BIS OXFORD ECONOMICS

THE BAE SYSTEMS ECONOMIC CONTRIBUTION OF THE HAWK AND F-35 SUPPORT PROGRAMS

OCTOBER 2020

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October 2020

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Hawk support

$152 million

Total contribution to GDP by 2022-23

Direct contribution to GDP of $83 million and 350 jobs by 2022-23.

870

Total jobs sustained by 2022-23

This study examines the economic contribution of BAE Systems' support programs for two of Australia's key aviation assets: the Hawk Lead-In Fighter (LIF) and the F-35 fighter jet.[1]

First introduced to Australia in 2000, and based at Williamtown, NSW and at Bullsbrook, WA the Hawk LIF is an advanced two-seater jet trainer. BAE Systems is responsible for ensuring that these aircraft are maintained in keeping with Royal Australian Air Force (RAAF) requirements. BAE Systems has been maintaining and upgrading these aircraft since they commenced RAAF service in 2001. The fleet was originally planned to be operational until at least 2026, although there may be potential to extend this further to 2036.

In addition to ongoing support for the Hawk LIF, BAE Systems is also responsible for assigned roles in sustaining the RAAF's new fleet of F-35 fighter jets, also based at Williamtown, and regional support roles in the Asia Pacific region for some of the global F-35 fleet. The F-35 platform represents one of the most advanced fighter aircraft in the world and sustaining it will require a unique blend of complex technical skills. With 21 jets currently at Williamtown, the fleet will grow to 72 by 2024. There is also potential for Australia to order an extra 28 F-35 aircraft by 2030 to replace the F/A-18F Super Hornets, growing the fleet to 100. Accordingly, the support program may run until planned withdrawal of the aircraft in 2054. There is also potential to extend the support program up to 2070, beyond the life of the RAAF fleet, bearing in mind that the global F-35 fleet is expected to operate until then.

F-35 support

$120 million

Total contribution to GDP by 2025

Direct contribution to GDP of $70 million and 360 jobs by 2025.

750

Total jobs sustained by 2025

Both the Hawk and F-35 support programs will provide jobs and support activity across the local, NSW and Australian economies for years to come. Accordingly, this report quantifies the economic contribution of BAE Systems' Hawk and F-35 support programs, both in the recent past (financial year 2019-20 for the Hawk and calendar year 2019 for the F-35) and near future (financial year 2022-23 for the Hawk and calendar year 2025 for the F-35). It assesses both the direct contribution to jobs and GDP in those years as well as the total economic footprint of the programs (including supply chain and consumer spending effects) at the state (NSW) and national levels and a variety of broader effects including productivity, skills and educational development.

The Hawk support program already makes an important contribution to the local, NSW and national economies and one which is anticipated to grow in future years. By 2022-23 the program will employ some 350 workers directly and a total of 870 workers across the country after the "ripple effects" of supply chain and consumer spending are allowed for. This indicates an employment multiplier of 2.5. For every 10 workers employed on the Hawk support program, 25 will be employed across the country as a whole (including the 10 direct employees). Likewise, the program will directly generate $83 million in GDP by that year, with a total GDP contribution across the country of $152 million.

[1] Note that this report refers to the economic contribution of BAE Systems' support for these platforms only. It excludes economic contributions which may be made by other entities (eg Lockheed Martin in the case of the F-35).

While the F-35 support program is currently in its early stages, by 2025 it will contribute some 360 jobs directly and some 750 in total across the national economy (an employment multiplier of 2.1). Likewise, the program will contribute $70 million in GDP in that year directly, rising to $120 million once its full economic footprint across Australia is taken into account.

Both programs also make longer term and broader contributions to the local, NSW and national economies.

Both are highly productive, which reflects staff skills, and the use of advanced plant and machinery. The productivity of the Hawk support program's employees, as measured by GDP per employee is projected to be 35% percent higher than the national average in 2025, while the F-35 support program is projected to be 11% higher.

Innovative solutions to complex problems have been pursued across both programs resulting in improved efficiency on key aircraft components and improved supply chain management.

In addition, both programs have been active in supporting small to medium enterprises in their local region as well as across Australia. The Hawk program currently purchases from 168 businesses across its supply chain, of which 86 are SMEs, with 20 of those SMEs being located in the Hunter region. By 2025 the F-35 program will purchase from 76 companies across the country, with 22 being SMEs and 5 being SMEs located in the Hunter.

Both programs have also acted to foster skills and educational development across the country, state and, in particular, the local area. For example, more than 30 skill sets are required for F-35 support. Numerous links have been forged with primary, secondary, and tertiary educational institutions as well as business institutions in the Hunter region, aimed at creating a pathway for skilled jobs in the region. Together, the two programs will contribute nearly 600 jobs to the Hunter region (and, correspondingly, NSW) by mid-decade. Moreover, the long-term nature of these programs means these jobs will remain in the Hunter, in particular, for many years to come.

1. INTRODUCTION

BAE Systems is responsible for support to two of Australia's key aviation assets: the Hawk Lead-In Fighter (LIF) and the F-35 fighter jet.[2]

First introduced to Australia in 2000, and based at Williamtown NSW and Bullsbrook WA, the Hawk LIF is an advanced two seater jet trainer, designed to prepare student pilots for eventual conversion to aircraft such as the F/A-18F Super Hornet, EA-18G Growler and the F-35. Australia currently maintains 33 of these aircraft with 19 at RAAF Williamtown near Newcastle in NSW and 14 at RAAF Pearce at Bullsbrook near Perth in Western Australia. BAE Systems is responsible for ensuring that these aircraft are maintained in keeping with Royal Australian Air Force (RAAF) requirements. BAE Systems has been maintaining and upgrading these aircraft since they commenced RAAF service in 2001. The fleet was originally planned to be operational until at least 2026, although there may be potential to extend this (and the BAE Systems support program) further. Accordingly, this will mean support for jobs and the broader economy for years to come.

In addition to ongoing support for Hawk, BAE Systems is also responsible for assigned roles in sustaining the RAAF's new fleet of F-35 fighter jets, also based at Williamtown, and regional support roles in the Asia Pacific region for some of the global F-35 fleet. The F-35 platform represents one of the most advanced fighter aircraft in the world and sustaining it will require a unique blend of complex technical skills. Commencing in October 2019 with the arrival of the first two F-35 aircraft to Williamtown – with planned growth to 72 jets by 2024 and potentially 100 by 2030 – the current support program may run until the planned withdrawal of the aircraft by 2054. There is also potential to extend the support program up to 2070, beyond the life of the RAAF fleet, bearing in mind that the global F-35 fleet is expected to operate until then.

The F-35 support program will provide jobs and support activity across the local (Hunter), NSW and Australian economies for years to come with the 21 jets currently at Williamtown scheduled to increase to 72 by 2024[3]. There is also potential for a follow-on order for up to 28 additional F-35 aircraft to replace the F/A-18F Super Hornet fleet in about 2030. The regional support role addresses a much larger fleet of F-35 aircraft being operated across the Asia Pacific region, and that support could operate as far out as 2070.

This report quantifies the economic contribution of BAE Systems' Hawk and F-35 support programs. It assesses how these programs are contributing (in both direct and total economic terms) to jobs and GDP at the state (NSW) and national levels (as well as some key aspects of their direct contribution to the

[2] Note that this report refers to the economic contribution of BAE Systems' support for these platforms only. It excludes economic contributions which may be made by other entities (eg Lockheed Martin in the case of the F-35).

[3] For the purposes of this report, the Hunter region is defined as comprising of the following local government areas (LGAS): Port Stephens, Newcastle, Lake Macquarie, Maitland, Cessnock, Singleton, Dungog, Muswellbrook and Upper Hunter Shire. This is consistent with Australian Bureau of Statistics (ABS) SA4 level definitions of Newcastle and the Hunter Valley.

Hunter economy)[4]. It also examines a variety of other related issues including capital spending and employee skills. Finally, it also examines the longer-term contribution that the programs are making to the local, NSW and national economies through their productivity contribution, innovative approach to skills, technology and supply chains and their educational role.

MODELLING THE ECONOMIC CONTRIBUTION

The economic contribution of a company or industry is measured using a standard mode of analysis called an "economic contribution assessment". In this study, we model the contribution of BAE Systems support programs for the Hawk and F-35 platforms to the Australian and NSW economies. The report quantifies the three "core" channels of contribution that comprise the total "economic footprint" for each support program:

- **Direct contribution**— the economic benefit of each program's operations and activities in Australia and NSW;
- **Indirect (supply chain) contribution**— the economic benefit and employment supported in each program's supply chains, as a result of the procurement of goods and services; and
- **Induced (consumer) contribution** — the wider economic benefits that arise when program employees and those employed within their supply chains spend their earnings on consuming goods and services, for example in local retail establishments.

The sum of these three elements equates to the total economic contribution.

These contribution channels are illustrated in more detail in the Technical Appendix at the end of this document. From these channels, the two programs' total economic footprints in Australia and NSW are presented, using two key metrics:

- **GDP** — or more technically, the Hawk and F-35 support programs' Gross Value Added (GVA) contribution to GDP; and
- **Employment** — the total number of people employed (measured by headcount).

In addition to the core economic impacts, this report examines some of the **wider effects** of the company's services or products in boosting economic activity and developing capability elsewhere in the economy. Such benefits may arise from the investment that BAE Systems makes through the programs in the form of capital spending, technical innovation and education.

The modelling for this report estimates the economic footprint of the Hawk and F-35 support programs in financial year 2019-20 (for the Hawk) and calendar year 2019 (for the F-35). It also examines a single future year in respect of both programs (2022-23 for the Hawk and calendar year 2025 for the F-35). Economic contributions are quantified for the Australian economy as well as that of NSW. Some discussion of direct contributions in terms of employment and procurement is also provided for the Hunter region.

[4] Note that as the focus here is defined as support activity. This report does not consider the component manufacture work for F-35 carried out in South Australia, which is also managed by BAE Systems.

