cheryl Gallant: Now let's talk about the functionality. Can you explain to us the importance of stealth capabilities within the F-35 and its impact within air combat?

Mr. Tom Burbage: Stealth is a technology that has evolved over time. We're now in what we call the third or fourth generation of stealth, F-22 being the predecessor, and F-35 being the successor to F-22 and building a lot on F-22 experience, taking it to another level, primarily in the area of ease of maintenance. We have substantially improved the fragility of stealth technology now, until it is very rugged; two of our three airplanes have to go to sea on ships, and therefore the technical characteristics have to be very rugged.

If you had your choice of being in a stealthy airplane or not being in one, you would want to be in one, because you have a significant tactical advantage in that there's uncertainty on the part of the adversary as to where you are and what you're doing, and there is certainty on your part as to where he is and what he's doing. That's a significant tactical advantage. When you couple that technology with the sensors we have now, to give the pilot a 360-degree view of everything that's happening around him and integrate all that data for him so that he basically is looking at a big-screen TV and seeing the world around him and not trying to manage sensors, you have a serious significant technical advantage over any other airplane that's flying out there.

We are very confident that this airplane is going to revolutionize. We're building this airplane for the next 50 years. We're operating some fighters today that are 50 years old, and we're going to be flying this airplane way into the future where technologies are changing more rapidly than they are today. So we have to have a good solid base on them. We have to have one that will evolve with time, and we think that's what this airplane does.

Mrs. Cheryl Gallant: Thank you.

[*Translation*]

The Chair: Mr. Bouchard, please.

Mr. Robert Bouchard (Chicoutimi—Le Fjord, BQ): Thank you, Mr. Chairman.

Thank you for being here today. We're asking questions today to find out more about this project. My first question relates to the economic spinoffs.

Your company has talked about $12 billion in benefits for Canada. According to a study done by the Pentagon, the actual benefits would be far less significant, in the range of $3.9 billion, as opposed to the $12 billion mentioned by your company. Canada also has its own estimates, which are that the benefits, other than the acquisition, construction and production of the future F-35s, would not exceed $6 billion.

How do you explain such a significant difference? Are you still saying that the purchase by Canada of 65 F-35 aircraft will yield $12 billion worth of benefits?

● (1630)

[*English*]

Mr. Tom Burbage: This is the second time I've heard reference to a Pentagon report that quotes an industry figure. The Pentagon isn't involved with our industrial activity. It's part of the agreement, but it's totally managed by the industry. I'm not familiar with the report you're talking about. I'm sorry. I know of no Pentagon report that quotes the number $3.9 billion. I'd be happy to find it and read it, but I'm just not aware of it.

An hon. member: It's a 2003 report.

Mr. Tom Burbage: Well, this is 2010, and things have matured. The value of our project has grown by $2 billion in the last two years.

[*Translation*]

Mr. Robert Bouchard: What kind of benefits do you see for Canada? You probably gave a sales pitch and said that if Canada joined the project, there would be benefits. Are you still putting forward that $12 billion figure? If not, what is the figure, in your opinion?

[*English*]

Mr. Tom Burbage: I see now where the number's coming from, but 2003 was less than a year after Canada joined the program. That's probably what it was worth at the time, because we had not explored the opportunities that are here. In the intervening seven years we found other opportunities and we brought many more companies on. So that's not the correct number.

On the number we're looking at now, if we take all the projects we've identified for Canada and extrapolate them over the production program, from the Lockheed Martin perspective, their worth is about $9.5 billion. When we add to that the engine work, it goes up to well over $10 billion.

We're not including in that any costs associated with sustainment of the airplane when it gets into service. It will be in service in Canada for about 30 years, so we are confident that there is a significant amount of additional industrial participation that's not accounted for yet. When we look at that versus the purchase cost of the airplane, we think there's a very big advantage to being part of this program. Because you're building parts for 3,173 airplanes, not for the 65 airplanes that Canada would buy.

That's the basis of the program. Now, is there any risk in that? There is risk in that industry has to perform, because no country, no government, wants to pay for poor performance as increased costs for their airplanes. Am I confident that Canadian industry will perform? I'm very confident. Your industry has been very competitive. Amongst all the partner nations I would say that Canada is as competitive or more competitive than the rest. They're very good.

It's a risk that industry has to take on. If they're willing to take on that risk, my sense is that the industrial benefits will far exceed those of the F-35. There will be opportunities in other programs. Your advanced composites manufacturers will be set up to do commercial work, as an example, so there are other opportunities that will open up by being part of this high-technology program.

[*Translation*]

Mr. Robert Bouchard: I would like to ask you about something else: the unit price of an F-35.

According to the figures I have here, one aircraft cost $50 million in 2002. Now the figure is $92 million.

In the MOU that you signed with Canada, are there rules that protect Canada and ensure that it will get its money's worth? Is there going to be continued growth or can the price not exceed a certain limit?

● (1635)

[*English*]

Mr. Tom Burbage: Yes. The cost of the Canadian airplane will be exactly what the U.S. cost is, because you're going to buy the airplane with the United States. It's going to come to us as one contract. We're going to build 200 airplanes, and some number of those airplanes will belong to Canada. We don't know which ones, because we don't have a separate contract with Canada.

So you have the buying power. This is the difference in having a competition. You have the buying power of a much larger quantity of airplanes to drive the cost down, and you have a very extensive negotiation process that we go through with the U.S. government on your behalf. There are advantages to that.

Now, in terms of the cost, when the U.S. looks at cost, they're not looking at cost through the same criteria that Canada looks at cost. They're looking at what it costs to establish a large number of operational bases inside the U.S. and what does it cost to complete the development program? Canada's costs are fixed and Canada will have a much smaller infrastructure, so the numbers you quoted are numbers that are in the media, but they're not an accurate representation of the cost of the Canadian airplane.

A better record is to look at the cost that we've actually settled our contracts for and project down that cost curve to the point at which Canada's going to buy their airplanes, which is still out in the future, four years from now, before the first contract is made. At that point in time, we have a very good estimate of what the cost is going to be for the Canadian airplanes, and we have a good confidence—not 100% confidence, but good confidence—band around that. And the amount of money that your government has budgeted for the airplane will be well within that.

You have to look at the numbers that are being used in the Washington media as not being completely representative of what Canada is going to pay for the airplane. You'll pay the unit price of the airplane—the same unit price the U.S. pays—but you won't be paying to put all the U.S. infrastructure in place, and you won't be paying all the development costs of the airplane.

The Chair: Thank you very much.

I will give the floor to Mr. Braid.

Mr. Peter Braid (Kitchener—Waterloo, CPC): Thank you very much, Mr. Chair.

Thank you, Mr. Burbage, for being here.

Mr. Burbage, it sounds like the Washington media gets it wrong sometimes as well. Is that correct?

Mr. Tom Burbage: I don't want to say they get it wrong. I'm just saying they're not describing Canada's program. They're describing Washington's program.

Mr. Peter Braid: Mr. Burbage, in your experience, do you believe that Canadian aerospace companies can compete with the best?

Mr. Tom Burbage: I think Canadian companies in many cases are the best. There's some work that's done here that's just absolutely top-notch.

Mr. Peter Braid: Are 54 Canadian companies currently involved in the F-35 process? is that correct?

Mr. Tom Burbage: Yes, that's correct.

Mr. Peter Braid: Does that number have the potential to grow?

Mr. Tom Burbage: Yes, it does. As the additional opportunities come online, it will grow, and I don't count in that number, as Madam Gallant said, the next several tiers of companies that are getting flow-down work from those contracts.

Mr. Peter Braid: Absolutely.

Mr. Tom Burbage: So in terms of numbers of companies, the numbers would grow.

Mr. Peter Braid: Is it your belief that there is more potential for Canadian aerospace companies for contracts, work, and jobs with a traditional IRB one-for-one arrangement? Or is there more potential for Canadian companies, contracts and jobs as a partner within the MOU?