2. CONTRIBUTION TO GDP

This section of the report describes the contribution that the Hawk and F-35 support programs made to Australian and NSW GDP in financial year 2019-20 (for the Hawk) and calendar year 2019 (for the F-35) and are projected to make in financial year 2022-23 and calendar year 2025 respectively.[5] It details the different channels of contribution that make up the total economic footprint of both programs, their labour productivity, the industries they support and how their contribution is expected to grow in future years.

2.1 GDP CONTRIBUTION[6]

2.1.1 Summary contribution to Australia and NSW: Hawk and F-35

The figures below indicate the individual program contributions made to Australian and NSW GDP in 2019-20 and 2022-23 for the Hawk support program and in 2019 and 2025 for the F-35 support program.[7]

With the F-35 support program currently gearing up, the Hawk program currently accounts for a much larger GDP contribution than the F-35. However, by 2025 the F-35 will also emerge as a major contributor to GDP.

The sections below provide further details on the individual contributions made by the Hawk and F-35 support programs.

Fig. 1. Hawk support program: GDP contributions

Region	Direct	Indirect	Induced	Total
		2019-20 ($ million)		
Australia	78	16	35	**128**
NSW	57	7	22	**86**
		2022-23 ($ million)		
Australia	83	32	37	**152**
NSW	61	14	22	**97**

Source: BIS Oxford Economics

[5] Note that the term Gross State Product (GSP) is sometimes used for state level output. For purposes of convenience, this report uses the term Gross Domestic Product (GDP) to refer to both state and national output.

[6] All figures in this report are subject to rounding. All GDP figures have been rounded to the nearest million dollars. Unless otherwise indicated, all employment figures have been rounded to the nearest 10 employees.

[7] Note that these divergent reporting dates do not allow for the program figures to be added together for a single year. Hawk support program contributions are reported in financial years while F-35 support program contributions are reported in calendar years. This is consistent with the intention of examining these programs individually. However, the GDP contribution figures for both programs give a broad indication of their current and future significance, with the Hawk program making the more substantial contribution at present but the F-35 program also making a large one by mid-decade. Also note that the F-35 support program figures exclude F-35 manufacturing activity based in South Australia.

Fig. 2. F-35 support program: GDP contributions

Region	Direct	Indirect	Induced	Total
		2019 ($ million)		
Australia	7	5	5	**18**
NSW	7	3	4	**15**
		2025 ($ million)		
Australia	70	13	38	**120**
NSW	65	5	30	**100**

Source: BIS Oxford Economics

$152 million

Total contribution of Hawk support program to Australia's GDP in 2022-23

2.1.2 Hawk support program contribution: 2019-20 and 2022-23

In 2019-20, the Hawk support program directly contributed $78 million to Australian GDP and $128 million in total once indirect (supply chain) and induced (consumer spending) effects are taken into account.

Given that it is based at Williamtown, much of the impact of the program is felt within the NSW economy. In NSW, the program directly contributed $57 million to GDP in 2019-20, while the total economic contribution (including direct, indirect, and induced effects) was $86 million.

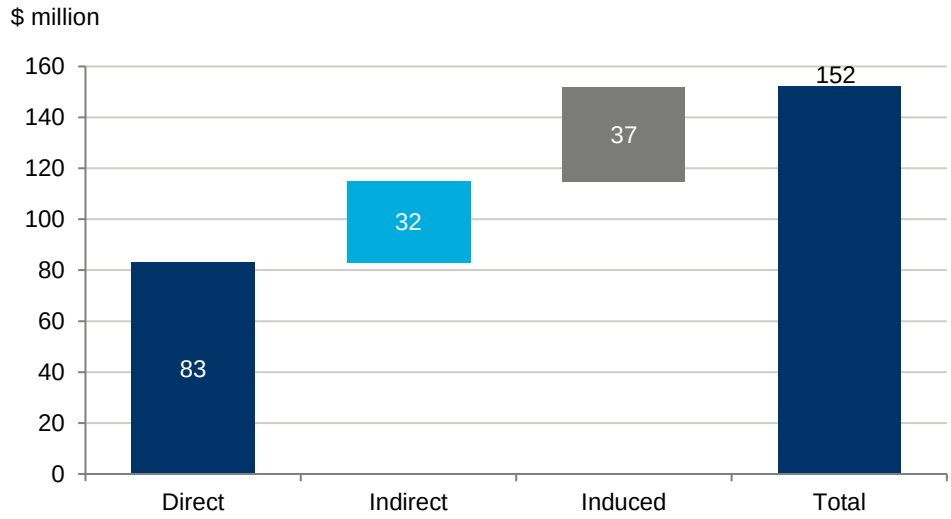
The program spent over $700,000 in recurrent spending and nearly $1 million in capital spending on Hunter suppliers alone in 2019-20, purchasing from 32 local businesses of which 20 were Small to Medium Enterprises (SMEs).

These figures are set to rise by 2022-23, mainly due to a projected increase in supply chain purchases. By that year direct benefits will contribute $83 million to national GDP, with indirect effects (due to supply chain purchases) totalling $32 million and induced effects (due to the spending of Hawk support worker and supply chain worker wages) accounting for $37 million. These combined effects equate to a total $152 million GDP contribution.

These impacts indicate that the Hawk program will have a GDP multiplier of 1.8 by 2022-23. This means that, for every dollar of GDP contributed by the program, the Australian economy will be boosted by a total of $1.80 (including the Hawk support program's direct contribution).

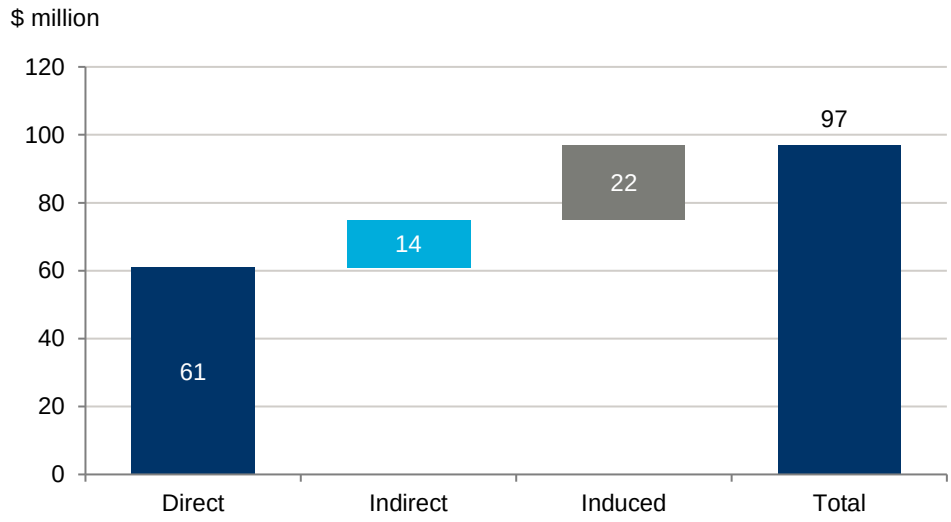
The equivalent figures for the NSW economy are $61 million in direct GDP contributions and $97 million in total. The figures below illustrate the GDP impacts of the Hawk support program in 2022-23 for the Australian and NSW economies.

Fig. 3. Hawk support program contribution to Australian GDP in 2022-23



Source: BIS Oxford Economics

Fig. 4. Hawk support program contribution to NSW GDP in 2022-23



Source: BIS Oxford Economics

2.1.3 F-35 support program contribution: 2019 and 2025

The F-35 support program is in its early phases, having been initiated in 2019. Nonetheless, in 2019 the F-35 support program directly contributed $7 million to Australian GDP, with total benefits – including direct, indirect (supply chain) and induced (consumption) effects – of $18 million.

As is the case for the Hawk program, much of the impact of the program will be felt within the NSW economy. In NSW, the program contribution in 2019 was $7 million, reflective of the fact all support personnel are currently based in Williamtown, while the total economic contribution – including direct, indirect and induced effects – totalled $15 million.

$120 million

Total contribution of F-35 support program to Australia's GDP in 2025

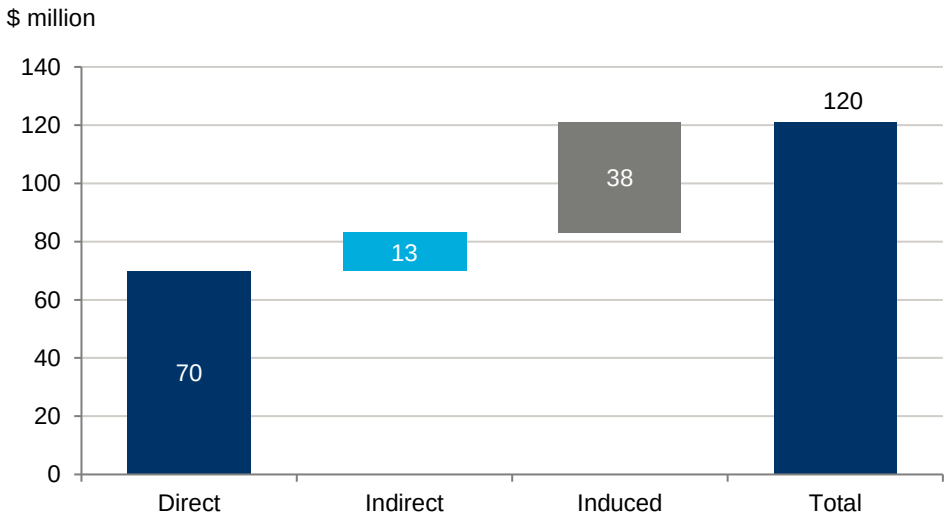
As with the Hawk support program, the local contribution of the F-35 support program is substantial. In this case, the program spent over $200,000 in recurrent spending and over $3 million in capital spending on Hunter suppliers alone in 2019, purchasing from 9 local businesses of which 5 were SMEs.