Mr. Tom Burbage: It's our belief that the best-value model we're putting in place on the F-35 is a new model and it is quite different from the offset or IRB model of the past.

The IRB model of the past is contingent on contract award. There's a period of performance that the contractor has to implement industrial benefits. Those benefits are not often direct to the airplane or not direct to even the aerospace industry, and they're short-lived: when the obligation is fulfilled, it's done.

In this case, it's early, and it continues on beyond procurement of the airplanes as long as we're building F-35s, so I think it's quite different. It's a different risk equation, because it's not guaranteed up front. But there's a huge reward to it because it's much longer term and much higher value.

Mr. Peter Braid: Very good.

You talked about the cost curve, the projections, and the fact that Canada has planned to purchase the plane at one of the lowest points of the cost curve. Does the cost curve go up at some point?

Mr. Tom Burbage: This is why cost is a tricky subject. When you look at costs in terms of real dollars and you take inflation out of it—constant-year dollars, 2010 economics—then you get a time-phased and continuously reducing curve.

If you look at the effects of inflation and calculate that same cost in then-year dollars, there's a point at which the cost curve gets flat. You're building the same quantity every year, year on year, you've learned how to build the airplane, and your suppliers are at the peak of their performance. Then you have a tail-up that occurs, which is inflationary, whatever the inflation increases are out in time.

You have to be specific as to whether you're talking about future-year dollars, current-year dollars, or constant-year dollars in the past. All three get very much jumbled up in the cost discussion on this program.

● (1640)

Mr. Peter Braid: Very good.

In your presentation, Mr. Burbage, you talked about your company's commitment to affordability. Could you just elaborate on that and explain what that is?

Mr. Tom Burbage: This program is founded on the potential for achieving economies of scale. In other words, if a lot of users buy a large number of airplanes, we can drive the cost of this airplane down below what you're paying for a much less capable airplane today. That's really the only way you can achieve the costs we're talking about.

It's not that we found a magic way to make the airplane; it's that you have the economies of scale. In order for you to get the economies of scale, the airplane has to be viewed as affordable in the eyes of the buyers. That forces us to be focused on driving the cost of the airplane down to as low as it can be.

We're confident that if you look at it side by side with airplanes of today's generation, we'll be at or below the cost of those, and we'll have next-generation technology.

Mr. Peter Braid: Excellent.

From your understanding, Mr. Burbage, could you explain the differences between the current CF-18 fighter jet and the F-35? What are the key differences and the value added that the F-35 brings in comparison?

Mr. Tom Burbage: The CF-18 was bought primarily because of the cold and the icy runways and the short runways you have, I assume, and the ability to use a tailhook. It has common characteristics with the navy for those reasons, and it is what we term a fourth-generation airplane.

We happened to build one of those, called the F-16, and it competes with the newer version of the F-18 around the world. The F-18C is built more on the principles of superior aerodynamics and less on the principles of superior avionics.

Today's airplanes have equivalent performance. In other words, from an aeronautical perspective, we can fly as fast and pull as many Gs, but the difference is that we're a stealthy airplane, and when you put weapons inside the airplane, we maintain those same performance characteristics with a combat load. If you take an F-18 or a CF-18 and you put a combat load on it, it loses much of that performance capability. That is one advantage.

The Chair: Thank you very much.

I will give the floor to Mr. LeBlanc.

Hon. Dominic LeBlanc: I'll give my turn to Mr. Wilfert. He can continue his incisive questioning, and I'll come back after.

Hon. Bryon Wilfert: Mr. Chairman, I apologize. I had to leave for a bit of time for a delegation.

I have a question, Mr. Chairman, and again I'm seeking information. Recent reports have shown that there have been problems with cracks developing in some of the number 496 bulkheads used in the F-35B models after approximately 1,500 hours of air flight testing. These same reports suggest the specific bulkheads in question are very similar to the number 472 bulkheads used in the F-35A, which the Canadian government currently plans on buying.