Given the gearing up of the F-35 program over the next few years, its contribution increases substantially. By 2025, direct impacts account for a $70 million contribution to GDP with a total contribution of $120 million across Australia. Of this, $13 million will be contributed through supply chain effects and $38 million through the spending of F-35 and supply chain worker wages (induced consumption).

This implies a GDP multiplier of 1.7 by 2025. For every dollar of GDP contributed by the program, the Australian economy will be boosted by a total of $1.70 (including the F-35 support program's direct contribution).

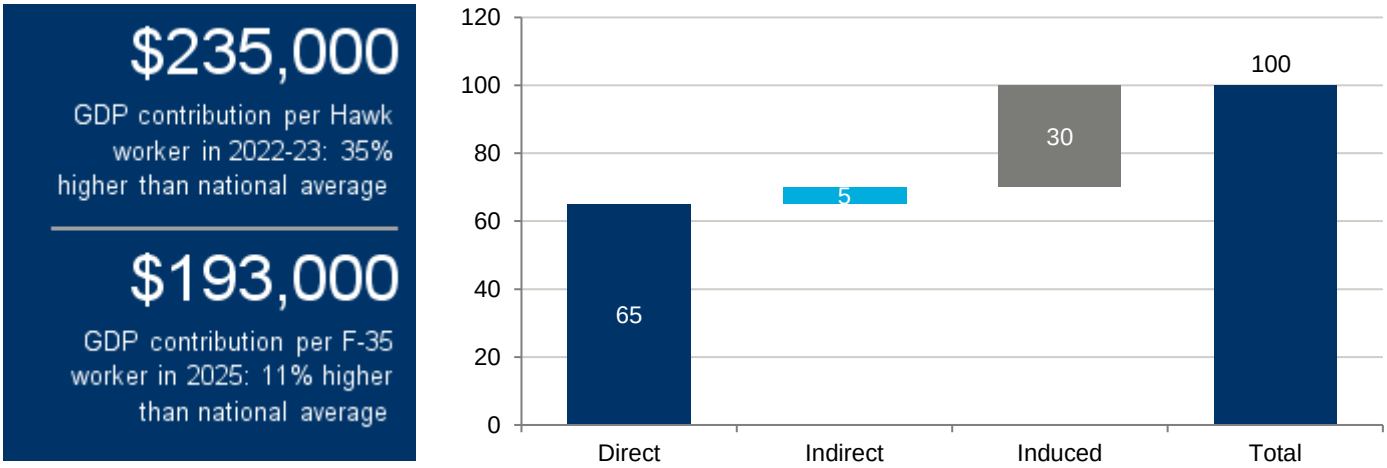
The equivalent figures for NSW economy in 2025 are $65 million in direct contributions and a $100 million total contribution to GDP. The figures below illustrate these impacts for the Australian and NSW economies.

Fig. 5. F-35 contribution to Australian GDP in 2025



Source: BIS Oxford Economics

Fig. 6. F-35 support program contribution to NSW GDP in 2025



Source: BIS Oxford Economics

2.2 LABOUR PRODUCTIVITY

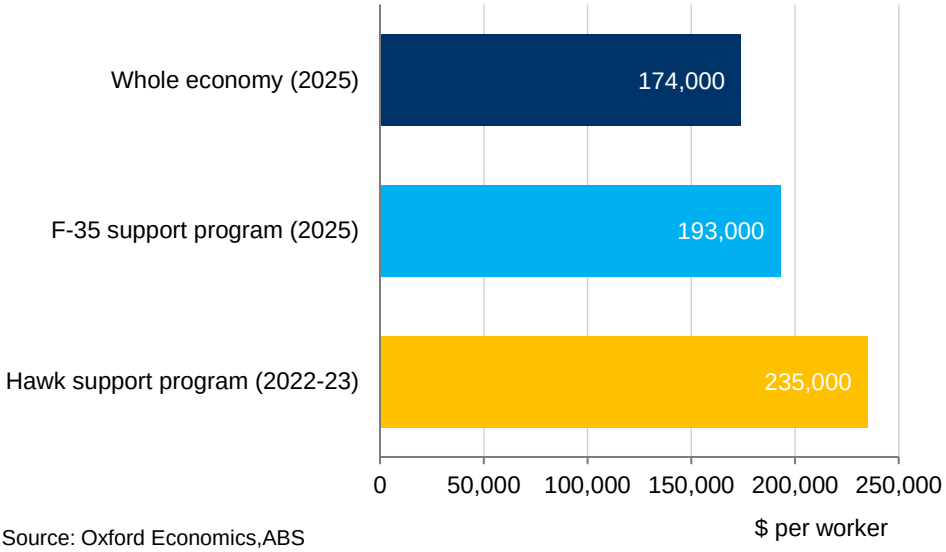
Both the Hawk and F-35 support programs enjoy high levels of labour productivity. Labour productivity is one measure of the quality of workforce skills and/or the use of capital equipment. Productivity, in turn, is one of the key drivers of wages, living standards and economic growth in the long term.

Labour productivity is measured here by assessing the GDP contribution per program employee. By 2022-23, the Hawk support program's GDP contribution will reach $235,000 per worker, while that of the F-35 program will reach $193,000 per employee.[8] Both of these will be substantially higher (35% and 11% respectively) than forecast labour productivity across the national economy as a whole by 2025 ($174,000 GDP contribution per employee).[9]

[8] The higher labour productivity of the Hawk program, as compared to the F-35 program, may reflect a mix of factors including the impact of built-up skills and experience in a mature program, which creates greater efficiencies over time as noted in the 'Wider Benefits' section of this report. Forward estimates for F-35 labour productivity may not (yet) include these factors as the program is still in its initial stages.

[9] The labour productivity value for the national economy is a forecast value for 2025, to give a single point of reference and is measured in nominal terms.

Fig. 7. Labour productivity of the Hawk and F-35 support programs and national economy (GDP per worker)



Source: Oxford Economics,ABS

2.3 SUPPLY CHAIN AND CONSUMER PURCHASING ANALYSIS

The above analysis can also be broken down to examine which downstream industries benefit from the Hawk and F-35 supply chain purchases (indirect effects) and support program and supply chain workers spending their wages on consumption (induced consumption effects). The focus here is on 2022-23 and 2025 for the Hawk and F-35 support programs respectively, when both programs will be well established.

2.3.1 Hawk support program

The Hawk support program sustains a large supply chain across Australia, producing economic activity in a range of sectors**.** The program's combined recurrent and capital spending on goods and services from Australian suppliers is projected to rise in 2022-23. Once the full supply chain effects are taken into account (i.e. suppliers purchasing from their suppliers and so on), this translates into a $32 million indirect contribution to GDP.

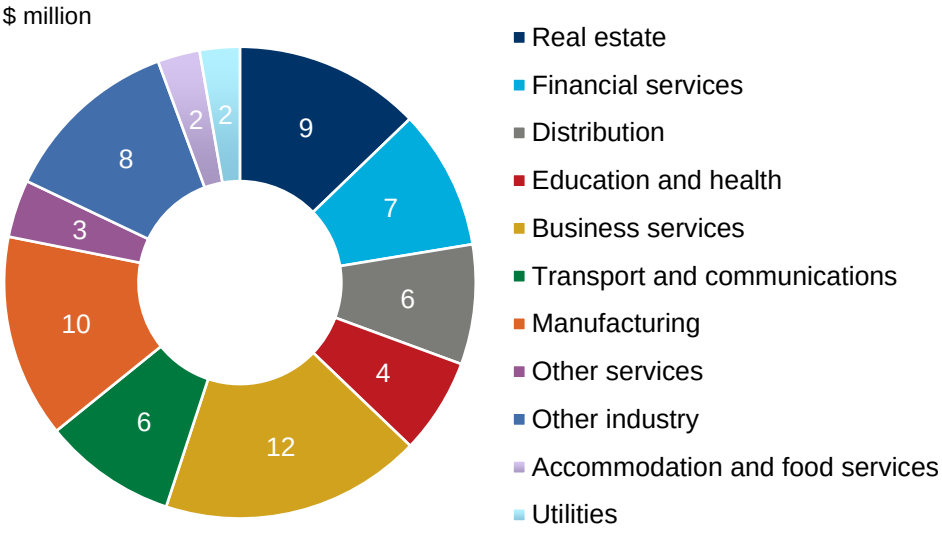
In addition, workers employed on the Hawk program and those employed on its supply chain spend their wages on a variety of goods and services, supporting other businesses and further contributing to the national economy. These induced consumption effects are estimated to contribute a projected $37 million to GDP across the country in 2022-23. The sum of these indirect and induced effects will amount to a $69 million contribution to GDP in 2022-23.

The supply chain and consumption spending can be further examined to determine which particular industries benefit from these ripple effects across the broader economy.

This analysis indicates that in 2022-23 the largest beneficiary is projected to be the business services sector, with a $12 million contribution to GDP. The next

largest economic contribution will come through the manufacturing sector ($10 million) followed by the real estate sector ($9 million contribution).

Fig. 8. Hawk support program indirect and induced contribution to GDP by sector in 2022-23



Source: BIS Oxford Economics

2.3.1 F-35 support program

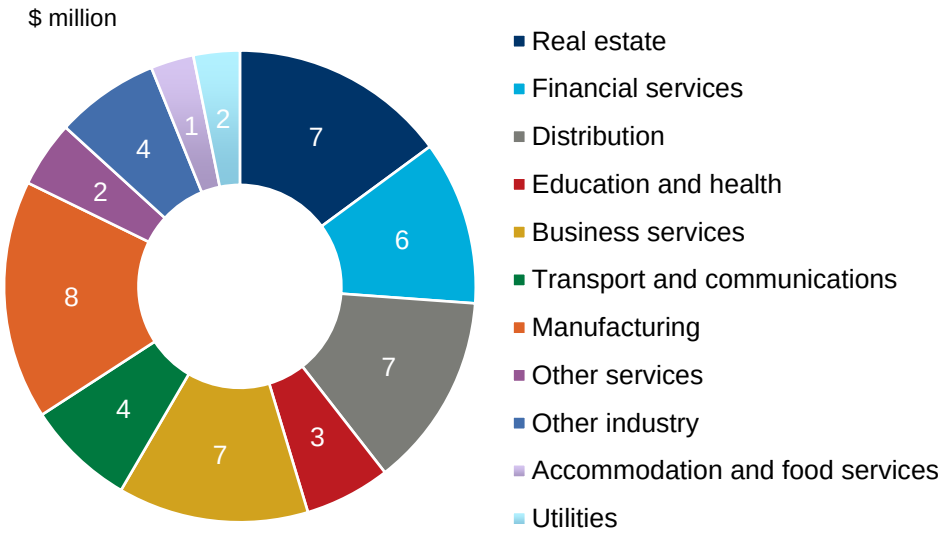
As is the case with the Hawk program, the F-35 support program sustains economic activity across Australia. This activity will grow substantially in future years.

By 2025, the support program's capital and recurrent procurement will contribute $13 million to GDP once full supply chain (or indirect) effects are taken into account. Adding to this will be $38 million generated through consumer spending (induced) effects. The sum of these indirect and induced effects will amount to a $50 million contribution to GDP in 2025.

By 2025, the largest beneficiary of F-35 support program purchases and associated consumer spending by F-35 and supply chain employees is estimated to be the manufacturing sector (an $8 million contribution). Other significant contributions are anticipated to be made to the real estate sector ($7 million) and the distribution (i.e. wholesale and retail) sector (a $7 million contribution to GDP).[10]

[10] These estimates are based on the most recent split (2019) of program spending, grossed up to 2025 values using total 2025 spending. While total figures are available, no disaggregation of purchasing by sector was available for 2025. However, it is likely that the broad nature of the procurement split would be similar to that in 2019.

Fig. 9. F-35 program indirect and induced contribution to GDP by sector in 2025



Source:BIS Oxford Economics

3. EMPLOYMENT SUPPORTED

Apart from GDP, the most obvious contribution the Hawk and F-35 support programs make to the economy – and to people's lives – is through employment. Accordingly, this chapter describes the employment impact of the two support programs both directly – in terms of BAE Systems employees – and across the Australian and NSW economies.

Figures presented in this section refer to employee headcount.

3.1 EMPLOYMENT CONTRIBUTION[11]

3.1.1 Summary contribution to Australia and NSW: Hawk and F-35

The figure below indicates the individual program contributions made to Australian and NSW employment in 2019-20 and 2022-23 for the Hawk support program and in for 2019 and 2025 for the F-35 support program.[12]

As is the case for GDP contributions, the Hawk program currently accounts for a much larger employment contribution than the F-35, as the latter is still in the gearing up phase. However, the employment effects of the F-35 program will increase markedly in future years.

Fig. 10. Hawk support program: employment contributions

Region	Direct	Indirect	Induced	Total
2019-20 (number of employees)				
Australia	350	120	250	**730**
NSW	260	60	170	**480**
2022-23 (number of employees)				
Australia	350	250	270	**870**
NSW	260	110	160	**530**

Source: BIS Oxford Economics

[11] All figures in this report are subject to rounding. All GDP figures have been rounded to the nearest million dollars. Unless otherwise indicated, all employment figures have been rounded to the nearest 10.

[12] Note that these divergent reporting dates do not allow for the program figures to be added together for a single year. Hawk support program contributions are reported in financial years while F-35 support program contributions are reported in calendar years. This is consistent with the intention of examining these programs individually. However, the employment contribution figures for both programs give a broad indication of their current and future significance, with Hawk making the more substantial contribution at present but F-35 also making a large one by mid-decade.

Fig. 11. F-35 support program: employment contributions

Region	Direct	Indirect	Induced	Total
2019 (number of employees)				
Australia	60	40	40	**140**
NSW	60	30	30	**120**
2025 (number of employees)				
Australia	360	110	270	**750**
NSW	340	40	220	**600**

Source: BIS Oxford Economics

The sections below provide further details on the Hawk and F-35 support program employment contributions.

3.1.2 Hawk support program: 2019-20 and 2022-23

870

Total contribution by Hawk support to national employment by 2022-23

For every 10 direct Hawk support employees, a total of 25 jobs will be supported nationwide.

The Hawk support program was responsible for contributing a total of 730 jobs across Australia in 2019-20. Of this, 350 were direct jobs working on the Hawk support program itself, of which 260 were employed in the Hunter (i.e. at Williamtown). Supply chain and induced effects across the country contributed a further 120 and 250 jobs respectively.

In terms of the NSW economy, the Hawk support program directly contributed 260 jobs in the Hunter region at Williamtown while the total economic contribution (including direct, indirect and induced effects) summed to 480 jobs in 2019-20.

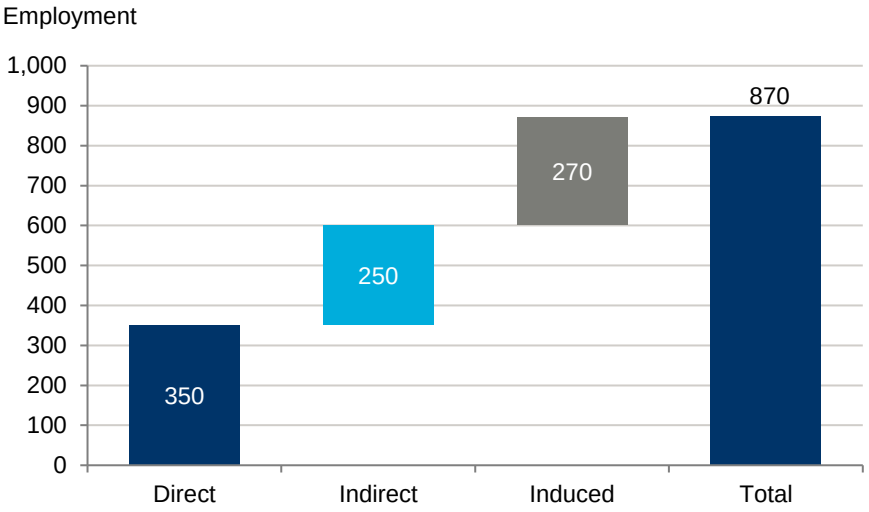
In 2022-23, employment at Williamtown and elsewhere in the country is expected to remain stable (at 260 jobs in Williamtown and 350 direct jobs in total). However an increase in procurement will drive further job gains across the country, with 250 jobs supported in the supply chain and 270 due to consumer spending effects for a total of 870 jobs across the country, taking into account direct, indirect and induced effects.

This means that by 2022-23 for every 10 people directly employed in the Hawk support program, a total of 25 jobs will be supported across the Australian economy (including the jobs directly employed on Hawk support); a jobs multiplier of 2.5.

In the case of the NSW economy, this activity will support 530 jobs across the State in total.

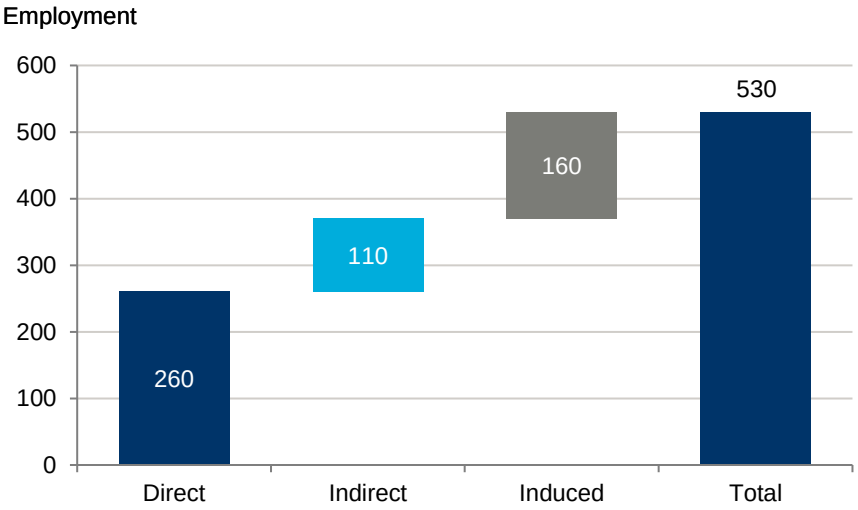
The figures below indicate these employment impacts for the Australian and NSW economies respectively.

Fig. 12. Hawk support program contribution to employment in Australia in 2022-23



Source: Oxford Economics

Fig. 13. Hawk support program contribution to employment in NSW in 2022-23



Source: Oxford Economics

3.1.3 F-35 support program: 2019 and 2025

While in its early stages, the F-35 support program employed some 60 people with BAE Systems at Williamtown in 2019. An additional 40 jobs were created through the supply chain across Australia while consumer spending by BAE Systems and supply chain employees produced a further induced contribution of 40 jobs across the national economy.