At Lockheed Martin, are you concerned at all about the possibility that some F-35A fighters may experience similar problems? If so, what steps would the company need to take to ensure structural durability?

Mr. Tom Burbage: That's a good question. First of all, none of that happened in flight. We have six test articles that we'll never fly. They go through very extensive ground testing. We put them in fixtures, and we cycle them through two lifetimes of use. That's 16,000 hours.

As we go through that cycle, we look for cracks. By the way, we like to find cracks. If we don't find any cracks and the airplane looks perfectly normal, you are probably going to find cracks later on when it's actually in flight. So we do that test very specifically to find these areas in the airframe that may be slightly undersized for the loads they're going to experience.

We found one. It was in the frame of the STOVL airplane, as you mentioned. That frame in the STOVL jet is made of aluminum. That frame in the air force jet is made of titanium, so it's a whole different metal, with different crack propagation and a different stress pattern and everything else. However, we did stop the air force testing until we could go back and do a full analysis of the air force frame and compare it with the Marine Corps frame. This is not a big deal. It's often trumpeted as being a big deal, but these are the kinds of things that you find in tests and that you fix to make sure you don't have any of these shortfalls when the airplane finally gets into the hands of the operator downstream.

We are working very closely right now with Héroux-Devtek, which is the manufacturer of those frames, to get a solution in place. The frames that are on the airplane will be repaired and returned to service. Then we'll be back in testing just after the first of the year. For those that are not built yet, it is a very simple software change to a tape that cuts a new frame. All the airplanes in the future will have the changes in them.

So we want to find these things and we want to find them now. We don't want to find them later. We don't want to have airplanes that are going to experience the cracks later.

● (1645)

Hon. Bryon Wilfert: Thank you.

I have one other question, Mr. Chairman.

I thank you for your answer. Obviously when these things come up, we need the answers.

What operational capabilities can the Canadian air force expect from its initial F-35 aircraft when they begin arriving—if they go ahead with the purchase—on Canadian air bases in 2016? Will these aircraft be able to fully support CAF-prescribed data or air-to-air or air-to-ground mission sets? If not, what can we expect until the full mission capabilities are available, equivalent to those offered by competing aircraft today? Are there any additional costs the Canadian government could expect to incur to fund these enhanced capabilities?

Mr. Tom Burbage: We introduce our software capability in what we call blocks. In 2014, the United States Marine Corps will go to operational capability with what we call a block II airplane. That block II airplane is fully capable of going into combat and is an operationally acceptable airplane for any air force, navy, or marine corps that wants to fly it.

At that point in time, the next block of software will be in flight tests. As soon as it completes flight tests, the software is dropped back to the other airplane, which instantly becomes a block III aircraft. There are no hardware changes: there's no mod and no retrofit associated with that. Canada's airplanes come in 2016. We will be completing flight tests in early 2016, and your airplanes will either have that software capability in them or they'll get it very shortly after they get here.

By the way, the reason the Marine Corps is taking that airplane to IOC is that it's so much better than the airplanes they're operating today.

Hon. Bryon Wilfert: Thank you.

[*Translation*]

The Chair: Mr. LeBlanc, please.

[*English*]

Hon. Dominic LeBlanc: Thank you, Mr. Chairman.

Mr. Burbage, there's been a lot of discussion around the competition held in 2001, at which your company was selected as the prime contractor and the Canadian government as partner in the development stage of the MOU.

When your company was competing in the 2001 competition, could you tell us what Canada's role was in that competition? Was Canada a robust partner in identifying requirements? Did Canada participate actively in that selection process that took place when you were selected in 2001?

Mr. Tom Burbage: Okay. The phase of the program that began the real competition was in 1994. All of the U.S. prime contractors were part of that; that was a concept definition phase, a study phase, a technology development phase. In 1997, the down selection was made. The competing contractors then were a team of McDonnell Douglas and British Aerospace, Boeing as another team, and Lockheed Martin another.

That competition down-selected from three to two. Then Lockheed Martin and Boeing continued on to actually build flying demonstrators and do a fly-off, so to speak. It's captured very well in a Canadian documentary called *The Battle of the X-Planes*.