These figures rise substantially during the 2020s as the program reaches maturity. By 2025, it is anticipated that the program will directly employ 360

750

Total contribution by F-35 support to national employment by 2025

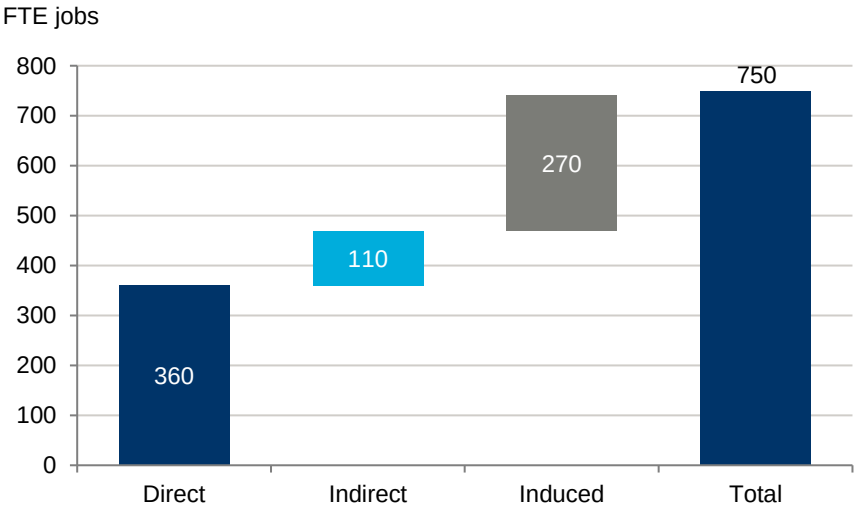
For every 10 direct F-35 support employees, a total of 21 jobs will be supported nationwide.

people (with 340 being based in the Hunter at Williamtown). The total (direct, indirect and induced) economic contribution to Australia will rise to 750 jobs in that year (110 contributed through supply chain effects, 270 through consumption effects). This indicates a jobs multiplier of 2.1: for every 10 personnel employed by BAE Systems on the support program, 21 will be employed across Australia (including BAE Systems employees).

Across the NSW economy specifically, the F-35 support program is estimated to directly contribute 340 jobs in the Hunter region at Williamtown by 2025, while the total State economic contribution (including direct, indirect and induced effects) will amount to 600 jobs in that year.

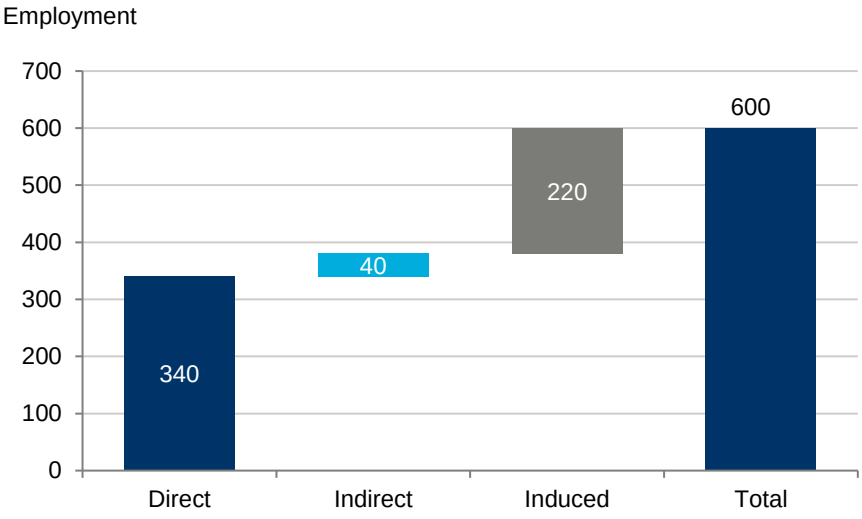
The figures below indicate these employment impacts for the Australian and NSW economies respectively.

Fig. 14. F-35 support program contribution to employment in Australia in 2025



Source: Oxford Economics

Fig. 15. F-35 support program contribution to employment in NSW in 2025



Source:BIS Oxford Economics

3.2 SUPPLY CHAIN AND CONSUMER PURCHASING ANALYSIS

As is the case for GDP, the above analysis can also be broken down to examine how jobs are contributed to downstream industries through Hawk and F-35 support program supply chain purchasing (indirect effects) and wage spending (induced effects). The focus here, once again, is on 2022-23 and 2025 for the Hawk and F-35 support programs respectively, when both programs will be well established.

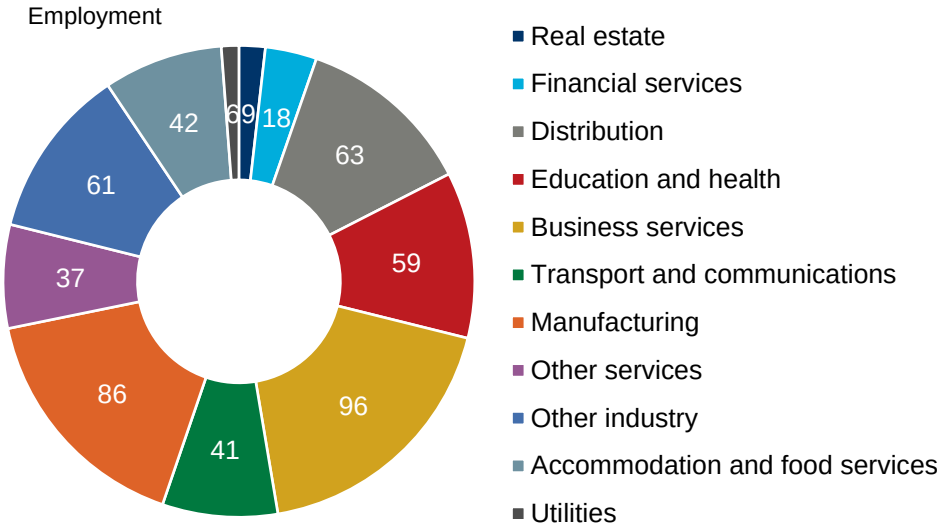
3.2.1 Hawk support program: 2022-23

520

Indirect and induced jobs sustained by Hawk support across Australia by 2022-23.

In addition to jobs directly sustained through the Hawk support program, spending across the supply chain (indirect effects) as well as consumer driven effects (induced effects) associated with the program are set to contribute some 520 jobs to Australia in 2022-23. The sector that will benefit the most is projected to be the business services sector, where 96 jobs will be supported by such spending. A further 86 jobs will be supported in manufacturing, while 63 jobs are projected to be supported in distribution (the wholesale and retail trades).

Fig. 16. Hawk indirect and induced employment supported, by sector, in 2022-23



Source: BIS Oxford Economics

3.2.2 F-35 support program: 2025

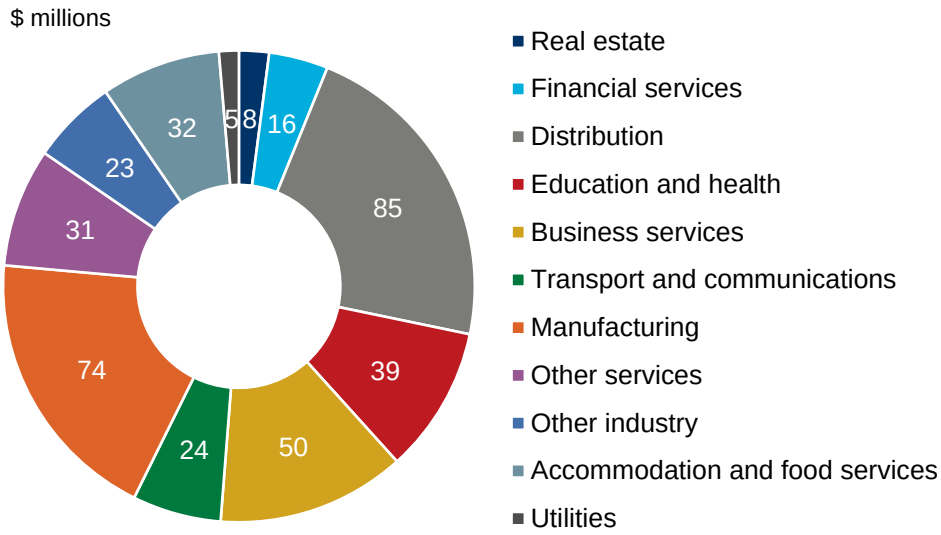
390

Indirect and induced jobs sustained by F-35 support across Australia by 2025.

In addition to the direct F-35 support program jobs, supply chain purchases and consumer spending associated with the F-35 support program contributed a combined total of some 80 jobs in Australia in 2019.

By 2025 these impacts will grow substantially, with total supply chain and consumer purchases associated with the program contributing a total of 390 jobs across the country. Key beneficiaries of spending in that year will include the distribution sector (85 jobs) manufacturing (74 jobs) and business services (50 jobs).

Fig. 17. F-35 indirect and induced employment supported by sector in 2025



Source:BIS Oxford Economics

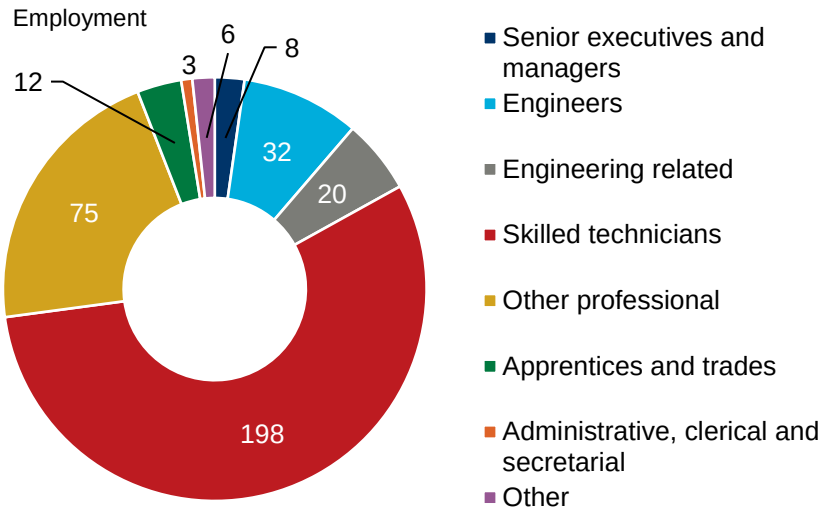
3.3 EMPLOYMENT STRUCTURE

The Hawk and F-35 programs both support a variety of highly skilled and professional roles. This contributes to the high levels of productivity in both programs. As indicated, high levels of skills and productivity in turn help drive the economy and living standards forward in the long term.