At that point in time, Canada was a participating observer, which meant there was really nothing to do but watch. But it was one of the countries participating in the evolution of the technology investment. In fact, we actually have contracts from the earlier phase with some Canadian companies that I'm not counting, because we didn't go on a contract until 2001. For example, Honeywell Canada was involved in work as far back as 1997-98, when we were still developing the technology for the airplane. But Canada was an observer.

Hon. Dominic LeBlanc: So we didn't actually select the winner. We didn't participate in the selection of the winner. That was a process driven by the U.S.

Mr. Tom Burbage: Yes. The U.S. is buying most of the airplanes, so the U.S. was the leader of the competition and did parse out all of the proposals, 25,000-page proposals, in six months of evaluation and all the rest of that. So yes, it was done by the U.S., but there were representatives from the nations that were interested in observing the process, but probably not at the decision-making level.

Hon. Dominic LeBlanc: Thank you.

The Chair: Thank you very much.

Mr. Payne.

● (1650)

Mr. LaVar Payne (Medicine Hat, CPC): Thank you, Mr. Chairman.

Welcome, Mr. Burbage. I'm pleased to have you here.

My questions, through the chair to you, are on a couple of interesting things. Maybe you can just explain to us what the difference is between fourth-generation and fifth-generation aircraft.

Mr. Tom Burbage: We refer to a fourth-gen airplane as a multi-role fighter that the services have used in a fairly service-specific role. It did not include the technologies of stealth, it did not include the technology of integrated avionics, and it wasn't designed with the intent of being an interoperable fighter. We've taken those fighters and had to use them in coalition operations, but they don't interoperate very well.

So one of the fundamental differences with a fifth-gen airplane is that the airplanes will all operate with each other. In many ways, it's like your laptop when you plug into the Internet. These airplanes will be nodes on the battle space internet in terms of information flow in the future.

We've also integrated in that the dimension of stealth, which gives a tactical advantage of surprise, and we've integrated into that advanced sustainment techniques to try to drop the cost of owning these airplanes.

Mr. LaVar Payne: Are you aware of any other fifth-generation aircraft?

Mr. Tom Burbage: The F-22.

Mr. LaVar Payne: The F-22? All right.

You talked about stealth, which I think is a really important aspect of the F-35. Could you help us out and tell us how that would enhance our military abilities?

Mr. Tom Burbage: In this airplane, stealth is almost a byproduct. We've developed the technology now to where it is not maintenance intensive.

While you could argue about whether or not you need it in the homeland of Canada, if you ever get into a situation where you're operating jointly with NORTHCOM or NORAD and side by side with the U.S., and there is a threat, you're going to be glad you have it. But it's when you get into coalitions—the interoperability features of the airplane and the ability to do the kinds of missions we may be called on to do during hostilities, or in parts of the world where there are sophisticated air defences—that this particular benefit really helps.

But it's the combination that matters. Stealth is only piece of it. Stealth gives you the capability when you need it, but it's the combination of that with the integrated avionics and the interoperability and sustainment that's the whole package. Having stealth on an airplane used to come at a pretty high premium. We think we've driven that cost down now, through our manufacturing techniques and investments in sustainment, to where it's not at a high premium.

Mr. LaVar Payne: I think it's an important aspect to the aircraft. In your view, what would it mean for the survivability of our pilots?

Mr. Tom Burbage: That's really the reason it's there. When you size your force, depending on what kind of a threat you size it against, there are additional aircraft required for attrition losses. This particular survivability feature—and it's only one of many on the airplane—is there to ensure that you have survivability, along with the other factors that go into calculating your force level. Without it, if you're looking at the threat environments that generate the requirement for F-35, you're going to have to buy a lot more airplanes than 65, just because of the losses that occur and that we don't expect to see with the F-35.

So I think that safety, the ability to return home, and the ability to effectively use the airplane in a high threat environment are all reasons why we do this.

Mr. LaVar Payne: In your comments, Mr. Burbage, you did talk about some additional benefits to Canada in terms of royalties. Could you expand on those a little? What do they really mean for Canada?

Mr. Tom Burbage: The agreement the partnership has in the second MOU I referred to is that other countries who come into the program will be required to pay a recoupment fee for all of the money the partners invested in designing and developing the airplane. That recoupment fee will be shared across the partnership on a pro rata basis, based on the number of airplanes each partner is buying.

So Canada will get an annuity with every airplane any other country buys. The U.S. reserves the right to waive the U.S. portion of that, but the U.S. has no influence over waiving the partner portion of it. The first time this has come into being is with the Israeli program that is going on right now. There is a recoupment fee there that will include some payment back to Canada in the long term.

Mr. LaVar Payne: Do we have any kind of estimate of what that might look like?

Mr. Tom Burbage: It's all done government to government. I don't know what the total value of it is, but it depends on the number of airplanes a country buys. There's a certain increment attached to each airplane, which comes back to repay the development costs.

● (1655)

Mr. LaVar Payne: Thank you.

The Chair: Thank you.

Mr. Boughen, you have the floor.

Mr. Ray Boughen (Palliser, CPC): Thank you, Mr. Chair.

Let me add my voice to welcoming to you this afternoon, sir.

I have just one question. I'm thinking of the 3,000 to 5,000 aircraft that may well be built in this program and I'm wondering what you foresee as the in-service support for these aircraft, not only in Canada but elsewhere.

Mr. Tom Burbage: The government office is going through what they call a sustainment baseline review right now, with participation from all the countries. They're looking first of all at what's required to support the global fleet: how many warehouses we need, how many maintenance repair facilities we need, and how many training centres we need.

Then they look at what each country wants to do. Not every country wants to have a training centre. One of Canada's aspirations is to have a training centre. So will Canada eventually be able to train the pilots of other nations in your training centre? That's an example.

All of those decisions are part of what's going on right now to determine what that baseline is. Another one is maintenance repair and overhaul. Is there a chance that the facilities put in place in Canada could be used for other nations' equipment, not necessarily the whole airplane, but for example, maybe the landing gear?

As I say, all of that is being put in place now. What they want to do first of all is identify the minimum-cost infrastructure that could be put in place, tempered by each nation's sovereign requirement of what it wants to do or have for its own aircraft, tempered further by what else comes outside of that and which you would want to pay for, and do, because you don't necessarily want to take part in somebody else's facility.

We're going through those steps right now, which will determine the facility laydown, so to speak, for the global solution. Anything Canada wants to do above and beyond that relative to maintenance repair, depot work, and trainers is all still at the disposition of Canada, as a sovereign nation, to determine.

Mr. Ray Boughen: Thank you, Chair.

Hon. Laurie Hawn: Do we have time?

The Chair: Thank you.

Yes. You can take two minutes.

Hon. Laurie Hawn: I just want to follow up on that a little bit. We're talking about the next generation of technology for Canadian industry. You alluded to it, to the other opportunities that will fall out of this. This is the stepping stone to what comes after this. Could you expand on that a little bit from your knowledge of the aerospace industry in general?

You mentioned composites and that sort of thing. Down the road, are there other opportunities that might follow in the electronics area or composites or anything else?

Mr. Tom Burbage: The two areas that are really emerging in our industry right now are high-speed machining, both hard and soft metals—titanium or aluminum—and advanced composites, which are not done the way we used to do composites; they're done with robotic machines and things like that.

As we build those parts for this airplane, we've had to change the standards of the industry, and Canadian industry has stepped up, a lot of it due to the partnership with Technology Canada and SADI, and the kinds of programs that you put in place to lead that. One of the reasons you have the horizontal tail for the air force airplane and outer wing for the navy airplane is that you do that well. That capability is required in the emerging commercial market for the A380 and the 787, and whatever comes beyond that.

If you look at the electronic systems that we're putting in the airplane, one of the most amazing mechanical systems is what we call the integrated power pack, a large portion of that made by Honeywell Canada. That will now define the next generation of integrated systems that manage large airplanes.