3.3.1 Hawk support program

In 2019-20, of the 350 staff employed on the Hawk support program, 198 (or 56%) worked in skilled technical roles, while 52 (15%) worked in engineering or engineering related positions. A further 83 (23%) worked in a range of managerial or other professional roles. The program also employed 12 apprentices in that year, helping in the transition from education to work in the Hunter.

Fig. 18. Hawk support program direct employment breakdown: 2019-20



Source: BIS Oxford Economics, BAE Systems

As indicated, of the 350 jobs in the program, 260 are based in NSW (and more specifically in the Hunter) at Williamtown.

It is anticipated that job numbers and roles will reflect a similar structure in 2022-23.

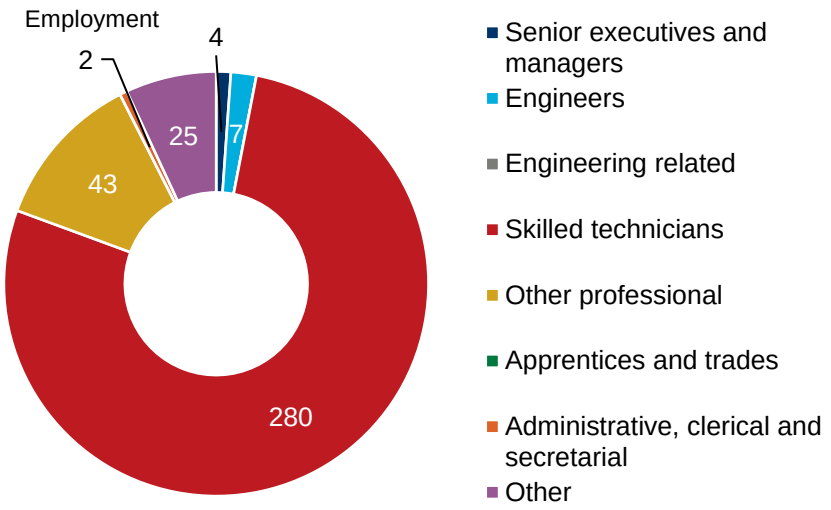
3.3.2 F-35 support program

While the F-35 support program currently employs 58 staff at Williamtown, this figure is expected to increase substantially in future years. By 2025, program staff are expected to number 360 (excluding staff involved in component manufacture work in South Australia).

Of the 360 jobs in the program that year, 340 will be based in NSW (i.e. at Williamtown), with the remainder based in the Northern Territory.

It is anticipated that 280 (78%) of the program's jobs will be skilled technical roles, 47 (13%) in managerial or other professional roles and seven in engineering positions.

Fig. 19. F-35 support program direct employment breakdown: 2025



Source: Oxford Economics, BAE Systems

4. WIDER EFFECTS

The Hawk and F-35 support program economic contributions described so far quantifies these programs' respective contributions at a given point in time. However, the programs also make broader and longer-term contributions to society at the local, state and national levels. These wider effects need to be considered in assessing the importance of the programs as a whole and are described below.

4.1 CAPITAL SPENDING

Both the Hawk and F-35 support programs will involve substantial capital expenditure over the course of their respective lifetimes. The Hawk support program involved the construction of specialist airside facilities shortly after program initiation in 2000, with continuing capital spending ever since. In 2019-20 this amounted to some $1 million.

Initiation of the F-35 support program has also been accompanied by substantial capital spending, with over $3 million spent in 2019.

This investment allows for the incorporation of new processes and technologies which, in turn, ensures the smooth operation of both platforms. Such spending also supports activity across the Hunter, NSW and Australian economies.

For example, construction of the Williamtown facilities for the Hawk support program allowed BAE Systems to undertake aircraft assembly, testing, integration and whole-life sustainment for the aircraft and also now provides such facilities for the F-35.

4.1 RAISING PRODUCTIVITY

In essence, productivity improvements can be thought of as doing the same (or more) with less. This matters because productivity improvements are what drive the economy forward (and raise wages, GDP and living standards across society as a whole) in the long term. The ways in which companies such as BAE Systems and the Hawk and F-35 support programs may improve productivity are detailed below.

Productivity improvements come in many forms. While better technology is an obvious one to many people, training and development of the workforce and the subsequent application of their talents creates a more skilled workforce which is able to adapt and develop solutions to complex problems. Better management of whole-of-program factors such as organisational management and the supply chain can also yield efficiency improvements. All of these factors may contribute to higher levels of productivity.

4.1.1 Improving technology and techniques

As indicated, BAE Systems employs highly skilled personnel along with making substantial investments in capital equipment. These investments in people, plant and equipment can help promote innovation and productivity.

The Hawk support program, in particular, has been active in innovative techniques and as such has been a notable contributor to BAE Systems' annual Chairman's Awards designed to recognise employee performance and innovation. Among the innovations of note are an improved design for the Hawk's pitot tubes (see the Case Study below). Also of note is the development of a virtual reality system by Australian technicians, helping to improve aircraft and engine maintenance performance along with the development of specialist maintenance equipment in cooperation with small to medium enterprises (e.g. specialist scaffolding). The extension of the lifetime of the Hawk platform itself has been assisted by improved maintenance techniques, extending Hawk service intervals and reducing total servicing costs.

In particular, the development of skills and knowledge on the Hawk program over the last 20 years has allowed for a reduction in the frequency of aircraft maintenance of nearly 38%. This has allowed for only 6 aircraft (out of a total of 33) being in maintenance at any one time (as compared to 9 previously). The use of critical chain project management (CCPM) has also helped to identify aircraft issues and organise maintenance efficiently. This approach has allowed technicians to choose aircraft which can be worked on most productively all at one time which avoids spreading resources across the Hawk fleet.

BAE Systems plans to adopt the same approach for the F-35 fleet.

More broadly, the Hawk support program is essentially managed through a partnership with the Commonwealth under the platform steward approach. So rather than undertaking individual contracts, BAE Systems provides a complete set of services (including all scope except the pilot training itself which is performed by RAAF pilots). This has helped produce double digit decreases in Hawk operational costs over its lifetime.

More efficient techniques have also been applied to logistics and supply chain management. These include the progressively expanded use of aviation specific software such as Ultramain (a suite of integrated planning, maintenance, and supply software). Ultramain allows for the application of mobile technology at the warehouse floor itself, helping to reduce errors and improve workplace efficiency by allowing staff to process warehouse requests directly from the shop floor. This helps improve inventory accuracy and cuts down on administration time. Aircraft maintenance is digitally transacted and recorded in Ultramain as well, building efficiencies in conducting, documenting and auditing maintenance activities and workforce productivity tracking.

Down the supply chain itself, a significant effort has been made to building relationships with Australian suppliers and developing direct procurement. This has produced significant savings for the Hawk support program and its development will likewise provide a benefit to the F-35 support program (see the Case Study below). Allied to this, implementation of CCPM has also assisted with timely aircraft delivery. In addition, life cycle cost (LCC) oversight has allowed for a focus on high cost drivers (typically 20% of items). This allows these drivers to be addressed, optimising the supply chain.

Suppliers themselves have benefited from their association with the two platforms. For example, Safran (an aviation equipment supplier) has benefited

86

Number of SMEs which Hawk support purchased from across Australia in 2019-20

46

Number of NSW SMEs which Hawk support purchased from in 2019-20

22

Number of SMEs which F-35 support purchased from across Australia in 2019

13

Number of NSW SMEs which F-35 support purchased from in 2019

from its long association with Hawk support, expanding its Bankstown (Sydney) facilities and giving them the capability to win new work with other clients due to its increased presence. The Hawk support program has also provided growth opportunities for GE Aviation, based in the Hunter, and has been active in assisting suppliers to get into the defence sector.

Moreover, substantial support has been offered to small to medium enterprises (SMEs) down the supply chain. 86 of the 169 businesses the Hawk support program purchased from across Australia in 2019-20 were SMEs with 46 of these NSW SMEs and 20 being SME's based in the Hunter.

In the case of the F-35 support program, some 22 of the 76 businesses purchased from in 2019 were SME's, 13 of which were located in NSW and five in the Hunter.

The development of the F-35 support program will create a body of skills that may see other users such as those in South Korea, Japan and Singapore come to Australia in search of expertise.

CASE STUDY: IMPROVING HAWK EFFICIENCY: PITOT TUBES

The Hawk LIF has a Pitot Probe (also known as a Pitot Tube) located at the front of the airframe to measure airspeed. It is important to monitor the condition of this critical piece of equipment and replace when required. The probe uses an electrical loom that feeds back through aircraft avionics bays.

Replacement of the tube previously involved a 3-person task, requiring some 8 hours to complete due to the complex routing of the loom. However, BAE Systems personnel at Williamtown developed an in-line connector to separate the loom from the probe, greatly reducing replacement time. In all, the innovation has reduced replacement time from 8 hours to 2 hours. This produced direct net maintenance savings of some 1,650 person hours or $90,000 (after allowing for the costs of the redesign). However, beyond this, the innovation allows for quicker turnaround of the aircraft to meet the flying program and contracted KPI requirements. Moreover, the streamlining of what was a complex and difficult operation reduces the risk of damage to structure and components during maintenance.

The innovation also produced broader benefits. It stood as a test case for engineering staff to determine an effective process of undertaking similar improvements to other aircraft systems and hardware. Moreover, the innovation had not been undertaken on Hawk aircraft anywhere else in the world. As such, this allowed BAE Systems engineers not only to demonstrate their talent for innovation but also providing a guide for other users, helping them to determine whether such an innovation could assist them.

CASE STUDY: MANAGING F-35 INVENTORY NEEDS

Managing the supply chain for the introduction of a new platform such as the F-35 is a complex task. While the F-35 support program has benefitted from the improved supply chain arrangements made under the Hawk support program (see next case study) it faces its own set of challenges.

In particular, managing the supply of General Use Consumables (GUCs) is integral to ensuring that aircraft are properly maintained and ready to fly. The approach to GUCs by BAE Systems' F-35 support staff at Williamtown has been singled out for its innovation.

The F-35 team adopted a program management approach to GUCs with notable success. The team had only a limited timeframe to adopt its supply chain procedures for GUCs prior to the arrival of the first F-35s in 2019. The adoption of a carefully phased approach to the implementation of a variety of supply chain improvements has ensured that GUC inventory is maintained and that aircraft operations are supported. Some 500 lines of GUC inventory were required to be sourced, procured, stored and delivered to support RAAF operations. The use of Ultramain systems (see main text) has also helped provide enhanced inventory arrangements and support best practice supply chain performance and reduce costs.

More broadly, the rapid and successful adoption of GUC management has built a high level of confidence in BAE Systems' support services with the defence customer.

CASE STUDY: IMPROVING SUPPLY CHAIN MANAGEMENT AND REDUCING LIFE CYCLE COSTS (HAWK AND F-35)

Ensuring a smooth supply chain which contributes to efficient and effective maintenance is integral to any aircraft support program. This is especially true for both the Hawk and F-35 support programs which involve the long-term maintenance of complex platforms and associated facilities.

One important innovation, mentioned in the main text, is in improving the effectiveness of the supply chain supporting these platforms. BAE Systems staff at Williamtown have been at the forefront of this since 2013, when a series of direct procurement procedures were introduced. These involved closer relations and improved communications and troubleshooting procedures with local Australian and overseas suppliers. This, in turn, has helped ensure the smooth running of the supply chain, improving turnaround times, and reducing costs. BAE Systems staff estimate that these improvements to supply chain management have allowed for decreases in turnaround time of some 40% and overall savings of some $2 million per year over the last eight years. The focus on building up a strong local supply chain and efficient management of that chain has also been consistent with supporting the Commonwealths' Australian Industry Capability (AIC) plan, aimed at building up Australia's sovereign defence capabilities through a stronger local industrial base.

To date, this approach to developing closer local supply chain relationships has seen both small and large companies providing in-country support including GE Australia, Airflite, Honeywell, Rockwell Collins, Safran, Pennant, Northrop Grumman, Airspeed and Varleys. This is particularly important as Australia transitions to a post-COVID-19 world in which international supply chains have come under considerable pressure, accompanied by geopolitical tensions. While these innovations were introduced for the Hawk support program they have also been adopted for the F-35, allowing that program to share in such benefits.

An important complement to improved supply chain management which has been implemented for Hawk, in particular, is the ongoing use of a Life Cycle Cost (LCC) model. The LCC provides ongoing reviews of the costs of the Hawk and allows for development of the most effective support model. Efficiencies produced by LCC implementation include:

- *Transfer of Radar Emulation pod* - to in-house repair, with significant cost savings.
- *Remote diagnostic testing* – developed with US vendors, this allowed for the overnight testing of Australian equipment using a US remote diagnostic test station. This allowed for a saving in shipping costs for no fault found (NFF) items.
- *Head down flight display replacement* – use of the LCC model determined that replacement of this unit was more cost effective then continued repair.
- *Generator reliability improvement program* – this involved work with the vendor to develop an upgrade program for the Hawk generator and associated control unit, as a result of cut-out affecting display systems. Investment by BAE Systems and the Commonwealth resulted in the replacement of 28 generators, a great improvement in aircraft reliability and producing considerable savings on repair costs.
- *Auxiliary Power Unit (APU) improvement* - with vendor modification leading to reliability and airworthiness improvements, as well as cost savings.

4.1.2 Contributing to the workforce and improving workforce skills

With the Hawk and F-35 support programs at Williamtown providing several hundred local jobs, BAE Systems is a key employer of skilled labour within the Hunter region. As indicated, the Hawk and F-35 support programs employ a variety of professionals – in areas ranging from aircraft maintenance engineers (AMEs) to finance, software engineering and management. In addition, the programs also offer employment to skilled tradespeople (typically TAFE Certificate II-IV) in areas such as sheet metalworking and technical trades). In addition, as noted above, BAE Systems also employs and trains apprentices, with links with local TAFE and other educational institutions (see below) helping to act as a feeder for jobs at Williamtown.

Apart from onsite training, particularly for apprentices and new graduates, the programs have also helped support aviation technical training to ADF aircraft technicians through the Defence Aeroskills Training Academy at RAAF Base Wagga.

In addition, the programs maintain close links with HunterNet, a network of manufacturing, engineering and specialist service companies located in the Hunter and Central Coast regions. HunterNet provides joint services such as joint training and development, marketing, and networking initiatives. This connection has assisted with apprentice training and staff skills development across both programs.

With the advent of the COVID-19 pandemic and the associated difficulties faced by the airline industry, BAE Systems has worked with Boeing and other local aerospace companies to offer employment to personnel formerly employed in the civilian aviation industry. This is particularly important given the major issues faced by the civilian industry and the need to find new roles for its skilled personnel.

This body of skills and knowledge is set to grow, bringing benefits to the Hunter, state and national economies. The Hawk program employs 52 people in engineering or engineering related roles with skills in complex areas such as structures, airworthiness and life extension. All up, over 30 different skill sets are utilised in the Hawk and F-35 support programs.

While the Hawk program and its workforce is relatively stable, the F-35 support program is set to expand into the 2020s. Skilled technician numbers for the F-35 support program are expected to grow from 32 today to an estimated 280 by 2025, with the overall F-35 support workforce expanding from 58 to 361. F-35 support employees have also been sent to the US to develop their engineering skills and their knowledge of the aircraft and its technologies.

The expansion of the F-35 program (including the development of new bays and painting facilities) will also offer support for regional employment – an issue of interest to both state and federal governments as they seek to stimulate jobs in a post COVID-19 environment. With an estimated 337 employees on the F-35 support program in the Hunter by 2025, combined with 260 Hawk support employees in the region (assuming steady employment to 2025), BAE Systems will employ some 600 local workers in the Hunter region supporting the two

platforms. This will make it one of the more significant employers in the Hunter and serve to enhance the regional skills base.

Moreover, the ramping up of the F-35 support program offers the opportunity to align a new generation of skilled labour to the defence industry. The local defence workforce is ageing and the recruitment of new employees for the program could potentially offer the opportunity for a lifetime career, with the F-35 platform potentially being supported for a period of 50 years, meaning long term benefits for the Hunter in particular. 12 apprentices are currently working on the Hawk support program (eight at Williamtown) with an additional three on the F-35 support program. Apprentice training typically involves some six months of hands-on aircraft specific training, where trainees get practical experience with aircraft maintenance. Some apprentices with Hawk support have also furthered their skills and gone on to engineering degrees.

The Commonwealth Government's Defence Industry Skilling and STEM support initiative has been important in helping BAE Systems invest in apprenticeship positions. NSW government support has also been important in supporting STEM funding in schools which, in turn, can provide a pathway to BAE Systems careers.

Moreover, apart from raising productivity across the nation, a more skilled and productive workforce also has other local benefits. This is because more skilled employees tend to be better paid. By employing and training skilled workers, the Hawk and F-35 support programs help contribute to higher wages in the Hunter. With both wages and employment facing challenges during the COVID-19 pandemic, and wage growth slow across the nation as a whole (even prior to the pandemic), this impact has become especially important.

4.2 EDUCATIONAL AND COMMUNITY LINKS

4.2.1 Links with educational institutions

The Hawk and F-35 support programs have forged links with TAFE NSW-Newcastle and the University of Newcastle, where an Aerospace Engineering degree has been established. These institutions act as a feeder for employment at Williamtown and for the two support programs specifically, helping to establish a smooth transition from education to skilled local employment.

More specifically, BAE Systems has partnered with Newcastle University through the Next Generation School and University Scholarship (NEXUS). This provides opportunities for aerospace students to attain placements into aerospace projects either during university vacations or for a year-long period during their university courses.

The company also supports Regional Development Australia's interactive STEM (iSTEM) subject in local Hunter schools, providing examples taken directly from industry for the iSTEM subject and work experience for students. Aeroskills has also been included as a subject in some Hunter high schools, leading to a pathway for a specialised trade certificate in the area. Ultimately, the F-35 support program is seen as an important potential employment

destination for many of these students with a big part of the program's personnel growth sourced from the Hunter. The F-35 support program therefore also offers the opportunity to develop and enhance STEM skills within the region.

Other activities include trade days for young people interested in defence or aviation careers and attendance at local career days.

4.2.2 Other community support

Other community initiatives include support for International Women's Day at Williamtown, as well as a drive to help women from poorer backgrounds re-enter the workforce, support for veterans through Soldier On Australia, and support for the local indigenous community through indigenous artwork programs.

5. CONCLUSION

Both the Hawk and F-35 support programs provide jobs and support activity across the Hunter, NSW and Australian economies.

The Hawk support program has been operating for a period of some 20 years and is anticipated to continue well into the 2020s. By 2022-23 the program will employ some 350 workers directly and support a total of 870 workers across the country after the “ripple effects” of supply chain and consumer spending are allowed for. For every 10 workers employed on the Hawk support program, 25 will be employed across the country as a whole (including the 10 direct employees). The program will also directly generate $83 million in GDP by 2022-23, with a total GDP contribution across the country of $152 million.

While the F-35 support program is currently in its early stages, by 2025 it will contribute some 360 jobs directly and some 750 in total across the national economy (an employment multiplier of 2.1). Likewise, the program will directly contribute $70 million in GDP in that year, rising to $120 million once its full economic footprint is taken into account.

Both programs also make longer term and broader contributions to the local, NSW and national economies. Both are highly productive, which reflects staff skills, and the use of advanced plant and machinery. The use of innovative solutions to complex problems and improved managerial and supply chain efficiency has contributed to these productivity outcomes.

In addition, both programs have been active in supporting SMEs in their local region as well as across Australia. The Hawk program currently purchases from 168 businesses across its supply chain, of which 86 are SMEs, with 20 of these SMEs being located in the Hunter region. By 2025 the F-35 program will purchase from 76 companies across the country, with 22 being SMEs and 5 being SMEs located in the Hunter.