I think all of these things that are being put in place to support the F-35 will be able to expand into adjacent markets beyond the F-35. We take no credit for that. It's just another advantage for being part of this revolution that's going on.

Hon. Laurie Hawn: But it would be pretty easy to conclude that this step we're taking with the F-35 is critical to what comes after that. If we're not part of that step, it's going to be hard to be with the next step.

Mr. Tom Burbage: As I said in my remarks, right now I don't see any program that is recapitalizing the aerospace and defence industry other than this one.

Hon. Laurie Hawn: Thank you.

The Chair: Thank you.

I'm going to give the floor to Mr. Bachand for three minutes.

[*Translation*]

Mr. Claude Bachand: Mr. Burbage, I want this to be clear. With respect to the $12 billion worth of economic spinoffs, are you basing your calculation on 3,000, 4,000 or 5,000 platforms?

[*English*]

Mr. Tom Burbage: We calculate our industrial estimates based on the U.S. and the partner procurement. The number we've been using is about 3,100 airplanes. The partners sometimes change their numbers. Last year, Canada changed from 80 to 65. Some changes are occurring within those numbers. As those numbers change, the number moves a little bit, but our calculation is based on roughly 3,100 airplanes.

● (1700)

[*Translation*]

Mr. Claude Bachand: Thank you very much.

What do you say to Eurofighter which claims that, in a computer-simulated combat scenario with the support of an airborne warning and control system, four Eurofighter aircraft can beat eight F-35s in combat? If that isn't true, could you provide us with the results of your simulations? Have you done simulations?

[*English*]

Mr. Tom Burbage: We don't do simulations. Our government does simulations. The U.S. Air Force, U.S. Navy, and U.S. Marine Corps do simulations. I'm sure they'd be happy to show you their results with the Eurofighter.

Mr. Claude Bachand: Would you intervene in my favour—

Some hon. members: Oh, oh!

Mr. Claude Bachand: —to the government to ask them for their simulations or...?

Mr. Tom Burbage: Like I said, that's a government-to-government issue. Your government can certainly see those.

In fact, we don't develop our capabilities in a vacuum. Your pilots have spent quite a bit of time in Fort Worth flying in our simulators in an advanced-threat scenario that you wouldn't fly today's airplanes in.

[*Translation*]

Mr. Claude Bachand: Fine, thank you.

Also, I don't know whether you read the article that appeared in *Bloomberg Businessweek* yesterday, but it mentions that the American Senate and Congress have cut the budget for the purchase of 43 jets. They have limited the number to 13 jets for now, until the testing is done. Did you read that article?

[*English*]

Mr. Tom Burbage: I don't know if you've got the numbers right with what she said.

I didn't, but I worked my Congress just like I'm here today, and I've been with all four of the defence committees. There is a position that's been taken by one of the committees to reduce the number from 42 to 32—not to 13, but to 32.

Mr. Claude Bachand: Okay. Well, they say 13 here. I'll show you the article after this.

Mr. Tom Burbage: *Bloomberg* is often—

Mr. Claude Bachand: Off the mark?

Mr. Tom Burbage: It often has a problem.

Some hon. members: Oh, oh!

Mr. Tom Burbage: It's 42 and 32, okay, and there's a conference that will occur between the committees that will decide the final number. That has not been decided yet.

[*Translation*]

Mr. Claude Bachand: In the article, it says that the F-35 program is four years behind. Can you confirm that?

[*English*]

Mr. Tom Burbage: I don't know how to measure that. I don't know what dates they're referring to.

Have we had some delays in the program? Yes, we have. They've been well publicized. We went through a year-and-a-half engineering review to reduce the weight on the STOVL airplane. That added time to the original schedule.

I don't recognize the number of four years. I've seen it in their writing, but I don't know what they're referring to.

But there is no delay on the Canadian airplanes, I can tell you that for sure.

The Chair: Thank you very much.

I will give the floor to Mr. Harris for two minutes.

Mr. Jack Harris: Thank you, Mr. Chairman.

On the issue of sustainment, last week we had two representatives of aerospace unions to testify and they were very concerned, obviously, about their members and jobs. But they talked about sustainment and keeping the planes in the air. It was very important to them, as I think it is to probably many Canadians from a sovereignty point of view, that if there are airplanes, if we buy them, the work on keeping those planes in the air would be done in Canada.

Is there anything in your program that would take away from that? Could some other company get the contract from you folks? Or are there other issues with respect to access to all the software data and the language? Are there any restrictions on your program?

Mr. Tom Burbage: All those are codified in government-to-government agreements and they are fully known to the Ministry of Defence. There are no restrictions to maintaining the airplane in Canada. Canada is a sovereign nation. Canada wants to maintain its own airplanes. There is not a problem with that.

Mr. Jack Harris: With respect to the codes, all the codes for software, is that kept by the American government or is it available to the partners?

Mr. Tom Burbage: There is a spectrum of activity in there. This is a very highly integrated and fuzed weapons system. I don't think Canada, as a military, as an MOD, has a desire to be able to change that code unilaterally, because now it's a unique airplane, but they will have the access they need. Such discussions will take place between the governments. We're not part of them. I'd be happy to answer the question if I knew, but we're not part of those discussions. They are government to government.

But there will be no restrictions on the Royal Canadian Air Force or Canadian industry maintaining the airplane in Canada. It does not have to go back to the United States to be worked on or anything else.

Mr. Jack Harris: These words “fifth generation” have been thrown around a lot. Some of your competitors—and I grant that they are competitors—have suggested that this is more a marketing device than anything else. Have you folks tried to trademark the name “fifth generation”? Was that one of your efforts?

● (1705)

Mr. Tom Burbage: I think we may have, a couple of years ago, yes, with the F-22.

Mr. Jack Harris: Were you successful?

Mr. Tom Burbage: I can't answer. I don't even know. I don't follow that side of it.

Mr. Jack Harris: If you were, nobody else could call their product “a fifth generation airplane”, isn't that correct?

Mr. Tom Burbage: Well, they call themselves “4.75”, “4.9”, and “5.1”. They're all around us, but nobody actually uses “fifth generation”.

Mr. Jack Harris: They're not allowed to say five because you guys have a trademark on it.

Mr. Tom Burbage: I don't know. I still hear them use it, but—

Mr. Jack Harris: Okay.

Mr. Tom Burbage: May I make a response to that? My response would be that I don't think you would see this level of investment in this technology if those airplanes were at the same capability.

The Chair: Thank you.

I will give the floor to our last member, for two minutes.

Mr. Hawn.

Hon. Laurie Hawn: Just to follow up on that, Canada, the U.S., Australia, England, Denmark, Norway, the Netherlands, Italy, Turkey, and Israel are all pretty highly advanced countries. We all have budget limitations. It would be pretty odd if all 10 of those countries examined their requirements with similar constraints and all 10 countries came to the same conclusion. I would call that more than a coincidence, wouldn't you?

Mr. Tom Burbage: Yes, sir.

I think the countries have sophisticated ways of analyzing this technology and this capability, and they have all decided in favour of it.

Hon. Laurie Hawn: Yes, and we all hire pretty expensive people to examine these things at a very high level of classification, which is not.... There's a very small number of people, relatively speaking, who can read into the full capabilities of this program and of your airplane—

Mr. Tom Burbage: Correct.

Hon. Laurie Hawn: —so from a pure business point of view, if you were hiring these people and paying them a lot of money to advise you, do you think it would be prudent to listen to their advice?

Mr. Tom Burbage: I do.

Hon. Laurie Hawn: Yes.

Thank you.

The Chair: Thank you very much.

I want to thank all members.

Thank you, Mr. Burbage, for your participation in our committee. I think you answered a lot of the members' questions. Thank you very much. It was very useful for us.

That ends our meeting number 37. Our next meeting will be next week. We're adjourned.

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