Both programs have also acted to foster skills and educational development across the country, state and, in particular, the local area. Numerous links have been forged with primary, secondary and tertiary educational institutions as well as business institutions in the Hunter region, aimed at creating a pathway for skilled jobs in the region.

Together, the two programs will contribute nearly 600 jobs to the Hunter region by mid-decade. Moreover, the long-term nature of these programs means these jobs will remain in the Hunter region in particular for many years to come.

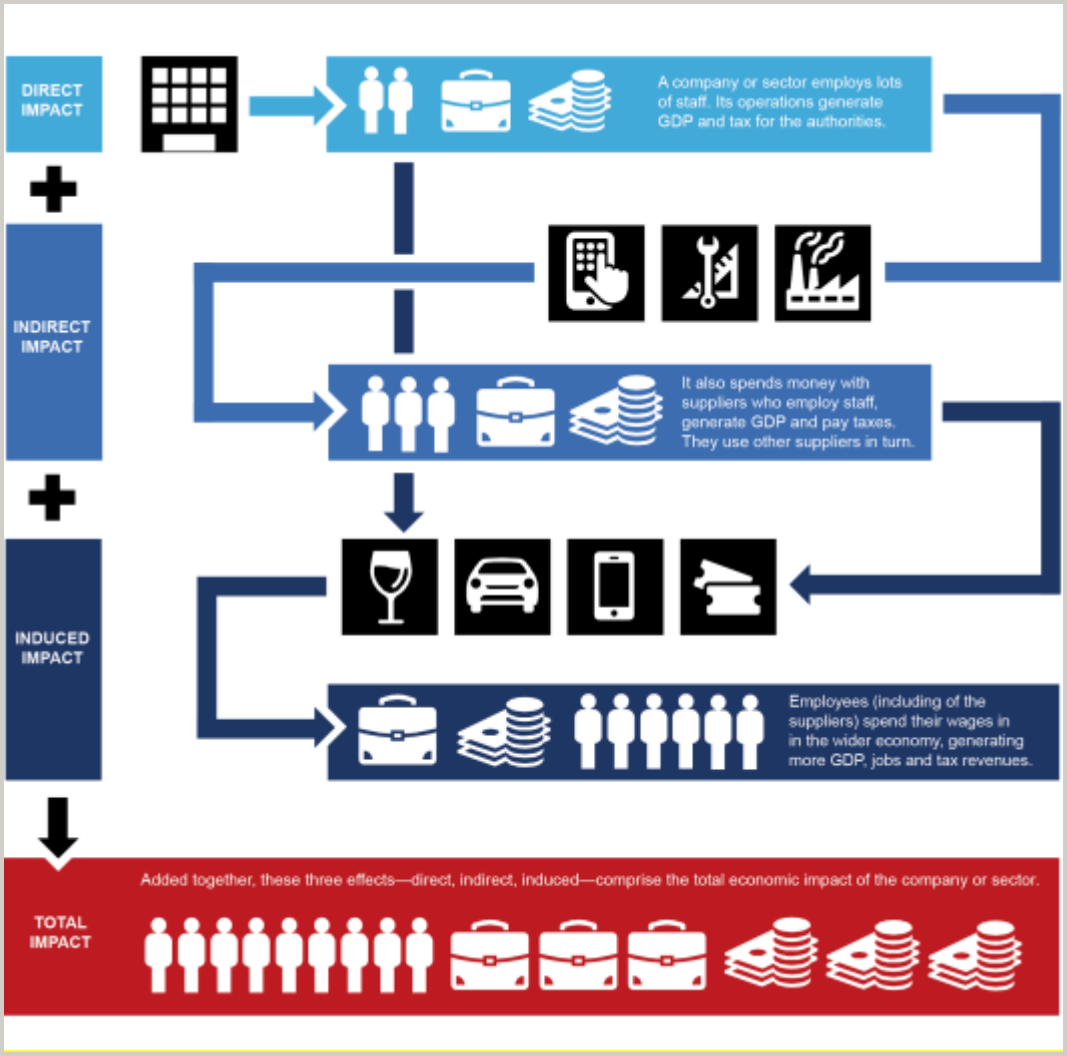
TECHNICAL APPENDIX

MODELLING THE ECONOMIC CONTRIBUTION

The analysis in this report utilises economic contribution modelling. This is a tool often used in order to assess the value of the economic contribution made by a business, industry or investment. The contribution that such an entity (or activity) has is analysed through three distinct channels:

- **Direct contribution** — includes all activities carried out by the Hawk and F-35 support programs themselves;
- **Indirect contribution**— concerns the procurement from suppliers (and subsequent rounds of procurement from their suppliers) for the Hawk and F-35 support programs). Both capital and recurrent purchases were included in the analysis; and
- **Induced contribution** — consists of the economic activity stemming from spending by direct and indirect employees of the Hawk and F-35 support programs.

Fig. 20. Structure of direct, indirect, induced, and total economic contribution



Direct Contribution

The direct contribution made to the Australian economy by the two programs is estimated using data provided by BAE Systems.

- **Gross Domestic Product (GDP) –** or more technically the Gross Value Added (GVA) contribution to GDP (but referred to as GDP, for simplicity, in this report). This is calculated as the total of the cost of employment (including wages, benefits and employee taxes), the Hawk and F-35 support programs' estimated EBITDA and other taxes on production. This relates to activity within Australia and therefore might not be the same as annual accounts figures which can follow different accounting rules and practices. Note that while GDP is sometimes referred to as Gross State Product (GSP) at the State level we refer to GDP throughout for simplicity.
- **Employment** - is estimated on headcount, based on the number of BAE Systems employees (including both full time and part time employees) on the Hawk and F-35 support programs.
- **Labour productivity** - is measured as the firm's GDP per employee.

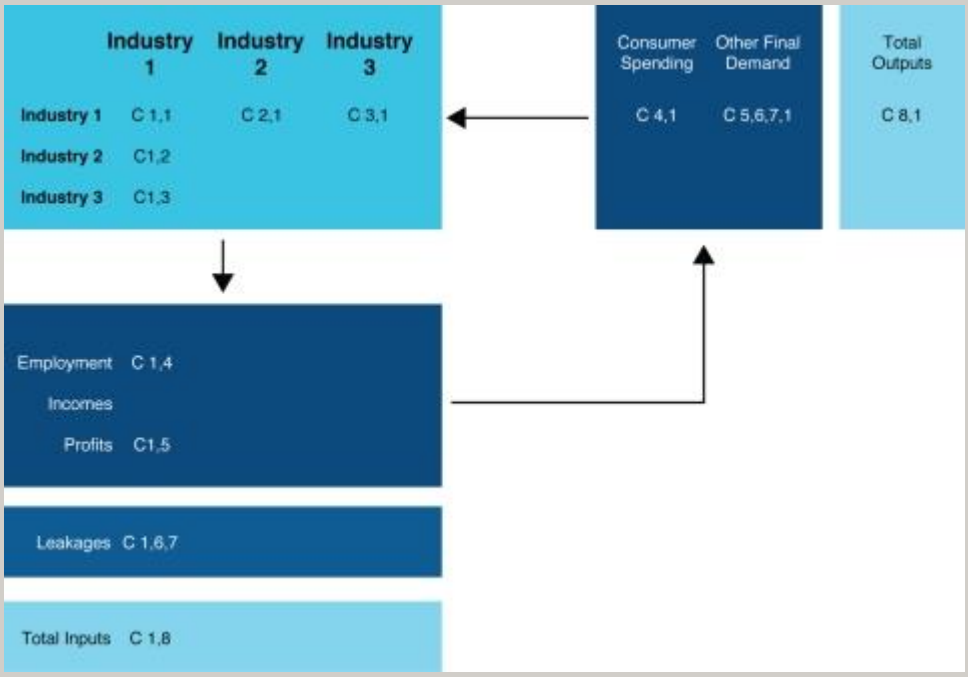
Indirect and induced contributions

The indirect and induced impacts that the programs make across the broader economy are estimated using an input-output model, which gives a snapshot of the interactions in the economy at a specific time. This details the spending flows which make up "final demand" (i.e. consumer spending, government spending investment and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other sector – the supply chain in other words); how much of that spending stays within the economy; and the distribution of income between employment compensation and corporate profits.

An input-output model uses a matrix representation of a nation's interconnected economy to calculate the effect of expenditure shocks by consumers or by an industry on other industries and therefore on the economy as a whole. The input-output model ultimately measures "multiplier effects" of an industry by tracing the effects of its inter-industry transactions – that is the value of goods and services that are needed (inputs) to produce each dollar of output for an individual sector. These models can be used to measure the relationship between an economic change or "shock," and the final outcome across the whole of the economy.

The figure below provides an illustrative guide to a stylised input-output model.

Fig. 21. A stylised input-output model



Oxford Economics constructed a series of specialised input-output (I-O) models to measure the contribution of the Hawk and F-35 support programs using Australian Input-Output Tables for 2017-2018, as published by the Australian Bureau of Statistics (ABS) (Cat No. 5209.0.55.001). These models were used to assess the impacts at the national level. In addition, a set of NSW state models was developed from this data using employment-based Location Quotients (LQs). LQs measure the relative specialisation of economic activity in a smaller region (i.e. NSW) relative to a larger economy (in the case of Australia).

Modelling for the Hawk and F-35 support programs was then carried out based on revenue, procurement, employment and other data supplied by BAE Systems. The respective models were “shocked” using these BAE Systems input data to produce the final results (outputs).

Modelling for the Australian and NSW economies was undertaken for financial years 2019-20 and 2022-23 in the case of the Hawk support program and calendar years 2019 and 2025 in the case of F-35.While the structure of the economy will inevitably change in the future, the modelling is intended to provide a broad-level indication of the scale and nature of the respective programs economic contributions.

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